SECTION 41

PROBABLE HYDROLOGIC CONSEQUENCES

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SECTION 41 PROBABLE HYDROLOGIC CONSEQUENCES

This section provides an assessment of the potential for adverse hydrologic impacts from proposed mining and reclamation at the Pinabete Mine Plan permit area (permit area). The primary focus of the probable hydrologic consequences (PHC) is to predict the effects of proposed mining and reclamation activities on the prevailing hydrologic balance with respect to the quality and quantity of water in surface water and groundwater systems both during mining and after reclamation. The PHC assessment builds on the baseline hydrologic and geologic information contained in the permit application package (PAP) and observations of hydrologic consequences of mining at the adjacent Navajo Mine. The PHC also couples those data with detailed SEDCAD™ 4 (SEDCAD) modeling of surface flows and sediment yields, spoil leaching test results, and groundwater flow and chemical transport modeling in order to develop projections about potential hydrologic impacts in the permit area.

Disruption of the geomorphic surface and underlying geologic strata together with the associated surface and groundwater flow systems is necessary in order to extract the coal resource by surface mining. Surface coal mining and reclamation operations may affect the hydrologic balance in a several ways, including:

- changing groundwater levels, recharge rates, and flow directions as a result of removal of geologic strata by mining and by backfilling mine pits with overburden and interburden materials;
- exposing unweathered mineral surfaces in the geologic strata to weathering processes during mining and backfilling operations;
- changing the water quality of alluvial groundwater due to changes in groundwater flow patterns, groundwater levels, and transport of groundwater from mine backfill
- changing the quantity and quality of surface runoff and stream flows due to disturbances from mining including construction and operation of diversions, sediment control structures, and other best management practices (BMPs);
- altering surface topography and stream channels during mining and reclamation; and
- modifying stream channel characteristics due to changes in the flows and sediment relationships downstream of mining.

The PHC is a process for identifying these potential changes in the hydrologic balance that may result from proposed mining and reclamation. The PHC also identifies the appropriate preventive and remedial measures required to minimize the impacts to water resources and water uses. Any unavoidable impacts on existing water uses and water rights must be replaced subject to existing state, federal, and Navajo Nation water rights laws. The PHC lays the groundwork for the monitoring plans described in Section 35 (Hydrologic Reclamation Plan) and Section 42 (Monitoring, Maintenance, Inspections, and Examinations).

41.1 Acid-Forming and Toxic-Forming Materials

The assessment of potentially acid- or toxic- forming materials (PATFM) indicates an overall net alkaline environment for overburden and interburden materials that will be removed during mining and used to backfill the mine pit. This assessment draws on the detailed characterization of overburden and interburden materials provided in Section 17 (Geologic Information). This section summarizes the results of overburden and interburden sampling and analyses performed within the permit area. Statistical analysis of overburden and interburden quality data is provided in Appendix 17.E. In summary, the sampling and analysis results show that there is no widespread occurrence of PATFM overburden or interburden materials within the permit area.

The characterization has identified some limited locations within the permit area, where the acid-base potential values within interburden intervals are outside the root-zone criteria limits. These locations are limited and the intervals are thin compared to the total thickness of interburden to be excavated during mining such that the mine backfill will remain net alkaline (Section 17, Geologic Information). The plans for removal and backfilling of interburden materials, that ensure adequate blending and mixing of these thin strata so that zones of PATFM will not occur within mine backfill, are described in Section 20 (Mining Operations) and Section 34 (Post Reclamation Topography).

The assessment of PATFM also draws on the detailed testing of mine spoils that are planned to be placed in the mine backfill to help achieve approximate original contour requirements for mine reclamation. Leaching tests of mine spoils are provided in Appendix 41.A and are summarized in Table 41.1-1. The relevant criteria used for interpretation of leaching test results include the livestock watering criteria in the Navajo Nation Surface Water Quality Standards promulgated by the Navajo Nation Environmental Protection Agency (NNEPA) (2008) and the livestock water quality criteria for total dissolved solids (TDS), sulfate and fluoride provided by Lardy et.al. (2008). The Lardy et.al. livestock use criteria are not enforceable standards for groundwater but are included as guidelines for suitability of groundwater supplies for livestock use.

These leaching tests included 18-hour batch leaching tests of composite mine spoils performed in accordance with the U.S. Environmental Protection Agency (USEPA) Synthetic Precipitation Leaching Procedure (SPLP, SW-846 Method 1312) and with the Synthetic Groundwater Leaching Procedure (SGLP). Also, the long-term leaching (LTL) procedure consisting of 45-day leaching tests was performed along with the standard 18-hour leaching procedure, in order to assess any changes associated with longer exposure to the leachant. The SGLP and the LTL procedure were developed at the Energy and Environmental Research Center (EERC) at the University of North Dakota and have been used for over 25 years to predict leaching behavior of solid waste materials under field conditions (Hassett et.al. 2003).

Composite spoil samples were obtained from Navajo Mine Area 3 in accordance with the regraded spoil sampling plan (Navajo Mine Permit Application Package, OSM Permit No. NM-0003F, Chapter 12) (BNCC 2009). A composite sample of coal seam water was comprised of equal proportions of water extracted from the No. 8 coal seam well KF2007-01 and from the No. 3 coal seam well KF98-02, located south and upgradient of the permit area. Two duplicate samples of the composite coal seam water were obtained and analysis results are presented in Table 41.1-1 as "Initial Coal Water Sample" and "Initial Coal Water DUP." The coal seam water sample was used for leaching the composite spoil sample for both 18-hour SGLP tests (Spoil Leachate 1 and Spoil Leachate 1 DUP) and a 45 day LTL test (Spoil 45-Day).

Synthetic precipitation was prepared in the laboratory and used as a surrogate for field site precipitation that could percolate through the spoil backfill and provide recharge to groundwater and potentially surface water discharge. The prepared solution is highly purified water with strong solvating properties. The water quality is presented in Table 41.1-1 under the heading "Initial Synthetic Precipitation". This synthetic precipitation sample was used in the 18-hour leaching test of spoil (Spoil SPLP) that was performed in accordance with the SPLP method

The leaching test results of mine spoils using both synthetic precipitation and site groundwater indicate that the pH of leachate remains neutral to alkaline. Thus, low pH values that are often a factor in enhanced trace metals transport would not occur within mine backfill. This finding is supported by data collected and conclusions reported for site wide geologic and hydrologic conditions in Section 17 (Geologic Information) and Section 18 (Water Resources), respectively. The synthetic precipitation leaching solution started with an initial pH of 5.0 and increased to a pH of 7.5 for spoil 18-hour batch samples. This indicates the buffering influence of spoil materials to slightly alkaline conditions. Based on the leaching test results, the concentrations of sulfate, calcium, magnesium, sodium, TDS, boron, and manganese are expected to initially increase in surface water infiltration or groundwater as they saturate mine spoils (Table 41.1-1). Nevertheless, the concentrations observed in mine spoil leachates are also within the range of concentrations observed in background groundwater within and near the permit area.

Fluoride, sulfate, and TDS concentrations were also above the relevant livestock watering criteria in background groundwater collected from Pictured Cliffs Sandstone (PCS), alluvial deposits, and the Fruitland Formation (Section 18, Water Resources). However, fluoride concentrations were attenuated in mine spoil leaching tests. These results showed fluoride concentrations dropping from 2.4 mg/L in the composite coal seam water used for leaching to concentrations of 1.6 and 1.5 mg/L in the in 18-hour and 45-day spoil leachates, respectively.

41.2 Probable Hydrologic Consequences During Mining and Reclamation Operations

The PHC relies heavily on baseline hydrologic information and focuses particularly on the water resources that need be preserved to support intended post-mining land uses. The detailed baseline groundwater and surface water information is presented in Section 18 (Water Resources) and is briefly summarized in this assessment.

41.2.1 Groundwater Changes During Mining and Reclamation Operations

BHP Navajo Coal Company (BNCC) has performed baseline monitoring of the groundwater quality of the alluvium in Pinabete and Cottonwood Arroyos. These results indicate poor water quality in the alluvium with TDS concentrations ranging from 1,500 to over 15,000 mg/L (Section 18, Water Resources). The alluvial groundwater in both Pinabete Arroyo and Cottonwood Arroyo is used for stock watering, although the TDS, sulfate, and fluoride concentrations in groundwater often exceed guidelines for livestock use (Lardy, et.al. 2008). Limited groundwater quality baseline data are also provided by Thorn (1993) for the Chaco River alluvium. The results indicate that the groundwater quality of the Chaco River alluvium is quite variable, with TDS concentrations ranging from 742 to 11,900 mg/L, sulfate concentrations ranging from 350 to 6,600 mg/L, and fluoride concentrations ranging from 0.4 to 1.7 mg/L. TDS concentrations in the alluvium generally increase from south to north, i.e. in the down gradient direction.

The groundwater resource within and adjacent to the permit area supports marginal stock water use. One stock water well (W-0345) is completed in alluvium of Pinabete Arroyo within the permit area (Section 18, Water Resources). Another stock water well (W-0343) is completed in the alluvium of a tributary to Pinabete Arroyo adjacent to the Burnham Road (Section 18, Water Resources). This well is recharged by an adjacent manmade pond and is equipped with a hand pump. Several livestock water wells are also completed in alluvium of Cottonwood Arroyo north of the permit area, within the alluvium of the Chaco River west of the permit area, and within the alluvium of Pinabete Arroyo south and east of the permit area (Section 18, Water Resources). The saturated thicknesses and yields at these alluvial wells are quite low and vary spatially and with time. The alluvial groundwater levels are sufficient to provide stock water via windmill driven pumps at several of the dug wells during normal and wet years. However, groundwater levels are generally too low to supply water to any of the dug wells during very dry years.

There are no water supply wells completed in the Fruitland Formation within or adjacent to the permit area and there is one stock water well (13-15-1), located south of the permit area that may be completed in the PCS (Section 18, Water Resources). However, the completion zone for this well is uncertain and the well has been capped and welded shut. The groundwater yields from wells completed in the Fruitland Formation and in the PCS, which underlies the Fruitland Formation, are quite low and wells are typically pumped dry during testing and well purging for sampling. Also, the water quality in the PCS and Fruitland

Formation is poor and is generally unsuitable for domestic use or livestock use (Section 18, Water Resources).

The potential impacts to the groundwater balance that are addressed in this section include:

- disruption of the Fruitland Formation by mining,
- pit inflows from the coal seams and the PCS,
- drawdown of water levels in the adjacent alluvial aquifers, the Fruitland Formation coal seams, and PCS due to mining within the permit area, and
- changes in groundwater quality resulting from mining and reclamation operations

41.2.1.1 Groundwater Quantity Changes During Mining and Reclamation Operations

41.2.1.1.1 Impacts to Alluvial Groundwater

Baseline information indicates that saturated conditions occur within portions of the alluvium of Pinabete Arroyo and Cottonwood Arroyo. Drawdown of water levels in the Fruitland Formation adjacent to proposed mining operations could result in drawdown of groundwater in the alluvium of the South Fork Cottonwood Arroyo. However, for this to occur, the saturated strata in the Fruitland Formation must be directly connected to the saturated alluvium. Based on the nested wells along Pinabete Arroyo, it has been shown that in some locations the saturation in the alluvium is perched above unsaturated bedrock and is not hydraulically connected with the saturated strata in the Fruitland formation. Nevertheless, there may be some locations along the South Fork of Cottonwood Arroyo where drawdown of alluvial groundwater levels could occur as a result of the proposed mining. Likewise, the mine pits at Navajo Mine may also induce groundwater flow from the Cottonwood Arroyo alluvium, which would temporarily diminish groundwater flow in the alluvium downstream of mining. There are two livestock wells in the Cottonwood alluvium down gradient of the permit area that could be impacted by temporary reductions in alluvial groundwater flow. Neither well is currently used for livestock watering. Well W-0618 (#35) is a collapsed well located near alluvial monitoring well QACW-2. Well QACW-2 was usually dry during baseline monitoring. Well QACW–2B (#126) is a dug well that was monitored by BNCC from 1986 to 1999 for baseline conditions. There was usually sufficient water in this well for sampling, but the groundwater at this well was found to exceed the recommended livestock use criteria for sulfate and TDS (Section 18, Table 18.2-11).

Drawdown of water levels in the Fruitland Formation adjacent to proposed mining operations are expected to have minimal impact on the groundwater in the Pinabete Arroyo alluvium. Perched alluvial groundwater was observed in nested wells along Pinabete Arroyo (Section 18, Water Resources), where the alluvium is closest to planned mining operations. Stock water well W-0345 is completed in the alluvium of Pinabete Arroyo at this location, but is not expected to be directly affected by proposed mining. Also, based on the perched groundwater in the alluvium at this location, proposed mining is not expected to result in a drawdown of groundwater in the alluvium. Nevertheless, the well is within the permit area so livestock use of water from this well will be temporarily suspended throughout mining and reclamation. Planned mining will directly disturb the stock water well W-0343, which is completed in the alluvium of a tributary to Pinabete Arroyo. Section 32 (Temporary Structures and Facilities Removal and Reclamation) describes the plans for abandonment of wells prior to mining.

41.2.1.1.2 Groundwater Level Drawdown in the Fruitland Formation and PCS

Open mining pits act as a drain to drawdown groundwater levels in the overburden/interburden and coal seams of the Fruitland Formation located adjacent to the pit. The amount of groundwater encountered during proposed mining is expected to be limited based on observations from exploration drilling and monitoring wells within and adjacent to the permit area Likewise, observations during mining at Navajo Mine Area 3 found that groundwater in the coal seams and overburden was insufficient to sustain pit inflows except on the south end of Dixon Pit adjacent to the Cottonwood Arroyo alluvium. There seepage from the highwall face in progressive strips has been sufficient to pool within the pit. At all other locations where seepage was observed along the face of the highwall, the seepage was removed by evaporation and did not pool within the mine pit.

The calibrated steady-state groundwater model of Area 4 North, Area 4 South and Area 5 of the BNCC's mining lease was used to simulate drawdown and recovery of groundwater levels during and after mining and reclamation (Appendix 41.B). The calibrated groundwater model was applied to perform transient simulations for mine pits advancing in 5-year increments as depicted in Figure 41.2-1. The first increment in the sequence represents planned mining within Area 4 North in accordance with the Navajo Mine PAP (BNCC 2009). The other five year mining blocks for years 1 through 25 are for planned mining within the permit area.

Figure 41.2-2 shows the 5-feet drawdown in the No. 3 coal seam after 5-years that was provided in the Navajo Mine PAP based on simulations of 1-year pit progressions for the planned mining within Area 4 North in that permit. This figure also shows estimated 5-feet drawdown in the No. 3 coal seam at the end of mining in Area 4 North in accordance with the Navajo Mine PAP based on model simulations using a 5-year pit progression. Figure 41.2-3 provides a similar comparison for the simulated 5-feet drawdown in the PCS the end of mining within Area 4 in accordance with the Navajo Mine PAP based on 1-year and 5-year mine pit progressions. These results show that the extent of the 5-feet drawdown is greater for the simulation using the 5-year mine pit progression as compared to the simulation using 1-year pit progressions. Five-year pit progressions are performed for the subsequent simulations due to the time and effort required to manually enter each change in the mine pit during the transient simulations. Furthermore, the drawdown projections using 5-year pit progression are considered to be conservative or worst-case projections of the extent of drawdown. The 5-feet drawdown in these figures that are based on simulations with the 5-year pit represent the estimated initial condition at the start of mining within the permit area for the subsequent model simulations of the proposed 25-year mine plan.

The estimated 5-feet drawdown in the No. 8 coal seam in Year 25 at the completion of planned mining in the permit area is provided in Figure 41.2-4. The corresponding 5-feet drawdown in the No. 3 coal seam and in the PCS at the completion of mining in Year 25 are provided in Figure 41.2-5 and Figure 41.2-6, respectively. The No. 8 coal seam is representative of the upper coal seams (coal seams 6 through 8) while the No. 3 coal seam is representative of lower coal seams (coal seams 2 through 4). No water supply wells are located in the Fruitland Formation within the study area. Thus, the expected drawdown in the Fruitland Formation during mining will not affect any existing or anticipated future use. Likewise, the projected drawdown in the PCS will not affect any existing or anticipated future use. The layer of shale separating the bottom of the lowest coal seam and the PCS should serve to restrict groundwater inflow from the PCS during mining. The thickness of shale layer varies and has been included in the geologic model that has been used to define the layers in the groundwater model. No noticeable upward seepage from the PCS through the shale has been observed in the mine pits at the Navajo Mine and at the San Juan Mine even though the potentiometric levels in the PCS are typically above the pit floor. Therefore, the projected drawdown in the PCS will not affect any existing or anticipated future use. Drawdown in the Fruitland Formation is also not expected to affect water levels in the Pinabete Arroyo alluvium because groundwater in Pinabete Arroyo alluvium is beyond the estimated 5-feet drawdown extent and the alluvial groundwater is perched above unsaturated bedrock (Figure 41.2-4 and Figure 41.2-5).

Although the model predictions are hypotheses based on current data that will need to be re-examined as mining and reclamation proceeds, the modeling results are useful in predicting the likely range of changes in hydrologic conditions and the likely time frames that might be associated with these changes. An uncertainty and error analysis has been included in the model simulations to provide indications of the likely affect of model error on the PHC predictions (Appendix 41.B). This PHC analysis of drawdown and recovery has relied on the best estimate for model parameters with sensitivity analysis adjustments in order to assess model prediction error and uncertainty in accordance with guidelines provided by the U.S. Army Corps of Engineers (USACE) (USACE 1999).

An error analysis on the effects of specific storage values for the various hydrogeologic units on the predicted extent of the 5-feet drawdown was presented in the groundwater modeling report (Appendix 41.B). The extent of the 5-feet drawdown was greater using the best estimates of specific storage of 2.8×10^{-5} per foot for the coal layers and 3.8×10^{-6} per foot for the non-coal layers as compared to the results using the FEFLOW default specific storage value of 10^{-4} per foot. Those results also showed that the drawdown extent in the deeper coal seams and the PCS was more sensitive to changes in the specific storage.

Additional error analysis was performed for this assessment to compare the extent of the 5-feet drawdown for the base case determined using the best estimates with four other scenarios performed with variations in backfill recharge rates, backfill hydraulic conductivity, Fruitland Formation hydraulic conductivity, and specific yield of units as outlined in Table 41.2-1. Sensitivity of the results to specific storage was not performed in this analysis but was included in the groundwater modeling report (Appendix 41.B). All but scenario 4 were modeled using the parameters from the steady-state baseline model calibration. In scenario 4, the hydraulic conductivity of the Fruitland Formation layers were increased by 5 times the values obtained from model calibration.

The 5-feet drawdowns at the completion of mining in Year 25 for scenarios 1 through 4 are provided in Figure 41.2-7 for the PCS, in Figure 41.2-8 for the No. 3 coal seam and in Figure 41.2-9 for the No. 8 coal seam. The drawdown results in the PCS and in the coal seams were similar to the results for the base case for all scenarios, indicating that predictions of drawdown extent are not sensitive to variations in backfill recharge rates, backfill hydraulic conductivity, and specific yield of non coal units. Previous results show that the extent of drawdown is more sensitive to the pit progression interval and the specific yield and specific storage of the coal seams.

The extent of drawdown was not sensitive to the hydraulic conductivity of the Fruitland Formation layers as indicated by comparison of Scenario 4 with the other results. However, the initial heads in this scenario were significantly different from the other scenarios and from the steady-state calibration targets. When model parameters values are changed from the calibrated values the model provides a poorer representation of hydrogeologic conditions and the model results may not be reliable. This demonstrates that the error analysis for model predictions should not focus on the calibrated model parameters. Instead, the model error analysis should address the error or uncertainty in the storage parameters used for transient simulations and the hydraulic conductivity and recharge values for the backfill as these parameters were not calibration parameters in the steady-state model.

Modeling results and model error analysis indicate that the extent of drawdown of potentiometric levels in the Fruitland Formation coal seams and in the PCS is limited, although the extent is sensitive to the time interval for pit progression and to the specific storage value for the coal seams and the PCS. The base case results are believed to provide an upper bound estimate of the extent of drawdown because they are based on a 5-year pit progression. The extent of drawdown in these units has limited adverse impact to existing or future groundwater use. Drawdown of water levels in the Fruitland Formation could also result in drawdown of water levels in the Cottonwood Arroyo alluvium at limited locations where the alluvium is hydraulically connected to the saturated portions of the Fruitland Formation at locations adjacent to the mine pit.

41.2.1.2 Groundwater Quality Changes During Mining and Reclamation Operations

Groundwater quality changes beyond the active mine area will be minimal during mining and reclamation operations. During active mining, hydraulic gradients and groundwater flow directions in the adjacent Fruitland Formation and within portions of the underlying PCS will be toward the mine pits and backfill areas. Thus, it is expected that there will be little change in the quality of groundwater beyond the limits of the mine pit and mine backfill during mining and reclamation operations.

The water quality in the mine backfill materials will evolve as these materials begin to resaturate with recharge from groundwater inflows from the adjacent Fruitland Formation coal seams and from the underlying PCS. Dissolved solids present in the pore water of mine overburden and interburden materials (spoil) that are removed and backfilled may be concentrated by evaporation during mining. Also, there may be some enhanced weathering of the minerals within the newly fractured and broken interburden strata that are exposed during mining.

The characteristics of the overburden and interburden in the permit area were determined from an extensive drilling, coring, and testing program described in Section 17 (Geologic Information). Test results include analyses of saturated paste extracts of overburden and interburden samples. McWhorter and Landers (1985) have found that the results of saturation extracts from overburden samples correlate well with the antecedent pore water that is displaced in the first flush from backfill material in column leach tests. Electrical conductivity (EC) in saturated paste extracts of overburden and interburden materials indicates considerable variability.

The average values from the various interburden layers indicate a general decline in EC with depth from the overburden layer (I8) above the No. 8 (S8) coal seam to the lowest interburden layer (I2) above the No. 2 (S2) coal seam as summarized in Table 41.2-2. Higher EC is observed in the shallower overburden above the No. 6 coal seam (S6) as a result of increased weathering and oxidation. The influence of weathering and associated EC values decreases with depth. The mean plus one standard deviation of the EC values for the interburden units I6, I7, and I8 located above the No. 6, No. 7, and No. 8 coal seams, respectively, of 4.2 to 5.2 mmhos/cm provides a reasonable range for the EC that might occur in the first flush of pore water from weathered mine spoils placed in the backfill materials. The EC estimate based on the mean plus one standard deviation is considered to be representative for weathered and oxidized backfill materials because it eliminates the lower EC values that may correspond with unweathered material in these interburden units. Assuming a TDS/EC ratio of about 700 based on coal and alluvial groundwater in the permit area and the EC in saturated paste extracts from weathered overburden, the TDS concentrations in initial mine backfill waters would be expected to be on the order of 2,940 mg/L to 3,640 mg/L within the permit area.

Resaturation of the mine backfill will develop from precipitation recharge, lateral inflow from the coal seams and interburden of the Fruitland Formation, and upward flow from the PCS. The summary in Table 41.2-3 provides spoil leaching test results for synthetic precipitation and for coal seam water. The TDS estimate of 1,200 mg/L for synthetic precipitation is thought to be too low for the initial mine spoils for the following reasons. First, the saturated paste test results from sampling of weathered overburden, as presented in Table 41.2-2, indicate TDS concentrations in initial mine backfill waters in the range from 2,940 mg/L to 3,640 mg/L. Also, the initial water source for the mine backfill will include much larger fractions of coal seam water and PCS water when water levels recover in the backfill. The TDS concentrations in these water sources will be considerably higher than the TDS concentrations leached from precipitation or in the SPLP leaching tests.

At the Navajo Mine, the TDS concentration in the representative coal seam water used for the leaching tests was 9,800 mg/L. The TDS leaching test results of two spoil samples using this coal seam water were 11,000 and 12,000 mg/L (Navajo Mine Permit Application Package, OSM Permit No. NM-0003F, Chapter 11, Table 11-14b) (BNCC 2009). These results are also reasonably consistent with the TDS concentrations of 12,000 and 14,600 mg/L observed in spoil-water monitoring wells in the Bitsui Pit, as indicated in Table 11-14a of the Navajo Mine PAP, Chapter 11 (BNCC 2009). The consistency between the leaching test and field monitoring results supports the use of the leaching test results using coal seam water to predict initial backfill water TDS concentrations at the permit area.

Although the TDS concentrations observed at the wells completed in the spoils at the Bitsui Pit at Navajo Mine were considerably higher than the TDS observed in spoil leaching tests using coal seam water from the permit area, the mine backfill water source at the Bitsui Pit at Navajo Mine is from water sources with higher initial TDS concentrations. These sources include the No. 8 coal seam water with TDS levels of 5,000 to 10,000 mg/L near the Bitsui mine pit and groundwater seepage from adjacent Navajo Agricultural Products Industry (NAPI) irrigation plots. The TDS in seepage from NAPI irrigation plots is not known and is likely to be quite variable. In some cases, the TDS in irrigation seepage approaches TDS concentrations in mine spoil water due to leaching of soluble salts from weathered and unweathered materials in the Fruitland Formation. In contrast, the TDS concentration in the coal seam water at the permit area is lower and on the order of 3,000 mg/L.

Leaching tests were performed on Navajo Mine spoils using synthetic precipitation and a composite sample of coal seam water as described in Section 41.1. All of the constituents in coal seam water that increased in concentration after leaching through mine spoils are summarized in Table 41.2-3. The test results for spoil leached with coal seam water are believed to provide the best estimates for the groundwater source concentrations for long-term post-reclamation transport modeling as discussed in Section 41.3.1.2.

41.2.2 Surface Water Changes During Mining and Reclamation Operations

Precipitation runoff from reclaimed areas might be reduced slightly from pre-mine levels due to lower slopes, enhanced vegetative growth from the use of better quality soils, engineered geomorphic drainage designs, and the use of other sediment-control BMPs that operate to retain water in the reclaimed areas.

41.2.2.1 Surface Water Quantity Changes During Mining and Reclamation Operations

Cottonwood Arroyo and Pinabete Arroyo will not be mined under the mine plan described in Section 20 (Mining Operations). Mining operations will temporarily intercept precipitation runoff from the tributary drainages that flow into the Cottonwood Arroyo and Pinabete Arroyo from the permit area. No stream diversions are anticipated to the needed for the proposed mine plan. The upgradient areas that drain to the mine pits are quite small and will either be intercepted by the mine pit or captured in temporary pit protection ponds located up gradient of mining. Precipitation runoff collected in the pit or in the pit protection ponds may be utilized for dust suppression, other mine needs, or will naturally diminish from evaporation and seepage (Section 25, Sediment Control Plan). Once reclamation is completed within the permit area, precipitation runoff from these reclaimed areas will flow through reclaimed channels to Cottonwood Arroyo, Pinabete Arroyo, and the unnamed tributary to the Chaco River and then into the Chaco River (Section 35, Hydrologic Reclamation Plan).

SEDCAD modeling was performed to evaluate peak flows and storm volumes under pre-mine, operational, and post-reclamation conditions on Pinabete Arroyo, Cottonwood Arroyo, and the unnamed tributary to the Chaco River. This tributary is located south of Cottonwood Arroyo and north of Pinabete Arroyo and drains an area of about 0.45 square miles on west side of the permit area (Exhibit 41.2-1). SEDCAD is a commercially available software package with routines derived from the Natural Resources Conservation Service Technical Release No. 55 (NRCS 1986). Application of the SEDCAD program involves subdivision of the drainage Area into subwatersheds and establishment of a linked network of routing between the watersheds. Designation of subwatersheds with relatively uniform surface characteristics enhances the application of model assumptions and improves the estimation of results. SEDCAD calculates the runoff response to a given precipitation event for specific surface topography, soil, and vegetative cover conditions. Curve numbers were assigned to subwatersheds based on their soil and cover characteristics. Information is designated for physical characteristics of channel segments that may affect flow-routing within channels. A medium hydrologic response class was utilized on all model runs. The 2-year, 10-year, 25-year, and 100-year 6-hour (100yr-6hr) events were modeled with SEDCAD. Pre-mine modeling may be reviewed in Appendix 18.B. Operational and post-reclamation modeling may be reviewed in Appendix 41.C and Appendix 41.D, respectively.

Prior to reclamation, BNCC plans to contain all mine disturbed area drainage in the mine pit or in designed runoff containment structures. The bermed containment structures and the mine pit function to contain the runoff from a 100yr-6hr precipitation event or larger. During reclamation, sediment ponds are designed to retain at a minimum the volume of runoff from a 10yr-24hr plus addition volume for sediment storage. Sediment ponds are used to contain and treat water until approval is obtained for use of alternative sediment controls in accordance with 40 CFR Part 434 Subpart H. This subpart applies to alkaline mine drainage from reclamation areas, brushing and grubbing areas, topsoil stockpiling area, and regraded areas at western coal mines. It allows operations to employ alternative sediment controls that are established in accordance with a sediment control plan that is designed to prevent an increase in the average annual sediment yield from pre-mined undisturbed conditions.

Peak flows and runoff volumes to Pinabete Arroyo and to Cottonwood Arroyo will be reduced during operations with worst-case projections shown in Table 41.2-4. The worst-case results in this table are based on no discharge up to the flows from a 100yr-6hr precipitation event from the mine area. Full containment of surface runoff over the entire mine area is unlikely to occur as some of the sediment ponds on reclaimed areas may discharge during precipitation runoff for events greater than a 10yr-24hr event and some areas may be approved for use of alternative sediment controls before containment systems are constructed for all of the planned mine disturbance area.

It is anticipated that Stevenson's Well Pond will be mined through along with Pond 4N/4S and one unnamed pond located within the northwest portion of the permit area on a tributary to Cottonwood Arroyo (Exhibit 18.1-2). Pond 4N/4S and the Stevenson's Well Pond are located on tributaries to Pinabete Arroyo. There are no surface water right filings within the permit area, although there may be occasional use of these ponds by livestock when water is available. Section 41.4 provides further discussion of the potential short-term and long-term impacts to surface water sources that may be used for livestock and wildlife in the permit area.

41.2.2.2 Erosion and Sediment Yields During Mining and Reclamation Operations

Under baseline conditions, sediment in the Chaco River, Pinabete Arroyo, and Cottonwood Arroyo is derived from a variety of natural sources, including:

- erosion of soils on the hillsides, particularly from badland areas;
- erosion from roads and disturbed areas; and
- erosion of bed or banks of the stream channels.

The erosion, sedimentation, and landscape evolution in semiarid drainage basin systems is unique in comparison with fluvial systems in more mesic environments. Several studies of basin sediment yield in the Southwest have found that channel incision and stream-bank erosion of alluvial channels contribute the majority of the total sediment yield from the drainage basin (Rosgen 2001). Ultimately, however, the primary source of the sediments in channel erosion is surface erosion from the contributing watershed. Sediments delivered to the valleys from the hill slopes and first-order drainage swales are typically carried only short distances within ephemeral streams during storm flow events. Sediments stored within the ephemeral stream valley result in progressive steepening of the valley slope. Also, ephemeral streams often deposit fans of material upon entering a larger valley with lower valley slopes. These fans of material can extend across the valley from the mouth of tributary drainages, resulting in convex valley segments. This deposition of sediments continues until flushing of the sediment takes place by gullying (Schumm et.al. 1980).

Thus, gullying and channel instabilities are common natural features in arid and semiarid landscapes. The cycle of incision and filling is called arroyo evolution (Schumm et.al. 1984; Gellis et.al. 1991). Arroyos are incised channel systems that carry large volumes of sediment during ephemeral flow events. Following channel incision, an arroyo evolves through time from a narrow, V-shaped gully with low width-to-depth ratios to a wide U-shaped channel. Sediment deposition and channel aggradation increase with the increase in channel width. With channel aggradation, a floodplain and small channel system develop within the wide U-shaped channel. Channel aggradation within the ephemeral stream valley results in steepening of the valley slope that continues until channel incision occurs with a repeat of the cycle of arroyo evolution. The stage within the arroyo evolution cycle varies spatially along an ephemeral stream valley, with channel incision occurring within some segments and channel aggradation occurring in other segments. This process of arroyo evolution with segments of channel incision and head cutting and segments of channel aggradation is a common phenomenon throughout the Southwest and is evident in the unnamed tributary to Chaco located on the west side of the permit area and in the reach of No Name Arroyo between the Burnham Road crossing and its confluence with the Chaco River.

Section 25 (Sediment Control Plan) provides a description of the plans and measures to be taken to control sediment and erosion during surface coal mining and reclamation operations. While these measures prevent additional contributions of suspended solids to stream flow outside of the permit area, these activities will not function to prevent the natural off-site erosion and stream channel evolution processes that currently exist downstream of the permit area.

BNCC will route all disturbed area runoff to sediment ponds or implement alternative sediment controls, as described in the sediment control plan in Section 25. Sediment ponds and BMPs for sediment control will stay in use through bond release period or until demonstrations that runoff from the disturbed areas will not contribute quantities of suspended solids greater than those generated pre-mining. Water management techniques, as described below, will reduce the impact of mine disturbance on off-site sediment transport to surface waters down gradient of the permit area. A National Pollutant Discharge Elimination System

(NPDES) Multi-Sector General Permit (MSGP) Sector H, Stormwater Pollution Prevention Plan (SWPPP) will be maintained during the construction and operational phases of mining and reclamation. This SWPPP will be maintained and available to the regulatory authority for review at the mine site.

Mine development will be initiated with the establishment of transportation features. Maximum road disturbances will be surveyed and storm-water BMPs will be employed. These may include but are not limited to the use of silt fences, rock check dams, straw wattles or fiber logs, straw bales, and soil berms between the disturbed area and down gradient channels or adjacent undisturbed areas. Topdressing materials will be salvaged and placed in protected stockpiles aligned and shaped to minimize wind and water erosion. Protection will consist of a drainage berm around the base of the stockpile and the surface stabilized to prevent the loss of topdressing material and the additional contribution of sediment from these stockpiles. Refer to Section 22 (Support Facilities) and Section 25 (Sediment Control Plan) for additional control measures and the operation of stockpiles.

Road construction will include the establishment of road fill embankments and associated road drainage structures, such as culverts across drainage swales and road ditching adjacent to primary roads. Diversion ditches may be established above road cuts to minimize flow across the cut. Berms, ditches, or downdrain pipes will be installed along the groin of road fills to safely pass water from the crest of the embankment to the toe. Energy dissipating BMPs will be utilized to control velocity at outlets of culverts, along steep slopes associated with embankments, and in areas exhibiting visual evidence of down cutting. Further discussion on road design and sediment and drainage control plans is found in Section 23 (Roads), Section 25 (Sediment Control Plan), and Section 26 (Drainage Control Plan).

Temporary sediment control will also be utilized during the construction of sediment ponds, most often through the use of containment berms, silt fences, or straw waddles. Suitable topdressing materials will be removed from areas disturbed for sediment ponds and ditch construction and placed in topdressing stockpiles (Sections 20, Mining Operations; Section 22, Support Facilities; Section 25, Sediment Control Plan; and Section 36, Post-Reclamation Soil).

Sediment ponds will be engineered to retain either a 10yr-24hr or 100yr-6hr storm event plus additional storage for sediment (Section 26, Drainage Control Plan). Spillway outlets will be armored with riprap, if necessary, to reduce erosive velocities during discharge. Sediment ponds will be used within the permit area to capture and/or treat surface water runoff from disturbed areas, including mine spoils, areas undergoing topdressing stripping, ancillary support facilities, and other disturbed areas within the permit area. Runoff from some of these disturbed areas may be intercepted by the active mine pit. Excess water in the mine pit during large storm events may be collected in pit sumps and pumped to one or more of the sediment ponds or managed as described in Section 25 (Sediment Control Plan).

Coal will be hauled by truck on haul roads to coal handling facilities outside of the permit area. Drainage control BMPs will predominantly include berms, side ditches along the roads, with ditch relief drains located at low points. If the flow velocity in a ditch channel or ditch relief drain exceeds the erosive velocity, an appropriate type of BMP will be utilized for controlling sediment and erosion (Section 26, Drainage Control Plan).

The perimeter 69-kV power line will also include a construction/maintenance road that will utilize culverts or low-water crossings to minimize the potential for vehicle travel through flowing channels (Section 23, Roads). Subsequent disturbances for ancillary facilities will be developed using the principles described above. The outside disturbance perimeter will be marked and down gradient areas will be protected from disturbed area runoff initially with earthen berms, silt fences, straw wattles/fiber logs or brush dams, and then sediment ponds capable of containing either the 10yr-24hr or 100yr-6hr storm event will be constructed. Water from these disturbed areas may alternatively be directed toward a mine pit, which will eliminate all potential for off-site discharge (Section 25, Sediment Control Plan, and Section 26, Drainage Control Plan). Areas disturbed during construction but not needed for operations and maintenance will be reclaimed in accordance with Section 37 (Post-Reclamation Vegetation).

In summary, erosion and sediment control for mine disturbance will employ BMPs to minimize erosion and the migration of sediment. Sediment yields from the mine area will be lower during mining and reclamation as disturbed area runoff and associated sediments are retained in sediment ponds, within berms, and within the mine pit. Excess water in the pit resulting from extreme precipitation events may be pumped to one or more of the sediment ponds. However, discharge from sediment ponds is expected to be rare based on large design capacities and the operational experience at the nearby Navajo Mine. Consequently, there will be little contribution of sediment to surface waters outside the permit area, as the sediment and runoff from all but the occasional extreme event (much larger than the 10yr-24hr event) are retained within the mine pit and sediment ponds. In addition, any such discharges will be further managed under applicable provisions of BNCC’s NPDES permit and applicable NPDES regulations.

SEDCAD modeling was performed to evaluate sediment generation under pre-mine, operational, and post-reclamation conditions for drainages traversing or intersecting the permit area. Projections on sediment yield are developed based on storm-specific flows and six parameters associated with sediment yield: soil texture, soil erodibility constants, representative slopes of overland flow within the watershed, representative lengths, cover, and management practices. Soil samples were acquired from selected representative soil types around the mining lease and sent to the University of Kentucky for assessment of the erodible particle size textural distribution (Appendix 18.B). These data were applied to mapped soil types within the permit area and adjacent watersheds and utilized to develop representative particle size distributions for use within the SEDCAD model. The results, coupled with applicable county soil survey textural information or texture data from soil mapping at the adjacent Navajo Mine were also employed to assign soil erodibility constants. Slope and length information were acquired from ArcGIS™ slope analyses of the watersheds. Cover information was applied to the subwatersheds from vegetation mapping and the management factor was assigned a value of 1 for all subwatersheds. Copies of pre-mine SEDCAD runs are provided in Appendix 18.B. Exhibit 18.B-1 shows the subwatersheds associated with the pre-mine SEDCAD drainage network delineation. Copies of operational and post-reclamation SEDCAD runs are provided in Appendix 41.C and Appendix 41.D, respectively. Exhibit 41.2-1 displays the subwatersheds associated with the post-reclamation models. This exhibit also identifies the subwatersheds that will contain storm runoff during mining operations.

Operational and pre-mine sediment yield projections from SEDCAD modeling are summarized and compared in Table 41.2-5. Results are quantified by sediment yield in tons/event. The effects are assessed with the modeling of Pinabete Arroyo at the confluence with the Chaco River, Cottonwood Arroyo at the confluence with the Chaco River, and the unnamed tributary to Chaco River downstream of the permit boundary as shown on Exhibit 41.2-1. Sediment yields reaching the Chaco River from Pinabete Arroyo, Cottonwood Arroyo, and the Unnamed Tributary to Chaco River are lower under operational conditions in comparison with the pre-mine baseline yields as shown in Table 41.2-5.

41.2.2.3 Surface Water Quality Changes During Mining and Reclamation Operations

Interaction between storm water runoff and newly exposed overburden, interburden, coals, and mine spoils may result in increases in TDS, sulfate, and manganese in surface runoff as suggested by the SPLP leaching tests of mine spoils presented in Table 41.1-1. Surface runoff from disturbed areas will be retained in the mine pit, sediment ponds, or berms. Thus, potential changes in surface water quality are expected to be negligible in Pinabete Arroyo, Cottonwood Arroyo, and the Chaco River during mining and reclamation operations as mine water is unlikely to reach these arroyos except during extreme precipitation events that exceed the designs of the containment structures. Mine disturbance will also generate additional sediment, but the water and sediment control measures, as outlined in Section 41.2.2.2, will prevent additional contributions of sediment to streams outside the permit area.

Motor fuel storage and equipment maintenance will be provided at the Navajo Mine facilities located outside of the permit area. Nevertheless, equipment repair may on occasion need to be conducted within the active mining or reclamation areas. BNCC maintains and implements a Spill Prevention, Control, and Countermeasure (SPCC) plan that identifies areas of risk, specifies appropriate controls for bulk storage areas, identifies control strategies for managing potential spills, and lists procedures for safely disposing of any contaminated materials.

Federal and state or tribal water quality standards will be met during surface coal mining and reclamation operations at the permit boundary, due to the use of perimeter berms and sediment ponds to contain runoff within the permit area. The NNEPA has designated four uses of drainages within the permit area, including livestock watering (LW), aquatic and wildlife habitat (A&WHbt), fish consumption (FC), and secondary human contact (ScHC) (NNEPA 2008). Baseline water quality occasionally exceeds the chronic aquatic standards for aluminum, cadmium, copper, selenium, and zinc in Pinabete Arroyo and in No Name Arroyo (Section 18, Water Resources). Also, the chronic aquatic criteria for mercury is below the detection limit of the analytical method used to analyze surface water samples. When flows occur, sediment loss results in significant concentrations of total suspended solids (TSS). Section 41.4 discusses the short-term and long-term impacts to surface water resources.

41.2.3 Changes to the Hydrologic Balance During Mining and Reclamation Operations

The mine will be developed in a planned, orderly progression to facilitate development of the operation while protecting the hydrologic balance. Mine planning incorporates the use of BMPs into all development activities potentially impacting water. BMPs may include but are not limited to minimizing inflow into the project area, eliminating traffic through flowing channels, and routing disturbed area runoff generated by storm events into either the mining pit or into sediment ponds.

The primary changes in the hydrologic balance during the surface mining and reclamation operations will be changes in ephemeral stream flows in Pinabete Arroyo and Cottonwood Arroyo that occur as a result of the containment of surface runoff within the mine area. These changes in flow are not expected to measurably affect the Chaco River due to the ephemeral nature of tributary flows and the relatively small drainage area of the tributaries relative to the drainage area of the Chaco River. The drainage areas of Pinabete and Cottonwood Arroyos represent only 1.4% and 1.8%, respectively, of the total Chaco River drainage basin

Groundwater within the mine areas will also be affected by the drawdown of potentiometric levels in the Fruitland Formation coal seams and the PCS adjacent to the permit area. The groundwater in the Chaco River alluvium will not be directly affected by mining and is beyond the projected drawdown of water levels in the Fruitland formation and PCS that is expected to occur as a result of mining. The drawdown in the Fruitland formation and PCS during mining is also unlikely to affect the groundwater levels in the Pinabete Arroyo alluvium due to the limited drawdown in the bedrock below the Pinabete Arroyo alluvium (Figure 41.2-2, Figure 41.2-3, Figure 41.2-4, Figure 41.2-5, and Figure 41.2-6) and the occurrence of perched groundwater within portions of the Pinabete Arroyo alluvium. Drawdown in the bedrock units during mining could affect water levels in the Cottonwood Arroyo alluvium where the groundwater is not perched. Thus, the alluvial groundwater flow along Cottonwood Arroyo might diminish downstream of mining during mining operations. Based on the valley gradient for Cottonwood of about 0.5%, an average hydraulic conductivity of 51 feet/day for the alluvium, the average saturated thickness of 2.5 feet estimated from monitoring wells and the estimated width of alluvium 500 feet, the steady-state groundwater flow in the alluvium is only about 1.7 gallons per minute (gpm). Some alluvial groundwater flow is likely to continue due to recharge from surface runoff and periodic release of flows from the irrigation canals associated with the NAPI. The potential effect of the predicted reduction in Cottonwood Arroyo alluvial flows on Chaco River alluvial flows is low.

Baseline groundwater flows in the Chaco River alluvium are estimated to be between one and two orders of magnitude higher than the groundwater flows from the Cottonwood Arroyo alluvium. Assuming that the hydraulic conductivity of the Chaco River alluvium is the same as the 51 feet/day value obtained for the Pinabete Arroyo alluvium and that the saturated thickness of the Chaco River alluvium is only 6.7 feet as observed at a well completed in the alluvium of the Chaco River southwest of the permit area by Metric Corporation (1991), the flow in the Chaco River alluvium is estimated at approximately 18 gpm or about 11 times the estimated alluvial flow in the Cottonwood Alluvium. The average width of the alluvium was estimated at 3,998 feet based on the average width of the mapped alluvium in the Geologic Map of New Mexico (Anderson and Jones 1994) for the segment of the Chaco River valley west of the permit and the slope of the potentiometric surface in the Chaco River alluvium was assumed to be the same as the valley gradient of 0.25% measured from the topographic map of the Chaco River valley segment west of the permit area. The groundwater flow rate in the Chaco River alluvium could be as much as an order of magnitude higher if the hydraulic conductivities and saturated thickness are greater than the estimates assumed in the calculations presented above.

It is also expected that the groundwater flow rates in both the Cottonwood Arroyo alluvium and Chaco River alluvium vary seasonally and from year to year. Existing water use of the Chaco alluvium is limited. The inventory of water wells in Exhibit 18.2-1 shows four livestock water wells completed in the alluvium of the Chaco River down gradient from the Cottonwood Arroyo confluence. A reduction in alluvial groundwater flow on the order of 1 to 10% is low relative to the year-to-year fluctuation observed in the alluvial groundwater wells that have been monitored and would not be expected to materially affect the water supply for these wells.

41.3 Post-reclamation Probable Hydrologic Consequences

41.3.1 Post-reclamation Groundwater Changes

The mine pits will be backfilled and reclaimed following the extraction of the coal resources, and the groundwater regime within and adjacent to the permit area will start to move towards a final equilibrium. The groundwater chemistry will also evolve over time as resaturation of the mine backfill occurs through recharge from precipitation, lateral inflow from the coal seams and interburden of the Fruitland Formation, and upward flow from the PCS. The potential impacts to the groundwater balance that are addressed in this section include:

- The rate and extent of saturation of the mine backfill;
- The rate and magnitude of recovery of water levels in the Fruitland Formation coal seams, and the underlying PCS;
- Potential changes in groundwater recharge rates, flow directions, and flow rates; and
- Possible changes in groundwater quality resulting from flow through the spoil backfill of the mine pit

41.3.1.1 Post-reclamation Groundwater Quantity Changes

The mining and reclamation of the Fruitland Formation will result in the removal of the individual coal seams and the backfilling of the mine pit with overburden and interburden materials (spoil) removed during mining. Under baseline conditions the coal seams have higher hydraulic conductivities than the interbedded shales, resulting in large downward vertical potentiometric gradients through the Fruitland Formation (Section 18, Water Resources). Lateral flow within the Fruitland Formation occurs primarily in the coal seams (Section 18, Water Resources). One of the primary hydrogeologic changes to occur as a result of mining is the removal of the coal, the interbedded shales, and the sandstone strata, resulting in more homogeneous and isotropic conditions within the mine backfill. The overburden and interburden material placed in the mine pit as backfill will be broken up during mining and will have higher porosity and hydraulic conductivity than in-situ interbedded sedimentary deposits of the Fruitland Formation. Laboratory measurements of pre-mine overburden core indicate porosity values of about 0.35 while porosity of mine spoils is on the order of 0.4. The higher porosity of the backfill is also expected to result in a higher hydraulic conductivity in comparison with the same material in its pre-mine setting.

Horizontal hydraulic conductivity values of pre-mine overburden and interburden strata are expected to range from $8.63x10^{-3}$ feet/day to $2.8x10^{-5}$ feet/day based on regional information from Kaiser et.al. (1994) and Frenzel (1983). The hydraulic conductivity estimates from laboratory measurements of two pre-mine overburden samples from the Navajo Mine are within this range. A horizontal hydraulic conductivity of $5.0x10^{-4}$ feet/day was found to best estimate for the unweathered interburden materials from model calibration.

A hydraulic conductivity value of $5.63x10^{-2}$ feet/day has been used in the post-reclamation model for the mine spoils in the backfill below 10 feet of the final reclaimed surface. This estimate for hydraulic conductivity of mine spoils was between the average of $1.13x10^{-2}$ feet/day estimated from laboratory tests on five mine spoil samples from the Navajo Mine and the estimate of $2.27x10^{-1}$ feet/day obtained by Rehm et.al. (1980) from the geometric mean of 40 hydraulic conductivity values measured for mine spoils in the Northern Great Plains. Often well test measurements of saturated hydraulic conductivities are higher than the values obtained from laboratory analysis of samples. Thus, the value selected as the best estimate for the hydraulic conductivity of mine spoils was higher than the estimates obtained from laboratory tests but well within the range of estimates provided by Rehm (1980) for western mine spoils. The results from Rehm et.al. (1980) are relevant because they include measurements from well tests of saturated spoils and they provide relevant information concerning the range and average values of hydraulic conductivities saturated mine spoils generated at western mines for a range of lithologies and a range of mining and recontouring methods. For the model layer representing the upper 10 feet within the mine backfill, the hydraulic conductivity value was increased by ten times to represent the hydraulic conductivity of weathered spoil and topdressing material.

Hydraulic parameters for mine spoils that were used for modeling post-reclamation conditions are summarized in Table 41.3-1. Given some degree of uncertainty in the ultimate hydraulic conductivity of mine spoils, the value selected for steady-state modeling was considered to be a reasonable upper bound for the hydraulic conductivity of the spoils over the long term. This value is approximately 5 times higher than the average of the laboratory measurements on representative spoil samples, 10 times higher than the model calibrated hydraulic conductivity of the weathered overburden and 100 times higher than the model calibrated hydraulic conductivity of the unweathered interburden material. The hydraulic conductivity of $1.13x10^{-2}$ feet/day estimated from laboratory tests on Navajo Mine spoils was considered to be a reasonable lower-bound estimate for hydraulic conductivity of mine spoils and was used to represent mine spoils in the transient model. As discussed below, this lower-bound estimate of backfill hydraulic conductivity provides a higher magnitude of water recovery in the mine backfill than those determined using higher estimates for the hydraulic conductivity of the backfill.

The recharge rate estimates used for modeling post-reclamation conditions are summarized in Table 41.3-1. Lower slopes and placement of topdressing materials within reclaimed areas are expected to result in higher recharge than the range from 0.002 to 0.03 inches per year obtained from the estimates from Stone (1987) assigned to the pre-mine surfaces based on slope categories. A recharge rate of 0.04 in/year determined by Stone (1987) as the mean recharge rate for reclaimed areas at Navajo Mine excluding depressions was used as a reasonable estimate of recharge rate for reclaimed mine areas over the long term following reclamation. This recharge rate is approximately twice the average pre-mine rate and reflects the improved surface and soil conditions resulting from mine reclamation. Stone (1987) estimates a recharge rate of 0.16 in/year for depressions during mine reclamation and the 0.4 in/year for final reclamation. A recharge rate of 0.10 in/year was used for mine spoils during mine reclamation in the transient modeling. This recharge rate represents an average rate for the mine backfill in various stages of reclamation.

The extent of drawdown at the end of mining in the No. 8 coal seam, the No. 3 coal seam and the PCS were presented in Section 41.2.1.1. The same transient model simulations of the mine pit progression and backfill sequence (Base Model and scenarios 1 to 3) were applied to simulate the drawdown and the rate and magnitude of recovery of water levels in mine backfill and in the Fruitland Formation coal seams and in the PCS at the various prediction locations in study area. Scenario 4 was not used in the analysis of recovery for reasons discussed previously. The variations in hydrologic parameters for the Base Model and Scenarios 1, 2 and 3 are discussion in Section 41.2 and summarized in Table 41.2-1.

Figure 41.3-1 shows a plan view of the location of mine spoil placement and the location of the five prediction points selected for presenting the modeled transient water level response. Two prediction locations are within areas of proposed mining and backfilling, two are at well locations near the proposed mining area, and one is at a well location upgradient of proposed mining (Figure 41.3-1). Model simulation results of drawdown and recovery presented in subsequent figures show that it could take longer than 1,000 years for groundwater levels to recover in the backfill to a steady-state condition.

Base Model simulation of drawdown and recovery at locations within the backfilled mine show larger drawdown from the pre-mine potentiometric levels at the CW-2 location compared to the GM-19 location (Figure 41.3-2). GM-19 is located near the western edge of proposed mining where the base of the mine pit is at a higher elevation. At location CW-2, the maximum drawdown of approximately 175 feet was observed relative to the pre-mine potentiometric elevation in the No. 8 coal seam. The drawdown was less in the lower units (e.g., 115 feet in the No. 3 coal seam and 100 feet in the PCS) (Figure 41.3-2).

The head recovery shown in Figure 41.3-2 for the No. 8 and No. 3 coal seams is the recovery in the backfill at the elevation corresponding to the pre-mine elevation for each coal seam. The recovery heads at the prediction locations within the backfill are similar for the two elevations and similar to the head recovery in the PCS. The plots indicate a slight downward gradient in heads at the GM-19 location and an upward gradient from the PCS to the mine backfill for about the first 150 years after start of mining at the CW-2 location. Thus, based on these simulation results the groundwater from the PCS will be one source for resaturation of the mine backfill for a relatively long period following mining until heads recover in the backfill to the level where the vertical gradients reverse. The recovery of potentiometric heads in the mine backfill at both prediction locations is below the pre-mine heads in No. 8 coal seam. Removal of the interbedded coals and shale strata by mining and placement of more uniform mine backfill eliminates the large downward potentiometric gradients that are observed under baseline conditions. The modeling does indicate that a slight downward hydraulic gradient is maintained in the mine backfill at both locations during the entire 1,000 year simulation. The model simulations show gradual recovery of potentiometric heads that are still recovering to a steady-state level at the end of the 1,000 year simulation.

Figure 41.3-3, Figure 41.3-4, and Figure 41.3-5 show the drawdown and recovery at the same prediction locations within the backfilled and in the underlying PCS for scenarios, 1, 2 and 3, respectively. The hydraulic conductivity of the backfill for scenario 1 is higher than the estimate used for the base modeling scenario. For scenario 3 the backfill conductivity is the same as scenario 1 and the recharge in the mine backfill is 1.6 times larger than the Base Model. The recovery of potentiometric head in the mine backfill is similar for scenario 1 (Figure 41.3-3) and scenario 3 (Figure 41.3-5). For both of these scenarios based on the higher estimate for the hydraulic conductivity of the backfill, there is no recovery in heads in the backfill at the GM-19 location. This shows that if the hydraulic conductivity is higher than estimated for the base model the backfill may remain dry within the western portion of the permit area near the Fruitland Formation outcrop.

Heads recover in the backfill within the eastern portions of the permit area but the magnitude of recovery in the mine backfill is considerably lower than estimated by the Base Model (Figure 41.3-2). The heads predicted in scenario 3 are slightly higher than the heads predicted in scenario 1, indicating that the magnitude of recovery will be higher if recharge is higher than assumed in the Base Model. However, comparisons of all three figures shows that the hydraulic conductivity of the backfill controls the recovery of heads to a much greater extent than recharge rates for the expected error bounds in these parameters. Finally, comparison of results in Figure 41.3-4 for scenario 2 with the Base Model in Figure 41.3-2 shows that the rate and magnitude of recovery in heads in the backfill will be higher if the specific yield of the coal and non-coal layers is lower than the estimates used for the base modeling scenario.

Drawdown and recovery curves from the Base Model simulation at locations GM-28 and VWP2007-01 are shown on Figure 41.3-6. Figure 41.3-7, Figure 41.3-8, and Figure 41.3-9 show the drawdown and recovery curves for scenarios 1, 2 3, respectively. The results for Base Model and for scenarios 1 and 3 are similar and similar to the backfill results. They show that the hydraulic conductivity of the backfill controls the recovery of heads in the adjacent coal seams and PCS to a much greater extent than recharge rates for the expected error bounds in these parameters. Likewise, the results for scenario 2 in Figure 41.3-8 show that the rate and magnitude of recovery in heads in the coal seams and the PCS will be higher if the specific yield of the coal and non-coal layers is lower than the estimates used for the Base Model scenario.

Figure 41.3-10 shows the drawdown and recovery curves from the Base Model simulation at VWP2007-02 located upgradient of the proposed mine. These results show only slight changes in heads. The potentiometric head in the No, 8 coal seam declines to a steady-state level approximately 4 feet below the pre-mining level. The heads in the No. 3 coal seam and PCS drawdown approximately 3 feet below the pre-mining level and recover to levels slightly above the pre-mining level at the end of the simulation.

Drawdown and recovery curves at location VWP2007-02 are shown on Figure 41.3-11, Figure 41.3-12, and Figure 41.3-13 for scenarios 1, 2 and 3, respectively. These results also show relatively slight changes in heads, although there is an overall drawdown in heads in the coal seams and the PCS if the hydraulic conductivity of the backfill is higher as assumed in scenarios 1 and 3. The results for scenario 2 presented in Figure 41.3-12 are similar to the results for the base model simulation although rate and magnitude of recovery in heads in No. 3 coal seam and in the PCS is slightly higher compared to the base modeling results in Figure 41.3-10.

Base Model post-reclamation steady-state potentiometric surfaces for the No. 8 coal seam, the No. 3 coal seam, and the PCS are shown on Figure 41.3-14, Figure 41.3-15, and Figure 41.3-16, respectively. The Base Model parameters (Table 41.3-1) are considered to be the best estimates. The backfill hydraulic conductivity of 0.056 feet/day was between the bounds used in sensitivity scenarios for transient drawdown and recovery.

The modeled post-mine potentiometric surface for the No. 8 coal seam shown on Figure 41.3-14 indicates that post-reclamation flow in the through the southern arm of the mine backfill will be to the north with a hydraulic gradient of about one half that of pre-mining conditions due to the higher hydraulic conductivity of the mine backfill compared to the hydraulic conductivity of the No. 8 coal seam for the pre-mining condition. The hydraulic gradient from the mine backfill is northwest toward Cottonwood Arroyo with a northeast gradient along the northeast boundary of the backfilled area. This differs from pre-mining conditions in which the overall gradient was to the northeast with a northwest gradient along the northwest boundary.

The post-reclamation potentiometric surfaces for the No. 3 coal seam (Figure 41.3-15) and for the PCS (Figure 41.3-16) indicate that gradients through the southern arm of the backfilled area will be predominantly to the north with some outward gradient along the east and west boundaries. The gradients in the northern portion of the backfilled area will be to the northwest toward Cottonwood Arroyo in the western portion of the mine backfill and to the northeast in the eastern portion of the mine backfill. Pre-mining gradients for the No. 3 coal seam and PCS in this area is predominantly to the north with a slight northwest component. There is also a post-mine gradient from the backfill toward the topographic low elevations along Pinabete Arroyo.

Under steady-state post-reclamation conditions there will also be a vertical downward potentiometric gradient and flow from mine backfill to the PCS within the southern portion of the mine area. The vertical gradients are negligible in the northern portion of the mine area as indicated by the comparison of the potentiometric surface in the PCS in Figure 41.3-15 with the potentiometric surface at the No. 3 coal seam elevation in the mine backfill as presented in Figure 41.3-14.

41.3.1.2 Post-reclamation Groundwater Quality Changes

Resaturation of mine backfill will develop from precipitation recharge, lateral inflow from the Fruitland Formation, and upward flow from the PCS. For some time following resaturation, there will be no flow from the mine backfill and each of these sources for resaturation of the backfill will influence the quality of the water in the backfill. Once water levels rise sufficiently in the backfill to reverse the upward gradient from the PCS, groundwater will flow at a very slow rate from the backfill into the PCS and toward the topographic lows along Cottonwood Arroyo. The modeling results presented in Section 41.3.1.1 show that the rate of groundwater recovery in the mine backfill will be very slow and may take more than 1,000 years before the final steady-state potentiometric levels and groundwater flow systems become established.

It is expected that TDS and sulfate concentrations will increase in the mine spoil relative to the baseline concentrations in the Fruitland Formation coal seams based on both spoil leaching tests results and the water quality analysis of spoil water samples taken from the Bitsui Pit at the Navajo Mine (BNCC 2009). The leaching test results summarized in Table 41.2-3 indicate that the major cations and the trace constituents aluminum, barium, boron, iron, lithium, manganese, and molybdenum may also increase in concentration but other trace constituents are expected to remain below detection limits or comparable to the concentrations observed in the baseline coal seam water. TDS is the only constituent that exceeded relevant livestock use criterion in the leaching tests.

The results for spoil leached with composite coal seam water were selected as a reasonable but lower bound estimate of 3,550 mg/L for TDS concentrations in the backfill. The geochemistry in mine spoils is complex and the TDS and sulfate concentrations in the spoil water in the permit area could be higher than the estimates from the leaching tests. Consequently, an upper bound estimate of 11,500 mg/L for the TDS concentration in the mine spoils was also used in the model simulations to account for the uncertainty in the post-mine spoil concentrations and provide more robust results for this PHC analysis. The upper bound estimate of 11,500 mg/L was the TDS concentration observed in the Bitsui-5 backfill well at Navajo Mine (BNCC 2009).

A chemical transport model was applied to the steady-state post-reclamation groundwater flow conditions to assist in the predictions of long-term post-reclamation groundwater quality. The FEFLOW™ software used for groundwater flow modeling includes features that simulate both conservative and reactive transport. The FEFLOW™ transport routines were applied to simulate the transport of TDS from the mine spoil backfill. The steady-state post-reclamation groundwater flow and transient transport simulations include the influence of mine backfill within Area 4 of the Navajo Mine PAP as well as the mine backfill for the permit area.

TDS was assumed to behave conservatively, that is with no attenuation due to adsorption or chemical transformation. Based on the observations at the Bitsui-5 spoil well, sulfate concentrations are expected to comprise about 43% of the TDS in spoil water. The results of leaching tests using composite coal seam water as summarized in Table 41.1-1 indicate sulfate fraction of TDS of 23% and 28% while the SPLP results indicate a sulfate fraction of about 56% of the TDS. For lateral transport from the mine spoil to the Cottonwood Arroyo alluvium, sulfate may be assumed to vary with TDS concentrations based on the sulfate-TDS ratio in the mine spoil source (i.e., Bitsui-5 well). Sulfate reduction is not likely to occur to a measurable degree because the shallow groundwater is likely to remain oxygenated near recharge areas along the alluvium and within the mine backfill. Sulfate reduction could occur where anoxic coal seam water enters mine spoil or in the coal seams down gradient of mine spoils after dissolved oxygen and nitrate in the groundwater have been depleted by the oxidation of organics. For this PHC assessment it is assumed that the TDS and sulfate transport from mine spoil to the Cottonwood Arroyo alluvium behaves conservatively with no measurable attenuation of sulfate by sulfate reduction.

The transport model solves advection-dispersion equations for constituent transport processes in groundwater flow. The transport modeling assumed that the TDS source concentrations remained constant throughout the 500-year transport modeling period, an environmentally conservative assumption. Natural background concentrations were not included in the transport modeling because the objective of the transport modeling is to simulate the direction and rate of transport of modeled constituents from the mine spoils, including the magnitude of attenuation due to dispersion. However, natural background concentrations have been considered in the subsequent interpretations drawn from the transport modeling results.

Several transport scenarios were performed to evaluate the sensitivity of transport results to changes in groundwater flow parameters. The transport scenarios are summarized in Table 41.3-2. Transport sensitivity scenarios specified the upper bound TDS source concentration of 11,500 mg/L that remained constant throughout the 500-year transport modeling period. An additional sensitivity scenario assuming the lower bound TDS source concentration of 3,550 mg/L was run with the most likely configuration of groundwater flow parameters.

The 500-year transport simulations were performed using the post-mine steady-state groundwater flow conditions as the initial condition for transport modeling. A 500-year simulation period was considered reasonable for modeling the fate and transport from a constant TDS source concentration in the backfill. After 500 years it is expected that the source concentrations in the mine backfill will decline as groundwater flows through the mine backfill and flushes salts that may have been concentrated in the mine spoils as a result of weathering and evaporation during mining and backfilling operations.

FEFLOW™ transient modeling results are presented for the following selected model layers:

- L1 - corresponding with the alluvium and upper 10 feet of soil and overburden in unmined areas and soil and backfill in mined areas;
- L4 - corresponding with the No. 8 coal seam in unmined areas and same elevation as the No. 8 coal seam in the mine backfill areas;
- L20 - corresponding with the No. 3 coal seam in unmined areas and same elevation as the No. 3 coal seam in the mine backfill areas;
- L28 - corresponding with the PCS throughout the model domain.

The results of the simulations at the end of the 500-year simulation period for L1 are presented in Figure 41.3-17, Figure 41.3-18, Figure 41.3-19, Figure 41.3-20, and Figure 41.3-21 for each of the model transport sensitivity scenarios listed in Table 41.3-2. The results of all scenario runs for the upper bound TDS source concentration of 11,500 mg/L show that the TDS concentrations above 5,000 mg/L remain near the mine backfill and do not extend beyond the permit boundary. The primary horizontal direction of TDS migration from the mine spoil in L1 is toward the alluvium and topographic lows along Cottonwood Arroyo. The TDS concentrations decline during transport from the mine backfill.

The L28 simulation results for TDS transport in the PCS at the end of the 500-year simulation period are presented in Figure 41.3-22, Figure 41.3-23, Figure 41.3-24, Figure 41.3-25, and Figure 41.3-26 for each of model transport sensitivity scenarios listed in Table 41.3-2. These results show that the primary direction for TDS transport from the mine spoils is vertically into the PCS. Thus, the primary direction for spoil water migration is into a water-bearing zone that has TDS concentrations similar to, if not higher than, the TDS levels expected for spoil water. The results for the upper bound TDS source concentrations show that the TDS concentrations in the PCS directly below the mine spoils are generally in the range of 5,000 to 10,000 mg/L. The higher TDS concentrations occur where the shale separating the backfill from the PCS is the thinnest or absent. Groundwater flow and TDS transport in the PCS in the vicinity of the mine backfill is predominantly laterally toward the alluvium and topographic low along Cottonwood Arroyo. TDS transport in the PCS to the north and east is limited as shown in these figures.

The simulation results at the end of the 500-year simulation period for the No. 8 coal seam (L4) are presented in Figure 41.3-27, Figure 41.3-28, Figure 41.3-29, Figure 41.3-30, and Figure 41.3-31 for each of the scenarios listed in Table 41.3-2. Likewise, TDS results at the end of the 500-year simulation period for No. 3 coal seam (L20) are presented in Figure 41.3-32, Figure 41.3-33, Figure 41.3-34, Figure 41.3-35, and Figure 41.3-36. These results show groundwater flow and TDS transport from the mine spoil to the north toward the Fruitland Formation outcrop along Cottonwood Arroyo. Lateral transport to the northeast in the No. 8 coal seam is restricted due to the lower heads in the mine backfill relative to the heads in the No. 8 coal seam prior to mining. Lateral transport in the No. 3 coal seam is also restricted despite the higher heads in the backfill relative to the heads in the No. 3 coal seam prior to mining. TDS transport in the No. 3 coal seam is restricted due to the lower permeability of the No. 3 seam coal relative to the No. 8 coal seam.

It should also be noted that the modeled post-reclamation TDS concentrations do not include any contribution of TDS to the alluvium from outside the mine backfill within Areas 4 North and 4 South. Transport modeling was performed to assess the fate of mine spoil water. The groundwater transport model shows that spoil water from the mine backfill will disperse laterally and vertically and that a component of flow and transport will be toward the alluvium within the topographic low along valley of Cottonwood Arroyo, where it will mix with groundwater flow in the Cottonwood alluvium.

Mixing calculations were performed using post-reclamation modeled concentrations together with actual background concentrations to arrive at better estimates of the post-reclamation groundwater concentrations in the alluvium at the mouth of Cottonwood Arroyo for each of the transport model scenarios. In order to perform the mixing calculations it was necessary to estimate the increase in the steady-state flow in the Cottonwood Arroyo alluvium resulting from mining and reclamation and the increase in TDS mass transport to the Cottonwood Arroyo alluvium from the mine spoils.

The estimated change in the steady-state groundwater flow in the alluvium was determined from the difference between the groundwater flow estimates the in the alluvium near the mouth of Cottonwood Arroyo from steady-state pre-mine calibrated model and the steady-state post-reclamation model. Table 41.3-3 provides the model predictions of pre-mine steady-state groundwater flow in the alluvium at the mouth of Cottonwood Arroyo and the post-reclamation steady-state flow in the Cottonwood alluvium for the various transport scenarios. For all but scenario 2, the steady-state groundwater flow increased under post-reclamation conditions due to the higher recharge rate estimated for these post-reclamation scenarios. Scenario 2 used the pre-mine recharge rate. In this scenario the steady-state alluvial groundwater flow declined relative to pre-mine results.

Table 41.3-3 also provides the modeled TDS concentrations in the alluvium at the mouth of Cottonwood Arroyo after 500 years based on the transport simulations for each of the model scenarios listed in Table 41.3-2. It should be noted that the post-reclamation potentiometric surfaces indicate gradients toward the Pinabete Arroyo alluvium. However, the transport simulations do not show measureable transport of TDS to the Pinabete Arroyo alluvium.

The estimates in Table 41.3-3 of the post-reclamation concentrations in the alluvium at the mouth of Cottonwood Arroyo were obtained by adding the estimated concentration in the alluvial groundwater flow determined from the model-predicted post-reclamation TDS mass flux in the alluvium at the mouth of

Cottonwood Arroyo to the pre-mine TDS concentration of 3,015 mg/L estimated for the alluvium near the mouth of Cottonwood Arroyo. The TDS concentration of 3,015 mg/L was obtained from the median of the baseline monitoring of Cottonwood Arroyo alluvial well QACW-2B located in the Cottonwood Arroyo alluvium west and down gradient of the permit Area.

Comparisons of the estimated post-reclamation concentrations in the alluvium at the mouth of Cottonwood Arroyo with the baseline estimates are provided in Table 41.3-3. These results show that the estimated changes in TDS concentrations in alluvium at the mouth of Cottonwood Arroyo range from an increase of 87 mg/L in scenario 5 to an increase of 942 mg/L in scenario 3. Scenarios 4 and 5 represent the most likely case of flow parameters and the bounds in TDS source concentration. Based on scenarios 4 and 5, the post-reclamation TDS concentration is predicted to increase over baseline estimates by 611 mg/L and by 87 mg/L, respectively. The predicted change in TDS concentrations is within the variability in TDS concentrations observed in the baseline results for monitoring wells completed in the Cottonwood Arroyo Alluvium. For instance, at well QACW-2B located in the alluvium down gradient of the permit area baseline TDS concentrations ranged from 2,590 to 3,800 mg/L. Wider ranges in TDS concentrations were observed at other wells completed in the alluvium of Cottonwood Arroyo and its tributaries.

Based on these results, changes in long-term post-reclamation TDS concentrations in the alluvial groundwater of Cottonwood Arroyo down gradient of the mine area may be expected. Upper bound source concentrations (scenario 4) indicated TDS concentration increases on the order of 20% while the simulation results with the lower bound source concentrations for mine spoil (scenario 5) indicate TDS concentrations increased on the order of 3%. The results for scenarios 4 and 5 are based on the most likely values for backfill recharge and specific storage and specific yield.

An increase in TDS concentrations of the magnitude predicted by this PHC assessment is not expected to materially impact the suitability of the alluvial groundwater for livestock use because the predicted TDS increase is within the range of natural variability in the alluvium of Cottonwood Arroyo. Also, the Cottonwood Arroyo alluvium is an unreliable supply for stock water and the quality is a poor source for livestock supply due to high baseline TDS and sulfate concentrations. The median baseline TDS concentration at well QACW-2B was 3,015 mg/L, which is slightly above the livestock suitability guideline of 3,000 mg/L recommended by Lardy et.al. (2008) (Table 18.1-11). The median baseline TDS concentration of 15,210 well GM-17 is far above the livestock suitability guideline while the median baseline TDS concentration in well QACW-2 is 2,305 mg/L, which is more suitable for livestock use but this well is often dry. The median baseline sulfate concentrations in all of the Cottonwood Arroyo alluvial wells is well above the livestock suitability guideline of 1,000 mg/L recommended by Lardy et.al. (2008) (Table 18.1-11). Finally, the alluvial groundwater flows in Cottonwood are extremely low and vary with space and time. Water levels obtained during baseline monitoring of the wells in the Cottonwood Arroyo alluvium demonstrate that the groundwater in the alluvium is an unreliable supply. The wells were often dry or had very limited saturated thickness, which limits its potential for livestock use.

In summary, the mine spoils are expected to have higher concentrations of TDS and sulfate than the pre-mine Fruitland Formation coals. Concentrations of aluminum, boron, iron, and manganese may also increase in the spoils but concentrations would be well within relevant criteria for livestock use. Estimates from mixing calculations indicated TDS concentrations in the Cottonwood Arroyo alluvium are likely to increase over the long-term but not sufficiently to materially impact potential groundwater use.

41.3.2 Post-reclamation Surface Water Changes

41.3.2.1 Post-reclamation Surface Water Quantity Changes

BNCC's objective in establishing the post-reclamation topography is to generally replicate the pre-mine relief at the site, to replace or improve the drainage density, and to enhance vegetation production to support the post mining land use. These measures will reduce surface erosion and sediment yield (Section 34, Post-Reclamation Topography; Section 35, Hydrologic Reclamation Plan; and Section 38, Post-Reclamation Surface Stabilization and Sediment Control). BNCC has designed the post-reclamation topography and drainages to conform with existing drainages along the perimeter of the mine in order to safely convey water from upstream, off-lease watersheds to either Pinabete Arroyo or Cottonwood Arroyo. BNCC will use appropriate channel types, slopes, and drainage densities to construct landforms appropriate to the area and based on reference watersheds, as described in Section 38 (Post-Reclamation Surface Stabilization and Sediment Control). Additional details on the post-reclamation topography may be reviewed in Section 34 (Post-Reclamation Topography).

BNCC modeled surface water flows in Pinabete Arroyo, Cottonwood Arroyo, and the unnamed tributary to the Chaco River using SEDCAD. Pre-mine surface water flow predictions are provided in Section 18 (Water Resources). SEDCAD was also applied to the post-reclamation drainage configuration and watershed conditions to predict post-reclamation flows. These SEDCAD event-based flow results for Pinabete and Cottonwood post-reclamation conditions are provided in Appendix 41.D. Comparisons of pre-mine and post-reclamation event-based peak flow results are provided in Table 41.3-4. Results show little difference between pre-mine conditions and post-reclamation conditions, except for the unnamed tributary to the Chaco River. There post-reclamation flows increase due to an increase in drainage area following reclamation (Table 41.3-4).

The hydrologic reclamation plan presented in Section 35 is predicated on the use of geomorphic principles that have been employed to create the reconstructed landforms, drainage density, and channels (Section 38, Post-Reclamation Surface Stabilization and Sediment Control). Although many of the pre-mine channels are incised with little or no active floodplain, reclaimed channels for higher-order drainages are designed for long-term stability with a low-flow or pilot channel capable of accommodating average annual peak flows or flows from a 2yr-6hr event and a floodplain to contain more extreme flows, as appropriate, based on slope (Section 38, Post-Reclamation Surface Stabilization and Sediment Control). Post-reclamation channels for first-order drainages are typically designed as vegetated swales.

BNCC is planning to reclaim all of the sediment and drainage control ponds utilized during the operation. At a future date, the Navajo Nation may request that some or all of the ponds remain. Future discussions may result in the retention or construction of ponds to replace the original livestock ponds that will be mined through (Section 18, Water Resources, and Section 35, Hydrologic Reclamation Plan). Should pond retention occur, ponds located on-channel will modify the hydrograph associated with each storm event by lowering the peak flows, extending the runoff over a longer period of time, and reducing storm runoff volumes. For small runoff events, the ponds may retain all of the storm runoff from upstream. Pond reconstruction will be performed to approximate the storage capacity and surface area of the original pre-mine impoundment. Specific discussions of temporary and permanent sediment ponds and the replacement of surface water sources are presented in Section 35 (Hydrologic Reclamation Plan).

41.3.2.2 Post-reclamation Erosion and Sediment Yields

It is difficult to obtain reliable measurements of baseline erosion and sediment yield, due to the infrequency of the transport events in ephemeral stream systems like those in the permit area. Consequently, event-based sediment yields have been estimated using the SEDCAD model. SEDCAD model estimates of sediment yields for pre-mine and post-reclamation conditions are summarized in Table 41.3-5. The results suggest that the replacement of poor quality sodic soils with suitable topdressing materials will reduce sediment generation from pre-mine to post-reclamation levels. The exception to this appears in the Pinabete Arroyo watershed, where the additional drainage area combined with a slight increase in the slope/length factor resulted in slightly larger sediment yields.

The sediment control plan and the surface stabilization and sediment control plan in Section 25 and Section 38, respectively, include a description of the sediment control measures that will be used on the reclaimed lands to prevent additional contributions of suspended solids to stream flow.

41.3.2.3 Post-reclamation Surface Water Quality Changes

Reclamation of disturbed areas and replacement of poor quality sodic soils with suitable topdressing materials is expected to result in improvement in surface water quality under post-reclamation conditions. SEDCAD modeling results presented in the previous section indicate reductions in post-reclamation sediment yields relative to baseline conditions. Groundwater flow and transport modeling presented in Section 41.3.1.2 project the transport of dissolved solids toward the topographic lows along Cottonwood Arroyo. The rates of groundwater flow, however, are very slow and are retained in the bedrock and the alluvium. Cottonwood Arroyo is an ephemeral stream and there is no groundwater contribution to surface flows.

Following reclamation, surface water quality in Cottonwood Arroyo and Pinabete Arroyo will probably be improved from pre-mine water quality for the following reasons:

- Sediment contribution from reclaimed areas is likely to decrease relative to baseline due to the overall reduction in slopes and improvement in the permanent vegetation cover.
- Sediment contribution from channel erosion is likely to decrease as incised unstable channels are replaced by stable channel and floodplain configurations.
- Poor quality and sodic soils will be buried within the backfill, and overland flow from the reclaimed areas is expected to exhibit lower concentrations of sodium and TDS.
- Aluminum concentrations should decline with the reduction in suspended solids associated with reduced surface and channel erosion.

Section 41.4 addresses the potential short-term and long-term impacts to surface water sources.

41.3.3 Post-reclamation Changes to the Hydrologic Balance

The groundwater within the alluvium of Cottonwood Arroyo and Pinabete Arroyos is the only groundwater source within the permit area and adjacent area that is adequate to support limited use for livestock water. One of the potential changes in the hydrologic balance after reclamation is the potential for an increase in groundwater flow toward the topographic lows along Cottonwood Arroyo if long-term recharge rates are higher for reclaimed areas as compared to pre-mine conditions.

Groundwater in mine spoils is expected to have higher concentrations of TDS and sulfate than the pre-mine Fruitland Formation coal seams. This water is expected to contribute to higher TDS and sulfate concentrations in the Cottonwood Arroyo alluvium. However, any increase in the post-reclamation concentrations of TDS and sulfate or in the trace constituents of aluminum, boron, iron, and manganese in the Cottonwood Arroyo alluvium are estimated to be minor and well within the variation measured baseline concentrations of these constituents in alluvial monitoring wells (Section 41.3.1.2).

The SEDCAD modeling presented in Section 41.3.2 shows little change in surface flows and sediment yields following reclamation relative to baseline conditions. Minor changes in ephemeral flow may occur if some of the sediment and drainage control ponds are converted to permanent replacement livestock water ponds at the request of the Navajo Nation or the local water user (Section 35, Hydrologic Reclamation Plan).

41.3.4 Post-reclamation Hydrologic Model

As previously discussed, a groundwater model of the post-reclamation hydrologic regime has been developed to support the PHC evaluations. The multilayer, numerical groundwater flow and transport model was developed and calibrated to baseline conditions as described in Appendix 41.B. This appendix includes a description of the conceptual model of both the baseline and post-reclamation groundwater flow system. A conceptual groundwater model is a complex hypothesis of the characteristics and functions of a hydrogeologic system, including recharge and discharge relationships, groundwater flow within and between hydrogeologic units, and the expected properties of these hydrogeologic units. The modeling results are presented in Section 41.3.1.

The constrained model calibration lends greater confidence in using the model results for prediction. Nevertheless, the 3-dimensional, multilayer saturated-unsaturated flow model is a simplified representation of a complex physical system. The calibrated model is useful and helps provide a better understanding of the likely short-term and long-term groundwater changes that are expected to occur within and adjacent to the permit area. The usefulness of the model must be considered in the context of the uncertainty in the model predictions and the consequences of making decisions based on erroneous model predictions. In the context of a PHC assessment, performance monitoring is used to adjust and modify model predictions over time so that adaptive measures can be taken to prevent material damage to the hydrologic balance

The USACE (1999) describe five approaches for dealing with uncertainty in model execution and interpretation of results. The first two, best estimate and worst case estimates are single value results that need to be used to some extent due to the large number of inputs and parameters required by complex models. However, these approaches do not lend much assurance as to the uncertainty of accuracy of the model predictions. The uncertainty in using the best estimates is reduced by constrained model calibration. This PHC has relied on the third and forth approaches for the more sensitive model parameters in order to assessing model prediction error and model uncertainty:

- Best estimate with sensitivity analysis adjustments and
- Bracketed ranges

The bracketed range is used to assess the uncertainty in the predictions of TDS transport in mine spoil. Best estimate with sensitivity analysis adjustments has been used to assess the uncertainty in the calibrated steady-state model and to characterize the uncertainty in model parameters required for prediction. These include the reclamation recharge rate, the backfill hydraulic conductivity, and the values for specific storage and specific yield.

Model results indicate that the extent of drawdown of potentiometric levels in the Fruitland Formation coal seams and in the PCS is limited, although the extent is sensitive to the actual specific storage in the coals and in the PCS. The extent of drawdown in the Fruitland Formation coal seams and in the PCS is also sensitive to the actual time step used in modeling the pit progression. The 5-year pit sequence used for these simulations estimates greater extent of drawdown compared to an annual pit sequence. Nevertheless, the rate and extent of drawdown has limited adverse impact to existing or future use. It is primarily of concern with respect to the potential for induced drawdown of water levels in the Cottonwood Arroyo alluvium.

Estimates of changes in TDS concentrations in the Cottonwood Arroyo alluvium from model predictions using bracketed ranges and best estimates with sensitivity analysis and from mixing calculations adjustments indicate that TDS concentrations in the Cottonwood Arroyo alluvium are likely to increase over the long-term. The predicted magnitude of change is sensitive to the estimate of TDS concentrations in the mine spoil, the values for specific storage and specific yield, the estimate for the reclamation recharge rate, and the backfill hydraulic conductivity. Nevertheless, the magnitude of the predicted increase in TDS concentrations is within the variability in TDS concentrations observed in the baseline monitoring or wells in the Cottonwood Arroyo alluvium.

While the model predictions are useful in identifying the direction of groundwater flow, the likely magnitude of change and the time frames that might be associated with these changes, the model predictions are hypotheses that will need to be re-examined as mining and reclamation proceed. Consequently, monitoring will be performed assess model predictions and to verify that material damage does not occur. It is anticipated that a monitoring well will be installed in the mine backfill after backfilling of a significant portion of the mine pit. Monitoring of this well would provide information on the actual TDS concentrations that develop within the mine spoil water. Likewise, it is anticipated that Cottonwood Arroyo alluvial well QACW-2B or comparable alluvial well will be monitored and that a monitoring well would be installed in the Fruitland Formation between the mine backfill and the Cottonwood Arroyo alluvium. Monitoring of water levels and TDS concentrations in these wells will provide information on drawdown, recovery, and water quality that can be used to adjust and modify the PHC model predictions if monitoring indicates significant change in the assumptions from which the model predictions were derived.

41.4 Impacts to Surface Water and Groundwater Availability

During surface coal mining operations there may be a temporary reduction in surface water flows in Pinabete Arroyo and Cottonwood Arroyo. Three ponds located within the permit area will also be removed by mining operations. There could also be a temporary reduction in groundwater levels and groundwater flows in the alluvium of Cottonwood Arroyo. Also, one livestock water supply well (13-15-2) completed in the alluvium of a tributary to Pinabete Arroyo (Section 18, Water Resources) will be removed by mining operations. Another livestock water well (W-0345) completed in alluvium of Pinabete Arroyo is within the permit area but will not be affected by mining. Livestock grazing will not occur within permit area during active mining. Alternate water supply will be provided for any off-lease livestock grazing that have used these stock water supply wells and ponds located within the permit area.

Groundwater flows in the Cottonwood Arroyo alluvium down gradient of the mine may diminish during active mining. Groundwater flows and TDS concentrations may increase in the Cottonwood Arroyo alluvium in the long-term after reclamation is complete. The groundwater modeling performed for the PHC assessment indicates that it could be many decades if not several centuries after mining and reclamation for any measurable increase in TDS concentration to develop along within the Cottonwood Alluvium down gradient of mining. The magnitude of any increase is predicted to be within the range of variation in TDS concentrations observed during baseline monitoring at monitoring wells completed in the alluvium of Cottonwood Arroyo. The Cottonwood Arroyo alluvium is currently a poor source of livestock water supply due to TDS and sulfate concentrations above recommended livestock use criteria. Furthermore, the quantity of water in the Cottonwood alluvium is limited and several of the baseline water monitoring wells in the alluvium are occasionally dry.

Following reclamation, the water supplies for existing livestock use will be replaced (Section 35, Hydrologic Reclamation Plan). Plans to replace water supplies for existing wells that will be impacted by mining have been included in Section 35 (Hydrologic Reclamation Plan).

Potential future use of groundwater within the reclaimed mine is negligible, due to the low permeability of the spoil and poor water quality. In addition, the potential use of groundwater from the PCS and Fruitland Formation near the site is limited, due to the low permeability and poor water quality observed in these sources in the baseline hydrology assessment (Section 18, Water Resources). As indicated in Section 18 (Water Resources), there are no known water supply wells completed in either the Fruitland Formation or PCS Formation within the permit area and adjacent area.

The ponds found in the permit areas during the baseline surveys do not appear to have water-right filings (Section 18, Water Resources); however, the small basins are periodically utilized by livestock and wildlife when water collects in them following a storm. Pond reconstruction, if executed, will be performed to generally reproduce the storage capacity and surface area of the original impoundment (Section 35 Hydrologic Reclamation Plan). The water availability at the reconstructed ponds should be comparable to pre-mine conditions. SEDCAD modeling presented in Section 41.3.2 shows little change in surface flows and sediment yields following reclamation relative to baseline conditions. Additional water supplies may be available if new ponds are constructed or some of the sediment and/or drainage control ponds are converted to permanent stock water use at the request of the Navajo Nation or local water users (Section 35, Hydrologic Reclamation Plan).

41.5 Probable Hydrologic Consequences Analysis

The probable hydrologic consequences analysis was developed with the support of site-specific data and modeling. Surface water and sediment modeling was performed using SEDCAD. Key assumptions on soil and cover were derived from soil and vegetation mapping at the site with contributions from erodible particle size data collected from depositional zones around the site. Geochemical and mineralogical characteristics of mine spoils were determined from chemical analysis of spoil materials and by the use of x-ray diffraction (XRD). The assessment of the long-term leaching from mine spoils was based on batch testing of mine spoil materials leached with groundwater collected from coal seams near the permit area and with synthetic precipitation. These results were evaluated using PHREEQC, public domain geochemical modeling software. Laboratory tests of geologic strata and mine spoils, well response tests, information from the literature, and model calibration provided the basis for the FEFLOW™ modeling, which was utilized to characterize groundwater flow and potentiometric conditions during and following mining. The chemical transport module in FEFLOW™ was also employed to assess the long-term transport of TDS concentrations from mine spoil materials.

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Table 41.1-1 Summary of Spoil Leaching Test Results

Analyte (mg/L unless otherwise sepecified)	EPA Drinking Water Criteria	Livestock (LW)[1]	Initial Coal Water Sample	Initial Coal Water DUP	Initial Synthetic Precipitation	Spoil SPLP	Spoil 45-Day	Spoil Leachate	Spoil Leachate Dup
Al			0.13	0.14	0.056	< 0.05	0.38	0.29	0.3
Sb	0.0056		<< 0.0067	<< 0.0067	<< 0.0067	<< 0.0067	<< 0.0067	<< 0.0067	<< 0.0067
As	0.01	0.2	<< 0.015	<< 0.015	<< 0.015	<< 0.015	<< 0.015	<< 0.015	<< 0.015
Ba	1		0.093	0.088		0.07	0.079	0.25	0.2
Be	0.004		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
HCO_3			1300	1200		33	960	1000	1000
B	0.6	5.0 D	0.31	0.29		0.084	0.36	0.44	0.45
Cd	0.005	0.05	<< 0.00051	<< 0.00051	<< 0.00051	<< 0.00051	<< 0.00051	< 0.006, 0.00087*	<< 0.00051
Ca			3.4	3.3	0.27	150	56	64	69
CO_3			260	300	< 7	14	< 7	< 7	< 7
Cl	250		710	700		1.5	600	610	610
Cr (III + VI)	0.1	1	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Co		1.0 D	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Cu	1.3	0.5 D	< 0.005	< 0.005	< 0.005	< 0.005	0.053	< 0.005	< 0.005
F	2	2	2.4	2.5	0.0067	0.54	1.5	1.6	1.6
Fe	0.3		0.067	0.073	< 0.05	< 0.05	< 0.05	0.17	0.18
Pb	0.015	0.1	<< 0.011	<< 0.011	<< 0.011	<< 0.011	<< 0.011	<< 0.011	<< 0.011
Li			< 0.1	< 0.1	< 0.1	< 0.1	0.11	0.1	0.1
Mg			1.3	1.2		15	12	13	13
Mn	0.05		< 0.01	< 0.01	< 0.01	0.19	0.098	0.11	0.1
Hg	0.002		<< 0.00005	<< 0.00005	<< 0.00005	<< 0.00005	<< 0.00005	< 0.00024, 0.0001*	< 0.0002, 0.00008*
Mo			0.012	< 0.01	< 0.01	< 0.01	0.015	0.014	0.014
Ni	0.61		< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
pH (standard units)	6.5 - 9.0	6.5 - 9.0	9	8.9	5	7.5	8	8	7.9
K			11	10	< 1	7	14	14	14
Se	0.05	0.05	<< 0.026	<< 0.026	<< 0.026	<< 0.026	<< 0.026	<< 0.026	<< 0.026
Ag	0.035		< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015
Na			1200	1100	5.7	150	1200	1200	1200
SO_4	250	1000	300	260	3.4	670	930	970	990
Tl	0.0017		<< 0.011	<< 0.011	<< 0.011	<< 0.011	< 0.4, 0.014*	<< 0.011	<< 0.011
TDS	500	3000	3100	3000	28	1200	3500	3500	3600
V		0.100 D	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Zn	5	25	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.0095

[1] Navajo Nation Water Quality Program, **2008**, Navajo Nation Surface Water Quality Standards. TDS, SO4 and F livestock watering criteria from Lardy et al 2008
<< Reported value is less than the MDL
*Above MDL, but below PQL
D – Dissolved

Table 41.2-1 Transient Modeling Scenarios

Scenario[1]	Backfill Recharge Rate (in/yr)		Hydraulic Conductivity (ft/d)		Specific Yield[2] (non-coal units)	Specific Yield (coal units)
	During Mining	After Final Reclamation	Backfill	Fruitland Formation		
Base	0.1	0.04	0.0113	Calibrated K	Porosity * 0.95	0.0475
1	0.1	0.04	0.56	Calibrated K	Porosity * 0.95	0.0475
2	0.1	0.04	0.0113	Calibrated K	Porosity * 0.5	0.005
3	0.16	0.06	0.56	Calibrated K	Porosity * 0.95	0.0475
4	0.1	0.04	0.0113	5 X Calibrated K	Porosity * 0.95	0.0475

[1]all scenarios used best specific storage estimates of $2.8X10^{-5}$ for coal and $3.8X10^{-6}$ for the non-coal layers
[2]all scenarios used best specific yield estimates of 0.005

Table 41.2-2 Saturated Paste Estimates of Spoil TDS

Interburden name	Electrical conductivity (mmhos/cm)	
	Mean	Mean + 1SD
I8	2.8	4.2
I7	2.4	4.5
I6	2.3	5.2
I4	1.8	3.0
I3	1.5	2.9
I2	1.3	1.8
I8 TDS equivalent (mg/L)	1,960	2,940
I7 TDS equivalent (mg/L)	1,680	3,150
I6 TDS equivalent (mg/L)	1,610	3,640

Table 41.2-3 Constituents that Increased in Concentration in Leaching of Mine Spoils

Analysis	Composite Coal Groundwater	Mine Spoil Leaching Concentrations (mg/L)	
		Spoil SPLP	Spoil leached with coal water
Aluminum	0.13	<0.05	0.29
Barium	0.093	0.07	0.25
Boron	0.3	0.084	0.45
Calcium	3.4	150	67
Iron	0.067	<0.05	0.18
Lithium	<0.1	<0.1	0.10
Magnesium	1.3	15	13
Manganese	<0.01	0.19	0.11
Molybdenum	0.012	<0.01	0.014
Potassium	11	7	14
Sodium	1150	150	1200
Sulfate	274	670	980
TDS	3027	1200	3550

KF= Fruitland Formation
SPLP= Synthetic Precipitation Leaching Procedure

Table 41.2-4 Comparison of Flows Pre-mining with Operations for Pinabete Arroyo, Cottonwood Arroyo, and Unnamed Tributary to Chaco River in Area 4 North

			2yr-6hr event (0.85 inches)		10yr-6hr event (1.28 inches)		25yr-6hr event (1.56 inches)		100yr-6hr event (2.04 inches)	
SEDCAD designation	Watershed location	Area (sq mi)	Flow (cfs)	Volume (acre-feet)	Flow (cfs)	Volume (acre-feet)	Flow (cfs)	Volume (acre-feet)	Flow (cfs)	Volume (acre-feet)
Structure 9	Pinabete at mouth, pre-mine	59.37	390	371.8	1,081	1,010.7	1,649	1,531.5	2,767	2,033.0
Structure 9	Pinabete at mouth, during mine operations	56.24	390	282.4	1,091	764.8	1,649	1,157.7	2,767	1,928.0
Structure 37	Cottonwood at mouth, pre-mine	80.11	1,250	459.5	2,839	1,165.0	4,049	1,732.0	6,325	2,836.0
Structure 37	Cottonwood at mouth, during mine operations	75.70	1,240	418.8	2,828	1,071.0	4,033	1,598.0	6,292	2,628.3
Structure 1	Chaco Trib , pre-mine	0.45	50	2.3	137	6.4	205	9.8	334	16.3
Structure 2	Chaco Trib, during mine operations	0.07	7.2	0.35	20	1.00	30	1.51	49	2.5

Table 41.2-5 Comparison of Sediment Yield Pre-mining with Mine Operations for Pinabete Arroyo, Cottonwood Arroyo, and Unnamed Tributary to Chaco River

SEDCAD designation	Watershed location	Area (sq mi)	2yr-6hr event (0.85 inches) Sediment yield (tons)	10yr-6hr Event (1.28 inches) Sediment yield (tons)	25yr-6hr event (1.56 inches) Sediment yield (tons)	100yr-6hr event (2.04 inches) Sediment yield (tons)
Structure 9	Pinabete at mouth, pre-mine	59.37	2,821	9,886	16,325	25,646
Structure 9	Pinabete at mouth, during mine operations	56.24	2,249	7,973	13,380	24,777
Structure 37	Cottonwood at mouth, pre-mine	80.11	10,744	27,242	40,586	67,180
Structure 37	Cottonwood at mouth, during mine operations	75.70	10,473	26,966	40,310	66,822
Structure 1	Chaco Trib , pre-mine	0.45	158	497	788	1,380
Structure 2	Chaco Trib, during mine operations	0.07	19	60	95	166

Table 41.3-1 Recharge Rates and Hydraulic Properties of Mine Spoils for Post-reclamation Groundwater Model

Surface characterization	Recharge range[1] (in/yr)	Mean recharge[1] (in/yr)	Modeled recharge (in/yr)
Reclaimed areas	0.01 to 0.23	0.04	
Reclaimed depression areas		0.16	
Reclaimed areas-transient during reclamation			0.1
Reclaimed areas- post reclamation & steady state			0.04
Alluvium	0.09	0.09	0.09
Badlands	.002 to 0.01	0.006	.002 to 0.01
Pre-mine surfaces (excluding alluvial terraces)	0.02 to 0.05	0.03	0.02 to 0.03

Reclamation materials	Porosity (%)	Ksat (cm/sec)	Ksat (ft/day)
Surface mine spoils (L1)	40.6	2.0E-04	5.6E-01
Mine spoils < L1	40.6	2.0E-05	5.6E-02
Geometric mean of mine spoils in northern Great Plains (Rehm et al. 1980)		8.0E-05	2.3E-01
Lab tests of Navajo Mine spoil samples	40.6	4.0E-06	1.1E-02

[1] Estimates from Stone (1987)

L1- Uppermost layer in model

Ksat - Saturated hydraulic conductivity

Table 41.3-2. Summary of Transport Model Sensitivity Runs

Transport Scenario	Backfill TDS Concentration (mg/l)	Backfill Recharge Rate (in/yr)	Backfill Hydraulic Conductivity (ft/d)	Specific Storage (1/ft)
1	11,500	0.04	0.056	$1x10^{-4}$
2	11,500	pre-mine	0.56	$3. 8x10^{-6}$ Coal: $2. 8x10^{-5}$
3	11,500	0.04	0.56	$3. 8x10^{-6}$ Coal: $2. 8x10^{-5}$
4	11,500	0.04	0.056	$3. 8x10^{-6}$ Coal: $2. 8x10^{-5}$
5	3,550	0.04	0.056	$3. 8x10^{-6}$ Coal: $2. 8x10^{-5}$

Table 41.3-3 Estimation of Cottonwood Alluvial Groundwater TDS Concentrations From Transport Modeling Scenarios

Scenario	TDS in Cottonwood Alluvial Groundwater near mouth (mg/l)	Transport Conc from Backfill after 500-years (mg/l)	Steady State Alluvial Groundwater Flux (ft3/d)	TDS Mass Flux (kg/d)
Pre-mine	3015		827	
1	3701	686	886	17.21
2	3609	594	742	12.48
3	3957	942	944	25.18
4	3626	611	882	15.26
5	3202	187	882	4.67

Table 41.3-4 Comparison of Pre-mine and Post-reclamation Flows for Pinabete Arroyo, Cottonwood Arroyo, and Unnamed Tributary to Chaco River

			2yr-6hr event (0.85 inches)		10yr-6hr event (1.28 inches)		25yr-6hr event (1.56 inches)		100yr-6hr event (2.04 inches)	
SEDCAD designation	Watershed location	Area (sq mi)	Flow (cfs)	Volume (acre-feet)	Flow (cfs)	Volume (acre-feet)	Flow (cfs)	Volume (acre-feet)	Flow (cfs)	Volume (acre-feet)
Structure 7	Pinabete upstream, pre-mine	47.80	401	293.5	1,113	801.7	1,698	1,217.1	2,851	2,033.0
Structure 9	Pinabete at mouth, pre-mine	59.37	390	377.8	1,081	1,010.7	1,649	1,531.0	2,767	2,526.3
Structure 9	Pinabete at mouth, post-reclamation	60.25	390	372.1	1,081	1,017.5	1,649	1,544.4	2,767	2,578.5
Structure 21	South Fork Cottonwood, pre-mine	21.08	729	194.9	1,588	411.2	2,220	627.0	3,439	971.4
Structure 21	South Fork Cottonwood, post-reclamation	20.80	707	185.2	1,542	423.4	2,182	602.8	3,387	938.0
Structure 37	Cottonwood at mouth, pre-mine	80.11	1,250	459.5	2,839	1,165.0	4,049	1,732.0	6,325	2,836.0
Structure 37	Cottonwood at mouth, post-reclamation	78.31	1,249	428.4	2,847	1,101.1	4,058	1,645.4	6,331	2,710.1
Structure 1	Chaco Trib , pre-mine	0.45	50	2.3	137	6.4	205	9.8	334	16.3
Structure 2	Chaco Trib, post-reclamation	0.93	7.2	0.35	92	5.45	153	15.3	276	27.1

Table 41.3-5 Comparison of Sediment Yield Pre-mining and Post-mining for Pinabete Arroyo, Cottonwood Arroyo, and Unnamed Tributary to Chaco River

			2yr-6hr event (0.85 inches)	10yr-6hr Event (1.28 inches)	25yr-6hr event (1.56 inches)	100yr-6hr event (2.04 inches)
SEDCAD designation	Watershed location	Area (sq mi)	Sediment yield (tons)	Sediment yield (tons)	Sediment yield (tons)	Sediment yield (tons)
Structure 7	Pinabete upstream, pre-mine	43.88	2,703	9,489	15,694	28,885
Structure 9	Pinabete at mouth, pre-mine	59.37	2,821	9,886	16,325	25,646
Structure 9	Pinabete at mouth, post-reclamation	60.25	2,847	9,923	16,470	30,085
Structure 21	South Fork Cottonwood, pre-mine	21.08	4,561	11,292	16,455	26,631
Structure 21	South Fork Cottonwood, post-reclamation	20.80	4,574	11,265	16,378	26,635
Structure 37	Cottonwood at mouth, pre-mine	80.11	10,744	27,242	40,586	67,180
Structure 37	Cottonwood at mouth, post-reclamation	78.77	10,662	26,929	40,054	66,396
Structure 1	Chaco Trib , pre-mine	0.45	158	497	788	1,380
Structure 2	Chaco Trib, post-reclamation	0.93	19	331	572	1,094

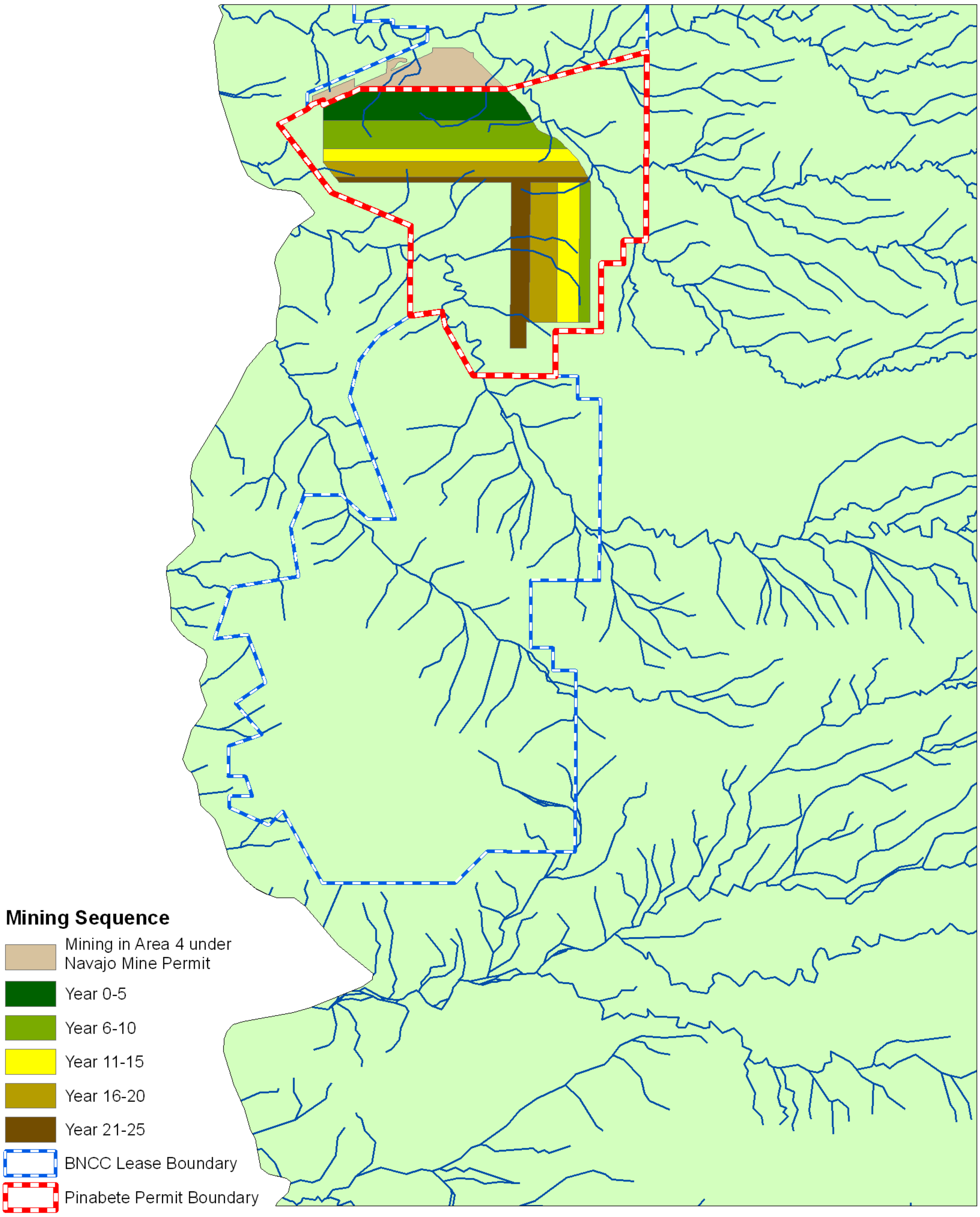


Figure 41.2-1 Mining Block Sequences used for Transient Model Simulations

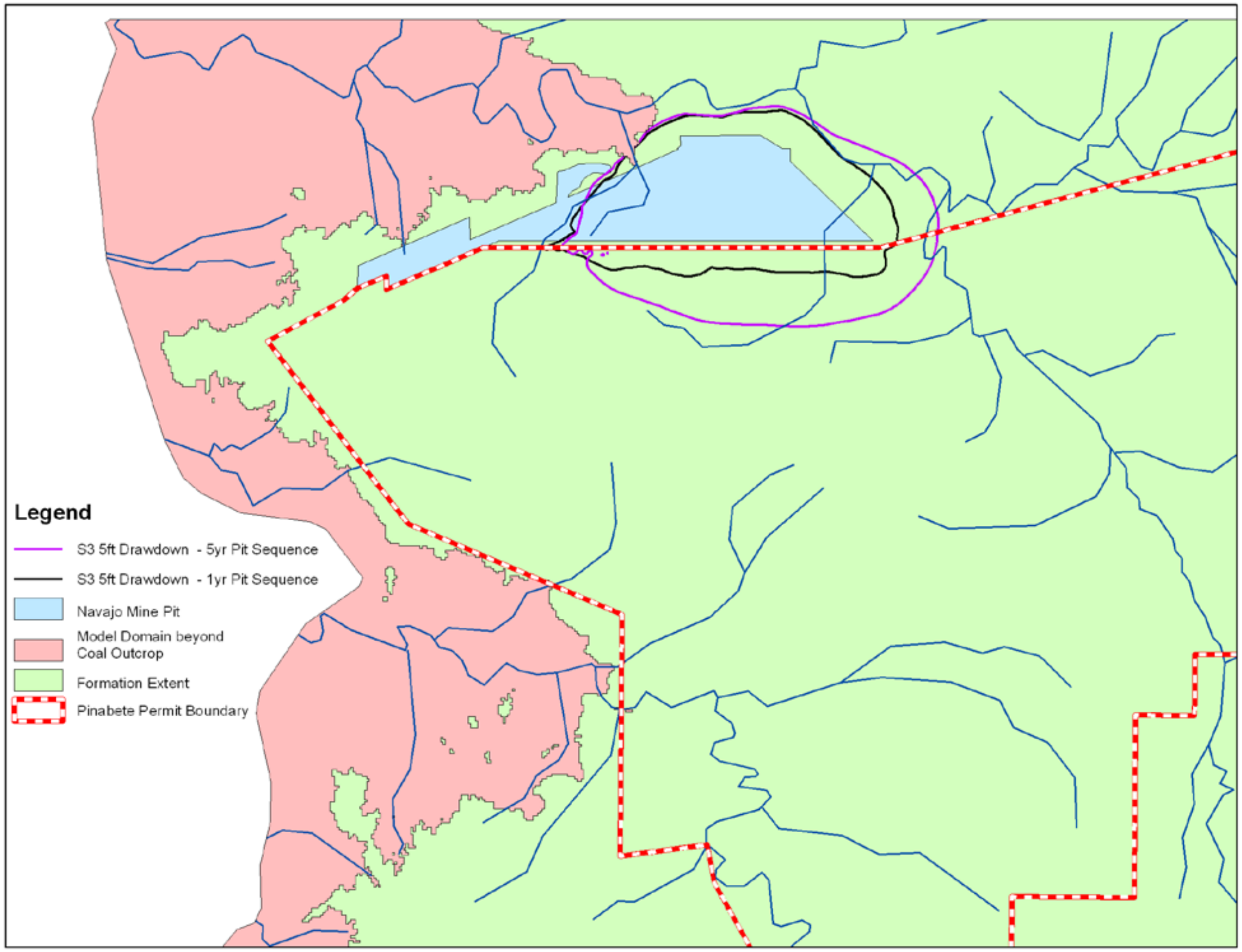


Figure 41.2-2 Predicted Drawdown in the No. 3 Coal Seam at Mine Year 5 Based on Annual Versus 5-year Pit Progression

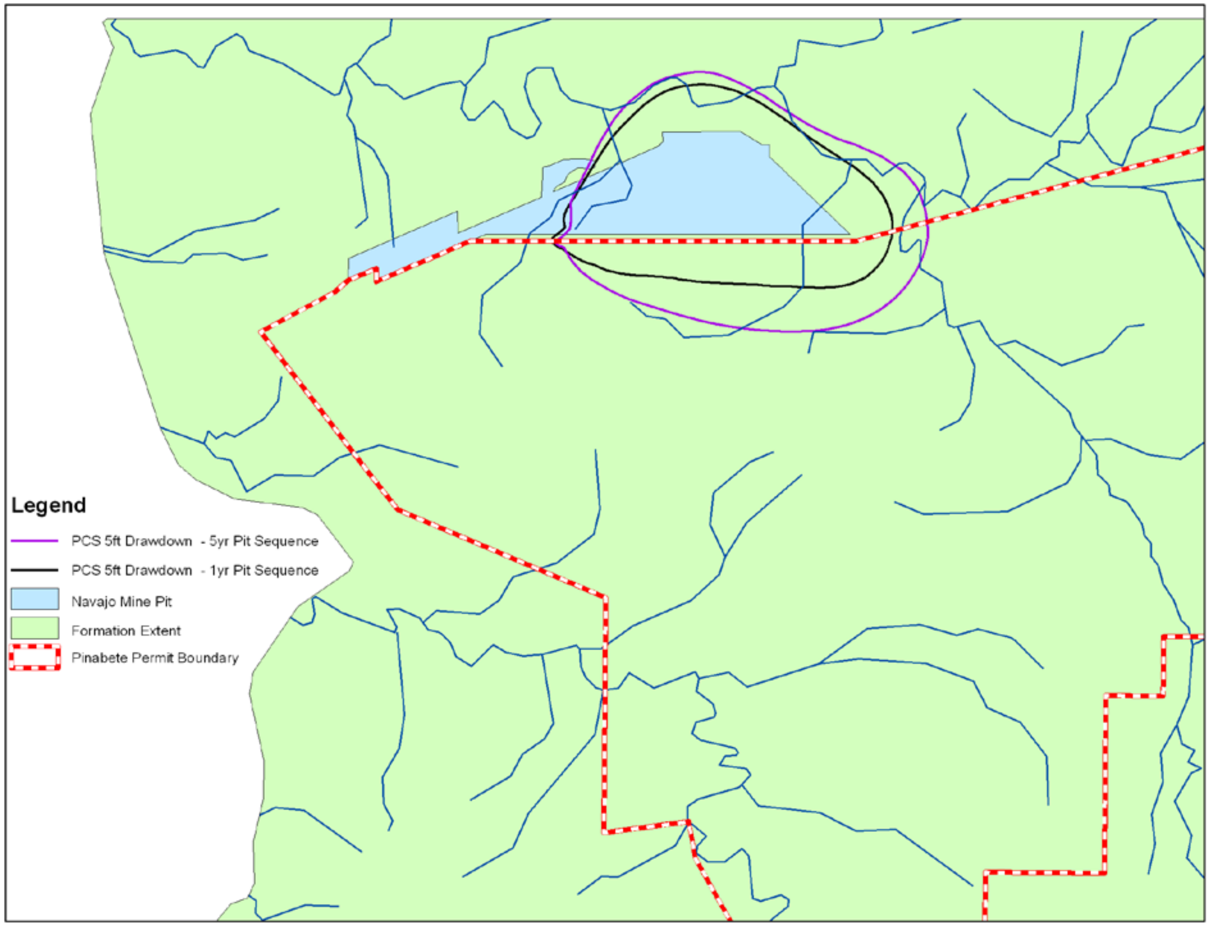


Figure 41.2-3 Predicted Drawdown in the PCS at Mine Year 5 Based on Annual Versus 5-year Pit Progression

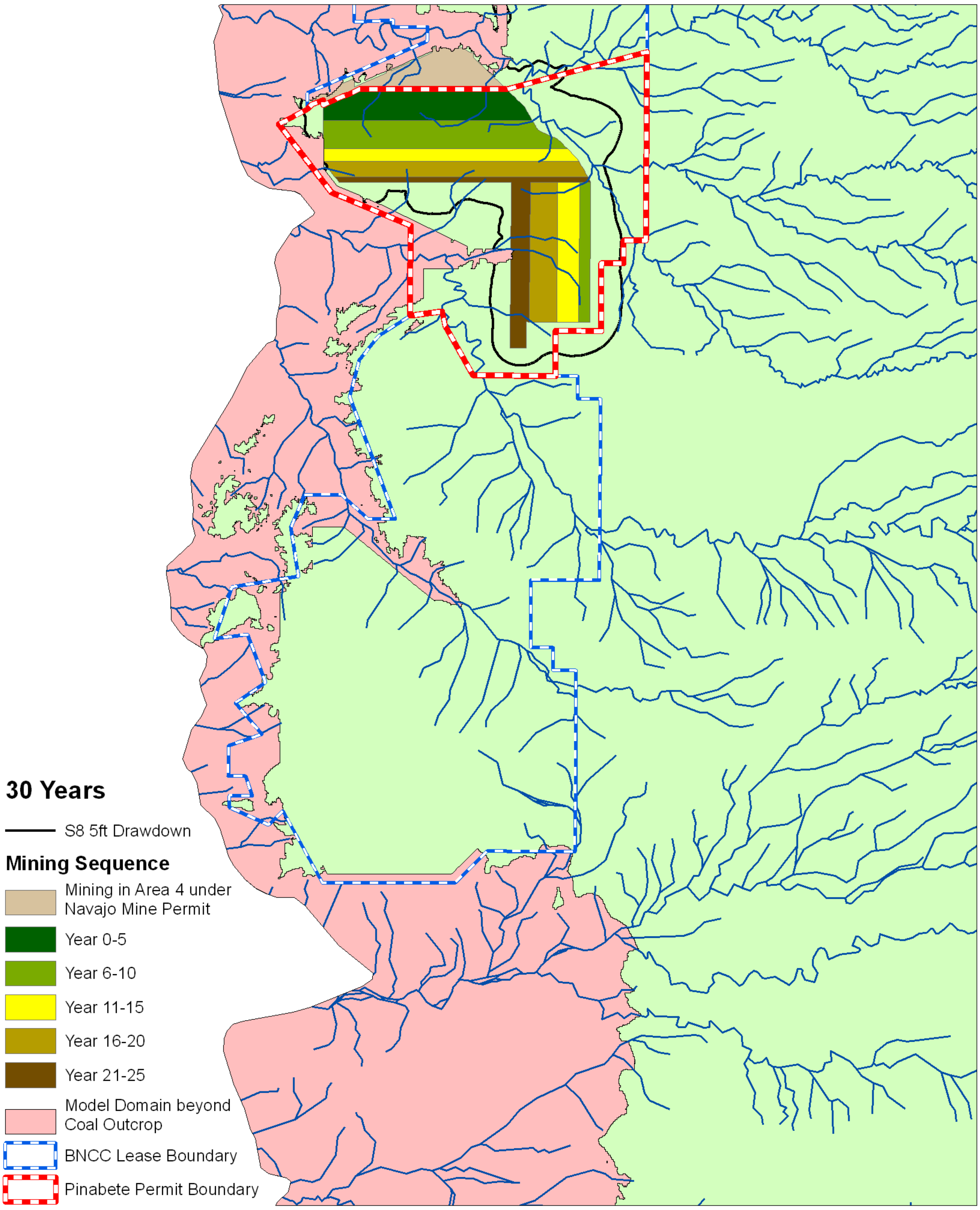


Figure 41.2-4 Modeled 5-feet Drawdown in the No. 8 Coal Seam (S8) at Mine Plan Year 25

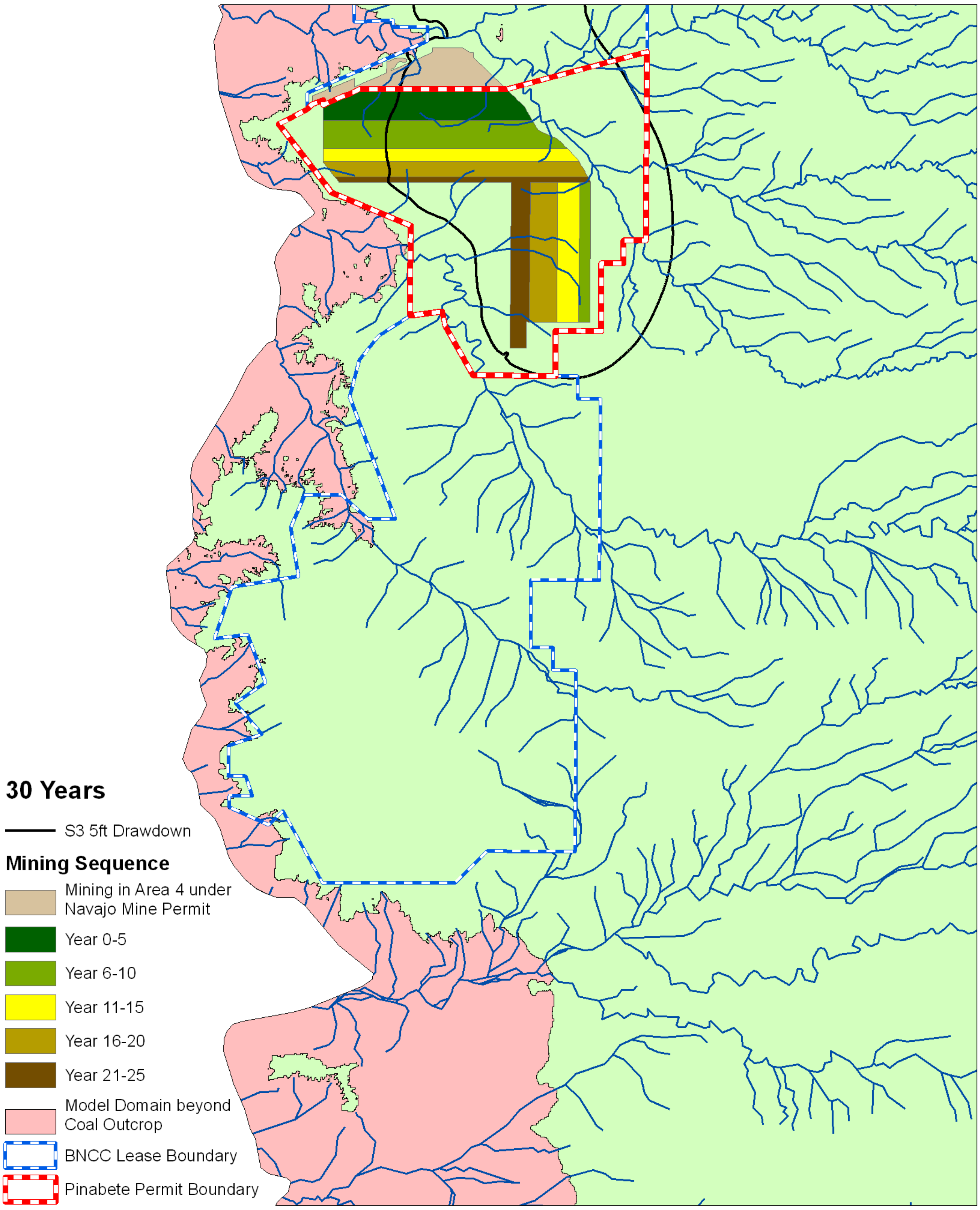


Figure 41.2-5 Modeled 5-feet Drawdown in the No. 3 Coal Seam (S3) at Mine Plan Year 25

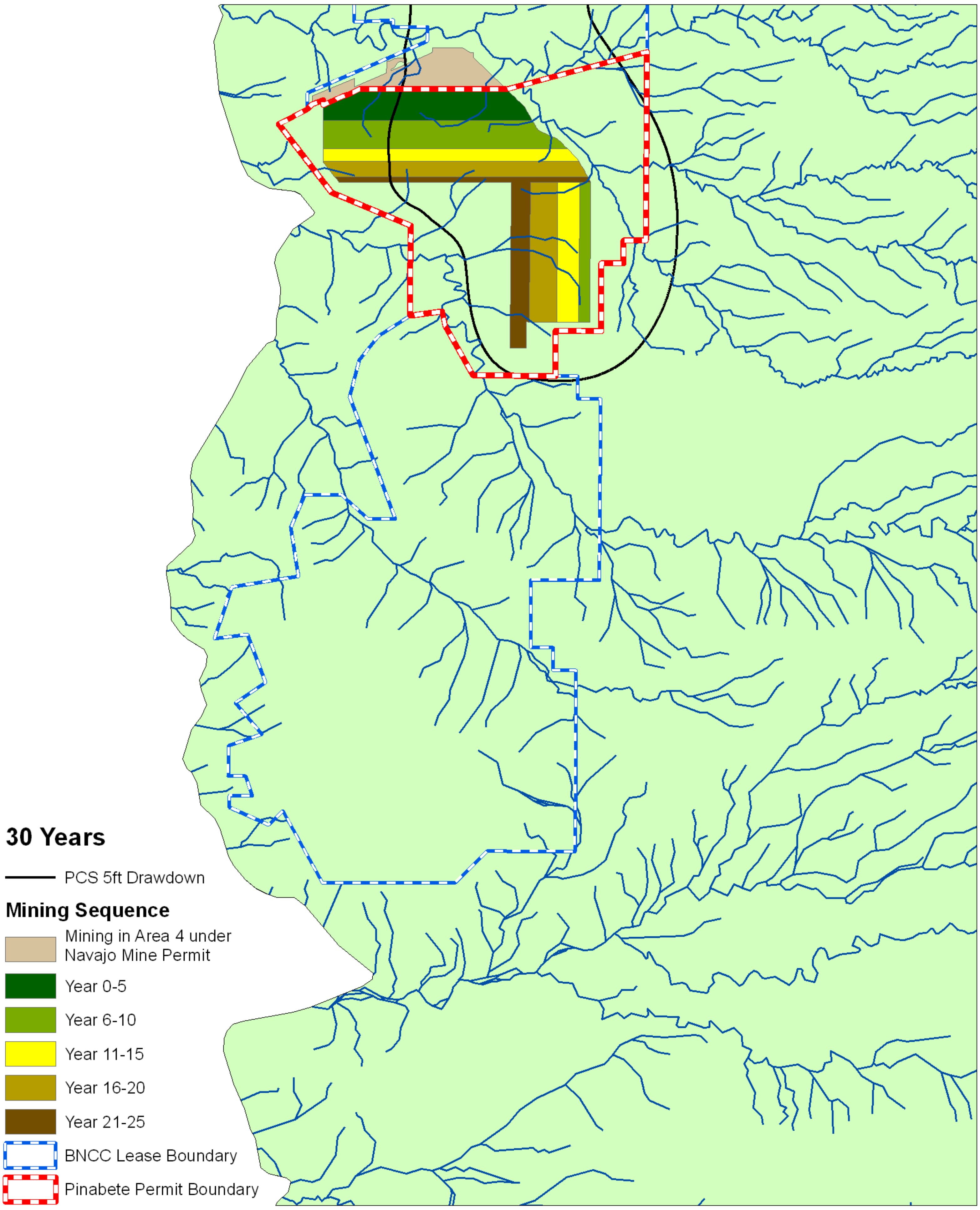


Figure 41.2-6 Modeled 5-feet Drawdown in the PCS at Mine Plan Year 25

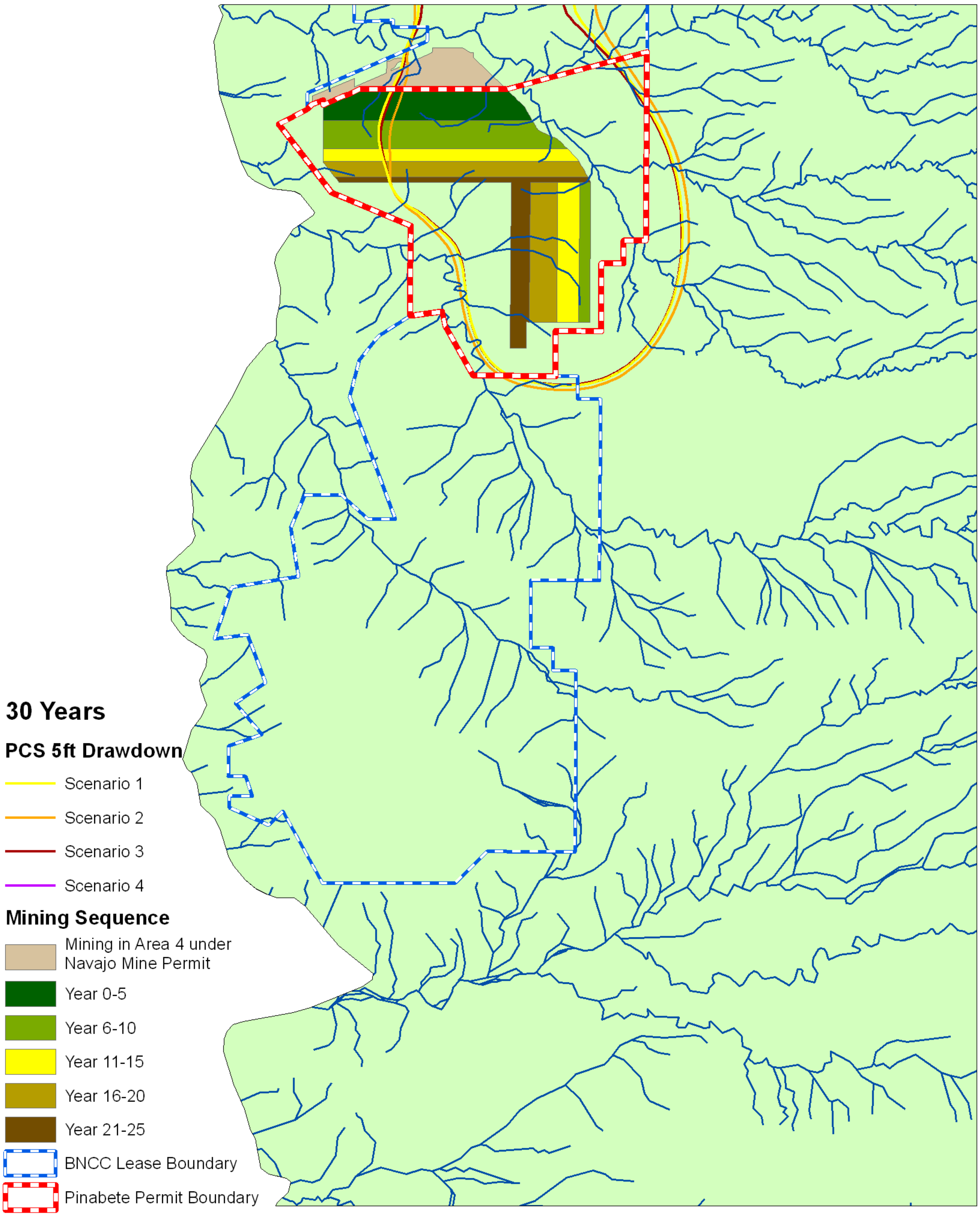


Figure 41.2-7 Modeled 5-feet Drawdown in the PCS, Scenarios 1 through 4

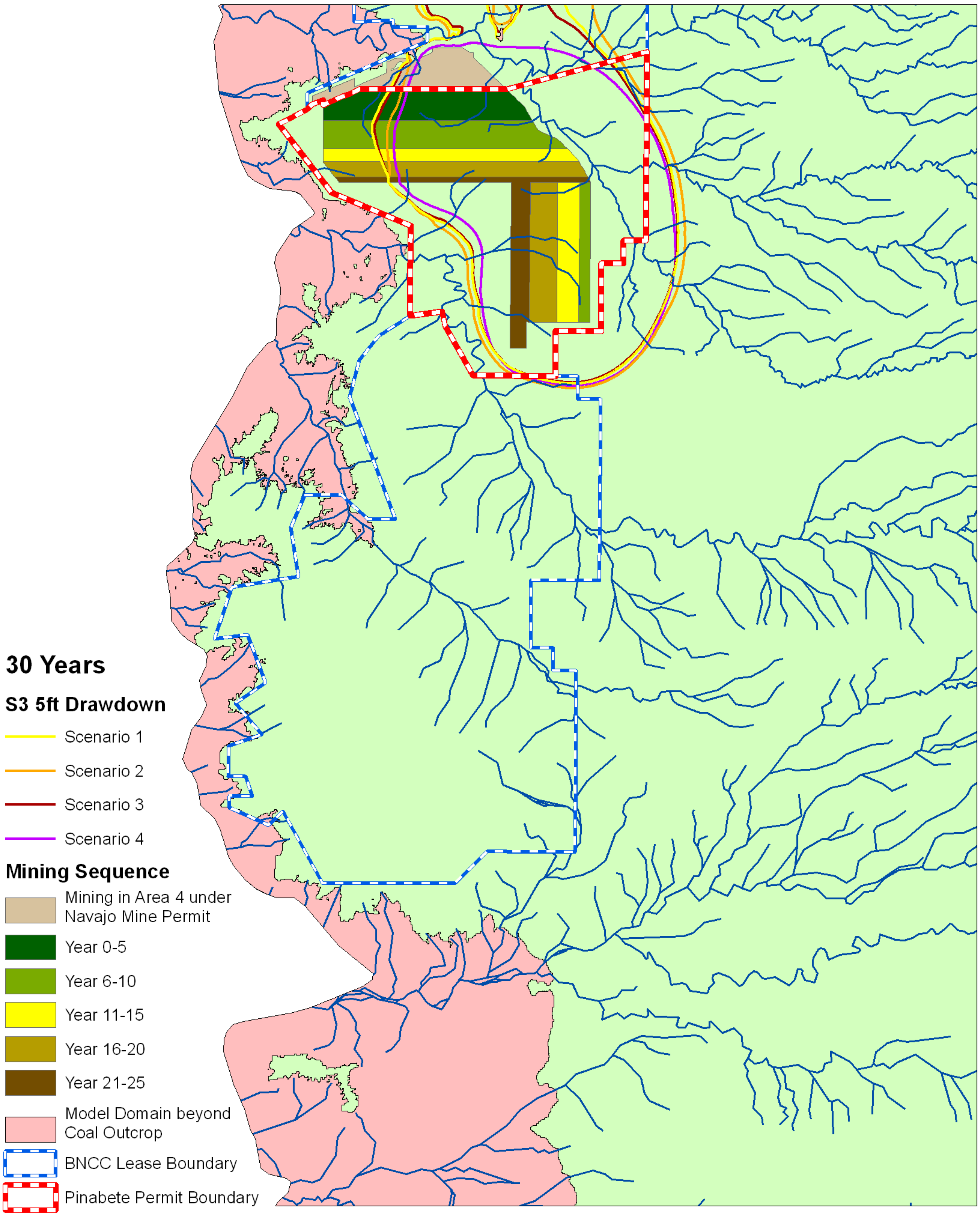


Figure 41.2-8 Modeled 5-feet Drawdown in the No. 3 Coal Seam, Scenarios 1 through 4

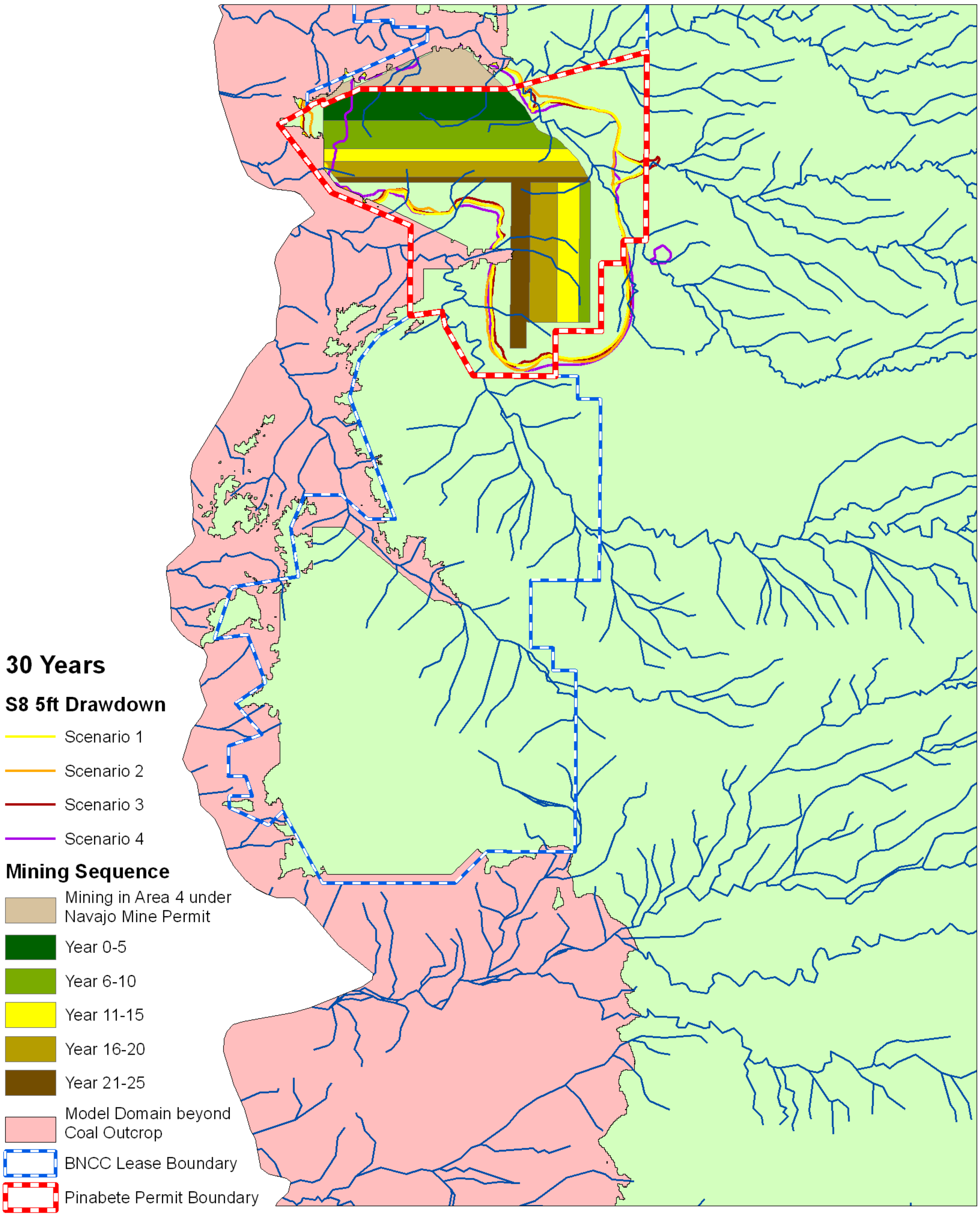


Figure 41.2-9 Modeled 5-feet Drawdown in the No. 8 Coal Seam, Scenarios 1 through 4

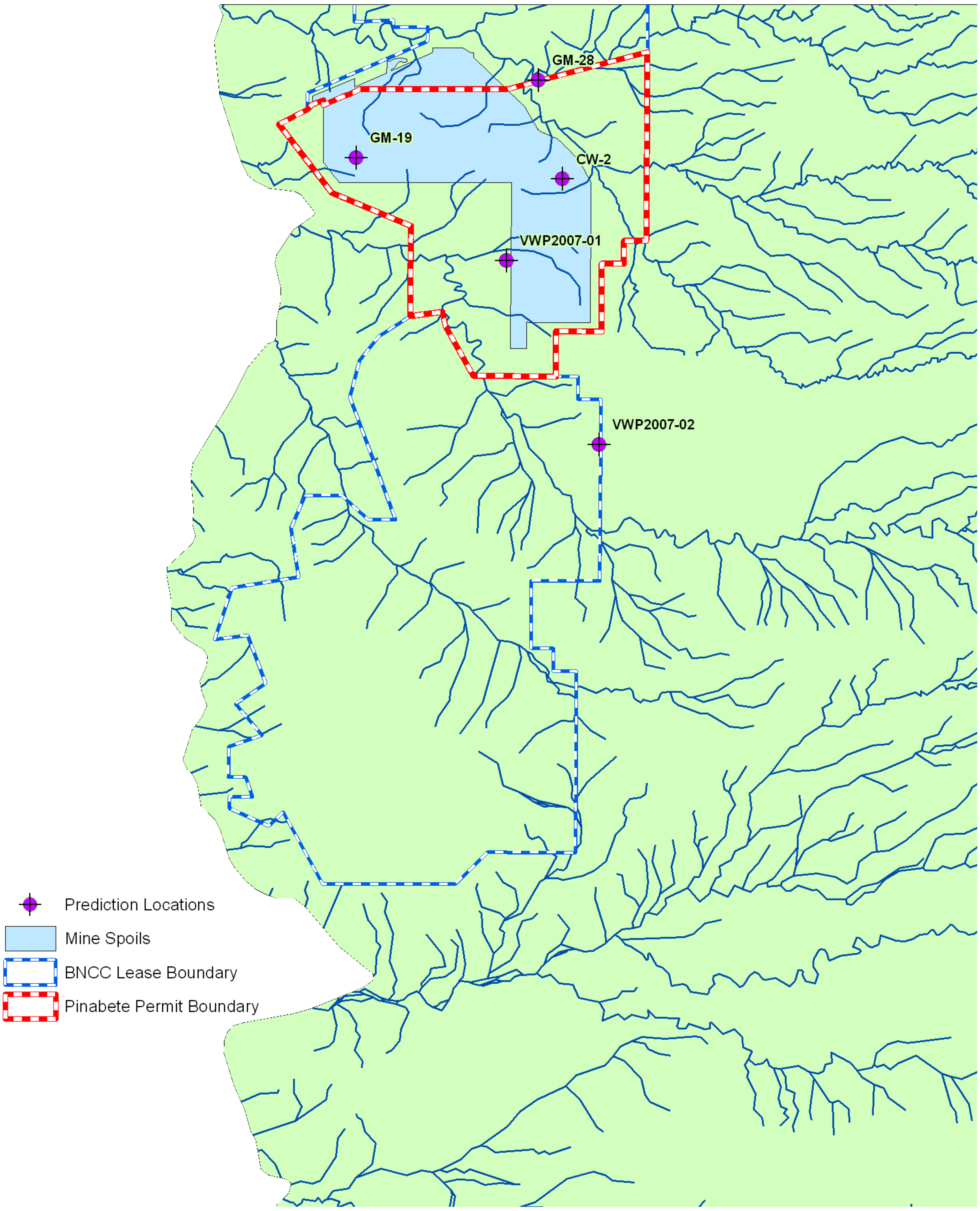


Figure 41.3-1 Mine Backfill and Prediction Locations for Water Level Plots

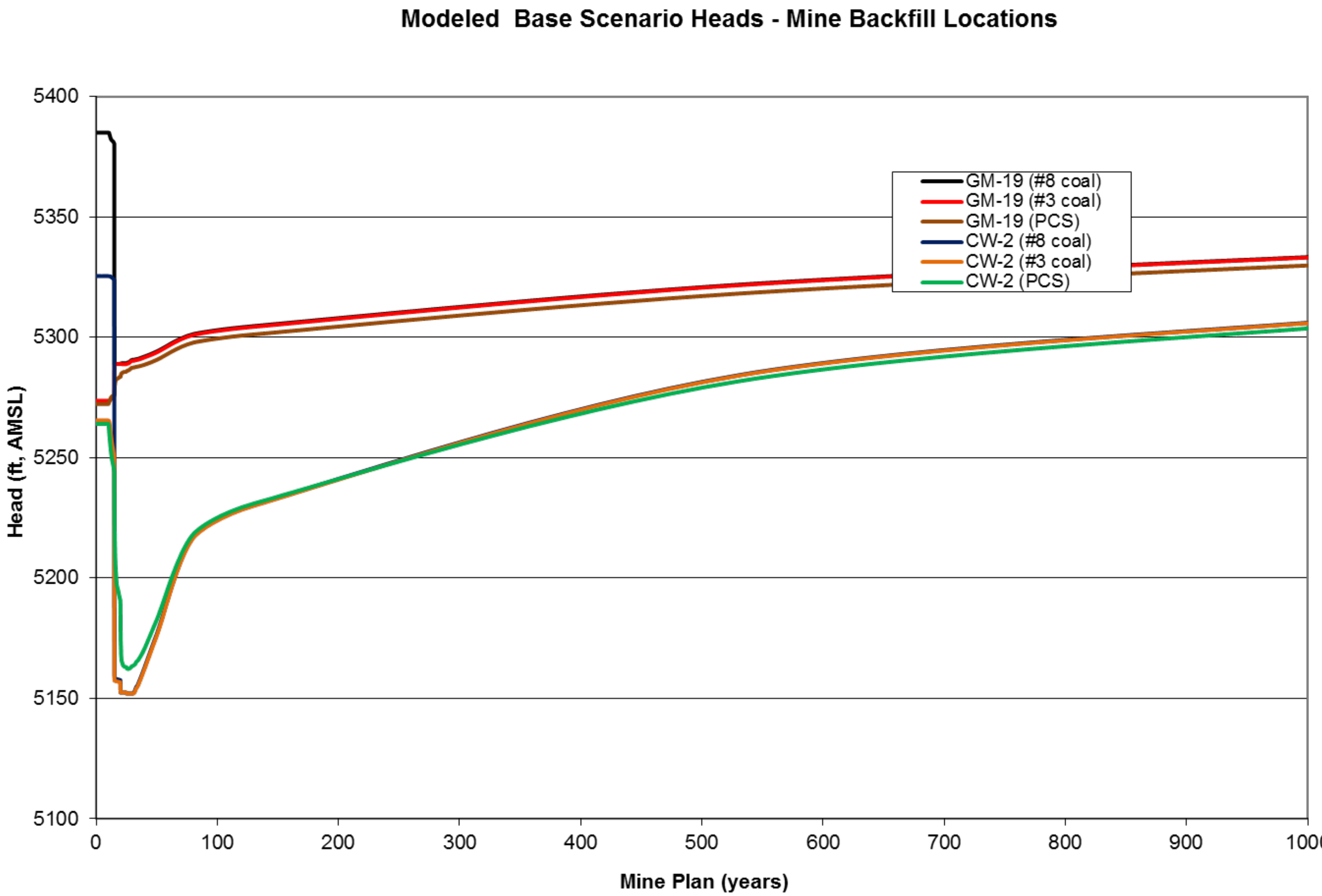


Figure 41.3-2 Base Scenario - Rate of Groundwater Recovery in the Mine Backfill

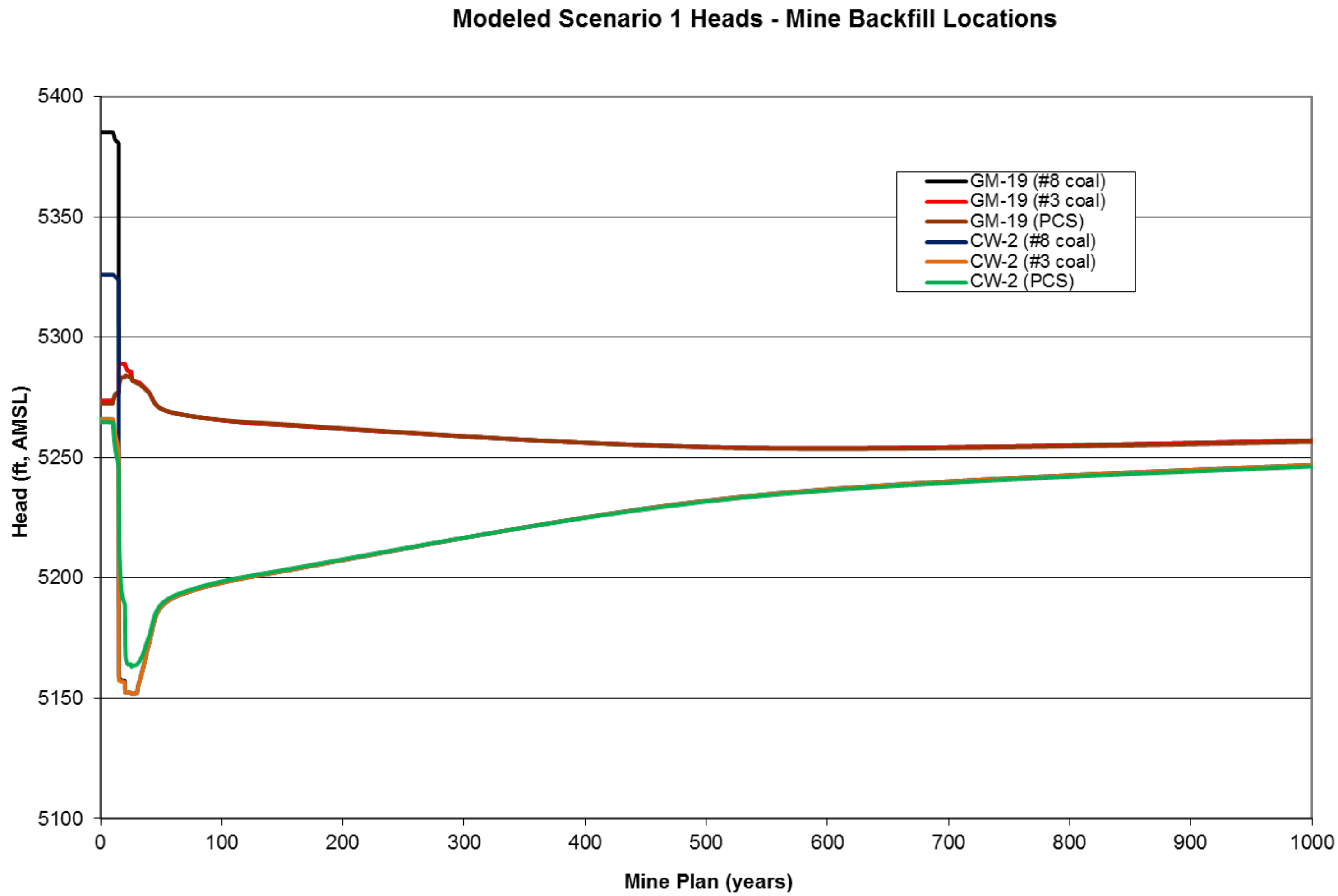


Figure 41.3-3 Flow Scenario 1 - Rate of Groundwater Recovery in the Mine Backfill

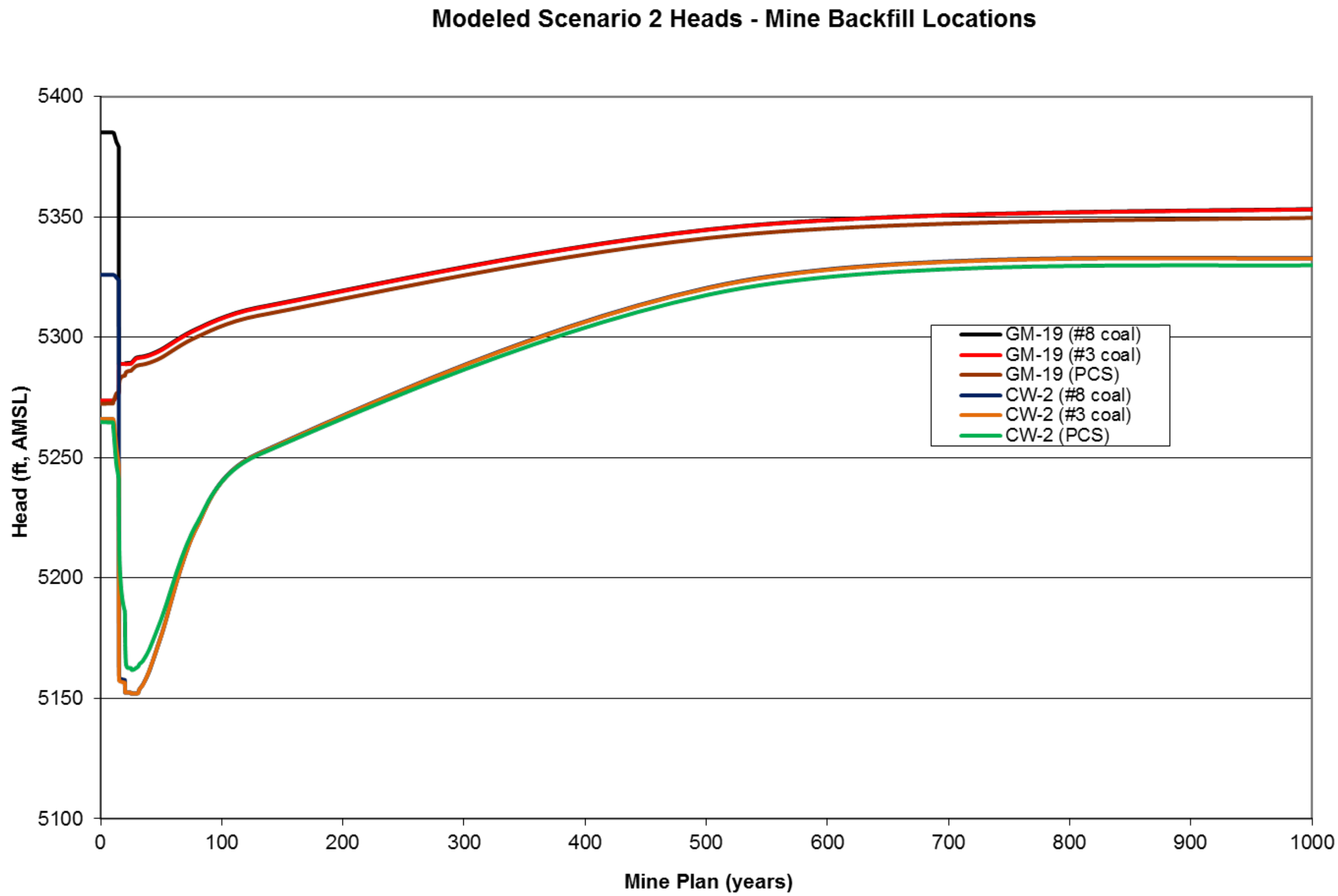


Figure 41.3-4 Flow Scenario 2 - Rate of Groundwater Recovery in the Mine Backfill

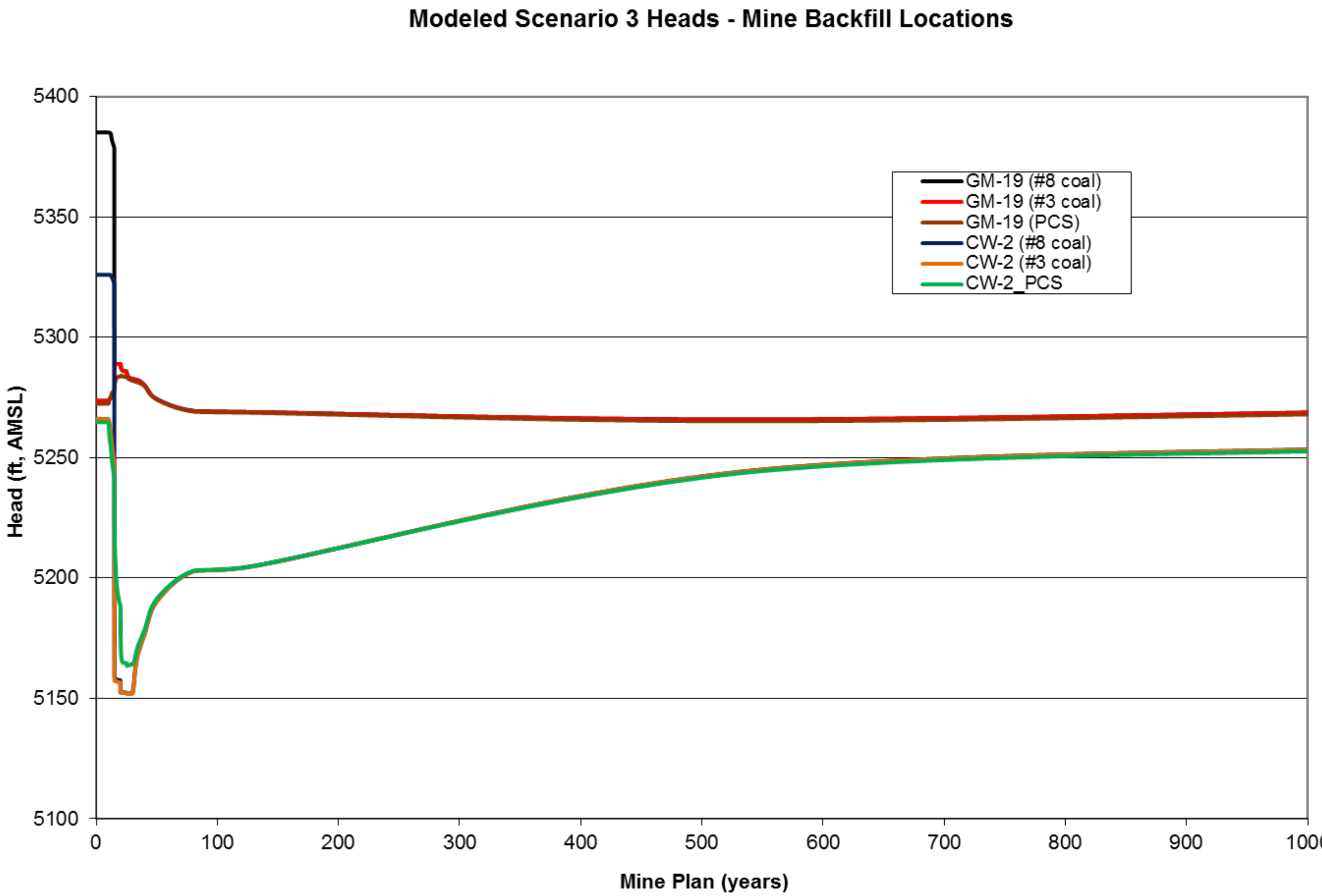


Figure 41.3-5 Flow Scenario 3 - Rate of Groundwater Recovery in the Mine Backfill

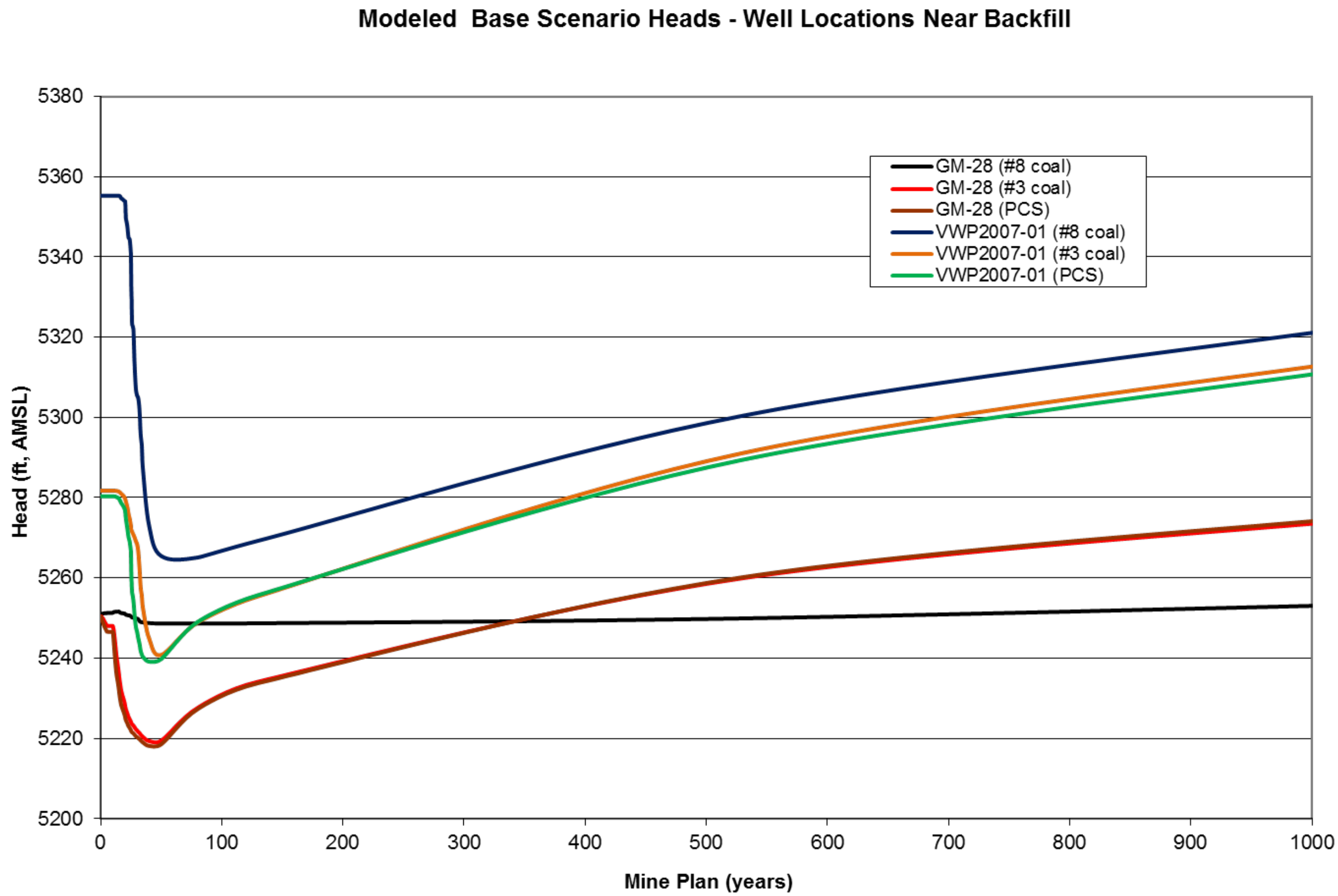


Figure 41.3-6 Base Scenario - Rate of Groundwater Recovery at Well Locations near Backfill

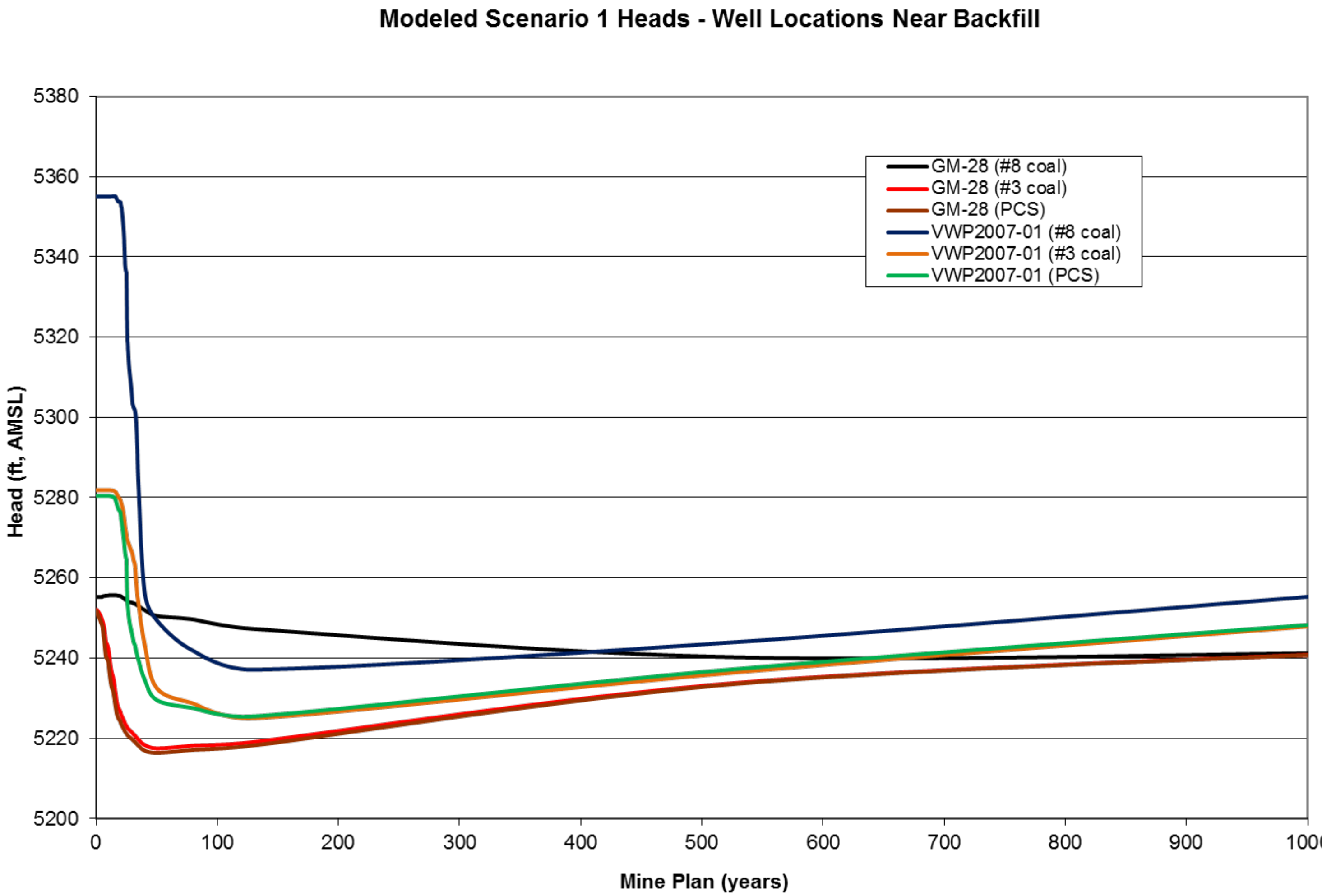


Figure 41.3-7 Flow Scenario 1 - Rate of Groundwater Recovery at Well Locations near Mine Backfill

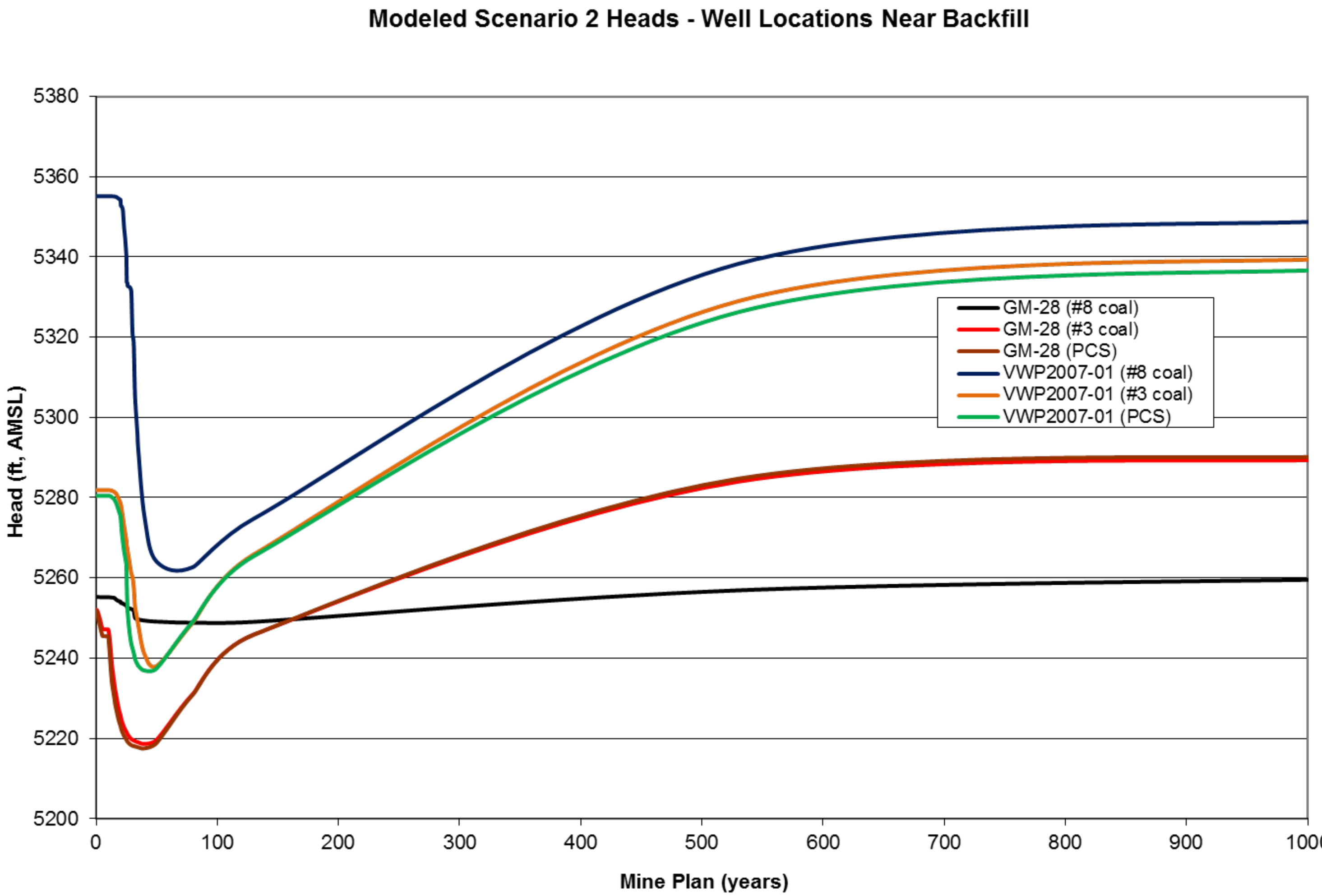


Figure 41.3-8 Flow Scenario 2 - Rate of Groundwater Recovery at Well Locations near Mine Backfill

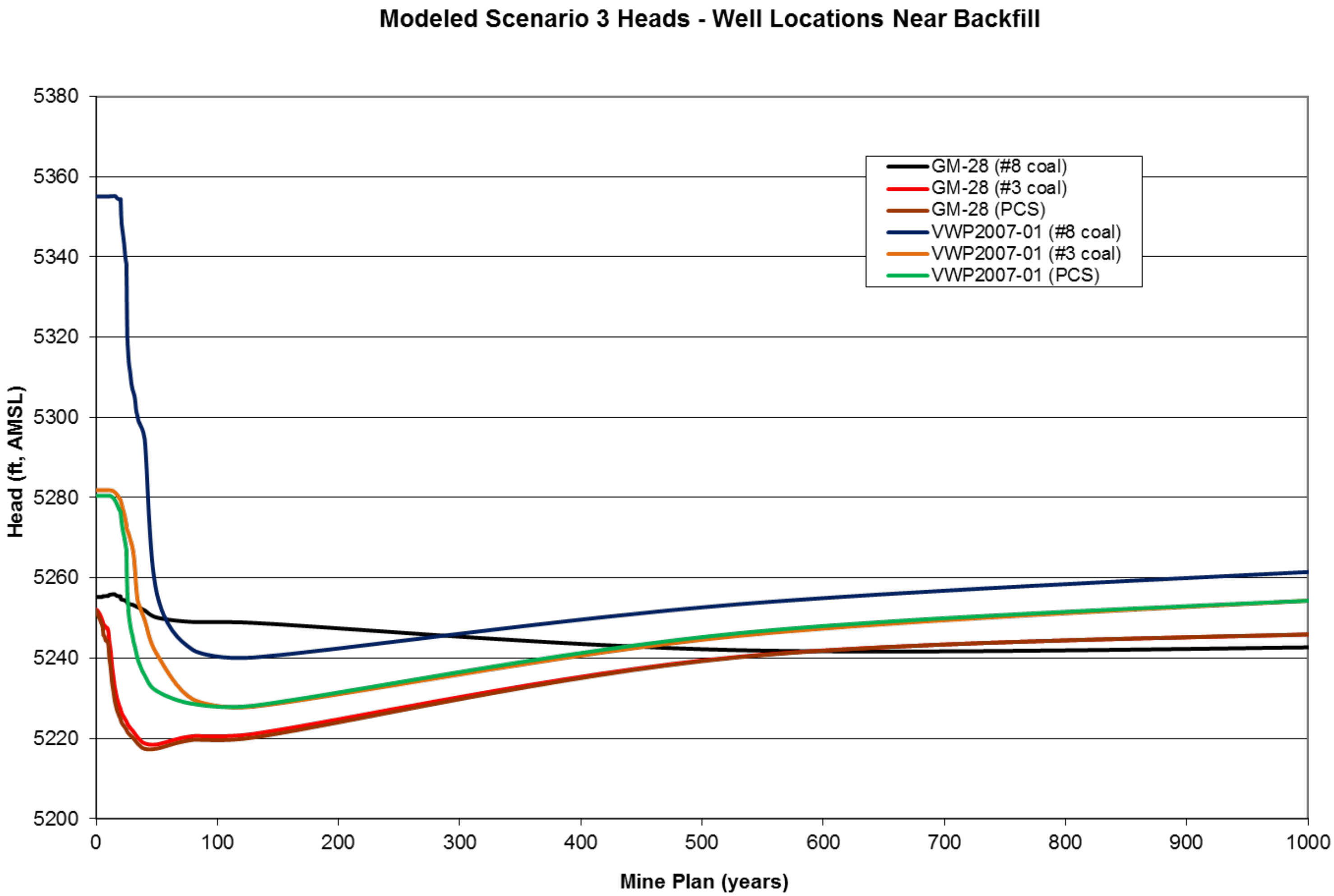


Figure 41.3-9 Flow Scenario 3 - Rate of Groundwater Recovery at Well Locations near Mine Backfill

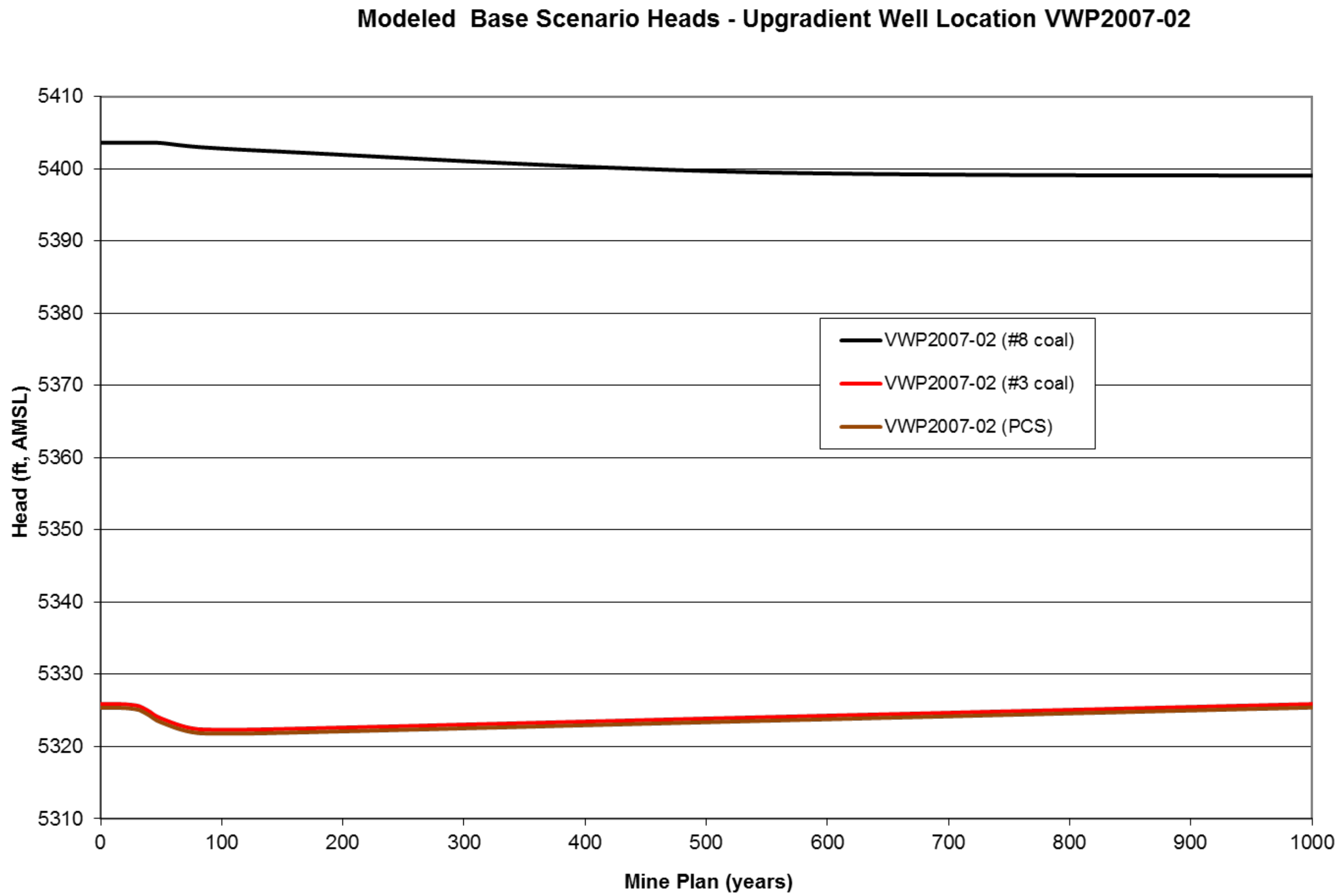


Figure 41.3-10 Base Scenario - Rate of Groundwater Recovery at Upgradient Well Location VWP2007-02

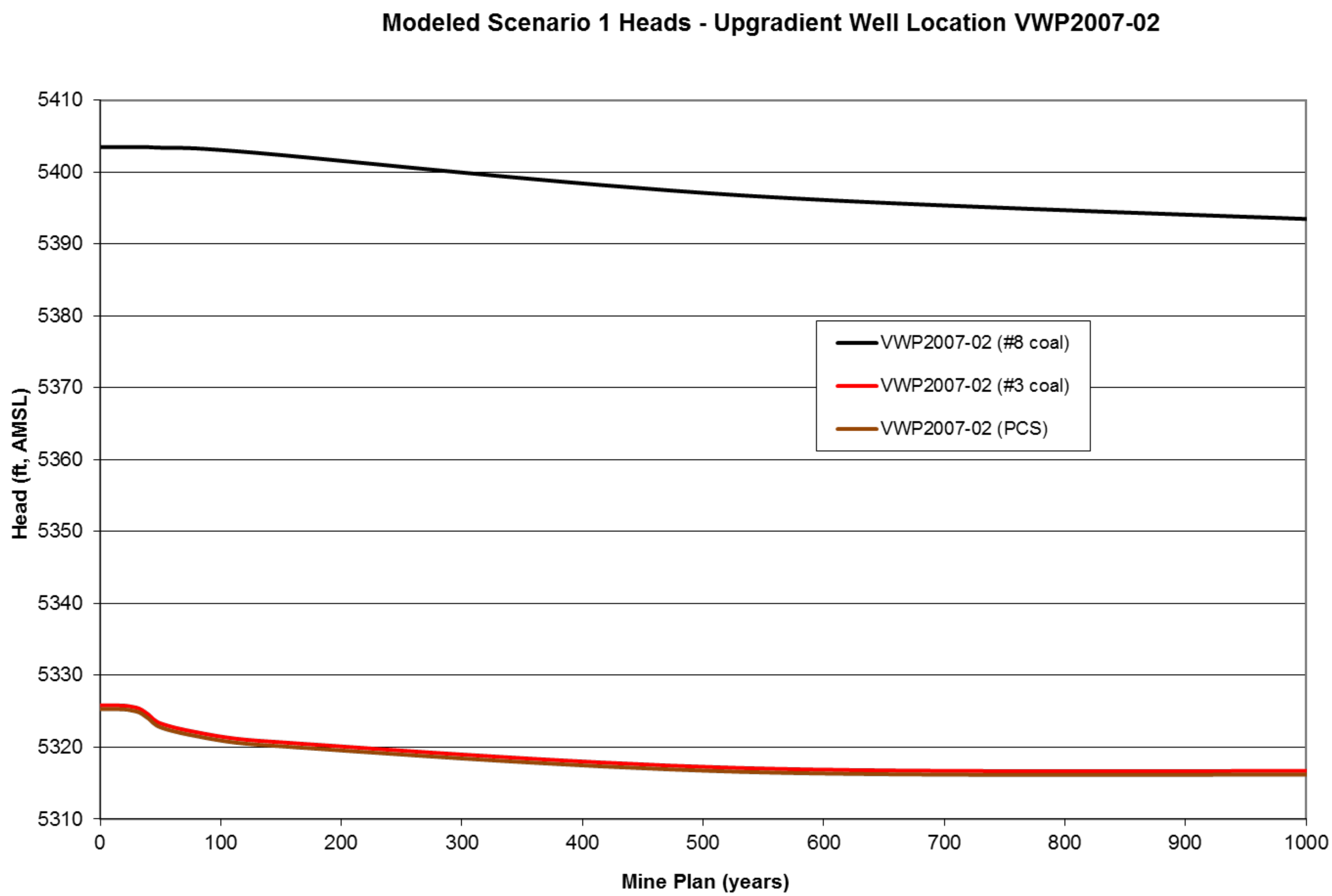


Figure 41.3-11 Flow Scenario 1 - Rate of Groundwater Recovery at Upgradient Well Location VWP2007-02

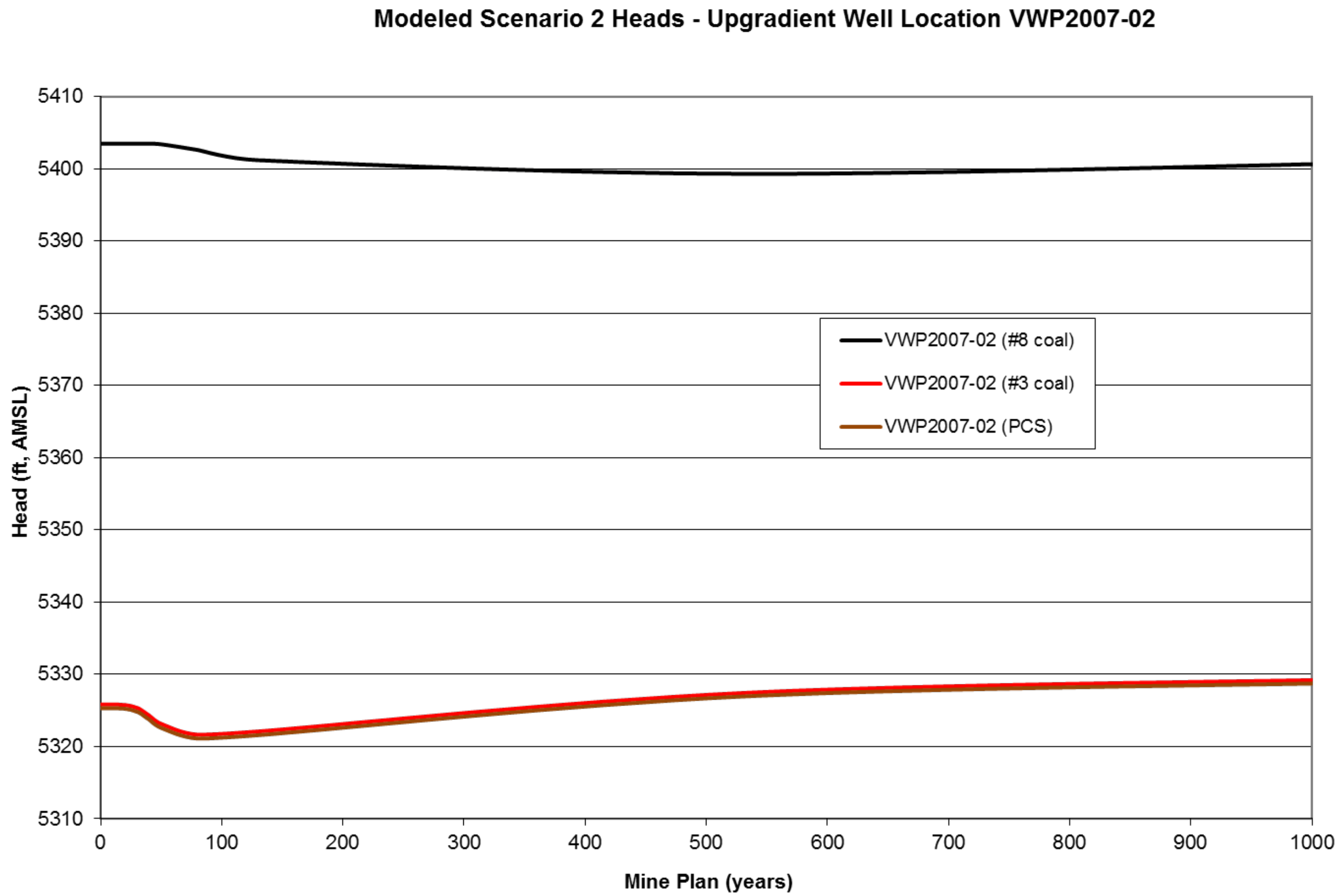


Figure 41.3-12 Flow Scenario 2 - Rate of Groundwater Recovery at Upgradient Well Location VWP2007-02

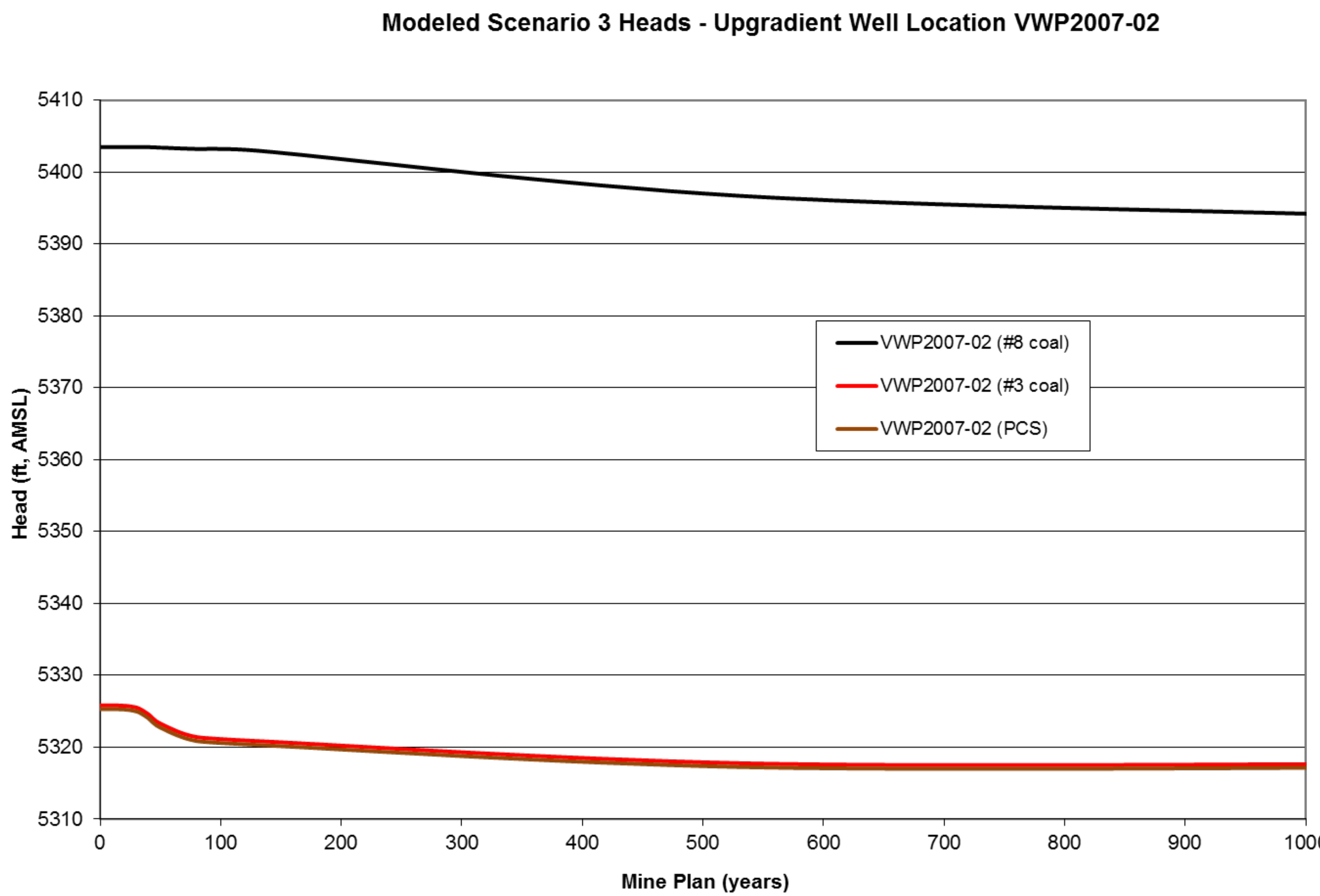


Figure 41.3-13 Flow Scenario 3 - Rate of Groundwater Recovery at Upgradient Well Location VWP2007-02

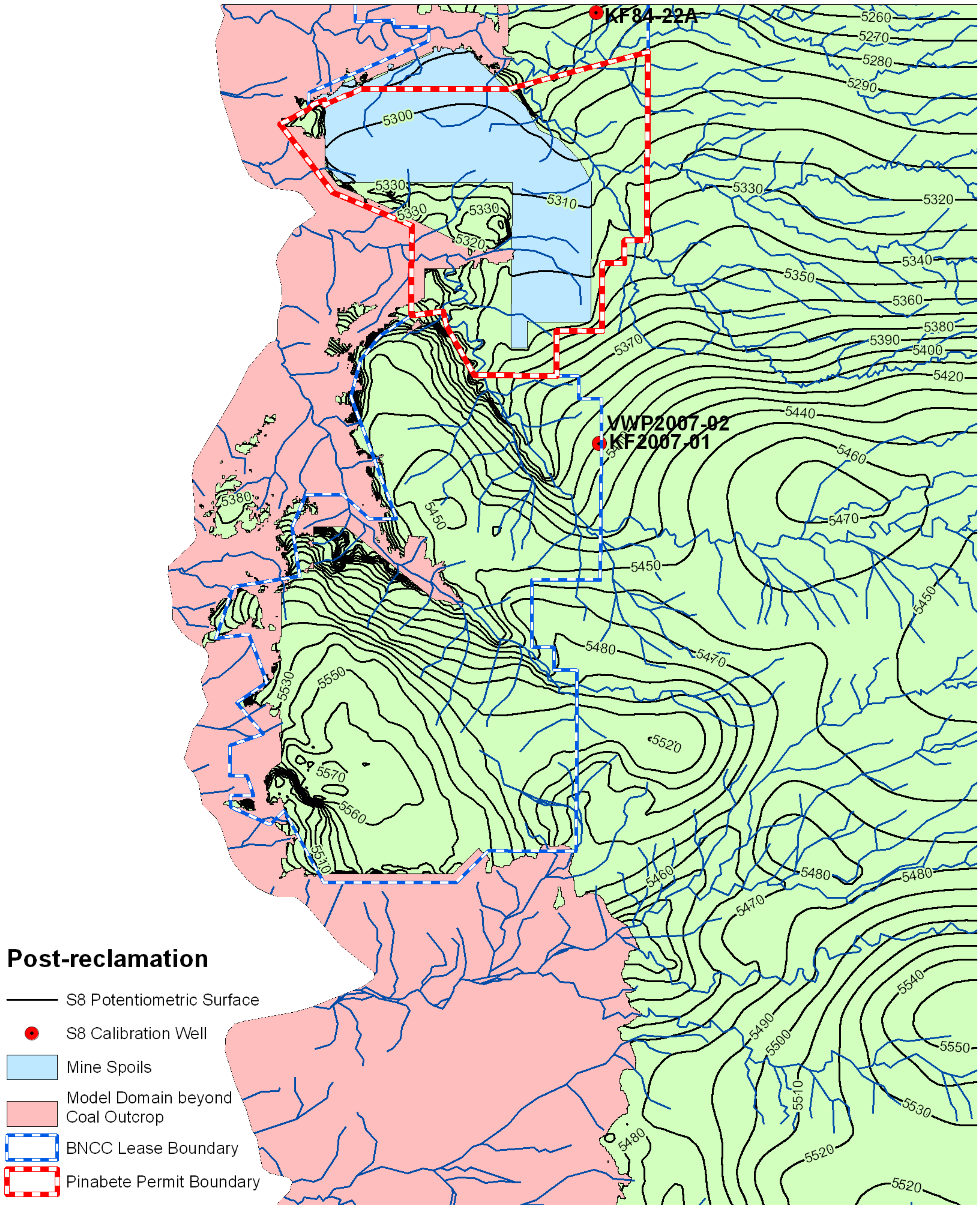


Figure 41.3-14 Base Scenario – Post-Reclamation Potentiometric Surface – No. 8 Coal Seam (S8)

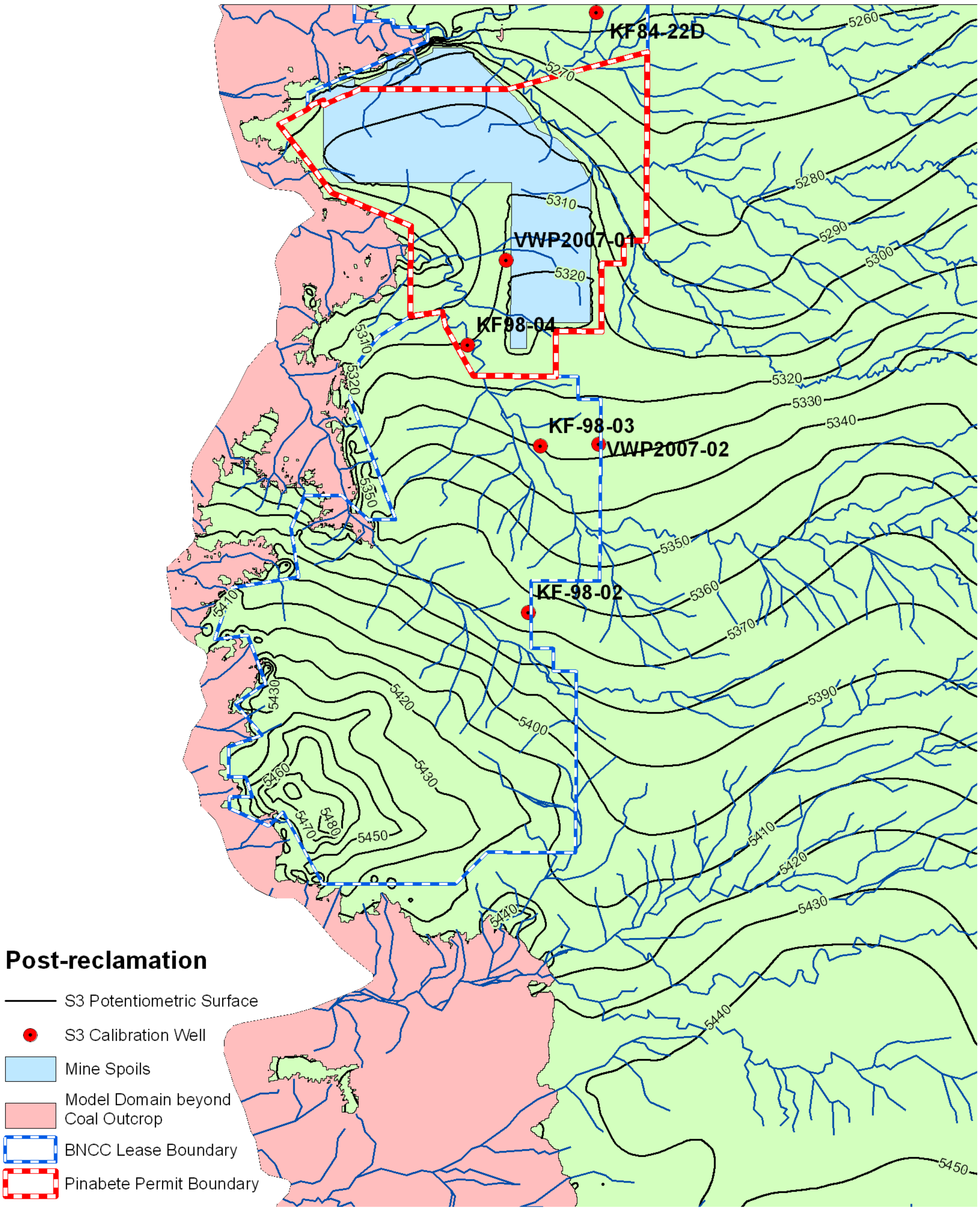


Figure 41.3-15 Base Scenario – Post-Reclamation Potentiometric Surface – No. 3 Coal Seam (S3)

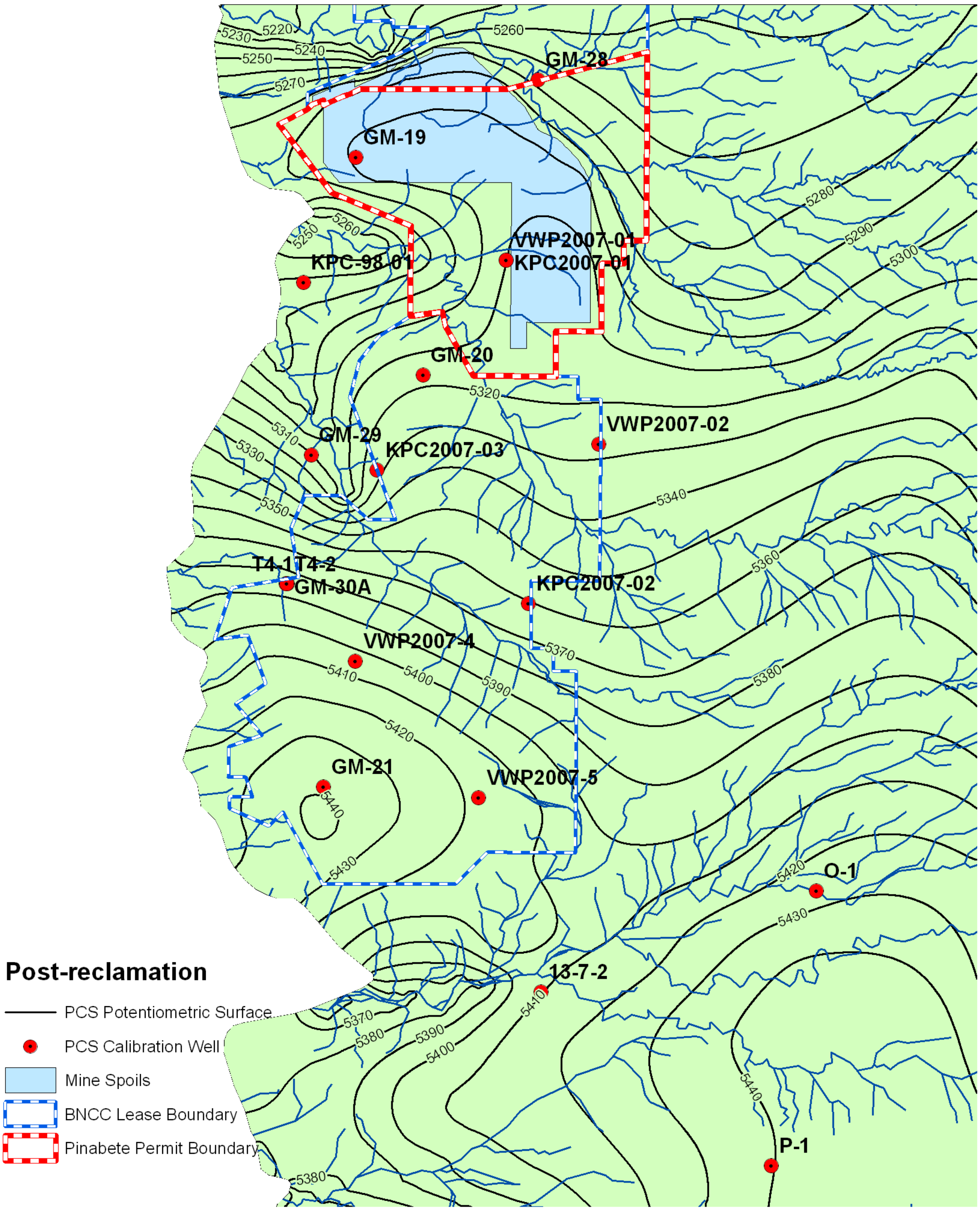


Figure 41.3-16 Base Scenario – Post-Reclamation Potentiometric Surface – Pictured Cliffs Sandstone (PCS)

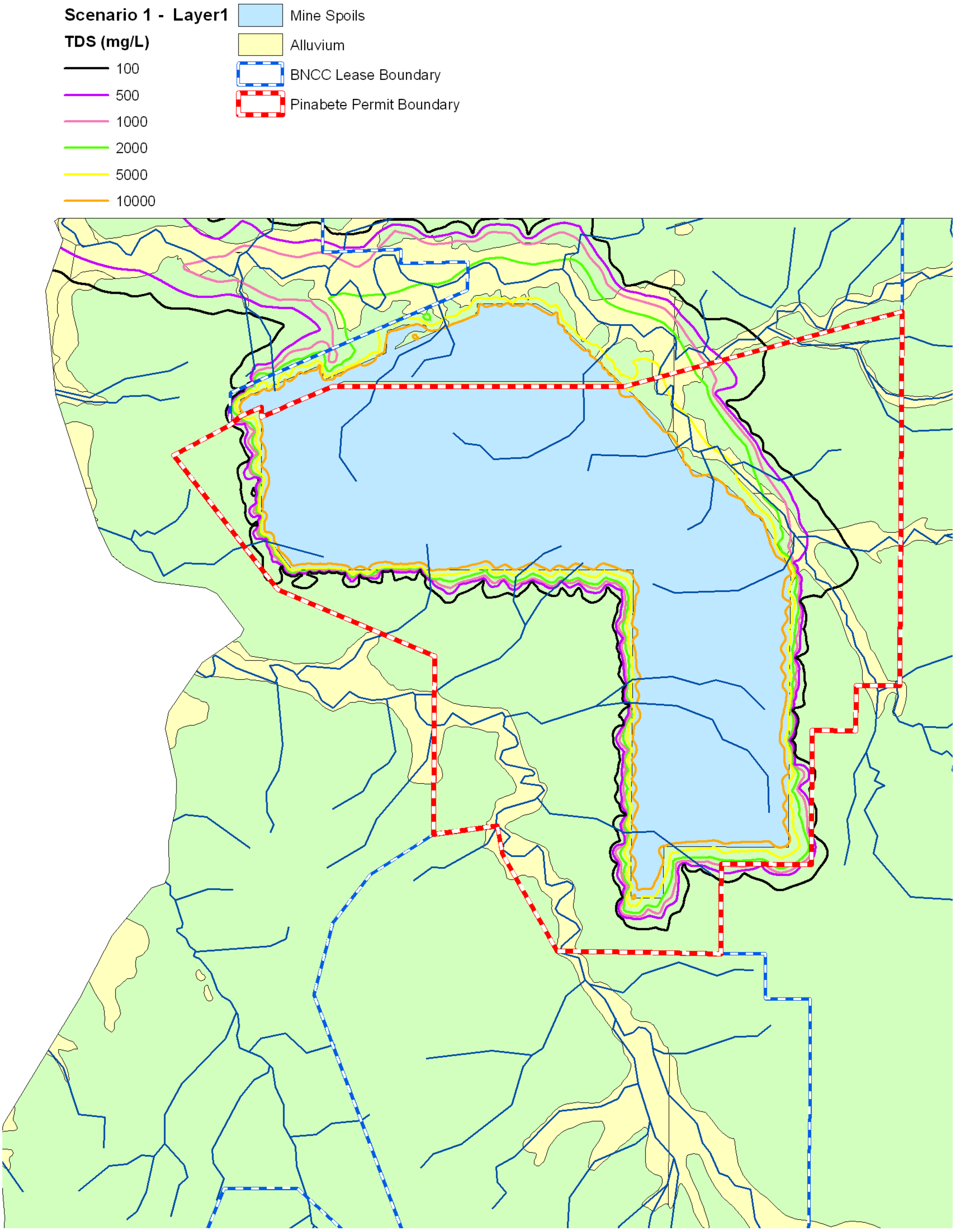


Figure 41.3-17 Transport Scenario 1 - TDS Transport in the L1 after 500-years with Constant Source of 11,500 mg/L

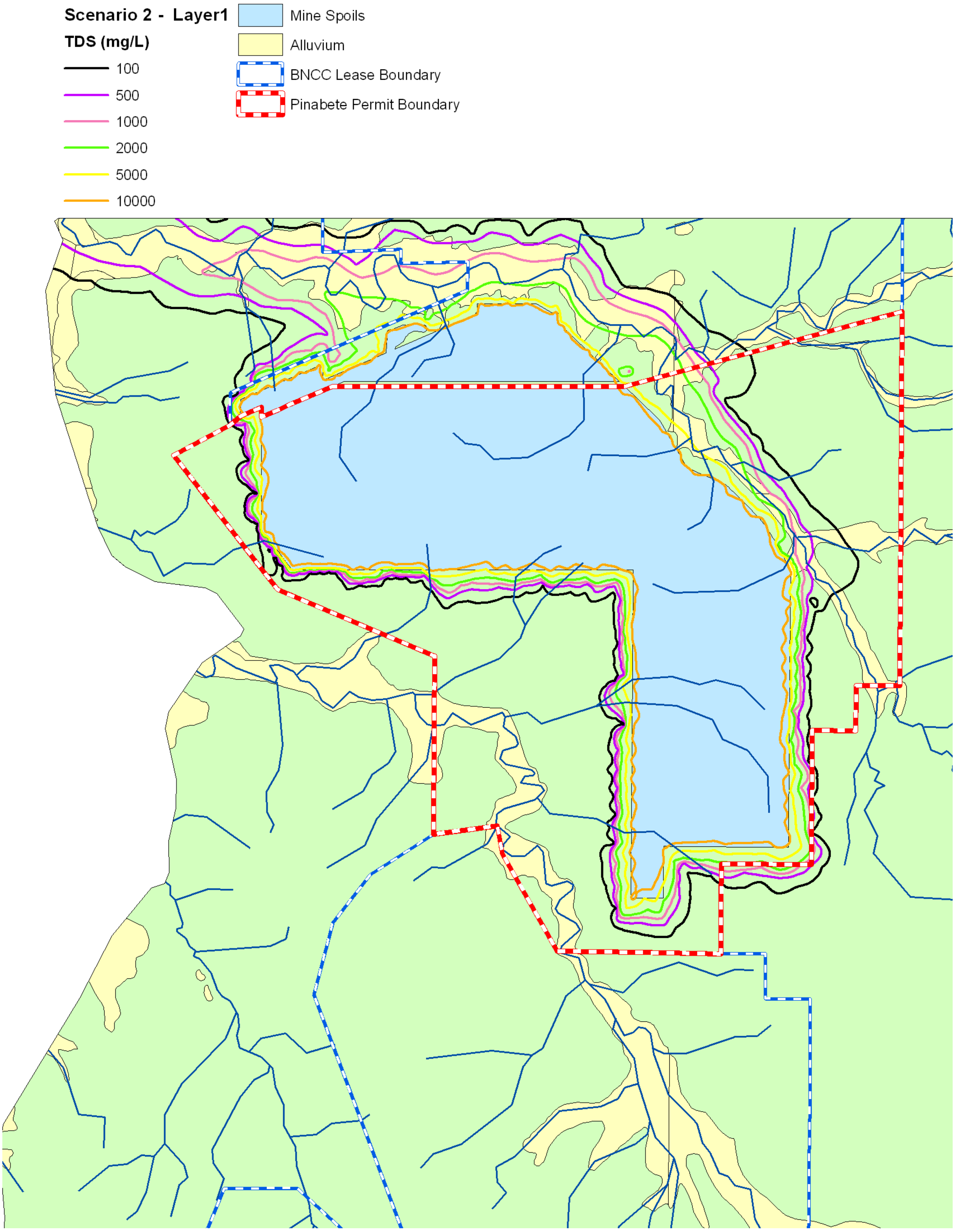


Figure 41.3-18 Transport Scenario 2 - TDS Transport in the L1 after 500-years with Constant Source of 11,500 mg/L

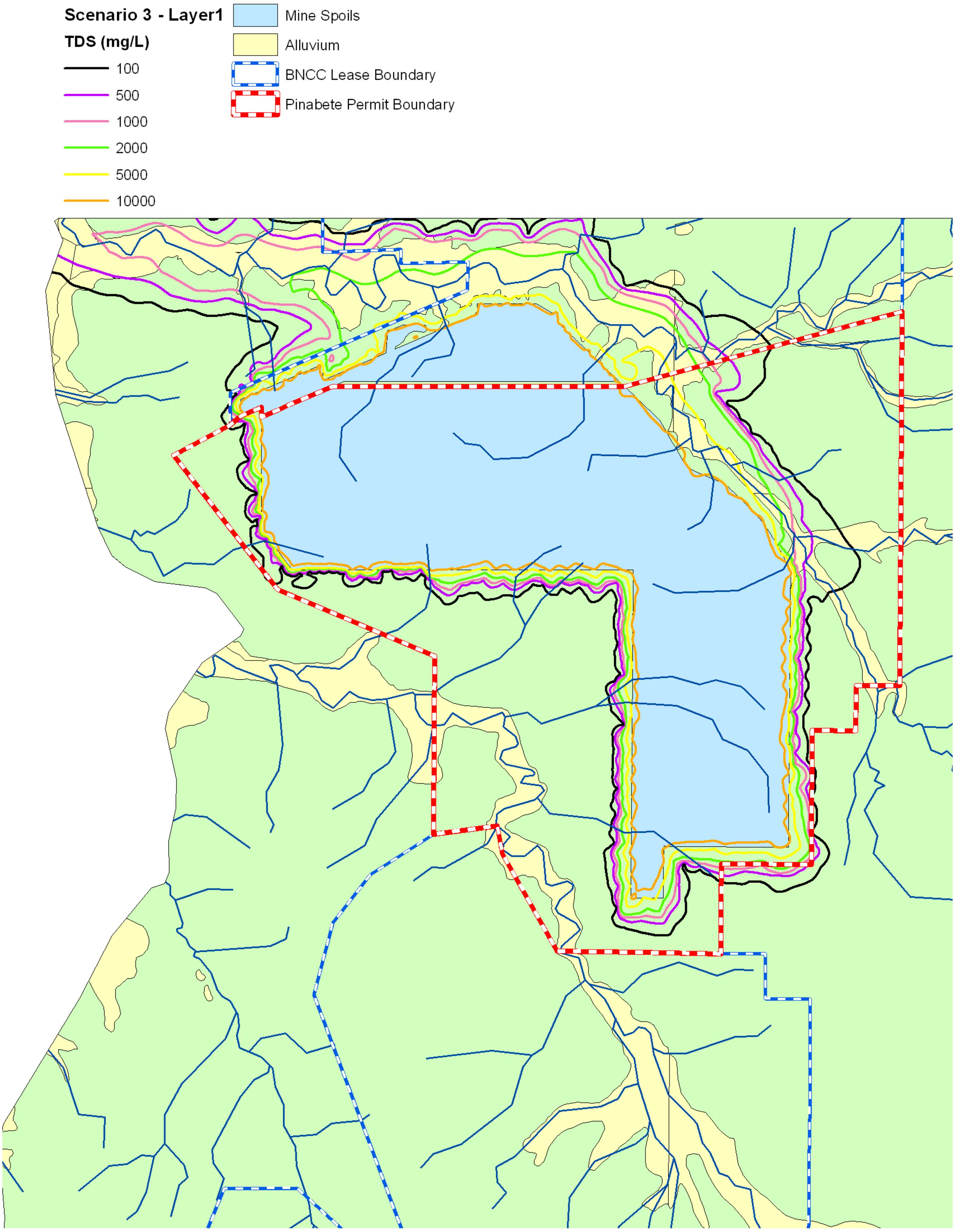


Figure 41.3-19 Transport Scenario 3 - TDS Transport in the L1 after 500-years with Constant Source of 11,500 mg/L

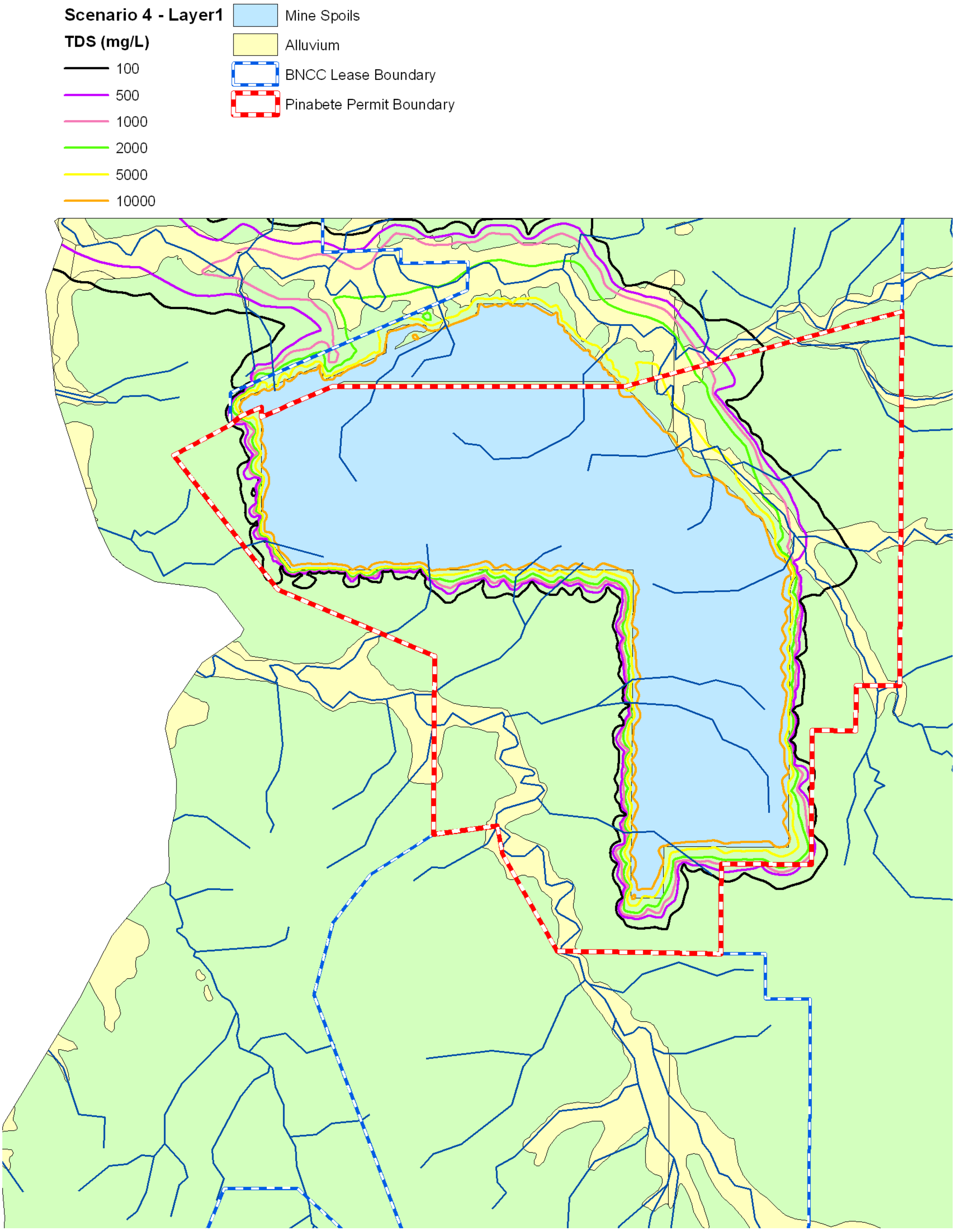


Figure 41.3-20 Transport Scenario 4 - TDS Transport in the L1 after 500-years with Constant Source of 11,500 mg/L

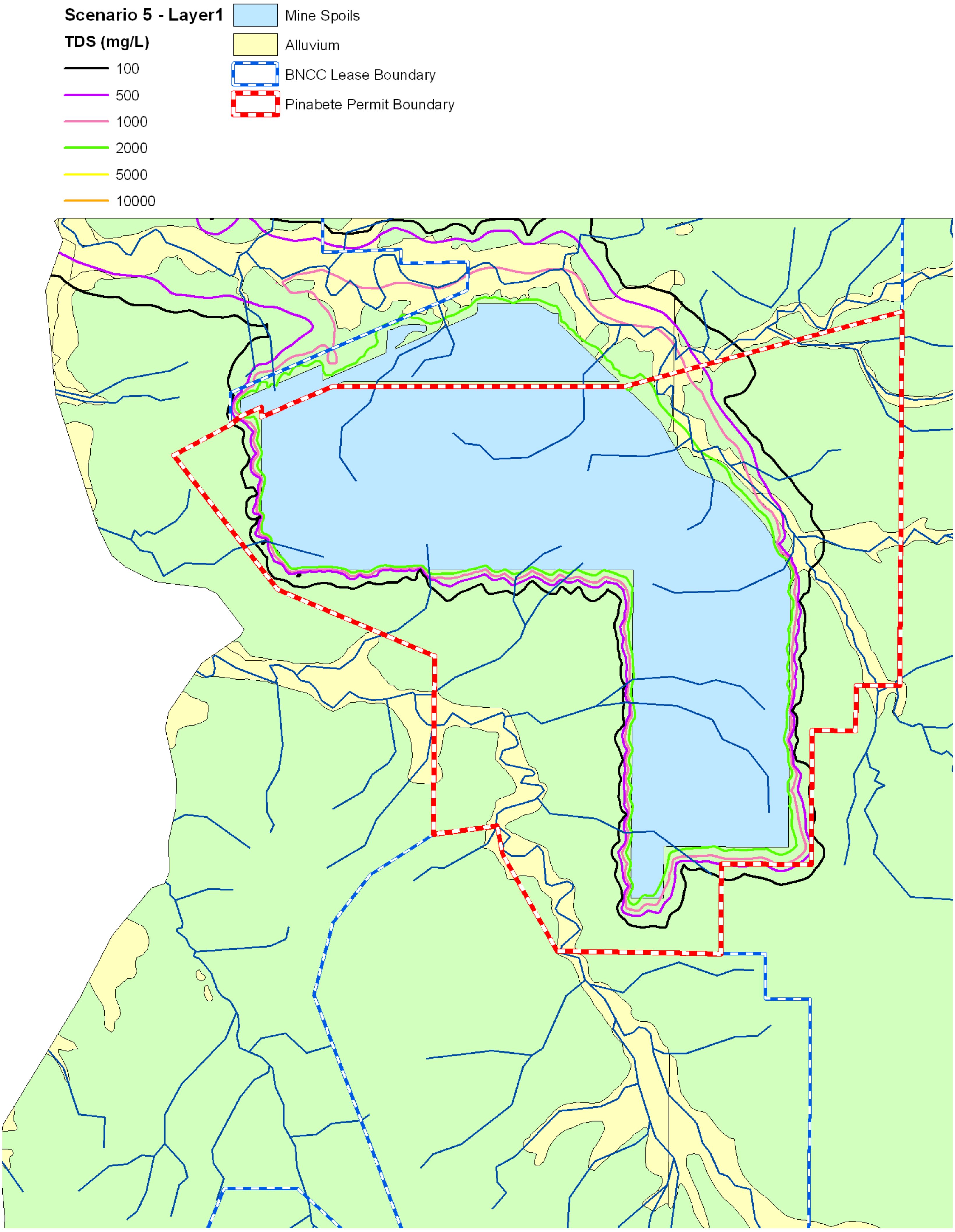


Figure 41.3-21 Transport Scenario 5 - TDS Transport in the L1 after 500-years with Constant Source of 3,550 mg/L

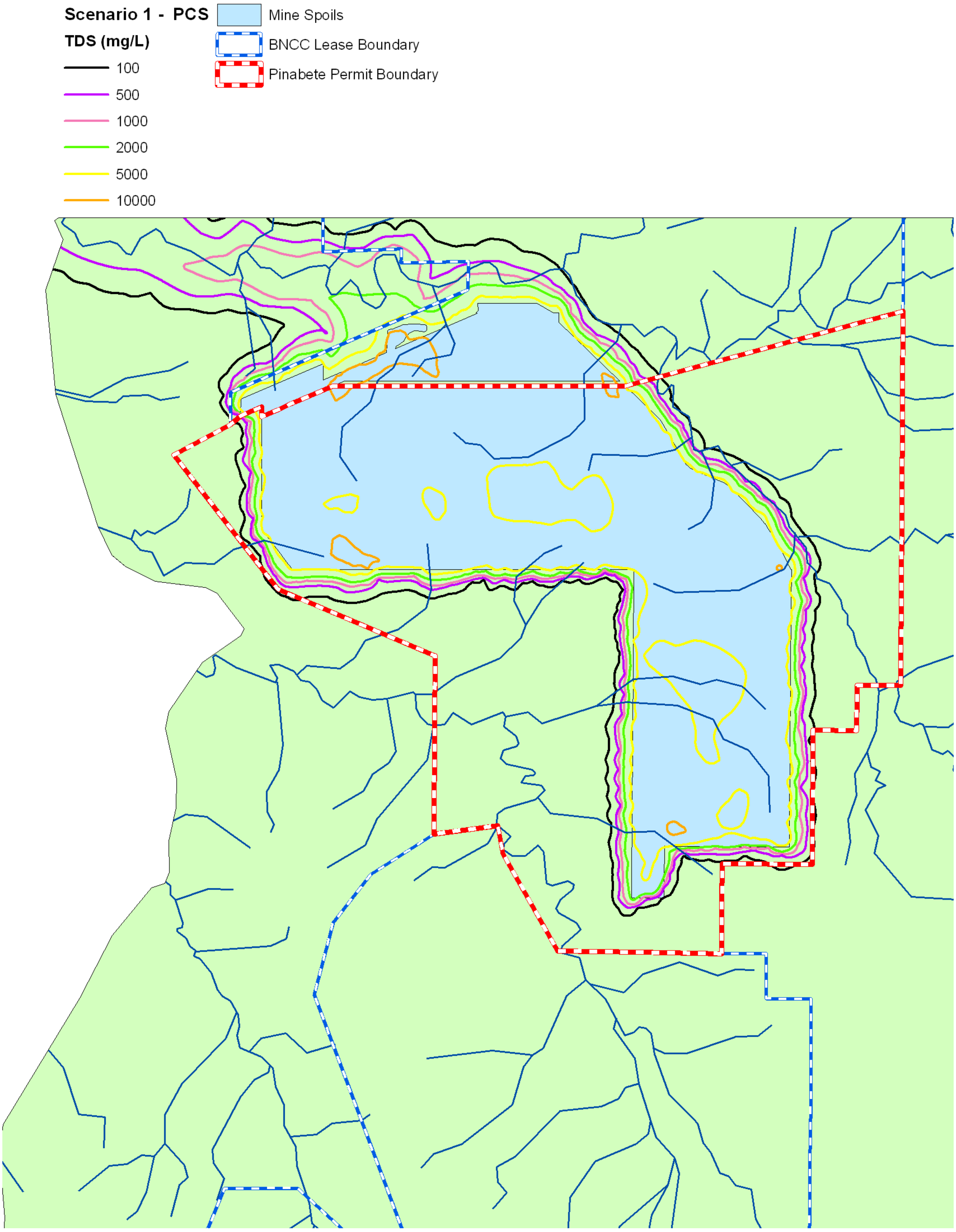


Figure 41.3-22 Transport Scenario 1 - TDS Transport in the PCS after 500-years with Constant Source of 11,500 mg/L

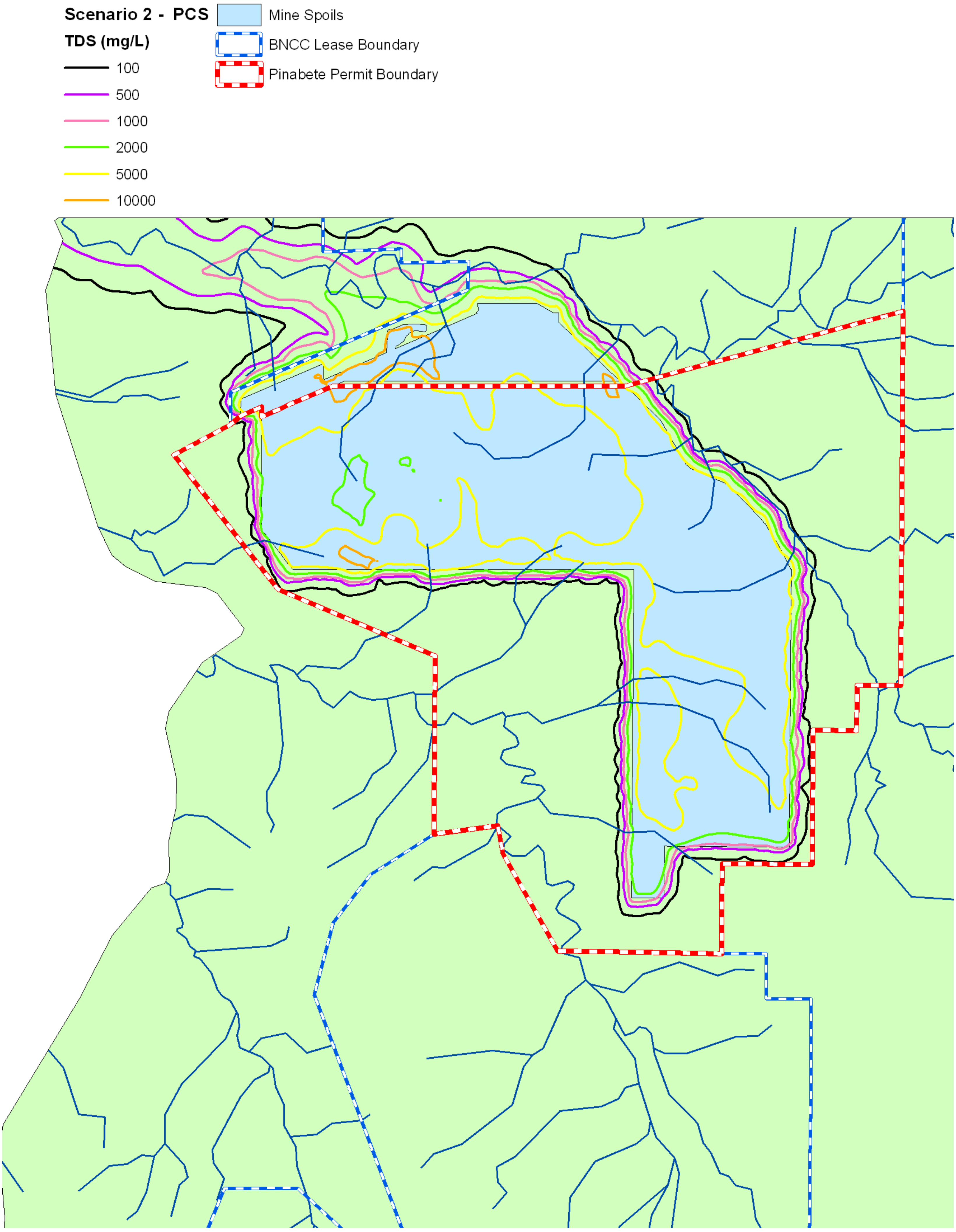


Figure 41.3-23 Transport Scenario 2 - TDS Transport in the PCS after 500-years with Constant Source of 11,500 mg/L

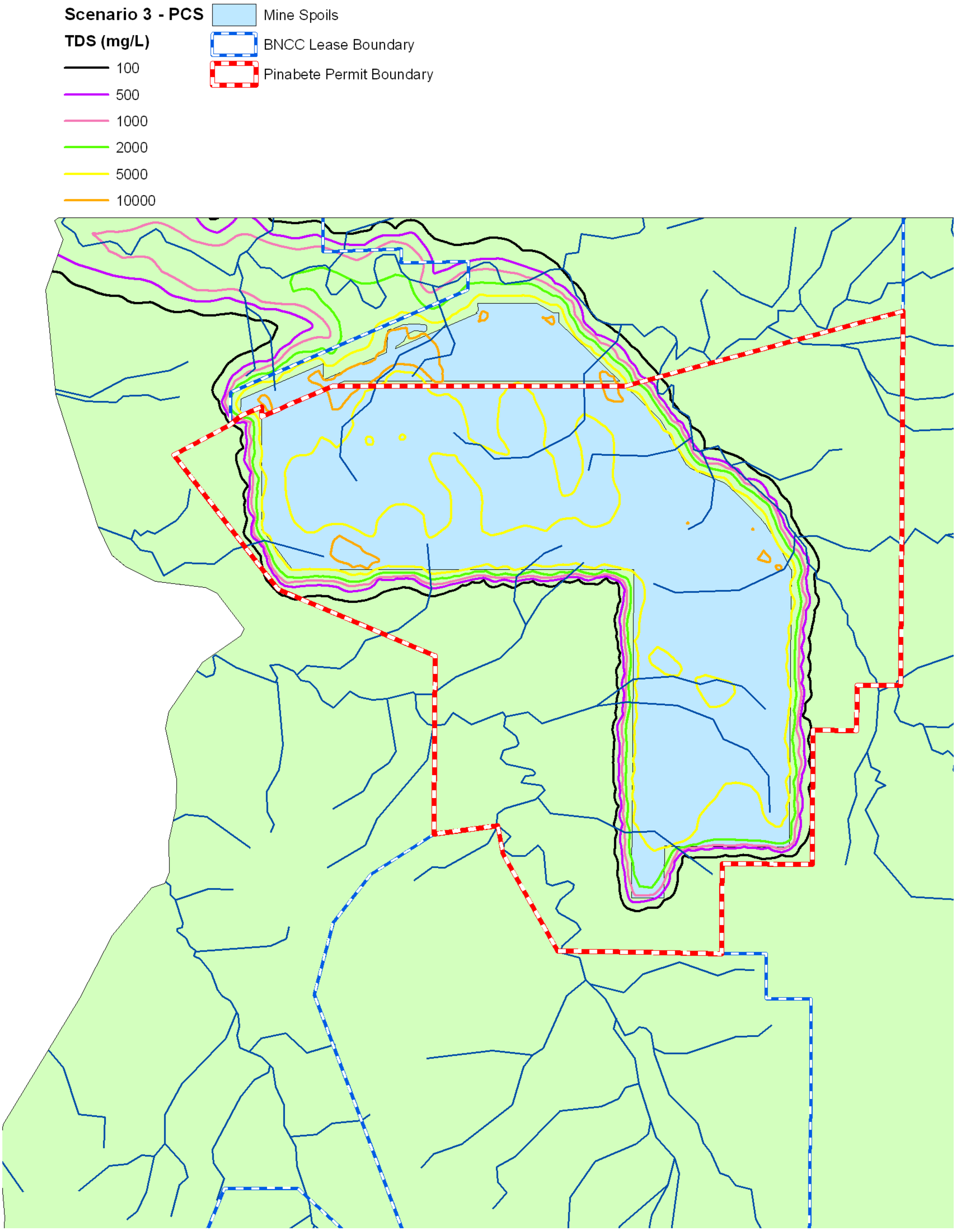


Figure 41.3-24 Transport Scenario 3 - TDS Transport in the PCS after 500-years with Constant Source of 11,500 mg/L

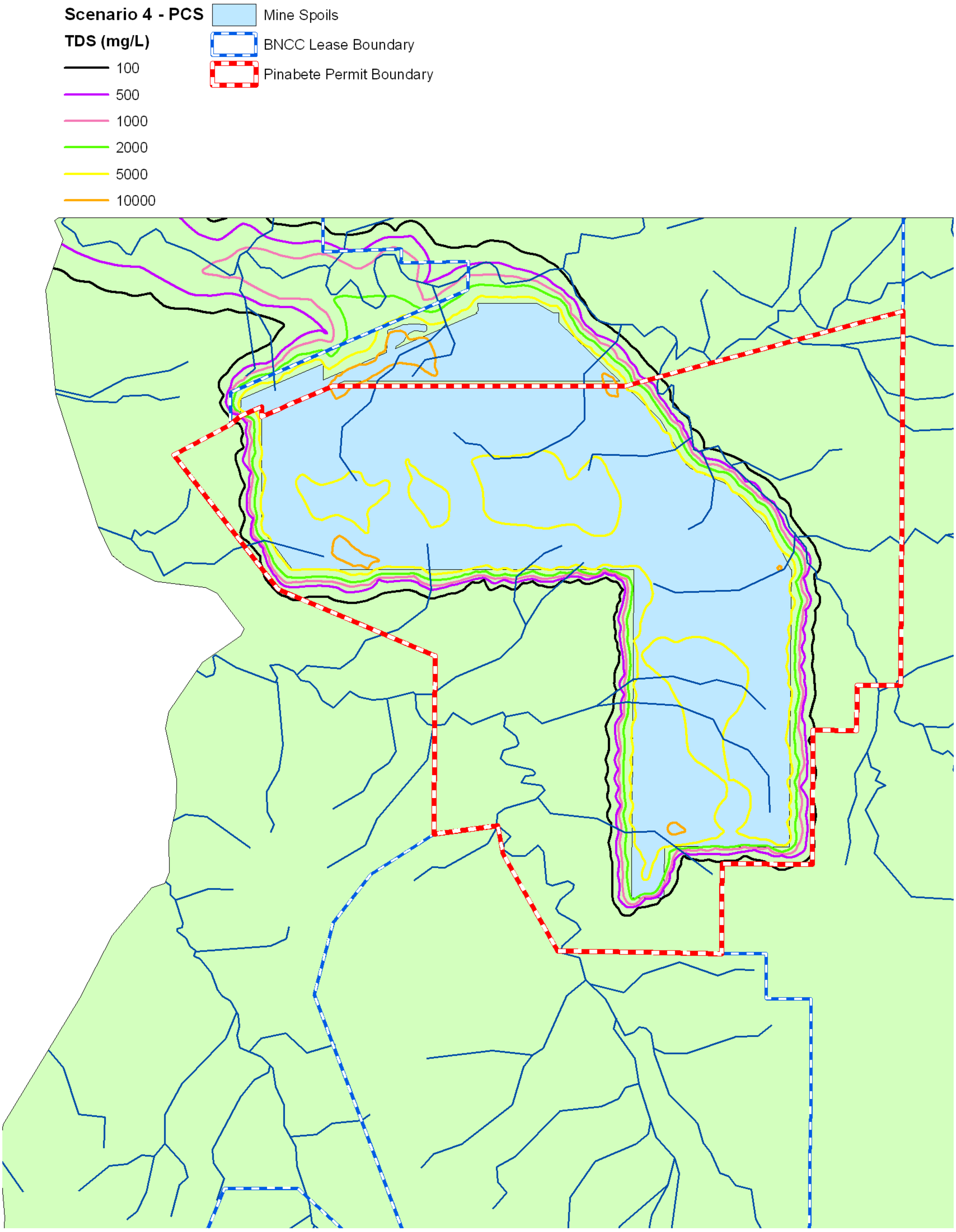


Figure 41.3-25 Transport Scenario 4 - TDS Transport in the PCS after 500-years with Constant Source of 11,500 mg/L

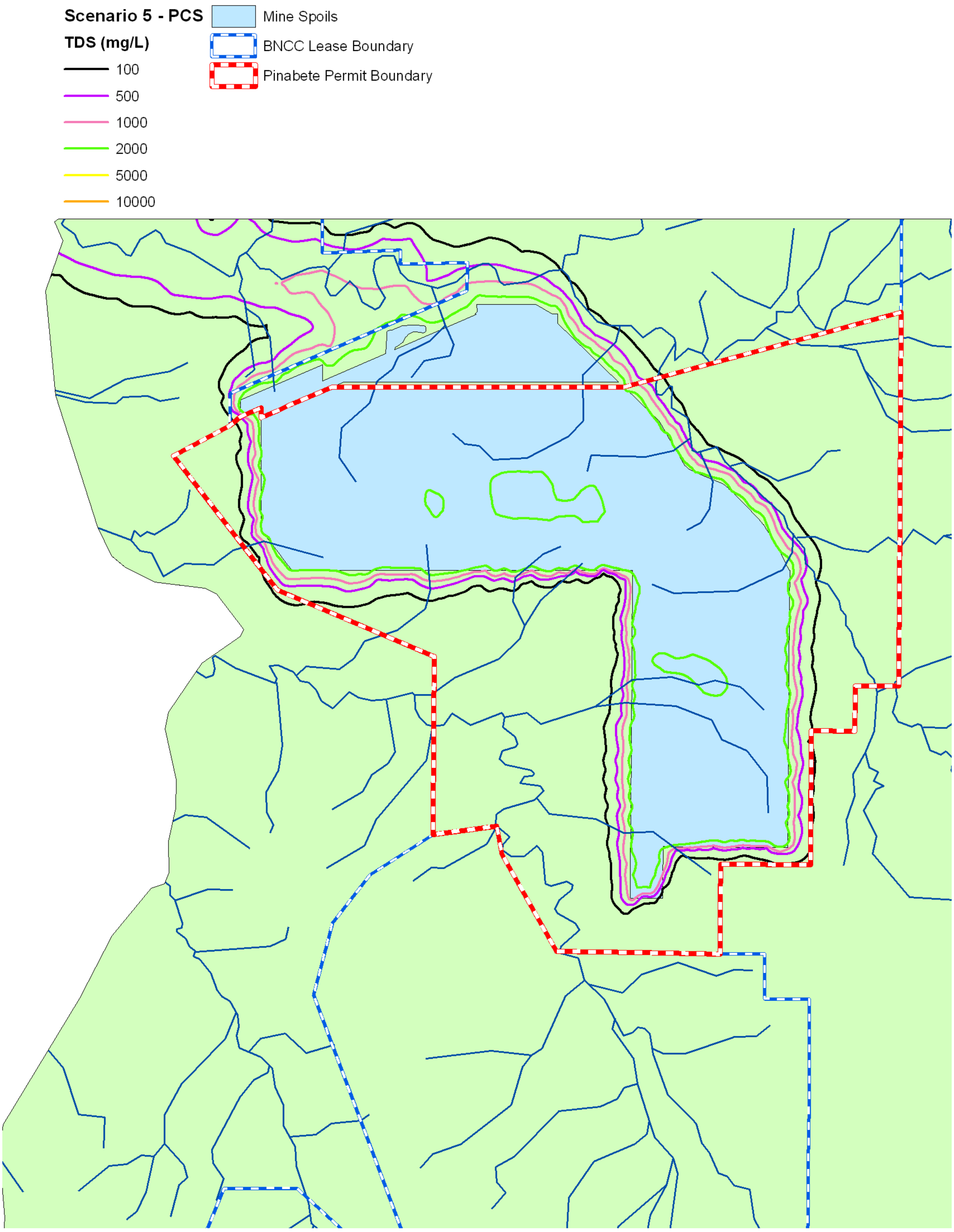


Figure 41.3-26 Transport Scenario 5 - TDS Transport in the PCS after 500-years with Constant Source of 3,550 mg/L

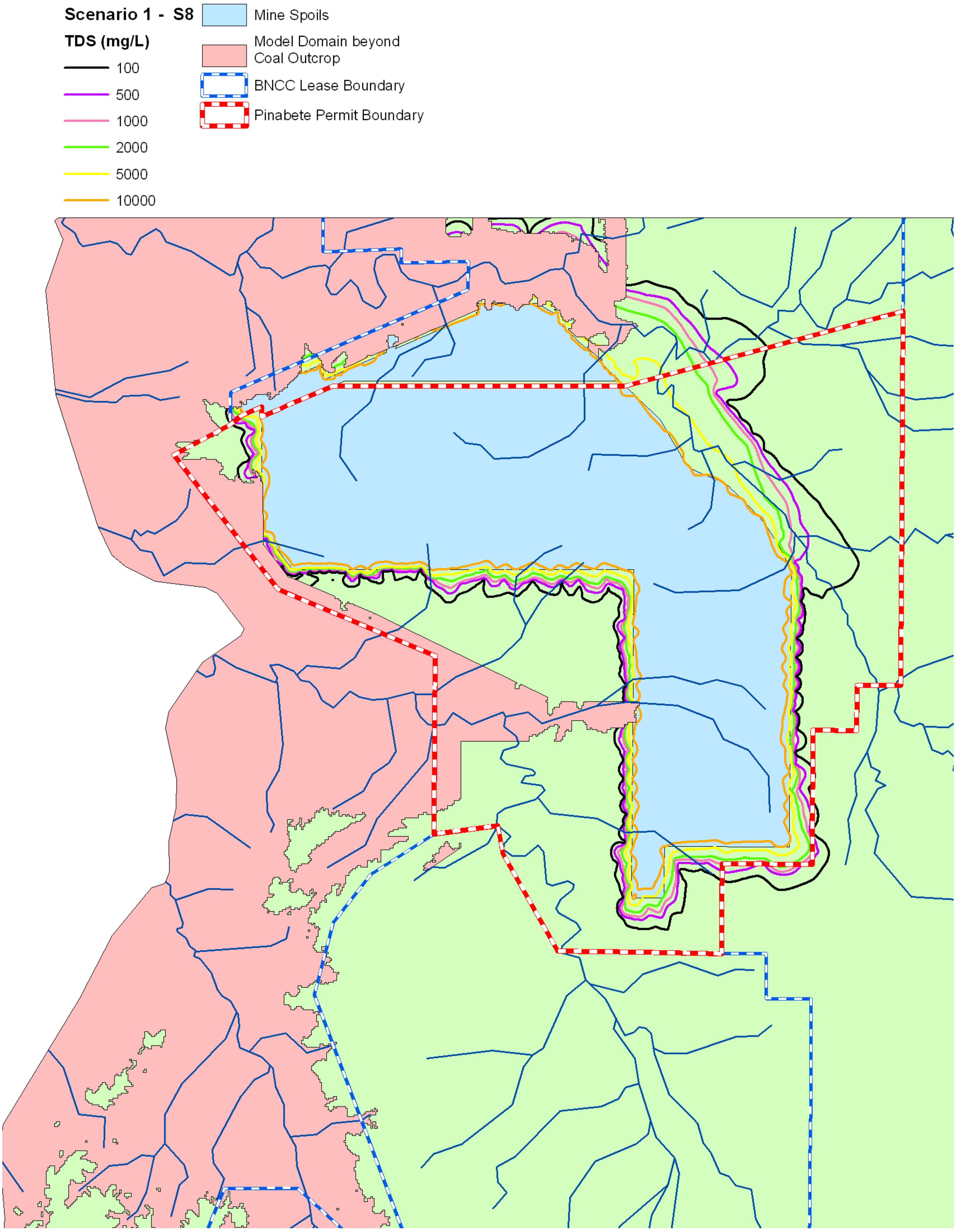


Figure 41.3-27 Transport Scenario 1 - TDS Transport in the No. 8 Coal Seam after 500-years with Constant Source of 11,500 mg/L

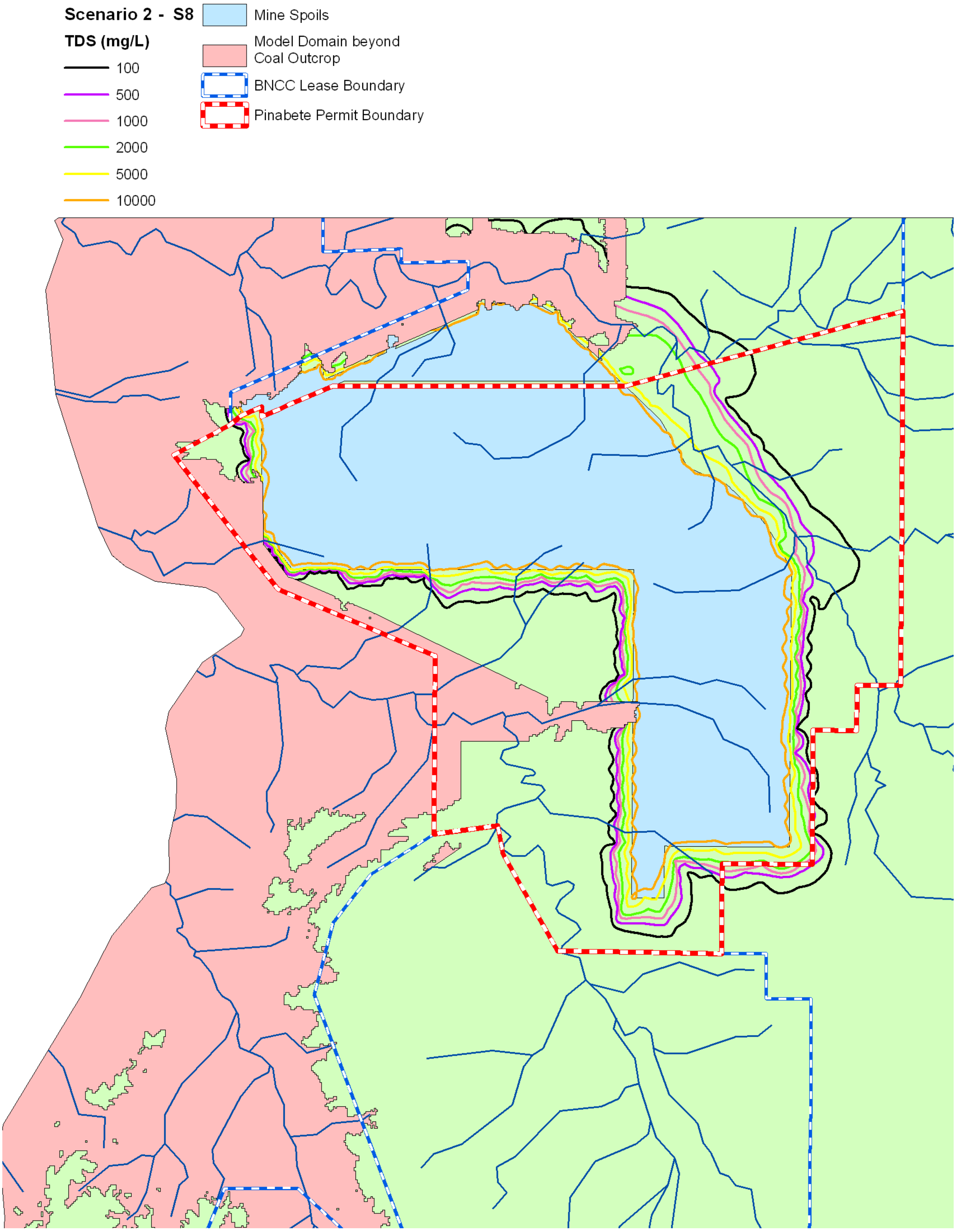


Figure 41.3-28 Transport Scenario 2 - TDS Transport in the No. 8 Coal Seam after 500-years with Constant Source of 11,500 mg/L

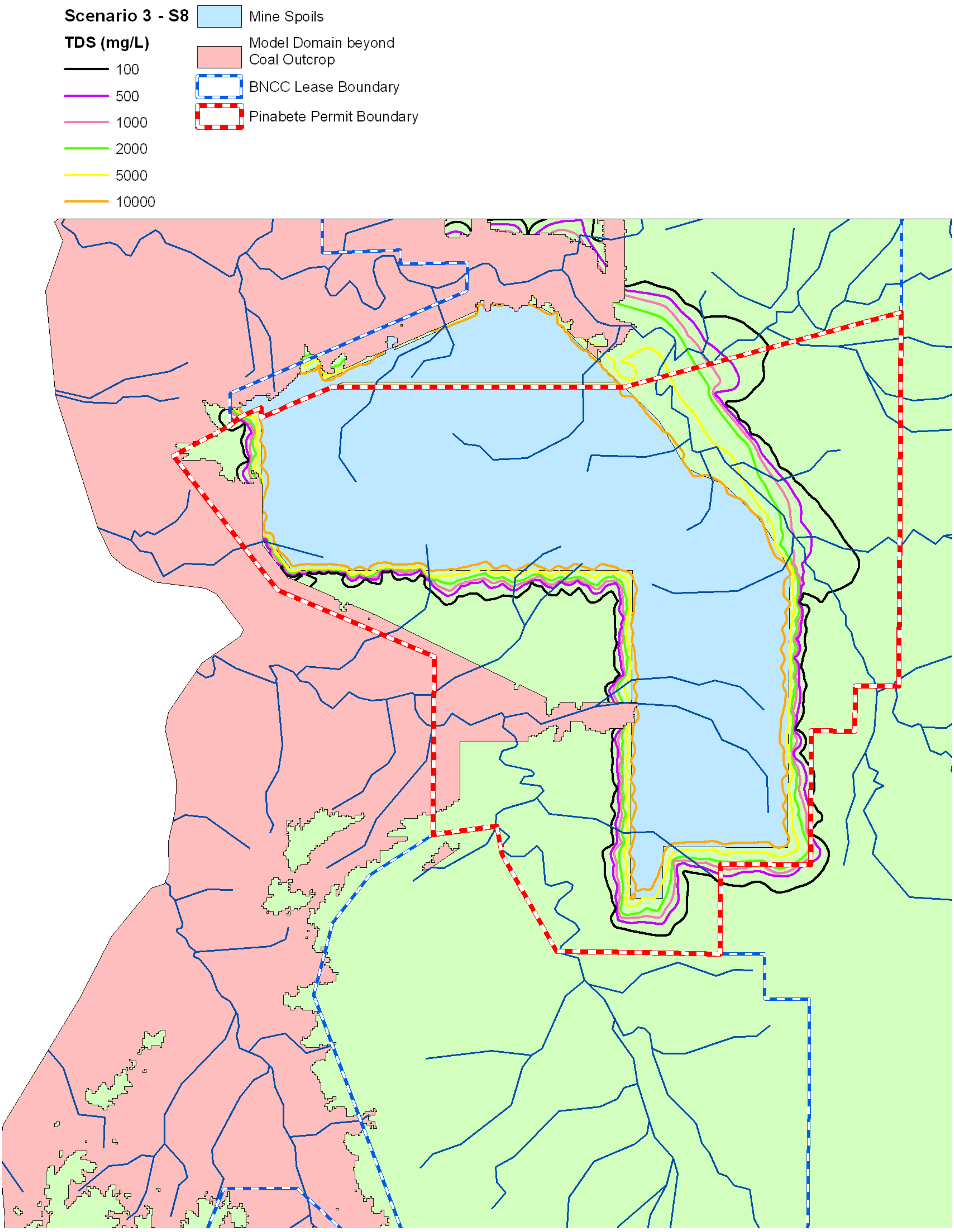


Figure 41.3-29 Transport Scenario 3 - TDS Transport in the No. 8 Coal Seam after 500-years with Constant Source of 11,500 mg/L

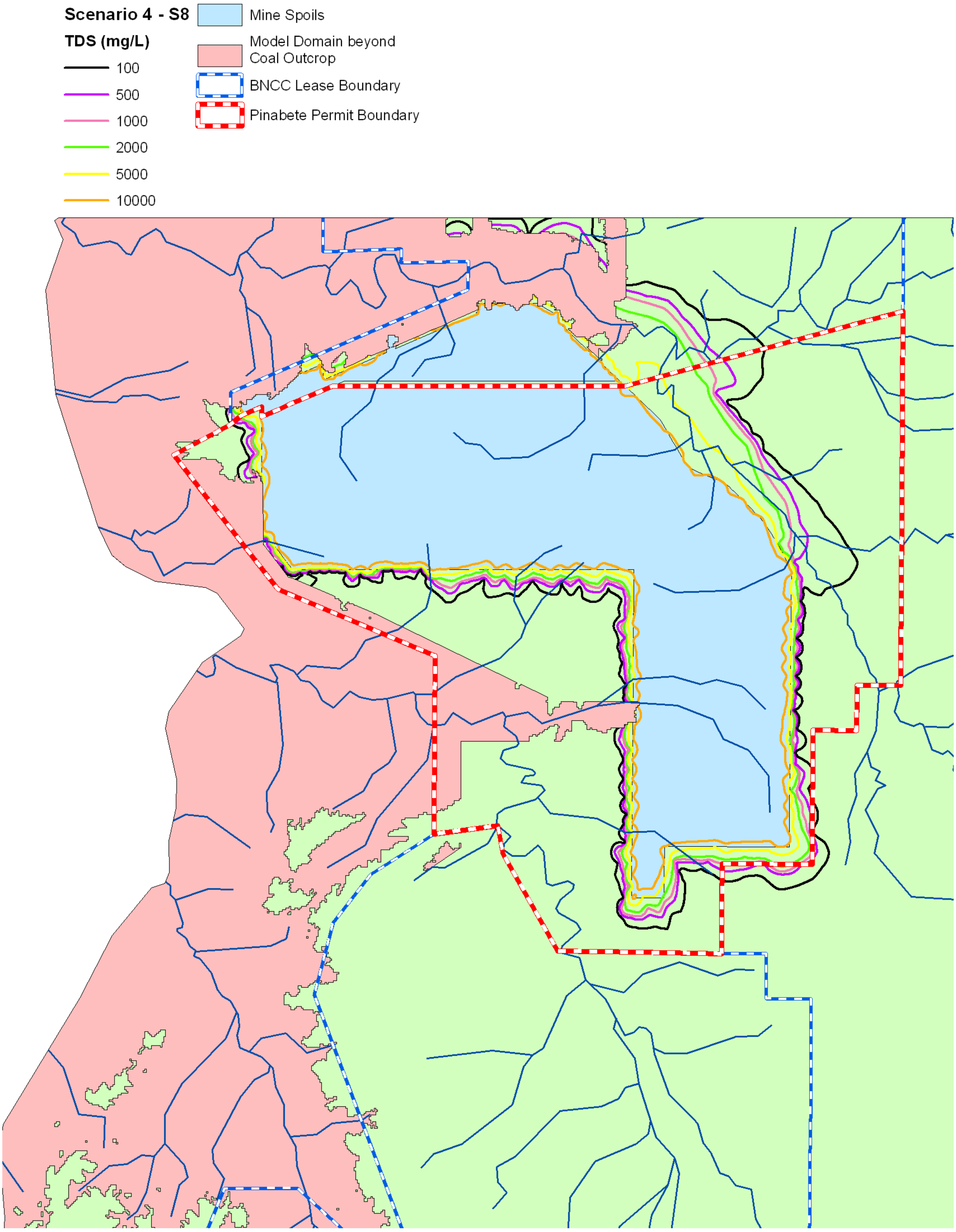


Figure 41.3-30 Transport Scenario 4 - TDS Transport in the No. 8 Coal Seam after 500-years with Constant Source of 11,500 mg/L

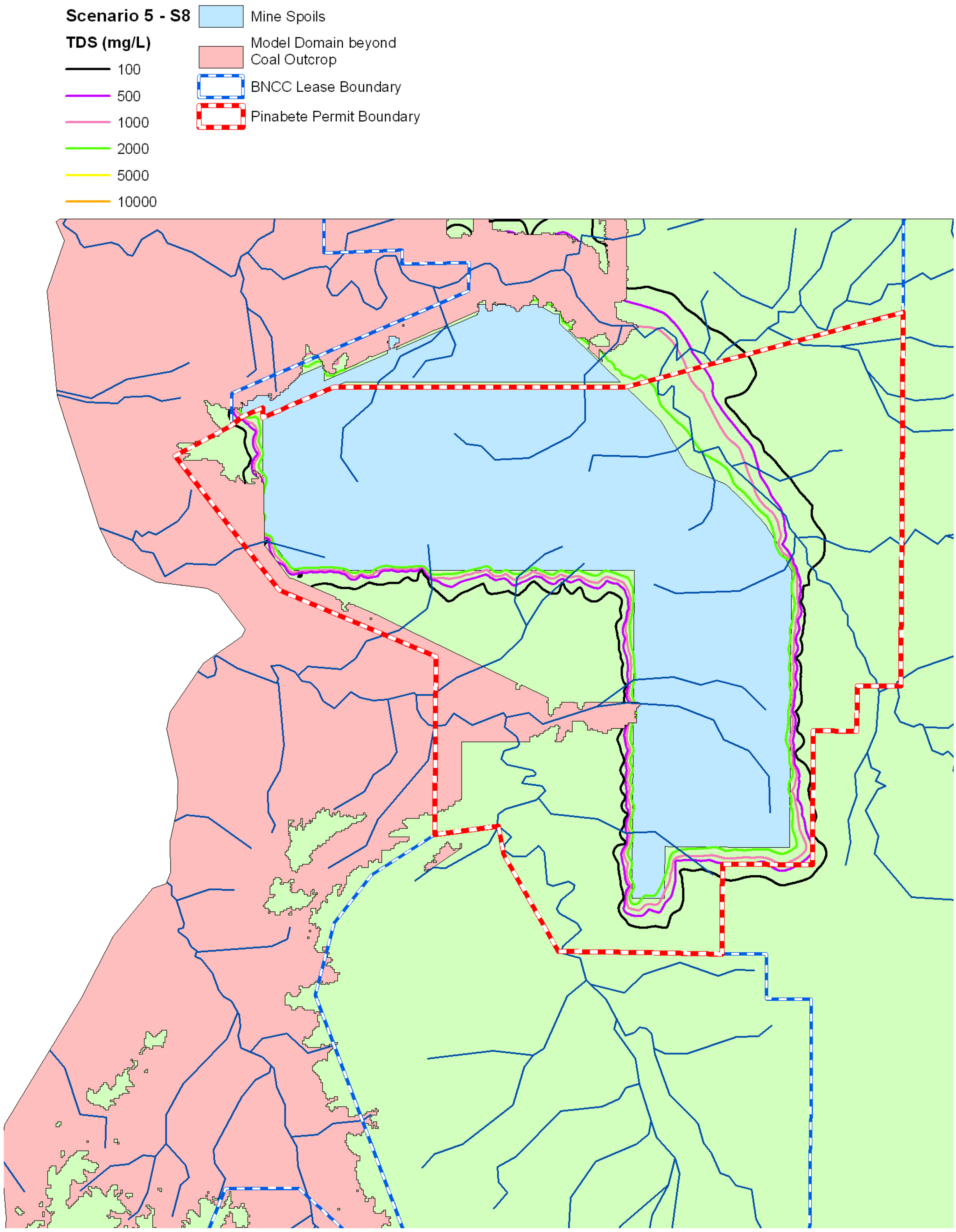


Figure 41.3-31 Transport Scenario 5 - TDS Transport in the No. 8 Coal Seam after 500-years with Constant Source of 3,550 mg/L

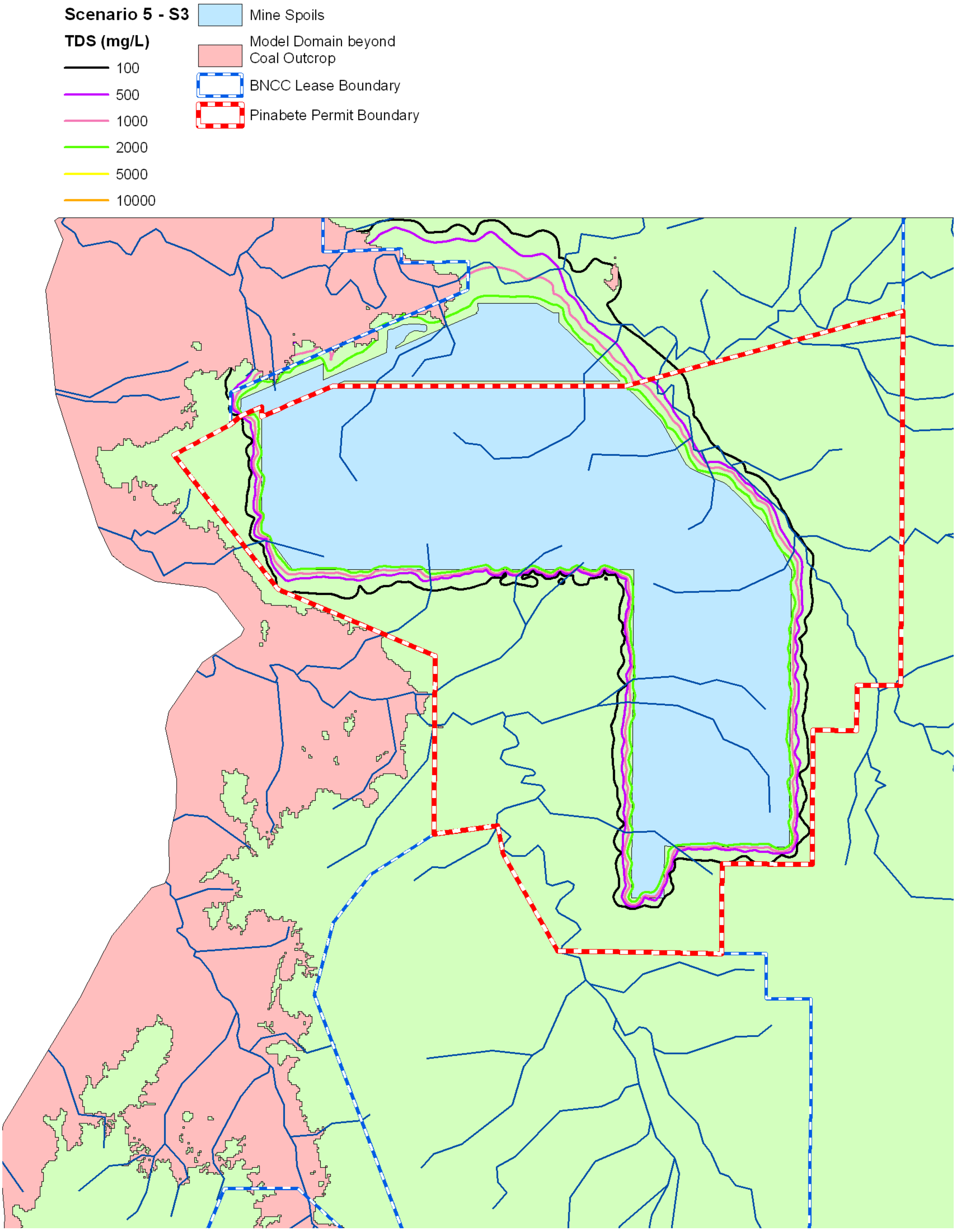


Figure 41.3-32 Transport Scenario 1 - TDS Transport in the No. 3 Coal Seam after 500-years with Constant Source of 11,500 mg/L

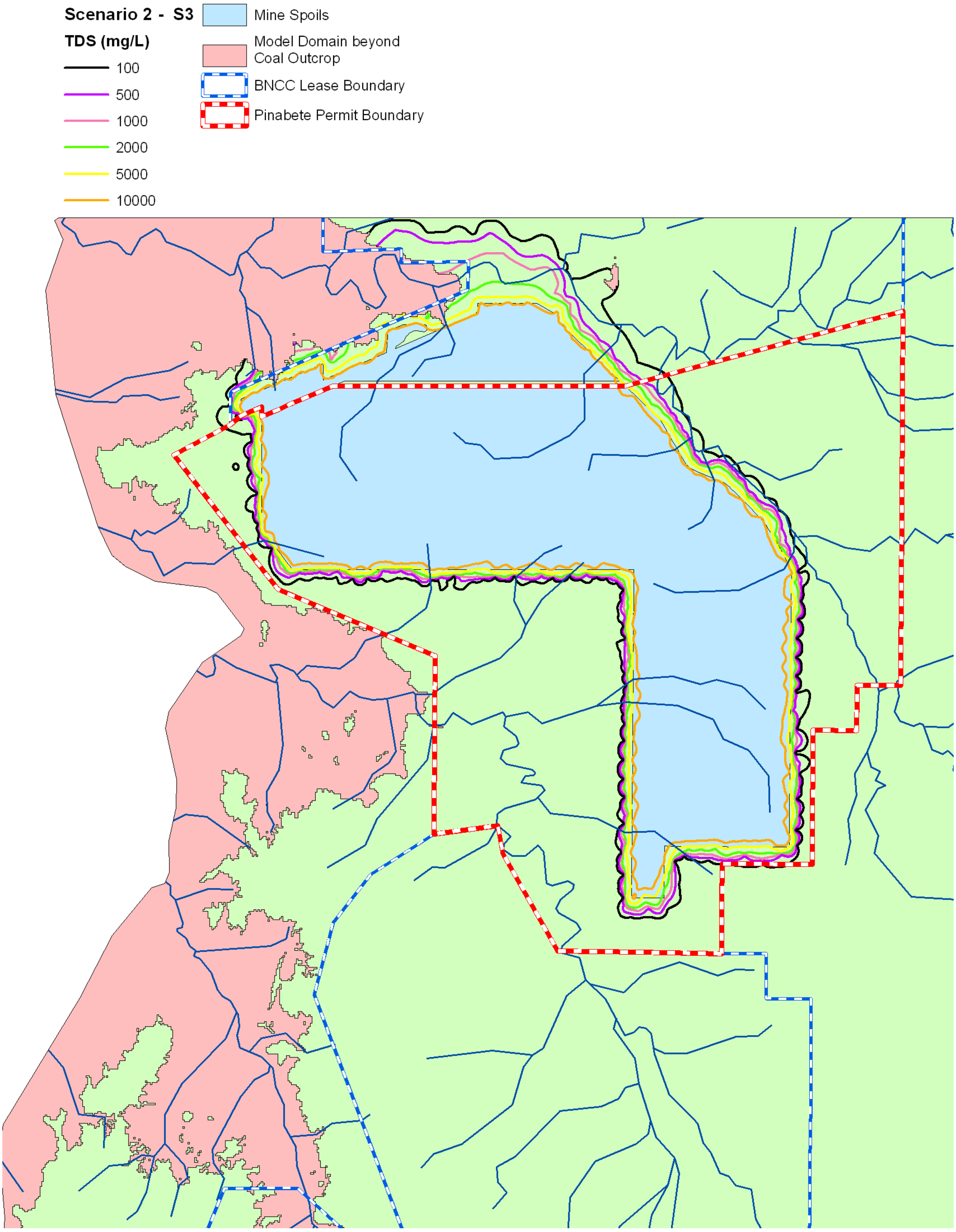


Figure 41.3-33 Transport Scenario 2 - TDS Transport in the No. 3 Coal Seam after 500-years with Constant Source of 11,500 mg/L

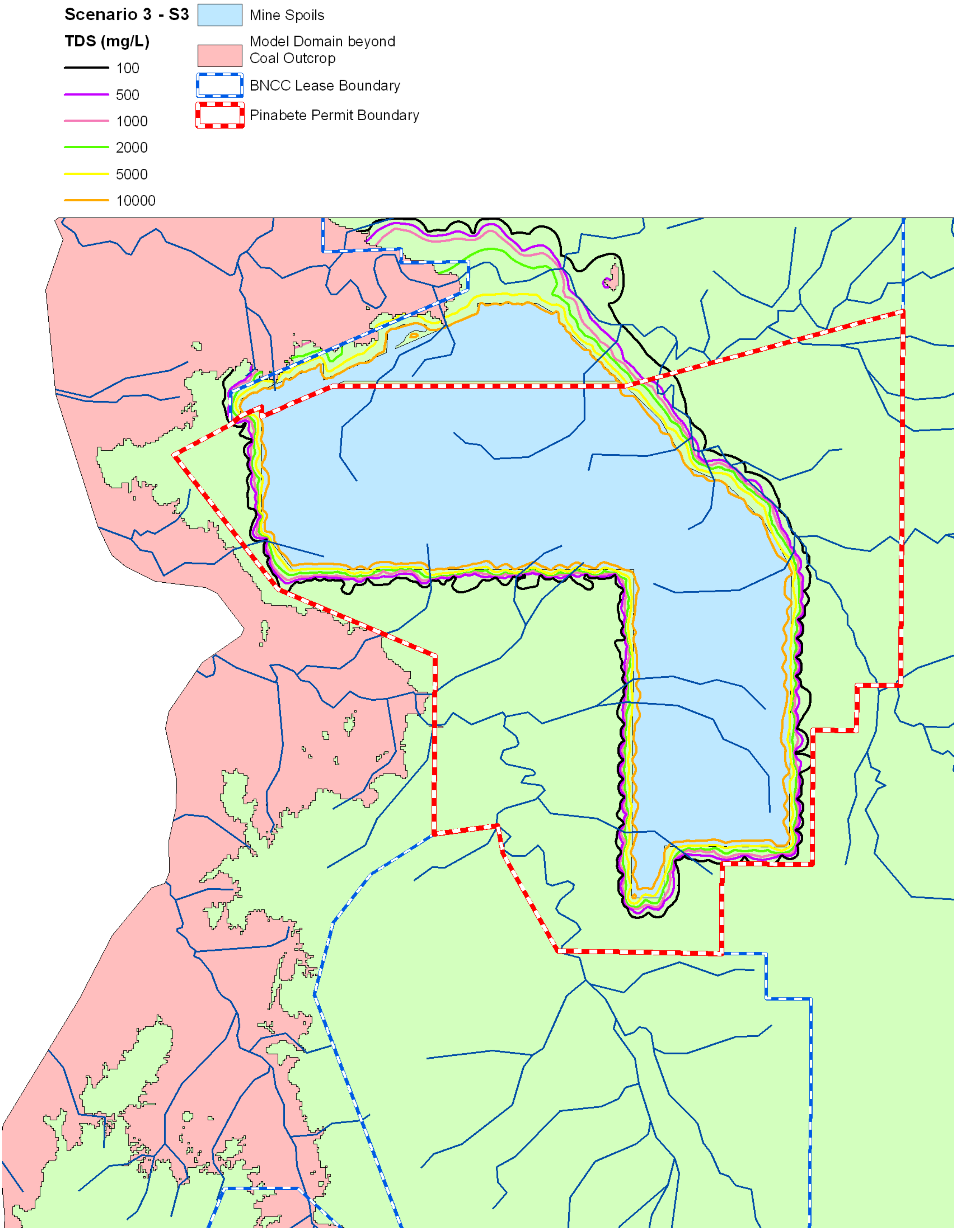


Figure 41.3-34 Transport Scenario 3 - TDS Transport in the No. 3 Coal Seam after 500-years with Constant Source of 11,500 mg/L

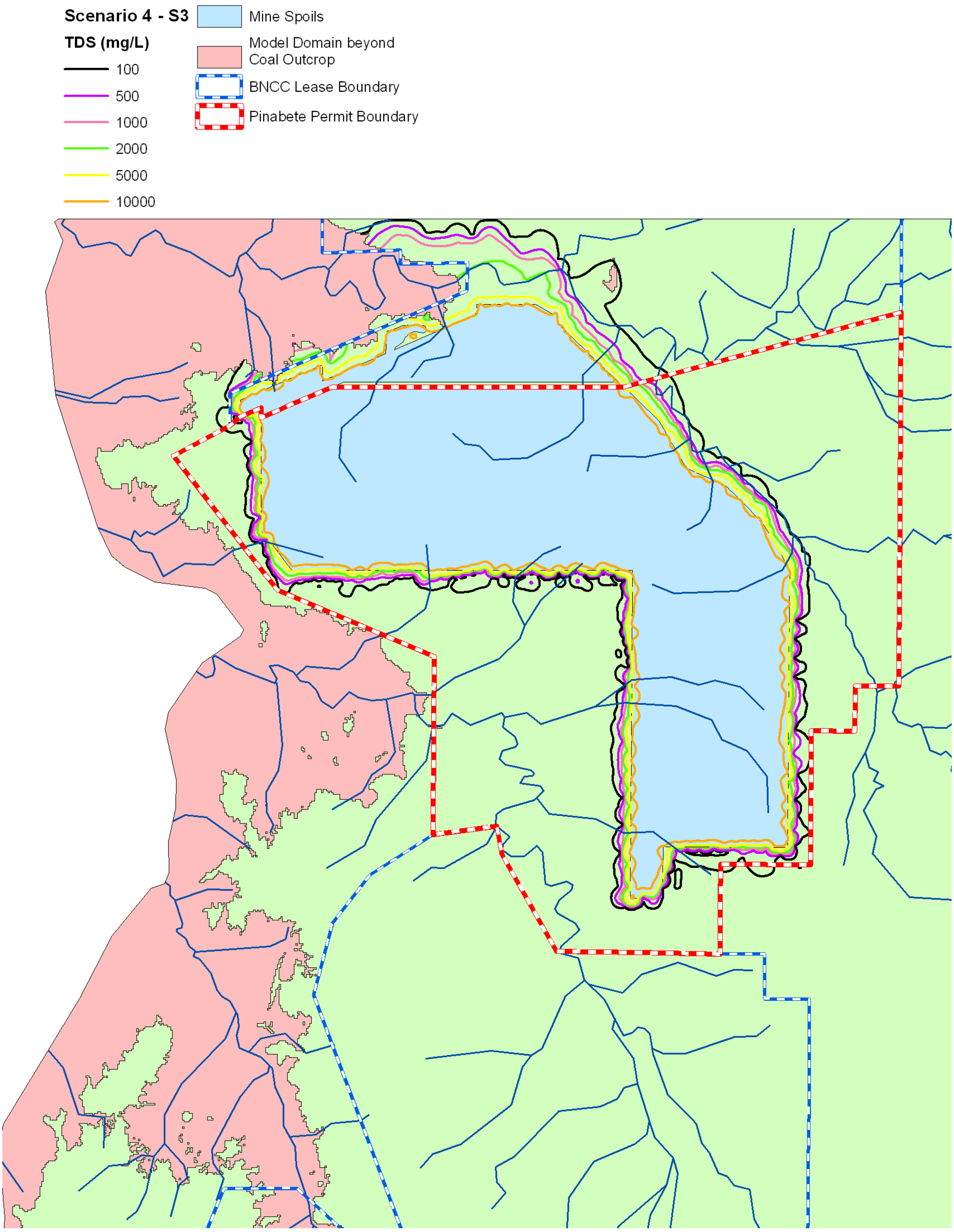


Figure 41.3-35 Transport Scenario 4 - TDS Transport in the No. 3 Coal Seam after 500-years with Constant Source of 11,500 mg/L

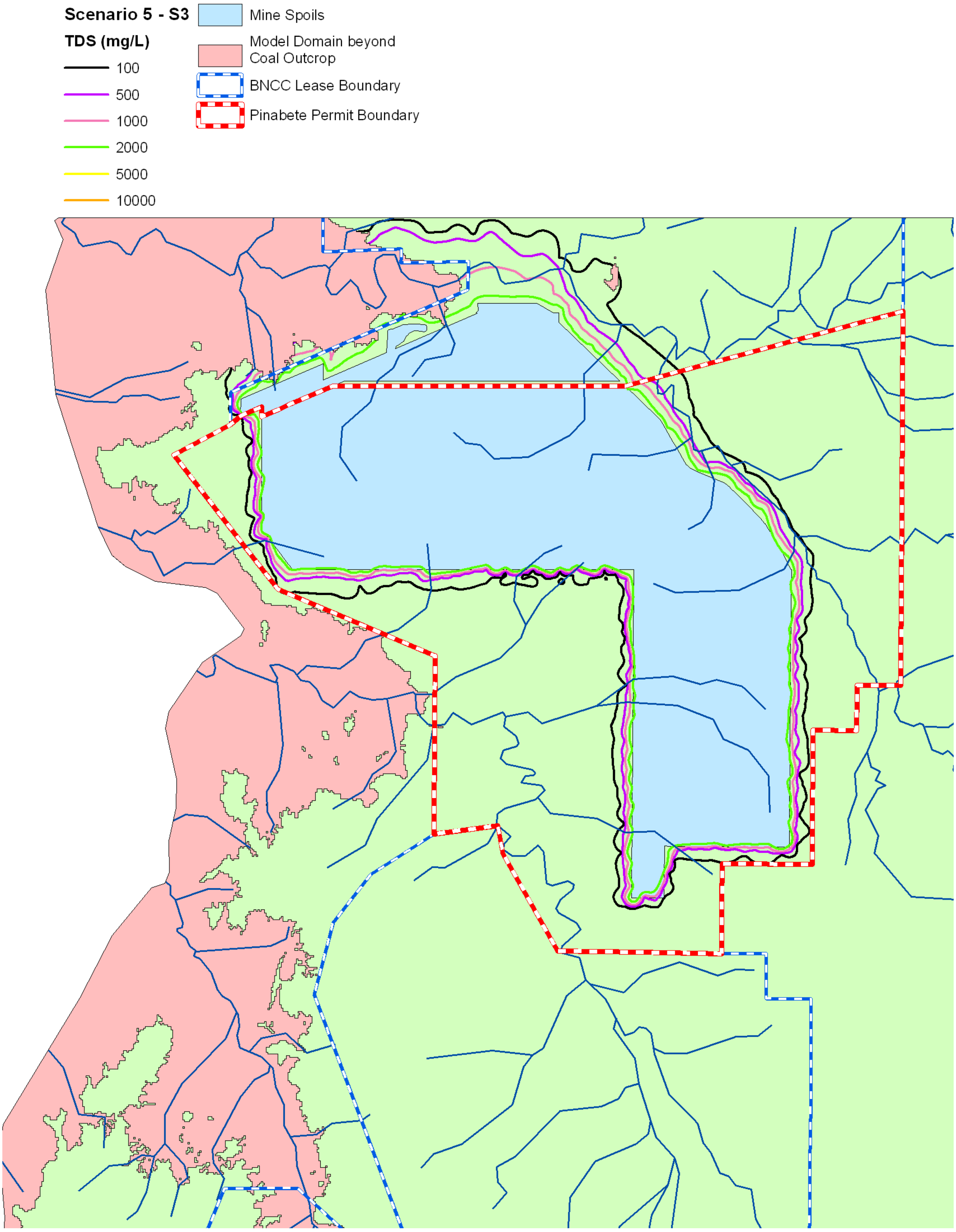
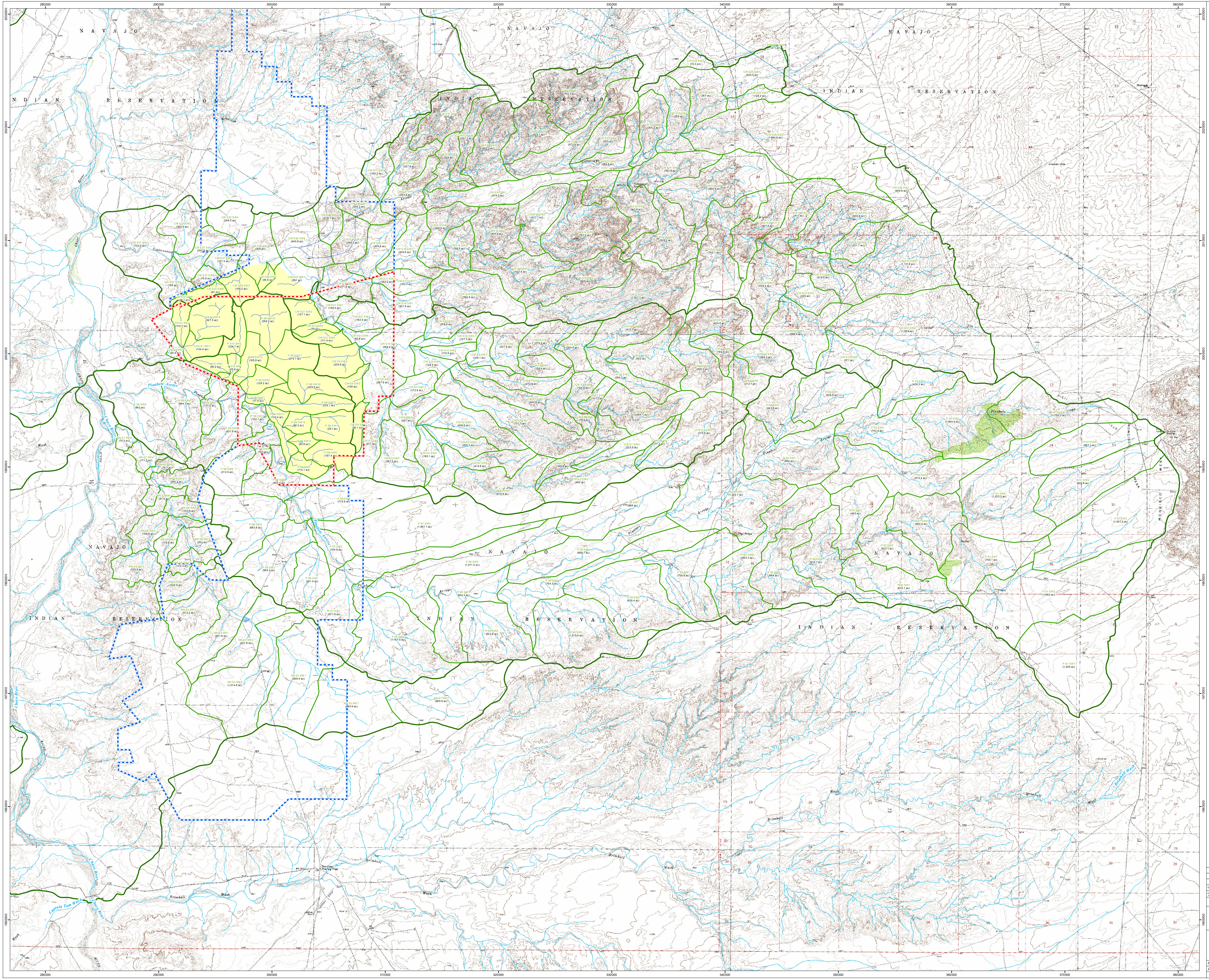


Figure 41.3-36 Transport Scenario 5 - TDS Transport in the No. 3 Coal Seam after 500-years with Constant Source of 3,550 mg/L



Legend

- SEDCAD Subwatersheds
- Watershed Boundaries
- Post-mine Channel
- Undistrubed Channel
- Ponds
- Pinabete Permit Boundary
- BNCC Lease Boundary
- Drainage Areas Containted by Mine Operations

Coordinate System:
NAD 1927 State Plane New Mexico West FIPS 3003
Projection: Transverse Mercator
Datum: North American 1927

Units: Foot US

N

0 1,250 2,500 5,000 7,500 Feet
1:30,000

REV. No.	DATE	DRAFT BY	REVISION DESCRIPTION	ENG.	EQ D.	PE.	
12-A	3/16/12	MPO	Prepared for Submittal to OSM		CKA		

APPROVALS

Exhibit 41.2-1

resourcing the future

BHP NAVAJO COAL COMPANY

SEDCAD Subwatersheds

PREPARED BY: MD	DRAWN BY: MPO	PAPER SIZE: ARCH E
APPROVED BY: CKA	DATE: 3/16/12	

Appendix 41.A

Pinabete Permit Project: Mine Spoil Leachate Test Analyses

NAVAJO MINE: MINE SPOIL LEACHATE TEST ANALYSES

Submitted to:
BHP NAVAJO COAL COMPANY

Date: November 14, 2011

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CORPORATION

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NORWEST CORPORATION

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1 INTRODUCTION

This document has been prepared to provide results of mine spoil leaching tests performed to support the Probable Hydrologic Consequences (PHC) assessment of the planned placement of spoil generated from the mining of coal at the Navajo Mine. The mine spoil is the non coal overburden and interburden materials removed to allow access to the coals of the Fruitland Formation. The spoil is generally rock of varying sizes. Placement of spoil within the mine pit as backfill is an accepted practice for handling of the spoils and necessary to achieve approximate original contour requirements for mine reclamation. The probable hydrologic consequences of placement of spoil materials for mine backfill is dependent on the hydrologic properties of mine spoil, the surface and groundwater conditions at the mine following reclamation and the inorganic chemistry of mine spoil including the potential for leaching or adsorption of constituents of concern.

A spoil testing program was completed to generate the information on spoil properties and leaching characteristics. The resulting information is used to support the PHC assessment for proposed spoil placement as mine backfill at the Navajo Mine. The spoils used for testing in this study were collected from the Area III mine spoils. The same coal units mined at Area III will be mined at Area IV so the interburden and overburden rock characteristics are expected to be essentially the same between the two areas.

2 MINE SPOIL TESTING PROGRAM

The following discussion summarizes the sampling and testing procedures followed in this study in order to provide a background and understanding for interpreting the results presented in Section 3.

2.1 COLLECTION OF REPRESENTATIVE SAMPLES

The geochemical testing was conducted using available materials that are representative of expected mine spoil in Area IV. Representative samples of backfill spoils from Area III were obtained and used for the testing. Likewise a composite coal water samples from wells completed in the upper and lower coal seams at Area IV were obtained for the spoil leaching test study.

2.1.1 Mine Spoil Samples

Composite spoil samples were obtained from the Navajo Mine Area III in accordance with the regraded spoil sampling plan. Samples were collected on a 2.5-acre (ac) square grid. The 2.5-acplot was divided into four equal subplots (0.625 ac each). A four-foot deep sample pit was then excavated in the center of each subplot. In order to obtain a representative sample of composite spoil material, sub-samples were collected over the interval from zero to four feet at each of the four subplot locations and one composite sample was prepared from the four sub-samples. The composite sample was be comprised of a minimum of 2 kg of spoil material and was split in the field using a corner to corner sampling technique (USDA-NRCS 1996).

Composite samples were collected, following the same procedure, at three additional 2.5-ac plot locations. Solids analysis was conducted on sample splits from each of the four 2.5-acre grid locations. The other split samples from the four 2.5-ac plots were combined and mixed to form a single composite sample of approximately 4 kg. This composite sample and the four splits were sent to the laboratory for geochemical testing.

The four individual sample splits were analyzed for trace metals and major ions in order to characterize the broad spatial variability in spoil material. The composite sample was mixed again in the lab and reduced in particle size as required by EPA Method 1312. Three subsamples of the composite sample were obtained for chemical and mineralogical analysis.

2.1.2 Groundwater Samples

A composite sample of coal water was be obtained from equal proportions of water extracted from the No. 8 coal seam well KF-2007-01 and from the No. 3 coal seam well KF-98-02 located within Area IV. Two 5-gallon containers of coal water sample were obtained from each well. The 5-gallon containers were sent to the laboratory where composite coal water was prepared for use in the batch tests. Two duplicate samples were obtained from the composite coal water and submitted for chemical analysis.

2.2 LABORATORY LEACHING TEST PROCEDURES

The leaching tests were conducted using the EPA Synthetic Precipitation Leaching Procedure (SPLP, SW-846 Method 1312), the Synthetic Groundwater Leaching Procedure (SGLP), and modifications of these tests. Modifications to the standard test were performed to address site specific conditions. The modifications were as follows:

1. Use of leaching fluids that are appropriate to the site through collection of groundwater samples in addition to the synthetic rainwater that is specified in the SPLP method.
2. Inclusion of a 45-day leach test in addition to the method specified 18-hour leaching procedure, in order to assess the impacts of longer exposure to the leachant.
3. For the 45-day leach test, it was not practical for the laboratory to tumble the sample for the entire period. Thus the procedure was modified to include periodic 18-hour tumble of the sample: at the start of the test, after 15-days, after 30 days and with a final 18-hour tumble at the end of the 45-day period. The periodic tumbling was followed by an extended period of time during which the solids remain in contact with the fluid without tumbling intended to provide an indication of any leaching changes due to mineral aging, hydrolysis, and or diffusion.

Proposed leaching procedures consist of the following components. The leachate name as used in the discussions in Section 3 is included in bold in the discussion below.

1. A sequence in which spoil was leached in duplicate (18-hr tests) with coal well water (**Spoil Leachate 1 and Spoil Leachate 1 DUP**). Analyses of all leachates were performed, providing a duplicate analysis of the spoil leaching and a single analysis of the final leach with spoil-exposed coal water.
2. A test in which spoil is exposed to coal water for 45 days according to the long-term leaching procedure described above (**Spoil 45-Day**).
3. 18-hour leaching tests of spoil using the synthetic leaching fluid described in the SPLP (**Spoil SPLP**).

2.3 SOLIDS ANALYSES

The spoil composites were analyzed using Rietveld XRD for mineral identification, total metals analysis for major element identification, and cation exchange capacity (CEC) for determining the amount of exchange of cations between solution and solids. As discussed in Section 2.2.1, the spoil composites are comprised of samples collected from spoil backfill from the Navajo Mine Area III.

Solids analysis was performed on sample splits from each of the four composite samples from the 2.5-ac grid locations. The individual sample splits (four samples) were analyzed for total trace metals and major ions in order to characterize the broad spatial variability in spoil material. The other split samples from the four 2.5-ac plots were combined and mixed to form a single composite sample of spoil material that was used for the leaching tests. Three splits of this composite spoil sample were taken for replicate for chemical and mineralogical analysis in order to assess homogeneity of the composite spoil sample. The four individual sample split results are contained in Attachment A and Attachment B. The following discussions focus on the three splits analyzed for the mixed composite sample discussed above.

2.3.1 Rietveld X-ray Diffraction Results

Rietveld XRD analysis was carried out in triplicate for the spoil composite samples at the Department of Earth and Ocean Sciences, The University of British Columbia, Vancouver, British Columbia under the direction of Professor Mati Raudsepp. The laboratory results are provided in Attachment A.

A summary of the Rietveld XRD data for the composite spoil sample is presented in Table 2-1. The spoil composite samples were analyzed in triplicate and the results summarized in Table 2-1 as Spoil A, Spoil B and Spoil C indicate good reproducibility. The spoils contain a large amount of amorphous material with no definite crystalline structure. The mineralogical composition of the amorphous material is not included in Table 2-1. The spoil samples were modeled by the XRD laboratory to fit a smectite model in order to characterize the amorphous material. These results are provided in Table 2-2. The initial spoil model without a smectite fit indicates that the spoil is primarily comprised of quartz, kaolinite, and K-feldspar with lesser amounts (<5%) of gypsum, anhydrite, and calcite. Fitting the smectite model to the XRD data resulted in additional minerals montmorillonite, albite, and orthoclase. Although gypsum, anhydrite, and calcite were found in smaller relative amounts (<5%) in both interpretative results, their role in reactive chemistry is very important. This is due to their high solubility and relatively quick dissolution and precipitation rates as well as the buffering capacity of calcite on pH where pH controls the sorption of trace metals and other potentially important constituents.

TABLE 2-1.
RESULTS OF COMPOSITE MINE SPOIL SAMPLES QUANTITATIVE PHASE ANALYSIS (WT. %)

First Model without Fit to Amorphous Material					
Mineral	**Ideal Formula**	**Spoil A**	**Spoil B**	**Spoil C**	**Average (wt %)**
Quartz	SiO_2	36.5	35.4	35.4	36
Plagioclase	$NaAlSi_3O_8$ - $CaAl_2Si_2O_8$	10.3	10.1	10.1	10
K-feldspar	$KAlSi_3O_8$	6	6.5	7	7
Kaolinite	$Al_2Si_2O_5(OH)_4$	40.8	40.8	40.6	41
Gypsum	$CaSO_4 \cdot 2H_2O$	2.6	3.1	2.8	3
Anhydrite	$CaSO_4$	0.9	1	1.1	1
Calcite	$CaCO_3$	2.9	3.1	2.9	3

TABLE 2-2.
RESULTS OF COMPOSITE MINE SPOIL SAMPLES SMECTITE MODEL QUANTITATIVE PHASE ANALYSIS (WT. %)

Smectite Model Fit to Amorphous Material					
Mineral	**Ideal formula**	**Spoil A**	**Spoil B**	**Spoil C**	**Average (wt %)**
Quartz	SiO_2	29.68	27.56	28.28	29
Calcite	$CaCO_3$	0.9	2.03	2.14	2
Gypsum	$CaSO_4 \cdot 2H_2O$	2.9	3.12	2.69	3
Albite low, calcium	$Na_{0.95}Ca_{0.05}Al_{1.05}Si_{2.95}O_8$, $NaAlSi_3O_8$	6.41	5.92	6.05	6
Anhydrite	$CaSO_4$	0.83	0.67	0.88	1
Orthoclase	$KAlSi_3O_8$	3.87	2.39	3.32	3
Kaolinite	$Al_2Si_2O_5(OH)_4$	11.68	12.08	10.46	11
Montmorillonite	$(Na,Ca)_{0.3}(Al,Mg)_2Si_4O_{10}(OH)_2 \cdot n(H2O)$	43.74	46.24	46.18	45

2.3.2 Total Metals Results

Total metals analysis was carried out in triplicate for the spoil composite samples using method 6010B at Analytica Environmental Laboratories, 12189 Pennsylvania Street, Thornton, Colorado. Laboratory results are provided in Attachment B.

The composite spoil samples were analyzed for metals (Table 2-3) The composite spoils are primarily comprised of Ca, Fe, Al, Na, Mg, and K. There are trace amounts (<1%) of several other trace metals. However, the results for all three analyses indicate As and thallium (Tl) are not present. The major cations also correlate with the primary minerals identified in the Rietveld XRD analyses:

- Ca with gypsum, calcite, and montmorillonite;
- Al with plagioclase, K-feldspar, kaolinite, albite, orthoclase, and montmorillonite;
- Na with plagioclase, albite, and montmorillonite;
- K with K-feldspar and orthoclase; and
- Mg with montmorillonite.

Although relatively high Fe concentrations are observed in the total Fe, no Fe containing minerals were identified in the XRD analyses. The Fe is associated with the non-identifiable amorphous material in the XRD analyses, most likely as amorphous Fe hydroxide. Additionally, siderite has been identified in the literature by Lucas et al. (2006) in the form of sideritic concretions.

2.3.3 Cation Exchange Capacity

The CEC was measured for spoil composites by Colorado Analytical Laboratories, Inc. using EPA method 9081 (US EPA 2007). The laboratory results are provided in Attachment C. Table 2-4 provides a summary of the results. The analyses were carried out for the seven collected spoil samples; including the four individual samples from each plot and the three composited samples.

The CEC value for the spoil samples ranged between 8.7 and 9.9 milli-equivalents per 100 grams (meq/100g) with an average of 9.3 meq/100g. These results indicate the relative ability of spoil materials to sorb and exchange different cations. The CEC is an indicator of major cation and trace metal attenuation the spoil may provide.

TABLE 2-3. TOTAL METALS ANALYSIS RESULTS FOR COMPOSITE SPOIL SAMPLES

	Spoil A			Spoil B			Spoil C					
Analyte (mg/Kg)	Result	PQL	MDL	Result	PQL	MDL	Result	PQL	MDL	RPD 1	RPD 2	RPD3
Al	10000	7.4	1.8	9500	6.8	1.7	9400	7.7	1.9	5%	6%	3%
Sb	0	10	0.58	0.052	9.3	0.52	0.9	11	0.59	-200%	-284%	159%
As	0	12	1.6	0	11	1.5	0	12	1.7			
Ba	170	0.37	0.029	180	0.34	0.026	170	0.38	0.03	-6%	0%	3%
Be	1	0.19	0.0082	1	0.17	0.0075	1	0.19	0.0085	0%	0%	0%
B	13	4.7	0.63	12	4.2	0.57	12	4.8	0.64	8%	8%	5%
Cd	0.64	0.74	0.054	0.63	0.68	0.049	0.59	0.77	0.055	2%	8%	4%
Ca	20000	13	5	22000	12	4.5	20000	13	5.1	-10%	0%	6%
Cr	6.7	1.9	0.28	6	1.7	0.25	6.1	1.9	0.28	11%	10%	6%
Co	11	2.8	0.24	11	2.5	0.22	11	2.9	0.25	0%	0%	0%
Cu	26	0.56	0.15	23	0.51	0.13	24	0.57	0.15	12%	8%	6%
Fe	20000	5.6	0.41	20000	5.1	0.37	20000	5.7	0.42	0%	0%	0%
Pb	16	5.6	0.98	17	5.1	0.89	18	5.7	1	-6%	-12%	6%
Mg	3100	9.3	0.89	2900	8.5	0.81	3000	9.6	0.92	7%	3%	3%
Mn	440	0.93	0.1	430	0.85	0.094	390	0.96	0.11	2%	12%	6%
Mo	0	1.9	0.22	0.0034	1.7	0.2	0	1.9	0.23	-200%	0%	173%
Ni	13	3.7	0.4	13	3.4	0.36	14	3.8	0.41	0%	-8%	4%
K	1900	93	29	1700	85	27	1800	96	30	11%	6%	6%
Se	2.9	9.3	2.3	2.7	8.5	2.1	2.9	9.6	2.4	7%	0%	4%
Na	4000	280	0.95	3900	250	0.86	4100	290	0.98	3%	-3%	3%
Tl	0	19	1.1	0	17	1	0	19	1.1			
V	23	0.93	0.18	22	0.85	0.16	22	0.96	0.19	4%	4%	3%
Zn	62	0.56	0.21	65	0.51	0.19	62	0.57	0.21	-5%	0%	3%
Li	8.6	4.7	0.045	8.2	4.2	0.041	8.1	4.8	0.047	5%	6%	3%
Hg	0.087	0.044	0.0061	0.073	0.044	0.006	0.068	0.044	0.006	18%	25%	13%
Moisture %	7.98	0.0465	0.0093	8.13	0.0465	0.0093	7.87	0.0466	0.00933	-2%	1%	2%

TABLE 2-4.
CATION EXCHANGE CAPACITY LABORATORY RESULTS SUMMARIZED

Sample ID	Sample Name	CEC (meq/100g)
B0711172-2B	123 S 87W 0-4' Spoil	9.7
B0711172-3B	123 S 89W 0-4' Spoil	8.7
B0711172-4B	125 S 88W 0-4' Spoil	9.4
B0711172-5B	120 S 89W 0-4' Spoil	9.0
B0711172-6B	Spoil A	9.0
B0711172-7B	Spoil B	9.6
B0711172-8B	Spoil C	9.9

3 LEACHATE TEST RESULTS OVERVIEW

3.1 LEACHATE SOLUTIONS

The solutions used as the beginning leachant solutions included groundwater collected and composited from two coal monitoring wells in Area IV and synthetic precipitation prepared in the laboratory. The laboratory water quality analysis reports for beginning leachant solutions and spoil leachate solutions are provide in Attachment D. These results are summarized in Table 3-1. The EPA drinking water standards and health advisories and the Navajo Nation livestock watering and aquatic and wildlife habitat criteria are also included in Table 3-1 for comparison.

Table 3-1 presents all reported values above the PQL from the laboratory with the exception of quality assurance quality control analyses. The data below the PQL are listed with a “<” sign followed by the PQL value and data below the method detection limit (MDL) are presented with “<<” followed by the MDL. The Navajo Nation aquatic and wildlife habitat chronic criteria for Hg and Pb and the EPA drinking water criteria for antimony Sb, As, and Tl are below the laboratory method MDL while the MDL for Cd of 0.00051 is essentially the same as the Navajo Nation aquatic and wildlife habitat chronic criteria. Additionally, the reported PQL values for Cd, Pb, and Se are above the EPA drinking water criteria. Detected values below the EPA drinking water criteria are included in Table 3-1 with the reported value listed in the table after the PQL value. However, the PQL is the lowest level of quantification that a laboratory can reliably achieve based on specified limits of precision and accuracy relating to instrumentation and sample interferences. Thus, the values below the PQL reported in Table 3-1 are not considered reliable and should be considered non-detect.

3.1.1 Synthetic Precipitation Leachate Solution Chemistry

Synthetic precipitation was prepared in the laboratory and used as a surrogate for field site precipitation that could percolate through the backfill and provide recharge to groundwater and potentially surface water discharge. The prepared solution is highly purified water with strong solvating properties. The water quality for the synthetic precipitation solution is presented in Table 3-1 under the heading “Initial Synthetic Precipitation”.

NORWEST CORPORATION

TABLE 3-1.
BATCH LEACHING TEST RESULTS

Analyte (mg/L)	EPA Drinking Water Criteria	Aquatic & Wildlife Habitat (Acute)[1]	Aquatic & Wildlife Habitat (Chronic)[1]	Livestock (LW)[1]	Initial Coal Water Sample	Initial Coal Water DUP	Initial Synthetic Precipitation	Spoil SPLP	Spoil 45-Day	Spoil Leachate	Spoil Leachate Dup
Al[3]		0.750 mg/L	0.087 mg/L	NCNS	0.13	0.14	0.056	< 0.05	0.38	0.29	0.3
Sb	0.0056				<< 0.0067	<< 0.0067	<< 0.0067	<< 0.0067	<< 0.0067	<< 0.0067	<< 0.0067
As	0.01	0.340 mg/L D	0.150 mg/L D	0.200 mg/L	<< 0.015	<< 0.015	<< 0.015	<< 0.015	<< 0.015	<< 0.015	<< 0.015
Ba	1	NCNS	NCNS	NCNS	0.093	0.088		0.07	0.079	0.25	0.2
Be	0.004				< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
HCO_3					1300	1200		33	960	1000	1000
B	0.63	NCNS	NCNS	5.0 mg/L D	0.31	0.29		0.084	0.36	0.44	0.45
Cd[2]	0.005	0.005	0.0005	0.05 mg/L	<< 0.00051	<< 0.00051	<< 0.00051	<< 0.00051	<< 0.00051	< 0.006, 0.00087*	<< 0.00051
Ca					3.4	3.3	0.27	150	56	64	69
CO_3					260	300	< 7	14	< 7	< 7	< 7
Cl	250				710	700		1.5	600	610	610
Cr (III + VI)[2]	0.1	1.2	0.156	1.0 mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Co		NCNS	NCNS	1.0 mg/L D	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Cu	1.3	0.032	0.019	0.5 mg/L D	< 0.005	< 0.005	< 0.005	< 0.005	0.053	< 0.005	< 0.005
F	2	NCNS	NCNS	NCNS	2.4	2.5	0.0067	0.54	1.5	1.6	1.6
Fe	0.3				0.067	0.073	< 0.05	< 0.05	< 0.05	0.17	0.18
Pb	0.015	0.171	0.007	0.100 mg/L	<< 0.011	<< 0.011	<< 0.011	<< 0.011	<< 0.011	<< 0.011	<< 0.011
Li					< 0.1	< 0.1	< 0.1	< 0.1	0.11	0.1	0.1
Mg					1.3	1.2		15	12	13	13
Mn	0.05[3]				< 0.01	< 0.01	< 0.01	0.19	0.098	0.11	0.1
Hg	0.002	0.0024 mg/L	0.000001 mg/L	NCNS	<< 0.00005	<< 0.00005	<< 0.00005	<< 0.00005	<< 0.00005	< 0.00024, 0.0001*	< 0.0002, 0.00008*
Mo		NCNS	NCNS	NCNS	0.012	< 0.01	< 0.01	< 0.01	0.015	0.014	0.014
Ni	0.61	1.011	0.112	NCNS	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
pH (standard units)	6.5 - 9.0	6.5 - 9.0	6.5 - 9.0	6.5 - 9.0	9	8.9	5	7.5	8	8	7.9
K					11	10	< 1	7	14	14	14
Se	0.05	0.033 mg/L	0.002 mg/L	0.05 mg/L	<< 0.026	<< 0.026	<< 0.026	<< 0.026	<< 0.026	<< 0.026	<< 0.026
Ag	0.035	0.0154	NCNS	NCNS	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015
Na					1200	1100	5.7	150	1200	1200	1200
SO_4	250				300	260	3.4	670	930	970	990
Tl	0.0017	0.700 mg/L D	0.150 mg/L D	NCNS	<< 0.011	<< 0.011	<< 0.011	<< 0.011	< 0.4, 0.014*	<< 0.011	<< 0.011
TDS	500				3100	3000	28	1200	3500	3500	3600
V		NCNS	NCNS	0.100 mg/L D	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Zn	5	0.253	0.255	25 mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.0095

[1] Navajo Nation Water Quality Program, **2007**, Navajo Nation Surface Water Quality Standards
[2]Hardness dependent criteria in NN SWQ Standards 2007 calculated based on median hardness for Chinde Arroyo of 248.5 mg/L as CaCO3. [2]Hardness dependent criteria in NN SWQ Standards 2007 for Cr(III) only
[3] pH 6.5 – 9
<< Reported value is less than the MDL
*Above MDL, but below PQL
D – Dissolved: NCNS – no current Navajo standard
NCNS – No Current Numeric Standard

3.1.2 Coal Groundwater Leachate Solution Chemistry

In order to simulate the effects of natural background groundwater interaction and flow through the backfill, batch leachate tests were performed using groundwater collected from the site. The composite groundwater sample was obtained from samples collected from well KF2007-01, completed in the No. 8 coal seam of the Fruitland Formation, and from well KF-98-02, completed in the No. 3 coal seam of the Fruitland Formation. Each sample was combined to form a composite sample for use as the leachant in leachate batch testing. The groundwater from the coal zones and precipitation recharge represent the water sources that are expected to re-saturate the backfill materials after mining. The groundwater quality data for the composite coal water sample is presented in Table 3-1 under the field heading “Initial Coal Water”.

The composite coal groundwater sample results indicate that the groundwater would not be suitable for drinking water due to elevated TDS, chloride, fluoride, and sulfate concentrations above the regulatory standards for drinking water (Table 3-1). The composite coal water sampling results are consistent with the sampling results reported in Appendix 6.G of the PAP for coal monitoring wells in Area III and IV.

3.2 LEACHATE MAJOR ION CHANGES AND TRACE ELEMENT DETECTIONS

The data was plotted and reviewed for overall general geochemical changes between initial groundwater and the final leachates.

3.2.1 Leachate Major Ion Changes

Major ion changes can be observed in the Durov diagram provided in Figure 3-1 and as major ion water types (Table 3-2). The TDS in the leachate from spoil only increases by approximately 500 mg/L from 3,027 mg/L in coal groundwater to approximately 3,525 mg/L in the supernatant. The TDS increases in spoil leachates resulted primarily as a function of leaching of Ca and sulfate. For those tests performed using coal water, the water changes from a Na bicarbonate water-type to a Na sulfate water-type.

For the leaching tests performed using synthetic precipitation, the water changes from a Na bicarbonate water type to a Ca sulfate water type. These results indicate a significant source of sulfate in the spoil materials.

FIGURE 3-1. DUROV DIAGRAM OF SPOIL LEACHATE ANALYSES AND INITIAL WATER COMPOSITIONS

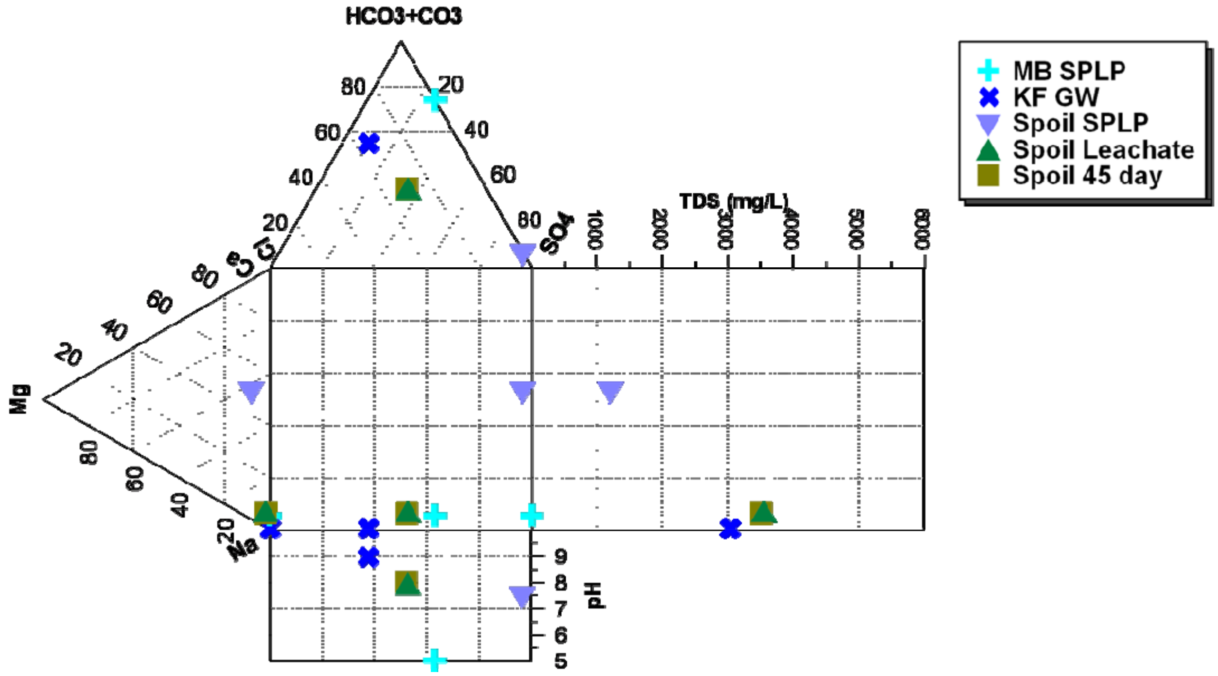

TABLE 3-2. MAJOR ION WATER TYPES

Sample ID	Water Type	Simple Water Type
Initial Synthetic Precipitation	Na-CO3-HCO3	Sodium Bicarbonate
Initial Coal Water	Na-HCO3-Cl	Sodium Bicarbonate
Spoil Leachate 1	Na-SO4-HC03-Cl	Sodium Sulfate
Spoil 45-Day	Na-SO4-HCO3-Cl	Sodium Sulfate
Spoil SPLP	Ca-Na-SO4	Calcium Sulfate

As the sulfate is increased both bicarbonate and carbonate in the initial coal groundwater are reduced in spoil leachates. Reduction in carbonate concentrations is reflected by a pH drop from approximately 9.0 in the coal groundwater to 8.0 in the spoil leachates. The sulfate and TDS in all the leachates exceed criteria for the drinking water use .

The EPA secondary drinking water limits for chloride are exceeded in all samples except for SPLP leachate. Additionally, chloride does not increase in value in groundwater leachates and increases from non-detect to 1.5 mg/L in spoil leachate. Chloride is removed in all final leachates compared to background groundwater when groundwater is used as the initial solution. The loss of chloride is significant (as much as 104 mg/L) and not attributed to sampling or analytical error. Typically, chloride is considered conservative meaning that it is not involved in sorption, oxidation, reduction, or degradation reactions. However, sorption of chloride on soils has been documented in the literature (Yu and Li 1997, Wang et al. 1987, Borggaard 1984). Sorption is a possible mechanism for the removal of chloride in these leachate tests. The leachate test results indicate spoil is not a source of chloride and that chloride is elevated in the natural groundwater at the site.

3.2.2 Leachate Trace Element Detections

Concentrations of Sb, beryllium (Be), Cd, cobalt (Co), Hg, Ni, Pb, Ag, and Tl are non-detect at levels reported below the PQL in all samples, while the Pb results for all samples were below the MDL (Table 3-1). Trace elements detected at concentrations above the PQL and above one or more of the relevant water quality criteria are as follows:

- Mn was detected at values above the PQL and above the EPA secondary drinking water criteria in all leachates.
- Zn was found in a duplicate split Spoil Leachate sample. The results for Zn indicate that it is potentially present in trace amounts in both spoil and is spatially variable but significantly below relevant Navajo Nation and EPA water quality criteria.

The reported values for Cd (only in one 18 hour duplicate), Hg, and Tl (only in the 45 day test) are above the MDL but below the PQL and are included in Table 3-1 for comparison with the Navajo Nation and EPA water quality criteria. Since the PQL is the lowest level of quantification that a laboratory can reliably achieve based on specified limits of precision and accuracy relating to instrumentation and sample interferences, the values below the PQL reported in Table 3-1 are not considered reliable and should be considered non-detect below the PQL. The non-detect analytes in leachate are not considered for further investigation.

3.2.3 Distribution Ratios

A distribution ratio (K_r) was calculated for Ba and F. The distribution ratio is similar to a sorption isotherm where the concentration in solution is related to the concentration associated with the mass in or on the solid phase. The distribution ratio is defined in equation 3.1.

eq. 3.1 $$K_r = \frac{\text{mass of solute on solid phase per unit mass of solute}}{\text{concentration of solute in solution}}$$

The calculated K_r values (Table 3-3) reflect overall geochemical reactions of sorption and precipitation that result in attenuation of the solutes. As discussed in detail within the literature review section, the pH, redox conditions, temperature, solids characteristics, and the constituents in solution will affect the distribution of solutes on the solid phase. The precipitation of oxides and oxyhydroxides, such as Fe and Mn oxides, can significantly increase sorption capacity. Thus, as precipitation reactions occur the number of sorption sites also increases providing greater attenuation. The results indicate that the majority of constituents show either no attenuation or are below detection limits such that a value could not be calculated (Table 3-1). However, the spoil showed the ability to attenuate Ba and F. The spoil attenuation was observed for leachate from coal groundwater.

TABLE 3-3.
CALCULATED DISTRIBUTION RATIOS FOR SELECTED TRACE METALS

Analyte	Spoil Leachate	Spoil 45-Day	Spoil SPLP
Al	--	--	BD
As	BD	BD	BD
B	--	--	--
Ba	--	2.91	--
Cr	BD	BD	BD
Cu	BD	--	BD
Fe	--	BD	BD
F	10.63	12.67	--
Mn	--	--	--
Mo	--	--	BD
Se	BD	BD	BD
SO4	--	--	--
V	BD	BD	BD
Zn	--	BD	BD

-- No observed attenuation
BD is below detection limit (PQL)

ATTACHMENT A
Rietveld X-ray Diffraction Laboratory Results

QUANTITATIVE PHASE ANALYSIS OF TWO POWDER SAMPLES USING THE RIETVELD METHOD AND X-RAY POWDER DIFFRACTION DATA.

Project: NavajoMine Extension Leaching Study – P.O. 62651

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January 18, 2008

EXPERIMENTAL METHODS

The six samples from Project Navajo Mine were reduced to the optimum grain-size range for quantitative X-ray analysis (<5 μm) by grinding under ethanol in a vibratory McCrone Micronising Mill for 7 minutes. Fine grain-size is an important factor in reducing micro-absorption contrast between phases.

Step-scan X-ray powder-diffraction data were collected over a range 3-80°2θ with CoKα radiation on a standard Siemens (Bruker) D5000 Bragg-Brentano diffractometer equipped with an Fe monochromator foil, 0.6 mm (0.3°) divergence slit, incident- and diffracted-beam Soller slits and a Vantec-1 strip detector. The long fine-focus Co X-ray tube was operated at 35 kV and 40 mA, using a take-off angle of 6°.

RESULTS

The X-ray diffractograms were analyzed using the International Centre for Diffraction Database PDF-4 using Search-Match software by Siemens (Bruker). X-ray powder-diffraction data were refined with Rietveld program Topas 3 (Bruker AXS). The results of quantitative phase analysis by Rietveld refinements are given in Table 1. These amounts represent the relative amounts of crystalline phases normalized to 100%. The Rietveld refinement plots are shown in Figures 1-6.

The patterns of the three "Spoil" samples show a hump between about 6 and 10º2θ that likely corresponds to either amorphous or nanoscale material (disordered clays?) we cannot identify. Therefore, the related results must be considerate approximate.

Table 1. Results of quantitative phase analysis (wt. %) – NORWEST Applied Hydrology - Project Navajo Mine

Mineral	**Ideal formula**	**BR3* Composite Spoil A**	**BR3* Composite Spoil B**	**BR3* Composite Spoil C**	**Ash Composite 70% FA**	**Ash Composite DUP 1 70%FA**	**Ash Composite DUP 2 70%FA**
Quartz	SiO_2	36.5	35.4	35.4	21.3	26.3	24.8
Plagioclase	$NaAlSi_3O_8 – CaAl_2Si_2O_8$	10.3	10.1	10.1			
K-feldspar	$KAlSi_3O_8$	6.0	6.5	7.0			
Kaolinite	$Al_2Si_2O_5(OH)_4$	40.8	40.8	40.6			
Gypsum	$CaSO_4{\cdot}2H_2O$	2.6	3.1	2.8	50.1	38.5	45.2
Anhydrite	$CaSO_4$	0.9	1.0	1.1			
Calcite	$CaCO_3$	2.9	3.1	2.9	1.8	1.4	
Dolomite	$CaMg(CO_3)_2$				3.4	1.8	
Mullite	$Al_6Si_2O_{13}$				23.4	29.5	30.0
Magnetite	Fe_3O_4					2.4	
Total		100.0	100.0	100.0	100.0	100.0	100.0

*** Semi-quantitative results**

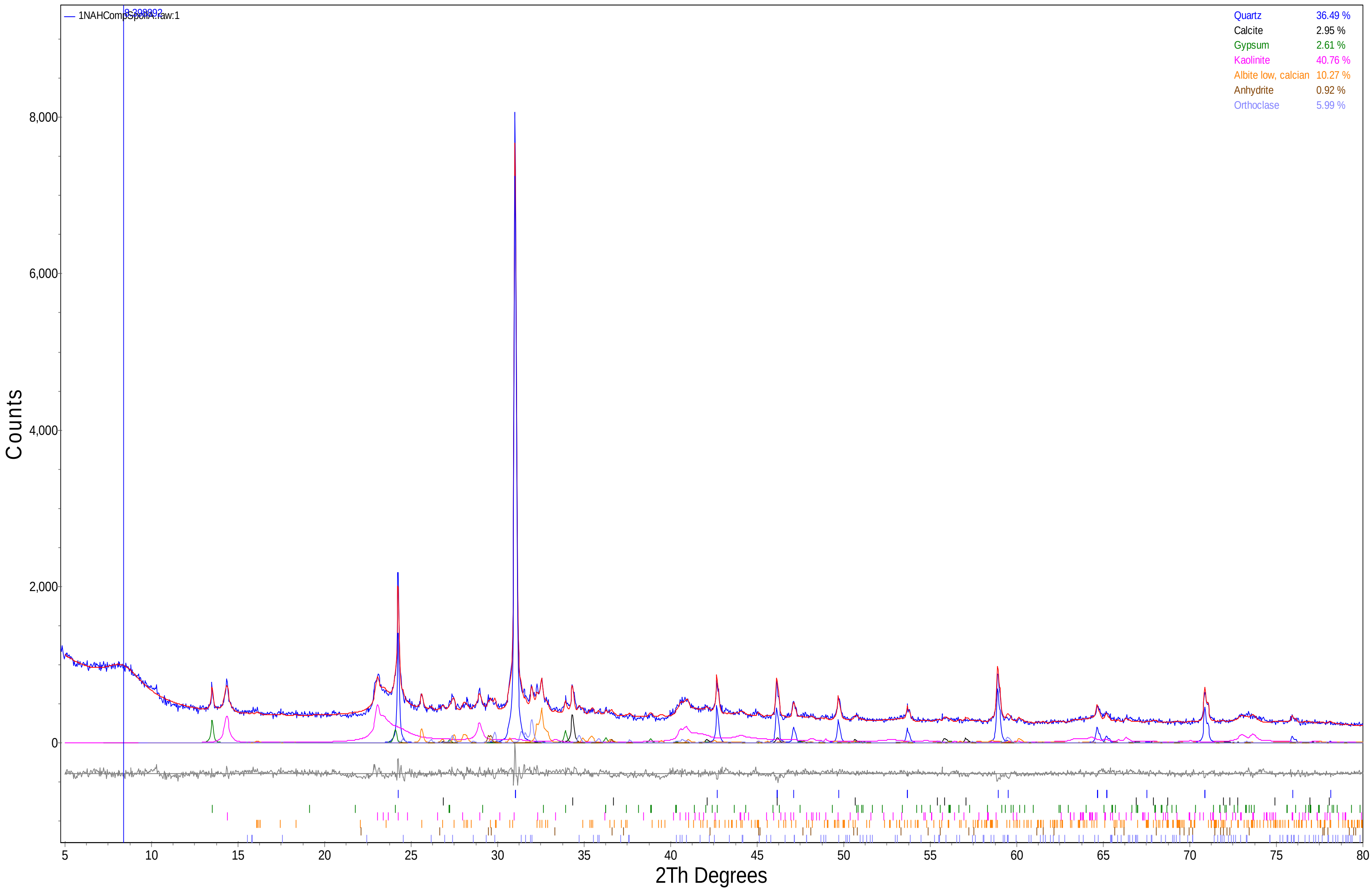

Figure 1. Rietveld refinement plot of sample **Norwest B.R.Composite Spoil A** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

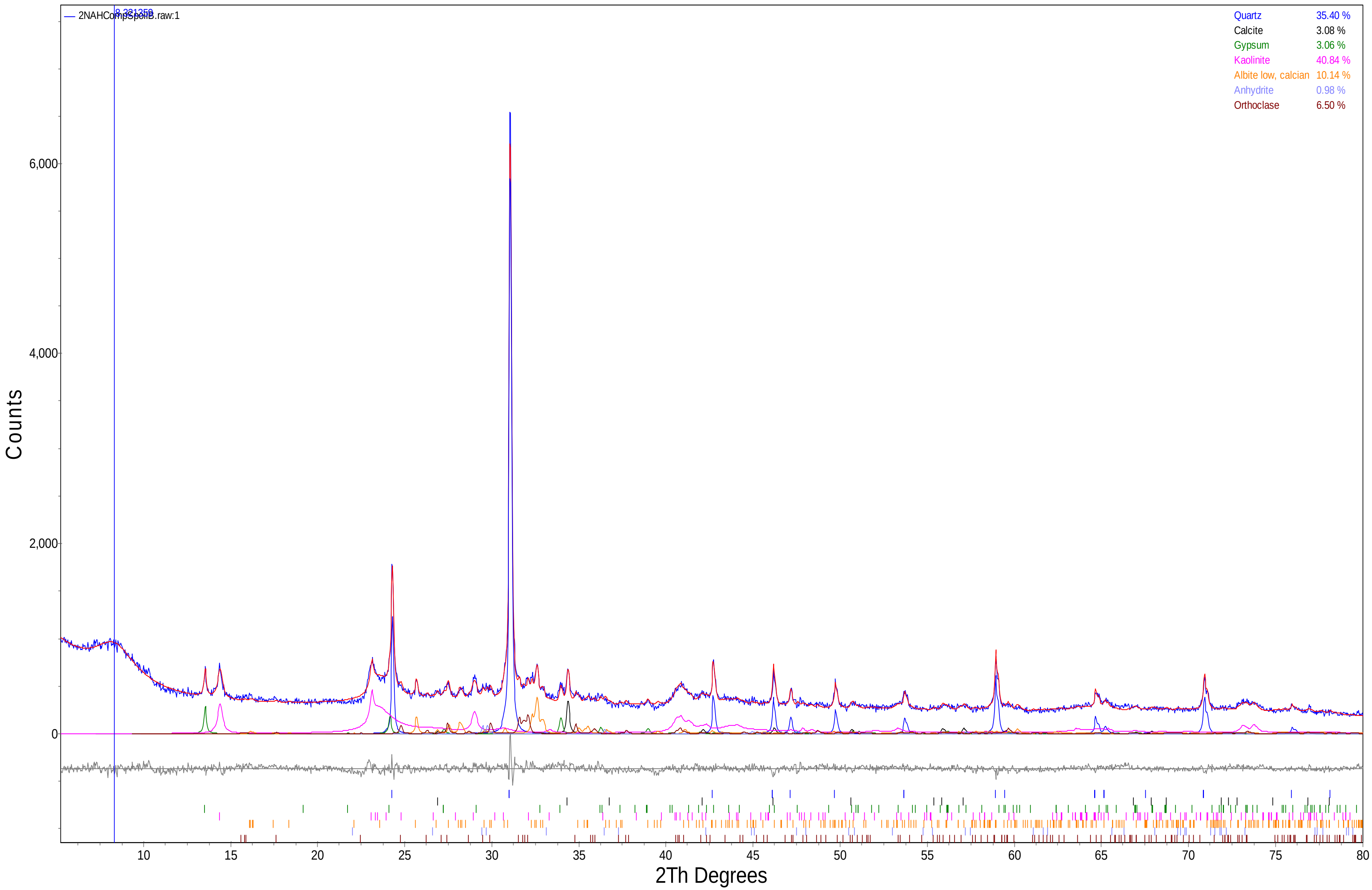

Figure 2. Rietveld refinement plot of sample **Norwest B.R. Composite Spoil B** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

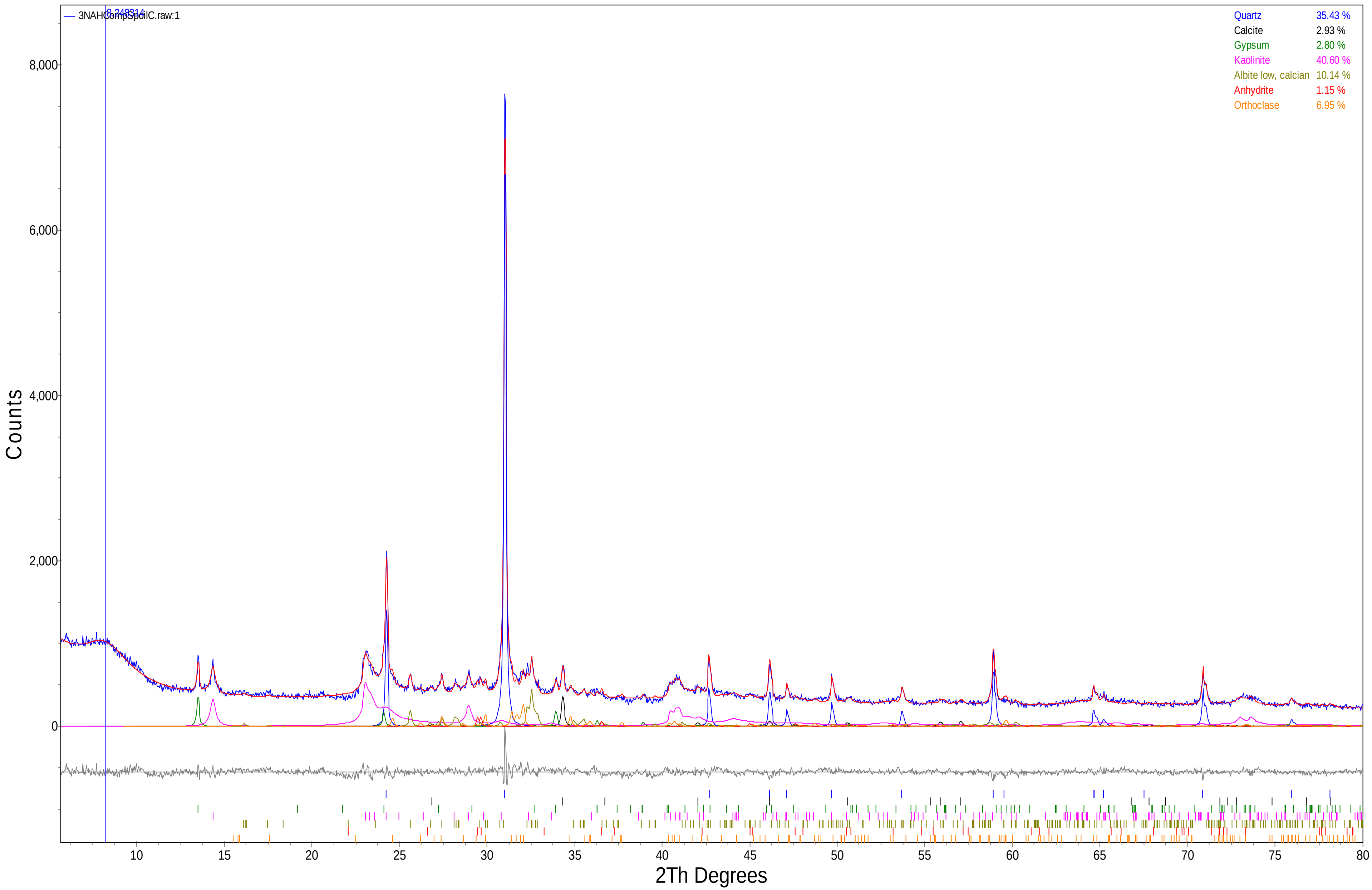

Figure 3. Rietveld refinement plot of sample **Norwest B.R. Composite Spoil C** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

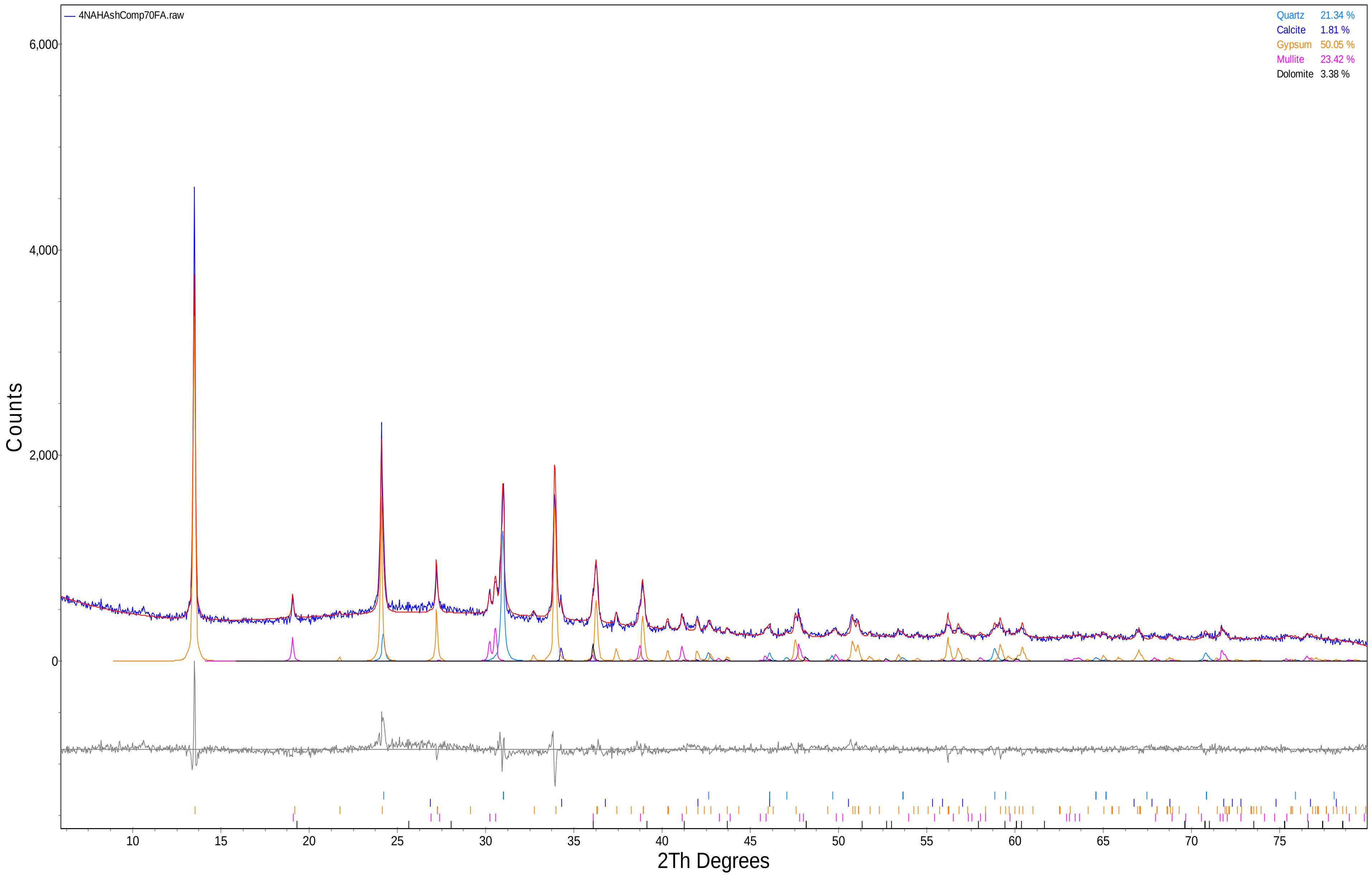

Figure 4. Rietveld refinement plot of sample **Norwest Ash Composite 70% FA** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

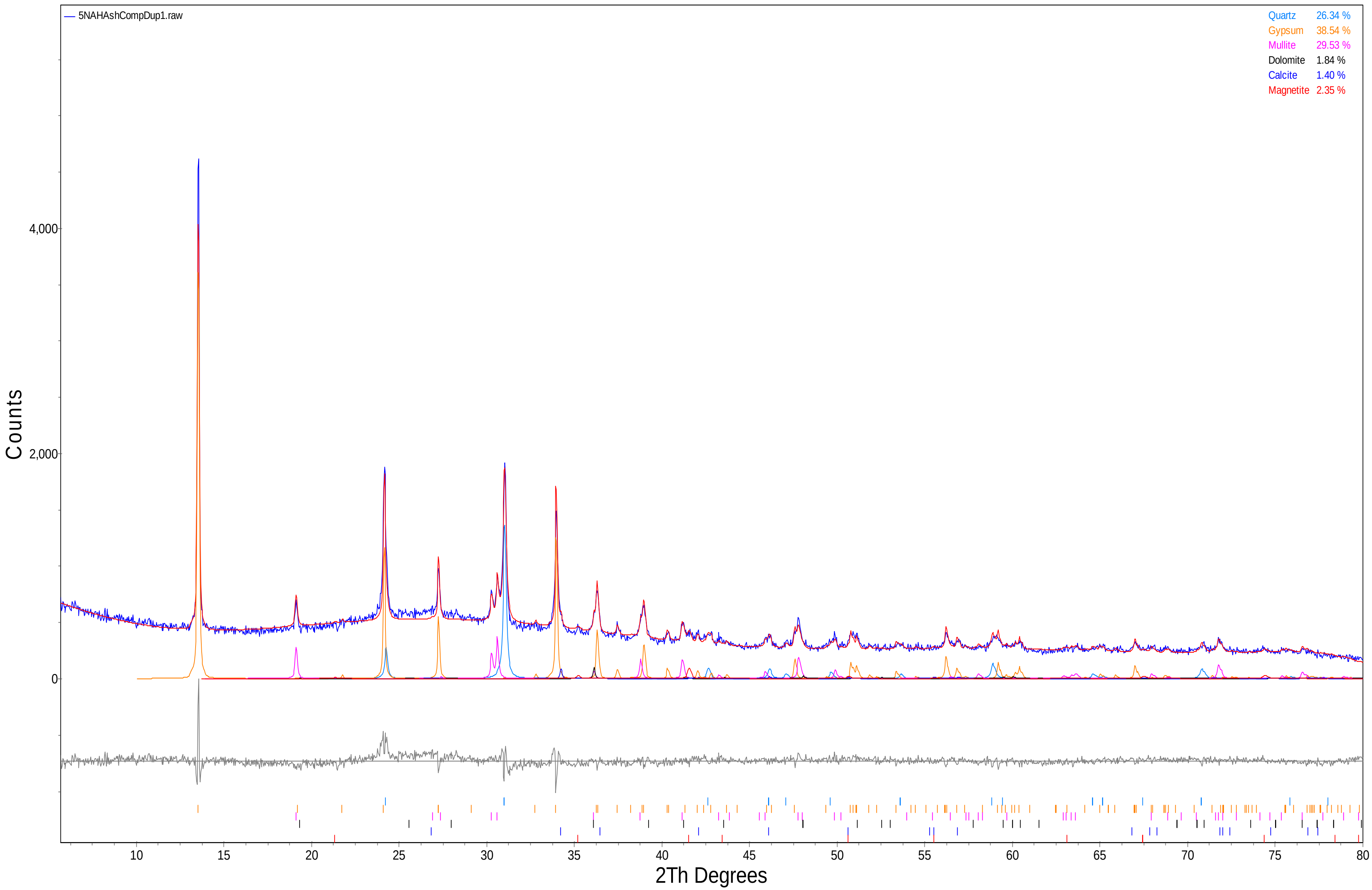

Figure 5. Rietveld refinement plot of sample **Norwest Ash Composite DUP 1 70% FA** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

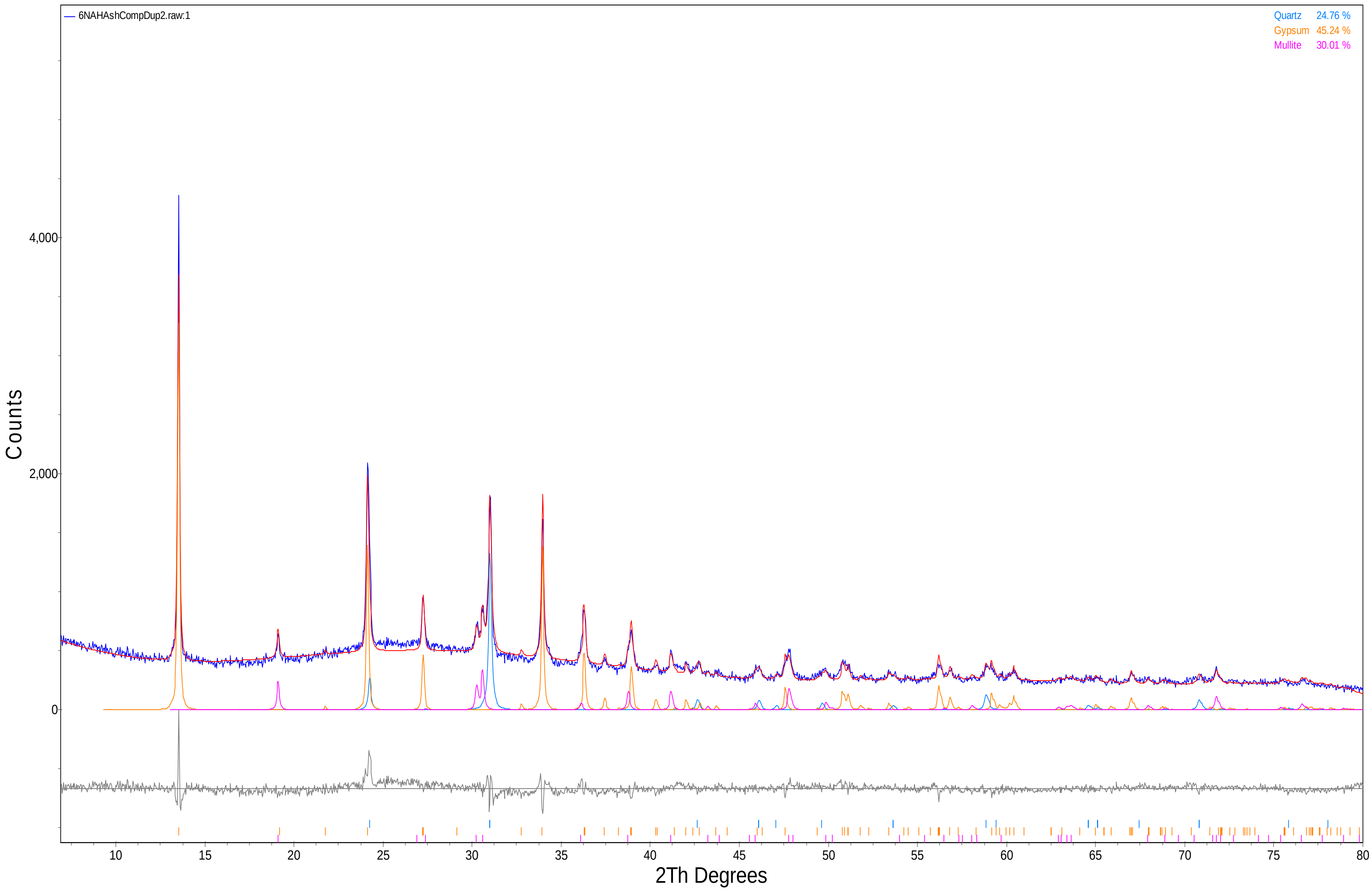

Figure 6. Rietveld refinement plot of sample **Norwest Ash Composite DUP 2 70% FA** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

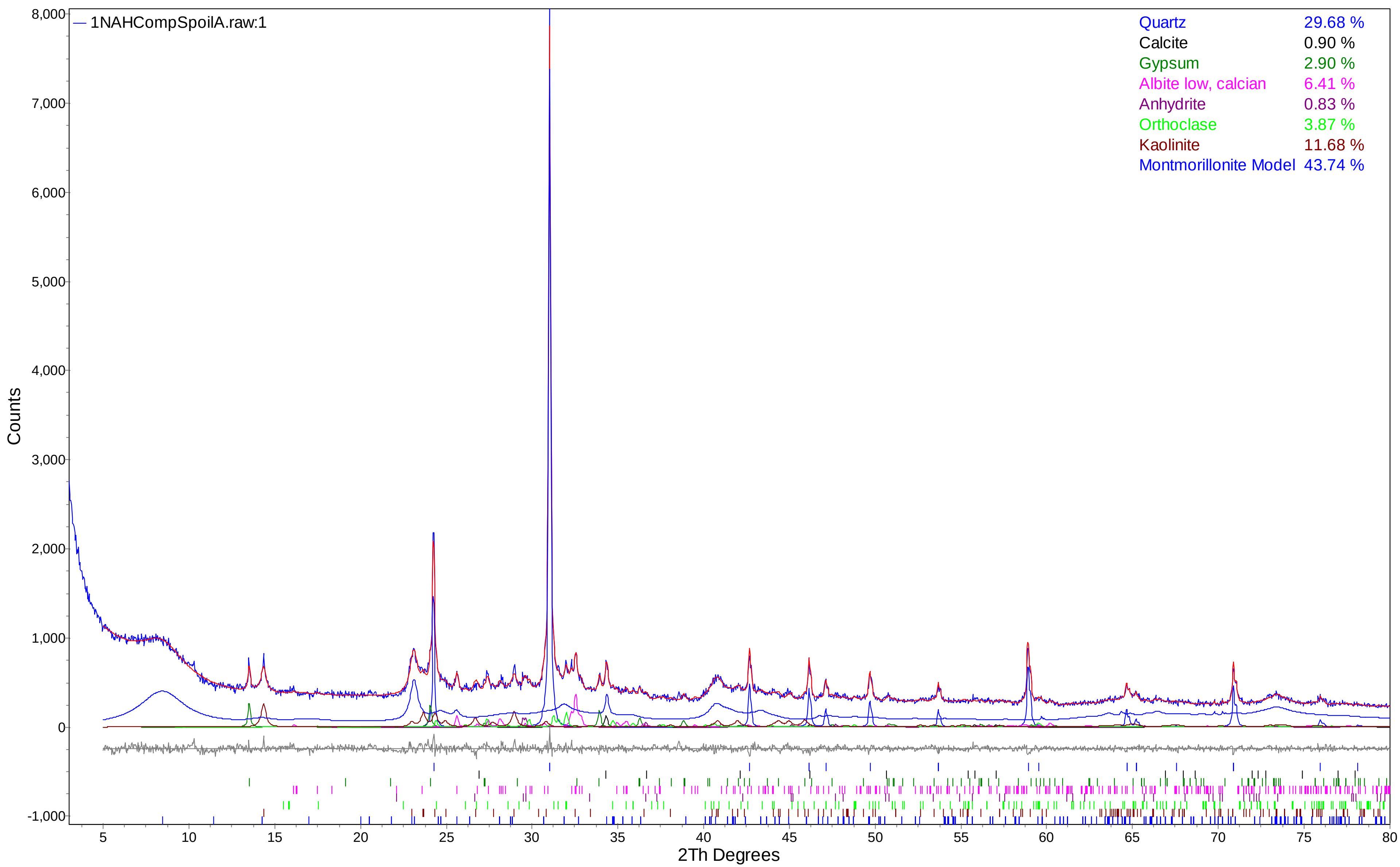

Figure 1. Rietveld refinement plot of sample **Norwest B.R.Composite Spoil A** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

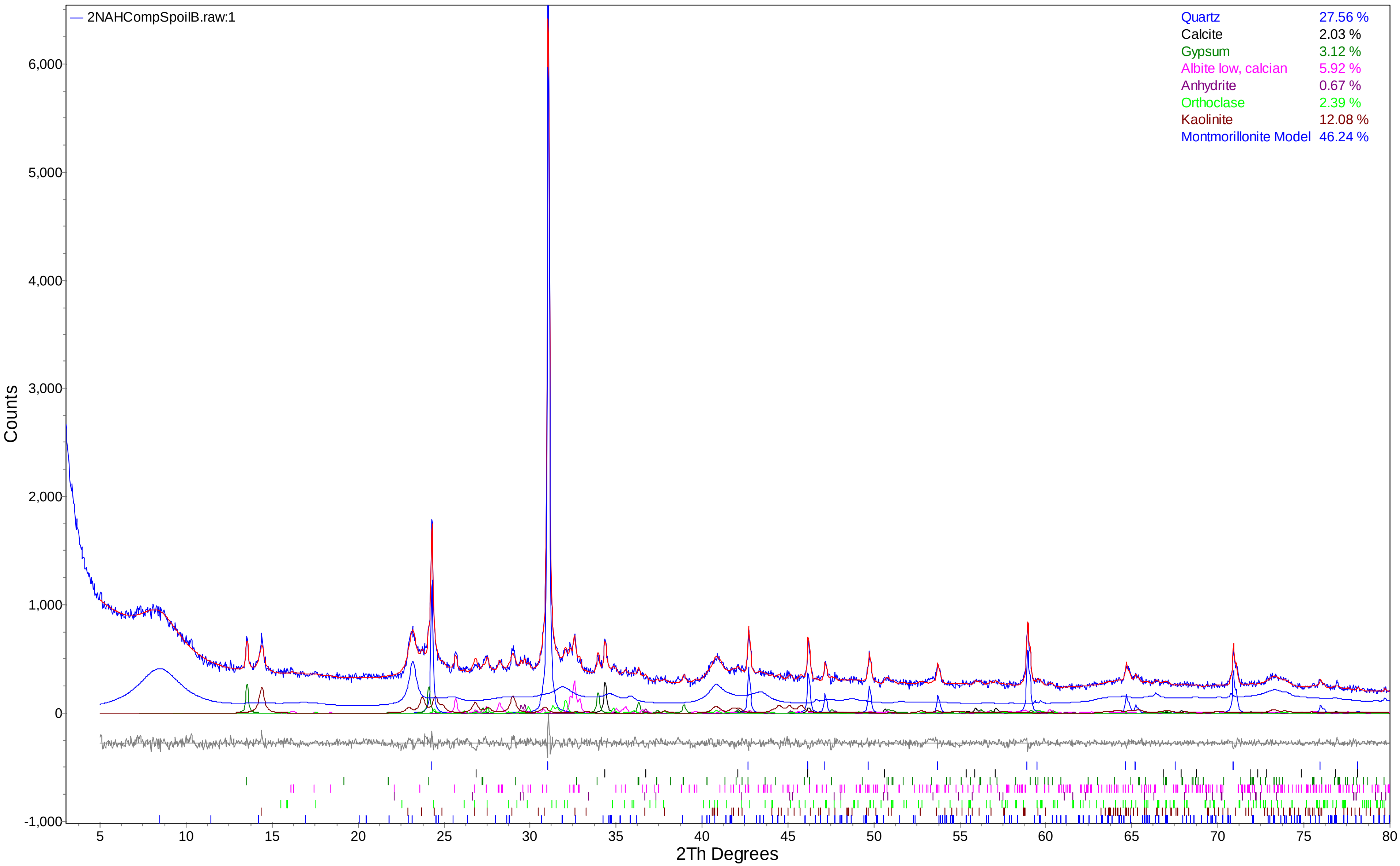

Figure 2. Rietveld refinement plot of sample **Norwest B.R. Composite Spoil B** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

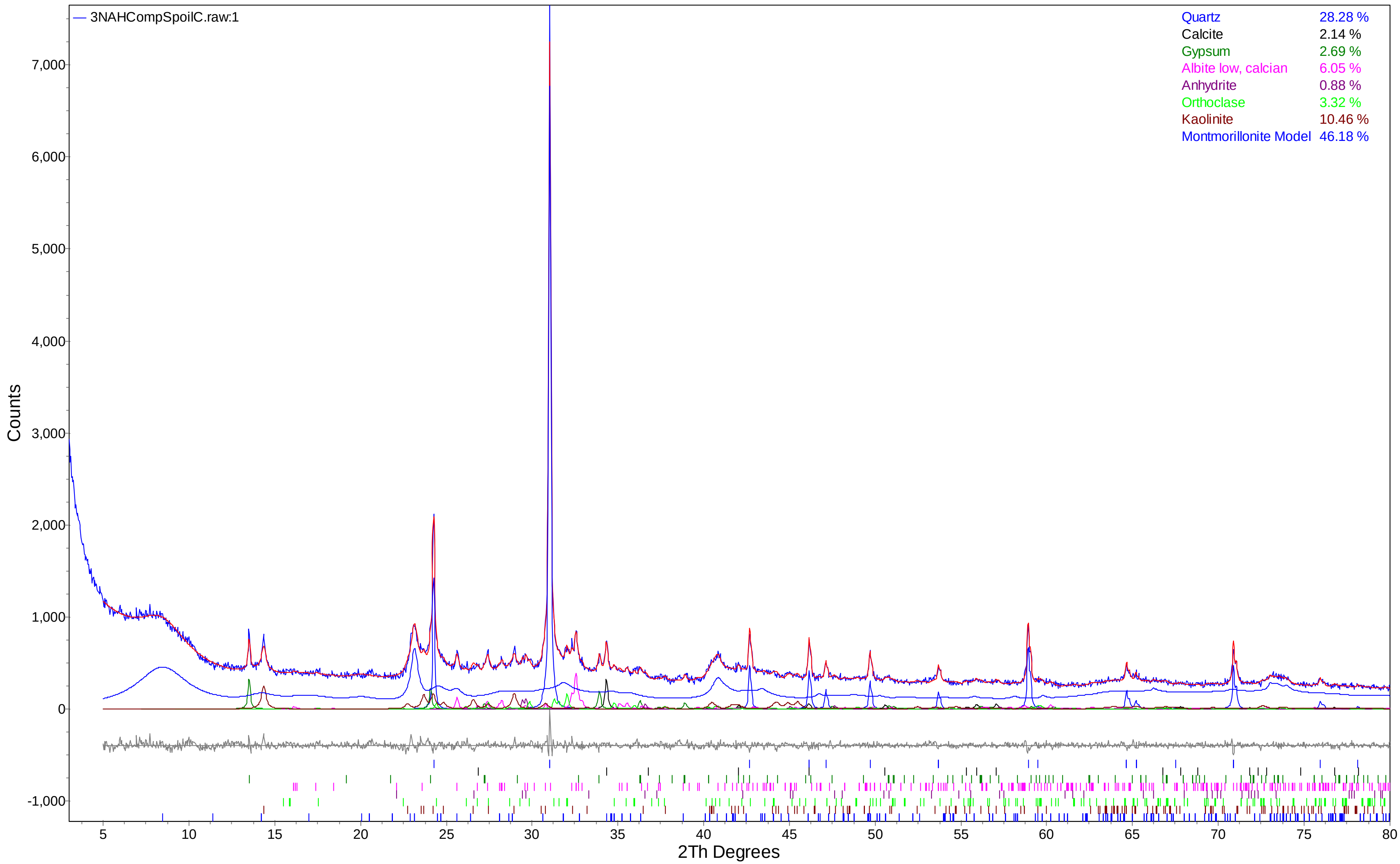

Figure 3. Rietveld refinement plot of sample **Norwest B.R. Composite Spoil C** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

Detailed Analytical Report Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0711172

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **KF2007-01(58) and KF-98-02(53)**

Matrix: Aqueous Collection Date: 11/15/2007 4:30:00PM

The following test was conducted by: Analytica - Thornton

Lab Sample Number: B0711172-01A Analysis Date: 11/30/2007 4:07:17PM
Prep Date: 11/30/2007 Instrument: CVAA_1
Analytical Method ID: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg File Name: B113007W.W
Prep Method ID: 7470A Dilution Factor: 1
Prep Batch Number: T071130013
Report Basis: As Received Analyst Initials: DL
Sample prep wt./vol: 30.00 ml Prep Extract Vol: 30.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Mercury	7439-97-6	ND		mg/L	0.00020	0.000050	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number: B0711172-01A Analysis Date: 12/3/2007 6:01:00PM
Prep Date: 12/3/2007 Instrument: ICP_2
Analytical Method ID: SW6010B - ICP - Total File Name: E12037A
Prep Method ID: 3010_ICP Dilution Factor: 1
Prep Batch Number: T071203011
Report Basis: As Received Analyst Initials: rm
Sample prep wt./vol: 50.00 ml Prep Extract Vol: 50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Aluminum	7429-90-5	**0.13**		mg/L	0.050	0.014	1
Antimony	7440-36-0	ND		mg/L	0.050	0.0067	
Arsenic	7440-38-2	ND		mg/L	0.10	0.015	
Barium	7440-39-3	**0.093**		mg/L	0.010	0.00016	
Beryllium	7440-41-7	ND		mg/L	0.0010	0.000060	
Cadmium	7440-43-9	ND		mg/L	0.0060	0.00051	
Calcium	7440-70-2	**3.4**		mg/L	0.10	0.013	
Chromium	7440-47-3	ND		mg/L	0.010	0.0018	
Cobalt	7440-48-4	ND		mg/L	0.0050	0.0016	
Copper	7440-50-8	ND		mg/L	0.0050	0.0019	
Iron	7439-89-6	**0.067**		mg/L	0.050	0.0027	
Lead	7439-92-1	ND		mg/L	0.050	0.011	
Lithium	7439-93-2	ND		mg/L	0.10	0.00072	
Magnesium	7439-96-4	**1.3**		mg/L	0.10	0.012	
Manganese	7439-96-5	ND		mg/L	0.010	0.00066	
Molybdenum	7439-98-7	**0.012**		mg/L	0.010	0.0018	
Nickel	7440-02-0	ND		mg/L	0.040	0.0027	
Potassium	7440-09-7	**11**		mg/L	1.0	0.31	
Selenium	7784-49-2	ND		mg/L	0.10	0.026	
Silver	7440-22-4	ND		mg/L	0.015	0.00066	
Sodium	7440-23-5	**1,200**		mg/L	3.0	0.028	
Thallium	7440-28-0	ND		mg/L	0.40	0.011	
Vanadium	7440-62-2	ND		mg/L	0.010	0.00072	

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0711172

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **KF2007-01(58) and KF-98-02(53)**

Matrix: Aqueous | Collection Date: 11/15/2007 4:30:00PM

Lab Sample Number:	B0711172-01A	Analysis Date:	12/3/2007 6:01:00PM
Prep Date:	12/3/2007	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E12037A
Prep Method ID:	3010_ICP	Dilution Factor:	1
Prep Batch Number:	T071203011		
Report Basis:	As Received	Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Zinc	7440-66-6	ND		mg/L	0.0050	0.0010	1

Lab Sample Number:	B0711172-01A	Analysis Date:	12/4/2007 5:19:00PM
Prep Date:	12/3/2007	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E12047A
Prep Method ID:	3010_ICP	Dilution Factor:	1
Prep Batch Number:	T071203011		
Report Basis:	As Received	Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Boron	7440-42-8	**0.31**		mg/L	0.050	0.0018	2

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0711172

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **123 S 87W 0-4' SPOIL**

Matrix: Solid

Collection Date: 11/15/2007 12:00:00PM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0711172-02A	Analysis Date:	12/4/2007 3:25:10PM
Prep Date:	12/4/2007	Instrument:	CVAA_1
Analytical Method ID:	SW7471A - Mercury in Solid or Semisolid Waste by CVAA - Total H	File Name:	B120407S.WK
Prep Method ID:	7471A	Dilution Factor:	1
Prep Batch Number:	T071204013	Percent Moisture	7.06
Report Basis:	Dry Weight Basis	Analyst Initials:	DL
Sample prep wt./vol:	0.67 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Mercury	7439-97-6	**0.12**		mg/Kg	0.040	0.0055	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0711172-02A	Analysis Date:	12/3/2007 1:27:00PM
Prep Date:	12/3/2007	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E12037A
Prep Method ID:	3050B	Dilution Factor:	1
Prep Batch Number:	T071203005	Percent Moisture	7.06
Report Basis:	Dry Weight Basis	Analyst Initials:	rm
Sample prep wt./vol:	0.60 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Aluminum	7429-90-5	**9,700**		mg/Kg	7.1	1.8	1
Antimony	7440-36-0	ND		mg/Kg	9.8	0.55	
Arsenic	7440-38-2	ND		mg/Kg	12	1.6	
Barium	7440-39-3	**150**		mg/Kg	0.36	0.028	
Beryllium	7440-41-7	**1.0**		mg/Kg	0.18	0.0079	
Boron	7440-42-8	**13**		mg/Kg	4.5	0.60	
Cadmium	7440-43-9	**0.74**		mg/Kg	0.71	0.051	
Calcium	7440-70-2	**14,000**		mg/Kg	12	4.8	
Chromium	7440-47-3	**6.7**		mg/Kg	1.8	0.26	
Cobalt	7440-48-4	**12**		mg/Kg	2.7	0.23	
Copper	7440-50-8	**28**		mg/Kg	0.54	0.14	
Iron	7439-89-6	**22,000**		mg/Kg	5.4	0.39	
Lead	7439-92-1	**17**		mg/Kg	5.4	0.94	
Magnesium	7439-96-4	**3,100**		mg/Kg	8.9	0.85	
Manganese	7439-96-5	**360**		mg/Kg	0.89	0.099	
Molybdenum	7439-98-7	ND		mg/Kg	1.8	0.21	
Nickel	7440-02-0	**15**		mg/Kg	3.6	0.38	
Potassium	7440-09-7	**1,800**		mg/Kg	89	28	
Selenium	7784-49-2	ND		mg/Kg	8.9	2.2	
Silver	7440-22-4	ND		mg/Kg	1.3	0.14	
Sodium	7440-23-5	**3,900**		mg/Kg	270	0.91	
Thallium	7440-28-0	ND		mg/Kg	18	1.1	
Vanadium	7440-62-2	**22**		mg/Kg	0.89	0.17	

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0711172

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **123 S 87W 0-4' SPOIL**

Matrix: Solid

Collection Date: 11/15/2007 12:00:00PM

Lab Sample Number:	B0711172-02A	Analysis Date:	12/3/2007 1:27:00PM
Prep Date:	12/3/2007	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E12037A
Prep Method ID:	3050B	Dilution Factor:	1
Prep Batch Number:	T071203005	Percent Moisture	7.06
Report Basis:	Dry Weight Basis	Analyst Initials:	rm
Sample prep wt./vol:	0.60 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Zinc	7440-66-6	**73**		mg/Kg	0.54	0.20	1

Lab Sample Number:	B0711172-02A	Analysis Date:	12/4/2007 3:03:00PM
Prep Date:	12/3/2007	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E12047A
Prep Method ID:	3050B	Dilution Factor:	1
Prep Batch Number:	T071203005	Percent Moisture	7.06
Report Basis:	Dry Weight Basis	Analyst Initials:	rm
Sample prep wt./vol:	0.60 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Lithium	7439-93-2	**9.1**		mg/Kg	4.5	0.043	2

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0711172

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **123 S 89W 0-4' SPOIL**

Matrix: Solid

Collection Date: 11/15/2007 12:00:00PM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0711172-03A	Analysis Date:	12/4/2007 4:05:31PM
Prep Date:	12/4/2007	Instrument:	CVAA_1
Analytical Method ID:	SW7471A - Mercury in Solid or Semisolid Waste by CVAA - Total H	File Name:	B120407S.WK
Prep Method ID:	7471A	Dilution Factor:	1
Prep Batch Number:	T071204013	Percent Moisture	8.64
Report Basis:	Dry Weight Basis	Analyst Initials:	DL
Sample prep wt./vol:	0.63 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Mercury	7439-97-6	**0.075**		mg/Kg	0.044	0.0060	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0711172-03A	Analysis Date:	12/3/2007 1:32:00PM
Prep Date:	12/3/2007	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E12037A
Prep Method ID:	3050B	Dilution Factor:	1
Prep Batch Number:	T071203005	Percent Moisture	8.64
Report Basis:	Dry Weight Basis	Analyst Initials:	rm
Sample prep wt./vol:	0.59 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Aluminum	7429-90-5	**9,600**		mg/Kg	7.5	1.8	1
Antimony	7440-36-0	ND		mg/Kg	10	0.58	
Arsenic	7440-38-2	ND		mg/Kg	12	1.6	
Barium	7440-39-3	**170**		mg/Kg	0.37	0.029	
Beryllium	7440-41-7	**1.0**		mg/Kg	0.19	0.0083	
Boron	7440-42-8	**13**		mg/Kg	4.7	0.63	
Cadmium	7440-43-9	**0.85**		mg/Kg	0.75	0.054	
Calcium	7440-70-2	**21,000**		mg/Kg	13	5.0	
Chromium	7440-47-3	**6.6**		mg/Kg	1.9	0.28	
Cobalt	7440-48-4	**11**		mg/Kg	2.8	0.24	
Copper	7440-50-8	**25**		mg/Kg	0.56	0.15	
Iron	7439-89-6	**24,000**		mg/Kg	5.6	0.41	
Lead	7439-92-1	**17**		mg/Kg	5.6	0.98	
Magnesium	7439-96-4	**3,100**		mg/Kg	9.3	0.89	
Manganese	7439-96-5	**590**		mg/Kg	0.93	0.10	
Molybdenum	7439-98-7	ND		mg/Kg	1.9	0.22	
Nickel	7440-02-0	**15**		mg/Kg	3.7	0.40	
Potassium	7440-09-7	**1,800**		mg/Kg	93	29	
Selenium	7784-49-2	ND		mg/Kg	9.3	2.3	
Silver	7440-22-4	ND		mg/Kg	1.4	0.14	
Sodium	7440-23-5	**3,800**		mg/Kg	280	0.95	
Thallium	7440-28-0	ND		mg/Kg	19	1.1	
Vanadium	7440-62-2	**24**		mg/Kg	0.93	0.18	

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0711172

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **123 S 89W 0-4' SPOIL**

Matrix: Solid

Collection Date: 11/15/2007 12:00:00PM

Lab Sample Number:	B0711172-03A	Analysis Date:	12/3/2007 1:32:00PM
Prep Date:	12/3/2007	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E12037A
Prep Method ID:	3050B	Dilution Factor:	1
Prep Batch Number:	T071203005	Percent Moisture	8.64
Report Basis:	Dry Weight Basis	Analyst Initials:	rm
Sample prep wt./vol:	0.59 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Zinc	7440-66-6	**69**		mg/Kg	0.56	0.21	1

Lab Sample Number:	B0711172-03A	Analysis Date:	12/4/2007 3:08:00PM
Prep Date:	12/3/2007	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E12047A
Prep Method ID:	3050B	Dilution Factor:	1
Prep Batch Number:	T071203005	Percent Moisture	8.64
Report Basis:	Dry Weight Basis	Analyst Initials:	rm
Sample prep wt./vol:	0.59 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Lithium	7439-93-2	**9.0**		mg/Kg	4.7	0.045	2

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0711172

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **125 S 88W 0-4' SPOIL**

Matrix: Solid

Collection Date: 11/15/2007 12:00:00PM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0711172-04A	Analysis Date:	12/4/2007 4:13:55PM
Prep Date:	12/4/2007	Instrument:	CVAA_1
Analytical Method ID:	SW7471A - Mercury in Solid or Semisolid Waste by CVAA - Total H	File Name:	B120407S.WK
Prep Method ID:	7471A	Dilution Factor:	1
Prep Batch Number:	T071204013	Percent Moisture	7.60
Report Basis:	Dry Weight Basis	Analyst Initials:	DL
Sample prep wt./vol:	0.62 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Mercury	7439-97-6	**0.053**		mg/Kg	0.044	0.0060	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0711172-04A	Analysis Date:	12/3/2007 1:37:00PM
Prep Date:	12/3/2007	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E12037A
Prep Method ID:	3050B	Dilution Factor:	1
Prep Batch Number:	T071203005	Percent Moisture	7.60
Report Basis:	Dry Weight Basis	Analyst Initials:	rm
Sample prep wt./vol:	0.61 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Aluminum	7429-90-5	**10,000**		mg/Kg	7.1	1.7	1
Antimony	7440-36-0	ND		mg/Kg	9.7	0.55	
Arsenic	7440-38-2	ND		mg/Kg	12	1.6	
Barium	7440-39-3	**220**		mg/Kg	0.35	0.027	
Beryllium	7440-41-7	**1.1**		mg/Kg	0.18	0.0078	
Boron	7440-42-8	**13**		mg/Kg	4.4	0.60	
Cadmium	7440-43-9	ND		mg/Kg	0.71	0.051	
Calcium	7440-70-2	**16,000**		mg/Kg	12	4.7	
Chromium	7440-47-3	**6.8**		mg/Kg	1.8	0.26	
Cobalt	7440-48-4	**11**		mg/Kg	2.7	0.23	
Copper	7440-50-8	**28**		mg/Kg	0.53	0.14	
Iron	7439-89-6	**22,000**		mg/Kg	5.3	0.39	
Lead	7439-92-1	**18**		mg/Kg	5.3	0.93	
Magnesium	7439-96-4	**3,100**		mg/Kg	8.9	0.85	
Manganese	7439-96-5	**380**		mg/Kg	0.89	0.098	
Molybdenum	7439-98-7	ND		mg/Kg	1.8	0.21	
Nickel	7440-02-0	**14**		mg/Kg	3.5	0.38	
Potassium	7440-09-7	**1,900**		mg/Kg	89	28	
Selenium	7784-49-2	ND		mg/Kg	8.9	2.2	
Silver	7440-22-4	ND		mg/Kg	1.3	0.14	
Sodium	7440-23-5	**4,200**		mg/Kg	270	0.90	
Thallium	7440-28-0	ND		mg/Kg	18	1.0	
Vanadium	7440-62-2	**25**		mg/Kg	0.89	0.17	

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0711172

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **125 S 88W 0-4' SPOIL**

Matrix: Solid

Collection Date: 11/15/2007 12:00:00PM

Lab Sample Number:	B0711172-04A	Analysis Date:	12/3/2007 1:37:00PM
Prep Date:	12/3/2007	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E12037A
Prep Method ID:	3050B	Dilution Factor:	1
Prep Batch Number:	T071203005	Percent Moisture	7.60
Report Basis:	Dry Weight Basis	Analyst Initials:	rm
Sample prep wt./vol:	0.61 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Zinc	7440-66-6	**66**		mg/Kg	0.53	0.20	1

Lab Sample Number:	B0711172-04A	Analysis Date:	12/4/2007 3:13:00PM
Prep Date:	12/3/2007	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E12047A
Prep Method ID:	3050B	Dilution Factor:	1
Prep Batch Number:	T071203005	Percent Moisture	7.60
Report Basis:	Dry Weight Basis	Analyst Initials:	rm
Sample prep wt./vol:	0.61 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Lithium	7439-93-2	**8.8**		mg/Kg	4.4	0.043	2

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0711172

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **120 S 89W 0-4' SPOIL**

Matrix: Solid

Collection Date: 11/15/2007 12:00:00PM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0711172-05A	Analysis Date:	12/5/2007 9:42:00AM
Prep Date:	12/4/2007	Instrument:	CVAA_1
Analytical Method ID:	SW7471A - Mercury in Solid or Semisolid Waste by CVAA - Total H	File Name:	B120407S.WK
Prep Method ID:	7471A	Dilution Factor:	1
Prep Batch Number:	T071204013	Percent Moisture	6.86
Report Basis:	Dry Weight Basis	Analyst Initials:	DL
Sample prep wt./vol:	0.62 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Mercury	7439-97-6	**0.12**		mg/Kg	0.044	0.0060	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0711172-05A	Analysis Date:	12/3/2007 1:43:00PM
Prep Date:	12/3/2007	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E12037A
Prep Method ID:	3050B	Dilution Factor:	1
Prep Batch Number:	T071203005	Percent Moisture	6.86
Report Basis:	Dry Weight Basis	Analyst Initials:	rm
Sample prep wt./vol:	0.56 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Aluminum	7429-90-5	**9,200**		mg/Kg	7.7	1.9	1
Antimony	7440-36-0	ND		mg/Kg	11	0.60	
Arsenic	7440-38-2	ND		mg/Kg	13	1.7	
Barium	7440-39-3	**140**		mg/Kg	0.39	0.030	
Beryllium	7440-41-7	**0.84**		mg/Kg	0.19	0.0085	
Boron	7440-42-8	**11**		mg/Kg	4.8	0.65	
Cadmium	7440-43-9	ND		mg/Kg	0.77	0.056	
Calcium	7440-70-2	**27,000**		mg/Kg	13	5.1	
Chromium	7440-47-3	**6.1**		mg/Kg	1.9	0.29	
Cobalt	7440-48-4	**11**		mg/Kg	2.9	0.25	
Copper	7440-50-8	**20**		mg/Kg	0.58	0.15	
Iron	7439-89-6	**19,000**		mg/Kg	5.8	0.42	
Lead	7439-92-1	**17**		mg/Kg	5.8	1.0	
Molybdenum	7439-98-7	ND		mg/Kg	1.9	0.23	
Nickel	7440-02-0	**14**		mg/Kg	3.9	0.41	
Potassium	7440-09-7	**1,900**		mg/Kg	96	30	
Selenium	7784-49-2	ND		mg/Kg	9.6	2.4	
Silver	7440-22-4	ND		mg/Kg	1.4	0.15	
Sodium	7440-23-5	**4,100**		mg/Kg	290	0.98	
Thallium	7440-28-0	ND		mg/Kg	19	1.1	
Vanadium	7440-62-2	**18**		mg/Kg	0.96	0.19	
Zinc	7440-66-6	**59**		mg/Kg	0.58	0.21	

Lab Sample Number: B0711172-05A

Analysis Date: 12/4/2007 3:18:00PM

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0711172

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **120 S 89W 0-4' SPOIL**

Matrix: Solid

Collection Date: 11/15/2007 12:00:00PM

Prep Date:	12/3/2007	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E12047A
Prep Method ID:	3050B	Dilution Factor:	1
Prep Batch Number:	T071203005	Percent Moisture	6.86
Report Basis:	Dry Weight Basis	Analyst Initials:	rm
Sample prep wt./vol:	0.56 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Lithium	7439-93-2	**8.2**		mg/Kg	4.8	0.047	3
Magnesium	7439-96-4	**3,200**		mg/Kg	9.6	0.92	
Manganese	7439-96-5	**370**		mg/Kg	0.96	0.11	

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0711172

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **Barber Ramp 3 Composite Spoil A**

Matrix: Solid

Collection Date: 11/15/2007 12:00:00PM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0711172-06A	Analysis Date:	12/5/2007 9:49:39AM
Prep Date:	12/4/2007	Instrument:	CVAA_1
Analytical Method ID:	SW7471A - Mercury in Solid or Semisolid Waste by CVAA - Total H	File Name:	B120407S.WK
Prep Method ID:	7471A	Dilution Factor:	1
Prep Batch Number:	T071204013	Percent Moisture	7.98
Report Basis:	Dry Weight Basis	Analyst Initials:	DL
Sample prep wt./vol:	0.61 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Mercury	7439-97-6	**0.087**		mg/Kg	0.044	0.0061	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0711172-06A	Analysis Date:	12/3/2007 2:28:00PM
Prep Date:	12/3/2007	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E12037A
Prep Method ID:	3050B	Dilution Factor:	1
Prep Batch Number:	T071203005	Percent Moisture	7.98
Report Basis:	Dry Weight Basis	Analyst Initials:	rm
Sample prep wt./vol:	0.58 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Aluminum	7429-90-5	**10,000**		mg/Kg	7.4	1.8	1
Antimony	7440-36-0	ND		mg/Kg	10	0.58	
Arsenic	7440-38-2	ND		mg/Kg	12	1.6	
Barium	7440-39-3	**170**		mg/Kg	0.37	0.029	
Beryllium	7440-41-7	**1.0**		mg/Kg	0.19	0.0082	
Boron	7440-42-8	**13**		mg/Kg	4.7	0.63	
Cadmium	7440-43-9	ND		mg/Kg	0.74	0.054	
Calcium	7440-70-2	**20,000**		mg/Kg	13	5.0	
Chromium	7440-47-3	**6.7**		mg/Kg	1.9	0.28	
Cobalt	7440-48-4	**11**		mg/Kg	2.8	0.24	
Copper	7440-50-8	**26**		mg/Kg	0.56	0.15	
Iron	7439-89-6	**20,000**		mg/Kg	5.6	0.41	
Lead	7439-92-1	**16**		mg/Kg	5.6	0.98	
Magnesium	7439-96-4	**3,100**		mg/Kg	9.3	0.89	
Manganese	7439-96-5	**440**		mg/Kg	0.93	0.10	
Molybdenum	7439-98-7	ND		mg/Kg	1.9	0.22	
Nickel	7440-02-0	**13**		mg/Kg	3.7	0.40	
Potassium	7440-09-7	**1,900**		mg/Kg	93	29	
Selenium	7784-49-2	ND		mg/Kg	9.3	2.3	
Silver	7440-22-4	ND		mg/Kg	1.4	0.14	
Sodium	7440-23-5	**4,000**		mg/Kg	280	0.95	
Thallium	7440-28-0	ND		mg/Kg	19	1.1	
Vanadium	7440-62-2	**23**		mg/Kg	0.93	0.18	

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0711172

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **Barber Ramp 3 Composite Spoil A**

Matrix: Solid

Collection Date: 11/15/2007 12:00:00PM

Lab Sample Number:	B0711172-06A	Analysis Date:	12/3/2007 2:28:00PM
Prep Date:	12/3/2007	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E12037A
Prep Method ID:	3050B	Dilution Factor:	1
Prep Batch Number:	T071203005	Percent Moisture	7.98
Report Basis:	Dry Weight Basis	Analyst Initials:	rm
Sample prep wt./vol:	0.58 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Zinc	7440-66-6	**62**		mg/Kg	0.56	0.21	1

Lab Sample Number:	B0711172-06A	Analysis Date:	12/4/2007 4:04:00PM
Prep Date:	12/3/2007	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E12047A
Prep Method ID:	3050B	Dilution Factor:	1
Prep Batch Number:	T071203005	Percent Moisture	7.98
Report Basis:	Dry Weight Basis	Analyst Initials:	rm
Sample prep wt./vol:	0.58 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Lithium	7439-93-2	**8.6**		mg/Kg	4.7	0.045	2

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0711172

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **Barber Ramp 3 Composite Spoil B**

Matrix: Solid

Collection Date: 11/15/2007 12:00:00PM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0711172-07A	Analysis Date:	12/5/2007 9:57:26AM
Prep Date:	12/4/2007	Instrument:	CVAA_1
Analytical Method ID:	SW7471A - Mercury in Solid or Semisolid Waste by CVAA - Total H	File Name:	B120407S.WK
Prep Method ID:	7471A	Dilution Factor:	1
Prep Batch Number:	T071204013	Percent Moisture	8.13
Report Basis:	Dry Weight Basis	Analyst Initials:	DL
Sample prep wt./vol:	0.62 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Mercury	7439-97-6	**0.073**		mg/Kg	0.044	0.0060	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0711172-07A	Analysis Date:	12/3/2007 2:33:00PM
Prep Date:	12/3/2007	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E12037A
Prep Method ID:	3050B	Dilution Factor:	1
Prep Batch Number:	T071203005	Percent Moisture	8.13
Report Basis:	Dry Weight Basis	Analyst Initials:	rm
Sample prep wt./vol:	0.64 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Aluminum	7429-90-5	**9,500**		mg/Kg	6.8	1.7	1
Antimony	7440-36-0	ND		mg/Kg	9.3	0.52	
Arsenic	7440-38-2	ND		mg/Kg	11	1.5	
Barium	7440-39-3	**180**		mg/Kg	0.34	0.026	
Beryllium	7440-41-7	**1.0**		mg/Kg	0.17	0.0075	
Boron	7440-42-8	**12**		mg/Kg	4.2	0.57	
Cadmium	7440-43-9	ND		mg/Kg	0.68	0.049	
Calcium	7440-70-2	**22,000**		mg/Kg	12	4.5	
Chromium	7440-47-3	**6.0**		mg/Kg	1.7	0.25	
Cobalt	7440-48-4	**11**		mg/Kg	2.5	0.22	
Copper	7440-50-8	**23**		mg/Kg	0.51	0.13	
Iron	7439-89-6	**20,000**		mg/Kg	5.1	0.37	
Lead	7439-92-1	**17**		mg/Kg	5.1	0.89	
Magnesium	7439-96-4	**2,900**		mg/Kg	8.5	0.81	
Manganese	7439-96-5	**430**		mg/Kg	0.85	0.094	
Molybdenum	7439-98-7	ND		mg/Kg	1.7	0.20	
Nickel	7440-02-0	**13**		mg/Kg	3.4	0.36	
Potassium	7440-09-7	**1,700**		mg/Kg	85	27	
Selenium	7784-49-2	ND		mg/Kg	8.5	2.1	
Silver	7440-22-4	ND		mg/Kg	1.3	0.13	
Sodium	7440-23-5	**3,900**		mg/Kg	250	0.86	
Thallium	7440-28-0	ND		mg/Kg	17	1.00	
Vanadium	7440-62-2	**22**		mg/Kg	0.85	0.16	

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0711172

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **Barber Ramp 3 Composite Spoil B**

Matrix: Solid

Collection Date: 11/15/2007 12:00:00PM

Lab Sample Number:	B0711172-07A	Analysis Date:	12/3/2007 2:33:00PM
Prep Date:	12/3/2007	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E12037A
Prep Method ID:	3050B	Dilution Factor:	1
Prep Batch Number:	T071203005	Percent Moisture	8.13
Report Basis:	Dry Weight Basis	Analyst Initials:	rm
Sample prep wt./vol:	0.64 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Zinc	7440-66-6	**65**		mg/Kg	0.51	0.19	1

Lab Sample Number:	B0711172-07A	Analysis Date:	12/4/2007 4:09:00PM
Prep Date:	12/3/2007	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E12047A
Prep Method ID:	3050B	Dilution Factor:	1
Prep Batch Number:	T071203005	Percent Moisture	8.13
Report Basis:	Dry Weight Basis	Analyst Initials:	rm
Sample prep wt./vol:	0.64 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Lithium	7439-93-2	**8.2**		mg/Kg	4.2	0.041	2

Detailed Analytical Report Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0711172

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **Barber Ramp 3 Composite Spoil C**

Matrix: Solid Collection Date: 11/15/2007 12:00:00PM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0711172-08A	Analysis Date:	12/5/2007 10:05:12AM
Prep Date:	12/4/2007	Instrument:	CVAA_1
Analytical Method ID:	SW7471A - Mercury in Solid or Semisolid Waste by CVAA - Total H	File Name:	B120407S.WK
Prep Method ID:	7471A	Dilution Factor:	1
Prep Batch Number:	T071204013	Percent Moisture	7.87
Report Basis:	Dry Weight Basis	Analyst Initials:	DL
Sample prep wt./vol:	0.62 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Mercury	7439-97-6	**0.068**		mg/Kg	0.044	0.0060	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0711172-08A	Analysis Date:	12/3/2007 2:38:00PM
Prep Date:	12/3/2007	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E12037A
Prep Method ID:	3050B	Dilution Factor:	1
Prep Batch Number:	T071203005	Percent Moisture	7.87
Report Basis:	Dry Weight Basis	Analyst Initials:	rm
Sample prep wt./vol:	0.57 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Aluminum	7429-90-5	**9,400**		mg/Kg	7.7	1.9	1
Antimony	7440-36-0	ND		mg/Kg	11	0.59	
Arsenic	7440-38-2	ND		mg/Kg	12	1.7	
Barium	7440-39-3	**170**		mg/Kg	0.38	0.030	
Beryllium	7440-41-7	**1.0**		mg/Kg	0.19	0.0085	
Boron	7440-42-8	**12**		mg/Kg	4.8	0.64	
Cadmium	7440-43-9	ND		mg/Kg	0.77	0.055	
Calcium	7440-70-2	**20,000**		mg/Kg	13	5.1	
Chromium	7440-47-3	**6.1**		mg/Kg	1.9	0.28	
Cobalt	7440-48-4	**11**		mg/Kg	2.9	0.25	
Copper	7440-50-8	**24**		mg/Kg	0.57	0.15	
Iron	7439-89-6	**20,000**		mg/Kg	5.7	0.42	
Lead	7439-92-1	**18**		mg/Kg	5.7	1.0	
Magnesium	7439-96-4	**3,000**		mg/Kg	9.6	0.92	
Manganese	7439-96-5	**390**		mg/Kg	0.96	0.11	
Molybdenum	7439-98-7	ND		mg/Kg	1.9	0.23	
Nickel	7440-02-0	**14**		mg/Kg	3.8	0.41	
Potassium	7440-09-7	**1,800**		mg/Kg	96	30	
Selenium	7784-49-2	ND		mg/Kg	9.6	2.4	
Silver	7440-22-4	ND		mg/Kg	1.4	0.15	
Sodium	7440-23-5	**4,100**		mg/Kg	290	0.98	
Thallium	7440-28-0	ND		mg/Kg	19	1.1	
Vanadium	7440-62-2	**22**		mg/Kg	0.96	0.19	

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0711172

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **Barber Ramp 3 Composite Spoil C**

Matrix: Solid

Collection Date: 11/15/2007 12:00:00PM

Lab Sample Number:	B0711172-08A	Analysis Date:	12/3/2007 2:38:00PM
Prep Date:	12/3/2007	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E12037A
Prep Method ID:	3050B	Dilution Factor:	1
Prep Batch Number:	T071203005	Percent Moisture	7.87
Report Basis:	Dry Weight Basis	Analyst Initials:	rm
Sample prep wt./vol:	0.57 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Zinc	7440-66-6	**62**		mg/Kg	0.57	0.21	1

Lab Sample Number:	B0711172-08A	Analysis Date:	12/4/2007 4:14:00PM
Prep Date:	12/3/2007	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E12047A
Prep Method ID:	3050B	Dilution Factor:	1
Prep Batch Number:	T071203005	Percent Moisture	7.87
Report Basis:	Dry Weight Basis	Analyst Initials:	rm
Sample prep wt./vol:	0.57 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Lithium	7439-93-2	**8.1**		mg/Kg	4.8	0.047	2

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0711172

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **KF2007-01(58) DUP and KF-98-02(53)DUP**

Matrix: Aqueous

Collection Date: 11/15/2007 4:30:00PM

The following test was conducted by: Analytica - Thornton

Lab Sample Number: B0711172-12A
Analysis Date: 11/30/2007 4:09:34PM
Prep Date: 11/30/2007
Instrument: CVAA_1
Analytical Method ID: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg
File Name: B113007W.W
Prep Method ID: 7470A
Dilution Factor: 1
Prep Batch Number: T071130013
Report Basis: As Received
Analyst Initials: DL
Sample prep wt./vol: 30.00 ml
Prep Extract Vol: 30.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Mercury	7439-97-6	ND		mg/L	0.00020	0.000050	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number: B0711172-12A
Analysis Date: 12/3/2007 6:06:00PM
Prep Date: 12/3/2007
Instrument: ICP_2
Analytical Method ID: SW6010B - ICP - Total
File Name: E12037A
Prep Method ID: 3010_ICP
Dilution Factor: 1
Prep Batch Number: T071203011
Report Basis: As Received
Analyst Initials: rm
Sample prep wt./vol: 50.00 ml
Prep Extract Vol: 50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Aluminum	7429-90-5	**0.14**		mg/L	0.050	0.014	1
Antimony	7440-36-0	ND		mg/L	0.050	0.0067	
Arsenic	7440-38-2	ND		mg/L	0.10	0.015	
Barium	7440-39-3	**0.088**		mg/L	0.010	0.00016	
Beryllium	7440-41-7	ND		mg/L	0.0010	0.000060	
Cadmium	7440-43-9	ND		mg/L	0.0060	0.00051	
Calcium	7440-70-2	**3.3**		mg/L	0.10	0.013	
Chromium	7440-47-3	ND		mg/L	0.010	0.0018	
Cobalt	7440-48-4	ND		mg/L	0.0050	0.0016	
Copper	7440-50-8	ND		mg/L	0.0050	0.0019	
Iron	7439-89-6	**0.073**		mg/L	0.050	0.0027	
Lead	7439-92-1	ND		mg/L	0.050	0.011	
Lithium	7439-93-2	ND		mg/L	0.10	0.00072	
Magnesium	7439-96-4	**1.2**		mg/L	0.10	0.012	
Manganese	7439-96-5	ND		mg/L	0.010	0.00066	
Molybdenum	7439-98-7	ND		mg/L	0.010	0.0018	
Nickel	7440-02-0	ND		mg/L	0.040	0.0027	
Potassium	7440-09-7	**10**		mg/L	1.0	0.31	
Selenium	7784-49-2	ND		mg/L	0.10	0.026	
Silver	7440-22-4	ND		mg/L	0.015	0.00066	
Sodium	7440-23-5	**1,100**		mg/L	3.0	0.028	
Thallium	7440-28-0	ND		mg/L	0.40	0.011	
Vanadium	7440-62-2	ND		mg/L	0.010	0.00072	

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0711172

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **KF2007-01(58) DUP and KF-98-02(53)DUP**

Matrix: Aqueous

Collection Date: 11/15/2007 4:30:00PM

Lab Sample Number: B0711172-12A
Prep Date: 12/3/2007
Analytical Method ID: SW6010B - ICP - Total
Prep Method ID: 3010_ICP
Prep Batch Number: T071203011
Report Basis: As Received
Sample prep wt./vol: 50.00 ml

Analysis Date: 12/3/2007 6:06:00PM
Instrument: ICP_2
File Name: E12037A
Dilution Factor: 1
Analyst Initials: rm
Prep Extract Vol: 50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Zinc	7440-66-6	ND		mg/L	0.0050	0.0010	1

Lab Sample Number: B0711172-12A
Prep Date: 12/3/2007
Analytical Method ID: SW6010B - ICP - Total
Prep Method ID: 3010_ICP
Prep Batch Number: T071203011
Report Basis: As Received
Sample prep wt./vol: 50.00 ml

Analysis Date: 12/4/2007 5:24:00PM
Instrument: ICP_2
File Name: E12047A
Dilution Factor: 1
Analyst Initials: rm
Prep Extract Vol: 50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Boron	7440-42-8	**0.29**		mg/L	0.050	0.0018	2

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0711172

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Method Blank Report

Client Sample Name: **MB**

Matrix: Solid

Collection Date: 12/4/2007 12:00:00AM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	T071204013-MB	Analysis Date:	12/4/2007 3:00:38PM
Prep Date:	12/4/2007	Instrument:	CVAA_1
Analytical Method ID:	SW7471A - Mercury in Solid or Semisolid Waste by CVAA - Total H	File Name:	B120407S.WK
Prep Method ID:	7471A	Dilution Factor:	1
Prep Batch Number:	T071204013	Percent Moisture	NA
Report Basis:	Dry Weight Basis	Analyst Initials:	DL
Sample prep wt./vol:	0.60 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Mercury	7439-97-6	ND		mg/Kg	0.042	0.0057	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	T071203005-MB	Analysis Date:	12/3/2007 1:12:00PM
Prep Date:	12/3/2007	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E12037A
Prep Method ID:	3050B	Dilution Factor:	1
Prep Batch Number:	T071203005	Percent Moisture	NA
Report Basis:	Dry Weight Basis	Analyst Initials:	rm
Sample prep wt./vol:	0.50 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Aluminum	7429-90-5	ND		mg/Kg	8.0	2.0	1
Antimony	7440-36-0	ND		mg/Kg	11	0.62	
Arsenic	7440-38-2	ND		mg/Kg	13	1.8	
Barium	7440-39-3	ND		mg/Kg	0.40	0.031	
Beryllium	7440-41-7	ND		mg/Kg	0.20	0.0089	
Boron	7440-42-8	ND		mg/Kg	5.0	0.67	
Cadmium	7440-43-9	ND		mg/Kg	0.80	0.058	
Calcium	7440-70-2	ND		mg/Kg	14	5.3	
Chromium	7440-47-3	ND		mg/Kg	2.0	0.30	
Cobalt	7440-48-4	ND		mg/Kg	3.0	0.26	
Copper	7440-50-8	ND		mg/Kg	0.60	0.16	
Iron	7439-89-6	ND		mg/Kg	6.0	0.44	
Lead	7439-92-1	ND		mg/Kg	6.0	1.1	
Magnesium	7439-96-4	ND		mg/Kg	10	0.96	
Manganese	7439-96-5	ND		mg/Kg	1.0	0.11	
Molybdenum	7439-98-7	ND		mg/Kg	2.0	0.24	
Nickel	7440-02-0	ND		mg/Kg	4.0	0.43	
Potassium	7440-09-7	ND		mg/Kg	100	31	
Selenium	7784-49-2	ND		mg/Kg	10	2.5	
Silver	7440-22-4	ND		mg/Kg	1.5	0.15	
Sodium	7440-23-5	ND		mg/Kg	300	1.0	
Thallium	7440-28-0	ND		mg/Kg	20	1.2	
Vanadium	7440-62-2	ND		mg/Kg	1.0	0.20	

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0711172

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: **Method Blank Report**

Client Sample Name: **MB**

Matrix: Solid

Collection Date: 12/3/2007 12:00:00AM

Lab Sample Number:	T071203005-MB	Analysis Date:	12/4/2007 2:48:00PM
Prep Date:	12/3/2007	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E12047A
Prep Method ID:	3050B	Dilution Factor:	1
Prep Batch Number:	T071203005	Percent Moisture	NA
Report Basis:	Dry Weight Basis	Analyst Initials:	rm
Sample prep wt./vol:	0.50 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Lithium	7439-93-2	ND		mg/Kg	5.0	0.049	2

Lab Sample Number:	T071203005-MB	Analysis Date:	12/5/2007 1:51:00PM
Prep Date:	12/3/2007	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E12057A
Prep Method ID:	3050B	Dilution Factor:	1
Prep Batch Number:	T071203005	Percent Moisture	NA
Report Basis:	Dry Weight Basis	Analyst Initials:	rm
Sample prep wt./vol:	0.50 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Zinc	7440-66-6	ND		mg/Kg	0.60	0.22	3

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	T071130013-MB	Analysis Date:	11/30/2007 4:00:22PM
Prep Date:	11/30/2007	Instrument:	CVAA_1
Analytical Method ID:	SW7470A - Mercury in Liquid Waste by CVAA - Total Hg	File Name:	B113007W.W
Prep Method ID:	7470A	Dilution Factor:	1
Prep Batch Number:	T071130013		
Report Basis:	Dry Weight Basis	Analyst Initials:	DL
Sample prep wt./vol:	30.00 ml	Prep Extract Vol:	30.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Mercury	7439-97-6	ND		mg/L	0.00020	0.000050	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	T071203011-MB	Analysis Date:	12/3/2007 5:46:00PM
Prep Date:	12/3/2007	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E12037A
Prep Method ID:	3010_ICP	Dilution Factor:	1
Prep Batch Number:	T071203011		
Report Basis:	Dry Weight Basis	Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Aluminum	7429-90-5	ND		mg/L	0.050	0.014	1
Antimony	7440-36-0	ND		mg/L	0.050	0.0067	
Arsenic	7440-38-2	ND		mg/L	0.10	0.015	

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0711172

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Method Blank Report

Client Sample Name: **MB**

Matrix: Aqueous

Collection Date: 12/3/2007 12:00:00AM

Lab Sample Number: T071203011-MB
Analysis Date: 12/3/2007 5:46:00PM
Prep Date: 12/3/2007
Instrument: ICP_2
Analytical Method ID: SW6010B - ICP - Total
File Name: E12037A
Prep Method ID: 3010_ICP
Dilution Factor: 1
Prep Batch Number: T071203011
Report Basis: Dry Weight Basis
Analyst Initials: rm
Sample prep wt./vol: 50.00 ml
Prep Extract Vol: 50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Barium	7440-39-3	ND		mg/L	0.010	0.00016	1
Beryllium	7440-41-7	ND		mg/L	0.0010	0.000060	
Cadmium	7440-43-9	ND		mg/L	0.0060	0.00051	
Calcium	7440-70-2	ND		mg/L	0.10	0.013	
Chromium	7440-47-3	ND		mg/L	0.010	0.0018	
Cobalt	7440-48-4	ND		mg/L	0.0050	0.0016	
Copper	7440-50-8	ND		mg/L	0.0050	0.0019	
Iron	7439-89-6	ND		mg/L	0.050	0.0027	
Lead	7439-92-1	ND		mg/L	0.050	0.011	
Lithium	7439-93-2	ND		mg/L	0.10	0.00072	
Magnesium	7439-96-4	ND		mg/L	0.10	0.012	
Manganese	7439-96-5	ND		mg/L	0.010	0.00066	
Molybdenum	7439-98-7	ND		mg/L	0.010	0.0018	
Nickel	7440-02-0	ND		mg/L	0.040	0.0027	
Potassium	7440-09-7	ND		mg/L	1.0	0.31	
Selenium	7784-49-2	ND		mg/L	0.10	0.026	
Silver	7440-22-4	ND		mg/L	0.015	0.00066	
Sodium	7440-23-5	ND		mg/L	3.0	0.028	
Thallium	7440-28-0	ND		mg/L	0.40	0.011	
Vanadium	7440-62-2	ND		mg/L	0.010	0.00072	

Lab Sample Number: T071203011-MB
Analysis Date: 12/4/2007 5:04:00PM
Prep Date: 12/3/2007
Instrument: ICP_2
Analytical Method ID: SW6010B - ICP - Total
File Name: E12047A
Prep Method ID: 3010_ICP
Dilution Factor: 1
Prep Batch Number: T071203011
Report Basis: Dry Weight Basis
Analyst Initials: rm
Sample prep wt./vol: 50.00 ml
Prep Extract Vol: 50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Boron	7440-42-8	ND		mg/L	0.050	0.0018	2

Lab Sample Number: T071203011-MB
Analysis Date: 12/5/2007 1:41:00PM
Prep Date: 12/3/2007
Instrument: ICP_2
Analytical Method ID: SW6010B - ICP - Total
File Name: E12057A
Prep Method ID: 3010_ICP
Dilution Factor: 1
Prep Batch Number: T071203011

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0711172

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Method Blank Report

Client Sample Name: **MB**

Matrix: Aqueous

Collection Date: 12/3/2007 12:00:00AM

Report Basis: Dry Weight Basis

Analyst Initials: rm

Sample prep wt./vol: 50.00 ml

Prep Extract Vol: 50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Zinc	7440-66-6	ND		mg/L	0.0050	0.0010	3

Workorder (SDG): B0711172

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: **Client Sample Report**

Client Sample Name: **KF2007-01(58) and KF-98-02(53)**

Matrix: Aqueous Collection Date: 11/15/2007 4:30:00PM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0711172-01B	Analysis Date:	11/29/2007 10:08:49AM
Prep Date:	11/29/2007	Instrument:	Titrametric
Analytical Method ID:	310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity	File Name:	
Prep Method ID:	Alkalinity_W	Dilution Factor:	1
Prep Batch Number:	T071203006		
Report Basis:	As Received	Analyst Initials:	kl
Sample prep wt./vol:	25.00 ml	Prep Extract Vol:	25.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Bicarbonate		**1,300**		mg/L	5.0	1.5	1
Carbonate		**260**		mg/L	7.0	1.2	

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0711172-01B	Analysis Date:	11/28/2007 10:05:27AM
Prep Date:	11/28/2007	Instrument:	Probe
Analytical Method ID:	150.1 - pH, Elecrometric - pH	File Name:	
Prep Method ID:	150.1	Dilution Factor:	1
Prep Batch Number:	T071203004		
Report Basis:	As Received	Analyst Initials:	kl
Sample prep wt./vol:	10.00 ml	Prep Extract Vol:	10.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
pH		**9.0**		pH	0.10	0.10	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0711172-01B	Analysis Date:	12/4/2007 9:06:42AM
Prep Date:	11/29/2007	Instrument:	SCALE
Analytical Method ID:	160.1 - Total Dissolved Solids dried at 180°C - TDS	File Name:	
Prep Method ID:	160.1	Dilution Factor:	1
Prep Batch Number:	T071203008		
Report Basis:	As Received	Analyst Initials:	kl
Sample prep wt./vol:	100.00 ml	Prep Extract Vol:	1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Total Dissolved Solids		**3,100**		mg/L	10	8.2	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0711172-01B	Analysis Date:	11/29/2007 1:54:49PM
Prep Date:	11/29/2007	Instrument:	IC
Analytical Method ID:	Inorganic Anions by Ion Chromatography - Anions by IC	File Name:	071129_013.D
Prep Method ID:	300.0	Dilution Factor:	1
Prep Batch Number:	T071130001		
Report Basis:	As Received	Analyst Initials:	KB
Sample prep wt./vol:	20.00 ml	Prep Extract Vol:	20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0711172

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **KF2007-01(58) and KF-98-02(53)**

Matrix: Aqueous

Collection Date: 11/15/2007 4:30:00PM

Lab Sample Number:	B0711172-01B	Analysis Date:	11/29/2007 1:54:49PM
Prep Date:	11/29/2007	Instrument:	IC
Analytical Method ID:	Inorganic Anions by Ion Chromatography - Anions by IC	File Name:	071129_013.D
Prep Method ID:	300.0	Dilution Factor:	1
Prep Batch Number:	T071130001		
Report Basis:	As Received	Analyst Initials:	KB
Sample prep wt./vol:	20.00 ml	Prep Extract Vol:	20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Fluoride		**2.4**		mg/L	0.40	0.031	2
Sulfate		**300**		mg/L	1.5	0.11	

Lab Sample Number:	B0711172-01B	Analysis Date:	11/30/2007 12:00:01PM
Prep Date:	11/29/2007	Instrument:	IC
Analytical Method ID:	Inorganic Anions by Ion Chromatography - Anions by IC	File Name:	071130_007.D
Prep Method ID:	300.0	Dilution Factor:	27
Prep Batch Number:	T071130001		
Report Basis:	As Received	Analyst Initials:	KB
Sample prep wt./vol:	20.00 ml	Prep Extract Vol:	20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Chloride		**710**		mg/L	21	1.1	1

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0711172

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **KF2007-01(58) DUP and KF-98-02(53)DUP**

Matrix: Aqueous

Collection Date: 11/15/2007 4:30:00PM

The following test was conducted by: Analytica - Thornton

Lab Sample Number: B0711172-12B | Analysis Date: 11/29/2007 10:08:49AM
Prep Date: 11/29/2007 | Instrument: Titrametric
Analytical Method ID: 310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity | File Name:
Prep Method ID: Alkalinity_W | Dilution Factor: 1
Prep Batch Number: T071203006
Report Basis: As Received | Analyst Initials: kl
Sample prep wt./vol: 25.00 ml | Prep Extract Vol: 25.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Bicarbonate		**1,200**		mg/L	5.0	1.5	1
Carbonate		**300**		mg/L	7.0	1.2	

The following test was conducted by: Analytica - Thornton

Lab Sample Number: B0711172-12B | Analysis Date: 11/28/2007 10:05:27AM
Prep Date: 11/28/2007 | Instrument: Probe
Analytical Method ID: 150.1 - pH, Elecrometric - pH | File Name:
Prep Method ID: 150.1 | Dilution Factor: 1
Prep Batch Number: T071203004
Report Basis: As Received | Analyst Initials: kl
Sample prep wt./vol: 10.00 ml | Prep Extract Vol: 10.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
pH		**8.9**		pH	0.10	0.10	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number: B0711172-12B | Analysis Date: 12/4/2007 9:06:42AM
Prep Date: 11/29/2007 | Instrument: SCALE
Analytical Method ID: 160.1 - Total Dissolved Solids dried at 180°C - TDS | File Name:
Prep Method ID: 160.1 | Dilution Factor: 1
Prep Batch Number: T071203008
Report Basis: As Received | Analyst Initials: kl
Sample prep wt./vol: 100.00 ml | Prep Extract Vol: 1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Total Dissolved Solids		**3,000**		mg/L	10	8.2	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number: B0711172-12B | Analysis Date: 11/29/2007 2:11:40PM
Prep Date: 11/29/2007 | Instrument: IC
Analytical Method ID: Inorganic Anions by Ion Chromatography - Anions by IC | File Name: 071129_014.D
Prep Method ID: 300.0 | Dilution Factor: 1
Prep Batch Number: T071130001
Report Basis: As Received | Analyst Initials: KB
Sample prep wt./vol: 20.00 ml | Prep Extract Vol: 20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0711172

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: **Client Sample Report**

Client Sample Name: **KF2007-01(58) DUP and KF-98-02(53)DUP**

Matrix: Aqueous Collection Date: 11/15/2007 4:30:00PM

Lab Sample Number:	B0711172-12B	Analysis Date:	11/29/2007 2:11:40PM
Prep Date:	11/29/2007	Instrument:	IC
Analytical Method ID:	Inorganic Anions by Ion Chromatography - Anions by IC	File Name:	071129_014.D
Prep Method ID:	300.0	Dilution Factor:	1
Prep Batch Number:	T071130001		
Report Basis:	As Received	Analyst Initials:	KB
Sample prep wt./vol:	20.00 ml	Prep Extract Vol:	20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Fluoride		**2.5**		mg/L	0.40	0.031	2

Lab Sample Number:	B0711172-12B	Analysis Date:	11/29/2007 10:36:20PM
Prep Date:	11/29/2007	Instrument:	IC
Analytical Method ID:	Inorganic Anions by Ion Chromatography - Anions by IC	File Name:	071129_044.D
Prep Method ID:	300.0	Dilution Factor:	10
Prep Batch Number:	T071130001		
Report Basis:	As Received	Analyst Initials:	KB
Sample prep wt./vol:	20.00 ml	Prep Extract Vol:	20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Sulfate		**260**		mg/L	15	1.1	3

Lab Sample Number:	B0711172-12B	Analysis Date:	11/30/2007 12:16:51PM
Prep Date:	11/29/2007	Instrument:	IC
Analytical Method ID:	Inorganic Anions by Ion Chromatography - Anions by IC	File Name:	071130_008.D
Prep Method ID:	300.0	Dilution Factor:	27
Prep Batch Number:	T071130001		
Report Basis:	As Received	Analyst Initials:	KB
Sample prep wt./vol:	20.00 ml	Prep Extract Vol:	20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Chloride		**700**		mg/L	21	1.1	1

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0711172

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Method Blank Report

Client Sample Name: **MB**

Matrix: Aqueous

Collection Date: 11/29/2007 12:00:00AM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	T071203006-MB	Analysis Date:	11/29/2007 10:08:49AM
Prep Date:	11/29/2007	Instrument:	Titrametric
Analytical Method ID:	310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity	File Name:	
Prep Method ID:	Alkalinity_W	Dilution Factor:	1
Prep Batch Number:	T071203006		
Report Basis:	Dry Weight Basis	Analyst Initials:	kl
Sample prep wt./vol:	100.00 ml	Prep Extract Vol:	100.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Bicarbonate		ND		mg/L	5.0	1.5	1
Carbonate		ND		mg/L	7.0	1.2	

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	T071203008-MB	Analysis Date:	12/4/2007 9:06:42AM
Prep Date:	11/29/2007	Instrument:	SCALE
Analytical Method ID:	160.1 - Total Dissolved Solids dried at 180°C - TDS	File Name:	
Prep Method ID:	160.1	Dilution Factor:	1
Prep Batch Number:	T071203008		
Report Basis:	Dry Weight Basis	Analyst Initials:	kl
Sample prep wt./vol:	100.00 ml	Prep Extract Vol:	1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Total Dissolved Solids		ND		mg/L	10	8.2	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	T071130001-MB	Analysis Date:	11/29/2007 1:04:19PM
Prep Date:	11/29/2007	Instrument:	IC
Analytical Method ID:	Inorganic Anions by Ion Chromatography - Anions by IC	File Name:	071129_010.D
Prep Method ID:	300.0	Dilution Factor:	1
Prep Batch Number:	T071130001		
Report Basis:	Dry Weight Basis	Analyst Initials:	KB
Sample prep wt./vol:	20.00 ml	Prep Extract Vol:	20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Chloride		ND		mg/L	0.80	0.042	1
Fluoride		ND		mg/L	0.40	0.031	
Sulfate		ND		mg/L	1.5	0.11	

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0711172

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0711172

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T071203011**

LCS/LCSD REPORT

Analysis: SW6010B - ICP - Total

MB: T071203011-MB

Prep Date: 12/3/2007

MB Anal. Date: 12/3/2007 5:46:00PM

Units: mg/L

LCS Anal. Date: 12/3/2007 5:51:00PM LCSD Anal. Date: 12/3/2007 5:56:00PM Matrix: Aqueous

Analyte Name	SampResult	LCSRes.	SDRes.	SPLev	SPDLev	Recov.	SD Recov	RPD	Recov Lim	RPDLim	Flag
Aluminum	ND	2.09	2.05	2.00	2.00	104.5	102.5	1.9	89 - 117	20	
Antimony	ND	0.504	0.491	0.500	0.500	100.8	98.2	2.6	82 - 117	20	
Arsenic	ND	2.04	2.00	2.00	2.00	102.0	100.0	2.0	86 - 116	20	
Barium	ND	2.00	1.97	2.00	2.00	100.0	98.5	1.5	86 - 116	20	
Beryllium	ND	0.0511	0.0500	0.0500	0.0500	102.2	100.0	2.2	87 - 111	20	
Boron	ND	0.650	0.638	0.500	0.500	130.0	127.6	1.9	76 - 130	20	
Cadmium	ND	0.0500	0.0482	0.0500	0.0500	100.0	96.4	3.7	79 - 113	20	
Calcium	ND	10.0	9.85	10.0	10.0	100.0	98.5	1.5	79 - 119	20	
Chromium	ND	0.202	0.197	0.200	0.200	101.0	98.5	2.5	86 - 117	20	
Cobalt	ND	0.506	0.494	0.500	0.500	101.2	98.8	2.4	82 - 118	20	
Copper	ND	0.252	0.247	0.250	0.250	100.8	98.8	2.0	86 - 117	20	
Iron	ND	1.02	1.02	1.00	1.00	102.0	102.0	0.0	83 - 121	20	
Lead	ND	0.511	0.505	0.500	0.500	102.2	101.0	1.2	83 - 121	20	
Magnesium	ND	10.6	10.4	10.0	10.0	106.0	104.0	1.9	83 - 118	20	
Manganese	ND	0.507	0.497	0.500	0.500	101.4	99.4	2.0	82 - 121	20	
Molybdenum	ND	0.508	0.496	0.500	0.500	101.6	99.2	2.4	82 - 120	20	
Nickel	ND	0.510	0.496	0.500	0.500	102.0	99.2	2.8	84 - 117	20	
Potassium	ND	9.04	8.48	10.0	10.0	90.4	84.8	6.4	74 - 110	20	
Selenium	ND	2.01	1.96	2.00	2.00	100.5	98.0	2.5	87 - 117	20	
Silver	ND	0.266	0.259	0.250	0.250	106.4	103.6	2.7	80 - 127	20	
Sodium	ND	9.67	9.69	10.0	10.0	96.7	96.9	0.2	87 - 113	20	
Thallium	ND	0.204	0.189	0.200	0.200	102.0	94.5	7.6	89 - 113	20	
Vanadium	ND	0.514	0.503	0.500	0.500	102.8	100.6	2.2	87 - 119	20	
Zinc	ND	0.495	0.478	0.500	0.500	99.0	95.6	3.5	81 - 120	20	
Lithium	ND	0.479	0.475	0.500	0.500	95.8	95.0	0.8	80 - 120	20	

Prep Batch: **T071130013**

LCS/LCSD REPORT

Project: **Navajo Mine Extension Leaching Study**
Client: **Applied Hydrology Associates, Inc.**
Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado
Workorder (SDG): B0711172
Project: Navajo Mine Extension Leaching Study
Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T071130013**

LCS/LCSD REPORT

Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg
MB: T071130013-MB
Prep Date: 11/30/2007
MB Anal. Date: 11/30/2007 4:00:22PM
Units: mg/L
LCS Anal. Date: 11/30/2007 4:02:28PM
LCSD Anal. Date: 11/30/2007 4:05:02PM
Matrix: Aqueous

Analyte Name	SampResult	LCSRes.	SDRes.	SPLev	SPDLev	Recov.	SD Recov	RPD	Recov Lim	RPDLim	Flag
Mercury	ND	0.00233	0.00196	0.00200	0.0020	116.5	98.0	17.2	80 - 120	20	

Prep Batch: **T071203005**

SAMPLE DUPLICATE REPORT

Analysis: SW6010B - ICP - Total
Base Sample: B0711172-05A
Prep Date: 12/3/2007
Samp. Anal. Date: 12/3/2007 1:43:00PM
Units: mg/Kg
DUP Anal. Date: 12/3/2007 1:48:00PM
Matrix: Solid

Analyte Name	SampResult	DUPRes.	RPD	RPDLim	Flag
Aluminum	9,240	10,500	12.8	35	
Antimony	ND	ND	0.0	35	
Arsenic	ND	ND	0.0	35	
Barium	141	142	0.7	35	
Beryllium	0.838	0.943	11.8	35	
Boron	10.8	11.9	9.7	35	
Cadmium	ND	ND	0.0	35	
Calcium	27,500	25,500	7.5	35	
Chromium	6.15	6.34	3.0	35	
Cobalt	11.1	10.6	4.6	35	
Copper	20.3	19.2	5.6	35	
Iron	19,200	19,200	0.0	35	
Lead	17.0	16.9	0.6	35	
Magnesium	3,160	3,310	4.6	35	
Manganese	374	461	20.8	35	
Molybdenum	ND	ND	0.0	35	
Nickel	14.3	13.6	5.0	35	
Potassium	1,880	1,980	5.2	35	
Selenium	ND	ND	0.0	35	
Silver	ND	ND	0.0	35	

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0711172

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0711172

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T071203005**

SAMPLE DUPLICATE REPORT

Analysis: SW6010B - ICP - Total

Base Sample: B0711172-05A

Prep Date: 12/3/2007

Samp. Anal. Date: 12/3/2007 1:43:00PM

DUP Anal. Date: 12/3/2007 1:48:00PM

Units: mg/Kg

Matrix: Solid

Analyte Name	SampResult	DUPRes.	RPD	RPDLim	Flag
Sodium	4,090	3,880	5.3	35	
Thallium	ND	ND	0.0	35	
Vanadium	17.9	19.5	8.6	35	
Zinc	59.4	60.1	1.2	35	
Lithium	8.19	9.07	10.2	35	

LCS/LCSD REPORT

Analysis: SW6010B - ICP - Total

MB: T071203005-MB

Prep Date: 12/3/2007

MB Anal. Date: 12/3/2007 1:12:00PM

Units: mg/Kg

LCS Anal. Date: 12/3/2007 1:17:00PM LCSD Anal. Date: 12/3/2007 1:22:00PM

Matrix: Solid

Analyte Name	SampResult	LCSRes.	SDRes.	SPLev	SPDLev	Recov.	SD Recov	RPD	Recov Lim	RPDLim	Flag
Aluminum	ND	204	203	200	200	102.0	101.5	0.5	70 - 130	35	
Antimony	ND	47.2	47.7	50.0	50.0	94.4	95.4	1.1	70 - 130	35	
Arsenic	ND	192	193	200	200	96.0	96.5	0.5	70 - 130	35	
Barium	ND	199	199	200	200	99.5	99.5	0.0	70 - 130	35	
Beryllium	ND	4.82	4.82	5.00	5.00	96.4	96.4	0.0	70 - 130	35	
Boron	ND	60.2	64.5	50.0	50.0	120.4	129.0	6.9	70 - 130	35	
Cadmium	ND	5.06	5.01	5.00	5.00	101.2	100.2	1.0	70 - 130	35	
Calcium	ND	954	947	1,000	1,000	95.4	94.7	0.7	70 - 130	35	
Chromium	ND	19.6	19.6	20.0	20.0	98.0	98.0	0.0	70 - 130	35	
Cobalt	ND	48.2	48.3	50.0	50.0	96.4	96.6	0.2	70 - 130	35	
Copper	ND	24.7	24.9	25.0	25.0	98.8	99.6	0.8	70 - 130	35	
Iron	ND	99.4	98.7	100	100	99.4	98.7	0.7	70 - 130	35	
Lead	ND	48.1	48.7	50.0	50.0	96.2	97.4	1.2	70 - 130	35	
Magnesium	ND	994	992	1,000	1,000	99.4	99.2	0.2	70 - 130	35	
Manganese	ND	49.0	48.8	50.0	50.0	98.0	97.6	0.4	70 - 130	35	
Molybdenum	ND	48.6	48.4	50.0	50.0	97.2	96.8	0.4	70 - 130	35	
Nickel	ND	47.9	48.1	50.0	50.0	95.8	96.2	0.4	70 - 130	35	
Potassium	ND	937	954	1,000	1,000	93.7	95.4	1.8	70 - 130	35	

ATTACHMENT B
Total Analyses Laboratory Results

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0711172

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0711172

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T071203005**

LCS/LCSD REPORT

Analysis: SW6010B - ICP - Total

MB: T071203005-MB

Prep Date: 12/3/2007

MB Anal. Date: 12/3/2007 1:12:00PM

Units: mg/Kg

LCS Anal. Date: 12/3/2007 1:17:00PM LCSD Anal. Date: 12/3/2007 1:22:00PM Matrix: Solid

Analyte Name	SampResult	LCSRes.	SDRes.	SPLev	SPDLev	Recov.	SD Recov	RPD	Recov Lim	RPDLim	Flag
Selenium	ND	189	191	200	200	94.5	95.5	1.1	70 - 130	35	
Silver	ND	24.9	25.0	25.0	25.0	99.6	100.0	0.4	70 - 130	35	
Sodium	ND	1,010	1,000	1,000	1,000	101.0	100.0	1.0	70 - 130	35	
Thallium	ND	20.4	18.6	20.0	20.0	102.0	93.0	9.2	70 - 130	35	
Vanadium	ND	49.9	49.6	50.0	50.0	99.8	99.2	0.6	70 - 130	35	
Zinc	ND	54.1	62.4	50.0	50.0	108.2	124.8	14.2	70 - 130	35	
Lithium	ND	47.3	47.0	50.0	50.0	94.6	94.0	0.6	70 - 130	35	

MS/MSD REPORT

Analysis: SW6010B - ICP - Total

Parent: B0711172-05A

Prep Date: 12/3/2007

Samp. Anal. Date: 12/3/2007 1:43:00PM

Units: mg/Kg

MS Anal. Date: 12/3/2007 1:53:00PM MSD Anal. Date: 12/3/2007 1:58:00PM Matrix: Solid

Analyte Name	SampResult	MSRes.	MSDRes	SPLev	SPDLev	Recov.	MSD Rec.	RPD	Recov Lim	RPDLim	Flag
Aluminum	9,240	13,400	13,700	192	191	2,171.5	2,334.7	2.2	70 - 130	35	*NOTE 2 NOTE 2*
Antimony	ND	19.7	18.6	47.9	47.8	41.1	38.9	5.7	70 - 130	35	*lowMS lowMSD*
Arsenic	ND	158	157	192	191	82.5	82.2	0.6	70 - 130	35	
Barium	141	319	320	192	191	92.9	93.7	0.3	70 - 130	35	
Beryllium	0.838	5.47	5.46	4.79	4.78	96.7	96.8	0.2	70 - 130	35	
Boron	10.8	67.1	66.8	47.9	47.8	117.6	117.3	0.4	70 - 130	35	
Cadmium	ND	5.48	5.44	4.79	4.78	114.4	113.9	0.7	70 - 130	35	
Calcium	27,500	25,900	25,900	958	955	-167.0	-167.5	0.0	70 - 130	35	*NOTE 2 NOTE 2*
Chromium	6.15	25.8	26.2	19.2	19.1	102.6	105.0	1.5	70 - 130	35	
Cobalt	11.1	54.1	54.3	47.9	47.8	89.8	90.5	0.4	70 - 130	35	
Copper	20.3	42.4	43.0	23.9	23.9	92.3	95.1	1.4	70 - 130	35	
Iron	19,200	18,800	20,200	95.8	95.5	-417.6	1,046.9	7.2	70 - 130	35	*NOTE 2 NOTE 2*
Lead	17.0	60.7	61.4	47.9	47.8	91.2	93.0	1.1	70 - 130	35	
Magnesium	3,160	4,370	4,600	1,030	955	117.7	150.8	5.1	70 - 130	35	*highMSD*

Workorder (SDG): B0711172

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0711172

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T071203005**

MS/MSD REPORT

Analysis: SW6010B - ICP - Total | Parent: B0711172-05A

Prep Date: 12/3/2007

Samp. Anal. Date: 12/4/2007 3:18:00PM | Units: mg/Kg

MS Anal. Date: 12/4/2007 3:28:00PM MSD Anal. Date: 12/4/2007 3:33:00PM | Matrix: Solid

Analyte Name	SampResult	MSRes.	MSDRes	SPLev	SPDLev	Recov.	MSD Rec.	RPD	Recov Lim	RPDLim	Flag
Manganese	374	431	419	51.4	47.8	110.9	94.2	2.8	70 - 130	35	*NOTE 2 NOTE 2*
Molybdenum	ND	43.2	42.4	47.9	47.8	90.2	88.8	1.9	70 - 130	35	
Nickel	14.3	56.9	58.1	47.9	47.8	88.9	91.7	2.1	70 - 130	35	
Potassium	1,880	2,870	2,920	958	955	103.4	108.9	1.7	70 - 130	35	
Selenium	ND	189	187	192	191	98.7	97.9	1.1	70 - 130	35	
Silver	ND	23.6	23.3	23.9	23.9	98.6	97.6	1.3	70 - 130	35	
Sodium	4,090	4,710	5,020	958	955	64.7	97.4	6.4	70 - 130	35	*NOTE 2 NOTE 2*
Thallium	ND	13.6	12.1	19.2	19.1	71.0	63.3	11.7	70 - 130	35	*lowMSD*
Vanadium	17.9	67.0	67.8	47.9	47.8	102.5	104.5	1.2	70 - 130	35	
Zinc	59.4	97.6	105	47.9	47.8	79.8	95.5	7.3	70 - 130	35	
Lithium	8.19	58.0	54.6	51.4	47.8	96.9	97.2	6.0	70 - 130	35	

POST DIGESTION SPIKE REPORT

Analysis: SW6010B - ICP - Total | Base Sample: B0711172-05A

Prep Date: 12/3/2007

Samp. Anal. Date: 12/3/2007 1:43:00PM | Units: mg/Kg

PDS Anal. Date: 12/3/2007 2:18:00PM | Matrix: Solid

Analyte Name	SampResult	PDSRes.	SPLev	Recov.	Recov Lim	Flag
Aluminum	9,240	14,100	206	2,369.3	70 - 130	Note 2
Antimony	ND	20.7	51.4	39.5	70 - 130	lowPDS
Arsenic	ND	168	206	93.7	70 - 130	
Barium	141	334	206	94.1	70 - 130	Note 2
Beryllium	0.838	5.72	5.14	95.0	70 - 130	
Boron	10.8	70.3	51.4	115.6	70 - 130	
Cadmium	ND	5.59	5.14	96.6	70 - 130	
Calcium	27,500	27,300	1,030	-23.3	70 - 130	Note 2
Chromium	6.15	27.1	20.6	102.0	70 - 130	Note 2

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0711172

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0711172

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T071203005**

POST DIGESTION SPIKE REPORT

Analysis: SW6010B - ICP - Total

Base Sample: B0711172-05A

Prep Date: 12/3/2007

Samp. Anal. Date: 12/3/2007 1:43:00PM

Units: mg/Kg

PDS Anal. Date: 12/3/2007 2:18:00PM

Matrix: Solid

Analyte Name	SampResult	PDSRes.	SPLev	Recov.	Recov Lim	Flag
Cobalt	11.1	57.0	51.4	89.3	70 - 130	
Copper	20.3	44.2	25.7	93.2	70 - 130	Note 2
Iron	19,200	19,800	103	569.3	70 - 130	Note 2
Lead	17.0	64.3	51.4	92.0	70 - 130	Note 2
Magnesium	3,160	4,600	1,030	139.6	70 - 130	Note 2
Manganese	374	446	51.4	139.5	70 - 130	Note 2
Molybdenum	ND	45.1	51.4	87.9	70 - 130	
Nickel	14.3	59.6	51.4	88.1	70 - 130	Note 2
Potassium	1,880	3,030	1,030	111.8	70 - 130	Note 2
Selenium	ND	203	206	98.3	70 - 130	
Silver	ND	24.9	25.7	98.3	70 - 130	
Sodium	4,090	4,990	1,030	87.3	70 - 130	Note 2
Thallium	ND	13.7	20.6	83.1	70 - 130	
Vanadium	17.9	70.3	51.4	102.0	70 - 130	Note 2
Zinc	59.4	103	51.4	84.3	70 - 130	Note 2
Lithium	8.19	59.1	51.4	99.0	70 - 130	

SERIAL DILUTION REPORT

Analysis: SW6010B - ICP - Total

Base Sample: B0711172-05A

Prep Date: 12/3/2007

Samp. Anal. Date: 12/3/2007 1:43:00PM

Units: mg/Kg

SER DIL. Date: 12/4/2007 3:59:00PM

Matrix: Solid

Analyte Name	SampResult	PQL.	MDL.	SerialRes.	SerPQL.	RPD	Flag
Aluminum	9,240	7.7	1.9	9,470	39	2.4	
Antimony	ND	11	0.60	ND	53		
Arsenic	ND	13	1.7	ND	63		
Barium	141	0.39	0.030	128	1.9	9.6	
Beryllium	0.838	0.19	0.0085	ND	0.96		
Boron	10.8	4.8	0.65	ND	24		

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0711172

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0711172

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T071203005**

SERIAL DILUTION REPORT

Analysis: SW6010B - ICP - Total

Base Sample: B0711172-05A

Prep Date: 12/3/2007

Samp. Anal. Date: 12/3/2007 1:43:00PM

Units: mg/Kg

SER DIL. Date: 12/4/2007 3:59:00PM

Matrix: Solid

Analyte Name	SampResult	PQL.	MDL.	SerialRes.	SerPQL.	RPD	Flag
Cadmium	ND	0.77	0.056	ND	3.9		
Calcium	27,500	13	5.1	23,800	67	14.4	OUT
Chromium	6.15	1.9	0.29	ND	9.6		
Cobalt	11.1	2.9	0.25	ND	14		
Copper	20.3	0.58	0.15	16.7	2.9	19.4	OUT
Iron	19,200	5.8	0.42	16,500	29	15.1	OUT
Lead	17.0	5.8	1.0	ND	29		
Magnesium	3,160	9.6	0.92	2,990	48	5.5	
Manganese	374	0.96	0.11	429	4.8	13.7	OUT
Molybdenum	ND	1.9	0.23	ND	9.6		
Nickel	14.3	3.9	0.41	ND	19		
Potassium	1,880	96	30	1,720	480	8.8	
Selenium	ND	9.6	2.4	ND	48		
Silver	ND	1.4	0.15	ND	7.2		
Sodium	4,090	290	0.98	3,400	1,400	18.4	OUT
Thallium	ND	19	1.1	ND	96		
Vanadium	17.9	0.96	0.19	19.6	4.8	9.0	
Zinc	59.4	0.58	0.21	55.1	2.9	7.5	
Lithium	8.19	4.8	0.047	ND	24		

Prep Batch: **T071204013**

SAMPLE DUPLICATE REPORT

Analysis: SW7471A - Mercury in Solid or Semisolid Waste by CVAA - Tot

Base Sample: B0711172-02A

Prep Date: 12/4/2007

Samp. Anal. Date: 12/4/2007 3:25:10PM

Units: mg/Kg

DUP Anal. Date: 12/4/2007 3:33:00PM

Matrix: Solid

Analyte Name	SampResult	DUPRes.	RPD	RPDLim	Flag
Mercury	0.124	0.134	7.8	35	

LCS/LCSD REPORT

Project: **Navajo Mine Extension Leaching Study**
Client: **Applied Hydrology Associates, Inc.**
Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado
Workorder (SDG): B0711172
Project: Navajo Mine Extension Leaching Study
Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T071204013**

LCS/LCSD REPORT

Analysis: SW7471A - Mercury in Solid or Semisolid Waste by CVAA - Tot
MB: T071204013-MB
Prep Date: 12/4/2007
MB Anal. Date: 12/4/2007 3:00:38PM
Units: mg/Kg
LCS Anal. Date: 12/4/2007 3:08:17PM LCSD Anal. Date: 12/4/2007 3:16:19PM
Matrix: Solid

Analyte Name	SampResult	LCSRes.	SDRes.	SPLev	SPDLev	Recov.	SD Recov	RPD	Recov Lim	RPDLim	Flag
Mercury	ND	0.845	0.843	0.833	0.833	101.4	101.2	0.2	70 - 130	35	

MS/MSD REPORT

Analysis: SW7471A - Mercury in Solid or Semisolid Waste by CVAA - Tot
Parent: B0711172-02A
Prep Date: 12/4/2007
Samp. Anal. Date: 12/4/2007 3:25:10PM
Units: mg/Kg
MS Anal. Date: 12/4/2007 3:41:00PM MSD Anal. Date: 12/4/2007 3:49:21PM
Matrix: Solid

Analyte Name	SampResult	MSRes.	MSDRes	SPLev	SPDLev	Recov.	MSD Rec.	RPD	Recov Lim	RPDLim	Flag
Mercury	0.124	0.966	0.999	0.845	0.873	99.7	100.2	3.4	70 - 130	35	

POST DIGESTION SPIKE REPORT

Analysis: SW7471A - Mercury in Solid or Semisolid Waste by CVAA - Tot
Base Sample: B0711172-02A
Prep Date: 12/4/2007
Samp. Anal. Date: 12/4/2007 3:25:10PM
Units: mg/Kg
PDS Anal. Date: 12/4/2007 3:57:39PM
Matrix: Solid

Analyte Name	SampResult	PDSRes.	SPLev	Recov.	Recov Lim	Flag
Mercury	0.124	1.01	0.876	101.3	80 - 130	

Workorder (SDG): B0711172

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

FOOTNOTES TO QC REPORT

Note 1: Results are shown to three significant figures to avoid rounding errors in calculations.

Note 2: If the sample concentration is greater than 4 times the spike level, a recovery is not meaningful, and the result should be used as a replicate. In such cases the spike is not as high as expected random measurement variability of the sample result itself.

Note 3: For sample duplicates, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample and duplicate results are not five times the PQL or greater, then the RPD is not expected to fall within the window shown and the comparison should be made on the basis of the absolute difference. Analytica uses the criterion that the absolute difference should be less than the PQL for water or less than 2XPQL for other matrices.

Note 4: For serial dilutions, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample result is not 50 times the MDL or greater, then the fact that the RPD does not meet the 10% criterion has little signifcance. Otherwise it indicates that a matrix bias may exist at the analytical step.

Detailed Analytical Report Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0711172

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0711172

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T071207005**

SAMPLE DUPLICATE REPORT

Analysis: ASTM D2216 - Pmoist

Base Sample: B0711172-11A

Prep Date: 12/6/2007

Samp. Anal. Date: 12/7/2007 9:39:41AM

DUP Anal. Date: 12/7/2007 9:39:41AM

Units: %

Matrix: Solid

Analyte Name	SampResult	DUPRes.	RPD	RPDLim	Flag
Moisture	6.98	6.39	8.8	20	

FOOTNOTES TO QC REPORT

Note 1: Results are shown to three significant figures to avoid rounding errors in calculations.

Note 2: If the sample concentration is greater than 4 times the spike level, a recovery is not meaningful, and the result should be used as a replicate. In such cases the spike is not as high as expected random measurement variability of the sample result itself.

Note 3: For sample duplicates, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample and duplicate results are not five times the PQL or greater, then the RPD is not expected to fall within the window shown and the comparison should be made on the basis of the absolute difference. Analytica uses the criterion that the absolute difference should be less than the PQL for water or less than 2XPQL for other matrices.

Note 4: For serial dilutions, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample result is not 50 times the MDL or greater, then the fact that the RPD does not meet the 10% criterion has little signifcance. Otherwise it indicates that a matrix bias may exist at the analytical step.

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0711172

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0711172

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T071130001**

SAMPLE DUPLICATE REPORT

Analysis: Inorganic Anions by Ion Chromatography - Anions by IC

Base Sample: B0711172-12B

Prep Date: 11/29/2007

Samp. Anal. Date: 11/29/2007 2:11:40PM

DUP Anal. Date: 11/29/2007 2:28:30PM

Units: mg/L

Matrix: Aqueous

Analyte Name	SampResult	DUPRes.	RPD	RPDLim	Flag
Fluoride	2.46	2.45	0.4	30	
Chloride	700	702	0.3	30	
Sulfate	263	263	0.0	30	

LCS/LCSD REPORT

Analysis: Inorganic Anions by Ion Chromatography - Anions by IC

MB: T071130001-MB

Prep Date: 11/29/2007

MB Anal. Date: 11/29/2007 1:04:19PM

Units: mg/L

LCS Anal. Date: 11/29/2007 1:21:08PM LCSD Anal. Date: 11/29/2007 1:37:58PM Matrix: Aqueous

Analyte Name	SampResult	LCSRes.	SDRes.	SPLev	SPDLev	Recov.	SD Recov	RPD	Recov Lim	RPDLim	Flag
Fluoride	ND	2.62	2.55	2.50	2.50	104.8	102.0	2.7	90 - 110	20	
Chloride	ND	5.13	5.12	5.00	5.00	102.6	102.4	0.2	90 - 110	20	
Sulfate	ND	39.0	39.1	37.5	37.5	104.0	104.3	0.3	90 - 110	20	

MS REPORT

Analysis: Inorganic Anions by Ion Chromatography - Anions by IC

Parent: B0711172-12B

Prep Date: 11/29/2007

Samp. Anal. Date: 11/29/2007 2:11:40PM

MS Anal. Date: 11/29/2007 2:45:21PM

Units: mg/L

Matrix: Aqueous

Analyte Name	SampResult	MSRes.	SPLev	Recov.	Recov Lim		Flag
Fluoride	2.46	5.28	2.50	112.8	70 - 130		
Chloride	700	845	133	108.8	70 - 130	*NOTE 2*	
Sulfate	263	693	375	114.7	70 - 130		

Prep Batch: **T071203008**

SAMPLE DUPLICATE REPORT

Workorder (SDG): B0711172

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0711172

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T071203008**

SAMPLE DUPLICATE REPORT

Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS

Base Sample: B0711172-01B

Prep Date: 11/29/2007

Samp. Anal. Date: 12/4/2007 9:06:42AM

DUP Anal. Date: 12/4/2007 9:06:42AM

Units: mg/L

Matrix: Aqueous

Analyte Name	SampResult	DUPRes.	RPD	RPDLim	Flag
Total Dissolved Solids	3,070	2,980	3.0	20	

LCS/LCSD REPORT

Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS

MB: T071203008-MB

Prep Date: 11/29/2007

MB Anal. Date: 12/4/2007 9:06:42AM

Units: mg/L

LCS Anal. Date: 12/4/2007 9:06:42AM LCSD Anal. Date: 12/4/2007 9:06:42AM

Matrix: Aqueous

Analyte Name	SampResult	LCSRes.	SDRes.	SPLev	SPDLev	Recov.	SD Recov	RPD	Recov Lim	RPDLim	Flag
Total Dissolved Solids	ND	730	735	744	744	98.1	98.8	0.7	80 - 120	20	

MS REPORT

Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS

Parent: B0711172-01B

Prep Date: 11/29/2007

Samp. Anal. Date: 12/4/2007 9:06:42AM

MS Anal. Date: 12/4/2007 9:06:42AM

Units: mg/L

Matrix: Aqueous

Analyte Name	SampResult	MSRes.	SPLev	Recov.	Recov Lim		Flag
Total Dissolved Solids	3,070	3,790	744	96.8	70 - 130	*NOTE 2*	

Prep Batch: **T071203004**

SAMPLE DUPLICATE REPORT

Analysis: 150.1 - pH, Elecrometric - pH

Base Sample: B0711172-01B

Prep Date: 11/28/2007

Samp. Anal. Date: 11/28/2007 10:05:27AM

DUP Anal. Date: 11/28/2007 10:05:27AM

Units: pH

Matrix: Aqueous

Analyte Name	SampResult	DUPRes.	RPD	RPDLim	Flag
pH	8.97	8.95	0.2	20	

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0711172

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0711172

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T071203004**

Prep Batch: **T071203006**

SAMPLE DUPLICATE REPORT

Analysis: 310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity

Base Sample: B0711172-01B
Prep Date: 11/29/2007

Samp. Anal. Date: 11/29/2007 10:08:49AM

DUP Anal. Date: 11/29/2007 10:08:49AM

Units: mg/L

Matrix: Aqueous

Analyte Name	SampResult	DUPRes.	RPD	RPDLim	Flag
Bicarbonate	1,280	1,230	4.0	20	
Carbonate	256	288	11.8	20	

LCS/LCSD REPORT

Analysis: 310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity

MB: T071203006-MB

Prep Date: 11/29/2007

MB Anal. Date: 11/29/2007 10:08:49AM

Units: mg/L

LCS Anal. Date: 11/29/2007 10:08:49AM LCSD Anal. Date: 11/29/2007 10:08:49AM

Matrix: Aqueous

Analyte Name	SampResult	LCSRes.	SDRes.	SPLev	SPDLev	Recov.	SD Recov	RPD	Recov Lim	RPDLim	Flag
Bicarbonate	ND	24.0	26.0	25.0	25.0	96.0	104.0	8.0	80 - 120	20	
Carbonate	ND	49.0	50.0	50.0	50.0	98.0	100.0	2.0	80 - 120	20	

FOOTNOTES TO QC REPORT

Note 1: Results are shown to three significant figures to avoid rounding errors in calculations.

Note 2: If the sample concentration is greater than 4 times the spike level, a recovery is not meaningful, and the result should be used as a replicate. In such cases the spike is not as high as expected random measurement variability of the sample result itself.

Note 3: For sample duplicates, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample and duplicate results are not five times the PQL or greater, then the RPD is not expected to fall within the window shown and the comparison should be made on the basis of the absolute difference. Analytica uses the criterion that the absolute difference should be less than the PQL for water or less than 2XPQL for other matrices.

Note 4: For serial dilutions, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample result is not 50 times the MDL or greater, then the fact that the RPD does not meet the 10% criterion has little signifcance. Otherwise it indicates that a matrix bias may exist at the analytical step.

Workorder (SDG): B0711172

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

QC BATCH ASSOCIATIONS - BY METHOD BLANK

Lab Project ID: **81,530** **Lab Project Number:** **B0711172**

Prep Date: 11/29/2007

Lab Method Blank Id: T071130001-MB

Prep Batch ID: T071130001

Method: Inorganic Anions by Ion Chromatography - Anions by IC

This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates:

SampleNum	ClientSampleName	DataFile	AnalysisDate
T071130001-LCS	LCS	071129_011.DXD	11/29/2007 1:21:08PM
T071130001-LCSD	LCSD	071129_012.DXD	11/29/2007 1:37:58PM
B0711172-01B	KF2007-01(58) and KF-98-02(53)	071129_013.DXD	11/29/2007 1:54:49PM
B0711172-12B	KF2007-01(58) DUP and KF-98-02(53)DUP	071129_014.DXD	11/29/2007 2:11:40PM
B0711172-12B-DUP	DUP	071129_015.DXD	11/29/2007 2:28:30PM
B0711172-12B-MS	MS	071129_016.DXD	11/29/2007 2:45:21PM
B0711172-12B	KF2007-01(58) DUP and KF-98-02(53)DUP	071129_044.DXD	11/29/2007 10:36:20PM
B0711172-12B-DUP	DUP	071129_045.DXD	11/29/2007 10:53:10PM
B0711172-12B-MS	MS	071129_046.DXD	11/29/2007 11:09:59PM
B0711172-01B	KF2007-01(58) and KF-98-02(53)	071130_007.DXD	11/30/2007 12:00:01PM
B0711172-12B	KF2007-01(58) DUP and KF-98-02(53)DUP	071130_008.DXD	11/30/2007 12:16:51PM
B0711172-12B-DUP	DUP	071130_009.DXD	11/30/2007 12:33:40PM
B0711172-12B-MS	MS	071130_010.DXD	11/30/2007 12:50:29PM

Prep Date: 11/30/2007

Lab Method Blank Id: T071130013-MB

Prep Batch ID: T071130013

Method: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg

This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates:

SampleNum	ClientSampleName	DataFile	AnalysisDate
B0711172-01A	KF2007-01(58) and KF-98-02(53)	B113007W.WKS	11/30/2007 4:07:17PM
B0711172-12A	KF2007-01(58) DUP and KF-98-02(53)DUP	B113007W.WKS	11/30/2007 4:09:34PM
J0711112-01B	Batch QC	B113007W.WKS	11/30/2007 4:14:48PM
T071130013-LCS	LCS	B113007W.WKS	11/30/2007 4:02:28PM
T071130013-LCSD	LCSD	B113007W.WKS	11/30/2007 4:05:02PM
J0711112-01B-DUP	DUP	B113007W.WKS	11/30/2007 4:17:01PM
J0711112-01B-MS	MS	B113007W.WKS	11/30/2007 4:19:11PM
J0711112-01B-MSD	MSD	B113007W.WKS	11/30/2007 4:21:35PM
J0711112-01B-PDS	PDS	B113007W.WKS	11/30/2007 4:23:43PM

Workorder (SDG): B0711172

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

QC BATCH ASSOCIATIONS - BY METHOD BLANK

Lab Project ID: **81,530** **Lab Project Number:** **B0711172**

Prep Date: 12/3/2007

Lab Method Blank Id: T071203005-MB
Prep Batch ID: T071203005
Method: SW6010B - ICP - Total

This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates:

SampleNum	ClientSampleName	DataFile	AnalysisDate
B0711172-02A	123 S 87W 0-4' SPOIL	E12037A	12/3/2007 1:27:00PM
B0711172-03A	123 S 89W 0-4' SPOIL	E12037A	12/3/2007 1:32:00PM
B0711172-04A	125 S 88W 0-4' SPOIL	E12037A	12/3/2007 1:37:00PM
B0711172-05A	120 S 89W 0-4' SPOIL	E12037A	12/3/2007 1:43:00PM
B0711172-06A	Barber Ramp 3 Composite Spoil A	E12037A	12/3/2007 2:28:00PM
B0711172-07A	Barber Ramp 3 Composite Spoil B	E12037A	12/3/2007 2:33:00PM
B0711172-08A	Barber Ramp 3 Composite Spoil C	E12037A	12/3/2007 2:38:00PM
B0711172-09A	Ash Composite 70% FA	E12037A	12/3/2007 2:43:00PM
B0711172-10A	Ash Composite Dup 1 70% FA	E12037A	12/3/2007 2:48:00PM
B0711172-11A	Ash Composite Dup2 70% FA	E12037A	12/3/2007 2:53:00PM
T071203005-LCS	LCS	E12037A	12/3/2007 1:17:00PM
T071203005-LCS	LCS	E12037A	12/3/2007 2:58:00PM
T071203005-LCSD	LCSD	E12037A	12/3/2007 1:22:00PM
B0711172-05A-DUP	DUP	E12037A	12/3/2007 1:48:00PM
B0711172-05A-MS	MS	E12037A	12/3/2007 1:53:00PM
B0711172-05A-MSD	MSD	E12037A	12/3/2007 1:58:00PM
B0711172-05A-PDS	PDS	E12037A	12/3/2007 2:18:00PM
B0711172-02A	123 S 87W 0-4' SPOIL	E12047A	12/4/2007 3:03:00PM
B0711172-03A	123 S 89W 0-4' SPOIL	E12047A	12/4/2007 3:08:00PM
B0711172-04A	125 S 88W 0-4' SPOIL	E12047A	12/4/2007 3:13:00PM
B0711172-05A	120 S 89W 0-4' SPOIL	E12047A	12/4/2007 3:18:00PM
B0711172-06A	Barber Ramp 3 Composite Spoil A	E12047A	12/4/2007 4:04:00PM
B0711172-07A	Barber Ramp 3 Composite Spoil B	E12047A	12/4/2007 4:09:00PM
B0711172-08A	Barber Ramp 3 Composite Spoil C	E12047A	12/4/2007 4:14:00PM
B0711172-09A	Ash Composite 70% FA	E12047A	12/4/2007 4:19:00PM
B0711172-10A	Ash Composite Dup 1 70% FA	E12047A	12/4/2007 4:24:00PM
B0711172-11A	Ash Composite Dup2 70% FA	E12047A	12/4/2007 4:29:00PM
T071203005-LCS	LCS	E12047A	12/4/2007 2:53:00PM
T071203005-LCSD	LCSD	E12047A	12/4/2007 2:58:00PM
B0711172-05A-DUP	DUP	E12047A	12/4/2007 3:23:00PM
B0711172-05A-MS	MS	E12047A	12/4/2007 3:28:00PM
B0711172-05A-MSD	MSD	E12047A	12/4/2007 3:33:00PM
B0711172-05A-PDS	PDS	E12047A	12/4/2007 3:54:00PM

Workorder (SDG): B0711172

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

QC BATCH ASSOCIATIONS - BY METHOD BLANK

Lab Project ID: **81,530** **Lab Project Number:** **B0711172**

Prep Date: 11/29/2007

Lab Method Blank Id: T071203006-MB
Prep Batch ID: T071203006
Method: 310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity

This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates:

SampleNum	ClientSampleName	DataFile	AnalysisDate
B0711172-01B	KF2007-01(58) and KF-98-02(53)		11/29/2007 10:08:49AM
B0711172-12B	KF2007-01(58) DUP and KF-98-02(53)DUP		11/29/2007 10:08:49AM
T071203006-LCS	LCS		11/29/2007 10:08:49AM
T071203006-LCSD	LCSD		11/29/2007 10:08:49AM
B0711172-01B-DUP	DUP		11/29/2007 10:08:49AM

Prep Date: 11/29/2007

Lab Method Blank Id: T071203008-MB
Prep Batch ID: T071203008
Method: 160.1 - Total Dissolved Solids dried at 180°C - TDS

This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates:

SampleNum	ClientSampleName	DataFile	AnalysisDate
B0711172-01B	KF2007-01(58) and KF-98-02(53)		12/4/2007 9:06:42AM
B0711172-12B	KF2007-01(58) DUP and KF-98-02(53)DUP		12/4/2007 9:06:42AM
T071203008-LCS	LCS		12/4/2007 9:06:42AM
T071203008-LCSD	LCSD		12/4/2007 9:06:42AM
B0711172-01B-DUP	DUP		12/4/2007 9:06:42AM
B0711172-01B-MS	MS		12/4/2007 9:06:42AM

Workorder (SDG): B0711172

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

QC BATCH ASSOCIATIONS - BY METHOD BLANK

Lab Project ID: **81,530** **Lab Project Number:** **B0711172**

Prep Date: 12/3/2007

Lab Method Blank Id: T071203011-MB
Prep Batch ID: T071203011
Method: SW6010B - ICP - Total

This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates:

SampleNum	ClientSampleName	DataFile	AnalysisDate
B0711172-01A	KF2007-01(58) and KF-98-02(53)	E12037A	12/3/2007 6:01:00PM
B0711172-12A	KF2007-01(58) DUP and KF-98-02(53)DUP	E12037A	12/3/2007 6:06:00PM
F0711221-01A	Batch QC	E12037A	12/3/2007 6:11:00PM
T071203011-LCS	LCS	E12037A	12/3/2007 5:51:00PM
T071203011-LCSD	LCSD	E12037A	12/3/2007 5:56:00PM
F0711221-01A-DUP	DUP	E12037A	12/3/2007 6:16:00PM
F0711221-01A-MS	MS	E12037A	12/3/2007 6:21:00PM
F0711221-01A-MSD	MSD	E12037A	12/3/2007 6:26:00PM
F0711221-01A-PDS	PDS	E12037A	12/3/2007 6:31:00PM
B0711172-01A	KF2007-01(58) and KF-98-02(53)	E12047A	12/4/2007 5:19:00PM
B0711172-12A	KF2007-01(58) DUP and KF-98-02(53)DUP	E12047A	12/4/2007 5:24:00PM
F0711221-01A	Batch QC	E12047A	12/5/2007 9:03:00AM
T071203011-LCS	LCS	E12047A	12/4/2007 5:09:00PM
T071203011-LCSD	LCSD	E12047A	12/4/2007 5:14:00PM
F0711221-01A-DUP	DUP	E12047A	12/5/2007 9:08:00AM
F0711221-01A-MS	MS	E12047A	12/5/2007 9:13:00AM
F0711221-01A-MSD	MSD	E12047A	12/5/2007 9:18:00AM
F0711221-01A-PDS	PDS	E12047A	12/5/2007 9:23:00AM
F0711221-01A-MS	MS	E12057A	12/5/2007 6:20:00PM
F0711221-01A-MSD	MSD	E12057A	12/6/2007 10:14:00AM

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0711172

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

QC BATCH ASSOCIATIONS - BY METHOD BLANK

Lab Project ID: **81,530** **Lab Project Number:** **B0711172**

Prep Date: 12/4/2007

Lab Method Blank Id: T071204013-MB

Prep Batch ID: T071204013

Method: SW7471A - Mercury in Solid or Semisolid Waste by CVAA - Tot

This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates:

SampleNum	ClientSampleName	DataFile	AnalysisDate
B0711172-02A	123 S 87W 0-4' SPOIL	B120407S.WKS	12/4/2007 3:25:10PM
B0711172-03A	123 S 89W 0-4' SPOIL	B120407S.WKS	12/4/2007 4:05:31PM
B0711172-04A	125 S 88W 0-4' SPOIL	B120407S.WKS	12/4/2007 4:13:55PM
B0711172-05A	120 S 89W 0-4' SPOIL	B120407S.WKS	12/5/2007 9:42:00AM
B0711172-06A	Barber Ramp 3 Composite Spoil A	B120407S.WKS	12/5/2007 9:49:39AM
B0711172-07A	Barber Ramp 3 Composite Spoil B	B120407S.WKS	12/5/2007 9:57:26AM
B0711172-08A	Barber Ramp 3 Composite Spoil C	B120407S.WKS	12/5/2007 10:05:12AM
B0711172-09A	Ash Composite 70% FA	B120407S.WKS	12/5/2007 10:21:36AM
B0711172-10A	Ash Composite Dup 1 70% FA	B120407S.WKS	12/5/2007 10:31:17AM
B0711172-11A	Ash Composite Dup2 70% FA	B120407S.WKS	12/5/2007 10:40:18AM
T071204013-LCS	LCS	B120407S.WKS	12/4/2007 3:08:17PM
T071204013-LCSD	LCSD	B120407S.WKS	12/4/2007 3:16:19PM
B0711172-02A-DUP	DUP	B120407S.WKS	12/4/2007 3:33:00PM
B0711172-02A-MS	MS	B120407S.WKS	12/4/2007 3:41:00PM
B0711172-02A-MSD	MSD	B120407S.WKS	12/4/2007 3:49:21PM
B0711172-02A-PDS	PDS	B120407S.WKS	12/4/2007 3:57:39PM

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0711172

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

QC BATCH ASSOCIATIONS - BY METHOD BLANK

Lab Project ID: **81,530** **Lab Project Number:** **B0711172**

Prep Date: 12/6/2007

Lab Method Blank Id: T071207005-MB

Prep Batch ID: T071207005

Method: ASTM D2216 - Pmoist

This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates:

SampleNum	ClientSampleName	DataFile	AnalysisDate
B0711172-02A	123 S 87W 0-4' SPOIL		12/7/2007 9:39:41AM
B0711172-03A	123 S 89W 0-4' SPOIL		12/7/2007 9:39:41AM
B0711172-04A	125 S 88W 0-4' SPOIL		12/7/2007 9:39:41AM
B0711172-05A	120 S 89W 0-4' SPOIL		12/7/2007 9:39:41AM
B0711172-06A	Barber Ramp 3 Composite Spoil A		12/7/2007 9:39:41AM
B0711172-07A	Barber Ramp 3 Composite Spoil B		12/7/2007 9:39:41AM
B0711172-08A	Barber Ramp 3 Composite Spoil C		12/7/2007 9:39:41AM
B0711172-09A	Ash Composite 70% FA		12/7/2007 9:39:41AM
B0711172-10A	Ash Composite Dup 1 70% FA		12/7/2007 9:39:41AM
B0711172-11A	Ash Composite Dup2 70% FA		12/7/2007 9:39:41AM
B0711172-11A-DUP	DUP		12/7/2007 9:39:41AM

DATA FLAGS AND DEFINITIONS

The PQL is the Method Quantitation Limit as defined by USACE.
Reporting Limit: Limit below which results are shown as "ND". This may be the PQL, MDL, or a value between. See the report conventions below.

Result Field:

- ND = Not Detected at or above the Reporting Limit
- NA = Analyte not applicable (see Case Narrative for discussion)

Qualifier Fields:

- LOW = Recovery is below Lower Control Limit
- HIGH = Recovery , RPD, or other parameter is above Upper Control Limit
- E = Reported concentration is above the instrument calibration upper range

Organic Analysis Flags:

- B = Analyte was detected in the laboratory method blank
- J = Analyte was detected above MDL or Reporting Limit but below the Quant Limit (PQL)

Inorganic Analysis Flags:

- J = Analyte was detected above the Reporting Limit but below the Quant Limit (PQL)
- W = Post digestion spike did not meet criteria
- S = Reported value determined by the Method of Standard Additions (MSA)

Other Flags may be applied. See Case Narrative for Description

Workorder (SDG): B0711172

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

REPORTING CONVENTIONS FOR THIS REPORT

B0711172

TestPkgName	Basis	# Sig Figs	Reporting Limit
150.1/150.1 (Aqueous) - pH	As Received		Report to PQL
160.1/160.1 (Aqueous) - TDS	As Received		Report to PQL
300.0/300.0 (Aqueous) - Anions by IC	As Received		Report to PQL
310.1/310.1 (Aqueous) - Alkalinity	As Received		Report to PQL
6010B/3010A (Aqueous) - Total	As Received		Report to PQL
6010B/3050B (Solid) - Total	Dry Weight Basis		Report to PQL
7470A/7470A (Aqueous) - Total Hg	As Received		Report to PQL
7471A/7471A (Solid) - Total Hg	Dry Weight Basis		Report to PQL
ASTMD2216/ASTMD2216 (Solid) - Pmoist	As Received		Report to MDL, J qual below PQL

ATTACHMENT C
Cation Exchange Capacity Laboratory Results

Colorado Analytical Laboratories, Inc.

Analytical Results

Report To: Claire Toon
Company: Analytica Environmental Labs
12189 Pennsylvania Street
Thornton CO 80241-3115

Task No: 07112932
Date Received 11/29/07
Reported: 12/13/07
Client PO: T13190
Client Project: B0711172

Customer Sample ID **123 S 87W 0-4' Spoil (B0711172-2B)**
Sample Date/Time: 11/15/07 12:00 PM
Lab Number: 07112932-01
Matrix: Soil - Environmental

Test	Result	Reporting Limit	Method
Dry Weight Basis			
Cation Exchange Capacity	**9.7 meq/100g**	0.1	EPA 9081

ASA - "Methods of Soil Analysis, Parts 1 and 2", Second Edition, American Society of Agronomy and Soil Science Society of America. Madison, WI, 1982.
SW-846 - "Test Methods for Evaluating Solid Waste"; USEPA; November 1986
AB-DTPA - "Soil Testing Methods Used at Colorado State University for the Evaluation of Fertility, Salinity and Trace Element Toxicity"; Colorado State University Technical Bulletin LTB88-2; Jan 1998; SM Workman, PN Soltanpour and RH Follett.

DATA APPROVED FOR RELEASE BY

240 South Main Street / Brighton, CO 80601-0507 / 303-659-2313
Mailing Address: P.O. Box 507 / Brighton, CO 80601-0507 / Fax: 303-659-2315

Colorado Analytical Laboratories, Inc.

Analytical Results

Report To: Claire Toon
Company: Analytica Environmental Labs
12189 Pennsylvania Street
Thornton CO 80241-3115

Task No: 07112932
Date Received 11/29/07
Reported: 12/13/07
Client PO: T13190
Client Project: B0711172

Customer Sample ID **123 S 89W 0-4' Spoil (B0711172-3B)**
Sample Date/Time: 11/15/07 12:00 PM
Lab Number: 07112932-02
Matrix: Soil - Environmental

Test	Result	Reporting Limit	Method
Dry Weight Basis			
Cation Exchange Capacity	**8.7 meq/100g**	0.1	EPA 9081

ASA = "Methods of Soil Analysis, Parts 1 and 2", Second Edition, American Society of Agronomy and Soil Science Society of America. Madison, WI. 1982.
SW-846 = "Test Methods for Evaluating Solid Waste"; USEPA; November 1986
AB-DTPA = "Soil Testing Methods Used at Colorado State University for the Evaluation of Fertility, Salinity and Trace Element Toxicity"; Colorado State University Technical Bulletin LTB88-2; Jan 1998; SM Workman, PN Soltanpour and RH Follett.

DATA APPROVED FOR RELEASE BY

240 South Main Street / Brighton, CO 80601-0507 / 303-659-2313
Mailing Address: P.O. Box 507 / Brighton, CO 80601-0507 / Fax: 303-659-2315

Colorado Analytical Laboratories, Inc.

Analytical Results

Report To: Claire Toon
Company: Analytica Environmental Labs
12189 Pennsylvania Street
Thornton CO 80241-3115

Task No: 07112932
Date Received 11/29/07
Reported: 12/13/07
Client PO: T13190
Client Project: B0711172

Customer Sample ID **125 S 88W 0-4' Spoil (B0711172-4B)**
Sample Date/Time: 11/15/07 12:00 PM

Lab Number: 07112932-03
Matrix: Soil - Environmental

Test	Result	Reporting Limit	Method
Dry Weight Basis			
Cation Exchange Capacity	**9.4 meq/100g**	0.1	EPA 9081

ASA – "Methods of Soil Analysis, Parts 1 and 2", Second Edition, American Society of Agronomy and Soil Science Society of America. Madison, WI. 1982.
SW-846 – "Test Methods for Evaluating Solid Waste"; USEPA; November 1986
AB-DTPA – "Soil Testing Methods Used at Colorado State University for the Evaluation of Fertility, Salinity and Trace Element Toxicity"; Colorado State University Technical Bulletin LTB88-2; Jan 1998; SM Workman, PN Soltanpour and RH Follett.

DATA APPROVED FOR RELEASE BY

240 South Main Street / Brighton, CO 80601-0507 / 303-659-2313
Mailing Address: P.O. Box 507 / Brighton, CO 80601-0507 / Fax: 303-659-2315

Colorado Analytical Laboratories, Inc.

Analytical Results

Report To: Claire Toon
Company: Analytica Environmental Labs
12189 Pennsylvania Street
Thornton CO 80241-3115

Task No: 07112932
Date Received 11/29/07
Reported: 12/13/07
Client PO: T13190
Client Project: B0711172

Customer Sample ID **120 S 89W 0-4' Spoil (B0711172-5B)**
Sample Date/Time: 11/15/07 12:00 PM
Lab Number: 07112932-04
Matrix: Soil - Environmental

Test	Result	Reporting Limit	Method
Dry Weight Basis			
Cation Exchange Capacity	**9.0 meq/100g**	0.1	EPA 9081

ASA = "Methods of Soil Analysis, Parts 1 and 2", Second Edition, American Society of Agronomy and Soil Science Society of America. Madison, WI. 1982.
SW-846 = "Test Methods for Evaluating Solid Waste"; USEPA; November 1986
AB-DTPA = "Soil Testing Methods Used at Colorado State University for the Evaluation of Fertility, Salinity and Trace Element Toxicity"; Colorado State University Technical Bulletin LTB88-2; Jan 1998; SM Workman, PN Soltanpour and RH Follett.

DATA APPROVED FOR RELEASE BY

240 South Main Street / Brighton, CO 80601-0507 / 303-659-2313
Mailing Address: P.O. Box 507 / Brighton, CO 80601-0507 / Fax: 303-659-2315

Colorado Analytical Laboratories, Inc.

Analytical Results

Report To: Claire Toon
Company: Analytica Environmental Labs
12189 Pennsylvania Street
Thornton CO 80241-3115

Task No: 07112932
Date Received 11/29/07
Reported: 12/13/07
Client PO: T13190
Client Project: B0711172

Customer Sample ID **Barber Ramp 3 Composite Soil A (B0711172**
Sample Date/Time: 11/15/07 12:00 PM
Lab Number: 07112932-05
Matrix: Soil - Environmental

Test	Result	Reporting Limit	Method
Dry Weight Basis			
Cation Exchange Capacity	**9.0 meq/100g**	0.1	EPA 9081

ASA – "Methods of Soil Analysis, Parts 1 and 2", Second Edition, American Society of Agronomy and Soil Science Society of America, Madison, WI, 1982.
SW-846 – "Test Methods for Evaluating Solid Waste"; USEPA; November 1986
AB-DTPA – "Soil Testing Methods Used at Colorado State University for the Evaluation of Fertility, Salinity and Trace Element Toxicity"; Colorado State University Technical Bulletin LTB88-2; Jan 1998; SM Workman, PN Soltanpour and RH Follett.

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240 South Main Street / Brighton, CO 80601-0507 / 303-659-2313
Mailing Address: P.O. Box 507 / Brighton, CO 80601-0507 / Fax: 303-659-2315

Colorado Analytical Laboratories, Inc.

Analytical Results

Report To: Claire Toon
Company: Analytica Environmental Labs
12189 Pennsylvania Street
Thornton CO 80241-3115

Task No: 07112932
Date Received 11/29/07
Reported: 12/13/07
Client PO: T13190
Client Project: B0711172

Customer Sample ID **Barber Ramp 3 Composite Soil B (B0711172**
Sample Date/Time: 11/15/07 12:00 PM
Lab Number: 07112932-06
Matrix: Soil - Environmental

Test	Result	Reporting Limit	Method
Dry Weight Basis			
Cation Exchange Capacity	**9.6 meq/100g**	0.1	EPA 9081

ASA = "Methods of Soil Analysis, Parts 1 and 2", Second Edition, American Society of Agronomy and Soil Science Society of America, Madison, WI, 1982.
SW-846 = "Test Methods for Evaluating Solid Waste"; USEPA; November 1986
AB-DTPA = "Soil Testing Methods Used at Colorado State University for the Evaluation of Fertility, Salinity and Trace Element Toxicity"; Colorado State University Technical Bulletin LTB88-2; Jan 1998; SM Workman, PN Soltanpour and RH Follett.

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240 South Main Street / Brighton, CO 80601-0507 / 303-659-2313
Mailing Address: P.O. Box 507 / Brighton, CO 80601-0507 / Fax: 303-659-2315

Colorado Analytical Laboratories, Inc.

Analytical Results

Report To: Claire Toon
Company: Analytica Environmental Labs
12189 Pennsylvania Street
Thornton CO 80241-3115

Task No: 07112932
Date Received 11/29/07
Reported: 12/13/07
Client PO: T13190
Client Project: B0711172

Customer Sample ID **Barber Ramp 3 Composite Soil C (B0711172**
Sample Date/Time: 11/15/07 12:00 PM
Lab Number: 07112932-07
Matrix: Soil - Environmental

Test	Result	Reporting Limit	Method
Dry Weight Basis			
Cation Exchange Capacity	**9.9 meq/100g**	0.1	EPA 9081

ASA = "Methods of Soil Analysis, Parts 1 and 2", Second Edition, American Society of Agronomy and Soil Science Society of America. Madison, WI, 1982.
SW-846 = "Test Methods for Evaluating Solid Waste"; USEPA; November 1986
AB-DTPA = "Soil Testing Methods Used at Colorado State University for the Evaluation of Fertility, Salinity and Trace Element Toxicity"; Colorado State University Technical Bulletin LTB88-2; Jan 1998; SM Workman, PN Soltanpour and RH Follett.

DATA APPROVED FOR RELEASE BY

240 South Main Street / Brighton, CO 80601-0507 / 303-659-2313
Mailing Address: P.O. Box 507 / Brighton, CO 80601-0507 / Fax: 303-659-2315

Colorado Analytical Laboratories, Inc.

Analytical Results

Report To: Claire Toon
Company: Analytica Environmental Labs
12189 Pennsylvania Street
Thornton CO 80241-3115

Task No: 07112932
Date Received 11/29/07
Reported: 12/13/07
Client PO: T13190
Client Project: B0711172

Customer Sample ID **Ash Composite 70% FA (B0711172-9B)**
Sample Date/Time: 11/26/07 10:00 AM
Lab Number: 07112932-08
Matrix: Soil - Environmental

Test	Result	Reporting Limit	Method
Dry Weight Basis			
Cation Exchange Capacity	**0.4 meq/100g**	0.1	EPA 9081

ASA = "Methods of Soil Analysis, Parts 1 and 2", Second Edition, American Society of Agronomy and Soil Science Society of America. Madison, WI, 1982.
SW-846 = "Test Methods for Evaluating Solid Waste"; USEPA; November 1986
AB-DTPA = "Soil Testing Methods Used at Colorado State University for the Evaluation of Fertility, Salinity and Trace Element Toxicity"; Colorado State University Technical Bulletin LTB88-2; Jan 1998; SM Workman, PN Soltanpour and RH Follett.

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240 South Main Street / Brighton, CO 80601-0507 / 303-659-2313
Mailing Address: P.O. Box 507 / Brighton, CO 80601-0507 / Fax: 303-659-2315

Colorado Analytical Laboratories, Inc.

Analytical Results

Report To: Claire Toon
Company: Analytica Environmental Labs
12189 Pennsylvania Street
Thornton CO 80241-3115

Task No: 07112932
Date Received 11/29/07
Reported: 12/13/07
Client PO: T13190
Client Project: B0711172

Customer Sample ID **Ash Composite Dup 1 70% FA (B0711172-10**
Sample Date/Time: 11/26/07 10:00 AM
Lab Number: 07112932-09
Matrix: Soil - Environmental

Test	Result	Reporting Limit	Method
Dry Weight Basis			
Cation Exchange Capacity	**0.2 meq/100g**	0.1	EPA 9081

ASA – "Methods of Soil Analysis, Parts 1 and 2", Second Edition, American Society of Agronomy and Soil Science Society of America, Madison, WI, 1982.
SW-846 – "Test Methods for Evaluating Solid Waste"; USEPA; November 1986
AB-DTPA – "Soil Testing Methods Used at Colorado State University for the Evaluation of Fertility, Salinity and Trace Element Toxicity"; Colorado State University Technical Bulletin LTB88-2; Jan 1998; SM Workman, PN Soltanpour and RH Follett.

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240 South Main Street / Brighton, CO 80601-0507 / 303-659-2313
Mailing Address: P.O. Box 507 / Brighton, CO 80601-0507 / Fax: 303-659-2315

Colorado Analytical Laboratories, Inc.

Analytical Results

Report To: Claire Toon
Company: Analytica Environmental Labs
12189 Pennsylvania Street
Thornton CO 80241-3115

Task No: 07112932
Date Received 11/29/07
Reported: 12/13/07
Client PO: T13190
Client Project: B0711172

Customer Sample ID **Ash Composite Dup 2 70% FA (B0711172-11**
Sample Date/Time: 11/26/07 10:00 AM
Lab Number: 07112932-10
Matrix: Soil - Environmental

Test	Result	Reporting Limit	Method
Dry Weight Basis			
Cation Exchange Capacity	**0.2 meq/100g**	0.1	EPA 9081

ASA = "Methods of Soil Analysis, Parts 1 and 2", Second Edition. American Society of Agronomy and Soil Science Society of America, Madison, WI, 1982.
SW-846 = "Test Methods for Evaluating Solid Waste"; USEPA; November 1986
AB-DTPA = "Soil Testing Methods Used at Colorado State University for the Evaluation of Fertility, Salinity and Trace Element Toxicity"; Colorado State University Technical Bulletin LTB98-2; Jan 1998; SM Workman, PN Soltanpour and RH Follett.

DATA APPROVED FOR RELEASE BY

240 South Main Street / Brighton, CO 80601-0507 / 303-659-2313
Mailing Address: P.O. Box 507 / Brighton, CO 80601-0507 / Fax: 303-659-2315

ANALYTICA GROUP

Analytica Chain of Custody Form

07112932

12189 Pennsylvania St. Thornton, CO 80241 (303) 469-8868 (303) 469-5254 fax
4307 Arctic Boulevard Anchorage, AK 99503 (907) 258-2155 (907) 258-6634 fax
475 Hall St. Fairbanks, AK 99701 (907) 456-3116 (907) 456-3125 Fax
5438 Shaune Drive Juneau, AK 99801 (907) 780-6668 (907) 780-6670 fax

Page ___ of ___

Chain of Custody No: 62661

Client Name & Address:

Public Water System (PWS) ID#:

Project Name: B0711172

Section To Be Completed by Analytica

Quote ID: | LGN:

Account #: | Cash | Credit Card

Report to: Claire Toon

Phone No: 303-301-2237

Fax No: above

E-mail: ctoon@analyticagroup.com

Turnaround Time for Results (TAT)

___ Standard ___ Expedited (< 10 days, prior authorization required) (please specify due date below; add'l charges may apply)

Requested Due Date for Results:

Invoice to Name & Address: Same as Client

Special Instructions/Comments: Sub to CAL

P.O. or Contract No: T13190

Kit Prep/Shipping Charge: $

Requested Analysis/Method

Client Sample Identification / Location	Date Sampled	Time Sampled	Matrix (S-DW-WW-Other)	No. of Containers	9081 Cation Exchange Cap.								Field Preserved	Field Filtered	MS/MSD ?
123 S 87W 0-4' Spoil (B0711172-2B)	11/15/07	12:00	Solid	1	X										
123 S 89W 0-4' Spoil (3B)	↓	↓	↓	↓	X										
125 S 88W 0-4' Spoil (4B)	↓	↓	↓	↓	X										
130 S 89W 0-4' Spoil (5B)	↓	↓	↓	↓	X										
Barber Ramp 3 Composite Spoil A (6B)	↓	↓	↓	↓	X										
Barber Ramp 3 Composite Spoil B (7B)	↓	↓	↓	↓	X										
Barber Ramp 3 Composite Spoil C (8B)	↓	↓	↓	↓	X										
Ash Composite 70% FA (9B)	11/26/07	10:00	↓	↓	X										
Ash Composite Dup1 70% FA (10B)	↓	↓	↓	↓	X										
Ash Composite Dup2 70% FA (11B)	↓	↓	↓	↓	X										

Relinquished by:	Date	Time	Received by:	Date	Time
[signature]	11/29/07	10:00	R. Lopez	11-29-07	1420
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time
Name of Sampler: (printed)					

Section To Be Completed by Analytica

	THO	ANC	JNU	FBKS
Condition of Custody Seal?:				
Initialed By:				
Temp/Loc:				
Thermo ID#:				
Shipped Via:				

Version 2.0

ATTACHMENT D
Leachate Water Quality Laboratory Results

Analytica Environmental
Laboratories, Inc.
12189 Pennsylvania Street
Thornton, CO 80241
Phone: 303-469-8868
Fax: 303-469-5254

1/3/2008

Applied Hydrology Associates, Inc.
950 South Cherry Street
Suite 810
Denver, CO 80246
Attn: Art O'Hayre

Work Order #: B0712127
Date: 1/3/2008
Work ID: Navajo Mine Extension Leaching Study
Date Received: 12/17/2007
Proj #: none

Sample Identification

Lab Sample Number	Client Description	Lab Sample Number	Client Description
B0712127-01	MB Leachate 1	B0712127-02	Ash Leachate 1
B0712127-03	Ash Leachate 1 Dup	B0712127-04	Spoil Leachate 1
B0712127-05	Spoil Leachate 1 Dup		

Enclosed are the analytical results for the submitted sample(s). Please review the CASE NARRATIVE for a discussion of any data and/or quality control issues. Listings of data qualifiers, analytical codes, key dates, and QC relationships are provided at the end of the report.

Sincerely,

Claire Toon
Project Manager

"The Science of Analysis, The Art of Service"

Case Narrative

Analytica Environmental Laboratories, Inc.
Work Order: B0712127

Samples were prepared and analyzed according to EPA or equivalent methods outlined in the following references:

Methods for Chemical Analysis of Water and Wastes, USEPA 600/4-79-020,March 1983.

Pfaff, J. D., C. A. Brockhoff and J. W. O'Dell. 1994. The Determination of Inorganic Anions in Water by Ion Chromatography. Method 300.0A. U. S. Environmental Protection Agency. Environmental Monitoring Systems Lab.

Methods for the Determination of Metals in Environmental Samples, EPA/600/R-94/111, May 1994.

SAMPLE RECEIPT:
Five (5) samples were received on 12/17/2007 3:10:00 PM., at a temperature of 20 deg C., at Analytica-Thornton. The samples were received in good condition and in order per chain of custody.

REVIEW FOR COMPLIANCE WITH ANALYTICA QA PLAN
A summary of our review is shown below.

All analytical results contained in this report have been reviewed under Analytica's internal quality assurance and quality control program. Any deviations in quality control parameters for specific analyses are noted in the following text. A complete quality assurance report, including laboratory control, matrix spike, and sample duplicate recoveries is kept on file in our office and is available upon request.

All method specifications were met for the following tests:

Test Method: 150.1 - pH, Elecrometric - pH - Aqueous

Test Method: 160.1 - Total Dissolved Solids dried at 180°C - TDS - Aqueous

Test Method: 310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity - Aqueous

Test Method: Inorganic Anions by Ion Chromatography - Anions by IC - Aqueous

Test Method: SW6010B - ICP - Total - Aqueous

MS/MSD and DUP OUTLIERS:
As shown below, the MS/MSD was outside of limits for Sodium. The sample had Sodium concentrations greater than four times the spike amount. In these cases it is not appropriate to calculate a recovery. The result should be used as a replicate.

Type	Client Sample	LabSample	Analyte	Recovery	LCL	UCL	Parent	Spike
MS	MB Leachate 1	B0712127-01A	Sodium	418	75	125	1180	10.0
MSD	MB Leachate 1	B0712127-01A	Sodium	-76.	75	125	1180	10.0

Test Method: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg - Aqueous

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0712127

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **MB Leachate 1**

Matrix: Aqueous

Collection Date: 12/17/2007 9:40:00AM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0712127-01A	Analysis Date:	12/18/2007 5:51:20PM
Prep Date:	12/18/2007	Instrument:	CVAA_1
Analytical Method ID:	SW7470A - Mercury in Liquid Waste by CVAA - Total Hg	File Name:	B121807W.W
Prep Method ID:	7470A	Dilution Factor:	1
Prep Batch Number:	T071218023		
Report Basis:	As Received	Analyst Initials:	DL
Sample prep wt./vol:	30.00 ml	Prep Extract Vol:	30.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Mercury	7439-97-6	**ND**		mg/L	0.00020	0.000050	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0712127-01A	Analysis Date:	12/19/2007 4:17:00PM
Prep Date:	12/18/2007	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E12197A
Prep Method ID:	3010_ICP	Dilution Factor:	1
Prep Batch Number:	T071218012		
Report Basis:	As Received	Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Aluminum	7429-90-5	**0.056**		mg/L	0.050	0.014	1
Antimony	7440-36-0	**ND**		mg/L	0.050	0.0067	
Arsenic	7440-38-2	**ND**		mg/L	0.10	0.015	
Barium	7440-39-3	**0.12**		mg/L	0.010	0.00016	
Beryllium	7440-41-7	**ND**		mg/L	0.0010	0.000060	
Boron	7440-42-8	**0.33**		mg/L	0.050	0.0018	
Cadmium	7440-43-9	**ND**		mg/L	0.0060	0.00051	
Calcium	7440-70-2	**2.9**		mg/L	0.10	0.013	
Chromium	7440-47-3	**ND**		mg/L	0.010	0.0018	
Cobalt	7440-48-4	**ND**		mg/L	0.0050	0.0016	
Copper	7440-50-8	**ND**		mg/L	0.0050	0.0019	
Iron	7439-89-6	**0.073**		mg/L	0.050	0.0027	
Lead	7439-92-1	**ND**		mg/L	0.050	0.011	
Lithium	7439-93-2	**ND**		mg/L	0.10	0.00072	
Magnesium	7439-96-4	**1.2**		mg/L	0.10	0.012	
Manganese	7439-96-5	**ND**		mg/L	0.010	0.00066	
Molybdenum	7439-98-7	**0.014**		mg/L	0.010	0.0018	
Nickel	7440-02-0	**ND**		mg/L	0.040	0.0027	
Potassium	7440-09-7	**11**		mg/L	1.0	0.31	
Selenium	7784-49-2	**ND**		mg/L	0.10	0.026	
Silver	7440-22-4	**ND**		mg/L	0.015	0.00066	

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0712127

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: **Client Sample Report**

Client Sample Name: **MB Leachate 1**

Matrix: Aqueous

Collection Date: 12/17/2007 9:40:00AM

Lab Sample Number: B0712127-01A | Analysis Date: 12/19/2007 4:17:00PM
Prep Date: 12/18/2007 | Instrument: ICP_2
Analytical Method ID: SW6010B - ICP - Total | File Name: E12197A
Prep Method ID: 3010_ICP | Dilution Factor: 1
Prep Batch Number: T071218012
Report Basis: As Received | Analyst Initials: rm
Sample prep wt./vol: 50.00 ml | Prep Extract Vol: 50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Sodium	7440-23-5	**1,200**		mg/L	3.0	0.028	1
Thallium	7440-28-0	**ND**		mg/L	0.40	0.011	
Vanadium	7440-62-2	**ND**		mg/L	0.010	0.00072	
Zinc	7440-66-6	**ND**		mg/L	0.0050	0.0010	

The following test was conducted by: Analytica - Thornton

Lab Sample Number: B0712127-01B | Analysis Date: 12/19/2007 2:30:16PM
Prep Date: 12/19/2007 | Instrument: Titrametric
Analytical Method ID: 310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity | File Name:
Prep Method ID: Alkalinity_W | Dilution Factor: 1
Prep Batch Number: T071219013
Report Basis: As Received | Analyst Initials: kl
Sample prep wt./vol: 100.00 ml | Prep Extract Vol: 100.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Bicarbonate		**1,300**		mg/L	5.0	1.5	1
Carbonate		**260**		mg/L	7.0	1.2	

The following test was conducted by: Analytica - Thornton

Lab Sample Number: B0712127-01B | Analysis Date: 12/18/2007 9:45:23AM
Prep Date: 12/18/2007 | Instrument: Probe
Analytical Method ID: 150.1 - pH, Elecrometric - pH | File Name:
Prep Method ID: 150.1 | Dilution Factor: 1
Prep Batch Number: T071218019
Report Basis: As Received | Analyst Initials: kl
Sample prep wt./vol: 10.00 ml | Prep Extract Vol: 10.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
pH		**9.0**		pH	0.10	0.10	1

The following test was conducted by: Analytica - Thornton

Workorder (SDG): B0712127

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: **Client Sample Report**

Client Sample Name: **MB Leachate 1**

Matrix: Aqueous Collection Date: 12/17/2007 9:40:00AM

Lab Sample Number: B0712127-01B Analysis Date: 12/31/2007 10:51:30AM
Prep Date: 12/21/2007 Instrument: SCALE
Analytical Method ID: 160.1 - Total Dissolved Solids dried at 180°C - TDS File Name:
Prep Method ID: 160.1 Dilution Factor: 1
Prep Batch Number: T071221010
Report Basis: As Received Analyst Initials: kl
Sample prep wt./vol: 100.00 ml Prep Extract Vol: 1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Total Dissolved Solids		**3,000**		mg/L	10	8.2	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number: B0712127-01B Analysis Date: 12/18/2007 8:44:03PM
Prep Date: 12/18/2007 Instrument: IC
Analytical Method ID: Inorganic Anions by Ion Chromatography - Anions by IC File Name: 071218_026.D
Prep Method ID: 300.0 Dilution Factor: 1
Prep Batch Number: T071218016
Report Basis: As Received Analyst Initials: KB
Sample prep wt./vol: 20.00 ml Prep Extract Vol: 20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Fluoride		**2.2**		mg/L	0.40	0.031	1
Sulfate		**280**		mg/L	1.5	0.11	

Lab Sample Number: B0712127-01B Analysis Date: 12/20/2007 5:51:04PM
Prep Date: 12/18/2007 Instrument: IC
Analytical Method ID: Inorganic Anions by Ion Chromatography - Anions by IC File Name: 071220_003.D
Prep Method ID: 300.0 Dilution Factor: 20
Prep Batch Number: T071218016
Report Basis: As Received Analyst Initials: KB
Sample prep wt./vol: 20.00 ml Prep Extract Vol: 20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Chloride		**620**		mg/L	16	0.84	3

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0712127

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **Ash Leachate 1**

Matrix: Aqueous

Collection Date: 12/17/2007 9:40:00AM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0712127-02A	Analysis Date:	12/18/2007 5:58:45PM
Prep Date:	12/18/2007	Instrument:	CVAA_1
Analytical Method ID:	SW7470A - Mercury in Liquid Waste by CVAA - Total Hg	File Name:	B121807W.W
Prep Method ID:	7470A	Dilution Factor:	1
Prep Batch Number:	T071218023		
Report Basis:	As Received	Analyst Initials:	DL
Sample prep wt./vol:	30.00 ml	Prep Extract Vol:	30.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Mercury	7439-97-6	**ND**		mg/L	0.00020	0.000050	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0712127-02A	Analysis Date:	12/19/2007 4:58:00PM
Prep Date:	12/18/2007	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E12197A
Prep Method ID:	3010_ICP	Dilution Factor:	1
Prep Batch Number:	T071218012		
Report Basis:	As Received	Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Aluminum	7429-90-5	**0.053**		mg/L	0.050	0.014	1
Antimony	7440-36-0	**ND**		mg/L	0.050	0.0067	
Arsenic	7440-38-2	**ND**		mg/L	0.10	0.015	
Barium	7440-39-3	**0.099**		mg/L	0.010	0.00016	
Beryllium	7440-41-7	**ND**		mg/L	0.0010	0.000060	
Boron	7440-42-8	**2.6**		mg/L	0.050	0.0018	
Cadmium	7440-43-9	**ND**		mg/L	0.0060	0.00051	
Calcium	7440-70-2	**570**		mg/L	0.10	0.013	
Chromium	7440-47-3	**0.011**		mg/L	0.010	0.0018	
Cobalt	7440-48-4	**ND**		mg/L	0.0050	0.0016	
Copper	7440-50-8	**ND**		mg/L	0.0050	0.0019	
Iron	7439-89-6	**ND**		mg/L	0.050	0.0027	
Lead	7439-92-1	**ND**		mg/L	0.050	0.011	
Lithium	7439-93-2	**0.13**		mg/L	0.10	0.00072	
Magnesium	7439-96-4	**7.7**		mg/L	0.10	0.012	
Manganese	7439-96-5	**0.095**		mg/L	0.010	0.00066	
Molybdenum	7439-98-7	**0.15**		mg/L	0.010	0.0018	
Nickel	7440-02-0	**ND**		mg/L	0.040	0.0027	
Potassium	7440-09-7	**12**		mg/L	1.0	0.31	
Selenium	7784-49-2	**0.14**		mg/L	0.10	0.026	
Silver	7440-22-4	**ND**		mg/L	0.015	0.00066	

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0712127

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **Ash Leachate 1**

Matrix: Aqueous — Collection Date: 12/17/2007 9:40:00AM

Lab Sample Number:	B0712127-02A	Analysis Date:	12/19/2007 4:58:00PM
Prep Date:	12/18/2007	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E12197A
Prep Method ID:	3010_ICP	Dilution Factor:	1
Prep Batch Number:	T071218012		
Report Basis:	As Received	Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Sodium	7440-23-5	**1,200**		mg/L	3.0	0.028	1
Thallium	7440-28-0	**ND**		mg/L	0.40	0.011	
Vanadium	7440-62-2	**0.12**		mg/L	0.010	0.00072	
Zinc	7440-66-6	**ND**		mg/L	0.0050	0.0010	

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0712127-02B	Analysis Date:	12/19/2007 2:30:16PM
Prep Date:	12/19/2007	Instrument:	Titrametric
Analytical Method ID:	310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity	File Name:	
Prep Method ID:	Alkalinity_W	Dilution Factor:	1
Prep Batch Number:	T071219013		
Report Basis:	As Received	Analyst Initials:	kl
Sample prep wt./vol:	100.00 ml	Prep Extract Vol:	100.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Bicarbonate		**810**		mg/L	5.0	1.5	1
Carbonate		**ND**		mg/L	7.0	1.2	

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0712127-02B	Analysis Date:	12/18/2007 9:45:23AM
Prep Date:	12/18/2007	Instrument:	Probe
Analytical Method ID:	150.1 - pH, Elecrometric - pH	File Name:	
Prep Method ID:	150.1	Dilution Factor:	1
Prep Batch Number:	T071218019		
Report Basis:	As Received	Analyst Initials:	kl
Sample prep wt./vol:	10.00 ml	Prep Extract Vol:	10.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
pH		**7.7**		pH	0.10	0.10	1

The following test was conducted by: Analytica - Thornton

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0712127

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **Ash Leachate 1**

Matrix: Aqueous | Collection Date: 12/17/2007 9:40:00AM

Lab Sample Number:	B0712127-02B	Analysis Date:	12/31/2007 10:51:30AM
Prep Date:	12/21/2007	Instrument:	SCALE
Analytical Method ID:	160.1 - Total Dissolved Solids dried at 180°C - TDS	File Name:	
Prep Method ID:	160.1	Dilution Factor:	1
Prep Batch Number:	T071221010		
Report Basis:	As Received	Analyst Initials:	kl
Sample prep wt./vol:	100.00 ml	Prep Extract Vol:	1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Total Dissolved Solids		**5,400**		mg/L	10	8.2	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0712127-02B	Analysis Date:	12/19/2007 9:50:23AM
Prep Date:	12/18/2007	Instrument:	IC
Analytical Method ID:	Inorganic Anions by Ion Chromatography - Anions by IC	File Name:	071218_027.D
Prep Method ID:	300.0	Dilution Factor:	1
Prep Batch Number:	T071218016		
Report Basis:	As Received	Analyst Initials:	KB
Sample prep wt./vol:	20.00 ml	Prep Extract Vol:	20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Fluoride		**5.0**		mg/L	0.40	0.031	1

Lab Sample Number:	B0712127-02B	Analysis Date:	12/20/2007 6:27:50PM
Prep Date:	12/18/2007	Instrument:	IC
Analytical Method ID:	Inorganic Anions by Ion Chromatography - Anions by IC	File Name:	071220_005.D
Prep Method ID:	300.0	Dilution Factor:	20
Prep Batch Number:	T071218016		
Report Basis:	As Received	Analyst Initials:	KB
Sample prep wt./vol:	20.00 ml	Prep Extract Vol:	20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Chloride		**620**		mg/L	16	0.84	4
Sulfate		**2,400**		mg/L	30	2.2	

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0712127

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **Ash Leachate 1 Dup**

Matrix: Aqueous

Collection Date: 12/17/2007 9:40:00AM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0712127-03A	Analysis Date:	12/18/2007 6:00:49PM
Prep Date:	12/18/2007	Instrument:	CVAA_1
Analytical Method ID:	SW7470A - Mercury in Liquid Waste by CVAA - Total Hg	File Name:	B121807W.W
Prep Method ID:	7470A	Dilution Factor:	1
Prep Batch Number:	T071218023		
Report Basis:	As Received	Analyst Initials:	DL
Sample prep wt./vol:	30.00 ml	Prep Extract Vol:	30.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Mercury	7439-97-6	**ND**		mg/L	0.00020	0.000050	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0712127-03A	Analysis Date:	12/19/2007 5:03:00PM
Prep Date:	12/18/2007	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E12197A
Prep Method ID:	3010_ICP	Dilution Factor:	1
Prep Batch Number:	T071218012		
Report Basis:	As Received	Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Aluminum	7429-90-5	**ND**		mg/L	0.050	0.014	1
Antimony	7440-36-0	**ND**		mg/L	0.050	0.0067	
Arsenic	7440-38-2	**ND**		mg/L	0.10	0.015	
Barium	7440-39-3	**0.10**		mg/L	0.010	0.00016	
Beryllium	7440-41-7	**ND**		mg/L	0.0010	0.000060	
Boron	7440-42-8	**2.5**		mg/L	0.050	0.0018	
Cadmium	7440-43-9	**ND**		mg/L	0.0060	0.00051	
Calcium	7440-70-2	**560**		mg/L	0.10	0.013	
Chromium	7440-47-3	**0.011**		mg/L	0.010	0.0018	
Cobalt	7440-48-4	**ND**		mg/L	0.0050	0.0016	
Copper	7440-50-8	**ND**		mg/L	0.0050	0.0019	
Iron	7439-89-6	**ND**		mg/L	0.050	0.0027	
Lead	7439-92-1	**ND**		mg/L	0.050	0.011	
Lithium	7439-93-2	**0.13**		mg/L	0.10	0.00072	
Magnesium	7439-96-4	**7.6**		mg/L	0.10	0.012	
Manganese	7439-96-5	**0.095**		mg/L	0.010	0.00066	
Molybdenum	7439-98-7	**0.14**		mg/L	0.010	0.0018	
Nickel	7440-02-0	**ND**		mg/L	0.040	0.0027	
Potassium	7440-09-7	**12**		mg/L	1.0	0.31	
Selenium	7784-49-2	**0.13**		mg/L	0.10	0.026	
Silver	7440-22-4	**ND**		mg/L	0.015	0.00066	

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0712127

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **Ash Leachate 1 Dup**

Matrix: Aqueous

Collection Date: 12/17/2007 9:40:00AM

Lab Sample Number:	B0712127-03A	Analysis Date:	12/19/2007 5:03:00PM
Prep Date:	12/18/2007	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E12197A
Prep Method ID:	3010_ICP	Dilution Factor:	1
Prep Batch Number:	T071218012		
Report Basis:	As Received	Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Sodium	7440-23-5	**1,200**		mg/L	3.0	0.028	1
Thallium	7440-28-0	**ND**		mg/L	0.40	0.011	
Vanadium	7440-62-2	**0.12**		mg/L	0.010	0.00072	
Zinc	7440-66-6	**ND**		mg/L	0.0050	0.0010	

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0712127-03B	Analysis Date:	12/19/2007 2:30:16PM
Prep Date:	12/19/2007	Instrument:	Titrametric
Analytical Method ID:	310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity	File Name:	
Prep Method ID:	Alkalinity_W	Dilution Factor:	1
Prep Batch Number:	T071219013		
Report Basis:	As Received	Analyst Initials:	kl
Sample prep wt./vol:	100.00 ml	Prep Extract Vol:	100.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Bicarbonate		**820**		mg/L	5.0	1.5	1
Carbonate		**ND**		mg/L	7.0	1.2	

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0712127-03B	Analysis Date:	12/18/2007 9:45:23AM
Prep Date:	12/18/2007	Instrument:	Probe
Analytical Method ID:	150.1 - pH, Elecrometric - pH	File Name:	
Prep Method ID:	150.1	Dilution Factor:	1
Prep Batch Number:	T071218019		
Report Basis:	As Received	Analyst Initials:	kl
Sample prep wt./vol:	10.00 ml	Prep Extract Vol:	10.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
pH		**7.6**		pH	0.10	0.10	1

The following test was conducted by: Analytica - Thornton

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0712127

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **Ash Leachate 1 Dup**

Matrix: Aqueous

Collection Date: 12/17/2007 9:40:00AM

Lab Sample Number: B0712127-03B
Analysis Date: 12/31/2007 10:51:30AM
Prep Date: 12/21/2007
Instrument: SCALE
Analytical Method ID: 160.1 - Total Dissolved Solids dried at 180°C - TDS
File Name:
Prep Method ID: 160.1
Dilution Factor: 1
Prep Batch Number: T071221010
Report Basis: As Received
Analyst Initials: kl
Sample prep wt./vol: 100.00 ml
Prep Extract Vol: 1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Total Dissolved Solids		**5,400**		mg/L	10	8.2	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number: B0712127-03B
Analysis Date: 12/19/2007 10:08:47AM
Prep Date: 12/18/2007
Instrument: IC
Analytical Method ID: Inorganic Anions by Ion Chromatography - Anions by IC
File Name: 071218_028.D
Prep Method ID: 300.0
Dilution Factor: 1
Prep Batch Number: T071218016
Report Basis: As Received
Analyst Initials: KB
Sample prep wt./vol: 20.00 ml
Prep Extract Vol: 20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Fluoride		**5.0**		mg/L	0.40	0.031	1

Lab Sample Number: B0712127-03B
Analysis Date: 12/20/2007 5:57:55AM
Prep Date: 12/18/2007
Instrument: IC
Analytical Method ID: Inorganic Anions by Ion Chromatography - Anions by IC
File Name: 071219_058.D
Prep Method ID: 300.0
Dilution Factor: 10
Prep Batch Number: T071218016
Report Basis: As Received
Analyst Initials: KB
Sample prep wt./vol: 20.00 ml
Prep Extract Vol: 20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Sulfate		**2,500**		mg/L	15	1.1	2

Lab Sample Number: B0712127-03B
Analysis Date: 12/20/2007 7:04:36PM
Prep Date: 12/18/2007
Instrument: IC
Analytical Method ID: Inorganic Anions by Ion Chromatography - Anions by IC
File Name: 071220_007.D
Prep Method ID: 300.0
Dilution Factor: 27
Prep Batch Number: T071218016
Report Basis: As Received
Analyst Initials: KB
Sample prep wt./vol: 20.00 ml
Prep Extract Vol: 20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Chloride		**610**		mg/L	21	1.1	3

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0712127

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **Spoil Leachate 1**

Matrix: Aqueous

Collection Date: 12/17/2007 9:40:00AM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0712127-04A	Analysis Date:	12/18/2007 6:03:02PM
Prep Date:	12/18/2007	Instrument:	CVAA_1
Analytical Method ID:	SW7470A - Mercury in Liquid Waste by CVAA - Total Hg	File Name:	B121807W.W
Prep Method ID:	7470A	Dilution Factor:	1
Prep Batch Number:	T071218023		
Report Basis:	As Received	Analyst Initials:	DL
Sample prep wt./vol:	25.00 ml	Prep Extract Vol:	30.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Mercury	7439-97-6	**ND**		mg/L	0.00024	0.000060	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0712127-04A	Analysis Date:	12/19/2007 5:08:00PM
Prep Date:	12/18/2007	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E12197A
Prep Method ID:	3010_ICP	Dilution Factor:	1
Prep Batch Number:	T071218012		
Report Basis:	As Received	Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Aluminum	7429-90-5	**0.29**		mg/L	0.050	0.014	1
Antimony	7440-36-0	**ND**		mg/L	0.050	0.0067	
Arsenic	7440-38-2	**ND**		mg/L	0.10	0.015	
Barium	7440-39-3	**0.25**		mg/L	0.010	0.00016	
Beryllium	7440-41-7	**ND**		mg/L	0.0010	0.000060	
Boron	7440-42-8	**0.44**		mg/L	0.050	0.0018	
Cadmium	7440-43-9	**ND**		mg/L	0.0060	0.00051	
Calcium	7440-70-2	**64**		mg/L	0.10	0.013	
Chromium	7440-47-3	**ND**		mg/L	0.010	0.0018	
Cobalt	7440-48-4	**ND**		mg/L	0.0050	0.0016	
Copper	7440-50-8	**ND**		mg/L	0.0050	0.0019	
Iron	7439-89-6	**0.17**		mg/L	0.050	0.0027	
Lead	7439-92-1	**ND**		mg/L	0.050	0.011	
Lithium	7439-93-2	**0.10**		mg/L	0.10	0.00072	
Magnesium	7439-96-4	**13**		mg/L	0.10	0.012	
Manganese	7439-96-5	**0.11**		mg/L	0.010	0.00066	
Molybdenum	7439-98-7	**0.014**		mg/L	0.010	0.0018	
Nickel	7440-02-0	**ND**		mg/L	0.040	0.0027	
Potassium	7440-09-7	**14**		mg/L	1.0	0.31	
Selenium	7784-49-2	**ND**		mg/L	0.10	0.026	
Silver	7440-22-4	**ND**		mg/L	0.015	0.00066	

Detailed Analytical Report Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0712127

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **Spoil Leachate 1**

Matrix: Aqueous Collection Date: 12/17/2007 9:40:00AM

Lab Sample Number:	B0712127-04A	Analysis Date:	12/19/2007 5:08:00PM
Prep Date:	12/18/2007	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E12197A
Prep Method ID:	3010_ICP	Dilution Factor:	1
Prep Batch Number:	T071218012		
Report Basis:	As Received	Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Sodium	7440-23-5	**1,200**		mg/L	3.0	0.028	1
Thallium	7440-28-0	**ND**		mg/L	0.40	0.011	
Vanadium	7440-62-2	**ND**		mg/L	0.010	0.00072	
Zinc	7440-66-6	**ND**		mg/L	0.0050	0.0010	

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0712127-04B	Analysis Date:	12/19/2007 2:30:16PM
Prep Date:	12/19/2007	Instrument:	Titrametric
Analytical Method ID:	310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity	File Name:	
Prep Method ID:	Alkalinity_W	Dilution Factor:	1
Prep Batch Number:	T071219013		
Report Basis:	As Received	Analyst Initials:	kl
Sample prep wt./vol:	100.00 ml	Prep Extract Vol:	100.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Bicarbonate		**1,000**		mg/L	5.0	1.5	1
Carbonate		**ND**		mg/L	7.0	1.2	

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0712127-04B	Analysis Date:	12/18/2007 9:45:23AM
Prep Date:	12/18/2007	Instrument:	Probe
Analytical Method ID:	150.1 - pH, Elecrometric - pH	File Name:	
Prep Method ID:	150.1	Dilution Factor:	1
Prep Batch Number:	T071218019		
Report Basis:	As Received	Analyst Initials:	kl
Sample prep wt./vol:	10.00 ml	Prep Extract Vol:	10.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
pH		**8.0**		pH	0.10	0.10	1

The following test was conducted by: Analytica - Thornton

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0712127

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **Spoil Leachate 1**

Matrix: Aqueous | Collection Date: 12/17/2007 9:40:00AM

Lab Sample Number: B0712127-04B | Analysis Date: 12/31/2007 10:51:30AM
Prep Date: 12/21/2007 | Instrument: SCALE
Analytical Method ID: 160.1 - Total Dissolved Solids dried at 180°C - TDS | File Name:
Prep Method ID: 160.1 | Dilution Factor: 1
Prep Batch Number: T071221010
Report Basis: As Received | Analyst Initials: kl
Sample prep wt./vol: 100.00 ml | Prep Extract Vol: 1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Total Dissolved Solids		**3,500**		mg/L	10	8.2	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number: B0712127-04B | Analysis Date: 12/19/2007 10:27:11AM
Prep Date: 12/18/2007 | Instrument: IC
Analytical Method ID: Inorganic Anions by Ion Chromatography - Anions by IC | File Name: 071218_029.D
Prep Method ID: 300.0 | Dilution Factor: 1
Prep Batch Number: T071218016
Report Basis: As Received | Analyst Initials: KB
Sample prep wt./vol: 20.00 ml | Prep Extract Vol: 20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Fluoride		**1.6**		mg/L	0.40	0.031	1

Lab Sample Number: B0712127-04B | Analysis Date: 12/20/2007 6:16:18AM
Prep Date: 12/18/2007 | Instrument: IC
Analytical Method ID: Inorganic Anions by Ion Chromatography - Anions by IC | File Name: 071219_059.D
Prep Method ID: 300.0 | Dilution Factor: 10
Prep Batch Number: T071218016
Report Basis: As Received | Analyst Initials: KB
Sample prep wt./vol: 20.00 ml | Prep Extract Vol: 20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Sulfate		**970**		mg/L	15	1.1	2

Lab Sample Number: B0712127-04B | Analysis Date: 12/20/2007 7:23:00PM
Prep Date: 12/18/2007 | Instrument: IC
Analytical Method ID: Inorganic Anions by Ion Chromatography - Anions by IC | File Name: 071220_008.D
Prep Method ID: 300.0 | Dilution Factor: 27
Prep Batch Number: T071218016
Report Basis: As Received | Analyst Initials: KB
Sample prep wt./vol: 20.00 ml | Prep Extract Vol: 20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Chloride		**610**		mg/L	21	1.1	3

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0712127

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **Spoil Leachate 1 Dup**

Matrix: Aqueous

Collection Date: 12/17/2007 9:40:00AM

The following test was conducted by: Analytica - Thornton

Lab Sample Number: B0712127-05A | Analysis Date: 12/18/2007 6:05:14PM
Prep Date: 12/18/2007 | Instrument: CVAA_1
Analytical Method ID: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg | File Name: B121807W.W
Prep Method ID: 7470A | Dilution Factor: 1
Prep Batch Number: T071218023
Report Basis: As Received | Analyst Initials: DL
Sample prep wt./vol: 30.00 ml | Prep Extract Vol: 30.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Mercury	7439-97-6	**ND**		mg/L	0.00020	0.000050	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number: B0712127-05A | Analysis Date: 12/19/2007 5:13:00PM
Prep Date: 12/18/2007 | Instrument: ICP_2
Analytical Method ID: SW6010B - ICP - Total | File Name: E12197A
Prep Method ID: 3010_ICP | Dilution Factor: 1
Prep Batch Number: T071218012
Report Basis: As Received | Analyst Initials: rm
Sample prep wt./vol: 50.00 ml | Prep Extract Vol: 50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Aluminum	7429-90-5	**0.30**		mg/L	0.050	0.014	1
Antimony	7440-36-0	**ND**		mg/L	0.050	0.0067	
Arsenic	7440-38-2	**ND**		mg/L	0.10	0.015	
Barium	7440-39-3	**0.20**		mg/L	0.010	0.00016	
Beryllium	7440-41-7	**ND**		mg/L	0.0010	0.000060	
Boron	7440-42-8	**0.45**		mg/L	0.050	0.0018	
Cadmium	7440-43-9	**ND**		mg/L	0.0060	0.00051	
Calcium	7440-70-2	**69**		mg/L	0.10	0.013	
Chromium	7440-47-3	**ND**		mg/L	0.010	0.0018	
Cobalt	7440-48-4	**ND**		mg/L	0.0050	0.0016	
Copper	7440-50-8	**ND**		mg/L	0.0050	0.0019	
Iron	7439-89-6	**0.18**		mg/L	0.050	0.0027	
Lead	7439-92-1	**ND**		mg/L	0.050	0.011	
Lithium	7439-93-2	**0.10**		mg/L	0.10	0.00072	
Magnesium	7439-96-4	**13**		mg/L	0.10	0.012	
Manganese	7439-96-5	**0.10**		mg/L	0.010	0.00066	
Molybdenum	7439-98-7	**0.014**		mg/L	0.010	0.0018	
Nickel	7440-02-0	**ND**		mg/L	0.040	0.0027	
Potassium	7440-09-7	**14**		mg/L	1.0	0.31	
Selenium	7784-49-2	**ND**		mg/L	0.10	0.026	
Silver	7440-22-4	**ND**		mg/L	0.015	0.00066	

Detailed Analytical Report Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0712127

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **Spoil Leachate 1 Dup**

Matrix: Aqueous Collection Date: 12/17/2007 9:40:00AM

Lab Sample Number: B0712127-05A Analysis Date: 12/19/2007 5:13:00PM
Prep Date: 12/18/2007 Instrument: ICP_2
Analytical Method ID: SW6010B - ICP - Total File Name: E12197A
Prep Method ID: 3010_ICP Dilution Factor: 1
Prep Batch Number: T071218012
Report Basis: As Received Analyst Initials: rm
Sample prep wt./vol: 50.00 ml Prep Extract Vol: 50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Sodium	7440-23-5	**1,200**		mg/L	3.0	0.028	1
Thallium	7440-28-0	**ND**		mg/L	0.40	0.011	
Vanadium	7440-62-2	**ND**		mg/L	0.010	0.00072	
Zinc	7440-66-6	**0.0095**		mg/L	0.0050	0.0010	

The following test was conducted by: Analytica - Thornton

Lab Sample Number: B0712127-05B Analysis Date: 12/19/2007 2:30:16PM
Prep Date: 12/19/2007 Instrument: Titrametric
Analytical Method ID: 310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity File Name:
Prep Method ID: Alkalinity_W Dilution Factor: 1
Prep Batch Number: T071219013
Report Basis: As Received Analyst Initials: kl
Sample prep wt./vol: 100.00 ml Prep Extract Vol: 100.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Bicarbonate		**1,000**		mg/L	5.0	1.5	1
Carbonate		**ND**		mg/L	7.0	1.2	

The following test was conducted by: Analytica - Thornton

Lab Sample Number: B0712127-05B Analysis Date: 12/18/2007 9:45:23AM
Prep Date: 12/18/2007 Instrument: Probe
Analytical Method ID: 150.1 - pH, Elecrometric - pH File Name:
Prep Method ID: 150.1 Dilution Factor: 1
Prep Batch Number: T071218019
Report Basis: As Received Analyst Initials: kl
Sample prep wt./vol: 10.00 ml Prep Extract Vol: 10.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
pH		**7.9**		pH	0.10	0.10	1

The following test was conducted by: Analytica - Thornton

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0712127

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **Spoil Leachate 1 Dup**

Matrix: Aqueous

Collection Date: 12/17/2007 9:40:00AM

Lab Sample Number: B0712127-05B | Analysis Date: 12/31/2007 10:51:30AM
Prep Date: 12/21/2007 | Instrument: SCALE
Analytical Method ID: 160.1 - Total Dissolved Solids dried at 180°C - TDS | File Name:
Prep Method ID: 160.1 | Dilution Factor: 1
Prep Batch Number: T071221010
Report Basis: As Received | Analyst Initials: kl
Sample prep wt./vol: 100.00 ml | Prep Extract Vol: 1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Total Dissolved Solids		**3,600**		mg/L	10	8.2	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number: B0712127-05B | Analysis Date: 12/19/2007 10:45:34AM
Prep Date: 12/18/2007 | Instrument: IC
Analytical Method ID: Inorganic Anions by Ion Chromatography - Anions by IC | File Name: 071218_030.D
Prep Method ID: 300.0 | Dilution Factor: 1
Prep Batch Number: T071218016
Report Basis: As Received | Analyst Initials: KB
Sample prep wt./vol: 20.00 ml | Prep Extract Vol: 20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Fluoride		**1.6**		mg/L	0.40	0.031	1

Lab Sample Number: B0712127-05B | Analysis Date: 12/20/2007 6:34:42AM
Prep Date: 12/18/2007 | Instrument: IC
Analytical Method ID: Inorganic Anions by Ion Chromatography - Anions by IC | File Name: 071219_060.D
Prep Method ID: 300.0 | Dilution Factor: 10
Prep Batch Number: T071218016
Report Basis: As Received | Analyst Initials: KB
Sample prep wt./vol: 20.00 ml | Prep Extract Vol: 20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Sulfate		**990**		mg/L	15	1.1	2

Lab Sample Number: B0712127-05B | Analysis Date: 12/20/2007 7:41:22PM
Prep Date: 12/18/2007 | Instrument: IC
Analytical Method ID: Inorganic Anions by Ion Chromatography - Anions by IC | File Name: 071220_009.D
Prep Method ID: 300.0 | Dilution Factor: 27
Prep Batch Number: T071218016
Report Basis: As Received | Analyst Initials: KB
Sample prep wt./vol: 20.00 ml | Prep Extract Vol: 20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Chloride		**610**		mg/L	21	1.1	3

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0712127

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Method Blank Report

Client Sample Name: **MB**

Matrix: Aqueous

Collection Date: 12/18/2007 12:00:00AM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	T071218023-MB	Analysis Date:	12/18/2007 5:28:28PM
Prep Date:	12/18/2007	Instrument:	CVAA_1
Analytical Method ID:	SW7470A - Mercury in Liquid Waste by CVAA - Total Hg	File Name:	B121807W.W
Prep Method ID:	7470A	Dilution Factor:	1
Prep Batch Number:	T071218023		
Report Basis:	As Received	Analyst Initials:	DL
Sample prep wt./vol:	30.00 ml	Prep Extract Vol:	30.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Mercury	7439-97-6	**ND**		mg/L	0.00020	0.000050	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	T071218012-MB	Analysis Date:	12/19/2007 3:57:00PM
Prep Date:	12/18/2007	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E12197A
Prep Method ID:	3010_ICP	Dilution Factor:	1
Prep Batch Number:	T071218012		
Report Basis:	As Received	Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Aluminum	7429-90-5	**ND**		mg/L	0.050	0.014	1
Antimony	7440-36-0	**ND**		mg/L	0.050	0.0067	
Arsenic	7440-38-2	**ND**		mg/L	0.10	0.015	
Barium	7440-39-3	**ND**		mg/L	0.010	0.00016	
Beryllium	7440-41-7	**ND**		mg/L	0.0010	0.000060	
Boron	7440-42-8	**ND**		mg/L	0.050	0.0018	
Cadmium	7440-43-9	**ND**		mg/L	0.0060	0.00051	
Calcium	7440-70-2	**ND**		mg/L	0.10	0.013	
Chromium	7440-47-3	**ND**		mg/L	0.010	0.0018	
Cobalt	7440-48-4	**ND**		mg/L	0.0050	0.0016	
Copper	7440-50-8	**ND**		mg/L	0.0050	0.0019	
Iron	7439-89-6	**ND**		mg/L	0.050	0.0027	
Lead	7439-92-1	**ND**		mg/L	0.050	0.011	
Lithium	7439-93-2	**ND**		mg/L	0.10	0.00072	
Magnesium	7439-96-4	**ND**		mg/L	0.10	0.012	
Manganese	7439-96-5	**ND**		mg/L	0.010	0.00066	
Molybdenum	7439-98-7	**ND**		mg/L	0.010	0.0018	
Nickel	7440-02-0	**ND**		mg/L	0.040	0.0027	
Potassium	7440-09-7	**ND**		mg/L	1.0	0.31	
Selenium	7784-49-2	**ND**		mg/L	0.10	0.026	
Silver	7440-22-4	**ND**		mg/L	0.015	0.00066	

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0712127

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Method Blank Report

Client Sample Name: **MB**

Matrix: Aqueous

Collection Date: 12/18/2007 12:00:00AM

Lab Sample Number: T071218012-MB
Prep Date: 12/18/2007
Analytical Method ID: SW6010B - ICP - Total
Prep Method ID: 3010_ICP
Prep Batch Number: T071218012
Report Basis: As Received
Sample prep wt./vol: 50.00 ml

Analysis Date: 12/19/2007 3:57:00PM
Instrument: ICP_2
File Name: E12197A
Dilution Factor: 1
Analyst Initials: rm
Prep Extract Vol: 50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Sodium	7440-23-5	**ND**		mg/L	3.0	0.028	1
Thallium	7440-28-0	**ND**		mg/L	0.40	0.011	
Vanadium	7440-62-2	**ND**		mg/L	0.010	0.00072	
Zinc	7440-66-6	**ND**		mg/L	0.0050	0.0010	

The following test was conducted by: Analytica - Thornton

Lab Sample Number: T071219013-MB
Prep Date: 12/19/2007
Analytical Method ID: 310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity
Prep Method ID: Alkalinity_W
Prep Batch Number: T071219013
Report Basis: As Received
Sample prep wt./vol: 100.00 ml

Analysis Date: 12/19/2007 2:30:16PM
Instrument: Titrametric
File Name:
Dilution Factor: 1
Analyst Initials: kl
Prep Extract Vol: 100.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Bicarbonate		**ND**		mg/L	5.0	1.5	1
Carbonate		**ND**		mg/L	7.0	1.2	

The following test was conducted by: Analytica - Thornton

Lab Sample Number: T071221010-MB
Prep Date: 12/21/2007
Analytical Method ID: 160.1 - Total Dissolved Solids dried at 180°C - TDS
Prep Method ID: 160.1
Prep Batch Number: T071221010
Report Basis: As Received
Sample prep wt./vol: 100.00 ml

Analysis Date: 12/31/2007 10:51:30AM
Instrument: SCALE
File Name:
Dilution Factor: 1
Analyst Initials: kl
Prep Extract Vol: 1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Total Dissolved Solids		**ND**		mg/L	10	8.2	1

The following test was conducted by: Analytica - Thornton

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0712127

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Method Blank Report

Client Sample Name: **MB**

Matrix: Aqueous

Collection Date: 12/18/2007 12:00:00AM

Lab Sample Number:	T071218016-MB	Analysis Date:	12/18/2007 6:17:08PM
Prep Date:	12/18/2007	Instrument:	IC
Analytical Method ID:	Inorganic Anions by Ion Chromatography - Anions by IC	File Name:	071218_018.D
Prep Method ID:	300.0	Dilution Factor:	1
Prep Batch Number:	T071218016		
Report Basis:	As Received	Analyst Initials:	KB
Sample prep wt./vol:	20.00 ml	Prep Extract Vol:	20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Chloride		**ND**		mg/L	0.80	0.042	1
Fluoride		**ND**		mg/L	0.40	0.031	
Sulfate		**ND**		mg/L	1.5	0.11	

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado
Workorder (SDG): B0712127
Project: Navajo Mine Extension Leaching Study
Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T071218012**

SAMPLE DUPLICATE REPORT

Analysis: SW6010B - ICP - Total
Base Sample: B0712127-01A
Prep Date: 12/18/2007

Samp. Anal. Date: 12/19/2007 4:17:00PM
DUP Anal. Date: 12/19/2007 4:22:00PM
Units: mg/L
Matrix: Aqueous

Analyte Name	SampResult	DUPRes.	RPD	RPDLim	Flag
Aluminum	0.0556	0.211	116.6	20	OUT
Antimony	ND	ND	0.0	20	
Arsenic	ND	ND	0.0	20	
Barium	0.118	0.143	19.2	20	
Beryllium	ND	ND	0.0	20	
Boron	0.331	0.340	2.7	20	
Cadmium	ND	ND	0.0	20	
Calcium	2.89	3.28	12.6	20	
Chromium	ND	ND	0.0	20	
Cobalt	ND	0.00726	0.0	20	
Copper	ND	0.00783	0.0	20	
Iron	0.0733	0.313	124.1	20	OUT
Lead	ND	ND	0.0	20	
Magnesium	1.24	1.42	13.5	20	
Manganese	ND	0.0116	0.0	20	
Molybdenum	0.0141	0.0180	24.3	20	OUT
Nickel	ND	ND	0.0	20	
Potassium	11.0	11.6	5.3	20	
Selenium	ND	ND	0.0	20	
Silver	ND	ND	0.0	20	
Sodium	1,180	1,200	1.7	20	
Thallium	ND	ND	0.0	20	
Vanadium	ND	ND	0.0	20	
Zinc	ND	0.00930	0.0	20	
Lithium	ND	ND	0.0	20	

LCS/LCSD REPORT

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0712127

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0712127

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T071218012**

LCS/LCSD REPORT

Analysis: SW6010B - ICP - Total

MB: T071218012-MB

Prep Date: 12/18/2007

MB Anal. Date: 12/19/2007 3:57:00PM

Units: mg/L

LCS Anal. Date: 12/19/2007 4:02:00PM LCSD Anal. Date: 12/19/2007 4:07:00PM Matrix: Aqueous

Analyte Name	SampResult	LCSRes.	SDRes.	SPLev	SPDLev	Recov.	SD Recov	RPD	Recov Lim	RPDLim	Flag
Aluminum	ND	2.06	2.08	2.00	2.00	103.0	104.0	1.0	89 - 117	20	
Antimony	ND	0.487	0.492	0.500	0.500	97.4	98.4	1.0	82 - 117	20	
Arsenic	ND	1.96	1.97	2.00	2.00	98.0	98.5	0.5	86 - 116	20	
Barium	ND	1.95	1.98	2.00	2.00	97.5	99.0	1.5	86 - 116	20	
Beryllium	ND	0.0507	0.0517	0.0500	0.0500	101.4	103.4	2.0	87 - 111	20	
Boron	ND	0.648	0.616	0.500	0.500	129.6	123.2	5.1	76 - 130	20	
Cadmium	ND	0.0434	0.0442	0.0500	0.0500	86.8	88.4	1.8	79 - 113	20	
Calcium	ND	9.92	10.2	10.0	10.0	99.2	102.0	2.8	79 - 119	20	
Chromium	ND	0.200	0.200	0.200	0.200	100.0	100.0	0.0	86 - 117	20	
Cobalt	ND	0.494	0.500	0.500	0.500	98.8	100.0	1.2	82 - 118	20	
Copper	ND	0.244	0.249	0.250	0.250	97.6	99.6	2.0	86 - 117	20	
Iron	ND	1.03	1.07	1.00	1.00	103.0	107.0	3.8	83 - 121	20	
Lead	ND	0.497	0.493	0.500	0.500	99.4	98.6	0.8	83 - 121	20	
Magnesium	ND	10.1	10.2	10.0	10.0	101.0	102.0	1.0	83 - 118	20	
Manganese	ND	0.497	0.505	0.500	0.500	99.4	101.0	1.6	82 - 121	20	
Molybdenum	ND	0.491	0.501	0.500	0.500	98.2	100.2	2.0	82 - 120	20	
Nickel	ND	0.490	0.496	0.500	0.500	98.0	99.2	1.2	84 - 117	20	
Potassium	ND	9.25	8.89	10.0	10.0	92.5	88.9	4.0	74 - 110	20	
Selenium	ND	1.93	1.97	2.00	2.00	96.5	98.5	2.1	87 - 117	20	
Silver	ND	0.256	0.259	0.250	0.250	102.4	103.6	1.2	80 - 127	20	
Sodium	ND	9.79	9.97	10.0	10.0	97.9	99.7	1.8	87 - 113	20	
Thallium	ND	0.199	0.207	0.200	0.200	99.5	103.5	3.9	89 - 113	20	
Vanadium	ND	0.504	0.512	0.500	0.500	100.8	102.4	1.6	87 - 119	20	
Zinc	ND	0.476	0.495	0.500	0.500	95.2	99.0	3.9	81 - 120	20	
Lithium	ND	0.492	0.500	0.500	0.500	98.4	100.0	1.6	80 - 120	20	

MS/MSD REPORT

Project: **Navajo Mine Extension Leaching Study**
Client: **Applied Hydrology Associates, Inc.**
Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado
Workorder (SDG): B0712127
Project: Navajo Mine Extension Leaching Study
Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T071218012**

MS/MSD REPORT

Analysis: SW6010B - ICP - Total
Parent: B0712127-01A
Prep Date: 12/18/2007
Samp. Anal. Date: 12/19/2007 4:17:00PM
Units: mg/L
MS Anal. Date: 12/19/2007 4:27:00PM
MSD Anal. Date: 12/19/2007 4:42:00PM
Matrix: Aqueous

Analyte Name	SampResult	MSRes.	MSDRes	SPLev	SPDLev	Recov.	MSD Rec.	RPD	Recov Lim	RPDLim	Flag
Aluminum	0.0556	2.11	2.04	2.00	2.00	102.7	99.2	3.4	75 - 125	20	
Antimony	ND	0.497	0.482	0.500	0.500	99.4	96.4	3.1	75 - 125	20	
Arsenic	ND	2.04	1.98	2.00	2.00	102.0	99.0	3.0	75 - 125	20	
Barium	0.118	2.03	1.93	2.00	2.00	95.6	90.6	5.1	75 - 125	20	
Beryllium	ND	0.0510	0.0495	0.0500	0.0500	102.0	99.0	3.0	75 - 125	20	
Boron	0.331								75 - 125		
Cadmium	ND	0.0445	0.0459	0.0500	0.0500	89.0	91.8	3.1	75 - 125	20	
Calcium	2.89	12.9	12.7	10.0	10.0	100.1	98.1	1.6	75 - 125	20	
Chromium	ND	0.198	0.196	0.200	0.200	99.0	98.0	1.0	75 - 125	20	
Cobalt	ND	0.490	0.482	0.500	0.500	98.0	96.4	1.6	75 - 125	20	
Copper	ND	0.244	0.234	0.250	0.250	97.6	93.6	4.2	75 - 125	20	
Iron	0.0733	1.05	1.02	1.00	1.00	97.7	94.7	2.9	75 - 125	20	
Lead	ND	0.499	0.484	0.500	0.500	99.8	96.8	3.1	75 - 125	20	
Magnesium	1.24	11.4	10.9	10.0	10.0	101.6	96.6	4.5	75 - 125	20	
Manganese	ND	0.499	0.484	0.500	0.500	99.8	96.8	3.1	75 - 125	20	
Molybdenum	0.0141	0.508	0.496	0.500	0.500	98.8	96.4	2.4	75 - 125	20	
Nickel	ND	0.487	0.478	0.500	0.500	97.4	95.6	1.9	75 - 125	20	
Potassium	11.0	21.0	20.3	10.0	10.0	100.0	93.0	3.4	75 - 125	20	
Selenium	ND	2.03	1.97	2.00	2.00	101.5	98.5	3.0	75 - 125	20	
Silver	ND	0.251	0.245	0.250	0.250	100.4	98.0	2.4	75 - 125	20	
Sodium	1,180	1,230	1,180	10.0	10.0	500.0	0.0	4.1	75 - 125	20	*NOTE 2 NOTE 2*
Thallium	ND		0.167		0.200		83.5		75 - 125	20	
Vanadium	ND	0.509	0.494	0.500	0.500	101.8	98.8	3.0	75 - 125	20	
Zinc	ND	0.492	0.484	0.500	0.500	98.4	96.8	1.6	75 - 125	20	
Lithium	ND	0.578	0.548	0.500	0.500	115.6	109.6	5.3	75 - 125	20	

Workorder (SDG): B0712127

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0712127

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T071218012**

POST DIGESTION SPIKE REPORT

Analysis: SW6010B - ICP - Total

Base Sample: B0712127-01A

Prep Date: 12/18/2007

Samp. Anal. Date: 12/19/2007 4:17:00PM

Units: mg/L

PDS Anal. Date: 12/19/2007 4:48:00PM

Matrix: Aqueous

Analyte Name	SampResult	PDSRes.	SPLev	Recov.	Recov Lim	Flag	
Aluminum	0.0556	2.04	2.00	99.3	75 - 117		
Antimony	ND	0.485	0.500	96.5	75 - 117		
Arsenic	ND	1.99	2.00	99.3	75 - 116		
Barium	0.118	1.93	2.00	90.7	75 - 116		
Beryllium	ND	0.0492	0.0500	98.0	75 - 111		
Cadmium	ND	0.0447	0.0500	89.7	75 - 113		
Calcium	2.89	12.6	10.0	97.4	75 - 119		
Chromium	ND	0.193	0.200	96.4	75 - 117		
Cobalt	ND	0.477	0.500	95.0	75 - 118		
Copper	ND	0.234	0.250	93.4	75 - 117		
Iron	0.0733	1.02	1.00	94.6	75 - 121		
Lead	ND	0.487	0.500	97.1	75 - 121		
Magnesium	1.24	11.0	10.0	97.3	75 - 118		
Manganese	ND	0.482	0.500	95.9	75 - 121		
Molybdenum	0.0141	0.494	0.500	96.1	75 - 120		
Nickel	ND	0.473	0.500	94.4	75 - 117		
Potassium	11.0	20.6	10.0	96.2	75 - 110		
Selenium	ND	1.98	2.00	99.7	75 - 117		
Silver	ND	0.245	0.250	98.4	75 - 127		
Sodium	1,180	1,180	10.0	-54.9	75 - 113	lowPDS	Note 2
Thallium	ND	0.191	0.200	90.7	75 - 113		
Vanadium	ND	0.492	0.500	98.0	75 - 119		
Zinc	ND	0.482	0.500	98.8	75 - 120		
Lithium	ND	0.553	0.500	94.5	75 - 120		

SERIAL DILUTION REPORT

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0712127

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T071218012**

SERIAL DILUTION REPORT

Analysis: SW6010B - ICP - Total

Base Sample: B0712127-01A

Prep Date: 12/18/2007

Samp. Anal. Date: 12/19/2007 4:17:00PM

Units: mg/L

SER DIL. Date: 12/19/2007 4:53:00PM

Matrix: Aqueous

Analyte Name	SampResult	PQL.	MDL.	SerialRes.	SerPQL.	RPD	Flag
Aluminum	0.0556	0.050	0.014	ND	0.25		
Antimony	ND	0.050	0.0067	ND	0.25		
Arsenic	ND	0.10	0.015	ND	0.50		
Barium	0.118	0.0100	0.00016	0.133	0.050	11.9	OUT
Beryllium	ND	0.0010	0.000060	ND	0.0050		
Boron	0.331	0.050	0.0018	0.365	0.25	9.7	
Cadmium	ND	0.0060	0.00051	ND	0.030		
Calcium	2.89	0.10	0.013	3.32	0.50	13.8	OUT
Chromium	ND	0.0100	0.0018	ND	0.050		
Cobalt	ND	0.0050	0.0016	ND	0.025		
Copper	ND	0.0050	0.0019	ND	0.025		
Iron	0.0733	0.050	0.0027	ND	0.25		
Lead	ND	0.050	0.011	ND	0.25		
Magnesium	1.24	0.10	0.012	1.32	0.50	6.2	
Manganese	ND	0.0100	0.00066	ND	0.050		
Molybdenum	0.0141	0.0100	0.0018	ND	0.050		
Nickel	ND	0.040	0.0027	ND	0.20		
Potassium	11.0	1.0	0.31	12.1	5.0	9.5	
Selenium	ND	0.10	0.026	ND	0.50		
Silver	ND	0.015	0.00066	ND	0.075		
Sodium	1,180	3.0	0.028	1,310	15	10.4	OUT
Thallium	ND	0.40	0.011	ND	2.0		
Vanadium	ND	0.0100	0.00072	ND	0.050		
Zinc	ND	0.0050	0.0010	ND	0.025		
Lithium	ND	0.10	0.00072	ND	0.50		

Prep Batch: **T071218023**

LCS/LCSD REPORT

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0712127

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T071218023**

LCS/LCSD REPORT

Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg

MB: T071218023-MB

Prep Date: 12/18/2007

MB Anal. Date: 12/18/2007 5:28:28PM

Units: mg/L

LCS Anal. Date: 12/18/2007 5:31:45PM

LCSD Anal. Date: 12/18/2007 5:33:52PM

Matrix: Aqueous

Analyte Name	SampResult	LCSRes.	SDRes.	SPLev	SPDLev	Recov.	SD Recov	RPD	Recov Lim	RPDLim	Flag
Mercury	ND	0.00218	0.00214	0.00200	0.0020	109.0	107.0	1.9	80 - 120	20	

FOOTNOTES TO QC REPORT

Note 1: Results are shown to three significant figures to avoid rounding errors in calculations.

Note 2: If the sample concentration is greater than 4 times the spike level, a recovery is not meaningful, and the result should be used as a replicate. In such cases the spike is not as high as expected random measurement variability of the sample result itself.

Note 3: For sample duplicates, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample and duplicate results are not five times the PQL or greater, then the RPD is not expected to fall within the window shown and the comparison should be made on the basis of the absolute difference. Analytica uses the criterion that the absolute difference should be less than the PQL for water or less than 2XPQL for other matrices.

Note 4: For serial dilutions, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample result is not 50 times the MDL or greater, then the fact that the RPD does not meet the 10% criterion has little signifcance. Otherwise it indicates that a matrix bias may exist at the analytical step.

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0712127

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0712127

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T071218016**

LCS/LCSD REPORT

Analysis: Inorganic Anions by Ion Chromatography - Anions by IC

MB: T071218016-MB

Prep Date: 12/18/2007

MB Anal. Date: 12/18/2007 6:17:08PM

Units: mg/L

LCS Anal. Date: 12/18/2007 6:35:30PM LCSD Anal. Date: 12/18/2007 6:53:53PM Matrix: Aqueous

Analyte Name	SampResult	LCSRes.	SDRes.	SPLev	SPDLev	Recov.	SD Recov	RPD	Recov Lim	RPDLim	Flag
Fluoride	ND	2.25	2.29	2.50	2.50	90.0	91.6	1.8	90 - 110	20	
Chloride	ND	4.68	4.68	5.00	5.00	93.6	93.6	0.0	90 - 110	20	
Sulfate	ND	38.6	36.4	37.5	37.5	102.9	97.1	5.9	90 - 110	20	

Prep Batch: **T071221010**

SAMPLE DUPLICATE REPORT

Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS

Base Sample: B0712127-01B

Prep Date: 12/21/2007

Samp. Anal. Date: 12/31/2007 10:51:30AM

Units: mg/L

DUP Anal. Date: 12/31/2007 10:51:30AM

Matrix: Aqueous

Analyte Name	SampResult	DUPRes.	RPD	RPDLim	Flag
Total Dissolved Solids	3,030	3,030	0.0	20	

LCS/LCSD REPORT

Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS

MB: T071221010-MB

Prep Date: 12/21/2007

MB Anal. Date: 12/31/2007 10:51:30AM

Units: mg/L

LCS Anal. Date: 12/31/2007 10:51:30AM LCSD Anal. Date: 12/31/2007 10:51:30AM Matrix: Aqueous

Analyte Name	SampResult	LCSRes.	SDRes.	SPLev	SPDLev	Recov.	SD Recov	RPD	Recov Lim	RPDLim	Flag
Total Dissolved Solids	ND	742	753	744	744	99.7	101.2	1.5	80 - 120	20	

MS REPORT

Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS

Parent: B0712127-01B

Prep Date: 12/21/2007

Samp. Anal. Date: 12/31/2007 10:51:30AM

Units: mg/L

MS Anal. Date: 12/31/2007 10:51:30AM

Matrix: Aqueous

Analyte Name	SampResult	MSRes.	SPLev	Recov.	Recov Lim		Flag
Total Dissolved Solids	3,030	3,820	744	106.2	70 - 130	*NOTE 2*	

Workorder (SDG): B0712127

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0712127

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T071221010**

MS REPORT

Prep Batch: **T071218019**

SAMPLE DUPLICATE REPORT

Analysis: 150.1 - pH, Elecrometric - pH

Base Sample: B0712127-01B

Prep Date: 12/18/2007

Samp. Anal. Date: 12/18/2007 9:45:23AM

DUP Anal. Date: 12/18/2007 9:45:23AM

Units: pH

Matrix: Aqueous

Analyte Name	SampResult	DUPRes.	RPD	RPDLim	Flag
pH	9.01	8.95	0.7	20	

Prep Batch: **T071219013**

SAMPLE DUPLICATE REPORT

Analysis: 310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity

Base Sample: B0712127-01B

Prep Date: 12/19/2007

Samp. Anal. Date: 12/19/2007 2:30:16PM

DUP Anal. Date: 12/19/2007 2:30:16PM

Units: mg/L

Matrix: Aqueous

Analyte Name	SampResult	DUPRes.	RPD	RPDLim	Flag
Bicarbonate	1,270	1,230	3.2	20	
Carbonate	264	284	7.3	20	

LCS/LCSD REPORT

Analysis: 310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity

MB: T071219013-MB

Prep Date: 12/19/2007

MB Anal. Date: 12/19/2007 2:30:16PM

Units: mg/L

LCS Anal. Date: 12/19/2007 2:30:16PM LCSD Anal. Date: 12/19/2007 2:30:16PM

Matrix: Aqueous

Analyte Name	SampResult	LCSRes.	SDRes.	SPLev	SPDLev	Recov.	SD Recov	RPD	Recov Lim	RPDLim	Flag
Bicarbonate	ND	25.0	25.0	25.0	25.0	100.0	100.0	0.0	80 - 120	20	
Carbonate	ND	51.0	50.0	50.0	50.0	102.0	100.0	2.0	80 - 120	20	

FOOTNOTES TO QC REPORT

Note 1: Results are shown to three significant figures to avoid rounding errors in calculations.

Note 2: If the sample concentration is greater than 4 times the spike level, a recovery is not meaningful, and the result should be used as a replicate. In such cases the spike is not as high as expected random measurement variability of the sample result itself.

Note 3: For sample duplicates, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample and duplicate results are not five times the PQL or greater, then the RPD is not expected to fall within the window shown and the comparison should be made on the basis of the absolute difference. Analytica uses the criterion that the absolute difference should be less than the PQL for water or less than 2XPQL for other matrices.

Note 4: For serial dilutions, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample result is not 50 times the MDL or greater, then the fact that the RPD does not meet the 10% criterion has little signifcance. Otherwise it indicates that a matrix bias may exist at the analytical step.

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0712127

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

QC BATCH ASSOCIATIONS - BY METHOD BLANK

Lab Project ID: **82,236** **Lab Project Number:** **B0712127**

Prep Date: 12/18/2007

Lab Method Blank Id: T071218012-MB

Prep Batch ID: T071218012

Method: SW6010B - ICP - Total

This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates:

SampleNum	ClientSampleName	DataFile	AnalysisDate
B0712127-01A	MB Leachate 1	E12197A	12/19/2007 4:17:00PM
B0712127-02A	Ash Leachate 1	E12197A	12/19/2007 4:58:00PM
B0712127-03A	Ash Leachate 1 Dup	E12197A	12/19/2007 5:03:00PM
B0712127-04A	Spoil Leachate 1	E12197A	12/19/2007 5:08:00PM
B0712127-05A	Spoil Leachate 1 Dup	E12197A	12/19/2007 5:13:00PM
T071218012-LCS	LCS	E12197A	12/19/2007 4:02:00PM
T071218012-LCSD	LCSD	E12197A	12/19/2007 4:07:00PM
B0712127-01A-DUP	DUP	E12197A	12/19/2007 4:22:00PM
B0712127-01A-MS	MS	E12197A	12/19/2007 4:27:00PM
B0712127-01A-MSD	MSD	E12197A	12/19/2007 4:42:00PM
B0712127-01A-PDS	PDS	E12197A	12/19/2007 4:48:00PM
T071218012-LCSD	LCSD	E12207A	12/20/2007 12:58:00PM

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0712127

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

QC BATCH ASSOCIATIONS - BY METHOD BLANK

Lab Project ID: **82,236** **Lab Project Number:** **B0712127**

Prep Date: 12/18/2007

Lab Method Blank Id: T071218016-MB

Prep Batch ID: T071218016

Method: Inorganic Anions by Ion Chromatography - Anions by IC

This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates:

SampleNum	ClientSampleName	DataFile	AnalysisDate
T071218016-LCS	LCS	071218_019.DXD	12/18/2007 6:35:30PM
T071218016-LCSD	LCSD	071218_020.DXD	12/18/2007 6:53:53PM
B0712136-01C	Batch QC	071218_022.DXD	12/18/2007 7:30:41PM
B0712136-01C-DUP	DUP	071218_023.DXD	12/18/2007 7:49:04PM
B0712136-01C-MS	MS	071218_024.DXD	12/18/2007 8:07:29PM
B0712127-01B	MB Leachate 1	071218_026.DXD	12/18/2007 8:44:03PM
B0712127-02B	Ash Leachate 1	071218_027.DXD	12/19/2007 9:50:23AM
B0712127-03B	Ash Leachate 1 Dup	071218_028.DXD	12/19/2007 10:08:47AM
B0712127-04B	Spoil Leachate 1	071218_029.DXD	12/19/2007 10:27:11AM
B0712127-05B	Spoil Leachate 1 Dup	071218_030.DXD	12/19/2007 10:45:34AM
T071218016-LCS	LCS	071219_049.DXD	12/20/2007 3:12:25AM
T071218016-LCSD	LCSD	071219_050.DXD	12/20/2007 3:30:48AM
B0712136-01C	Batch QC	071219_052.DXD	12/20/2007 4:07:34AM
B0712136-01C-DUP	DUP	071219_053.DXD	12/20/2007 4:25:58AM
B0712136-01C-MS	MS	071219_054.DXD	12/20/2007 4:44:21AM
B0712127-03B	Ash Leachate 1 Dup	071219_058.DXD	12/20/2007 5:57:55AM
B0712127-04B	Spoil Leachate 1	071219_059.DXD	12/20/2007 6:16:18AM
B0712127-05B	Spoil Leachate 1 Dup	071219_060.DXD	12/20/2007 6:34:42AM
B0712127-01B	MB Leachate 1	071220_003.DXD	12/20/2007 5:51:04PM
B0712127-02B	Ash Leachate 1	071220_005.DXD	12/20/2007 6:27:50PM
B0712127-03B	Ash Leachate 1 Dup	071220_007.DXD	12/20/2007 7:04:36PM
B0712127-04B	Spoil Leachate 1	071220_008.DXD	12/20/2007 7:23:00PM
B0712127-05B	Spoil Leachate 1 Dup	071220_009.DXD	12/20/2007 7:41:22PM

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0712127

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

QC BATCH ASSOCIATIONS - BY METHOD BLANK

Lab Project ID: **82,236** **Lab Project Number:** **B0712127**

Prep Date: 12/18/2007

Lab Method Blank Id: T071218023-MB
Prep Batch ID: T071218023
Method: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg

This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates:

SampleNum	ClientSampleName	DataFile	AnalysisDate
J0712041-01B-MS	MS	B1218072.WKS	12/19/2007 12:58:57PM
B0712127-01A	MB Leachate 1	B121807W.WKS	12/18/2007 5:51:20PM
B0712127-02A	Ash Leachate 1	B121807W.WKS	12/18/2007 5:58:45PM
B0712127-03A	Ash Leachate 1 Dup	B121807W.WKS	12/18/2007 6:00:49PM
B0712127-04A	Spoil Leachate 1	B121807W.WKS	12/18/2007 6:03:02PM
B0712127-05A	Spoil Leachate 1 Dup	B121807W.WKS	12/18/2007 6:05:14PM
J0712041-01B	Batch QC	B121807W.WKS	12/18/2007 6:13:47PM
T071218023-LCS	LCS	B121807W.WKS	12/18/2007 5:31:45PM
T071218023-LCSD	LCSD	B121807W.WKS	12/18/2007 5:33:52PM
J0712041-01B-DUP	DUP	B121807W.WKS	12/18/2007 6:15:51PM
J0712041-01B-MSD	MSD	B121807W.WKS	12/18/2007 6:25:46PM
J0712041-01B-PDS	PDS	B121807W.WKS	12/18/2007 6:27:55PM

Prep Date: 12/19/2007

Lab Method Blank Id: T071219013-MB
Prep Batch ID: T071219013
Method: 310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity

This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates:

SampleNum	ClientSampleName	DataFile	AnalysisDate
B0712127-01B	MB Leachate 1		12/19/2007 2:30:16PM
B0712127-02B	Ash Leachate 1		12/19/2007 2:30:16PM
B0712127-03B	Ash Leachate 1 Dup		12/19/2007 2:30:16PM
B0712127-04B	Spoil Leachate 1		12/19/2007 2:30:16PM
B0712127-05B	Spoil Leachate 1 Dup		12/19/2007 2:30:16PM
T071219013-LCS	LCS		12/19/2007 2:30:16PM
T071219013-LCSD	LCSD		12/19/2007 2:30:16PM
B0712127-01B-DUP	DUP		12/19/2007 2:30:16PM

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0712127

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

QC BATCH ASSOCIATIONS - BY METHOD BLANK

Lab Project ID: **82,236** **Lab Project Number:** **B0712127**

Prep Date: 12/21/2007

Lab Method Blank Id: T071221010-MB

Prep Batch ID: T071221010

Method: 160.1 - Total Dissolved Solids dried at 180°C - TDS

This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates:

SampleNum	ClientSampleName	DataFile	AnalysisDate
B0712127-01B	MB Leachate 1		12/31/2007 10:51:30AM
B0712127-02B	Ash Leachate 1		12/31/2007 10:51:30AM
B0712127-03B	Ash Leachate 1 Dup		12/31/2007 10:51:30AM
B0712127-04B	Spoil Leachate 1		12/31/2007 10:51:30AM
B0712127-05B	Spoil Leachate 1 Dup		12/31/2007 10:51:30AM
T071221010-LCS	LCS		12/31/2007 10:51:30AM
T071221010-LCSD	LCSD		12/31/2007 10:51:30AM
B0712127-01B-DUP	DUP		12/31/2007 10:51:30AM
B0712127-01B-MS	MS		12/31/2007 10:51:30AM

Workorder (SDG): B0712127

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

DATA FLAGS AND DEFINITIONS

The PQL is the Method Quantitation Limit as defined by USACE.
Reporting Limit: Limit below which results are shown as "ND". This may be the PQL, MDL, or a value between. See the report conventions below.

Result Field:

- ND = Not Detected at or above the Reporting Limit
- NA = Analyte not applicable (see Case Narrative for discussion)

Qualifier Fields:

- LOW = Recovery is below Lower Control Limit
- HIGH = Recovery , RPD, or other parameter is above Upper Control Limit
- E = Reported concentration is above the instrument calibration upper range

Organic Analysis Flags:

- B = Analyte was detected in the laboratory method blank
- J = Analyte was detected above MDL or Reporting Limit but below the Quant Limit (PQL)

Inorganic Analysis Flags:

- J = Analyte was detected above the Reporting Limit but below the Quant Limit (PQL)
- W = Post digestion spike did not meet criteria
- S = Reported value determined by the Method of Standard Additions (MSA)

Several ways of defining the limit of detection and quantitation are prevalent in the laboratory industry and may appear in Analytica reports. These include the following:

- MRL = "minimum reporting level", from the EPA Safe Drinking Water program (SDW)
- PQL = "practical quantitation limit", from SW-846
- EQL = "estimated quantitation limit", from SW-846
- LOQ = "limit of quantitation", from a number of authoritative sources

In Analytica's work, all of these terms have the same meaning, equivalent to the EPA definition of the MRL. This reporting level is supported by a satisfactory calibration data point which is at that level or lower, and also is supported by a method detection limit (MDL) determined by the procedure in 40CFR. The MDL is lower than the MRL and represents an estimate of the level where positive detections have a 99% probability of being real, but where quantitation accuracy is unknown.

The MRL as defined by Analytica is the lowest demonstrated point of known quantitation accuracy.
The MRL should not be confused with the MCL, which is the EPA-defined "maximum contaminant level" allowed for certain regulated targets under specific regulations, such as the National Primary Drinking Water Regulations. Normally, the MRL is set at a level which is much lower than the MCL in order to ensure that levels are well below those limits. Not all target analytes have MCL levels established.

Other Flags may be applied. See Case Narrative for Description

Workorder (SDG): B0712127

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

REPORTING CONVENTIONS FOR THIS REPORT

B0712127

TestPkgName	Basis	# Sig Figs	Reporting Limit
150.1/150.1 (Aqueous) - pH	As Received	2	Report to PQL
160.1/160.1 (Aqueous) - TDS	As Received	2	Report to PQL
300.0/300.0 (Aqueous) - Anions by IC	As Received	2	Report to PQL
310.1/310.1 (Aqueous) - Alkalinity	As Received	2	Report to PQL
6010B/3010A (Aqueous) - Total	As Received	2	Report to PQL
7470A/7470A (Aqueous) - Total Hg	As Received	2	Report to PQL

ANALYTICA GROUP®

Analytica Chain of Custody Form

Page ____ of ____

12189 Pennsylvania St. Thornton, CO 80241 (303) 469-8868 (303) 469-5254 fax
4307 Arctic Boulevard Anchorage, AK 99503 (907) 258-2155 (907) 258-6634 fax
475 Hall St. Fairbanks, AK 99701 (907) 456-3116 (907) 456-3125 Fax
5438 Shaune Drive Juneau, AK 99801 (907) 780-6668 (907) 780-6670 fax

Chain of Custody No: 62854

Client Name & Address: Applied Hydrology Associates, Inc.

Public Water System (PWS) ID#:

Project Name: Navajo Mine Extension Leaching Study

Section To be Completed by Analytica

Quote ID: | LGN: B0712127
Account #: 030188 | Cash | Credit Card

Report to:

Phone No:

Fax No:

E-mail:

Turnaround Time for Results (TAT)

___ Standard ___ **Expedited** (< 10 days, prior authorization required) *(please specify due date below; add'l charges may apply)*

Requested Due Date for Results:

Invoice to Name & Address:

Special Instructions/Comments: Tumbled in house by R.S.
Duplicate 18 hour tumble step 1

P.O. or Contract No:

Kit Prep/Shipping Charge: $

Client Sample Identification / Location	Date Sampled	Time Sampled	Matrix (S-DW-WW-Other)	No. of Containers	6010B/3010A - TTL	Lot #: Pres:	7470A/7470A - Hg	Lot #: Pres:	150.1 pH	Lot #: Pres:	160.1 TDS	Lot #: Pres:	300.0 Anions/IC	Lot #: Pres:	310.1 Alk	Lot #: Pres:		Lot #: Pres:	Field Preserved	Field Filtered	MS/MSD ?
MB Leachate 1	12/17/07	0940	other	2	X		X		X		X		X		X						
Ash leachate 1	↓	↓	↓	↓	↓		↓		↓		↓		↓		↓						
Ash Leachate 1 Dup	↓	↓	↓	↓	↓		↓		↓		↓		↓		↓						
Spoil leachate 1	↓	↓	↓	↓	↓		↓		↓		↓		↓		↓						
Spoil leachate 1 Dup	↓	↓	↓	↓	↓		↓		↓		↓		↓		↓						

Relinquished by:	Date	Time	Received by:	Date	Time
R. Seeman	12/17/07	1510	[signature]	12/17/07	15:10
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time

Name of Sampler: (printed)

Section To Be Completed by Analytica

	THO	ANC	JNU	FBKS
Condition of Custody Seal?:				
Initialed By:				
Temp/Loc:				
Thermo ID#:				
Shipped Via:				

Version 2.0

ANALYTICA

Cooler Receipt Form

Client: Applied Hydrology Associates **Client Code:** 030188 **Order #:** B0712127
Project: Navajo Mine Extension Leaching Study

Cooler ID: 1

A. Preliminary Examination Phase:

Date cooler opened: 12/17/2007
Cooler opened by: gp **Signature:** GP

1. **Was airbill Attached?** N/A **Airbill #:** **Carrier Name:** Other
2. **Custody Seals?** N/A **How many?** 0 **Location:** **Seal Name:**
3. **Seals intact?** N/A
4. **COC Attached?** Yes **Properly Completed?** Yes **Signed by AEL employee?** Yes
5. **Project Identification from custody paper:** Navajo Mine Extension Leaching Study
6. **Preservative:** None **Temperature:** 20.0 **deg. C**

Designated person initial here to acknowledge receipt: GP **Date:** 12/17/07

COMMENTS:

B. Log-In Phase: **Samples Log-in Date:** 12/17/2007 **Log-in By:** gp

1. **Packing Type:** Other
2. **Were samples in separate bags?** N/A
3. **Were containers intact?** Yes **Labels agree with COC?** Yes
4. **Number of bottles received:** 10 **Number of samples received:** 5
5. **Correct containers used?** Yes **Correct preservatives added?** Yes
6. **Sufficient sample volume?** Yes
7. **Bubbles in VOA samples?** N/A
8. **Was Project manager called and status discussed?** No
9. **Was anyone called?** No **Who was called?** ______ **By whom?** ______ **Date:** ______

COMMENTS:

The Analytica Group
CLIENT INVOICE

Remit to:	Accounting Dpt Analytica Environmental Laboratories, Inc. P.O. Box 973426 Dallas,TX 75397-3426	**Invoice #:**	**81993**
		Work Order#:	**B0801027**
		Account#:	030188
		Quote ID#:	11340
		Invoice Date:	1/21/2008
		Work ID:	Navajo Mine Extension Leaching Study
Phone:	(303) 469-8868	**PO #:**	none
Attention:	Mr.Art O'Hayre	**Received:**	1/7/2008
Invoice to:	Applied Hydrology Associates, Inc. 950 South Cherry Street Suite 810 Denver, CO 80246	**Reported:**	1/21/2008
		Client Project#:	Navajo Mine Extension Leach

Comments:

Item charges		**Qty**	**Price**	**Total**
SW7470A - Mercury in Liquid Waste by CVAA - Total Hg In Aqueous	M	2	35.00	70.00
160.1 - Total Dissolved Solids dried at 180°C - TDS In Liquid	Matrix	2	22.00	44.00
150.1 - pH, Elecrometric - pH In Liquid	Matrix	2	10.00	20.00
SW6010B - ICP - Total In Aqueous	Matrix	2	312.00	624.00
Inorganic Anions by Ion Chromatography - Anions by IC In Liquid	Matrix	2	54.00	108.00
310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity In Liquid	Matrix	2	36.00	72.00
	Total of Items Above:			**$938.00**

Adjustments or Special Services	**Qty**	**Price**	**Total**
One Gallon of DI water	4	24.00	96.00
Tumbling Charge	1	95.00	95.00
Total of Items Above:			**$191.00**

Grand Total: **$1,129.00**

All invoices are due and payable upon receipt. Outstanding balances over 30 days are subject to a finance charge of 1.5% per month, plus a late fee of $25.00. If Analytica engages legal counsel to enforce its rights or any other rights under an application for payment, the customer will be liable to Analytica for all costs of collection and other legal expenses, including reasonable attorney fees.

The Analytica Group
CLIENT INVOICE

REMITTANCE ADVICE
PLEASE RETURN THIS PORTION WITH YOUR PAYMENT

Mr.Art O'Hayre		**Account#:**	030188
Applied Hydrology Associates, Inc.		**Invoice #:**	**81993**
950 South Cherry Street		**Invoice Date:**	1/21/2008
Suite 810 Denver, CO 80246			

TOTAL INVOICE AMOUNT: **$1,129.00**

PAYMENT AMOUNT ENCLOSED: ____________________

ANALYTICA
Environmental Laboratories

Analytica Environmental
Laboratories, Inc.
12189 Pennsylvania Street
Thornton, CO 80241
Phone: 303-469-8868
Fax: 303-469-5254

1/21/2008

Applied Hydrology Associates, Inc.
950 South Cherry Street
Suite 810
Denver, CO 80246
Attn: Art O'Hayre

Work Order #: B0801027
Date: 1/21/2008
Work ID: Navajo Mine Extension Leaching Study
Date Received: 1/7/2008
Proj #: none

Sample Identification

Lab Sample Number	Client Description	Lab Sample Number	Client Description
B0801027-01	MB	B0801027-02	4 Corners PP Bottom Ash Leac

Enclosed are the analytical results for the submitted sample(s). Please review the CASE NARRATIVE for a discussion of any data and/or quality control issues. Listings of data qualifiers, analytical codes, key dates, and QC relationships are provided at the end of the report.

Sincerely,

Kristen Stone
Project Manager

"The Science of Analysis, The Art of Service"

Case Narrative

Analytica Environmental Laboratories, Inc.
Work Order: B0801027

Samples were prepared and analyzed according to EPA or equivalent methods outlined in the following references:

Methods for Chemical Analysis of Water and Wastes, USEPA 600/4-79-020, March 1983.

Pfaff, J. D., C. A. Brockhoff and J. W. O'Dell. 1994. The Determination of Inorganic Anions in Water by Ion Chromatography. Method 300.0A. U. S. Environmental Protection Agency. Environmental Monitoring Systems Lab.

Methods for the Determination of Metals in Environmental Samples, EPA/600/R-94/111, May 1994.

SAMPLE RECEIPT:
Two (2) samples were received on 1/7/2008 1:55:00 PM., at a temperature of 3.1 deg C., at Analytica-Thornton. The samples were received in good condition and in order per chain of custody. The samples were tumbled upon arrival to the laboratory.

REVIEW FOR COMPLIANCE WITH ANALYTICA QA PLAN
A summary of our review is shown below.

All analytical results contained in this report have been reviewed under Analytica's internal quality assurance and quality control program. Any deviations in quality control parameters for specific analyses are noted in the following text. A complete quality assurance report, including laboratory control, matrix spike, and sample duplicate recoveries is kept on file in our office and is available upon request.

All method specifications were met for the following tests:

Test Method: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg - Aqueous
Test Method: 150.1 - pH, Elecrometric - pH - Aqueous
Test Method: 160.1 - Total Dissolved Solids dried at 180°C - TDS - Aqueous
Test Method: Inorganic Anions by Ion Chromatography - Anions by IC - Aqueous

Test Method: 310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity - Aqueous

MS/MSD and DUP OUTLIERS:
As shown below, the MS was outside of limits for Bicarbonate and Carbonate. Bicarbonate had a sample concentration that was greater than four times the spike amount. In these cases it is not appropriate to calculate a recovery. The result should be used as a replicate. The MS recovery of Carbonate was slightly low. No corrective action was taken, as the recoveries of this compounds in the LCS/LCSD were acceptable.

Type	Client Sample	LabSample	Analyte	Recovery	LCL	UCL	Parent	Spike
MS	4 Corners PP Bot	B0801027-02B	Bicarbonate	56.0	70	130	1250	50.0
MS	4 Corners PP Bot	B0801027-02B	Carbonate	68.0	70	130	228	100

Test Method: SW6010B - ICP - Total - Aqueous

MS/MSD and DUP OUTLIERS:

As shown below, the MS/MSD were outside of the limits for Sodium. Sodium had a sample concentration that was greater than four times the spike amount. In these cases it is not appropriate to calculate a recovery. The result should be used as a replicate. The MSD recovery of Potassium is slightly low. No corrective action was taken, as the recovery of Pottasium in the LCS/LCSD/MS were acceptable.

Type	Client Sample	LabSample	Analyte	Recovery	LCL	UCL	Parent	Spike
MS	4 Corners PP Bot	B0801027-02A	Sodium	-149	75	125	1130	10.0
MSD	4 Corners PP Bot	B0801027-02A	Potassium	71.2	75	125	10.9	10.0
MSD	4 Corners PP Bot	B0801027-02A	Sodium	-607	75	125	1130	10.0

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801027

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **MB**

Matrix: Aqueous | Collection Date: 1/4/2008 1:20:00PM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0801027-01A	Analysis Date:	1/8/2008 5:17:11PM
Prep Date:	1/8/2008	Instrument:	CVAA_1
Analytical Method ID:	SW7470A - Mercury in Liquid Waste by CVAA - Total Hg	File Name:	B010807W.W
Prep Method ID:	7470A	Dilution Factor:	1
Prep Batch Number:	T080108012		
Report Basis:	As Received	Analyst Initials:	DL
Sample prep wt./vol:	30.00 ml	Prep Extract Vol:	30.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Mercury	7439-97-6	**ND**		mg/L	0.00020	0.000050	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0801027-01A	Analysis Date:	1/8/2008 7:53:00PM
Prep Date:	1/8/2008	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E01088A
Prep Method ID:	3010_ICP	Dilution Factor:	1
Prep Batch Number:	T080108015		
Report Basis:	As Received	Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Aluminum	7429-90-5	**0.058**		mg/L	0.050	0.014	1
Antimony	7440-36-0	**ND**		mg/L	0.050	0.0067	
Arsenic	7440-38-2	**ND**		mg/L	0.10	0.015	
Barium	7440-39-3	**0.088**		mg/L	0.010	0.00016	
Cadmium	7440-43-9	**ND**		mg/L	0.0060	0.00051	
Calcium	7440-70-2	**2.4**		mg/L	0.10	0.013	
Chromium	7440-47-3	**ND**		mg/L	0.010	0.0018	
Cobalt	7440-48-4	**ND**		mg/L	0.0050	0.0016	
Copper	7440-50-8	**0.0073**		mg/L	0.0050	0.0019	
Iron	7439-89-6	**ND**		mg/L	0.050	0.0027	
Lead	7439-92-1	**ND**		mg/L	0.050	0.011	
Lithium	7439-93-2	**ND**		mg/L	0.10	0.00072	
Magnesium	7439-96-4	**1.2**		mg/L	0.10	0.012	
Manganese	7439-96-5	**ND**		mg/L	0.010	0.00066	
Molybdenum	7439-98-7	**ND**		mg/L	0.010	0.0018	
Nickel	7440-02-0	**ND**		mg/L	0.040	0.0027	
Potassium	7440-09-7	**11**		mg/L	1.0	0.31	
Selenium	7784-49-2	**ND**		mg/L	0.10	0.026	
Silver	7440-22-4	**ND**		mg/L	0.015	0.00066	
Sodium	7440-23-5	**1,200**		mg/L	3.0	0.028	
Vanadium	7440-62-2	**ND**		mg/L	0.010	0.00072	

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801027

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **MB**

Matrix: Aqueous — Collection Date: 1/4/2008 1:20:00PM

Lab Sample Number:	B0801027-01A	Analysis Date:	1/8/2008 7:53:00PM
Prep Date:	1/8/2008	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E01088A
Prep Method ID:	3010_ICP	Dilution Factor:	1
Prep Batch Number:	T080108015		
Report Basis:	As Received	Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Zinc	7440-66-6	**ND**		mg/L	0.0050	0.0010	1

Lab Sample Number:	B0801027-01A	Analysis Date:	1/9/2008 1:35:00PM
Prep Date:	1/8/2008	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E01098A
Prep Method ID:	3010_ICP	Dilution Factor:	1
Prep Batch Number:	T080108015		
Report Basis:	As Received	Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Beryllium	7440-41-7	**ND**		mg/L	0.0010	0.000060	2
Boron	7440-42-8	**0.35**		mg/L	0.050	0.0018	
Thallium	7440-28-0	**ND**		mg/L	0.40	0.011	

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0801027-01B	Analysis Date:	1/17/2008 2:31:55PM
Prep Date:	1/17/2008	Instrument:	Titrametric
Analytical Method ID:	310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity	File Name:	
Prep Method ID:	Alkalinity_W	Dilution Factor:	1
Prep Batch Number:	T080117013		
Report Basis:	As Received	Analyst Initials:	kl
Sample prep wt./vol:	50.00 ml	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Bicarbonate		**1,300**		mg/L	5.0	1.5	1
Carbonate		**220**		mg/L	7.0	1.2	

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0801027-01B	Analysis Date:	1/5/2008 9:29:27AM
Prep Date:	1/5/2008	Instrument:	Probe
Analytical Method ID:	150.1 - pH, Elecrometric - pH	File Name:	
Prep Method ID:	150.1	Dilution Factor:	1
Prep Batch Number:	T080117001		
Report Basis:	As Received	Analyst Initials:	rs
Sample prep wt./vol:	10.00 ml	Prep Extract Vol:	10.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801027

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **MB**

Matrix: Aqueous

Collection Date: 1/4/2008 1:20:00PM

Lab Sample Number: B0801027-01B
Analysis Date: 1/5/2008 9:29:27AM
Prep Date: 1/5/2008
Instrument: Probe
Analytical Method ID: 150.1 - pH, Elecrometric - pH
File Name:
Prep Method ID: 150.1
Dilution Factor: 1
Prep Batch Number: T080117001
Report Basis: As Received
Analyst Initials: rs
Sample prep wt./vol: 10.00 ml
Prep Extract Vol: 10.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
pH		**9.0**		pH	0.10	0.10	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number: B0801027-01B
Analysis Date: 1/16/2008 1:50:18PM
Prep Date: 1/11/2008
Instrument: SCALE
Analytical Method ID: 160.1 - Total Dissolved Solids dried at 180°C - TDS
File Name:
Prep Method ID: 160.1
Dilution Factor: 1
Prep Batch Number: T080111013
Report Basis: As Received
Analyst Initials: KLibhart
Sample prep wt./vol: 100.00 ml
Prep Extract Vol: 1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Total Dissolved Solids		**3,100**		mg/L	10	8.2	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number: B0801027-01B
Analysis Date: 1/8/2008 2:44:31AM
Prep Date: 1/7/2008
Instrument: IC
Analytical Method ID: Inorganic Anions by Ion Chromatography - Anions by IC
File Name: 080107_047.D
Prep Method ID: 300.0
Dilution Factor: 25
Prep Batch Number: T080107001
Report Basis: As Received
Analyst Initials: CS
Sample prep wt./vol: 20.00 ml
Prep Extract Vol: 20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Chloride		**630**		mg/L	20	1.1	1

Lab Sample Number: B0801027-01B
Analysis Date: 1/8/2008 3:21:16AM
Prep Date: 1/7/2008
Instrument: IC
Analytical Method ID: Inorganic Anions by Ion Chromatography - Anions by IC
File Name: 080107_049.D
Prep Method ID: 300.0
Dilution Factor: 1
Prep Batch Number: T080107001
Report Basis: As Received
Analyst Initials: CS
Sample prep wt./vol: 20.00 ml
Prep Extract Vol: 20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Fluoride		**2.2**		mg/L	0.40	0.031	3
Sulfate		**280**		mg/L	1.5	0.11	

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801027

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **4 Corners PP Bottom Ash Leachate**

Matrix: Aqueous — Collection Date: 1/4/2008 1:20:00PM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0801027-02A	Analysis Date:	1/8/2008 5:19:17PM
Prep Date:	1/8/2008	Instrument:	CVAA_1
Analytical Method ID:	SW7470A - Mercury in Liquid Waste by CVAA - Total Hg	File Name:	B010807W.W
Prep Method ID:	7470A	Dilution Factor:	1
Prep Batch Number:	T080108012		
Report Basis:	As Received	Analyst Initials:	DL
Sample prep wt./vol:	30.00 ml	Prep Extract Vol:	30.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Mercury	7439-97-6	**ND**		mg/L	0.00020	0.000050	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0801027-02A	Analysis Date:	1/8/2008 7:58:00PM
Prep Date:	1/8/2008	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E01088A
Prep Method ID:	3010_ICP	Dilution Factor:	1
Prep Batch Number:	T080108015		
Report Basis:	As Received	Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Aluminum	7429-90-5	**0.20**		mg/L	0.050	0.014	1
Antimony	7440-36-0	**ND**		mg/L	0.050	0.0067	
Arsenic	7440-38-2	**ND**		mg/L	0.10	0.015	
Barium	7440-39-3	**0.13**		mg/L	0.010	0.00016	
Cadmium	7440-43-9	**ND**		mg/L	0.0060	0.00051	
Calcium	7440-70-2	**3.1**		mg/L	0.10	0.013	
Chromium	7440-47-3	**ND**		mg/L	0.010	0.0018	
Cobalt	7440-48-4	**ND**		mg/L	0.0050	0.0016	
Copper	7440-50-8	**ND**		mg/L	0.0050	0.0019	
Iron	7439-89-6	**0.054**		mg/L	0.050	0.0027	
Lead	7439-92-1	**ND**		mg/L	0.050	0.011	
Lithium	7439-93-2	**ND**		mg/L	0.10	0.00072	
Magnesium	7439-96-4	**1.3**		mg/L	0.10	0.012	
Manganese	7439-96-5	**ND**		mg/L	0.010	0.00066	
Molybdenum	7439-98-7	**ND**		mg/L	0.010	0.0018	
Nickel	7440-02-0	**ND**		mg/L	0.040	0.0027	
Potassium	7440-09-7	**11**		mg/L	1.0	0.31	
Selenium	7784-49-2	**ND**		mg/L	0.10	0.026	
Silver	7440-22-4	**ND**		mg/L	0.015	0.00066	
Sodium	7440-23-5	**1,100**		mg/L	3.0	0.028	
Vanadium	7440-62-2	**ND**		mg/L	0.010	0.00072	

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801027

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: **Client Sample Report**

Client Sample Name: **4 Corners PP Bottom Ash Leachate**

Matrix: Aqueous — Collection Date: 1/4/2008 1:20:00PM

Lab Sample Number: B0801027-02A — Analysis Date: 1/8/2008 7:58:00PM
Prep Date: 1/8/2008 — Instrument: ICP_2
Analytical Method ID: SW6010B - ICP - Total — File Name: E01088A
Prep Method ID: 3010_ICP — Dilution Factor: 1
Prep Batch Number: T080108015
Report Basis: As Received — Analyst Initials: rm
Sample prep wt./vol: 50.00 ml — Prep Extract Vol: 50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Zinc	7440-66-6	**ND**		mg/L	0.0050	0.0010	1

Lab Sample Number: B0801027-02A — Analysis Date: 1/9/2008 1:40:00PM
Prep Date: 1/8/2008 — Instrument: ICP_2
Analytical Method ID: SW6010B - ICP - Total — File Name: E01098A
Prep Method ID: 3010_ICP — Dilution Factor: 1
Prep Batch Number: T080108015
Report Basis: As Received — Analyst Initials: rm
Sample prep wt./vol: 50.00 ml — Prep Extract Vol: 50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Beryllium	7440-41-7	**ND**		mg/L	0.0010	0.000060	3
Boron	7440-42-8	**0.39**		mg/L	0.050	0.0018	
Thallium	7440-28-0	**ND**		mg/L	0.40	0.011	

The following test was conducted by: Analytica - Thornton

Lab Sample Number: B0801027-02B — Analysis Date: 1/17/2008 2:31:55PM
Prep Date: 1/17/2008 — Instrument: Titrametric
Analytical Method ID: 310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity — File Name:
Prep Method ID: Alkalinity_W — Dilution Factor: 1
Prep Batch Number: T080117013
Report Basis: As Received — Analyst Initials: kl
Sample prep wt./vol: 50.00 ml — Prep Extract Vol: 50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Bicarbonate		**1,300**		mg/L	5.0	1.5	1
Carbonate		**230**		mg/L	7.0	1.2	

The following test was conducted by: Analytica - Thornton

Lab Sample Number: B0801027-02B — Analysis Date: 1/5/2008 9:29:27AM
Prep Date: 1/5/2008 — Instrument: Probe
Analytical Method ID: 150.1 - pH, Elecrometric - pH — File Name:
Prep Method ID: 150.1 — Dilution Factor: 1
Prep Batch Number: T080117001
Report Basis: As Received — Analyst Initials: rs
Sample prep wt./vol: 10.00 ml — Prep Extract Vol: 10.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801027

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **4 Corners PP Bottom Ash Leachate**

Matrix: Aqueous — Collection Date: 1/4/2008 1:20:00PM

Lab Sample Number: B0801027-02B — Analysis Date: 1/5/2008 9:29:27AM
Prep Date: 1/5/2008 — Instrument: Probe
Analytical Method ID: 150.1 - pH, Elecrometric - pH — File Name:
Prep Method ID: 150.1 — Dilution Factor: 1
Prep Batch Number: T080117001
Report Basis: As Received — Analyst Initials: rs
Sample prep wt./vol: 10.00 ml — Prep Extract Vol: 10.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
pH		**9.0**		pH	0.10	0.10	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number: B0801027-02B — Analysis Date: 1/16/2008 1:50:18PM
Prep Date: 1/11/2008 — Instrument: SCALE
Analytical Method ID: 160.1 - Total Dissolved Solids dried at 180°C - TDS — File Name:
Prep Method ID: 160.1 — Dilution Factor: 1
Prep Batch Number: T080111013
Report Basis: As Received — Analyst Initials: KLibhart
Sample prep wt./vol: 100.00 ml — Prep Extract Vol: 1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Total Dissolved Solids		**3,100**		mg/L	10	8.2	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number: B0801027-02B — Analysis Date: 1/8/2008 3:58:04AM
Prep Date: 1/7/2008 — Instrument: IC
Analytical Method ID: Inorganic Anions by Ion Chromatography - Anions by IC — File Name: 080107_051.D
Prep Method ID: 300.0 — Dilution Factor: 25
Prep Batch Number: T080107001
Report Basis: As Received — Analyst Initials: CS
Sample prep wt./vol: 20.00 ml — Prep Extract Vol: 20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Chloride		**630**		mg/L	20	1.1	1

Lab Sample Number: B0801027-02B — Analysis Date: 1/8/2008 4:34:49AM
Prep Date: 1/7/2008 — Instrument: IC
Analytical Method ID: Inorganic Anions by Ion Chromatography - Anions by IC — File Name: 080107_053.D
Prep Method ID: 300.0 — Dilution Factor: 1
Prep Batch Number: T080107001
Report Basis: As Received — Analyst Initials: CS
Sample prep wt./vol: 20.00 ml — Prep Extract Vol: 20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Fluoride		**2.2**		mg/L	0.40	0.031	3
Sulfate		**280**		mg/L	1.5	0.11	

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801027

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Method Blank Report

Client Sample Name: **MB**

Matrix: Aqueous

Collection Date: 1/8/2008 12:00:00AM

The following test was conducted by: Analytica - Thornton

Lab Sample Number: T080108012-MB
Analysis Date: 1/8/2008 5:04:24PM
Prep Date: 1/8/2008
Instrument: CVAA_1
Analytical Method ID: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg
File Name: B010807W.W
Prep Method ID: 7470A
Dilution Factor: 1
Prep Batch Number: T080108012
Report Basis: As Received
Analyst Initials: DL
Sample prep wt./vol: 30.00 ml
Prep Extract Vol: 30.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Mercury	7439-97-6	**ND**		mg/L	0.00020	0.000050	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number: T080108015-MB
Analysis Date: 1/8/2008 7:38:00PM
Prep Date: 1/8/2008
Instrument: ICP_2
Analytical Method ID: SW6010B - ICP - Total
File Name: E01088A
Prep Method ID: 3010_ICP
Dilution Factor: 1
Prep Batch Number: T080108015
Report Basis: As Received
Analyst Initials: rm
Sample prep wt./vol: 50.00 ml
Prep Extract Vol: 50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Aluminum	7429-90-5	**ND**		mg/L	0.050	0.014	1
Antimony	7440-36-0	**ND**		mg/L	0.050	0.0067	
Arsenic	7440-38-2	**ND**		mg/L	0.10	0.015	
Barium	7440-39-3	**ND**		mg/L	0.010	0.00016	
Cadmium	7440-43-9	**ND**		mg/L	0.0060	0.00051	
Calcium	7440-70-2	**ND**		mg/L	0.10	0.013	
Chromium	7440-47-3	**ND**		mg/L	0.010	0.0018	
Cobalt	7440-48-4	**ND**		mg/L	0.0050	0.0016	
Copper	7440-50-8	**ND**		mg/L	0.0050	0.0019	
Iron	7439-89-6	**ND**		mg/L	0.050	0.0027	
Lead	7439-92-1	**ND**		mg/L	0.050	0.011	
Lithium	7439-93-2	**ND**		mg/L	0.10	0.00072	
Magnesium	7439-96-4	**ND**		mg/L	0.10	0.012	
Manganese	7439-96-5	**ND**		mg/L	0.010	0.00066	
Molybdenum	7439-98-7	**ND**		mg/L	0.010	0.0018	
Nickel	7440-02-0	**ND**		mg/L	0.040	0.0027	
Potassium	7440-09-7	**ND**		mg/L	1.0	0.31	
Selenium	7784-49-2	**ND**		mg/L	0.10	0.026	
Silver	7440-22-4	**ND**		mg/L	0.015	0.00066	
Sodium	7440-23-5	**ND**		mg/L	3.0	0.028	
Vanadium	7440-62-2	**ND**		mg/L	0.010	0.00072	

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801027

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Method Blank Report

Client Sample Name: **MB**

Matrix: Aqueous | Collection Date: 1/8/2008 12:00:00AM

Lab Sample Number:	T080108015-MB	Analysis Date:	1/8/2008 7:38:00PM
Prep Date:	1/8/2008	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E01088A
Prep Method ID:	3010_ICP	Dilution Factor:	1
Prep Batch Number:	T080108015		
Report Basis:	As Received	Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Zinc	7440-66-6	**ND**		mg/L	0.0050	0.0010	1

Lab Sample Number:	T080108015-MB	Analysis Date:	1/9/2008 1:05:00PM
Prep Date:	1/8/2008	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E01098A
Prep Method ID:	3010_ICP	Dilution Factor:	1
Prep Batch Number:	T080108015		
Report Basis:	As Received	Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Beryllium	7440-41-7	**ND**		mg/L	0.0010	0.000060	2
Boron	7440-42-8	**ND**		mg/L	0.050	0.0018	
Thallium	7440-28-0	**ND**		mg/L	0.40	0.011	

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	T080117013-MB	Analysis Date:	1/17/2008 2:31:55PM
Prep Date:	1/17/2008	Instrument:	Titrametric
Analytical Method ID:	310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity	File Name:	
Prep Method ID:	Alkalinity_W	Dilution Factor:	1
Prep Batch Number:	T080117013		
Report Basis:	As Received	Analyst Initials:	kl
Sample prep wt./vol:	100.00 ml	Prep Extract Vol:	100.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Bicarbonate		**ND**		mg/L	5.0	1.5	1
Carbonate		**ND**		mg/L	7.0	1.2	

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	T080111013-MB	Analysis Date:	1/16/2008 1:50:18PM
Prep Date:	1/11/2008	Instrument:	SCALE
Analytical Method ID:	160.1 - Total Dissolved Solids dried at 180°C - TDS	File Name:	
Prep Method ID:	160.1	Dilution Factor:	1
Prep Batch Number:	T080111013		
Report Basis:	As Received	Analyst Initials:	KLibhart
Sample prep wt./vol:	100.00 ml	Prep Extract Vol:	1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801027

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Method Blank Report

Client Sample Name: **MB**

Matrix: Aqueous   Collection Date: 1/11/2008 12:00:00AM

Lab Sample Number:	T080111013-MB	Analysis Date:	1/16/2008 1:50:18PM
Prep Date:	1/11/2008	Instrument:	SCALE
Analytical Method ID:	160.1 - Total Dissolved Solids dried at 180°C - TDS	File Name:	
Prep Method ID:	160.1	Dilution Factor:	1
Prep Batch Number:	T080111013		
Report Basis:	As Received	Analyst Initials:	KLibhart
Sample prep wt./vol:	100.00 ml	Prep Extract Vol:	1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Total Dissolved Solids		**ND**		mg/L	10	8.2	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	T080107001-MB	Analysis Date:	1/8/2008 12:12:51PM
Prep Date:	1/7/2008	Instrument:	IC
Analytical Method ID:	Inorganic Anions by Ion Chromatography - Anions by IC	File Name:	080108_009.D
Prep Method ID:	300.0	Dilution Factor:	1
Prep Batch Number:	T080107001		
Report Basis:	As Received	Analyst Initials:	KB
Sample prep wt./vol:	20.00 ml	Prep Extract Vol:	20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Sulfate		**ND**		mg/L	1.5	0.11	2

Lab Sample Number:	T080107001-MB	Analysis Date:	1/9/2008 3:32:33AM
Prep Date:	1/7/2008	Instrument:	IC
Analytical Method ID:	Inorganic Anions by Ion Chromatography - Anions by IC	File Name:	080108_059.D
Prep Method ID:	300.0	Dilution Factor:	1
Prep Batch Number:	T080107001		
Report Basis:	As Received	Analyst Initials:	KB
Sample prep wt./vol:	20.00 ml	Prep Extract Vol:	20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Fluoride		**ND**		mg/L	0.40	0.031	3

Lab Sample Number:	T080107001-MB	Analysis Date:	1/10/2008 9:49:26PM
Prep Date:	1/7/2008	Instrument:	IC
Analytical Method ID:	Inorganic Anions by Ion Chromatography - Anions by IC	File Name:	080110_032.D
Prep Method ID:	300.0	Dilution Factor:	1
Prep Batch Number:	T080107001		
Report Basis:	As Received	Analyst Initials:	KB
Sample prep wt./vol:	20.00 ml	Prep Extract Vol:	20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Chloride		**ND**		mg/L	0.80	0.042	4

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801027

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0801027

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T080108015**

SAMPLE DUPLICATE REPORT

Analysis: SW6010B - ICP - Total

Base Sample: B0801027-02A

Prep Date: 1/8/2008

Samp. Anal. Date: 1/8/2008 7:58:00PM

DUP Anal. Date: 1/8/2008 8:03:00PM

Units: mg/L

Matrix: Aqueous

Analyte Name	SampResult	DUPRes.	RPD	RPDLim	Flag
Aluminum	0.198	0.205	3.5	20	
Antimony	ND	ND	0.0	20	
Arsenic	ND	ND	0.0	20	
Barium	0.127	0.128	0.8	20	
Beryllium	ND	ND	0.0	20	
Boron	0.390	0.386	1.0	20	
Cadmium	ND	ND	0.0	20	
Calcium	3.11	3.12	0.3	20	
Chromium	ND	ND	0.0	20	
Cobalt	ND	ND	0.0	20	
Copper	ND	ND	0.0	20	
Iron	0.0542	0.0637	16.1	20	
Lead	ND	ND	0.0	20	
Magnesium	1.32	1.33	0.8	20	
Manganese	ND	ND	0.0	20	
Molybdenum	ND	ND	0.0	20	
Nickel	ND	ND	0.0	20	
Potassium	10.9	11.2	2.7	20	
Selenium	ND	ND	0.0	20	
Silver	ND	ND	0.0	20	
Sodium	1,130	1,140	0.9	20	
Thallium	ND	ND	0.0	20	
Vanadium	ND	ND	0.0	20	
Zinc	ND	ND	0.0	20	
Lithium	ND	ND	0.0	20	

LCS/LCSD REPORT

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801027

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0801027

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T080108015**

LCS/LCSD REPORT

Analysis: SW6010B - ICP - Total

MB: T080108015-MB

Prep Date: 1/8/2008

MB Anal. Date: 1/8/2008 7:38:00PM

Units: mg/L

LCS Anal. Date: 1/8/2008 7:43:00PM LCSD Anal. Date: 1/8/2008 7:48:00PM

Matrix: Aqueous

Analyte Name	SampResult	LCSRes.	SDRes.	SPLev	SPDLev	Recov.	SD Recov	RPD	Recov Lim	RPDLim	Flag
Aluminum	ND	1.83	1.85	2.00	2.00	91.5	92.5	1.1	89 - 117	20	
Antimony	ND	0.433	0.446	0.500	0.500	86.6	89.2	3.0	82 - 117	20	
Arsenic	ND	1.77	1.78	2.00	2.00	88.5	89.0	0.6	86 - 116	20	
Barium	ND	1.84	1.86	2.00	2.00	92.0	93.0	1.1	86 - 116	20	
Beryllium	ND	0.0507	0.0505	0.0500	0.0500	101.4	101.0	0.4	87 - 111	20	
Boron	ND	0.509	0.507	0.500	0.500	101.8	101.4	0.4	76 - 130	20	
Cadmium	ND	0.0475	0.0471	0.0500	0.0500	95.0	94.2	0.8	79 - 113	20	
Calcium	ND	8.53	8.99	10.0	10.0	85.3	89.9	5.3	79 - 119	20	
Chromium	ND	0.178	0.184	0.200	0.200	89.0	92.0	3.3	86 - 117	20	
Cobalt	ND	0.436	0.443	0.500	0.500	87.2	88.6	1.6	82 - 118	20	
Copper	ND	0.234	0.237	0.250	0.250	93.6	94.8	1.3	86 - 117	20	
Iron	ND	0.913	0.952	1.00	1.00	91.3	95.2	4.2	83 - 121	20	
Lead	ND	0.442	0.454	0.500	0.500	88.4	90.8	2.7	83 - 121	20	
Magnesium	ND	9.31	9.42	10.0	10.0	93.1	94.2	1.2	83 - 118	20	
Manganese	ND	0.444	0.451	0.500	0.500	88.8	90.2	1.6	82 - 121	20	
Molybdenum	ND	0.431	0.435	0.500	0.500	86.2	87.0	0.9	82 - 120	20	
Nickel	ND	0.434	0.440	0.500	0.500	86.8	88.0	1.4	84 - 117	20	
Potassium	ND	9.01	8.87	10.0	10.0	90.1	88.7	1.6	74 - 110	20	
Selenium	ND	1.78	1.84	2.00	2.00	89.0	92.0	3.3	87 - 117	20	
Silver	ND	0.244	0.246	0.250	0.250	97.6	98.4	0.8	80 - 127	20	
Sodium	ND	9.55	10.6	10.0	10.0	95.5	106.0	10.4	87 - 113	20	
Thallium	ND	0.198	0.218	0.200	0.200	99.0	109.0	9.6	89 - 113	20	
Vanadium	ND	0.450	0.456	0.500	0.500	90.0	91.2	1.3	87 - 119	20	
Zinc	ND	0.436	0.473	0.500	0.500	87.2	94.6	8.1	81 - 120	20	
Lithium	ND	0.490	0.497	0.500	0.500	98.0	99.4	1.4	80 - 120	20	

MS/MSD REPORT

Workorder (SDG): B0801027

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0801027

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T080108015**

MS/MSD REPORT

Analysis: SW6010B - ICP - Total

Parent: B0801027-02A

Prep Date: 1/8/2008

Samp. Anal. Date: 1/8/2008 7:58:00PM

Units: mg/L

MS Anal. Date: 1/8/2008 8:23:00PM MSD Anal. Date: 1/8/2008 8:28:00PM

Matrix: Aqueous

Analyte Name	SampResult	MSRes.	MSDRes	SPLev	SPDLev	Recov.	MSD Rec.	RPD	Recov Lim	RPDLim	Flag
Aluminum	0.198	1.73	1.94	2.00	2.00	76.6	87.1	11.4	75 - 125	20	
Antimony	ND	0.378	0.430	0.500	0.500	75.6	86.0	12.9	75 - 125	20	
Arsenic	ND	1.54	1.73	2.00	2.00	77.0	86.5	11.6	75 - 125	20	
Barium	0.127	2.08	1.83	2.00	2.00	97.7	85.2	12.8	75 - 125	20	
Beryllium	ND	0.0499	0.0498	0.0500	0.0500	99.8	99.6	0.2	75 - 125	20	
Boron	0.390	0.870	0.869	0.500	0.500	96.0	95.8	0.1	75 - 125	20	
Cadmium	ND	0.0410	0.0413	0.0500	0.0500	82.0	82.6	0.7	75 - 125	20	
Calcium	3.11	13.1	11.0	10.0	10.0	99.9	78.9	17.4	75 - 125	20	
Chromium	ND	0.192	0.166	0.200	0.200	96.0	83.0	14.5	75 - 125	20	
Cobalt	ND	0.475	0.410	0.500	0.500	95.0	82.0	14.7	75 - 125	20	
Copper	ND	0.196	0.221	0.250	0.250	78.4	88.4	12.0	75 - 125	20	
Iron	0.0542	0.819	0.905	1.00	1.00	76.5	85.1	10.0	75 - 125	20	
Lead	ND	0.376	0.414	0.500	0.500	75.2	82.8	9.6	75 - 125	20	
Magnesium	1.32	8.91	9.93	10.0	10.0	75.9	86.1	10.8	75 - 125	20	
Manganese	ND	0.379	0.422	0.500	0.500	75.8	84.4	10.7	75 - 125	20	
Molybdenum	ND	0.377	0.423	0.500	0.500	75.4	84.6	11.5	75 - 125	20	
Nickel	ND	0.481	0.409	0.500	0.500	96.2	81.8	16.2	75 - 125	20	
Potassium	10.9	19.0	18.0	10.0	10.0	81.0	71.0	5.4	75 - 125	20	*lowMSD*
Selenium	ND	1.56	1.75	2.00	2.00	78.0	87.5	11.5	75 - 125	20	
Silver	ND	0.207	0.229	0.250	0.250	82.8	91.6	10.1	75 - 125	20	
Sodium	1,130	984	1,070	10.0	10.0	-1,460.0	-600.0	8.4	75 - 125	20	*NOTE 2 NOTE 2*
Thallium	ND	0.187	0.174	0.200	0.200	93.5	87.0	7.2	75 - 125	20	
Vanadium	ND	0.381	0.429	0.500	0.500	76.2	85.8	11.9	75 - 125	20	
Zinc	ND	0.383	0.424	0.500	0.500	76.6	84.8	10.2	75 - 125	20	
Lithium	ND	0.465	0.524	0.500	0.500	93.0	104.8	11.9	75 - 125	20	

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado
Workorder (SDG): B0801027
Project: Navajo Mine Extension Leaching Study
Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T080108015**

POST DIGESTION SPIKE REPORT

Analysis: SW6010B - ICP - Total

Base Sample: B0801027-02A
Prep Date: 1/8/2008

Samp. Anal. Date: 1/8/2008 7:58:00PM
Units: mg/L

PDS Anal. Date: 1/8/2008 8:33:00PM
Matrix: Aqueous

Analyte Name	SampResult	PDSRes.	SPLev	Recov.	Recov Lim	Flag	
Aluminum	0.198	1.98	2.00	88.9	75 - 117		
Antimony	ND	0.438	0.500	87.0	75 - 117		
Arsenic	ND	1.78	2.00	88.8	75 - 116		
Barium	0.127	1.88	2.00	87.5	75 - 116		
Beryllium	ND	0.0478	0.0500	95.4	75 - 111		
Boron	0.390	0.846	0.500	91.1	75 - 130		
Cadmium	ND	0.0408	0.0500	86.7	75 - 113		
Calcium	3.11	11.2	10.0	80.8	75 - 119		
Chromium	ND	0.172	0.200	85.4	75 - 117		
Cobalt	ND	0.418	0.500	83.5	75 - 118		
Copper	ND	0.228	0.250	91.1	75 - 117		
Iron	0.0542	0.925	1.00	87.1	75 - 121		
Lead	ND	0.430	0.500	86.0	75 - 121		
Magnesium	1.32	10.1	10.0	88.3	75 - 118		
Manganese	ND	0.431	0.500	84.9	75 - 121		
Molybdenum	ND	0.429	0.500	84.0	75 - 120		
Nickel	ND	0.417	0.500	83.0	75 - 117		
Potassium	10.9	17.8	10.0	69.0	75 - 110	lowPDS	
Selenium	ND	1.79	2.00	89.2	75 - 117		
Silver	ND	0.234	0.250	93.2	75 - 127		
Sodium	1,130	1,100	10.0	-349.9	75 - 113	lowPDS	Note 2
Thallium	ND	0.174	0.200	85.7	75 - 113		
Vanadium	ND	0.440	0.500	87.4	75 - 119		
Zinc	ND	0.432	0.500	86.5	75 - 120		
Lithium	ND	0.539	0.500	92.0	75 - 120		

SERIAL DILUTION REPORT

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801027

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0801027

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T080108015**

SERIAL DILUTION REPORT

Analysis: SW6010B - ICP - Total

Base Sample: B0801027-02A

Prep Date: 1/8/2008

Samp. Anal. Date: 1/8/2008 7:58:00PM

Units: mg/L

SER DIL. Date: 1/8/2008 8:38:00PM

Matrix: Aqueous

Analyte Name	SampResult	PQL.	MDL.	SerialRes.	SerPQL.	RPD	Flag
Aluminum	0.198	0.050	0.014	ND	0.25		
Antimony	ND	0.050	0.0067	ND	0.25		
Arsenic	ND	0.10	0.015	ND	0.50		
Barium	0.127	0.0100	0.00016	0.111	0.050	13.4	OUT
Cadmium	ND	0.0060	0.00051	ND	0.030		
Calcium	3.11	0.10	0.013	5.53	0.50	56.0	OUT
Chromium	ND	0.0100	0.0018	ND	0.050		
Cobalt	ND	0.0050	0.0016	ND	0.025		
Copper	ND	0.0050	0.0019	ND	0.025		
Iron	0.0542	0.050	0.0027	ND	0.25		
Lead	ND	0.050	0.011	ND	0.25		
Magnesium	1.32	0.10	0.012	1.11	0.50	17.2	OUT
Manganese	ND	0.0100	0.00066	ND	0.050		
Molybdenum	ND	0.0100	0.0018	ND	0.050		
Nickel	ND	0.040	0.0027	ND	0.20		
Potassium	10.9	1.0	0.31	10.3	5.0	5.6	
Selenium	ND	0.10	0.026	ND	0.50		
Silver	ND	0.015	0.00066	ND	0.075		
Sodium	1,130	3.0	0.028	1,030	15	9.2	
Vanadium	ND	0.0100	0.00072	ND	0.050		
Zinc	ND	0.0050	0.0010	0.204	0.025		
Lithium	ND	0.10	0.00072	ND	0.50		

Prep Batch: **T080108012**

SAMPLE DUPLICATE REPORT

Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg

Base Sample: B0801027-02A

Prep Date: 1/8/2008

Samp. Anal. Date: 1/8/2008 5:19:17PM

Units: mg/L

DUP Anal. Date: 1/8/2008 5:21:31PM

Matrix: Aqueous

Analyte Name	SampResult	DUPRes.	RPD	RPDLim	Flag

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0801027

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T080108012**

SAMPLE DUPLICATE REPORT

Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg

Base Sample: B0801027-02A

Prep Date: 1/8/2008

Samp. Anal. Date: 1/8/2008 5:19:17PM

Units: mg/L

DUP Anal. Date: 1/8/2008 5:21:31PM

Matrix: Aqueous

Analyte Name	SampResult	DUPRes.	RPD	RPDLim	Flag
Mercury	ND	ND	0.0	20	

LCS/LCSD REPORT

Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg

MB: T080108012-MB

Prep Date: 1/8/2008

MB Anal. Date: 1/8/2008 5:04:24PM

Units: mg/L

LCS Anal. Date: 1/8/2008 5:10:50PM LCSD Anal. Date: 1/8/2008 5:12:54PM

Matrix: Aqueous

Analyte Name	SampResult	LCSRes.	SDRes.	SPLev	SPDLev	Recov.	SD Recov	RPD	Recov Lim	RPDLim	Flag
Mercury	ND	0.00203	0.00208	0.00200	0.0020	101.5	104.0	2.4	80 - 120	20	

MS/MSD REPORT

Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg

Parent: B0801027-02A

Prep Date: 1/8/2008

Samp. Anal. Date: 1/8/2008 5:19:17PM

Units: mg/L

MS Anal. Date: 1/8/2008 5:23:34PM MSD Anal. Date: 1/8/2008 5:25:40PM

Matrix: Aqueous

Analyte Name	SampResult	MSRes.	MSDRes	SPLev	SPDLev	Recov.	MSD Rec.	RPD	Recov Lim	RPDLim	Flag
Mercury	ND	0.00213	0.00210	0.00200	0.00200	106.5	105.0	1.4	70 - 130	20	

POST DIGESTION SPIKE REPORT

Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg

Base Sample: B0801027-02A

Prep Date: 1/8/2008

Samp. Anal. Date: 1/8/2008 5:19:17PM

Units: mg/L

PDS Anal. Date: 1/8/2008 5:27:45PM

Matrix: Aqueous

Analyte Name	SampResult	PDSRes.	SPLev	Recov.	Recov Lim	Flag
Mercury	ND	0.00216	0.00200	103.1	80 - 120	

Workorder (SDG): B0801027

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

FOOTNOTES TO QC REPORT

Note 1: Results are shown to three significant figures to avoid rounding errors in calculations.

Note 2: If the sample concentration is greater than 4 times the spike level, a recovery is not meaningful, and the result should be used as a replicate. In such cases the spike is not as high as expected random measurement variability of the sample result itself.

Note 3: For sample duplicates, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample and duplicate results are not five times the PQL or greater, then the RPD is not expected to fall within the window shown and the comparison should be made on the basis of the absolute difference. Analytica uses the criterion that the absolute difference should be less than the PQL for water or less than 2XPQL for other matrices.

Note 4: For serial dilutions, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample result is not 50 times the MDL or greater, then the fact that the RPD does not meet the 10% criterion has little signifcance. Otherwise it indicates that a matrix bias may exist at the analytical step.

Project: **Navajo Mine Extension Leaching Study**
Client: **Applied Hydrology Associates, Inc.**
Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado
Workorder (SDG): B0801027
Project: Navajo Mine Extension Leaching Study
Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T080107001**

LCS/LCSD REPORT

Analysis: Inorganic Anions by Ion Chromatography - Anions by IC
MB: T080107001-MB
Prep Date: 1/7/2008
MB Anal. Date: 1/9/2008 3:32:33AM
Units: mg/L
LCS Anal. Date: 1/7/2008 6:27:53PM LCSD Anal. Date: 1/7/2008 6:46:17PM
Matrix: Aqueous

Analyte Name	SampResult	LCSRes.	SDRes.	SPLev	SPDLev	Recov.	SD Recov	RPD	Recov Lim	RPDLim	Flag
Fluoride	ND	2.31	2.25	2.50	2.50	92.4	90.0	2.6	90 - 110	20	
Chloride	ND	4.71	4.71	5.00	5.00	94.2	94.2	0.0	90 - 110	20	
Sulfate	ND	34.1	34.0	37.5	37.5	90.9	90.7	0.3	90 - 110	20	

MS REPORT

Analysis: Inorganic Anions by Ion Chromatography - Anions by IC
Parent: B0801027-02B
Prep Date: 1/7/2008
Samp. Anal. Date: 1/8/2008 4:34:49AM
Units: mg/L
MS Anal. Date: 1/9/2008 2:37:21AM
Matrix: Aqueous

Analyte Name	SampResult	MSRes.	SPLev	Recov.	Recov Lim		Flag
Fluoride	2.16	4.39	2.50	89.2	70 - 130		
Chloride	632	755	125	98.4	70 - 130	*NOTE 2*	
Sulfate	285	323	37.5	101.3	70 - 130	*NOTE 2*	

Prep Batch: **T080111013**

SAMPLE DUPLICATE REPORT

Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS
Base Sample: B0801027-02B
Prep Date: 1/11/2008
Samp. Anal. Date: 1/16/2008 1:50:18PM
Units: mg/L
DUP Anal. Date: 1/16/2008 1:50:18PM
Matrix: Aqueous

Analyte Name	SampResult	DUPRes.	RPD	RPDLim	Flag
Total Dissolved Solids	3,070	3,060	0.3	20	

LCS/LCSD REPORT

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801027

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0801027

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T080111013**

LCS/LCSD REPORT

Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS

MB: T080111013-MB

Prep Date: 1/11/2008

MB Anal. Date: 1/16/2008 1:50:18PM

Units: mg/L

LCS Anal. Date: 1/16/2008 1:50:18PM LCSD Anal. Date: 1/16/2008 1:50:18PM

Matrix: Aqueous

Analyte Name	SampResult	LCSRes.	SDRes.	SPLev	SPDLev	Recov.	SD Recov	RPD	Recov Lim	RPDLim	Flag
Total Dissolved Solids	ND	815	826	825	825	98.8	100.1	1.3	80 - 120	20	

MS REPORT

Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS

Parent: B0801027-02B

Prep Date: 1/11/2008

Samp. Anal. Date: 1/16/2008 1:50:18PM

Units: mg/L

MS Anal. Date: 1/16/2008 1:50:18PM

Matrix: Aqueous

Analyte Name	SampResult	MSRes.	SPLev	Recov.	Recov Lim	Flag
Total Dissolved Solids	3,070	3,850	825	94.5	70 - 130	

Prep Batch: **T080117001**

SAMPLE DUPLICATE REPORT

Analysis: 150.1 - pH, Elecrometric - pH

Base Sample: B0801027-02B

Prep Date: 1/5/2008

Samp. Anal. Date: 1/5/2008 9:29:27AM

Units: pH

DUP Anal. Date: 1/5/2008 9:29:27AM

Matrix: Aqueous

Analyte Name	SampResult	DUPRes.	RPD	RPDLim	Flag
pH	8.97	8.97	0.0	20	

Prep Batch: **T080117013**

SAMPLE DUPLICATE REPORT

Workorder (SDG): B0801027

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0801027

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T080117013**

SAMPLE DUPLICATE REPORT

Analysis: 310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity

Base Sample: B0801027-02B
Prep Date: 1/17/2008

Samp. Anal. Date: 1/17/2008 2:31:55PM
DUP Anal. Date: 1/17/2008 2:31:55PM

Units: mg/L
Matrix: Aqueous

Analyte Name	SampResult	DUPRes.	RPD	RPDLim	Flag
Bicarbonate	1,250	1,240	0.8	20	
Carbonate	228	248	8.4	20	

LCS/LCSD REPORT

Analysis: 310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity

MB: T080117013-MB
Prep Date: 1/17/2008

MB Anal. Date: 1/17/2008 2:31:55PM
Units: mg/L

LCS Anal. Date: 1/17/2008 2:31:55PM LCSD Anal. Date: 1/17/2008 2:31:55PM Matrix: Aqueous

Analyte Name	SampResult	LCSRes.	SDRes.	SPLev	SPDLev	Recov.	SD Recov	RPD	Recov Lim	RPDLim	Flag
Bicarbonate	ND	28.0	26.0	25.0	25.0	112.0	104.0	7.4	80 - 120	20	
Carbonate	ND	51.0	49.0	50.0	50.0	102.0	98.0	4.0	80 - 120	20	

MS REPORT

Analysis: 310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity

Parent: B0801027-02B
Prep Date: 1/17/2008

Samp. Anal. Date: 1/17/2008 2:31:55PM
MS Anal. Date: 1/17/2008 2:31:55PM

Units: mg/L
Matrix: Aqueous

Analyte Name	SampResult	MSRes.	SPLev	Recov.	Recov Lim		Flag
Bicarbonate	1,250	1,280	50.0	60.0	70 - 130	*NOTE 2*	
Carbonate	228	296	100	68.0	70 - 130	*lowMS*	

Workorder (SDG): B0801027

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

FOOTNOTES TO QC REPORT

Note 1: Results are shown to three significant figures to avoid rounding errors in calculations.

Note 2: If the sample concentration is greater than 4 times the spike level, a recovery is not meaningful, and the result should be used as a replicate. In such cases the spike is not as high as expected random measurement variability of the sample result itself.

Note 3: For sample duplicates, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample and duplicate results are not five times the PQL or greater, then the RPD is not expected to fall within the window shown and the comparison should be made on the basis of the absolute difference. Analytica uses the criterion that the absolute difference should be less than the PQL for water or less than 2XPQL for other matrices.

Note 4: For serial dilutions, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample result is not 50 times the MDL or greater, then the fact that the RPD does not meet the 10% criterion has little signifcance. Otherwise it indicates that a matrix bias may exist at the analytical step.

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801027

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

QC BATCH ASSOCIATIONS - BY METHOD BLANK

Lab Project ID: **82,878** **Lab Project Number:** **B0801027**

Prep Date: 1/7/2008

Lab Method Blank Id: T080107001-MB

Prep Batch ID: T080107001

Method: Inorganic Anions by Ion Chromatography - Anions by IC

This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates:

SampleNum	ClientSampleName	DataFile	AnalysisDate
T080107001-LCS	LCS	080107_020.DXD	1/7/2008 6:27:53PM
T080107001-LCSD	LCSD	080107_021.DXD	1/7/2008 6:46:17PM
B0801018-08B	Batch QC	080107_036.DXD	1/7/2008 11:22:10PM
B0801027-01B	MB	080107_047.DXD	1/8/2008 2:44:31AM
B0801027-01B	MB	080107_049.DXD	1/8/2008 3:21:16AM
B0801027-02B	4 Corners PP Bottom Ash Leachate	080107_051.DXD	1/8/2008 3:58:04AM
B0801027-02B	4 Corners PP Bottom Ash Leachate	080107_053.DXD	1/8/2008 4:34:49AM
T080107001-LCS	LCS	080108_010.DXD	1/8/2008 12:31:14PM
T080107001-LCSD	LCSD	080108_011.DXD	1/8/2008 12:49:38PM
B0801018-08B-DUP	DUP	080108_026.DXD	1/8/2008 5:25:29PM
B0801018-08B-MS	MS	080108_027.DXD	1/8/2008 5:43:52PM
B0801027-02B-MS	MS	080108_052.DXD	1/9/2008 1:23:44AM
B0801027-02B-MS	MS	080108_056.DXD	1/9/2008 2:37:21AM
B0801018-08B	Batch QC	080111_042.DXD	1/12/2008 12:33:51AM
B0801018-08B-DUP	DUP	080111_043.DXD	1/12/2008 12:52:16AM

Prep Date: 1/8/2008

Lab Method Blank Id: T080108012-MB

Prep Batch ID: T080108012

Method: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg

This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates:

SampleNum	ClientSampleName	DataFile	AnalysisDate
B0801027-01A	MB	B010807W.WKS	1/8/2008 5:17:11PM
B0801027-02A	4 Corners PP Bottom Ash Leachate	B010807W.WKS	1/8/2008 5:19:17PM
T080108012-LCS	LCS	B010807W.WKS	1/8/2008 5:10:50PM
T080108012-LCSD	LCSD	B010807W.WKS	1/8/2008 5:12:54PM
B0801027-02A-DUP	DUP	B010807W.WKS	1/8/2008 5:21:31PM
B0801027-02A-MS	MS	B010807W.WKS	1/8/2008 5:23:34PM
B0801027-02A-MSD	MSD	B010807W.WKS	1/8/2008 5:25:40PM
B0801027-02A-PDS	PDS	B010807W.WKS	1/8/2008 5:27:45PM

Workorder (SDG): B0801027

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

QC BATCH ASSOCIATIONS - BY METHOD BLANK

Lab Project ID: **82,878** **Lab Project Number:** **B0801027**

Prep Date: 1/8/2008

Lab Method Blank Id: T080108015-MB
Prep Batch ID: T080108015
Method: SW6010B - ICP - Total

This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates:

SampleNum	ClientSampleName	DataFile	AnalysisDate
B0801027-01A	MB	E01088A	1/8/2008 7:53:00PM
B0801027-02A	4 Corners PP Bottom Ash Leachate	E01088A	1/8/2008 7:58:00PM
T080108015-LCS	LCS	E01088A	1/8/2008 7:43:00PM
T080108015-LCSD	LCSD	E01088A	1/8/2008 7:48:00PM
B0801027-02A-DUP	DUP	E01088A	1/8/2008 8:03:00PM
B0801027-02A-MS	MS	E01088A	1/8/2008 8:23:00PM
B0801027-02A-MSD	MSD	E01088A	1/8/2008 8:28:00PM
B0801027-02A-PDS	PDS	E01088A	1/8/2008 8:33:00PM
B0801027-01A	MB	E01098A	1/9/2008 1:35:00PM
B0801027-02A	4 Corners PP Bottom Ash Leachate	E01098A	1/9/2008 1:40:00PM
T080108015-LCS	LCS	E01098A	1/9/2008 1:10:00PM
T080108015-LCSD	LCSD	E01098A	1/9/2008 1:15:00PM
B0801027-02A-DUP	DUP	E01098A	1/9/2008 1:45:00PM
B0801027-02A-MS	MS	E01098A	1/9/2008 1:50:00PM
B0801027-02A-MSD	MSD	E01098A	1/9/2008 1:56:00PM
B0801027-02A-PDS	PDS	E01098A	1/9/2008 2:01:00PM

Prep Date: 1/11/2008

Lab Method Blank Id: T080111013-MB
Prep Batch ID: T080111013
Method: 160.1 - Total Dissolved Solids dried at 180°C - TDS

This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates:

SampleNum	ClientSampleName	DataFile	AnalysisDate
B0801027-01B	MB		1/16/2008 1:50:18PM
B0801027-02B	4 Corners PP Bottom Ash Leachate		1/16/2008 1:50:18PM
T080111013-LCS	LCS		1/16/2008 1:50:18PM
T080111013-LCSD	LCSD		1/16/2008 1:50:18PM
B0801027-02B-DUP	DUP		1/16/2008 1:50:18PM
B0801027-02B-MS	MS		1/16/2008 1:50:18PM

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801027

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

QC BATCH ASSOCIATIONS - BY METHOD BLANK

Lab Project ID: **82,878** **Lab Project Number:** **B0801027**

Prep Date: 1/17/2008

Lab Method Blank Id: T080117013-MB

Prep Batch ID: T080117013

Method: 310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity

This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates:

SampleNum	ClientSampleName	DataFile	AnalysisDate
B0801027-01B	MB		1/17/2008 2:31:55PM
B0801027-02B	4 Corners PP Bottom Ash Leachate		1/17/2008 2:31:55PM
T080117013-LCS	LCS		1/17/2008 2:31:55PM
T080117013-LCSD	LCSD		1/17/2008 2:31:55PM
B0801027-02B-DUP	DUP		1/17/2008 2:31:55PM
B0801027-02B-MS	MS		1/17/2008 2:31:55PM

Project: **Navajo Mine Extension Leaching Study**
Client: **Applied Hydrology Associates, Inc.**
Client Project Number: **none**

DATA FLAGS AND DEFINITIONS

The PQL is the Method Quantitation Limit as defined by USACE.
Reporting Limit: Limit below which results are shown as "ND". This may be the PQL, MDL, or a value between. See the report conventions below.

Result Field:
- ND = Not Detected at or above the Reporting Limit
- NA = Analyte not applicable (see Case Narrative for discussion)

Qualifier Fields:
- LOW = Recovery is below Lower Control Limit
- HIGH = Recovery , RPD, or other parameter is above Upper Control Limit
- E = Reported concentration is above the instrument calibration upper range

Organic Analysis Flags:
- B = Analyte was detected in the laboratory method blank
- J = Analyte was detected above MDL or Reporting Limit but below the Quant Limit (PQL)

Inorganic Analysis Flags:
- J = Analyte was detected above the Reporting Limit but below the Quant Limit (PQL)
- W = Post digestion spike did not meet criteria
- S = Reported value determined by the Method of Standard Additions (MSA)

Several ways of defining the limit of detection and quantitation are prevalent in the laboratory industry and may appear in Analytica reports. These include the following:

- MRL = "minimum reporting level", from the EPA Safe Drinking Water program (SDW)
- PQL = "practical quantitation limit", from SW-846
- EQL = "estimated quantitation limit", from SW-846
- LOQ = "limit of quantitation", from a number of authoritative sources

In Analytica's work, all of these terms have the same meaning, equivalent to the EPA definition of the MRL. This reporting level is supported by a satisfactory calibration data point which is at that level or lower, and also is supported by a method detection limit (MDL) determined by the procedure in 40CFR. The MDL is lower than the MRL and represents an estimate of the level where positive detections have a 99% probability of being real, but where quantitation accuracy is unknown.

The MRL as defined by Analytica is the lowest demonstrated point of known quantitation accuracy.
The MRL should not be confused with the MCL, which is the EPA-defined "maximum contaminant level" allowed for certain regulated targets under specific regulations, such as the National Primary Drinking Water Regulations. Normally, the MRL is set at a level which is much lower than the MCL in order to ensure that levels are well below those limits. Not all target analytes have MCL levels established.

Other Flags may be applied. See Case Narrative for Description

Workorder (SDG): B0801027

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

REPORTING CONVENTIONS FOR THIS REPORT

B0801027

TestPkgName	Basis	# Sig Figs	Reporting Limit
150.1/150.1 (Aqueous) - pH	As Received	2	Report to PQL
160.1/160.1 (Aqueous) - TDS	As Received	2	Report to PQL
300.0/300.0 (Aqueous) - Anions by IC	As Received	2	Report to PQL
310.1/310.1 (Aqueous) - Alkalinity	As Received	2	Report to PQL
6010B/3010A (Aqueous) - Total	As Received	2	Report to PQL
7470A/7470A (Aqueous) - Total Hg	As Received	2	Report to PQL

ANALYTICA GROUP®

Analytica Chain of Custody Form

Page _____ of _____

12189 Pennsylvania St. Thornton, CO 80241 (303) 469-8868 (303) 469-5254 fax
4307 Arctic Boulevard Anchorage, AK 99503 (907) 258-2155 (907) 258-6634 fax
475 Hall St. Fairbanks, AK 99701 (907) 456 - 3116 (907) 456-3125 Fax
5438 Shaune Drive Juneau, AK 99801 (907) 780-6668 (907) 780-6670 fax

Chain of Custody No: 62918

Client Name & Address: Applied Hydrology Associates, INC.

Public Water System (PWS) ID#:

Project Name: Navajo Mine Extension Leaching Study

Section To be Completed by Analytica
Quote ID:
LGN: B080102?
Account #: 030188 | Cash | Credit Card

Report to:
Phone No:
Fax No:
E-mail:

Turnaround Time for Results (TAT)
___ Standard ___ Expedited (< 10 days, prior authorization required) (please specify due date below; add'l charges may apply)
Requested Due Date for Results:

Invoice to Name & Address:

Special Instructions/Comments:
Tumbled in House by R.S.
Bottom Ash Leachate Study

P.O. or Contract No:

Kit Prep/Shipping Charge: $

Requested Analysis/Method

Client Sample Identification / Location	Date Sampled	Time Sampled	Matrix (S-DW-WW-Other)	No. of Containers	6010B/3010A-TTL (Lot #: Pres:)	7470A Hg (Lot #: Pres:)	150.1 pH (Lot #: Pres:)	160.1 TDS (Lot #: Pres:)	300.0 Anions/IC (Lot #: Pres:)	310.1 Alk (Lot #: Pres:)	(Lot #: Pres:)	Field Preserved	Field Filtered	MS/MSD ?
MB	1/4/08	13:20	AQ	8	✓	✓	✓	✓	✓	✓		1/2		
4 corners PP Bottom Ash Leachate	1/4/08	13:20	↓	↓	✓	✓	✓	✓	✓	✓		1/2		X

Relinquished by:	Date	Time	Received by:	Date	Time
R. Seeman	1/7/08	13:55	[signature]	1/7/08	13:55
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time
Name of Sampler: (printed)					

Section To Be Completed by Analytica

	THO	ANC	JNU	FBKS
Condition of Custody Seal?:	—			
Initialed By:	—			
Temp/Loc:	3.1			
Thermo ID#:				
Shipped Via:	Ryan Seeman			

Version 2.0

ANALYTICA

Cooler Receipt Form

Client: Applied Hydrology Associates **Client Code:** 030188 **Order #:** B0801027
Project: Navajo Mine Extension Leaching Study

Cooler ID: 1

A. Preliminary Examination Phase: **Date cooler opened:** 1/7/2008
Cooler opened by: gp **Signature:** GP

1. **Was airbill Attached?** N/A **Airbill #:** **Carrier Name:** Other
2. **Custody Seals?** N/A **How many?** 0 **Location:** **Seal Name:**
3. **Seals intact?** N/A
4. **COC Attached?** Yes **Properly Completed?** Yes **Signed by AEL employee?** Yes
5. **Project Identification from custody paper:** Navajo Mine Extension Leaching Study
6. **Preservative:** None **Temperature:** 3.1 **deg. C**

Designated person initial here to acknowledge receipt: GP **Date:** 1/7/08

COMMENTS:

B. Log-In Phase: **Samples Log-in Date:** 1/7/2008 **Log-in By:** gp

1. **Packing Type:** Other
2. **Were samples in separate bags?** N/A
3. **Were containers intact?** Yes **Labels agree with COC?** Yes
4. **Number of bottles received:** 4 **Number of samples received:** 2
5. **Correct containers used?** Yes **Correct preservatives added?** Yes
6. **Sufficient sample volume?** Yes
7. **Bubbles in VOA samples?** N/A
8. **Was Project manager called and status discussed?** No
9. **Was anyone called?** No **Who was called?** ________ **By whom?** ________ **Date:** ________

COMMENTS:

The Analytica Group
CLIENT INVOICE

Remit to: Accounting Dpt
Analytica Environmental Laboratories, Inc.
P.O. Box 973426
Dallas,TX 75397-3426

Phone: (303) 469-8868

Attention: Mr.Art O'Hayre
Invoice to: Applied Hydrology Associates, Inc.
950 South Cherry Street
Suite 810
Denver, CO 80246

Invoice #: **82649**
Work Order#: **B0801191**
Account#: 030188
Quote ID#: 11340
Invoice Date: 2/11/2008
Work ID: Navajo Mine Extension Leaching Study
PO #: none
Received: 1/28/2008
Reported: 2/11/2008
Client Project#: Navajo Mine Extension Leach

Comments:

Item charges		Qty	Price	Total
SW7470A - Mercury in Liquid Waste by CVAA - Total Hg In Aqueous	M	6	35.00	210.00
160.1 - Total Dissolved Solids dried at 180°C - TDS In Liquid	Matrix	6	22.00	132.00
150.1 - pH, Elecrometric - pH In Liquid	Matrix	6	10.00	60.00
SW6010B - ICP - Total In Aqueous	Matrix	6	312.00	1,872.00
Inorganic Anions by Ion Chromatography - Anions by IC In Liquid	Matrix	6	54.00	324.00
310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity In Liquid	Matrix	6	36.00	216.00

Total of Items Above: **$2,814.00**

Adjustments or Special Services	Qty	Price	Total
Tumbling Charge	5	95.00	475.00

Total of Items Above: **$475.00**

Grand Total: **$3,289.00**

All invoices are due and payable upon receipt. Outstanding balances over 30 days are subject to a finance charge of 1.5% per month, plus a late fee of $25.00. If Analytica engages legal counsel to enforce its rights or any other rights under an application for payment, the customer will be liable to Analytica for all costs of collection and other legal expenses, including reasonable attorney fees.

REMITTANCE ADVICE
PLEASE RETURN THIS PORTION WITH YOUR PAYMENT

Mr.Art O'Hayre		**Account#:**	030188
Applied Hydrology Associates, Inc.		**Invoice #:**	**82649**
950 South Cherry Street		**Invoice Date:**	2/11/2008
Suite 810 Denver, CO 80246			

TOTAL INVOICE AMOUNT: **$3,289.00**

PAYMENT AMOUNT ENCLOSED: ____________________

ANALYTICA
Environmental Laboratories

Analytica Environmental
Laboratories, Inc.
12189 Pennsylvania Street
Thornton, CO 80241
Phone: 303-469-8868
Fax: 303-469-5254

2/11/2008

Applied Hydrology Associates, Inc.
950 South Cherry Street
Suite 810
Denver, CO 80246
Attn: Art O'Hayre

Work Order #: B0801191
Date: 2/11/2008
Work ID: Navajo Mine Extension Leaching Study
Date Received: 1/28/2008
Proj #: none

Sample Identification

Lab Sample Number	Client Description	Lab Sample Number	Client Description
B0801191-01	MB 45 day	B0801191-02	Ash Composite 45 day
B0801191-03	Spoil Composite 45 day	B0801191-04	MB SPLP
B0801191-05	Ash Composite SPLP	B0801191-06	Spoil Composite SPLP

Enclosed are the analytical results for the submitted sample(s). Please review the CASE NARRATIVE for a discussion of any data and/or quality control issues. Listings of data qualifiers, analytical codes, key dates, and QC relationships are provided at the end of the report.

Sincerely,

Kristen Stone
Project Manager

"The Science of Analysis, The Art of Service"

Case Narrative

Analytica Environmental Laboratories, Inc.

Work Order: B0801191

Samples were prepared and analyzed according to EPA or equivalent methods outlined in the following references:

Methods for Chemical Analysis of Water and Wastes, USEPA 600/4-79-020, March 1983.

Pfaff, J. D., C. A. Brockhoff and J. W. O'Dell. 1994. The Determination of Inorganic Anions in Water by Ion Chromatography. Method 300.0A. U. S. Environmental Protection Agency. Environmental Monitoring Systems Lab.

Methods for the Determination of Metals in Environmental Samples, EPA/600/R-94/111, May 1994.

SAMPLE RECEIPT:
Six (6) samples were received on 1/28/2008 12:35:00 PM., at a temperature of 6 deg C., at Analytica-Thornton. The samples were received in good condition and in order per chain of custody. The samples were tumbled at the laboratory.

REVIEW FOR COMPLIANCE WITH ANALYTICA QA PLAN
A summary of our review is shown below.

All analytical results contained in this report have been reviewed under Analytica's internal quality assurance and quality control program. Any deviations in quality contro parameters for specific analyses are noted in the following text. A complete quality assurance report, including laboratory control, matrix spike, and sample duplicate recoveries is kept on file in our office and is available upon request.

All method specifications were met for the following tests:

Test Method: 150.1 - pH, Elecrometric - pH - Aqueous
Test Method: 160.1 - Total Dissolved Solids dried at 180°C - TDS - Aqueous
Test Method: 310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity - Aqueous
Test Method: Inorganic Anions by Ion Chromatography - Anions by IC - Aqueous
Test Method: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg - Aqueous

Test Method: SW6010B - ICP - Total - Aqueous
MS/MSD and DUP OUTLIERS:
As shown below, the MSD was outside of limits for Calcium. The sample had Calcium concentrations greater than four times the spike amount. In these cases it is not appropriate to calculate a recovery. The result should be used as a replicate.

Type	Client Sample	LabSample	Analyte	Recovery	LCL	UCL	Parent	Spike
MSD	Ash Composite SP	B0801191-05A	Calcium	-11.	75	125	562	10.0

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801191

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **MB 45 day**

Matrix: Aqueous

Collection Date: 1/25/2008 2:00:00PM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0801191-01A	Analysis Date:	1/31/2008 1:50:33PM
Prep Date:	1/29/2008	Instrument:	CVAA_1
Analytical Method ID:	SW7470A - Mercury in Liquid Waste by CVAA - Total Hg	File Name:	B013108W.W
Prep Method ID:	7470A	Dilution Factor:	1
Prep Batch Number:	T080131004		
Report Basis:	As Received	Analyst Initials:	DL
Sample prep wt./vol:	30.00 ml	Prep Extract Vol:	30.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Mercury	7439-97-6	**ND**		mg/L	0.000200	.000050	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0801191-01A	Analysis Date:	1/30/2008 12:59:00PM
Prep Date:	1/29/2008	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E01308A
Prep Method ID:	3010_ICP	Dilution Factor:	1
Prep Batch Number:	T080129008		
Report Basis:	As Received	Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Aluminum	7429-90-5	**0.85**		mg/L	0.050	0.014	1
Antimony	7440-36-0	**ND**		mg/L	0.050	0.0067	
Arsenic	7440-38-2	**ND**		mg/L	0.10	0.015	
Barium	7440-39-3	**0.081**		mg/L	0.010	0.00016	
Beryllium	7440-41-7	**ND**		mg/L	0.0010	0.000060	
Boron	7440-42-8	**0.32**		mg/L	0.050	0.0018	
Cadmium	7440-43-9	**ND**		mg/L	0.0060	0.00051	
Calcium	7440-70-2	**3.0**		mg/L	0.10	0.013	
Chromium	7440-47-3	**ND**		mg/L	0.010	0.0018	
Cobalt	7440-48-4	**ND**		mg/L	0.0050	0.0016	
Copper	7440-50-8	**0.14**		mg/L	0.0050	0.0019	
Iron	7439-89-6	**ND**		mg/L	0.050	0.0027	
Lead	7439-92-1	**ND**		mg/L	0.050	0.011	
Lithium	7439-93-2	**ND**		mg/L	0.10	0.00072	
Magnesium	7439-96-4	**1.2**		mg/L	0.10	0.012	
Manganese	7439-96-5	**ND**		mg/L	0.010	0.00066	
Molybdenum	7439-98-7	**0.013**		mg/L	0.010	0.0018	
Nickel	7440-02-0	**ND**		mg/L	0.040	0.0027	
Potassium	7440-09-7	**12**		mg/L	1.0	0.31	
Selenium	7784-49-2	**ND**		mg/L	0.10	0.026	
Silver	7440-22-4	**ND**		mg/L	0.015	0.00066	

Workorder (SDG): B0801191

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **MB 45 day**

Matrix: Aqueous | Collection Date: 1/25/2008 2:00:00PM

Lab Sample Number:	B0801191-01A	Analysis Date:	1/30/2008 12:59:00PM
Prep Date:	1/29/2008	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E01308A
Prep Method ID:	3010_ICP	Dilution Factor:	1
Prep Batch Number:	T080129008		
Report Basis:	As Received	Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Sodium	7440-23-5	**1,200**		mg/L	3.0	0.028	1
Thallium	7440-28-0	**ND**		mg/L	0.40	0.011	
Vanadium	7440-62-2	**ND**		mg/L	0.010	0.00072	
Zinc	7440-66-6	**0.0053**		mg/L	0.0050	0.0010	

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0801191-01B	Analysis Date:	2/4/2008 9:52:02AM
Prep Date:	2/4/2008	Instrument:	Titrametric
Analytical Method ID:	310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity	File Name:	
Prep Method ID:	Alkalinity_W	Dilution Factor:	1
Prep Batch Number:	T080205001		
Report Basis:	As Received	Analyst Initials:	cs
Sample prep wt./vol:	50.00 ml	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Bicarbonate		**1,200**		mg/L	5.0	1.5	1
Carbonate		**260**		mg/L	7.0	1.2	

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0801191-01B	Analysis Date:	1/25/2008 2:10:00PM
Prep Date:	1/25/2008	Instrument:	Probe
Analytical Method ID:	150.1 - pH, Elecrometric - pH	File Name:	
Prep Method ID:	150.1	Dilution Factor:	1
Prep Batch Number:	T080201005		
Report Basis:	As Received	Analyst Initials:	R. Seeman
Sample prep wt./vol:	10.00 ml	Prep Extract Vol:	10.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
pH		**8.7**		pH	0.10	0.10	1

The following test was conducted by: Analytica - Thornton

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801191

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **MB 45 day**

Matrix: Aqueous

Collection Date: 1/25/2008 2:00:00PM

Lab Sample Number: B0801191-01B

Analysis Date: 2/4/2008 12:47:24PM

Prep Date: 1/31/2008

Instrument: SCALE

Analytical Method ID: 160.1 - Total Dissolved Solids dried at 180°C - TDS

File Name:

Prep Method ID: 160.1

Dilution Factor: 1

Prep Batch Number: T080131008

Report Basis: As Received

Analyst Initials: kl

Sample prep wt./vol: 100.00 ml

Prep Extract Vol: 1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Total Dissolved Solids		**3,000**		mg/L	10	8.2	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number: B0801191-01B

Analysis Date: 1/30/2008 4:18:17PM

Prep Date: 1/30/2008

Instrument: IC

Analytical Method ID: Inorganic Anions by Ion Chromatography - Anions by IC

File Name: 080130_011.D

Prep Method ID: 300.0

Dilution Factor: 25

Prep Batch Number: T080130013

Report Basis: As Received

Analyst Initials: KB

Sample prep wt./vol: 20.00 ml

Prep Extract Vol: 20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Chloride		**600**		mg/L	20	1.1	1

Lab Sample Number: B0801191-01B

Analysis Date: 1/30/2008 9:12:31PM

Prep Date: 1/30/2008

Instrument: IC

Analytical Method ID: Inorganic Anions by Ion Chromatography - Anions by IC

File Name: 080130_027.D

Prep Method ID: 300.0

Dilution Factor: 1

Prep Batch Number: T080130013

Report Basis: As Received

Analyst Initials: KB

Sample prep wt./vol: 20.00 ml

Prep Extract Vol: 20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Fluoride		**2.2**		mg/L	0.40	0.031	2
Sulfate		**280**		mg/L	1.5	0.11	

Workorder (SDG): B0801191

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **Ash Composite 45 day**

Matrix: Aqueous Collection Date: 1/25/2008 2:00:00PM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0801191-02A	Analysis Date:	1/31/2008 2:39:43PM
Prep Date:	1/29/2008	Instrument:	CVAA_1
Analytical Method ID:	SW7470A - Mercury in Liquid Waste by CVAA - Total Hg	File Name:	B013108W.W
Prep Method ID:	7470A	Dilution Factor:	1
Prep Batch Number:	T080131004		
Report Basis:	As Received	Analyst Initials:	DL
Sample prep wt./vol:	30.00 ml	Prep Extract Vol:	30.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Mercury	7439-97-6	**ND**		mg/L	0.000200	0.000050	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0801191-02A	Analysis Date:	1/30/2008 1:04:00PM
Prep Date:	1/29/2008	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E01308A
Prep Method ID:	3010_ICP	Dilution Factor:	1
Prep Batch Number:	T080129008		
Report Basis:	As Received	Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Aluminum	7429-90-5	**4.6**		mg/L	0.050	0.014	1
Antimony	7440-36-0	**ND**		mg/L	0.050	0.0067	
Arsenic	7440-38-2	**ND**		mg/L	0.10	0.015	
Barium	7440-39-3	**0.033**		mg/L	0.010	0.00016	
Beryllium	7440-41-7	**ND**		mg/L	0.0010	0.000060	
Boron	7440-42-8	**2.6**		mg/L	0.050	0.0018	
Cadmium	7440-43-9	**ND**		mg/L	0.0060	0.00051	
Calcium	7440-70-2	**530**		mg/L	0.10	0.013	
Chromium	7440-47-3	**0.031**		mg/L	0.010	0.0018	
Cobalt	7440-48-4	**ND**		mg/L	0.0050	0.0016	
Copper	7440-50-8	**0.72**		mg/L	0.0050	0.0019	
Iron	7439-89-6	**0.071**		mg/L	0.050	0.0027	
Lead	7439-92-1	**ND**		mg/L	0.050	0.011	
Lithium	7439-93-2	**0.14**		mg/L	0.10	0.00072	
Magnesium	7439-96-4	**12**		mg/L	0.10	0.012	
Manganese	7439-96-5	**0.12**		mg/L	0.010	0.00066	
Molybdenum	7439-98-7	**0.15**		mg/L	0.010	0.0018	
Nickel	7440-02-0	**ND**		mg/L	0.040	0.0027	
Potassium	7440-09-7	**12**		mg/L	1.0	0.31	
Selenium	7784-49-2	**0.15**		mg/L	0.10	0.026	
Silver	7440-22-4	**ND**		mg/L	0.015	0.00066	

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801191

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **Ash Composite 45 day**

Matrix: Aqueous

Collection Date: 1/25/2008 2:00:00PM

Lab Sample Number:	B0801191-02A	Analysis Date:	1/30/2008 1:04:00PM
Prep Date:	1/29/2008	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E01308A
Prep Method ID:	3010_ICP	Dilution Factor:	1
Prep Batch Number:	T080129008		
Report Basis:	As Received	Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Sodium	7440-23-5	**1,200**		mg/L	3.0	0.028	1
Thallium	7440-28-0	**ND**		mg/L	0.40	0.011	
Vanadium	7440-62-2	**0.10**		mg/L	0.010	0.00072	
Zinc	7440-66-6	**0.098**		mg/L	0.0050	0.0010	

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0801191-02B	Analysis Date:	2/4/2008 9:52:02AM
Prep Date:	2/4/2008	Instrument:	Titrametric
Analytical Method ID:	310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity	File Name:	
Prep Method ID:	Alkalinity_W	Dilution Factor:	1
Prep Batch Number:	T080205001		
Report Basis:	As Received	Analyst Initials:	cs
Sample prep wt./vol:	50.00 ml	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Bicarbonate		**1,100**		mg/L	5.0	1.5	1
Carbonate		**ND**		mg/L	7.0	1.2	

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0801191-02B	Analysis Date:	1/25/2008 2:10:00PM
Prep Date:	1/25/2008	Instrument:	Probe
Analytical Method ID:	150.1 - pH, Elecrometric - pH	File Name:	
Prep Method ID:	150.1	Dilution Factor:	1
Prep Batch Number:	T080201005		
Report Basis:	As Received	Analyst Initials:	R. Seeman
Sample prep wt./vol:	10.00 ml	Prep Extract Vol:	10.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
pH		**7.8**		pH	0.10	0.10	1

The following test was conducted by: Analytica - Thornton

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801191

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **Ash Composite 45 day**

Matrix: Aqueous

Collection Date: 1/25/2008 2:00:00PM

Lab Sample Number: B0801191-02B
Analysis Date: 2/4/2008 12:47:24PM
Prep Date: 1/31/2008
Instrument: SCALE
Analytical Method ID: 160.1 - Total Dissolved Solids dried at 180°C - TDS
File Name:
Prep Method ID: 160.1
Dilution Factor: 1
Prep Batch Number: T080131008
Report Basis: As Received
Analyst Initials: kl
Sample prep wt./vol: 100.00 ml
Prep Extract Vol: 1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Total Dissolved Solids		**5,300**		mg/L	10	8.2	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number: B0801191-02B
Analysis Date: 1/30/2008 4:36:41PM
Prep Date: 1/30/2008
Instrument: IC
Analytical Method ID: Inorganic Anions by Ion Chromatography - Anions by IC
File Name: 080130_012.D
Prep Method ID: 300.0
Dilution Factor: 25
Prep Batch Number: T080130013
Report Basis: As Received
Analyst Initials: KB
Sample prep wt./vol: 20.00 ml
Prep Extract Vol: 20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Chloride		**610**		mg/L	20	1.1	1
Sulfate		**2,500**		mg/L	38	2.8	

Lab Sample Number: B0801191-02B
Analysis Date: 1/30/2008 9:49:17PM
Prep Date: 1/30/2008
Instrument: IC
Analytical Method ID: Inorganic Anions by Ion Chromatography - Anions by IC
File Name: 080130_029.D
Prep Method ID: 300.0
Dilution Factor: 1
Prep Batch Number: T080130013
Report Basis: As Received
Analyst Initials: KB
Sample prep wt./vol: 20.00 ml
Prep Extract Vol: 20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Fluoride		**8.2**		mg/L	0.40	0.031	2

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801191

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **Spoil Composite 45 day**

Matrix: Aqueous

Collection Date: 1/25/2008 2:00:00PM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0801191-03A	Analysis Date:	1/31/2008 2:41:52PM
Prep Date:	1/29/2008	Instrument:	CVAA_1
Analytical Method ID:	SW7470A - Mercury in Liquid Waste by CVAA - Total Hg	File Name:	B013108W.W
Prep Method ID:	7470A	Dilution Factor:	1
Prep Batch Number:	T080131004		
Report Basis:	As Received	Analyst Initials:	DL
Sample prep wt./vol:	30.00 ml	Prep Extract Vol:	30.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Mercury	7439-97-6	**ND**		mg/L	0.000200	0.000050	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0801191-03A	Analysis Date:	1/30/2008 1:09:00PM
Prep Date:	1/29/2008	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E01308A
Prep Method ID:	3010_ICP	Dilution Factor:	1
Prep Batch Number:	T080129008		
Report Basis:	As Received	Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Aluminum	7429-90-5	**0.38**		mg/L	0.050	0.014	1
Antimony	7440-36-0	**ND**		mg/L	0.050	0.0067	
Arsenic	7440-38-2	**ND**		mg/L	0.10	0.015	
Barium	7440-39-3	**0.079**		mg/L	0.010	0.00016	
Beryllium	7440-41-7	**ND**		mg/L	0.0010	0.000060	
Boron	7440-42-8	**0.36**		mg/L	0.050	0.0018	
Cadmium	7440-43-9	**ND**		mg/L	0.0060	0.00051	
Calcium	7440-70-2	**56**		mg/L	0.10	0.013	
Chromium	7440-47-3	**ND**		mg/L	0.010	0.0018	
Cobalt	7440-48-4	**ND**		mg/L	0.0050	0.0016	
Copper	7440-50-8	**0.053**		mg/L	0.0050	0.0019	
Iron	7439-89-6	**ND**		mg/L	0.050	0.0027	
Lead	7439-92-1	**ND**		mg/L	0.050	0.011	
Lithium	7439-93-2	**0.11**		mg/L	0.10	0.00072	
Magnesium	7439-96-4	**12**		mg/L	0.10	0.012	
Manganese	7439-96-5	**0.098**		mg/L	0.010	0.00066	
Molybdenum	7439-98-7	**0.015**		mg/L	0.010	0.0018	
Nickel	7440-02-0	**ND**		mg/L	0.040	0.0027	
Potassium	7440-09-7	**14**		mg/L	1.0	0.31	
Selenium	7784-49-2	**ND**		mg/L	0.10	0.026	
Silver	7440-22-4	**ND**		mg/L	0.015	0.00066	

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801191

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **Spoil Composite 45 day**

Matrix: Aqueous

Collection Date: 1/25/2008 2:00:00PM

Lab Sample Number: B0801191-03A
Analysis Date: 1/30/2008 1:09:00PM
Prep Date: 1/29/2008
Instrument: ICP_2
Analytical Method ID: SW6010B - ICP - Total
File Name: E01308A
Prep Method ID: 3010_ICP
Dilution Factor: 1
Prep Batch Number: T080129008
Report Basis: As Received
Analyst Initials: rm
Sample prep wt./vol: 50.00 ml
Prep Extract Vol: 50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Sodium	7440-23-5	**1,200**		mg/L	3.0	0.028	1
Thallium	7440-28-0	**ND**		mg/L	0.40	0.011	
Vanadium	7440-62-2	**ND**		mg/L	0.010	0.00072	
Zinc	7440-66-6	**ND**		mg/L	0.0050	0.0010	

The following test was conducted by: Analytica - Thornton

Lab Sample Number: B0801191-03B
Analysis Date: 2/4/2008 9:52:02AM
Prep Date: 2/4/2008
Instrument: Titrametric
Analytical Method ID: 310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity
File Name:
Prep Method ID: Alkalinity_W
Dilution Factor: 1
Prep Batch Number: T080205001
Report Basis: As Received
Analyst Initials: cs
Sample prep wt./vol: 50.00 ml
Prep Extract Vol: 50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Bicarbonate		**960**		mg/L	5.0	1.5	1
Carbonate		**ND**		mg/L	7.0	1.2	

The following test was conducted by: Analytica - Thornton

Lab Sample Number: B0801191-03B
Analysis Date: 1/25/2008 2:10:00PM
Prep Date: 1/25/2008
Instrument: Probe
Analytical Method ID: 150.1 - pH, Elecrometric - pH
File Name:
Prep Method ID: 150.1
Dilution Factor: 1
Prep Batch Number: T080201005
Report Basis: As Received
Analyst Initials: R. Seeman
Sample prep wt./vol: 10.00 ml
Prep Extract Vol: 10.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
pH		**8.0**		pH	0.10	0.10	1

The following test was conducted by: Analytica - Thornton

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801191

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **Spoil Composite 45 day**

Matrix: Aqueous

Collection Date: 1/25/2008 2:00:00PM

Lab Sample Number: B0801191-03B
Analysis Date: 2/4/2008 12:47:24PM
Prep Date: 1/31/2008
Instrument: SCALE
Analytical Method ID: 160.1 - Total Dissolved Solids dried at 180°C - TDS
File Name:
Prep Method ID: 160.1
Dilution Factor: 1
Prep Batch Number: T080131008
Report Basis: As Received
Analyst Initials: kl
Sample prep wt./vol: 100.00 ml
Prep Extract Vol: 1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Total Dissolved Solids		**3,500**		mg/L	10	8.2	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number: B0801191-03B
Analysis Date: 1/30/2008 5:50:15PM
Prep Date: 1/30/2008
Instrument: IC
Analytical Method ID: Inorganic Anions by Ion Chromatography - Anions by IC
File Name: 080130_016.D
Prep Method ID: 300.0
Dilution Factor: 25
Prep Batch Number: T080130013
Report Basis: As Received
Analyst Initials: KB
Sample prep wt./vol: 20.00 ml
Prep Extract Vol: 20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Chloride		**600**		mg/L	20	1.1	1
Sulfate		**930**		mg/L	38	2.8	

Lab Sample Number: B0801191-03B
Analysis Date: 1/30/2008 11:02:52PM
Prep Date: 1/30/2008
Instrument: IC
Analytical Method ID: Inorganic Anions by Ion Chromatography - Anions by IC
File Name: 080130_033.D
Prep Method ID: 300.0
Dilution Factor: 1
Prep Batch Number: T080130013
Report Basis: As Received
Analyst Initials: KB
Sample prep wt./vol: 20.00 ml
Prep Extract Vol: 20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Fluoride		**1.5**		mg/L	0.40	0.031	2

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801191

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **MB SPLP**

Matrix: Aqueous

Collection Date: 1/25/2008 2:00:00PM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0801191-04A	Analysis Date:	1/31/2008 2:44:26PM
Prep Date:	1/29/2008	Instrument:	CVAA_1
Analytical Method ID:	SW7470A - Mercury in Liquid Waste by CVAA - Total Hg	File Name:	B013108W.W
Prep Method ID:	7470A	Dilution Factor:	1
Prep Batch Number:	T080131004		
Report Basis:	As Received	Analyst Initials:	DL
Sample prep wt./vol:	30.00 ml	Prep Extract Vol:	30.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Mercury	7439-97-6	**ND**		mg/L	0.000200	0.000050	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0801191-04A	Analysis Date:	1/30/2008 1:14:00PM
Prep Date:	1/29/2008	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E01308A
Prep Method ID:	3010_ICP	Dilution Factor:	1
Prep Batch Number:	T080129008		
Report Basis:	As Received	Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Aluminum	7429-90-5	**0.056**		mg/L	0.050	0.014	1
Antimony	7440-36-0	**ND**		mg/L	0.050	0.0067	
Arsenic	7440-38-2	**ND**		mg/L	0.10	0.015	
Barium	7440-39-3	**ND**		mg/L	0.010	0.00016	
Beryllium	7440-41-7	**ND**		mg/L	0.0010	0.000060	
Boron	7440-42-8	**ND**		mg/L	0.050	0.0018	
Cadmium	7440-43-9	**ND**		mg/L	0.0060	0.00051	
Calcium	7440-70-2	**0.27**		mg/L	0.10	0.013	
Chromium	7440-47-3	**ND**		mg/L	0.010	0.0018	
Cobalt	7440-48-4	**ND**		mg/L	0.0050	0.0016	
Copper	7440-50-8	**0.0067**		mg/L	0.0050	0.0019	
Iron	7439-89-6	**ND**		mg/L	0.050	0.0027	
Lead	7439-92-1	**ND**		mg/L	0.050	0.011	
Lithium	7439-93-2	**ND**		mg/L	0.10	0.00072	
Magnesium	7439-96-4	**ND**		mg/L	0.10	0.012	
Manganese	7439-96-5	**ND**		mg/L	0.010	0.00066	
Molybdenum	7439-98-7	**ND**		mg/L	0.010	0.0018	
Nickel	7440-02-0	**ND**		mg/L	0.040	0.0027	
Potassium	7440-09-7	**ND**		mg/L	1.0	0.31	
Selenium	7784-49-2	**ND**		mg/L	0.10	0.026	
Silver	7440-22-4	**ND**		mg/L	0.015	0.00066	

Workorder (SDG): B0801191

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **MB SPLP**

Matrix: Aqueous | Collection Date: 1/25/2008 2:00:00PM

Lab Sample Number:	B0801191-04A	Analysis Date:	1/30/2008 1:14:00PM
Prep Date:	1/29/2008	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E01308A
Prep Method ID:	3010_ICP	Dilution Factor:	1
Prep Batch Number:	T080129008		
Report Basis:	As Received	Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Sodium	7440-23-5	**5.7**		mg/L	3.0	0.028	1
Thallium	7440-28-0	**ND**		mg/L	0.40	0.011	
Vanadium	7440-62-2	**ND**		mg/L	0.010	0.00072	
Zinc	7440-66-6	**ND**		mg/L	0.0050	0.0010	

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0801191-04B	Analysis Date:	2/4/2008 9:52:02AM
Prep Date:	2/4/2008	Instrument:	Titrametric
Analytical Method ID:	310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity	File Name:	
Prep Method ID:	Alkalinity_W	Dilution Factor:	1
Prep Batch Number:	T080205001		
Report Basis:	As Received	Analyst Initials:	cs
Sample prep wt./vol:	100.00 ml	Prep Extract Vol:	100.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Bicarbonate		**ND**		mg/L	5.0	1.5	1
Carbonate		**10**		mg/L	7.0	1.2	

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0801191-04B	Analysis Date:	1/25/2008 2:10:00PM
Prep Date:	1/25/2008	Instrument:	Probe
Analytical Method ID:	150.1 - pH, Elecrometric - pH	File Name:	
Prep Method ID:	150.1	Dilution Factor:	1
Prep Batch Number:	T080201005		
Report Basis:	As Received	Analyst Initials:	R. Seeman
Sample prep wt./vol:	10.00 ml	Prep Extract Vol:	10.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
pH		**5.0**		pH	0.10	0.10	1

The following test was conducted by: Analytica - Thornton

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801191

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **MB SPLP**

Matrix: Aqueous

Collection Date: 1/25/2008 2:00:00PM

Lab Sample Number: B0801191-04B

Analysis Date: 2/4/2008 12:47:24PM

Prep Date: 1/31/2008

Instrument: SCALE

Analytical Method ID: 160.1 - Total Dissolved Solids dried at 180°C - TDS

File Name:

Prep Method ID: 160.1

Dilution Factor: 1

Prep Batch Number: T080131008

Report Basis: As Received

Analyst Initials: kl

Sample prep wt./vol: 100.00 ml

Prep Extract Vol: 1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Total Dissolved Solids		**ND**		mg/L	10	8.2	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number: B0801191-04B

Analysis Date: 1/31/2008 12:16:31AM

Prep Date: 1/30/2008

Instrument: IC

Analytical Method ID: Inorganic Anions by Ion Chromatography - Anions by IC

File Name: 080130_037.D

Prep Method ID: 300.0

Dilution Factor: 1

Prep Batch Number: T080130013

Report Basis: As Received

Analyst Initials: KB

Sample prep wt./vol: 20.00 ml

Prep Extract Vol: 20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Chloride		**ND**		mg/L	0.80	0.042	2
Fluoride		**ND**		mg/L	0.40	0.031	
Sulfate		**3.4**		mg/L	1.5	0.11	

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801191

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **Ash Composite SPLP**

Matrix: Aqueous   Collection Date: 1/25/2008 2:00:00PM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0801191-05A	Analysis Date:	1/31/2008 2:46:54PM
Prep Date:	1/29/2008	Instrument:	CVAA_1
Analytical Method ID:	SW7470A - Mercury in Liquid Waste by CVAA - Total Hg	File Name:	B013108W.W
Prep Method ID:	7470A	Dilution Factor:	1
Prep Batch Number:	T080131004		
Report Basis:	As Received	Analyst Initials:	DL
Sample prep wt./vol:	30.00 ml	Prep Extract Vol:	30.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Mercury	7439-97-6	**ND**		mg/L	0.000200	0.000050	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0801191-05A	Analysis Date:	1/30/2008 1:19:00PM
Prep Date:	1/29/2008	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E01308A
Prep Method ID:	3010_ICP	Dilution Factor:	1
Prep Batch Number:	T080129008		
Report Basis:	As Received	Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Aluminum	7429-90-5	**0.36**		mg/L	0.050	0.014	1
Antimony	7440-36-0	**ND**		mg/L	0.050	0.0067	
Arsenic	7440-38-2	**ND**		mg/L	0.10	0.015	
Barium	7440-39-3	**0.11**		mg/L	0.010	0.00016	
Beryllium	7440-41-7	**ND**		mg/L	0.0010	0.000060	
Boron	7440-42-8	**0.28**		mg/L	0.050	0.0018	
Cadmium	7440-43-9	**ND**		mg/L	0.0060	0.00051	
Calcium	7440-70-2	**560**		mg/L	0.10	0.013	
Chromium	7440-47-3	**ND**		mg/L	0.010	0.0018	
Cobalt	7440-48-4	**ND**		mg/L	0.0050	0.0016	
Copper	7440-50-8	**ND**		mg/L	0.0050	0.0019	
Iron	7439-89-6	**ND**		mg/L	0.050	0.0027	
Lead	7439-92-1	**ND**		mg/L	0.050	0.011	
Lithium	7439-93-2	**ND**		mg/L	0.10	0.00072	
Magnesium	7439-96-4	**0.88**		mg/L	0.10	0.012	
Manganese	7439-96-5	**ND**		mg/L	0.010	0.00066	
Molybdenum	7439-98-7	**0.089**		mg/L	0.010	0.0018	
Nickel	7440-02-0	**ND**		mg/L	0.040	0.0027	
Potassium	7440-09-7	**ND**		mg/L	1.0	0.31	
Selenium	7784-49-2	**ND**		mg/L	0.10	0.026	
Silver	7440-22-4	**ND**		mg/L	0.015	0.00066	

Workorder (SDG): B0801191

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **Ash Composite SPLP**

Matrix: Aqueous
Collection Date: 1/25/2008 2:00:00PM

Lab Sample Number: B0801191-05A
Analysis Date: 1/30/2008 1:19:00PM
Prep Date: 1/29/2008
Instrument: ICP_2
Analytical Method ID: SW6010B - ICP - Total
File Name: E01308A
Prep Method ID: 3010_ICP
Dilution Factor: 1
Prep Batch Number: T080129008
Report Basis: As Received
Analyst Initials: rm
Sample prep wt./vol: 50.00 ml
Prep Extract Vol: 50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Sodium	7440-23-5	**8.8**		mg/L	3.0	0.028	1
Thallium	7440-28-0	**ND**		mg/L	0.40	0.011	
Vanadium	7440-62-2	**0.088**		mg/L	0.010	0.00072	
Zinc	7440-66-6	**ND**		mg/L	0.0050	0.0010	

The following test was conducted by: Analytica - Thornton

Lab Sample Number: B0801191-05B
Analysis Date: 2/4/2008 9:52:02AM
Prep Date: 2/4/2008
Instrument: Titrametric
Analytical Method ID: 310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity
File Name:
Prep Method ID: Alkalinity_W
Dilution Factor: 1
Prep Batch Number: T080205001
Report Basis: As Received
Analyst Initials: cs
Sample prep wt./vol: 100.00 ml
Prep Extract Vol: 100.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Bicarbonate		**ND**		mg/L	5.0	1.5	1
Carbonate		**18**		mg/L	7.0	1.2	

The following test was conducted by: Analytica - Thornton

Lab Sample Number: B0801191-05B
Analysis Date: 1/25/2008 2:10:00PM
Prep Date: 1/25/2008
Instrument: Probe
Analytical Method ID: 150.1 - pH, Elecrometric - pH
File Name:
Prep Method ID: 150.1
Dilution Factor: 1
Prep Batch Number: T080201005
Report Basis: As Received
Analyst Initials: R. Seeman
Sample prep wt./vol: 10.00 ml
Prep Extract Vol: 10.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
pH		**7.4**		pH	0.10	0.10	1

The following test was conducted by: Analytica - Thornton

Detailed Analytical Report Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801191

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **Ash Composite SPLP**

Matrix: Aqueous Collection Date: 1/25/2008 2:00:00PM

Lab Sample Number: B0801191-05B Analysis Date: 2/4/2008 12:47:24PM
Prep Date: 1/31/2008 Instrument: SCALE
Analytical Method ID: 160.1 - Total Dissolved Solids dried at 180°C - TDS File Name:
Prep Method ID: 160.1 Dilution Factor: 1
Prep Batch Number: T080131008
Report Basis: As Received Analyst Initials: kl
Sample prep wt./vol: 100.00 ml Prep Extract Vol: 1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Total Dissolved Solids		**2,200**		mg/L	10	8.2	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number: B0801191-05B Analysis Date: 1/30/2008 6:27:01PM
Prep Date: 1/30/2008 Instrument: IC
Analytical Method ID: Inorganic Anions by Ion Chromatography - Anions by IC File Name: 080130_018.D
Prep Method ID: 300.0 Dilution Factor: 25
Prep Batch Number: T080130013
Report Basis: As Received Analyst Initials: KB
Sample prep wt./vol: 20.00 ml Prep Extract Vol: 20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Sulfate		**1,300**		mg/L	38	2.8	1

Lab Sample Number: B0801191-05B Analysis Date: 1/31/2008 12:34:55AM
Prep Date: 1/30/2008 Instrument: IC
Analytical Method ID: Inorganic Anions by Ion Chromatography - Anions by IC File Name: 080130_038.D
Prep Method ID: 300.0 Dilution Factor: 1
Prep Batch Number: T080130013
Report Basis: As Received Analyst Initials: KB
Sample prep wt./vol: 20.00 ml Prep Extract Vol: 20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Chloride		**5.6**		mg/L	0.80	0.042	2
Fluoride		**3.2**		mg/L	0.40	0.031	

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801191

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **Spoil Composite SPLP**

Matrix: Aqueous

Collection Date: 1/25/2008 2:00:00PM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0801191-06A	Analysis Date:	1/31/2008 2:48:59PM
Prep Date:	1/29/2008	Instrument:	CVAA_1
Analytical Method ID:	SW7470A - Mercury in Liquid Waste by CVAA - Total Hg	File Name:	B013108W.W
Prep Method ID:	7470A	Dilution Factor:	1
Prep Batch Number:	T080131004		
Report Basis:	As Received	Analyst Initials:	DL
Sample prep wt./vol:	30.00 ml	Prep Extract Vol:	30.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Mercury	7439-97-6	**ND**		mg/L	0.000200	0.000050	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0801191-06A	Analysis Date:	1/30/2008 2:29:00PM
Prep Date:	1/29/2008	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E01308A
Prep Method ID:	3010_ICP	Dilution Factor:	1
Prep Batch Number:	T080129008		
Report Basis:	As Received	Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Aluminum	7429-90-5	**ND**		mg/L	0.050	0.014	1
Antimony	7440-36-0	**ND**		mg/L	0.050	0.0067	
Arsenic	7440-38-2	**ND**		mg/L	0.10	0.015	
Barium	7440-39-3	**0.070**		mg/L	0.010	0.00016	
Beryllium	7440-41-7	**ND**		mg/L	0.0010	0.000060	
Boron	7440-42-8	**0.084**		mg/L	0.050	0.0018	
Cadmium	7440-43-9	**ND**		mg/L	0.0060	0.00051	
Calcium	7440-70-2	**150**		mg/L	0.10	0.013	
Chromium	7440-47-3	**ND**		mg/L	0.010	0.0018	
Cobalt	7440-48-4	**ND**		mg/L	0.0050	0.0016	
Copper	7440-50-8	**ND**		mg/L	0.0050	0.0019	
Iron	7439-89-6	**ND**		mg/L	0.050	0.0027	
Lead	7439-92-1	**ND**		mg/L	0.050	0.011	
Lithium	7439-93-2	**ND**		mg/L	0.10	0.00072	
Magnesium	7439-96-4	**15**		mg/L	0.10	0.012	
Manganese	7439-96-5	**0.19**		mg/L	0.010	0.00066	
Molybdenum	7439-98-7	**ND**		mg/L	0.010	0.0018	
Nickel	7440-02-0	**ND**		mg/L	0.040	0.0027	
Potassium	7440-09-7	**7.0**		mg/L	1.0	0.31	
Selenium	7784-49-2	**ND**		mg/L	0.10	0.026	
Silver	7440-22-4	**ND**		mg/L	0.015	0.00066	

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801191

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **Spoil Composite SPLP**

Matrix: Aqueous | Collection Date: 1/25/2008 2:00:00PM

Lab Sample Number:	B0801191-06A	Analysis Date:	1/30/2008 2:29:00PM
Prep Date:	1/29/2008	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E01308A
Prep Method ID:	3010_ICP	Dilution Factor:	1
Prep Batch Number:	T080129008		
Report Basis:	As Received	Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Sodium	7440-23-5	**150**		mg/L	3.0	0.028	1
Thallium	7440-28-0	**ND**		mg/L	0.40	0.011	
Vanadium	7440-62-2	**ND**		mg/L	0.010	0.00072	
Zinc	7440-66-6	**ND**		mg/L	0.0050	0.0010	

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0801191-06B	Analysis Date:	2/4/2008 9:52:02AM
Prep Date:	2/4/2008	Instrument:	Titrametric
Analytical Method ID:	310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity	File Name:	
Prep Method ID:	Alkalinity_W	Dilution Factor:	1
Prep Batch Number:	T080205001		
Report Basis:	As Received	Analyst Initials:	cs
Sample prep wt./vol:	100.00 ml	Prep Extract Vol:	100.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Bicarbonate		**33**		mg/L	5.0	1.5	1
Carbonate		**14**		mg/L	7.0	1.2	

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0801191-06B	Analysis Date:	1/25/2008 2:10:00PM
Prep Date:	1/25/2008	Instrument:	Probe
Analytical Method ID:	150.1 - pH, Elecrometric - pH	File Name:	
Prep Method ID:	150.1	Dilution Factor:	1
Prep Batch Number:	T080201005		
Report Basis:	As Received	Analyst Initials:	R. Seeman
Sample prep wt./vol:	10.00 ml	Prep Extract Vol:	10.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
pH		**7.5**		pH	0.10	0.10	1

The following test was conducted by: Analytica - Thornton

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801191

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: **Client Sample Report**

Client Sample Name: **Spoil Composite SPLP**

Matrix: Aqueous

Collection Date: 1/25/2008 2:00:00PM

Lab Sample Number:	B0801191-06B	Analysis Date:	2/4/2008 12:47:24PM
Prep Date:	1/31/2008	Instrument:	SCALE
Analytical Method ID:	160.1 - Total Dissolved Solids dried at 180°C - TDS	File Name:	
Prep Method ID:	160.1	Dilution Factor:	1
Prep Batch Number:	T080131008		
Report Basis:	As Received	Analyst Initials:	kl
Sample prep wt./vol:	100.00 ml	Prep Extract Vol:	1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Total Dissolved Solids		**1,200**		mg/L	10	8.2	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0801191-06B	Analysis Date:	1/30/2008 7:40:34PM
Prep Date:	1/30/2008	Instrument:	IC
Analytical Method ID:	Inorganic Anions by Ion Chromatography - Anions by IC	File Name:	080130_022.D
Prep Method ID:	300.0	Dilution Factor:	25
Prep Batch Number:	T080130013		
Report Basis:	As Received	Analyst Initials:	KB
Sample prep wt./vol:	20.00 ml	Prep Extract Vol:	20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Sulfate		**670**		mg/L	38	2.8	1

Lab Sample Number:	B0801191-06B	Analysis Date:	1/31/2008 12:53:17AM
Prep Date:	1/30/2008	Instrument:	IC
Analytical Method ID:	Inorganic Anions by Ion Chromatography - Anions by IC	File Name:	080130_039.D
Prep Method ID:	300.0	Dilution Factor:	1
Prep Batch Number:	T080130013		
Report Basis:	As Received	Analyst Initials:	KB
Sample prep wt./vol:	20.00 ml	Prep Extract Vol:	20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Chloride		**1.5**		mg/L	0.80	0.042	2
Fluoride		**0.54**		mg/L	0.40	0.031	

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801191

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Method Blank Report

Client Sample Name: **MB**

Matrix: Aqueous

Collection Date: 1/29/2008 12:00:00AM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	T080131004-MB	Analysis Date:	1/31/2008 1:01:23PM
Prep Date:	1/29/2008	Instrument:	CVAA_1
Analytical Method ID:	SW7470A - Mercury in Liquid Waste by CVAA - Total Hg	File Name:	B013108W.W
Prep Method ID:	7470A	Dilution Factor:	1
Prep Batch Number:	T080131004		
Report Basis:	As Received	Analyst Initials:	DL
Sample prep wt./vol:	30.00 ml	Prep Extract Vol:	30.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Mercury	7439-97-6	**ND**		mg/L	0.000200	.000050	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	T080129008-MB	Analysis Date:	1/30/2008 12:34:00PM
Prep Date:	1/29/2008	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E01308A
Prep Method ID:	3010_ICP	Dilution Factor:	1
Prep Batch Number:	T080129008		
Report Basis:	As Received	Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Aluminum	7429-90-5	**ND**		mg/L	0.050	0.014	1
Antimony	7440-36-0	**ND**		mg/L	0.050	0.0067	
Arsenic	7440-38-2	**ND**		mg/L	0.10	0.015	
Barium	7440-39-3	**ND**		mg/L	0.010	0.00016	
Beryllium	7440-41-7	**ND**		mg/L	0.0010	0.000060	
Boron	7440-42-8	**ND**		mg/L	0.050	0.0018	
Cadmium	7440-43-9	**ND**		mg/L	0.0060	0.00051	
Calcium	7440-70-2	**ND**		mg/L	0.10	0.013	
Chromium	7440-47-3	**ND**		mg/L	0.010	0.0018	
Cobalt	7440-48-4	**ND**		mg/L	0.0050	0.0016	
Copper	7440-50-8	**ND**		mg/L	0.0050	0.0019	
Iron	7439-89-6	**ND**		mg/L	0.050	0.0027	
Lead	7439-92-1	**ND**		mg/L	0.050	0.011	
Lithium	7439-93-2	**ND**		mg/L	0.10	0.00072	
Magnesium	7439-96-4	**ND**		mg/L	0.10	0.012	
Manganese	7439-96-5	**ND**		mg/L	0.010	0.00066	
Molybdenum	7439-98-7	**ND**		mg/L	0.010	0.0018	
Nickel	7440-02-0	**ND**		mg/L	0.040	0.0027	
Potassium	7440-09-7	**ND**		mg/L	1.0	0.31	
Selenium	7784-49-2	**ND**		mg/L	0.10	0.026	
Silver	7440-22-4	**ND**		mg/L	0.015	0.00066	

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801191

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: **Method Blank Report**

Client Sample Name: **MB**

Matrix: Aqueous — Collection Date: 1/29/2008 12:00:00AM

Lab Sample Number:	T080129008-MB	Analysis Date:	1/30/2008 12:34:00PM
Prep Date:	1/29/2008	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E01308A
Prep Method ID:	3010_ICP	Dilution Factor:	1
Prep Batch Number:	T080129008		
Report Basis:	As Received	Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Sodium	7440-23-5	ND		mg/L	3.0	0.028	1
Thallium	7440-28-0	ND		mg/L	0.40	0.011	
Vanadium	7440-62-2	ND		mg/L	0.010	0.00072	

Lab Sample Number:	T080129008-MB	Analysis Date:	1/31/2008 11:13:00AM
Prep Date:	1/29/2008	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E01318A
Prep Method ID:	3010_ICP	Dilution Factor:	1
Prep Batch Number:	T080129008		
Report Basis:	As Received	Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Zinc	7440-66-6	ND		mg/L	0.0050	0.0010	2

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	T080205001-MB	Analysis Date:	2/4/2008 9:52:02AM
Prep Date:	2/4/2008	Instrument:	Titrametric
Analytical Method ID:	310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity	File Name:	
Prep Method ID:	Alkalinity_W	Dilution Factor:	1
Prep Batch Number:	T080205001		
Report Basis:	As Received	Analyst Initials:	cs
Sample prep wt./vol:	100.00 ml	Prep Extract Vol:	100.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Bicarbonate		ND		mg/L	5.0	1.5	1
Carbonate		ND		mg/L	7.0	1.2	

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	T080131008-MB	Analysis Date:	2/4/2008 12:47:24PM
Prep Date:	1/31/2008	Instrument:	SCALE
Analytical Method ID:	160.1 - Total Dissolved Solids dried at 180°C - TDS	File Name:	
Prep Method ID:	160.1	Dilution Factor:	1
Prep Batch Number:	T080131008		
Report Basis:	As Received	Analyst Initials:	kl
Sample prep wt./vol:	100.00 ml	Prep Extract Vol:	1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801191

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Method Blank Report

Client Sample Name: **MB**

Matrix: Aqueous

Collection Date: 1/31/2008 12:00:00AM

Lab Sample Number:	T080131008-MB	Analysis Date:	2/4/2008 12:47:24PM
Prep Date:	1/31/2008	Instrument:	SCALE
Analytical Method ID:	160.1 - Total Dissolved Solids dried at 180°C - TDS	File Name:	
Prep Method ID:	160.1	Dilution Factor:	1
Prep Batch Number:	T080131008		
Report Basis:	As Received	Analyst Initials:	kl
Sample prep wt./vol:	100.00 ml	Prep Extract Vol:	1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Total Dissolved Solids		**ND**		mg/L	10	8.2	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	T080130013-MB	Analysis Date:	1/30/2008 3:04:45PM
Prep Date:	1/30/2008	Instrument:	IC
Analytical Method ID:	Inorganic Anions by Ion Chromatography - Anions by IC	File Name:	080130_007.D
Prep Method ID:	300.0	Dilution Factor:	1
Prep Batch Number:	T080130013		
Report Basis:	As Received	Analyst Initials:	KB
Sample prep wt./vol:	20.00 ml	Prep Extract Vol:	20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Chloride		**ND**		mg/L	0.80	0.042	1
Fluoride		**ND**		mg/L	0.40	0.031	
Sulfate		**ND**		mg/L	1.5	0.11	

Workorder (SDG): B0801191

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0801191

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T080129008**

SAMPLE DUPLICATE REPORT

Analysis: SW6010B - ICP - Total

Base Sample: B0801191-05A

Prep Date: 1/29/2008

Samp. Anal. Date: 1/30/2008 1:19:00PM

DUP Anal. Date: 1/30/2008 1:40:00PM

Units: mg/L

Matrix: Aqueous

Analyte Name	SampResult	DUPRes.	RPD	RPDLim	Flag
Aluminum	0.359	0.346	3.7	20	
Antimony	ND	ND	0.0	20	
Arsenic	ND	ND	0.0	20	
Barium	0.113	0.110	2.7	20	
Beryllium	ND	ND	0.0	20	
Boron	0.282	0.278	1.4	20	
Cadmium	ND	ND	0.0	20	
Calcium	562	549	2.3	20	
Chromium	ND	ND	0.0	20	
Cobalt	ND	ND	0.0	20	
Copper	ND	ND	0.0	20	
Iron	ND	ND	0.0	20	
Lead	ND	ND	0.0	20	
Magnesium	0.883	0.856	3.1	20	
Manganese	ND	ND	0.0	20	
Molybdenum	0.0886	0.0859	3.1	20	
Nickel	ND	ND	0.0	20	
Potassium	ND	1.10	0.0	20	
Selenium	ND	ND	0.0	20	
Silver	ND	ND	0.0	20	
Sodium	8.85	8.45	4.6	20	
Thallium	ND	ND	0.0	20	
Vanadium	0.0883	0.0868	1.7	20	
Zinc	ND	ND	0.0	20	
Lithium	ND	ND	0.0	20	

LCS/LCSD REPORT

Workorder (SDG): B0801191

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0801191

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T080129008**

LCS/LCSD REPORT

Analysis: SW6010B - ICP - Total

MB: T080129008-MB

Prep Date: 1/29/2008

MB Anal. Date: 1/30/2008 12:34:00PM

Units: mg/L

LCS Anal. Date: 1/30/2008 12:39:00PM LCSD Anal. Date: 1/30/2008 12:44:00PM Matrix: Aqueous

Analyte Name	SampResult	LCSRes.	SDRes.	SPLev	SPDLev	Recov.	SD Recov	RPD	Recov Lim	RPDLim	Flag
Aluminum	ND	1.91	1.88	2.00	2.00	95.5	94.0	1.6	89 - 117	20	
Antimony	ND	0.474	0.458	0.500	0.500	94.8	91.6	3.4	82 - 117	20	
Arsenic	ND	1.81	1.82	2.00	2.00	90.5	91.0	0.6	86 - 116	20	
Barium	ND	1.87	1.85	2.00	2.00	93.5	92.5	1.1	86 - 116	20	
Beryllium	ND	0.0481	0.0477	0.0500	0.0500	96.2	95.4	0.8	87 - 111	20	
Boron	ND	0.463	0.459	0.500	0.500	92.6	91.8	0.9	76 - 130	20	
Cadmium	ND	0.0448	0.0430	0.0500	0.0500	89.6	86.0	4.1	79 - 113	20	
Calcium	ND	9.59	9.28	10.0	10.0	95.9	92.8	3.3	79 - 119	20	
Chromium	ND	0.189	0.185	0.200	0.200	94.5	92.5	2.1	86 - 117	20	
Cobalt	ND	0.468	0.464	0.500	0.500	93.6	92.8	0.9	82 - 118	20	
Copper	ND	0.231	0.231	0.250	0.250	92.4	92.4	0.0	86 - 117	20	
Iron	ND	0.981	0.972	1.00	1.00	98.1	97.2	0.9	83 - 121	20	
Lead	ND	0.472	0.453	0.500	0.500	94.4	90.6	4.1	83 - 121	20	
Magnesium	ND	9.61	9.54	10.0	10.0	96.1	95.4	0.7	83 - 118	20	
Manganese	ND	0.475	0.471	0.500	0.500	95.0	94.2	0.8	82 - 121	20	
Molybdenum	ND	0.468	0.463	0.500	0.500	93.6	92.6	1.1	82 - 120	20	
Nickel	ND	0.472	0.468	0.500	0.500	94.4	93.6	0.9	84 - 117	20	
Potassium	ND	7.84	7.75	10.0	10.0	78.4	77.5	1.2	74 - 110	20	
Selenium	ND	1.86	1.86	2.00	2.00	93.0	93.0	0.0	87 - 117	20	
Silver	ND	0.248	0.247	0.250	0.250	99.2	98.8	0.4	80 - 127	20	
Sodium	ND	9.34	10.1	10.0	10.0	93.4	101.0	7.8	87 - 113	20	
Thallium	ND	0.190	0.198	0.200	0.200	95.0	99.0	4.1	89 - 113	20	
Vanadium	ND	0.481	0.476	0.500	0.500	96.2	95.2	1.0	87 - 119	20	
Zinc	ND	0.476	0.543	0.500	0.500	95.2	108.6	13.2	81 - 120	20	
Lithium	ND	0.463	0.459	0.500	0.500	92.6	91.8	0.9	80 - 120	20	

MS/MSD REPORT

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801191

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0801191

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T080129008**

MS/MSD REPORT

Analysis: SW6010B - ICP - Total

Parent: B0801191-05A

Prep Date: 1/29/2008

Samp. Anal. Date: 1/30/2008 1:19:00PM

Units: mg/L

MS Anal. Date: 1/30/2008 1:45:00PM

MSD Anal. Date: 1/30/2008 1:50:00PM

Matrix: Aqueous

Analyte Name	SampResult	MSRes.	MSDRes	SPLev	SPDLev	Recov.	MSD Rec.	RPD	Recov Lim	RPDLim	Flag
Aluminum	0.359	2.23	2.20	2.00	2.00	93.6	92.1	1.4	75 - 125	20	
Antimony	ND	0.449	0.440	0.500	0.500	89.8	88.0	2.0	75 - 125	20	
Arsenic	ND	1.80	1.73	2.00	2.00	90.0	86.5	4.0	75 - 125	20	
Barium	0.113	1.89	1.82	2.00	2.00	88.9	85.4	3.8	75 - 125	20	
Beryllium	ND	0.0466	0.0452	0.0500	0.0500	93.2	90.4	3.1	75 - 125	20	
Boron	0.282	0.733	0.715	0.500	0.500	90.2	86.6	2.5	75 - 125	20	
Cadmium	ND	0.0408	0.0411	0.0500	0.0500	81.6	82.2	0.7	75 - 125	20	
Calcium	562	572	560	10.0	10.0	100.0	-20.0	2.1	75 - 125	20	*NOTE 2 NOTE 2*
Chromium	ND	0.184	0.180	0.200	0.200	92.0	90.0	2.2	75 - 125	20	
Cobalt	ND	0.437	0.427	0.500	0.500	87.4	85.4	2.3	75 - 125	20	
Copper	ND	0.229	0.221	0.250	0.250	91.6	88.4	3.6	75 - 125	20	
Iron	ND	0.935	0.925	1.00	1.00	93.5	92.5	1.1	75 - 125	20	
Lead	ND	0.434	0.429	0.500	0.500	86.8	85.8	1.2	75 - 125	20	
Magnesium	0.883	10.5	10.2	10.0	10.0	96.2	93.2	2.9	75 - 125	20	
Manganese	ND	0.445	0.431	0.500	0.500	89.0	86.2	3.2	75 - 125	20	
Molybdenum	0.0886	0.525	0.513	0.500	0.500	87.3	84.9	2.3	75 - 125	20	
Nickel	ND	0.445	0.433	0.500	0.500	89.0	86.6	2.7	75 - 125	20	
Potassium	ND	9.32	9.45	10.0	10.0	93.2	94.5	1.4	75 - 125	20	
Selenium	ND	1.94	1.87	2.00	2.00	97.0	93.5	3.7	75 - 125	20	
Silver	ND	0.241	0.234	0.250	0.250	96.4	93.6	2.9	75 - 125	20	
Sodium	8.85	18.0	17.5	10.0	10.0	91.5	86.5	2.8	75 - 125	20	
Thallium	ND	0.179	0.176	0.200	0.200	89.5	88.0	1.7	75 - 125	20	
Vanadium	0.0883	0.546	0.532	0.500	0.500	91.5	88.7	2.6	75 - 125	20	
Zinc	ND	0.428	0.419	0.500	0.500	85.6	83.8	2.1	75 - 125	20	
Lithium	ND	0.523	0.505	0.500	0.500	104.6	101.0	3.5	75 - 125	20	

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801191

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0801191

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T080129008**

POST DIGESTION SPIKE REPORT

Analysis: SW6010B - ICP - Total

Base Sample: B0801191-05A

Prep Date: 1/29/2008

Samp. Anal. Date: 1/30/2008 1:19:00PM

Units: mg/L

PDS Anal. Date: 1/30/2008 1:55:00PM

Matrix: Aqueous

Analyte Name	SampResult	PDSRes.	SPLev	Recov.	Recov Lim	Flag	
Aluminum	0.359	2.27	2.00	95.7	75 - 117		
Antimony	ND	0.444	0.500	87.5	75 - 117		
Arsenic	ND	1.76	2.00	88.3	75 - 116		
Barium	0.113	1.89	2.00	89.0	75 - 116		
Beryllium	ND	0.0467	0.0500	92.5	75 - 111		
Boron	0.282	0.736	0.500	90.7	75 - 130		
Cadmium	ND	0.0404	0.0500	79.3	75 - 113		
Calcium	562	580	10.0	186.5	75 - 119	highPDS	Note 2
Chromium	ND	0.185	0.200	88.3	75 - 117		
Cobalt	ND	0.438	0.500	87.3	75 - 118		
Copper	ND	0.227	0.250	89.9	75 - 117		
Iron	ND	0.957	1.00	95.5	75 - 121		
Lead	ND	0.438	0.500	88.0	75 - 121		
Magnesium	0.883	10.6	10.0	96.7	75 - 118		
Manganese	ND	0.443	0.500	88.4	75 - 121		
Molybdenum	0.0886	0.525	0.500	87.3	75 - 120		
Nickel	ND	0.443	0.500	88.9	75 - 117		
Potassium	ND	9.68	10.0	87.5	75 - 110		
Selenium	ND	1.94	2.00	95.6	75 - 117		
Silver	ND	0.240	0.250	96.5	75 - 127		
Sodium	8.85	18.4	10.0	95.2	75 - 113		
Thallium	ND	0.169	0.200	80.3	75 - 113		
Vanadium	0.0883	0.547	0.500	91.7	75 - 119		
Zinc	ND	0.428	0.500	88.6	75 - 120		
Lithium	ND	0.531	0.500	96.7	75 - 120		

SERIAL DILUTION REPORT

Detailed Analytical Report Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801191

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0801191

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T080129008**

SERIAL DILUTION REPORT

Analysis: SW6010B - ICP - Total

Base Sample: B0801191-05A

Prep Date: 1/29/2008

Samp. Anal. Date: 1/30/2008 1:19:00PM

Units: mg/L

SER DIL. Date: 1/30/2008 2:24:00PM

Matrix: Aqueous

Analyte Name	SampResult	PQL.	MDL.	SerialRes.	SerPQL.	RPD	Flag
Aluminum	0.359	0.050	0.014	0.526	0.25	37.7	Note 4
Antimony	ND	0.050	0.0067	ND	0.25		
Arsenic	ND	0.10	0.015	ND	0.50		
Barium	0.113	0.0100	0.00016	0.122	0.050	7.6	
Beryllium	ND	0.0010	0.000060	ND	0.0050		
Boron	0.282	0.050	0.0018	0.301	0.25	6.5	
Cadmium	ND	0.0060	0.00051	ND	0.030		
Calcium	562	0.10	0.013	585	0.50	4.0	
Chromium	ND	0.0100	0.0018	ND	0.050		
Cobalt	ND	0.0050	0.0016	ND	0.025		
Copper	ND	0.0050	0.0019	ND	0.025		
Iron	ND	0.050	0.0027	ND	0.25		
Lead	ND	0.050	0.011	ND	0.25		
Magnesium	0.883	0.10	0.012	0.965	0.50	8.8	
Manganese	ND	0.0100	0.00066	ND	0.050		
Molybdenum	0.0886	0.0100	0.0018	0.0920	0.050	3.7	
Nickel	ND	0.040	0.0027	ND	0.20		
Potassium	ND	1.0	0.31	ND	5.0		
Selenium	ND	0.10	0.026	ND	0.50		
Silver	ND	0.015	0.00066	ND	0.075		
Sodium	8.85	3.0	0.028	ND	15		
Thallium	ND	0.40	0.011	ND	2.0		
Vanadium	0.0883	0.0100	0.00072	0.0903	0.050	2.2	
Zinc	ND	0.0050	0.0010	ND	0.025		
Lithium	ND	0.10	0.00072	ND	0.50		

Prep Batch: **T080131004**

LCS/LCSD REPORT

Workorder (SDG): B0801191

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0801191

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T080131004**

LCS/LCSD REPORT

Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg

MB: T080131004-MB

Prep Date: 1/29/2008

MB Anal. Date: 1/31/2008 1:01:23PM

Units: mg/L

LCS Anal. Date: 1/31/2008 1:03:28PM LCSD Anal. Date: 1/31/2008 1:06:14PM

Matrix: Aqueous

Analyte Name	SampResult	LCSRes.	SDRes.	SPLev	SPDLev	Recov.	SD Recov	RPD	Recov Lim	RPDLim	Flag
Mercury	ND	0.00204	0.00209	0.00200	0.0020	102.0	104.5	2.4	80 - 120	20	

FOOTNOTES TO QC REPORT

Note 1: Results are shown to three significant figures to avoid rounding errors in calculations.

Note 2: If the sample concentration is greater than 4 times the spike level, a recovery is not meaningful, and the result should be used as a replicate. In such cases the spike is not as high as expected random measurement variability of the sample result itself.

Note 3: For sample duplicates, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample and duplicate results are not five times the PQL or greater, then the RPD is not expected to fall within the window shown and the comparison should be made on the basis of the absolute difference. Analytica uses the criterion that the absolute difference should be less than the PQL for water or less than 2XPQL for other matrices.

Note 4: For serial dilutions, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample result is not 50 times the MDL or greater, then the fact that the RPD does not meet the 10% criterion has little signifcance. Otherwise it indicates that a matrix bias may exist at the analytical step.

Detailed Analytical Report Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801191

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0801191

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T080130013**

SAMPLE DUPLICATE REPORT

Analysis: Inorganic Anions by Ion Chromatography - Anions by IC

Base Sample: B0801191-02B

Prep Date: 1/30/2008

Samp. Anal. Date: 1/30/2008 9:49:17PM

DUP Anal. Date: 1/30/2008 10:07:41PM

Units: mg/L

Matrix: Aqueous

Analyte Name	SampResult	DUPRes.	RPD	RPDLim	Flag
Fluoride	8.19	8.30	1.3	30	
Chloride	611	599	2.0	30	
Sulfate	2,480	2,440	1.6	30	

LCS/LCSD REPORT

Analysis: Inorganic Anions by Ion Chromatography - Anions by IC

MB: T080130013-MB

Prep Date: 1/30/2008

MB Anal. Date: 1/30/2008 3:04:45PM

Units: mg/L

LCS Anal. Date: 1/31/2008 2:12:57PM LCSD Anal. Date: 1/31/2008 2:31:20PM

Matrix: Aqueous

Analyte Name	SampResult	LCSRes.	SDRes.	SPLev	SPDLev	Recov.	SD Recov	RPD	Recov Lim	RPDLim	Flag
Fluoride	ND	2.37	2.36	2.50	2.50	94.8	94.4	0.4	90 - 110	20	
Chloride	ND	4.75	4.75	5.00	5.00	95.0	95.0	0.0	90 - 110	20	
Sulfate	ND	34.1	34.1	37.5	37.5	90.9	90.9	0.0	90 - 110	20	

MS REPORT

Analysis: Inorganic Anions by Ion Chromatography - Anions by IC

Parent: B0801191-02B

Prep Date: 1/30/2008

Samp. Anal. Date: 1/30/2008 9:49:17PM

MS Anal. Date: 1/30/2008 10:26:05PM

Units: mg/L

Matrix: Aqueous

Analyte Name	SampResult	MSRes.	SPLev	Recov.	Recov Lim		Flag
Fluoride	8.19	10.6	2.50	96.4	70 - 130		
Chloride	611	727	125	92.8	70 - 130	*NOTE 2*	
Sulfate	2,480	3,420	938	100.3	70 - 130		

Prep Batch: **T080131008**

SAMPLE DUPLICATE REPORT

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801191

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0801191

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T080131008**

SAMPLE DUPLICATE REPORT

Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS

Base Sample: B0801191-02B

Prep Date: 1/31/2008

Samp. Anal. Date: 2/4/2008 12:47:24PM

DUP Anal. Date: 2/4/2008 12:47:24PM

Units: mg/L

Matrix: Aqueous

Analyte Name	SampResult	DUPRes.	RPD	RPDLim	Flag
Total Dissolved Solids	5,320	5,430	2.0	20	

LCS/LCSD REPORT

Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS

MB: T080131008-MB

Prep Date: 1/31/2008

MB Anal. Date: 2/4/2008 12:47:24PM

Units: mg/L

LCS Anal. Date: 2/4/2008 12:47:24PM LCSD Anal. Date: 2/4/2008 12:47:24PM

Matrix: Aqueous

Analyte Name	SampResult	LCSRes.	SDRes.	SPLev	SPDLev	Recov.	SD Recov	RPD	Recov Lim	RPDLim	Flag
Total Dissolved Solids	ND	802	765	821	821	97.6	93.1	4.7	80 - 120	20	

MS REPORT

Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS

Parent: B0801191-02B

Prep Date: 1/31/2008

Samp. Anal. Date: 2/4/2008 12:47:24PM

Units: mg/L

MS Anal. Date: 2/4/2008 12:47:24PM

Matrix: Aqueous

Analyte Name	SampResult	MSRes.	SPLev	Recov.	Recov Lim		Flag
Total Dissolved Solids	5,320	6,190	821	105.9	70 - 130	*NOTE 2*	

Prep Batch: **T080205001**

SAMPLE DUPLICATE REPORT

Analysis: 310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity

Base Sample: B0801191-04B

Prep Date: 2/4/2008

Samp. Anal. Date: 2/4/2008 9:52:02AM

DUP Anal. Date: 2/4/2008 9:52:02AM

Units: mg/L

Matrix: Aqueous

Analyte Name	SampResult	DUPRes.	RPD	RPDLim	Flag
Bicarbonate	ND	ND	0.0	20	
Carbonate	10.0	8.00	22.2	20	OUT

Detailed Analytical Report Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801191

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0801191

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T080205001**

LCS/LCSD REPORT

Analysis: 310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity

MB: T080205001-MB

Prep Date: 2/4/2008

MB Anal. Date: 2/4/2008 9:52:02AM

Units: mg/L

LCS Anal. Date: 2/4/2008 9:52:02AM LCSD Anal. Date: 2/4/2008 9:52:02AM Matrix: Aqueous

Analyte Name	SampResult	LCSRes.	SDRes.	SPLev	SPDLev	Recov.	SD Recov	RPD	Recov Lim	RPDLim	Flag
Bicarbonate	ND	24.0	27.0	25.0	25.0	96.0	108.0	11.8	80 - 120	20	
Carbonate	ND	50.0	51.0	50.0	50.0	100.0	102.0	2.0	80 - 120	20	

FOOTNOTES TO QC REPORT

Note 1: Results are shown to three significant figures to avoid rounding errors in calculations.

Note 2: If the sample concentration is greater than 4 times the spike level, a recovery is not meaningful, and the result should be used as a replicate. In such cases the spike is not as high as expected random measurement variability of the sample result itself.

Note 3: For sample duplicates, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample and duplicate results are not five times the PQL or greater, then the RPD is not expected to fall within the window shown and the comparison should be made on the basis of the absolute difference. Analytica uses the criterion that the absolute difference should be less than the PQL for water or less than 2XPQL for other matrices.

Note 4: For serial dilutions, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample result is not 50 times the MDL or greater, then the fact that the RPD does not meet the 10% criterion has little signifcance. Otherwise it indicates that a matrix bias may exist at the analytical step.

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801191

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

QC BATCH ASSOCIATIONS - BY METHOD BLANK

Lab Project ID: **83,542** **Lab Project Number:** **B0801191**

Prep Date: 1/29/2008

Lab Method Blank Id: T080129008-MB
Prep Batch ID: T080129008
Method: SW6010B - ICP - Total

This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates:

SampleNum	ClientSampleName	DataFile	AnalysisDate
B0801191-01A	MB 45 day	E01308A	1/30/2008 12:59:00PM
B0801191-02A	Ash Composite 45 day	E01308A	1/30/2008 1:04:00PM
B0801191-03A	Spoil Composite 45 day	E01308A	1/30/2008 1:09:00PM
B0801191-04A	MB SPLP	E01308A	1/30/2008 1:14:00PM
B0801191-05A	Ash Composite SPLP	E01308A	1/30/2008 1:19:00PM
B0801191-06A	Spoil Composite SPLP	E01308A	1/30/2008 2:29:00PM
T080129008-LCS	LCS	E01308A	1/30/2008 12:39:00PM
T080129008-LCSD	LCSD	E01308A	1/30/2008 12:44:00PM
B0801191-05A-DUP	DUP	E01308A	1/30/2008 1:40:00PM
B0801191-05A-MS	MS	E01308A	1/30/2008 1:45:00PM
B0801191-05A-MSD	MSD	E01308A	1/30/2008 1:50:00PM
B0801191-05A-PDS	PDS	E01308A	1/30/2008 1:55:00PM
T080129008-LCS	LCS	E01318A	1/31/2008 11:18:00AM
T080129008-LCSD	LCSD	E01318A	1/31/2008 11:23:00AM
B0801191-05A-MS	MS	E01318A	1/31/2008 11:28:00AM
B0801191-05A-MSD	MSD	E01318A	1/31/2008 11:33:00AM
B0801191-05A-PDS	PDS	E01318A	1/31/2008 11:38:00AM

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801191

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

QC BATCH ASSOCIATIONS - BY METHOD BLANK

Lab Project ID: **83,542** **Lab Project Number:** **B0801191**

Prep Date: 1/30/2008

Lab Method Blank Id: T080130013-MB

Prep Batch ID: T080130013

Method: Inorganic Anions by Ion Chromatography - Anions by IC

This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates:

SampleNum	ClientSampleName	DataFile	AnalysisDate
T080130013-LCS	LCS	080130_008.DXD	1/30/2008 3:23:07PM
T080130013-LCSD	LCSD	080130_009.DXD	1/30/2008 3:41:32PM
B0801191-01B	MB 45 day	080130_011.DXD	1/30/2008 4:18:17PM
B0801191-02B	Ash Composite 45 day	080130_012.DXD	1/30/2008 4:36:41PM
B0801191-02B-DUP	DUP	080130_013.DXD	1/30/2008 4:55:04PM
B0801191-02B-MS	MS	080130_014.DXD	1/30/2008 5:13:28PM
B0801191-03B	Spoil Composite 45 day	080130_016.DXD	1/30/2008 5:50:15PM
B0801191-05B	Ash Composite SPLP	080130_018.DXD	1/30/2008 6:27:01PM
B0801191-06B	Spoil Composite SPLP	080130_022.DXD	1/30/2008 7:40:34PM
B0801197-02B	Batch QC	080130_024.DXD	1/30/2008 8:17:21PM
B0801197-02B-MS	MS	080130_025.DXD	1/30/2008 8:35:45PM
B0801191-01B	MB 45 day	080130_027.DXD	1/30/2008 9:12:31PM
B0801191-02B	Ash Composite 45 day	080130_029.DXD	1/30/2008 9:49:17PM
B0801191-02B-DUP	DUP	080130_030.DXD	1/30/2008 10:07:41PM
B0801191-02B-MS	MS	080130_031.DXD	1/30/2008 10:26:05PM
B0801191-03B	Spoil Composite 45 day	080130_033.DXD	1/30/2008 11:02:52PM
B0801191-04B	MB SPLP	080130_037.DXD	1/31/2008 12:16:31AM
B0801191-05B	Ash Composite SPLP	080130_038.DXD	1/31/2008 12:34:55AM
B0801191-06B	Spoil Composite SPLP	080130_039.DXD	1/31/2008 12:53:17AM
B0801197-02B	Batch QC	080130_043.DXD	1/31/2008 2:06:51AM
B0801197-02B-MS	MS	080130_044.DXD	1/31/2008 2:25:15AM
T080130013-LCS	LCS	080131_010.DXD	1/31/2008 2:12:57PM
T080130013-LCSD	LCSD	080131_011.DXD	1/31/2008 2:31:20PM

Workorder (SDG): B0801191

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

QC BATCH ASSOCIATIONS - BY METHOD BLANK

Lab Project ID: **83,542** **Lab Project Number:** **B0801191**

Prep Date: 1/29/2008

Lab Method Blank Id: T080131004-MB

Prep Batch ID: T080131004

Method: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg

This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates:

SampleNum	ClientSampleName	DataFile	AnalysisDate
A0801184-01D	Batch QC	B013108W.WKS	1/31/2008 1:13:50PM
B0801191-01A	MB 45 day	B013108W.WKS	1/31/2008 1:50:33PM
B0801191-02A	Ash Composite 45 day	B013108W.WKS	1/31/2008 2:39:43PM
B0801191-03A	Spoil Composite 45 day	B013108W.WKS	1/31/2008 2:41:52PM
B0801191-04A	MB SPLP	B013108W.WKS	1/31/2008 2:44:26PM
B0801191-05A	Ash Composite SPLP	B013108W.WKS	1/31/2008 2:46:54PM
B0801191-06A	Spoil Composite SPLP	B013108W.WKS	1/31/2008 2:48:59PM
T080131004-LCS	LCS	B013108W.WKS	1/31/2008 1:03:28PM
T080131004-LCSD	LCSD	B013108W.WKS	1/31/2008 1:06:14PM
A0801184-01D-DUP	DUP	B013108W.WKS	1/31/2008 1:16:26PM
A0801184-01D-MS	MS	B013108W.WKS	1/31/2008 1:18:43PM
A0801184-01D-MSD	MSD	B013108W.WKS	1/31/2008 1:20:47PM
A0801184-01D-PDS	PDS	B013108W.WKS	1/31/2008 1:23:11PM

Prep Date: 1/31/2008

Lab Method Blank Id: T080131008-MB

Prep Batch ID: T080131008

Method: 160.1 - Total Dissolved Solids dried at 180°C - TDS

This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates:

SampleNum	ClientSampleName	DataFile	AnalysisDate
B0801191-01B	MB 45 day		2/4/2008 12:47:24PM
B0801191-02B	Ash Composite 45 day		2/4/2008 12:47:24PM
B0801191-03B	Spoil Composite 45 day		2/4/2008 12:47:24PM
B0801191-04B	MB SPLP		2/4/2008 12:47:24PM
B0801191-05B	Ash Composite SPLP		2/4/2008 12:47:24PM
B0801191-06B	Spoil Composite SPLP		2/4/2008 12:47:24PM
B0801197-02B	Batch QC		2/4/2008 12:47:24PM
T080131008-LCS	LCS		2/4/2008 12:47:24PM
T080131008-LCSD	LCSD		2/4/2008 12:47:24PM
B0801191-02B-DUP	DUP		2/4/2008 12:47:24PM
B0801191-02B-MS	MS		2/4/2008 12:47:24PM
B0801197-02B-MS	MS		2/4/2008 12:47:24PM

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801191

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

QC BATCH ASSOCIATIONS - BY METHOD BLANK

Lab Project ID: **83,542** **Lab Project Number:** **B0801191**

Prep Date: 2/4/2008

Lab Method Blank Id: T080205001-MB

Prep Batch ID: T080205001

Method: 310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity

This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates:

SampleNum	ClientSampleName	DataFile	AnalysisDate
B0801191-01B	MB 45 day		2/4/2008 9:52:02AM
B0801191-02B	Ash Composite 45 day		2/4/2008 9:52:02AM
B0801191-03B	Spoil Composite 45 day		2/4/2008 9:52:02AM
B0801191-04B	MB SPLP		2/4/2008 9:52:02AM
B0801191-05B	Ash Composite SPLP		2/4/2008 9:52:02AM
B0801191-06B	Spoil Composite SPLP		2/4/2008 9:52:02AM
T080205001-LCS	LCS		2/4/2008 9:52:02AM
T080205001-LCSD	LCSD		2/4/2008 9:52:02AM
B0801191-04B-DUP	DUP		2/4/2008 9:52:02AM

Workorder (SDG): B0801191

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

DATA FLAGS AND DEFINITIONS

The PQL is the Method Quantitation Limit as defined by USACE.
Reporting Limit: Limit below which results are shown as "ND". This may be the PQL, MDL, or a value between. See the report conventions below.

Result Field:

- ND = Not Detected at or above the Reporting Limit
- NA = Analyte not applicable (see Case Narrative for discussion)

Qualifier Fields:

- LOW = Recovery is below Lower Control Limit
- HIGH = Recovery , RPD, or other parameter is above Upper Control Limit
- E = Reported concentration is above the instrument calibration upper range

Organic Analysis Flags:

- B = Analyte was detected in the laboratory method blank
- J = Analyte was detected above MDL or Reporting Limit but below the Quant Limit (PQL)

Inorganic Analysis Flags:

- J = Analyte was detected above the Reporting Limit but below the Quant Limit (PQL)
- W = Post digestion spike did not meet criteria
- S = Reported value determined by the Method of Standard Additions (MSA)

Several ways of defining the limit of detection and quantitation are prevalent in the laboratory industry and may appear in Analytica reports. These include the following:

- MRL = "minimum reporting level", from the EPA Safe Drinking Water program (SDW)
- PQL = "practical quantitation limit", from SW-846
- EQL = "estimated quantitation limit", from SW-846
- LOQ = "limit of quantitation", from a number of authoritative sources

In Analytica's work, all of these terms have the same meaning, equivalent to the EPA definition of the MRL. This reporting level is supported by a satisfactory calibration data point which is at that level or lower, and also is supported by a method detection limit (MDL) determined by the procedure in 40CFR. The MDL is lower than the MRL and represents an estimate of the level where positive detections have a 99% probability of being real, but where quantitation accuracy is unknown.

The MRL as defined by Analytica is the lowest demonstrated point of known quantitation accuracy.
The MRL should not be confused with the MCL, which is the EPA-defined "maximum contaminant level" allowed for certain regulated targets under specific regulations, such as the National Primary Drinking Water Regulations. Normally, the MRL is set at a level which is much lower than the MCL in order to ensure that levels are well below those limits. Not all target analytes have MCL levels established.

Other Flags may be applied. See Case Narrative for Description

Detailed Analytical Report Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801191

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

REPORTING CONVENTIONS FOR THIS REPORT

B0801191

TestPkgName	Basis	# Sig Figs	Reporting Limit
150.1/150.1 (Aqueous) - pH	As Received	2	Report to PQL
160.1/160.1 (Aqueous) - TDS	As Received	2	Report to PQL
300.0/300.0 (Aqueous) - Anions by IC	As Received	2	Report to PQL
310.1/310.1 (Aqueous) - Alkalinity	As Received	2	Report to PQL
6010B/3010A (Aqueous) - Total	As Received	2	Report to PQL
7470A/7470A (Aqueous) - Total Hg	As Received	2	Report to PQL

Analytica Chain of Custody Form

ANALYTICA GROUP®

12189 Pennsylvania St. Thornton, CO 80241 (303) 469-8868 (303) 469-5254 fax
4307 Arctic Boulevard Anchorage, AK 99503 (907) 258-2155 (907) 258-6634 fax
475 Hall St. Fairbanks, AK 99701 (907) 456-3116 (907) 456-3125 Fax
5438 Shaune Drive Juneau, AK 99801 (907) 780-6668 (907) 780-6670 fax

Chain of Custody No: 63226

Client Name & Address: Applied Hydrology Associates, Inc.

Public Water System (PWS) ID#:

Project Name: Navajo Mine Extension Leaching Study

Section To be Completed by Analytica
Quote ID:
LGN: 6080119I
Account #: | Cash | Credit Card

Report to:
Phone No:
Fax No:
E-mail:

Turnaround Time for Results (TAT)
X Standard
___ Expedited (< 10 days, prior authorization required) (please specify due date below; add'l charges may apply)

Requested Due Date for Results:

Invoice to Name & Address:

P.O. or Contract No:

Special Instructions/Comments:
Tumbled in house by R. Seeman
45 day Coal water and SPLP leach

Kit Prep/Shipping Charge: $

Requested Analysis/Method

Client Sample Identification / Location	Date Sampled	Time Sampled	Matrix (S-DW-WW-Other)	No. of Containers	6010B/3010A-TTL (Lot #: 1107090, Pres: HNO3)	7470A/7470A-Hg (Lot #: 1107090, Pres: HNO3)	150.1 pH (Lot #:, Pres:)	160.1 TDS (Lot #:, Pres:)	300.0 Anions/IC (Lot #:, Pres:)	310.1 Alk (Lot #:, Pres:)	(Lot #:, Pres:)	Field Preserved	Field Filtered	MS/MSD ?
MB 45 day	1/25/08	14:00	Aq	2	X	X	X	X	X	X		1/2	Yes	
Ash Composite 45 day	|	|	|	3	X	X	X	X	X	X		1/3	|	X
Spoil Composite 45 day	|	|	|	2	X	X	X	X	X	X		1/2	|	
MB SPLP	|	|	|	2	X	X	X	X	X	X		|	|	
Ash Composite SPLP	|	|	|	2	X	X	X	X	X	X		|	|	
Spoil Composite SPLP	|	|	|	2	X	X	X	X	X	X		|	|	

Relinquished by:	Date	Time	Received by:	Date	Time
R. Seeman	1/28/08	12:35	[signature]	1/28/08	12:35
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time

Name of Sampler: (printed)

Section To Be Completed by Analytica

	THO	ANC	JNU	FBKS
Condition of Custody Seal?:	—			
Initialed By:	—			
Temp/Loc:	6.0			
Thermo ID#:				
Shipped Via:	Ryan Seeman			

Version 2.0

ANALYTICA

Cooler Receipt Form

Client: Applied Hydrology Associates **Client Code:** 030188 **Order #:** B0801191
Project: Navajo Mine Extension Leaching Study

Cooler ID: 1

A. Preliminary Examination Phase:

Date cooler opened: 1/28/2008
Cooler opened by: gp **Signature:** GP

1. **Was airbill Attached?** N/A **Airbill #:** **Carrier Name:** Other
2. **Custody Seals?** N/A **How many?** 0 **Location:** **Seal Name:**
3. **Seals intact?** N/A
4. **COC Attached?** Yes **Properly Completed?** Yes **Signed by AEL employee?** Yes
5. **Project Identification from custody paper:** Navajo Mine Extension Leaching Study
6. **Preservative:** None **Temperature:** 6.0 **deg. C**

Designated person initial here to acknowledge receipt: GP **Date:** 1/28/08

COMMENTS: Tumbled in house by R. Seeman. 45 day coal water and SPLP Leach.

B. Log-In Phase: **Samples Log-in Date:** 1/28/2008 **Log-in By:** gp

1. **Packing Type:** Other
2. **Were samples in separate bags?** N/A
3. **Were containers intact?** Yes **Labels agree with COC?** Yes
4. **Number of bottles received:** 13 **Number of samples received:** 6
5. **Correct containers used?** Yes **Correct preservatives added?** Yes
6. **Sufficient sample volume?** Yes
7. **Bubbles in VOA samples?** N/A
8. **Was Project manager called and status discussed?** No
9. **Was anyone called?** No **Who was called?** ______ **By whom?** ______ **Date:** ______

COMMENTS:

The Analytica Group
CLIENT INVOICE

Remit to:	Accounting Dpt Analytica Environmental Laboratories, Inc. P.O. Box 973426 Dallas,TX 75397-3426	**Invoice #:**	**82691**
		Work Order#:	**B0801197**
		Account#:	030188
		Quote ID#:	11340
		Invoice Date:	2/11/2008
		Work ID:	Navajo Mine Extension Leaching Study
Phone:	(303) 469-8868	**PO #:**	none
Attention:	Mr.Art O'Hayre	**Received:**	1/29/2008
Invoice to:	Applied Hydrology Associates, Inc. 950 South Cherry Street Suite 810 Denver, CO 80246	**Reported:**	2/11/2008
		Client Project#:	Navajo Mine Extension Leach

Comments:

Item charges		**Qty**	**Price**	**Total**
SW7470A - Mercury in Liquid Waste by CVAA - Total Hg In Aqueous	M	2	35.00	70.00
160.1 - Total Dissolved Solids dried at 180°C - TDS In Liquid	Matrix	2	22.00	44.00
150.1 - pH, Elecrometric - pH In Liquid	Matrix	2	10.00	20.00
SW6010B - ICP - Total In Aqueous	Matrix	2	312.00	624.00
Inorganic Anions by Ion Chromatography - Anions by IC In Liquid	Matrix	2	54.00	108.00
310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity In Liquid	Matrix	2	36.00	72.00
		Total of Items Above:		**$938.00**

Adjustments or Special Services	**Qty**	**Price**	**Total**
Tumbling Charge	1	95.00	95.00
	Total of Items Above:		**$95.00**
	Grand Total:		**$1,033.00**

All invoices are due and payable upon receipt. Outstanding balances over 30 days are subject to a finance charge of 1.5% per month, plus a late fee of $25.00. If Analytica engages legal counsel to enforce its rights or any other rights under an application for payment, the customer will be liable to Analytica for all costs of collection and other legal expenses, including reasonable attorney fees.

The Analytica Group

CLIENT INVOICE

REMITTANCE ADVICE
PLEASE RETURN THIS PORTION WITH YOUR PAYMENT

Mr.Art O'Hayre		**Account#:**	030188
Applied Hydrology Associates, Inc.		**Invoice #:**	**82691**
950 South Cherry Street		**Invoice Date:**	2/11/2008
Suite 810 Denver, CO 80246			

TOTAL INVOICE AMOUNT: **$1,033.00**

PAYMENT AMOUNT ENCLOSED: ____________________

Analytica Environmental
Laboratories, Inc.
12189 Pennsylvania Street
Thornton, CO 80241
Phone: 303-469-8868
Fax: 303-469-5254

ANALYTICA
Environmental Laboratories

2/11/2008

Applied Hydrology Associates, Inc.
950 South Cherry Street
Suite 810
Denver, CO 80246
Attn: Art O'Hayre

Work Order #: B0801197
Date: 2/11/2008
Work ID: Navajo Mine Extension Leaching Study
Date Received: 1/29/2008
Proj #: none

Sample Identification

Lab Sample Number	Client Description	Lab Sample Number	Client Description
B0801197-01	MB Successive #1	B0801197-02	Ash Successive #1

Enclosed are the analytical results for the submitted sample(s). Please review the CASE NARRATIVE for a discussion of any data and/or quality control issues. Listings of data qualifiers, analytical codes, key dates, and QC relationships are provided at the end of the report.

Sincerely,

Kristen Stone
Project Manager

"The Science of Analysis, The Art of Service"

Case Narrative

Analytica Environmental Laboratories, Inc.

Work Order: B0801197

Samples were prepared and analyzed according to EPA or equivalent methods outlined in the following references:

Methods for Chemical Analysis of Water and Wastes, USEPA 600/4-79-020, March 1983.

Pfaff, J. D., C. A. Brockhoff and J. W. O'Dell. 1994. The Determination of Inorganic Anions in Water by Ion Chromatography. Method 300.0A. U. S. Environmental Protection Agency. Environmental Monitoring Systems Lab.

Methods for the Determination of Metals in Environmental Samples, EPA/600/R-94/111, May 1994.

SAMPLE RECEIPT:
Two (2) samples were received on 1/29/2008 1:40:00 PM., at a temperature of 20 deg C., at Analytica-Thornton. The samples were received in good condition and in order per chain of custody. The samples were tumbled at the laboratory.

REVIEW FOR COMPLIANCE WITH ANALYTICA QA PLAN
A summary of our review is shown below.

All analytical results contained in this report have been reviewed under Analytica's internal quality assurance and quality control program. Any deviations in quality contro parameters for specific analyses are noted in the following text. A complete quality assurance report, including laboratory control, matrix spike, and sample duplicate recoveries is kept on file in our office and is available upon request.

All method specifications were met for the following tests:

Test Method: 150.1 - pH, Elecrometric - pH - Aqueous
Test Method: 160.1 - Total Dissolved Solids dried at 180°C - TDS - Aqueous
Test Method: 310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity - Aqueous
Test Method: Inorganic Anions by Ion Chromatography - Anions by IC - Aqueous
Test Method: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg - Aqueous

Test Method: SW6010B - ICP - Total - Aqueous

MS/MSD and DUP OUTLIERS:
As shown below, the MS/MSD was outside of limits for Sodium and Calcium. The sample had Sodium and Calcium concentrations greater than four times the spike amount. In these case it is not appropriate to calculate a recovery. The result should be used as a replicate.

Type	Client Sample	LabSample	Analyte	Recovery	LCL	UCL	Parent	Spike
MS	Ash Successive #	B0801197-02A	Sodium	52.8	75	125	1130	10.0
MSD	Ash Successive #	B0801197-02A	Calcium	217	75	125	472	10.0
MSD	Ash Successive #	B0801197-02A	Sodium	352	75	125	1130	10.0

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801197

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **MB Successive #1**

Matrix: Aqueous

Collection Date: 1/29/2008 11:10:00AM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0801197-01A	Analysis Date:	2/5/2008 4:36:31PM
Prep Date:	2/5/2008	Instrument:	CVAA_1
Analytical Method ID:	SW7470A - Mercury in Liquid Waste by CVAA - Total Hg	File Name:	B020508W.W
Prep Method ID:	7470A	Dilution Factor:	1
Prep Batch Number:	T080205004		
Report Basis:	As Received	Analyst Initials:	DL
Sample prep wt./vol:	30.00 ml	Prep Extract Vol:	30.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Mercury	7439-97-6	**ND**		mg/L	0.000200	.000050	2

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0801197-01A	Analysis Date:	1/31/2008 1:35:00PM
Prep Date:	1/30/2008	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E01318A
Prep Method ID:	3010_ICP	Dilution Factor:	1
Prep Batch Number:	T080130010		
Report Basis:	As Received	Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Aluminum	7429-90-5	**0.063**		mg/L	0.050	0.014	1
Antimony	7440-36-0	**ND**		mg/L	0.050	0.0067	
Arsenic	7440-38-2	**ND**		mg/L	0.10	0.015	
Barium	7440-39-3	**0.085**		mg/L	0.010	0.00016	
Beryllium	7440-41-7	**ND**		mg/L	0.0010	0.000060	
Boron	7440-42-8	**0.31**		mg/L	0.050	0.0018	
Cadmium	7440-43-9	**ND**		mg/L	0.0060	0.00051	
Calcium	7440-70-2	**3.2**		mg/L	0.10	0.013	
Chromium	7440-47-3	**ND**		mg/L	0.010	0.0018	
Cobalt	7440-48-4	**ND**		mg/L	0.0050	0.0016	
Copper	7440-50-8	**ND**		mg/L	0.0050	0.0019	
Iron	7439-89-6	**ND**		mg/L	0.050	0.0027	
Lead	7439-92-1	**ND**		mg/L	0.050	0.011	
Lithium	7439-93-2	**ND**		mg/L	0.10	0.00072	
Magnesium	7439-96-4	**1.3**		mg/L	0.10	0.012	
Manganese	7439-96-5	**ND**		mg/L	0.010	0.00066	
Molybdenum	7439-98-7	**0.016**		mg/L	0.010	0.0018	
Nickel	7440-02-0	**ND**		mg/L	0.040	0.0027	
Potassium	7440-09-7	**12**		mg/L	1.0	0.31	
Selenium	7784-49-2	**ND**		mg/L	0.10	0.026	
Silver	7440-22-4	**ND**		mg/L	0.015	0.00066	

Workorder (SDG): B0801197

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: **Client Sample Report**

Client Sample Name: **MB Successive #1**

Matrix: Aqueous Collection Date: 1/29/2008 11:10:00AM

Lab Sample Number:	B0801197-01A	Analysis Date:	1/31/2008 1:35:00PM
Prep Date:	1/30/2008	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E01318A
Prep Method ID:	3010_ICP	Dilution Factor:	1
Prep Batch Number:	T080130010		
Report Basis:	As Received	Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Sodium	7440-23-5	**1,200**		mg/L	3.0	0.028	1
Thallium	7440-28-0	**ND**		mg/L	0.40	0.011	
Vanadium	7440-62-2	**ND**		mg/L	0.010	0.00072	
Zinc	7440-66-6	**ND**		mg/L	0.0050	0.0010	

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0801197-01B	Analysis Date:	2/4/2008 9:52:02AM
Prep Date:	2/4/2008	Instrument:	Titrametric
Analytical Method ID:	310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity	File Name:	
Prep Method ID:	Alkalinity_W	Dilution Factor:	1
Prep Batch Number:	T080205001		
Report Basis:	As Received	Analyst Initials:	cs
Sample prep wt./vol:	50.00 ml	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Bicarbonate		**1,100**		mg/L	5.0	1.5	1
Carbonate		**280**		mg/L	7.0	1.2	

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0801197-01B	Analysis Date:	1/29/2008 11:20:00AM
Prep Date:	1/29/2008	Instrument:	Probe
Analytical Method ID:	150.1 - pH, Elecrometric - pH	File Name:	
Prep Method ID:	150.1	Dilution Factor:	1
Prep Batch Number:	T080201006		
Report Basis:	As Received	Analyst Initials:	R. Seeman
Sample prep wt./vol:	10.00 ml	Prep Extract Vol:	10.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
pH		**9.1**		pH	0.10	0.10	1

The following test was conducted by: Analytica - Thornton

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801197

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **MB Successive #1**

Matrix: Aqueous

Collection Date: 1/29/2008 11:10:00AM

Lab Sample Number: B0801197-01B
Analysis Date: 2/4/2008 12:47:24PM
Prep Date: 1/31/2008
Instrument: SCALE
Analytical Method ID: 160.1 - Total Dissolved Solids dried at 180°C - TDS
File Name:
Prep Method ID: 160.1
Dilution Factor: 1
Prep Batch Number: T080131008
Report Basis: As Received
Analyst Initials: kl
Sample prep wt./vol: 100.00 ml
Prep Extract Vol: 1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Total Dissolved Solids		**3,000**		mg/L	10	8.2	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number: B0801197-01B
Analysis Date: 1/30/2008 7:58:57PM
Prep Date: 1/30/2008
Instrument: IC
Analytical Method ID: Inorganic Anions by Ion Chromatography - Anions by IC
File Name: 080130_023.D
Prep Method ID: 300.0
Dilution Factor: 25
Prep Batch Number: T080130013
Report Basis: As Received
Analyst Initials: KB
Sample prep wt./vol: 20.00 ml
Prep Extract Vol: 20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Chloride		**600**		mg/L	20	1.1	1

Lab Sample Number: B0801197-01B
Analysis Date: 1/31/2008 1:30:04AM
Prep Date: 1/30/2008
Instrument: IC
Analytical Method ID: Inorganic Anions by Ion Chromatography - Anions by IC
File Name: 080130_041.D
Prep Method ID: 300.0
Dilution Factor: 1
Prep Batch Number: T080130013
Report Basis: As Received
Analyst Initials: KB
Sample prep wt./vol: 20.00 ml
Prep Extract Vol: 20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Fluoride		**2.2**		mg/L	0.40	0.031	2
Sulfate		**280**		mg/L	1.5	0.11	

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801197

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **Ash Successive #1**

Matrix: Aqueous   Collection Date: 1/29/2008 11:10:00AM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0801197-02A	Analysis Date:	2/5/2008 4:38:47PM
Prep Date:	2/5/2008	Instrument:	CVAA_1
Analytical Method ID:	SW7470A - Mercury in Liquid Waste by CVAA - Total Hg	File Name:	B020508W.W
Prep Method ID:	7470A	Dilution Factor:	1
Prep Batch Number:	T080205004		
Report Basis:	As Received	Analyst Initials:	DL
Sample prep wt./vol:	30.00 ml	Prep Extract Vol:	30.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Mercury	7439-97-6	**ND**		mg/L	0.000200	0.000050	2

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0801197-02A	Analysis Date:	1/31/2008 1:40:00PM
Prep Date:	1/30/2008	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E01318A
Prep Method ID:	3010_ICP	Dilution Factor:	1
Prep Batch Number:	T080130010		
Report Basis:	As Received	Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Aluminum	7429-90-5	**0.065**		mg/L	0.050	0.014	1
Antimony	7440-36-0	**ND**		mg/L	0.050	0.0067	
Arsenic	7440-38-2	**ND**		mg/L	0.10	0.015	
Barium	7440-39-3	**0.033**		mg/L	0.010	0.00016	
Beryllium	7440-41-7	**ND**		mg/L	0.0010	0.000060	
Boron	7440-42-8	**0.37**		mg/L	0.050	0.0018	
Cadmium	7440-43-9	**ND**		mg/L	0.0060	0.00051	
Calcium	7440-70-2	**470**		mg/L	0.10	0.013	
Chromium	7440-47-3	**ND**		mg/L	0.010	0.0018	
Cobalt	7440-48-4	**ND**		mg/L	0.0050	0.0016	
Copper	7440-50-8	**ND**		mg/L	0.0050	0.0019	
Iron	7439-89-6	**ND**		mg/L	0.050	0.0027	
Lead	7439-92-1	**ND**		mg/L	0.050	0.011	
Lithium	7439-93-2	**ND**		mg/L	0.10	0.00072	
Magnesium	7439-96-4	**2.0**		mg/L	0.10	0.012	
Manganese	7439-96-5	**0.021**		mg/L	0.010	0.00066	
Molybdenum	7439-98-7	**0.019**		mg/L	0.010	0.0018	
Nickel	7440-02-0	**ND**		mg/L	0.040	0.0027	
Potassium	7440-09-7	**12**		mg/L	1.0	0.31	
Selenium	7784-49-2	**ND**		mg/L	0.10	0.026	
Silver	7440-22-4	**ND**		mg/L	0.015	0.00066	

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801197

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **Ash Successive #1**

Matrix: Aqueous

Collection Date: 1/29/2008 11:10:00AM

Lab Sample Number:	B0801197-02A	Analysis Date:	1/31/2008 1:40:00PM
Prep Date:	1/30/2008	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E01318A
Prep Method ID:	3010_ICP	Dilution Factor:	1
Prep Batch Number:	T080130010		
Report Basis:	As Received	Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Sodium	7440-23-5	**1,100**		mg/L	3.0	0.028	1
Thallium	7440-28-0	**ND**		mg/L	0.40	0.011	
Vanadium	7440-62-2	**0.034**		mg/L	0.010	0.00072	
Zinc	7440-66-6	**ND**		mg/L	0.0050	0.0010	

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0801197-02B	Analysis Date:	2/4/2008 9:52:02AM
Prep Date:	2/4/2008	Instrument:	Titrametric
Analytical Method ID:	310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity	File Name:	
Prep Method ID:	Alkalinity_W	Dilution Factor:	1
Prep Batch Number:	T080205001		
Report Basis:	As Received	Analyst Initials:	cs
Sample prep wt./vol:	50.00 ml	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Bicarbonate		**790**		mg/L	5.0	1.5	1
Carbonate		**ND**		mg/L	7.0	1.2	

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0801197-02B	Analysis Date:	1/29/2008 11:20:00AM
Prep Date:	1/29/2008	Instrument:	Probe
Analytical Method ID:	150.1 - pH, Elecrometric - pH	File Name:	
Prep Method ID:	150.1	Dilution Factor:	1
Prep Batch Number:	T080201006		
Report Basis:	As Received	Analyst Initials:	R. Seeman
Sample prep wt./vol:	10.00 ml	Prep Extract Vol:	10.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
pH		**7.4**		pH	0.10	0.10	1

The following test was conducted by: Analytica - Thornton

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801197

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **Ash Successive #1**

Matrix: Aqueous

Collection Date: 1/29/2008 11:10:00AM

Lab Sample Number:	B0801197-02B	Analysis Date:	2/4/2008 12:47:24PM
Prep Date:	1/31/2008	Instrument:	SCALE
Analytical Method ID:	160.1 - Total Dissolved Solids dried at 180°C - TDS	File Name:	
Prep Method ID:	160.1	Dilution Factor:	1
Prep Batch Number:	T080131008		
Report Basis:	As Received	Analyst Initials:	kl
Sample prep wt./vol:	100.00 ml	Prep Extract Vol:	1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Total Dissolved Solids		**4,900**		mg/L	10	8.2	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0801197-02B	Analysis Date:	1/30/2008 8:17:21PM
Prep Date:	1/30/2008	Instrument:	IC
Analytical Method ID:	Inorganic Anions by Ion Chromatography - Anions by IC	File Name:	080130_024.D
Prep Method ID:	300.0	Dilution Factor:	25
Prep Batch Number:	T080130013		
Report Basis:	As Received	Analyst Initials:	KB
Sample prep wt./vol:	20.00 ml	Prep Extract Vol:	20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Chloride		**610**		mg/L	20	1.1	1
Sulfate		**2,100**		mg/L	38	2.8	

Lab Sample Number:	B0801197-02B	Analysis Date:	1/31/2008 2:06:51AM
Prep Date:	1/30/2008	Instrument:	IC
Analytical Method ID:	Inorganic Anions by Ion Chromatography - Anions by IC	File Name:	080130_043.D
Prep Method ID:	300.0	Dilution Factor:	1
Prep Batch Number:	T080130013		
Report Basis:	As Received	Analyst Initials:	KB
Sample prep wt./vol:	20.00 ml	Prep Extract Vol:	20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Fluoride		**2.6**		mg/L	0.40	0.031	2

Detailed Analytical Report Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801197

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Method Blank Report

Client Sample Name: **MB**

Matrix: Aqueous Collection Date: 2/5/2008 12:00:00AM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	T080205004-MB	Analysis Date:	2/5/2008 4:23:51PM
Prep Date:	2/5/2008	Instrument:	CVAA_1
Analytical Method ID:	SW7470A - Mercury in Liquid Waste by CVAA - Total Hg	File Name:	B020508W.W
Prep Method ID:	7470A	Dilution Factor:	1
Prep Batch Number:	T080205004		
Report Basis:	As Received	Analyst Initials:	DL
Sample prep wt./vol:	30.00 ml	Prep Extract Vol:	30.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Mercury	7439-97-6	**ND**		mg/L	0.000200	0.000050	2

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	T080130010-MB	Analysis Date:	1/31/2008 1:04:00PM
Prep Date:	1/30/2008	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E01318A
Prep Method ID:	3010_ICP	Dilution Factor:	1
Prep Batch Number:	T080130010		
Report Basis:	As Received	Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Aluminum	7429-90-5	**ND**		mg/L	0.050	0.014	1
Antimony	7440-36-0	**ND**		mg/L	0.050	0.0067	
Arsenic	7440-38-2	**ND**		mg/L	0.10	0.015	
Barium	7440-39-3	**ND**		mg/L	0.010	0.00016	
Beryllium	7440-41-7	**ND**		mg/L	0.0010	0.000060	
Boron	7440-42-8	**ND**		mg/L	0.050	0.0018	
Cadmium	7440-43-9	**ND**		mg/L	0.0060	0.00051	
Calcium	7440-70-2	**ND**		mg/L	0.10	0.013	
Chromium	7440-47-3	**ND**		mg/L	0.010	0.0018	
Cobalt	7440-48-4	**ND**		mg/L	0.0050	0.0016	
Copper	7440-50-8	**ND**		mg/L	0.0050	0.0019	
Iron	7439-89-6	**ND**		mg/L	0.050	0.0027	
Lithium	7439-93-2	**ND**		mg/L	0.10	0.00072	
Magnesium	7439-96-4	**ND**		mg/L	0.10	0.012	
Manganese	7439-96-5	**ND**		mg/L	0.010	0.00066	
Molybdenum	7439-98-7	**ND**		mg/L	0.010	0.0018	
Nickel	7440-02-0	**ND**		mg/L	0.040	0.0027	
Potassium	7440-09-7	**ND**		mg/L	1.0	0.31	
Selenium	7784-49-2	**ND**		mg/L	0.10	0.026	
Silver	7440-22-4	**ND**		mg/L	0.015	0.00066	
Sodium	7440-23-5	**ND**		mg/L	3.0	0.028	

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801197

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Method Blank Report

Client Sample Name: **MB**

Matrix: Aqueous

Collection Date: 1/30/2008 12:00:00AM

Lab Sample Number: T080130010-MB | Analysis Date: 1/31/2008 1:04:00PM
Prep Date: 1/30/2008 | Instrument: ICP_2
Analytical Method ID: SW6010B - ICP - Total | File Name: E01318A
Prep Method ID: 3010_ICP | Dilution Factor: 1
Prep Batch Number: T080130010
Report Basis: As Received | Analyst Initials: rm
Sample prep wt./vol: 50.00 ml | Prep Extract Vol: 50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Thallium	7440-28-0	ND		mg/L	0.40	0.011	1
Vanadium	7440-62-2	ND		mg/L	0.010	0.00072	

Lab Sample Number: T080130010-MB | Analysis Date: 2/1/2008 12:48:00PM
Prep Date: 1/30/2008 | Instrument: ICP_2
Analytical Method ID: SW6010B - ICP - Total | File Name: E02018A
Prep Method ID: 3010_ICP | Dilution Factor: 1
Prep Batch Number: T080130010
Report Basis: As Received | Analyst Initials: rm
Sample prep wt./vol: 50.00 ml | Prep Extract Vol: 50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Lead	7439-92-1	ND		mg/L	0.050	0.011	2
Zinc	7440-66-6	ND		mg/L	0.0050	0.0010	

The following test was conducted by: Analytica - Thornton

Lab Sample Number: T080205001-MB | Analysis Date: 2/4/2008 9:52:02AM
Prep Date: 2/4/2008 | Instrument: Titrametric
Analytical Method ID: 310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity | File Name:
Prep Method ID: Alkalinity_W | Dilution Factor: 1
Prep Batch Number: T080205001
Report Basis: As Received | Analyst Initials: cs
Sample prep wt./vol: 100.00 ml | Prep Extract Vol: 100.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Bicarbonate		ND		mg/L	5.0	1.5	1
Carbonate		ND		mg/L	7.0	1.2	

The following test was conducted by: Analytica - Thornton

Lab Sample Number: T080131008-MB | Analysis Date: 2/4/2008 12:47:24PM
Prep Date: 1/31/2008 | Instrument: SCALE
Analytical Method ID: 160.1 - Total Dissolved Solids dried at 180°C - TDS | File Name:
Prep Method ID: 160.1 | Dilution Factor: 1
Prep Batch Number: T080131008
Report Basis: As Received | Analyst Initials: kl
Sample prep wt./vol: 100.00 ml | Prep Extract Vol: 1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:

Detailed Analytical Report Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801197

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Method Blank Report

Client Sample Name: **MB**

Matrix: Aqueous

Collection Date: 1/31/2008 12:00:00AM

Lab Sample Number: T080131008-MB

Analysis Date: 2/4/2008 12:47:24PM

Prep Date: 1/31/2008

Instrument: SCALE

Analytical Method ID: 160.1 - Total Dissolved Solids dried at 180°C - TDS

File Name:

Prep Method ID: 160.1

Dilution Factor: 1

Prep Batch Number: T080131008

Report Basis: As Received

Analyst Initials: kl

Sample prep wt./vol: 100.00 ml

Prep Extract Vol: 1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Total Dissolved Solids		**ND**		mg/L	10	8.2	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number: T080130013-MB

Analysis Date: 1/30/2008 3:04:45PM

Prep Date: 1/30/2008

Instrument: IC

Analytical Method ID: Inorganic Anions by Ion Chromatography - Anions by IC

File Name: 080130_007.D

Prep Method ID: 300.0

Dilution Factor: 1

Prep Batch Number: T080130013

Report Basis: As Received

Analyst Initials: KB

Sample prep wt./vol: 20.00 ml

Prep Extract Vol: 20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Chloride		**ND**		mg/L	0.80	0.042	1
Fluoride		**ND**		mg/L	0.40	0.031	
Sulfate		**ND**		mg/L	1.5	0.11	

Project: **Navajo Mine Extension Leaching Study**
Client: **Applied Hydrology Associates, Inc.**
Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado
Workorder (SDG): B0801197
Project: Navajo Mine Extension Leaching Study
Project Number:
Prep Batch: **T080130010**

QUALITY CONTROL REPORT

SAMPLE DUPLICATE REPORT

Analysis: SW6010B - ICP - Total
Base Sample: B0801197-02A
Prep Date: 1/30/2008

Samp. Anal. Date: 1/31/2008 1:40:00PM
DUP Anal. Date: 1/31/2008 1:45:00PM
Units: mg/L
Matrix: Aqueous

Analyte Name	SampResult	DUPRes.	RPD	RPDLim	Flag
Aluminum	0.0655	ND	0.0	20	
Antimony	ND	ND	0.0	20	
Arsenic	ND	ND	0.0	20	
Barium	0.0334	0.0320	4.3	20	
Beryllium	ND	ND	0.0	20	
Boron	0.369	0.359	2.7	20	
Cadmium	ND	ND	0.0	20	
Calcium	472	452	4.3	20	
Chromium	ND	ND	0.0	20	
Cobalt	ND	ND	0.0	20	
Copper	ND	ND	0.0	20	
Iron	ND	ND	0.0	20	
Lead	ND	ND	0.0	20	
Magnesium	1.99	1.89	5.2	20	
Manganese	0.0213	0.0202	5.3	20	
Molybdenum	0.0188	0.0181	3.8	20	
Nickel	ND	ND	0.0	20	
Potassium	11.8	11.9	0.8	20	
Selenium	ND	ND	0.0	20	
Silver	ND	ND	0.0	20	
Sodium	1,130	1,080	4.5	20	
Thallium	ND	ND	0.0	20	
Vanadium	0.0339	0.0313	8.0	20	
Zinc	ND	ND	0.0	20	
Lithium	ND	ND	0.0	20	

LCS/LCSD REPORT

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801197

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0801197

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T080130010**

LCS/LCSD REPORT

Analysis: SW6010B - ICP - Total

MB: T080130010-MB

Prep Date: 1/30/2008

MB Anal. Date: 1/31/2008 1:04:00PM

Units: mg/L

LCS Anal. Date: 1/31/2008 1:25:00PM LCSD Anal. Date: 1/31/2008 1:30:00PM Matrix: Aqueous

Analyte Name	SampResult	LCSRes.	SDRes.	SPLev	SPDLev	Recov.	SD Recov	RPD	Recov Lim	RPDLim	Flag
Aluminum	ND	1.89	1.94	2.00	2.00	94.5	97.0	2.6	89 - 117	20	
Antimony	ND	0.451	0.464	0.500	0.500	90.2	92.8	2.8	82 - 117	20	
Arsenic	ND	1.84	1.88	2.00	2.00	92.0	94.0	2.2	86 - 116	20	
Barium	ND	1.84	1.89	2.00	2.00	92.0	94.5	2.7	86 - 116	20	
Beryllium	ND	0.0499	0.0512	0.0500	0.0500	99.8	102.4	2.6	87 - 111	20	
Boron	ND	0.440	0.452	0.500	0.500	88.0	90.4	2.7	76 - 130	20	
Cadmium	ND	0.0438	0.0439	0.0500	0.0500	87.6	87.8	0.2	79 - 113	20	
Calcium	ND	9.54	9.93	10.0	10.0	95.4	99.3	4.0	79 - 119	20	
Chromium	ND	0.192	0.197	0.200	0.200	96.0	98.5	2.6	86 - 117	20	
Cobalt	ND	0.474	0.488	0.500	0.500	94.8	97.6	2.9	82 - 118	20	
Copper	ND	0.229	0.234	0.250	0.250	91.6	93.6	2.2	86 - 117	20	
Iron	ND	0.998	1.04	1.00	1.00	99.8	104.0	4.1	83 - 121	20	
Lead	ND	0.465	0.479	0.500	0.500	93.0	95.8	3.0	83 - 121	20	
Magnesium	ND	9.89	10.2	10.0	10.0	98.9	102.0	3.1	83 - 118	20	
Manganese	ND	0.480	0.493	0.500	0.500	96.0	98.6	2.7	82 - 121	20	
Molybdenum	ND	0.468	0.483	0.500	0.500	93.6	96.6	3.2	82 - 120	20	
Nickel	ND	0.478	0.490	0.500	0.500	95.6	98.0	2.5	84 - 117	20	
Potassium	ND	8.36	8.35	10.0	10.0	83.6	83.5	0.1	74 - 110	20	
Selenium	ND	1.89	1.93	2.00	2.00	94.5	96.5	2.1	87 - 117	20	
Silver	ND	0.248	0.253	0.250	0.250	99.2	101.2	2.0	80 - 127	20	
Sodium	ND	9.23	9.80	10.0	10.0	92.3	98.0	6.0	87 - 113	20	
Thallium	ND	0.199	0.178	0.200	0.200	99.5	89.0	11.1	89 - 113	20	lowdup
Vanadium	ND	0.484	0.497	0.500	0.500	96.8	99.4	2.7	87 - 119	20	
Zinc	ND	0.450	0.459	0.500	0.500	90.0	91.8	2.0	81 - 120	20	
Lithium	ND	0.457	0.471	0.500	0.500	91.4	94.2	3.0	80 - 120	20	

MS/MSD REPORT

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801197

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0801197

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T080130010**

MS/MSD REPORT

Analysis: SW6010B - ICP - Total

Parent: B0801197-02A

Prep Date: 1/30/2008

Samp. Anal. Date: 1/31/2008 1:40:00PM

Units: mg/L

MS Anal. Date: 1/31/2008 1:50:00PM MSD Anal. Date: 1/31/2008 1:55:00PM

Matrix: Aqueous

Analyte Name	SampResult	MSRes.	MSDRes	SPLev	SPDLev	Recov.	MSD Rec.	RPD	Recov Lim	RPDLim	Flag
Aluminum	0.0655	1.96	1.96	2.00	2.00	94.7	94.7	0.0	75 - 125	20	
Antimony	ND	0.449	0.459	0.500	0.500	89.8	91.8	2.2	75 - 125	20	
Arsenic	ND	1.85	1.92	2.00	2.00	92.5	96.0	3.7	75 - 125	20	
Barium	0.0334	1.77	1.82	2.00	2.00	86.8	89.3	2.8	75 - 125	20	
Beryllium	ND	0.0469	0.0492	0.0500	0.0500	93.8	98.4	4.8	75 - 125	20	
Boron	0.369	0.789	0.815	0.500	0.500	84.0	89.2	3.2	75 - 125	20	
Cadmium	ND	0.0392	0.0387	0.0500	0.0500	78.4	77.4	1.3	75 - 125	20	
Calcium	472	480	493	10.0	10.0	80.0	210.0	2.7	75 - 125	20	*NOTE 2 NOTE 2*
Chromium	ND	0.177	0.184	0.200	0.200	88.5	92.0	3.9	75 - 125	20	
Cobalt	ND	0.430	0.450	0.500	0.500	86.0	90.0	4.5	75 - 125	20	
Copper	ND	0.223	0.232	0.250	0.250	89.2	92.8	4.0	75 - 125	20	
Iron	ND	0.925	0.956	1.00	1.00	92.5	95.6	3.3	75 - 125	20	
Lead	ND	0.432	0.448	0.500	0.500	86.4	89.6	3.6	75 - 125	20	
Magnesium	1.99	11.6	12.0	10.0	10.0	96.1	100.1	3.4	75 - 125	20	
Manganese	0.0213	0.463	0.479	0.500	0.500	88.3	91.5	3.4	75 - 125	20	
Molybdenum	0.0188	0.455	0.469	0.500	0.500	87.2	90.0	3.0	75 - 125	20	
Nickel	ND	0.439	0.455	0.500	0.500	87.8	91.0	3.6	75 - 125	20	
Potassium	11.8	20.4	21.4	10.0	10.0	86.0	96.0	4.8	75 - 125	20	
Selenium	ND	2.00	2.07	2.00	2.00	100.0	103.5	3.4	75 - 125	20	
Silver	ND	0.237	0.244	0.250	0.250	94.8	97.6	2.9	75 - 125	20	
Sodium	1,130	1,130	1,160	10.0	10.0	0.0	300.0	2.6	75 - 125	20	*NOTE 2 NOTE 2*
Thallium	ND	0.166	0.165	0.200	0.200	83.0	82.5	0.6	75 - 125	20	
Vanadium	0.0339	0.494	0.509	0.500	0.500	92.0	95.0	3.0	75 - 125	20	
Zinc	ND	0.434	0.445	0.500	0.500	86.8	89.0	2.5	75 - 125	20	
Lithium	ND	0.562	0.579	0.500	0.500	112.4	115.8	3.0	75 - 125	20	

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801197

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0801197

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T080130010**

POST DIGESTION SPIKE REPORT

Analysis: SW6010B - ICP - Total

Base Sample: B0801197-02A

Prep Date: 1/30/2008

Samp. Anal. Date: 1/31/2008 1:40:00PM

Units: mg/L

PDS Anal. Date: 1/31/2008 2:00:00PM

Matrix: Aqueous

Analyte Name	SampResult	PDSRes.	SPLev	Recov.	Recov Lim	Flag	
Aluminum	0.0655	1.91	2.00	92.0	75 - 117		
Antimony	ND	0.447	0.500	87.2	75 - 117		
Arsenic	ND	1.85	2.00	91.2	75 - 116		
Barium	0.0334	1.76	2.00	86.3	75 - 116		
Beryllium	ND	0.0477	0.0500	94.4	75 - 111		
Boron	0.369	0.791	0.500	84.4	75 - 130		
Cadmium	ND	0.0391	0.0500	77.3	75 - 113		
Calcium	472	480	10.0	78.6	75 - 119		Note 2
Chromium	ND	0.178	0.200	88.8	75 - 117		
Cobalt	ND	0.435	0.500	86.7	75 - 118		
Copper	ND	0.225	0.250	89.0	75 - 117		
Iron	ND	0.931	1.00	93.2	75 - 121		
Lead	ND	0.442	0.500	87.1	75 - 121		
Magnesium	1.99	11.7	10.0	97.3	75 - 118		
Manganese	0.0213	0.466	0.500	89.0	75 - 121		
Molybdenum	0.0188	0.457	0.500	87.6	75 - 120		
Nickel	ND	0.444	0.500	88.3	75 - 117		
Potassium	11.8	21.1	10.0	93.1	75 - 110		
Selenium	ND	1.98	2.00	97.3	75 - 117		
Silver	ND	0.239	0.250	93.8	75 - 127		
Sodium	1,130	1,130	10.0	22.3	75 - 113	lowPDS	Note 2
Thallium	ND	0.165	0.200	79.3	75 - 113		
Vanadium	0.0339	0.496	0.500	92.4	75 - 119		
Zinc	ND	0.439	0.500	90.6	75 - 120		
Lithium	ND	0.559	0.500	94.3	75 - 120		

SERIAL DILUTION REPORT

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0801197

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T080130010**

SERIAL DILUTION REPORT

Analysis: SW6010B - ICP - Total

Base Sample: B0801197-02A

Prep Date: 1/30/2008

Samp. Anal. Date: 1/31/2008 1:40:00PM

Units: mg/L

SER DIL. Date: 1/31/2008 2:05:00PM

Matrix: Aqueous

Analyte Name	SampResult	PQL.	MDL.	SerialRes.	SerPQL.	RPD	Flag
Aluminum	0.0655	0.050	0.014	ND	0.25		
Antimony	ND	0.050	0.0067	ND	0.25		
Arsenic	ND	0.10	0.015	ND	0.50		
Barium	0.0334	0.0100	0.00016	ND	0.050		
Beryllium	ND	0.0010	0.000060	ND	0.0050		
Boron	0.369	0.050	0.0018	0.353	0.25	4.4	
Cadmium	ND	0.0060	0.00051	ND	0.030		
Calcium	472	0.10	0.013	435	0.50	8.1	
Chromium	ND	0.0100	0.0018	ND	0.050		
Cobalt	ND	0.0050	0.0016	ND	0.025		
Copper	ND	0.0050	0.0019	ND	0.025		
Iron	ND	0.050	0.0027	ND	0.25		
Lead	ND	0.050	0.011	ND	0.25		
Magnesium	1.99	0.10	0.012	1.72	0.50	14.5	OUT
Manganese	0.0213	0.0100	0.00066	ND	0.050		
Molybdenum	0.0188	0.0100	0.0018	ND	0.050		
Nickel	ND	0.040	0.0027	ND	0.20		
Potassium	11.8	1.0	0.31	11.7	5.0	0.8	
Selenium	ND	0.10	0.026	ND	0.50		
Silver	ND	0.015	0.00066	ND	0.075		
Sodium	1,130	3.0	0.028	1,030	15	9.2	
Thallium	ND	0.40	0.011	ND	2.0		
Vanadium	0.0339	0.0100	0.00072	ND	0.050		
Zinc	ND	0.0050	0.0010	ND	0.025		
Lithium	ND	0.10	0.00072	ND	0.50		

Prep Batch: **T080205004**

SAMPLE DUPLICATE REPORT

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801197

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0801197

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T080205004**

SAMPLE DUPLICATE REPORT

Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg

Base Sample: B0801197-02A

Prep Date: 2/5/2008

Samp. Anal. Date: 2/5/2008 4:38:47PM

DUP Anal. Date: 2/5/2008 4:41:14PM

Units: mg/L

Matrix: Aqueous

Analyte Name	SampResult	DUPRes.	RPD	RPDLim	Flag
Mercury	ND	ND	0.0	20	

LCS/LCSD REPORT

Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg

MB: T080205004-MB

Prep Date: 2/5/2008

MB Anal. Date: 2/5/2008 4:23:51PM

Units: mg/L

LCS Anal. Date: 2/5/2008 4:26:44PM LCSD Anal. Date: 2/5/2008 4:29:07PM

Matrix: Aqueous

Analyte Name	SampResult	LCSRes.	SDRes.	SPLev	SPDLev	Recov.	SD Recov	RPD	Recov Lim	RPDLim	Flag
Mercury	ND	0.00223	0.00227	0.00200	0.0020	111.5	113.5	1.8	80 - 120	20	

MS/MSD REPORT

Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg

Parent: B0801197-02A

Prep Date: 2/5/2008

Samp. Anal. Date: 2/5/2008 4:38:47PM

Units: mg/L

MS Anal. Date: 2/5/2008 4:43:28PM MSD Anal. Date: 2/5/2008 4:46:03PM

Matrix: Aqueous

Analyte Name	SampResult	MSRes.	MSDRes	SPLev	SPDLev	Recov.	MSD Rec.	RPD	Recov Lim	RPDLim	Flag
Mercury	ND	0.00209	0.00203	0.00200	0.00200	104.5	101.5	2.9	70 - 130	20	

POST DIGESTION SPIKE REPORT

Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg

Base Sample: B0801197-02A

Prep Date: 2/5/2008

Samp. Anal. Date: 2/5/2008 4:38:47PM

Units: mg/L

PDS Anal. Date: 2/5/2008 4:52:53PM

Matrix: Aqueous

Analyte Name	SampResult	PDSRes.	SPLev	Recov.	Recov Lim	Flag
Mercury	ND	0.00211	0.00200	110.2	80 - 120	

Workorder (SDG): B0801197

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

FOOTNOTES TO QC REPORT

Note 1: Results are shown to three significant figures to avoid rounding errors in calculations.

Note 2: If the sample concentration is greater than 4 times the spike level, a recovery is not meaningful, and the result should be used as a replicate. In such cases the spike is not as high as expected random measurement variability of the sample result itself.

Note 3: For sample duplicates, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample and duplicate results are not five times the PQL or greater, then the RPD is not expected to fall within the window shown and the comparison should be made on the basis of the absolute difference. Analytica uses the criterion that the absolute difference should be less than the PQL for water or less than 2XPQL for other matrices.

Note 4: For serial dilutions, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample result is not 50 times the MDL or greater, then the fact that the RPD does not meet the 10% criterion has little signifcance. Otherwise it indicates that a matrix bias may exist at the analytical step.

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801197

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0801197

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T080130013**

LCS/LCSD REPORT

Analysis: Inorganic Anions by Ion Chromatography - Anions by IC

MB: T080130013-MB

Prep Date: 1/30/2008

MB Anal. Date: 1/30/2008 3:04:45PM

Units: mg/L

LCS Anal. Date: 1/31/2008 2:12:57PM LCSD Anal. Date: 1/31/2008 2:31:20PM

Matrix: Aqueous

Analyte Name	SampResult	LCSRes.	SDRes.	SPLev	SPDLev	Recov.	SD Recov	RPD	Recov Lim	RPDLim	Flag
Fluoride	ND	2.37	2.36	2.50	2.50	94.8	94.4	0.4	90 - 110	20	
Chloride	ND	4.75	4.75	5.00	5.00	95.0	95.0	0.0	90 - 110	20	
Sulfate	ND	34.1	34.1	37.5	37.5	90.9	90.9	0.0	90 - 110	20	

MS REPORT

Analysis: Inorganic Anions by Ion Chromatography - Anions by IC

Parent: B0801197-02B

Prep Date: 1/30/2008

Samp. Anal. Date: 1/31/2008 2:06:51AM

Units: mg/L

MS Anal. Date: 1/31/2008 2:25:15AM

Matrix: Aqueous

Analyte Name	SampResult	MSRes.	SPLev	Recov.	Recov Lim		Flag
Fluoride	2.55	4.83	2.50	91.2	70 - 130		
Chloride	605	743	125	110.4	70 - 130	*NOTE 2*	
Sulfate	2,100	3,120	938	108.8	70 - 130		

Prep Batch: **T080131008**

LCS/LCSD REPORT

Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS

MB: T080131008-MB

Prep Date: 1/31/2008

MB Anal. Date: 2/4/2008 12:47:24PM

Units: mg/L

LCS Anal. Date: 2/4/2008 12:47:24PM LCSD Anal. Date: 2/4/2008 12:47:24PM

Matrix: Aqueous

Analyte Name	SampResult	LCSRes.	SDRes.	SPLev	SPDLev	Recov.	SD Recov	RPD	Recov Lim	RPDLim	Flag
Total Dissolved Solids	ND	802	765	821	821	97.6	93.1	4.7	80 - 120	20	

MS REPORT

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801197

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0801197

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T080131008**

MS REPORT

Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS

Parent: B0801197-02B

Prep Date: 1/31/2008

Samp. Anal. Date: 2/4/2008 12:47:24PM

Units: mg/L

MS Anal. Date: 2/4/2008 12:47:24PM

Matrix: Aqueous

Analyte Name	SampResult	MSRes.	SPLev	Recov.	Recov Lim		Flag
Total Dissolved Solids	4,880	5,940	821	129.0	70 - 130	*NOTE 2*	

Prep Batch: **T080205001**

LCS/LCSD REPORT

Analysis: 310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity

MB: T080205001-MB

Prep Date: 2/4/2008

MB Anal. Date: 2/4/2008 9:52:02AM

Units: mg/L

LCS Anal. Date: 2/4/2008 9:52:02AM LCSD Anal. Date: 2/4/2008 9:52:02AM

Matrix: Aqueous

Analyte Name	SampResult	LCSRes.	SDRes.	SPLev	SPDLev	Recov.	SD Recov	RPD	Recov Lim	RPDLim	Flag
Bicarbonate	ND	24.0	27.0	25.0	25.0	96.0	108.0	11.8	80 - 120	20	
Carbonate	ND	50.0	51.0	50.0	50.0	100.0	102.0	2.0	80 - 120	20	

FOOTNOTES TO QC REPORT

Note 1: Results are shown to three significant figures to avoid rounding errors in calculations.

Note 2: If the sample concentration is greater than 4 times the spike level, a recovery is not meaningful, and the result should be used as a replicate. In such cases the spike is not as high as expected random measurement variability of the sample result itself.

Note 3: For sample duplicates, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample and duplicate results are not five times the PQL or greater, then the RPD is not expected to fall within the window shown and the comparison should be made on the basis of the absolute difference. Analytica uses the criterion that the absolute difference should be less than the PQL for water or less than 2XPQL for other matrices.

Note 4: For serial dilutions, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample result is not 50 times the MDL or greater, then the fact that the RPD does not meet the 10% criterion has little signifcance. Otherwise it indicates that a matrix bias may exist at the analytical step.

Workorder (SDG): B0801197

Project:	**Navajo Mine Extension Leaching Study**
Client:	**Applied Hydrology Associates, Inc.**
Client Project Number:	**none**

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801197

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

QC BATCH ASSOCIATIONS - BY METHOD BLANK

Lab Project ID: **83,582** **Lab Project Number:** **B0801197**

Prep Date: 1/30/2008

Lab Method Blank Id: T080130010-MB

Prep Batch ID: T080130010

Method: SW6010B - ICP - Total

This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates:

SampleNum	ClientSampleName	DataFile	AnalysisDate
B0801197-02A-PDS	PDS	E02018A	2/1/2008 1:13:00PM
T080130010-LCSD	LCSD	E02018A	2/1/2008 12:58:00PM
B0801197-02A-MS	MS	E02018A	2/1/2008 1:03:00PM
B0801197-02A-MSD	MSD	E02018A	2/1/2008 1:08:00PM
B0801197-02A-MSD	MSD	E01318A	1/31/2008 1:55:00PM
B0801197-02A-PDS	PDS	E01318A	1/31/2008 2:00:00PM
T080130010-LCS	LCS	E02018A	2/1/2008 12:53:00PM
T080130010-LCSD	LCSD	E01318A	1/31/2008 1:30:00PM
B0801197-02A-DUP	DUP	E01318A	1/31/2008 1:45:00PM
B0801197-02A-MS	MS	E01318A	1/31/2008 1:50:00PM
B0801197-01A	MB Successive #1	E01318A	1/31/2008 1:35:00PM
B0801197-02A	Ash Successive #1	E01318A	1/31/2008 1:40:00PM
T080130010-LCS	LCS	E01318A	1/31/2008 1:25:00PM

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801197

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

QC BATCH ASSOCIATIONS - BY METHOD BLANK

Lab Project ID: **83,582** **Lab Project Number:** **B0801197**

Prep Date: 1/30/2008

Lab Method Blank Id: T080130013-MB
Prep Batch ID: T080130013
Method: Inorganic Anions by Ion Chromatography - Anions by IC

This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates:

SampleNum	ClientSampleName	DataFile	AnalysisDate
T080130013-LCSD	LCSD	080131_011.DXD	1/31/2008 2:31:20PM
B0801197-02B	Ash Successive #1	080130_043.DXD	1/31/2008 2:06:51AM
B0801197-02B-MS	MS	080130_044.DXD	1/31/2008 2:25:15AM
T080130013-LCS	LCS	080131_010.DXD	1/31/2008 2:12:57PM
B0801191-02B-DUP	DUP	080130_030.DXD	1/30/2008 10:07:41PM
B0801191-02B-MS	MS	080130_031.DXD	1/30/2008 10:26:05PM
B0801197-01B	MB Successive #1	080130_041.DXD	1/31/2008 1:30:04AM
B0801197-02B	Ash Successive #1	080130_024.DXD	1/30/2008 8:17:21PM
B0801197-02B-MS	MS	080130_025.DXD	1/30/2008 8:35:45PM
B0801191-02B	Batch QC	080130_029.DXD	1/30/2008 9:49:17PM
B0801191-02B-DUP	DUP	080130_013.DXD	1/30/2008 4:55:04PM
B0801191-02B-MS	MS	080130_014.DXD	1/30/2008 5:13:28PM
B0801197-01B	MB Successive #1	080130_023.DXD	1/30/2008 7:58:57PM
T080130013-LCS	LCS	080130_008.DXD	1/30/2008 3:23:07PM
T080130013-LCSD	LCSD	080130_009.DXD	1/30/2008 3:41:32PM
B0801191-02B	Batch QC	080130_012.DXD	1/30/2008 4:36:41PM

Prep Date: 1/31/2008

Lab Method Blank Id: T080131008-MB
Prep Batch ID: T080131008
Method: 160.1 - Total Dissolved Solids dried at 180°C - TDS

This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates:

SampleNum	ClientSampleName	DataFile	AnalysisDate
B0801191-02B-MS	MS		2/4/2008 12:47:24PM
B0801197-02B-MS	MS		2/4/2008 12:47:24PM
T080131008-LCS	LCS		2/4/2008 12:47:24PM
T080131008-LCSD	LCSD		2/4/2008 12:47:24PM
B0801191-02B-DUP	DUP		2/4/2008 12:47:24PM
B0801191-02B	Batch QC		2/4/2008 12:47:24PM
B0801197-01B	MB Successive #1		2/4/2008 12:47:24PM
B0801197-02B	Ash Successive #1		2/4/2008 12:47:24PM

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801197

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

QC BATCH ASSOCIATIONS - BY METHOD BLANK

Lab Project ID: **83,582** **Lab Project Number:** **B0801197**

Prep Date: 2/4/2008

Lab Method Blank Id: T080205001-MB

Prep Batch ID: T080205001

Method: 310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity

This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates:

SampleNum	ClientSampleName	DataFile	AnalysisDate
T080205001-LCS	LCS		2/4/2008 9:52:02AM
T080205001-LCSD	LCSD		2/4/2008 9:52:02AM
B0801191-04B-DUP	DUP		2/4/2008 9:52:02AM
B0801191-04B	Batch QC		2/4/2008 9:52:02AM
B0801197-01B	MB Successive #1		2/4/2008 9:52:02AM
B0801197-02B	Ash Successive #1		2/4/2008 9:52:02AM

Prep Date: 2/5/2008

Lab Method Blank Id: T080205004-MB

Prep Batch ID: T080205004

Method: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg

This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates:

SampleNum	ClientSampleName	DataFile	AnalysisDate
B0801197-02A-PDS	PDS	B020508W.WKS	2/5/2008 4:52:53PM
B0801210-02A-PDS	PDS	B020508W.WKS	2/5/2008 5:08:38PM
B0801210-04A-PDS	PDS	B020508W.WKS	2/5/2008 5:27:21PM
B0801197-02A-MSD	MSD	B020508W.WKS	2/5/2008 4:46:03PM
B0801210-02A-MSD	MSD	B020508W.WKS	2/5/2008 5:06:23PM
B0801210-04A-MSD	MSD	B020508W.WKS	2/5/2008 5:25:08PM
B0801197-02A-MS	MS	B020508W.WKS	2/5/2008 4:43:28PM
B0801210-02A-MS	MS	B020508W.WKS	2/5/2008 5:04:18PM
B0801210-04A-MS	MS	B020508W.WKS	2/5/2008 5:22:59PM
B0801197-02A-DUP	DUP	B020508W.WKS	2/5/2008 4:41:14PM
B0801210-02A-DUP	DUP	B020508W.WKS	2/5/2008 5:02:05PM
B0801210-04A-DUP	DUP	B020508W.WKS	2/5/2008 5:20:14PM
B0801210-04A	Batch QC	B020508W.WKS	2/5/2008 5:13:23PM
T080205004-LCS	LCS	B020508W.WKS	2/5/2008 4:26:44PM
T080205004-LCSD	LCSD	B020508W.WKS	2/5/2008 4:29:07PM
B0801197-01A	MB Successive #1	B020508W.WKS	2/5/2008 4:36:31PM
B0801197-02A	Ash Successive #1	B020508W.WKS	2/5/2008 4:38:47PM
B0801210-02A	Batch QC	B020508W.WKS	2/5/2008 4:59:48PM

Workorder (SDG): B0801197

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

DATA FLAGS AND DEFINITIONS

The PQL is the Method Quantitation Limit as defined by USACE.
Reporting Limit: Limit below which results are shown as "ND". This may be the PQL, MDL, or a value between. See the report conventions below.

Result Field:

- ND = Not Detected at or above the Reporting Limit
- NA = Analyte not applicable (see Case Narrative for discussion)

Qualifier Fields:

- LOW = Recovery is below Lower Control Limit
- HIGH = Recovery , RPD, or other parameter is above Upper Control Limit
- E = Reported concentration is above the instrument calibration upper range

Organic Analysis Flags:

- B = Analyte was detected in the laboratory method blank
- J = Analyte was detected above MDL or Reporting Limit but below the Quant Limit (PQL)

Inorganic Analysis Flags:

- J = Analyte was detected above the Reporting Limit but below the Quant Limit (PQL)
- W = Post digestion spike did not meet criteria
- S = Reported value determined by the Method of Standard Additions (MSA)

Several ways of defining the limit of detection and quantitation are prevalent in the laboratory industry and may appear in Analytica reports. These include the following:

- MRL = "minimum reporting level", from the EPA Safe Drinking Water program (SDW)
- PQL = "practical quantitation limit", from SW-846
- EQL = "estimated quantitation limit", from SW-846
- LOQ = "limit of quantitation", from a number of authoritative sources

In Analytica's work, all of these terms have the same meaning, equivalent to the EPA definition of the MRL. This reporting level is supported by a satisfactory calibration data point which is at that level or lower, and also is supported by a method detection limit (MDL) determined by the procedure in 40CFR. The MDL is lower than the MRL and represents an estimate of the level where positive detections have a 99% probability of being real, but where quantitation accuracy is unknown.

The MRL as defined by Analytica is the lowest demonstrated point of known quantitation accuracy.
The MRL should not be confused with the MCL, which is the EPA-defined "maximum contaminant level" allowed for certain regulated targets under specific regulations, such as the National Primary Drinking Water Regulations. Normally, the MRL is set at a level which is much lower than the MCL in order to ensure that levels are well below those limits. Not all target analytes have MCL levels established.

Other Flags may be applied. See Case Narrative for Description

Workorder (SDG): B0801197

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

REPORTING CONVENTIONS FOR THIS REPORT

B0801197

TestPkgName	Basis	# Sig Figs	Reporting Limit
150.1/150.1 (Aqueous) - pH	As Received	2	Report to PQL
160.1/160.1 (Aqueous) - TDS	As Received	2	Report to PQL
300.0/300.0 (Aqueous) - Anions by IC	As Received	2	Report to PQL
310.1/310.1 (Aqueous) - Alkalinity	As Received	2	Report to PQL
6010B/3010A (Aqueous) - Total	As Received	2	Report to PQL
7470A/7470A (Aqueous) - Total Hg	As Received	2	Report to PQL

Analytica Chain of Custody Form

ANALYTICA GROUP®

12189 Pennsylvania St. Thornton, CO 80241 (303) 469-8868 (303) 469-5254 fax
4307 Arctic Boulevard Anchorage, AK 99503 (907) 258-2155 (907) 258-6634 fax
475 Hall St. Fairbanks, AK 99701 (907) 456 - 3116 (907) 456-3125 Fax
5438 Shaune Drive Juneau, AK 99801 (907) 780-6668 (907) 780-6670 fax

Chain of Custody No: 63243

Client Name & Address: Applied Hydrology Associates Inc.

Public Water System (PWS) ID#:

Project Name: Navajo Mine extension Leaching Study

Section To be Completed by Analytica
Quote ID:
LGN: B0801197
Account #: Cash Credit Card

Report to:
Phone No:
Fax No:
E-mail:

Turnaround Time for Results (TAT)
X Standard ___ Expedited (< 10 days, prior authorization required) (please specify due date below; add'l charges may apply)

Requested Due Date for Results:

Invoice to Name & Address:

Special Instructions/Comments: Tumbled in house by R.Seeman
Successive Ash leaching Study

P.O. or Contract No:

Kit Prep/Shipping Charge: $

Requested Analysis/Method

Client Sample Identification / Location	Date Sampled	Time Sampled	Matrix (S-DW-WW-Other)	No. of Containers	6010B/3010A TTL (Lot #: 1107090 Pres: HNO3)	7470A/7470A Hg (Lot #: 1107090 Pres: HNO3)	150.1 pH (Lot #: Pres:)	160.1 TDS (Lot #: Pres:)	300.0 Anions IC (Lot #: Pres:)	310.1 Alk (Lot #: Pres:)	(Lot #: Pres:)	Field Preserved	Field Filtered	MS/MSD ?
MB Successive #1	1/29/08	11:10	Aq	2	X	X	X	X	X	X		½	✓	
Ash Successive #1	1/29/08	11:10	Aq	2	X	X	X	X	X	X		½	✓	X

Relinquished by:	Date	Time	Received by:	Date	Time
R. Seeman	1/29/08	13:40	[signature]	1/29/08	13:40
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time

Name of Sampler: (printed)

Section To Be Completed by Analytica

	THO	ANC	JNU	FBKS
Condition of Custody Seal?:	—			
Initialed By:	—			
Temp/Loc:	20			
Thermo ID#:				
Shipped Via:	Ryan Seeman			

Version 2.0

ANALYTICA

Cooler Receipt Form

Client: Applied Hydrology Associates **Client Code:** 030188 **Order #:** B0801197
Project: Navajo Mine Extension Leaching Study

Cooler ID: 1

A. Preliminary Examination Phase:

Date cooler opened: 1/29/2008
Cooler opened by: gp **Signature:** GP

1. **Was airbill Attached?** N/A **Airbill #:** **Carrier Name:** Other
2. **Custody Seals?** N/A **How many?** 0 **Location:** **Seal Name:**
3. **Seals intact?** N/A
4. **COC Attached?** Yes **Properly Completed?** Yes **Signed by AEL employee?** Yes
5. **Project Identification from custody paper:** Navajo Mine Extension Leaching Study
6. **Preservative:** None **Temperature:** 20.0 **deg. C**

Designated person initial here to acknowledge receipt: GP **Date:** 1/29/08

COMMENTS: Tumbled in house by R. Seeman. Successive Ash leaching study.

B. Log-in Phase: **Samples Log-in Date:** 1/29/2008 **Log-in By:** gp

1. **Packing Type:** Other
2. **Were samples in separate bags?** N/A
3. **Were containers intact?** Yes **Labels agree with COC?** Yes
4. **Number of bottles received:** 4 **Number of samples received:** 2
5. **Correct containers used?** Yes **Correct preservatives added?** Yes
6. **Sufficient sample volume?** Yes
7. **Bubbles in VOA samples?** N/A
8. **Was Project manager called and status discussed?** No
9. **Was anyone called?** No **Who was called?** ________ **By whom?** ________ **Date:** ________

COMMENTS:

ANALYTICA
Environmental Laboratories

Analytica Environmental
Laboratories, Inc.
12189 Pennsylvania Street
Thornton, CO 80241
Phone: 303-469-8868
Fax: 303-469-5254

2/21/2008

Applied Hydrology Associates, Inc.
950 South Cherry Street
Suite 810
Denver, CO 80246
Attn: Art O'Hayre

Work Order #: B0801210
Date: 2/21/2008
Work ID: Navajo Mine Extension Leaching Study
Date Received: 1/31/2008
Proj #: none

Sample Identification

Lab Sample Number	Client Description	Lab Sample Number	Client Description
B0801210-01	MB Successive #2	B0801210-02	Ash Successive #2
B0801210-03	MB Successive #3	B0801210-04	Ash Successive #3

Enclosed are the analytical results for the submitted sample(s). Please review the CASE NARRATIVE for a discussion of any data and/or quality control issues. Listings of data qualifiers, analytical codes, key dates, and QC relationships are provided at the end of the report.

Sincerely,

Kristen Stone
Project Manager

"The Science of Analysis, The Art of Service"

Case Narrative

Analytica Environmental Laboratories, Inc.

Work Order: B0801210

Samples were prepared and analyzed according to EPA or equivalent methods outlined in the following references:

Methods for Chemical Analysis of Water and Wastes, USEPA 600/4-79-020, March 1983.

Pfaff, J. D., C. A. Brockhoff and J. W. O'Dell. 1994. The Determination of Inorganic Anions in Water by Ion Chromatography. Method 300.0 A. U. S. Environmental Protection Agency. Environmental Monitoring Systems Lab.

Test Methods for Evaluating Solid Waste, USEPA SW-846, Third Edition, Revision 4, Decembe 1996.

PLEASE NOTE: THIS (2/21/08) IS A RE-ISSUE OF THE REPORT. ALL RESULTS ARE UNCHANGED EXCEPT FOR THE ICP METALS RESULTS. THE DATA VALIDATOR CONTACTED THE LABORATORY NOTING THAT THE ION BALANCE WAS OUT OF CONTROL FOR ALL SAMPLES ON THIS SDG, AND REQUESTED REANALYSIS FOR METALS. THE METALS WERE REANALYZED WITH THE EXCEPTION OF THE MATRIX SPIKES, FOR WHICH THERE WAS NOT SUFFICIENT SAMPLE. RESULTS WERE HIGHER, AND THE DATA VALIDATOR INDICATED THAT THE ION BALANCE WAS NOW IN CONTROL. THEREFORE THESE RESULTS ARE PREFERRED AND ARE SUBMITTED WITH THIS REPORT.

SAMPLE RECEIPT:
Four (4) samples were received on 1/31/2008 3:05:00 PM., at a temperature of 3 deg C., at Analytica-Thornton. The samples were received in good condition and in order per chain of custody.

REVIEW FOR COMPLIANCE WITH ANALYTICA QA PLAN
A summary of our review is shown below.

All analytical results contained in this report have been reviewed under Analytica's internal quality assurance and quality control program. Any deviations in quality contro parameters for specific analyses are noted in the following text. A complete quality assurance report, including laboratory control, matrix spike, and sample duplicate recoveries is kept on file in our office and is available upon request.

All method specifications were met for the following tests:

Test Method: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg - Aqueous
Test Method: 150.1 - pH, Elecrometric - pH - Aqueous
Test Method: 160.1 - Total Dissolved Solids dried at 180°C - TDS - Aqueous
Test Method: 310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity - Aqueous
Test Method: Inorganic Anions by Ion Chromatography - Anions by IC - Aqueous

Test Method: SW6010B - ICP - Total - Aqueous

CLOSING CONTINUING CALIBRATIONS:
The closing CCV immediately following these samples was slightly elevated for Sodium. Th samples are high in Sodium and this is due to small amounts of carryover. A subsequent CCV was analyzed and is in control. The results are not expected to be significantly impacted and are submitted as they are. There is not sufficient sample remaining for reanalysis.

Case Narrative

Analytica Environmental Laboratories, Inc.
Work Order: B0801210
(continued)

RunDate	Data File	Analyte	Recovery	LCL	UCL
2/19/2008 3:01:00 PM	E02198A	Sodium	111.	90	110

MS/MSD and DUP OUTLIERS:

As shown below, the MS/MSD were outside of limits for a number of targets. With the exception of Cadmium, Aluminum, Potassium, and Boron, these samples had target concentrations greater than four times the spike amount. In these cases it is not appropriate to calculate recoveries. The results should be used as replicates. Although reanalyses were conducted, there was not sufficient sample remaining to re-spike for the targets that are out of limits. These should be reviewed for potential low bias.

MS/MSD and DUP OUTLIERS:

Type	Client Sample	LabSample	Analyte	Recovery	LCL	UCL	Parent	Spike
MS	Ash Successive #2	B0801210-02A	Aluminum	71.9	75	125	0.984	2.00
MS	Ash Successive #3	B0801210-04A	Boron	72.9	75	125	0.341	0.500
MS	Ash Successive #3	B0801210-04A	Cadmium	71.9	75	125	-0.00124	0.0500
MS	Ash Successive #3	B0801210-04A	Potassium	59.6	75	125	12.4	10.0
MS	Ash Successive #3	B0801210-04A	Sodium	-291	75	125	1270	10.0
MS	Ash Successive #2	B0801210-02A	Cadmium	67.8	75	125	-0.00148	0.0500
MS	Ash Successive #2	B0801210-02A	Sodium	-272	75	125	1220	10.0
MSD	Ash Successive #2	B0801210-02A	Potassium	70.4	75	125	11.5	10.0
MSD	Ash Successive #2	B0801210-02A	Sodium	-247	75	125	1220	10.0
MSD	Ash Successive #3	B0801210-04A	Boron	72.4	75	125	0.341	0.500
MSD	Ash Successive #3	B0801210-04A	Cadmium	72.1	75	125	-0.00124	0.0500
MSD	Ash Successive #3	B0801210-04A	Potassium	60.6	75	125	12.4	10.0
MSD	Ash Successive #3	B0801210-04A	Sodium	-290	75	125	1270	10.0
MSD	Ash Successive #2	B0801210-02A	Aluminum	73.8	75	125	0.984	2.00
MSD	Ash Successive #2	B0801210-02A	Boron	69.9	75	125	0.345	0.500
MSD	Ash Successive #2	B0801210-02A	Cadmium	69.0	75	125	-0.00148	0.0500

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801210

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **MB Successive #2**

Matrix: Aqueous

Collection Date: 1/30/2008 11:20:00AM

The following test was conducted by: Analytica - Thornton

Lab Sample Number: B0801210-01A
Analysis Date: 2/5/2008 4:57:34PM
Prep Date: 2/5/2008
Instrument: CVAA_1
Analytical Method ID: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg
File Name: B020508W.W
Reg. Method ID: 7470A
Dilution Factor: 1
Prep Batch Number: T080205004
Report Basis: As Received
Analyst Initials: DL
Sample prep wt./vol: 30.00 ml
Prep Extract Vol: 30.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Mercury	7439-97-6	**ND**		mg/L	0.000200	.000050	2

The following test was conducted by: Analytica - Thornton

Lab Sample Number: B0801210-01A
Analysis Date: 2/19/2008 2:36:00PM
Prep Date: 2/5/2008
Instrument: ICP_2
Analytical Method ID: SW6010B - ICP - Total
File Name: E02198A
Reg. Method ID: 6010B
Dilution Factor: 1
Prep Batch Number: T080205002
Report Basis: As Received
Analyst Initials: rm
Sample prep wt./vol: 50.00 ml
Prep Extract Vol: 50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Aluminum	7429-90-5	**0.051**		mg/L	0.050	0.014	2
Antimony	7440-36-0	**ND**		mg/L	0.050	0.0067	
Arsenic	7440-38-2	**ND**		mg/L	0.10	0.015	
Barium	7440-39-3	**0.089**		mg/L	0.010	0.00016	
Beryllium	7440-41-7	**ND**		mg/L	0.0010	0.000060	
Boron	7440-42-8	**0.31**		mg/L	0.050	0.0018	
Cadmium	7440-43-9	**ND**		mg/L	0.0060	0.00051	
Calcium	7440-70-2	**3.0**		mg/L	0.10	0.013	
Chromium	7440-47-3	**ND**		mg/L	0.010	0.0018	
Cobalt	7440-48-4	**ND**		mg/L	0.0050	0.0016	
Copper	7440-50-8	**ND**		mg/L	0.0050	0.0019	
Iron	7439-89-6	**ND**		mg/L	0.050	0.0027	
Lead	7439-92-1	**ND**		mg/L	0.050	0.011	
Lithium	7439-93-2	**ND**		mg/L	0.10	0.00072	
Magnesium	7439-96-4	**1.3**		mg/L	0.10	0.012	
Manganese	7439-96-5	**ND**		mg/L	0.010	0.00066	
Molybdenum	7439-98-7	**0.010**		mg/L	0.010	0.0018	
Nickel	7440-02-0	**ND**		mg/L	0.040	0.0027	
Potassium	7440-09-7	**12**		mg/L	1.0	0.31	
Selenium	7784-49-2	**ND**		mg/L	0.10	0.026	
Silver	7440-22-4	**ND**		mg/L	0.015	0.00066	

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801210

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **MB Successive #2**

Matrix: Aqueous

Collection Date: 1/30/2008 11:20:00AM

Lab Sample Number:	B0801210-01A	Analysis Date:	2/19/2008 2:36:00PM
Prep Date:	2/5/2008	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E02198A
Reg. Method ID:	6010B	Dilution Factor:	1
Prep Batch Number:	T080205002		
Report Basis:	As Received	Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Sodium	7440-23-5	**1,200**		mg/L	3.0	0.028	2
Thallium	7440-28-0	**ND**		mg/L	0.40	0.011	
Vanadium	7440-62-2	**ND**		mg/L	0.010	0.00072	
Zinc	7440-66-6	**ND**		mg/L	0.0050	0.0010	

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0801210-01B	Analysis Date:	2/4/2008 9:52:02AM
Prep Date:	2/4/2008	Instrument:	Titrametric
Analytical Method ID:	310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity	File Name:	
Reg. Method ID:	310.1	Dilution Factor:	1
Prep Batch Number:	T080205001		
Report Basis:	As Received	Analyst Initials:	cs
Sample prep wt./vol:	50.00 ml	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Bicarbonate		**1,100**		mg/L	5.0	1.5	1
Carbonate		**320**		mg/L	7.0	1.2	

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0801210-01B	Analysis Date:	1/31/2008 11:25:00AM
Prep Date:	1/31/2008	Instrument:	Probe
Analytical Method ID:	150.1 - pH, Elecrometric - pH	File Name:	
Reg. Method ID:	150.1	Dilution Factor:	1
Prep Batch Number:	T080201007		
Report Basis:	As Received	Analyst Initials:	R. Seeman
Sample prep wt./vol:	10.00 ml	Prep Extract Vol:	10.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
pH		**9.1**		pH	0.10	0.10	1

The following test was conducted by: Analytica - Thornton

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801210

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: **Client Sample Report**

Client Sample Name: **MB Successive #2**

Matrix: Aqueous | Collection Date: 1/30/2008 11:20:00AM

Lab Sample Number: B0801210-01B | Analysis Date: 2/12/2008 10:07:15AM
Prep Date: 2/6/2008 | Instrument: SCALE
Analytical Method ID: 160.1 - Total Dissolved Solids dried at 180°C - TDS | File Name:
Reg. Method ID: 160.1 | Dilution Factor: 1
Prep Batch Number: T080207003
Report Basis: As Received | Analyst Initials: kl
Sample prep wt./vol: 100.00 ml | Prep Extract Vol: 1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Total Dissolved Solids		**3,000**		mg/L	10	8.2	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number: B0801210-01B | Analysis Date: 2/4/2008 4:07:47PM
Prep Date: 2/4/2008 | Instrument: IC
Analytical Method ID: Inorganic Anions by Ion Chromatography - Anions by IC | File Name: 080204_017.D
Reg. Method ID: 300.0 | Dilution Factor: 25
Prep Batch Number: T080204004
Report Basis: As Received | Analyst Initials: CS
Sample prep wt./vol: 20.00 ml | Prep Extract Vol: 20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Chloride		**600**		mg/L	20	1.1	1

Lab Sample Number: B0801210-01B | Analysis Date: 2/4/2008 7:30:06PM
Prep Date: 2/4/2008 | Instrument: IC
Analytical Method ID: Inorganic Anions by Ion Chromatography - Anions by IC | File Name: 080204_028.D
Reg. Method ID: 300.0 | Dilution Factor: 1
Prep Batch Number: T080204004
Report Basis: As Received | Analyst Initials: CS
Sample prep wt./vol: 20.00 ml | Prep Extract Vol: 20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Fluoride		**2.2**		mg/L	0.40	0.031	2
Sulfate		**280**		mg/L	1.5	0.11	

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801210

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **Ash Successive #2**

Matrix: Aqueous

Collection Date: 1/30/2008 11:20:00AM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0801210-02A	Analysis Date:	2/5/2008 4:59:48PM
Prep Date:	2/5/2008	Instrument:	CVAA_1
Analytical Method ID:	SW7470A - Mercury in Liquid Waste by CVAA - Total Hg	File Name:	B020508W.W
Reg. Method ID:	7470A	Dilution Factor:	1
Prep Batch Number:	T080205004		
Report Basis:	As Received	Analyst Initials:	DL
Sample prep wt./vol:	30.00 ml	Prep Extract Vol:	30.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Mercury	7439-97-6	**ND**		mg/L	0.000200	0.000050	2

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0801210-02A	Analysis Date:	2/19/2008 2:41:00PM
Prep Date:	2/5/2008	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E02198A
Reg. Method ID:	6010B	Dilution Factor:	1
Prep Batch Number:	T080205002		
Report Basis:	As Received	Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Aluminum	7429-90-5	**0.98**		mg/L	0.050	0.014	3
Antimony	7440-36-0	**ND**		mg/L	0.050	0.0067	
Arsenic	7440-38-2	**0.11**		mg/L	0.10	0.015	
Barium	7440-39-3	**0.053**		mg/L	0.010	0.00016	
Beryllium	7440-41-7	**ND**		mg/L	0.0010	0.000060	
Boron	7440-42-8	**0.34**		mg/L	0.050	0.0018	
Cadmium	7440-43-9	**ND**		mg/L	0.0060	0.00051	
Calcium	7440-70-2	**3.6**		mg/L	0.10	0.013	
Chromium	7440-47-3	**ND**		mg/L	0.010	0.0018	
Cobalt	7440-48-4	**ND**		mg/L	0.0050	0.0016	
Copper	7440-50-8	**ND**		mg/L	0.0050	0.0019	
Iron	7439-89-6	**ND**		mg/L	0.050	0.0027	
Lead	7439-92-1	**ND**		mg/L	0.050	0.011	
Lithium	7439-93-2	**ND**		mg/L	0.10	0.00072	
Magnesium	7439-96-4	**1.5**		mg/L	0.10	0.012	
Manganese	7439-96-5	**ND**		mg/L	0.010	0.00066	
Molybdenum	7439-98-7	**0.016**		mg/L	0.010	0.0018	
Nickel	7440-02-0	**ND**		mg/L	0.040	0.0027	
Potassium	7440-09-7	**11**		mg/L	1.0	0.31	
Selenium	7784-49-2	**ND**		mg/L	0.10	0.026	
Silver	7440-22-4	**ND**		mg/L	0.015	0.00066	

Workorder (SDG): B0801210

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: **Client Sample Report**

Client Sample Name: **Ash Successive #2**

Matrix: Aqueous Collection Date: 1/30/2008 11:20:00AM

Lab Sample Number: B0801210-02A Analysis Date: 2/19/2008 2:41:00PM
Prep Date: 2/5/2008 Instrument: ICP_2
Analytical Method ID: SW6010B - ICP - Total File Name: E02198A
Reg. Method ID: 6010B Dilution Factor: 1
Prep Batch Number: T080205002
Report Basis: As Received Analyst Initials: rm
Sample prep wt./vol: 50.00 ml Prep Extract Vol: 50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Sodium	7440-23-5	**1,200**		mg/L	3.0	0.028	3
Thallium	7440-28-0	**ND**		mg/L	0.40	0.011	
Vanadium	7440-62-2	**0.063**		mg/L	0.010	0.00072	
Zinc	7440-66-6	**0.0081**		mg/L	0.0050	0.0010	

The following test was conducted by: Analytica - Thornton

Lab Sample Number: B0801210-02B Analysis Date: 2/4/2008 9:52:02AM
Prep Date: 2/4/2008 Instrument: Titrametric
Analytical Method ID: 310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity File Name:
Reg. Method ID: 310.1 Dilution Factor: 1
Prep Batch Number: T080205001
Report Basis: As Received Analyst Initials: cs
Sample prep wt./vol: 50.00 ml Prep Extract Vol: 50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Bicarbonate		**1,200**		mg/L	5.0	1.5	1
Carbonate		**160**		mg/L	7.0	1.2	

The following test was conducted by: Analytica - Thornton

Lab Sample Number: B0801210-02B Analysis Date: 1/31/2008 11:25:00AM
Prep Date: 1/31/2008 Instrument: Probe
Analytical Method ID: 150.1 - pH, Elecrometric - pH File Name:
Reg. Method ID: 150.1 Dilution Factor: 1
Prep Batch Number: T080201007
Report Basis: As Received Analyst Initials: R. Seeman
Sample prep wt./vol: 10.00 ml Prep Extract Vol: 10.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
pH		**8.8**		pH	0.10	0.10	1

The following test was conducted by: Analytica - Thornton

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801210

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **Ash Successive #2**

Matrix: Aqueous

Collection Date: 1/30/2008 11:20:00AM

Lab Sample Number: B0801210-02B
Analysis Date: 2/12/2008 10:07:15AM
Prep Date: 2/6/2008
Instrument: SCALE
Analytical Method ID: 160.1 - Total Dissolved Solids dried at 180°C - TDS
File Name:
Reg. Method ID: 160.1
Dilution Factor: 1
Prep Batch Number: T080207003
Report Basis: As Received
Analyst Initials: kl
Sample prep wt./vol: 100.00 ml
Prep Extract Vol: 1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Total Dissolved Solids		**3,100**		mg/L	10	8.2	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number: B0801210-02B
Analysis Date: 2/4/2008 4:26:11PM
Prep Date: 2/4/2008
Instrument: IC
Analytical Method ID: Inorganic Anions by Ion Chromatography - Anions by IC
File Name: 080204_018.D
Reg. Method ID: 300.0
Dilution Factor: 25
Prep Batch Number: T080204004
Report Basis: As Received
Analyst Initials: KB
Sample prep wt./vol: 20.00 ml
Prep Extract Vol: 20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Chloride		**610**		mg/L	20	1.1	1
Sulfate		**350**		mg/L	38	2.8	

Lab Sample Number: B0801210-02B
Analysis Date: 2/4/2008 7:48:30PM
Prep Date: 2/4/2008
Instrument: IC
Analytical Method ID: Inorganic Anions by Ion Chromatography - Anions by IC
File Name: 080204_029.D
Reg. Method ID: 300.0
Dilution Factor: 1
Prep Batch Number: T080204004
Report Basis: As Received
Analyst Initials: CS
Sample prep wt./vol: 20.00 ml
Prep Extract Vol: 20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Fluoride		**10**		mg/L	0.40	0.031	2

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801210

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **MB Successive #3**

Matrix: Aqueous

Collection Date: 1/31/2008 11:00:00AM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0801210-03A	Analysis Date:	2/5/2008 5:11:03PM
Prep Date:	2/5/2008	Instrument:	CVAA_1
Analytical Method ID:	SW7470A - Mercury in Liquid Waste by CVAA - Total Hg	File Name:	B020508W.W
Reg. Method ID:	7470A	Dilution Factor:	1
Prep Batch Number:	T080205004		
Report Basis:	As Received	Analyst Initials:	DL
Sample prep wt./vol:	30.00 ml	Prep Extract Vol:	30.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Mercury	7439-97-6	**ND**		mg/L	0.000200	0.000050	2

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0801210-03A	Analysis Date:	2/19/2008 2:46:00PM
Prep Date:	2/5/2008	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E02198A
Reg. Method ID:	6010B	Dilution Factor:	1
Prep Batch Number:	T080205002		
Report Basis:	As Received	Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Aluminum	7429-90-5	**ND**		mg/L	0.050	0.014	2
Antimony	7440-36-0	**ND**		mg/L	0.050	0.0067	
Arsenic	7440-38-2	**ND**		mg/L	0.10	0.015	
Barium	7440-39-3	**0.089**		mg/L	0.010	0.00016	
Beryllium	7440-41-7	**ND**		mg/L	0.0010	0.000060	
Boron	7440-42-8	**0.32**		mg/L	0.050	0.0018	
Cadmium	7440-43-9	**ND**		mg/L	0.0060	0.00051	
Calcium	7440-70-2	**3.0**		mg/L	0.10	0.013	
Chromium	7440-47-3	**ND**		mg/L	0.010	0.0018	
Cobalt	7440-48-4	**ND**		mg/L	0.0050	0.0016	
Copper	7440-50-8	**ND**		mg/L	0.0050	0.0019	
Iron	7439-89-6	**0.051**		mg/L	0.050	0.0027	
Lead	7439-92-1	**ND**		mg/L	0.050	0.011	
Lithium	7439-93-2	**ND**		mg/L	0.10	0.00072	
Magnesium	7439-96-4	**1.3**		mg/L	0.10	0.012	
Manganese	7439-96-5	**ND**		mg/L	0.010	0.00066	
Molybdenum	7439-98-7	**0.011**		mg/L	0.010	0.0018	
Nickel	7440-02-0	**ND**		mg/L	0.040	0.0027	
Potassium	7440-09-7	**12**		mg/L	1.0	0.31	
Selenium	7784-49-2	**ND**		mg/L	0.10	0.026	
Silver	7440-22-4	**ND**		mg/L	0.015	0.00066	

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801210

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **MB Successive #3**

Matrix: Aqueous

Collection Date: 1/31/2008 11:00:00AM

Lab Sample Number: B0801210-03A
Analysis Date: 2/19/2008 2:46:00PM
Prep Date: 2/5/2008
Instrument: ICP_2
Analytical Method ID: SW6010B - ICP - Total
File Name: E02198A
Reg. Method ID: 6010B
Dilution Factor: 1
Prep Batch Number: T080205002
Report Basis: As Received
Analyst Initials: rm
Sample prep wt./vol: 50.00 ml
Prep Extract Vol: 50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Sodium	7440-23-5	**1,300**		mg/L	3.0	0.028	2
Thallium	7440-28-0	**ND**		mg/L	0.40	0.011	
Vanadium	7440-62-2	**ND**		mg/L	0.010	0.00072	
Zinc	7440-66-6	**ND**		mg/L	0.0050	0.0010	

The following test was conducted by: Analytica - Thornton

Lab Sample Number: B0801210-03B
Analysis Date: 2/4/2008 9:52:02AM
Prep Date: 2/4/2008
Instrument: Titrametric
Analytical Method ID: 310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity
File Name:
Reg. Method ID: 310.1
Dilution Factor: 1
Prep Batch Number: T080205001
Report Basis: As Received
Analyst Initials: cs
Sample prep wt./vol: 50.00 ml
Prep Extract Vol: 50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Bicarbonate		**1,200**		mg/L	5.0	1.5	1
Carbonate		**320**		mg/L	7.0	1.2	

The following test was conducted by: Analytica - Thornton

Lab Sample Number: B0801210-03B
Analysis Date: 1/31/2008 11:25:00AM
Prep Date: 1/31/2008
Instrument: Probe
Analytical Method ID: 150.1 - pH, Elecrometric - pH
File Name:
Reg. Method ID: 150.1
Dilution Factor: 1
Prep Batch Number: T080201007
Report Basis: As Received
Analyst Initials: R. Seeman
Sample prep wt./vol: 10.00 ml
Prep Extract Vol: 10.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
pH		**9.1**		pH	0.10	0.10	1

The following test was conducted by: Analytica - Thornton

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801210

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **MB Successive #3**

Matrix: Aqueous

Collection Date: 1/31/2008 11:00:00AM

Lab Sample Number:	B0801210-03B	Analysis Date:	2/12/2008 10:07:15AM
Prep Date:	2/6/2008	Instrument:	SCALE
Analytical Method ID:	160.1 - Total Dissolved Solids dried at 180°C - TDS	File Name:	
Reg. Method ID:	160.1	Dilution Factor:	1
Prep Batch Number:	T080207003		
Report Basis:	As Received	Analyst Initials:	kl
Sample prep wt./vol:	100.00 ml	Prep Extract Vol:	1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Total Dissolved Solids		**3,100**		mg/L	10	8.2	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0801210-03B	Analysis Date:	2/4/2008 5:39:45PM
Prep Date:	2/4/2008	Instrument:	IC
Analytical Method ID:	Inorganic Anions by Ion Chromatography - Anions by IC	File Name:	080204_022.D
Reg. Method ID:	300.0	Dilution Factor:	25
Prep Batch Number:	T080204004		
Report Basis:	As Received	Analyst Initials:	KB
Sample prep wt./vol:	20.00 ml	Prep Extract Vol:	20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Chloride		**620**		mg/L	20	1.1	1

Lab Sample Number:	B0801210-03B	Analysis Date:	2/4/2008 9:02:06PM
Prep Date:	2/4/2008	Instrument:	IC
Analytical Method ID:	Inorganic Anions by Ion Chromatography - Anions by IC	File Name:	080204_033.D
Reg. Method ID:	300.0	Dilution Factor:	1
Prep Batch Number:	T080204004		
Report Basis:	As Received	Analyst Initials:	KB
Sample prep wt./vol:	20.00 ml	Prep Extract Vol:	20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Fluoride		**2.2**		mg/L	0.40	0.031	2
Sulfate		**280**		mg/L	1.5	0.11	

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801210

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **Ash Successive #3**

Matrix: Aqueous

Collection Date: 1/31/2008 11:00:00AM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0801210-04A	Analysis Date:	2/5/2008 5:13:23PM
Prep Date:	2/5/2008	Instrument:	CVAA_1
Analytical Method ID:	SW7470A - Mercury in Liquid Waste by CVAA - Total Hg	File Name:	B020508W.W
Reg. Method ID:	7470A	Dilution Factor:	1
Prep Batch Number:	T080205004		
Report Basis:	As Received	Analyst Initials:	DL
Sample prep wt./vol:	30.00 ml	Prep Extract Vol:	30.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Mercury	7439-97-6	**ND**		mg/L	0.000200	0.000050	2

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0801210-04A	Analysis Date:	2/19/2008 2:51:00PM
Prep Date:	2/5/2008	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E02198A
Reg. Method ID:	6010B	Dilution Factor:	1
Prep Batch Number:	T080205002		
Report Basis:	As Received	Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Aluminum	7429-90-5	**0.67**		mg/L	0.050	0.014	3
Antimony	7440-36-0	**ND**		mg/L	0.050	0.0067	
Arsenic	7440-38-2	**ND**		mg/L	0.10	0.015	
Barium	7440-39-3	**0.070**		mg/L	0.010	0.00016	
Beryllium	7440-41-7	**ND**		mg/L	0.0010	0.000060	
Boron	7440-42-8	**0.34**		mg/L	0.050	0.0018	
Cadmium	7440-43-9	**ND**		mg/L	0.0060	0.00051	
Calcium	7440-70-2	**3.3**		mg/L	0.10	0.013	
Chromium	7440-47-3	**ND**		mg/L	0.010	0.0018	
Cobalt	7440-48-4	**ND**		mg/L	0.0050	0.0016	
Copper	7440-50-8	**ND**		mg/L	0.0050	0.0019	
Iron	7439-89-6	**ND**		mg/L	0.050	0.0027	
Lead	7439-92-1	**ND**		mg/L	0.050	0.011	
Lithium	7439-93-2	**ND**		mg/L	0.10	0.00072	
Magnesium	7439-96-4	**1.9**		mg/L	0.10	0.012	
Manganese	7439-96-5	**ND**		mg/L	0.010	0.00066	
Molybdenum	7439-98-7	**0.013**		mg/L	0.010	0.0018	
Nickel	7440-02-0	**ND**		mg/L	0.040	0.0027	
Potassium	7440-09-7	**12**		mg/L	1.0	0.31	
Selenium	7784-49-2	**ND**		mg/L	0.10	0.026	
Silver	7440-22-4	**ND**		mg/L	0.015	0.00066	

Workorder (SDG): B0801210

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **Ash Successive #3**

Matrix: Aqueous Collection Date: 1/31/2008 11:00:00AM

Lab Sample Number: B0801210-04A Analysis Date: 2/19/2008 2:51:00PM
Prep Date: 2/5/2008 Instrument: ICP_2
Analytical Method ID: SW6010B - ICP - Total File Name: E02198A
Reg. Method ID: 6010B Dilution Factor: 1
Prep Batch Number: T080205002
Report Basis: As Received Analyst Initials: rm
Sample prep wt./vol: 50.00 ml Prep Extract Vol: 50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Sodium	7440-23-5	**1,300**		mg/L	3.0	0.028	3
Thallium	7440-28-0	**ND**		mg/L	0.40	0.011	
Vanadium	7440-62-2	**0.031**		mg/L	0.010	0.00072	
Zinc	7440-66-6	**ND**		mg/L	0.0050	0.0010	

The following test was conducted by: Analytica - Thornton

Lab Sample Number: B0801210-04B Analysis Date: 2/4/2008 9:52:02AM
Prep Date: 2/4/2008 Instrument: Titrametric
Analytical Method ID: 310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity File Name:
Reg. Method ID: 310.1 Dilution Factor: 1
Prep Batch Number: T080205001
Report Basis: As Received Analyst Initials: cs
Sample prep wt./vol: 50.00 ml Prep Extract Vol: 50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Bicarbonate		**1,100**		mg/L	5.0	1.5	1
Carbonate		**340**		mg/L	7.0	1.2	

The following test was conducted by: Analytica - Thornton

Lab Sample Number: B0801210-04B Analysis Date: 1/31/2008 11:25:00AM
Prep Date: 1/31/2008 Instrument: Probe
Analytical Method ID: 150.1 - pH, Elecrometric - pH File Name:
Reg. Method ID: 150.1 Dilution Factor: 1
Prep Batch Number: T080201007
Report Basis: As Received Analyst Initials: R. Seeman
Sample prep wt./vol: 10.00 ml Prep Extract Vol: 10.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
pH		**9.0**		pH	0.10	0.10	1

The following test was conducted by: Analytica - Thornton

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801210

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Client Sample Report

Client Sample Name: **Ash Successive #3**

Matrix: Aqueous

Collection Date: 1/31/2008 11:00:00AM

Lab Sample Number:	B0801210-04B	Analysis Date:	2/12/2008 10:07:15AM
Prep Date:	2/6/2008	Instrument:	SCALE
Analytical Method ID:	160.1 - Total Dissolved Solids dried at 180°C - TDS	File Name:	
Reg. Method ID:	160.1	Dilution Factor:	1
Prep Batch Number:	T080207003		
Report Basis:	As Received	Analyst Initials:	kl
Sample prep wt./vol:	100.00 ml	Prep Extract Vol:	1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Total Dissolved Solids		**3,100**		mg/L	10	8.2	1

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	B0801210-04B	Analysis Date:	2/4/2008 5:58:09PM
Prep Date:	2/4/2008	Instrument:	IC
Analytical Method ID:	Inorganic Anions by Ion Chromatography - Anions by IC	File Name:	080204_023.D
Reg. Method ID:	300.0	Dilution Factor:	25
Prep Batch Number:	T080204004		
Report Basis:	As Received	Analyst Initials:	KB
Sample prep wt./vol:	20.00 ml	Prep Extract Vol:	20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Chloride		**620**		mg/L	20	1.1	1

Lab Sample Number:	B0801210-04B	Analysis Date:	2/4/2008 9:20:30PM
Prep Date:	2/4/2008	Instrument:	IC
Analytical Method ID:	Inorganic Anions by Ion Chromatography - Anions by IC	File Name:	080204_034.D
Reg. Method ID:	300.0	Dilution Factor:	1
Prep Batch Number:	T080204004		
Report Basis:	As Received	Analyst Initials:	CS
Sample prep wt./vol:	20.00 ml	Prep Extract Vol:	20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Fluoride		**4.7**		mg/L	0.40	0.031	2
Sulfate		**290**		mg/L	1.5	0.11	

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801210

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Method Blank Report

Client Sample Name: **MB**

Matrix: Aqueous

Collection Date: 2/5/2008 12:00:00AM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	T080205004-MB	Analysis Date:	2/5/2008 4:23:51PM
Prep Date:	2/5/2008	Instrument:	CVAA_1
Analytical Method ID:	SW7470A - Mercury in Liquid Waste by CVAA - Total Hg	File Name:	B020508W.W
Reg. Method ID:	7470A	Dilution Factor:	1
Prep Batch Number:	T080205004		
Report Basis:	As Received	Analyst Initials:	DL
Sample prep wt./vol:	30.00 ml	Prep Extract Vol:	30.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Mercury	7439-97-6	**ND**		mg/L	0.000200	.000050	2

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	T080205002-MB	Analysis Date:	2/5/2008 4:27:00PM
Prep Date:	2/5/2008	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E02058A
Reg. Method ID:	6010B	Dilution Factor:	1
Prep Batch Number:	T080205002		
Report Basis:	As Received	Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Aluminum	7429-90-5	**ND**		mg/L	0.050	0.014	1
Antimony	7440-36-0	**ND**		mg/L	0.050	0.0067	
Arsenic	7440-38-2	**ND**		mg/L	0.10	0.015	
Barium	7440-39-3	**ND**		mg/L	0.010	0.00016	
Beryllium	7440-41-7	**ND**		mg/L	0.0010	0.000060	
Boron	7440-42-8	**ND**		mg/L	0.050	0.0018	
Cadmium	7440-43-9	**ND**		mg/L	0.0060	0.00051	
Calcium	7440-70-2	**ND**		mg/L	0.10	0.013	
Chromium	7440-47-3	**ND**		mg/L	0.010	0.0018	
Cobalt	7440-48-4	**ND**		mg/L	0.0050	0.0016	
Copper	7440-50-8	**ND**		mg/L	0.0050	0.0019	
Iron	7439-89-6	**ND**		mg/L	0.050	0.0027	
Lead	7439-92-1	**ND**		mg/L	0.050	0.011	
Lithium	7439-93-2	**ND**		mg/L	0.10	0.00072	
Magnesium	7439-96-4	**ND**		mg/L	0.10	0.012	
Manganese	7439-96-5	**ND**		mg/L	0.010	0.00066	
Molybdenum	7439-98-7	**ND**		mg/L	0.010	0.0018	
Nickel	7440-02-0	**ND**		mg/L	0.040	0.0027	
Potassium	7440-09-7	**ND**		mg/L	1.0	0.31	
Selenium	7784-49-2	**ND**		mg/L	0.10	0.026	
Silver	7440-22-4	**ND**		mg/L	0.015	0.00066	

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801210

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Method Blank Report

Client Sample Name: **MB**

Matrix: Aqueous

Collection Date: 2/5/2008 12:00:00AM

Lab Sample Number:	T080205002-MB	Analysis Date:	2/5/2008 4:27:00PM
Prep Date:	2/5/2008	Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	File Name:	E02058A
Reg. Method ID:	6010B	Dilution Factor:	1
Prep Batch Number:	T080205002		
Report Basis:	As Received	Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Sodium	7440-23-5	ND		mg/L	3.0	0.028	1
Thallium	7440-28-0	ND		mg/L	0.40	0.011	
Vanadium	7440-62-2	ND		mg/L	0.010	0.00072	
Zinc	7440-66-6	ND		mg/L	0.0050	0.0010	

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	T080205001-MB	Analysis Date:	2/4/2008 9:52:02AM
Prep Date:	2/4/2008	Instrument:	Titrametric
Analytical Method ID:	310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity	File Name:	
Reg. Method ID:	310.1	Dilution Factor:	1
Prep Batch Number:	T080205001		
Report Basis:	As Received	Analyst Initials:	cs
Sample prep wt./vol:	100.00 ml	Prep Extract Vol:	100.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Bicarbonate		ND		mg/L	5.0	1.5	1
Carbonate		ND		mg/L	7.0	1.2	

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	T080207003-MB	Analysis Date:	2/12/2008 10:07:15AM
Prep Date:	2/6/2008	Instrument:	SCALE
Analytical Method ID:	160.1 - Total Dissolved Solids dried at 180°C - TDS	File Name:	
Reg. Method ID:	160.1	Dilution Factor:	1
Prep Batch Number:	T080207003		
Report Basis:	As Received	Analyst Initials:	kl
Sample prep wt./vol:	100.00 ml	Prep Extract Vol:	1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Total Dissolved Solids		ND		mg/L	10	8.2	1

The following test was conducted by: Analytica - Thornton

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801210

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Report Section: Method Blank Report

Client Sample Name: **MB**

Matrix: Aqueous

Collection Date: 2/4/2008 12:00:00AM

Lab Sample Number:	T080204004-MB	Analysis Date:	2/4/2008 2:54:13PM
Prep Date:	2/4/2008	Instrument:	IC
Analytical Method ID:	Inorganic Anions by Ion Chromatography - Anions by IC	File Name:	080204_013.D
Reg. Method ID:	300.0	Dilution Factor:	1
Prep Batch Number:	T080204004		
Report Basis:	As Received	Analyst Initials:	CS
Sample prep wt./vol:	20.00 ml	Prep Extract Vol:	20.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	run #:
Chloride		**ND**		mg/L	0.80	0.042	1
Fluoride		**ND**		mg/L	0.40	0.031	
Sulfate		**ND**		mg/L	1.5	0.11	

Workorder (SDG): B0801210

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0801210

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T080205002**

SAMPLE DUPLICATE REPORT

Analysis: SW6010B - ICP - Total

Base Sample: B0801210-02A

Prep Date: 2/5/2008

Samp. Anal. Date: 2/19/2008 2:41:00PM

DUP Anal. Date: 2/5/2008 4:52:00PM

Units: mg/L

Matrix: Aqueous

Analyte Name	SampResult	DUPRes.	RPD	RPDLim	Flag
Aluminum	0.984	0.855	14.0	20	
Antimony	ND	ND	0.0	20	
Arsenic	0.108	ND	0.0	20	
Barium	0.0533	0.0470	12.6	20	
Beryllium	ND	ND	0.0	20	
Boron	0.345	0.309	11.0	20	
Cadmium	ND	ND	0.0	20	
Calcium	3.61	3.34	7.8	20	
Chromium	ND	ND	0.0	20	
Cobalt	ND	ND	0.0	20	
Copper	ND	ND	0.0	20	
Iron	ND	ND	0.0	20	
Lead	ND	ND	0.0	20	
Magnesium	1.50	1.36	9.8	20	
Manganese	ND	ND	0.0	20	
Molybdenum	0.0160	0.0193	18.7	20	
Nickel	ND	ND	0.0	20	
Potassium	11.5	10.2	12.0	20	
Selenium	ND	ND	0.0	20	
Silver	ND	ND	0.0	20	
Sodium	1,220	994	20.4	20	OUT
Thallium	ND	ND	0.0	20	
Vanadium	0.0630	0.0540	15.4	20	
Zinc	0.00809	0.00785	3.0	20	
Lithium	ND	ND	0.0	20	

Detailed Analytical Report Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801210

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0801210

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T080205002**

SAMPLE DUPLICATE REPORT

Analysis: SW6010B - ICP - Total

Base Sample: B0801210-04A

Prep Date: 2/5/2008

Samp. Anal. Date: 2/19/2008 2:51:00PM

Units: mg/L

DUP Anal. Date: 2/5/2008 6:06:00PM

Matrix: Aqueous

Analyte Name	SampResult	DUPRes.	RPD	RPDLim	Flag
Aluminum	0.674	0.601	11.5	20	
Antimony	ND	ND	0.0	20	
Arsenic	ND	ND	0.0	20	
Barium	0.0701	0.0615	13.1	20	
Beryllium	ND	ND	0.0	20	
Boron	0.341	0.311	9.2	20	
Cadmium	ND	ND	0.0	20	
Calcium	3.27	2.96	10.0	20	
Chromium	ND	ND	0.0	20	
Cobalt	ND	ND	0.0	20	
Copper	ND	ND	0.0	20	
Iron	ND	ND	0.0	20	
Lead	ND	ND	0.0	20	
Magnesium	1.88	1.65	13.0	20	
Manganese	ND	ND	0.0	20	
Molybdenum	0.0127	0.0147	14.6	20	
Nickel	ND	ND	0.0	20	
Potassium	12.4	10.4	17.5	20	
Selenium	ND	ND	0.0	20	
Silver	ND	ND	0.0	20	
Sodium	1,270	1,040	19.9	20	
Thallium	ND	ND	0.0	20	
Vanadium	0.0313	0.0268	15.5	20	
Zinc	ND	ND	0.0	20	
Lithium	ND	ND	0.0	20	

LCS/LCSD REPORT

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801210

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0801210

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T080205002**

LCS/LCSD REPORT

Analysis: SW6010B - ICP - Total

MB: T080205002-MB

Prep Date: 2/5/2008

MB Anal. Date: 2/5/2008 4:27:00PM

Units: mg/L

LCS Anal. Date: 2/5/2008 4:32:00PM LCSD Anal. Date: 2/5/2008 4:37:00PM Matrix: Aqueous

Analyte Name	SampResult	LCSRes.	SDRes.	SPLev	SPDLev	Recov.	SD Recov	RPD	Recov Lim	RPDLim	Flag
Aluminum	ND	1.91	1.92	2.00	2.00	95.5	96.0	0.5	89 - 117	20	
Antimony	ND	0.445	0.442	0.500	0.500	89.0	88.4	0.7	82 - 117	20	
Arsenic	ND	1.81	1.82	2.00	2.00	90.5	91.0	0.6	86 - 116	20	
Barium	ND	1.89	1.91	2.00	2.00	94.5	95.5	1.1	86 - 116	20	
Beryllium	ND	0.0497	0.0500	0.0500	0.0500	99.4	100.0	0.6	87 - 111	20	
Boron	ND	0.458	0.461	0.500	0.500	91.6	92.2	0.7	76 - 130	20	
Cadmium	ND	0.0425	0.0428	0.0500	0.0500	85.0	85.6	0.7	79 - 113	20	
Calcium	ND	9.41	9.45	10.0	10.0	94.1	94.5	0.4	79 - 119	20	
Chromium	ND	0.191	0.191	0.200	0.200	95.5	95.5	0.0	86 - 117	20	
Cobalt	ND	0.468	0.471	0.500	0.500	93.6	94.2	0.6	82 - 118	20	
Copper	ND	0.233	0.235	0.250	0.250	93.2	94.0	0.9	86 - 117	20	
Iron	ND	1.01	1.02	1.00	1.00	101.0	102.0	1.0	83 - 121	20	
Lead	ND	0.456	0.465	0.500	0.500	91.2	93.0	2.0	83 - 121	20	
Magnesium	ND	9.99	10.0	10.0	10.0	99.9	100.0	0.1	83 - 118	20	
Manganese	ND	0.472	0.474	0.500	0.500	94.4	94.8	0.4	82 - 121	20	
Molybdenum	ND	0.464	0.467	0.500	0.500	92.8	93.4	0.6	82 - 120	20	
Nickel	ND	0.483	0.484	0.500	0.500	96.6	96.8	0.2	84 - 117	20	
Potassium	ND	8.29	8.02	10.0	10.0	82.9	80.2	3.3	74 - 110	20	
Selenium	ND	1.87	1.87	2.00	2.00	93.5	93.5	0.0	87 - 117	20	
Silver	ND	0.248	0.250	0.250	0.250	99.2	100.0	0.8	80 - 127	20	
Sodium	ND	9.48	9.59	10.0	10.0	94.8	95.9	1.2	87 - 113	20	
Thallium	ND	0.212	0.206	0.200	0.200	106.0	103.0	2.9	89 - 113	20	
Vanadium	ND	0.483	0.485	0.500	0.500	96.6	97.0	0.4	87 - 119	20	
Zinc	ND	0.455	0.457	0.500	0.500	91.0	91.4	0.4	81 - 120	20	
Lithium	ND	0.477	0.482	0.500	0.500	95.4	96.4	1.0	80 - 120	20	

MS/MSD REPORT

Detailed Analytical Report Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801210

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0801210

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T080205002**

MS/MSD REPORT

Analysis: SW6010B - ICP - Total

Parent: B0801210-02A

Prep Date: 2/5/2008

Samp. Anal. Date: 2/19/2008 2:41:00PM

Units: mg/L

MS Anal. Date: 2/5/2008 4:57:00PM MSD Anal. Date: 2/5/2008 5:02:00PM

Matrix: Aqueous

Analyte Name	SampResult	MSRes.	MSDRes	SPLev	SPDLev	Recov.	MSD Rec.	RPD	Recov Lim	RPDLim	Flag
Aluminum	0.984	2.42	2.46	2.00	2.00	71.8	73.8	1.6	75 - 125	20	*lowMS lowMSD*
Antimony	ND	0.395	0.403	0.500	0.500	79.0	80.6	2.0	75 - 125	20	
Arsenic	0.108	1.69	1.74	2.00	2.00	79.1	81.6	2.9	75 - 125	20	
Barium	0.0533	1.57	1.61	2.00	2.00	75.8	77.8	2.5	75 - 125	20	
Beryllium	ND	0.0421	0.0432	0.0500	0.0500	84.2	86.4	2.6	75 - 125	20	
Boron	0.345	0.737	0.694	0.500	0.500	78.4	69.8	6.0	75 - 125	20	*lowMSD*
Cadmium	ND	0.0339	0.0345	0.0500	0.0500	67.8	69.0	1.8	75 - 125	20	*lowMS lowMSD*
Calcium	3.61	11.4	11.6	10.0	10.0	77.9	79.9	1.7	75 - 125	20	
Chromium	ND	0.165	0.169	0.200	0.200	82.5	84.5	2.4	75 - 125	20	
Cobalt	ND	0.403	0.412	0.500	0.500	80.6	82.4	2.2	75 - 125	20	
Copper	ND	0.198	0.202	0.250	0.250	79.2	80.8	2.0	75 - 125	20	
Iron	ND	0.891	0.907	1.00	1.00	89.1	90.7	1.8	75 - 125	20	
Lead	ND	0.405	0.414	0.500	0.500	81.0	82.8	2.2	75 - 125	20	
Magnesium	1.50	9.70	9.90	10.0	10.0	82.0	84.0	2.0	75 - 125	20	
Manganese	ND	0.400	0.409	0.500	0.500	80.0	81.8	2.2	75 - 125	20	
Molybdenum	0.0160	0.414	0.424	0.500	0.500	79.6	81.6	2.4	75 - 125	20	
Nickel	ND	0.415	0.423	0.500	0.500	83.0	84.6	1.9	75 - 125	20	
Potassium	11.5	19.7	18.5	10.0	10.0	82.0	70.0	6.3	75 - 125	20	*lowMSD*
Selenium	ND	1.69	1.75	2.00	2.00	84.5	87.5	3.5	75 - 125	20	
Silver	ND	0.215	0.214	0.250	0.250	86.0	85.6	0.5	75 - 125	20	
Sodium	1,220	945	970	10.0	10.0	-2,750.0	-2,500.0	2.6	75 - 125	20	*NOTE 2 NOTE 2*
Thallium	ND	0.181	0.153	0.200	0.200	90.5	76.5	16.8	75 - 125	20	
Vanadium	0.0630	0.460	0.473	0.500	0.500	79.4	82.0	2.8	75 - 125	20	
Zinc	0.00809	0.417	0.424	0.500	0.500	81.8	83.2	1.7	75 - 125	20	
Lithium	ND	0.482	0.495	0.500	0.500	96.4	99.0	2.7	75 - 125	20	

Workorder (SDG): B0801210

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0801210

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T080205002**

MS/MSD REPORT

Analysis: SW6010B - ICP - Total

Parent: B0801210-04A

Prep Date: 2/5/2008

Samp. Anal. Date: 2/19/2008 2:51:00PM

Units: mg/L

MS Anal. Date: 2/5/2008 6:11:00PM MSD Anal. Date: 2/5/2008 6:16:00PM

Matrix: Aqueous

Analyte Name	SampResult	MSRes.	MSDRes	SPLev	SPDLev	Recov.	MSD Rec.	RPD	Recov Lim	RPDLim	Flag
Aluminum	0.674	2.32	2.29	2.00	2.00	82.3	80.8	1.3	75 - 125	20	
Antimony	ND	0.434	0.444	0.500	0.500	86.8	88.8	2.3	75 - 125	20	
Arsenic	ND	1.76	1.77	2.00	2.00	88.0	88.5	0.6	75 - 125	20	
Barium	0.0701	1.71	1.71	2.00	2.00	82.0	82.0	0.0	75 - 125	20	
Beryllium	ND	0.0424	0.0420	0.0500	0.0500	84.8	84.0	0.9	75 - 125	20	
Boron	0.341	0.705	0.703	0.500	0.500	72.8	72.4	0.3	75 - 125	20	*lowMS lowMSD*
Cadmium	ND	0.0359	0.0361	0.0500	0.0500	71.8	72.2	0.6	75 - 125	20	*lowMS lowMSD*
Calcium	3.27	12.6	12.5	10.0	10.0	93.3	92.3	0.8	75 - 125	20	
Chromium	ND	0.170	0.169	0.200	0.200	85.0	84.5	0.6	75 - 125	20	
Cobalt	ND	0.417	0.416	0.500	0.500	83.4	83.2	0.2	75 - 125	20	
Copper	ND	0.217	0.215	0.250	0.250	86.8	86.0	0.9	75 - 125	20	
Iron	ND	1.02	1.02	1.00	1.00	102.0	102.0	0.0	75 - 125	20	
Lead	ND	0.428	0.418	0.500	0.500	85.6	83.6	2.4	75 - 125	20	
Magnesium	1.88	10.3	10.3	10.0	10.0	84.2	84.2	0.0	75 - 125	20	
Manganese	ND	0.427	0.425	0.500	0.500	85.4	85.0	0.5	75 - 125	20	
Molybdenum	0.0127	0.446	0.443	0.500	0.500	86.7	86.1	0.7	75 - 125	20	
Nickel	ND	0.425	0.419	0.500	0.500	85.0	83.8	1.4	75 - 125	20	
Potassium	12.4	18.3	18.4	10.0	10.0	59.0	60.0	0.5	75 - 125	20	*lowMS lowMSD*
Selenium	ND	1.76	1.75	2.00	2.00	88.0	87.5	0.6	75 - 125	20	
Silver	ND	0.222	0.219	0.250	0.250	88.8	87.6	1.4	75 - 125	20	
Sodium	1,270	982	983	10.0	10.0	-2,880.0	-2,870.0	0.1	75 - 125	20	*NOTE 2 NOTE 2*
Thallium	ND	0.170	0.160	0.200	0.200	85.0	80.0	6.1	75 - 125	20	
Vanadium	0.0313	0.469	0.467	0.500	0.500	87.5	87.1	0.4	75 - 125	20	
Zinc	ND	0.448	0.444	0.500	0.500	89.6	88.8	0.9	75 - 125	20	
Lithium	ND	0.512	0.512	0.500	0.500	102.4	102.4	0.0	75 - 125	20	

Workorder (SDG): B0801210

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0801210

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T080205002**

POST DIGESTION SPIKE REPORT

Analysis: SW6010B - ICP - Total

Base Sample: B0801210-02A

Prep Date: 2/5/2008

Samp. Anal. Date: 2/19/2008 2:41:00PM

Units: mg/L

PDS Anal. Date: 2/5/2008 5:46:00PM

Matrix: Aqueous

Analyte Name	SampResult	PDSRes.	SPLev	Recov.	Recov Lim	Flag	
Aluminum	0.984	2.79	2.00	90.2	75 - 117		
Antimony	ND	0.473	0.500	93.2	75 - 117		
Arsenic	0.108	1.97	2.00	93.1	75 - 116		
Barium	0.0533	1.85	2.00	89.7	75 - 116		
Beryllium	ND	0.0459	0.0500	92.3	75 - 111		
Boron	0.345	0.780	0.500	87.0	75 - 130		
Cadmium	ND	0.0350	0.0500	73.0	75 - 113	lowPDS	
Calcium	3.61	12.5	10.0	88.6	75 - 119		
Chromium	ND	0.185	0.200	90.6	75 - 117		
Cobalt	ND	0.452	0.500	90.2	75 - 118		
Copper	ND	0.229	0.250	89.9	75 - 117		
Iron	ND	0.971	1.00	92.9	75 - 121		
Lead	ND	0.455	0.500	90.5	75 - 121		
Magnesium	1.50	10.6	10.0	91.4	75 - 118		
Manganese	ND	0.457	0.500	91.0	75 - 121		
Molybdenum	0.0160	0.481	0.500	93.0	75 - 120		
Nickel	ND	0.455	0.500	90.8	75 - 117		
Potassium	11.5	18.8	10.0	73.6	75 - 110	lowPDS	
Selenium	ND	1.96	2.00	93.6	75 - 117		
Silver	ND	0.237	0.250	95.2	75 - 127		
Sodium	1,220	1,070	10.0	-1,516.8	75 - 113	lowPDS	Note 2
Thallium	ND	0.185	0.200	85.5	75 - 113		
Vanadium	0.0630	0.540	0.500	95.4	75 - 119		
Zinc	0.00809	0.477	0.500	93.8	75 - 120		
Lithium	ND	0.558	0.500	94.8	75 - 120		

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801210

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0801210

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T080205002**

POST DIGESTION SPIKE REPORT

Analysis: SW6010B - ICP - Total

Base Sample: B0801210-04A

Prep Date: 2/5/2008

Samp. Anal. Date: 2/19/2008 2:51:00PM

Units: mg/L

PDS Anal. Date: 2/5/2008 6:21:00PM

Matrix: Aqueous

Analyte Name	SampResult	PDSRes.	SPLev	Recov.	Recov Lim	Flag	
Aluminum	0.674	2.33	2.00	82.8	75 - 117		
Antimony	ND	0.433	0.500	85.3	75 - 117		
Arsenic	ND	1.77	2.00	86.4	75 - 116		
Barium	0.0701	1.74	2.00	83.7	75 - 116		
Beryllium	ND	0.0425	0.0500	85.5	75 - 111		
Boron	0.341	0.712	0.500	74.2	75 - 130	lowPDS	
Cadmium	ND	0.0330	0.0500	68.5	75 - 113	lowPDS	
Calcium	3.27	12.6	10.0	93.5	75 - 119		
Chromium	ND	0.172	0.200	84.0	75 - 117		
Cobalt	ND	0.418	0.500	82.7	75 - 118		
Copper	ND	0.219	0.250	87.1	75 - 117		
Iron	ND	1.04	1.00	100.4	75 - 121		
Lead	ND	0.422	0.500	84.6	75 - 121		
Magnesium	1.88	10.4	10.0	85.3	75 - 118		
Manganese	ND	0.429	0.500	85.4	75 - 121		
Molybdenum	0.0127	0.449	0.500	87.2	75 - 120		
Nickel	ND	0.424	0.500	84.9	75 - 117		
Potassium	12.4	18.1	10.0	57.7	75 - 110	lowPDS	
Selenium	ND	1.74	2.00	87.0	75 - 117		
Silver	ND	0.222	0.250	89.9	75 - 127		
Sodium	1,270	996	10.0	-2,766.0	75 - 113	lowPDS	Note 2
Thallium	ND	0.165	0.200	78.9	75 - 113		
Vanadium	0.0313	0.473	0.500	88.3	75 - 119		
Zinc	ND	0.449	0.500	89.5	75 - 120		
Lithium	ND	0.523	0.500	86.7	75 - 120		

SERIAL DILUTION REPORT

Workorder (SDG): B0801210

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0801210

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T080205002**

SERIAL DILUTION REPORT

Analysis: SW6010B - ICP - Total

Base Sample: B0801210-02A

Prep Date: 2/5/2008

Samp. Anal. Date: 2/19/2008 2:41:00PM

Units: mg/L

SER DIL. Date: 2/5/2008 5:51:00PM

Matrix: Aqueous

Analyte Name	SampResult	PQL.	MDL.	SerialRes.	SerPQL.	RPD	Flag
Aluminum	0.984	0.050	0.014	1.04	0.25	5.5	
Antimony	ND	0.050	0.0067	ND	0.25		
Arsenic	0.108	0.10	0.015	ND	0.50		
Barium	0.0533	0.0100	0.00016	0.0576	0.050	7.7	
Beryllium	ND	0.0010	0.000060	ND	0.0050		
Boron	0.345	0.050	0.0018	0.348	0.25	0.8	
Cadmium	ND	0.0060	0.00051	ND	0.030		
Calcium	3.61	0.10	0.013	3.63	0.50	0.5	
Chromium	ND	0.0100	0.0018	ND	0.050		
Cobalt	ND	0.0050	0.0016	ND	0.025		
Copper	ND	0.0050	0.0019	ND	0.025		
Iron	ND	0.050	0.0027	ND	0.25		
Lead	ND	0.050	0.011	ND	0.25		
Magnesium	1.50	0.10	0.012	1.50	0.50	0.0	
Manganese	ND	0.0100	0.00066	ND	0.050		
Molybdenum	0.0160	0.0100	0.0018	ND	0.050		
Nickel	ND	0.040	0.0027	ND	0.20		
Potassium	11.5	1.0	0.31	11.7	5.0	1.7	
Selenium	ND	0.10	0.026	ND	0.50		
Silver	ND	0.015	0.00066	ND	0.075		
Sodium	1,220	3.0	0.028	1,100	15	10.3	OUT
Thallium	ND	0.40	0.011	ND	2.0		
Vanadium	0.0630	0.0100	0.00072	0.0681	0.050	7.7	
Zinc	0.00809	0.0050	0.0010	ND	0.025		
Lithium	ND	0.10	0.00072	ND	0.50		

Analysis: SW6010B - ICP - Total

Base Sample: B0801210-04A

Prep Date: 2/5/2008

Samp. Anal. Date: 2/19/2008 2:51:00PM

Units: mg/L

SER DIL. Date: 2/5/2008 6:26:00PM

Matrix: Aqueous

Analyte Name	SampResult	PQL.	MDL.	SerialRes.	SerPQL.	RPD	Flag

Detailed Analytical Report Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801210

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0801210

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T080205002**

SERIAL DILUTION REPORT

Analysis: SW6010B - ICP - Total

Base Sample: B0801210-04A

Prep Date: 2/5/2008

Samp. Anal. Date: 2/19/2008 2:51:00PM

Units: mg/L

SER DIL. Date: 2/5/2008 6:26:00PM

Matrix: Aqueous

Analyte Name	SampResult	PQL.	MDL.	SerialRes.	SerPQL.	RPD	Flag
Aluminum	0.674	0.050	0.014	0.749	0.25	10.5	Note 4
Antimony	ND	0.050	0.0067	ND	0.25		
Arsenic	ND	0.10	0.015	ND	0.50		
Barium	0.0701	0.0100	0.00016	0.0688	0.050	1.8	
Beryllium	ND	0.0010	0.000060	ND	0.0050		
Boron	0.341	0.050	0.0018	0.331	0.25	2.9	
Cadmium	ND	0.0060	0.00051	ND	0.030		
Calcium	3.27	0.10	0.013	3.24	0.50	0.9	
Chromium	ND	0.0100	0.0018	ND	0.050		
Cobalt	ND	0.0050	0.0016	ND	0.025		
Copper	ND	0.0050	0.0019	ND	0.025		
Iron	ND	0.050	0.0027	ND	0.25		
Lead	ND	0.050	0.011	ND	0.25		
Magnesium	1.88	0.10	0.012	1.81	0.50	3.7	
Manganese	ND	0.0100	0.00066	ND	0.050		
Molybdenum	0.0127	0.0100	0.0018	ND	0.050		
Nickel	ND	0.040	0.0027	ND	0.20		
Potassium	12.4	1.0	0.31	11.7	5.0	5.8	
Selenium	ND	0.10	0.026	ND	0.50		
Silver	ND	0.015	0.00066	ND	0.075		
Sodium	1,270	3.0	0.028	1,080	15	16.1	OUT
Thallium	ND	0.40	0.011	ND	2.0		
Vanadium	0.0313	0.0100	0.00072	ND	0.050		Note 4
Zinc	ND	0.0050	0.0010	ND	0.025		
Lithium	ND	0.10	0.00072	ND	0.50		

Prep Batch: **T080205004**

SAMPLE DUPLICATE REPORT

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801210

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0801210

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T080205004**

SAMPLE DUPLICATE REPORT

Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg

Base Sample: B0801210-02A
Prep Date: 2/5/2008

Samp. Anal. Date: 2/5/2008 4:59:48PM
DUP Anal. Date: 2/5/2008 5:02:05PM

Units: mg/L
Matrix: Aqueous

Analyte Name	SampResult	DUPRes.	RPD	RPDLim	Flag
Mercury	ND	ND	0.0	20	

Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg

Base Sample: B0801210-04A
Prep Date: 2/5/2008

Samp. Anal. Date: 2/5/2008 5:13:23PM
DUP Anal. Date: 2/5/2008 5:20:14PM

Units: mg/L
Matrix: Aqueous

Analyte Name	SampResult	DUPRes.	RPD	RPDLim	Flag
Mercury	ND	ND	0.0	20	

LCS/LCSD REPORT

Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg

MB: T080205004-MB
Prep Date: 2/5/2008

MB Anal. Date: 2/5/2008 4:23:51PM
LCS Anal. Date: 2/5/2008 4:26:44PM LCSD Anal. Date: 2/5/2008 4:29:07PM

Units: mg/L
Matrix: Aqueous

Analyte Name	SampResult	LCSRes.	SDRes.	SPLev	SPDLev	Recov.	SD Recov	RPD	Recov Lim	RPDLim	Flag
Mercury	ND	0.00223	0.00227	0.00200	0.0020	111.5	113.5	1.8	80 - 120	20	

MS/MSD REPORT

Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg

Parent: B0801210-02A
Prep Date: 2/5/2008

Samp. Anal. Date: 2/5/2008 4:59:48PM
MS Anal. Date: 2/5/2008 5:04:18PM MSD Anal. Date: 2/5/2008 5:06:23PM

Units: mg/L
Matrix: Aqueous

Analyte Name	SampResult	MSRes.	MSDRes	SPLev	SPDLev	Recov.	MSD Rec.	RPD	Recov Lim	RPDLim	Flag
Mercury	ND	0.00217	0.00209	0.00200	0.00200	108.5	104.5	3.8	70 - 130	20	

Workorder (SDG): B0801210

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0801210

Project: Navajo Mine Extension Leaching Study

QUALITY CONTROL REPORT

Project Number:

Prep Batch: **T080205004**

MS/MSD REPORT

Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg

Parent: B0801210-04A

Prep Date: 2/5/2008

Samp. Anal. Date: 2/5/2008 5:13:23PM

Units: mg/L

MS Anal. Date: 2/5/2008 5:22:59PM MSD Anal. Date: 2/5/2008 5:25:08PM

Matrix: Aqueous

Analyte Name	SampResult	MSRes.	MSDRes	SPLev	SPDLev	Recov.	MSD Rec.	RPD	Recov Lim	RPDLim	Flag
Mercury	ND	0.00215	0.00209	0.00200	0.00200	107.5	104.5	2.8	70 - 130	20	

POST DIGESTION SPIKE REPORT

Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg

Base Sample: B0801210-02A

Prep Date: 2/5/2008

Samp. Anal. Date: 2/5/2008 4:59:48PM

Units: mg/L

PDS Anal. Date: 2/5/2008 5:08:38PM

Matrix: Aqueous

Analyte Name	SampResult	PDSRes.	SPLev	Recov.	Recov Lim	Flag
Mercury	ND	0.00211	0.00200	109.4	80 - 120	

Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg

Base Sample: B0801210-04A

Prep Date: 2/5/2008

Samp. Anal. Date: 2/5/2008 5:13:23PM

Units: mg/L

PDS Anal. Date: 2/5/2008 5:27:21PM

Matrix: Aqueous

Analyte Name	SampResult	PDSRes.	SPLev	Recov.	Recov Lim	Flag
Mercury	ND	0.00208	0.00200	109.4	80 - 120	

Workorder (SDG): B0801210

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

FOOTNOTES TO QC REPORT

Note 1: Results are shown to three significant figures to avoid rounding errors in calculations.

Note 2: If the sample concentration is greater than 4 times the spike level, a recovery is not meaningful, and the result should be used as a replicate. In such cases the spike is not as high as expected random measurement variability of the sample result itself.

Note 3: For sample duplicates, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample and duplicate results are not five times the PQL or greater, then the RPD is not expected to fall within the window shown and the comparison should be made on the basis of the absolute difference. Analytica uses the criterion that the absolute difference should be less than the PQL for water or less than 2XPQL for other matrices.

Note 4: For serial dilutions, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample result is not 50 times the MDL or greater, then the fact that the RPD does not meet the 10% criterion has little signifcance. Otherwise it indicates that a matrix bias may exist at the analytical step.

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801210

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0801210

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T080204004**

SAMPLE DUPLICATE REPORT

Analysis: Inorganic Anions by Ion Chromatography - Anions by IC

Base Sample: B0801210-02B
Prep Date: 2/4/2008

Samp. Anal. Date: 2/4/2008 7:48:30PM
Units: mg/L

DUP Anal. Date: 2/4/2008 8:06:54PM
Matrix: Aqueous

Analyte Name	SampResult	DUPRes.	RPD	RPDLim	Flag
Fluoride	10.2	10.2	0.0	30	
Chloride	607	609	0.3	30	
Sulfate	349	352	0.9	30	

LCS/LCSD REPORT

Analysis: Inorganic Anions by Ion Chromatography - Anions by IC

MB: T080204004-MB
Prep Date: 2/4/2008

MB Anal. Date: 2/4/2008 2:54:13PM
Units: mg/L

LCS Anal. Date: 2/4/2008 3:12:36PM LCSD Anal. Date: 2/4/2008 3:31:00PM
Matrix: Aqueous

Analyte Name	SampResult	LCSRes.	SDRes.	SPLev	SPDLev	Recov.	SD Recov	RPD	Recov Lim	RPDLim	Flag
Fluoride	ND	2.46	2.43		2.50		97.2	1.2	90 - 110	20	
Chloride	ND	5.15	5.14		5.00		102.8	0.2	90 - 110	20	
Sulfate	ND	37.1	37.1		37.5		98.9	0.0	90 - 110	20	

MS REPORT

Analysis: Inorganic Anions by Ion Chromatography - Anions by IC

Parent: B0801210-02B
Prep Date: 2/4/2008

Samp. Anal. Date: 2/4/2008 7:48:30PM
Units: mg/L

MS Anal. Date: 2/4/2008 8:25:18PM
Matrix: Aqueous

Analyte Name	SampResult	MSRes.	SPLev	Recov.	Recov Lim		Flag
Fluoride	10.2	12.8	2.50	104.0	70 - 130	*NOTE 2*	
Chloride	607	743	125	108.8	70 - 130	*NOTE 2*	
Sulfate	349	1,270	938	98.2	70 - 130		

Analysis: Inorganic Anions by Ion Chromatography - Anions by IC

Parent: B0801210-04B
Prep Date: 2/4/2008

Samp. Anal. Date: 2/4/2008 9:20:30PM
Units: mg/L

MS Anal. Date: 2/4/2008 9:38:55PM
Matrix: Aqueous

Analyte Name	SampResult	MSRes.	SPLev	Recov.	Recov Lim	Flag

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801210

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0801210

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T080204004**

MS REPORT

Analysis: Inorganic Anions by Ion Chromatography - Anions by IC

Parent: B0801210-04B

Prep Date: 2/4/2008

Samp. Anal. Date: 2/4/2008 9:20:30PM

Units: mg/L

MS Anal. Date: 2/4/2008 9:38:55PM

Matrix: Aqueous

Analyte Name	SampResult	MSRes.	SPLev	Recov.	Recov Lim		Flag
Fluoride	4.72	7.14	2.50	96.8	70 - 130		
Chloride	624	757	125	106.4	70 - 130	*NOTE 2*	
Sulfate	285	321	37.5	96.0	70 - 130	*NOTE 2*	

Prep Batch: **T080207003**

SAMPLE DUPLICATE REPORT

Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS

Base Sample: B0801210-02B

Prep Date: 2/6/2008

Samp. Anal. Date: 2/12/2008 10:07:15AM

Units: mg/L

DUP Anal. Date: 2/12/2008 10:07:15AM

Matrix: Aqueous

Analyte Name	SampResult	DUPRes.	RPD	RPDLim	Flag
Total Dissolved Solids	3,070	3,050	0.7	20	

LCS/LCSD REPORT

Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS

MB: T080207003-MB

Prep Date: 2/6/2008

MB Anal. Date: 2/12/2008 10:07:15AM

Units: mg/L

LCS Anal. Date: 2/12/2008 10:07:15AM LCSD Anal. Date: 2/12/2008 10:07:15AM

Matrix: Aqueous

Analyte Name	SampResult	LCSRes.	SDRes.	SPLev	SPDLev	Recov.	SD Recov	RPD	Recov Lim	RPDLim	Flag
Total Dissolved Solids	ND	797	845	821	821	97.0	102.9	5.8	80 - 120	20	

MS REPORT

Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS

Parent: B0801210-02B

Prep Date: 2/6/2008

Samp. Anal. Date: 2/12/2008 10:07:15AM

Units: mg/L

MS Anal. Date: 2/12/2008 10:07:15AM

Matrix: Aqueous

Analyte Name	SampResult	MSRes.	SPLev	Recov.	Recov Lim	Flag

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801210

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): B0801210

Project: Navajo Mine Extension Leaching Study

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T080207003**

MS REPORT

Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS

Parent: B0801210-02B

Prep Date: 2/6/2008

Samp. Anal. Date: 2/12/2008 10:07:15AM

Units: mg/L

MS Anal. Date: 2/12/2008 10:07:15AM

Matrix: Aqueous

Analyte Name	SampResult	MSRes.	SPLev	Recov.	Recov Lim	Flag
Total Dissolved Solids	3,070	3,890	821	99.8	70 - 130	

Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS

Parent: B0801210-04B

Prep Date: 2/6/2008

Samp. Anal. Date: 2/12/2008 10:07:15AM

Units: mg/L

MS Anal. Date: 2/12/2008 10:07:15AM

Matrix: Aqueous

Analyte Name	SampResult	MSRes.	SPLev	Recov.	Recov Lim	Flag
Total Dissolved Solids	3,060	3,930	821	105.9	70 - 130	

Prep Batch: **T080205001**

LCS/LCSD REPORT

Analysis: 310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity

MB: T080205001-MB

Prep Date: 2/4/2008

MB Anal. Date: 2/4/2008 9:52:02AM

Units: mg/L

LCS Anal. Date: 2/4/2008 9:52:02AM LCSD Anal. Date: 2/4/2008 9:52:02AM

Matrix: Aqueous

Analyte Name	SampResult	LCSRes.	SDRes.	SPLev	SPDLev	Recov.	SD Recov	RPD	Recov Lim	RPDLim	Flag
Bicarbonate	ND	24.0	27.0	25.0	25.0	96.0	108.0	11.8	80 - 120	20	
Carbonate	ND	50.0	51.0	50.0	50.0	100.0	102.0	2.0	80 - 120	20	

Workorder (SDG): B0801210

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

FOOTNOTES TO QC REPORT

Note 1: Results are shown to three significant figures to avoid rounding errors in calculations.

Note 2: If the sample concentration is greater than 4 times the spike level, a recovery is not meaningful, and the result should be used as a replicate. In such cases the spike is not as high as expected random measurement variability of the sample result itself.

Note 3: For sample duplicates, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample and duplicate results are not five times the PQL or greater, then the RPD is not expected to fall within the window shown and the comparison should be made on the basis of the absolute difference. Analytica uses the criterion that the absolute difference should be less than the PQL for water or less than 2XPQL for other matrices.

Note 4: For serial dilutions, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample result is not 50 times the MDL or greater, then the fact that the RPD does not meet the 10% criterion has little signifcance. Otherwise it indicates that a matrix bias may exist at the analytical step.

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801210

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

QC BATCH ASSOCIATIONS - BY METHOD BLANK

Lab Project ID: **83,686** **Lab Project Number:** **B0801210**

Prep Date: 2/4/2008

Lab Method Blank Id: T080204004-MB
Prep Batch ID: T080204004
Method: Inorganic Anions by Ion Chromatography - Anions by IC

This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates:

SampleNum	ClientSampleName	DataFile	AnalysisDate
T080204004-LCS	LCS	080204_014.DXD	2/4/2008 3:12:36PM
T080204004-LCSD	LCSD	080204_015.DXD	2/4/2008 3:31:00PM
B0801210-01B	MB Successive #2	080204_017.DXD	2/4/2008 4:07:47PM
B0801210-02B	Ash Successive #2	080204_018.DXD	2/4/2008 4:26:11PM
B0801210-02B-DUP	DUP	080204_019.DXD	2/4/2008 4:44:34PM
B0801210-02B-MS	MS	080204_020.DXD	2/4/2008 5:02:58PM
B0801210-03B	MB Successive #3	080204_022.DXD	2/4/2008 5:39:45PM
B0801210-04B	Ash Successive #3	080204_023.DXD	2/4/2008 5:58:09PM
B0801210-04B-MS	MS	080204_024.DXD	2/4/2008 6:16:33PM
B0801210-01B	MB Successive #2	080204_028.DXD	2/4/2008 7:30:06PM
B0801210-02B	Ash Successive #2	080204_029.DXD	2/4/2008 7:48:30PM
B0801210-02B-DUP	DUP	080204_030.DXD	2/4/2008 8:06:54PM
B0801210-02B-MS	MS	080204_031.DXD	2/4/2008 8:25:18PM
B0801210-03B	MB Successive #3	080204_033.DXD	2/4/2008 9:02:06PM
B0801210-04B	Ash Successive #3	080204_034.DXD	2/4/2008 9:20:30PM
B0801210-04B-MS	MS	080204_035.DXD	2/4/2008 9:38:55PM

Prep Date: 2/4/2008

Lab Method Blank Id: T080205001-MB
Prep Batch ID: T080205001
Method: 310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity

This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates:

SampleNum	ClientSampleName	DataFile	AnalysisDate
B0801191-04B	Batch QC		2/4/2008 9:52:02AM
B0801210-01B	MB Successive #2		2/4/2008 9:52:02AM
B0801210-02B	Ash Successive #2		2/4/2008 9:52:02AM
B0801210-03B	MB Successive #3		2/4/2008 9:52:02AM
B0801210-04B	Ash Successive #3		2/4/2008 9:52:02AM
T080205001-LCS	LCS		2/4/2008 9:52:02AM
T080205001-LCSD	LCSD		2/4/2008 9:52:02AM
B0801191-04B-DUP	DUP		2/4/2008 9:52:02AM

Workorder (SDG): B0801210

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

QC BATCH ASSOCIATIONS - BY METHOD BLANK

Lab Project ID: **83,686** **Lab Project Number:** **B0801210**

Prep Date: 2/5/2008

Lab Method Blank Id: T080205002-MB
Prep Batch ID: T080205002
Method: SW6010B - ICP - Total

This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates:

SampleNum	ClientSampleName	DataFile	AnalysisDate
T080205002-LCS	LCS	E02058A	2/5/2008 4:32:00PM
T080205002-LCSD	LCSD	E02058A	2/5/2008 4:37:00PM
B0801210-02A-DUP	DUP	E02058A	2/5/2008 4:52:00PM
B0801210-04A-DUP	DUP	E02058A	2/5/2008 6:06:00PM
B0801210-02A-MS	MS	E02058A	2/5/2008 4:57:00PM
B0801210-04A-MS	MS	E02058A	2/5/2008 6:11:00PM
B0801210-02A-MSD	MSD	E02058A	2/5/2008 5:02:00PM
B0801210-04A-MSD	MSD	E02058A	2/5/2008 6:16:00PM
B0801210-02A-PDS	PDS	E02058A	2/5/2008 5:46:00PM
B0801210-04A-PDS	PDS	E02058A	2/5/2008 6:21:00PM
T080205002-LCS	LCS	E02068A	2/6/2008 1:59:00PM
T080205002-LCSD	LCSD	E02068A	2/6/2008 2:04:00PM
B0801210-02A-MS	MS	E02068A	2/6/2008 2:09:00PM
B0801210-04A-MS	MS	E02068A	2/6/2008 2:19:00PM
B0801210-02A-MSD	MSD	E02068A	2/6/2008 2:14:00PM
B0801210-04A-MSD	MSD	E02068A	2/6/2008 2:24:00PM
B0801210-01A	MB Successive #2	E02198A	2/19/2008 2:36:00PM
B0801210-02A	Ash Successive #2	E02198A	2/19/2008 2:41:00PM
B0801210-03A	MB Successive #3	E02198A	2/19/2008 2:46:00PM
B0801210-04A	Ash Successive #3	E02198A	2/19/2008 2:51:00PM

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801210

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

QC BATCH ASSOCIATIONS - BY METHOD BLANK

Lab Project ID: **83,686** **Lab Project Number:** **B0801210**

Prep Date: 2/5/2008

Lab Method Blank Id: T080205004-MB

Prep Batch ID: T080205004

Method: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg

This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates:

SampleNum	ClientSampleName	DataFile	AnalysisDate
B0801197-02A	Batch QC	B020508W.WKS	2/5/2008 4:38:47PM
B0801210-01A	MB Successive #2	B020508W.WKS	2/5/2008 4:57:34PM
B0801210-02A	Ash Successive #2	B020508W.WKS	2/5/2008 4:59:48PM
B0801210-03A	MB Successive #3	B020508W.WKS	2/5/2008 5:11:03PM
B0801210-04A	Ash Successive #3	B020508W.WKS	2/5/2008 5:13:23PM
T080205004-LCS	LCS	B020508W.WKS	2/5/2008 4:26:44PM
T080205004-LCSD	LCSD	B020508W.WKS	2/5/2008 4:29:07PM
B0801197-02A-DUP	DUP	B020508W.WKS	2/5/2008 4:41:14PM
B0801210-02A-DUP	DUP	B020508W.WKS	2/5/2008 5:02:05PM
B0801210-04A-DUP	DUP	B020508W.WKS	2/5/2008 5:20:14PM
B0801197-02A-MS	MS	B020508W.WKS	2/5/2008 4:43:28PM
B0801210-02A-MS	MS	B020508W.WKS	2/5/2008 5:04:18PM
B0801210-04A-MS	MS	B020508W.WKS	2/5/2008 5:22:59PM
B0801197-02A-MSD	MSD	B020508W.WKS	2/5/2008 4:46:03PM
B0801210-02A-MSD	MSD	B020508W.WKS	2/5/2008 5:06:23PM
B0801210-04A-MSD	MSD	B020508W.WKS	2/5/2008 5:25:08PM
B0801197-02A-PDS	PDS	B020508W.WKS	2/5/2008 4:52:53PM
B0801210-02A-PDS	PDS	B020508W.WKS	2/5/2008 5:08:38PM
B0801210-04A-PDS	PDS	B020508W.WKS	2/5/2008 5:27:21PM

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801210

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

QC BATCH ASSOCIATIONS - BY METHOD BLANK

Lab Project ID: **83,686** **Lab Project Number:** **B0801210**

Prep Date: 2/6/2008

Lab Method Blank Id: T080207003-MB

Prep Batch ID: T080207003

Method: 160.1 - Total Dissolved Solids dried at 180°C - TDS

This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates:

SampleNum	ClientSampleName	DataFile	AnalysisDate
B0801210-01B	MB Successive #2		2/12/2008 10:07:15AM
B0801210-02B	Ash Successive #2		2/12/2008 10:07:15AM
B0801210-03B	MB Successive #3		2/12/2008 10:07:15AM
B0801210-04B	Ash Successive #3		2/12/2008 10:07:15AM
T080207003-LCS	LCS		2/12/2008 10:07:15AM
T080207003-LCSD	LCSD		2/12/2008 10:07:15AM
B0801210-02B-DUP	DUP		2/12/2008 10:07:15AM
B0801210-02B-MS	MS		2/12/2008 10:07:15AM
B0801210-04B-MS	MS		2/12/2008 10:07:15AM

Workorder (SDG): B0801210

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

DATA FLAGS AND DEFINITIONS

The PQL is the Method Quantitation Limit as defined by USACE.
Reporting Limit: Limit below which results are shown as "ND". This may be the PQL, MDL, or a value between. See the report conventions below.

Result Field:

ND = Not Detected at or above the Reporting Limit
NA = Analyte not applicable (see Case Narrative for discussion)

Qualifier Fields:

LOW = Recovery is below Lower Control Limit
HIGH = Recovery , RPD, or other parameter is above Upper Control Limit
E = Reported concentration is above the instrument calibration upper range

Organic Analysis Flags:

B = Analyte was detected in the laboratory method blank
J = Analyte was detected above MDL or Reporting Limit but below the Quant Limit (PQL)

Inorganic Analysis Flags:

J = Analyte was detected above the Reporting Limit but below the Quant Limit (PQL)
W = Post digestion spike did not meet criteria
S = Reported value determined by the Method of Standard Additions (MSA)

Several ways of defining the limit of detection and quantitation are prevalent in the laboratory industry and may appear in Analytica reports. These include the following:

MRL = "minimum reporting level", from the EPA Safe Drinking Water program (SDW)
PQL = "practical quantitation limit", from SW-846
EQL = "estimated quantitation limit", from SW-846
LOQ = "limit of quantitation", from a number of authoritative sources

In Analytica's work, all of these terms have the same meaning, equivalent to the EPA definition of the MRL. This reporting level is supported by a satisfactory calibration data point which is at that level or lower, and also is supported by a method detection limit (MDL) determined by the procedure in 40CFR. The MDL is lower than the MRL and represents an estimate of the level where positive detections have a 99% probability of being real, but where quantitation accuracy is unknown.

The MRL as defined by Analytica is the lowest demonstrated point of known quantitation accuracy.
The MRL should not be confused with the MCL, which is the EPA-defined "maximum contaminant level" allowed for certain regulated targets under specific regulations, such as the National Primary Drinking Water Regulations. Normally, the MRL is set at a level which is much lower than the MCL in order to ensure that levels are well below those limits. Not all target analytes have MCL levels established.

Other Flags may be applied. See Case Narrative for Description

Workorder (SDG): B0801210

Project: **Navajo Mine Extension Leaching Study**

Client: **Applied Hydrology Associates, Inc.**

Client Project Number: **none**

REPORTING CONVENTIONS FOR THIS REPORT

B0801210

TestPkgName	Basis	# Sig Figs	Reporting Limit
150.1/150.1 (Aqueous) - pH	As Received	2	Report to PQL
160.1/160.1 (Aqueous) - TDS	As Received	2	Report to PQL
300.0/300.0 (Aqueous) - Anions by IC	As Received	2	Report to PQL
310.1/310.1 (Aqueous) - Alkalinity	As Received	2	Report to PQL
6010B/3010A (Aqueous) - Total	As Received	2	Report to PQL
7470A/7470A (Aqueous) - Total Hg	As Received	2	Report to PQL

Analytica Chain of Custody Form

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Client Name & Address: Applied Hydrology Associates, INC

Public Water System (PWS) ID#:

Project Name: Navajo Mine Extension Leaching Study

Section To be Completed by Analytica

Quote ID:
LGN: B0801210
Account #: | Cash | Credit Card

Report to:
Phone No:
Fax No:
E-mail:

Turnaround Time for Results (TAT)
____ Standard ____ Expedited (< 10 days, prior authorization required) (please specify due date below; add'tl charges may apply)

Requested Due Date for Results:

Invoice to Name & Address:

P.O. or Contract No:

Special Instructions/Comments: Tumbled in house by R.Seeman
Ash Successive leaching Study

Kit Prep/Shipping Charge: $

Requested Analysis/Method

Client Sample Identification / Location	Date Sampled	Time Sampled	Matrix (S-DW-WW-Other)	No. of Containers	6010B/3010A TTL (Lot #: 1109096, Pres: HNO3)	7470A/7470A Hg (Lot #: 1109096, Pres: HNO3)	150.1 pH (Lot #: Pres:)	160.1 TDS (Lot #: Pres:)	300.0 Anions IC (Lot #: Pres:)	310.1 Alk. (Lot #: Pres:)	(Lot #: Pres:)	Field Preserved	Field Filtered	MS/MSD ?
MB Successive #2	1/30/08	11:20	Aq	2	X	X	X	X	X	X		Y/N	Y/N	
Ash Successive #2	↓	↓	↓	2	X	X	X	X	X	X		↓	↓	X
MB Successive #3	1/31/08	11:00	↓	2	X	X	X	X	X	X		↓	↓	
Ash Successive #3	↓	↓	↓	2	X	X	X	X	X	X		↓	↓	X

Relinquished by:	Date	Time	Received by:	Date	Time
R.Seeman	1/31/08	15:05	[signature]	1/31/08	15:05

Section To Be Completed by Analytica

	THO	ANC	JNU	FBKS
Condition of Custody Seal?:	—			
Initialed By:	—			
Temp/Loc:	3.0			
Thermo ID#:				
Shipped Via:	Ryan Seeman			

Name of Sampler: (printed)

Version 2.0

Appendix 41.B

Groundwater Model for Assessment of Probable Hydrologic Consequences

NAVAJO MINE AREA IV.
GROUNDWATER MODELING REPORT

Submitted to:
BHP Navajo Coal Company,
Farmington, New Mexico
November 15, 2011

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1 INTRODUCTION

1.1 BACKGROUND

This report describes the numerical groundwater flow model developed for BHP Navajo Coal Company (BNCC) in support of a previously proposed different mining operation within resource area (Area) IV South of the BNCC coal lease, located on the western flank of the San Juan Structural Basin within the Navajo Nation Indian Reservation, southwest of Farmington, New Mexico. The groundwater flow model also included Area IV North within the model domain so that the affects of coal mining in Area IV North could also be simulated. Consequently, this model has been applied to simulate the affects of BNCC's proposed mining within Area IV North to meet its Pre-2016 fuel sales obligations with Four Corners Power Plant The model can also be applied to simulate the affects of future mining and reclamation within Area IV South and Area V as well as within the portions Area IV North beyond the Pre-2016 mine plan.

The coal seams to be mined include seams 2, 3, 4, 6, 7, and 8 of the Cretaceous age Fruitland Formation. Seams 7 and 8 extend over only a portion of the coal lease. The coal lease area and adjacent area within Area IV North is dominated by badlands and mesas with the Chaco River valley coursing from south to north approximately 1 mile west of the coal lease. The Chaco River flows north into the San Juan River approximately 18 miles north-north-west of the model area. The regional setting for the model area is shown in Figure 1-1. Although the Chaco River drains an area of more than 4,000 square miles, the flow in the river and in tributary drainages is ephemeral in the vicinity of the project site.

The BNCC coal lease at resource areas IV North and IV South is crossed by three arroyos, Cottonwood Arroyo at the north edge of Area IV North, Pinabete Arroyo through Area IV South and No Name Arroyo, which separates Area IV South from Area V. These arroyos flow into the Chaco River but are ephemeral streams that only flow in response to large storm events. Cottonwood Arroyo may experience temporary flows resulting from irrigation channel releases from the Navajo Indian Irrigation Project. Alluvial groundwater is present in the alluvium of both Pinabete and Cottonwood Arroyos, although the saturated thickness is variable and is often insufficient to yield water from the few dug water wells that have been installed for stock water use. Cottonwood Arroyo has a drainage area of approximately 80 square miles and flows from east to west along the north side of Area IV North. Pinabete Arroyo traverses in a northwest direction across Area IV South, and then flows west to the Chaco River. The drainage basin area of Pinabete Arroyo is approximately 60 square miles. The surface water drainage immediately south of Pinabete Arroyo is No Name Arroyo, which separates Area IV South from Area V. A topographic and structural high area exists on the west side of the Area V south of No Name Arroyo.

Groundwater recharge is quite low due to the arid climate. Evaporation rates are high, averaging over 60 inches per year, while precipitation is low, averaging less than 6 inches per year. Most precipitation occurs during several large high intensity precipitation events. Snow rarely accumulates in any significant depth over the site.

Groundwater modeling was performed to support the baseline hydrogeologic characterization and the probable hydrologic consequences (PHC) assessment of proposed mining and reclamation activities. The hydrogeologic units within the BNCC coal lease that could potentially be affected by proposed mining and reclamation include:

- The alluvium of Cottonwood and Pinabete Arroyos
- The Coal Seams of the Fruitland Formation
- The Pictured Cliffs Sandstone, located below the Fruitland Formation No. 2 Coal Seam

Among these units, only the alluvium of Cottonwood and Pinabete Arroyos supply water to wells located within or adjacent to BNCC's Navajo coal lease. The saturated thickness and yield of these alluvial wells is quite low but at times is sufficient to provide stock water via windmill driven pumps at dug wells. The water level in the alluvium varies with precipitation patterns. Alluvial groundwater levels are generally too low to supply water to dug wells in the Cottonwood alluvium west of the coal lease during most years and to dug wells in the Pinabete alluvium within the coal lease during dry years. For example, in the Fall of 2007 the saturated thickness of the Pinabete alluvium was less than 3-feet at monitoring well PA-2 located adjacent to dug well 13R-37. The groundwater quality in the Pinabete and Cottonwood alluvium is also poor with total dissolved solids (TDS), sulfate, fluoride, iron, and manganese concentrations above drinking water standards. Although the groundwater in the alluvium has been used for stock watering, the fluoride, sulfate and TDS concentrations exceed recommended criteria for livestock use (BNCC's Navajo Mine permit application package (PAP) NM-0003F, Chapter 6, Appendix 6.G).

Although, groundwater is also found in the coal units of the Fruitland Formation and in the Pictured Cliffs Sandstone (PCS), which underlies the Fruitland Formation at BNCC coal lease, the yields from these units are quite low and wells are typically pumped dry during testing and well purging for sampling. The water quality in these units is also poor. The sulfate and fluoride concentrations at most monitoring locations exceed recommended criteria for livestock use (Appendix 6.G). Stone and others (1983) state that the Pictured Cliffs Sandstone cannot be considered a major aquifer, and it is important only because it is the water-bearing horizon immediately underlying the coals in the Fruitland Formation.

There are no water supply wells completed in the Fruitland Formation or the PCS within or near the project area. One well, 13-15-1, is located within Area V of BNCC's coal lease. The completion interval for this well is not known but is believed to be a PCS well based on the depth reported by Metric Corporation (1991). The well has not been used for at least 20 years and has been capped and welded shut.

Groundwater models are conceptual descriptions or approximations that describe physical systems using mathematical equations. Groundwater models used for a PHC assessment can range from simple empirical equations to complex numerical computer simulations of groundwater flow and groundwater chemistry. Regardless of the level of complexity, all groundwater models are based on certain simplifying assumptions which typically involve: the direction of flow, geometry of the hydrogeologic units, the heterogeneity or anisotropy of sediments or bedrock within these aquifer units, and the location of boundaries and conditions at these boundaries.

As a result of these assumptions and the uncertainties in the values of parameters and data required by the model, all models are an approximation and not an exact representation of the physical systems being modeled. In order to select and apply an appropriate modeling code it is necessary to:

- consider modeling objectives,
- have a thorough understanding of the physical system with sufficient site-specific data to apply the modeling code, and
- have sufficient data to assess how well the model approximates the groundwater conditions at the Site.

Extensive information on the baseline groundwater conditions at the Navajo Mine is provided in Chapter 6 Navajo Mine PAP. Information specific to Area IV North, Area IV South and Area V is provided in Appendix 6.G while regional groundwater information is also available from the U.S Geological Survey and the New Mexico Bureau of Mines and Mineral Resources Reports, and from the nearby San Juan Mine and CONSOL Energy's Burnham Mine, located outside of Burnham, New Mexico.

1.2 OBJECTIVES AND SCOPE

The first step in developing a groundwater model is to define the objectives of the study. The primary groundwater resource issue related to surface coal mining within Areas IV North and IV South concern the effects of proposed mining and reclamation on the quantity and quality of groundwater in the alluvium of Pinabete Arroyo, Cottonwood Arroyo and the Chaco River that provide potential livestock water supplies. Specific objectives of the groundwater model are as follows:

- The first objective is to provide a better understanding of the baseline groundwater flow systems within and adjacent to the proposed mining locations. .
- The second objective is to provide a better understanding of the likely groundwater changes that may occur during and after mining.

The modeling process involved the following steps:

- development of a conceptual model of groundwater systems within the proposed mine area and adjacent area;
- selection of a numerical code or modeling software capable of representing the conceptual model;
- development of a three-dimensional groundwater flow model using the chosen software;
- calibration of the model such that it is representative of observed conditions; and
- application of the model to support the PHC assessment of proposed mining and reclamation.

This supporting document describes the model development, calibration and sensitivity evaluation, and discusses the application of the model for PHC assessment. Prior to developing the numerical groundwater flow model, it was first necessary to develop a conceptual model of the groundwater flow system. A conceptual groundwater model is a complex hypothesis of the characteristics and functions of a hydrogeologic system, including recharge and discharge relationships, groundwater flow within and between hydrogeologic units and the expected properties of these hydrogeologic units. Section 2 of this report presents the conceptual model, including the description of the model domain and basin hydrogeology. Section 3 describes the model code selection, model setup and application of the model code to the conceptual model. Section 4 describes the model calibration, the steady state baseline simulation results, and the sensitivity evaluations. Section 5 describes the application of the model to simulate the results for a specific mine plan. The mine plan discussed in this section is BNCC's mine plan revision submitted to OSM on February 15, 2011. The revision provides the plans to conduct surface coal mining and reclamation activities within a 704 acre mining block in Area IV North to allow mining to continue through mid-2016 in order to meet mine lease terms with the Navajo Nation and contractual coal tonnage delivery obligations with the Four Corners Power Plant. The results of the simulations described in Section 5 are included in the PHC in Chapter 11 of BNCC's mine permit revision submitted to OSM on February 15, 2011. The calibrated model also provides a tool that can be used for subsequent permit revisions. The modeling results for subsequent mine plan revisions will be provided in the PHC revisions in Chapter 11 of the Navajo Mine Permit Application. References can be found in Section 6 of this report.

2 CONCEPTUAL MODEL

A conceptual model of the groundwater flow system is the foundation on which the numerical model is based. The conceptual model needs to incorporate the major processes and factors controlling the magnitude, rate, and direction of groundwater flow. The groundwater flow systems at a particular site are governed by geology, topography, and groundwater recharge. This section summarizes the conceptual model of the groundwater flow system at the project location. The nature and patterns of groundwater flow, from the locations where water enters the subsurface at a recharge area, to the locations where groundwater discharges, from a groundwater flow system. A combination of groundwater flow systems from local to regional in scale can develop in an area (Toth, 1963). Intermediate and regional systems tend to predominate in arid areas and areas with gentle topography. Local flow systems tend to be dominant in areas with high topographic relief and wetter climates.

Groundwater flow models are used to calculate or simulate the rate and direction of movement of groundwater through geologic units. The simulation of groundwater flow requires a thorough understanding of the hydrogeologic characteristics of the site, including:

- the extent, thickness and characteristics of hydrogeologic units included in the model domain;
- the boundary conditions for the model domain;
- the distribution and magnitude of either groundwater recharge or groundwater discharge, which is needed to characterize the overall water balance of the groundwater flow system; and
- the horizontal and vertical distribution of hydraulic heads throughout the modeled domain, which is needed for model calibration.

2.1 HYDROGEOLOGIC UNITS

The San Juan Basin is a typical asymmetrical, Rocky Mountain basin, with a gently dipping southern flank and a steeply dipping northern flank (Stone et al., 1983). The project site is located along the western flank of the central basin with a northwest trending axis parallel to the Hogback monocline located northwest of the project site. The stratigraphic section in the project area reflects the Late Cretaceous transition of a shallow marine depositional environment to a terrestrial fluvial depositional environment. The four formations encompassing this depositional environment change are (in ascending order): the Lewis Shale, the Pictured Cliffs Sandstone, the Fruitland Formation, and the Kirtland Shale.

The Lewis Shale contains the last purely marine shales deposited in the Upper Cretaceous. It consists of gray to black shale with some interbeds of sandy limestone, brown sandstone, and bentonite. The Pictured Cliffs Sandstone (PCS) conformably overlies and intertongues with the Lewis Shale. This formation consists of both delta-front and barrier-beach sediments and marks the change to a littoral (near-shore) depositional environment. The upper two-thirds of the PCS consists of a generally coarsening upward sequence of light gray, fine to medium grained sandstone while the lower one-third of the formation consists of interbedded shale and sandstone. The total thickness of the PCS is approximately 110 to 120 feet in the model area.

The Fruitland Formation, which conformably overlies the PCS, contains minable coal seams that are the target for proposed surface mining. The coal seams are highly continuous within the coal lease area and are nearly flat lying, with a dip of up to 2 degrees to the east-northeast. Localized pinches, rolls, and occasional faults with minor offsets are encountered. The topography within the project area rises gently from west to east, with the overburden becoming thicker from west to east. The coal seams outcrop or subcrop close to the western limits of the mine lease. The coal resource is burned or washed out beyond the western limit of the mine lease and within portions of the mine lease for some of the upper coal seams. The upper seams typically do not exist within much of the lower topographic surface in the western portions of the coal lease, but come into the sequence on the eastern portion of the lease area where the topography rises and as the strata dip to the east.

Surface soils are thin or nonexistent, and the near surface geology is typically comprised of a layer of weathered shale and sandstone along with unconsolidated eolian sands. Deposits of Quaternary alluvial sediments and unconsolidated eolian sands also occur along the ephemeral stream channels. The unconsolidated surficial materials overlie a competent overburden comprised of shales, sandstones, and siltstones. Within the project area the stratigraphically highest coal seam (Seam 8) occasionally lies directly under the unconsolidated layer. Portions of Seams 8 and 7 within the lease are weathered, and very little of Seam 8 is found within Area V. Overburden depths range from a few feet to over 80 feet. Interburdens and partings are generally composed primarily of soft gray shale, a dark gray siltstone, and carbonaceous shale. Sandstone lenses and stringers with minor thickness are found to a limited extent within the interburden, but shales and siltstones are predominant.

The Kirtland Shale conformably overlies the Fruitland Formation to the east of the coal lease. This formation is divided into two units, the upper shale member, which includes the Farmington Sandstone Member, and the lower shale member. The lower shale member is composed of gray claystone shales that contain a few thin interbeds of siltstone and sandstone. No coal beds exist in the Kirtland Shale (Fasset and Hinds, 1971).

A more thorough description of the regional and local geology of the Navajo Mine SMCRA permit area is provided in Chapters 5 and 6 of the Navajo Mine PAP, with specific information concerning Areas IV North, IV South and V in Appendix 6.G. Based on both regional and site-specific information, the Fruitland Formation and associated coal units and the PCS are unsaturated, or partially saturated, near the outcrop of these units on the west side of Areas IV North, IV South and V of the coal lease, but become saturated to the east and down dip of the outcrop.

One conceptualization of the hydrogeology of the model area is to consider the Fruitland Formation as a single hydrogeologic unit. The single hydrogeologic unit approach was previously proposed by Billings and Associates (1987) for modeling groundwater at the Navajo Mine because of the complexity of the individual coal seams, which often split or pinch out. Kaiser et al (1994) note that "Regionally, the Fruitland Formation is a single hydrologic unit, but compartmentalization is indicated locally by large vertical and lateral pressure gradients." On the more localized scale of Area IV of BNCC's Navajo coal lease, the interbedded strata and coal beds have a significant influence on the hydrogeology of the Fruitland Formation. Although the hydraulic conductivities of the coals are relatively low, they are still considerably higher than those of the interbedded shales, resulting in large vertical potentiometric gradients among the coals within the coal lease. One of the primary hydrogeologic changes to occur as a result of mining is the removal of the coals and the interbedded shales and sandstone strata in the overburden and interburden resulting in more homogeneous and isotropic conditions within the mine backfill. Furthermore, water chemistry has been found to vary among the individual coal units within the Fruitland Formation. Typically, TDS concentrations increase with depth, while sulfate concentrations decrease with depth.

Although the coal geology is complex with multiple coal bed splits and coal beds that pinch out, there is good correlation and spatial continuity for particular coal zones, or seams, within BNCC's Navajo coal lease. These coal seams may feature one coal bed, or they may include splits with multiple coal beds. Within the Navajo coal lease these coal zones, or seams, are numbered sequentially from the bottom coal zone (No. 2) to the uppermost coal in this area, the No 8 coal. The No. 1 coal zone and the No. 5 coal zone are not present within BNCC's Navajo coal lease, while the No. 2, No. 3, No. 4, No. 6, No. 7 and No. 8 coal zones all occur within Areas IV North, IV South and V. For these reasons, the conceptual hydrogeologic model and the numerical groundwater model for the project handles the individual coal zones, or seams, as separate and distinct hydrogeologic units.

The PCS, the first hydrogeologic unit below the Fruitland Formation has been included in the groundwater flow model. The top of the Lewis Shale has been included as the base of the model domain. Generally, a shale zone such as the Lewis Shale would be considered as an impermeable boundary. However, given the low recharge rates at the site, overall low permeability of the Fruitland Formation shales and coals, and the relatively low permeability of the PCS, the flow conditions at the boundary between the PCS and Lewis Shale were found to be significant for calibrating the groundwater flow model.

The delineation of the hydrogeologic units within the model domain was developed from the extensive geologic and groundwater information developed for BNCC's Navajo coal lease. The extent of geologic and groundwater information that is available to support the conceptual and numerical model is more limited beyond the coal lease boundaries. Consequently, information was obtained from a variety of sources to help delineate the hydrogeologic units and define groundwater conditions for the portions of the model domain that are beyond the limits of the coal lease. Information sources included various regional geologic and hydrogeologic reports sited in the references provided at the end of this report, the hydrogeologic data in the Navajo Mine and Burnham Mine Permit Application Packages, and logs from oil and gas wells located within or near the model domain.

2.1.1 Hydraulic Conductivities of Modeled Units

Another element of the conceptual model is to define to the extent possible the properties of these hydrogeolgic units, including hydraulic conductivities and storage characteristics of these hydrogeologic units. The representative range for hydraulic conductivities of individual model layers is provided in Table 2-1. The sources of information used to establish the range of hydraulic conductivities and storage characteristics of modeled hydrogeologic units is provided in Attachment 1. Hydraulic conductivities for the hydrogeologic units were modified during model calibration. Calibrated hydraulic conductivity values are shown in Table 2-1 along with the representative range of values determined from local or regional data.

2.1.2 Storage Coefficient and Specific Yield of Modeled Units

The amount of water an aquifer can yield is described by the storage parameters: specific storage and specific yield. The specific storage of a confined aquifer is the volume of water that a unit volume of the aquifer releases from storage per unit decline in head. Specific storage is a measure of the compressibility of the aquifer matrix and the expansion of water. In unconfined aquifers, changes in storage are controlled by the specific yield and not by the compressibility of the matrix or the water in storage. The specific yield is the volume of water that drains from an unconfined aquifer per unit decline in head. The specific yield is less than the porosity but much larger than specific storage.

Specific storage values for the various hydrogeologic units were obtained from aquifer testing results and from literature values for similar formations in other Rocky Mountain sedimentary basins. The specific storage value was set to 3.8×10^{-6} ft^{-1} in the PCS based on the observation well response during a pumping test at PCS well T4-1 (Attachment 1). This specific storage estimate is consistent with the specific storage of approximately 10^{-6} ft^{-1} reported by Lohman (1972, p 53) as a reliable estimate for confined sedimentary bedrock aquifers. Specific storage values were also set to the PCS value of 3.8×10^{-6} ft^{-1} for the Fruitland Formation overburden and interburden layers. This value is within the range of 2×10^{-5} and 1×10^{-6} listed by Bredehoeft et al (1983) for specific storage values determined from laboratory consolidation tests of Cretaceous shale confining layers. Also, it is expected that the specific storage for the sedimentary rock in the Fruitland Formation should be similar to the specific storage values found in the underlying PSC and in the literature for confined sedimentary bedrock aquifers. Specific storage for the coal units was set to 2.8×10^{-5} ft^{-1}. The specific storage for the coal was estimated from observation well response during a pumping test of the No. 8 coal seam well at the San Juan Mine (Attachment 1).

Specific yield (under unconfined conditions) was assumed to be similar to estimated effective porosities. Specific yield will always be lower than porosity as some of the groundwater will not drain from the formation since it is held by capillary forces. A specific yield of 20 % was used for the alluvium and overburden and interburden units in the model. A lower specific yield of 0.5 % is used for the coals due to the low effective porosity of the coals (Attachment 1).

2.1.3 Unsaturated Parameters of Modeled Units

Little hard data was available on unsaturated zone parameters in the area of the model domain. It was assumed that high capillary head wetting curves were needed given the arid site climate in the study area.

2.2 MODEL DOMAIN AND BOUNDARY CONDITIONS

An essential part of both the conceptual and numerical models is the representation of the horizontal and vertical boundaries of the hydrogeologic system (the model domain) and the delineation of the hydrogeologic units within the model domain. It is also essential that the hydraulic head or flow conditions be defined for each of the hydrogeologic units along the boundaries of the model domain.

The vertical extent of the hydrogeologic model is from the ground surface to the base of the PCS. A head dependent boundary condition was established through model calibration to represent the Lewis Shale at the base of the PCS.

The horizontal extent of the hydrogeologic model is provided in Figure 1-1. The model domain was established where there are physical boundaries, such as the outcrop of the geologic units west of the project as shown in Figure 1-1. The model domain extended sufficient distances to the east and south of the coal lease where the required assumptions about hydrogeologic conditions at these boundaries are expected to have limited influence on the predicted changes in the groundwater system due to drawdown associated with proposed mine pit advance and recovery following planned backfill sequences as evidenced by minimal drawdown and minimal changes in fluxes at these boundaries. The model domain extended to just north of the Cottonwood Arroyo, near where there are a number of wells to better define the steady state pre-mine conditions at the north boundary.

The boundary conditions at the horizontal model extents were established based on the conceptual model. The outcrop of both the PCS and the Lewis Shale is shown in Figure 1-1 along with the model extents. A no flow boundary condition was designated for the west boundary of the model domain along the outcrop of the PCS/Lewis Shale stratigraphic interface. Since this model is an unsaturated-saturated flow model, saturation to the west extends as far as the model solution determines for the calibrated steady-state pre-mine condition but no further than the physical outcrop boundary, which is defined as a no flow boundary.

The boundary conditions for the PCS on the south, east and north boundaries of the model domain were established based on the conceptual model and the potentiometric surface. The potentiometric surface within the model domain is well characterized from current and historic water level monitoring data from wells completed in the PCS within the vicinity of BNCC's Navajo coal lease and from Burnham Mine monitoring wells to the south of the Navajo coal lease. In addition, the PCS outcrop map in the vicinity indicates a large outcrop area for potential recharge along the Hunter Wash valley south of the model domain as shown in Figure 1-1. It is expected that potentiometric elevations for the PCS along Hunter Wash are close to the elevation of the channel bottom. Down dip to the northeast and along the east side of the model domain, the potentiometric gradient is believed to be from south to north as indicated by Kaiser et al (1994). Localized discharge is expected to occur along the topographic lows where the PCS subcrops beneath the alluvium of the ephemeral streams. The regional potentiometric surface depicted in Figure 1-1 was developed based on all these sources of information.

A constant head boundary has been defined for the PCS based on the potentiometric surface along the north, south and east boundaries as depicted in Figure 3-3. A no flow boundary has been specified along the west boundary. Boundary conditions for the model layers corresponding to the Fruitland Formation Coal Seams were established along the south boundary as depicted in Figure 3-2. Constant head boundary conditions were defined at the locations along the eastern portion of the south boundary based on the potentiometric surface of the PCS. The PCS outcrops along Hunter Wash just south of the model domain and the Fruitland coals are not present along portions of the south boundary. A no flow boundary was assigned to the model layers corresponding to the Fruitland coals along the south boundary where the coal is not present or where the potentiometric surface of the PCS was below the elevation of the coal as shown in Figure 3-2. These boundary conditions are consistent with the conceptual model as areal recharge is the source of the groundwater in the shallow coals near the outcrop. However, there may be some lateral flow from the coals across the eastern segment of the south boundary. The constant head boundary within this segment permits flow to enter the model domain along this segment consistent with the conceptual model.

Constant flux (Cauchy) boundary conditions were established for the coal layers along the north model boundary east of the location where a portion of the south end of Dixon Pit of the Area III mine crosses the boundary as depicted in Figure 3-2. The fluxes for boundary conditions were determined based on the estimated potentiometric gradient and the estimated transmissivities of the coals at these locations. No flow boundary conditions were established for the Fruitland Formation layers along the west and east boundaries and along the north model boundary west of the location where a portion of the south end of Dixon Pit of the Area III mine crosses the boundary. The no flow condition for the Fruitland Formation along this segment of the north boundary represents the conceptual model depiction of the lower Cottonwood valley as a local discharge area with no flow to the north. The conceptual model of no groundwater flow in the Fruitland coals to the north of Cottonwood near the southwest boundary of Area III is supported by the relatively flat potentiometric surface for the No. 8 Coal and the No. 3 Coal over much of Area III as depicted in Figures 6.G-2 and 6.G-3, respectively. The no flow condition for the Fruitland Formation along the segment of the east boundary represents the conceptual model depiction of the general northerly direction of flow in the Fruitland Formation along this boundary. Based on the transient simulations for the Area IV North mine plan, the northern boundary conditions appear to have minimal influence on the predicted changes in the groundwater system due to mining and backfilling.

A constrained constant head boundary was also established where the alluvium of Brimhall Wash, No Name Arroyo, Pinabete Arroyo and Cottonwood Arroyo occur along the western boundary of the model domain as depicted by the Dirichlet (constant head) boundary conditions shown in Figure 3-2. A constrained constant head boundary was also extended into the model layer representing the PCS below the alluvium as depicted by the Dirichlet (constant head) boundary conditions shown in Figure 3-3. The constraint on the boundary was that there could be no inflow to the model domain at the constant head boundary. The constant head was determined based on average depth to alluvial groundwater near the mouth of these ephemeral streams.

Constrained head dependent boundary conditions analogous to drain boundaries were also established along the lower portions of model layer representing the alluvium along Cottonwood Arroyo, Pinabete Arroyo, No Name Arroyo and Brimhall Wash.

2.3 DISTRIBUTION AND MAGNITUDE OF GROUNDWATER RECHARGE

The conceptual model also includes an interpretation of spatial relationships between recharge and discharge and the approximate rates of recharge and discharge, including the groundwater inflows and outflows from the model domain. A critical aspect of hydrogeologic modeling is obtaining a reliable estimate of the magnitude of either groundwater recharge or groundwater discharge in order to constrain the overall water balance.

In hydrogeologic settings where groundwater discharge is primarily at streams, an estimate of discharge can generally be determined from measurement of the baseflow of the streams. However, this method for measuring discharge cannot be applied in arid environments, where groundwater discharge rates are low and insufficient to support baseflow at any time. Recharge rates are quite low at the site due to the arid climate. Annual precipitation averages about six inches (150 mm) per year with most precipitation occurring during several large high intensity precipitation events during the seasonal ‘monsoon’ periods. These generally occur in March and August of each year. Snow rarely accumulates in any significant depth over the project area. Summers are hot with low relative humidity. Evaporation rates are high, averaging over 60 inches per year.

Fortunately, reliable estimates of groundwater recharge rates at the Navajo Mine were obtained from studies conducted by Stone (1984, 1986, and 1987). Recharge estimates for undisturbed areas at the Navajo Mine ranged from 0.002 to 0.09 in/yr and are expected to be higher at surface depressions and impoundments.

“Badlands” topography comprises about half of the drainage basins of Cottonwood Arroyo, Pinabete Arroyo and No Name Arroyo and accounts for the high discharge and flow intensities observed in these ephemeral streams. Little groundwater recharge occurs within the badlands areas, due not only to the low rainfall rates, but also to the high proportion of rainfall that results in runoff. The low permeability of sodic clay soils nearly precludes groundwater recharge within badlands areas.

Groundwater recharge from precipitation and ephemeral stream flow within the project area moves vertically downward through the interbedded shales and coal units of the Fruitland Formation and into the PCS. Where Fruitland Formation coals are saturated, groundwater will flow laterally. Based on information obtained from water levels measured in the coal seam wells and piezometers, the flow directions in the coals within the model domain are toward the north-northeast.

Although the vertical hydraulic conductivities of the interbedded shales in the Fruitland Formation are quite low, recharge rates are lower still. Direct recharge rates measured by chloride mass balance methods on undisturbed areas at the Navajo Mine ranged from 0.002 to 0.09 in/yr, (Stone 1987). The highest recharge rate of 0.09 in/yr was for valley terraces while the lowest recharge rate of 0.002 in/year was for badland areas. Recharge from upland flats averaged 0.03 in/year.

Based on the research by Kearns and Hendricks (1998), aerial recharge is thought to occur during very large precipitation events and during extended wet periods with increasing soil moisture. Recharge is expected to be higher along ephemeral stream channels with saturated alluvium and surface impoundments. Although Stone's research (Stone, 1986 and 1987) did not include recharge estimates for ephemeral stream channels and surface impoundments, he does provide an estimate of an average recharge rate of 0.16 inches per year from depressions within reclaimed mine areas at the Navajo Mine. Recharge of the alluvium along the ephemeral stream channels is dynamic and variable and dependent upon precipitation runoff. Recharge at surface depressions at the mine is also dynamic and variable and also dependent upon precipitation runoff. Thus the estimate was expected to provide a reasonable approximation for the recharge of the alluvium and gave reasonable results during model calibration. The recharge of the alluvium is a very small component of the overall water balance due to the relatively small area of the alluvium in the model domain.

Slopes were calculated based on the U.S. Geological Survey (USGS) digital elevation model (DEM) and Stone's recharge rate estimates for geomorphologic categories were then assigned to various slope ranges in order to estimate spatially varying recharge rates for the groundwater model. These categories, slope ranges, the associated recharge rates from Stone's research, and the associated model recharge rates are provided in Table 2-2.

2.4 POTENTIOMETRIC LEVELS AND GROUNDWATER FLOW

A potentiometric surface map for the PCS within the model domain is provided in Figure 1-1. As indicated on the potentiometric surface map, groundwater flow is from the recharge areas at the outcrops along Hunter Wash in the south toward the regional discharge area to the north and locally toward topographic lows in the stream valleys along the west side of the model domain. Potentiometric data for the No 2, No. 3 and No. 8 coal seams indicate a general potentiometric gradient to the north northeast, although the data are limited and are not sufficient to identify possible local gradients toward topographic lows and drainages.

3 GROUNDWATER MODEL SETUP

The low rate of recharge and the interbedded strata at the site results in large vertical downward potentiometric gradients with perched groundwater zones. One of the primary hydrogeologic changes to occur as a result of mining is the removal of the coal and the interbedded shales and sandstone strata and placement of a more homogeneous post mine backfill. Saturated groundwater flow models, such as MODFLOW, are incapable of handling three-dimensional unconfined situations with several dry model layers separating a water table from perched groundwater overlying low conductivity units. Consequently, in order to meet the modeling objectives, a multi-layer numerical groundwater flow model of the project area was developed using the FEFLOW (Finite Element subsurface FLOW system) software developed and supported by DHI-WASY GmbH, a German research and consulting group specializing in groundwater and surface water hydrology. The software uses a finite element analysis technique to solve the groundwater flow equations for both saturated and unsaturated conditions.

FEFLOW can be efficiently used to describe the spatial and temporal distribution of groundwater quality constituents, to estimate the duration and travel times of these constituents in aquifers and to assist in designing alternatives and effective monitoring schemes. It includes a sophisticated interface with GIS applications such as ArcInfo, ArcView and ArcGIS for ASCII and binary vector and grid formats. FEFLOW is used worldwide as a high-end groundwater modeling tool at universities, research institutions, government agencies and engineering companies.

Although the objective of the groundwater modeling study is to model flow and transport in the saturated zone, given the arid climate and the perched groundwater conditions over much of the study area, a full saturated/unsaturated implementation of FEFLOW was used in modeling.

3.1 MODEL MESH DISCRETIZATION

The model domain was discretized on a triangular mesh pattern as shown in Figure 3-1 to establish a 3D finite element mesh of 6-node triangular prisms. The groundwater flow model domain was established as described in Section 2.2. The element size was chosen to be sufficiently small to capture significant variations in topography, hydrology, and geology but large enough to minimize the model size. The pre- and post- mining steady state model mesh includes additional detail within the coal lease area and the areas of Cottonwood, Pinabete No Name Arroyos and Brimhall Wash. The pre- and post-mining steady state model mesh contains 805,280 elements and 424,821 nodes. The post-mining transient model contains 855,176 elements and 450,660 nodes.

3.2 MODEL LAYERS

The model is discretized vertically into 29 slices corresponding to 28 layers to accommodate the hydrogeologic units of interest. Layers are continuous horizontally across the model. Hydraulic parameters were assigned to each hydrostratigraphic unit through the corresponding model layer. Additional layers are needed in the finite element formulation to accommodate the transition between hydrogeologic units and for the implementation of boundary conditions in the coal layers. Thin (1.0 ft thick) buffer layers were added to reduce the conductivity contrast between the low conductivity overburden and interburden layers and the higher conductivity coals to improve model convergence. These buffer layers were assigned hydraulic properties of the corresponding overburden, or interburden, unit. Table 3-1 summarizes the correlation between model layers and slices and hydrostratigraphic units used in model design.

Implementation of the conceptual hydrogeologic model into the numerical groundwater model for the project includes the individual coal zones or seams as separate and distinct hydrogeologic units. Spatial grids with the elevations of the top of the PCS and the top and bottom of all coal beds within and adjacent to the coal lease were provided by BNCC. Additional data from the Burnham Mine, and surface topography of the PCS outcrop were used to extend the top of the PCS beyond the coal lease area. The individual coal beds were also identified according to coal zone. These data were used to construct the model layers. Additional data from Burnham Mine was used to extend the coal layers to the south. The top and bottom of the individual coal zones were determined from the upper and lower coal bed within the particular seam at individual grid locations. The Lewis Shale is a low conductivity unit that forms the base of the modeled groundwater flow system and was included as a head dependent boundary in the model. The top of the Lewis Shale was assumed to be 120 feet below the top of the PCS. The top surface of the model is based on topography derived from USGS DEMs.

3.3 MODEL BOUNDARY CONDITIONS

The conceptual boundaries discussed in Section 2.2 are implemented in FEFLOW as no flow boundaries, constant head boundaries, constant flux boundaries, and head dependent boundaries. The various boundary conditions in FEFLOW can be constrained by head or flux to represent conceptual boundaries such as drains or streams. The constraints are limitations which result from the requirement that the boundary condition is only valid as long as minimum and/or maximum head or flux bounds are satisfied. If, during a simulation run, the conditions fall below or are exceeded, the constraints are to be assigned as new intermediate boundary conditions. This section is a discussion of the implementation of boundary conditions and constraints in the model.

The boundary locations for a typical model layer and for the PCS are shown on Figure 3-2 and Figure 3-3.

3.3.1 No Flow Boundaries

No flow boundaries are shown on Figures 3-2 and 3-3 at locations along the edge of the model domain where no other boundary conditions are depicted in the Figures. A no flow boundary was set along the west edge of the model corresponding to the outcrop of the PCS/Lewis shale contact. A no flow boundary was also set in the model layers representing the Fruitland Formation along the east edge of the model where this boundary is parallel to the regional groundwater flow direction. A no flow boundary was also set in the model layers representing the Fruitland Formation along the western portion of the north boundary where the Cottonwood alluvium represents a local discharge area. No flow boundary conditions were also assigned to the model layers corresponding to the Fruitland coals along the south boundary where the coal is not present or where the potentiometric surface of the PCS was below the elevation of the coal as shown in Figure 3-2.

3.3.2 Recharge

Recharge in FEFLOW can be treated as a constant flux boundary condition with a constraint that allows flow only into the model, or as a flow into top layer of the model. Constrained boundary conditions can add significantly to the computational time to run the model, so the simplified flow into the top of the model was chosen to represent recharge. The distribution of recharge boundaries is shown on Figure 3-4.

3.3.3 Stream Boundaries

The ephemeral streams (Cottonwood Arroyo, Pinabete Arroyo, No Name Arroyo, and Brimhall Wash) and tributaries are represented as head dependent (Cauchy) boundary conditions constrained such that the boundary removes water when the groundwater elevation is greater than a specified reference head, but that no flow in to the groundwater system is contributed by the boundary. When constrained this way the boundary acts similar to a MODFLOW drain boundary. Drain conductance is specified as a leakage coefficient and was set to a value of 10^{-4}/day. Stream boundaries are shown on Figure 3-2.

3.3.4 Head Dependent (Cauchy) Boundaries

During initial model calibration it became clear that the boundary between the PCS and the Lewis Shale needed to account for vertical flow to support model calibration. Head dependent, or Cauchy, boundary conditions were assigned to each finite element node at the base of model to simulate flow between the PCS and Lewis Shale. These boundary conditions were unconstrained to allow flow into or out of the base of the model.

An effort was made to examine alternate conceptual models for this boundary condition. Several configurations of reference head and leakage coefficient for the boundary conditions were examined to represent the potentiometric surface of the Lewis Shale and vertical hydraulic conductivity between the PCS and the Lewis Shale, respectively. For example, the reference head was first set as the elevation of the base of the PCS with a constant leakage coefficient. Other conceptual models examined included a reference head with a constant slope from south to north and a linear increase in leakage coefficient from west to east.

In the final calibrated model, the reference head is a damped surface based on the elevation of the top of the PCS, and the leakage coefficient varies in space, generally decreasing with the depth to the top of the PCS. The damped reference head surface for the head dependent boundary conditions was determined by choosing a reference elevation contour of the top of the PCS and smoothing the highs and lows in the PCS top based on this reference contour. The final calibrated leakage coefficient is higher on the west side of the model where the PCS is shallower and decreases as the PCS dips to the east. The reference head surface and the distribution of leakage coefficient for the head dependent boundary conditions are shown on Figure 3-5 and Figure 3-6, respectively. The modeling of vertical leakage to the Lewis Shale is developed through model calibrations. It is, however, consistent with the conceptual model of low rates of vertical flow through the shales in the Fruitland and the PCS as well as in the Lewis Shale. These shales exhibit low vertical hydraulic conductivities and the hydraulic conductivity would be expected to decrease with depth due to consolidation.

3.3.5 Constant Head (Dirichlet) Boundaries

Constant head, or Dirichlet, boundaries were assigned at finite element nodes where the four main streams intersect the west model boundary. These boundary conditions are constrained by setting a maximum flux constraint equal to zero. With the maximum flux constrained to zero, the boundary condition can only remove water from the model representing stream flow out of the model domain. The locations of these boundaries are shown on Figure 3-2.

Unconstrained constant head boundaries were also assigned along the south edges of the model domain in the layers corresponding to the Fruitland Formation coal seams. These boundaries were assigned the potentiometric head of the PCS and were assigned where the potentiometric head of the PCS was above the bottom of the specific model layers.

In the model layers corresponding to the PCS, constant head boundaries were assigned along the entire lengths of the south, east and north edges of the model domain. The constant head boundaries along the north boundary are constrained such that groundwater can only flow out of the model domain. These boundaries are shown on Figure 3-2 and 3-3.

3.3.6 Flux (Neumann) Boundaries

Constant flux, or Neumann, boundaries were assigned along portions of the north model boundary in layers representing the Fruitland Formation coal seams to represent groundwater flow out of the model domain. Fluxes were determined from regional groundwater gradients and hydraulic conductivities of the individual model layers. The locations of the flux boundary conditions are shown on Figure 3-2, and the constant fluxes assigned to the boundaries in individual layers are shown in Table 3-2.

3.4 Unsaturated Zone Flow Implementation

FEFLOW utilizes a full implementation of Richard's Equation for solving saturated/unsaturated flow problems. The modified Van Genuchten parametric relationship for capillary pressure head and relative conductivity was used to model unsaturated zone flow.

4 MODEL CALIBRATION AND SENSITIVITY ANALYSIS

In multilayer groundwater models, the hydraulic parameters (mainly hydraulic conductivity) of the model layers and boundary conditions (mainly recharge, potentiometric heads, and leakage coefficients) are adjusted during model calibration in order to obtain a better match with observed heads and potentiometric gradients. Model calibration is necessary because hydraulic parameters obtained from well tests, regional studies, or literature values for similar hydrogeologic units are, at best, order of magnitude estimates of the average hydraulic conductivity and storage properties of the hydrogeologic unit on the scale of the model. With reliable estimates for the expected magnitude of either groundwater recharge or groundwater discharge and estimates for the expected upper and lower bounds for hydraulic conductivities of the hydrogeologic units, the model can be constrained during model calibration to arrive at a model that is an acceptable representation of the hydrogeologic system.

Model calibration can also serve to revise the conceptual model of the groundwater system and provide a better assessment of the properties of hydrogeologic units on a regional scale that cannot be obtained solely from local pumping test results. Model calibration is assumed to be achieved once the model reasonably simulates the interpreted groundwater flow conditions in the area of interest using input values that are within the range of measured or estimated values. The primary measures of model calibration are the match between the measured groundwater potentiometric surface ("heads") and the model's predicted values at the same location. Other considerations in arriving at an acceptable calibrated model included any model predicted locations of surface saturation and comparison of modeled potentiometric surfaces with potentiometric surfaces developed for the conceptual model. The data used in model calibration and the calibration results are discussed in this section.

4.1 CALIBRATION TARGETS

The calibration targets for the model were measured groundwater elevations in monitoring wells within individual coal seams, in the alluvium and in the PCS. Surface saturation and groundwater potentiometric surfaces were also used as a general guide in model calibration. Table 4-1 lists the calibration wells, formation, model layer, observed potentiometric head, and the calibrated model potentiometric head. The locations of the calibration wells are shown on Figure 4-1.

4.2 STEADY STATE MODEL CALIBRATION

Model calibration was performed by running the model repeatedly with the steady state boundary conditions and using a range of values for model parameters. In order to better match the observed head calibration targets, several model input parameters were varied within acceptable ranges. These parameters included hydraulic conductivity, leakage coefficient for drain and stream boundaries, recharge, and reference head and leakage coefficient for the head dependent boundary condition at the base of the model. Unsaturated zone wetting curve parameters were also varied during model calibration. The final calibrated regional PCS potentiometric surface is shown in Figure 4-2, and the calculated vs. observed heads for all calibration wells is shown in Figure 4-3 and in Table 4-1.

4.3 STEADY STATE MODEL RESULTS

Detailed discussions of the steady-state baseline modeling results are presented in Appendix 6.G of the Navajo Mine PAP. Transient simulation results are dependent upon the specific mine plan being simulated and are included in the PHC assessment supporting the mine permit application. Selected model results are presented below.

4.3.1 Mass Balance and Groundwater Budget

The model mass balance was reviewed as part of the steady state model calibration. The mass balance is the difference between the inflow into the model and the outflow (discharge) from the model. The overall model mass balance difference is 0.24 %. A low mass balance difference is indicative of a lack of numerical issues with the model and that the model is run with adequately small convergence criteria. Various authors recommend that the mass balance difference should be less than 0.1% for saturated groundwater flow models (Konikow 1996) and less than 1% for variably saturated groundwater flow models (USGS 2000).

4.3.2 Potentiometric Surface Contour Maps

The model calibrated PCS potentiometric surface is shown on Figure 4-2. The modeled potentiometric surfaces for the No. 3 Coal and the No. 8 Coal are shown on Figures 6.G-2 and 6.G-3 in Appendix 6.G of the Navajo Mine PAP. The modeled pre-mining potentiometric surfaces generally follow the conceptual model. The modeled steady state results and recharge rates are consistent with the measurements or estimates obtained from baseline monitoring as previously discussed. However, the modeled potentiometric surfaces extend beyond the limits that could be depicted from measurements at monitoring wells and piezometers. For example, the results for the No. 3 Coal in Figure 6.G-2 in Appendix 6.G show groundwater flow toward the topographic lows along the west side of the model domain in the valleys of No Name Arroyo, Pinabete Arroyo, Brimhall Wash, and Cottonwood Arroyo. These results could not be determined from potentiometric measurements alone, which indicate a general potentiometric gradient to the north northeast in the No. 3 coal. A detailed discussion of the steady state model potentiometry is found in Appendix 6.G.

4.4 STEADY STATE MODEL SENSITIVITY ANALYSIS

A sensitivity analysis was performed after model calibration to determine the affect on model calibration of changes in the calibrated model parameters. The model parameters included in the sensitivity analysis were the hydraulic conductivities of the alluvium, the coals, the overburden and interburden, and the PCS; the recharge rate; and the leakage coefficient of the head dependent boundary condition at the base of the PCS. The steady state model was run varying the individual parameters over the ranges shown in Table 4-2. In addition to the formal sensitivity analysis, the effect of other model parameters was noted during model calibration. The results of both of these efforts are discussed in this section. Plots of calculated vs. observed heads resulting from the sensitivity runs are shown in Figures 4-4 through 4-21. The plots show the effect that varying of individual model parameters has on the model calibration.

Figures 4-4 and 4-5 show the results of varying the hydraulic conductivity of the PCS over the range of one-half the calibrated value to twice the calibrated value. A hydraulic conductivity for the PCS of one-half the calibrated value, results in over prediction of most of the head values particularly in the higher head locations as shown in Figure 4-4. A hydraulic conductivity for the PCS of twice the calibrated value does not indicate a particular bias in the head predictions as shown in Figure 4-4 but does result in more scatter in the prediction as indicated by the higher mean absolute (MA) residual. The results show that modeled potentiometric heads in the PCS are somewhat sensitive to the hydraulic conductivity of the PCS, and that the potentiometric heads in the Fruitland Coals are less sensitive to this parameter.

During model calibration it was noted that predicted results were not very sensitive to the horizontal hydraulic conductivity of the lower coals within the calibration range but the results were more sensitive to the horizontal hydraulic conductivity of the upper coals. A hydraulic conductivity for the upper coals of five times the calibrated value results in more scatter as shown in Figure 4-6. The results show that modeled potentiometric heads in the alluvium and the upper coal are very sensitive to the increase in the horizontal hydraulic conductivity of the upper coals. A hydraulic conductivity for the upper coals of half the calibrated value as shown in Figure 4-7 also results in more scatter in the prediction, although the mean absolute (MA) residual is better than the results in Figure 4-6. The results in Figure 4-7 show that modeled potentiometric heads in the alluvium are particularly sensitive to the decrease in the horizontal hydraulic conductivity of the upper coals.

Weathered coals were identified in the upper coal seams (No. 6, No. 7 and No. 8) in the geologic model. Model calibration improved when these weathered coals were assigned a hydraulic conductivity one order of magnitude greater than the unweathered coal. Figure 4-8 provides the sensitivity results performed with the weathered coal hydraulic conductivity equal to that of the unweathered coal. The plot shows much greater scatter in the head prediction in comparison with the calibration results with an MA residual of 25.5 feet in comparison with 11.4 feet for the calibrated model. The results show that modeled potentiometric heads in the PCS and the alluvium are highly sensitive to the hydraulic conductivity of the weathered coals and that the heads in the coals are less sensitive to this parameter. This result is most likely due to the fact that the weathered coals are nearest to the formation outcrops near the alluvium.

During model calibration, the predicted results were found to be sensitive to the vertical hydraulic conductivities of the interburden layers. In particular, a vertical hydraulic conductivity of 1.0 x 10^{-6} ft/day (Kx/Kz = 500) was needed for the interburden layer between the No. 6 coal and the No. 4 coal in order simulate the large vertical head gradients between the upper coal seams and the lower coal seams. Sensitivity model runs were made with Kz for this interburden zone (layer 14) adjusted to 5 x 10^{-6} ft/day (Kx/Kz = 100) and to 5 x 10^{-7} ft/day (Kx/Kz = 1,000). These results are provided in Figures 4-9 and 4-10 respectively, and show that the results are highly sensitive to the vertical hydraulic conductivity of the interburden layer separating the upper coals from the lower coals, particularly the predicted heads in the alluvium and the upper coals units. The calibration error increased as the Kz was increased or decreased from the calibrated value but the error was higher with the decrease in the vertical hydraulic conductivity to 5 x 10^{-7} ft/day.

Sensitivity runs were made with vertical hydraulic conductivity, Kz, of the interburden layers separating the upper coals (No. 6, No. 7 and No. 8 coals) decreased from 5.0 x 10^{-6} ft/day (Kx/Kz=100) to 2.0 x 10^{-7} ft/day (Kx/Kz=2,500) as shown in Figure 4-11. Figure 4-12 provides the plot of predicted versus observed head with the vertical hydraulic conductivity, Kz, of the interburden layers separating the upper coals (No. 6, No. 7 and No. 8 coals) increased from 5.0 x 10^{-6} ft/day (Kx/Kz=100) to 2.5 x 10^{-5} ft/day (Kx/Kz=20). These plots show the model calibration to be much less sensitive to these changes in the Kx/Kz ratios of the interburden within the upper coals in comparison with the Kz separating the upper coals from the lower coals.

The model calibration was even less sensitive to the Kz of the interburden layers between the lower coals (No. 2, No. 3 and No. 4 coals). Figure 4-13 shows the relative minor decrease in the MA residual when the Kz of the interburden layers between the lower coals is decreased from 2.0 x 10^{-5} ft/day (Kx/Kz=25) to 2.0 x 10^{-7} ft/day (Kx/Kz=2,500).

Figures 4-14 through 4-16 show the results of varying the hydraulic conductivity of alluvium in Cottonwood Wash, Pinabete Arroyo, No Name Arroyo, and Brimhall Wash. The results show that the modeled potentiometric heads in the coal layers are highly sensitive to the hydraulic conductivity of the alluvium. The heads in the PCS are also sensitive to this parameter, but less so than the heads in the coals. The best calibration was with a hydraulic conductivity for the alluvium of 156 ft/day, which is above the hydraulic conductivity of the alluvium expected from aquifer test information provided in Attachment 1. Despite the relatively fine mesh depicted in

Figure 3-1, the alluvium is often represented by a width of one or two elements along the length the alluvium. The finite element calculation essentially averages the hydraulic conductivity from elements adjacent to the nodes to calculate the head at the node. This averaging occurs in both the horizontal and vertical dimensions. Due to this averaging effect, a higher hydraulic conductivity needs to be assigned to the elements representing alluvium to compensate for the lower hydraulic conductivity of the adjacent elements or a finer mesh is needed to transition between the alluvium and the adjacent bedrock. However, model predictions would not necessarily be more reliable with further mesh refinement because a hydraulic conductivity needed for model simulation is developed from model calibration. Furthermore, further mesh refinement would be of limited value given that depth and extent of the alluvium varies are defined approximately and would be difficult to identify for a fine mesh without a considerable amount of additional drilling information.

During the model calibration process it became evident that the calibration was also highly sensitive to the reference head and the leakage coefficient of the head dependent boundary at the base of the model which represents groundwater interaction between the PCS and the Lewis Shale. The reference head of this boundary condition represents the potentiometric head in the Lewis Shale, and the leakage coefficient is a function of the vertical hydraulic conductivities and thicknesses of the two formations. The effect of these parameters on model calibration appears to be highly coupled, therefore, only the leakage coefficient was varied in the sensitivity analysis. In the calibrated model, the leakage coefficient ranged over the model domain from $4x10^{-9}$/day to $3x10^{-8}$/day (Figure 3-6). In the sensitivity analysis, the leakage coefficient was ranged from one-half to twice the calibrated value. These results are shown in Figures 4-17 and 4-18, respectively. An additional sensitivity run was made with a constant leakage coefficient of $3x10^{-8}$/day as shown in Figure 4-19. The residual plots resulting from varying the leakage coefficient of the head dependent boundary at the base of the model show that the model calibration is highly sensitive to this parameter.

In addition to the sensitivity runs discussed above, model calibration runs revealed a high sensitivity to the recharge rates of the various surface characterizations in Table 2-2 (particularly, the upland flat recharge rate). Figures 4-20 and 4-21 show plots of the results of varying the recharge rates in the model from 0.8 to 1.2 times the calibrated values. The recharge parameters are the main parameters that control flow into the groundwater system over the model domain. Hence, the model calibration is very sensitive to these model parameters. Nevertheless, the best model calibration results, as measured by the Root Mean Squared error (RMS) of residuals between predicted heads and measured heads, included the recharge estimates that were consistent with Stone's measurements of recharge at Navajo Mine. Also, the location and extent of surface saturation was sensitive to the estimated recharge. There are essentially no areas of surface saturation within the model domain so that the location and extent of surface saturation predicted by the steady state model was also used to support model calibration. Thus, the final calibrated model, in which model parameters and recharge estimates were within the range determined from site measurement or relevant literature data, was selected from the calibration results that best satisfied measures of goodness of fit based on both RMS error of modeled and measured heads and the extent of surface saturation predicted by the calibrated model.

4.5 TRANSIENT MODEL SENSITIVITY ANALYSIS

The calibrated steady state model is applied to simulate the transient response to mining. This application requires that the storage characteristics of the hydrogeologic units within the model domain be defined. It also assumes that the transient behavior can be simulated adequately without transient model calibration. As mining progresses the observations of drawdown at monitoring wells will provide the transient response that can be used to revise the model calibration for future predictions if previous predictions are off. Thus, with limited observations from the model domain as mining progresses, confidence in model predictions for long-term predictions will improve.

The groundwater drawdown and recovery resulting from mining and reclamation was simulated using the FEFLOW default specific storage value of 10^{-4} per foot and default specific yield of 0.2 and using the specific storage values and specific yield best estimate values for the various units as determined in Attachment 1 (Base). Figure 4-22 shows the differences in the drawdown and recovery in the backfill and in the PCS at the two locations Y3 and Y5 that result using the FEFLOW default values and the Base estimates for the various units. The Y3 and Y5 locations are shown in Figure 4-23 and represent locations within the year-3 mine pit and the year-5 mine pit. The results in Figure 4-22 show that the FEFLOW default values simulate less drawdown but slower rates of recovery in both the PCS and the mine backfill in comparison with the Base or best estimates. The drawdown and recovery response also varies spatially with greater drawdown at the Y3 location relative to the Y5 location.

In addition, the sensitivity analysis of the extent of drawdown to changes in specific storage and specific yield were assessed using the FEFLOW default values and the Base estimates determined from the best estimates of specific storage and specific yield for the various units in Attachment 1. The maximum extent of the 5 foot drawdown for the No 8 coal for the two simulations is shown in Figure 4-23. These results show that the drawdown extent in the upper coals is not particularly sensitive to changes in the specific storage and specific yield However the drawdown extent in the deeper coals and in the PCS is more sensitive to the changes in specific storage and specific yield as shown in Figures 4-24 and 4-25, respectively

4.6 MODEL LIMITATIONS AND USES

As with any model of a complex physical system, the groundwater model has limitations and uncertainties. Simplifying assumptions must be made to model the complex hydrogeologic system. In particular, the hydrogeologic units within the model domain have been represented as homogeneous and isotropic. Geologic environments are never homogeneous and isotropic. However, such assumptions are required because it is not possible to define hydraulic conductivities, specific storage, specific yield, porosity and other properties spatially within all the hydrogeologic units within the model domain.

The groundwater model assumes that Darcy's law and the equations of flow through porous media apply to the strata at the site. However, almost all the bedrock sedimentary deposits and coals within the model domain have low matrix permeability and are fractured. Groundwater flow is typically through fractures, bedding-plane partings, and coal cleats and to a much lesser degree through the intergranular pores. Low permeability units (such as the claystones, the shales and in many cases the sandstones) also exert significant control on groundwater flow. The facies, fractures and hydrogeologic properties of these units all vary spatially. At best, the properties of particular hydrogeologic units can be determined from site testing and adjusted during model calibration to arrive at a model that adequately represents the general behavior of the hydrogeologic system.

Model calibration produces a non unique solution and there are a number of calibrations that could be selected on the basis of comparable measures of head residuals. Furthermore, it would have been possible to arrive at a better calibration by spatially varying the hydraulic conductivities for the various hydrogeologic units within the model domain. However, adjustments to improve calibration were not performed unless there was supporting geologic information for such spatial adjustment. The geologic model provided a fairly clear delineation between the weathered coals and the non-weathered coals. As such, the delineated weathered coals were the only locations, where the hydrogeologic properties were adjusted spatially during model calibration to values that were different from the corresponding coal unit.

The hydrogeologic unit within the model domain that is believed to include the greatest uncertainty in the model simulations is the alluvium within the valleys of Cottonwood, Pinabete and Brimhall. Part of this uncertainty is due to the difficulties in delineating the extent and depth of alluvium and representing that delineation by the finite element mesh. Also, the baseline information shows that the groundwater within the alluvium is not at steady state as is assumed in the calibration of the steady state model. Groundwater flows, groundwater levels and groundwater recharge within the alluvium varies seasonally and from year to year. Perched conditions also occur within some segments of the alluvium as indicated by the well nest adjacent to Pinabete Arroyo. All of these conditions add to the uncertainty in the predictions within the alluvium based on the calibrated steady-state groundwater model.

Despite these limitations, the model provides a better understanding of the hydrogeologic system and the nature of the changes in the system that might occur as a result of mining and reclamation. The model predictions are essentially scientific hypotheses that will be re-examined as mining and reclamation proceed. The model is a useful tool for evaluating the possible extent and magnitude of changes in the hydrogeologic system that might occur in response to proposed mining and reclamation. The model is also useful in identifying the time frames that might be associated with these changes. These results provide better insight into the locations and frequency of monitoring that can be used to confirm or modify the PHC predictions.

Groundwater monitoring has been performed at various locations within the vicinity of the site over the past forty years. These monitoring results show very little change in the hydrogeologic conditions in the bedrock units over these time frames. Transient model simulations also show that the response in the bedrock units beyond the direct impact area of mining is very slow and damped. Nevertheless, model predictions far beyond the historic monitoring period need to be considered in the context of other changes that might be influencing the hydrogeologic system in the long-term to avoid false confidence in model predictions far into the future.

5 SIMULATION OF PROPOSED MINING AND RECLAMATION

5.1 STEADY STATE POST MINING CONDITIONS

For the PHC modeling scenario, mine backfill properties were added to the mined out area associated with the Area IV North mine plan. The overburden and interburden material placed in the mine pit as backfill will have higher porosity and hydraulic conductivity than the pre-mine interbedded sedimentary deposits of the Fruitland Formation. Laboratory measurements of pre-mine overburden core indicate porosity values of about 0.35 while porosity of mine spoils is on the order of 0.40. These laboratory porosity measurements are consistent with the swell factor of 12% estimated based on experience in mining the same formation at the Navajo Mine. The higher porosity will result in higher hydraulic conductivity in comparison with the pre-mine interburden and overburden material (Van Voast, 1974).

A detailed discussion of the steady state model simulation results for post-mining conditions following proposed mining within Area IV North is presented in Section 11.6.2.4 of the Navajo Mine PAP. Comparison of the steady state pre-mine and post-mining groundwater model results show the changes in the groundwater flow patterns and rates that are expected to occur in the long-term following mining. These results support the quantitative assessments of the potential changes in regional or local aquifers resulting from mining. In particular, these effects include the removal of the interbedded coal, shales and sandstone strata and replacement with a relatively homogeneous and isotropic spoil backfill and the increase in recharge rates for reclaimed surfaces. The steady state pre-mine groundwater model simulates a large decline in heads with depth in the Fruitland Formation, including the occurrence of perched groundwater zones. After mining, the simulated steady state heads in the mine spoil are much more uniform with depth, although there is still a slight downward gradient and downward flow. Also, the perched groundwater that occurs under pre-mine conditions within the mine area is eliminated within and near the spoil backfill under long-term steady state conditions following mining. Both the pre-mine and post-mine steady state groundwater flow models show a flow component from Area IV North toward the topographic low elevations along Cottonwood Arroyo in the PCS and in the Fruitland Formation coals. The rate of groundwater flow toward these topographic lows increases for post-mining conditions due to the increase in recharge rate within the reclaimed mine areas.

5.2 TRANSIENT MODEL SIMULATIONS

For the transient simulations of proposed mining operations in Area IV North, detailed mine progression plans were lumped into one-year time increments with constant head boundaries set to the base of mining in all mined out layers over the area covered by the specific one-year time increment (i.e. for a one-year time increment, the entire area of the one-year plan was simulated as dewatered over the one year increment). The proposed plan for pit advance within Area IV North from year 2011 to year 2016 is shown in Figure 11-39 in Chapter 11 of the Navajo Mine PAP. The transient model was run for 500 years after the completion of mining to simulate post-mining transient behavior. A recharge rate of 0.10 in/year was used for mine spoils in the transient modeling until final reclamation, after which the long-term recharge rate of 0.04 in/year was used for reclaimed areas in the transient model. This recharge rate of 0.10 in/year used for mine backfill and initial reclamation in the transient simulations represents an average rate for the mine backfill in various stages of reclamation and is based on the average between Stone's estimate of 0.16 in/year for depressions during mine reclamation and the 0.04 in/year for final reclamation.

5.2.1 Transient Model Parameters

The area covering the one-year increment being mined was assigned hydraulic properties to simulate "air" in the open pit. The specific yield and specific storage in these areas were set equal to 1, and hydraulic conductivity was set equal to 8,640 ft/d. As one increment ended and the next was started, mine backfill hydraulic parameters were added to the model over the area of the previous one-year increment. As discussed in Section 5.1, swelling of mine backfill is accompanied by an increase porosity and permeability, therefore, hydraulic conductivity and storage properties were increased in the transient simulations compared with those used in the steady state pre- mining runs. Mine backfill properties are shown in Table 5-1. The hydraulic conductivity of 0.0113 ft/day ($4.0x10^{-6}$ cm/sec) estimated from laboratory tests on Navajo Mine spoils was used as a lower bound estimate for mine spoils to provide more conservative estimates of water recovery rates in mine spoils.

5.2.2 Initial Conditions

The head and saturation distributions from the pre-mining steady state simulation were used as initial conditions for the first one-year transient run in the mine plan. Subsequent one-year transient runs used the final result of the prior year run as initial conditions. At the conclusion of the proposed Area IV North mine plan, the final mine area was assigned backfill properties and a post mining transient simulation was run for 500 years to simulate rebound in groundwater levels in the mine backfill.

5.2.3 Transient Model Results

The results of the transient mining simulations are discussed in Section 11.6.2.4 of the Navajo Mine PAP. The transient modeling results presented in Section 11.6.2.4 of the Navajo Mine PAP show the slow rate of spoils resaturation as well as the rate of drawdown and recovery in the coals and PCS adjacent to mining.

5.3 MASS TRANSPORT MODEL SIMULATIONS

The FEFLOW software used for groundwater flow modeling also includes features that simulate conservative and reactive transport. The FEFLOW transport routines were applied to simulate the transport of TDS as a conservative constituent from mine spoil materials that are planned for backfilling of mine pits. TDS was selected for transport modeling based on analysis of constituents in spoil monitoring wells and spoil leaching tests as described in Section 11.6.2.4.3 of the Navajo Mine PAP. TDS transport modeling simulations were performed using a lower bound source concentration of 3,550 mg/l and an upper bound TDS concentration of 11,850 mg/l. TDS was assumed to behave conservatively, that is with no attenuation due to adsorption or chemical transformation.

The transport model solves advection-dispersion equations of transport processes in groundwater flow. Natural background concentrations were not included in the transport modeling because the objective of the transport modeling is to simulate the direction and rate of transport of modeled constituents from the mine spoils, including the magnitude of attenuation due to dispersion. Mass transport simulations were run for 500 years after the completion of mining assuming that the TDS source concentrations remain constant throughout the 500-year transport modeling period. The 500-year transport simulation was performed using the post-mine steady-state groundwater flow conditions as the initial condition for transport modeling. Experience from other surface mining operations as well as the successive leaching test results indicate that the concentrations of TDS are expected to decline over time with leaching of the mine spoils. A 500-year simulation period was considered reasonable for modeling the fate and transport from a constant TDS source concentration in the backfill. After 500 years it is expected that the source concentrations in the mine backfill will decline as groundwater flows through the mine backfill and flushes salts that may have been concentrated in the mine spoils as a result of weathering and evaporation during mining and backfilling operations.

5.3.1 Initial Conditions

The results of the steady state post-mining flow simulation were used as the initial flow condition for the transport simulations.

5.3.2 Mass Transport Boundaries

Transport runs for TDS were performed assuming that the source concentrations in mine spoils remained constant throughout the 500-year transport modeling period. Constant concentration boundary conditions were assigned to mine backfill for the runs simulating constant leaching to groundwater over time. These constant concentration boundary conditions were assigned concentrations equal to the initial source concentrations as described above.

5.4 MASS TRANSPORT MODEL RESULTS

Mass transport modeling results for the PHC for the proposed mine area in resource Area IV North are presented in Section 11.6.2.4.3 of the Navajo Mine PAP. The transport simulations based on the assumption that source concentrations remain constant throughout the 500-year simulation period show a substantial reduction in concentrations due to dispersion and mixing. Transport modeling results show that lateral migration of groundwater flow and constituents from the mine backfill in Area IV North is primarily vertically downward to the PCS and laterally toward the alluvium and topographic lows along Cottonwood Arroyo.

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TABLES

TABLE 2-1. HYDRAULIC CONDUCTIVITY OF MODEL LAYERS AND CORRESPONDING HYDROSTRATIGRAPHIC UNITS

Formation	Estimated Kx Range		Calibrated Results			Comment
	Kx (ft/d)	Kx (ft/d)	Kx (ft/d)	Kx/Kz	Kx[1] (ft/d)	
Alluvium	5.13E+01	1.15E+01	1.56E+02			
No Name Alluvium			3.11E+01			
Weathered Overburden			5.02E-03	1		
Overburden	1.43E-03	9.64E-04	1.00E-03	10		
S8 Coal	6.00E-02	4.00E-03	1.25E-02	125	1.25E-01	Kz of weathered coal 5.0E-02
Interburden	8.64E-03	2.80E-05	5.01E-04	100		
S7 Coal	8.00E-03	2.00E-03	2.49E-03	2.5	2.49E-02	Kz of weathered coal 1.0E-02
Interburden	8.64E-03	2.80E-05	5.01E-04	100		
S6 Coal	2. 0E-03	1.0E-04	1.88E-03	2.5	1.88E-02	Kz of weathered coal 7.5E-03
Interburden	8.64E-03	2.80E-05	5.01E-04	500		
S4 Coal	2.0E-03	1.0E-0	1.88E-03	2.5		
Interburden	8.64E-03	2.80E-05	5.01E-04	25		
S3 Coal	2.0E-03	1.0E-04	4.99E-03	5		
Interburden	8.64E-03	2.80E-05	5.01E-04	25		
S2 Coal	2.0E-03	1.0E-04	1.25E-03	2.5		
Interburden	8.64E-03	2.80E-05	5.01E-04	25		
Pictured Cliffs Sandstone	4.41E-02	1.00E-04	1.00E-02	1		

[1] calibrated Kx for weathered coals

TABLE 2-2. RECHARGE VALUES AND SURFACE CHARACTERIZATION

Surface Characterization	Recharge Range[1] (in/yr)	Mean Recharge[1] (in/yr)	Modeled Recharge (in/yr)
Badlands	0.002 to 0.01	0.006	
Slopes > 5%			0.002
Slopes: 2 to 5%			0.01
Upland Flat	.02 to 0.05	0.03	
Upland Flat (slope<1%)			0.03
Upland (Slope 1 to 2%)			0.02
Alluvial Valley	0.09	0.09	0.09
Mine Backfill			0.04

[1]From Stone, W. J. 1987. Phase-III Recharge Study at Navajo Mine

TABLE 3-1 MODEL LAYERS AND CORRESPONDING HYDROSTRATIGRAPHIC UNITS

Layer	Slice	Formation
1	1	Alluvium and Weathered Overburden
2,3	2,3	Overburden
4	4	S8 Coal
5,6,7	5,6,7	Interburden
8	8	S7 Coal
9,10,11	9,10,11	Interburden
12	12	S6 Coal
13,14,15	13,14,15	Interburden
16	16	S4 Coal
17,18,19	17,18,19	Interburden
20	20	S3 Coal
21,22,23	21,22,23	Interburden
24	24	S2 Coal
25,26	25,26	Interburden
27,28	27,28,29	Pictured Cliffs Sandstone

TABLE 3-2. FLUXES ASSIGNED TO CONSTANT FLUX BOUNDARY CONDITIONS

Model Layer	Coal Seam	Constant Flux (ft/d)
4	#8	$1.704x10^{-4}$
8	#7	$8.52x10^{-6}$
12	#6	$6.375x10^{-5}$
16	#4	$6.375x10^{-5}$
20	#3	$8.52x10^{-5}$
24	#2	$4.25x10^{-6}$

TABLE 4-1. CALIBRATION DATA

Well	Formation	Model Layer	Observed Head	Calibrated Head	Residual
QACW-2B	Alluvium	1	5235.20	5224.97	-10.23
PA-1	Alluvium	1	5340.81	5319.97	-20.84
PA-2	Alluvium	1	5422.73	5403.40	-19.33
KF2007-01	#8 Coal	4	5392.01	5403.41	11.40
KF84-22A	#8 Coal	4	5270.49	5258.15	-12.34
VWP2007-02	#8 Coal	4	5393.67	5403.45	9.78
KF84-21C	#7 Coal	8	5273.98	5240.47	-33.51
KF84-22B	#7 Coal	8	5268.95	5256.52	-12.43
VWP2007-02	#7 Coal	8	5370.81	5389.16	18.35
KF84-22C	#6 Coal	12	5257.20	5255.42	-1.78
VWP2007-01	#6 Coal	12	5329.88	5347.48	17.60
KF84-22D	#3 Coal	20	5248.20	5249.50	1.30
KF-98-02	#3 Coal	20	5354.47	5364.56	10.09
KF-98-03	#3 Coal	20	5291.94	5327.26	35.32
VWP2007-01	#3 Coal	20	5278.56	5281.84	3.27
VWP2007-02	#3 Coal	20	5287.85	5325.76	37.92
KF-98-04	#3 Coal	20	5288.48	5301.90	13.42
KF84-21A	#2 Coal	24	5240.95	5243.31	2.36
KF84-22E	#2 Coal	24	5246.90	5249.37	2.47
VWP2007-01	#2 Coal	24	5273.37	5281.64	8.27
VWP2007-02	#2 Coal	24	5291.09	5325.54	34.45
VWP2007-03	#2 Coal	24	5357.60	5362.06	4.46
VWP2007-5	#2 Coal	24	5410.61	5421.95	11.35
GM-19	PCS	28	5265.00	5272.31	7.31
GM-20	PCS	28	5333.00	5312.87	-20.13
GM-21	PCS	28	5428.00	5439.27	11.27
GM-29	PCS	28	5305.00	5310.11	5.11
GM-30A	PCS	28	5387.00	5385.22	-1.78
KPC2007-01	PCS	28	5262.00	5280.46	18.46
KPC2007-02	PCS	28	5351.90	5360.50	8.60
KPC2007-03	PCS	28	5336.52	5326.88	-9.64
KPC-98-01	PCS	28	5288.31	5271.78	-16.53
T4-1	PCS	28	5385.85	5385.29	-0.56
T4-2	PCS	28	5385.20	5385.31	0.11
O-1	PCS	28	5422.00	5426.77	4.77
13-7-2	PCS	28	5402.00	5410.29	8.29

Well	Formation	Model Layer	Observed Head	Calibrated Head	Residual
P-1	PCS	28	5430.00	5439.69	9.69
VWP2007-01	PCS	28	5268.30	5280.44	12.14
VWP2007-02	PCS	28	5296.81	5325.25	28.44
VWP2007-4	PCS	28	5397.48	5404.55	7.07
VWP2007-5	PCS	28	5411.26	5419.03	7.77
GM-28	PCS	28	5265.00	5251.82	-13.18

TABLE 4-2.
Model Parameters Varied in Sensitivity Analysis of Steady State Model

Model Parameter	Calibrated Value	Sensitivity Analysis Range
Alluvium Kx	155 ft/d	31 to 187 ft/d
Upper Coals (#6, #7 and #8) Kx	Variable	Calibrated Value x 5, Calibrated Value / 2
Upper Coal Interburden Kx/Kz Ratio	100/1	20/1 to 2,500/1
Lower Coal Interburden Kx/Kz Ratio	25/1	25/1 to 2,500/1
Interburden between Upper and Lower Coals Kx/Kz Ratio	500/1	100/1 to 1000/1
PCS Kx	0.01 ft/d	0.005 to 0.02 ft/d
Leakage Coefficient of Head Dependent Boundary at Base of Model	Variable	$3x10^{-4}$/day, Calibrated Value x 2, Calibrated Value / 2
Kx of Weathered Coal	Variable	Kx same as unweathered
Recharge	Variable	Calibrated Values x 0.8 Calibrated Values x 1.2

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TABLE 5-1.
RECHARGE RATES AND HYDRAULIC PROPERTIES OF MINE SPOILS FOR POST-MINE GROUNDWATER MODEL

Surface Characterization	Recharge Range[1] (in/yr)	Mean Recharge[1] (in/yr)	Modeled Recharge (in/yr)
Reclaimed Areas	0.01 to 0.23	0.04	
Reclaimed Depression Areas		0.16	
Reclaimed Areas-Transient			0.1
Reclaimed Areas-Steady State			0.04
Alluvium- Pre-Mine and Reclaimed	0.09		0.09
Pre-Mine Surfaces	0.002 to 0.04		0.02

Reclamation Materials	Porosity (%)	Ksat (cm/sec)	Ksat (ft/day)
Surface Mine Spoils (L1)	40.6	2.0E-04	0.563
Mine Spoils <L1	40.6	2.0E-05	0.0563
Geometric Mean of Mine Spoils in Northern Great Plains (Rehm et al, 1980)		8.0E-05	0.2268
Lab Tests of Navajo Mine Spoil Samples	40.6	4.0E-06	0.0113

[1] Estimates from Stone (1987)

FIGURES

FIGURE 1-1. PICTURED CLIFFS SANDSTONE CONCEPTUAL GROUNDWATER MODEL

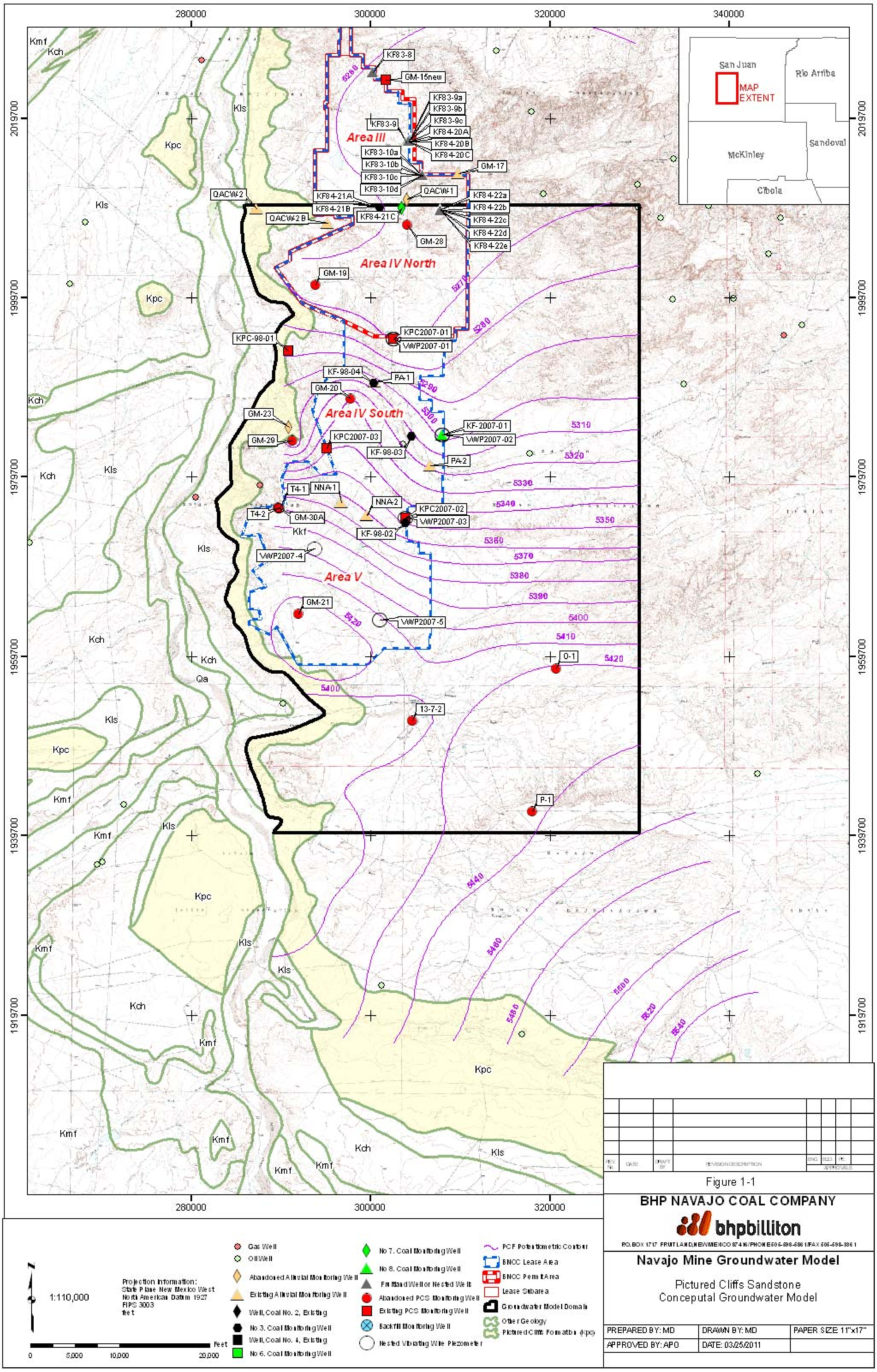

FIGURE 3-1. MODEL DOMAIN AND MESH DISCRETIZATION

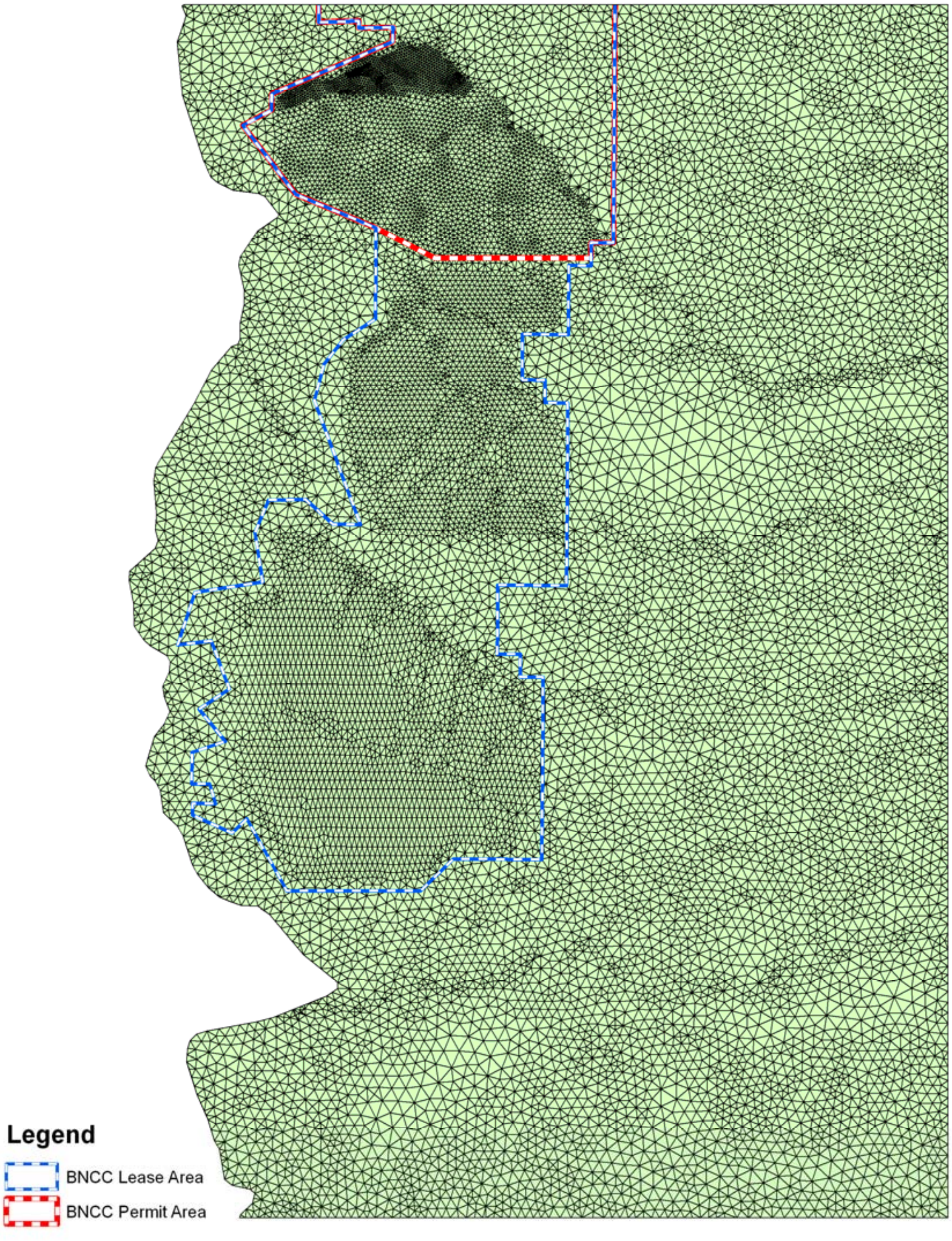

FIGURE 3-2. LOCATIONS OF BOUNDARY CONDITIONS - FRUITLAND AND ALLUVIAL MODEL LAYERS

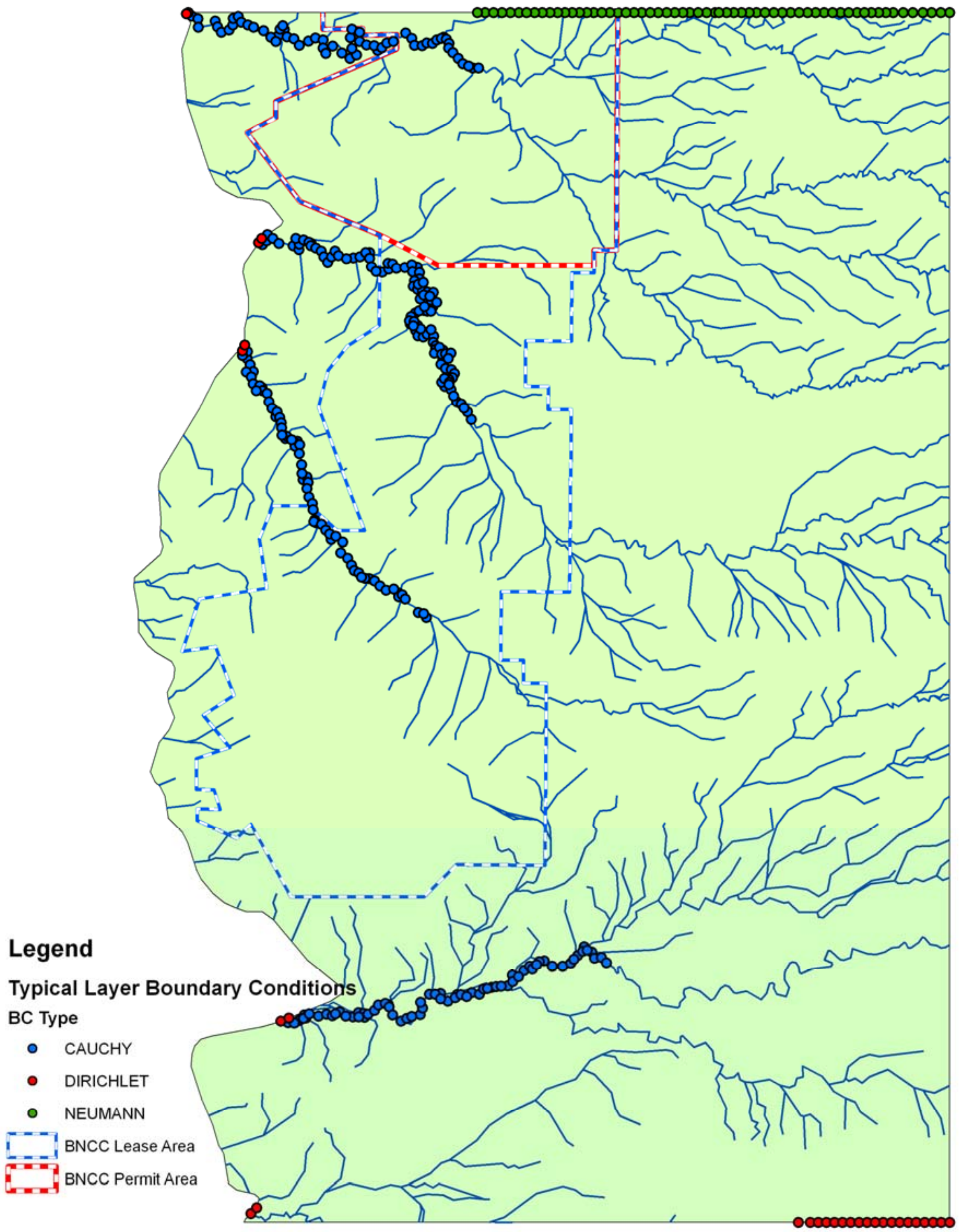

FIGURE 3-3. LOCATIONS OF BOUNDARY CONDITIONS - PCS

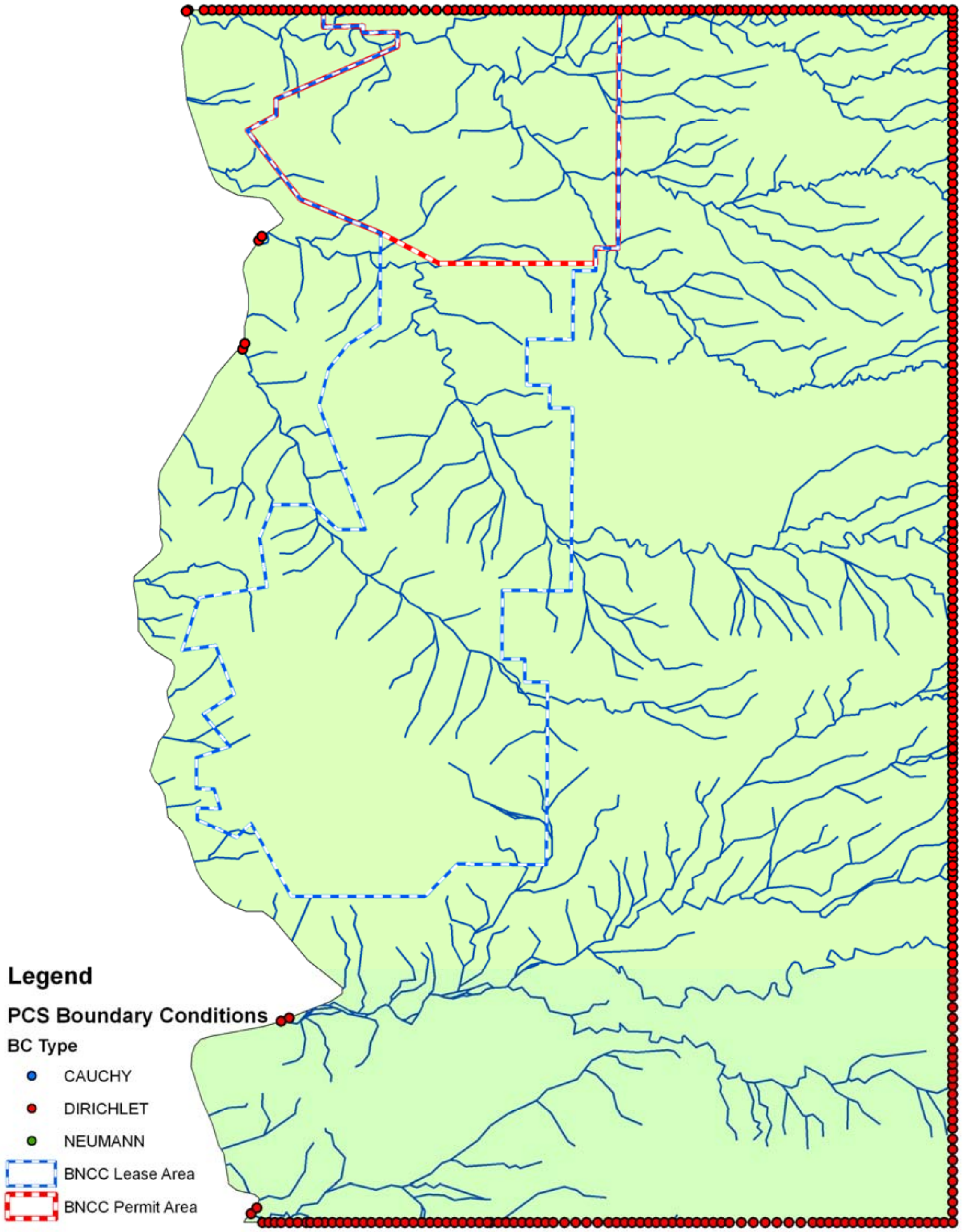

FIGURE 3-4. RECHARGE DISTRIBUTION

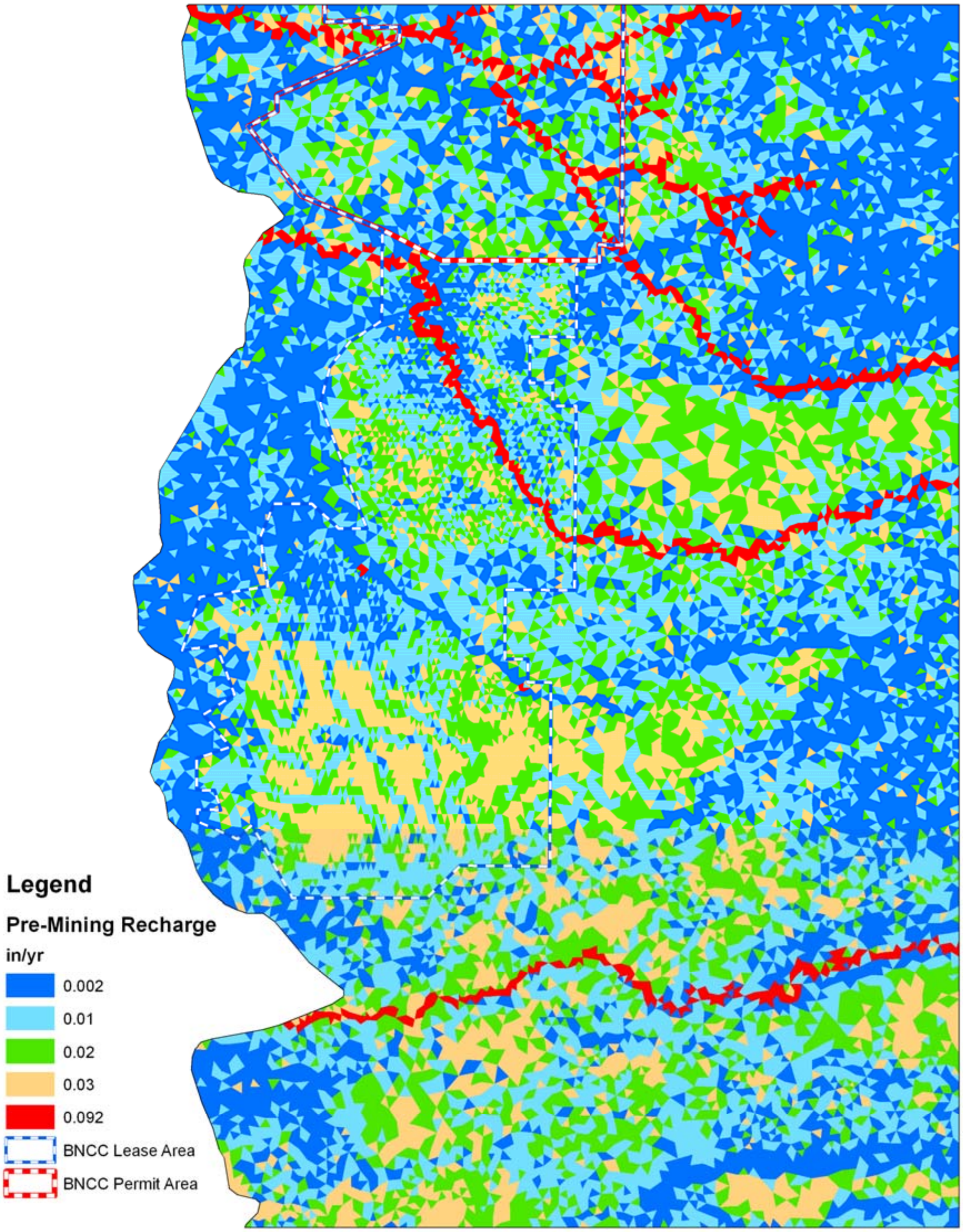

FIGURE 3-5. HEAD DEPENDENT BOUNDARY CONDITIONS - REFERENCE HEAD

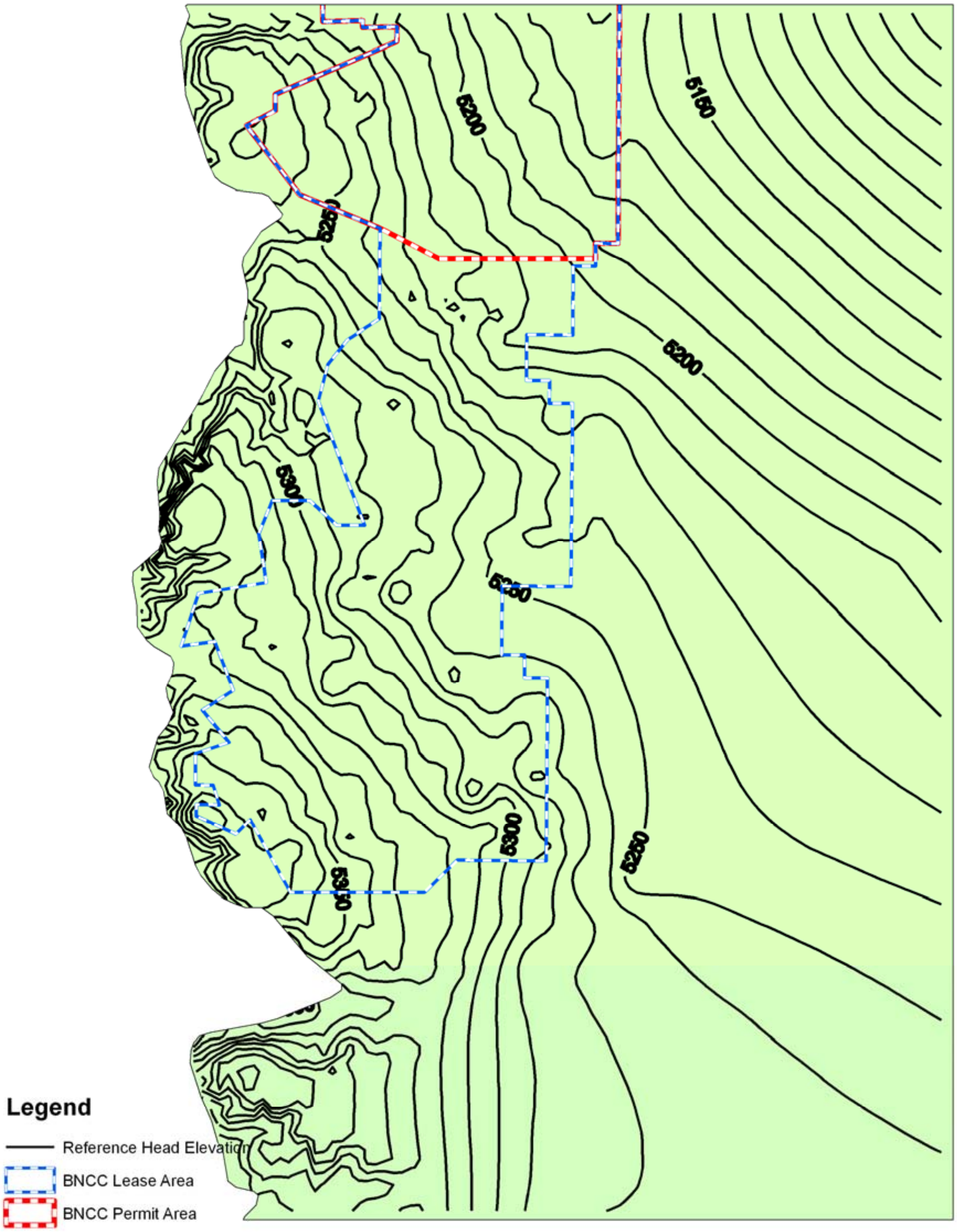

FIGURE 3-6. HEAD DEPENDENT BOUNDARY CONDTIONS - LEAKAGE COEFFICIENT

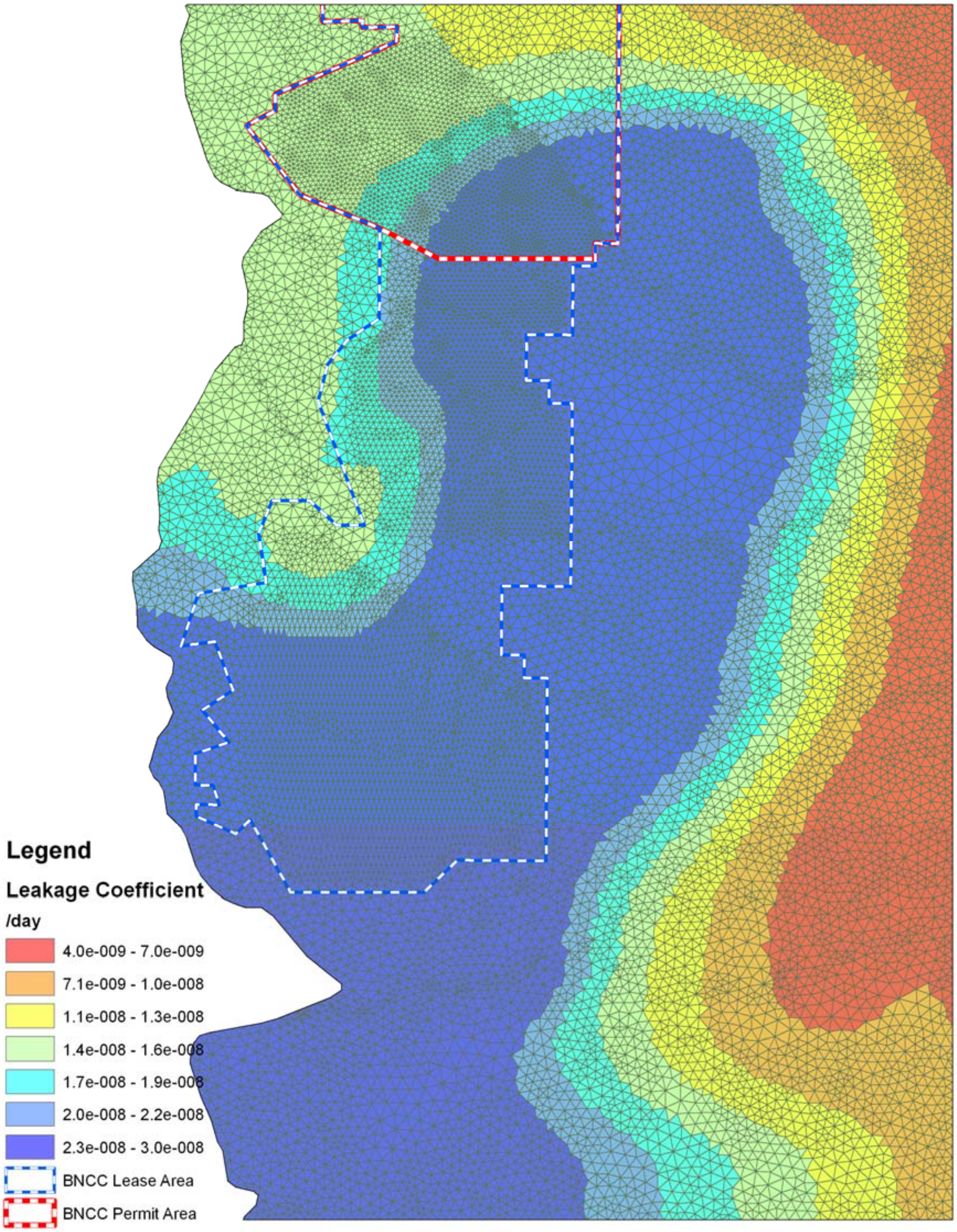

FIGURE 4-1. CALIBRATION WELL LOCATIONS

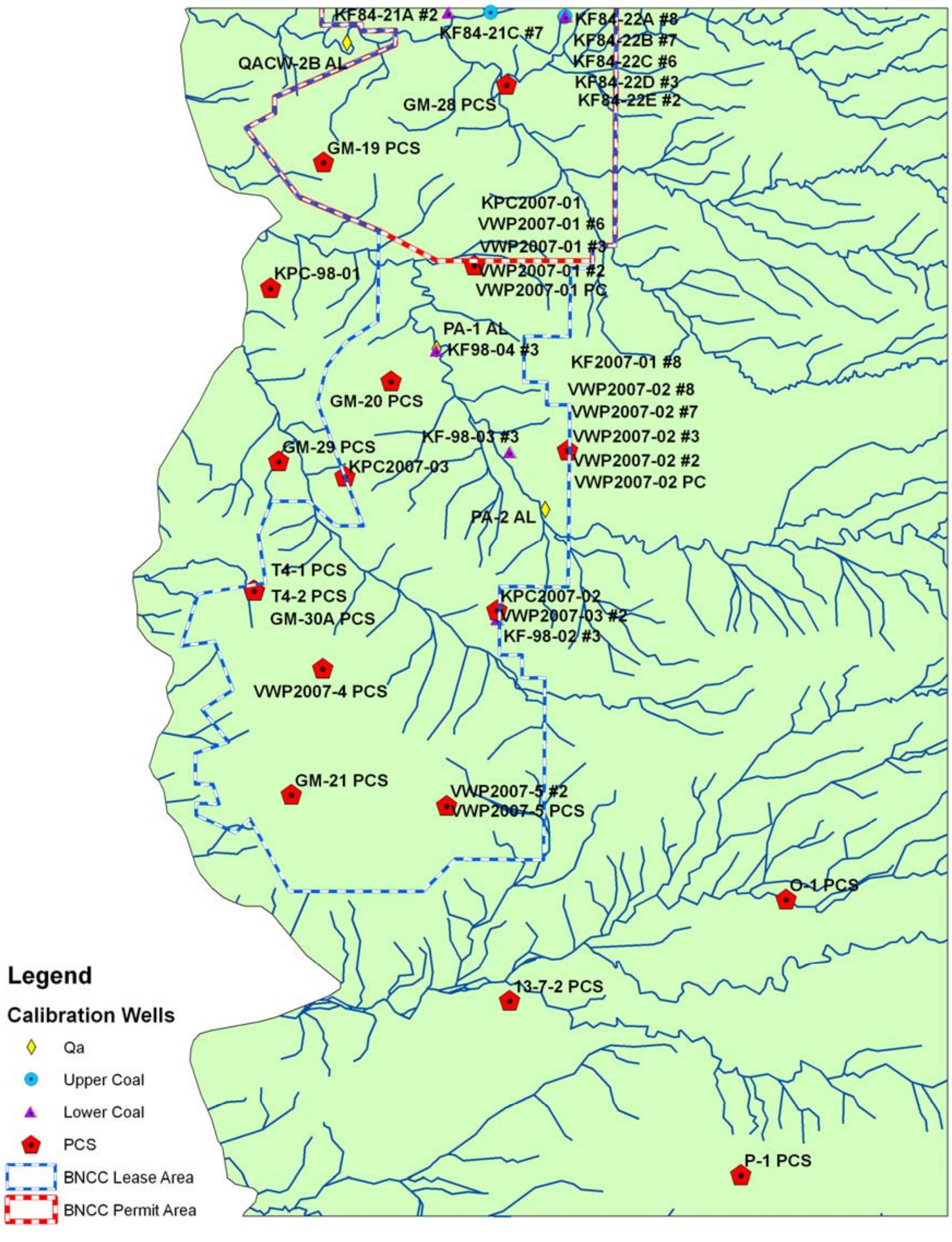

FIGURE 4-2. CALIBRATED PCS POTENTIOMETRIC SURFACE

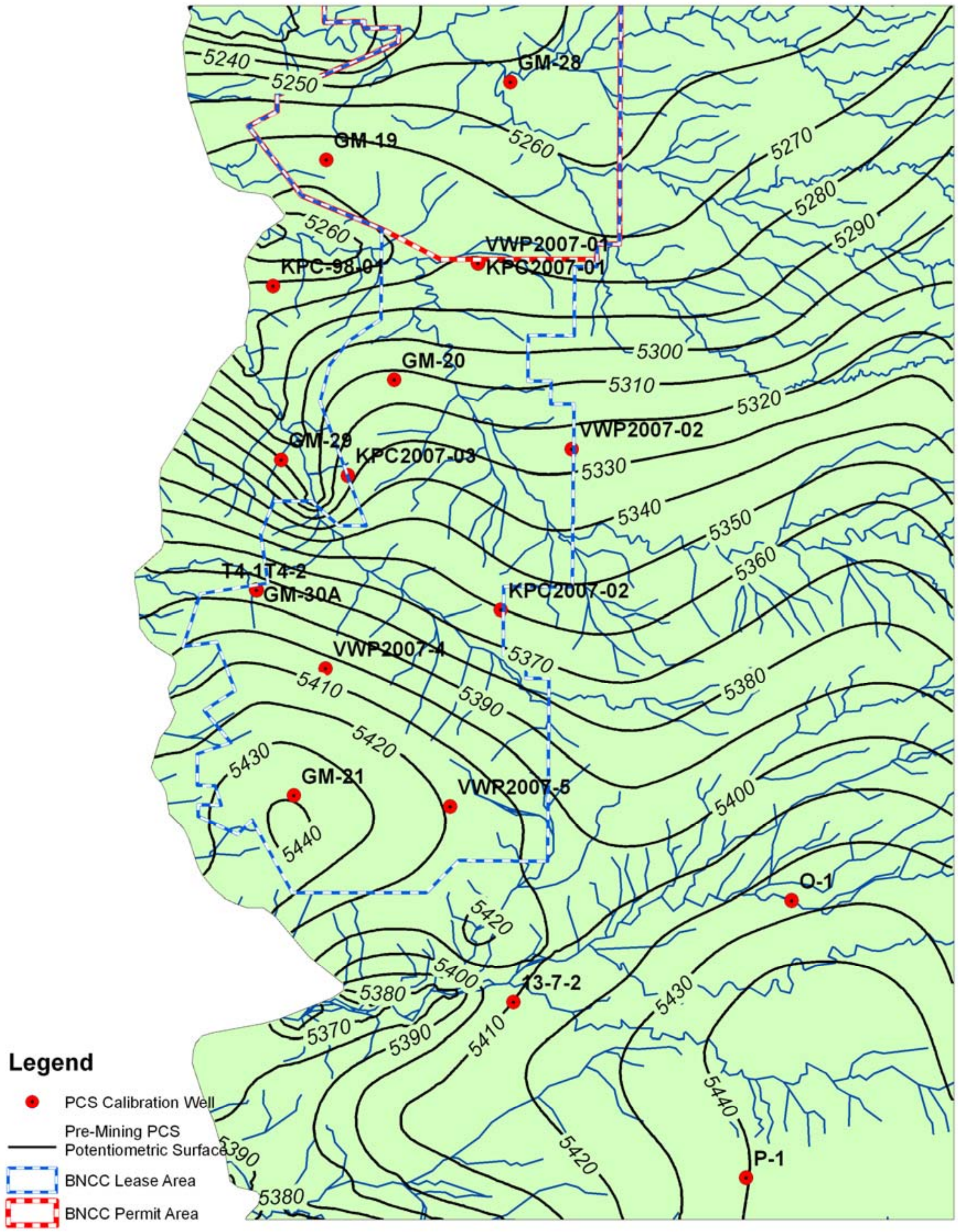

FIGURE 4-3. MODEL CALIBRATION - CALCULATED VS. OBSERVED HEADS

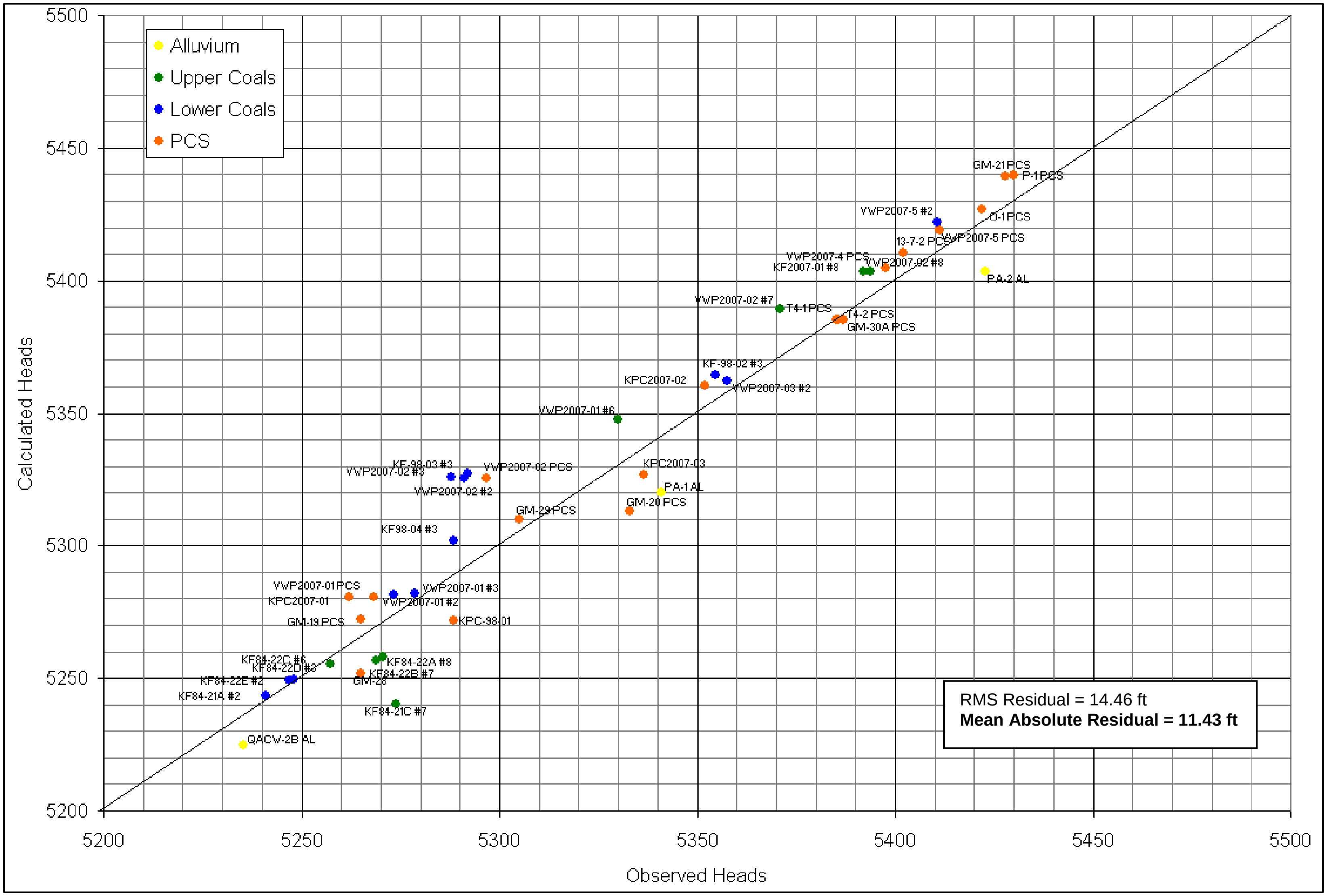

FIGURE 4-4. Sensitivity Analysis - Calculated vs. Observed Heads - K_{PCS}=0.005 ft/d

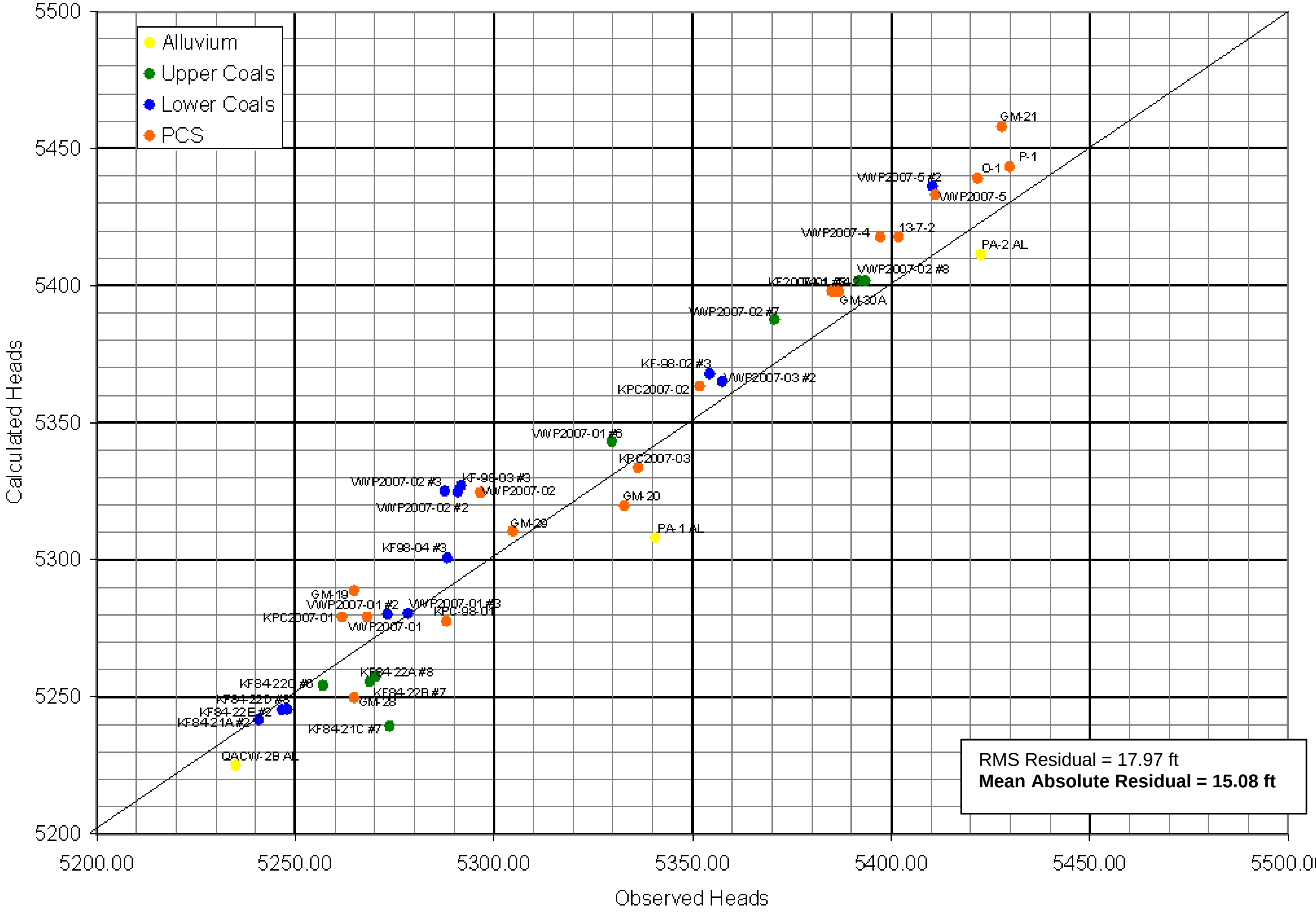

Figure 4-5. Sensitivity Analysis - Calculated vs. Observed Heads - KPCS=0.02 ft/d

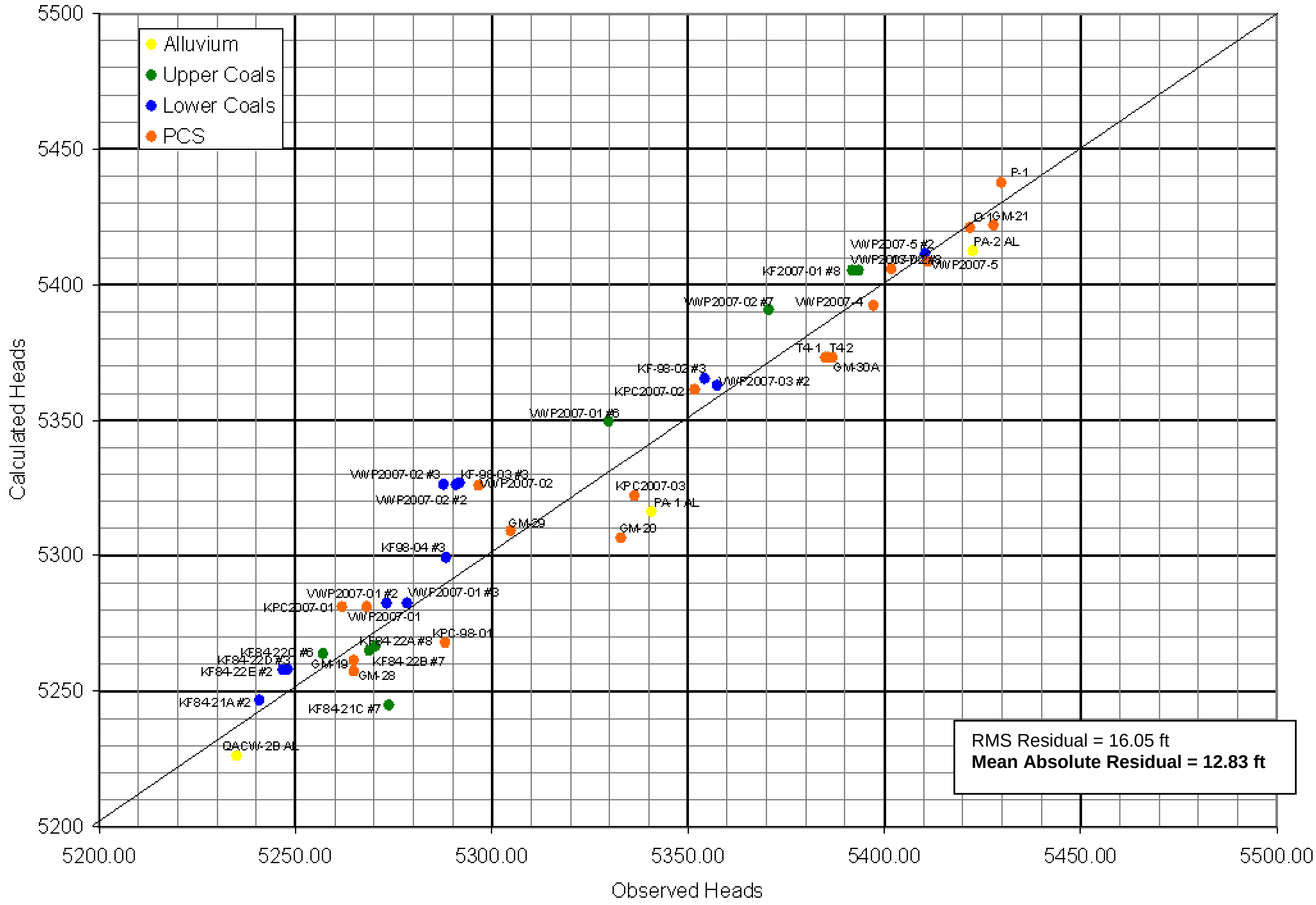

FIGURE 4-6. Sensitivity Analysis - Calculated vs. Observed Heads – Kx of upper coals X5

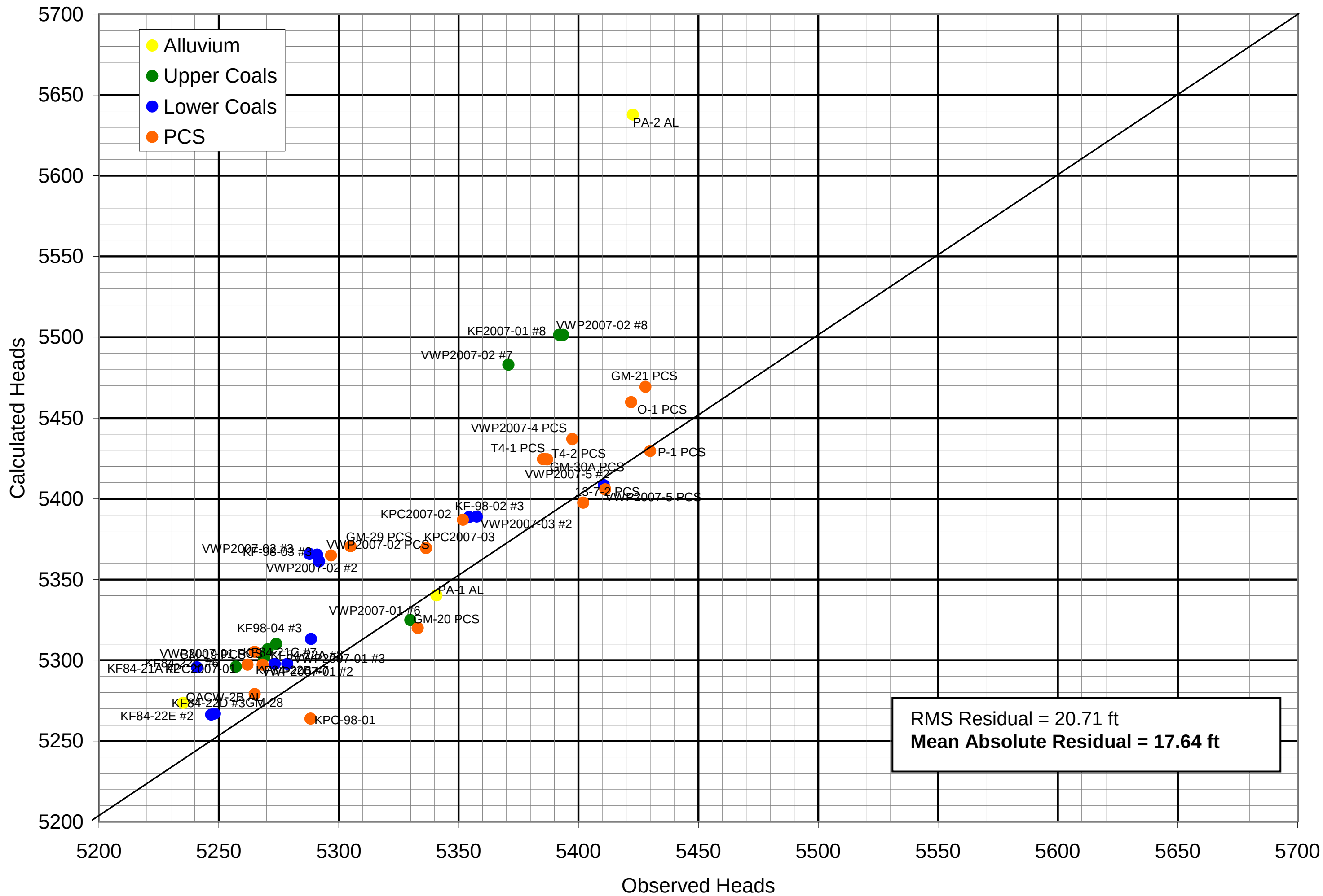

FIGURE 4-7. Sensitivity Analysis - Calculated vs. Observed Heads – Kx of upper coals /2

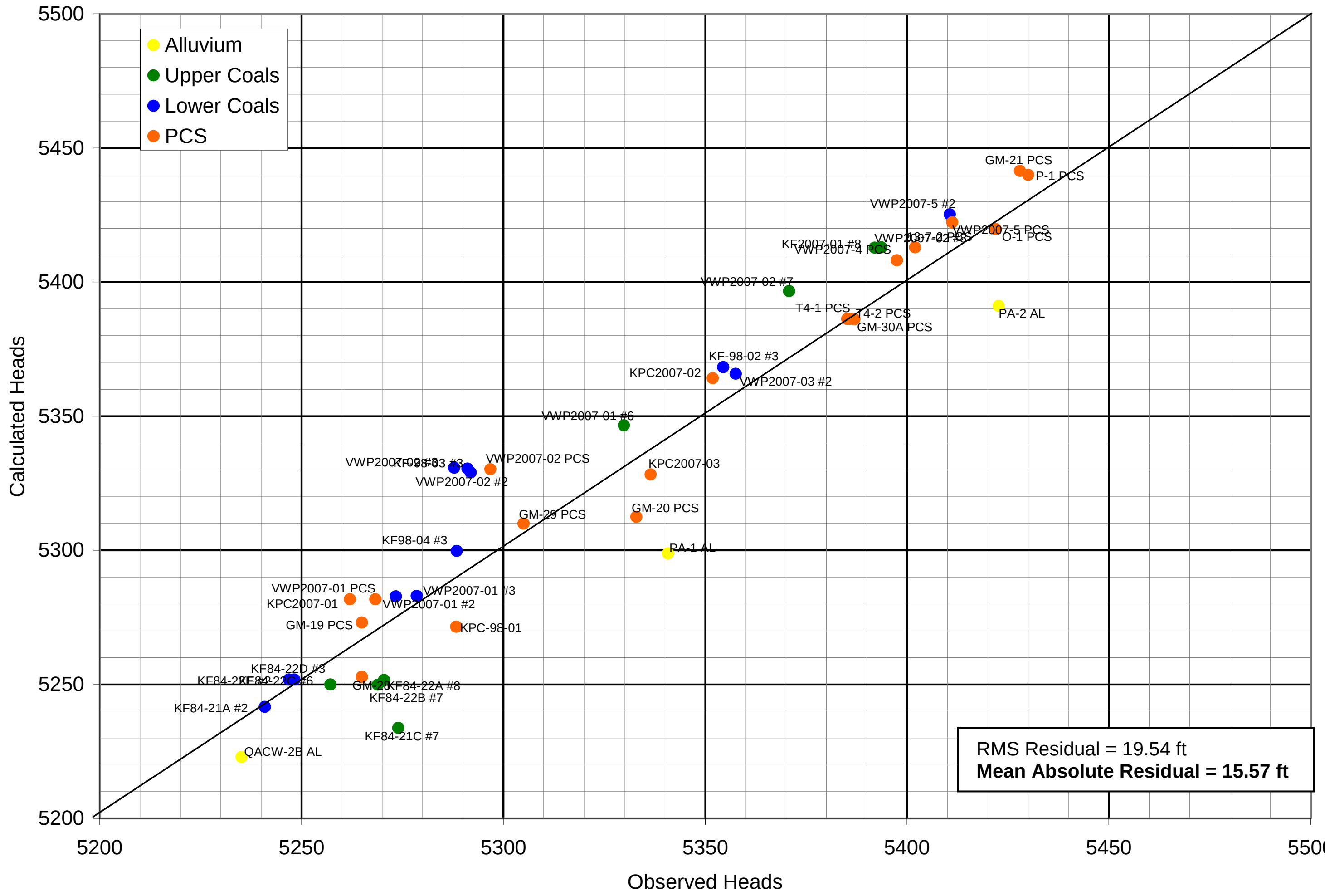

FIGURE 4-8. Sensitivity Analysis - Calculated vs. Observed Heads - $K_{weathered\ coal}$=$K_{unweathered\ coal}$

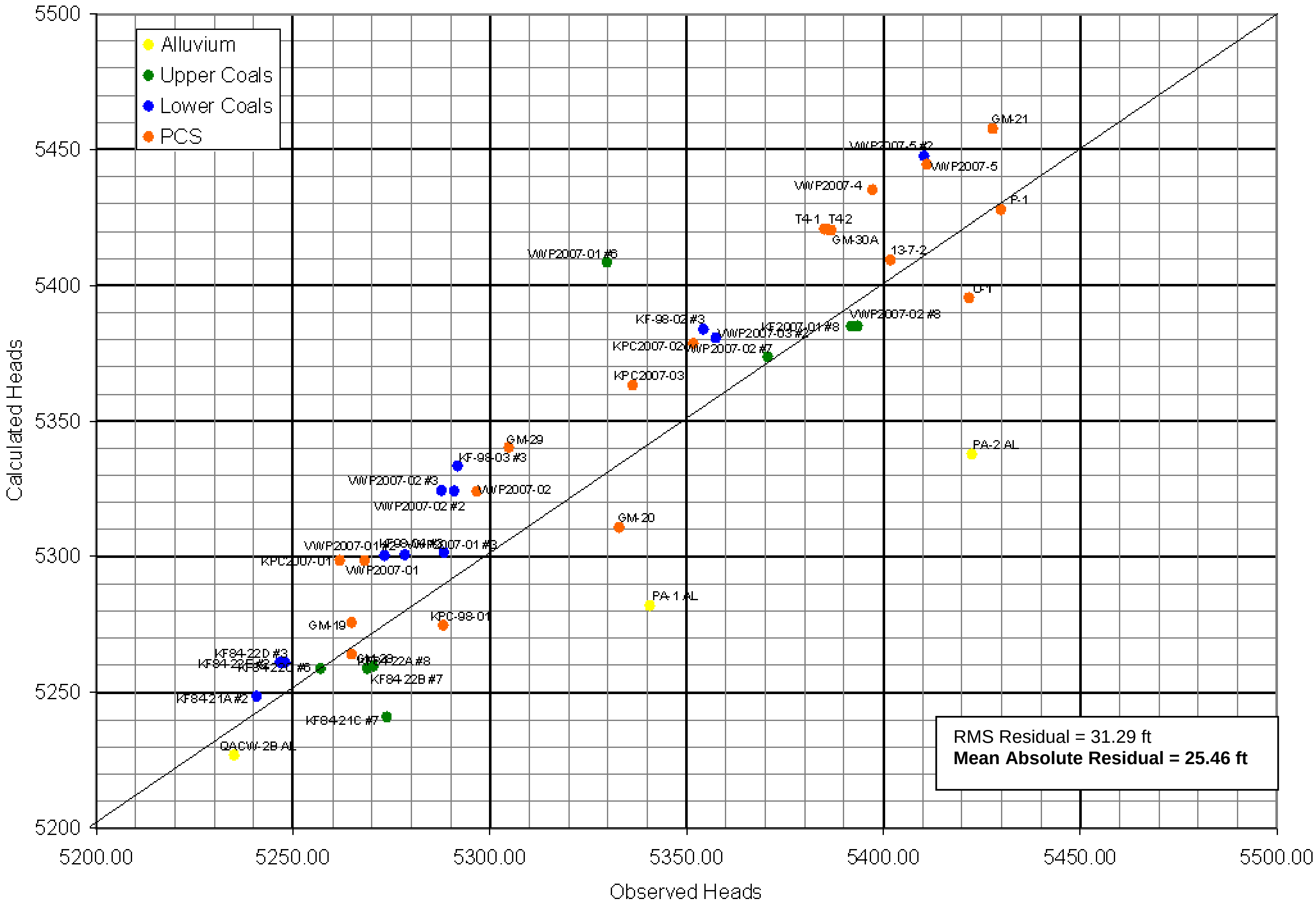

FIGURE 4-9. Sensitivity Analysis - Calculated vs. Observed Heads - $Kz_{14}=5x10^{-6}$ ft/d (Kx/Kz=100)

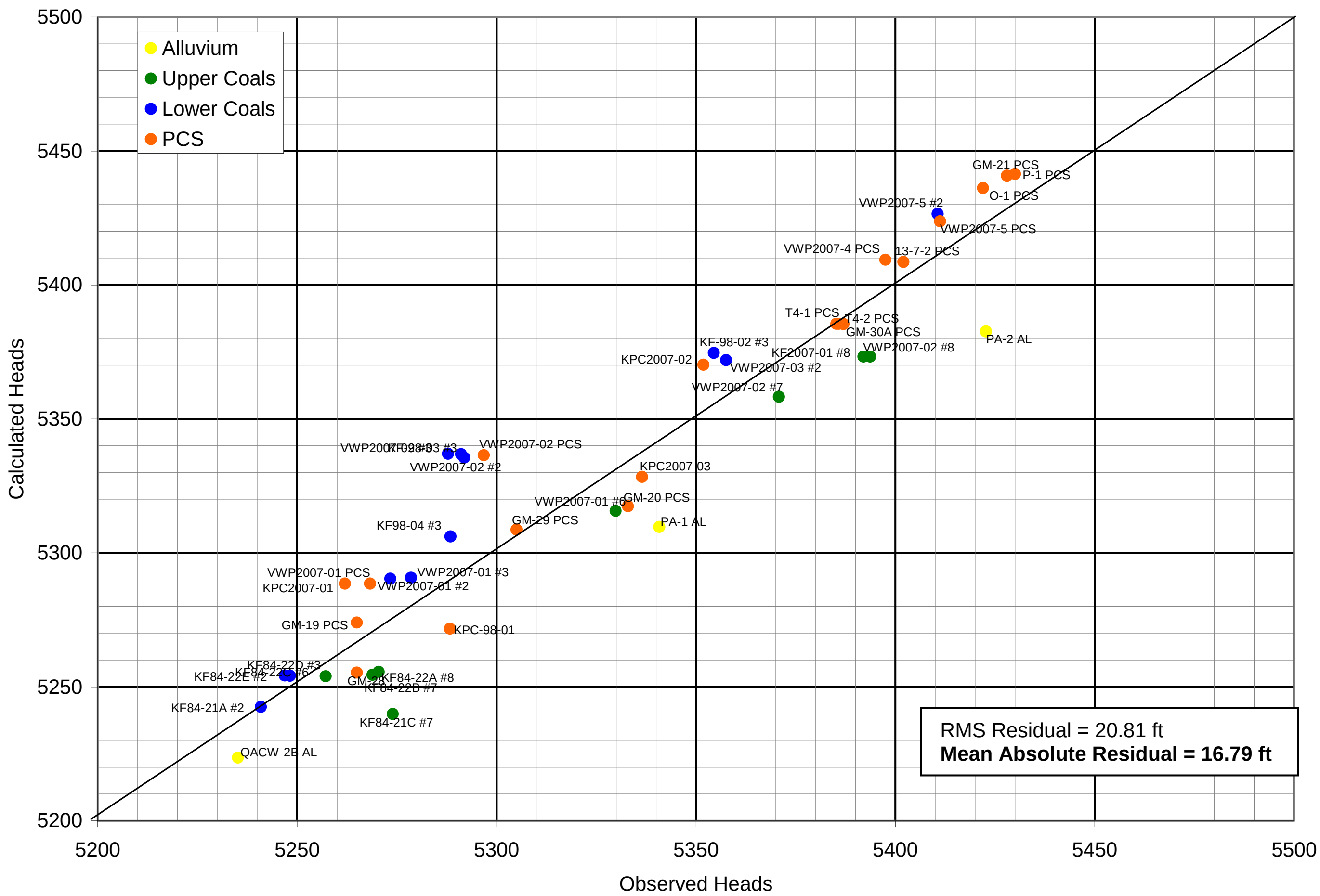

FIGURE 4-10. Sensitivity Analysis - Calculated vs. Observed Heads - Kz_{14}=5x10^{-7} ft/d (Kx/Kz=1,000)

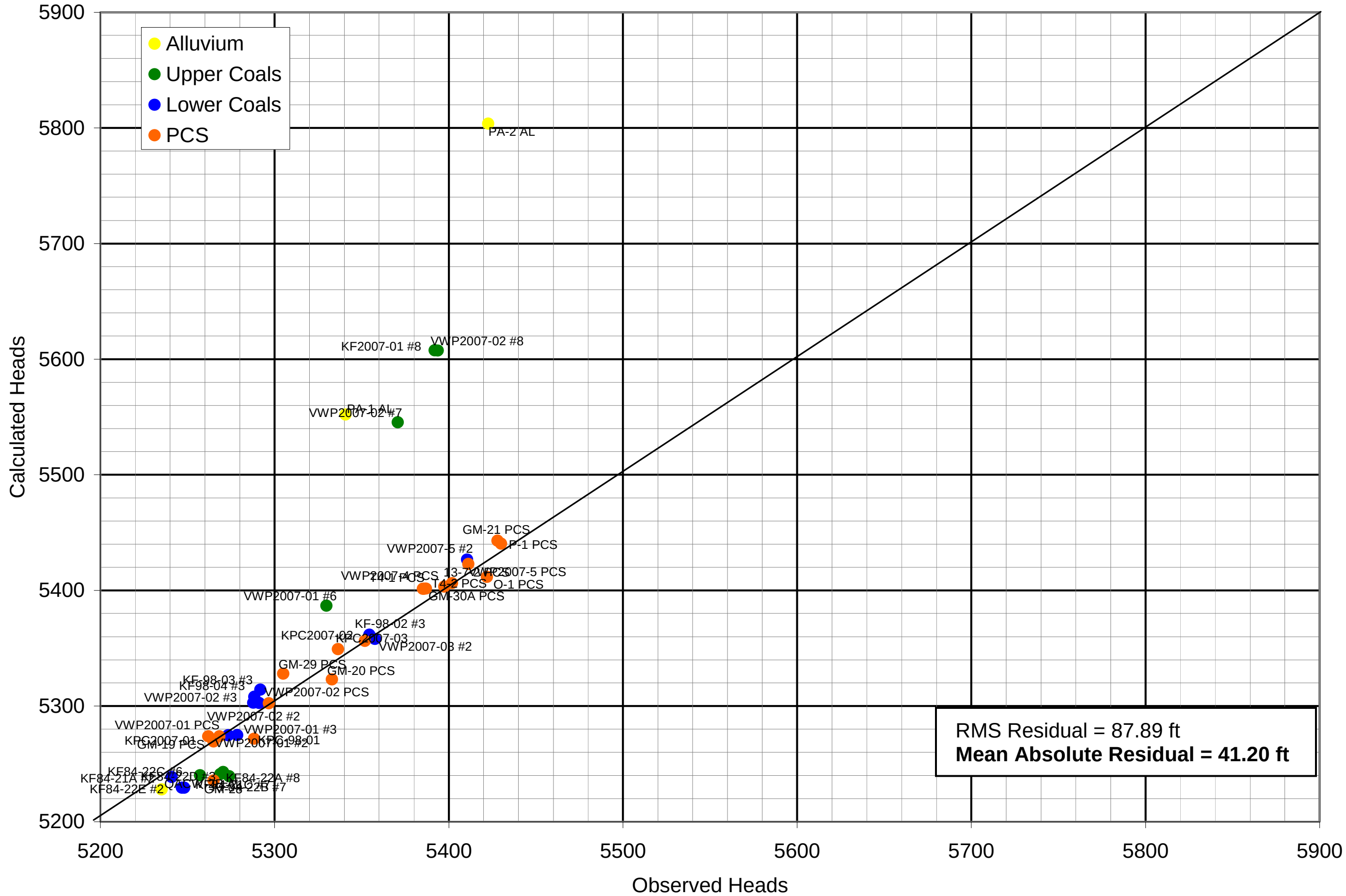

FIGURE 4-11. Sensitivity Analysis - Calculated vs. Observed Heads - $Kz_{UpperIB}=2x10^{-7}$ ft/d (Kx/Kz=2,500)

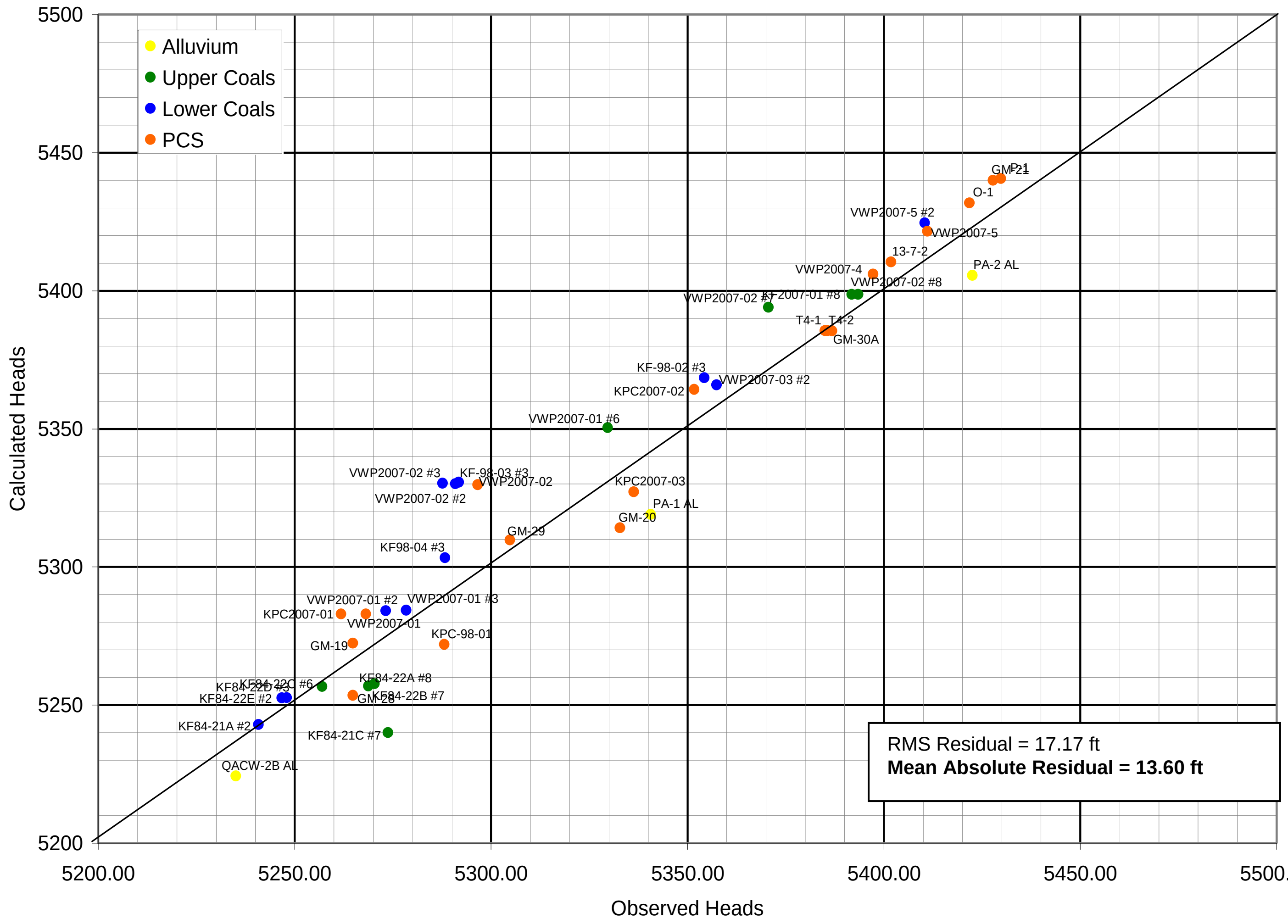

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FIGURE 4-12. Sensitivity Analysis - Calculated vs. Observed Heads - $Kz_{UpperIB}$=2.5x10^{-5} ft/d (Kx/Kz=20)

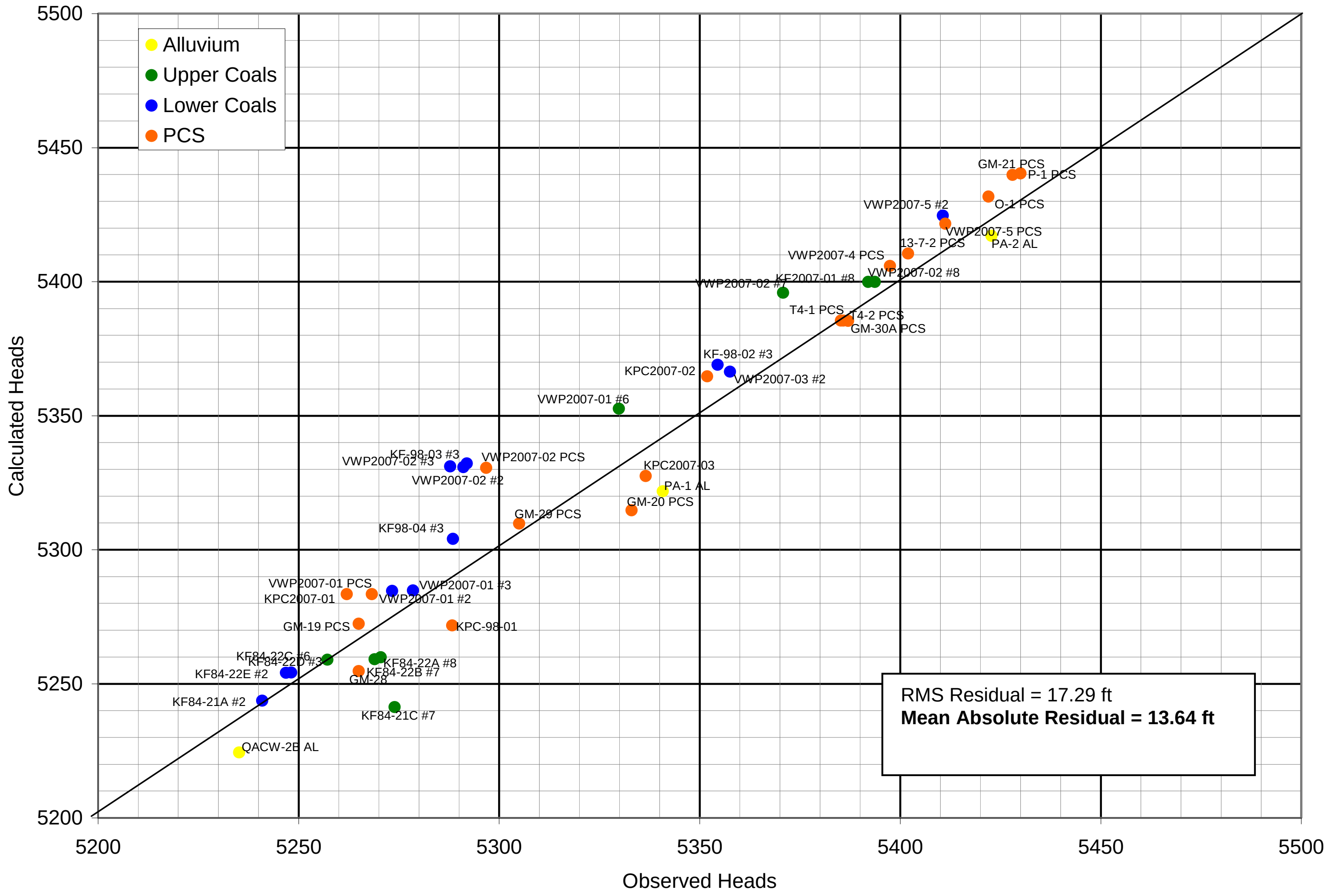


FIGURE 4-13. Sensitivity Analysis - Calculated vs. Observed Heads - $Kz_{LowerIB}$=2x10^{-7} ft/d (Kx/Kz=2,500)

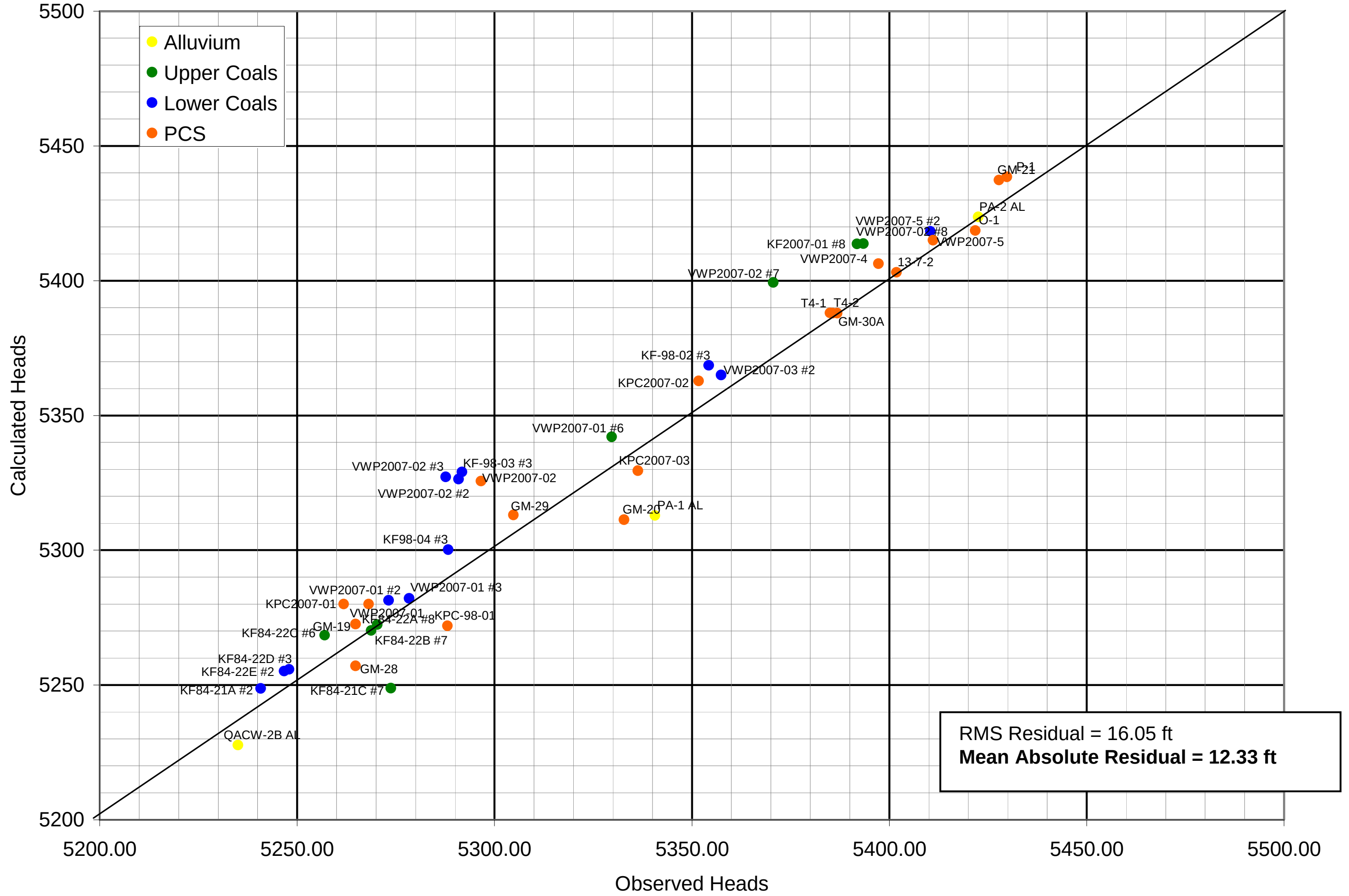


Figure 4-14. Sensitivity Analysis - Calculated vs. Observed Heads - K_{al}=31 ft/d

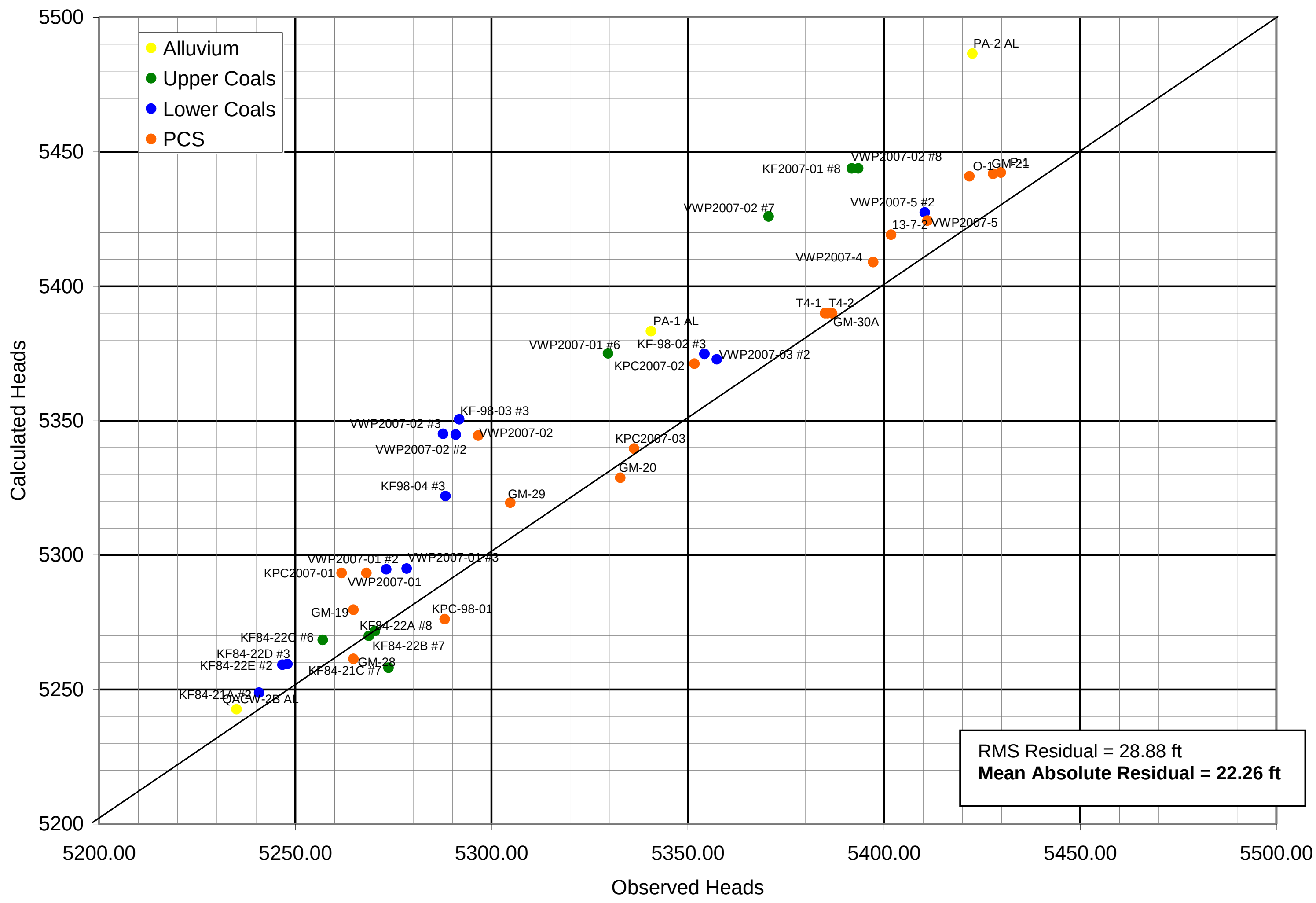


Figure 4-15. Sensitivity Analysis - Calculated vs. Observed Heads - K_{al}=62 ft/d

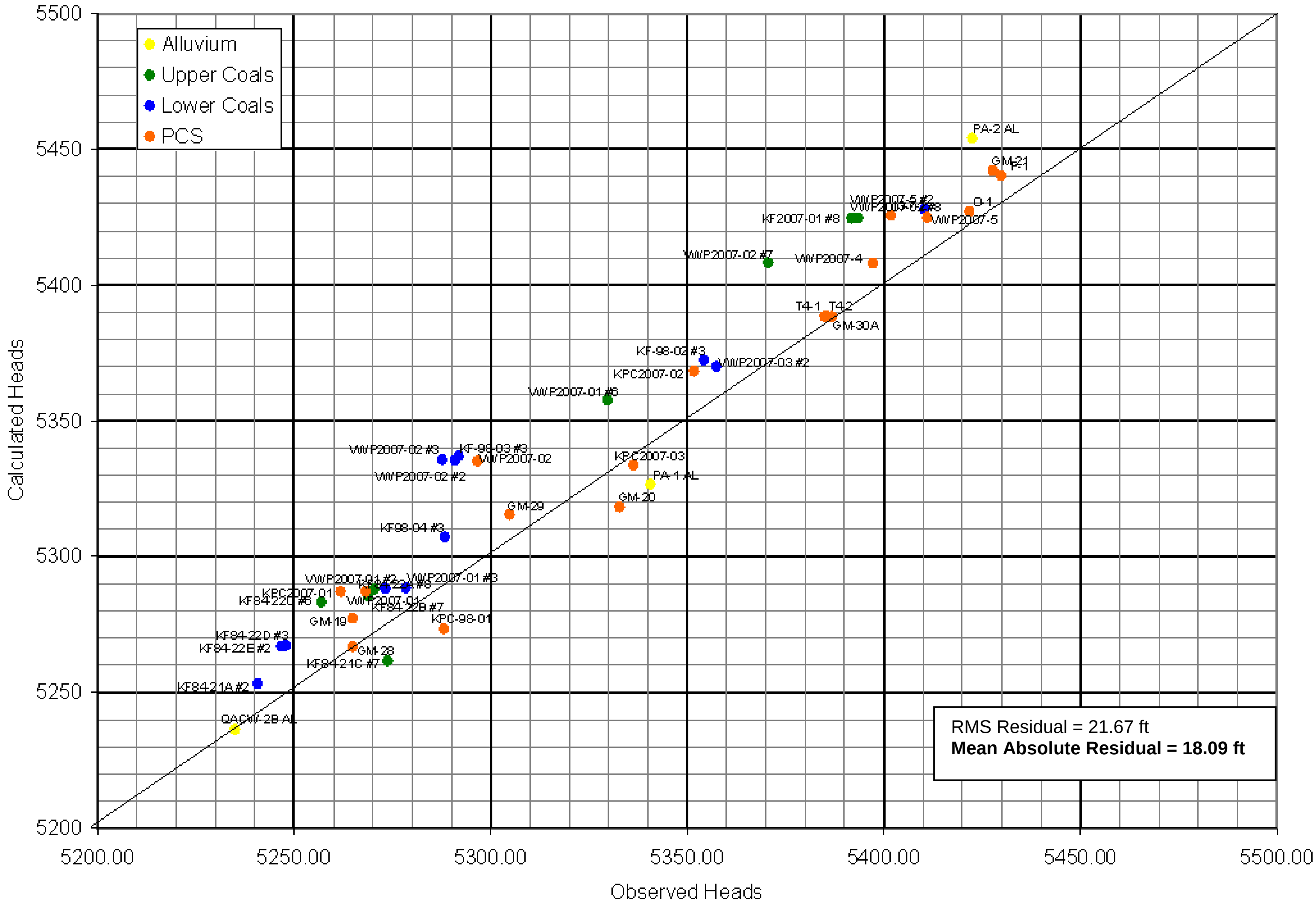


Figure 4-16. Sensitivity Analysis - Calculated vs. Observed Heads - K_{al}=187 ft/d

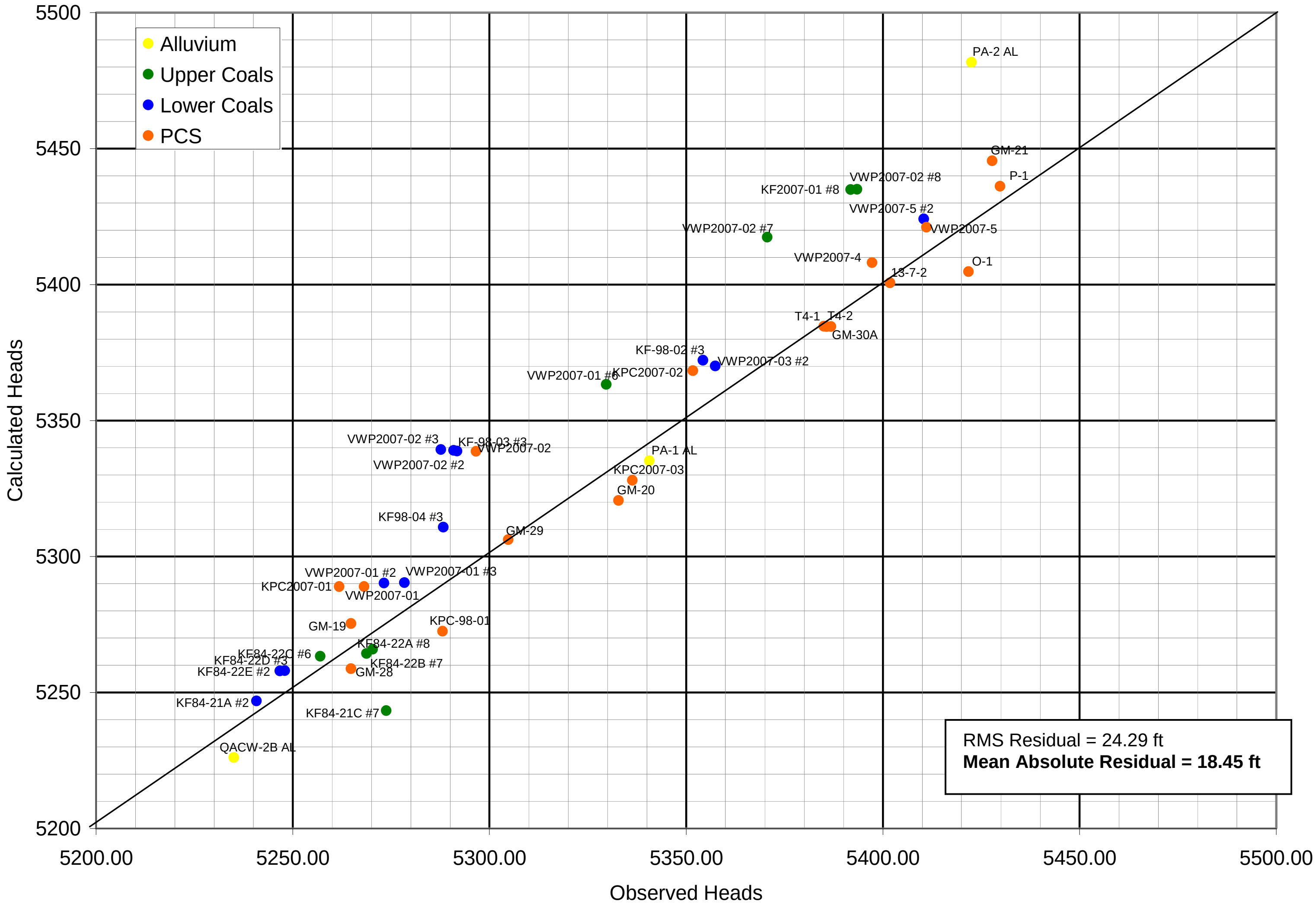


Figure 4-17. Sensitivity Analysis - Calculated vs. Observed Heads - Leakage Coefficient = 1/2 Calibrated Value

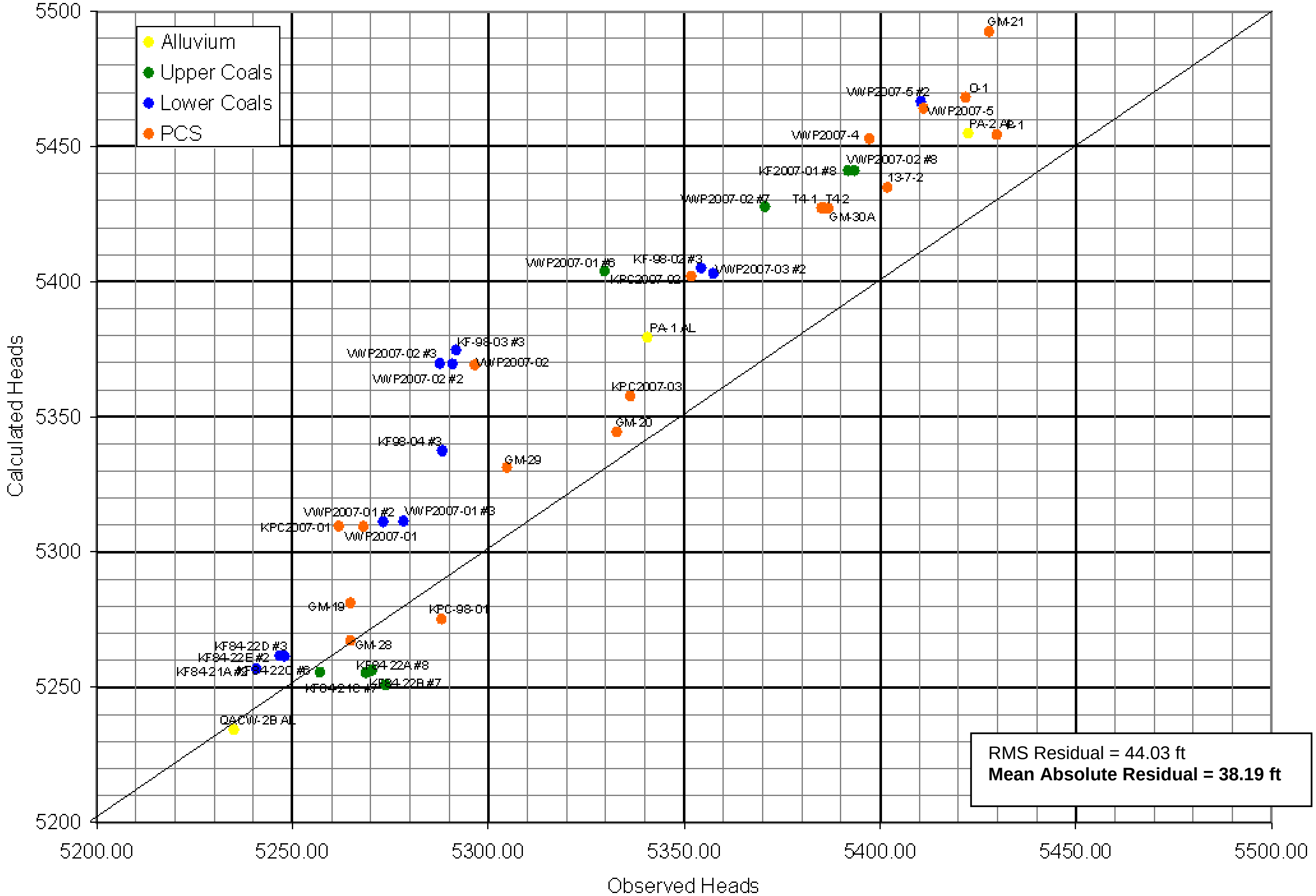


Figure 4-18. Sensitivity Analysis - Calculated vs. Observed Heads - Leakage Coefficient = 2x Calibrated Value

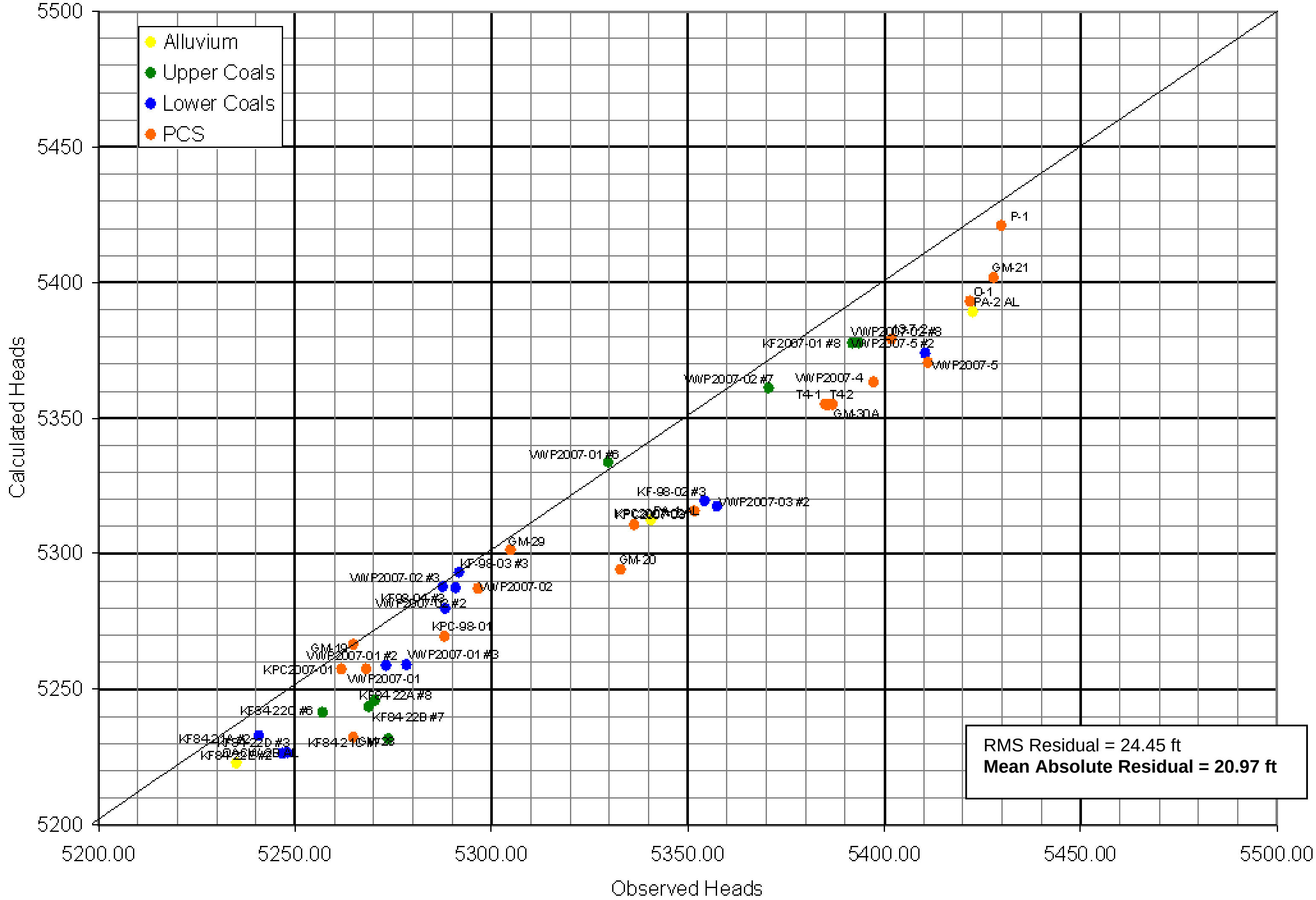


Figure 4-19. Sensitivity Analysis - Calculated vs. Observed Heads - Leakage Coefficient=3x10^{-4}/d

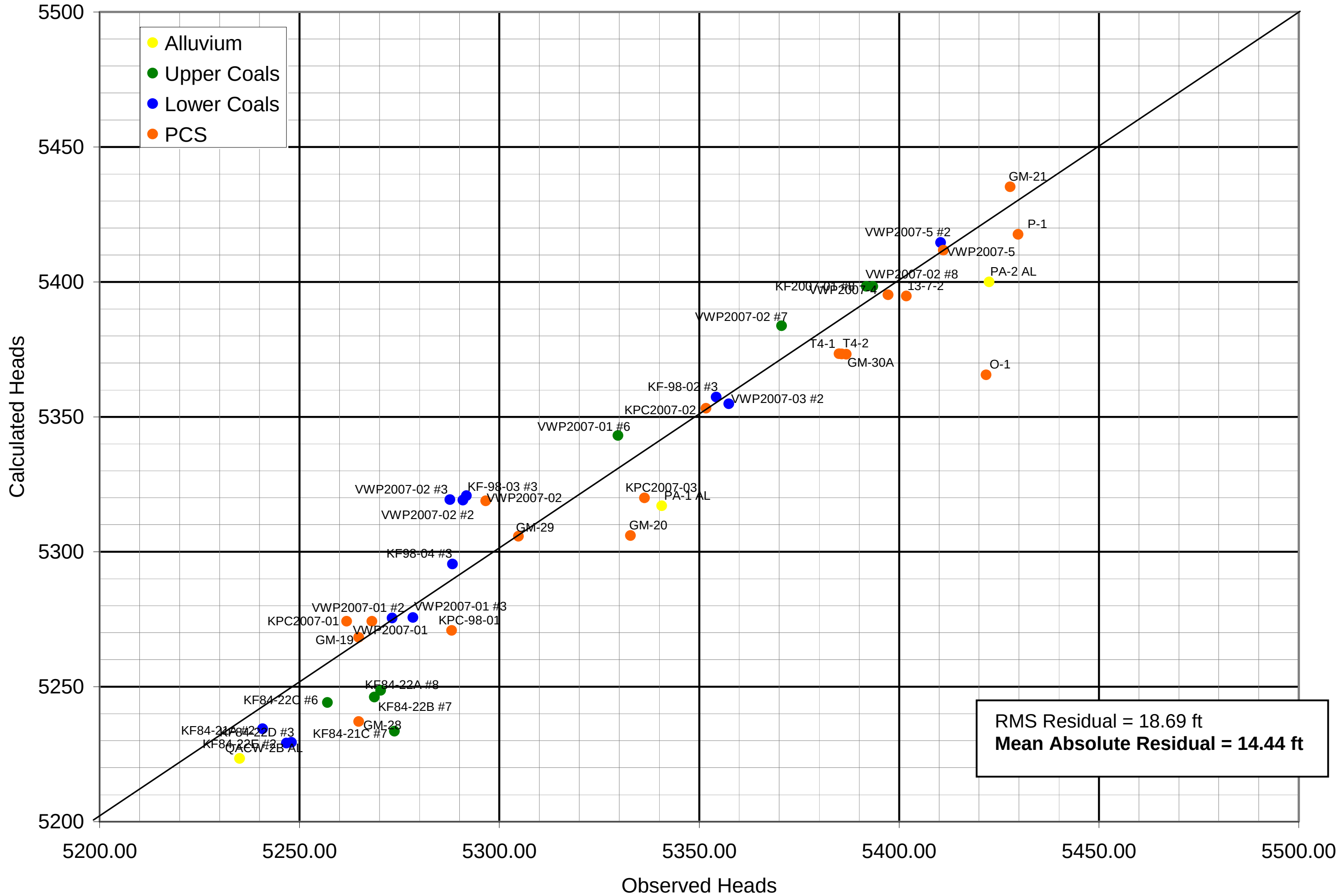


Figure 4-20. Sensitivity Analysis - Calculated vs. Observed Heads - Recharge = 0.8 x Calibrated Value

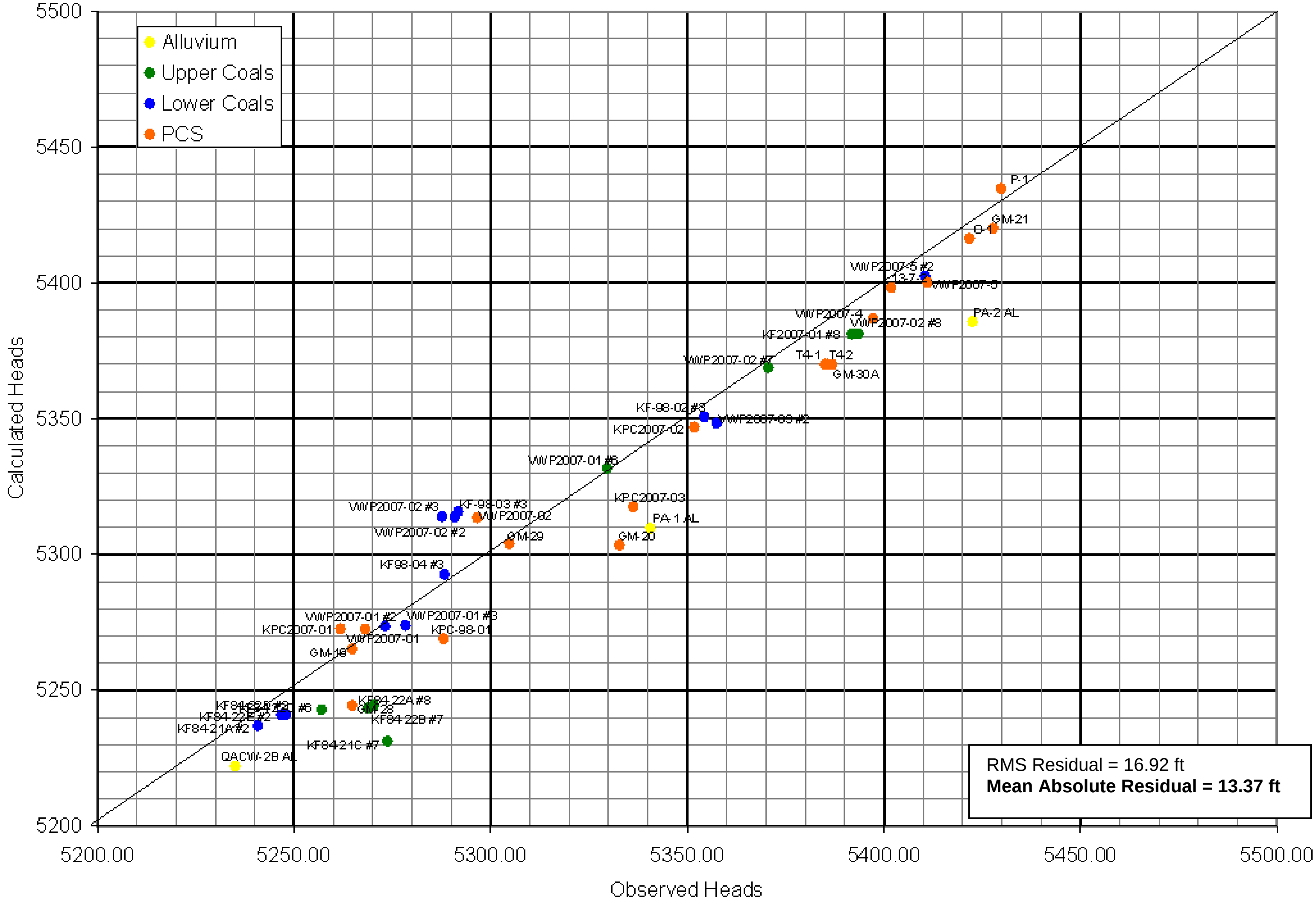


Figure 4-21. Sensitivity Analysis - Calculated vs. Observed Heads - Recharge = 1.2 x Calibrated Value

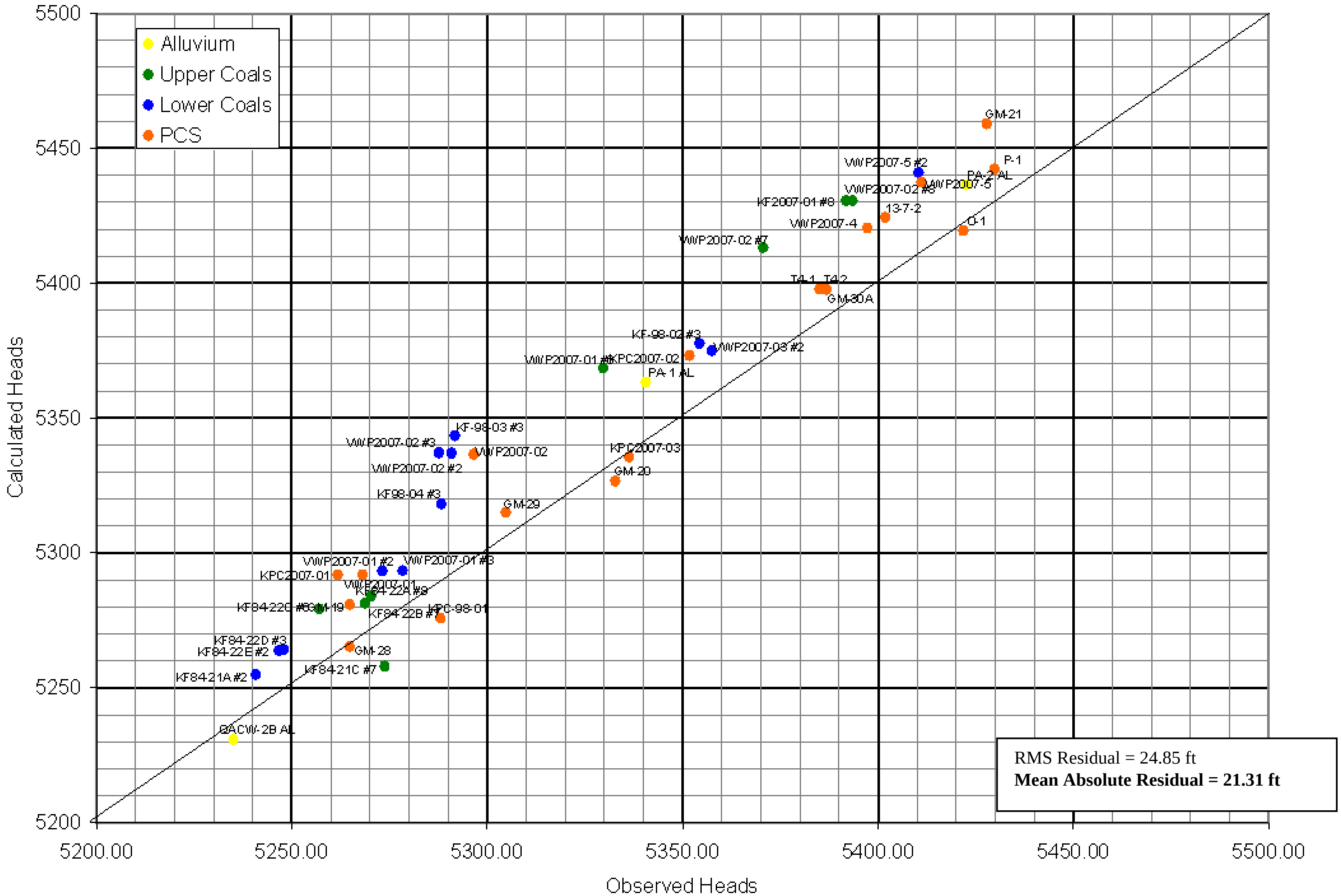


Figure 4-22. Drawdown and Recovery-Sensitivity Results Default Ss versus Base Ss

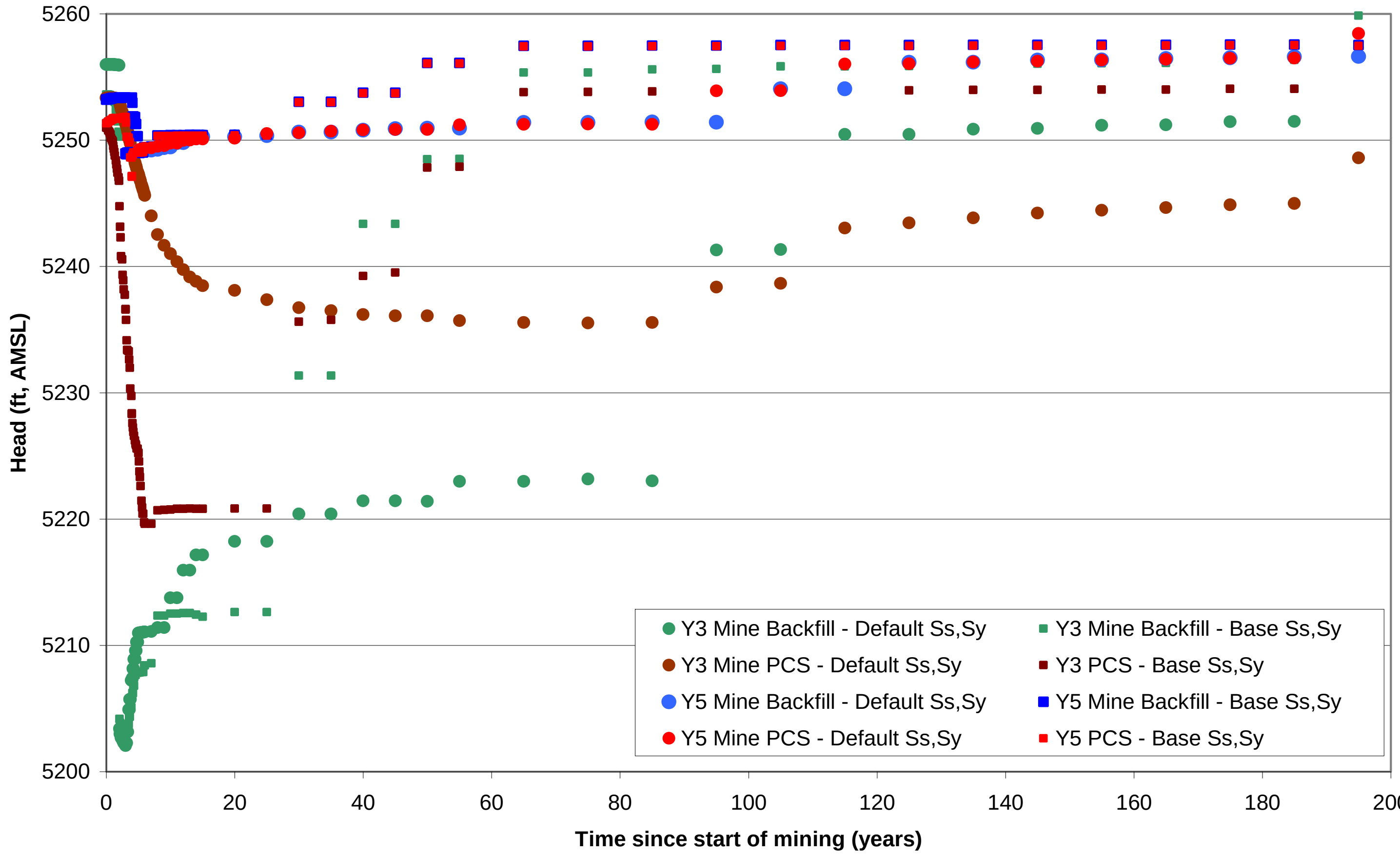
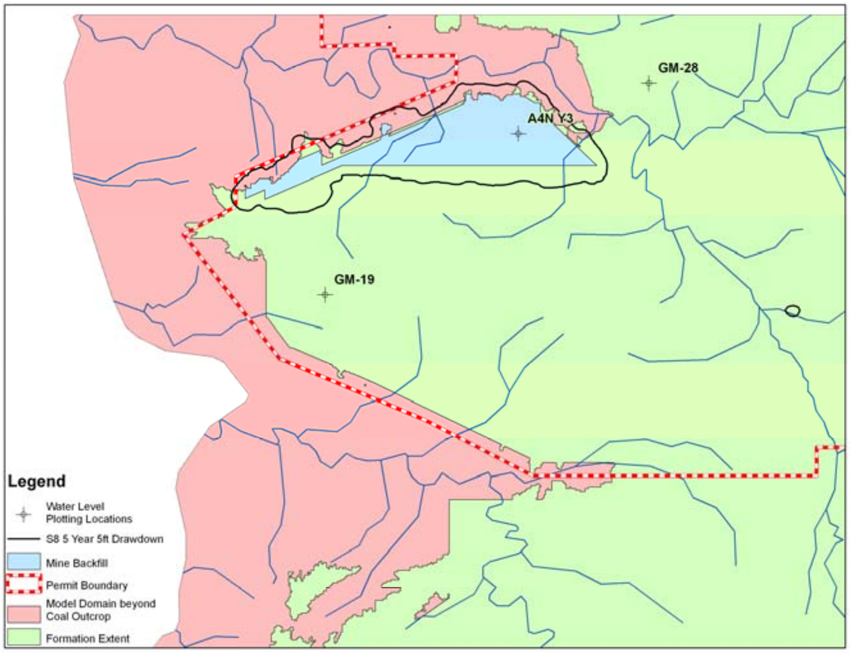


Figure 4-23. Maximum 5-foot Drawdown in No. 8 Coal –Sensitivity Results

Default Ss & Sy



Base Ss & Sy

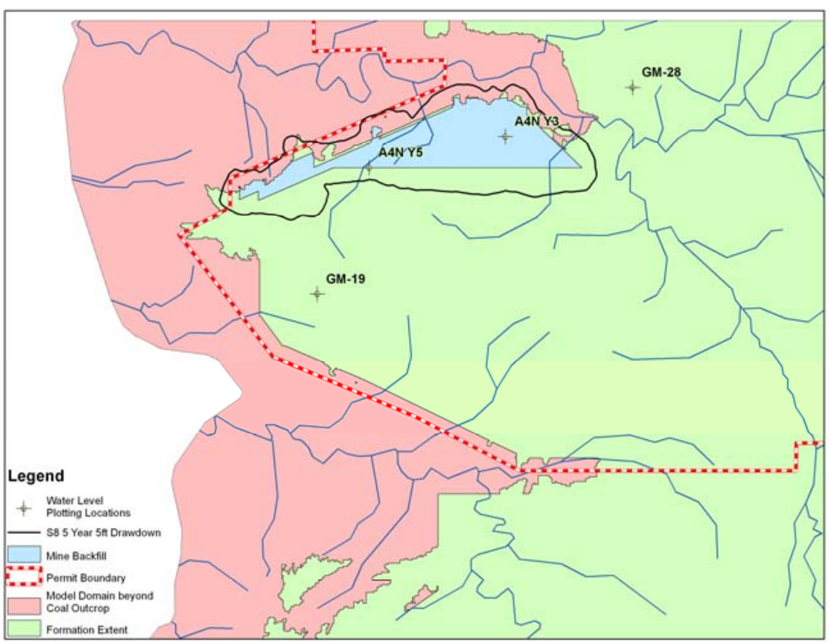
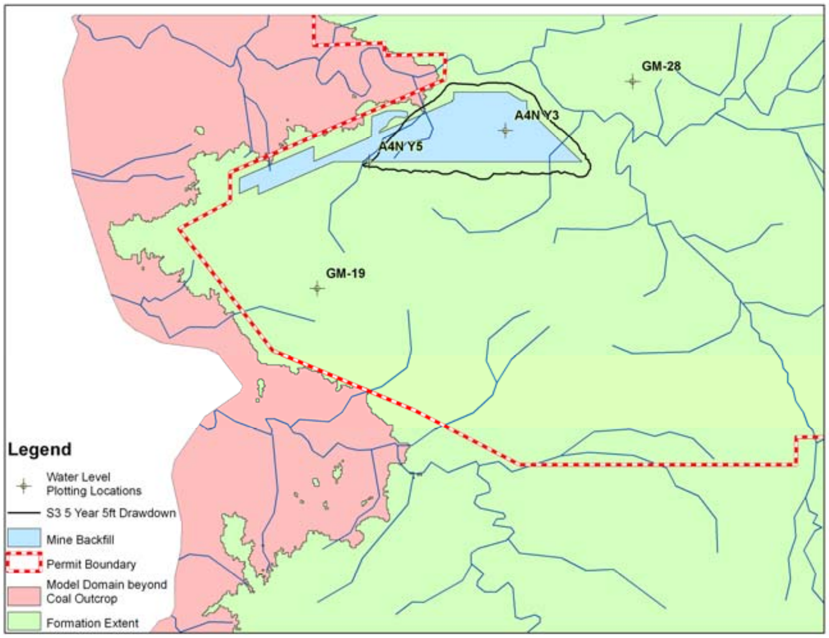


Figure 4-24. Maximum 5-foot Drawdown in No. 3 Coal –Sensitivity Results

Default Ss



Base Ss

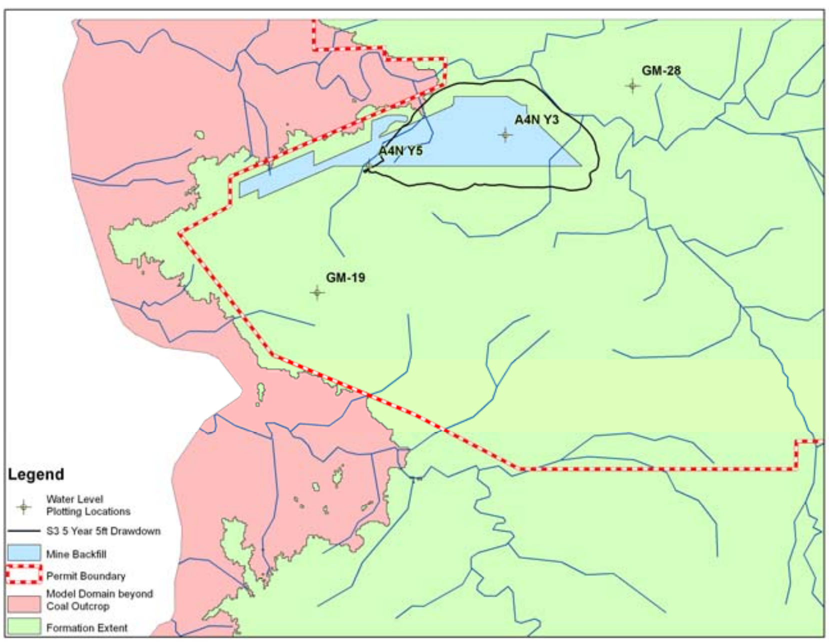
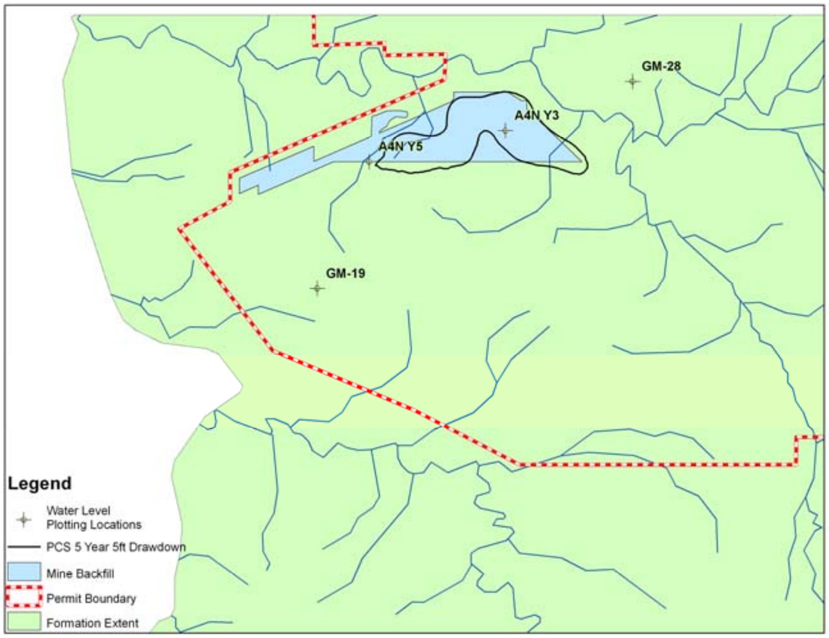
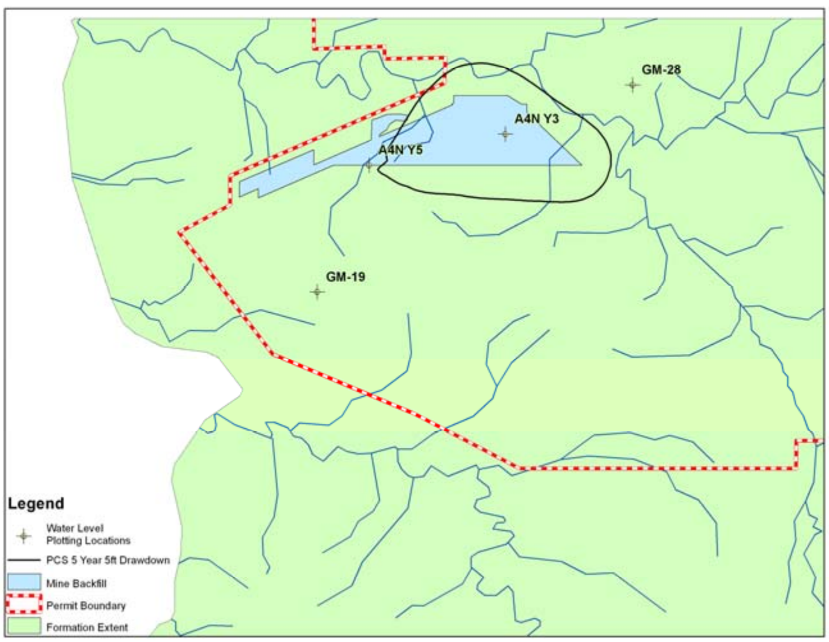


Figure 4-25. Maximum 5-foot Drawdown in PCS –Sensitivity Results

Default Ss



Base Ss



ATTACHMENT 1
HYDRAULIC CONDUCTIVITY AND STORAGE CHARACTERISTICS OF MODELED HYDROGEOLOGIC UNITS

Pinabete and Cottonwood Alluvium

The estimated range in hydraulic conductivities for the alluvial fill deposits within the valley bottoms of Cottonwood and Pinabete Arroyos within the model domain were obtained from constant rate pumping tests performed on wells PA-1 and PA-2 completed in Pinabete Alluvium within Area IV South on May 16, 1998. The test results are summarized in Table 6.G-4 in Appendix 6.G of the Navajo Mine permit application package (BNCC, 2011). These results indicate a hydraulic conductivity of 51.3 ft/day (1.8 x10-2 cm/sec) for well PA-1 and a hydraulic conductivity of 11.5 ft/day (4.1 x10-3 cm/sec) for well PA-2. Tests were not conducted on wells in Cottonwood Arroyo because wells were dry or had limited saturation insufficient for aquifer testing. However, the hydraulic conductivities for the Cottonwood Alluvium should be similar to that alluvial deposits along Pinabete Arroyo because the alluvial materials in the two arroyos are similar, ranging from fine-grained wind blown sand to coarse-grained sands and gravels.

Kernodele (1996) notes that the specific yield for the alluvium in the San Juan Basin would be in the range from 0.1 to 0.25 and that tests for specific storage have been performed because the alluvium is unconfined. The FEFLOW default specific yield of 0.2 is within the range indicated by Kernodele and has been used to represent the alluvium in the transient simulations. Physically, specific storage is a measure of the compressibility of the aquifer matrix and the expansion of water. In unconfined aquifers, changes in storage are controlled by the specific yield and not by the compressibility of the matrix or the water in storage.

Pictured Cliffs Sandstone

The hydraulic conductivities for the Pictured Cliffs Sandstone (PCS) from aquifer tests performed within the model domain are summarized in Table 6.G-11 in Appendix 6.G of the Navajo Mine permit application package (BNCC, 2011). Well KPC-98-01 was installed in 1998 near the PCS outcrop at the location west of Navajo Mine lease Area IV South. In 2007, wells KPC2007-01, KPC2007-02, and KPC2007-03 were completed in the PCS at locations around the perimeter of Area IV South. Water yields from these monitoring wells completed in the PCS at the Navajo Mine lease are quite low. Two of the PCS wells were quickly pumped or bailed dry during conventional sampling. The yield from one of the PCS wells was sufficient to sustain a rate of about 0.4 gallons per minute (gpm) during a constant rate pumping test. The fourth PCS monitoring well was pumped dry after about 140 minutes during a constant-rate pumping test at a rate of about 1 gpm.

An aquifer test was conducted by Science Application Inc. (1979) at well T4-1 installed in the PCS near the western side of the Navajo Mine Area V lease. The drawdown and recovery measurements were recorded at the pumped well, at observation well GM30A located 55.8 ft from the pumping well, and at observation well T4-2 located 12.5 ft from the pumping well. The top of the PCS is approximately 146 ft blow ground surface at the test location while the static water level was at a depth of 134 ft, demonstrating confined conditions at the test location. The results of this aquifer test are summarized in the attached table, along with the results of tests performed at the PCS monitoring wells installed within or adjacent to Area IV South.

The hydraulic conductivity from the recovery response at well GM-30A from the pumping test at the PCS well T4-1 was 0.0016 ft/day (5.6 x 10^{-7} cm/sec). The storage coefficient determined from the observation well response at GM-30A was 3.4 x 10^{-4}. A specific storage of 3.9 x 10^{-6} per foot is estimated based on the estimated PCS aquifer thickness of 84 feet at the test well location. The hydraulic conductivity estimate for the PCS of 0.02 ft/day (7.0 x 10^{-6} cm/sec) was obtained from the test at monitoring well KPC-98-01, located west of the Navajo Mine Area IV South coal lease. The PCS is unconfined at this location. The results for this well are consistent with the aquifer test results of 0.032 ft/day (1.1 x 10^{-5} cm/sec) from a slug test at Well O-1 completed in the PCS at the Burnham Mine but higher than the range from 0.0 to 0.0001 ft/day (2.6 x 10^{-6} to 3.5 10^{-8} cm/sec) obtained from the slug tests at the three other PCS monitoring wells at the Navajo Mine as summarized in the attached.

Pumping test results for the PCS monitoring well O-1 in the PAP for the Burnham Mine are on file in the library of the OSM in Denver. In this well test, pumping at a relatively high rate of 18.3 gpm could be sustained for only 8.7 minutes when most of the well-bore storage water was removed and the test had to be terminated. Although the results were interpreted in the Burnham Mine PAP as a pumping test, this approach is not correct due to the predominant influence of well-bore storage. Consequently, the well test results have been reinterpreted as a slug test in the attached table. Slug test results indicate a hydraulic conductivity of 0.032 ft/day (1.1 x 10^{-5} cm/sec).

There is no information in the literature concerning the specific yield for the PCS and little information concerning specific yield of sandstone aquifers. The specific yield is the storage parameter that applies only to the unconfined portion of the aquifer. Normally this is where the aquifer is shallow and often weathered. Johnson (1967) provides specific yield values ranging from about 0.1 to 0.3 for fine sands and sands. The New Mexico State Engineer (2010) provides specific yield estimates of 0.14 and 0.25 for well tests in the Mesa Verde Group. The Mesa Verde Group is comprised of inter bedded sedimentary deposits of sandstones, siltstones, shales and coals not unlike the Fruitland Formation and the PCS. Consequently, the FEFLOW default specific yield of 0.2 is within the range indicated by the Mesa Verde tests and has been used to represent both the PCS and the interburden and overburden sedimentary layers in the Fruitland Formation.

Summary of Pictured Cliffs Sandstone Aquifer Test Results

Well	Well Depth (ft)	Test type	Transmissivity (ft^2/day)	Hydraulic conductivity		Saturated thickness (ft)	Storage coefficient
				(ft/day)	(cm/sec)		
KPC-98-01	125.7	0.4 gpm pumping test	0.79	0.020	7.1E-06	39	NA
KPC2007-01	208.84	0.95 gpm, Theis analysis	0.576	0.0074	2.6E-06	78	NA
KPC2007-03	138.4	Bower and Rice	0.04	0.004	1.4E-06	10	NA
		Horslev slug test	0.9	0.09	3.2E-05	10	NA
Pumping test well T4-1	228	0.15 gpm pumping	0.1203	0.0014	4.9E-07	84	0.00032
Recovery test well GM-30A	191.6	Theis recovery	0.1337	0.0016	5.6E-07	84	0.00034
O-1[1]	414	Cooper slug test	2.7300	0.0321	1.1E-05	85	NA
		Horslev slug test	3.7500	0.0441	1.6E-05	85	NA

[1] Burnham Mine well pumped dry in 8.7 minutes at 18.3 gpm. Re-interpreted as a slug test

Fruitland Coals

The hydraulic conductivities for the Fruitland Formation coal zones have been obtained from aquifer tests performed within the model domain as summarized in Table 6.G-8 in Appendix 6.G of the Navajo Mine permit application package (BNCC, 2011) and from tests performed at Fruitland coal wells at Navajo Mine as summarized in Table 6-1 in the Navajo Mine permit application package (BNCC, 2011). The results of these aquifer tests are summarized in the attached table, including a description of the relevant coal unit tested. The upper coal units, #8 and #7 have higher hydraulic conductivities than the lower coal units. Test information is sufficient to establish a range for the hydraulic conductivities for the No. 8 coal, the No. 7 coal, and the No. 3 coal. Only one test result was found for the No. 6 coal, the No. 4 coal, and the No. 2 coal. These tests were within the range found for the No. 3 coal. Thus the range of hydraulic conductivity for the No. 3 coal is also used for all the lower coal seams. All of these tests were single well tests, which do not provide estimates of confined storage coefficients for the coals.

A storage coefficient estimate of 4.2 x 10^{-4} was reported in the Western Coal Company (1979) permit application for the San Juan Underground Mine Project. The thickness of the coal zone tested and the specific storage were not listed. However, the thickness of No. 8 coal unit at San Juan Mine averages about 15 feet, resulting in an approximate specific storage value of 2.8 x 10^{-5} per foot. A storage coefficient estimate of 1 x 10^{-5} was also obtained by Neimczyk and Walters (1980) using a single well step-test of Fruitland coal well GT-2 located east of the San Juan Mine. Based on an estimated 14.3 feet of coal in the test well, the specific storage of the coal is approximately of 3.9 x 10^{-6} per foot. The specific storage estimates determined from these tests for the Fruitland No. 8 coal are within the range of 1 x 10^{-3} to 3 x 10^{-7} per foot determined from fourteen pump tests of coal referenced by Rehm et al (1980). The average specific storage from these fourteen tests was 3 x 10^{-5} per foot, which is almost the same as the estimate for the No. 8 coal reported for the San Juan Underground Mine Project.

A lower specific yield of 0.5 % is used for the coals due to the low effective porosity of the coals. This specific yield value is consistent with the median value of 0.4% for coal was found in a comprehensive review of aquifer characteristics from pumping tests conducted in support of plans for coal mining and reclamation in the Powder River Basin (Applied Hydrology Associates and Greystone Environmental Consultants (2002).

Fruitland Overburden and Interburden

Laboratory tests of two samples of unconsolidated overburden material at the Navajo Mine found hydraulic conductivity values of 1.43 x 10^{-3} ft/day (5 x 10^{-7} cm/sec) and 9.64 x 10^{-4} ft/day (3.4 x 10^{-7} cm/sec). Frenzel and Lyford (1982) utilized literature estimates based on descriptions of the geology to estimate the horizontal hydraulic conductivity values for confining beds ranging from 8.64 x 10^{-3} ft/day to 8.64 x 10^{-4} ft/day. Vertical hydraulic conductivity values for the confining beds were estimated from model calibration and ranged from 5 x 10^{-6} ft/day to 8.64 x 10^{-8} ft/day and were generally 10^{-4} times lower than the horizontal hydraulic conductivities. Model calibration was very sensitive to the ratio.

Summary of Aquifer Test Results For Fruitland Coals

Well	Coal seam	Elevation (ft)	Well depth (ft)	Test type	Transmissivity (ft^2/day)	Hydraulic conductivity (ft/day)	Hydraulic conductivity (cm/sec)	Saturated thickness
Kf-98-02	#3	5505.89	216.5	Displacement Test	0.0010	0.0001	4.6E-08	7.5
Kf-98-03	#3	5423.45	133.9	Bailed Recovery Test	0.010	0.002	7.1E-07	5
Kf-98-04	#3	5351.80	64.8	Bailed Recovery Test	0.010	0.001	3.5E-07	10
Kf84-22D	#3	5124.20	220	MCWhorter Recovery	0.01	0.002	7.1E-07	5.0
Kpc2007-01	#8	5352.97	118	Papadopulos-Cooper Pumping Test	1.398	0.056	2.0E-05	25
SJKF84#3	#8	4990.18	120	MCWhorter Recovery	0.71	0.04	1.4E-05	18.0
SJKF84#4	#8	5046.67	71	MCWhorter Recovery	1.03	0.06	2.1E-05	18.0
SJKF84#5	#8	5092.00	180	MCWhorter Recovery	0.07	0.004	1.4E-06	18.0
KF84-20(d)	#7	5213.92	190	MCWhorter Recovery	0.01	0.002	7.1E-07	5.0
Kf84-21C	#7	5219.66	75	MCWhorter Recovery	0.04	0.008	2.8E-06	5.0
Kf84-22B	#7	5204.10	140	MCWhorter Recovery	0.02	0.003	1.1E-06	5.0
Kf84-22C	#4-6	5142.50	202	MCWhorter Recovery	0.01	0.0014	4.9E-07	7.0
Kf84-20A	#2	5163.78	240	MCWhorter Recovery	0.009	0.001	3.5E-07	10.0
Kf84-22E	#2	5107.80	237	MCWhorter Recovery	0.01	0.001	3.5E-07	10.0

Most estimates of vertical hydraulic conductivities of confining units, such as the Fruitland Formation interburden, are obtained indirectly by model calibration. Kaiser et al (1994) performed regional hydrogeologic modeling of the Fruitland Formation and overlying and underlying formations. They found that large ratios of horizontal to vertical hydraulic conductivity (kh/kv) on the order of (1000/1) were required to simulate observed heads. The New Mexico Office of the State Engineer Aquifer Test Index provides an estimate of the vertical hydraulic conductivity of 1 x 10^{-5} ft/day for a confining zone in the Brushy Basin Shale member of the Morrison Formation based on a long-term pumping test at well 16u162 located in the San Juan Basin in T27N, R13W, Sec 16 about 13 miles east of the Navajo Mine.

Mine Spoils

Based upon laboratory determinations in Appendix 11-K of the Navajo Mine permit application package (BNCC, 2011), the hydraulic conductivity or permeability of the backfilled spoil will be on the order of 1.13 x 10^{-2} ft/day (4 x 10^{-6} cm/sec). Laboratory tests are thought to provide a lower bound estimate of hydraulic conductivity of mine spoils. Saturated spoils are not found in the Navajo Mine permit area that could be assessed with a well test. However, some of the mine spoil in the pre-law Bitsui Pit is saturated. Well tests have not been performed on these saturated spoils but future testing plans are being considered. In the mean time, the geometric mean of mine spoils of 2.268 x 10^{-1} ft/day (8 x 10^{-5} cm/sec) obtained from tests on mine spoils at a number of mines in the Northern Great Plains (Rehm et al, 1980) provides information on the expected hydraulic properties of mine spoil. Laboratory tests of mine spoils in Appendix 11-K also indicate that mine spoils will have a porosity of about 40%.

A hydraulic conductivity value of 5.63 x 10^{-2} ft/day has been used in the post-reclamation model for the mine spoils in the backfill below 10 ft of the final reclaimed surface at Area IV North. This estimate of hydraulic conductivity for mine spoils was between the average of 1.13 x 10^{-2} ft/day estimated from laboratory tests on five mine spoil samples from the Navajo Mine (Physical Testing Laboratory Data provided in Appendix 11-K) and the estimate of 2.27 x 10^{-1} ft/day obtained by Rehm et al. (1980) from the geometric mean of 40 hydraulic conductivity values measured for mine spoils in the Northern Great Plains. A hydraulic conductivity value of 5.63 x 10^{-1} ft/day has been used to represent the model layer for the upper 10 ft within the mine backfill, which will be comprised of weathered spoil and topdressing material.

Appendix 41.C

SEDCAD^{TM}4 Modeling of Flood Flows and Sediment Yields for Mining Operation Conditions

APPENDIX 41.C

SEDCAD™4 MODELING OF FLOOD FLOWS AND SEDIMENT YIELDS FOR MINING OPERATION CONDITIONS

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APPENDIX 41.C

SEDCAD™4 MODELING OF FLOOD FLOWS AND SEDIMENT YIELDS FOR MINING OPERATION CONDITIONS

LIST OF ATTACHMENTS

SEDCAD™4 MODELING OF FLOOD FLOWS AND SEDIMENT YIELDS FOR MINING OPERATION CONDITIONS

The SEDCAD™4 (SEDCAD) hydrology model has been used to determine flood flows and sediment yields for the mining operation conditions for Pinabete Arroyo, Cottonwood Arroyo, and the unnamed tributary to the Chaco River located in the permit area. Application of the SEDCAD program involves dividing the drainage area into subwatersheds. Designation of subwatersheds with relatively uniform soil and vegetation characteristics helps in the estimation of model parameters required by SEDCAD. Information is required for physical structures located along the channel that may affect flow and sediment routing within the stream channels. SEDCAD null structures are also established at appropriate locations along the channel network where flow and sedimentology predictions are needed.

The SEDCAD input parameters are provided in tables to this appendix and output results for the 6-hour rainfall event at the 2-year, 10-year, 25-year, and 100-year frequency precipitation events are provided as attachments to this appendix. The post-mine SEDCAD models in Appendix 41.D were used as for modeling operating conditions. Storm water runoff from disturbed areas is retained by the mine pit, berms and sediment containment ponds during mine operations. These containment structures have sufficient capacity to contain the runoff from a 100year-6hour (100yr-6hr) precipitation event. Sediment ponds for reclaimed surfaces are sometimes designed to contain the runoff from a 10yr-24hr event but the worst case assumption for reduction in surface runoff is containment for runoff events in excess of the 100yr-6hr storm runoff.

The disturbed areas from which runoff is contained by the mine pit, berms and sediment containment ponds during mine operations have been delineated in Exhibit 41.2-1. The effect of these containment structures is simulated by generating zero runoff from the containment areas using the post-mine SEDCAD models. The model results from these SEDCAD model simulation for the Pinabete Arroyo, Cottonwood Arroyo, and the Chaco River Unnamed Tributary are provided in Attachment 41.C-1, Attachment 41.C-2, and Attachment 41.C-3, respectively .

Personnel

Persons or organizations responsible for data collection, analysis, and preparation of this appendix:

Kent Applegate	Norwest Corporation
Matt Owens	Denver, CO
BHP Navajo Coal Company	

Attachment 41.C-1

Pinabete Arroyo Hydrology and Sedimentology

SEDCAD™ Model Output During Mine Operations

PINABETE DRAINAGE

HYDROLOGY AND SEDIMENTOLOGY DURING MINING OPERATIONS

2-year, 6-hour Precipitation Event

Kevin Ritter

General Information

Storm Information:

Storm Type:	Type II-70
Design Storm:	2 yr - 6 hr
Rainfall Depth:	0.850 inches

Particle Size Distribution:

Size (mm)	P1	P2	P3	P4	P5	P6	P7
0.4250	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%
0.2500	85.529%	83.954%	83.494%	79.684%	74.336%	71.800%	68.824%
0.1500	72.267%	70.070%	68.714%	64.718%	55.514%	53.158%	47.671%
0.0750	58.134%	56.187%	54.477%	51.673%	42.977%	40.816%	35.579%
0.0159	49.962%	48.376%	46.844%	44.689%	37.721%	35.600%	31.445%
0.0100	38.953%	37.808%	36.471%	35.083%	30.403%	28.065%	25.380%
0.0050	9.675%	9.683%	9.177%	10.018%	9.205%	9.529%	8.929%
0.0020	6.279%	6.204%	5.875%	6.237%	5.303%	5.591%	4.938%
0.0010	6.010%	5.917%	5.567%	5.908%	4.905%	5.155%	4.462%
0.0004	4.942%	4.914%	4.659%	5.035%	4.387%	4.686%	4.216%

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Null	#1	==>	#2	1.674	0.331	
Null	#2	==>	#5	4.188	0.295	
Null	#3	==>	#4	1.961	0.319	
Null	#4	==>	#5	3.103	0.304	
Null	#5	==>	#6	1.300	0.273	
Null	#6	==>	#7	0.995	0.281	EAST LEASE BNDY
Null	#7	==>	#8	2.793	0.277	
Null	#8	==>	#9	2.630	0.259	WEST LEASE BNDY
Null	#9	==>	End	0.000	0.000	
Null	#10	==>	#9	1.961	0.281	

Structure Routing Details:

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	8. Large gullies, diversions, and low flowing streams	1.24	250.00	20,136.00	3.34	1.674

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	**Muskingum K:**					**1.674**
#2	8. Large gullies, diversions, and low flowing streams	0.67	245.00	36,791.00	2.44	4.188
#2	**Muskingum K:**					**4.188**
#3	8. Large gullies, diversions, and low flowing streams	0.99	210.00	21,118.00	2.99	1.961
#3	**Muskingum K:**					**1.961**
#4	8. Large gullies, diversions, and low flowing streams	0.77	227.00	29,388.00	2.63	3.103
#4	**Muskingum K:**					**3.103**
#5	8. Large gullies, diversions, and low flowing streams	0.47	45.00	9,601.00	2.05	1.300
#5	**Muskingum K:**					**1.300**
#6	8. Large gullies, diversions, and low flowing streams	0.54	42.00	7,845.00	2.19	0.995
#6	**Muskingum K:**					**0.995**
#7	8. Large gullies, diversions, and low flowing streams	0.49	105.00	21,218.00	2.11	2.793
#7	**Muskingum K:**					**2.793**
#8	8. Large gullies, diversions, and low flowing streams	0.37	64.00	17,238.00	1.82	2.630
#8	**Muskingum K:**					**2.630**
#10	8. Large gullies, diversions, and low flowing streams	0.53	82.00	15,391.00	2.18	1.961
#10	**Muskingum K:**					**1.961**

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc. (ml/l)	24VW (ml/l)
#10	282.000	282.000	0.00	0.00	0.0	1	0.00	0.00
#3	3,941.300	3,941.300	53.32	11.34	210.3	19,141	1.79	1.27
#4	3,216.300	7,157.600	99.02	29.46	588.4	31,027	3.42	1.60
#1	8,452.701	8,452.701	154.36	42.53	701.9	27,440	3.84	1.69
#2	3,838.600	12,291.300	330.91	91.70	1,663.7	30,481	3.51	1.53
#5	5,441.700	24,890.600	409.05	193.50	2,426.9	16,195	1.30	0.74
#6	3,064.700	27,955.300	404.64	227.82	2,245.0	13,165	0.63	0.35
#7	2,633.600	30,588.900	401.25	233.71	2,221.6	14,571	0.63	0.30
#8	5,652.000	36,240.900	394.42	267.50	2,077.6	35,603	1.98	0.32
#9	2,037.000	38,559.900	389.95	282.36	2,249.5	26,088	1.70	0.38

Particle Size Distribution(s) at Each Structure

Structure #10:

Size (mm)	In/Out
0.4250	0.000%
0.2500	0.000%
0.1500	0.000%
0.0750	0.000%
0.0159	0.000%
0.0100	0.000%
0.0050	0.000%
0.0020	0.000%
0.0010	0.000%
0.0004	0.000%

Structure #3:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	100.000%
0.0159	98.225%
0.0100	93.241%
0.0050	39.535%
0.0020	21.924%
0.0010	19.855%
0.0004	18.769%

Structure #4:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	100.000%
0.0159	100.000%

Size (mm)	In/Out
0.0100	89.679%
0.0050	41.421%
0.0020	23.581%
0.0010	21.548%
0.0004	19.948%

Structure #1:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	100.000%
0.0159	100.000%
0.0100	86.314%
0.0050	32.994%
0.0020	19.815%
0.0010	18.393%
0.0004	16.392%

Structure #2:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	100.000%
0.0159	98.787%
0.0100	90.397%
0.0050	32.553%
0.0020	20.003%
0.0010	18.789%
0.0004	16.270%

Structure #5:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	100.000%
0.0159	98.547%
0.0100	94.837%

Size (mm)	In/Out
0.0050	43.464%
0.0020	26.423%
0.0010	24.724%
0.0004	21.615%

Structure #6 (EAST LEASE BNDY):

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	100.000%
0.0159	100.000%
0.0100	99.051%
0.0050	51.192%
0.0020	31.223%
0.0010	29.246%
0.0004	25.505%

Structure #7:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	100.000%
0.0159	100.000%
0.0100	99.738%
0.0050	52.415%
0.0020	31.943%
0.0010	29.916%
0.0004	26.100%

Structure #8 (WEST LEASE BNDY):

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	99.094%
0.0159	98.568%
0.0100	96.675%
0.0050	59.445%

Size (mm)	In/Out
0.0020	36.205%
0.0010	33.888%
0.0004	29.597%

Structure #9:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	100.000%
0.0159	98.243%
0.0100	95.119%
0.0050	58.848%
0.0020	35.742%
0.0010	33.424%
0.0004	29.258%

Structure Detail:

Structure #10 (Null)

Structure #3 (Null)

Structure #4 (Null)

Structure #1 (Null)

Structure #2 (Null)

Structure #5 (Null)

Structure #6 (Null)

EAST LEASE BNDY

Structure #7 (Null)

Structure #8 (Null)

WEST LEASE BNDY

Structure #9 (Null)

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#10	1	58.000	0.152	0.000	0.000	1.000	M	0.00	0.000
	2	90.000	0.305	0.054	0.353	1.000	M	0.00	0.000
	3	134.000	0.290	0.121	0.360	1.000	M	0.00	0.000
	Σ	**282.000**						**0.00**	**0.000**
#3	1	790.200	1.145	1.181	0.350	80.800	M	19.09	2.677
	2	1,064.500	0.915	0.596	0.351	80.800	M	30.68	3.607
	3	428.300	0.571	0.319	0.355	81.300	M	19.94	1.609
	4	742.900	0.625	0.000	0.000	78.500	M	15.07	1.479
	5	915.400	1.119	0.000	0.000	78.800	M	13.10	1.968
	Σ	**3,941.300**						**53.32**	**11.339**
#4	1	539.800	0.726	1.710	0.319	81.700	M	22.91	2.192
	2	443.800	0.503	1.429	0.318	86.000	M	56.01	3.768
	3	890.000	0.815	0.998	0.318	82.100	M	37.70	3.901
	4	1,342.700	0.919	0.000	0.000	84.000	M	75.51	8.259
	Σ	**7,157.600**						**99.02**	**29.460**
#1	1	1,249.000	1.349	1.345	0.354	80.800	M	26.47	4.230
	2	1,652.000	1.465	0.849	0.360	80.300	M	28.99	5.030
	3	1,407.200	1.573	1.241	0.357	81.100	M	28.30	5.069
	4	839.600	1.102	0.977	0.364	81.000	M	21.93	2.963
	5	687.100	1.067	1.113	0.365	81.600	M	21.13	2.735
	6	1,223.200	0.778	0.596	0.352	81.800	M	50.32	5.064
	7	740.100	0.745	0.530	0.354	83.600	M	45.39	4.253
	8	654.500	0.801	0.000	0.000	92.200	M	144.42	13.182
	Σ	**8,452.701**						**154.36**	**42.526**
#2	1	610.100	0.668	1.219	0.340	85.700	M	59.37	4.944
	2	537.100	0.610	1.436	0.329	91.600	M	133.06	10.008
	3	455.000	0.546	1.288	0.324	82.000	M	25.57	1.958
	4	619.100	0.634	0.852	0.324	87.900	M	88.84	6.954
	5	664.000	0.452	0.453	0.315	91.200	M	189.97	11.736
	6	953.300	0.984	0.000	0.000	89.600	M	125.57	13.576
	Σ	**12,291.300**						**330.91**	**91.702**
#5	1	758.800	0.682	3.507	0.293	84.100	M	54.69	4.748
	2	946.400	1.117	2.231	0.289	89.200	M	106.38	12.754
	3	1,015.600	0.996	1.587	0.291	92.000	M	184.77	19.929
	4	688.700	1.908	1.255	0.291	80.800	M	11.06	2.332
	5	754.300	2.307	1.084	0.287	86.200	M	29.27	6.590
	6	623.600	0.538	0.595	0.301	93.000	M	202.72	13.951

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
	7	654.300	0.560	0.000	0.000	91.500	M	169.62	12.031
	Σ	**24,890.600**						**409.05**	**193.498**
#6	1	886.000	1.151	1.896	0.315	81.100	M	22.88	3.192
	2	1,011.200	1.871	0.166	0.287	83.500	M	29.16	5.706
	3	1,167.500	1.126	0.000	0.000	92.800	M	214.91	25.420
	Σ	**27,955.300**						**404.64**	**227.815**
#7	1	971.600	0.819	0.665	0.285	82.900	M	48.38	4.937
	2	1,467.100	2.587	0.000	0.000	75.000	M	2.85	0.930
	3	194.900	0.596	0.000	0.000	72.600	M	0.13	0.030
	Σ	**30,588.900**						**401.25**	**233.712**
#8	1	392.000	0.538	2.912	0.280	93.000	M	127.43	8.770
	2	565.000	0.734	2.659	0.279	92.400	M	136.68	11.688
	3	684.000	0.853	2.311	0.280	87.600	M	74.88	7.359
	4	716.000	1.690	2.328	0.277	76.200	M	2.99	0.720
	5	400.000	0.740	1.423	0.277	79.500	M	9.66	1.019
	6	313.000	0.436	1.168	0.285	85.600	M	40.90	2.500
	7	197.000	0.448	0.938	0.279	83.800	M	18.36	1.172
	8	112.000	0.412	0.707	0.318	1.000	M	0.00	0.000
	9	197.000	0.396	1.003	0.317	1.000	M	0.00	0.000
	10	221.000	0.388	0.417	0.339	1.000	M	0.00	0.000
	11	102.000	0.283	0.232	0.317	83.300	M	11.77	0.559
	12	64.000	0.259	0.356	0.398	1.000	M	0.00	0.000
	13	130.000	0.524	0.232	0.317	1.000	M	0.00	0.000
	14	90.000	0.301	0.443	0.321	1.000	M	0.00	0.000
	15	235.000	0.636	0.232	0.317	1.000	M	0.00	0.000
	16	229.000	0.596	0.384	0.382	1.000	M	0.00	0.000
	17	275.000	0.552	0.503	0.312	1.000	M	0.00	0.000
	18	359.000	0.666	0.503	0.312	1.000	M	0.00	0.000
	19	166.000	0.519	0.129	0.319	1.000	M	0.00	0.000
	20	128.000	0.585	0.000	0.000	1.000	M	0.00	0.000
	21	77.000	0.650	0.000	0.000	1.000	M	0.00	0.000
	Σ	**36,240.900**						**394.42**	**267.499**
#9	1	0.000	0.000	0.000	0.000	1.000	M	0.00	0.000
	2	432.000	0.633	2.204	0.256	84.900	M	38.13	3.082
	3	177.000	0.686	1.864	0.256	84.900	M	14.70	1.263
	4	565.000	0.655	0.983	0.255	85.800	M	56.75	4.651
	5	863.000	0.668	0.000	0.000	84.600	M	69.30	5.870
	Σ	**38,559.900**						**389.95**	**282.363**

Subwatershed Sedimentology Detail:

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
#10	1	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	2	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	3	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	Σ							**0.0**	**1**	**0.00**	**0.00**
#3	1	0.150	100.00	9.10	0.3050	1.0000	18	52.9	19,967	2.38	1.72
	2	0.181	100.00	10.10	0.3050	1.0000	13	118.7	33,740	7.21	5.12
	3	0.151	200.00	5.50	0.3050	1.0000	18	33.1	22,318	6.72	4.53
	4	0.183	130.00	7.60	0.3160	1.0000	12	37.3	27,396	5.82	3.91
	5	0.185	100.00	8.30	0.2760	1.0000	6	34.8	18,046	1.01	0.72
	Σ							**210.3**	**19,141**	**1.79**	**1.27**
#4	1	0.173	130.00	7.00	0.2850	1.0000	7	46.3	21,798	5.61	3.97
	2	0.148	100.00	12.00	0.2220	1.0000	5	128.9	35,591	11.48	8.02
	3	0.185	75.00	13.60	0.2740	1.0000	17	161.4	42,361	9.86	6.98
	4	0.213	100.00	10.60	0.2330	1.0000	6	301.2	37,919	7.35	5.14
	Σ							**588.4**	**31,027**	**3.42**	**1.60**
#1	1	0.220	280.00	2.20	0.2960	1.0000	13	36.5	8,683	0.93	0.68
	2	0.202	240.00	3.30	0.2960	1.0000	13	53.7	10,679	0.78	0.57
	3	0.206	280.00	2.60	0.2960	1.0000	13	45.7	9,006	0.67	0.49
	4	0.188	200.00	5.10	0.2960	1.0000	13	55.4	18,982	3.23	2.32
	5	0.124	240.00	3.60	0.3130	1.0000	18	22.5	8,414	1.35	0.97
	6	0.178	130.00	7.90	0.2850	1.0000	7	132.8	27,364	6.68	4.66
	7	0.191	100.00	9.20	0.2540	1.0000	6	120.1	29,544	7.02	4.89
	8	0.199	75.00	15.10	0.1510	1.0000	2	458.1	35,717	7.36	5.20
	Σ							**701.9**	**27,440**	**3.84**	**1.69**
#2	1	0.188	130.00	7.30	0.2120	1.0000	5	104.7	22,050	5.75	4.03
	2	0.199	75.00	12.60	0.1510	1.0000	2	297.2	30,342	7.80	5.56
	3	0.200	100.00	8.60	0.2020	1.0000	11	42.3	22,810	3.56	2.46
	4	0.193	75.00	12.30	0.1730	1.0000	4	208.1	31,115	7.25	5.08
	5	0.187	75.00	14.00	0.1590	1.0000	3	450.0	40,005	12.97	9.02
	6	0.198	75.00	13.70	0.1680	1.0000	4	421.6	31,932	4.74	3.35
	Σ							**1,663.7**	**30,481**	**3.51**	**1.53**
#5	1	0.213	130.00	6.30	0.2330	1.0000	6	105.7	22,424	5.99	4.34
	2	0.209	130.00	7.10	0.1680	1.0000	4	211.7	16,677	1.81	1.32
	3	0.191	100.00	8.40	0.1500	1.0000	2	320.7	16,240	2.30	1.67
	4	0.235	200.00	4.90	0.2870	1.0000	9	38.5	16,281	0.77	0.57
	5	0.220	240.00	3.70	0.1900	1.0000	16	48.8	7,379	0.40	0.30
	6	0.200	130.00	7.30	0.1410	1.0000	1	263.4	19,552	5.62	3.96
	7	0.204	200.00	4.70	0.1560	1.0000	2	201.9	17,706	4.83	3.35

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
	Σ							**2,426.9**	**16,195**	**1.30**	**0.74**
#6	1	0.228	280.00	2.70	0.2870	1.0000	9	34.8	10,963	1.85	1.34
	2	0.226	280.00	2.40	0.2330	1.0000	6	39.9	7,033	0.39	0.28
	3	0.200	200.00	4.20	0.1460	1.0000	1	289.5	11,653	1.27	0.91
	Σ							**2,245.0**	**13,165**	**0.63**	**0.35**
#7	1	0.197	280.00	2.70	0.2330	1.0000	5	47.3	9,977	1.52	1.07
	2	0.204	420.00	1.80	0.3270	1.0000	19	4.4	4,393	0.12	0.09
	3	0.171	280.00	2.40	0.3380	1.0000	10	0.1	3,042	1.47	1.32
	Σ							**2,221.6**	**14,571**	**0.63**	**0.30**
#8	1	0.200	280.00	2.70	0.1410	1.0000	1	69.0	7,873	2.26	1.66
	2	0.204	280.00	2.30	0.1550	1.0000	3	81.8	7,051	1.76	1.28
	3	0.173	280.00	3.00	0.2220	1.0000	6	69.6	9,604	2.65	1.92
	4	0.204	280.00	3.00	0.3180	1.0000	19	5.3	6,968	0.23	0.18
	5	0.187	200.00	5.90	0.2960	1.0000	12	22.0	22,133	4.47	3.18
	6	0.167	200.00	4.20	0.2740	1.0000	8	48.8	20,530	8.86	6.15
	7	0.215	100.00	9.40	0.2650	1.0000	20	42.6	38,368	15.89	10.94
	8	0.201	100.00	8.10	0.2960	1.0000	13	0.0	1	0.00	0.00
	9	0.208	280.00	2.70	0.2120	1.0000	15	0.0	1	0.00	0.00
	10	0.225	200.00	4.50	0.2540	1.0000	14	0.0	1	0.00	0.00
	11	0.198	100.00	9.20	0.2450	1.0000	6	18.1	36,430	14.84	9.57
	12	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	13	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	14	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	15	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	16	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	17	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	18	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	19	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	20	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	21	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	Σ							**2,077.6**	**35,603**	**1.98**	**0.32**
#9	1	0.206	130.00	7.80	0.1800	1.0000	16	0.0	1	0.00	0.00
	2	0.189	100.00	11.10	0.2450	1.0000	6	117.8	38,662	11.49	8.24
	3	0.177	100.00	8.30	0.2330	1.0000	6	23.4	18,952	5.31	3.79
	4	0.161	100.00	10.00	0.2220	1.0000	5	119.3	26,555	7.09	4.99
	5	0.175	200.00	5.90	0.2450	1.0000	6	136.7	24,930	7.00	4.77
	Σ							**2,249.5**	**26,088**	**1.70**	**0.38**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	2.99	22.00	736.00	1.720	0.118
		8. Large gullies, diversions, and low flowing streams	0.63	66.00	10,511.00	2.370	1.231
#1	**1**	**Time of Concentration:**					**1.349**
#1	2	5. Nearly bare and untilled, and alluvial valley fans	1.02	8.00	785.00	1.000	0.218
		8. Large gullies, diversions, and low flowing streams	1.48	242.00	16,353.00	3.640	1.247
#1	**2**	**Time of Concentration:**					**1.465**
#1	3	5. Nearly bare and untilled, and alluvial valley fans	0.88	10.00	1,136.10	0.930	0.339
		8. Large gullies, diversions, and low flowing streams	1.31	200.00	15,244.00	3.430	1.234
#1	**3**	**Time of Concentration:**					**1.573**
#1	4	5. Nearly bare and untilled, and alluvial valley fans	1.85	10.00	542.00	1.350	0.111
		8. Large gullies, diversions, and low flowing streams	1.62	220.00	13,595.00	3.810	0.991
#1	**4**	**Time of Concentration:**					**1.102**
#1	5	5. Nearly bare and untilled, and alluvial valley fans	1.23	10.00	812.00	1.100	0.205
		8. Large gullies, diversions, and low flowing streams	1.41	156.00	11,049.00	3.560	0.862
#1	**5**	**Time of Concentration:**					**1.067**
#1	6	5. Nearly bare and untilled, and alluvial valley fans	3.12	22.00	706.00	1.760	0.111
		8. Large gullies, diversions, and low flowing streams	2.85	346.00	12,152.00	5.060	0.667
#1	**6**	**Time of Concentration:**					**0.778**
#1	7	5. Nearly bare and untilled, and alluvial valley fans	4.66	43.00	922.01	2.150	0.119
		8. Large gullies, diversions, and low flowing streams	2.67	295.00	11,057.38	4.900	0.626
#1	**7**	**Time of Concentration:**					**0.745**
#1	8	5. Nearly bare and untilled, and alluvial valley fans	7.46	65.00	871.00	2.730	0.088
		8. Large gullies, diversions, and low flowing streams	2.61	324.00	12,433.00	4.840	0.713
#1	**8**	**Time of Concentration:**					**0.801**
#2	1	5. Nearly bare and untilled, and alluvial valley fans	6.24	30.00	481.00	2.490	0.053
		8. Large gullies, diversions, and low flowing streams	3.34	406.00	12,141.00	5.480	0.615
#2	**1**	**Time of Concentration:**					**0.668**
#2	2	5. Nearly bare and untilled, and alluvial valley fans	3.16	30.00	950.00	1.770	0.149
		8. Large gullies, diversions, and low flowing streams	4.22	432.00	10,229.00	6.160	0.461
#2	**2**	**Time of Concentration:**					**0.610**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#2	3	5. Nearly bare and untilled, and alluvial valley fans	2.65	10.00	378.00	1.620	0.064
		8. Large gullies, diversions, and low flowing streams	2.72	234.00	8,592.00	4.950	0.482
#2	**3**	**Time of Concentration:**					**0.546**
#2	4	5. Nearly bare and untilled, and alluvial valley fans	3.07	25.00	815.00	1.750	0.129
		8. Large gullies, diversions, and low flowing streams	3.32	330.00	9,931.00	5.460	0.505
#2	**4**	**Time of Concentration:**					**0.634**
#2	5	5. Nearly bare and untilled, and alluvial valley fans	7.45	45.00	604.00	2.720	0.061
		8. Large gullies, diversions, and low flowing streams	3.78	310.00	8,210.00	5.820	0.391
#2	**5**	**Time of Concentration:**					**0.452**
#2	6	5. Nearly bare and untilled, and alluvial valley fans	9.10	80.00	879.00	3.010	0.081
		8. Large gullies, diversions, and low flowing streams	2.32	344.00	14,831.00	4.560	0.903
#2	**6**	**Time of Concentration:**					**0.984**
#3	1	5. Nearly bare and untilled, and alluvial valley fans	1.29	15.00	1,163.00	1.130	0.285
		8. Large gullies, diversions, and low flowing streams	2.37	338.00	14,280.00	4.610	0.860
#3	**1**	**Time of Concentration:**					**1.145**
#3	2	5. Nearly bare and untilled, and alluvial valley fans	3.04	33.00	1,087.00	1.740	0.173
		8. Large gullies, diversions, and low flowing streams	2.06	238.00	11,527.00	4.310	0.742
#3	**2**	**Time of Concentration:**					**0.915**
#3	3	5. Nearly bare and untilled, and alluvial valley fans	5.02	45.00	897.00	2.230	0.111
		8. Large gullies, diversions, and low flowing streams	3.09	270.00	8,741.00	5.270	0.460
#3	**3**	**Time of Concentration:**					**0.571**
#3	4	5. Nearly bare and untilled, and alluvial valley fans	7.41	28.00	378.00	2.720	0.038
		8. Large gullies, diversions, and low flowing streams	3.43	402.00	11,736.00	5.550	0.587
#3	**4**	**Time of Concentration:**					**0.625**
#3	5	5. Nearly bare and untilled, and alluvial valley fans	3.39	30.00	885.00	1.840	0.133
		8. Large gullies, diversions, and low flowing streams	2.58	442.00	17,121.00	4.820	0.986
#3	**5**	**Time of Concentration:**					**1.119**
#4	1	5. Nearly bare and untilled, and alluvial valley fans	3.59	62.00	1,729.00	1.890	0.254
		8. Large gullies, diversions, and low flowing streams	2.09	154.00	7,372.00	4.330	0.472
#4	**1**	**Time of Concentration:**					**0.726**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#4	2	5. Nearly bare and untilled, and alluvial valley fans	6.83	25.00	366.00	2.610	0.038
		8. Large gullies, diversions, and low flowing streams	2.36	182.00	7,708.00	4.600	0.465
#4	**2**	**Time of Concentration:**					**0.503**
#4	3	5. Nearly bare and untilled, and alluvial valley fans	19.03	47.00	247.00	4.360	0.015
		8. Large gullies, diversions, and low flowing streams	2.13	268.00	12,586.00	4.370	0.800
#4	**3**	**Time of Concentration:**					**0.815**
#4	4	5. Nearly bare and untilled, and alluvial valley fans	14.08	50.00	355.00	3.750	0.026
		8. Large gullies, diversions, and low flowing streams	2.46	372.00	15,119.00	4.700	0.893
#4	**4**	**Time of Concentration:**					**0.919**
#5	1	5. Nearly bare and untilled, and alluvial valley fans	12.55	65.00	518.00	3.540	0.040
		8. Large gullies, diversions, and low flowing streams	1.92	184.00	9,592.00	4.150	0.642
#5	**1**	**Time of Concentration:**					**0.682**
#5	2	5. Nearly bare and untilled, and alluvial valley fans	5.10	30.00	588.00	2.250	0.072
		8. Large gullies, diversions, and low flowing streams	1.77	266.00	15,016.00	3.990	1.045
#5	**2**	**Time of Concentration:**					**1.117**
#5	3	5. Nearly bare and untilled, and alluvial valley fans	1.90	20.00	1,050.00	1.380	0.211
		8. Large gullies, diversions, and low flowing streams	2.19	274.00	12,532.00	4.430	0.785
#5	**3**	**Time of Concentration:**					**0.996**
#5	4	5. Nearly bare and untilled, and alluvial valley fans	2.78	32.00	1,152.00	1.660	0.192
		8. Large gullies, diversions, and low flowing streams	0.99	182.00	18,415.00	2.980	1.716
#5	**4**	**Time of Concentration:**					**1.908**
#5	5	5. Nearly bare and untilled, and alluvial valley fans	2.52	23.00	911.00	1.580	0.160
		8. Large gullies, diversions, and low flowing streams	1.07	256.00	23,965.00	3.100	2.147
#5	**5**	**Time of Concentration:**					**2.307**
#5	6	5. Nearly bare and untilled, and alluvial valley fans	6.36	25.00	393.00	2.520	0.043
		8. Large gullies, diversions, and low flowing streams	2.39	198.00	8,272.00	4.640	0.495
#5	**6**	**Time of Concentration:**					**0.538**
#5	7	5. Nearly bare and untilled, and alluvial valley fans	9.66	28.00	290.00	3.100	0.025
		8. Large gullies, diversions, and low flowing streams	2.12	179.00	8,427.00	4.370	0.535
#5	**7**	**Time of Concentration:**					**0.560**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#6	1	5. Nearly bare and untilled, and alluvial valley fans	31.83	120.00	377.00	5.640	0.018
		8. Large gullies, diversions, and low flowing streams	1.38	198.00	14,361.00	3.520	1.133
#6	**1**	**Time of Concentration:**					**1.151**
#6	2	5. Nearly bare and untilled, and alluvial valley fans	4.25	40.00	941.00	2.060	0.126
		8. Large gullies, diversions, and low flowing streams	0.96	176.00	18,407.00	2.930	1.745
#6	**2**	**Time of Concentration:**					**1.871**
#6	3	5. Nearly bare and untilled, and alluvial valley fans	4.35	25.00	575.00	2.080	0.076
		8. Large gullies, diversions, and low flowing streams	1.57	224.00	14,223.00	3.760	1.050
#6	**3**	**Time of Concentration:**					**1.126**
#7	1	5. Nearly bare and untilled, and alluvial valley fans	2.51	10.00	399.00	1.580	0.070
		8. Large gullies, diversions, and low flowing streams	1.11	95.00	8,524.00	3.160	0.749
#7	**1**	**Time of Concentration:**					**0.819**
#7	3	5. Nearly bare and untilled, and alluvial valley fans	2.14	14.00	655.00	1.460	0.124
		8. Large gullies, diversions, and low flowing streams	1.07	56.00	5,255.00	3.090	0.472
#7	**3**	**Time of Concentration:**					**0.596**
#8	1	5. Nearly bare and untilled, and alluvial valley fans	1.97	5.00	254.00	1.400	0.050
		8. Large gullies, diversions, and low flowing streams	1.64	111.00	6,755.00	3.840	0.488
#8	**1**	**Time of Concentration:**					**0.538**
#8	2	5. Nearly bare and untilled, and alluvial valley fans	2.49	8.00	321.00	1.570	0.056
		8. Large gullies, diversions, and low flowing streams	1.16	91.00	7,866.00	3.220	0.678
#8	**2**	**Time of Concentration:**					**0.734**
#8	3	5. Nearly bare and untilled, and alluvial valley fans	3.58	25.00	698.00	1.890	0.102
		8. Large gullies, diversions, and low flowing streams	1.12	96.00	8,579.00	3.170	0.751
#8	**3**	**Time of Concentration:**					**0.853**
#8	4	5. Nearly bare and untilled, and alluvial valley fans	0.85	10.00	1,181.00	0.920	0.356
		8. Large gullies, diversions, and low flowing streams	0.90	123.00	13,645.00	2.840	1.334
#8	**4**	**Time of Concentration:**					**1.690**
#8	5	5. Nearly bare and untilled, and alluvial valley fans	6.53	39.00	597.00	2.550	0.065
		8. Large gullies, diversions, and low flowing streams	1.42	123.00	8,678.00	3.570	0.675
#8	**5**	**Time of Concentration:**					**0.740**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#8	6	5. Nearly bare and untilled, and alluvial valley fans	1.45	5.00	344.00	1.200	0.079
		8. Large gullies, diversions, and low flowing streams	2.21	127.00	5,746.00	4.460	0.357
#8	**6**	**Time of Concentration:**					**0.436**
#8	7	5. Nearly bare and untilled, and alluvial valley fans	2.98	12.00	403.00	1.720	0.065
		8. Large gullies, diversions, and low flowing streams	1.97	114.00	5,796.00	4.200	0.383
#8	**7**	**Time of Concentration:**					**0.448**
#8	8	5. Nearly bare and untilled, and alluvial valley fans	9.90	200.00	2,020.00	3.140	0.178
		8. Large gullies, diversions, and low flowing streams	0.83	19.20	2,307.00	2.730	0.234
#8	**8**	**Time of Concentration:**					**0.412**
#8	9	5. Nearly bare and untilled, and alluvial valley fans	5.71	80.00	1,400.00	2.390	0.162
		8. Large gullies, diversions, and low flowing streams	0.83	19.20	2,307.00	2.730	0.234
#8	**9**	**Time of Concentration:**					**0.396**
#8	10	5. Nearly bare and untilled, and alluvial valley fans	5.00	60.00	1,200.00	2.230	0.149
		8. Large gullies, diversions, and low flowing streams	1.75	60.00	3,422.00	3.970	0.239
#8	**10**	**Time of Concentration:**					**0.388**
#8	11	5. Nearly bare and untilled, and alluvial valley fans	4.84	24.00	496.00	2.190	0.062
		8. Large gullies, diversions, and low flowing streams	2.79	111.00	3,980.20	5.000	0.221
#8	**11**	**Time of Concentration:**					**0.283**
#8	12	5. Nearly bare and untilled, and alluvial valley fans	5.00	70.00	1,400.00	2.230	0.174
		8. Large gullies, diversions, and low flowing streams	2.67	40.00	1,500.00	4.890	0.085
#8	**12**	**Time of Concentration:**					**0.259**
#8	13	5. Nearly bare and untilled, and alluvial valley fans	4.44	40.00	900.00	2.100	0.119
		8. Large gullies, diversions, and low flowing streams	1.05	47.00	4,479.00	3.070	0.405
#8	**13**	**Time of Concentration:**					**0.524**
#8	14	5. Nearly bare and untilled, and alluvial valley fans	5.00	60.00	1,200.00	2.230	0.149
		8. Large gullies, diversions, and low flowing streams	1.81	40.20	2,216.00	4.040	0.152
#8	**14**	**Time of Concentration:**					**0.301**
#8	15	5. Nearly bare and untilled, and alluvial valley fans	10.00	70.00	700.00	3.160	0.061
		8. Large gullies, diversions, and low flowing streams	1.28	90.00	7,023.00	3.390	0.575
#8	**15**	**Time of Concentration:**					**0.636**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#8	16	5. Nearly bare and untilled, and alluvial valley fans	2.00	50.00	2,500.00	1.410	0.492
		8. Large gullies, diversions, and low flowing streams	1.12	13.40	1,196.00	3.170	0.104
#8	**16**	**Time of Concentration:**					**0.596**
#8	17	5. Nearly bare and untilled, and alluvial valley fans	7.27	80.00	1,100.00	2.690	0.113
		8. Large gullies, diversions, and low flowing streams	0.70	27.80	3,969.00	2.510	0.439
#8	**17**	**Time of Concentration:**					**0.552**
#8	18	5. Nearly bare and untilled, and alluvial valley fans	5.63	90.00	1,600.00	2.370	0.187
		8. Large gullies, diversions, and low flowing streams	0.74	33.00	4,452.00	2.580	0.479
#8	**18**	**Time of Concentration:**					**0.666**
#8	19	5. Nearly bare and untilled, and alluvial valley fans	7.89	150.00	1,900.00	2.800	0.188
		8. Large gullies, diversions, and low flowing streams	0.70	21.00	2,997.00	2.510	0.331
#8	**19**	**Time of Concentration:**					**0.519**
#8	20	5. Nearly bare and untilled, and alluvial valley fans	3.33	110.00	3,300.00	1.820	0.503
		8. Large gullies, diversions, and low flowing streams	0.70	5.20	746.00	2.500	0.082
#8	**20**	**Time of Concentration:**					**0.585**
#8	21	5. Nearly bare and untilled, and alluvial valley fans	4.19	130.00	3,100.00	2.040	0.422
		8. Large gullies, diversions, and low flowing streams	0.70	14.50	2,068.00	2.510	0.228
#8	**21**	**Time of Concentration:**					**0.650**
#9	1	5. Nearly bare and untilled, and alluvial valley fans	7.42	25.00	337.00	2.720	0.034
		8. Large gullies, diversions, and low flowing streams	1.50	107.00	7,136.00	3.670	0.540
#9	**1**	**Time of Concentration:**					**0.000**
#9	2	5. Nearly bare and untilled, and alluvial valley fans	11.19	15.00	134.00	3.340	0.011
		8. Large gullies, diversions, and low flowing streams	1.96	184.00	9,391.00	4.190	0.622
#9	**2**	**Time of Concentration:**					**0.633**
#9	3	5. Nearly bare and untilled, and alluvial valley fans	3.14	25.00	796.00	1.770	0.124
		8. Large gullies, diversions, and low flowing streams	1.68	132.00	7,862.00	3.880	0.562
#9	**3**	**Time of Concentration:**					**0.686**
#9	4	5. Nearly bare and untilled, and alluvial valley fans	12.82	35.00	273.00	3.580	0.021
		8. Large gullies, diversions, and low flowing streams	1.93	183.00	9,495.00	4.160	0.634
#9	**4**	**Time of Concentration:**					**0.655**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#9	5	5. Nearly bare and untilled, and alluvial valley fans	2.66	15.00	564.00	1.630	0.096
		8. Large gullies, diversions, and low flowing streams	1.68	135.00	8,020.00	3.890	0.572
#9	**5**	**Time of Concentration:**					**0.668**
#10	1	5. Nearly bare and untilled, and alluvial valley fans	10.00	80.00	800.00	3.160	0.070
		8. Large gullies, diversions, and low flowing streams	1.80	21.60	1,197.00	4.020	0.082
#10	**1**	**Time of Concentration:**					**0.152**
#10	2	5. Nearly bare and untilled, and alluvial valley fans	8.00	40.00	500.00	2.820	0.049
		8. Large gullies, diversions, and low flowing streams	1.48	50.00	3,373.00	3.650	0.256
#10	**2**	**Time of Concentration:**					**0.305**
#10	3	5. Nearly bare and untilled, and alluvial valley fans	7.78	70.00	900.00	2.780	0.089
		8. Large gullies, diversions, and low flowing streams	2.50	85.90	3,435.00	4.740	0.201
#10	**3**	**Time of Concentration:**					**0.290**

Subwatershed Muskingum Routing Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	8. Large gullies, diversions, and low flowing streams	1.89	378.00	19,958.00	4.120	1.345
#1	**1**	**Muskingum K:**					**1.345**
#1	2	8. Large gullies, diversions, and low flowing streams	2.11	282.00	13,337.00	4.360	0.849
#1	**2**	**Muskingum K:**					**0.849**
#1	3	8. Large gullies, diversions, and low flowing streams	2.02	384.00	19,036.00	4.260	1.241
#1	**3**	**Muskingum K:**					**1.241**
#1	4	8. Large gullies, diversions, and low flowing streams	2.28	364.00	15,948.82	4.530	0.977
#1	**4**	**Muskingum K:**					**0.977**
#1	5	8. Large gullies, diversions, and low flowing streams	2.33	428.00	18,360.00	4.580	1.113
#1	**5**	**Muskingum K:**					**1.113**
#1	6	8. Large gullies, diversions, and low flowing streams	1.82	158.00	8,675.00	4.040	0.596
#1	**6**	**Muskingum K:**					**0.596**
#1	7	8. Large gullies, diversions, and low flowing streams	1.89	149.00	7,868.00	4.120	0.530
#1	**7**	**Muskingum K:**					**0.530**
#2	1	8. Large gullies, diversions, and low flowing streams	1.44	228.00	15,800.00	3.600	1.219
#2	**1**	**Muskingum K:**					**1.219**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#2	2	8. Large gullies, diversions, and low flowing streams	1.19	202.00	16,912.00	3.270	1.436
#2	**2**	**Muskingum K:**					**1.436**
#2	3	8. Large gullies, diversions, and low flowing streams	1.10	160.00	14,568.00	3.140	1.288
#2	**3**	**Muskingum K:**					**1.288**
#2	4	8. Large gullies, diversions, and low flowing streams	1.09	104.00	9,576.00	3.120	0.852
#2	**4**	**Muskingum K:**					**0.852**
#2	5	8. Large gullies, diversions, and low flowing streams	0.93	44.00	4,715.00	2.890	0.453
#2	**5**	**Muskingum K:**					**0.453**
#3	1	8. Large gullies, diversions, and low flowing streams	1.75	294.00	16,845.00	3.960	1.181
#3	**1**	**Muskingum K:**					**1.181**
#3	2	8. Large gullies, diversions, and low flowing streams	1.79	154.00	8,609.00	4.010	0.596
#3	**2**	**Muskingum K:**					**0.596**
#3	3	8. Large gullies, diversions, and low flowing streams	1.93	92.00	4,778.00	4.160	0.319
#3	**3**	**Muskingum K:**					**0.319**
#4	1	8. Large gullies, diversions, and low flowing streams	1.01	186.00	18,477.00	3.000	1.710
#4	**1**	**Muskingum K:**					**1.710**
#4	2	8. Large gullies, diversions, and low flowing streams	0.98	150.00	15,281.00	2.970	1.429
#4	**2**	**Muskingum K:**					**1.429**
#4	3	8. Large gullies, diversions, and low flowing streams	0.98	104.00	10,645.00	2.960	0.998
#4	**3**	**Muskingum K:**					**0.998**
#5	1	8. Large gullies, diversions, and low flowing streams	0.64	195.00	30,309.00	2.400	3.507
#5	**1**	**Muskingum K:**					**3.507**
#5	2	8. Large gullies, diversions, and low flowing streams	0.60	113.00	18,717.00	2.330	2.231
#5	**2**	**Muskingum K:**					**2.231**
#5	3	8. Large gullies, diversions, and low flowing streams	0.63	85.00	13,541.00	2.370	1.587
#5	**3**	**Muskingum K:**					**1.587**
#5	4	8. Large gullies, diversions, and low flowing streams	0.63	67.00	10,710.00	2.370	1.255
#5	**4**	**Muskingum K:**					**1.255**
#5	5	8. Large gullies, diversions, and low flowing streams	0.59	53.00	8,978.00	2.300	1.084
#5	**5**	**Muskingum K:**					**1.084**
#5	6	8. Large gullies, diversions, and low flowing streams	0.74	41.00	5,528.00	2.580	0.595
#5	**6**	**Muskingum K:**					**0.595**
#6	1	8. Large gullies, diversions, and low flowing streams	0.94	186.00	19,797.00	2.900	1.896

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#6	**1**	**Muskingum K:**					**1.896**
#6	2	8. Large gullies, diversions, and low flowing streams	0.58	8.00	1,372.00	2.290	0.166
#6	**2**	**Muskingum K:**					**0.166**
#7	1	8. Large gullies, diversions, and low flowing streams	0.57	31.00	5,417.00	2.260	0.665
#7	**1**	**Muskingum K:**					**0.665**
#8	1	8. Large gullies, diversions, and low flowing streams	0.53	120.00	22,753.13	2.170	2.912
#8	**1**	**Muskingum K:**					**2.912**
#8	2	8. Large gullies, diversions, and low flowing streams	0.51	106.00	20,587.00	2.150	2.659
#8	**2**	**Muskingum K:**					**2.659**
#8	3	8. Large gullies, diversions, and low flowing streams	0.53	95.00	18,060.00	2.170	2.311
#8	**3**	**Muskingum K:**					**2.311**
#8	4	8. Large gullies, diversions, and low flowing streams	0.50	88.00	17,689.00	2.110	2.328
#8	**4**	**Muskingum K:**					**2.328**
#8	5	8. Large gullies, diversions, and low flowing streams	0.50	54.00	10,815.00	2.110	1.423
#8	**5**	**Muskingum K:**					**1.423**
#8	6	8. Large gullies, diversions, and low flowing streams	0.57	54.00	9,503.00	2.260	1.168
#8	**6**	**Muskingum K:**					**1.168**
#8	7	8. Large gullies, diversions, and low flowing streams	0.51	37.00	7,229.00	2.140	0.938
#8	**7**	**Muskingum K:**					**0.938**
#8	8	8. Large gullies, diversions, and low flowing streams	0.98	50.00	5,079.00	2.970	0.475
		8. Large gullies, diversions, and low flowing streams	0.97	24.00	2,468.00	2.950	0.232
#8	**8**	**Muskingum K:**					**0.707**
#8	9	8. Large gullies, diversions, and low flowing streams	0.93	29.00	3,107.00	2.890	0.298
		8. Large gullies, diversions, and low flowing streams	0.98	74.00	7,547.17	2.970	0.705
#8	**9**	**Muskingum K:**					**1.003**
#8	10	8. Large gullies, diversions, and low flowing streams	1.71	50.00	2,916.00	3.920	0.206
		8. Large gullies, diversions, and low flowing streams	1.09	26.00	2,379.00	3.130	0.211
#8	**10**	**Muskingum K:**					**0.417**
#8	11	8. Large gullies, diversions, and low flowing streams	0.97	24.00	2,468.00	2.950	0.232
#8	**11**	**Muskingum K:**					**0.232**
#8	12	9. Small streams flowing bankfull	0.98	39.00	3,979.00	8.900	0.124
		8. Large gullies, diversions, and low flowing streams	0.97	24.00	2,468.00	2.950	0.232
#8	**12**	**Muskingum K:**					**0.356**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#8	13	8. Large gullies, diversions, and low flowing streams	0.97	24.00	2,468.00	2.950	0.232
#8	**13**	**Muskingum K:**					**0.232**
#8	14	8. Large gullies, diversions, and low flowing streams	1.09	26.00	2,379.00	3.130	0.211
		8. Large gullies, diversions, and low flowing streams	0.97	24.00	2,468.00	2.950	0.232
#8	**14**	**Muskingum K:**					**0.443**
#8	15	8. Large gullies, diversions, and low flowing streams	0.97	24.00	2,468.00	2.950	0.232
#8	**15**	**Muskingum K:**					**0.232**
#8	16	8. Large gullies, diversions, and low flowing streams	0.71	20.00	2,800.00	2.530	0.307
		9. Small streams flowing bankfull	0.97	24.00	2,468.00	8.870	0.077
#8	**16**	**Muskingum K:**					**0.384**
#8	17	8. Large gullies, diversions, and low flowing streams	0.84	31.00	3,697.00	2.740	0.374
		8. Large gullies, diversions, and low flowing streams	1.00	14.00	1,400.00	3.000	0.129
#8	**17**	**Muskingum K:**					**0.503**
#8	18	8. Large gullies, diversions, and low flowing streams	0.88	45.00	5,097.00	2.810	0.503
#8	**18**	**Muskingum K:**					**0.503**
#8	19	8. Large gullies, diversions, and low flowing streams	1.00	14.00	1,400.00	3.000	0.129
#8	**19**	**Muskingum K:**					**0.129**
#9	2	8. Large gullies, diversions, and low flowing streams	0.36	51.00	14,207.00	1.790	2.204
#9	**2**	**Muskingum K:**					**2.204**
#9	3	8. Large gullies, diversions, and low flowing streams	0.36	43.00	12,015.00	1.790	1.864
#9	**3**	**Muskingum K:**					**1.864**
#9	4	8. Large gullies, diversions, and low flowing streams	0.35	22.00	6,269.00	1.770	0.983
#9	**4**	**Muskingum K:**					**0.983**
#10	2	8. Large gullies, diversions, and low flowing streams	1.88	15.00	800.00	4.100	0.054
#10	**2**	**Muskingum K:**					**0.054**
#10	3	8. Large gullies, diversions, and low flowing streams	2.11	40.00	1,897.00	4.350	0.121
#10	**3**	**Muskingum K:**					**0.121**

PINABETE DRAINAGE

HYDROLOGY AND SEDIMENTOLOGY DURING MINING OPERATIONS

10-year, 6-hour Precipitation Event

Kevin Ritter

General Information

Storm Information:

Storm Type:	Type II-70
Design Storm:	10 yr - 6 hr
Rainfall Depth:	1.280 inches

Particle Size Distribution:

Size (mm)	P1	P2	P3	P4	P5	P6	P7
0.4250	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%
0.2500	85.529%	83.954%	83.494%	79.684%	74.336%	71.800%	68.824%
0.1500	72.267%	70.070%	68.714%	64.718%	55.514%	53.158%	47.671%
0.0750	58.134%	56.187%	54.477%	51.673%	42.977%	40.816%	35.579%
0.0159	49.962%	48.376%	46.844%	44.689%	37.721%	35.600%	31.445%
0.0100	38.953%	37.808%	36.471%	35.083%	30.403%	28.065%	25.380%
0.0050	9.675%	9.683%	9.177%	10.018%	9.205%	9.529%	8.929%
0.0020	6.279%	6.204%	5.875%	6.237%	5.303%	5.591%	4.938%
0.0010	6.010%	5.917%	5.567%	5.908%	4.905%	5.155%	4.462%
0.0004	4.942%	4.914%	4.659%	5.035%	4.387%	4.686%	4.216%

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc. (ml/l)	24VW (ml/l)
#10	282.000	282.000	0.00	0.00	0.0	1	0.00	0.00
#3	3,941.300	3,941.300	260.89	48.54	1,137.1	23,455	4.13	3.01
#4	3,216.300	7,157.600	373.14	106.61	2,518.5	37,600	5.82	2.66
#1	8,452.701	8,452.701	591.37	138.82	2,545.8	31,258	5.38	2.31
#2	3,838.600	12,291.300	789.58	255.29	4,555.7	31,954	4.09	1.67
#5	5,441.700	24,890.600	1,129.03	529.45	8,635.3	22,777	2.23	1.17
#6	3,064.700	27,955.300	1,119.16	611.73	8,049.4	19,310	1.15	0.58
#7	2,633.600	30,588.900	1,112.69	638.40	7,921.2	20,125	1.10	0.50
#8	5,652.000	36,240.900	1,094.55	721.44	7,521.3	40,425	2.95	0.56
#9	2,037.000	38,559.900	1,080.95	764.77	7,972.8	30,005	2.53	0.64

Particle Size Distribution(s) at Each Structure

Structure #10:

Size (mm)	In/Out
0.4250	0.000%
0.2500	0.000%
0.1500	0.000%
0.0750	0.000%
0.0159	0.000%
0.0100	0.000%
0.0050	0.000%
0.0020	0.000%
0.0010	0.000%
0.0004	0.000%

Structure #3:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	94.497%
0.0159	91.497%
0.0100	81.629%
0.0050	32.291%
0.0020	17.946%
0.0010	16.271%
0.0004	15.354%

Structure #4:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	99.861%
0.0159	94.248%

Size (mm)	In/Out
0.0100	84.197%
0.0050	35.479%
0.0020	20.145%
0.0010	18.392%
0.0004	17.068%

Structure #1:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	100.000%
0.0159	97.062%
0.0100	82.425%
0.0050	28.715%
0.0020	16.850%
0.0010	15.534%
0.0004	14.088%

Structure #2:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	100.000%
0.0159	98.030%
0.0100	88.399%
0.0050	32.409%
0.0020	19.605%
0.0010	18.330%
0.0004	16.071%

Structure #5:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	99.689%
0.0159	97.841%
0.0100	93.240%

Size (mm)	In/Out
0.0050	35.075%
0.0020	20.995%
0.0010	19.544%
0.0004	17.321%

Structure #6 (EAST LEASE BNDY):

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	100.000%
0.0159	100.000%
0.0100	98.684%
0.0050	40.573%
0.0020	24.366%
0.0010	22.703%
0.0004	20.077%

Structure #7:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	100.000%
0.0159	99.823%
0.0100	99.393%
0.0050	42.285%
0.0020	25.356%
0.0010	23.622%
0.0004	20.906%

Structure #8 (WEST LEASE BNDY):

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	99.861%
0.0750	98.555%
0.0159	97.795%
0.0100	95.776%
0.0050	47.354%

Size (mm)	In/Out
0.0020	28.373%
0.0010	26.419%
0.0004	23.408%

Structure #9:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	98.395%
0.0159	96.567%
0.0100	93.954%
0.0050	47.972%
0.0020	28.692%
0.0010	26.701%
0.0004	23.691%

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#10	1	58.000	0.152	0.000	0.000	1.000	M	0.00	0.000
	2	90.000	0.305	0.054	0.353	1.000	M	0.00	0.000
	3	134.000	0.290	0.121	0.360	1.000	M	0.00	0.000
	Σ	**282.000**						**0.00**	**0.000**
#3	1	790.200	1.145	1.181	0.350	80.800	M	84.82	10.674
	2	1,064.500	0.915	0.596	0.351	80.800	M	136.68	14.385
	3	428.300	0.571	0.319	0.355	81.300	M	83.75	6.131
	4	742.900	0.625	0.000	0.000	78.500	M	94.68	7.608
	5	915.400	1.119	0.000	0.000	78.800	M	77.18	9.738
	Σ	**3,941.300**						**260.89**	**48.537**
#4	1	539.800	0.726	1.710	0.319	81.700	M	92.50	8.076
	2	443.800	0.503	1.429	0.318	86.000	M	157.15	10.402
	3	890.000	0.815	0.998	0.318	82.100	M	146.29	13.911
	4	1,342.700	0.919	0.000	0.000	84.000	M	249.13	25.690
	Σ	**7,157.600**						**373.14**	**106.615**
#1	1	1,249.000	1.349	1.345	0.354	80.800	M	117.25	16.868
	2	1,652.000	1.465	0.849	0.360	80.300	M	136.05	21.053
	3	1,407.200	1.573	1.241	0.357	81.100	M	120.72	19.666
	4	839.600	1.102	0.977	0.364	81.000	M	95.29	11.603
	5	687.100	1.067	1.113	0.365	81.600	M	86.10	10.160
	6	1,223.200	0.778	0.596	0.352	81.800	M	201.15	18.502
	7	740.100	0.745	0.530	0.354	83.600	M	154.44	13.584
	8	654.500	0.801	0.000	0.000	92.200	M	302.90	27.380
	Σ	**8,452.701**						**591.37**	**138.816**
#2	1	610.100	0.668	1.219	0.340	85.700	M	172.28	13.878
	2	537.100	0.610	1.436	0.329	91.600	M	284.92	21.301
	3	455.000	0.546	1.288	0.324	82.000	M	99.75	7.037
	4	619.100	0.634	0.852	0.324	87.900	M	225.52	17.417
	5	664.000	0.452	0.453	0.315	91.200	M	409.55	25.393
	6	953.300	0.984	0.000	0.000	89.600	M	295.56	31.445
	Σ	**12,291.300**						**789.58**	**255.286**
#5	1	758.800	0.682	3.507	0.293	84.100	M	178.60	14.673
	2	946.400	1.117	2.231	0.289	89.200	M	255.45	30.071
	3	1,015.600	0.996	1.587	0.291	92.000	M	391.75	41.732
	4	688.700	1.908	1.255	0.291	80.800	M	48.50	9.300
	5	754.300	2.307	1.084	0.287	86.200	M	82.71	17.997
	6	623.600	0.538	0.595	0.301	93.000	M	405.92	28.067

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
	7	654.300	0.560	0.000	0.000	91.500	M	363.86	25.711
	Σ	**24,890.600**						**1,129.03**	**529.452**
#6	1	886.000	1.151	1.896	0.315	81.100	M	98.28	12.385
	2	1,011.200	1.871	0.166	0.287	83.500	M	99.27	18.352
	3	1,167.500	1.126	0.000	0.000	92.800	M	440.92	51.546
	Σ	**27,955.300**						**1,119.16**	**611.735**
#7	1	971.600	0.819	0.665	0.285	82.900	M	174.43	16.563
	2	1,467.100	2.587	0.000	0.000	75.000	M	35.28	9.274
	3	194.900	0.596	0.000	0.000	72.600	M	9.50	0.831
	Σ	**30,588.900**						**1,112.69**	**638.403**
#8	1	392.000	0.538	2.912	0.280	93.000	M	255.16	17.643
	2	565.000	0.734	2.659	0.279	92.400	M	283.64	24.083
	3	684.000	0.853	2.311	0.280	87.600	M	194.73	18.702
	4	716.000	1.690	2.328	0.277	76.200	M	29.61	5.398
	5	400.000	0.740	1.423	0.277	79.500	M	51.31	4.640
	6	313.000	0.436	1.168	0.285	85.600	M	116.73	7.056
	7	197.000	0.448	0.938	0.279	83.800	M	60.26	3.694
	8	112.000	0.412	0.707	0.318	1.000	M	0.00	0.000
	9	197.000	0.396	1.003	0.317	1.000	M	0.00	0.000
	10	221.000	0.388	0.417	0.339	1.000	M	0.00	0.000
	11	102.000	0.283	0.232	0.317	83.300	M	38.64	1.822
	12	64.000	0.259	0.356	0.398	1.000	M	0.00	0.000
	13	130.000	0.524	0.232	0.317	1.000	M	0.00	0.000
	14	90.000	0.301	0.443	0.321	1.000	M	0.00	0.000
	15	235.000	0.636	0.232	0.317	1.000	M	0.00	0.000
	16	229.000	0.596	0.384	0.382	1.000	M	0.00	0.000
	17	275.000	0.552	0.503	0.312	1.000	M	0.00	0.000
	18	359.000	0.666	0.503	0.312	1.000	M	0.00	0.000
	19	166.000	0.519	0.129	0.319	1.000	M	0.00	0.000
	20	128.000	0.585	0.000	0.000	1.000	M	0.00	0.000
	21	77.000	0.650	0.000	0.000	1.000	M	0.00	0.000
	Σ	**36,240.900**						**1,094.55**	**721.440**
#9	1	0.000	0.000	0.000	0.000	1.000	M	0.00	0.000
	2	432.000	0.633	2.204	0.256	84.900	M	116.82	9.061
	3	177.000	0.686	1.864	0.256	84.900	M	45.14	3.713
	4	565.000	0.655	0.983	0.255	85.800	M	163.47	12.982
	5	863.000	0.668	0.000	0.000	84.600	M	217.51	17.576
	Σ	**38,559.900**						**1,080.95**	**764.772**

Subwatershed Sedimentology Detail:

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
#10	1	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	2	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	3	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	Σ							**0.0**	**1**	**0.00**	**0.00**
#3	1	0.150	100.00	9.10	0.3050	1.0000	18	264.7	25,106	6.02	4.34
	2	0.181	100.00	10.10	0.3050	1.0000	13	594.6	42,246	13.48	9.57
	3	0.151	200.00	5.50	0.3050	1.0000	18	156.5	27,134	10.52	7.22
	4	0.183	130.00	7.60	0.3160	1.0000	12	261.2	36,753	12.61	8.56
	5	0.185	100.00	8.30	0.2760	1.0000	6	230.3	24,376	3.82	2.70
	Σ							**1,137.1**	**23,455**	**4.13**	**3.01**
#4	1	0.173	130.00	7.00	0.2850	1.0000	7	209.9	26,626	9.23	6.57
	2	0.148	100.00	12.00	0.2220	1.0000	5	405.8	39,931	14.84	10.52
	3	0.185	75.00	13.60	0.2740	1.0000	17	702.6	51,310	16.59	11.81
	4	0.213	100.00	10.60	0.2330	1.0000	6	1,109.5	44,423	12.32	8.68
	Σ							**2,518.5**	**37,600**	**5.82**	**2.66**
#1	1	0.220	280.00	2.20	0.2960	1.0000	13	182.5	10,943	2.52	1.82
	2	0.202	240.00	3.30	0.2960	1.0000	13	284.5	13,658	2.75	1.99
	3	0.206	280.00	2.60	0.2960	1.0000	13	219.9	11,261	2.18	1.58
	4	0.188	200.00	5.10	0.2960	1.0000	13	270.7	23,747	6.68	4.79
	5	0.124	240.00	3.60	0.3130	1.0000	18	103.0	10,374	2.76	1.98
	6	0.178	130.00	7.90	0.2850	1.0000	7	596.1	33,328	11.16	7.85
	7	0.191	100.00	9.20	0.2540	1.0000	6	456.8	34,747	11.02	7.75
	8	0.199	75.00	15.10	0.1510	1.0000	2	1,044.5	38,884	9.66	6.88
	Σ							**2,545.8**	**31,258**	**5.38**	**2.31**
#2	1	0.188	130.00	7.30	0.2120	1.0000	5	338.7	25,140	8.10	5.73
	2	0.199	75.00	12.60	0.1510	1.0000	2	695.0	33,040	9.80	7.04
	3	0.200	100.00	8.60	0.2020	1.0000	11	185.5	27,430	7.12	4.99
	4	0.193	75.00	12.30	0.1730	1.0000	4	586.4	34,540	9.89	7.01
	5	0.187	75.00	14.00	0.1590	1.0000	3	1,066.0	43,229	15.43	10.86
	6	0.198	75.00	13.70	0.1680	1.0000	4	1,089.8	35,284	7.32	5.23
	Σ							**4,555.7**	**31,954**	**4.09**	**1.67**
#5	1	0.213	130.00	6.30	0.2330	1.0000	6	385.7	26,282	8.90	6.49
	2	0.209	130.00	7.10	0.1680	1.0000	4	559.0	18,612	3.13	2.28
	3	0.191	100.00	8.40	0.1500	1.0000	2	738.9	17,804	3.46	2.52
	4	0.235	200.00	4.90	0.2870	1.0000	9	191.2	20,459	2.84	2.09
	5	0.220	240.00	3.70	0.1900	1.0000	16	153.3	8,507	0.50	0.37
	6	0.200	130.00	7.30	0.1410	1.0000	1	574.6	20,970	6.68	4.76
	7	0.204	200.00	4.70	0.1560	1.0000	2	473.7	19,216	5.97	4.18

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
	Σ							**8,635.3**	**22,777**	**2.23**	**1.17**
#6	1	0.228	280.00	2.70	0.2870	1.0000	9	168.0	13,700	3.82	2.77
	2	0.226	280.00	2.40	0.2330	1.0000	6	152.4	8,389	0.69	0.50
	3	0.200	200.00	4.20	0.1460	1.0000	1	643.1	12,708	1.94	1.40
	Σ							**8,049.4**	**19,310**	**1.15**	**0.58**
#7	1	0.197	280.00	2.70	0.2330	1.0000	5	191.1	11,927	3.00	2.13
	2	0.204	420.00	1.80	0.3270	1.0000	19	64.6	6,915	0.24	0.18
	3	0.171	280.00	2.40	0.3380	1.0000	10	7.9	10,550	2.09	1.39
	Σ							**7,921.2**	**20,125**	**1.10**	**0.50**
#8	1	0.200	280.00	2.70	0.1410	1.0000	1	150.5	8,484	2.70	1.99
	2	0.204	280.00	2.30	0.1550	1.0000	3	184.5	7,675	2.21	1.62
	3	0.173	280.00	3.00	0.2220	1.0000	6	200.5	10,820	3.55	2.58
	4	0.204	280.00	3.00	0.3180	1.0000	19	58.8	10,814	0.65	0.48
	5	0.187	200.00	5.90	0.2960	1.0000	12	130.8	28,878	9.32	6.63
	6	0.167	200.00	4.20	0.2740	1.0000	8	157.0	23,016	10.81	7.63
	7	0.215	100.00	9.40	0.2650	1.0000	20	157.7	44,132	20.45	14.34
	8	0.201	100.00	8.10	0.2960	1.0000	13	0.0	1	0.00	0.00
	9	0.208	280.00	2.70	0.2120	1.0000	15	0.0	1	0.00	0.00
	10	0.225	200.00	4.50	0.2540	1.0000	14	0.0	1	0.00	0.00
	11	0.198	100.00	9.20	0.2450	1.0000	6	68.1	40,412	18.29	12.28
	12	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	13	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	14	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	15	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	16	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	17	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	18	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	19	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	20	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	21	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	Σ							**7,521.3**	**40,425**	**2.95**	**0.56**
#9	1	0.206	130.00	7.80	0.1800	1.0000	16	0.0	1	0.00	0.00
	2	0.189	100.00	11.10	0.2450	1.0000	6	403.2	44,542	15.97	11.56
	3	0.177	100.00	8.30	0.2330	1.0000	6	80.2	21,903	7.55	5.44
	4	0.161	100.00	10.00	0.2220	1.0000	5	383.3	30,201	9.86	7.02
	5	0.175	200.00	5.90	0.2450	1.0000	6	479.5	28,702	9.96	6.90
	Σ							**7,972.8**	**30,005**	**2.53**	**0.64**

Subwatershed Time of Concentration Details:

PINABETE DRAINAGE

HYDROLOGY AND SEDIMENTOLOGY DURING MINING OPERATIONS

25-year, 6-hour Precipitation Event

Kevin Ritter

General Information

Storm Information:

Storm Type:	Type II-70
Design Storm:	25 yr - 6 hr
Rainfall Depth:	1.560 inches

Particle Size Distribution:

Size (mm)	P1	P2	P3	P4	P5	P6	P7
0.4250	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%
0.2500	85.529%	83.954%	83.494%	79.684%	74.336%	71.800%	68.824%
0.1500	72.267%	70.070%	68.714%	64.718%	55.514%	53.158%	47.671%
0.0750	58.134%	56.187%	54.477%	51.673%	42.977%	40.816%	35.579%
0.0159	49.962%	48.376%	46.844%	44.689%	37.721%	35.600%	31.445%
0.0100	38.953%	37.808%	36.471%	35.083%	30.403%	28.065%	25.380%
0.0050	9.675%	9.683%	9.177%	10.018%	9.205%	9.529%	8.929%
0.0020	6.279%	6.204%	5.875%	6.237%	5.303%	5.591%	4.938%
0.0010	6.010%	5.917%	5.567%	5.908%	4.905%	5.155%	4.462%
0.0004	4.942%	4.914%	4.659%	5.035%	4.387%	4.686%	4.216%

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc. (ml/l)	24VW (ml/l)
#10	282.000	282.000	0.00	0.00	0.0	1	0.00	0.00
#3	3,941.300	3,941.300	458.57	82.51	2,117.1	25,373	5.44	4.01
#4	3,216.300	7,157.600	632.72	174.18	4,474.2	40,516	7.17	3.31
#1	8,452.701	8,452.701	983.41	221.49	4,246.3	32,524	6.32	2.72
#2	3,838.600	12,291.300	1,143.25	389.09	6,989.5	32,796	4.42	1.77
#5	5,441.700	24,890.600	1,721.59	802.96	14,612.7	25,878	3.20	1.64
#6	3,064.700	27,955.300	1,706.42	922.55	13,636.5	21,749	1.40	0.69
#7	2,633.600	30,588.900	1,697.60	969.21	13,374.8	21,639	1.27	0.59
#8	5,652.000	36,240.900	1,669.88	1,091.19	12,731.8	41,886	3.27	0.67
#9	2,037.000	38,559.900	1,648.67	1,157.68	13,379.8	31,457	2.82	0.76

Particle Size Distribution(s) at Each Structure

Structure #10:

Size (mm)	In/Out
0.4250	0.000%
0.2500	0.000%
0.1500	0.000%
0.0750	0.000%
0.0159	0.000%
0.0100	0.000%
0.0050	0.000%
0.0020	0.000%
0.0010	0.000%
0.0004	0.000%

Structure #3:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	99.615%
0.0750	92.352%
0.0159	89.426%
0.0100	76.209%
0.0050	29.726%
0.0020	16.528%
0.0010	14.989%
0.0004	14.139%

Structure #4:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	97.789%
0.0159	92.810%

Size (mm)	In/Out
0.0100	81.173%
0.0050	32.804%
0.0020	18.614%
0.0010	16.991%
0.0004	15.777%

Structure #1:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	100.000%
0.0159	93.635%
0.0100	79.463%
0.0050	27.252%
0.0020	15.922%
0.0010	14.652%
0.0004	13.349%

Structure #2:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	100.000%
0.0159	96.908%
0.0100	87.544%
0.0050	32.017%
0.0020	19.288%
0.0010	18.007%
0.0004	15.852%

Structure #5:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	99.169%
0.0159	97.380%
0.0100	89.373%

Size (mm)	In/Out
0.0050	31.950%
0.0020	19.045%
0.0010	17.700%
0.0004	15.751%

Structure #6 (EAST LEASE BNDY):

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	100.000%
0.0159	100.000%
0.0100	98.468%
0.0050	36.811%
0.0020	22.012%
0.0010	20.476%
0.0004	18.185%

Structure #7:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	100.000%
0.0159	99.693%
0.0100	99.280%
0.0050	38.667%
0.0020	23.082%
0.0010	21.469%
0.0004	19.083%

Structure #8 (WEST LEASE BNDY):

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	99.681%
0.0750	98.341%
0.0159	97.512%
0.0100	95.628%
0.0050	43.238%

Size (mm)	In/Out
0.0020	25.788%
0.0010	23.974%
0.0004	21.335%

Structure #9:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	97.836%
0.0159	96.152%
0.0100	93.743%
0.0050	44.186%
0.0020	26.315%
0.0010	24.452%
0.0004	21.786%

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#10	1	58.000	0.152	0.000	0.000	1.000	M	0.00	0.000
	2	90.000	0.305	0.054	0.353	1.000	M	0.00	0.000
	3	134.000	0.290	0.121	0.360	1.000	M	0.00	0.000
	Σ	**282.000**						**0.00**	**0.000**
#3	1	790.200	1.145	1.181	0.350	80.800	M	144.92	17.825
	2	1,064.500	0.915	0.596	0.351	80.800	M	233.31	24.022
	3	428.300	0.571	0.319	0.355	81.300	M	140.09	10.125
	4	742.900	0.625	0.000	0.000	78.500	M	172.65	13.454
	5	915.400	1.119	0.000	0.000	78.800	M	139.71	17.082
	Σ	**3,941.300**						**458.57**	**82.507**
#4	1	539.800	0.726	1.710	0.319	81.700	M	153.83	13.221
	2	443.800	0.503	1.429	0.318	86.000	M	237.77	15.698
	3	890.000	0.815	0.998	0.318	82.100	M	241.23	22.582
	4	1,342.700	0.919	0.000	0.000	84.000	M	393.96	40.171
	Σ	**7,157.600**						**632.72**	**174.180**
#1	1	1,249.000	1.349	1.345	0.354	80.800	M	200.36	28.168
	2	1,652.000	1.465	0.849	0.360	80.300	M	235.63	35.567
	3	1,407.200	1.573	1.241	0.357	81.100	M	204.62	32.620
	4	839.600	1.102	0.977	0.364	81.000	M	161.93	19.289
	5	687.100	1.067	1.113	0.365	81.600	M	144.03	16.669
	6	1,223.200	0.778	0.596	0.352	81.800	M	333.99	30.224
	7	740.100	0.745	0.530	0.354	83.600	M	245.71	21.402
	8	654.500	0.801	0.000	0.000	92.200	M	415.85	37.550
	Σ	**8,452.701**						**983.41**	**221.490**
#2	1	610.100	0.668	1.219	0.340	85.700	M	262.46	21.052
	2	537.100	0.610	1.436	0.329	91.600	M	393.62	29.470
	3	455.000	0.546	1.288	0.324	82.000	M	163.69	11.447
	4	619.100	0.634	0.852	0.324	87.900	M	331.72	25.481
	5	664.000	0.452	0.453	0.315	91.200	M	566.08	35.337
	6	953.300	0.984	0.000	0.000	89.600	M	423.81	44.813
	Σ	**12,291.300**						**1,143.25**	**389.090**
#5	1	758.800	0.682	3.507	0.293	84.100	M	280.68	22.902
	2	946.400	1.117	2.231	0.289	89.200	M	368.97	43.117
	3	1,015.600	0.996	1.587	0.291	92.000	M	540.44	57.400
	4	688.700	1.908	1.255	0.291	80.800	M	82.73	15.530
	5	754.300	2.307	1.084	0.287	86.200	M	125.58	27.069
	6	623.600	0.538	0.595	0.301	93.000	M	547.07	38.047

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
	7	654.300	0.560	0.000	0.000	91.500	M	502.79	35.623
	Σ	**24,890.600**						**1,721.59**	**802.958**
#6	1	886.000	1.151	1.896	0.315	81.100	M	166.59	20.542
	2	1,011.200	1.871	0.166	0.287	83.500	M	159.01	28.970
	3	1,167.500	1.126	0.000	0.000	92.800	M	600.96	70.079
	Σ	**27,955.300**						**1,706.42**	**922.549**
#7	1	971.600	0.819	0.665	0.285	82.900	M	282.27	26.453
	2	1,467.100	2.587	0.000	0.000	75.000	M	72.88	18.372
	3	194.900	0.596	0.000	0.000	72.600	M	22.86	1.834
	Σ	**30,588.900**						**1,697.60**	**969.208**
#8	1	392.000	0.538	2.912	0.280	93.000	M	343.89	23.917
	2	565.000	0.734	2.659	0.279	92.400	M	387.79	32.932
	3	684.000	0.853	2.311	0.280	87.600	M	288.18	27.492
	4	716.000	1.690	2.328	0.277	76.200	M	58.45	10.237
	5	400.000	0.740	1.423	0.277	79.500	M	90.77	7.993
	6	313.000	0.436	1.168	0.285	85.600	M	177.32	10.722
	7	197.000	0.448	0.938	0.279	83.800	M	94.25	5.798
	8	112.000	0.412	0.707	0.318	1.000	M	0.00	0.000
	9	197.000	0.396	1.003	0.317	1.000	M	0.00	0.000
	10	221.000	0.388	0.417	0.339	1.000	M	0.00	0.000
	11	102.000	0.283	0.232	0.317	83.300	M	59.88	2.887
	12	64.000	0.259	0.356	0.398	1.000	M	0.00	0.000
	13	130.000	0.524	0.232	0.317	1.000	M	0.00	0.000
	14	90.000	0.301	0.443	0.321	1.000	M	0.00	0.000
	15	235.000	0.636	0.232	0.317	1.000	M	0.00	0.000
	16	229.000	0.596	0.384	0.382	1.000	M	0.00	0.000
	17	275.000	0.552	0.503	0.312	1.000	M	0.00	0.000
	18	359.000	0.666	0.503	0.312	1.000	M	0.00	0.000
	19	166.000	0.519	0.129	0.319	1.000	M	0.00	0.000
	20	128.000	0.585	0.000	0.000	1.000	M	0.00	0.000
	21	77.000	0.650	0.000	0.000	1.000	M	0.00	0.000
	Σ	**36,240.900**						**1,669.88**	**1,091.186**
#9	1	0.000	0.000	0.000	0.000	1.000	M	0.00	0.000
	2	432.000	0.633	2.204	0.256	84.900	M	180.31	13.939
	3	177.000	0.686	1.864	0.256	84.900	M	69.79	5.712
	4	565.000	0.655	0.983	0.255	85.800	M	248.62	19.658
	5	863.000	0.668	0.000	0.000	84.600	M	338.15	27.184
	Σ	**38,559.900**						**1,648.67**	**1,157.678**

Subwatershed Sedimentology Detail:

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
#10	1	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	2	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	3	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	Σ							**0.0**	**1**	**0.00**	**0.00**
#3	1	0.150	100.00	9.10	0.3050	1.0000	18	476.1	27,003	7.40	5.33
	2	0.181	100.00	10.10	0.3050	1.0000	13	1,068.9	45,310	15.79	11.24
	3	0.151	200.00	5.50	0.3050	1.0000	18	276.5	28,831	11.86	8.18
	4	0.183	130.00	7.60	0.3160	1.0000	12	503.2	39,673	14.91	10.21
	5	0.185	100.00	8.30	0.2760	1.0000	6	439.8	26,478	5.42	3.84
	Σ							**2,117.1**	**25,373**	**5.44**	**4.01**
#4	1	0.173	130.00	7.00	0.2850	1.0000	7	367.8	28,357	10.54	7.53
	2	0.148	100.00	12.00	0.2220	1.0000	5	644.3	41,776	16.23	11.56
	3	0.185	75.00	13.60	0.2740	1.0000	17	1,219.6	54,635	19.09	13.63
	4	0.213	100.00	10.60	0.2330	1.0000	6	1,842.1	46,885	14.21	10.06
	Σ							**4,474.2**	**40,516**	**7.17**	**3.31**
#1	1	0.220	280.00	2.20	0.2960	1.0000	13	328.3	11,776	3.13	2.27
	2	0.202	240.00	3.30	0.2960	1.0000	13	519.0	14,740	3.54	2.56
	3	0.206	280.00	2.60	0.2960	1.0000	13	392.3	12,109	2.79	2.03
	4	0.188	200.00	5.10	0.2960	1.0000	13	484.3	25,489	7.99	5.74
	5	0.124	240.00	3.60	0.3130	1.0000	18	181.3	11,099	3.30	2.37
	6	0.178	130.00	7.90	0.2850	1.0000	7	1,042.4	35,483	12.79	9.03
	7	0.191	100.00	9.20	0.2540	1.0000	6	764.2	36,748	12.52	8.84
	8	0.199	75.00	15.10	0.1510	1.0000	2	1,488.7	40,245	10.65	7.61
	Σ							**4,246.3**	**32,524**	**6.32**	**2.72**
#2	1	0.188	130.00	7.30	0.2120	1.0000	5	541.5	26,376	9.02	6.41
	2	0.199	75.00	12.60	0.1510	1.0000	2	998.9	34,168	10.63	7.67
	3	0.200	100.00	8.60	0.2020	1.0000	11	321.5	28,994	8.34	5.89
	4	0.193	75.00	12.30	0.1730	1.0000	4	900.6	36,137	11.06	7.86
	5	0.187	75.00	14.00	0.1590	1.0000	3	1,537.6	44,504	16.40	11.62
	6	0.198	75.00	13.70	0.1680	1.0000	4	1,626.1	36,830	8.43	6.04
	Σ							**6,989.5**	**32,796**	**4.42**	**1.77**
#5	1	0.213	130.00	6.30	0.2330	1.0000	6	637.6	27,723	9.97	7.30
	2	0.209	130.00	7.10	0.1680	1.0000	4	840.4	19,481	3.76	2.75
	3	0.191	100.00	8.40	0.1500	1.0000	2	1,057.7	18,497	3.94	2.87
	4	0.235	200.00	4.90	0.2870	1.0000	9	343.7	22,037	4.01	2.94
	5	0.220	240.00	3.70	0.1900	1.0000	16	243.4	8,985	0.54	0.40
	6	0.200	130.00	7.30	0.1410	1.0000	1	805.3	21,597	7.12	5.09
	7	0.204	200.00	4.70	0.1560	1.0000	2	681.4	19,838	6.43	4.53

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
	Σ							**14,612.7**	**25,878**	**3.20**	**1.64**
#6	1	0.228	280.00	2.70	0.2870	1.0000	9	299.7	14,709	4.57	3.32
	2	0.226	280.00	2.40	0.2330	1.0000	6	256.1	8,936	1.01	0.73
	3	0.200	200.00	4.20	0.1460	1.0000	1	908.5	13,173	2.29	1.65
	Σ							**13,636.5**	**21,749**	**1.40**	**0.69**
#7	1	0.197	280.00	2.70	0.2330	1.0000	5	325.3	12,676	3.55	2.52
	2	0.204	420.00	1.80	0.3270	1.0000	19	142.2	7,747	0.31	0.23
	3	0.171	280.00	2.40	0.3380	1.0000	10	20.2	12,032	3.22	2.16
	Σ							**13,374.8**	**21,639**	**1.27**	**0.59**
#8	1	0.200	280.00	2.70	0.1410	1.0000	1	210.9	8,752	2.88	2.13
	2	0.204	280.00	2.30	0.1550	1.0000	3	261.9	7,956	2.41	1.76
	3	0.173	280.00	3.00	0.2220	1.0000	6	309.8	11,352	3.94	2.86
	4	0.204	280.00	3.00	0.3180	1.0000	19	123.2	11,976	1.34	0.99
	5	0.187	200.00	5.90	0.2960	1.0000	12	244.2	31,166	11.04	7.88
	6	0.167	200.00	4.20	0.2740	1.0000	8	250.8	24,016	11.60	8.24
	7	0.215	100.00	9.40	0.2650	1.0000	20	260.8	46,174	22.03	15.54
	8	0.201	100.00	8.10	0.2960	1.0000	13	0.0	1	0.00	0.00
	9	0.208	280.00	2.70	0.2120	1.0000	15	0.0	1	0.00	0.00
	10	0.225	200.00	4.50	0.2540	1.0000	14	0.0	1	0.00	0.00
	11	0.198	100.00	9.20	0.2450	1.0000	6	112.6	41,616	19.32	13.13
	12	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	13	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	14	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	15	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	16	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	17	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	18	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	19	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	20	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	21	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	Σ							**12,731.8**	**41,886**	**3.27**	**0.67**
#9	1	0.206	130.00	7.80	0.1800	1.0000	16	0.0	1	0.00	0.00
	2	0.189	100.00	11.10	0.2450	1.0000	6	654.4	46,803	17.66	12.82
	3	0.177	100.00	8.30	0.2330	1.0000	6	130.4	23,063	8.40	6.07
	4	0.161	100.00	10.00	0.2220	1.0000	5	611.6	31,711	10.98	7.84
	5	0.175	200.00	5.90	0.2450	1.0000	6	783.8	30,074	11.03	7.70
	Σ							**13,379.8**	**31,457**	**2.82**	**0.76**

Subwatershed Time of Concentration Details:

PINABETE DRAINAGE

HYDROLOGY AND SEDIMENTOLOGY DURING MINING OPERATIONS

100-year, 6-hour Precipitation Event

Kevin Ritter

General Information

Storm Information:

Storm Type:	Type II-70
Design Storm:	100 yr - 6 hr
Rainfall Depth:	2.040 inches

Particle Size Distribution:

Size (mm)	P1	P2	P3	P4	P5	P6	P7
0.4250	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%
0.2500	85.529%	83.954%	83.494%	79.684%	74.336%	71.800%	68.824%
0.1500	72.267%	70.070%	68.714%	64.718%	55.514%	53.158%	47.671%
0.0750	58.134%	56.187%	54.477%	51.673%	42.977%	40.816%	35.579%
0.0159	49.962%	48.376%	46.844%	44.689%	37.721%	35.600%	31.445%
0.0100	38.953%	37.808%	36.471%	35.083%	30.403%	28.065%	25.380%
0.0050	9.675%	9.683%	9.177%	10.018%	9.205%	9.529%	8.929%
0.0020	6.279%	6.204%	5.875%	6.237%	5.303%	5.591%	4.938%
0.0010	6.010%	5.917%	5.567%	5.908%	4.905%	5.155%	4.462%
0.0004	4.942%	4.914%	4.659%	5.035%	4.387%	4.686%	4.216%

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc. (ml/l)	24VW (ml/l)
#10	282.000	282.000	0.00	0.00	0.0	1	0.00	0.00
#3	3,941.300	3,941.300	876.33	153.37	4,300.0	27,415	6.91	5.15
#4	3,216.300	7,157.600	1,173.11	311.98	8,690.6	43,746	8.75	4.05
#1	8,452.701	8,452.701	1,791.85	388.42	7,879.9	33,917	7.74	3.38
#2	3,838.600	12,291.300	1,950.43	651.97	12,335.3	34,628	5.05	2.01
#5	5,441.700	24,890.600	2,889.58	1,338.90	27,143.8	28,907	4.69	2.40
#6	3,064.700	27,955.300	2,864.33	1,529.70	25,411.8	24,539	1.89	0.93
#7	2,633.600	30,588.900	2,850.88	1,619.21	24,833.7	23,822	1.49	0.70
#8	5,652.000	36,240.900	2,803.11	1,816.27	23,742.7	43,788	3.65	0.80
#9	2,037.000	38,559.900	2,767.31	1,928.03	24,777.4	33,476	3.19	0.90

Particle Size Distribution(s) at Each Structure

Structure #10:

Size (mm)	In/Out
0.4250	0.000%
0.2500	0.000%
0.1500	0.000%
0.0750	0.000%
0.0159	0.000%
0.0100	0.000%
0.0050	0.000%
0.0020	0.000%
0.0010	0.000%
0.0004	0.000%

Structure #3:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	97.810%
0.0750	90.413%
0.0159	86.007%
0.0100	71.382%
0.0050	27.506%
0.0020	15.301%
0.0010	13.880%
0.0004	13.087%

Structure #4:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	95.807%
0.0159	90.260%

Size (mm)	In/Out
0.0100	78.133%
0.0050	30.502%
0.0020	17.296%
0.0010	15.785%
0.0004	14.666%

Structure #1:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	97.914%
0.0159	90.185%
0.0100	75.012%
0.0050	25.647%
0.0020	14.921%
0.0010	13.707%
0.0004	12.544%

Structure #2:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	99.567%
0.0159	95.585%
0.0100	86.191%
0.0050	30.301%
0.0020	18.176%
0.0010	16.941%
0.0004	14.977%

Structure #5:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	98.573%
0.0159	95.581%
0.0100	83.628%

Size (mm)	In/Out
0.0050	29.238%
0.0020	17.353%
0.0010	16.102%
0.0004	14.390%

Structure #6 (EAST LEASE BNDY):

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	100.000%
0.0159	100.000%
0.0100	96.749%
0.0050	33.485%
0.0020	19.936%
0.0010	18.513%
0.0004	16.514%

Structure #7:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	99.831%
0.0159	99.546%
0.0100	99.149%
0.0050	35.479%
0.0020	21.081%
0.0010	19.577%
0.0004	17.478%

Structure #8 (WEST LEASE BNDY):

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	99.483%
0.0750	98.019%
0.0159	97.146%
0.0100	95.375%
0.0050	39.551%

Size (mm)	In/Out
0.0020	23.479%
0.0010	21.793%
0.0004	19.481%

Structure #9:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	97.209%
0.0159	95.663%
0.0100	93.453%
0.0050	40.691%
0.0020	24.128%
0.0010	22.387%
0.0004	20.028%

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#10	1	58.000	0.152	0.000	0.000	1.000	M	0.00	0.000
	2	90.000	0.305	0.054	0.353	1.000	M	0.00	0.000
	3	134.000	0.290	0.121	0.360	1.000	M	0.00	0.000
	Σ	**282.000**						**0.00**	**0.000**
#3	1	790.200	1.145	1.181	0.350	80.800	M	269.35	32.573
	2	1,064.500	0.915	0.596	0.351	80.800	M	432.66	43.896
	3	428.300	0.571	0.319	0.355	81.300	M	254.30	18.305
	4	742.900	0.625	0.000	0.000	78.500	M	337.90	25.922
	5	915.400	1.119	0.000	0.000	78.800	M	273.52	32.672
	Σ	**3,941.300**						**876.33**	**153.369**
#4	1	539.800	0.726	1.710	0.319	81.700	M	278.05	23.704
	2	443.800	0.503	1.429	0.318	86.000	M	392.85	25.931
	3	890.000	0.815	0.998	0.318	82.100	M	432.99	40.156
	4	1,342.700	0.919	0.000	0.000	84.000	M	680.94	68.824
	Σ	**7,157.600**						**1,173.11**	**311.985**
#1	1	1,249.000	1.349	1.345	0.354	80.800	M	372.72	51.474
	2	1,652.000	1.465	0.849	0.360	80.300	M	443.86	65.709
	3	1,407.200	1.573	1.241	0.357	81.100	M	378.04	59.227
	4	839.600	1.102	0.977	0.364	81.000	M	299.40	35.096
	5	687.100	1.067	1.113	0.365	81.600	M	262.47	29.948
	6	1,223.200	0.778	0.596	0.352	81.800	M	603.15	54.077
	7	740.100	0.745	0.530	0.354	83.600	M	427.57	36.947
	8	654.500	0.801	0.000	0.000	92.200	M	618.10	55.938
	Σ	**8,452.701**						**1,791.85**	**388.415**
#2	1	610.100	0.668	1.219	0.340	85.700	M	438.95	34.962
	2	537.100	0.610	1.436	0.329	91.600	M	588.75	44.327
	3	455.000	0.546	1.288	0.324	82.000	M	292.68	20.396
	4	619.100	0.634	0.852	0.324	87.900	M	531.13	40.732
	5	664.000	0.452	0.453	0.315	91.200	M	846.42	53.498
	6	953.300	0.984	0.000	0.000	89.600	M	661.67	69.636
	Σ	**12,291.300**						**1,950.43**	**651.967**
#5	1	758.800	0.682	3.507	0.293	84.100	M	483.65	39.163
	2	946.400	1.117	2.231	0.289	89.200	M	580.71	67.443
	3	1,015.600	0.996	1.587	0.291	92.000	M	808.31	85.784
	4	688.700	1.908	1.255	0.291	80.800	M	153.91	28.380
	5	754.300	2.307	1.084	0.287	86.200	M	208.51	44.558
	6	623.600	0.538	0.595	0.301	93.000	M	799.68	55.953

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
	7	654.300	0.560	0.000	0.000	91.500	M	752.01	53.670
	Σ	**24,890.600**						**2,889.58**	**1,338.901**
#6	1	886.000	1.151	1.896	0.315	81.100	M	307.38	37.297
	2	1,011.200	1.871	0.166	0.287	83.500	M	278.51	50.109
	3	1,167.500	1.126	0.000	0.000	92.800	M	886.94	103.391
	Σ	**27,955.300**						**2,864.33**	**1,529.698**
#7	1	971.600	0.819	0.665	0.285	82.900	M	498.18	46.291
	2	1,467.100	2.587	0.000	0.000	75.000	M	159.36	38.991
	3	194.900	0.596	0.000	0.000	72.600	M	55.76	4.229
	Σ	**30,588.900**						**2,850.88**	**1,619.209**
#8	1	392.000	0.538	2.912	0.280	93.000	M	502.68	35.172
	2	565.000	0.734	2.659	0.279	92.400	M	573.54	48.901
	3	684.000	0.853	2.311	0.280	87.600	M	466.01	44.171
	4	716.000	1.690	2.328	0.277	76.200	M	123.57	20.961
	5	400.000	0.740	1.423	0.277	79.500	M	173.44	15.037
	6	313.000	0.436	1.168	0.285	85.600	M	294.05	17.838
	7	197.000	0.448	0.938	0.279	83.800	M	162.40	9.972
	8	112.000	0.412	0.707	0.318	1.000	M	0.00	0.000
	9	197.000	0.396	1.003	0.317	1.000	M	0.00	0.000
	10	221.000	0.388	0.417	0.339	1.000	M	0.00	0.000
	11	102.000	0.283	0.232	0.317	83.300	M	102.28	5.013
	12	64.000	0.259	0.356	0.398	1.000	M	0.00	0.000
	13	130.000	0.524	0.232	0.317	1.000	M	0.00	0.000
	14	90.000	0.301	0.443	0.321	1.000	M	0.00	0.000
	15	235.000	0.636	0.232	0.317	1.000	M	0.00	0.000
	16	229.000	0.596	0.384	0.382	1.000	M	0.00	0.000
	17	275.000	0.552	0.503	0.312	1.000	M	0.00	0.000
	18	359.000	0.666	0.503	0.312	1.000	M	0.00	0.000
	19	166.000	0.519	0.129	0.319	1.000	M	0.00	0.000
	20	128.000	0.585	0.000	0.000	1.000	M	0.00	0.000
	21	77.000	0.650	0.000	0.000	1.000	M	0.00	0.000
	Σ	**36,240.900**						**2,803.11**	**1,816.274**
#9	1	0.000	0.000	0.000	0.000	1.000	M	0.00	0.000
	2	432.000	0.633	2.204	0.256	84.900	M	306.16	23.486
	3	177.000	0.686	1.864	0.256	84.900	M	118.55	9.624
	4	565.000	0.655	0.983	0.255	85.800	M	414.82	32.589
	5	863.000	0.668	0.000	0.000	84.600	M	577.38	46.054
	Σ	**38,559.900**						**2,767.31**	**1,928.026**

Subwatershed Sedimentology Detail:

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
#10	1	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	2	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	3	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	Σ							**0.0**	**1**	**0.00**	**0.00**
#3	1	0.150	100.00	9.10	0.3050	1.0000	18	944.2	29,196	9.04	6.53
	2	0.181	100.00	10.10	0.3050	1.0000	13	2,117.3	48,796	18.44	13.19
	3	0.151	200.00	5.50	0.3050	1.0000	18	538.0	30,715	13.35	9.30
	4	0.183	130.00	7.60	0.3160	1.0000	12	1,058.1	42,735	17.38	12.04
	5	0.185	100.00	8.30	0.2760	1.0000	6	921.2	28,850	7.20	5.12
	Σ							**4,300.0**	**27,415**	**6.91**	**5.15**
#4	1	0.173	130.00	7.00	0.2850	1.0000	7	710.4	30,409	12.07	8.66
	2	0.148	100.00	12.00	0.2220	1.0000	5	1,130.5	44,011	17.95	12.88
	3	0.185	75.00	13.60	0.2740	1.0000	17	2,335.9	58,459	21.96	15.76
	4	0.213	100.00	10.60	0.2330	1.0000	6	3,383.4	49,899	16.49	11.75
	Σ							**8,690.6**	**43,746**	**8.75**	**4.05**
#1	1	0.220	280.00	2.20	0.2960	1.0000	13	651.4	12,772	3.85	2.80
	2	0.202	240.00	3.30	0.2960	1.0000	13	1,043.4	16,025	4.47	3.24
	3	0.206	280.00	2.60	0.2960	1.0000	13	772.7	13,126	3.52	2.56
	4	0.188	200.00	5.10	0.2960	1.0000	13	955.3	27,534	9.50	6.84
	5	0.124	240.00	3.60	0.3130	1.0000	18	352.2	11,975	3.95	2.84
	6	0.178	130.00	7.90	0.2850	1.0000	7	2,010.2	37,985	14.67	10.43
	7	0.191	100.00	9.20	0.2540	1.0000	6	1,414.9	39,176	14.33	10.17
	8	0.199	75.00	15.10	0.1510	1.0000	2	2,323.4	41,957	11.86	8.51
	Σ							**7,879.9**	**33,917**	**7.74**	**3.38**
#2	1	0.188	130.00	7.30	0.2120	1.0000	5	959.4	27,956	10.20	7.29
	2	0.199	75.00	12.60	0.1510	1.0000	2	1,572.9	35,644	11.65	8.43
	3	0.200	100.00	8.60	0.2020	1.0000	11	615.2	30,911	9.78	6.95
	4	0.193	75.00	12.30	0.1730	1.0000	4	1,524.5	38,060	12.46	8.90
	5	0.187	75.00	14.00	0.1590	1.0000	3	2,429.6	46,047	17.56	12.55
	6	0.198	75.00	13.70	0.1680	1.0000	4	2,671.1	38,762	9.82	7.05
	Σ							**12,335.3**	**34,628**	**5.05**	**2.01**
#5	1	0.213	130.00	6.30	0.2330	1.0000	6	1,167.7	29,579	11.34	8.32
	2	0.209	130.00	7.10	0.1680	1.0000	4	1,391.9	20,593	4.52	3.31
	3	0.191	100.00	8.40	0.1500	1.0000	2	1,659.6	19,371	4.53	3.31
	4	0.235	200.00	4.90	0.2870	1.0000	9	682.0	23,913	5.33	3.91
	5	0.220	240.00	3.70	0.1900	1.0000	16	427.4	9,582	0.64	0.47
	6	0.200	130.00	7.30	0.1410	1.0000	1	1,236.2	22,488	7.72	5.54
	7	0.204	200.00	4.70	0.1560	1.0000	2	1,074.0	20,603	6.99	4.96

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
	Σ							**27,143.8**	**28,907**	**4.69**	**2.40**
#6	1	0.228	280.00	2.70	0.2870	1.0000	9	589.8	15,915	5.46	3.97
	2	0.226	280.00	2.40	0.2330	1.0000	6	476.5	9,605	1.45	1.05
	3	0.200	200.00	4.20	0.1460	1.0000	1	1,404.6	13,767	2.69	1.94
	Σ							**25,411.8**	**24,539**	**1.89**	**0.93**
#7	1	0.197	280.00	2.70	0.2330	1.0000	5	611.7	13,556	4.20	2.99
	2	0.204	420.00	1.80	0.3270	1.0000	19	336.0	8,651	0.38	0.28
	3	0.171	280.00	2.40	0.3380	1.0000	10	53.2	13,557	4.44	3.01
	Σ							**24,833.7**	**23,822**	**1.49**	**0.70**
#8	1	0.200	280.00	2.70	0.1410	1.0000	1	323.8	9,111	3.13	2.32
	2	0.204	280.00	2.30	0.1550	1.0000	3	406.9	8,308	2.64	1.94
	3	0.173	280.00	3.00	0.2220	1.0000	6	528.8	12,021	4.42	3.22
	4	0.204	280.00	3.00	0.3180	1.0000	19	279.9	13,300	2.31	1.69
	5	0.187	200.00	5.90	0.2960	1.0000	12	499.9	33,691	12.98	9.31
	6	0.167	200.00	4.20	0.2740	1.0000	8	442.8	25,261	12.57	9.00
	7	0.215	100.00	9.40	0.2650	1.0000	20	479.3	48,901	24.13	17.16
	8	0.201	100.00	8.10	0.2960	1.0000	13	0.0	1	0.00	0.00
	9	0.208	280.00	2.70	0.2120	1.0000	15	0.0	1	0.00	0.00
	10	0.225	200.00	4.50	0.2540	1.0000	14	0.0	1	0.00	0.00
	11	0.198	100.00	9.20	0.2450	1.0000	6	207.0	43,271	20.73	14.34
	12	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	13	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	14	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	15	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	16	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	17	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	18	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	19	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	20	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	21	0.198	209.00	5.00	0.2430	1.0000	17	0.0	1	0.00	0.00
	Σ							**23,742.7**	**43,788**	**3.65**	**0.80**
#9	1	0.206	130.00	7.80	0.1800	1.0000	16	0.0	1	0.00	0.00
	2	0.189	100.00	11.10	0.2450	1.0000	6	1,178.9	49,732	19.86	14.50
	3	0.177	100.00	8.30	0.2330	1.0000	6	234.9	24,548	9.50	6.89
	4	0.161	100.00	10.00	0.2220	1.0000	5	1,081.1	33,631	12.39	8.89
	5	0.175	200.00	5.90	0.2450	1.0000	6	1,420.8	31,951	12.44	8.74
	Σ							**24,777.4**	**33,476**	**3.19**	**0.90**

Subwatershed Time of Concentration Details:

Attachment 41.C-2

Cottonwood Arroyo Hydrology and Sedimentology

SEDCAD™ Model Output During Mine Operations

Cottonwood Arroyo Mine Operations Hydrology and Sedimentology

The drainage subdivisions and containment areas used to model the hydrology is shown on Exhibit 41.2-1.

Revised February 21, 2012

Art O'Hayre

General Information

Storm Information:

Storm Type:	Type II-70
Design Storm:	2 yr - 6 hr
Rainfall Depth:	0.850 inches

Particle Size Distribution:

Size (mm)	PostMine-LoamySand	PreMine-LoamySand	PreMine-Badlands	LoamySand Postmining
2.0000	100.000%	100.000%	100.000%	0.000%
0.1000	26.500%	30.000%	83.500%	0.000%
0.0500	14.000%	17.000%	77.000%	0.000%
0.0020	11.000%	11.000%	56.000%	0.000%
0.0010	0.000%	0.000%	0.000%	0.000%

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Null	#1	==>	#2	0.961	0.307	
Null	#2	==>	#3	0.068	0.331	
Null	#3	==>	#4	0.000	0.000	
Null	#4	==>	#9	0.718	0.281	
Null	#5	==>	#6	1.205	0.328	
Null	#6	==>	#7	0.189	0.304	
Null	#7	==>	#8	0.000	0.000	
Null	#8	==>	#10	0.989	0.300	
Null	#9	==>	#11	0.000	0.000	
Null	#10	==>	#11	0.000	0.000	
Null	#11	==>	#21	0.495	0.453	
Null	#12	==>	#13	0.076	0.330	
Null	#13	==>	#14	3.790	0.314	
Null	#14	==>	#16	1.198	0.286	
Null	#15	==>	#16	1.198	0.286	
Null	#16	==>	#20	1.087	0.273	
Null	#17	==>	#19	0.000	0.000	
Null	#18	==>	#19	0.000	0.000	
Null	#19	==>	#20	0.915	0.252	
Null	#20	==>	#22	0.000	0.000	End of Middle Fork
Null	#21	==>	#22	0.000	0.000	End of South Fork
Null	#22	==>	#23	0.811	0.247	
Null	#23	==>	#35	0.000	0.000	
Null	#24	==>	#25	0.964	0.340	
Null	#25	==>	#27	1.454	0.333	
Null	#26	==>	#27	1.454	0.333	
Null	#27	==>	#29	0.800	0.323	
Null	#28	==>	#29	0.800	0.323	
Null	#29	==>	#32	0.479	0.298	
Null	#30	==>	#32	0.479	0.298	
Null	#31	==>	#33	0.000	0.000	
Null	#32	==>	#33	0.000	0.000	
Null	#33	==>	#34	1.348	0.294	Inlet to North Fork Diversion
Null	#34	==>	#35	0.000	0.000	End of North Fork
Null	#35	==>	#36	0.735	0.251	all forks
Null	#36	==>	#37	3.388	0.246	
Null	#37	==>	End	0.000	0.000	

#30
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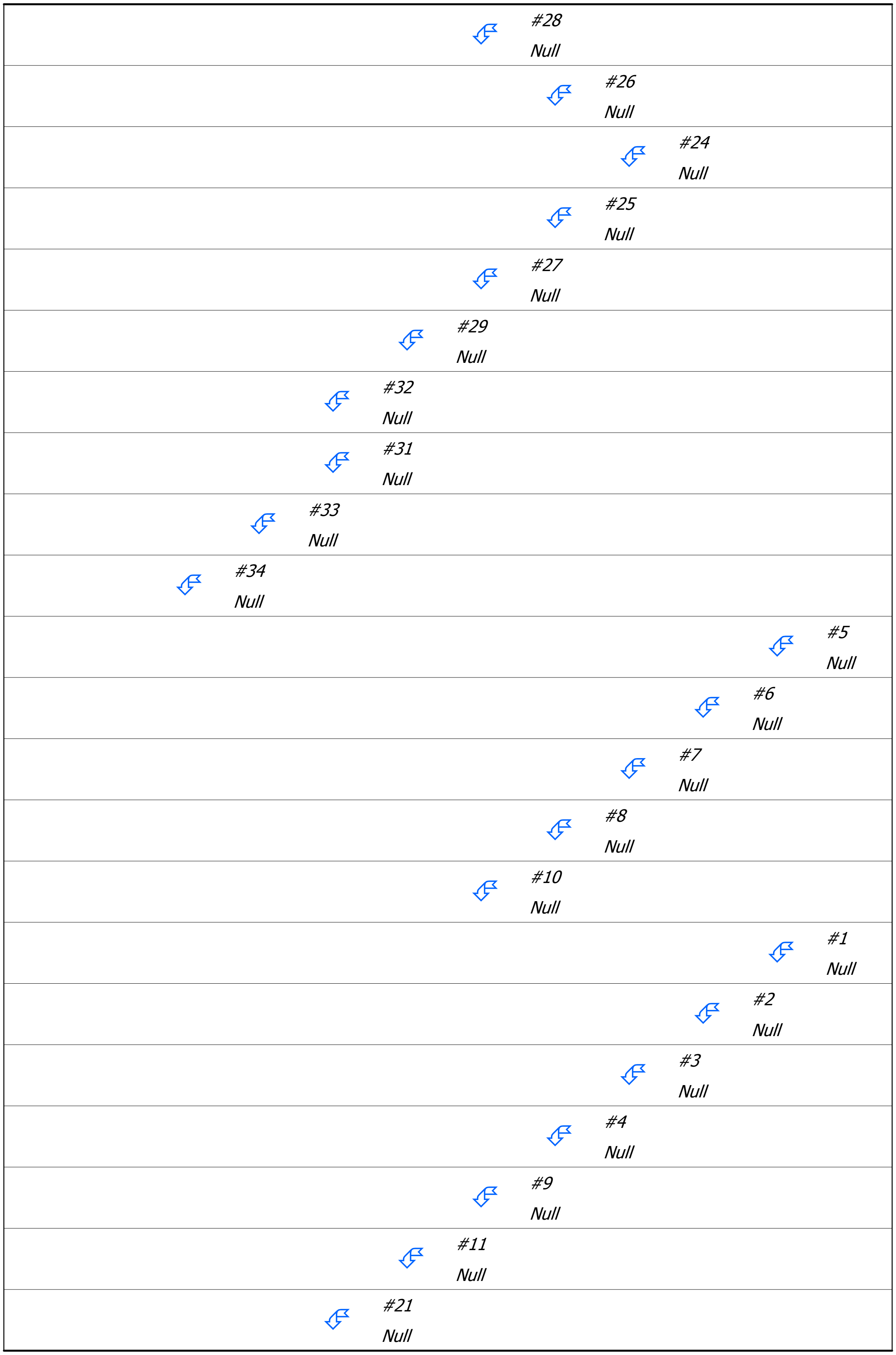
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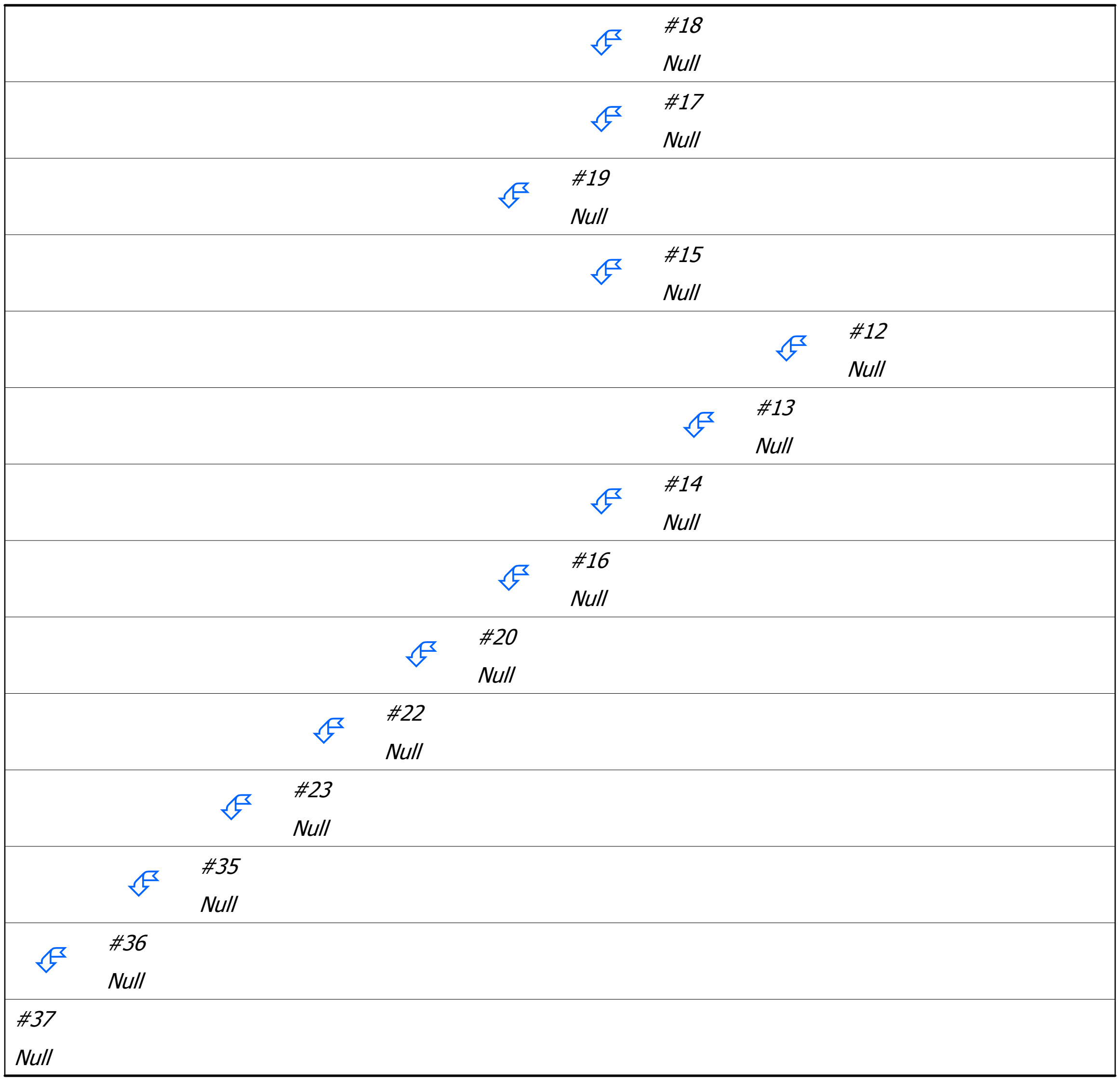


Structure Routing Details:

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	8. Large gullies, diversions, and low flowing streams	0.81	76.00	9,347.00	2.70	0.961
#1	**Muskingum K:**					**0.961**
#2	8. Large gullies, diversions, and low flowing streams	1.23	10.00	814.00	3.32	0.068
#2	**Muskingum K:**					**0.068**
#3	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.00	0.000
#3	**Muskingum K:**					**0.000**
#4	8. Large gullies, diversions, and low flowing streams	0.53	30.00	5,637.00	2.18	0.718
#4	**Muskingum K:**					**0.718**

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#5	8. Large gullies, diversions, and low flowing streams	1.17	165.00	14,065.00	3.24	1.205
#5	**Muskingum K:**					**1.205**
#6	8. Large gullies, diversions, and low flowing streams	0.78	14.00	1,799.25	2.64	0.189
#6	**Muskingum K:**					**0.189**
#8	8. Large gullies, diversions, and low flowing streams	0.72	65.00	9,046.00	2.54	0.989
#8	**Muskingum K:**					**0.989**
#11	8. Large gullies, diversions, and low flowing streams	30.00	8,801.00	29,336.66	16.43	0.495
#11	**Muskingum K:**					**0.495**
#12	8. Large gullies, diversions, and low flowing streams	1.21	11.00	906.00	3.30	0.076
#12	**Muskingum K:**					**0.076**
#13	8. Large gullies, diversions, and low flowing streams	0.92	363.00	39,301.00	2.88	3.790
#13	**Muskingum K:**					**3.790**
#14	8. Large gullies, diversions, and low flowing streams	0.58	57.00	9,834.00	2.28	1.198
#14	**Muskingum K:**					**1.198**
#15	8. Large gullies, diversions, and low flowing streams	0.58	57.00	9,834.00	2.28	1.198
#15	**Muskingum K:**					**1.198**
#16	8. Large gullies, diversions, and low flowing streams	0.46	37.00	7,984.00	2.04	1.087
#16	**Muskingum K:**					**1.087**
#19	8. Large gullies, diversions, and low flowing streams	0.33	19.00	5,699.00	1.73	0.915
#19	**Muskingum K:**					**0.915**
#22	8. Large gullies, diversions, and low flowing streams	0.31	15.00	4,852.00	1.66	0.811
#22	**Muskingum K:**					**0.811**
#24	8. Large gullies, diversions, and low flowing streams	1.46	184.00	12,568.00	3.62	0.964
#24	**Muskingum K:**					**0.964**
#25	8. Large gullies, diversions, and low flowing streams	1.28	228.00	17,755.00	3.39	1.454
#25	**Muskingum K:**					**1.454**
#26	8. Large gullies, diversions, and low flowing streams	1.28	228.00	17,755.62	3.39	1.454
#26	**Muskingum K:**					**1.454**
#27	8. Large gullies, diversions, and low flowing streams	1.07	96.00	8,938.00	3.10	0.800
#27	**Muskingum K:**					**0.800**
#28	8. Large gullies, diversions, and low flowing streams	1.07	96.00	8,938.00	3.10	0.800
#28	**Muskingum K:**					**0.800**
#29	8. Large gullies, diversions, and low flowing streams	0.70	30.00	4,313.00	2.50	0.479

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#29	**Muskingum K:**					**0.479**
#30	8. Large gullies, diversions, and low flowing streams	0.70	30.00	4,313.00	2.50	0.479
#30	**Muskingum K:**					**0.479**
#33	8. Large gullies, diversions, and low flowing streams	0.66	77.00	11,748.55	2.42	1.348
#33	**Muskingum K:**					**1.348**
#35	8. Large gullies, diversions, and low flowing streams	0.33	15.00	4,556.50	1.72	0.735
#35	**Muskingum K:**					**0.735**
#36	8. Large gullies, diversions, and low flowing streams	0.30	60.00	20,005.00	1.64	3.388
#36	**Muskingum K:**					**3.388**

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc. (ml/l)	24VW (ml/l)
#30	476.400	476.400	0.42	0.11	0.4	2,965	1.82	1.55
#28	1,217.900	1,217.900	168.77	19.36	939.7	51,228	0.00	0.00
#26	2,486.400	2,486.400	8.59	2.86	13.1	4,375	0.55	0.42
#24	8,061.800	8,061.800	11.17	6.64	17.5	2,885	0.18	0.12
#25	1,015.700	9,077.500	43.84	10.83	64.9	15,537	6.38	1.81
#27	1,783.700	13,347.600	76.77	20.93	211.6	23,433	10.13	3.21
#29	966.000	15,531.500	221.98	55.19	2,116.8	64,602	2.94	1.26
#32	293.700	16,301.600	225.12	61.87	2,217.3	56,165	0.00	0.00
#31	957.100	957.100	186.43	19.66	773.0	37,599	0.40	0.30
#33	0.000	17,258.700	306.26	81.53	2,990.3	46,265	0.13	0.07
#34	1,156.300	18,415.000	307.96	88.07	2,839.9	41,501	0.10	0.06
#5	2,023.000	2,023.000	229.14	23.65	597.2	35,964	1.23	0.63
#6	1,743.200	3,766.200	265.00	46.82	1,150.6	31,888	0.18	0.10
#7	2,395.300	6,161.500	489.93	97.92	3,549.5	40,575	0.00	0.00
#8	0.000	6,161.500	489.93	97.92	3,549.5	40,575	0.00	0.00
#10	1,053.200	7,214.700	502.27	115.36	3,451.8	36,547	0.05	0.03
#1	2,411.100	2,411.100	145.59	19.69	601.9	34,411	2.97	1.92
#2	1,497.000	3,908.100	219.24	47.99	977.7	22,730	0.13	0.09
#3	828.500	4,736.600	271.89	59.69	1,086.0	18,351	0.04	0.03
#4	0.000	4,736.600	271.89	59.69	1,086.0	18,351	0.04	0.03
#9	712.000	5,448.600	267.75	62.06	1,092.0	17,549	0.27	0.20
#11	0.000	12,663.300	695.59	177.41	4,543.8	30,866	0.15	0.09
#21	646.500	13,309.800	696.25	178.83	4,549.6	31,570	0.14	0.08
#18	848.500	848.500	87.84	11.61	118.2	12,305	0.00	0.00
#17	182.200	182.200	65.14	4.08	55.0	14,274	0.37	0.26
#19	0.000	1,030.700	148.60	15.69	173.2	11,407	0.09	0.07
#15	1,992.700	1,992.700	180.77	24.60	857.0	40,282	0.20	0.12
#12	3,494.500	3,494.500	54.37	8.31	106.0	14,291	5.52	3.61
#13	2,720.700	6,215.200	99.03	15.37	232.3	16,747	7.21	4.76
#14	5,096.800	11,312.000	214.75	67.68	1,686.3	69,407	0.58	0.15
#16	1,022.000	14,326.700	406.07	113.86	3,186.9	46,135	0.51	0.23
#20	577.100	15,934.500	413.71	140.15	3,440.9	40,782	0.28	0.12
#22	0.000	29,244.300	1,047.30	318.98	7,990.5	30,847	0.17	0.10
#23	146.440	29,390.740	1,039.26	319.60	7,960.0	30,797	0.09	0.05
#35	0.000	47,805.740	1,283.68	407.66	10,799.9	30,133	0.07	0.05
#36	463.090	48,268.830	1,274.23	408.77	10,743.5	30,649	0.02	0.01
#37	1,661.000	49,929.830	1,240.31	418.81	10,473.1	31,530	0.06	0.03

Particle Size Distribution(s) at Each Structure

Structure #30:

Size (mm)	In/Out
2.0000	100.000%
0.1000	48.542%
0.0500	27.507%
0.0020	17.799%
0.0010	0.000%

Structure #28:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	100.000%
0.0010	0.000%

Structure #26:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	98.959%
0.0020	67.283%
0.0010	0.000%

Structure #24:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	82.732%
0.0010	0.000%

Structure #25:

Size (mm)	In/Out
2.0000	100.000%
0.1000	75.475%
0.0500	54.531%
0.0020	41.368%
0.0010	0.000%

Structure #27:

Size (mm)	In/Out
2.0000	100.000%
0.1000	83.117%
0.0500	53.429%
0.0020	36.645%
0.0010	0.000%

Structure #29:

Size (mm)	In/Out
2.0000	100.000%
0.1000	98.330%
0.0500	95.362%
0.0020	92.997%
0.0010	0.000%

Structure #32:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	100.000%
0.0010	0.000%

Structure #31:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	96.996%
0.0010	0.000%

Structure #33 (Inlet to North Fork Diversion):

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	99.224%
0.0010	0.000%

Structure #34 (End of North Fork):

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.866%
0.0500	99.706%
0.0020	99.668%
0.0010	0.000%

Structure #5:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	97.321%
0.0020	93.713%
0.0010	0.000%

Structure #6:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	98.412%
0.0010	0.000%

Structure #7:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	100.000%
0.0010	0.000%

Structure #8:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	100.000%
0.0010	0.000%

Structure #10:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	99.871%
0.0020	99.779%
0.0010	0.000%

Structure #1:

Size (mm)	In/Out
2.0000	100.000%
0.1000	98.279%
0.0500	91.147%
0.0020	86.784%
0.0010	0.000%

Structure #2:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	98.374%
0.0010	0.000%

Structure #3:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	99.421%
0.0010	0.000%

Structure #4:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	99.421%
0.0010	0.000%

Structure #9:

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.451%
0.0500	98.299%
0.0020	97.768%
0.0010	0.000%

Structure #11:

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.868%
0.0500	99.493%
0.0020	99.295%
0.0010	0.000%

Structure #21 (End of South Fork):

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.868%
0.0500	99.576%
0.0020	99.304%
0.0010	0.000%

Structure #18:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	100.000%
0.0010	0.000%

Structure #17:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	92.667%
0.0010	0.000%

Structure #19:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	97.672%
0.0010	0.000%

Structure #15:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	98.619%
0.0010	0.000%

Structure #12:

Size (mm)	In/Out
2.0000	100.000%
0.1000	91.000%
0.0500	61.522%
0.0020	39.808%
0.0010	0.000%

Structure #13:

Size (mm)	In/Out
2.0000	100.000%
0.1000	88.147%
0.0500	54.905%
0.0020	35.527%
0.0010	0.000%

Structure #14:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	97.648%
0.0010	0.000%

Structure #16:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	96.863%
0.0010	0.000%

Structure #20 (End of Middle Fork):

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	98.081%
0.0010	0.000%

Structure #22:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	99.759%
0.0020	98.778%
0.0010	0.000%

Structure #23:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	99.198%
0.0010	0.000%

Structure #35 (all forks):

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	99.321%
0.0010	0.000%

Structure #36:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	99.857%
0.0010	0.000%

Structure #37:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	99.819%
0.0020	99.702%
0.0010	0.000%

Structure Detail:

Structure #30 (Null)

Structure #28 (Null)

Structure #26 (Null)

Structure #24 (Null)

Structure #25 (Null)

Structure #27 (Null)

Structure #29 (Null)

Structure #32 (Null)

Structure #31 (Null)

Structure #33 (Null)

Inlet to North Fork Diversion

Structure #34 (Null)

End of North Fork

Structure #5 (Null)

Structure #6 (Null)

Structure #7 (Null)

Structure #8 (Null)

Structure #10 (Null)

Structure #1 (Null)

Structure #2 (Null)

Structure #3 (Null)

Structure #4 (Null)

Structure #9 (Null)

Structure #11 (Null)

Structure #21 (Null)

End of South Fork

Structure #18 (Null)

Structure #17 (Null)

Structure #19 (Null)

Structure #15 (Null)

Structure #12 (Null)

Structure #13 (Null)

Structure #14 (Null)

Structure #16 (Null)

Structure #20 (Null)

End of Middle Fork

Structure #22 (Null)

Structure #23 (Null)

Structure #35 (Null)

all forks

Structure #36 (Null)

Structure #37 (Null)

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#30	1	476.400	1.131	0.000	0.000	73.100	M	0.42	0.108
	Σ	**476.400**						**0.42**	**0.108**
#28	1	772.300	0.657	0.523	0.334	90.400	M	154.33	12.273
	2	445.600	0.587	0.000	0.000	90.400	M	96.41	7.084
	Σ	**1,217.900**						**168.77**	**19.357**
#26	1	447.600	2.192	0.000	0.000	74.200	M	0.63	0.195
	2	2,038.800	3.000	0.000	0.000	77.000	M	7.95	2.663
	Σ	**2,486.400**						**8.59**	**2.858**
#24	1	2,607.500	5.367	2.377	0.305	75.200	M	3.53	1.798
	2	2,331.900	4.813	2.431	0.304	74.700	M	2.75	1.295
	3	1,758.500	2.231	1.788	0.297	76.200	M	6.20	1.768
	4	1,363.900	2.618	0.000	0.000	77.000	M	5.82	1.781
	Σ	**8,061.800**						**11.17**	**6.642**
#25	1	515.200	0.990	0.342	0.357	78.200	M	6.68	0.949
	2	130.500	0.787	0.342	0.357	78.100	M	1.94	0.234
	3	370.000	0.516	0.000	0.000	85.700	M	43.63	3.000
	Σ	**9,077.500**						**43.84**	**10.825**
#27	1	354.400	0.612	1.233	0.337	83.100	M	22.90	1.867
	2	305.200	0.529	1.054	0.328	84.000	M	26.16	1.879
	3	289.800	0.692	0.551	0.328	75.500	M	1.46	0.226
	4	253.000	0.361	0.551	0.328	79.400	M	10.21	0.631
	5	581.300	0.980	0.000	0.000	82.300	M	22.25	2.645
	Σ	**13,347.600**						**76.77**	**20.932**
#29	1	508.800	0.409	0.416	0.312	89.500	M	123.40	7.174
	2	233.200	0.521	0.291	0.312	91.600	M	64.31	4.349
	3	224.000	0.467	0.000	0.000	90.000	M	53.48	3.373
	Σ	**15,531.500**						**221.98**	**55.186**
#32	1	293.700	0.576	0.000	0.000	93.000	M	91.29	6.575
	Σ	**16,301.600**						**225.12**	**61.868**
#31	1	431.100	0.588	0.450	0.336	91.500	M	108.09	7.934
	2	325.800	0.432	0.149	0.327	93.000	M	121.15	7.302
	3	200.200	0.373	0.000	0.000	92.900	M	79.56	4.422
	Σ	**957.100**						**186.43**	**19.658**
#33	**Σ**	**17,258.700**						**306.26**	**81.526**

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#34	1	250.000	0.423	1.019	0.292	90.500	M	67.74	4.035
	2	219.100	0.611	0.267	0.322	80.000	M	7.03	0.625
	3	246.200	0.688	0.466	0.293	80.000	M	7.21	0.702
	4	441.000	0.370	0.000	0.000	79.700	M	19.00	1.177
	Σ	**18,415.000**						**307.96**	**88.066**
#5	1	503.600	0.618	0.000	0.000	87.600	M	70.38	5.418
	2	406.500	0.388	0.501	0.350	84.800	M	50.23	2.856
	3	439.600	0.342	0.681	0.347	87.800	M	93.95	4.893
	4	162.600	0.280	0.681	0.347	86.000	M	29.90	1.385
	5	294.100	0.375	1.021	0.348	92.000	M	104.07	5.773
	6	216.600	0.272	1.018	0.348	90.100	M	70.08	3.321
	Σ	**2,023.000**						**229.14**	**23.646**
#6	1	149.100	0.331	0.000	0.000	92.600	M	60.49	3.180
	2	245.000	0.529	0.192	0.328	88.100	M	41.26	2.835
	3	276.200	0.450	0.461	0.319	89.500	M	63.13	3.884
	4	158.400	0.380	1.385	0.185	93.000	M	63.13	3.542
	5	206.200	0.402	0.796	0.320	89.400	M	49.86	2.867
	6	414.000	0.430	1.066	0.323	87.200	M	70.28	4.213
	7	294.300	0.535	1.066	0.323	86.400	M	37.89	2.654
	Σ	**3,766.200**						**265.00**	**46.822**
#7	1	731.700	1.274	0.000	0.000	93.000	M	125.32	16.354
	2	445.800	1.043	0.000	0.000	93.000	M	89.59	9.961
	3	270.800	0.804	0.000	0.000	93.000	M	66.41	6.053
	4	78.900	0.267	1.035	0.328	93.000	M	36.64	1.774
	5	154.900	0.310	1.071	0.326	93.000	M	67.89	3.478
	6	101.400	0.288	1.164	0.328	92.900	M	45.26	2.246
	7	117.700	0.298	1.344	0.329	92.200	M	47.63	2.379
	8	494.100	0.518	1.344	0.329	91.300	M	131.34	8.857
	Σ	**6,161.500**						**489.93**	**97.922**
#8	1	0.000	0.000	0.000	0.000	1.000	0.00	0.000	
	Σ	**6,161.500**						**489.93**	**97.922**
#10	1	355.500	1.286	0.000	0.000	93.000	M	60.42	7.944
	2	307.100	1.282	0.668	0.305	83.200	M	11.38	1.645
	3	147.300	1.245	0.517	0.303	90.600	M	18.52	2.401
	4	126.400	0.585	0.517	0.303	93.000	M	38.88	2.830
	5	116.900	1.179	0.621	0.305	93.000	M	21.32	2.613
	Σ	**7,214.700**						**502.27**	**115.355**
#1	1	557.400	0.941	0.000	0.000	83.600	M	28.55	3.202
	2	169.600	1.616	0.677	0.333	93.000	M	23.89	3.790
	3	636.400	1.842	0.729	0.333	81.000	M	11.02	2.246

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
	4	223.400	0.846	1.005	0.336	84.100	M	13.64	1.398
	5	77.700	0.330	1.392	0.341	81.400	M	5.49	0.299
	6	746.600	0.678	1.392	0.341	88.200	M	106.62	8.758
	Σ	**2,411.100**						**145.59**	**19.692**
#2	1	257.000	0.423	0.000	0.000	93.000	M	96.72	5.764
	2	180.500	0.562	0.478	0.281	91.800	M	48.62	3.452
	3	200.700	0.687	0.574	0.283	93.000	M	55.21	4.488
	4	438.600	0.811	0.574	0.283	93.000	M	106.86	9.806
	5	420.200	1.247	0.801	0.293	88.000	M	36.13	4.787
	Σ	**3,908.100**						**219.24**	**47.989**
#3	1	172.600	0.443	0.000	0.000	93.000	M	63.26	3.862
	2	277.000	0.890	0.000	0.000	88.900	M	35.65	3.583
	3	378.900	0.632	0.209	0.314	87.900	M	54.50	4.256
	Σ	**4,736.600**						**271.89**	**59.690**
#4	**Σ**	**4,736.600**						**271.89**	**59.690**
#9	1	288.000	0.987	0.000	0.000	85.800	M	21.04	2.368
	2	236.000	0.436	0.000	0.000	1.000	M	0.00	0.000
	3	106.000	0.324	0.297	0.268	1.000	M	0.00	0.000
	4	82.000	0.315	0.666	0.300	1.000	M	0.00	0.000
	Σ	**5,448.600**						**267.75**	**62.057**
#11	**Σ**	**12,663.300**						**695.59**	**177.412**
#21	1	146.000	0.819	0.000	0.000	86.900	M	14.78	1.418
	2	137.000	0.213	0.249	0.263	1.000	M	0.00	0.000
	3	182.500	0.289	0.878	0.256	1.000	M	0.00	0.000
	4	70.000	0.939	0.878	0.256	1.000	M	0.00	0.000
	5	111.000	0.297	0.947	0.263	1.000	M	0.00	0.000
	Σ	**13,309.800**						**696.25**	**178.830**
#18	1	301.700	0.652	0.000	0.000	93.000	M	86.12	6.753
	2	546.800	0.768	0.561	0.320	86.300	M	52.82	4.856
	Σ	**848.500**						**87.84**	**11.608**
#17	1	182.200	0.462	0.000	0.000	93.000	M	65.14	4.077
	Σ	**182.200**						**65.14**	**4.077**
#19	**Σ**	**1,030.700**						**148.60**	**15.685**
#15	1	437.400	0.803	0.000	0.000	91.300	M	85.27	7.826
	2	549.000	0.637	0.654	0.327	91.300	M	126.59	9.828
	3	1,006.300	1.023	0.768	0.331	84.700	M	59.01	6.949
	Σ	**1,992.700**						**180.77**	**24.603**

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#12	1	517.800	0.791	0.000	0.000	81.900	M	21.49	2.184
	2	229.000	0.571	0.043	0.418	80.100	M	7.95	0.669
	3	592.700	0.706	0.044	0.417	81.500	M	24.57	2.314
	4	1,806.900	1.542	0.487	0.362	76.700	M	9.77	2.147
	5	348.100	0.618	0.487	0.362	80.000	11.07	0.993	
	Σ	**3,494.500**						**54.37**	**8.307**
#13	1	411.600	0.725	0.000	0.000	79.700	M	10.68	1.098
	2	636.400	0.774	0.322	0.336	80.700	M	20.37	2.112
	3	319.000	0.575	0.685	0.318	85.500	M	33.59	2.506
	4	231.700	0.314	0.923	0.328	80.400	M	13.44	0.724
	5	1,122.000	1.308	0.923	0.328	74.700	M	2.63	0.623
	Σ	**6,215.200**						**99.03**	**15.370**
#14	1	405.900	0.384	0.000	0.000	90.800	M	121.19	6.801
	2	411.100	0.452	0.707	0.308	90.700	M	109.89	6.798
	3	787.400	0.658	0.975	0.307	91.400	M	179.88	14.295
	4	144.200	0.341	1.716	0.310	86.200	M	24.38	1.267
	5	343.800	0.289	1.970	0.312	86.500	M	66.96	3.155
	6	392.800	0.806	2.107	0.316	81.900	M	16.07	1.657
	7	528.200	0.518	2.544	0.316	87.200	M	78.91	5.369
	8	890.900	1.253	2.544	0.316	83.500	M	35.63	5.030
	9	741.400	1.076	3.047	0.316	84.800	M	42.51	5.204
	10	451.100	0.916	3.354	0.316	83.900	M	24.97	2.728
	Σ	**11,312.000**						**214.75**	**67.675**
#16	1	475.100	1.721	0.000	0.000	92.400	M	58.55	9.819
	2	348.400	0.542	0.951	0.283	92.500	M	105.55	7.299
	3	198.500	0.266	1.384	0.278	93.000	M	92.31	4.462
	Σ	**14,326.700**						**406.07**	**113.858**
#20	1	271.100	0.667	0.000	0.000	89.400	M	46.63	3.761
	2	306.000	0.713	0.410	0.287	93.000	M	81.95	6.842
	Σ	**15,934.500**						**413.71**	**140.147**
#22	**Σ**	**29,244.300**						**1,047.30**	**318.977**
#23	1	146.440	0.564	0.000	0.000	81.900	M	7.86	0.618
	Σ	**29,390.740**						**1,039.26**	**319.595**
#35	**Σ**	**47,805.740**						**1,283.68**	**407.662**
#36	1	262.090	0.606	0.000	0.000	81.900	M	13.33	1.107
	2	45.000	0.159	0.470	0.263	1.000	M	0.00	0.000
	3	156.000	0.158	0.000	0.000	1.000	M	0.00	0.000
	Σ	**48,268.830**						**1,274.23**	**408.769**

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#37	1	344.000	1.756	0.000	0.000	84.800	M	13.24	2.414
	2	300.000	0.415	1.870	0.241	87.800	M	56.95	3.334
	3	185.000	0.332	1.493	0.241	85.500	M	28.46	1.459
	4	246.000	0.363	2.653	0.246	1.000	M	0.00	0.000
	5	157.000	0.611	2.512	0.242	84.100	M	12.31	0.983
	6	76.000	0.095	2.512	0.242	84.100	M	27.98	0.595
	7	243.000	0.673	1.814	0.241	83.000	M	14.34	1.258
	8	81.000	0.151	0.095	0.383	1.000	M	0.00	0.000
	9	29.000	0.118	1.721	0.298	1.000	M	0.00	0.000
	Σ	**49,929.830**						**1,240.31**	**418.810**

Subwatershed Sedimentology Detail:

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
#30	1	0.095	200.00	3.80	0.3720	1.0000	2	0.4	2,965	1.82	1.55
	Σ							**0.4**	**2,965**	**1.82**	**1.55**
#28	1	0.187	100.00	10.10	0.3750	1.0000	3	739.2	61,682	0.00	0.00
	2	0.196	100.00	10.20	0.3930	1.0000	3	465.2	68,043	0.00	0.00
	Σ							**939.7**	**51,228**	**0.00**	**0.00**
#26	1	0.155	400.00	1.40	0.3480	1.0000	2	0.5	2,388	0.74	0.59
	2	0.155	300.00	2.40	0.3340	1.0000	2	12.6	4,534	0.54	0.41
	Σ							**13.1**	**4,375**	**0.55**	**0.42**
#24	1	0.128	300.00	2.30	0.3360	1.0000	2	5.1	2,784	0.20	0.15
	2	0.136	300.00	2.70	0.3440	1.0000	2	4.7	3,502	0.38	0.29
	3	0.107	300.00	2.30	0.3330	1.0000	2	5.8	3,108	0.51	0.39
	4	0.163	400.00	1.60	0.3210	1.0000	2	6.5	3,508	0.46	0.36
	Σ							**17.5**	**2,885**	**0.18**	**0.12**
#25	1	0.125	400.00	1.90	0.3440	1.0000	2	4.7	5,072	1.86	1.34
	2	0.124	300.00	2.60	0.3280	1.0000	2	1.2	5,507	2.23	1.57
	3	0.122	175.00	4.90	0.2660	1.0000	2	43.0	15,659	8.76	5.86
	Σ							**64.9**	**15,537**	**6.38**	**1.81**
#27	1	0.127	175.00	5.90	0.3160	1.0000	2	33.9	19,102	9.87	6.86
	2	0.122	150.00	7.50	0.2920	1.0000	2	37.9	21,382	11.60	7.99
	3	0.070	125.00	8.40	0.3270	1.0000	2	1.5	6,752	2.44	1.82
	4	0.097	125.00	9.60	0.3170	1.0000	2	13.5	23,951	12.80	8.34
	5	0.126	125.00	8.90	0.3290	1.0000	2	56.1	22,130	9.81	6.86

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
	Σ							**211.6**	**23,433**	**10.13**	**3.21**
#29	1	0.190	125.00	9.80	0.3930	1.0000	3	532.0	77,172	0.75	0.52
	2	0.203	125.00	8.90	0.3940	1.0000	3	258.7	61,430	0.00	0.00
	3	0.193	125.00	8.40	0.3940	1.0000	3	175.6	54,954	0.00	0.00
	Σ							**2,116.8**	**64,602**	**2.94**	**1.26**
#32	1	0.210	150.00	7.70	0.3990	1.0000	3	371.2	58,211	0.00	0.00
	Σ							**2,217.3**	**56,165**	**0.00**	**0.00**
#31	1	0.204	125.00	8.70	0.3620	1.0000	3	431.7	55,950	0.00	0.00
	2	0.210	150.00	7.30	0.3990	1.0000	3	438.0	62,096	2.06	1.43
	3	0.210	175.00	4.50	0.3980	1.0000	3	177.9	42,351	1.96	1.35
	Σ							**773.0**	**37,599**	**0.40**	**0.30**
#33	Σ							**2,990.3**	**46,265**	**0.13**	**0.07**
#34	1	0.193	200.00	3.84	0.2460	1.0000	3	65.9	16,977	0.23	0.16
	2	0.100	200.00	3.66	0.2540	1.0000	1	3.3	5,779	2.98	2.02
	3	0.100	300.00	2.54	0.2540	1.0000	1	2.9	4,419	2.21	1.53
	4	0.100	200.00	3.50	0.2540	1.0000	1	8.0	7,963	4.51	2.81
	Σ							**2,839.9**	**41,501**	**0.10**	**0.06**
#5	1	0.149	75.00	12.50	0.3230	1.0000	3	233.9	45,624	0.00	0.00
	2	0.133	75.00	15.80	0.3190	1.0000	2	160.7	60,621	35.07	23.47
	3	0.103	100.00	11.00	0.2030	1.0000	3	112.4	24,558	0.41	0.28
	4	0.093	75.00	13.80	0.2130	1.0000	2	31.5	24,650	15.01	10.10
	5	0.123	100.00	11.00	0.1370	1.0000	3	105.5	18,986	0.74	0.52
	6	0.149	75.00	14.70	0.1990	1.0000	3	134.3	42,024	2.19	1.53
	Σ							**597.2**	**35,964**	**1.23**	**0.63**
#6	1	0.208	175.00	4.30	0.3980	1.0000	3	120.1	39,925	2.16	1.49
	2	0.183	175.00	5.40	0.3910	1.0000	3	97.6	36,476	0.00	0.00
	3	0.188	150.00	7.60	0.3900	1.0000	3	194.4	52,428	0.00	0.00
	4	0.210	150.00	6.30	0.3990	1.0000	3	176.3	49,309	2.24	1.64
	5	0.185	125.00	8.10	0.3860	1.0000	3	136.3	49,341	0.54	0.38
	6	0.104	100.00	11.30	0.2240	1.0000	3	101.7	25,411	0.00	0.00
	7	0.164	100.00	11.20	0.3740	1.0000	3	144.7	56,415	0.00	0.00
	Σ							**1,150.6**	**31,888**	**0.18**	**0.10**
#7	1	0.208	150.00	7.80	0.3780	1.0000	3	702.2	43,218	0.00	0.00
	2	0.209	100.00	10.20	0.3940	1.0000	3	578.3	58,417	0.00	0.00
	3	0.210	150.00	6.70	0.3990	1.0000	3	259.8	43,870	0.00	0.00
	4	0.210	100.00	11.50	0.3990	1.0000	3	160.1	89,864	6.44	4.62
	5	0.210	150.00	7.10	0.3990	1.0000	3	203.3	58,980	3.65	2.61
	6	0.209	150.00	7.90	0.3990	1.0000	3	139.9	62,665	4.16	2.98

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
	7	0.206	75.00	15.50	0.3990	1.0000	3	266.1	110,381	6.55	4.71
	8	0.202	75.00	14.50	0.3980	1.0000	3	883.3	99,436	0.00	0.00
	Σ							**3,549.5**	**40,575**	**0.00**	**0.00**
#8	1	0.000	0.00	0.00	0.0000	1.0000	0	0.0	1	0.00	0.00
	Σ							**3,549.5**	**40,575**	**0.00**	**0.00**
#10	1	0.190	300.00	2.70	0.1930	1.0000	3	57.1	7,337	0.00	0.00
	2	0.153	200.00	3.50	0.3610	1.0000	2	15.7	9,695	3.99	2.88
	3	0.189	200.00	3.70	0.3190	1.0000	3	29.3	12,402	0.00	0.00
	4	0.190	300.00	2.10	0.1940	1.0000	3	20.0	7,361	0.00	0.00
	5	0.201	300.00	2.00	0.3030	1.0000	3	21.7	8,433	0.00	0.00
	Σ							**3,451.8**	**36,547**	**0.05**	**0.03**
#1	1	0.157	150.00	6.80	0.3830	1.0000	2	82.5	26,888	12.53	8.75
	2	0.210	150.00	6.60	0.3990	1.0000	3	111.1	29,342	0.00	0.00
	3	0.149	200.00	3.90	0.3870	1.0000	2	21.2	9,384	2.84	2.10
	4	0.169	175.00	4.70	0.3950	1.0000	2	28.9	21,381	10.40	7.35
	5	0.157	100.00	10.10	0.3940	1.0000	2	12.5	44,935	25.37	17.19
	6	0.175	75.00	12.60	0.2840	1.0000	3	403.0	47,055	0.00	0.00
	Σ							**601.9**	**34,411**	**2.97**	**1.92**
#2	1	0.190	150.00	7.90	0.1930	1.0000	3	159.6	29,198	1.03	0.71
	2	0.184	175.00	4.80	0.2010	1.0000	3	55.3	16,688	0.00	0.00
	3	0.202	200.00	3.90	0.3220	1.0000	3	86.9	19,896	0.00	0.00
	4	0.203	150.00	7.40	0.3220	1.0000	3	381.1	39,430	0.00	0.00
	5	0.181	175.00	5.10	0.3710	1.0000	3	108.1	22,816	0.00	0.00
	Σ							**977.7**	**22,730**	**0.13**	**0.09**
#3	1	0.190	175.00	5.20	0.1930	1.0000	3	72.9	19,971	0.61	0.42
	2	0.177	175.00	4.20	0.2560	1.0000	3	51.3	14,914	0.00	0.00
	3	0.166	175.00	4.30	0.2290	1.0000	3	61.4	15,297	0.00	0.00
	Σ							**1,086.0**	**18,351**	**0.04**	**0.03**
#4	Σ							**1,086.0**	**18,351**	**0.04**	**0.03**
#9	1	0.212	175.00	4.17	0.2490	1.0000	2	35.0	15,407	7.45	5.23
	2	0.100	200.00	4.50	0.2540	1.0000	4	0.0	1	0.00	0.00
	3	0.100	200.00	4.50	0.2540	1.0000	4	0.0	1	0.00	0.00
	4	0.100	200.00	6.50	0.2540	1.0000	4	0.0	1	0.00	0.00
	Σ							**1,092.0**	**17,549**	**0.27**	**0.20**
#11	Σ							**4,543.8**	**30,866**	**0.15**	**0.09**
#21	1	0.206	175.00	4.44	0.2560	1.0000	2	22.8	16,944	8.78	6.11
	2	0.100	175.00	14.00	0.2540	1.0000	4	0.0	1	0.00	0.00
	3	0.185	300.00	2.70	0.2180	1.0000	3	0.0	1	0.00	0.00

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
	4	0.100	300.00	8.00	0.2540	1.0000	1	0.0	1	0.00	0.00
	5	0.100	200.00	5.00	0.2540	1.0000	1	0.0	1	0.00	0.00
	Σ							**4,549.6**	**31,570**	**0.14**	**0.08**
#18	1	0.193	300.00	2.80	0.2200	1.0000	3	76.0	11,763	0.00	0.00
	2	0.173	175.00	4.70	0.3880	1.0000	3	124.7	26,650	0.00	0.00
	Σ							**118.2**	**12,305**	**0.00**	**0.00**
#17	1	0.196	300.00	2.60	0.2600	1.0000	3	55.0	14,274	0.37	0.26
	Σ							**55.0**	**14,274**	**0.37**	**0.26**
#19	Σ							**173.2**	**11,407**	**0.09**	**0.07**
#15	1	0.201	125.00	8.20	0.3960	1.0000	3	368.1	48,226	0.00	0.00
	2	0.161	100.00	11.40	0.3060	1.0000	3	487.2	50,739	0.00	0.00
	3	0.118	100.00	10.20	0.2850	1.0000	2	152.8	22,483	10.48	7.48
	Σ							**857.0**	**40,282**	**0.20**	**0.12**
#12	1	0.124	150.00	6.30	0.3070	1.0000	2	33.4	16,317	7.66	5.26
	2	0.132	200.00	3.60	0.3500	1.0000	2	6.7	11,058	5.41	3.57
	3	0.136	175.00	5.00	0.3330	1.0000	2	38.4	17,881	8.59	5.82
	4	0.188	200.00	3.40	0.3570	1.0000	2	19.8	8,880	2.17	1.65
	5	0.228	175.00	4.10	0.3640	1.0000	2	23.2	25,014	11.93	8.15
	Σ							**106.0**	**14,291**	**5.52**	**3.61**
#13	1	0.128	150.00	6.90	0.3390	1.0000	2	19.1	18,713	8.41	5.72
	2	0.130	175.00	5.70	0.3300	1.0000	2	35.2	17,524	7.99	5.56
	3	0.191	175.00	6.00	0.2890	1.0000	2	69.3	29,144	15.93	11.00
	4	0.122	175.00	5.10	0.3460	1.0000	2	13.5	20,608	11.54	7.65
	5	0.137	175.00	4.20	0.3530	1.0000	2	4.8	7,061	2.12	1.69
	Σ							**232.3**	**16,747**	**7.21**	**4.76**
#14	1	0.196	100.00	10.20	0.3980	1.0000	3	523.7	80,672	2.17	1.48
	2	0.193	150.00	6.70	0.4020	1.0000	3	340.2	51,669	0.39	0.28
	3	0.169	75.00	13.80	0.3240	1.0000	3	881.1	62,374	0.00	0.00
	4	0.114	100.00	11.00	0.2980	1.0000	3	40.3	32,851	0.11	0.08
	5	0.078	100.00	10.10	0.1830	1.0000	3	44.0	14,425	0.35	0.25
	6	0.084	150.00	7.10	0.2700	1.0000	2	16.3	10,073	4.71	3.36
	7	0.087	100.00	10.00	0.1840	1.0000	3	69.6	13,279	0.00	0.00
	8	0.126	150.00	6.70	0.2740	1.0000	2	68.1	13,578	5.70	4.16
	9	0.117	150.00	7.30	0.2600	1.0000	2	73.3	14,162	6.51	4.74
	10	0.115	125.00	8.50	0.2610	1.0000	2	41.0	15,152	7.17	5.20
	Σ							**1,686.3**	**69,407**	**0.58**	**0.15**
#16	1	0.201	300.00	2.78	0.3030	1.0000	3	107.7	11,117	0.00	0.00
	2	0.204	150.00	6.00	0.3630	1.0000	3	297.4	41,540	0.09	0.06

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
	3	0.210	150.00	6.10	0.3990	1.0000	3	240.0	53,468	3.85	2.79
	Σ							**3,186.9**	**46,135**	**0.51**	**0.23**
#20	1	0.186	175.00	3.19	0.2130	1.0000	3	34.7	9,786	0.00	0.00
	2	0.194	200.00	3.42	0.2330	1.0000	3	84.4	12,734	0.00	0.00
	Σ							**3,440.9**	**40,782**	**0.28**	**0.12**
#22	Σ							**7,990.5**	**30,847**	**0.17**	**0.10**
#23	1	0.100	350.00	8.00	0.2540	1.0000	1	12.0	21,398	11.71	7.77
	Σ							**7,960.0**	**30,797**	**0.09**	**0.05**
#35	Σ							**10,799.9**	**30,133**	**0.07**	**0.05**
#36	1	0.100	200.00	3.14	0.2540	1.0000	1	5.7	5,672	3.06	2.04
	2	0.100	450.00	13.00	0.2540	1.0000	1	0.0	1	0.00	0.00
	3	0.100	300.00	10.00	0.2540	1.0000	1	0.0	1	0.00	0.00
	Σ							**10,743.5**	**30,649**	**0.02**	**0.01**
#37	1	0.196	200.00	3.80	0.3980	1.0000	2	32.3	13,558	5.09	3.68
	2	0.194	200.00	3.42	0.4020	1.0000	3	79.3	24,132	0.00	0.00
	3	0.173	150.00	7.10	0.2770	1.0000	3	43.9	31,001	0.00	0.00
	4	0.100	175.00	5.00	0.2540	1.0000	1	0.0	1	0.00	0.00
	5	0.171	150.00	6.50	0.2990	1.0000	3	21.6	22,285	0.00	0.00
	6	0.171	150.00	6.50	0.2990	1.0000	3	22.8	39,070	10.14	7.23
	7	0.100	300.00	1.20	0.2540	1.0000	1	3.1	2,554	1.38	0.98
	8	0.100	300.00	10.00	0.2540	1.0000	1	0.0	1	0.00	0.00
	9	0.100	250.00	10.00	0.2540	1.0000	1	0.0	1	0.00	0.00
	Σ							**10,473.1**	**31,530**	**0.06**	**0.03**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	3.65	50.00	1,369.00	1.910	0.199
		8. Large gullies, diversions, and low flowing streams	1.57	157.00	10,030.00	3.750	0.742
#1	**1**	**Time of Concentration:**					**0.941**
#1	2	5. Nearly bare and untilled, and alluvial valley fans	6.63	70.00	1,056.00	2.570	0.114
		5. Nearly bare and untilled, and alluvial valley fans	1.98	150.00	7,573.00	1.400	1.502
#1	**2**	**Time of Concentration:**					**1.616**
#1	3	5. Nearly bare and untilled, and alluvial valley fans	1.65	117.00	7,070.00	1.280	1.534

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	2.43	126.00	5,188.00	4.670	0.308
#1	**3**	**Time of Concentration:**					**1.842**
#1	4	5. Nearly bare and untilled, and alluvial valley fans	5.77	260.00	4,506.00	2.400	0.521
		8. Large gullies, diversions, and low flowing streams	2.84	168.00	5,924.00	5.050	0.325
#1	**4**	**Time of Concentration:**					**0.846**
#1	5	5. Nearly bare and untilled, and alluvial valley fans	19.93	180.00	903.00	4.460	0.056
		8. Large gullies, diversions, and low flowing streams	3.30	178.00	5,393.00	5.450	0.274
#1	**5**	**Time of Concentration:**					**0.330**
#1	6	5. Nearly bare and untilled, and alluvial valley fans	13.43	105.00	782.00	3.660	0.059
		8. Large gullies, diversions, and low flowing streams	2.62	283.00	10,822.00	4.850	0.619
#1	**6**	**Time of Concentration:**					**0.678**
#2	1	5. Nearly bare and untilled, and alluvial valley fans	6.84	70.00	1,024.00	2.610	0.108
		8. Large gullies, diversions, and low flowing streams	1.62	70.00	4,325.00	3.810	0.315
#2	**1**	**Time of Concentration:**					**0.423**
#2	2	5. Nearly bare and untilled, and alluvial valley fans	5.56	45.00	810.00	2.350	0.095
		8. Large gullies, diversions, and low flowing streams	0.86	40.00	4,663.00	2.770	0.467
#2	**2**	**Time of Concentration:**					**0.562**
#2	3	5. Nearly bare and untilled, and alluvial valley fans	5.89	50.00	849.00	2.420	0.097
		8. Large gullies, diversions, and low flowing streams	1.17	80.00	6,862.00	3.230	0.590
#2	**3**	**Time of Concentration:**					**0.687**
#2	4	5. Nearly bare and untilled, and alluvial valley fans	12.63	95.00	752.00	3.550	0.058
		8. Large gullies, diversions, and low flowing streams	1.40	135.00	9,630.00	3.550	0.753
#2	**4**	**Time of Concentration:**					**0.811**
#2	5	5. Nearly bare and untilled, and alluvial valley fans	11.02	70.00	635.00	3.320	0.053
		8. Large gullies, diversions, and low flowing streams	0.46	40.00	8,732.00	2.030	1.194
#2	**5**	**Time of Concentration:**					**1.247**
#3	1	5. Nearly bare and untilled, and alluvial valley fans	1.24	10.00	805.00	1.110	0.201
		8. Large gullies, diversions, and low flowing streams	1.33	40.00	3,017.00	3.450	0.242
#3	**1**	**Time of Concentration:**					**0.443**
#3	2	5. Nearly bare and untilled, and alluvial valley fans	0.68	10.00	1,478.00	0.820	0.500

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	1.78	100.00	5,622.00	4.000	0.390
#3	**2**	**Time of Concentration:**					**0.890**
#3	3	5. Nearly bare and untilled, and alluvial valley fans	4.66	70.00	1,501.00	2.150	0.193
		8. Large gullies, diversions, and low flowing streams	1.17	60.00	5,126.00	3.240	0.439
#3	**3**	**Time of Concentration:**					**0.632**
#5	1	5. Nearly bare and untilled, and alluvial valley fans	19.06	285.00	1,495.00	4.360	0.095
		8. Large gullies, diversions, and low flowing streams	2.64	242.00	9,174.00	4.870	0.523
#5	**1**	**Time of Concentration:**					**0.618**
#5	2	5. Nearly bare and untilled, and alluvial valley fans	14.27	105.00	736.00	3.770	0.054
		8. Large gullies, diversions, and low flowing streams	4.08	297.00	7,279.00	6.050	0.334
#5	**2**	**Time of Concentration:**					**0.388**
#5	3	5. Nearly bare and untilled, and alluvial valley fans	8.27	35.00	423.00	2.870	0.040
		8. Large gullies, diversions, and low flowing streams	3.44	208.00	6,049.00	5.560	0.302
#5	**3**	**Time of Concentration:**					**0.342**
#5	4	5. Nearly bare and untilled, and alluvial valley fans	14.58	85.00	583.00	3.810	0.042
		8. Large gullies, diversions, and low flowing streams	4.53	248.00	5,473.00	6.380	0.238
#5	**4**	**Time of Concentration:**					**0.280**
#5	5	5. Nearly bare and untilled, and alluvial valley fans	5.07	70.00	1,382.00	2.250	0.170
		8. Large gullies, diversions, and low flowing streams	3.89	170.00	4,375.00	5.910	0.205
#5	**5**	**Time of Concentration:**					**0.375**
#5	6	5. Nearly bare and untilled, and alluvial valley fans	12.48	90.00	721.00	3.530	0.056
		8. Large gullies, diversions, and low flowing streams	5.16	274.00	5,308.02	6.810	0.216
#5	**6**	**Time of Concentration:**					**0.272**
#6	1	5. Nearly bare and untilled, and alluvial valley fans	5.36	75.00	1,399.00	2.310	0.168
		8. Large gullies, diversions, and low flowing streams	2.41	66.00	2,742.00	4.650	0.163
#6	**1**	**Time of Concentration:**					**0.331**
#6	2	5. Nearly bare and untilled, and alluvial valley fans	3.39	80.00	2,359.00	1.840	0.356
		8. Large gullies, diversions, and low flowing streams	2.63	80.00	3,039.00	4.860	0.173
#6	**2**	**Time of Concentration:**					**0.529**
#6	3	5. Nearly bare and untilled, and alluvial valley fans	4.60	34.00	739.00	2.140	0.095

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	2.33	136.00	5,845.00	4.570	0.355
#6	**3**	**Time of Concentration:**					**0.450**
#6	4	5. Nearly bare and untilled, and alluvial valley fans	6.06	85.00	1,402.00	2.460	0.158
		8. Large gullies, diversions, and low flowing streams	2.52	96.00	3,810.00	4.760	0.222
#6	**4**	**Time of Concentration:**					**0.380**
#6	5	5. Nearly bare and untilled, and alluvial valley fans	7.24	70.00	967.00	2.690	0.099
		8. Large gullies, diversions, and low flowing streams	2.34	117.00	5,003.00	4.580	0.303
#6	**5**	**Time of Concentration:**					**0.402**
#6	6	5. Nearly bare and untilled, and alluvial valley fans	31.83	183.00	575.00	5.640	0.028
		8. Large gullies, diversions, and low flowing streams	3.38	270.00	7,990.00	5.510	0.402
#6	**6**	**Time of Concentration:**					**0.430**
#6	7	5. Nearly bare and untilled, and alluvial valley fans	23.08	325.00	1,408.00	4.800	0.081
		8. Large gullies, diversions, and low flowing streams	2.88	240.00	8,327.00	5.090	0.454
#6	**7**	**Time of Concentration:**					**0.535**
#7	1	5. Nearly bare and untilled, and alluvial valley fans	11.42	90.00	788.00	3.370	0.064
		8. Large gullies, diversions, and low flowing streams	1.46	230.00	15,769.00	3.620	1.210
#7	**1**	**Time of Concentration:**					**1.274**
#7	2	5. Nearly bare and untilled, and alluvial valley fans	10.97	60.00	547.00	3.310	0.045
		8. Large gullies, diversions, and low flowing streams	1.61	220.00	13,660.00	3.800	0.998
#7	**2**	**Time of Concentration:**					**1.043**
#7	3	5. Nearly bare and untilled, and alluvial valley fans	6.40	60.00	938.00	2.520	0.103
		8. Large gullies, diversions, and low flowing streams	1.72	171.00	9,931.00	3.930	0.701
#7	**3**	**Time of Concentration:**					**0.804**
#7	4	5. Nearly bare and untilled, and alluvial valley fans	19.23	80.00	416.00	4.380	0.026
		8. Large gullies, diversions, and low flowing streams	2.45	100.00	4,083.00	4.690	0.241
#7	**4**	**Time of Concentration:**					**0.267**
#7	5	5. Nearly bare and untilled, and alluvial valley fans	6.09	67.00	1,101.00	2.460	0.124
		8. Large gullies, diversions, and low flowing streams	2.51	80.00	3,184.00	4.750	0.186
#7	**5**	**Time of Concentration:**					**0.310**
#7	6	5. Nearly bare and untilled, and alluvial valley fans	5.93	63.00	1,062.00	2.430	0.121

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	2.74	82.00	2,993.00	4.960	0.167
#7	**6**	**Time of Concentration:**					**0.288**
#7	7	5. Nearly bare and untilled, and alluvial valley fans	7.97	65.00	816.00	2.820	0.080
		8. Large gullies, diversions, and low flowing streams	3.48	153.00	4,400.00	5.590	0.218
#7	**7**	**Time of Concentration:**					**0.298**
#7	8	5. Nearly bare and untilled, and alluvial valley fans	6.60	50.00	758.00	2.560	0.082
		8. Large gullies, diversions, and low flowing streams	4.66	473.00	10,157.00	6.470	0.436
#7	**8**	**Time of Concentration:**					**0.518**
#9	1	5. Nearly bare and untilled, and alluvial valley fans	3.01	55.00	1,829.00	1.730	0.293
		8. Large gullies, diversions, and low flowing streams	0.76	50.00	6,548.00	2.620	0.694
#9	**1**	**Time of Concentration:**					**0.987**
#9	2	5. Nearly bare and untilled, and alluvial valley fans	4.67	70.00	1,500.02	2.160	0.192
		8. Large gullies, diversions, and low flowing streams	1.43	45.00	3,150.15	3.580	0.244
#9	**2**	**Time of Concentration:**					**0.436**
#9	3	5. Nearly bare and untilled, and alluvial valley fans	4.44	40.00	900.00	2.100	0.119
		8. Large gullies, diversions, and low flowing streams	1.48	40.00	2,700.14	3.650	0.205
#9	**3**	**Time of Concentration:**					**0.324**
#9	4	5. Nearly bare and untilled, and alluvial valley fans	6.50	65.00	1,000.00	2.540	0.109
		8. Large gullies, diversions, and low flowing streams	1.00	20.00	2,000.00	3.000	0.185
		9. Small streams flowing bankfull	2.92	35.00	1,200.00	15.370	0.021
#9	**4**	**Time of Concentration:**					**0.315**
#10	1	5. Nearly bare and untilled, and alluvial valley fans	1.24	41.00	3,317.00	1.110	0.830
		8. Large gullies, diversions, and low flowing streams	0.70	29.00	4,125.00	2.510	0.456
#10	**1**	**Time of Concentration:**					**1.286**
#10	2	5. Nearly bare and untilled, and alluvial valley fans	2.25	125.00	5,554.00	1.500	1.028
		8. Large gullies, diversions, and low flowing streams	2.13	85.00	3,997.00	4.370	0.254
#10	**2**	**Time of Concentration:**					**1.282**
#10	3	5. Nearly bare and untilled, and alluvial valley fans	1.39	68.00	4,904.00	1.170	1.164
		8. Large gullies, diversions, and low flowing streams	4.73	90.00	1,904.00	6.520	0.081
#10	**3**	**Time of Concentration:**					**1.245**
#10	4	5. Nearly bare and untilled, and alluvial valley fans	3.76	51.00	1,357.00	1.930	0.195

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	0.65	22.00	3,385.00	2.410	0.390
#10	**4**	**Time of Concentration:**					**0.585**
#10	5	5. Nearly bare and untilled, and alluvial valley fans	1.63	88.00	5,391.16	1.270	1.179
#10	**5**	**Time of Concentration:**					**1.179**
#12	1	5. Nearly bare and untilled, and alluvial valley fans	4.50	75.00	1,667.00	2.120	0.218
		8. Large gullies, diversions, and low flowing streams	1.85	155.00	8,400.00	4.070	0.573
#12	**1**	**Time of Concentration:**					**0.791**
#12	2	5. Nearly bare and untilled, and alluvial valley fans	2.99	50.00	1,674.03	1.720	0.270
		8. Large gullies, diversions, and low flowing streams	1.67	70.00	4,201.17	3.870	0.301
#12	**2**	**Time of Concentration:**					**0.571**
#12	3	5. Nearly bare and untilled, and alluvial valley fans	4.04	57.00	1,411.00	2.000	0.195
		8. Large gullies, diversions, and low flowing streams	1.55	107.00	6,884.00	3.740	0.511
#12	**3**	**Time of Concentration:**					**0.706**
#12	4	5. Nearly bare and untilled, and alluvial valley fans	2.23	84.00	3,771.04	1.490	0.703
		8. Large gullies, diversions, and low flowing streams	1.62	186.00	11,515.60	3.810	0.839
#12	**4**	**Time of Concentration:**					**1.542**
#12	5	5. Nearly bare and untilled, and alluvial valley fans	3.68	53.00	1,442.00	1.910	0.209
		8. Large gullies, diversions, and low flowing streams	1.95	120.00	6,155.00	4.180	0.409
#12	**5**	**Time of Concentration:**					**0.618**
#13	1	5. Nearly bare and untilled, and alluvial valley fans	4.62	62.00	1,342.00	2.140	0.174
		8. Large gullies, diversions, and low flowing streams	1.91	157.00	8,225.00	4.140	0.551
#13	**1**	**Time of Concentration:**					**0.725**
#13	2	5. Nearly bare and untilled, and alluvial valley fans	2.91	50.00	1,717.00	1.700	0.280
		8. Large gullies, diversions, and low flowing streams	2.28	183.00	8,039.00	4.520	0.494
#13	**2**	**Time of Concentration:**					**0.774**
#13	3	5. Nearly bare and untilled, and alluvial valley fans	6.18	95.00	1,537.00	2.480	0.172
		8. Large gullies, diversions, and low flowing streams	2.13	135.00	6,347.00	4.370	0.403
#13	**3**	**Time of Concentration:**					**0.575**
#13	4	5. Nearly bare and untilled, and alluvial valley fans	3.17	10.00	315.00	1.780	0.049
		8. Large gullies, diversions, and low flowing streams	2.30	100.00	4,344.00	4.550	0.265
#13	**4**	**Time of Concentration:**					**0.314**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#13	5	5. Nearly bare and untilled, and alluvial valley fans	3.10	70.00	2,255.00	1.760	0.355
		8. Large gullies, diversions, and low flowing streams	1.23	140.00	11,392.00	3.320	0.953
#13	**5**	**Time of Concentration:**					**1.308**
#14	1	5. Nearly bare and untilled, and alluvial valley fans	10.59	63.00	595.00	3.250	0.050
		8. Large gullies, diversions, and low flowing streams	2.60	151.00	5,808.00	4.830	0.334
#14	**1**	**Time of Concentration:**					**0.384**
#14	2	5. Nearly bare and untilled, and alluvial valley fans	7.28	67.00	920.00	2.690	0.095
		8. Large gullies, diversions, and low flowing streams	2.17	123.00	5,670.00	4.410	0.357
#14	**2**	**Time of Concentration:**					**0.452**
#14	3	5. Nearly bare and untilled, and alluvial valley fans	21.46	150.00	699.00	4.630	0.041
		8. Large gullies, diversions, and low flowing streams	3.10	364.00	11,728.00	5.280	0.617
#14	**3**	**Time of Concentration:**					**0.658**
#14	4	5. Nearly bare and untilled, and alluvial valley fans	3.39	35.00	1,032.00	1.840	0.155
		8. Large gullies, diversions, and low flowing streams	2.97	103.00	3,470.00	5.160	0.186
#14	**4**	**Time of Concentration:**					**0.341**
#14	5	5. Nearly bare and untilled, and alluvial valley fans	28.15	125.00	444.00	5.300	0.023
		8. Large gullies, diversions, and low flowing streams	4.18	246.00	5,886.00	6.130	0.266
#14	**5**	**Time of Concentration:**					**0.289**
#14	6	5. Nearly bare and untilled, and alluvial valley fans	3.18	40.00	1,257.00	1.780	0.196
		8. Large gullies, diversions, and low flowing streams	2.29	228.00	9,963.00	4.530	0.610
#14	**6**	**Time of Concentration:**					**0.806**
#14	7	5. Nearly bare and untilled, and alluvial valley fans	16.72	100.00	598.00	4.080	0.040
		8. Large gullies, diversions, and low flowing streams	2.81	243.00	8,649.00	5.020	0.478
#14	**7**	**Time of Concentration:**					**0.518**
#14	8	5. Nearly bare and untilled, and alluvial valley fans	1.70	47.00	2,765.00	1.300	0.590
		8. Large gullies, diversions, and low flowing streams	2.44	274.00	11,208.00	4.690	0.663
#14	**8**	**Time of Concentration:**					**1.253**
#14	9	5. Nearly bare and untilled, and alluvial valley fans	2.87	105.00	3,657.00	1.690	0.601
		8. Large gullies, diversions, and low flowing streams	2.43	194.00	7,991.00	4.670	0.475
#14	**9**	**Time of Concentration:**					**1.076**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#14	10	5. Nearly bare and untilled, and alluvial valley fans	2.75	80.00	2,907.00	1.650	0.489
		8. Large gullies, diversions, and low flowing streams	2.41	172.00	7,149.00	4.650	0.427
#14	**10**	**Time of Concentration:**					**0.916**
#15	1	5. Nearly bare and untilled, and alluvial valley fans	12.80	54.00	422.00	3.570	0.032
		8. Large gullies, diversions, and low flowing streams	1.68	181.00	10,781.00	3.880	0.771
#15	**1**	**Time of Concentration:**					**0.803**
#15	2	5. Nearly bare and untilled, and alluvial valley fans	44.22	260.00	588.00	6.640	0.024
		8. Large gullies, diversions, and low flowing streams	2.45	254.00	10,354.24	4.690	0.613
#15	**2**	**Time of Concentration:**					**0.637**
#15	3	5. Nearly bare and untilled, and alluvial valley fans	10.04	85.00	847.00	3.160	0.074
		8. Large gullies, diversions, and low flowing streams	2.34	366.00	15,663.00	4.580	0.949
#15	**3**	**Time of Concentration:**					**1.023**
#16	1	5. Nearly bare and untilled, and alluvial valley fans	2.26	117.00	5,179.00	1.500	0.959
		8. Large gullies, diversions, and low flowing streams	0.46	26.00	5,601.00	2.040	0.762
#16	**1**	**Time of Concentration:**					**1.721**
#16	2	5. Nearly bare and untilled, and alluvial valley fans	8.70	62.00	713.00	2.940	0.067
		8. Large gullies, diversions, and low flowing streams	1.99	144.00	7,241.00	4.230	0.475
#16	**2**	**Time of Concentration:**					**0.542**
#16	3	5. Nearly bare and untilled, and alluvial valley fans	6.88	32.00	465.00	2.620	0.049
		8. Large gullies, diversions, and low flowing streams	2.29	81.00	3,543.00	4.530	0.217
#16	**3**	**Time of Concentration:**					**0.266**
#17	1	5. Nearly bare and untilled, and alluvial valley fans	9.37	65.00	694.00	3.060	0.062
		8. Large gullies, diversions, and low flowing streams	1.19	56.00	4,712.00	3.270	0.400
#17	**1**	**Time of Concentration:**					**0.462**
#18	1	5. Nearly bare and untilled, and alluvial valley fans	9.00	60.00	667.00	2.990	0.061
		8. Large gullies, diversions, and low flowing streams	0.97	61.00	6,287.00	2.950	0.591
#18	**1**	**Time of Concentration:**					**0.652**
#18	2	5. Nearly bare and untilled, and alluvial valley fans	2.47	33.00	1,336.00	1.570	0.236
		8. Large gullies, diversions, and low flowing streams	2.01	164.00	8,154.00	4.250	0.532
#18	**2**	**Time of Concentration:**					**0.768**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#20	1	5. Nearly bare and untilled, and alluvial valley fans	11.87	45.00	379.00	3.440	0.030
		8. Large gullies, diversions, and low flowing streams	0.75	45.00	5,969.00	2.600	0.637
#20	**1**	**Time of Concentration:**					**0.667**
#20	2	5. Nearly bare and untilled, and alluvial valley fans	5.40	45.00	833.00	2.320	0.099
		8. Large gullies, diversions, and low flowing streams	1.30	98.00	7,547.00	3.410	0.614
#20	**2**	**Time of Concentration:**					**0.713**
#21	1	5. Nearly bare and untilled, and alluvial valley fans	4.09	60.00	1,467.02	2.020	0.201
		8. Large gullies, diversions, and low flowing streams	0.93	60.00	6,433.62	2.890	0.618
#21	**1**	**Time of Concentration:**					**0.819**
#21	2	5. Nearly bare and untilled, and alluvial valley fans	3.85	50.00	1,300.00	1.960	0.184
		8. Large gullies, diversions, and low flowing streams	42.86	900.00	2,100.00	19.630	0.029
#21	**2**	**Time of Concentration:**					**0.213**
#21	3	5. Nearly bare and untilled, and alluvial valley fans	1.70	15.00	881.00	1.300	0.188
		9. Small streams flowing bankfull	1.49	60.00	4,014.18	11.000	0.101
#21	**3**	**Time of Concentration:**					**0.289**
#21	4	5. Nearly bare and untilled, and alluvial valley fans	2.21	40.00	1,811.02	1.480	0.339
		8. Large gullies, diversions, and low flowing streams	0.84	50.00	5,949.54	2.750	0.600
#21	**4**	**Time of Concentration:**					**0.939**
#21	5	5. Nearly bare and untilled, and alluvial valley fans	4.00	30.00	750.00	2.000	0.104
		8. Large gullies, diversions, and low flowing streams	2.34	75.00	3,200.06	4.590	0.193
#21	**5**	**Time of Concentration:**					**0.297**
#23	1	5. Nearly bare and untilled, and alluvial valley fans	8.00	80.00	1,000.00	2.820	0.098
		8. Large gullies, diversions, and low flowing streams	2.74	85.00	3,100.00	4.960	0.173
		8. Large gullies, diversions, and low flowing streams	0.40	8.00	2,000.00	1.890	0.293
#23	**1**	**Time of Concentration:**					**0.564**
#24	1	5. Nearly bare and untilled, and alluvial valley fans	1.71	430.00	25,118.00	1.300	5.367
#24	**1**	**Time of Concentration:**					**5.367**
#24	2	5. Nearly bare and untilled, and alluvial valley fans	1.84	430.00	23,393.00	1.350	4.813
#24	**2**	**Time of Concentration:**					**4.813**
#24	3	5. Nearly bare and untilled, and alluvial valley fans	1.82	155.00	8,498.00	1.350	1.748
		8. Large gullies, diversions, and low flowing streams	0.84	40.00	4,771.00	2.740	0.483

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#24	**3**	**Time of Concentration:**					**2.231**
#24	4	5. Nearly bare and untilled, and alluvial valley fans	1.24	50.00	4,042.00	1.110	1.011
		8. Large gullies, diversions, and low flowing streams	0.49	60.00	12,150.00	2.100	1.607
#24	**4**	**Time of Concentration:**					**2.618**
#25	1	5. Nearly bare and untilled, and alluvial valley fans	0.51	10.00	1,950.00	0.710	0.762
		8. Large gullies, diversions, and low flowing streams	1.81	60.00	3,322.00	4.030	0.228
#25	**1**	**Time of Concentration:**					**0.990**
#25	2	5. Nearly bare and untilled, and alluvial valley fans	1.11	25.00	2,254.00	1.050	0.596
		8. Large gullies, diversions, and low flowing streams	2.36	75.00	3,178.00	4.600	0.191
#25	**2**	**Time of Concentration:**					**0.787**
#25	3	5. Nearly bare and untilled, and alluvial valley fans	3.23	30.00	929.00	1.790	0.144
		8. Large gullies, diversions, and low flowing streams	2.45	154.00	6,297.00	4.690	0.372
#25	**3**	**Time of Concentration:**					**0.516**
#26	1	5. Nearly bare and untilled, and alluvial valley fans	1.20	103.00	8,602.00	1.090	2.192
#26	**1**	**Time of Concentration:**					**2.192**
#26	2	5. Nearly bare and untilled, and alluvial valley fans	1.23	120.00	9,780.00	1.100	2.469
		8. Large gullies, diversions, and low flowing streams	2.18	184.00	8,454.00	4.420	0.531
#26	**2**	**Time of Concentration:**					**3.000**
#27	1	5. Nearly bare and untilled, and alluvial valley fans	4.32	50.00	1,158.02	2.070	0.155
		8. Large gullies, diversions, and low flowing streams	2.53	198.00	7,838.16	4.760	0.457
#27	**1**	**Time of Concentration:**					**0.612**
#27	2	5. Nearly bare and untilled, and alluvial valley fans	5.26	30.00	570.00	2.290	0.069
		8. Large gullies, diversions, and low flowing streams	3.15	278.00	8,822.00	5.320	0.460
#27	**2**	**Time of Concentration:**					**0.529**
#27	3	5. Nearly bare and untilled, and alluvial valley fans	16.33	80.00	490.00	4.040	0.033
		8. Large gullies, diversions, and low flowing streams	2.15	225.00	10,443.00	4.400	0.659
#27	**3**	**Time of Concentration:**					**0.692**
#27	4	5. Nearly bare and untilled, and alluvial valley fans	12.43	65.00	523.00	3.520	0.041
		8. Large gullies, diversions, and low flowing streams	3.49	225.00	6,454.00	5.600	0.320
#27	**4**	**Time of Concentration:**					**0.361**
#27	5	5. Nearly bare and untilled, and alluvial valley fans	9.40	25.00	266.00	3.060	0.024

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	2.32	364.00	15,700.00	4.560	0.956
#27	**5**	**Time of Concentration:**					**0.980**
#28	1	5. Nearly bare and untilled, and alluvial valley fans	5.25	40.00	762.00	2.290	0.092
		8. Large gullies, diversions, and low flowing streams	2.96	310.00	10,479.34	5.150	0.565
#28	**1**	**Time of Concentration:**					**0.657**
#28	2	5. Nearly bare and untilled, and alluvial valley fans	25.86	105.00	406.00	5.080	0.022
		8. Large gullies, diversions, and low flowing streams	2.96	310.00	10,479.34	5.150	0.565
#28	**2**	**Time of Concentration:**					**0.587**
#29	1	5. Nearly bare and untilled, and alluvial valley fans	11.58	30.00	259.00	3.400	0.021
		8. Large gullies, diversions, and low flowing streams	3.61	288.00	7,976.00	5.700	0.388
#29	**1**	**Time of Concentration:**					**0.409**
#29	2	5. Nearly bare and untilled, and alluvial valley fans	8.06	40.00	496.00	2.830	0.048
		8. Large gullies, diversions, and low flowing streams	2.90	252.00	8,693.55	5.100	0.473
#29	**2**	**Time of Concentration:**					**0.521**
#29	3	5. Nearly bare and untilled, and alluvial valley fans	7.25	25.00	345.00	2.690	0.035
		8. Large gullies, diversions, and low flowing streams	2.26	158.00	7,001.00	4.500	0.432
#29	**3**	**Time of Concentration:**					**0.467**
#30	1	5. Nearly bare and untilled, and alluvial valley fans	4.93	35.00	710.00	2.220	0.088
		8. Large gullies, diversions, and low flowing streams	1.67	243.00	14,540.00	3.870	1.043
#30	**1**	**Time of Concentration:**					**1.131**
#31	1	5. Nearly bare and untilled, and alluvial valley fans	2.91	15.00	515.00	1.700	0.084
		8. Large gullies, diversions, and low flowing streams	2.74	247.00	9,006.00	4.960	0.504
#31	**1**	**Time of Concentration:**					**0.588**
#31	2	5. Nearly bare and untilled, and alluvial valley fans	7.46	25.00	335.00	2.730	0.034
		8. Large gullies, diversions, and low flowing streams	2.18	138.00	6,335.00	4.420	0.398
#31	**2**	**Time of Concentration:**					**0.432**
#31	3	5. Nearly bare and untilled, and alluvial valley fans	3.84	20.00	521.00	1.950	0.074
		8. Large gullies, diversions, and low flowing streams	2.24	108.00	4,826.00	4.480	0.299
#31	**3**	**Time of Concentration:**					**0.373**
#32	1	5. Nearly bare and untilled, and alluvial valley fans	3.48	22.00	632.00	1.860	0.094

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	1.56	101.00	6,494.00	3.740	0.482
#32	**1**	**Time of Concentration:**					**0.576**
#34	1	5. Nearly bare and untilled, and alluvial valley fans	2.28	35.00	1,538.00	1.500	0.284
		8. Large gullies, diversions, and low flowing streams	2.89	74.00	2,560.00	5.100	0.139
#34	**1**	**Time of Concentration:**					**0.423**
#34	2	5. Nearly bare and untilled, and alluvial valley fans	2.69	38.00	1,415.00	1.630	0.241
		8. Large gullies, diversions, and low flowing streams	1.60	81.00	5,052.00	3.790	0.370
#34	**2**	**Time of Concentration:**					**0.611**
#34	3	5. Nearly bare and untilled, and alluvial valley fans	3.80	56.00	1,474.00	1.940	0.211
		8. Large gullies, diversions, and low flowing streams	0.70	30.00	4,293.00	2.500	0.477
#34	**3**	**Time of Concentration:**					**0.688**
#34	4	5. Nearly bare and untilled, and alluvial valley fans	4.17	35.00	840.00	2.040	0.114
		8. Large gullies, diversions, and low flowing streams	1.89	72.00	3,807.00	4.120	0.256
#34	**4**	**Time of Concentration:**					**0.370**
#36	1	5. Nearly bare and untilled, and alluvial valley fans	3.21	90.00	2,800.00	1.790	0.434
		8. Large gullies, diversions, and low flowing streams	2.54	33.00	1,300.00	4.770	0.075
		9. Small streams flowing bankfull	0.40	8.00	2,000.00	5.690	0.097
#36	**1**	**Time of Concentration:**					**0.606**
#36	2	5. Nearly bare and untilled, and alluvial valley fans	6.92	90.00	1,300.00	2.630	0.137
		8. Large gullies, diversions, and low flowing streams	47.06	800.00	1,700.00	20.570	0.022
#36	**2**	**Time of Concentration:**					**0.159**
#36	3	5. Nearly bare and untilled, and alluvial valley fans	90.00	900.00	1,000.00	9.480	0.029
		8. Large gullies, diversions, and low flowing streams	3.70	100.00	2,700.00	5.770	0.129
#36	**3**	**Time of Concentration:**					**0.158**
#37	1	5. Nearly bare and untilled, and alluvial valley fans	4.68	129.00	2,754.05	2.160	0.354
		8. Large gullies, diversions, and low flowing streams	0.16	10.00	6,108.73	1.210	1.402
#37	**1**	**Time of Concentration:**					**1.756**
#37	2	5. Nearly bare and untilled, and alluvial valley fans	5.17	44.97	869.82	2.270	0.106
		8. Large gullies, diversions, and low flowing streams	2.01	95.23	4,737.81	4.250	0.309
#37	**2**	**Time of Concentration:**					**0.415**
#37	3	5. Nearly bare and untilled, and alluvial valley fans	3.52	30.00	853.00	1.870	0.126

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	4.02	179.85	4,474.00	6.010	0.206
#37	**3**	**Time of Concentration:**					**0.332**
#37	4	5. Nearly bare and untilled, and alluvial valley fans	3.18	34.82	1,095.00	1.780	0.170
		8. Large gullies, diversions, and low flowing streams	1.49	37.90	2,544.00	3.660	0.193
#37	**4**	**Time of Concentration:**					**0.363**
#37	5	5. Nearly bare and untilled, and alluvial valley fans	2.59	40.00	1,543.00	1.610	0.266
		8. Large gullies, diversions, and low flowing streams	1.48	67.00	4,529.00	3.640	0.345
#37	**5**	**Time of Concentration:**					**0.611**
#37	6	8. Large gullies, diversions, and low flowing streams	3.42	65.00	1,900.00	5.540	0.095
#37	**6**	**Time of Concentration:**					**0.095**
#37	7	5. Nearly bare and untilled, and alluvial valley fans	6.00	30.00	500.00	2.440	0.056
		8. Large gullies, diversions, and low flowing streams	1.36	45.00	3,300.00	3.500	0.261
		8. Large gullies, diversions, and low flowing streams	1.11	45.00	4,050.00	3.160	0.356
#37	**7**	**Time of Concentration:**					**0.673**
#37	8	5. Nearly bare and untilled, and alluvial valley fans	8.33	50.00	600.00	2.880	0.057
		8. Large gullies, diversions, and low flowing streams	6.00	150.00	2,500.00	7.340	0.094
#37	**8**	**Time of Concentration:**					**0.151**
#37	9	5. Nearly bare and untilled, and alluvial valley fans	7.00	70.00	1,000.00	2.640	0.105
		8. Large gullies, diversions, and low flowing streams	12.00	60.00	500.00	10.390	0.013
#37	**9**	**Time of Concentration:**					**0.118**

Subwatershed Muskingum Routing Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	2	8. Large gullies, diversions, and low flowing streams	1.29	107.00	8,294.00	3.400	0.677
#1	**2**	**Muskingum K:**					**0.677**
#1	3	8. Large gullies, diversions, and low flowing streams	1.27	113.00	8,880.00	3.380	0.729
#1	**3**	**Muskingum K:**					**0.729**
#1	4	8. Large gullies, diversions, and low flowing streams	1.35	171.00	12,634.00	3.490	1.005
#1	**4**	**Muskingum K:**					**1.005**
#1	5	8. Large gullies, diversions, and low flowing streams	1.49	274.00	18,349.00	3.660	1.392

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	**5**	**Muskingum K:**					**1.392**
#1	6	8. Large gullies, diversions, and low flowing streams	1.49	274.00	18,349.00	3.660	1.392
#1	**6**	**Muskingum K:**					**1.392**
#2	2	8. Large gullies, diversions, and low flowing streams	0.53	20.00	3,756.00	2.180	0.478
#2	**2**	**Muskingum K:**					**0.478**
#2	3	8. Large gullies, diversions, and low flowing streams	0.55	25.00	4,570.00	2.210	0.574
#2	**3**	**Muskingum K:**					**0.574**
#2	4	8. Large gullies, diversions, and low flowing streams	0.55	25.00	4,570.00	2.210	0.574
#2	**4**	**Muskingum K:**					**0.574**
#2	5	8. Large gullies, diversions, and low flowing streams	0.65	45.00	6,955.00	2.410	0.801
#2	**5**	**Muskingum K:**					**0.801**
#3	3	8. Large gullies, diversions, and low flowing streams	0.92	20.00	2,168.00	2.880	0.209
#3	**3**	**Muskingum K:**					**0.209**
#5	1	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.000	0.000
#5	**1**	**Muskingum K:**					**0.000**
#5	2	8. Large gullies, diversions, and low flowing streams	1.75	125.00	7,149.00	3.960	0.501
#5	**2**	**Muskingum K:**					**0.501**
#5	3	8. Large gullies, diversions, and low flowing streams	1.65	155.00	9,418.00	3.840	0.681
#5	**3**	**Muskingum K:**					**0.681**
#5	4	8. Large gullies, diversions, and low flowing streams	1.65	155.00	9,418.00	3.840	0.681
#5	**4**	**Muskingum K:**					**0.681**
#5	5	8. Large gullies, diversions, and low flowing streams	1.67	239.00	14,273.00	3.880	1.021
#5	**5**	**Muskingum K:**					**1.021**
#5	6	8. Large gullies, diversions, and low flowing streams	1.68	239.00	14,223.00	3.880	1.018
#5	**6**	**Muskingum K:**					**1.018**
#7	1	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.000	0.000
#7	**1**	**Muskingum K:**					**0.000**
#7	2	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.000	0.000
#7	**2**	**Muskingum K:**					**0.000**
#7	4	8. Large gullies, diversions, and low flowing streams	1.16	140.00	12,037.00	3.230	1.035
#7	**4**	**Muskingum K:**					**1.035**
#7	5	8. Large gullies, diversions, and low flowing streams	1.14	140.00	12,307.69	3.190	1.071
#7	**5**	**Muskingum K:**					**1.071**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#7	6	8. Large gullies, diversions, and low flowing streams	1.17	158.00	13,546.00	3.230	1.164
#7	**6**	**Muskingum K:**					**1.164**
#7	7	8. Large gullies, diversions, and low flowing streams	1.18	187.00	15,784.00	3.260	1.344
#7	**7**	**Muskingum K:**					**1.344**
#7	8	8. Large gullies, diversions, and low flowing streams	1.18	187.00	15,784.00	3.260	1.344
#7	**8**	**Muskingum K:**					**1.344**
#9	3	8. Large gullies, diversions, and low flowing streams	0.43	9.00	2,100.00	1.960	0.297
#9	**3**	**Muskingum K:**					**0.297**
#9	4	8. Large gullies, diversions, and low flowing streams	1.01	20.00	1,975.00	3.010	0.182
		8. Large gullies, diversions, and low flowing streams	0.60	24.30	4,050.00	2.320	0.484
#9	**4**	**Muskingum K:**					**0.666**
#10	3	8. Large gullies, diversions, and low flowing streams	0.76	37.00	4,861.00	2.610	0.517
#10	**3**	**Muskingum K:**					**0.517**
#10	4	8. Large gullies, diversions, and low flowing streams	0.76	37.00	4,861.00	2.610	0.517
#10	**4**	**Muskingum K:**					**0.517**
#10	5	8. Large gullies, diversions, and low flowing streams	0.79	47.00	5,956.00	2.660	0.621
#10	**5**	**Muskingum K:**					**0.621**
#12	2	8. Large gullies, diversions, and low flowing streams	8.24	111.00	1,347.00	8.610	0.043
#12	**2**	**Muskingum K:**					**0.043**
#12	3	8. Large gullies, diversions, and low flowing streams	8.01	109.00	1,360.00	8.490	0.044
#12	**3**	**Muskingum K:**					**0.044**
#12	4	8. Large gullies, diversions, and low flowing streams	2.24	176.00	7,866.00	4.480	0.487
#12	**4**	**Muskingum K:**					**0.487**
#12	5	8. Large gullies, diversions, and low flowing streams	2.24	176.00	7,866.00	4.480	0.487
#12	**5**	**Muskingum K:**					**0.487**
#13	2	8. Large gullies, diversions, and low flowing streams	1.34	54.00	4,025.00	3.470	0.322
#13	**2**	**Muskingum K:**					**0.322**
#13	3	8. Large gullies, diversions, and low flowing streams	0.98	72.00	7,333.00	2.970	0.685
#13	**3**	**Muskingum K:**					**0.685**
#13	4	8. Large gullies, diversions, and low flowing streams	1.18	127.00	10,806.00	3.250	0.923
#13	**4**	**Muskingum K:**					**0.923**
#13	5	8. Large gullies, diversions, and low flowing streams	1.18	127.00	10,806.00	3.250	0.923
#13	**5**	**Muskingum K:**					**0.923**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#14	1	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.000	0.000
#14	**1**	**Muskingum K:**					**0.000**
#14	2	8. Large gullies, diversions, and low flowing streams	0.83	58.00	6,957.00	2.730	0.707
#14	**2**	**Muskingum K:**					**0.707**
#14	3	8. Large gullies, diversions, and low flowing streams	0.81	77.00	9,480.00	2.700	0.975
#14	**3**	**Muskingum K:**					**0.975**
#14	4	8. Large gullies, diversions, and low flowing streams	0.86	147.00	17,117.00	2.770	1.716
#14	**4**	**Muskingum K:**					**1.716**
#14	5	8. Large gullies, diversions, and low flowing streams	0.88	175.00	19,934.00	2.810	1.970
#14	**5**	**Muskingum K:**					**1.970**
#14	6	8. Large gullies, diversions, and low flowing streams	0.95	211.00	22,155.00	2.920	2.107
#14	**6**	**Muskingum K:**					**2.107**
#14	7	8. Large gullies, diversions, and low flowing streams	0.96	257.00	26,835.00	2.930	2.544
#14	**7**	**Muskingum K:**					**2.544**
#14	8	8. Large gullies, diversions, and low flowing streams	0.96	257.00	26,835.00	2.930	2.544
#14	**8**	**Muskingum K:**					**2.544**
#14	9	8. Large gullies, diversions, and low flowing streams	0.95	307.00	32,146.59	2.930	3.047
#14	**9**	**Muskingum K:**					**3.047**
#14	10	8. Large gullies, diversions, and low flowing streams	0.96	339.00	35,382.00	2.930	3.354
#14	**10**	**Muskingum K:**					**3.354**
#15	2	8. Large gullies, diversions, and low flowing streams	1.14	86.00	7,535.26	3.200	0.654
#15	**2**	**Muskingum K:**					**0.654**
#15	3	8. Large gullies, diversions, and low flowing streams	1.25	115.00	9,236.00	3.340	0.768
#15	**3**	**Muskingum K:**					**0.768**
#16	2	8. Large gullies, diversions, and low flowing streams	0.55	42.00	7,608.00	2.220	0.951
#16	**2**	**Muskingum K:**					**0.951**
#16	3	8. Large gullies, diversions, and low flowing streams	0.51	54.00	10,615.00	2.130	1.384
#16	**3**	**Muskingum K:**					**1.384**
#17	1	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.000	0.000
#17	**1**	**Muskingum K:**					**0.000**
#18	1	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.000	0.000
#18	**1**	**Muskingum K:**					**0.000**
#18	2	8. Large gullies, diversions, and low flowing streams	1.02	62.00	6,103.00	3.020	0.561

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#18	**2**	**Muskingum K:**					**0.561**
#20	2	8. Large gullies, diversions, and low flowing streams	0.59	20.00	3,400.00	2.300	0.410
#20	**2**	**Muskingum K:**					**0.410**
#21	1	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.000	0.000
#21	**1**	**Muskingum K:**					**0.000**
#21	2	8. Large gullies, diversions, and low flowing streams	0.40	6.80	1,700.00	1.890	0.249
#21	**2**	**Muskingum K:**					**0.249**
#21	3	8. Large gullies, diversions, and low flowing streams	0.36	20.00	5,627.46	1.780	0.878
#21	**3**	**Muskingum K:**					**0.878**
#21	4	8. Large gullies, diversions, and low flowing streams	0.36	20.00	5,627.46	1.780	0.878
#21	**4**	**Muskingum K:**					**0.878**
#21	5	8. Large gullies, diversions, and low flowing streams	0.40	25.80	6,450.00	1.890	0.947
#21	**5**	**Muskingum K:**					**0.947**
#24	1	8. Large gullies, diversions, and low flowing streams	0.79	180.00	22,769.00	2.660	2.377
#24	**1**	**Muskingum K:**					**2.377**
#24	2	8. Large gullies, diversions, and low flowing streams	0.78	180.00	23,111.00	2.640	2.431
#24	**2**	**Muskingum K:**					**2.431**
#24	4	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.000	0.000
#24	**4**	**Muskingum K:**					**0.000**
#25	1	8. Large gullies, diversions, and low flowing streams	1.99	104.00	5,220.00	4.230	0.342
#25	**1**	**Muskingum K:**					**0.342**
#25	2	8. Large gullies, diversions, and low flowing streams	1.99	104.00	5,220.00	4.230	0.342
#25	**2**	**Muskingum K:**					**0.342**
#25	3	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.000	0.000
#25	**3**	**Muskingum K:**					**0.000**
#27	1	8. Large gullies, diversions, and low flowing streams	1.38	216.00	15,629.00	3.520	1.233
#27	**1**	**Muskingum K:**					**1.233**
#27	2	8. Large gullies, diversions, and low flowing streams	1.17	144.00	12,301.00	3.240	1.054
#27	**2**	**Muskingum K:**					**1.054**
#27	3	8. Large gullies, diversions, and low flowing streams	1.18	76.00	6,454.00	3.250	0.551
#27	**3**	**Muskingum K:**					**0.551**
#27	4	8. Large gullies, diversions, and low flowing streams	1.18	76.00	6,454.00	3.250	0.551
#27	**4**	**Muskingum K:**					**0.551**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#28	1	8. Large gullies, diversions, and low flowing streams	1.30	84.00	6,445.17	3.420	0.523
#28	**1**	**Muskingum K:**					**0.523**
#29	1	8. Large gullies, diversions, and low flowing streams	0.88	37.00	4,210.00	2.810	0.416
#29	**1**	**Muskingum K:**					**0.416**
#29	2	8. Large gullies, diversions, and low flowing streams	0.88	26.00	2,949.00	2.810	0.291
#29	**2**	**Muskingum K:**					**0.291**
#31	1	8. Large gullies, diversions, and low flowing streams	1.35	76.00	5,639.00	3.480	0.450
#31	**1**	**Muskingum K:**					**0.450**
#31	2	8. Large gullies, diversions, and low flowing streams	1.15	20.00	1,734.00	3.220	0.149
#31	**2**	**Muskingum K:**					**0.149**
#34	1	8. Large gullies, diversions, and low flowing streams	0.64	56.00	8,773.00	2.390	1.019
#34	**1**	**Muskingum K:**					**1.019**
#34	2	8. Large gullies, diversions, and low flowing streams	1.05	31.00	2,957.00	3.070	0.267
#34	**2**	**Muskingum K:**					**0.267**
#34	3	8. Large gullies, diversions, and low flowing streams	0.64	26.00	4,031.00	2.400	0.466
#34	**3**	**Muskingum K:**					**0.466**
#37	2	8. Large gullies, diversions, and low flowing streams	0.28	29.79	10,639.28	1.580	1.870
#37	**2**	**Muskingum K:**					**1.870**
#37	3	8. Large gullies, diversions, and low flowing streams	0.28	23.78	8,493.00	1.580	1.493
#37	**3**	**Muskingum K:**					**1.493**
#37	4	8. Large gullies, diversions, and low flowing streams	0.30	46.99	15,665.00	1.640	2.653
#37	**4**	**Muskingum K:**					**2.653**
#37	5	8. Large gullies, diversions, and low flowing streams	0.28	29.10	10,392.85	1.580	1.827
		8. Large gullies, diversions, and low flowing streams	0.30	12.15	4,050.00	1.640	0.685
#37	**5**	**Muskingum K:**					**2.512**
#37	6	8. Large gullies, diversions, and low flowing streams	0.28	29.10	10,396.00	1.580	1.827
		8. Large gullies, diversions, and low flowing streams	0.30	12.15	4,050.00	1.640	0.685
#37	**6**	**Muskingum K:**					**2.512**
#37	7	8. Large gullies, diversions, and low flowing streams	0.28	28.89	10,320.00	1.580	1.814
#37	**7**	**Muskingum K:**					**1.814**
#37	8	8. Large gullies, diversions, and low flowing streams	3.42	65.00	1,900.00	5.540	0.095
#37	**8**	**Muskingum K:**					**0.095**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#37	9	8. Large gullies, diversions, and low flowing streams	2.37	90.00	3,800.00	4.610	0.228
		8. Large gullies, diversions, and low flowing streams	0.28	23.78	8,493.00	1.580	1.493
#37	**9**	**Muskingum K:**					**1.721**

Cottonwood Arroyo Mine Operations Hydrology and Sedimentology

The drainage subdivisions and containment areas used to model the hydrology is shown on Exhibit 41.2-1.

Revised February 21, 2012

Art O'Hayre

General Information

Storm Information:

Storm Type:	Type II-70
Design Storm:	10 yr - 6 hr
Rainfall Depth:	1.280 inches

Particle Size Distribution:

Size (mm)	PostMine-LoamySand	PreMine-LoamySand	PreMine-Badlands	LoamySand Postmining
2.0000	100.000%	100.000%	100.000%	0.000%
0.1000	26.500%	30.000%	83.500%	0.000%
0.0500	14.000%	17.000%	77.000%	0.000%
0.0020	11.000%	11.000%	56.000%	0.000%
0.0010	0.000%	0.000%	0.000%	0.000%

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc. (ml/l)	24VW (ml/l)
#30	476.400	476.400	15.70	2.21	15.3	7,167	2.78	1.97
#28	1,217.900	1,217.900	382.70	43.31	2,332.2	55,472	0.03	0.02
#26	2,486.400	2,486.400	68.99	19.67	120.6	6,040	1.43	1.06
#24	8,061.800	8,061.800	94.96	55.80	195.1	4,045	0.42	0.27
#25	1,015.700	9,077.500	129.82	70.58	314.3	15,722	4.37	0.91
#27	1,783.700	13,347.600	257.18	116.43	1,049.3	28,391	12.11	2.82
#29	966.000	15,531.500	568.72	193.37	5,788.0	69,501	6.28	1.96
#32	293.700	16,301.600	577.68	208.81	6,156.3	61,380	1.79	0.63
#31	957.100	957.100	385.29	40.58	1,766.9	40,461	0.55	0.43
#33	0.000	17,258.700	689.75	249.39	7,923.2	52,770	1.36	0.59
#34	1,156.300	18,415.000	694.74	269.35	7,420.9	46,403	0.28	0.13
#5	2,023.000	2,023.000	569.83	57.97	1,713.8	40,068	2.73	1.47
#6	1,743.200	3,766.200	653.56	112.46	3,143.8	35,092	0.20	0.12
#7	2,395.300	6,161.500	1,113.99	216.70	8,725.2	44,676	0.00	0.00
#8	0.000	6,161.500	1,113.99	216.70	8,725.2	44,676	0.00	0.00
#10	1,053.200	7,214.700	1,133.41	254.36	8,518.5	40,724	0.09	0.05
#1	2,411.100	2,411.100	392.20	53.71	1,765.4	36,630	4.79	3.12
#2	1,497.000	3,908.100	470.12	113.29	2,441.9	23,797	0.18	0.12
#3	828.500	4,736.600	588.89	140.28	2,711.7	18,861	0.05	0.04
#4	0.000	4,736.600	588.89	140.28	2,711.7	18,861	0.05	0.04
#9	712.000	5,448.600	585.94	146.88	2,752.5	18,055	0.39	0.29
#11	0.000	12,663.300	1,519.51	401.24	11,271.0	34,109	0.23	0.14
#21	646.500	13,309.800	1,521.43	404.97	11,284.9	34,729	0.22	0.13
#18	848.500	848.500	183.01	26.77	311.1	14,117	0.05	0.03
#17	182.200	182.200	129.55	8.20	119.5	15,200	0.69	0.49
#19	0.000	1,030.700	301.05	34.98	430.6	13,250	0.20	0.14
#15	1,992.700	1,992.700	432.94	58.72	2,203.9	44,481	1.26	0.77
#12	3,494.500	3,494.500	233.63	38.33	558.4	16,053	6.71	4.46
#13	2,720.700	6,215.200	410.93	68.61	1,149.1	17,747	8.09	5.58
#14	5,096.800	11,312.000	521.22	201.24	4,552.2	78,723	1.23	0.25
#16	1,022.000	14,326.700	924.77	304.15	8,175.0	51,718	1.21	0.46
#20	577.100	15,934.500	936.87	361.68	8,757.8	45,630	0.71	0.27
#22	0.000	29,244.300	2,305.13	766.66	20,042.7	34,334	0.36	0.20
#23	146.440	29,390.740	2,303.73	768.90	20,047.9	34,362	0.34	0.19
#35	0.000	47,805.740	2,908.48	1,038.25	27,468.8	33,155	0.30	0.17
#36	463.090	48,268.830	2,891.47	1,042.26	27,318.5	34,024	0.17	0.10
#37	1,661.000	49,929.830	2,828.39	1,071.00	26,965.9	35,502	0.11	0.06

Particle Size Distribution(s) at Each Structure

Structure #30:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	61.212%
0.0020	39.608%
0.0010	0.000%

Structure #28:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	99.873%
0.0010	0.000%

Structure #26:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	84.182%
0.0020	54.471%
0.0010	0.000%

Structure #24:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	93.900%
0.0020	78.509%
0.0010	0.000%

Structure #25:

Size (mm)	In/Out
2.0000	100.000%
0.1000	80.595%
0.0500	68.505%
0.0020	61.192%
0.0010	0.000%

Structure #27:

Size (mm)	In/Out
2.0000	100.000%
0.1000	75.314%
0.0500	52.685%
0.0020	39.141%
0.0010	0.000%

Structure #29:

Size (mm)	In/Out
2.0000	100.000%
0.1000	95.562%
0.0500	91.459%
0.0020	85.259%
0.0010	0.000%

Structure #32:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	99.317%
0.0020	92.618%
0.0010	0.000%

Structure #31:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	96.135%
0.0010	0.000%

Structure #33 (Inlet to North Fork Diversion):

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	99.470%
0.0020	93.402%
0.0010	0.000%

Structure #34 (End of North Fork):

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.585%
0.0500	99.307%
0.0020	99.154%
0.0010	0.000%

Structure #5:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	93.455%
0.0020	88.980%
0.0010	0.000%

Structure #6:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	98.356%
0.0010	0.000%

Structure #7:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	100.000%
0.0010	0.000%

Structure #8:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	100.000%
0.0010	0.000%

Structure #10:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	99.796%
0.0020	99.658%
0.0010	0.000%

Structure #1:

Size (mm)	In/Out
2.0000	100.000%
0.1000	95.498%
0.0500	85.914%
0.0020	80.819%
0.0010	0.000%

Structure #2:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	97.866%
0.0010	0.000%

Structure #3:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	99.187%
0.0010	0.000%

Structure #4:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	99.187%
0.0010	0.000%

Structure #9:

Size (mm)	In/Out
2.0000	100.000%
0.1000	98.881%
0.0500	97.585%
0.0020	96.987%
0.0010	0.000%

Structure #11:

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.727%
0.0500	99.256%
0.0020	99.006%
0.0010	0.000%

Structure #21 (End of South Fork):

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.791%
0.0500	99.360%
0.0020	99.030%
0.0010	0.000%

Structure #18:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	99.022%
0.0010	0.000%

Structure #17:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	87.184%
0.0010	0.000%

Structure #19:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	95.736%
0.0010	0.000%

Structure #15:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	98.087%
0.0020	94.423%
0.0010	0.000%

Structure #12:

Size (mm)	In/Out
2.0000	100.000%
0.1000	83.026%
0.0500	56.746%
0.0020	36.718%
0.0010	0.000%

Structure #13:

Size (mm)	In/Out
2.0000	100.000%
0.1000	80.507%
0.0500	51.093%
0.0020	33.060%
0.0010	0.000%

Structure #14:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	95.609%
0.0010	0.000%

Structure #16:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	99.497%
0.0020	94.022%
0.0010	0.000%

Structure #20 (End of Middle Fork):

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	95.607%
0.0010	0.000%

Structure #22:

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.882%
0.0500	99.640%
0.0020	97.535%
0.0010	0.000%

Structure #23:

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.881%
0.0500	99.691%
0.0020	97.570%
0.0010	0.000%

Structure #35 (all forks):

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.801%
0.0500	99.588%
0.0020	97.998%
0.0010	0.000%

Structure #36:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	98.559%
0.0010	0.000%

Structure #37:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	99.722%
0.0020	99.477%
0.0010	0.000%

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#30	1	476.400	1.131	0.000	0.000	73.100	M	15.70	2.214
	Σ	**476.400**						**15.70**	**2.214**
#28	1	772.300	0.657	0.523	0.334	90.400	M	348.71	27.461
	2	445.600	0.587	0.000	0.000	90.400	M	217.35	15.851
	Σ	**1,217.900**						**382.70**	**43.312**
#26	1	447.600	2.192	0.000	0.000	74.200	M	10.72	2.498
	2	2,038.800	3.000	0.000	0.000	77.000	M	59.31	17.168
	Σ	**2,486.400**						**68.99**	**19.666**
#24	1	2,607.500	5.367	2.377	0.305	75.200	M	35.68	16.987
	2	2,331.900	4.813	2.431	0.304	74.700	M	32.19	14.077
	3	1,758.500	2.231	1.788	0.297	76.200	M	57.92	13.255
	4	1,363.900	2.618	0.000	0.000	77.000	M	44.42	11.485
	Σ	**8,061.800**						**94.96**	**55.804**
#25	1	515.200	0.990	0.342	0.357	78.200	M	44.10	5.083
	2	130.500	0.787	0.342	0.357	78.100	M	13.16	1.271
	3	370.000	0.516	0.000	0.000	85.700	M	125.08	8.421
	Σ	**9,077.500**						**129.82**	**70.579**
#27	1	354.400	0.612	1.233	0.337	83.100	M	81.00	6.173
	2	305.200	0.529	1.054	0.328	84.000	M	85.27	5.846
	3	289.800	0.692	0.551	0.328	75.500	M	21.73	1.976
	4	253.000	0.361	0.551	0.328	79.400	M	53.79	2.908
	5	581.300	0.980	0.000	0.000	82.300	M	84.68	9.284
	Σ	**13,347.600**						**257.18**	**116.433**
#29	1	508.800	0.409	0.416	0.312	89.500	M	285.47	16.691
	2	233.200	0.521	0.291	0.312	91.600	M	136.95	9.256
	3	224.000	0.467	0.000	0.000	90.000	M	121.81	7.678
	Σ	**15,531.500**						**568.72**	**193.370**
#32	1	293.700	0.576	0.000	0.000	93.000	M	183.24	13.227
	Σ	**16,301.600**						**577.68**	**208.811**
#31	1	431.100	0.588	0.450	0.336	91.500	M	232.24	16.956
	2	325.800	0.432	0.149	0.327	93.000	M	240.11	14.690
	3	200.200	0.373	0.000	0.000	92.900	M	157.01	8.931
	Σ	**957.100**						**385.29**	**40.576**
#33	Σ	**17,258.700**						**689.75**	**249.387**

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#34	1	250.000	0.423	1.019	0.292	90.500	M	150.52	8.990
	2	219.100	0.611	0.267	0.322	80.000	M	34.70	2.699
	3	246.200	0.688	0.466	0.293	80.000	M	35.65	3.031
	4	441.000	0.370	0.000	0.000	79.700	M	95.82	5.246
	Σ	**18,415.000**						**694.74**	**269.353**
#5	1	503.600	0.618	0.000	0.000	87.600	M	181.32	13.768
	2	406.500	0.388	0.501	0.350	84.800	M	150.41	8.450
	3	439.600	0.342	0.681	0.347	87.800	M	231.97	12.313
	4	162.600	0.280	0.681	0.347	86.000	M	79.58	3.825
	5	294.100	0.375	1.021	0.348	92.000	M	213.88	12.088
	6	216.600	0.272	1.018	0.348	90.100	M	154.07	7.526
	Σ	**2,023.000**						**569.83**	**57.970**
#6	1	149.100	0.331	0.000	0.000	92.600	M	120.20	6.499
	2	245.000	0.529	0.192	0.328	88.100	M	103.04	7.033
	3	276.200	0.450	0.461	0.319	89.500	M	146.70	9.035
	4	158.400	0.380	1.385	0.185	93.000	M	124.15	7.126
	5	206.200	0.402	0.796	0.320	89.400	M	115.74	6.701
	6	414.000	0.430	1.066	0.323	87.200	M	181.89	10.921
	7	294.300	0.535	1.066	0.323	86.400	M	104.00	7.171
	Σ	**3,766.200**						**653.56**	**112.457**
#7	1	731.700	1.274	0.000	0.000	93.000	M	255.12	32.900
	2	445.800	1.043	0.000	0.000	93.000	M	182.08	20.038
	3	270.800	0.804	0.000	0.000	93.000	M	134.47	12.176
	4	78.900	0.267	1.035	0.328	93.000	M	71.04	3.568
	5	154.900	0.310	1.071	0.326	93.000	M	132.26	6.996
	6	101.400	0.288	1.164	0.328	92.900	M	88.35	4.536
	7	117.700	0.298	1.344	0.329	92.200	M	95.91	4.942
	8	494.100	0.518	1.344	0.329	91.300	M	283.54	19.084
	Σ	**6,161.500**						**1,113.99**	**216.697**
#8	1	0.000	0.000	0.000	0.000	1.000	0.00	0.000	
	Σ	**6,161.500**						**1,113.99**	**216.697**
#10	1	355.500	1.286	0.000	0.000	93.000	M	123.01	15.981
	2	307.100	1.282	0.668	0.305	83.200	M	39.93	5.401
	3	147.300	1.245	0.517	0.303	90.600	M	41.73	5.327
	4	126.400	0.585	0.517	0.303	93.000	M	78.09	5.694
	5	116.900	1.179	0.621	0.305	93.000	M	43.37	5.257
	Σ	**7,214.700**						**1,133.41**	**254.357**
#1	1	557.400	0.941	0.000	0.000	83.600	M	97.16	10.228
	2	169.600	1.616	0.677	0.333	93.000	M	48.64	7.624
	3	636.400	1.842	0.729	0.333	81.000	M	47.29	8.792

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
	4	223.400	0.846	1.005	0.336	84.100	M	44.68	4.320
	5	77.700	0.330	1.392	0.341	81.400	M	22.18	1.129
	6	746.600	0.678	1.392	0.341	88.200	M	267.03	21.621
	Σ	**2,411.100**						**392.20**	**53.715**
#2	1	257.000	0.423	0.000	0.000	93.000	M	191.46	11.596
	2	180.500	0.562	0.478	0.281	91.800	M	102.88	7.288
	3	200.700	0.687	0.574	0.283	93.000	M	111.40	9.029
	4	438.600	0.811	0.574	0.283	93.000	M	216.42	19.727
	5	420.200	1.247	0.801	0.293	88.000	M	92.44	11.930
	Σ	**3,908.100**						**470.12**	**113.285**
#3	1	172.600	0.443	0.000	0.000	93.000	M	125.54	7.770
	2	277.000	0.890	0.000	0.000	88.900	M	86.67	8.563
	3	378.900	0.632	0.209	0.314	87.900	M	138.33	10.658
	Σ	**4,736.600**						**588.89**	**140.275**
#4	Σ	**4,736.600**						**588.89**	**140.275**
#9	1	288.000	0.987	0.000	0.000	85.800	M	61.17	6.609
	2	236.000	0.436	0.000	0.000	1.000	M	0.00	0.000
	3	106.000	0.324	0.297	0.268	1.000	M	0.00	0.000
	4	82.000	0.315	0.666	0.300	1.000	M	0.00	0.000
	Σ	**5,448.600**						**585.94**	**146.884**
#11	Σ	**12,663.300**						**1,519.51**	**401.241**
#21	1	146.000	0.819	0.000	0.000	86.900	M	40.00	3.733
	2	137.000	0.213	0.249	0.263	1.000	M	0.00	0.000
	3	182.500	0.289	0.878	0.256	1.000	M	0.00	0.000
	4	70.000	0.939	0.878	0.256	1.000	M	0.00	0.000
	5	111.000	0.297	0.947	0.263	1.000	M	0.00	0.000
	Σ	**13,309.800**						**1,521.43**	**404.973**
#18	1	301.700	0.652	0.000	0.000	93.000	M	173.54	13.585
	2	546.800	0.768	0.561	0.320	86.300	M	148.05	13.189
	Σ	**848.500**						**183.01**	**26.774**
#17	1	182.200	0.462	0.000	0.000	93.000	M	129.55	8.202
	Σ	**182.200**						**129.55**	**8.202**
#19	Σ	**1,030.700**						**301.05**	**34.976**
#15	1	437.400	0.803	0.000	0.000	91.300	M	185.92	16.863
	2	549.000	0.637	0.654	0.327	91.300	M	275.19	21.177
	3	1,006.300	1.023	0.768	0.331	84.700	M	185.11	20.683
	Σ	**1,992.700**						**432.94**	**58.723**

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#12	1	517.800	0.791	0.000	0.000	81.900	M	85.06	7.915
	2	229.000	0.571	0.043	0.418	80.100	M	38.64	2.855
	3	592.700	0.706	0.044	0.417	81.500	M	101.30	8.668
	4	1,806.900	1.542	0.487	0.362	76.700	M	86.99	14.604
	5	348.100	0.618	0.487	0.362	80.000	54.66	4.285	
	Σ	**3,494.500**						**233.63**	**38.327**
#13	1	411.600	0.725	0.000	0.000	79.700	M	55.06	4.891
	2	636.400	0.774	0.322	0.336	80.700	M	91.95	8.503
	3	319.000	0.575	0.685	0.318	85.500	M	98.20	7.115
	4	231.700	0.314	0.923	0.328	80.400	M	60.73	3.000
	5	1,122.000	1.308	0.923	0.328	74.700	M	44.53	6.775
	Σ	**6,215.200**						**410.93**	**68.612**
#14	1	405.900	0.384	0.000	0.000	90.800	M	263.85	14.961
	2	411.100	0.452	0.707	0.308	90.700	M	242.63	15.020
	3	787.400	0.658	0.975	0.307	91.400	M	389.56	30.676
	4	144.200	0.341	1.716	0.310	86.200	M	65.46	3.461
	5	343.800	0.289	1.970	0.312	86.500	M	173.76	8.480
	6	392.800	0.806	2.107	0.316	81.900	M	63.61	6.004
	7	528.200	0.518	2.544	0.316	87.200	M	206.25	13.918
	8	890.900	1.253	2.544	0.316	83.500	M	122.07	16.175
	9	741.400	1.076	3.047	0.316	84.800	M	132.42	15.394
	10	451.100	0.916	3.354	0.316	83.900	M	83.00	8.542
	Σ	**11,312.000**						**521.22**	**201.243**
#16	1	475.100	1.721	0.000	0.000	92.400	M	122.19	20.231
	2	348.400	0.542	0.951	0.283	92.500	M	216.12	14.980
	3	198.500	0.266	1.384	0.278	93.000	M	178.92	8.977
	Σ	**14,326.700**						**924.77**	**304.153**
#20	1	271.100	0.667	0.000	0.000	89.400	M	110.20	8.789
	2	306.000	0.713	0.410	0.287	93.000	M	165.52	13.765
	Σ	**15,934.500**						**936.87**	**361.682**
#22	Σ	**29,244.300**						**2,305.13**	**766.656**
#23	1	146.440	0.564	0.000	0.000	81.900	M	31.01	2.240
	Σ	**29,390.740**						**2,303.73**	**768.896**
#35	Σ	**47,805.740**						**2,908.48**	**1,038.248**
#36	1	262.090	0.606	0.000	0.000	81.900	M	52.66	4.011
	2	45.000	0.159	0.470	0.263	1.000	M	0.00	0.000
	3	156.000	0.158	0.000	0.000	1.000	M	0.00	0.000
	Σ	**48,268.830**						**2,891.47**	**1,042.259**

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#37	1	344.000	1.756	0.000	0.000	84.800	M	41.06	7.140
	2	300.000	0.415	1.870	0.241	87.800	M	142.61	8.390
	3	185.000	0.332	1.493	0.241	85.500	M	79.71	4.141
	4	246.000	0.363	2.653	0.246	1.000	M	0.00	0.000
	5	157.000	0.611	2.512	0.242	84.100	M	40.04	3.037
	6	76.000	0.095	2.512	0.242	84.100	M	69.96	1.841
	7	243.000	0.673	1.814	0.241	83.000	M	51.21	4.189
	8	81.000	0.151	0.095	0.383	1.000	M	0.00	0.000
	9	29.000	0.118	1.721	0.298	1.000	M	0.00	0.000
	Σ	**49,929.830**						**2,828.39**	**1,070.997**

Subwatershed Sedimentology Detail:

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
#30	1	0.095	200.00	3.80	0.3720	1.0000	2	15.3	7,167	2.78	1.97
	Σ							**15.3**	**7,167**	**2.78**	**1.97**
#28	1	0.187	100.00	10.10	0.3750	1.0000	3	1,831.9	67,442	0.00	0.00
	2	0.196	100.00	10.20	0.3930	1.0000	3	1,151.2	74,204	0.07	0.05
	Σ							**2,332.2**	**55,472**	**0.03**	**0.02**
#26	1	0.155	400.00	1.40	0.3480	1.0000	2	10.2	4,082	1.09	0.81
	2	0.155	300.00	2.40	0.3340	1.0000	2	110.4	6,393	1.49	1.10
	Σ							**120.6**	**6,040**	**1.43**	**1.06**
#24	1	0.128	300.00	2.30	0.3360	1.0000	2	66.0	3,840	0.35	0.26
	2	0.136	300.00	2.70	0.3440	1.0000	2	70.5	4,930	0.50	0.37
	3	0.107	300.00	2.30	0.3330	1.0000	2	62.4	4,664	1.37	1.02
	4	0.163	400.00	1.60	0.3210	1.0000	2	57.9	5,031	1.35	0.99
	Σ							**195.1**	**4,045**	**0.42**	**0.27**
#25	1	0.125	400.00	1.90	0.3440	1.0000	2	34.8	7,104	3.32	2.35
	2	0.124	300.00	2.60	0.3280	1.0000	2	9.3	7,737	3.85	2.68
	3	0.122	175.00	4.90	0.2660	1.0000	2	138.2	17,512	10.27	7.04
	Σ							**314.3**	**15,722**	**4.37**	**0.91**
#27	1	0.127	175.00	5.90	0.3160	1.0000	2	134.4	22,614	12.66	8.90
	2	0.122	150.00	7.50	0.2920	1.0000	2	138.7	24,759	14.29	9.99
	3	0.070	125.00	8.40	0.3270	1.0000	2	23.7	12,704	6.26	4.32
	4	0.097	125.00	9.60	0.3170	1.0000	2	80.5	30,075	17.67	11.85
	5	0.126	125.00	8.90	0.3290	1.0000	2	239.4	26,689	13.37	9.42

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
	Σ							**1,049.3**	**28,391**	**12.11**	**2.82**
#29	1	0.190	125.00	9.80	0.3930	1.0000	3	1,365.3	83,318	3.07	2.16
	2	0.203	125.00	8.90	0.3940	1.0000	3	603.0	66,304	1.59	1.12
	3	0.193	125.00	8.40	0.3940	1.0000	3	441.4	59,660	1.55	1.08
	Σ							**5,788.0**	**69,501**	**6.28**	**1.96**
#32	1	0.210	150.00	7.70	0.3990	1.0000	3	811.1	62,434	1.37	0.97
	Σ							**6,156.3**	**61,380**	**1.79**	**0.63**
#31	1	0.204	125.00	8.70	0.3620	1.0000	3	1,013.7	60,814	0.53	0.37
	2	0.210	150.00	7.30	0.3990	1.0000	3	950.2	65,819	3.41	2.41
	3	0.210	175.00	4.50	0.3980	1.0000	3	385.8	44,601	2.82	1.98
	Σ							**1,766.9**	**40,461**	**0.55**	**0.43**
#33	Σ							**7,923.2**	**52,770**	**1.36**	**0.59**
#34	1	0.193	200.00	3.84	0.2460	1.0000	3	161.4	18,389	0.72	0.52
	2	0.100	200.00	3.66	0.2540	1.0000	1	18.5	7,338	4.20	2.88
	3	0.100	300.00	2.54	0.2540	1.0000	1	16.2	5,649	3.17	2.20
	4	0.100	200.00	3.50	0.2540	1.0000	1	45.5	9,751	5.97	3.89
	Σ							**7,420.9**	**46,403**	**0.28**	**0.13**
#5	1	0.149	75.00	12.50	0.3230	1.0000	3	670.0	50,428	0.00	0.00
	2	0.133	75.00	15.80	0.3190	1.0000	2	545.2	67,505	40.75	28.02
	3	0.103	100.00	11.00	0.2030	1.0000	3	312.6	26,590	1.17	0.81
	4	0.093	75.00	13.80	0.2130	1.0000	2	96.3	26,589	16.60	11.46
	5	0.123	100.00	11.00	0.1370	1.0000	3	238.9	20,258	1.18	0.84
	6	0.149	75.00	14.70	0.1990	1.0000	3	330.1	44,599	3.21	2.28
	Σ							**1,713.8**	**40,068**	**2.73**	**1.47**
#6	1	0.208	175.00	4.30	0.3980	1.0000	3	263.3	41,902	2.95	2.07
	2	0.183	175.00	5.40	0.3910	1.0000	3	271.1	40,223	0.00	0.00
	3	0.188	150.00	7.60	0.3900	1.0000	3	500.1	56,955	1.53	1.07
	4	0.210	150.00	6.30	0.3990	1.0000	3	380.9	52,378	3.26	2.41
	5	0.185	125.00	8.10	0.3860	1.0000	3	351.4	53,638	2.03	1.44
	6	0.104	100.00	11.30	0.2240	1.0000	3	295.4	27,989	0.49	0.34
	7	0.164	100.00	11.20	0.3740	1.0000	3	444.3	63,189	0.00	0.00
	Σ							**3,143.8**	**35,092**	**0.20**	**0.12**
#7	1	0.208	150.00	7.80	0.3780	1.0000	3	1,546.4	47,076	0.00	0.00
	2	0.209	100.00	10.20	0.3940	1.0000	3	1,272.4	63,450	0.00	0.00
	3	0.210	150.00	6.70	0.3990	1.0000	3	570.4	47,474	0.00	0.00
	4	0.210	100.00	11.50	0.3990	1.0000	3	343.1	94,143	8.06	5.87
	5	0.210	150.00	7.10	0.3990	1.0000	3	436.9	62,203	4.78	3.45
	6	0.209	150.00	7.90	0.3990	1.0000	3	301.6	65,955	5.34	3.87

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
	7	0.206	75.00	15.50	0.3990	1.0000	3	593.0	116,344	8.81	6.42
	8	0.202	75.00	14.50	0.3980	1.0000	3	2,089.2	107,811	2.44	1.76
	Σ							**8,725.2**	**44,676**	**0.00**	**0.00**
#8	1	0.000	0.00	0.00	0.0000	1.0000	0	0.0	1	0.00	0.00
	Σ							**8,725.2**	**44,676**	**0.00**	**0.00**
#10	1	0.190	300.00	2.70	0.1930	1.0000	3	125.7	8,003	0.00	0.00
	2	0.153	200.00	3.50	0.3610	1.0000	2	61.7	11,607	5.45	3.93
	3	0.189	200.00	3.70	0.3190	1.0000	3	72.2	13,712	0.00	0.00
	4	0.190	300.00	2.10	0.1940	1.0000	3	43.8	7,943	0.16	0.11
	5	0.201	300.00	2.00	0.3030	1.0000	3	47.8	9,191	0.00	0.00
	Σ							**8,518.5**	**40,724**	**0.09**	**0.05**
#1	1	0.157	150.00	6.80	0.3830	1.0000	2	313.9	31,708	16.32	11.49
	2	0.210	150.00	6.60	0.3990	1.0000	3	244.8	32,032	0.00	0.00
	3	0.149	200.00	3.90	0.3870	1.0000	2	102.9	11,753	4.57	3.34
	4	0.169	175.00	4.70	0.3950	1.0000	2	105.8	25,092	13.31	9.47
	5	0.157	100.00	10.10	0.3940	1.0000	2	57.7	53,203	32.06	22.27
	6	0.175	75.00	12.60	0.2840	1.0000	3	1,117.8	52,264	0.00	0.00
	Σ							**1,765.4**	**36,630**	**4.79**	**3.12**
#2	1	0.190	150.00	7.90	0.1930	1.0000	3	346.0	30,942	1.66	1.16
	2	0.184	175.00	4.80	0.2010	1.0000	3	127.8	18,066	0.30	0.21
	3	0.202	200.00	3.90	0.3220	1.0000	3	190.3	21,517	0.00	0.00
	4	0.203	150.00	7.40	0.3220	1.0000	3	837.0	42,735	0.00	0.00
	5	0.181	175.00	5.10	0.3710	1.0000	3	305.1	25,752	0.00	0.00
	Σ							**2,441.9**	**23,797**	**0.18**	**0.12**
#3	1	0.190	175.00	5.20	0.1930	1.0000	3	158.4	21,221	1.05	0.74
	2	0.177	175.00	4.20	0.2560	1.0000	3	137.3	16,531	0.00	0.00
	3	0.166	175.00	4.30	0.2290	1.0000	3	173.0	16,953	0.00	0.00
	Σ							**2,711.7**	**18,861**	**0.05**	**0.04**
#4	Σ							**2,711.7**	**18,861**	**0.05**	**0.04**
#9	1	0.212	175.00	4.17	0.2490	1.0000	2	113.1	17,678	9.23	6.53
	2	0.100	200.00	4.50	0.2540	1.0000	4	0.0	1	0.00	0.00
	3	0.100	200.00	4.50	0.2540	1.0000	4	0.0	1	0.00	0.00
	4	0.100	200.00	6.50	0.2540	1.0000	4	0.0	1	0.00	0.00
	Σ							**2,752.5**	**18,055**	**0.39**	**0.29**
#11	Σ							**11,271.0**	**34,109**	**0.23**	**0.14**
#21	1	0.206	175.00	4.44	0.2560	1.0000	2	68.6	19,080	10.47	7.37
	2	0.100	175.00	14.00	0.2540	1.0000	4	0.0	1	0.00	0.00
	3	0.185	300.00	2.70	0.2180	1.0000	3	0.0	1	0.00	0.00

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
	4	0.100	300.00	8.00	0.2540	1.0000	1	0.0	1	0.00	0.00
	5	0.100	200.00	5.00	0.2540	1.0000	1	0.0	1	0.00	0.00
	Σ							**11,284.9**	**34,729**	**0.22**	**0.13**
#18	1	0.193	300.00	2.80	0.2200	1.0000	3	166.4	12,680	0.08	0.06
	2	0.173	175.00	4.70	0.3880	1.0000	3	388.7	30,310	0.00	0.00
	Σ							**311.1**	**14,117**	**0.05**	**0.03**
#17	1	0.196	300.00	2.60	0.2600	1.0000	3	119.5	15,200	0.69	0.49
	Σ							**119.5**	**15,200**	**0.69**	**0.49**
#19	Σ							**430.6**	**13,250**	**0.20**	**0.14**
#15	1	0.201	125.00	8.20	0.3960	1.0000	3	875.5	52,729	0.00	0.00
	2	0.161	100.00	11.40	0.3060	1.0000	3	1,156.8	55,407	0.00	0.00
	3	0.118	100.00	10.20	0.2850	1.0000	2	533.7	26,236	13.40	9.61
	Σ							**2,203.9**	**44,481**	**1.26**	**0.77**
#12	1	0.124	150.00	6.30	0.3070	1.0000	2	148.5	19,741	10.37	7.20
	2	0.132	200.00	3.60	0.3500	1.0000	2	36.4	13,817	7.60	5.13
	3	0.136	175.00	5.00	0.3330	1.0000	2	177.8	21,738	11.65	8.02
	4	0.188	200.00	3.40	0.3570	1.0000	2	197.1	13,622	5.15	3.73
	5	0.228	175.00	4.10	0.3640	1.0000	2	128.9	31,777	17.19	11.85
	Σ							**558.4**	**16,053**	**6.71**	**4.46**
#13	1	0.128	150.00	6.90	0.3390	1.0000	2	110.5	23,979	12.49	8.59
	2	0.130	175.00	5.70	0.3300	1.0000	2	178.6	21,951	11.41	7.97
	3	0.191	175.00	6.00	0.2890	1.0000	2	226.5	33,049	19.05	13.35
	4	0.122	175.00	5.10	0.3460	1.0000	2	69.8	24,833	14.95	10.22
	5	0.137	175.00	4.20	0.3530	1.0000	2	88.6	13,184	5.06	3.67
	Σ							**1,149.1**	**17,747**	**8.09**	**5.58**
#14	1	0.196	100.00	10.20	0.3980	1.0000	3	1,259.0	86,487	4.31	3.00
	2	0.193	150.00	6.70	0.4020	1.0000	3	826.2	56,062	1.89	1.34
	3	0.169	75.00	13.80	0.3240	1.0000	3	2,082.9	67,952	0.00	0.00
	4	0.114	100.00	11.00	0.2980	1.0000	3	122.8	36,090	1.27	0.91
	5	0.078	100.00	10.10	0.1830	1.0000	3	130.6	15,659	0.79	0.57
	6	0.084	150.00	7.10	0.2700	1.0000	2	72.2	12,296	6.43	4.61
	7	0.087	100.00	10.00	0.1840	1.0000	3	203.3	14,793	0.00	0.00
	8	0.126	150.00	6.70	0.2740	1.0000	2	261.0	16,178	7.68	5.60
	9	0.117	150.00	7.30	0.2600	1.0000	2	254.1	16,557	8.36	6.10
	10	0.115	125.00	8.50	0.2610	1.0000	2	152.1	17,901	9.30	6.77
	Σ							**4,552.2**	**78,723**	**1.23**	**0.25**
#16	1	0.201	300.00	2.78	0.3030	1.0000	3	243.8	12,178	0.00	0.00
	2	0.204	150.00	6.00	0.3630	1.0000	3	664.4	44,793	1.14	0.82

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
	3	0.210	150.00	6.10	0.3990	1.0000	3	514.2	56,224	4.83	3.55
	Σ							**8,175.0**	**51,718**	**1.21**	**0.46**
#20	1	0.186	175.00	3.19	0.2130	1.0000	3	90.5	10,762	0.00	0.00
	2	0.194	200.00	3.42	0.2330	1.0000	3	185.1	13,793	0.00	0.00
	Σ							**8,757.8**	**45,630**	**0.71**	**0.27**
#22	**Σ**							**20,042.7**	**34,334**	**0.36**	**0.20**
#23	1	0.100	350.00	8.00	0.2540	1.0000	1	53.3	25,565	15.06	10.23
	Σ							**20,047.9**	**34,362**	**0.34**	**0.19**
#35	**Σ**							**27,468.8**	**33,155**	**0.30**	**0.17**
#36	1	0.100	200.00	3.14	0.2540	1.0000	1	25.4	6,807	3.97	2.70
	2	0.100	450.00	13.00	0.2540	1.0000	1	0.0	1	0.00	0.00
	3	0.100	300.00	10.00	0.2540	1.0000	1	0.0	1	0.00	0.00
	Σ							**27,318.5**	**34,024**	**0.17**	**0.10**
#37	1	0.196	200.00	3.80	0.3980	1.0000	2	111.8	15,857	6.83	4.93
	2	0.194	200.00	3.42	0.4020	1.0000	3	222.2	26,570	0.67	0.49
	3	0.173	150.00	7.10	0.2770	1.0000	3	140.2	34,187	1.16	0.84
	4	0.100	175.00	5.00	0.2540	1.0000	1	0.0	1	0.00	0.00
	5	0.171	150.00	6.50	0.2990	1.0000	3	78.8	26,024	0.00	0.00
	6	0.171	150.00	6.50	0.2990	1.0000	3	71.7	38,780	10.07	7.34
	7	0.100	300.00	1.20	0.2540	1.0000	1	12.5	3,046	1.76	1.26
	8	0.100	300.00	10.00	0.2540	1.0000	1	0.0	1	0.00	0.00
	9	0.100	250.00	10.00	0.2540	1.0000	1	0.0	1	0.00	0.00
	Σ							**26,965.9**	**35,502**	**0.11**	**0.06**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	3.65	50.00	1,369.00	1.910	0.199
		8. Large gullies, diversions, and low flowing streams	1.57	157.00	10,030.00	3.750	0.742
#1	**1**	**Time of Concentration:**					**0.941**
#1	2	5. Nearly bare and untilled, and alluvial valley fans	6.63	70.00	1,056.00	2.570	0.114
		5. Nearly bare and untilled, and alluvial valley fans	1.98	150.00	7,573.00	1.400	1.502
#1	**2**	**Time of Concentration:**					**1.616**
#1	3	5. Nearly bare and untilled, and alluvial valley fans	1.65	117.00	7,070.00	1.280	1.534

Cottonwood Arroyo Mine Operations Hydrology and Sedimentology

The drainage subdivisions and containment areas used to model the hydrology is shown on Exhibit 41.2-1.

Revised February 21, 2012

Art O'Hayre

General Information

Storm Information:

Storm Type:	Type II-70
Design Storm:	25 yr - 6 hr
Rainfall Depth:	1.560 inches

Particle Size Distribution:

Size (mm)	PostMine-LoamySand	PreMine-LoamySand	PreMine-Badlands	LoamySand Postmining
2.0000	100.000%	100.000%	100.000%	0.000%
0.1000	26.500%	30.000%	83.500%	0.000%
0.0500	14.000%	17.000%	77.000%	0.000%
0.0020	11.000%	11.000%	56.000%	0.000%
0.0010	0.000%	0.000%	0.000%	0.000%

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc. (ml/l)	24VW (ml/l)
#30	476.400	476.400	36.53	4.76	37.8	8,241	3.58	2.53
#28	1,217.900	1,217.900	540.05	60.99	3,425.4	57,102	0.35	0.25
#26	2,486.400	2,486.400	132.85	36.83	246.5	6,616	1.86	1.38
#24	8,061.800	8,061.800	184.75	107.97	413.0	4,459	0.52	0.33
#25	1,015.700	9,077.500	200.88	132.08	560.2	15,558	3.88	0.78
#27	1,783.700	13,347.600	411.67	211.75	1,872.8	29,782	12.72	2.77
#29	966.000	15,531.500	846.18	320.24	8,834.4	71,508	7.80	2.18
#32	293.700	16,301.600	861.61	342.94	9,448.4	63,077	3.77	1.20
#31	957.100	957.100	527.85	55.53	2,515.1	41,599	0.63	0.49
#33	0.000	17,258.700	979.82	398.47	11,963.5	54,725	2.76	1.10
#34	1,156.300	18,415.000	987.58	429.85	11,161.6	47,865	0.54	0.22
#5	2,023.000	2,023.000	837.11	84.35	2,651.8	41,867	3.61	1.97
#6	1,743.200	3,766.200	956.02	162.51	4,790.3	36,533	0.21	0.12
#7	2,395.300	6,161.500	1,580.25	304.55	12,734.9	46,225	0.00	0.00
#8	0.000	6,161.500	1,580.25	304.55	12,734.9	46,225	0.00	0.00
#10	1,053.200	7,214.700	1,604.48	357.12	12,452.2	42,273	0.11	0.07
#1	2,411.100	2,411.100	588.72	81.15	2,757.0	37,715	5.52	3.62
#2	1,497.000	3,908.100	655.37	163.33	3,619.6	24,206	0.19	0.13
#3	828.500	4,736.600	821.07	201.79	4,012.0	19,072	0.06	0.05
#4	0.000	4,736.600	821.07	201.79	4,012.0	19,072	0.06	0.05
#9	712.000	5,448.600	820.57	211.80	4,085.8	18,345	0.43	0.33
#11	0.000	12,663.300	2,159.09	568.92	16,538.0	35,287	0.28	0.17
#21	646.500	13,309.800	2,161.59	574.47	16,558.1	35,541	0.26	0.15
#18	848.500	848.500	268.00	38.22	496.6	15,750	0.12	0.07
#17	182.200	182.200	174.08	11.12	167.2	15,582	0.82	0.58
#19	0.000	1,030.700	409.10	49.34	663.8	14,808	0.28	0.18
#15	1,992.700	1,992.700	627.55	84.79	3,281.0	46,290	1.92	1.17
#12	3,494.500	3,494.500	397.28	66.53	1,024.9	16,872	7.34	4.90
#13	2,720.700	6,215.200	697.21	118.62	2,079.9	18,344	8.61	6.01
#14	5,096.800	11,312.000	857.46	314.10	7,172.5	83,385	1.80	0.36
#16	1,022.000	14,326.700	1,313.19	459.17	12,449.7	53,268	1.64	0.61
#20	577.100	15,934.500	1,328.30	539.74	13,313.9	47,179	0.99	0.37
#22	0.000	29,244.300	3,269.57	1,114.20	29,872.0	35,578	0.47	0.26
#23	146.440	29,390.740	3,261.25	1,117.85	29,847.2	35,549	0.43	0.23
#35	0.000	47,805.740	4,137.07	1,547.70	41,008.8	34,100	0.40	0.23
#36	463.090	48,268.830	4,115.42	1,554.24	40,781.8	34,811	0.28	0.15
#37	1,661.000	49,929.830	4,032.62	1,598.13	40,310.4	35,296	0.13	0.07

Particle Size Distribution(s) at Each Structure

Structure #30:

Size (mm)	In/Out
2.0000	100.000%
0.1000	95.919%
0.0500	54.354%
0.0020	35.170%
0.0010	0.000%

Structure #28:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	98.281%
0.0010	0.000%

Structure #26:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	77.468%
0.0020	50.127%
0.0010	0.000%

Structure #24:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	92.408%
0.0020	76.427%
0.0010	0.000%

Structure #25:

Size (mm)	In/Out
2.0000	100.000%
0.1000	81.685%
0.0500	71.766%
0.0020	65.129%
0.0010	0.000%

Structure #27:

Size (mm)	In/Out
2.0000	100.000%
0.1000	74.075%
0.0500	52.339%
0.0020	39.457%
0.0010	0.000%

Structure #29:

Size (mm)	In/Out
2.0000	100.000%
0.1000	94.549%
0.0500	89.941%
0.0020	81.885%
0.0010	0.000%

Structure #32:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	96.353%
0.0020	87.711%
0.0010	0.000%

Structure #31:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	95.759%
0.0010	0.000%

Structure #33 (Inlet to North Fork Diversion):

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	97.119%
0.0020	89.403%
0.0010	0.000%

Structure #34 (End of North Fork):

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.457%
0.0500	99.140%
0.0020	97.927%
0.0010	0.000%

Structure #5:

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.651%
0.0500	91.884%
0.0020	85.871%
0.0010	0.000%

Structure #6:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	98.363%
0.0010	0.000%

Structure #7:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	100.000%
0.0010	0.000%

Structure #8:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	100.000%
0.0010	0.000%

Structure #10:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	99.741%
0.0020	99.580%
0.0010	0.000%

Structure #1:

Size (mm)	In/Out
2.0000	100.000%
0.1000	94.414%
0.0500	84.026%
0.0020	78.767%
0.0010	0.000%

Structure #2:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	97.739%
0.0010	0.000%

Structure #3:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	99.125%
0.0010	0.000%

Structure #4:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	99.125%
0.0010	0.000%

Structure #9:

Size (mm)	In/Out
2.0000	100.000%
0.1000	98.649%
0.0500	97.317%
0.0020	96.702%
0.0010	0.000%

Structure #11:

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.666%
0.0500	99.142%
0.0020	98.869%
0.0010	0.000%

Structure #21 (End of South Fork):

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.760%
0.0500	99.253%
0.0020	98.899%
0.0010	0.000%

Structure #18:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	97.922%
0.0010	0.000%

Structure #17:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	85.172%
0.0010	0.000%

Structure #19:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	94.709%
0.0010	0.000%

Structure #15:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	96.507%
0.0020	92.676%
0.0010	0.000%

Structure #12:

Size (mm)	In/Out
2.0000	100.000%
0.1000	80.910%
0.0500	54.212%
0.0020	35.079%
0.0010	0.000%

Structure #13:

Size (mm)	In/Out
2.0000	100.000%
0.1000	78.331%
0.0500	49.080%
0.0020	31.758%
0.0010	0.000%

Structure #14:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	93.915%
0.0010	0.000%

Structure #16:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	99.091%
0.0020	92.446%
0.0010	0.000%

Structure #20 (End of Middle Fork):

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	94.113%
0.0010	0.000%

Structure #22:

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.867%
0.0500	99.586%
0.0020	96.766%
0.0010	0.000%

Structure #23:

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.851%
0.0500	99.755%
0.0020	96.913%
0.0010	0.000%

Structure #35 (all forks):

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.744%
0.0500	99.587%
0.0020	97.189%
0.0010	0.000%

Structure #36:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	97.754%
0.0010	0.000%

Structure #37:

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.896%
0.0500	99.684%
0.0020	99.381%
0.0010	0.000%

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#30	1	476.400	1.131	0.000	0.000	73.100	M	36.53	4.764
	Σ	**476.400**						**36.53**	**4.764**
#28	1	772.300	0.657	0.523	0.334	90.400	M	491.68	38.669
	2	445.600	0.587	0.000	0.000	90.400	M	305.95	22.321
	Σ	**1,217.900**						**540.05**	**60.991**
#26	1	447.600	2.192	0.000	0.000	74.200	M	23.11	5.111
	2	2,038.800	3.000	0.000	0.000	77.000	M	112.68	31.721
	Σ	**2,486.400**						**132.85**	**36.832**
#24	1	2,607.500	5.367	2.377	0.305	75.200	M	71.74	33.393
	2	2,331.900	4.813	2.431	0.304	74.700	M	66.31	28.216
	3	1,758.500	2.231	1.788	0.297	76.200	M	113.95	25.140
	4	1,363.900	2.618	0.000	0.000	77.000	M	84.58	21.220
	Σ	**8,061.800**						**184.75**	**107.969**
#25	1	515.200	0.990	0.342	0.357	78.200	M	81.39	9.063
	2	130.500	0.787	0.342	0.357	78.100	M	24.40	2.273
	3	370.000	0.516	0.000	0.000	85.700	M	190.15	12.775
	Σ	**9,077.500**						**200.88**	**132.080**
#27	1	354.400	0.612	1.233	0.337	83.100	M	129.85	9.820
	2	305.200	0.529	1.054	0.328	84.000	M	133.52	9.142
	3	289.800	0.692	0.551	0.328	75.500	M	44.45	3.841
	4	253.000	0.361	0.551	0.328	79.400	M	93.60	5.022
	5	581.300	0.980	0.000	0.000	82.300	M	139.19	15.009
	Σ	**13,347.600**						**411.67**	**211.747**
#29	1	508.800	0.409	0.416	0.312	89.500	M	404.67	23.823
	2	233.200	0.521	0.291	0.312	91.600	M	188.69	12.806
	3	224.000	0.467	0.000	0.000	90.000	M	171.82	10.877
	Σ	**15,531.500**						**846.18**	**320.244**
#32	1	293.700	0.576	0.000	0.000	93.000	M	247.25	17.930
	Σ	**16,301.600**						**861.61**	**342.938**
#31	1	431.100	0.588	0.450	0.336	91.500	M	321.18	23.493
	2	325.800	0.432	0.149	0.327	93.000	M	322.14	19.913
	3	200.200	0.373	0.000	0.000	92.900	M	210.22	12.124
	Σ	**957.100**						**527.85**	**55.530**
#33	Σ	**17,258.700**						**979.82**	**398.468**

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#34	1	250.000	0.423	1.019	0.292	90.500	M	210.04	12.641
	2	219.100	0.611	0.267	0.322	80.000	M	60.29	4.592
	3	246.200	0.688	0.466	0.293	80.000	M	62.05	5.158
	4	441.000	0.370	0.000	0.000	79.700	M	165.34	8.992
	Σ	**18,415.000**						**987.58**	**429.850**
#5	1	503.600	0.618	0.000	0.000	87.600	M	268.07	20.239
	2	406.500	0.388	0.501	0.350	84.800	M	230.58	13.021
	3	439.600	0.342	0.681	0.347	87.800	M	336.99	18.042
	4	162.600	0.280	0.681	0.347	86.000	M	118.70	5.772
	5	294.100	0.375	1.021	0.348	92.000	M	290.40	16.627
	6	216.600	0.272	1.018	0.348	90.100	M	214.22	10.646
	Σ	**2,023.000**						**837.11**	**84.347**
#6	1	149.100	0.331	0.000	0.000	92.600	M	161.30	8.862
	2	245.000	0.529	0.192	0.328	88.100	M	150.59	10.257
	3	276.200	0.450	0.461	0.319	89.500	M	208.50	12.896
	4	158.400	0.380	1.385	0.185	93.000	M	166.02	9.660
	5	206.200	0.402	0.796	0.320	89.400	M	164.26	9.578
	6	414.000	0.430	1.066	0.323	87.200	M	269.04	16.158
	7	294.300	0.535	1.066	0.323	86.400	M	156.53	10.750
	Σ	**3,766.200**						**956.02**	**162.509**
#7	1	731.700	1.274	0.000	0.000	93.000	M	346.80	44.600
	2	445.800	1.043	0.000	0.000	93.000	M	247.27	27.164
	3	270.800	0.804	0.000	0.000	93.000	M	182.24	16.506
	4	78.900	0.267	1.035	0.328	93.000	M	94.49	4.837
	5	154.900	0.310	1.071	0.326	93.000	M	176.25	9.484
	6	101.400	0.288	1.164	0.328	92.900	M	117.81	6.157
	7	117.700	0.298	1.344	0.329	92.200	M	129.29	6.777
	8	494.100	0.518	1.344	0.329	91.300	M	392.49	26.519
	Σ	**6,161.500**						**1,580.25**	**304.553**
#8	1	0.000	0.000	0.000	0.000	1.000	0.00	0.000	
	Σ	**6,161.500**						**1,580.25**	**304.553**
#10	1	355.500	1.286	0.000	0.000	93.000	M	167.23	21.664
	2	307.100	1.282	0.668	0.305	83.200	M	64.37	8.575
	3	147.300	1.245	0.517	0.303	90.600	M	58.93	7.480
	4	126.400	0.585	0.517	0.303	93.000	M	105.39	7.719
	5	116.900	1.179	0.621	0.305	93.000	M	58.93	7.126
	Σ	**7,214.700**						**1,604.48**	**357.116**
#1	1	557.400	0.941	0.000	0.000	83.600	M	155.00	16.115
	2	169.600	1.616	0.677	0.333	93.000	M	66.17	10.336
	3	636.400	1.842	0.729	0.333	81.000	M	80.29	14.616

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
	4	223.400	0.846	1.005	0.336	84.100	M	70.44	6.742
	5	77.700	0.330	1.392	0.341	81.400	M	36.23	1.860
	6	746.600	0.678	1.392	0.341	88.200	M	391.01	31.484
	Σ	**2,411.100**						**588.72**	**81.153**
#2	1	257.000	0.423	0.000	0.000	93.000	M	256.73	15.720
	2	180.500	0.562	0.478	0.281	91.800	M	141.48	10.054
	3	200.700	0.687	0.574	0.283	93.000	M	150.71	12.240
	4	438.600	0.811	0.574	0.283	93.000	M	293.34	26.741
	5	420.200	1.247	0.801	0.293	88.000	M	135.94	17.427
	Σ	**3,908.100**						**655.37**	**163.335**
#3	1	172.600	0.443	0.000	0.000	93.000	M	168.52	10.532
	2	277.000	0.890	0.000	0.000	88.900	M	125.68	12.334
	3	378.900	0.632	0.209	0.314	87.900	M	203.46	15.593
	Σ	**4,736.600**						**821.07**	**201.793**
#4	**Σ**	**4,736.600**						**821.07**	**201.793**
#9	1	288.000	0.987	0.000	0.000	85.800	M	93.35	10.008
	2	236.000	0.436	0.000	0.000	1.000	M	0.00	0.000
	3	106.000	0.324	0.297	0.268	1.000	M	0.00	0.000
	4	82.000	0.315	0.666	0.300	1.000	M	0.00	0.000
	Σ	**5,448.600**						**820.57**	**211.801**
#11	**Σ**	**12,663.300**						**2,159.09**	**568.917**
#21	1	146.000	0.819	0.000	0.000	86.900	M	59.84	5.549
	2	137.000	0.213	0.249	0.263	1.000	M	0.00	0.000
	3	182.500	0.289	0.878	0.256	1.000	M	0.00	0.000
	4	70.000	0.939	0.878	0.256	1.000	M	0.00	0.000
	5	111.000	0.297	0.947	0.263	1.000	M	0.00	0.000
	Σ	**13,309.800**						**2,161.59**	**574.467**
#18	1	301.700	0.652	0.000	0.000	93.000	M	234.61	18.415
	2	546.800	0.768	0.561	0.320	86.300	M	223.53	19.804
	Σ	**848.500**						**268.00**	**38.220**
#17	1	182.200	0.462	0.000	0.000	93.000	M	174.08	11.118
	Σ	**182.200**						**174.08**	**11.118**
#19	**Σ**	**1,030.700**						**409.10**	**49.338**
#15	1	437.400	0.803	0.000	0.000	91.300	M	258.94	23.432
	2	549.000	0.637	0.654	0.327	91.300	M	382.26	29.427
	3	1,006.300	1.023	0.768	0.331	84.700	M	288.75	31.930
	Σ	**1,992.700**						**627.55**	**84.789**

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#12	1	517.800	0.791	0.000	0.000	81.900	M	140.91	12.902
	2	229.000	0.571	0.043	0.418	80.100	M	66.83	4.847
	3	592.700	0.706	0.044	0.417	81.500	M	169.25	14.252
	4	1,806.900	1.542	0.487	0.362	76.700	M	168.42	27.242
	5	348.100	0.618	0.487	0.362	80.000	94.98	7.291	
	Σ	**3,494.500**						**397.28**	**66.533**
#13	1	411.600	0.725	0.000	0.000	79.700	M	96.79	8.384
	2	636.400	0.774	0.322	0.336	80.700	M	157.14	14.233
	3	319.000	0.575	0.685	0.318	85.500	M	149.91	10.830
	4	231.700	0.314	0.923	0.328	80.400	M	101.73	5.057
	5	1,122.000	1.308	0.923	0.328	74.700	M	94.33	13.581
	Σ	**6,215.200**						**697.21**	**118.618**
#14	1	405.900	0.384	0.000	0.000	90.800	M	365.33	20.943
	2	411.100	0.452	0.707	0.308	90.700	M	338.08	21.056
	3	787.400	0.658	0.975	0.307	91.400	M	540.50	42.565
	4	144.200	0.341	1.716	0.310	86.200	M	98.01	5.205
	5	343.800	0.289	1.970	0.312	86.500	M	257.38	12.690
	6	392.800	0.806	2.107	0.316	81.900	M	105.39	9.788
	7	528.200	0.518	2.544	0.316	87.200	M	306.31	20.592
	8	890.900	1.253	2.544	0.316	83.500	M	195.49	25.534
	9	741.400	1.076	3.047	0.316	84.800	M	206.21	23.723
	10	451.100	0.916	3.354	0.316	83.900	M	131.53	13.383
	Σ	**11,312.000**						**857.46**	**314.097**
#16	1	475.100	1.721	0.000	0.000	92.400	M	167.82	27.665
	2	348.400	0.542	0.951	0.283	92.500	M	293.69	20.454
	3	198.500	0.266	1.384	0.278	93.000	M	237.98	12.169
	Σ	**14,326.700**						**1,313.19**	**459.175**
#20	1	271.100	0.667	0.000	0.000	89.400	M	158.02	12.563
	2	306.000	0.713	0.410	0.287	93.000	M	224.02	18.659
	Σ	**15,934.500**						**1,328.30**	**539.735**
#22	Σ	**29,244.300**						**3,269.57**	**1,114.202**
#23	1	146.440	0.564	0.000	0.000	81.900	M	51.05	3.651
	Σ	**29,390.740**						**3,261.25**	**1,117.854**
#35	Σ	**47,805.740**						**4,137.07**	**1,547.704**
#36	1	262.090	0.606	0.000	0.000	81.900	M	86.84	6.539
	2	45.000	0.159	0.470	0.263	1.000	M	0.00	0.000
	3	156.000	0.158	0.000	0.000	1.000	M	0.00	0.000
	Σ	**48,268.830**						**4,115.42**	**1,554.242**

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#37	1	344.000	1.756	0.000	0.000	84.800	M	64.04	11.003
	2	300.000	0.415	1.870	0.241	87.800	M	208.41	12.295
	3	185.000	0.332	1.493	0.241	85.500	M	120.54	6.303
	4	246.000	0.363	2.653	0.246	1.000	M	0.00	0.000
	5	157.000	0.611	2.512	0.242	84.100	M	62.79	4.740
	6	76.000	0.095	2.512	0.242	84.100	M	100.66	2.874
	7	243.000	0.673	1.814	0.241	83.000	M	82.44	6.677
	8	81.000	0.151	0.095	0.383	1.000	M	0.00	0.000
	9	29.000	0.118	1.721	0.298	1.000	M	0.00	0.000
	Σ	**49,929.830**						**4,032.62**	**1,598.134**

Subwatershed Sedimentology Detail:

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
#30	1	0.095	200.00	3.80	0.3720	1.0000	2	37.8	8,241	3.58	2.53
	Σ							**37.8**	**8,241**	**3.58**	**2.53**
#28	1	0.187	100.00	10.10	0.3750	1.0000	3	2,689.8	70,014	0.00	0.00
	2	0.196	100.00	10.20	0.3930	1.0000	3	1,688.7	76,821	0.95	0.67
	Σ							**3,425.4**	**57,102**	**0.35**	**0.25**
#26	1	0.155	400.00	1.40	0.3480	1.0000	2	23.5	4,623	1.48	1.08
	2	0.155	300.00	2.40	0.3340	1.0000	2	223.0	7,027	1.94	1.43
	Σ							**246.5**	**6,616**	**1.86**	**1.38**
#24	1	0.128	300.00	2.30	0.3360	1.0000	2	142.6	4,234	0.49	0.37
	2	0.136	300.00	2.70	0.3440	1.0000	2	156.0	5,467	0.69	0.51
	3	0.107	300.00	2.30	0.3330	1.0000	2	130.5	5,163	1.74	1.28
	4	0.163	400.00	1.60	0.3210	1.0000	2	117.0	5,534	1.71	1.25
	Σ							**413.0**	**4,459**	**0.52**	**0.33**
#25	1	0.125	400.00	1.90	0.3440	1.0000	2	67.8	7,753	3.82	2.71
	2	0.124	300.00	2.60	0.3280	1.0000	2	18.3	8,435	4.40	3.07
	3	0.122	175.00	4.90	0.2660	1.0000	2	220.7	18,283	10.89	7.52
	Σ							**560.2**	**15,558**	**3.88**	**0.78**
#27	1	0.127	175.00	5.90	0.3160	1.0000	2	227.1	23,856	13.64	9.65
	2	0.122	150.00	7.50	0.2920	1.0000	2	229.0	25,945	15.24	10.73
	3	0.070	125.00	8.40	0.3270	1.0000	2	51.3	14,063	7.33	5.09
	4	0.097	125.00	9.60	0.3170	1.0000	2	149.1	31,802	19.09	12.97
	5	0.126	125.00	8.90	0.3290	1.0000	2	413.8	28,401	14.71	10.41

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
	Σ							**1,872.8**	**29,782**	**12.72**	**2.77**
#29	1	0.190	125.00	9.80	0.3930	1.0000	3	2,025.8	86,051	4.01	2.83
	2	0.203	125.00	8.90	0.3940	1.0000	3	865.3	68,289	2.28	1.62
	3	0.193	125.00	8.40	0.3940	1.0000	3	650.4	61,594	2.23	1.56
	Σ							**8,834.4**	**71,508**	**7.80**	**2.18**
#32	1	0.210	150.00	7.70	0.3990	1.0000	3	1,137.5	64,212	1.95	1.39
	Σ							**9,448.4**	**63,077**	**3.77**	**1.20**
#31	1	0.204	125.00	8.70	0.3620	1.0000	3	1,459.0	62,828	1.19	0.85
	2	0.210	150.00	7.30	0.3990	1.0000	3	1,328.3	67,409	3.95	2.81
	3	0.210	175.00	4.50	0.3980	1.0000	3	539.2	45,502	3.16	2.24
	Σ							**2,515.1**	**41,599**	**0.63**	**0.49**
#33	Σ							**11,963.5**	**54,725**	**2.76**	**1.10**
#34	1	0.193	200.00	3.84	0.2460	1.0000	3	235.4	18,993	0.92	0.66
	2	0.100	200.00	3.66	0.2540	1.0000	1	34.0	7,872	4.62	3.19
	3	0.100	300.00	2.54	0.2540	1.0000	1	29.8	6,067	3.50	2.44
	4	0.100	200.00	3.50	0.2540	1.0000	1	83.6	10,268	6.40	4.24
	Σ							**11,161.6**	**47,865**	**0.54**	**0.22**
#5	1	0.149	75.00	12.50	0.3230	1.0000	3	1,034.7	52,699	0.00	0.00
	2	0.133	75.00	15.80	0.3190	1.0000	2	882.3	70,193	42.92	29.78
	3	0.103	100.00	11.00	0.2030	1.0000	3	477.2	27,418	1.49	1.04
	4	0.093	75.00	13.80	0.2130	1.0000	2	151.7	27,429	17.29	12.07
	5	0.123	100.00	11.00	0.1370	1.0000	3	338.9	20,783	1.35	0.97
	6	0.149	75.00	14.70	0.1990	1.0000	3	482.1	45,729	3.62	2.59
	Σ							**2,651.8**	**41,867**	**3.61**	**1.97**
#6	1	0.208	175.00	4.30	0.3980	1.0000	3	369.3	42,677	3.27	2.31
	2	0.183	175.00	5.40	0.3910	1.0000	3	414.2	41,856	0.48	0.34
	3	0.188	150.00	7.60	0.3900	1.0000	3	743.1	58,940	2.20	1.55
	4	0.210	150.00	6.30	0.3990	1.0000	3	531.4	53,736	3.69	2.72
	5	0.185	125.00	8.10	0.3860	1.0000	3	522.2	55,347	2.64	1.88
	6	0.104	100.00	11.30	0.2240	1.0000	3	458.0	29,084	0.88	0.62
	7	0.164	100.00	11.20	0.3740	1.0000	3	700.8	65,996	0.00	0.00
	Σ							**4,790.3**	**36,533**	**0.21**	**0.12**
#7	1	0.208	150.00	7.80	0.3780	1.0000	3	2,177.7	48,781	0.00	0.00
	2	0.209	100.00	10.20	0.3940	1.0000	3	1,790.8	65,658	0.00	0.00
	3	0.210	150.00	6.70	0.3990	1.0000	3	801.8	49,036	0.00	0.00
	4	0.210	100.00	11.50	0.3990	1.0000	3	477.3	96,068	8.73	6.38
	5	0.210	150.00	7.10	0.3990	1.0000	3	608.5	63,520	5.23	3.80
	6	0.209	150.00	7.90	0.3990	1.0000	3	420.5	67,295	5.82	4.25

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
	7	0.206	75.00	15.50	0.3990	1.0000	3	836.5	118,836	9.71	7.12
	8	0.202	75.00	14.50	0.3980	1.0000	3	3,013.5	111,222	3.59	2.60
	Σ							**12,734.9**	**46,225**	**0.00**	**0.00**
#8	1	0.000	0.00	0.00	0.0000	1.0000	0	0.0	1	0.00	0.00
	Σ							**12,734.9**	**46,225**	**0.00**	**0.00**
#10	1	0.190	300.00	2.70	0.1930	1.0000	3	177.0	8,298	0.00	0.00
	2	0.153	200.00	3.50	0.3610	1.0000	2	104.5	12,354	6.02	4.35
	3	0.189	200.00	3.70	0.3190	1.0000	3	105.9	14,296	0.00	0.00
	4	0.190	300.00	2.10	0.1940	1.0000	3	61.5	8,188	0.23	0.17
	5	0.201	300.00	2.00	0.3030	1.0000	3	67.2	9,536	0.00	0.00
	Σ							**12,452.2**	**42,273**	**0.11**	**0.07**
#1	1	0.157	150.00	6.80	0.3830	1.0000	2	525.9	33,536	17.76	12.57
	2	0.210	150.00	6.60	0.3990	1.0000	3	344.9	33,236	0.00	0.00
	3	0.149	200.00	3.90	0.3870	1.0000	2	184.0	12,655	5.25	3.82
	4	0.169	175.00	4.70	0.3950	1.0000	2	175.1	26,524	14.42	10.30
	5	0.157	100.00	10.10	0.3940	1.0000	2	100.5	55,458	33.92	23.86
	6	0.175	75.00	12.60	0.2840	1.0000	3	1,708.1	54,643	0.00	0.00
	Σ							**2,757.0**	**37,715**	**5.52**	**3.62**
#2	1	0.190	150.00	7.90	0.1930	1.0000	3	483.6	31,655	1.91	1.35
	2	0.184	175.00	4.80	0.2010	1.0000	3	182.9	18,684	0.49	0.35
	3	0.202	200.00	3.90	0.3220	1.0000	3	267.3	22,234	0.20	0.14
	4	0.203	150.00	7.40	0.3220	1.0000	3	1,176.7	44,218	0.00	0.00
	5	0.181	175.00	5.10	0.3710	1.0000	3	468.2	26,988	0.00	0.00
	Σ							**3,619.6**	**24,206**	**0.19**	**0.13**
#3	1	0.190	175.00	5.20	0.1930	1.0000	3	221.4	21,734	1.23	0.87
	2	0.177	175.00	4.20	0.2560	1.0000	3	207.4	17,282	0.00	0.00
	3	0.166	175.00	4.30	0.2290	1.0000	3	265.7	17,717	0.00	0.00
	Σ							**4,012.0**	**19,072**	**0.06**	**0.05**
#4	Σ							**4,012.0**	**19,072**	**0.06**	**0.05**
#9	1	0.212	175.00	4.17	0.2490	1.0000	2	180.8	18,570	9.92	7.06
	2	0.100	200.00	4.50	0.2540	1.0000	4	0.0	1	0.00	0.00
	3	0.100	200.00	4.50	0.2540	1.0000	4	0.0	1	0.00	0.00
	4	0.100	200.00	6.50	0.2540	1.0000	4	0.0	1	0.00	0.00
	Σ							**4,085.8**	**18,345**	**0.43**	**0.33**
#11	Σ							**16,538.0**	**35,287**	**0.28**	**0.17**
#21	1	0.206	175.00	4.44	0.2560	1.0000	2	107.3	19,975	11.18	7.90
	2	0.100	175.00	14.00	0.2540	1.0000	4	0.0	1	0.00	0.00
	3	0.185	300.00	2.70	0.2180	1.0000	3	0.0	1	0.00	0.00

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
	4	0.100	300.00	8.00	0.2540	1.0000	1	0.0	1	0.00	0.00
	5	0.100	200.00	5.00	0.2540	1.0000	1	0.0	1	0.00	0.00
	Σ							**16,558.1**	**35,541**	**0.26**	**0.15**
#18	1	0.193	300.00	2.80	0.2200	1.0000	3	233.6	13,072	0.20	0.15
	2	0.173	175.00	4.70	0.3880	1.0000	3	614.7	31,763	0.00	0.00
	Σ							**496.6**	**15,750**	**0.12**	**0.07**
#17	1	0.196	300.00	2.60	0.2600	1.0000	3	167.2	15,582	0.82	0.58
	Σ							**167.2**	**15,582**	**0.82**	**0.58**
#19	Σ							**663.8**	**14,808**	**0.28**	**0.18**
#15	1	0.201	125.00	8.20	0.3960	1.0000	3	1,267.2	54,687	0.00	0.00
	2	0.161	100.00	11.40	0.3060	1.0000	3	1,671.9	57,370	0.43	0.31
	3	0.118	100.00	10.20	0.2850	1.0000	2	873.0	27,740	14.56	10.46
	Σ							**3,281.0**	**46,290**	**1.92**	**1.17**
#12	1	0.124	150.00	6.30	0.3070	1.0000	2	259.1	20,985	11.35	7.93
	2	0.132	200.00	3.60	0.3500	1.0000	2	66.5	14,727	8.34	5.68
	3	0.136	175.00	5.00	0.3330	1.0000	2	313.0	23,102	12.74	8.84
	4	0.188	200.00	3.40	0.3570	1.0000	2	404.6	15,016	6.20	4.48
	5	0.228	175.00	4.10	0.3640	1.0000	2	236.6	33,971	18.96	13.17
	Σ							**1,024.9**	**16,872**	**7.34**	**4.90**
#13	1	0.128	150.00	6.90	0.3390	1.0000	2	205.0	25,757	13.91	9.63
	2	0.130	175.00	5.70	0.3300	1.0000	2	321.8	23,501	12.64	8.87
	3	0.191	175.00	6.00	0.2890	1.0000	2	363.2	34,639	20.30	14.29
	4	0.122	175.00	5.10	0.3460	1.0000	2	124.9	26,092	15.97	11.02
	5	0.137	175.00	4.20	0.3530	1.0000	2	199.0	14,832	6.29	4.55
	Σ							**2,079.9**	**18,344**	**8.61**	**6.01**
#14	1	0.196	100.00	10.20	0.3980	1.0000	3	1,823.8	88,626	5.13	3.60
	2	0.193	150.00	6.70	0.4020	1.0000	3	1,202.1	57,829	2.49	1.77
	3	0.169	75.00	13.80	0.3240	1.0000	3	3,005.9	70,417	0.28	0.20
	4	0.114	100.00	11.00	0.2980	1.0000	3	193.5	37,483	1.77	1.28
	5	0.078	100.00	10.10	0.1830	1.0000	3	203.9	16,212	0.99	0.72
	6	0.084	150.00	7.10	0.2700	1.0000	2	126.0	13,104	7.06	5.08
	7	0.087	100.00	10.00	0.1840	1.0000	3	315.9	15,469	0.14	0.10
	8	0.126	150.00	6.70	0.2740	1.0000	2	438.7	17,197	8.46	6.18
	9	0.117	150.00	7.30	0.2600	1.0000	2	414.9	17,508	9.09	6.64
	10	0.115	125.00	8.50	0.2610	1.0000	2	253.2	18,957	10.12	7.38
	Σ							**7,172.5**	**83,385**	**1.80**	**0.36**
#16	1	0.201	300.00	2.78	0.3030	1.0000	3	347.0	12,660	0.00	0.00
	2	0.204	150.00	6.00	0.3630	1.0000	3	939.3	46,151	1.58	1.14

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
	3	0.210	150.00	6.10	0.3990	1.0000	3	715.4	57,437	5.23	3.86
	Σ							**12,449.7**	**53,268**	**1.64**	**0.61**
#20	1	0.186	175.00	3.19	0.2130	1.0000	3	135.2	11,203	0.00	0.00
	2	0.194	200.00	3.42	0.2330	1.0000	3	260.0	14,249	0.06	0.04
	Σ							**13,313.9**	**47,179**	**0.99**	**0.37**
#22	Σ							**29,872.0**	**35,578**	**0.47**	**0.26**
#23	1	0.100	350.00	8.00	0.2540	1.0000	1	92.7	26,973	16.20	11.12
	Σ							**29,847.2**	**35,549**	**0.43**	**0.23**
#35	Σ							**41,008.8**	**34,100**	**0.40**	**0.23**
#36	1	0.100	200.00	3.14	0.2540	1.0000	1	44.1	7,198	4.28	2.94
	2	0.100	450.00	13.00	0.2540	1.0000	1	0.0	1	0.00	0.00
	3	0.100	300.00	10.00	0.2540	1.0000	1	0.0	1	0.00	0.00
	Σ							**40,781.8**	**34,811**	**0.28**	**0.15**
#37	1	0.196	200.00	3.80	0.3980	1.0000	2	182.6	16,794	7.54	5.45
	2	0.194	200.00	3.42	0.4020	1.0000	3	340.3	27,613	1.02	0.74
	3	0.173	150.00	7.10	0.2770	1.0000	3	223.7	35,623	1.65	1.20
	4	0.100	175.00	5.00	0.2540	1.0000	1	0.0	1	0.00	0.00
	5	0.171	150.00	6.50	0.2990	1.0000	3	130.1	27,414	0.00	0.00
	6	0.171	150.00	6.50	0.2990	1.0000	3	112.8	38,722	10.05	7.40
	7	0.100	300.00	1.20	0.2540	1.0000	1	21.1	3,225	1.90	1.37
	8	0.100	300.00	10.00	0.2540	1.0000	1	0.0	1	0.00	0.00
	9	0.100	250.00	10.00	0.2540	1.0000	1	0.0	1	0.00	0.00
	Σ							**40,310.4**	**35,296**	**0.13**	**0.07**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	3.65	50.00	1,369.00	1.910	0.199
		8. Large gullies, diversions, and low flowing streams	1.57	157.00	10,030.00	3.750	0.742
#1	**1**	**Time of Concentration:**					**0.941**
#1	2	5. Nearly bare and untilled, and alluvial valley fans	6.63	70.00	1,056.00	2.570	0.114
		5. Nearly bare and untilled, and alluvial valley fans	1.98	150.00	7,573.00	1.400	1.502
#1	**2**	**Time of Concentration:**					**1.616**
#1	3	5. Nearly bare and untilled, and alluvial valley fans	1.65	117.00	7,070.00	1.280	1.534

Cottonwood Arroyo Mine Operations Hydrology and Sedimentology

The drainage subdivisions and containment areas used to model the hydrology is shown on Exhibit 41.2-1.

Revised February 21, 2012

Art O'Hayre

General Information

Storm Information:

Storm Type:	Type II-70
Design Storm:	100 yr - 6 hr
Rainfall Depth:	2.040 inches

Particle Size Distribution:

Size (mm)	PostMine-LoamySand	PreMine-LoamySand	PreMine-Badlands	LoamySand Postmining
2.0000	100.000%	100.000%	100.000%	0.000%
0.1000	26.500%	30.000%	83.500%	0.000%
0.0500	14.000%	17.000%	77.000%	0.000%
0.0020	11.000%	11.000%	56.000%	0.000%
0.0010	0.000%	0.000%	0.000%	0.000%

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc. (ml/l)	24VW (ml/l)
#30	476.400	476.400	86.92	10.78	97.1	9,320	4.41	3.12
#28	1,217.900	1,217.900	832.25	93.54	5,541.5	59,612	0.74	0.53
#26	2,486.400	2,486.400	275.55	74.66	548.8	7,278	2.35	1.74
#24	8,061.800	8,061.800	386.57	224.86	949.6	4,970	0.73	0.46
#25	1,015.700	9,077.500	393.25	268.09	1,185.4	15,996	3.69	0.75
#27	1,783.700	13,347.600	724.52	419.60	3,780.3	31,465	13.44	2.82
#29	966.000	15,531.500	1,383.20	586.28	15,023.3	74,082	9.73	2.44
#32	293.700	16,301.600	1,413.07	623.43	16,148.1	65,499	6.14	1.76
#31	957.100	957.100	785.51	82.54	3,927.1	43,239	0.95	0.75
#33	0.000	17,258.700	1,524.15	705.97	20,075.2	57,141	4.55	1.65
#34	1,156.300	18,415.000	1,537.36	760.30	18,665.2	49,486	1.47	0.54
#5	2,023.000	2,023.000	1,349.47	134.18	4,549.4	44,265	4.91	2.73
#6	1,743.200	3,766.200	1,527.16	256.62	8,062.5	38,199	0.25	0.15
#7	2,395.300	6,161.500	2,444.68	466.74	20,462.9	48,159	0.00	0.00
#8	0.000	6,161.500	2,444.68	466.74	20,462.9	48,159	0.00	0.00
#10	1,053.200	7,214.700	2,478.16	546.78	20,048.7	44,185	0.15	0.09
#1	2,411.100	2,411.100	969.41	134.57	4,774.2	39,132	6.43	4.23
#2	1,497.000	3,908.100	1,059.91	257.90	6,149.0	25,315	0.21	0.14
#3	828.500	4,736.600	1,247.07	317.71	6,601.2	19,828	0.07	0.05
#4	0.000	4,736.600	1,247.07	317.71	6,601.2	19,828	0.07	0.05
#9	712.000	5,448.600	1,251.87	334.30	6,745.1	19,241	0.50	0.38
#11	0.000	12,663.300	3,351.93	881.08	26,793.8	36,763	0.33	0.20
#21	646.500	13,309.800	3,355.35	890.10	26,825.2	37,071	0.31	0.18
#18	848.500	848.500	434.05	59.62	885.6	17,901	0.19	0.12
#17	182.200	182.200	254.12	16.35	256.5	16,193	1.00	0.71
#19	0.000	1,030.700	603.09	75.97	1,142.2	16,875	0.37	0.24
#15	1,992.700	1,992.700	996.33	133.89	5,389.3	48,450	2.83	1.71
#12	3,494.500	3,494.500	739.31	126.25	2,083.8	17,988	8.18	5.49
#13	2,720.700	6,215.200	1,297.09	224.49	4,182.2	19,433	9.44	6.62
#14	5,096.800	11,312.000	1,550.26	540.08	12,534.2	88,446	3.03	0.57
#16	1,022.000	14,326.700	2,034.74	763.28	20,995.4	56,504	2.43	0.86
#20	577.100	15,934.500	2,055.27	886.28	22,426.7	49,522	1.47	0.55
#22	0.000	29,244.300	5,071.06	1,776.38	49,252.0	37,135	0.67	0.37
#23	146.440	29,390.740	5,054.38	1,782.90	49,191.0	37,114	0.61	0.33
#35	0.000	47,805.740	6,437.89	2,543.20	67,856.3	35,717	0.72	0.39
#36	463.090	48,268.830	6,407.75	2,554.87	67,471.2	36,405	0.58	0.31
#37	1,661.000	49,929.830	6,292.47	2,628.32	66,822.3	39,819	0.30	0.14

Particle Size Distribution(s) at Each Structure

Structure #30:

Size (mm)	In/Out
2.0000	100.000%
0.1000	85.557%
0.0500	48.482%
0.0020	31.371%
0.0010	0.000%

Structure #28:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	96.519%
0.0010	0.000%

Structure #26:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	70.975%
0.0020	45.925%
0.0010	0.000%

Structure #24:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	91.071%
0.0020	70.221%
0.0010	0.000%

Structure #25:

Size (mm)	In/Out
2.0000	100.000%
0.1000	83.836%
0.0500	74.932%
0.0020	66.501%
0.0010	0.000%

Structure #27:

Size (mm)	In/Out
2.0000	100.000%
0.1000	73.416%
0.0500	52.287%
0.0020	39.482%
0.0010	0.000%

Structure #29:

Size (mm)	In/Out
2.0000	100.000%
0.1000	93.366%
0.0500	88.050%
0.0020	77.980%
0.0010	0.000%

Structure #32:

Size (mm)	In/Out
2.0000	100.000%
0.1000	98.135%
0.0500	93.024%
0.0020	82.321%
0.0010	0.000%

Structure #31:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	93.833%
0.0010	0.000%

Structure #33 (Inlet to North Fork Diversion):

Size (mm)	In/Out
2.0000	100.000%
0.1000	98.500%
0.0500	94.389%
0.0020	84.573%
0.0010	0.000%

Structure #34 (End of North Fork):

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.308%
0.0500	98.950%
0.0020	92.964%
0.0010	0.000%

Structure #5:

Size (mm)	In/Out
2.0000	100.000%
0.1000	97.755%
0.0500	89.765%
0.0020	81.593%
0.0010	0.000%

Structure #6:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	98.129%
0.0010	0.000%

Structure #7:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	100.000%
0.0010	0.000%

Structure #8:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	100.000%
0.0010	0.000%

Structure #10:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	99.672%
0.0020	99.485%
0.0010	0.000%

Structure #1:

Size (mm)	In/Out
2.0000	100.000%
0.1000	92.714%
0.0500	81.846%
0.0020	76.465%
0.0010	0.000%

Structure #2:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	97.665%
0.0010	0.000%

Structure #3:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	99.056%
0.0010	0.000%

Structure #4:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	99.056%
0.0010	0.000%

Structure #9:

Size (mm)	In/Out
2.0000	100.000%
0.1000	98.376%
0.0500	97.023%
0.0020	96.399%
0.0010	0.000%

Structure #11:

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.591%
0.0500	99.005%
0.0020	98.708%
0.0010	0.000%

Structure #21 (End of South Fork):

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.721%
0.0500	99.123%
0.0020	98.744%
0.0010	0.000%

Structure #18:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	96.995%
0.0010	0.000%

Structure #17:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	82.629%
0.0010	0.000%

Structure #19:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	93.769%
0.0010	0.000%

Structure #15:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	94.463%
0.0020	90.477%
0.0010	0.000%

Structure #12:

Size (mm)	In/Out
2.0000	100.000%
0.1000	78.989%
0.0500	51.223%
0.0020	33.145%
0.0010	0.000%

Structure #13:

Size (mm)	In/Out
2.0000	100.000%
0.1000	75.897%
0.0500	46.580%
0.0020	30.140%
0.0010	0.000%

Structure #14:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	99.621%
0.0020	90.811%
0.0010	0.000%

Structure #16:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	98.392%
0.0020	89.884%
0.0010	0.000%

Structure #20 (End of Middle Fork):

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	91.608%
0.0010	0.000%

Structure #22:

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.848%
0.0500	99.523%
0.0020	95.495%
0.0010	0.000%

Structure #23:

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.816%
0.0500	99.732%
0.0020	95.687%
0.0010	0.000%

Structure #35 (all forks):

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.676%
0.0500	99.517%
0.0020	94.938%
0.0010	0.000%

Structure #36:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	95.506%
0.0010	0.000%

Structure #37:

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.860%
0.0500	99.641%
0.0020	98.351%
0.0010	0.000%

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#30	1	476.400	1.131	0.000	0.000	73.100	M	86.92	10.783
	Σ	**476.400**						**86.92**	**10.783**
#28	1	772.300	0.657	0.523	0.334	90.400	M	752.74	59.308
	2	445.600	0.587	0.000	0.000	90.400	M	467.33	34.234
	Σ	**1,217.900**						**832.25**	**93.542**
#26	1	447.600	2.192	0.000	0.000	74.200	M	52.15	11.131
	2	2,038.800	3.000	0.000	0.000	77.000	M	230.69	63.525
	Σ	**2,486.400**						**275.55**	**74.655**
#24	1	2,607.500	5.367	2.377	0.305	75.200	M	153.86	70.433
	2	2,331.900	4.813	2.431	0.304	74.700	M	144.95	60.455
	3	1,758.500	2.231	1.788	0.297	76.200	M	240.04	51.476
	4	1,363.900	2.618	0.000	0.000	77.000	M	173.49	42.495
	Σ	**8,061.800**						**386.57**	**224.858**
#25	1	515.200	0.990	0.342	0.357	78.200	M	161.95	17.593
	2	130.500	0.787	0.342	0.357	78.100	M	48.57	4.423
	3	370.000	0.516	0.000	0.000	85.700	M	316.29	21.215
	Σ	**9,077.500**						**393.25**	**268.089**
#27	1	354.400	0.612	1.233	0.337	83.100	M	227.69	17.118
	2	305.200	0.529	1.054	0.328	84.000	M	229.89	15.662
	3	289.800	0.692	0.551	0.328	75.500	M	96.22	8.028
	4	253.000	0.361	0.551	0.328	79.400	M	174.11	9.470
	5	581.300	0.980	0.000	0.000	82.300	M	249.37	26.582
	Σ	**13,347.600**						**724.52**	**419.604**
#29	1	508.800	0.409	0.416	0.312	89.500	M	621.45	37.080
	2	233.200	0.521	0.291	0.312	91.600	M	281.23	19.263
	3	224.000	0.467	0.000	0.000	90.000	M	262.75	16.791
	Σ	**15,531.500**						**1,383.20**	**586.280**
#32	1	293.700	0.576	0.000	0.000	93.000	M	361.60	26.368
	Σ	**16,301.600**						**1,413.07**	**623.431**
#31	1	431.100	0.588	0.450	0.336	91.500	M	480.90	35.394
	2	325.800	0.432	0.149	0.327	93.000	M	469.94	29.285
	3	200.200	0.373	0.000	0.000	92.900	M	306.19	17.858
	Σ	**957.100**						**785.51**	**82.537**
#33	**Σ**	**17,258.700**						**1,524.15**	**705.968**

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#34	1	250.000	0.423	1.019	0.292	90.500	M	317.28	19.356
	2	219.100	0.611	0.267	0.322	80.000	M	113.14	8.541
	3	246.200	0.688	0.466	0.293	80.000	M	116.82	9.593
	4	441.000	0.370	0.000	0.000	79.700	M	305.93	16.839
	Σ	**18,415.000**						**1,537.36**	**760.296**
#5	1	503.600	0.618	0.000	0.000	87.600	M	431.41	32.518
	2	406.500	0.388	0.501	0.350	84.800	M	387.10	21.979
	3	439.600	0.342	0.681	0.347	87.800	M	530.42	28.890
	4	162.600	0.280	0.681	0.347	86.000	M	192.17	9.534
	5	294.100	0.375	1.021	0.348	92.000	M	427.35	24.849
	6	216.600	0.272	1.018	0.348	90.100	M	322.06	16.408
	Σ	**2,023.000**						**1,349.47**	**134.179**
#6	1	149.100	0.331	0.000	0.000	92.600	M	234.00	13.116
	2	245.000	0.529	0.192	0.328	88.100	M	239.24	16.340
	3	276.200	0.450	0.461	0.319	89.500	M	321.32	20.072
	4	158.400	0.380	1.385	0.185	93.000	M	241.78	14.207
	5	206.200	0.402	0.796	0.320	89.400	M	252.54	14.933
	6	414.000	0.430	1.066	0.323	87.200	M	431.96	26.139
	7	294.300	0.535	1.066	0.323	86.400	M	256.99	17.634
	Σ	**3,766.200**						**1,527.16**	**256.621**
#7	1	731.700	1.274	0.000	0.000	93.000	M	510.48	65.589
	2	445.800	1.043	0.000	0.000	93.000	M	363.36	39.948
	3	270.800	0.804	0.000	0.000	93.000	M	267.12	24.274
	4	78.900	0.267	1.035	0.328	93.000	M	135.40	7.113
	5	154.900	0.310	1.071	0.326	93.000	M	253.21	13.947
	6	101.400	0.288	1.164	0.328	92.900	M	169.28	9.070
	7	117.700	0.298	1.344	0.329	92.200	M	188.00	10.096
	8	494.100	0.518	1.344	0.329	91.300	M	588.05	40.082
	Σ	**6,161.500**						**2,444.68**	**466.740**
#8	1	0.000	0.000	0.000	0.000	1.000	0.00	0.000	
	Σ	**6,161.500**						**2,444.68**	**466.740**
#10	1	355.500	1.286	0.000	0.000	93.000	M	246.17	31.859
	2	307.100	1.282	0.668	0.305	83.200	M	113.34	14.918
	3	147.300	1.245	0.517	0.303	90.600	M	90.51	11.434
	4	126.400	0.585	0.517	0.303	93.000	M	154.15	11.351
	5	116.900	1.179	0.621	0.305	93.000	M	86.70	10.480
	Σ	**7,214.700**						**2,478.16**	**546.782**
#1	1	557.400	0.941	0.000	0.000	83.600	M	269.99	27.820
	2	169.600	1.616	0.677	0.333	93.000	M	97.53	15.200
	3	636.400	1.842	0.729	0.333	81.000	M	148.68	26.594

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
	4	223.400	0.846	1.005	0.336	84.100	M	121.50	11.530
	5	77.700	0.330	1.392	0.341	81.400	M	64.44	3.356
	6	746.600	0.678	1.392	0.341	88.200	M	623.33	50.074
	Σ	**2,411.100**						**969.41**	**134.574**
#2	1	257.000	0.423	0.000	0.000	93.000	M	374.44	23.118
	2	180.500	0.562	0.478	0.281	91.800	M	210.48	15.074
	3	200.700	0.687	0.574	0.283	93.000	M	220.68	18.000
	4	438.600	0.811	0.574	0.283	93.000	M	429.99	39.326
	5	420.200	1.247	0.801	0.293	88.000	M	218.78	27.811
	Σ	**3,908.100**						**1,059.91**	**257.902**
#3	1	172.600	0.443	0.000	0.000	93.000	M	245.91	15.489
	2	277.000	0.890	0.000	0.000	88.900	M	198.52	19.389
	3	378.900	0.632	0.209	0.314	87.900	M	325.75	24.926
	Σ	**4,736.600**						**1,247.07**	**317.706**
#4	Σ	**4,736.600**						**1,247.07**	**317.706**
#9	1	288.000	0.987	0.000	0.000	85.800	M	156.16	16.590
	2	236.000	0.436	0.000	0.000	1.000	M	0.00	0.000
	3	106.000	0.324	0.297	0.268	1.000	M	0.00	0.000
	4	82.000	0.315	0.666	0.300	1.000	M	0.00	0.000
	Σ	**5,448.600**						**1,251.87**	**334.296**
#11	Σ	**12,663.300**						**3,351.93**	**881.078**
#21	1	146.000	0.819	0.000	0.000	86.900	M	98.01	9.024
	2	137.000	0.213	0.249	0.263	1.000	M	0.00	0.000
	3	182.500	0.289	0.878	0.256	1.000	M	0.00	0.000
	4	70.000	0.939	0.878	0.256	1.000	M	0.00	0.000
	5	111.000	0.297	0.947	0.263	1.000	M	0.00	0.000
	Σ	**13,309.800**						**3,355.35**	**890.102**
#18	1	301.700	0.652	0.000	0.000	93.000	M	343.42	27.082
	2	546.800	0.768	0.561	0.320	86.300	M	370.15	32.542
	Σ	**848.500**						**434.05**	**59.624**
#17	1	182.200	0.462	0.000	0.000	93.000	M	254.12	16.351
	Σ	**182.200**						**254.12**	**16.351**
#19	Σ	**1,030.700**						**603.09**	**75.975**
#15	1	437.400	0.803	0.000	0.000	91.300	M	391.26	35.417
	2	549.000	0.637	0.654	0.327	91.300	M	575.39	44.478
	3	1,006.300	1.023	0.768	0.331	84.700	M	492.78	53.997
	Σ	**1,992.700**						**996.33**	**133.892**

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#12	1	517.800	0.791	0.000	0.000	81.900	M	253.96	23.036
	2	229.000	0.571	0.043	0.418	80.100	M	124.82	8.994
	3	592.700	0.706	0.044	0.417	81.500	M	307.18	25.658
	4	1,806.900	1.542	0.487	0.362	76.700	M	350.97	55.002
	5	348.100	0.618	0.487	0.362	80.000	178.31	13.561	
	Σ	**3,494.500**						**739.31**	**126.252**
#13	1	411.600	0.725	0.000	0.000	79.700	M	183.88	15.700
	2	636.400	0.774	0.322	0.336	80.700	M	291.36	26.065
	3	319.000	0.575	0.685	0.318	85.500	M	251.02	18.050
	4	231.700	0.314	0.923	0.328	80.400	M	183.82	9.322
	5	1,122.000	1.308	0.923	0.328	74.700	M	210.47	29.098
	Σ	**6,215.200**						**1,297.09**	**224.487**
#14	1	405.900	0.384	0.000	0.000	90.800	M	546.94	31.913
	2	411.100	0.452	0.707	0.308	90.700	M	510.03	32.137
	3	787.400	0.658	0.975	0.307	91.400	M	812.59	64.232
	4	144.200	0.341	1.716	0.310	86.200	M	159.03	8.568
	5	343.800	0.289	1.970	0.312	86.500	M	413.08	20.780
	6	392.800	0.806	2.107	0.316	81.900	M	190.01	17.476
	7	528.200	0.518	2.544	0.316	87.200	M	494.68	33.311
	8	890.900	1.253	2.544	0.316	83.500	M	341.95	44.165
	9	741.400	1.076	3.047	0.316	84.800	M	351.34	40.044
	10	451.100	0.916	3.354	0.316	83.900	M	227.77	22.972
	Σ	**11,312.000**						**1,550.26**	**540.085**
#16	1	475.100	1.721	0.000	0.000	92.400	M	250.03	41.080
	2	348.400	0.542	0.951	0.283	92.500	M	432.31	30.323
	3	198.500	0.266	1.384	0.278	93.000	M	340.98	17.895
	Σ	**14,326.700**						**2,034.74**	**763.276**
#20	1	271.100	0.667	0.000	0.000	89.400	M	246.39	19.587
	2	306.000	0.713	0.410	0.287	93.000	M	328.13	27.441
	Σ	**15,934.500**						**2,055.27**	**886.278**
#22	Σ	**29,244.300**						**5,071.06**	**1,776.380**
#23	1	146.440	0.564	0.000	0.000	81.900	M	91.52	6.519
	Σ	**29,390.740**						**5,054.38**	**1,782.900**
#35	Σ	**47,805.740**						**6,437.89**	**2,543.196**
#36	1	262.090	0.606	0.000	0.000	81.900	M	155.88	11.675
	2	45.000	0.159	0.470	0.263	1.000	M	0.00	0.000
	3	156.000	0.158	0.000	0.000	1.000	M	0.00	0.000
	Σ	**48,268.830**						**6,407.75**	**2,554.871**

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#37	1	344.000	1.756	0.000	0.000	84.800	M	109.22	18.572
	2	300.000	0.415	1.870	0.241	87.800	M	330.38	19.687
	3	185.000	0.332	1.493	0.241	85.500	M	198.10	10.506
	4	246.000	0.363	2.653	0.246	1.000	M	0.00	0.000
	5	157.000	0.611	2.512	0.242	84.100	M	108.10	8.105
	6	76.000	0.095	2.512	0.242	84.100	M	156.43	4.916
	7	243.000	0.673	1.814	0.241	83.000	M	144.99	11.662
	8	81.000	0.151	0.095	0.383	1.000	M	0.00	0.000
	9	29.000	0.118	1.721	0.298	1.000	M	0.00	0.000
	Σ	**49,929.830**						**6,292.47**	**2,628.318**

Subwatershed Sedimentology Detail:

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
#30	1	0.095	200.00	3.80	0.3720	1.0000	2	97.1	9,320	4.41	3.12
	Σ							**97.1**	**9,320**	**4.41**	**3.12**
#28	1	0.187	100.00	10.10	0.3750	1.0000	3	4,338.2	73,262	0.83	0.60
	2	0.196	100.00	10.20	0.3930	1.0000	3	2,720.2	80,011	2.01	1.43
	Σ							**5,541.5**	**59,612**	**0.74**	**0.53**
#26	1	0.155	400.00	1.40	0.3480	1.0000	2	57.3	5,194	1.90	1.38
	2	0.155	300.00	2.40	0.3340	1.0000	2	491.5	7,755	2.47	1.81
	Σ							**548.8**	**7,278**	**2.35**	**1.74**
#24	1	0.128	300.00	2.30	0.3360	1.0000	2	331.9	4,689	0.69	0.52
	2	0.136	300.00	2.70	0.3440	1.0000	2	370.4	6,080	1.07	0.79
	3	0.107	300.00	2.30	0.3330	1.0000	2	295.9	5,731	2.16	1.59
	4	0.163	400.00	1.60	0.3210	1.0000	2	258.2	6,111	2.13	1.55
	Σ							**949.6**	**4,970**	**0.73**	**0.46**
#25	1	0.125	400.00	1.90	0.3440	1.0000	2	144.5	8,472	4.38	3.12
	2	0.124	300.00	2.60	0.3280	1.0000	2	39.0	9,182	4.99	3.51
	3	0.122	175.00	4.90	0.2660	1.0000	2	389.9	19,291	11.68	8.13
	Σ							**1,185.4**	**15,996**	**3.69**	**0.75**
#27	1	0.127	175.00	5.90	0.3160	1.0000	2	424.5	25,447	14.88	10.58
	2	0.122	150.00	7.50	0.2920	1.0000	2	419.7	27,541	16.50	11.70
	3	0.070	125.00	8.40	0.3270	1.0000	2	119.4	15,575	8.52	5.95
	4	0.097	125.00	9.60	0.3170	1.0000	2	301.0	33,444	20.45	14.14
	5	0.126	125.00	8.90	0.3290	1.0000	2	789.9	30,401	16.28	11.59

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
	Σ							**3,780.3**	**31,465**	**13.44**	**2.82**
#29	1	0.190	125.00	9.80	0.3930	1.0000	3	3,300.2	89,222	5.11	3.64
	2	0.203	125.00	8.90	0.3940	1.0000	3	1,359.9	71,018	3.10	2.22
	3	0.193	125.00	8.40	0.3940	1.0000	3	1,052.2	63,883	3.03	2.14
	Σ							**15,023.3**	**74,082**	**9.73**	**2.44**
#32	1	0.210	150.00	7.70	0.3990	1.0000	3	1,746.7	66,745	2.70	1.93
	Σ							**16,148.1**	**65,499**	**6.14**	**1.76**
#31	1	0.204	125.00	8.70	0.3620	1.0000	3	2,300.9	65,305	1.98	1.42
	2	0.210	150.00	7.30	0.3990	1.0000	3	2,036.7	70,003	4.74	3.39
	3	0.210	175.00	4.50	0.3980	1.0000	3	826.7	47,117	3.68	2.62
	Σ							**3,927.1**	**43,239**	**0.95**	**0.75**
#33	**Σ**							**20,075.2**	**57,141**	**4.55**	**1.65**
#34	1	0.193	200.00	3.84	0.2460	1.0000	3	376.5	19,714	1.15	0.83
	2	0.100	200.00	3.66	0.2540	1.0000	1	68.5	8,450	5.08	3.54
	3	0.100	300.00	2.54	0.2540	1.0000	1	60.1	6,541	3.87	2.72
	4	0.100	200.00	3.50	0.2540	1.0000	1	167.6	10,761	6.81	4.62
	Σ							**18,665.2**	**49,486**	**1.47**	**0.54**
#5	1	0.149	75.00	12.50	0.3230	1.0000	3	1,761.5	55,417	0.26	0.18
	2	0.133	75.00	15.80	0.3190	1.0000	2	1,581.0	73,701	45.73	32.04
	3	0.103	100.00	11.00	0.2030	1.0000	3	800.7	28,422	1.85	1.32
	4	0.093	75.00	13.80	0.2130	1.0000	2	263.1	28,361	18.06	12.80
	5	0.123	100.00	11.00	0.1370	1.0000	3	527.0	21,481	1.58	1.14
	6	0.149	75.00	14.70	0.1990	1.0000	3	771.8	47,043	4.10	2.97
	Σ							**4,549.4**	**44,265**	**4.91**	**2.73**
#6	1	0.208	175.00	4.30	0.3980	1.0000	3	566.5	43,809	3.67	2.62
	2	0.183	175.00	5.40	0.3910	1.0000	3	696.7	43,787	1.15	0.81
	3	0.188	150.00	7.60	0.3900	1.0000	3	1,212.9	61,278	2.99	2.13
	4	0.210	150.00	6.30	0.3990	1.0000	3	814.1	55,762	4.31	3.20
	5	0.185	125.00	8.10	0.3860	1.0000	3	852.0	57,331	3.34	2.40
	6	0.104	100.00	11.30	0.2240	1.0000	3	781.6	30,493	1.34	0.95
	7	0.164	100.00	11.20	0.3740	1.0000	3	1,220.4	69,527	1.18	0.84
	Σ							**8,062.5**	**38,199**	**0.25**	**0.15**
#7	1	0.208	150.00	7.80	0.3780	1.0000	3	3,355.9	50,966	0.00	0.00
	2	0.209	100.00	10.20	0.3940	1.0000	3	2,757.2	68,474	0.00	0.00
	3	0.210	150.00	6.70	0.3990	1.0000	3	1,232.8	51,046	0.00	0.00
	4	0.210	100.00	11.50	0.3990	1.0000	3	724.5	98,573	9.53	7.00
	5	0.210	150.00	7.10	0.3990	1.0000	3	925.0	65,247	5.79	4.23
	6	0.209	150.00	7.90	0.3990	1.0000	3	640.0	69,035	6.39	4.69

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
	7	0.206	75.00	15.50	0.3990	1.0000	3	1,289.7	122,298	10.82	7.97
	8	0.202	75.00	14.50	0.3980	1.0000	3	4,762.8	115,519	4.96	3.61
	Σ							**20,462.9**	**48,159**	**0.00**	**0.00**
#8	1	0.000	0.00	0.00	0.0000	1.0000	0	0.0	1	0.00	0.00
	Σ							**20,462.9**	**48,159**	**0.00**	**0.00**
#10	1	0.190	300.00	2.70	0.1930	1.0000	3	272.9	8,677	0.00	0.00
	2	0.153	200.00	3.50	0.3610	1.0000	2	195.6	13,269	6.72	4.86
	3	0.189	200.00	3.70	0.3190	1.0000	3	170.7	15,060	0.00	0.00
	4	0.190	300.00	2.10	0.1940	1.0000	3	94.4	8,517	0.33	0.24
	5	0.201	300.00	2.00	0.3030	1.0000	3	103.6	9,977	0.00	0.00
	Σ							**20,048.7**	**44,185**	**0.15**	**0.09**
#1	1	0.157	150.00	6.80	0.3830	1.0000	2	974.2	35,729	19.48	13.87
	2	0.210	150.00	6.60	0.3990	1.0000	3	531.9	34,819	0.00	0.00
	3	0.149	200.00	3.90	0.3870	1.0000	2	363.4	13,724	6.05	4.41
	4	0.169	175.00	4.70	0.3950	1.0000	2	321.0	28,267	15.78	11.32
	5	0.157	100.00	10.10	0.3940	1.0000	2	193.1	58,434	36.30	25.77
	6	0.175	75.00	12.60	0.2840	1.0000	3	2,876.0	57,530	0.00	0.00
	Σ							**4,774.2**	**39,132**	**6.43**	**4.23**
#2	1	0.190	150.00	7.90	0.1930	1.0000	3	741.4	32,869	2.28	1.62
	2	0.184	175.00	4.80	0.2010	1.0000	3	286.7	19,447	0.71	0.51
	3	0.202	200.00	3.90	0.3220	1.0000	3	410.8	23,164	0.46	0.33
	4	0.203	150.00	7.40	0.3220	1.0000	3	1,809.1	46,104	0.00	0.00
	5	0.181	175.00	5.10	0.3710	1.0000	3	794.1	28,621	0.00	0.00
	Σ							**6,149.0**	**25,315**	**0.21**	**0.14**
#3	1	0.190	175.00	5.20	0.1930	1.0000	3	339.6	22,578	1.48	1.05
	2	0.177	175.00	4.20	0.2560	1.0000	3	345.2	18,214	0.00	0.00
	3	0.166	175.00	4.30	0.2290	1.0000	3	449.8	18,658	0.06	0.04
	Σ							**6,601.2**	**19,828**	**0.07**	**0.05**
#4	Σ							**6,601.2**	**19,828**	**0.07**	**0.05**
#9	1	0.212	175.00	4.17	0.2490	1.0000	2	320.1	19,740	10.83	7.73
	2	0.100	200.00	4.50	0.2540	1.0000	4	0.0	1	0.00	0.00
	3	0.100	200.00	4.50	0.2540	1.0000	4	0.0	1	0.00	0.00
	4	0.100	200.00	6.50	0.2540	1.0000	4	0.0	1	0.00	0.00
	Σ							**6,745.1**	**19,241**	**0.50**	**0.38**
#11	Σ							**26,793.8**	**36,763**	**0.33**	**0.20**
#21	1	0.206	175.00	4.44	0.2560	1.0000	2	185.8	21,160	12.10	8.59
	2	0.100	175.00	14.00	0.2540	1.0000	4	0.0	1	0.00	0.00
	3	0.185	300.00	2.70	0.2180	1.0000	3	0.0	1	0.00	0.00

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
	4	0.100	300.00	8.00	0.2540	1.0000	1	0.0	1	0.00	0.00
	5	0.100	200.00	5.00	0.2540	1.0000	1	0.0	1	0.00	0.00
	Σ							**26,825.2**	**37,071**	**0.31**	**0.18**
#18	1	0.193	300.00	2.80	0.2200	1.0000	3	358.9	13,605	0.36	0.26
	2	0.173	175.00	4.70	0.3880	1.0000	3	1,076.7	33,688	0.00	0.00
	Σ							**885.6**	**17,901**	**0.19**	**0.12**
#17	1	0.196	300.00	2.60	0.2600	1.0000	3	256.5	16,193	1.00	0.71
	Σ							**256.5**	**16,193**	**1.00**	**0.71**
#19	Σ							**1,142.2**	**16,875**	**0.37**	**0.24**
#15	1	0.201	125.00	8.20	0.3960	1.0000	3	2,012.4	57,137	0.00	0.00
	2	0.161	100.00	11.40	0.3060	1.0000	3	2,649.4	59,791	1.19	0.85
	3	0.118	100.00	10.20	0.2850	1.0000	2	1,580.5	29,583	15.98	11.51
	Σ							**5,389.3**	**48,450**	**2.83**	**1.71**
#12	1	0.124	150.00	6.30	0.3070	1.0000	2	498.5	22,410	12.48	8.80
	2	0.132	200.00	3.60	0.3500	1.0000	2	133.4	15,703	9.13	6.31
	3	0.136	175.00	5.00	0.3330	1.0000	2	607.5	24,640	13.97	9.79
	4	0.188	200.00	3.40	0.3570	1.0000	2	904.7	16,633	7.42	5.37
	5	0.228	175.00	4.10	0.3640	1.0000	2	476.5	36,486	20.95	14.66
	Σ							**2,083.8**	**17,988**	**8.18**	**5.49**
#13	1	0.128	150.00	6.90	0.3390	1.0000	2	417.2	27,706	15.46	10.81
	2	0.130	175.00	5.70	0.3300	1.0000	2	638.1	25,298	14.04	9.91
	3	0.191	175.00	6.00	0.2890	1.0000	2	645.3	36,645	21.88	15.51
	4	0.122	175.00	5.10	0.3460	1.0000	2	245.0	27,365	17.00	11.90
	5	0.137	175.00	4.20	0.3530	1.0000	2	478.0	16,624	7.66	5.54
	Σ							**4,182.2**	**19,433**	**9.44**	**6.62**
#14	1	0.196	100.00	10.20	0.3980	1.0000	3	2,894.3	91,132	6.10	4.33
	2	0.193	150.00	6.70	0.4020	1.0000	3	1,917.7	59,949	3.20	2.29
	3	0.169	75.00	13.80	0.3240	1.0000	3	4,755.6	73,522	1.21	0.87
	4	0.114	100.00	11.00	0.2980	1.0000	3	335.5	39,158	2.35	1.70
	5	0.078	100.00	10.10	0.1830	1.0000	3	350.3	16,865	1.22	0.89
	6	0.084	150.00	7.10	0.2700	1.0000	2	242.5	14,080	7.82	5.64
	7	0.087	100.00	10.00	0.1840	1.0000	3	540.9	16,298	0.40	0.29
	8	0.126	150.00	6.70	0.2740	1.0000	2	815.5	18,458	9.42	6.89
	9	0.117	150.00	7.30	0.2600	1.0000	2	749.6	18,705	10.00	7.32
	10	0.115	125.00	8.50	0.2610	1.0000	2	466.0	20,278	11.14	8.14
	Σ							**12,534.2**	**88,446**	**3.03**	**0.57**
#16	1	0.201	300.00	2.78	0.3030	1.0000	3	541.3	13,279	0.00	0.00
	2	0.204	150.00	6.00	0.3630	1.0000	3	1,454.1	47,970	2.12	1.53

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
	3	0.210	150.00	6.10	0.3990	1.0000	3	1,085.9	59,002	5.71	4.24
	Σ							**20,995.4**	**56,504**	**2.43**	**0.86**
#20	1	0.186	175.00	3.19	0.2130	1.0000	3	222.4	11,743	0.05	0.03
	2	0.194	200.00	3.42	0.2330	1.0000	3	399.5	14,838	0.22	0.16
	Σ							**22,426.7**	**49,522**	**1.47**	**0.55**
#22	Σ							**49,252.0**	**37,135**	**0.67**	**0.37**
#23	1	0.100	350.00	8.00	0.2540	1.0000	1	177.8	28,633	17.54	12.17
	Σ							**49,191.0**	**37,114**	**0.61**	**0.33**
#35	Σ							**67,856.3**	**35,717**	**0.72**	**0.39**
#36	1	0.100	200.00	3.14	0.2540	1.0000	1	84.7	7,654	4.65	3.23
	2	0.100	450.00	13.00	0.2540	1.0000	1	0.0	1	0.00	0.00
	3	0.100	300.00	10.00	0.2540	1.0000	1	0.0	1	0.00	0.00
	Σ							**67,471.2**	**36,405**	**0.58**	**0.31**
#37	1	0.196	200.00	3.80	0.3980	1.0000	2	330.1	17,944	8.41	6.09
	2	0.194	200.00	3.42	0.4020	1.0000	3	573.4	28,879	1.43	1.05
	3	0.173	150.00	7.10	0.2770	1.0000	3	393.3	37,272	2.22	1.62
	4	0.100	175.00	5.00	0.2540	1.0000	1	0.0	1	0.00	0.00
	5	0.171	150.00	6.50	0.2990	1.0000	3	238.1	29,210	0.00	0.00
	6	0.171	150.00	6.50	0.2990	1.0000	3	195.1	38,774	10.07	7.48
	7	0.100	300.00	1.20	0.2540	1.0000	1	39.6	3,449	2.08	1.50
	8	0.100	300.00	10.00	0.2540	1.0000	1	0.0	1	0.00	0.00
	9	0.100	250.00	10.00	0.2540	1.0000	1	0.0	1	0.00	0.00
	Σ							**66,822.3**	**39,819**	**0.30**	**0.14**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	3.65	50.00	1,369.00	1.910	0.199
		8. Large gullies, diversions, and low flowing streams	1.57	157.00	10,030.00	3.750	0.742
#1	**1**	**Time of Concentration:**					**0.941**
#1	2	5. Nearly bare and untilled, and alluvial valley fans	6.63	70.00	1,056.00	2.570	0.114
		5. Nearly bare and untilled, and alluvial valley fans	1.98	150.00	7,573.00	1.400	1.502
#1	**2**	**Time of Concentration:**					**1.616**
#1	3	5. Nearly bare and untilled, and alluvial valley fans	1.65	117.00	7,070.00	1.280	1.534

Attachment 41.C-3

Chaco River Unnamed Tributary Hydrology and Sedimentology

SEDCAD™ Model Output During Mine Operations

UNNAMED TRIBUTARY TO CHACO MINE OPERATIONS HYDROLOGY AND SEDIMENTOLOGY

2-yr, 6-hour PRECIPITATION

BHP Billiton

General Information

Storm Information:

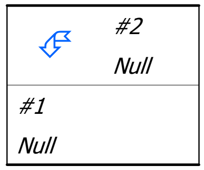
Storm Type:	Type II-70
Design Storm:	2 yr - 6 hr
Rainfall Depth:	0.850 inches

Particle Size Distribution:

Size (mm)	PostMine-LoamySand	PreMine-LoamySand	PreMine-Badlands	LoamySand Postmining
2.0000	100.000%	100.000%	100.000%	0.000%
0.1000	26.500%	30.000%	83.500%	0.000%
0.0500	14.000%	17.000%	77.000%	0.000%
0.0020	11.000%	11.000%	56.000%	0.000%
0.0010	0.000%	0.000%	0.000%	0.000%

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Null	#1	==>	End	0.000	0.000	Unnamed Tributary to Chaco CHA S2 SW1
Null	#2	==>	#1	0.120	0.335	CHA S1



Structure Routing Details:

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#2	8. Large gullies, diversions, and low flowing streams	1.33	20.00	1,500.00	3.46	0.120
#2	**Muskingum K:**					**0.120**

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc. (ml/l)	24VW (ml/l)
#2	552.600	552.600	0.00	0.00	0.0	1	0.00	0.00
#1	44.400	597.000	7.19	0.35	18.7	59,631	0.59	0.38

Particle Size Distribution(s) at Each Structure

Structure #2 (CHA S1):

Size (mm)	In/Out
2.0000	0.000%
0.1000	0.000%
0.0500	0.000%
0.0020	0.000%
0.0010	0.000%

Structure #1:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	97.203%
0.0010	0.000%

Structure Detail:

Structure #2 (Null)

CHA S1

Structure #1 (Null)

Unnamed Tributary to Chaco CHA S2 SW1

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#2	1	134.400	1.061	0.000	0.000	1.000	M	0.00	0.000
	2	307.500	0.669	0.097	0.351	1.000	M	0.00	0.000
	3	110.700	0.514	0.000	0.000	1.000	M	0.00	0.000
	Σ	**552.600**						**0.00**	**0.000**
#1	1	44.400	0.305	0.000	0.000	85.500	M	7.19	0.350
	Σ	**597.000**						**7.19**	**0.350**

Subwatershed Sedimentology Detail:

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
#2	1	0.100	275.00	7.50	0.2540	1.0000	1	0.0	1	0.00	0.00
	2	0.100	700.00	9.00	0.2540	1.0000	1	0.0	1	0.00	0.00
	3	0.100	800.00	10.00	0.2540	1.0000	1	0.0	1	0.00	0.00
	Σ							**0.0**	**1**	**0.00**	**0.00**
#1	1	0.151	1,000.00	7.30	0.2450	1.0000	3	18.7	59,631	0.59	0.38
	Σ							**18.7**	**59,631**	**0.59**	**0.38**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	3.85	50.00	1,300.00	1.960	0.184
		8. Large gullies, diversions, and low flowing streams	1.30	19.49	1,500.00	3.420	0.121
#1	**1**	**Time of Concentration:**					**0.305**
#2	1	5. Nearly bare and untilled, and alluvial valley fans	3.89	35.00	900.02	1.970	0.126
		5. Nearly bare and untilled, and alluvial valley fans	1.03	35.00	3,400.00	1.010	0.935
#2	**1**	**Time of Concentration:**					**1.061**
#2	2	5. Nearly bare and untilled, and alluvial valley fans	3.93	55.00	1,400.00	1.980	0.196
		8. Large gullies, diversions, and low flowing streams	1.04	54.00	5,200.00	3.050	0.473
#2	**2**	**Time of Concentration:**					**0.669**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#2	3	5. Nearly bare and untilled, and alluvial valley fans	5.00	50.00	1,000.00	2.230	0.124
		8. Large gullies, diversions, and low flowing streams	0.82	31.00	3,800.00	2.700	0.390
#2	**3**	**Time of Concentration:**					**0.514**

Subwatershed Muskingum Routing Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#2	2	8. Large gullies, diversions, and low flowing streams	1.79	25.00	1,400.00	4.000	0.097
#2	**2**	**Muskingum K:**					**0.097**

UNNAMED TRIBUTARY TO CHACO MINE OPERATIONS HYDROLOGY AND SEDIMENTOLOGY

10-yr, 6-hour PRECIPITATION

BHP Billiton

General Information

Storm Information:

Storm Type:	Type II-70
Design Storm:	10 yr - 6 hr
Rainfall Depth:	1.280 inches

Particle Size Distribution:

Size (mm)	PostMine-LoamySand	PreMine-LoamySand	PreMine-Badlands	LoamySand Postmining
2.0000	100.000%	100.000%	100.000%	0.000%
0.1000	26.500%	30.000%	83.500%	0.000%
0.0500	14.000%	17.000%	77.000%	0.000%
0.0020	11.000%	11.000%	56.000%	0.000%
0.0010	0.000%	0.000%	0.000%	0.000%

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc. (ml/l)	24VW (ml/l)
#2	552.600	552.600	0.00	0.00	0.0	1	0.00	0.00
#1	44.400	597.000	19.96	0.99	59.5	63,897	2.66	1.80

Particle Size Distribution(s) at Each Structure

Structure #2 (CHA S1):

Size (mm)	In/Out
2.0000	0.000%
0.1000	0.000%
0.0500	0.000%
0.0020	0.000%
0.0010	0.000%

Structure #1:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	88.264%
0.0010	0.000%

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#2	1	134.400	1.061	0.000	0.000	1.000	M	0.00	0.000
	2	307.500	0.669	0.097	0.351	1.000	M	0.00	0.000
	3	110.700	0.514	0.000	0.000	1.000	M	0.00	0.000
	Σ	**552.600**						**0.00**	**0.000**
#1	1	44.400	0.305	0.000	0.000	85.500	M	19.96	0.993
	Σ	**597.000**						**19.96**	**0.993**

Subwatershed Sedimentology Detail:

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
#2	1	0.100	275.00	7.50	0.2540	1.0000	1	0.0	1	0.00	0.00
	2	0.100	700.00	9.00	0.2540	1.0000	1	0.0	1	0.00	0.00
	3	0.100	800.00	10.00	0.2540	1.0000	1	0.0	1	0.00	0.00
	Σ							**0.0**	**1**	**0.00**	**0.00**
#1	1	0.151	1,000.00	7.30	0.2450	1.0000	3	59.5	63,897	2.66	1.80
	Σ							**59.5**	**63,897**	**2.66**	**1.80**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	3.85	50.00	1,300.00	1.960	0.184
		8. Large gullies, diversions, and low flowing streams	1.30	19.49	1,500.00	3.420	0.121
#1	**1**	**Time of Concentration:**					**0.305**
#2	1	5. Nearly bare and untilled, and alluvial valley fans	3.89	35.00	900.02	1.970	0.126
		5. Nearly bare and untilled, and alluvial valley fans	1.03	35.00	3,400.00	1.010	0.935
#2	**1**	**Time of Concentration:**					**1.061**
#2	2	5. Nearly bare and untilled, and alluvial valley fans	3.93	55.00	1,400.00	1.980	0.196
		8. Large gullies, diversions, and low flowing streams	1.04	54.00	5,200.00	3.050	0.473
#2	**2**	**Time of Concentration:**					**0.669**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#2	3	5. Nearly bare and untilled, and alluvial valley fans	5.00	50.00	1,000.00	2.230	0.124
		8. Large gullies, diversions, and low flowing streams	0.82	31.00	3,800.00	2.700	0.390
#2	**3**	**Time of Concentration:**					**0.514**

Subwatershed Muskingum Routing Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#2	2	8. Large gullies, diversions, and low flowing streams	1.79	25.00	1,400.00	4.000	0.097
#2	**2**	**Muskingum K:**					**0.097**

UNNAMED TRIBUTARY TO CHACO MINE OPERATIONS HYDROLOGY AND SEDIMENTOLOGY

25-yr, 6-hour PRECIPITATION

BHP Billiton

General Information

Storm Information:

Storm Type:	Type II-70
Design Storm:	25 yr - 6 hr
Rainfall Depth:	1.560 inches

Particle Size Distribution:

Size (mm)	PostMine-LoamySand	PreMine-LoamySand	PreMine-Badlands	LoamySand Postmining
2.0000	100.000%	100.000%	100.000%	0.000%
0.1000	26.500%	30.000%	83.500%	0.000%
0.0500	14.000%	17.000%	77.000%	0.000%
0.0020	11.000%	11.000%	56.000%	0.000%
0.0010	0.000%	0.000%	0.000%	0.000%

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc. (ml/l)	24VW (ml/l)
#2	552.600	552.600	0.00	0.00	0.0	1	0.00	0.00
#1	44.400	597.000	30.09	1.51	94.7	66,005	3.51	2.40

Particle Size Distribution(s) at Each Structure

Structure #2 (CHA S1):

Size (mm)	In/Out
2.0000	0.000%
0.1000	0.000%
0.0500	0.000%
0.0020	0.000%
0.0010	0.000%

Structure #1:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	85.061%
0.0010	0.000%

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#2	1	134.400	1.061	0.000	0.000	1.000	M	0.00	0.000
	2	307.500	0.669	0.097	0.351	1.000	M	0.00	0.000
	3	110.700	0.514	0.000	0.000	1.000	M	0.00	0.000
	Σ	**552.600**						**0.00**	**0.000**
#1	1	44.400	0.305	0.000	0.000	85.500	M	30.09	1.512
	Σ	**597.000**						**30.09**	**1.512**

Subwatershed Sedimentology Detail:

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
#2	1	0.100	275.00	7.50	0.2540	1.0000	1	0.0	1	0.00	0.00
	2	0.100	700.00	9.00	0.2540	1.0000	1	0.0	1	0.00	0.00
	3	0.100	800.00	10.00	0.2540	1.0000	1	0.0	1	0.00	0.00
	Σ							**0.0**	**1**	**0.00**	**0.00**
#1	1	0.151	1,000.00	7.30	0.2450	1.0000	3	94.7	66,005	3.51	2.40
	Σ							**94.7**	**66,005**	**3.51**	**2.40**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	3.85	50.00	1,300.00	1.960	0.184
		8. Large gullies, diversions, and low flowing streams	1.30	19.49	1,500.00	3.420	0.121
#1	**1**	**Time of Concentration:**					**0.305**
#2	1	5. Nearly bare and untilled, and alluvial valley fans	3.89	35.00	900.02	1.970	0.126
		5. Nearly bare and untilled, and alluvial valley fans	1.03	35.00	3,400.00	1.010	0.935
#2	**1**	**Time of Concentration:**					**1.061**
#2	2	5. Nearly bare and untilled, and alluvial valley fans	3.93	55.00	1,400.00	1.980	0.196
		8. Large gullies, diversions, and low flowing streams	1.04	54.00	5,200.00	3.050	0.473
#2	**2**	**Time of Concentration:**					**0.669**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#2	3	5. Nearly bare and untilled, and alluvial valley fans	5.00	50.00	1,000.00	2.230	0.124
		8. Large gullies, diversions, and low flowing streams	0.82	31.00	3,800.00	2.700	0.390
#2	**3**	**Time of Concentration:**					**0.514**

Subwatershed Muskingum Routing Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#2	2	8. Large gullies, diversions, and low flowing streams	1.79	25.00	1,400.00	4.000	0.097
#2	**2**	**Muskingum K:**					**0.097**

UNNAMED TRIBUTARY TO CHACO MINE OPERATIONS HYDROLOGY AND SEDIMENTOLOGY

100-yr, 6-hour PRECIPITATION

BHP Billiton

General Information

Storm Information:

Storm Type:	Type II-70
Design Storm:	100 yr - 6 hr
Rainfall Depth:	2.040 inches

Particle Size Distribution:

Size (mm)	PostMine-LoamySand	PreMine-LoamySand	PreMine-Badlands	LoamySand Postmining
2.0000	100.000%	100.000%	100.000%	0.000%
0.1000	26.500%	30.000%	83.500%	0.000%
0.0500	14.000%	17.000%	77.000%	0.000%
0.0020	11.000%	11.000%	56.000%	0.000%
0.0010	0.000%	0.000%	0.000%	0.000%

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc. (ml/l)	24VW (ml/l)
#2	552.600	552.600	0.00	0.00	0.0	1	0.00	0.00
#1	44.400	597.000	49.31	2.52	166.2	68,464	4.50	3.12

Particle Size Distribution(s) at Each Structure

Structure #2 (CHA S1):

Size (mm)	In/Out
2.0000	0.000%
0.1000	0.000%
0.0500	0.000%
0.0020	0.000%
0.0010	0.000%

Structure #1:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	81.641%
0.0010	0.000%

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#2	1	134.400	1.061	0.000	0.000	1.000	M	0.00	0.000
	2	307.500	0.669	0.097	0.351	1.000	M	0.00	0.000
	3	110.700	0.514	0.000	0.000	1.000	M	0.00	0.000
	Σ	**552.600**						**0.00**	**0.000**
#1	1	44.400	0.305	0.000	0.000	85.500	M	49.31	2.520
	Σ	**597.000**						**49.31**	**2.520**

Subwatershed Sedimentology Detail:

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
#2	1	0.100	275.00	7.50	0.2540	1.0000	1	0.0	1	0.00	0.00
	2	0.100	700.00	9.00	0.2540	1.0000	1	0.0	1	0.00	0.00
	3	0.100	800.00	10.00	0.2540	1.0000	1	0.0	1	0.00	0.00
	Σ							**0.0**	**1**	**0.00**	**0.00**
#1	1	0.151	1,000.00	7.30	0.2450	1.0000	3	166.2	68,464	4.50	3.12
	Σ							**166.2**	**68,464**	**4.50**	**3.12**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	3.85	50.00	1,300.00	1.960	0.184
		8. Large gullies, diversions, and low flowing streams	1.30	19.49	1,500.00	3.420	0.121
#1	**1**	**Time of Concentration:**					**0.305**
#2	1	5. Nearly bare and untilled, and alluvial valley fans	3.89	35.00	900.02	1.970	0.126
		5. Nearly bare and untilled, and alluvial valley fans	1.03	35.00	3,400.00	1.010	0.935
#2	**1**	**Time of Concentration:**					**1.061**
#2	2	5. Nearly bare and untilled, and alluvial valley fans	3.93	55.00	1,400.00	1.980	0.196
		8. Large gullies, diversions, and low flowing streams	1.04	54.00	5,200.00	3.050	0.473
#2	**2**	**Time of Concentration:**					**0.669**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#2	3	5. Nearly bare and untilled, and alluvial valley fans	5.00	50.00	1,000.00	2.230	0.124
		8. Large gullies, diversions, and low flowing streams	0.82	31.00	3,800.00	2.700	0.390
#2	**3**	**Time of Concentration:**					**0.514**

Subwatershed Muskingum Routing Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#2	2	8. Large gullies, diversions, and low flowing streams	1.79	25.00	1,400.00	4.000	0.097
#2	**2**	**Muskingum K:**					**0.097**

Appendix 41.D

SEDCAD^{TM}4 Modeling of Flood Flows and Sediment Yields for Post-reclamation Conditions

APPENDIX 41.D

SEDCAD™4 MODELING OF FLOOD FLOWS AND SEDIMENT YIELDS FOR POST-RECLAMATION CONDITIONS

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SEDCAD™4 MODELING OF FLOOD FLOWS AND SEDIMENT YIELDS FOR POST-RECLAMATION CONDITIONS

LIST OF ATTACHMENTS

SEDCAD™4 MODELING OF FLOOD FLOWS AND SEDIMENT YIELDS FOR POST-RECLAMATION CONDITIONS

The SEDCAD™4 (SEDCAD) hydrology model has been used to determine flood flows and sediment yields for the post-reclamation watershed conditions of Pinabete Arroyo, Cottonwood Arroyo, , and the unnamed tributary to the Chaco River. Application of the SEDCAD program involves dividing the drainage area into subwatersheds. Designation of subwatersheds with relatively uniform soil and vegetation characteristics helps in the estimation of model parameters required by SEDCAD. Information is required for physical structures located along the channel that may affect flow and sediment routing within the stream channels. SEDCAD null structures are also established at appropriate locations along the channel network where flow and sedimentology predictions are needed.

The SEDCAD input parameters are provided in tables to this appendix and output results for the 6-hour rainfall events on 2-year, 10-year, 25-year, and 100-year frequency precipitation events are provided as attachments to this appendix. There is one SEDCAD model for Pinabete Arroyo under post-reclamation conditions (Attachment 41.D-1). One model addresses post-reclamation conditions in Cottonwood Arroyo (Attachment 41.D-2). One model addresses post-reclamation conditions in the unnamed tributary to the Chaco River (Attachment 41.D-3).

Soil erosion by water for a specific watershed is usually calculated using the well known empirical Revised Universal Soil Loss Equation (RUSLE) (Renard et al. 1997) and is given by the following expression:

$$A = RKLSCP$$

A is the average soil loss per unit area, expressed in units selected for *K* and the time period specified by *R*. Normal English units are tons/acre/year.

R is the rainfall/runoff factor, which is the number of rainfall units for rainfall energy and runoff, plus the factor for runoff from snowmelt.

K is the soil erodibility factor, which is the rate of soil loss per unit of *R* for a given soil on a slope of 9% with slope length of 72.6 feet.

L is the slope length factor, which is the ratio of soil loss from a defined slope length relative to that from a slope length of 72.6 feet.

S is the slope steepness factor, which is the ratio of soil loss from a slope with a given steepness relative to that from a 9% slope.

C is the cover and management factor, which is the ratio of soil loss from an area with a known cover and management. And,

P is the supporting conservation practice factor.

SEDCAD requires these types of inputs be developed for each watershed being analyzed. To follow is a discussion on how the necessary parameter inputs were developed and calculated for Pinabete Mine Plan permit application package. This approach is similar to the one used when assessing the baseline flood flows and sediment yields (Appendix 18.B).

Runoff Modeling

Subwatershed Designation and Slopes

The SEDCAD subwatershed designations and drainage configuration for the watersheds of interest are shown on Exhibit 41.2-1. The subwatershed information was developed using Carlson Civil Suite 2008, AutoCAD®, and ArcGIS® software. The base mapping used to develop the off-lease subwatersheds are a combination of 10-feet contoured aerial flight and digital elevation model (DEM) data. The DEM images were based on digital raster graphics, representing US Geologic Survey (USGS) 7.5 minute topographic quadrangle maps (NMRGIS 2009 and USGS 2009). All DEM analysis was performed utilizing the Spatial Analyst extension for ArcGIS® on DEM images projected to the North American Datum of 1927 - State Plane New Mexico West coordinate system and in standard units (feet) of measure.

The mapping represents the conceptual final on-lease surface configuration and associated subwatershed delineation developed using Natural Regrade® software for AutoCAD®. The development of this surface, the post-reclamation surface stabilization, and sediment control performance are discussed in detail in Section 34 (Post-Reclamation Topography) and Section 38 (Post-Reclamation Surface Stabilization and Sediment Control). Subwatershed parameters required by the SEDCAD program were determined as described below.

Time of Concentration

The time of concentration for each subwatershed was calculated by the SEDCAD program from the length and slope of the longest flow path that was input from the topographic map using AutoCAD® software.

Rainfall Duration, Frequency, and Distribution

For evaluation purposes, peak flows were estimated for the 6-hour rainfall event at the 2-year, 10-year, 25-year, and 100-year frequencies. Storm precipitation values provided in Section 18 (Water Resources) for the various return periods were obtained from the National Oceanic and Atmospheric Administration (NOAA) online frequency estimates (Bonnin et. al. 2006) for a location within the Pinabete drainage in Area 4 South and from Atlas 14, New Mexico for the location of the Pinabete Arroyo watershed. A Soil Conservation Service (SCS) Type II-70 rainfall distribution was applied to all storms, which is consistent with the rainfall distribution used for the baseline modeling in Section 18 (Water Resources), Appendix 18.B.

Curve Number

Hydrologic group for the various soil types within each watershed was obtained from the “Soil Survey of San Juan County, Eastern Part” (Keetch 1980) for lands outside the BNCC lease area and from the baseline soils study (Section 14, Soil) for lands inside the BNCC lease area. These soil surveys classified soil types into four hydrologic group ratings: A, B, C, or D. Runoff curve numbers were developed from the “SEDCAD™4 User Manual” and software (Warner et al. 1998) and from SCS Engineering Division Technical Release *"Urban Hydrology for Small Watersheds*, Table 2-2d, page 2-8, "Runoff curve numbers for arid and semiarid rangelands" (USDA 1986), for each hydrologic soil group assuming a land use/condition between “Herbaceous” and “Desert Shrub” each with a poor cover condition. From this information, runoff curve numbers were derived for each of the four surface texture types. The curve numbers derived for each texture type are summarized in Table 41.D-1. The runoff curve number for a subwatershed was calculated as a weighted average based on overall the surface texture proportions determined for that watershed.

Hydrologic Response Class

A medium hydrologic response class was applied to all subwatersheds. The hydrologic response class determines the shape of the unit hydrograph used in the SEDCAD model. The medium class is typical of agricultural and semiarid rangeland conditions and was determined to be representative of site conditions.

Sedimentology Evaluation

The SEDCAD sedimentology analysis relies on a rainfall factor, erodible particle size data, a soil’s erodibility factor, the watershed’s topography and the resulting distance of overland flow, cover values and cultural practices at the site. Data for all of these parameters are entered for each subwatershed within the model.

Erodible Particle Size Distributions

BHP Navajo Coal Company (BNCC) obtained information about soils within and adjacent to the permit area as part of the rigorous baseline soils investigation for the permit area. This information came from site-specific studies (Section 14, Soil) and regional soil survey data (Keetch 1980). Soil mapping units were categorized into four surface textures to provide a basis for developing values for sedimentology parameters used in the SEDCAD model. These surface texture classes included: fine, fine loamy, coarse loamy, and sandy. ArcGIS® software was used to overlay the pre-mine subwatersheds with the baseline soils information to produce a database file that contained the areas corresponding to each soil type within each subwatershed. Textures were linked to the soil types, and an evaluation of the percentage of each texture within each watershed was calculated as a function of area. This surface texture distribution was used to calculate the remaining factors needed for SEDCAD modeling.

Erodible particle size distributions (EPSD) were developed for each of the four surface texture classes in a study conducted by Dr. Richard Warner of the Biosystems and Agricultural Engineering Department at the University of Kentucky (Section 18, Water Resources, Appendix 18.B, Attachment 18.B-6). The SEDCAD modeling software has a maximum of 20 ESPD per watershed model. For some watershed models, there were more subwatersheds than the number of ESPDs allowed by SEDCAD. In these cases, average or representative EPSDs were used. This data was entered into the model, and the specific particle size distribution referenced for each structure. These particle size distributions are specific to each watershed model and are uniquely numbered. Due to formatting difficulties with the SEDCAD output, BNCC has reproduced the particle size distributions for the major model runs in supplemental tables to completely document the assumptions incorporated by the sedimentology analysis. Nineteen particle size distributions were utilized to represent Pinabete Arroyo subwatershed conditions as summarized on Table 41.D-2. Erodible particle size distribution (EPSD) information was more limited for Cottonwood Arroyo and the Unnamed tributary to the Chaco River. The three particle size distributions for Cottonwood Arroyo are summarized on Table 41.D-3. This table was also used to represent the particle distributions for the Unnamed tributary to the Chaco River.

Erodibiltiy Factor (K)

The RUSLE K-Factor is a measure of a soil's resistance to erosive powers of rainfall energy and runoff. Practically, soil erodibility is an integration of the impacts of rainfall and runoff on soil loss for a given soil. Experimentally, soil loss erodibility is the soil loss per unit rainfall index on a standard erosion plot. K-factor can be obtained through three different sources: published data, the Wischmeier nomograph developed from data collected on 55 different midwestern USA agricultural soils, or the analytical approximation of the Wischmeier nomograph (Renard et. al. 1997). Inter-Mountain Labs (IML) determined the K-factor for the four soil texture types using the analytical approximation of the Wischmeier nomograph, which is given by the following relationship:

$$K = \frac{2.1 \times 10^{-4}(12 - OM)M^{1.14} + 3.25(S_1 - 2) + 2.5(P_1 - 3)}{100}$$

K is the soil erodibility factor in tons per acre per unit rainfall index (ton/acre/unit rainfall)

Unit rainfall index is in hundreds of feet · tons-force · inches per hour (100s feet tonsf inches/hour)

OM is the percentage organic matter,

P_1 is the permeability index (1 to 4),

S_1 is the soil structure index (1 to 6),

M is a parameter that depends on the parent particle size distribution and is given by the following and is valid for values of *%MS* + *%VFS* less than 70:

$$M = (\%MS + \%VFS)(100 - \%CL)$$

%CL is percentage clay (size < 0.002 mm in diameter),

%MS is percentage silt (0.002 – 0.05 mm) and

%VFS is percentage very fine sand (0.05 – 0.1 mm).

The percentage clay, silt, and very fine sand are obtained directly from the parent particle size distribution using American Society for Testing and Materials (ASTM) D422 – "Standard Test Method for Particle-Size Analysis of Soils" (ASTM 2000). The percentage of organic matter (*OM*) was determined using the Wakley-Black (WB) method (Nelson and Sommers 1982). IML also determined *OM* using the loss on ignition (LOI) described by Nelson and Sommers (1996). The results of these analyses are provided in Appendix 18.B, Attachment 18.B-7. The K-factors for each texture type are summarized in Table 41.D-1. The K-factor for a subwatershed was then calculated as a weighted average based on the overall surface texture distribution determined for that watershed.

Cover Factor (C)

Representative vegetative cover and surface cover information was derived for each of the EPSD texture classes from baseline vegetation surveys (Section 15, Vegetation). This information was integrated with the EPSD texture class information using ArcGIS® to generate canopy cover and surface cover values for each of the four soil textures. Between 104 and 131 transects were used to determine the mean percent total vegetative cover (canopy cover) and mean percent surface cover for each of the four EPSD texture classes. The canopy cover and surface cover derived for each texture type are summarized in Table 41.D-1. The canopy cover versus surface cover tables for rangeland contained within SEDCAD were expanded through linear interpolation to provide cover factors for subwatersheds based on the surface texture distribution. The average cover values were calculated for subwatersheds as a weighted average based on area. These values were used to determine the cover factor through interpolation in Table 41.D-4.

Results

The results of the hydrology and sedimentology models for each of the watersheds are provided as attachments. Each attachment contains the summary output from SEDCAD including: storm information, structure networking, structure routing details, EPSD for each structure, subwatershed hydrology details, subwatershed sedimentology details, subwatershed time of concentration details, subwatershed Muskingum routing details. The subwatershed structure networking is shown on Exhibit 41.2-1. The attachments also contain structure summaries for the following storm events: 2-year 6-hour (2yr-6hr), 10yr-6hr, 25yr-6hr, and 100yr-6hr.

Peak flows and sediment yields calculated from the aforementioned SEDCAD models for the 6-hour rainfall events on 2-year, 10-year, 25-year, and 100-year frequencies are reported in Section 41.3 in Table 41.3-4 and Table 41.3-5 for each of the surface water monitoring stations on Pinabete Arroyo, Cottonwood Arroyo, and the unnamed tributary to Chaco River.

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Table 41.D-1 SEDCAD™ Model Input Factors Based on Erodible Particle Size Distribution (EPSD) Texture Class for Post-reclamation Conditions

EPSD texture	K-factor	Run-off curve number	Canopy cover	Surface cover
Fine	0.20	93.0	4.7	30.8
Fine loamy	0.27	92.4	9.2	18.1
Coarse loamy	0.10	81.9	14.5	7.9
Sandy	0.20	65.6	13.9	1.6

Table 41.D-2 Pinabete Arroyo SEDCAD Model Erobible Particle Size Distribution Input for Post-reclamation Conditions

EPSD designation Diameter (mm)	P1	P2	P3	P4	P5	P6	P7	PR1	P9	PR2
0.450	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000
0.250	85.529	83.954	83.494	79.684	74.336	71.800	68.824	59.708	66.130	66.555
0.150	72.267	70.070	68.714	64.718	55.514	53.158	47.671	39.864	47.750	47.703
0.075	58.134	56.187	54.477	51.673	42.977	40.816	35.579	32.451	36.084	37.767
0.01585	49.962	48.376	46.844	44.689	37.721	35.600	31.445	30.046	31.122	33.776
0.01000	38.953	37.808	36.471	35.083	30.403	28.065	25.380	26.345	23.407	27.949
0.005012	9.675	9.683	9.177	10.018	9.205	9.529	8.929	12.646	10.343	11.148
0.001995	6.279	6.204	5.875	6.237	5.303	5.591	4.938	6.647	6.209	6.190
0.001000	6.010	5.917	5.567	5.908	4.905	5.155	4.462	6.189	5.698	5.755
0.000398	4.942	4.914	4.659	5.035	4.387	4.686	4.216	5.779	5.329	5.272

Note: Values reported as percent of sample passing through sieve with corresponding diameter

Table 41.D-2 (Continued)

EPSD designation Diameter (mm)	P11	P12	P13	PR3	PR4	P16	P17	P18	PR5
0.450	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000
0.250	71.599	65.531	66.688	84.341	66.364	76.546	69.115	68.866	78.238
0.150	57.036	45.088	46.416	70.811	47.418	60.175	48.743	45.562	61.247
0.075	47.507	34.380	34.657	57.016	35.438	46.743	36.650	33.437	47.106
0.01585	42.049	30.640	30.363	49.109	30.544	40.133	32.221	30.098	40.390
0.01000	34.448	25.007	23.816	38.440	22.931	30.717	25.703	25.355	30.915
0.005012	12.666	10.180	9.557	9.841	9.934	9.459	9.189	8.126	8.725
0.001995	7.405	5.608	5.458	6.312	5.945	5.929	5.194	4.149	5.492
0.001000	7.069	5.126	4.956	6.035	5.428	5.532	4.723	3.674	5.099
0.000398	6.144	4.829	4.693	4.992	5.109	4.866	4.420	3.561	4.474

Note: Values reported as percent of sample passing through sieve with corresponding diameter

Table 41.D-3 Cottonwood Arroyo SEDCAD™ Model Erodible Particle Size Distribution (EPSD) Input for Pre- & Post-reclamation

EPSD designation Diameter (mm)	Pre-Mine Badland	Pre-Mine Loamy Sand	Post-Mine Loamy Sand
2.000	100.000	100.000	100.000
0.100	83.500	30.000	26.500
0.050	77.000	17.000	14.000
0.002	56.000	11.000	11.000
0.001	0.000	0.000	0.000

Table 41.D-4: Cover Factor Canopy and Surface Cover Interpolation

	Cover that Contacts the Surface																			
Canopy Cover (%)	0%	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%	16%	17%	18%	19%
0%	0.45	0.438	0.425	0.413	0.4	0.388	0.375	0.363	0.35	0.338	0.325	0.313	0.3	0.288	0.275	0.263	0.25	0.238	0.225	0.213
1%	0.446	0.434	0.422	0.409	0.397	0.385	0.372	0.36	0.347	0.335	0.323	0.31	0.298	0.285	0.273	0.261	0.248	0.236	0.224	0.211
2%	0.443	0.431	0.418	0.406	0.394	0.382	0.369	0.357	0.345	0.332	0.32	0.308	0.296	0.283	0.271	0.259	0.247	0.234	0.222	0.21
3%	0.439	0.427	0.415	0.403	0.391	0.379	0.366	0.354	0.342	0.33	0.318	0.306	0.294	0.281	0.269	0.257	0.245	0.233	0.221	0.209
4%	0.436	0.424	0.412	0.4	0.388	0.376	0.363	0.351	0.339	0.327	0.315	0.303	0.291	0.279	0.267	0.255	0.243	0.231	0.219	0.207
5%	0.432	0.42	0.408	0.396	0.384	0.373	0.361	0.349	0.337	0.325	0.313	0.301	0.289	0.277	0.265	0.254	0.242	0.23	0.218	0.206
6%	0.428	0.417	0.405	0.393	0.381	0.37	0.358	0.346	0.334	0.322	0.311	0.299	0.287	0.275	0.263	0.252	0.24	0.228	0.216	0.205
7%	0.425	0.413	0.401	0.39	0.378	0.367	0.355	0.343	0.332	0.32	0.308	0.297	0.285	0.273	0.262	0.25	0.238	0.227	0.215	0.203
8%	0.421	0.41	0.398	0.387	0.375	0.364	0.352	0.34	0.329	0.317	0.306	0.294	0.283	0.271	0.26	0.248	0.237	0.225	0.213	0.202
9%	0.418	0.406	0.395	0.383	0.372	0.361	0.349	0.338	0.326	0.315	0.303	0.292	0.281	0.269	0.258	0.246	0.235	0.223	0.212	0.201
10%	0.414	0.403	0.391	0.38	0.369	0.358	0.346	0.335	0.324	0.312	0.301	0.29	0.278	0.267	0.256	0.245	0.233	0.222	0.211	0.199
11%	0.41	0.399	0.388	0.377	0.366	0.355	0.343	0.332	0.321	0.31	0.299	0.287	0.276	0.265	0.254	0.243	0.232	0.22	0.209	0.198
12%	0.407	0.396	0.385	0.374	0.363	0.352	0.34	0.329	0.318	0.307	0.296	0.285	0.274	0.263	0.252	0.241	0.23	0.219	0.208	0.197
13%	0.403	0.392	0.381	0.37	0.359	0.349	0.338	0.327	0.316	0.305	0.294	0.283	0.272	0.261	0.25	0.239	0.228	0.217	0.206	0.195
14%	0.4	0.389	0.378	0.367	0.356	0.346	0.335	0.324	0.313	0.302	0.291	0.281	0.27	0.259	0.248	0.237	0.226	0.216	0.205	0.194
15%	0.396	0.385	0.375	0.364	0.353	0.343	0.332	0.321	0.31	0.3	0.289	0.278	0.268	0.257	0.246	0.236	0.225	0.214	0.203	0.193
16%	0.392	0.382	0.371	0.361	0.35	0.34	0.329	0.318	0.308	0.297	0.287	0.276	0.265	0.255	0.244	0.234	0.223	0.213	0.202	0.191
17%	0.389	0.378	0.368	0.357	0.347	0.337	0.326	0.316	0.305	0.295	0.284	0.274	0.263	0.253	0.242	0.232	0.221	0.211	0.201	0.19
18%	0.385	0.375	0.365	0.354	0.344	0.334	0.323	0.313	0.302	0.292	0.282	0.271	0.261	0.251	0.24	0.23	0.22	0.209	0.199	0.189
19%	0.382	0.371	0.361	0.351	0.341	0.331	0.32	0.31	0.3	0.29	0.279	0.269	0.259	0.249	0.239	0.228	0.218	0.208	0.198	0.187
20%	0.378	0.368	0.358	0.348	0.338	0.328	0.317	0.307	0.297	0.287	0.277	0.267	0.257	0.247	0.237	0.227	0.216	0.206	0.196	0.186
21%	0.374	0.364	0.354	0.344	0.334	0.325	0.315	0.305	0.295	0.285	0.275	0.265	0.255	0.245	0.235	0.225	0.215	0.205	0.195	0.185
22%	0.371	0.361	0.351	0.341	0.331	0.322	0.312	0.302	0.292	0.282	0.272	0.262	0.252	0.243	0.233	0.223	0.213	0.203	0.193	0.183
23%	0.367	0.357	0.348	0.338	0.328	0.319	0.309	0.299	0.289	0.28	0.27	0.26	0.25	0.241	0.231	0.221	0.211	0.202	0.192	0.182
24%	0.364	0.354	0.344	0.335	0.325	0.316	0.306	0.296	0.287	0.277	0.267	0.258	0.248	0.239	0.229	0.219	0.21	0.2	0.19	0.181
25%	0.36	0.351	0.341	0.332	0.322	0.313	0.303	0.294	0.284	0.275	0.265	0.256	0.246	0.237	0.227	0.218	0.208	0.199	0.189	0.18
50%	0.26	0.254	0.247	0.241	0.234	0.228	0.221	0.215	0.208	0.202	0.195					0.163				
75%	0.17	0.167	0.163	0.16	0.156	0.153	0.149	0.146	0.142	0.139	0.135					0.118				

Developed from SedCAD Tables
Blue text is from SedCAD Table, Black Text is linear interpolation calculation

Table 41.D-4: (Continued)

	Cover that Contacts the Surface																			
Canopy Cover (%)	20%	21%	22%	23%	24%	25%	26%	27%	28%	29%	30%	31%	32%	33%	34%	35%	36%	37%	38%	39%
0%	0.2	0.195	0.19	0.185	0.18	0.175	0.17	0.165	0.16	0.155	0.15	0.145	0.14	0.135	0.13	0.125	0.12	0.115	0.11	0.105
1%	0.199	0.194	0.189	0.184	0.179	0.174	0.169	0.164	0.159	0.154	0.149	0.144	0.139							0.105
2%	0.198	0.193	0.188	0.183	0.178	0.173	0.168	0.163	0.158	0.153	0.148	0.143	0.139							0.104
3%	0.196	0.192	0.186	0.182	0.177	0.172	0.167	0.162	0.157	0.152	0.148	0.143	0.138							0.104
4%	0.195	0.19	0.185	0.181	0.176	0.171	0.166	0.161	0.156	0.152	0.147	0.142	0.137							0.103
5%	0.194	0.189	0.184	0.18	0.175	0.17	0.165	0.16	0.156	0.151	0.146	0.141	0.136							0.103
6%	0.193	0.188	0.183	0.179	0.174	0.169	0.164	0.159	0.155	0.15	0.145	0.14	0.136							0.102
7%	0.192	0.187	0.181	0.177	0.173	0.168	0.163	0.159	0.154	0.149	0.144	0.14	0.135							0.102
8%	0.19	0.186	0.18	0.176	0.172	0.167	0.162	0.158	0.153	0.148	0.144	0.139	0.134							0.101
9%	0.189	0.185	0.179	0.175	0.171	0.166	0.161	0.157	0.152	0.147	0.143	0.138	0.134							0.101
10%	0.188	0.183	0.178	0.174	0.17	0.165	0.16	0.156	0.151	0.147	0.142	0.137	0.133							0.101
11%	0.187	0.182	0.176	0.173	0.169	0.164	0.159	0.155	0.15	0.146	0.141	0.137	0.132							0.1
12%	0.186	0.181	0.175	0.172	0.168	0.163	0.158	0.154	0.149	0.145	0.14	0.136	0.131							0.1
13%	0.184	0.18	0.174	0.171	0.166	0.162	0.158	0.153	0.149	0.144	0.14	0.135	0.131							0.099
14%	0.183	0.179	0.173	0.17	0.165	0.161	0.157	0.152	0.148	0.143	0.139	0.134	0.13							0.099
15%	0.182	0.178	0.172	0.169	0.164	0.16	0.156	0.151	0.147	0.142	0.138	0.134	0.129							0.098
16%	0.181	0.176	0.17	0.168	0.163	0.159	0.155	0.15	0.146	0.142	0.137	0.133	0.128							0.098
17%	0.18	0.175	0.169	0.167	0.162	0.158	0.154	0.149	0.145	0.141	0.136	0.132	0.128							0.098
18%	0.178	0.174	0.168	0.166	0.161	0.157	0.153	0.148	0.144	0.14	0.136	0.131	0.127							0.097
19%	0.177	0.173	0.167	0.164	0.16	0.156	0.152	0.148	0.143	0.139	0.135	0.131	0.126							0.097
20%	0.176	0.172	0.165	0.163	0.159	0.155	0.151	0.147	0.142	0.138	0.134	0.13	0.126							0.096
21%	0.175	0.171	0.164	0.162	0.158	0.154	0.15	0.146	0.142	0.137	0.133	0.129	0.125							0.096
22%	0.174	0.169	0.163	0.161	0.157	0.153	0.149	0.145	0.141	0.137	0.132	0.128	0.124							0.095
23%	0.172	0.168	0.162	0.16	0.156	0.152	0.148	0.144	0.14	0.136	0.132	0.128	0.123							0.095
24%	0.171	0.167	0.16	0.159	0.155	0.151	0.147	0.143	0.139	0.135	0.131	0.127	0.123							0.094
25%	0.17	0.166	0.162	0.158	0.154	0.15	0.146	0.142	0.138	0.134	0.13	0.126	0.122	0.118	0.114	0.11	0.106	0.102	0.098	0.094
50%	0.13					0.115					0.1					0.085				
75%	0.1					0.09					0.08					0.07				

Developed from SedCAD Tables
Blue text is from SedCAD Table, Black Text is linear interpolation calculation

Table 41.D-4: (Continued)

	Cover that Contacts the Surface									
Canopy Cover (%)	40%	45%	50%	55%	60%	61%	62%	65%	80%	95%
0%	0.1	0.086	0.071	0.057	0.042	0.041	0.039	0.035	0.013	0.003
1%	0.1				0.042	0.04	0.039			
2%	0.099				0.042	0.04	0.039			
3%	0.099				0.042	0.04	0.039			
4%	0.098				0.041	0.04	0.038			
5%	0.098				0.041	0.04	0.038			
6%	0.098				0.041	0.04	0.038			
7%	0.097				0.041	0.039	0.038			
8%	0.097				0.041	0.039	0.038			
9%	0.096				0.041	0.039	0.038			
10%	0.096				0.04	0.039	0.038			
11%	0.096				0.04	0.039	0.037			
12%	0.095				0.04	0.039	0.037			
13%	0.095				0.04	0.038	0.037			
14%	0.094				0.04	0.038	0.037			
15%	0.094				0.04	0.038	0.037			
16%	0.094				0.039	0.038	0.037			
17%	0.093				0.039	0.038	0.036			
18%	0.093				0.039	0.038	0.036			
19%	0.092				0.039	0.038	0.036			
20%	0.092				0.039	0.037	0.036			
21%	0.092				0.039	0.037	0.036			
22%	0.091				0.038	0.037	0.036			
23%	0.091				0.038	0.037	0.035			
24%	0.09				0.038	0.037	0.035			
25%	0.09	0.077	0.064	0.051	0.038	0.037	0.035	0.032	0.012	0.003
50%	0.07	0.061	0.053	0.044	0.035			0.029	0.012	0.003
75%	0.06	0.053	0.046	0.038	0.031			0.026	0.011	0.003

Developed from SedCAD Tables
Blue text is from SedCAD Table, Black Text is linear interpolation calculation

Attachment 41.D-1

Pinabete Arroyo Post-reclamation Hydrology and Sedimentology

SEDCAD™ Model Output

PINABETE DRAINAGE POST-MINE HYDROLOGY AND SEDIMENTOLOGY

I:\Departments\NMC Business Development\Environmental Management\SMCRA Permitting\Hydrology\Surface Hydrology\Calc_Pinabete_PreMine_SedCAD_Input_Parameters_DLP_080824.xls

Kevin Ritter

General Information

Storm Information:

Storm Type:	Type II-70
Design Storm:	2 yr - 6 hr
Rainfall Depth:	0.850 inches

Particle Size Distribution:

Size (mm)	P1	P2	P3	P4	P5	P6	P7
0.4250	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%
0.2500	85.529%	83.954%	83.494%	79.684%	74.336%	71.800%	68.824%
0.1500	72.267%	70.070%	68.714%	64.718%	55.514%	53.158%	47.671%
0.0750	58.134%	56.187%	54.477%	51.673%	42.977%	40.816%	35.579%
0.0159	49.962%	48.376%	46.844%	44.689%	37.721%	35.600%	31.445%
0.0100	38.953%	37.808%	36.471%	35.083%	30.403%	28.065%	25.380%
0.0050	9.675%	9.683%	9.177%	10.018%	9.205%	9.529%	8.929%
0.0020	6.279%	6.204%	5.875%	6.237%	5.303%	5.591%	4.938%
0.0010	6.010%	5.917%	5.567%	5.908%	4.905%	5.155%	4.462%
0.0004	4.942%	4.914%	4.659%	5.035%	4.387%	4.686%	4.216%

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Null	#1	==>	#2	1.674	0.331	
Null	#2	==>	#5	4.188	0.295	
Null	#3	==>	#4	1.961	0.319	
Null	#4	==>	#5	3.103	0.304	
Null	#5	==>	#6	1.300	0.273	
Null	#6	==>	#7	0.995	0.281	EAST LEASE BNDY
Null	#7	==>	#8	2.793	0.277	
Null	#8	==>	#9	2.630	0.259	WEST LEASE BNDY
Null	#9	==>	End	0.000	0.000	
Null	#10	==>	#9	1.961	0.281	

Structure Routing Details:

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	8. Large gullies, diversions, and low flowing streams	1.24	250.00	20,136.00	3.34	1.674

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	**Muskingum K:**					**1.674**
#2	8. Large gullies, diversions, and low flowing streams	0.67	245.00	36,791.00	2.44	4.188
#2	**Muskingum K:**					**4.188**
#3	8. Large gullies, diversions, and low flowing streams	0.99	210.00	21,118.00	2.99	1.961
#3	**Muskingum K:**					**1.961**
#4	8. Large gullies, diversions, and low flowing streams	0.77	227.00	29,388.00	2.63	3.103
#4	**Muskingum K:**					**3.103**
#5	8. Large gullies, diversions, and low flowing streams	0.47	45.00	9,601.00	2.05	1.300
#5	**Muskingum K:**					**1.300**
#6	8. Large gullies, diversions, and low flowing streams	0.54	42.00	7,845.00	2.19	0.995
#6	**Muskingum K:**					**0.995**
#7	8. Large gullies, diversions, and low flowing streams	0.49	105.00	21,218.00	2.11	2.793
#7	**Muskingum K:**					**2.793**
#8	8. Large gullies, diversions, and low flowing streams	0.37	64.00	17,238.00	1.82	2.630
#8	**Muskingum K:**					**2.630**
#10	8. Large gullies, diversions, and low flowing streams	0.53	82.00	15,391.00	2.18	1.961
#10	**Muskingum K:**					**1.961**

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc. (ml/l)	24VW (ml/l)
#10	282.000	282.000	27.73	1.93	37.4	26,030	11.59	7.84
#3	3,941.300	3,941.300	53.32	14.24	238.2	21,665	2.61	1.85
#4	3,216.300	7,157.600	99.02	36.99	663.3	33,219	3.57	1.76
#1	8,452.701	8,452.701	154.36	53.41	773.0	30,189	4.06	1.78
#2	3,838.600	12,291.300	330.91	115.14	1,855.6	32,273	4.04	1.85
#5	5,441.700	24,890.600	409.05	242.96	2,902.5	19,800	1.67	0.93
#6	3,064.700	27,955.300	404.64	286.07	2,727.8	16,910	0.94	0.49
#7	2,633.600	30,588.900	401.25	293.48	2,702.7	18,832	0.97	0.44
#8	5,652.000	36,240.900	394.42	351.51	2,642.7	19,749	1.62	0.57
#9	2,037.000	38,559.900	389.95	372.10	2,846.7	26,333	1.93	0.52

Particle Size Distribution(s) at Each Structure

Structure #10:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	86.484%
0.0750	65.028%
0.0159	57.169%
0.0100	45.605%
0.0050	16.304%
0.0020	9.216%
0.0010	8.380%
0.0004	7.842%

Structure #3:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	99.434%
0.0159	97.289%
0.0100	89.488%
0.0050	34.895%
0.0020	19.351%
0.0010	17.524%
0.0004	16.566%

Structure #4:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	100.000%
0.0159	100.000%

Size (mm)	In/Out
0.0100	90.845%
0.0050	36.743%
0.0020	20.918%
0.0010	19.114%
0.0004	17.696%

Structure #1:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	100.000%
0.0159	100.000%
0.0100	87.311%
0.0050	30.156%
0.0020	17.991%
0.0010	16.700%
0.0004	14.883%

Structure #2:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	100.000%
0.0159	97.896%
0.0100	89.396%
0.0050	29.269%
0.0020	17.934%
0.0010	16.846%
0.0004	14.587%

Structure #5:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	100.000%
0.0159	98.566%
0.0100	95.258%

Size (mm)	In/Out
0.0050	36.396%
0.0020	22.093%
0.0010	20.673%
0.0004	18.074%

Structure #6 (EAST LEASE BNDY):

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	100.000%
0.0159	100.000%
0.0100	99.219%
0.0050	42.188%
0.0020	25.697%
0.0010	24.070%
0.0004	20.991%

Structure #7:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	100.000%
0.0159	100.000%
0.0100	99.778%
0.0050	43.142%
0.0020	26.257%
0.0010	24.591%
0.0004	21.454%

Structure #8 (WEST LEASE BNDY):

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	98.268%
0.0159	96.876%
0.0100	94.109%
0.0050	48.801%

Size (mm)	In/Out
0.0020	29.612%
0.0010	27.689%
0.0004	24.244%

Structure #9:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	99.596%
0.0159	98.024%
0.0100	95.404%
0.0050	48.634%
0.0020	29.430%
0.0010	27.493%
0.0004	24.129%

Structure Detail:

Structure #10 (Null)

Structure #3 (Null)

Structure #4 (Null)

Structure #1 (Null)

Structure #2 (Null)

Structure #5 (Null)

Structure #6 (Null)

EAST LEASE BNDY

Structure #7 (Null)

Structure #8 (Null)

WEST LEASE BNDY

Structure #9 (Null)

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#10	1	58.000	0.152	0.000	0.000	83.300	M	8.86	0.397
	2	90.000	0.305	0.054	0.353	83.300	M	9.91	0.616
	3	134.000	0.290	0.121	0.360	83.300	M	15.23	0.918
	Σ	**282.000**						**27.73**	**1.931**
#3	1	790.200	1.145	1.181	0.350	80.800	M	19.09	3.362
	2	1,064.500	0.915	0.596	0.351	80.800	M	30.68	4.529
	3	428.300	0.571	0.319	0.355	81.300	M	19.94	2.018
	4	742.900	0.625	0.000	0.000	78.500	M	15.07	1.859
	5	915.400	1.119	0.000	0.000	78.800	M	13.10	2.472
	Σ	**3,941.300**						**53.32**	**14.240**
#4	1	539.800	0.726	1.710	0.319	81.700	M	22.91	2.752
	2	443.800	0.503	1.429	0.318	86.000	M	56.01	4.726
	3	890.000	0.815	0.998	0.318	82.100	M	37.70	4.899
	4	1,342.700	0.919	0.000	0.000	84.000	M	75.51	10.370
	Σ	**7,157.600**						**99.02**	**36.986**
#1	1	1,249.000	1.349	1.345	0.354	80.800	M	26.47	5.314
	2	1,652.000	1.465	0.849	0.360	80.300	M	28.99	6.320
	3	1,407.200	1.573	1.241	0.357	81.100	M	28.30	6.367
	4	839.600	1.102	0.977	0.364	81.000	M	21.93	3.722
	5	687.100	1.067	1.113	0.365	81.600	M	21.13	3.435
	6	1,223.200	0.778	0.596	0.352	81.800	M	50.32	6.358
	7	740.100	0.745	0.530	0.354	83.600	M	45.39	5.339
	8	654.500	0.801	0.000	0.000	92.200	M	144.42	16.557
	Σ	**8,452.701**						**154.36**	**53.413**
#2	1	610.100	0.668	1.219	0.340	85.700	M	59.37	6.202
	2	537.100	0.610	1.436	0.329	91.600	M	133.06	12.559
	3	455.000	0.546	1.288	0.324	82.000	M	25.57	2.457
	4	619.100	0.634	0.852	0.324	87.900	M	88.84	8.732
	5	664.000	0.452	0.453	0.315	91.200	M	189.97	14.727
	6	953.300	0.984	0.000	0.000	89.600	M	125.57	17.051
	Σ	**12,291.300**						**330.91**	**115.142**
#5	1	758.800	0.682	3.507	0.293	84.100	M	54.69	5.960
	2	946.400	1.117	2.231	0.289	89.200	M	106.38	16.023
	3	1,015.600	0.996	1.587	0.291	92.000	M	184.77	25.028
	4	688.700	1.908	1.255	0.291	80.800	M	11.06	2.930
	5	754.300	2.307	1.084	0.287	86.200	M	29.27	8.281
	6	623.600	0.538	0.595	0.301	93.000	M	202.72	17.508

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
	7	654.300	0.560	0.000	0.000	91.500	M	169.62	15.099
	Σ	**24,890.600**						**409.05**	**242.957**
#6	1	886.000	1.151	1.896	0.315	81.100	M	22.88	4.009
	2	1,011.200	1.871	0.166	0.287	83.500	M	29.16	7.170
	3	1,167.500	1.126	0.000	0.000	92.800	M	214.91	31.938
	Σ	**27,955.300**						**404.64**	**286.074**
#7	1	971.600	0.819	0.665	0.285	82.900	M	48.38	6.197
	2	1,467.100	2.587	0.000	0.000	75.000	M	2.85	1.169
	3	194.900	0.596	0.000	0.000	72.600	M	0.13	0.038
	Σ	**30,588.900**						**401.25**	**293.478**
#8	1	392.000	0.538	2.912	0.280	93.000	M	127.43	11.006
	2	565.000	0.734	2.659	0.279	92.400	M	136.68	14.672
	3	684.000	0.853	2.311	0.280	87.600	M	74.88	9.240
	4	716.000	1.690	2.328	0.277	76.200	M	2.99	0.905
	5	400.000	0.740	1.423	0.277	79.500	M	9.66	1.279
	6	313.000	0.436	1.168	0.285	85.600	M	40.90	3.133
	7	197.000	0.448	0.938	0.279	83.800	M	18.36	1.471
	8	112.000	0.412	0.707	0.318	83.300	M	10.06	0.767
	9	197.000	0.396	1.003	0.317	83.300	M	18.20	1.349
	10	221.000	0.388	0.417	0.339	83.300	M	20.71	1.513
	11	102.000	0.283	0.232	0.317	83.300	M	11.77	0.698
	12	64.000	0.259	0.356	0.398	83.300	M	7.80	0.438
	13	130.000	0.524	0.232	0.317	83.300	M	9.81	0.890
	14	90.000	0.301	0.443	0.321	83.300	M	9.99	0.616
	15	235.000	0.636	0.232	0.317	83.300	M	15.33	1.609
	16	229.000	0.596	0.384	0.382	83.300	M	15.68	1.568
	17	275.000	0.552	0.503	0.312	83.300	M	19.95	1.883
	18	359.000	0.666	0.503	0.312	83.300	M	22.63	2.458
	19	166.000	0.519	0.129	0.319	83.300	M	12.61	1.137
	20	128.000	0.585	0.000	0.000	83.300	M	8.89	0.876
	21	77.000	0.650	0.000	0.000	83.300	M	4.94	0.527
	Σ	**36,240.900**						**394.42**	**351.514**
#9	1	0.000	0.000	0.000	0.000	1.000	M	0.00	0.000
	2	432.000	0.633	2.204	0.256	84.900	M	38.13	3.870
	3	177.000	0.686	1.864	0.256	84.900	M	14.70	1.586
	4	565.000	0.655	0.983	0.255	85.800	M	56.75	5.834
	5	863.000	0.668	0.000	0.000	84.600	M	69.30	7.363
	Σ	**38,559.900**						**389.95**	**372.098**

Subwatershed Sedimentology Detail:

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
#10	1	0.198	209.00	5.00	0.2430	1.0000	17	8.3	30,350	14.87	9.13
	2	0.198	209.00	5.00	0.2430	1.0000	17	11.2	26,099	11.20	7.14
	3	0.198	209.00	5.00	0.2430	1.0000	17	17.9	27,875	12.14	7.74
	Σ							**37.4**	**26,030**	**11.59**	**7.84**
#3	1	0.150	100.00	9.10	0.3050	1.0000	18	52.9	19,967	2.38	1.72
	2	0.181	100.00	10.10	0.3050	1.0000	13	118.7	33,740	7.21	5.12
	3	0.151	200.00	5.50	0.3050	1.0000	18	33.1	22,318	6.72	4.53
	4	0.183	130.00	7.60	0.3160	1.0000	12	37.3	27,396	5.82	3.91
	5	0.185	100.00	8.30	0.2760	1.0000	6	34.8	18,046	1.01	0.72
	Σ							**238.2**	**21,665**	**2.61**	**1.85**
#4	1	0.173	130.00	7.00	0.2850	1.0000	7	46.3	21,798	5.61	3.97
	2	0.148	100.00	12.00	0.2220	1.0000	5	128.9	35,591	11.48	8.02
	3	0.185	75.00	13.60	0.2740	1.0000	17	161.4	42,361	9.86	6.98
	4	0.213	100.00	10.60	0.2330	1.0000	6	301.2	37,919	7.35	5.14
	Σ							**663.3**	**33,219**	**3.57**	**1.76**
#1	1	0.220	280.00	2.20	0.2960	1.0000	13	36.5	8,683	0.93	0.68
	2	0.202	240.00	3.30	0.2960	1.0000	13	53.7	10,679	0.78	0.57
	3	0.206	280.00	2.60	0.2960	1.0000	13	45.7	9,006	0.67	0.49
	4	0.188	200.00	5.10	0.2960	1.0000	13	55.4	18,982	3.23	2.32
	5	0.124	240.00	3.60	0.3130	1.0000	18	22.5	8,414	1.35	0.97
	6	0.178	130.00	7.90	0.2850	1.0000	7	132.8	27,364	6.68	4.66
	7	0.191	100.00	9.20	0.2540	1.0000	6	120.1	29,544	7.02	4.89
	8	0.199	75.00	15.10	0.1510	1.0000	2	458.1	35,717	7.36	5.20
	Σ							**773.0**	**30,189**	**4.06**	**1.78**
#2	1	0.188	130.00	7.30	0.2120	1.0000	5	104.7	22,050	5.75	4.03
	2	0.199	75.00	12.60	0.1510	1.0000	2	297.2	30,342	7.80	5.56
	3	0.200	100.00	8.60	0.2020	1.0000	11	42.3	22,810	3.56	2.46
	4	0.193	75.00	12.30	0.1730	1.0000	4	208.1	31,115	7.25	5.08
	5	0.187	75.00	14.00	0.1590	1.0000	3	450.0	40,005	12.97	9.02
	6	0.198	75.00	13.70	0.1680	1.0000	4	421.6	31,932	4.74	3.35
	Σ							**1,855.6**	**32,273**	**4.04**	**1.85**
#5	1	0.213	130.00	6.30	0.2330	1.0000	6	105.7	22,424	5.99	4.34
	2	0.209	130.00	7.10	0.1680	1.0000	4	211.7	16,677	1.81	1.32
	3	0.191	100.00	8.40	0.1500	1.0000	2	320.7	16,240	2.30	1.67
	4	0.235	200.00	4.90	0.2870	1.0000	9	38.5	16,281	0.77	0.57
	5	0.220	240.00	3.70	0.1900	1.0000	16	48.8	7,379	0.40	0.30
	6	0.200	130.00	7.30	0.1410	1.0000	1	263.4	19,552	5.62	3.96
	7	0.204	200.00	4.70	0.1560	1.0000	2	201.9	17,706	4.83	3.35

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
	Σ							**2,902.5**	**19,800**	**1.67**	**0.93**
#6	1	0.228	280.00	2.70	0.2870	1.0000	9	34.8	10,963	1.85	1.34
	2	0.226	280.00	2.40	0.2330	1.0000	6	39.9	7,033	0.39	0.28
	3	0.200	200.00	4.20	0.1460	1.0000	1	289.5	11,653	1.27	0.91
	Σ							**2,727.8**	**16,910**	**0.94**	**0.49**
#7	1	0.197	280.00	2.70	0.2330	1.0000	5	47.3	9,977	1.52	1.07
	2	0.204	420.00	1.80	0.3270	1.0000	19	4.4	4,393	0.12	0.09
	3	0.171	280.00	2.40	0.3380	1.0000	10	0.1	3,042	1.47	1.32
	Σ							**2,702.7**	**18,832**	**0.97**	**0.44**
#8	1	0.200	280.00	2.70	0.1410	1.0000	1	69.0	7,873	2.26	1.66
	2	0.204	280.00	2.30	0.1550	1.0000	3	81.8	7,051	1.76	1.28
	3	0.173	280.00	3.00	0.2220	1.0000	6	69.6	9,604	2.65	1.92
	4	0.204	280.00	3.00	0.3180	1.0000	19	5.3	6,968	0.23	0.18
	5	0.187	200.00	5.90	0.2960	1.0000	12	22.0	22,133	4.47	3.18
	6	0.167	200.00	4.20	0.2740	1.0000	8	48.8	20,530	8.86	6.15
	7	0.215	100.00	9.40	0.2650	1.0000	20	42.6	38,368	15.89	10.94
	8	0.201	100.00	8.10	0.2960	1.0000	13	17.5	30,794	12.75	8.60
	9	0.208	280.00	2.70	0.2120	1.0000	15	11.2	11,222	3.49	2.37
	10	0.225	200.00	4.50	0.2540	1.0000	14	29.6	27,000	11.08	7.33
	11	0.198	100.00	9.20	0.2450	1.0000	6	18.1	36,430	14.84	9.57
	12	0.198	209.00	5.00	0.2430	1.0000	17	8.1	26,371	11.84	7.57
	13	0.198	209.00	5.00	0.2430	1.0000	17	13.7	21,025	7.27	4.89
	14	0.198	209.00	5.00	0.2430	1.0000	17	11.3	25,508	10.99	7.21
	15	0.198	209.00	5.00	0.2430	1.0000	17	24.6	20,510	6.35	4.33
	16	0.198	209.00	5.00	0.2430	1.0000	17	24.5	21,089	6.79	4.61
	17	0.198	209.00	5.00	0.2430	1.0000	17	31.1	22,207	7.47	5.09
	18	0.198	209.00	5.00	0.2430	1.0000	17	38.8	20,918	6.28	4.34
	19	0.198	209.00	5.00	0.2430	1.0000	17	18.1	21,868	7.60	5.08
	20	0.198	209.00	5.00	0.2430	1.0000	17	12.9	20,058	6.53	4.39
	21	0.198	209.00	5.00	0.2430	1.0000	17	7.0	17,927	5.47	3.71
	Σ							**2,642.7**	**19,749**	**1.62**	**0.57**
#9	1	0.206	130.00	7.80	0.1800	1.0000	16	0.0	1	0.00	0.00
	2	0.189	100.00	11.10	0.2450	1.0000	6	117.8	38,662	11.49	8.24
	3	0.177	100.00	8.30	0.2330	1.0000	6	23.4	18,952	5.31	3.79
	4	0.161	100.00	10.00	0.2220	1.0000	5	119.3	26,555	7.09	4.99
	5	0.175	200.00	5.90	0.2450	1.0000	6	136.7	24,930	7.00	4.77
	Σ							**2,846.7**	**26,333**	**1.93**	**0.52**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	2.99	22.00	736.00	1.720	0.118
		8. Large gullies, diversions, and low flowing streams	0.63	66.00	10,511.00	2.370	1.231
#1	**1**	**Time of Concentration:**					**1.349**
#1	2	5. Nearly bare and untilled, and alluvial valley fans	1.02	8.00	785.00	1.000	0.218
		8. Large gullies, diversions, and low flowing streams	1.48	242.00	16,353.00	3.640	1.247
#1	**2**	**Time of Concentration:**					**1.465**
#1	3	5. Nearly bare and untilled, and alluvial valley fans	0.88	10.00	1,136.10	0.930	0.339
		8. Large gullies, diversions, and low flowing streams	1.31	200.00	15,244.00	3.430	1.234
#1	**3**	**Time of Concentration:**					**1.573**
#1	4	5. Nearly bare and untilled, and alluvial valley fans	1.85	10.00	542.00	1.350	0.111
		8. Large gullies, diversions, and low flowing streams	1.62	220.00	13,595.00	3.810	0.991
#1	**4**	**Time of Concentration:**					**1.102**
#1	5	5. Nearly bare and untilled, and alluvial valley fans	1.23	10.00	812.00	1.100	0.205
		8. Large gullies, diversions, and low flowing streams	1.41	156.00	11,049.00	3.560	0.862
#1	**5**	**Time of Concentration:**					**1.067**
#1	6	5. Nearly bare and untilled, and alluvial valley fans	3.12	22.00	706.00	1.760	0.111
		8. Large gullies, diversions, and low flowing streams	2.85	346.00	12,152.00	5.060	0.667
#1	**6**	**Time of Concentration:**					**0.778**
#1	7	5. Nearly bare and untilled, and alluvial valley fans	4.66	43.00	922.01	2.150	0.119
		8. Large gullies, diversions, and low flowing streams	2.67	295.00	11,057.38	4.900	0.626
#1	**7**	**Time of Concentration:**					**0.745**
#1	8	5. Nearly bare and untilled, and alluvial valley fans	7.46	65.00	871.00	2.730	0.088
		8. Large gullies, diversions, and low flowing streams	2.61	324.00	12,433.00	4.840	0.713
#1	**8**	**Time of Concentration:**					**0.801**
#2	1	5. Nearly bare and untilled, and alluvial valley fans	6.24	30.00	481.00	2.490	0.053
		8. Large gullies, diversions, and low flowing streams	3.34	406.00	12,141.00	5.480	0.615
#2	**1**	**Time of Concentration:**					**0.668**
#2	2	5. Nearly bare and untilled, and alluvial valley fans	3.16	30.00	950.00	1.770	0.149
		8. Large gullies, diversions, and low flowing streams	4.22	432.00	10,229.00	6.160	0.461
#2	**2**	**Time of Concentration:**					**0.610**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#2	3	5. Nearly bare and untilled, and alluvial valley fans	2.65	10.00	378.00	1.620	0.064
		8. Large gullies, diversions, and low flowing streams	2.72	234.00	8,592.00	4.950	0.482
#2	**3**	**Time of Concentration:**					**0.546**
#2	4	5. Nearly bare and untilled, and alluvial valley fans	3.07	25.00	815.00	1.750	0.129
		8. Large gullies, diversions, and low flowing streams	3.32	330.00	9,931.00	5.460	0.505
#2	**4**	**Time of Concentration:**					**0.634**
#2	5	5. Nearly bare and untilled, and alluvial valley fans	7.45	45.00	604.00	2.720	0.061
		8. Large gullies, diversions, and low flowing streams	3.78	310.00	8,210.00	5.820	0.391
#2	**5**	**Time of Concentration:**					**0.452**
#2	6	5. Nearly bare and untilled, and alluvial valley fans	9.10	80.00	879.00	3.010	0.081
		8. Large gullies, diversions, and low flowing streams	2.32	344.00	14,831.00	4.560	0.903
#2	**6**	**Time of Concentration:**					**0.984**
#3	1	5. Nearly bare and untilled, and alluvial valley fans	1.29	15.00	1,163.00	1.130	0.285
		8. Large gullies, diversions, and low flowing streams	2.37	338.00	14,280.00	4.610	0.860
#3	**1**	**Time of Concentration:**					**1.145**
#3	2	5. Nearly bare and untilled, and alluvial valley fans	3.04	33.00	1,087.00	1.740	0.173
		8. Large gullies, diversions, and low flowing streams	2.06	238.00	11,527.00	4.310	0.742
#3	**2**	**Time of Concentration:**					**0.915**
#3	3	5. Nearly bare and untilled, and alluvial valley fans	5.02	45.00	897.00	2.230	0.111
		8. Large gullies, diversions, and low flowing streams	3.09	270.00	8,741.00	5.270	0.460
#3	**3**	**Time of Concentration:**					**0.571**
#3	4	5. Nearly bare and untilled, and alluvial valley fans	7.41	28.00	378.00	2.720	0.038
		8. Large gullies, diversions, and low flowing streams	3.43	402.00	11,736.00	5.550	0.587
#3	**4**	**Time of Concentration:**					**0.625**
#3	5	5. Nearly bare and untilled, and alluvial valley fans	3.39	30.00	885.00	1.840	0.133
		8. Large gullies, diversions, and low flowing streams	2.58	442.00	17,121.00	4.820	0.986
#3	**5**	**Time of Concentration:**					**1.119**
#4	1	5. Nearly bare and untilled, and alluvial valley fans	3.59	62.00	1,729.00	1.890	0.254
		8. Large gullies, diversions, and low flowing streams	2.09	154.00	7,372.00	4.330	0.472
#4	**1**	**Time of Concentration:**					**0.726**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#4	2	5. Nearly bare and untilled, and alluvial valley fans	6.83	25.00	366.00	2.610	0.038
		8. Large gullies, diversions, and low flowing streams	2.36	182.00	7,708.00	4.600	0.465
#4	**2**	**Time of Concentration:**					**0.503**
#4	3	5. Nearly bare and untilled, and alluvial valley fans	19.03	47.00	247.00	4.360	0.015
		8. Large gullies, diversions, and low flowing streams	2.13	268.00	12,586.00	4.370	0.800
#4	**3**	**Time of Concentration:**					**0.815**
#4	4	5. Nearly bare and untilled, and alluvial valley fans	14.08	50.00	355.00	3.750	0.026
		8. Large gullies, diversions, and low flowing streams	2.46	372.00	15,119.00	4.700	0.893
#4	**4**	**Time of Concentration:**					**0.919**
#5	1	5. Nearly bare and untilled, and alluvial valley fans	12.55	65.00	518.00	3.540	0.040
		8. Large gullies, diversions, and low flowing streams	1.92	184.00	9,592.00	4.150	0.642
#5	**1**	**Time of Concentration:**					**0.682**
#5	2	5. Nearly bare and untilled, and alluvial valley fans	5.10	30.00	588.00	2.250	0.072
		8. Large gullies, diversions, and low flowing streams	1.77	266.00	15,016.00	3.990	1.045
#5	**2**	**Time of Concentration:**					**1.117**
#5	3	5. Nearly bare and untilled, and alluvial valley fans	1.90	20.00	1,050.00	1.380	0.211
		8. Large gullies, diversions, and low flowing streams	2.19	274.00	12,532.00	4.430	0.785
#5	**3**	**Time of Concentration:**					**0.996**
#5	4	5. Nearly bare and untilled, and alluvial valley fans	2.78	32.00	1,152.00	1.660	0.192
		8. Large gullies, diversions, and low flowing streams	0.99	182.00	18,415.00	2.980	1.716
#5	**4**	**Time of Concentration:**					**1.908**
#5	5	5. Nearly bare and untilled, and alluvial valley fans	2.52	23.00	911.00	1.580	0.160
		8. Large gullies, diversions, and low flowing streams	1.07	256.00	23,965.00	3.100	2.147
#5	**5**	**Time of Concentration:**					**2.307**
#5	6	5. Nearly bare and untilled, and alluvial valley fans	6.36	25.00	393.00	2.520	0.043
		8. Large gullies, diversions, and low flowing streams	2.39	198.00	8,272.00	4.640	0.495
#5	**6**	**Time of Concentration:**					**0.538**
#5	7	5. Nearly bare and untilled, and alluvial valley fans	9.66	28.00	290.00	3.100	0.025
		8. Large gullies, diversions, and low flowing streams	2.12	179.00	8,427.00	4.370	0.535
#5	**7**	**Time of Concentration:**					**0.560**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#6	1	5. Nearly bare and untilled, and alluvial valley fans	31.83	120.00	377.00	5.640	0.018
		8. Large gullies, diversions, and low flowing streams	1.38	198.00	14,361.00	3.520	1.133
#6	**1**	**Time of Concentration:**					**1.151**
#6	2	5. Nearly bare and untilled, and alluvial valley fans	4.25	40.00	941.00	2.060	0.126
		8. Large gullies, diversions, and low flowing streams	0.96	176.00	18,407.00	2.930	1.745
#6	**2**	**Time of Concentration:**					**1.871**
#6	3	5. Nearly bare and untilled, and alluvial valley fans	4.35	25.00	575.00	2.080	0.076
		8. Large gullies, diversions, and low flowing streams	1.57	224.00	14,223.00	3.760	1.050
#6	**3**	**Time of Concentration:**					**1.126**
#7	1	5. Nearly bare and untilled, and alluvial valley fans	2.51	10.00	399.00	1.580	0.070
		8. Large gullies, diversions, and low flowing streams	1.11	95.00	8,524.00	3.160	0.749
#7	**1**	**Time of Concentration:**					**0.819**
#7	3	5. Nearly bare and untilled, and alluvial valley fans	2.14	14.00	655.00	1.460	0.124
		8. Large gullies, diversions, and low flowing streams	1.07	56.00	5,255.00	3.090	0.472
#7	**3**	**Time of Concentration:**					**0.596**
#8	1	5. Nearly bare and untilled, and alluvial valley fans	1.97	5.00	254.00	1.400	0.050
		8. Large gullies, diversions, and low flowing streams	1.64	111.00	6,755.00	3.840	0.488
#8	**1**	**Time of Concentration:**					**0.538**
#8	2	5. Nearly bare and untilled, and alluvial valley fans	2.49	8.00	321.00	1.570	0.056
		8. Large gullies, diversions, and low flowing streams	1.16	91.00	7,866.00	3.220	0.678
#8	**2**	**Time of Concentration:**					**0.734**
#8	3	5. Nearly bare and untilled, and alluvial valley fans	3.58	25.00	698.00	1.890	0.102
		8. Large gullies, diversions, and low flowing streams	1.12	96.00	8,579.00	3.170	0.751
#8	**3**	**Time of Concentration:**					**0.853**
#8	4	5. Nearly bare and untilled, and alluvial valley fans	0.85	10.00	1,181.00	0.920	0.356
		8. Large gullies, diversions, and low flowing streams	0.90	123.00	13,645.00	2.840	1.334
#8	**4**	**Time of Concentration:**					**1.690**
#8	5	5. Nearly bare and untilled, and alluvial valley fans	6.53	39.00	597.00	2.550	0.065
		8. Large gullies, diversions, and low flowing streams	1.42	123.00	8,678.00	3.570	0.675
#8	**5**	**Time of Concentration:**					**0.740**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#8	6	5. Nearly bare and untilled, and alluvial valley fans	1.45	5.00	344.00	1.200	0.079
		8. Large gullies, diversions, and low flowing streams	2.21	127.00	5,746.00	4.460	0.357
#8	**6**	**Time of Concentration:**					**0.436**
#8	7	5. Nearly bare and untilled, and alluvial valley fans	2.98	12.00	403.00	1.720	0.065
		8. Large gullies, diversions, and low flowing streams	1.97	114.00	5,796.00	4.200	0.383
#8	**7**	**Time of Concentration:**					**0.448**
#8	8	5. Nearly bare and untilled, and alluvial valley fans	9.90	200.00	2,020.00	3.140	0.178
		8. Large gullies, diversions, and low flowing streams	0.83	19.20	2,307.00	2.730	0.234
#8	**8**	**Time of Concentration:**					**0.412**
#8	9	5. Nearly bare and untilled, and alluvial valley fans	5.71	80.00	1,400.00	2.390	0.162
		8. Large gullies, diversions, and low flowing streams	0.83	19.20	2,307.00	2.730	0.234
#8	**9**	**Time of Concentration:**					**0.396**
#8	10	5. Nearly bare and untilled, and alluvial valley fans	5.00	60.00	1,200.00	2.230	0.149
		8. Large gullies, diversions, and low flowing streams	1.75	60.00	3,422.00	3.970	0.239
#8	**10**	**Time of Concentration:**					**0.388**
#8	11	5. Nearly bare and untilled, and alluvial valley fans	4.84	24.00	496.00	2.190	0.062
		8. Large gullies, diversions, and low flowing streams	2.79	111.00	3,980.20	5.000	0.221
#8	**11**	**Time of Concentration:**					**0.283**
#8	12	5. Nearly bare and untilled, and alluvial valley fans	5.00	70.00	1,400.00	2.230	0.174
		8. Large gullies, diversions, and low flowing streams	2.67	40.00	1,500.00	4.890	0.085
#8	**12**	**Time of Concentration:**					**0.259**
#8	13	5. Nearly bare and untilled, and alluvial valley fans	4.44	40.00	900.00	2.100	0.119
		8. Large gullies, diversions, and low flowing streams	1.05	47.00	4,479.00	3.070	0.405
#8	**13**	**Time of Concentration:**					**0.524**
#8	14	5. Nearly bare and untilled, and alluvial valley fans	5.00	60.00	1,200.00	2.230	0.149
		8. Large gullies, diversions, and low flowing streams	1.81	40.20	2,216.00	4.040	0.152
#8	**14**	**Time of Concentration:**					**0.301**
#8	15	5. Nearly bare and untilled, and alluvial valley fans	10.00	70.00	700.00	3.160	0.061
		8. Large gullies, diversions, and low flowing streams	1.28	90.00	7,023.00	3.390	0.575
#8	**15**	**Time of Concentration:**					**0.636**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#8	16	5. Nearly bare and untilled, and alluvial valley fans	2.00	50.00	2,500.00	1.410	0.492
		8. Large gullies, diversions, and low flowing streams	1.12	13.40	1,196.00	3.170	0.104
#8	**16**	**Time of Concentration:**					**0.596**
#8	17	5. Nearly bare and untilled, and alluvial valley fans	7.27	80.00	1,100.00	2.690	0.113
		8. Large gullies, diversions, and low flowing streams	0.70	27.80	3,969.00	2.510	0.439
#8	**17**	**Time of Concentration:**					**0.552**
#8	18	5. Nearly bare and untilled, and alluvial valley fans	5.63	90.00	1,600.00	2.370	0.187
		8. Large gullies, diversions, and low flowing streams	0.74	33.00	4,452.00	2.580	0.479
#8	**18**	**Time of Concentration:**					**0.666**
#8	19	5. Nearly bare and untilled, and alluvial valley fans	7.89	150.00	1,900.00	2.800	0.188
		8. Large gullies, diversions, and low flowing streams	0.70	21.00	2,997.00	2.510	0.331
#8	**19**	**Time of Concentration:**					**0.519**
#8	20	5. Nearly bare and untilled, and alluvial valley fans	3.33	110.00	3,300.00	1.820	0.503
		8. Large gullies, diversions, and low flowing streams	0.70	5.20	746.00	2.500	0.082
#8	**20**	**Time of Concentration:**					**0.585**
#8	21	5. Nearly bare and untilled, and alluvial valley fans	4.19	130.00	3,100.00	2.040	0.422
		8. Large gullies, diversions, and low flowing streams	0.70	14.50	2,068.00	2.510	0.228
#8	**21**	**Time of Concentration:**					**0.650**
#9	1	5. Nearly bare and untilled, and alluvial valley fans	7.42	25.00	337.00	2.720	0.034
		8. Large gullies, diversions, and low flowing streams	1.50	107.00	7,136.00	3.670	0.540
#9	**1**	**Time of Concentration:**					**0.000**
#9	2	5. Nearly bare and untilled, and alluvial valley fans	11.19	15.00	134.00	3.340	0.011
		8. Large gullies, diversions, and low flowing streams	1.96	184.00	9,391.00	4.190	0.622
#9	**2**	**Time of Concentration:**					**0.633**
#9	3	5. Nearly bare and untilled, and alluvial valley fans	3.14	25.00	796.00	1.770	0.124
		8. Large gullies, diversions, and low flowing streams	1.68	132.00	7,862.00	3.880	0.562
#9	**3**	**Time of Concentration:**					**0.686**
#9	4	5. Nearly bare and untilled, and alluvial valley fans	12.82	35.00	273.00	3.580	0.021
		8. Large gullies, diversions, and low flowing streams	1.93	183.00	9,495.00	4.160	0.634
#9	**4**	**Time of Concentration:**					**0.655**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#9	5	5. Nearly bare and untilled, and alluvial valley fans	2.66	15.00	564.00	1.630	0.096
		8. Large gullies, diversions, and low flowing streams	1.68	135.00	8,020.00	3.890	0.572
#9	**5**	**Time of Concentration:**					**0.668**
#10	1	5. Nearly bare and untilled, and alluvial valley fans	10.00	80.00	800.00	3.160	0.070
		8. Large gullies, diversions, and low flowing streams	1.80	21.60	1,197.00	4.020	0.082
#10	**1**	**Time of Concentration:**					**0.152**
#10	2	5. Nearly bare and untilled, and alluvial valley fans	8.00	40.00	500.00	2.820	0.049
		8. Large gullies, diversions, and low flowing streams	1.48	50.00	3,373.00	3.650	0.256
#10	**2**	**Time of Concentration:**					**0.305**
#10	3	5. Nearly bare and untilled, and alluvial valley fans	7.78	70.00	900.00	2.780	0.089
		8. Large gullies, diversions, and low flowing streams	2.50	85.90	3,435.00	4.740	0.201
#10	**3**	**Time of Concentration:**					**0.290**

Subwatershed Muskingum Routing Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	8. Large gullies, diversions, and low flowing streams	1.89	378.00	19,958.00	4.120	1.345
#1	**1**	**Muskingum K:**					**1.345**
#1	2	8. Large gullies, diversions, and low flowing streams	2.11	282.00	13,337.00	4.360	0.849
#1	**2**	**Muskingum K:**					**0.849**
#1	3	8. Large gullies, diversions, and low flowing streams	2.02	384.00	19,036.00	4.260	1.241
#1	**3**	**Muskingum K:**					**1.241**
#1	4	8. Large gullies, diversions, and low flowing streams	2.28	364.00	15,948.82	4.530	0.977
#1	**4**	**Muskingum K:**					**0.977**
#1	5	8. Large gullies, diversions, and low flowing streams	2.33	428.00	18,360.00	4.580	1.113
#1	**5**	**Muskingum K:**					**1.113**
#1	6	8. Large gullies, diversions, and low flowing streams	1.82	158.00	8,675.00	4.040	0.596
#1	**6**	**Muskingum K:**					**0.596**
#1	7	8. Large gullies, diversions, and low flowing streams	1.89	149.00	7,868.00	4.120	0.530
#1	**7**	**Muskingum K:**					**0.530**
#2	1	8. Large gullies, diversions, and low flowing streams	1.44	228.00	15,800.00	3.600	1.219
#2	**1**	**Muskingum K:**					**1.219**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#2	2	8. Large gullies, diversions, and low flowing streams	1.19	202.00	16,912.00	3.270	1.436
#2	**2**	**Muskingum K:**					**1.436**
#2	3	8. Large gullies, diversions, and low flowing streams	1.10	160.00	14,568.00	3.140	1.288
#2	**3**	**Muskingum K:**					**1.288**
#2	4	8. Large gullies, diversions, and low flowing streams	1.09	104.00	9,576.00	3.120	0.852
#2	**4**	**Muskingum K:**					**0.852**
#2	5	8. Large gullies, diversions, and low flowing streams	0.93	44.00	4,715.00	2.890	0.453
#2	**5**	**Muskingum K:**					**0.453**
#3	1	8. Large gullies, diversions, and low flowing streams	1.75	294.00	16,845.00	3.960	1.181
#3	**1**	**Muskingum K:**					**1.181**
#3	2	8. Large gullies, diversions, and low flowing streams	1.79	154.00	8,609.00	4.010	0.596
#3	**2**	**Muskingum K:**					**0.596**
#3	3	8. Large gullies, diversions, and low flowing streams	1.93	92.00	4,778.00	4.160	0.319
#3	**3**	**Muskingum K:**					**0.319**
#4	1	8. Large gullies, diversions, and low flowing streams	1.01	186.00	18,477.00	3.000	1.710
#4	**1**	**Muskingum K:**					**1.710**
#4	2	8. Large gullies, diversions, and low flowing streams	0.98	150.00	15,281.00	2.970	1.429
#4	**2**	**Muskingum K:**					**1.429**
#4	3	8. Large gullies, diversions, and low flowing streams	0.98	104.00	10,645.00	2.960	0.998
#4	**3**	**Muskingum K:**					**0.998**
#5	1	8. Large gullies, diversions, and low flowing streams	0.64	195.00	30,309.00	2.400	3.507
#5	**1**	**Muskingum K:**					**3.507**
#5	2	8. Large gullies, diversions, and low flowing streams	0.60	113.00	18,717.00	2.330	2.231
#5	**2**	**Muskingum K:**					**2.231**
#5	3	8. Large gullies, diversions, and low flowing streams	0.63	85.00	13,541.00	2.370	1.587
#5	**3**	**Muskingum K:**					**1.587**
#5	4	8. Large gullies, diversions, and low flowing streams	0.63	67.00	10,710.00	2.370	1.255
#5	**4**	**Muskingum K:**					**1.255**
#5	5	8. Large gullies, diversions, and low flowing streams	0.59	53.00	8,978.00	2.300	1.084
#5	**5**	**Muskingum K:**					**1.084**
#5	6	8. Large gullies, diversions, and low flowing streams	0.74	41.00	5,528.00	2.580	0.595
#5	**6**	**Muskingum K:**					**0.595**
#6	1	8. Large gullies, diversions, and low flowing streams	0.94	186.00	19,797.00	2.900	1.896

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#6	**1**	**Muskingum K:**					**1.896**
#6	2	8. Large gullies, diversions, and low flowing streams	0.58	8.00	1,372.00	2.290	0.166
#6	**2**	**Muskingum K:**					**0.166**
#7	1	8. Large gullies, diversions, and low flowing streams	0.57	31.00	5,417.00	2.260	0.665
#7	**1**	**Muskingum K:**					**0.665**
#8	1	8. Large gullies, diversions, and low flowing streams	0.53	120.00	22,753.13	2.170	2.912
#8	**1**	**Muskingum K:**					**2.912**
#8	2	8. Large gullies, diversions, and low flowing streams	0.51	106.00	20,587.00	2.150	2.659
#8	**2**	**Muskingum K:**					**2.659**
#8	3	8. Large gullies, diversions, and low flowing streams	0.53	95.00	18,060.00	2.170	2.311
#8	**3**	**Muskingum K:**					**2.311**
#8	4	8. Large gullies, diversions, and low flowing streams	0.50	88.00	17,689.00	2.110	2.328
#8	**4**	**Muskingum K:**					**2.328**
#8	5	8. Large gullies, diversions, and low flowing streams	0.50	54.00	10,815.00	2.110	1.423
#8	**5**	**Muskingum K:**					**1.423**
#8	6	8. Large gullies, diversions, and low flowing streams	0.57	54.00	9,503.00	2.260	1.168
#8	**6**	**Muskingum K:**					**1.168**
#8	7	8. Large gullies, diversions, and low flowing streams	0.51	37.00	7,229.00	2.140	0.938
#8	**7**	**Muskingum K:**					**0.938**
#8	8	8. Large gullies, diversions, and low flowing streams	0.98	50.00	5,079.00	2.970	0.475
		8. Large gullies, diversions, and low flowing streams	0.97	24.00	2,468.00	2.950	0.232
#8	**8**	**Muskingum K:**					**0.707**
#8	9	8. Large gullies, diversions, and low flowing streams	0.93	29.00	3,107.00	2.890	0.298
		8. Large gullies, diversions, and low flowing streams	0.98	74.00	7,547.17	2.970	0.705
#8	**9**	**Muskingum K:**					**1.003**
#8	10	8. Large gullies, diversions, and low flowing streams	1.71	50.00	2,916.00	3.920	0.206
		8. Large gullies, diversions, and low flowing streams	1.09	26.00	2,379.00	3.130	0.211
#8	**10**	**Muskingum K:**					**0.417**
#8	11	8. Large gullies, diversions, and low flowing streams	0.97	24.00	2,468.00	2.950	0.232
#8	**11**	**Muskingum K:**					**0.232**
#8	12	9. Small streams flowing bankfull	0.98	39.00	3,979.00	8.900	0.124
		8. Large gullies, diversions, and low flowing streams	0.97	24.00	2,468.00	2.950	0.232
#8	**12**	**Muskingum K:**					**0.356**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#8	13	8. Large gullies, diversions, and low flowing streams	0.97	24.00	2,468.00	2.950	0.232
#8	**13**	**Muskingum K:**					**0.232**
#8	14	8. Large gullies, diversions, and low flowing streams	1.09	26.00	2,379.00	3.130	0.211
		8. Large gullies, diversions, and low flowing streams	0.97	24.00	2,468.00	2.950	0.232
#8	**14**	**Muskingum K:**					**0.443**
#8	15	8. Large gullies, diversions, and low flowing streams	0.97	24.00	2,468.00	2.950	0.232
#8	**15**	**Muskingum K:**					**0.232**
#8	16	8. Large gullies, diversions, and low flowing streams	0.71	20.00	2,800.00	2.530	0.307
		9. Small streams flowing bankfull	0.97	24.00	2,468.00	8.870	0.077
#8	**16**	**Muskingum K:**					**0.384**
#8	17	8. Large gullies, diversions, and low flowing streams	0.84	31.00	3,697.00	2.740	0.374
		8. Large gullies, diversions, and low flowing streams	1.00	14.00	1,400.00	3.000	0.129
#8	**17**	**Muskingum K:**					**0.503**
#8	18	8. Large gullies, diversions, and low flowing streams	0.88	45.00	5,097.00	2.810	0.503
#8	**18**	**Muskingum K:**					**0.503**
#8	19	8. Large gullies, diversions, and low flowing streams	1.00	14.00	1,400.00	3.000	0.129
#8	**19**	**Muskingum K:**					**0.129**
#9	2	8. Large gullies, diversions, and low flowing streams	0.36	51.00	14,207.00	1.790	2.204
#9	**2**	**Muskingum K:**					**2.204**
#9	3	8. Large gullies, diversions, and low flowing streams	0.36	43.00	12,015.00	1.790	1.864
#9	**3**	**Muskingum K:**					**1.864**
#9	4	8. Large gullies, diversions, and low flowing streams	0.35	22.00	6,269.00	1.770	0.983
#9	**4**	**Muskingum K:**					**0.983**
#10	2	8. Large gullies, diversions, and low flowing streams	1.88	15.00	800.00	4.100	0.054
#10	**2**	**Muskingum K:**					**0.054**
#10	3	8. Large gullies, diversions, and low flowing streams	2.11	40.00	1,897.00	4.350	0.121
#10	**3**	**Muskingum K:**					**0.121**

General Information

Storm Information:

Storm Type:	Type II-70
Design Storm:	2 yr - 6 hr
Rainfall Depth:	0.850 inches

Particle Size Distribution:

Size (mm)	P1	P2	P3	P4	P5	P6	P7
0.4250	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%
0.2500	85.529%	83.954%	83.494%	79.684%	74.336%	71.800%	68.824%
0.1500	72.267%	70.070%	68.714%	64.718%	55.514%	53.158%	47.671%
0.0750	58.134%	56.187%	54.477%	51.673%	42.977%	40.816%	35.579%
0.0159	49.962%	48.376%	46.844%	44.689%	37.721%	35.600%	31.445%
0.0100	38.953%	37.808%	36.471%	35.083%	30.403%	28.065%	25.380%
0.0050	9.675%	9.683%	9.177%	10.018%	9.205%	9.529%	8.929%
0.0020	6.279%	6.204%	5.875%	6.237%	5.303%	5.591%	4.938%
0.0010	6.010%	5.917%	5.567%	5.908%	4.905%	5.155%	4.462%
0.0004	4.942%	4.914%	4.659%	5.035%	4.387%	4.686%	4.216%

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc. (ml/l)	24VW (ml/l)
#10	282.000	282.000	27.73	1.93	37.4	26,030	11.59	7.84
#3	3,941.300	3,941.300	53.32	14.24	238.2	21,665	2.61	1.85
#4	3,216.300	7,157.600	99.02	36.99	663.3	33,219	3.57	1.76
#1	8,452.701	8,452.701	154.36	53.41	773.0	30,189	4.06	1.78
#2	3,838.600	12,291.300	330.91	115.14	1,855.6	32,273	4.04	1.85
#5	5,441.700	24,890.600	409.05	242.96	2,902.5	19,800	1.67	0.93
#6	3,064.700	27,955.300	404.64	286.07	2,727.8	16,910	0.94	0.49
#7	2,633.600	30,588.900	401.25	293.48	2,702.7	18,832	0.97	0.44
#8	5,652.000	36,240.900	394.42	351.51	2,642.7	19,749	1.62	0.57
#9	2,037.000	38,559.900	389.95	372.10	2,846.7	26,333	1.93	0.52

Particle Size Distribution(s) at Each Structure

Structure #10:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	86.484%
0.0750	65.028%
0.0159	57.169%
0.0100	45.605%
0.0050	16.304%
0.0020	9.216%
0.0010	8.380%
0.0004	7.842%

Structure #3:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	99.434%
0.0159	97.289%
0.0100	89.488%
0.0050	34.895%
0.0020	19.351%
0.0010	17.524%
0.0004	16.566%

Structure #4:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	100.000%
0.0159	100.000%

Size (mm)	In/Out
0.0100	90.845%
0.0050	36.743%
0.0020	20.918%
0.0010	19.114%
0.0004	17.696%

Structure #1:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	100.000%
0.0159	100.000%
0.0100	87.311%
0.0050	30.156%
0.0020	17.991%
0.0010	16.700%
0.0004	14.883%

Structure #2:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	100.000%
0.0159	97.896%
0.0100	89.396%
0.0050	29.269%
0.0020	17.934%
0.0010	16.846%
0.0004	14.587%

Structure #5:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	100.000%
0.0159	98.566%
0.0100	95.258%

Size (mm)	In/Out
0.0050	36.396%
0.0020	22.093%
0.0010	20.673%
0.0004	18.074%

Structure #6 (EAST LEASE BNDY):

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	100.000%
0.0159	100.000%
0.0100	99.219%
0.0050	42.188%
0.0020	25.697%
0.0010	24.070%
0.0004	20.991%

Structure #7:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	100.000%
0.0159	100.000%
0.0100	99.778%
0.0050	43.142%
0.0020	26.257%
0.0010	24.591%
0.0004	21.454%

Structure #8 (WEST LEASE BNDY):

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	98.268%
0.0159	96.876%
0.0100	94.109%
0.0050	48.801%

Size (mm)	In/Out
0.0020	29.612%
0.0010	27.689%
0.0004	24.244%

Structure #9:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	99.596%
0.0159	98.024%
0.0100	95.404%
0.0050	48.634%
0.0020	29.430%
0.0010	27.493%
0.0004	24.129%

Structure Detail:

Structure #10 (Null)

Structure #3 (Null)

Structure #4 (Null)

Structure #1 (Null)

Structure #2 (Null)

Structure #5 (Null)

Structure #6 (Null)

EAST LEASE BNDY

Structure #7 (Null)

Structure #8 (Null)

WEST LEASE BNDY

Structure #9 (Null)

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#10	1	58.000	0.152	0.000	0.000	83.300	M	8.86	0.397
	2	90.000	0.305	0.054	0.353	83.300	M	9.91	0.616
	3	134.000	0.290	0.121	0.360	83.300	M	15.23	0.918
	Σ	**282.000**						**27.73**	**1.931**
#3	1	790.200	1.145	1.181	0.350	80.800	M	19.09	3.362
	2	1,064.500	0.915	0.596	0.351	80.800	M	30.68	4.529
	3	428.300	0.571	0.319	0.355	81.300	M	19.94	2.018
	4	742.900	0.625	0.000	0.000	78.500	M	15.07	1.859
	5	915.400	1.119	0.000	0.000	78.800	M	13.10	2.472
	Σ	**3,941.300**						**53.32**	**14.240**
#4	1	539.800	0.726	1.710	0.319	81.700	M	22.91	2.752
	2	443.800	0.503	1.429	0.318	86.000	M	56.01	4.726
	3	890.000	0.815	0.998	0.318	82.100	M	37.70	4.899
	4	1,342.700	0.919	0.000	0.000	84.000	M	75.51	10.370
	Σ	**7,157.600**						**99.02**	**36.986**
#1	1	1,249.000	1.349	1.345	0.354	80.800	M	26.47	5.314
	2	1,652.000	1.465	0.849	0.360	80.300	M	28.99	6.320
	3	1,407.200	1.573	1.241	0.357	81.100	M	28.30	6.367
	4	839.600	1.102	0.977	0.364	81.000	M	21.93	3.722
	5	687.100	1.067	1.113	0.365	81.600	M	21.13	3.435
	6	1,223.200	0.778	0.596	0.352	81.800	M	50.32	6.358
	7	740.100	0.745	0.530	0.354	83.600	M	45.39	5.339
	8	654.500	0.801	0.000	0.000	92.200	M	144.42	16.557
	Σ	**8,452.701**						**154.36**	**53.413**
#2	1	610.100	0.668	1.219	0.340	85.700	M	59.37	6.202
	2	537.100	0.610	1.436	0.329	91.600	M	133.06	12.559
	3	455.000	0.546	1.288	0.324	82.000	M	25.57	2.457
	4	619.100	0.634	0.852	0.324	87.900	M	88.84	8.732
	5	664.000	0.452	0.453	0.315	91.200	M	189.97	14.727
	6	953.300	0.984	0.000	0.000	89.600	M	125.57	17.051
	Σ	**12,291.300**						**330.91**	**115.142**
#5	1	758.800	0.682	3.507	0.293	84.100	M	54.69	5.960
	2	946.400	1.117	2.231	0.289	89.200	M	106.38	16.023
	3	1,015.600	0.996	1.587	0.291	92.000	M	184.77	25.028
	4	688.700	1.908	1.255	0.291	80.800	M	11.06	2.930
	5	754.300	2.307	1.084	0.287	86.200	M	29.27	8.281
	6	623.600	0.538	0.595	0.301	93.000	M	202.72	17.508

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
	7	654.300	0.560	0.000	0.000	91.500	M	169.62	15.099
	Σ	**24,890.600**						**409.05**	**242.957**
#6	1	886.000	1.151	1.896	0.315	81.100	M	22.88	4.009
	2	1,011.200	1.871	0.166	0.287	83.500	M	29.16	7.170
	3	1,167.500	1.126	0.000	0.000	92.800	M	214.91	31.938
	Σ	**27,955.300**						**404.64**	**286.074**
#7	1	971.600	0.819	0.665	0.285	82.900	M	48.38	6.197
	2	1,467.100	2.587	0.000	0.000	75.000	M	2.85	1.169
	3	194.900	0.596	0.000	0.000	72.600	M	0.13	0.038
	Σ	**30,588.900**						**401.25**	**293.478**
#8	1	392.000	0.538	2.912	0.280	93.000	M	127.43	11.006
	2	565.000	0.734	2.659	0.279	92.400	M	136.68	14.672
	3	684.000	0.853	2.311	0.280	87.600	M	74.88	9.240
	4	716.000	1.690	2.328	0.277	76.200	M	2.99	0.905
	5	400.000	0.740	1.423	0.277	79.500	M	9.66	1.279
	6	313.000	0.436	1.168	0.285	85.600	M	40.90	3.133
	7	197.000	0.448	0.938	0.279	83.800	M	18.36	1.471
	8	112.000	0.412	0.707	0.318	83.300	M	10.06	0.767
	9	197.000	0.396	1.003	0.317	83.300	M	18.20	1.349
	10	221.000	0.388	0.417	0.339	83.300	M	20.71	1.513
	11	102.000	0.283	0.232	0.317	83.300	M	11.77	0.698
	12	64.000	0.259	0.356	0.398	83.300	M	7.80	0.438
	13	130.000	0.524	0.232	0.317	83.300	M	9.81	0.890
	14	90.000	0.301	0.443	0.321	83.300	M	9.99	0.616
	15	235.000	0.636	0.232	0.317	83.300	M	15.33	1.609
	16	229.000	0.596	0.384	0.382	83.300	M	15.68	1.568
	17	275.000	0.552	0.503	0.312	83.300	M	19.95	1.883
	18	359.000	0.666	0.503	0.312	83.300	M	22.63	2.458
	19	166.000	0.519	0.129	0.319	83.300	M	12.61	1.137
	20	128.000	0.585	0.000	0.000	83.300	M	8.89	0.876
	21	77.000	0.650	0.000	0.000	83.300	M	4.94	0.527
	Σ	**36,240.900**						**394.42**	**351.514**
#9	1	0.000	0.000	0.000	0.000	1.000	M	0.00	0.000
	2	432.000	0.633	2.204	0.256	84.900	M	38.13	3.870
	3	177.000	0.686	1.864	0.256	84.900	M	14.70	1.586
	4	565.000	0.655	0.983	0.255	85.800	M	56.75	5.834
	5	863.000	0.668	0.000	0.000	84.600	M	69.30	7.363
	Σ	**38,559.900**						**389.95**	**372.098**

Subwatershed Sedimentology Detail:

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
#10	1	0.198	209.00	5.00	0.2430	1.0000	17	8.3	30,350	14.87	9.13
	2	0.198	209.00	5.00	0.2430	1.0000	17	11.2	26,099	11.20	7.14
	3	0.198	209.00	5.00	0.2430	1.0000	17	17.9	27,875	12.14	7.74
	Σ							**37.4**	**26,030**	**11.59**	**7.84**
#3	1	0.150	100.00	9.10	0.3050	1.0000	18	52.9	19,967	2.38	1.72
	2	0.181	100.00	10.10	0.3050	1.0000	13	118.7	33,740	7.21	5.12
	3	0.151	200.00	5.50	0.3050	1.0000	18	33.1	22,318	6.72	4.53
	4	0.183	130.00	7.60	0.3160	1.0000	12	37.3	27,396	5.82	3.91
	5	0.185	100.00	8.30	0.2760	1.0000	6	34.8	18,046	1.01	0.72
	Σ							**238.2**	**21,665**	**2.61**	**1.85**
#4	1	0.173	130.00	7.00	0.2850	1.0000	7	46.3	21,798	5.61	3.97
	2	0.148	100.00	12.00	0.2220	1.0000	5	128.9	35,591	11.48	8.02
	3	0.185	75.00	13.60	0.2740	1.0000	17	161.4	42,361	9.86	6.98
	4	0.213	100.00	10.60	0.2330	1.0000	6	301.2	37,919	7.35	5.14
	Σ							**663.3**	**33,219**	**3.57**	**1.76**
#1	1	0.220	280.00	2.20	0.2960	1.0000	13	36.5	8,683	0.93	0.68
	2	0.202	240.00	3.30	0.2960	1.0000	13	53.7	10,679	0.78	0.57
	3	0.206	280.00	2.60	0.2960	1.0000	13	45.7	9,006	0.67	0.49
	4	0.188	200.00	5.10	0.2960	1.0000	13	55.4	18,982	3.23	2.32
	5	0.124	240.00	3.60	0.3130	1.0000	18	22.5	8,414	1.35	0.97
	6	0.178	130.00	7.90	0.2850	1.0000	7	132.8	27,364	6.68	4.66
	7	0.191	100.00	9.20	0.2540	1.0000	6	120.1	29,544	7.02	4.89
	8	0.199	75.00	15.10	0.1510	1.0000	2	458.1	35,717	7.36	5.20
	Σ							**773.0**	**30,189**	**4.06**	**1.78**
#2	1	0.188	130.00	7.30	0.2120	1.0000	5	104.7	22,050	5.75	4.03
	2	0.199	75.00	12.60	0.1510	1.0000	2	297.2	30,342	7.80	5.56
	3	0.200	100.00	8.60	0.2020	1.0000	11	42.3	22,810	3.56	2.46
	4	0.193	75.00	12.30	0.1730	1.0000	4	208.1	31,115	7.25	5.08
	5	0.187	75.00	14.00	0.1590	1.0000	3	450.0	40,005	12.97	9.02
	6	0.198	75.00	13.70	0.1680	1.0000	4	421.6	31,932	4.74	3.35
	Σ							**1,855.6**	**32,273**	**4.04**	**1.85**
#5	1	0.213	130.00	6.30	0.2330	1.0000	6	105.7	22,424	5.99	4.34
	2	0.209	130.00	7.10	0.1680	1.0000	4	211.7	16,677	1.81	1.32
	3	0.191	100.00	8.40	0.1500	1.0000	2	320.7	16,240	2.30	1.67
	4	0.235	200.00	4.90	0.2870	1.0000	9	38.5	16,281	0.77	0.57
	5	0.220	240.00	3.70	0.1900	1.0000	16	48.8	7,379	0.40	0.30
	6	0.200	130.00	7.30	0.1410	1.0000	1	263.4	19,552	5.62	3.96
	7	0.204	200.00	4.70	0.1560	1.0000	2	201.9	17,706	4.83	3.35

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
	Σ							**2,902.5**	**19,800**	**1.67**	**0.93**
#6	1	0.228	280.00	2.70	0.2870	1.0000	9	34.8	10,963	1.85	1.34
	2	0.226	280.00	2.40	0.2330	1.0000	6	39.9	7,033	0.39	0.28
	3	0.200	200.00	4.20	0.1460	1.0000	1	289.5	11,653	1.27	0.91
	Σ							**2,727.8**	**16,910**	**0.94**	**0.49**
#7	1	0.197	280.00	2.70	0.2330	1.0000	5	47.3	9,977	1.52	1.07
	2	0.204	420.00	1.80	0.3270	1.0000	19	4.4	4,393	0.12	0.09
	3	0.171	280.00	2.40	0.3380	1.0000	10	0.1	3,042	1.47	1.32
	Σ							**2,702.7**	**18,832**	**0.97**	**0.44**
#8	1	0.200	280.00	2.70	0.1410	1.0000	1	69.0	7,873	2.26	1.66
	2	0.204	280.00	2.30	0.1550	1.0000	3	81.8	7,051	1.76	1.28
	3	0.173	280.00	3.00	0.2220	1.0000	6	69.6	9,604	2.65	1.92
	4	0.204	280.00	3.00	0.3180	1.0000	19	5.3	6,968	0.23	0.18
	5	0.187	200.00	5.90	0.2960	1.0000	12	22.0	22,133	4.47	3.18
	6	0.167	200.00	4.20	0.2740	1.0000	8	48.8	20,530	8.86	6.15
	7	0.215	100.00	9.40	0.2650	1.0000	20	42.6	38,368	15.89	10.94
	8	0.201	100.00	8.10	0.2960	1.0000	13	17.5	30,794	12.75	8.60
	9	0.208	280.00	2.70	0.2120	1.0000	15	11.2	11,222	3.49	2.37
	10	0.225	200.00	4.50	0.2540	1.0000	14	29.6	27,000	11.08	7.33
	11	0.198	100.00	9.20	0.2450	1.0000	6	18.1	36,430	14.84	9.57
	12	0.198	209.00	5.00	0.2430	1.0000	17	8.1	26,371	11.84	7.57
	13	0.198	209.00	5.00	0.2430	1.0000	17	13.7	21,025	7.27	4.89
	14	0.198	209.00	5.00	0.2430	1.0000	17	11.3	25,508	10.99	7.21
	15	0.198	209.00	5.00	0.2430	1.0000	17	24.6	20,510	6.35	4.33
	16	0.198	209.00	5.00	0.2430	1.0000	17	24.5	21,089	6.79	4.61
	17	0.198	209.00	5.00	0.2430	1.0000	17	31.1	22,207	7.47	5.09
	18	0.198	209.00	5.00	0.2430	1.0000	17	38.8	20,918	6.28	4.34
	19	0.198	209.00	5.00	0.2430	1.0000	17	18.1	21,868	7.60	5.08
	20	0.198	209.00	5.00	0.2430	1.0000	17	12.9	20,058	6.53	4.39
	21	0.198	209.00	5.00	0.2430	1.0000	17	7.0	17,927	5.47	3.71
	Σ							**2,642.7**	**19,749**	**1.62**	**0.57**
#9	1	0.206	130.00	7.80	0.1800	1.0000	16	0.0	1	0.00	0.00
	2	0.189	100.00	11.10	0.2450	1.0000	6	117.8	38,662	11.49	8.24
	3	0.177	100.00	8.30	0.2330	1.0000	6	23.4	18,952	5.31	3.79
	4	0.161	100.00	10.00	0.2220	1.0000	5	119.3	26,555	7.09	4.99
	5	0.175	200.00	5.90	0.2450	1.0000	6	136.7	24,930	7.00	4.77
	Σ							**2,846.7**	**26,333**	**1.93**	**0.52**

Subwatershed Time of Concentration Details:

General Information

Storm Information:

Storm Type:	Type II-70
Design Storm:	25 yr - 6 hr
Rainfall Depth:	1.560 inches

Particle Size Distribution:

Size (mm)	P1	P2	P3	P4	P5	P6	P7
0.4250	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%
0.2500	85.529%	83.954%	83.494%	79.684%	74.336%	71.800%	68.824%
0.1500	72.267%	70.070%	68.714%	64.718%	55.514%	53.158%	47.671%
0.0750	58.134%	56.187%	54.477%	51.673%	42.977%	40.816%	35.579%
0.0159	49.962%	48.376%	46.844%	44.689%	37.721%	35.600%	31.445%
0.0100	38.953%	37.808%	36.471%	35.083%	30.403%	28.065%	25.380%
0.0050	9.675%	9.683%	9.177%	10.018%	9.205%	9.529%	8.929%
0.0020	6.279%	6.204%	5.875%	6.237%	5.303%	5.591%	4.938%
0.0010	6.010%	5.917%	5.567%	5.908%	4.905%	5.155%	4.462%
0.0004	4.942%	4.914%	4.659%	5.035%	4.387%	4.686%	4.216%

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc. (ml/l)	24VW (ml/l)
#10	282.000	282.000	149.29	9.98	232.0	29,798	14.79	10.48
#3	3,941.300	3,941.300	458.57	103.62	2,399.8	28,722	7.29	5.38
#4	3,216.300	7,157.600	632.72	218.70	4,990.2	42,505	8.02	3.93
#1	8,452.701	8,452.701	983.41	278.20	4,703.0	35,972	8.79	3.78
#2	3,838.600	12,291.300	1,143.25	488.58	7,798.3	34,442	4.87	2.07
#5	5,441.700	24,890.600	1,721.59	1,008.26	16,950.7	29,388	4.90	2.57
#6	3,064.700	27,955.300	1,706.42	1,158.51	15,928.2	25,289	2.12	1.06
#7	2,633.600	30,588.900	1,697.60	1,217.10	15,693.9	25,589	1.62	0.75
#8	5,652.000	36,240.900	1,669.88	1,450.97	15,566.0	25,161	2.75	1.08
#9	2,037.000	38,559.900	1,648.67	1,544.38	16,470.1	31,817	2.98	0.92

Particle Size Distribution(s) at Each Structure

Structure #10:

Size (mm)	In/Out
0.4250	100.000%
0.2500	98.751%
0.1500	73.813%
0.0750	55.500%
0.0159	48.793%
0.0100	38.923%
0.0050	13.915%
0.0020	7.865%
0.0010	7.152%
0.0004	6.693%

Structure #3:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	99.660%
0.0750	92.158%
0.0159	86.120%
0.0100	71.316%
0.0050	26.224%
0.0020	14.581%
0.0010	13.224%
0.0004	12.473%

Structure #4:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	98.017%
0.0159	92.218%

Size (mm)	In/Out
0.0100	79.836%
0.0050	29.412%
0.0020	16.689%
0.0010	15.234%
0.0004	14.146%

Structure #1:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	97.305%
0.0159	90.013%
0.0100	73.015%
0.0050	24.606%
0.0020	14.375%
0.0010	13.229%
0.0004	12.053%

Structure #2:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	99.662%
0.0159	96.546%
0.0100	86.977%
0.0050	28.696%
0.0020	17.288%
0.0010	16.139%
0.0004	14.208%

Structure #5:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	98.906%
0.0159	95.779%
0.0100	83.071%

Size (mm)	In/Out
0.0050	27.544%
0.0020	16.418%
0.0010	15.259%
0.0004	13.579%

Structure #6 (EAST LEASE BNDY):

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	100.000%
0.0159	100.000%
0.0100	95.811%
0.0050	31.515%
0.0020	18.845%
0.0010	17.530%
0.0004	15.569%

Structure #7:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	100.000%
0.0159	99.724%
0.0100	99.372%
0.0050	32.953%
0.0020	19.671%
0.0010	18.296%
0.0004	16.263%

Structure #8 (WEST LEASE BNDY):

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	99.297%
0.0750	95.997%
0.0159	94.524%
0.0100	91.785%
0.0050	37.172%

Size (mm)	In/Out
0.0020	22.125%
0.0010	20.551%
0.0004	18.329%

Structure #9:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	99.777%
0.0750	97.615%
0.0159	96.152%
0.0100	94.056%
0.0050	37.799%
0.0020	22.464%
0.0010	20.855%
0.0004	18.622%

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#10	1	58.000	0.152	0.000	0.000	83.300	M	42.26	2.052
	2	90.000	0.305	0.054	0.353	83.300	M	51.01	3.185
	3	134.000	0.290	0.121	0.360	83.300	M	77.78	4.741
	Σ	**282.000**						**149.29**	**9.978**
#3	1	790.200	1.145	1.181	0.350	80.800	M	144.92	22.388
	2	1,064.500	0.915	0.596	0.351	80.800	M	233.31	30.160
	3	428.300	0.571	0.319	0.355	81.300	M	140.09	12.701
	4	742.900	0.625	0.000	0.000	78.500	M	172.65	16.910
	5	915.400	1.119	0.000	0.000	78.800	M	139.71	21.460
	Σ	**3,941.300**						**458.57**	**103.619**
#4	1	539.800	0.726	1.710	0.319	81.700	M	153.83	16.595
	2	443.800	0.503	1.429	0.318	86.000	M	237.77	19.688
	3	890.000	0.815	0.998	0.318	82.100	M	241.23	28.355
	4	1,342.700	0.919	0.000	0.000	84.000	M	393.96	50.440
	Σ	**7,157.600**						**632.72**	**218.698**
#1	1	1,249.000	1.349	1.345	0.354	80.800	M	200.36	35.387
	2	1,652.000	1.465	0.849	0.360	80.300	M	235.63	44.688
	3	1,407.200	1.573	1.241	0.357	81.100	M	204.62	40.979
	4	839.600	1.102	0.977	0.364	81.000	M	161.93	24.228
	5	687.100	1.067	1.113	0.365	81.600	M	144.03	20.935
	6	1,223.200	0.778	0.596	0.352	81.800	M	333.99	37.943
	7	740.100	0.745	0.530	0.354	83.600	M	245.71	26.871
	8	654.500	0.801	0.000	0.000	92.200	M	415.85	47.167
	Σ	**8,452.701**						**983.41**	**278.197**
#2	1	610.100	0.668	1.219	0.340	85.700	M	262.46	26.410
	2	537.100	0.610	1.436	0.329	91.600	M	393.62	36.980
	3	455.000	0.546	1.288	0.324	82.000	M	163.69	14.368
	4	619.100	0.634	0.852	0.324	87.900	M	331.72	31.995
	5	664.000	0.452	0.453	0.315	91.200	M	566.08	44.342
	6	953.300	0.984	0.000	0.000	89.600	M	423.81	56.286
	Σ	**12,291.300**						**1,143.25**	**488.578**
#5	1	758.800	0.682	3.507	0.293	84.100	M	280.68	28.748
	2	946.400	1.117	2.231	0.289	89.200	M	368.97	54.168
	3	1,015.600	0.996	1.587	0.291	92.000	M	540.44	72.086
	4	688.700	1.908	1.255	0.291	80.800	M	82.73	19.512
	5	754.300	2.307	1.084	0.287	86.200	M	125.58	34.013
	6	623.600	0.538	0.595	0.301	93.000	M	547.07	47.747

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
	7	654.300	0.560	0.000	0.000	91.500	M	502.79	44.707
	Σ	**24,890.600**						**1,721.59**	**1,008.256**
#6	1	886.000	1.151	1.896	0.315	81.100	M	166.59	25.801
	2	1,011.200	1.871	0.166	0.287	83.500	M	159.01	36.400
	3	1,167.500	1.126	0.000	0.000	92.800	M	600.96	88.050
	Σ	**27,955.300**						**1,706.42**	**1,158.507**
#7	1	971.600	0.819	0.665	0.285	82.900	M	282.27	33.208
	2	1,467.100	2.587	0.000	0.000	75.000	M	72.88	23.084
	3	194.900	0.596	0.000	0.000	72.600	M	22.86	2.299
	Σ	**30,588.900**						**1,697.60**	**1,217.099**
#8	1	392.000	0.538	2.912	0.280	93.000	M	343.89	30.014
	2	565.000	0.734	2.659	0.279	92.400	M	387.79	41.339
	3	684.000	0.853	2.311	0.280	87.600	M	288.18	34.518
	4	716.000	1.690	2.328	0.277	76.200	M	58.45	12.861
	5	400.000	0.740	1.423	0.277	79.500	M	90.77	10.034
	6	313.000	0.436	1.168	0.285	85.600	M	177.32	13.438
	7	197.000	0.448	0.938	0.279	83.800	M	94.25	7.276
	8	112.000	0.412	0.707	0.318	83.300	M	54.08	3.963
	9	197.000	0.396	1.003	0.317	83.300	M	97.34	6.971
	10	221.000	0.388	0.417	0.339	83.300	M	110.46	7.820
	11	102.000	0.283	0.232	0.317	83.300	M	59.88	3.609
	12	64.000	0.259	0.356	0.398	83.300	M	39.06	2.265
	13	130.000	0.524	0.232	0.317	83.300	M	53.93	4.600
	14	90.000	0.301	0.443	0.321	83.300	M	51.33	3.185
	15	235.000	0.636	0.232	0.317	83.300	M	85.26	8.315
	16	229.000	0.596	0.384	0.382	83.300	M	87.00	8.103
	17	275.000	0.552	0.503	0.312	83.300	M	110.14	9.730
	18	359.000	0.666	0.503	0.312	83.300	M	126.02	12.703
	19	166.000	0.519	0.129	0.319	83.300	M	69.31	5.874
	20	128.000	0.585	0.000	0.000	83.300	M	49.26	4.529
	21	77.000	0.650	0.000	0.000	83.300	M	27.51	2.725
	Σ	**36,240.900**						**1,669.88**	**1,450.968**
#9	1	0.000	0.000	0.000	0.000	1.000	M	0.00	0.000
	2	432.000	0.633	2.204	0.256	84.900	M	180.31	17.504
	3	177.000	0.686	1.864	0.256	84.900	M	69.79	7.172
	4	565.000	0.655	0.983	0.255	85.800	M	248.62	24.659
	5	863.000	0.668	0.000	0.000	84.600	M	338.15	34.102
	Σ	**38,559.900**						**1,648.67**	**1,544.382**

Subwatershed Sedimentology Detail:

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
#10	1	0.198	209.00	5.00	0.2430	1.0000	17	49.7	32,403	17.04	11.40
	2	0.198	209.00	5.00	0.2430	1.0000	17	70.6	29,904	14.52	9.80
	3	0.198	209.00	5.00	0.2430	1.0000	17	111.8	31,858	15.60	10.52
	Σ							**232.0**	**29,798**	**14.79**	**10.48**
#3	1	0.150	100.00	9.10	0.3050	1.0000	18	476.1	27,003	7.40	5.33
	2	0.181	100.00	10.10	0.3050	1.0000	13	1,068.9	45,310	15.79	11.24
	3	0.151	200.00	5.50	0.3050	1.0000	18	276.5	28,831	11.86	8.18
	4	0.183	130.00	7.60	0.3160	1.0000	12	503.2	39,673	14.91	10.21
	5	0.185	100.00	8.30	0.2760	1.0000	6	439.8	26,478	5.42	3.84
	Σ							**2,399.8**	**28,722**	**7.29**	**5.38**
#4	1	0.173	130.00	7.00	0.2850	1.0000	7	367.8	28,357	10.54	7.53
	2	0.148	100.00	12.00	0.2220	1.0000	5	644.3	41,776	16.23	11.56
	3	0.185	75.00	13.60	0.2740	1.0000	17	1,219.6	54,635	19.09	13.63
	4	0.213	100.00	10.60	0.2330	1.0000	6	1,842.1	46,885	14.21	10.06
	Σ							**4,990.2**	**42,505**	**8.02**	**3.93**
#1	1	0.220	280.00	2.20	0.2960	1.0000	13	328.3	11,776	3.13	2.27
	2	0.202	240.00	3.30	0.2960	1.0000	13	519.0	14,740	3.54	2.56
	3	0.206	280.00	2.60	0.2960	1.0000	13	392.3	12,109	2.79	2.03
	4	0.188	200.00	5.10	0.2960	1.0000	13	484.3	25,489	7.99	5.74
	5	0.124	240.00	3.60	0.3130	1.0000	18	181.3	11,099	3.30	2.37
	6	0.178	130.00	7.90	0.2850	1.0000	7	1,042.4	35,483	12.79	9.03
	7	0.191	100.00	9.20	0.2540	1.0000	6	764.2	36,748	12.52	8.84
	8	0.199	75.00	15.10	0.1510	1.0000	2	1,488.7	40,245	10.65	7.61
	Σ							**4,703.0**	**35,972**	**8.79**	**3.78**
#2	1	0.188	130.00	7.30	0.2120	1.0000	5	541.5	26,376	9.02	6.41
	2	0.199	75.00	12.60	0.1510	1.0000	2	998.9	34,168	10.63	7.67
	3	0.200	100.00	8.60	0.2020	1.0000	11	321.5	28,994	8.34	5.89
	4	0.193	75.00	12.30	0.1730	1.0000	4	900.6	36,137	11.06	7.86
	5	0.187	75.00	14.00	0.1590	1.0000	3	1,537.6	44,504	16.40	11.62
	6	0.198	75.00	13.70	0.1680	1.0000	4	1,626.1	36,830	8.43	6.04
	Σ							**7,798.3**	**34,442**	**4.87**	**2.07**
#5	1	0.213	130.00	6.30	0.2330	1.0000	6	637.6	27,723	9.97	7.30
	2	0.209	130.00	7.10	0.1680	1.0000	4	840.4	19,481	3.76	2.75
	3	0.191	100.00	8.40	0.1500	1.0000	2	1,057.7	18,497	3.94	2.87
	4	0.235	200.00	4.90	0.2870	1.0000	9	343.7	22,037	4.01	2.94
	5	0.220	240.00	3.70	0.1900	1.0000	16	243.4	8,985	0.54	0.40
	6	0.200	130.00	7.30	0.1410	1.0000	1	805.3	21,597	7.12	5.09
	7	0.204	200.00	4.70	0.1560	1.0000	2	681.4	19,838	6.43	4.53

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
	Σ							**16,950.7**	**29,388**	**4.90**	**2.57**
#6	1	0.228	280.00	2.70	0.2870	1.0000	9	299.7	14,709	4.57	3.32
	2	0.226	280.00	2.40	0.2330	1.0000	6	256.1	8,936	1.01	0.73
	3	0.200	200.00	4.20	0.1460	1.0000	1	908.5	13,173	2.29	1.65
	Σ							**15,928.2**	**25,289**	**2.12**	**1.06**
#7	1	0.197	280.00	2.70	0.2330	1.0000	5	325.3	12,676	3.55	2.52
	2	0.204	420.00	1.80	0.3270	1.0000	19	142.2	7,747	0.31	0.23
	3	0.171	280.00	2.40	0.3380	1.0000	10	20.2	12,032	3.22	2.16
	Σ							**15,693.9**	**25,589**	**1.62**	**0.75**
#8	1	0.200	280.00	2.70	0.1410	1.0000	1	210.9	8,752	2.88	2.13
	2	0.204	280.00	2.30	0.1550	1.0000	3	261.9	7,956	2.41	1.76
	3	0.173	280.00	3.00	0.2220	1.0000	6	309.8	11,352	3.94	2.86
	4	0.204	280.00	3.00	0.3180	1.0000	19	123.2	11,976	1.34	0.99
	5	0.187	200.00	5.90	0.2960	1.0000	12	244.2	31,166	11.04	7.88
	6	0.167	200.00	4.20	0.2740	1.0000	8	250.8	24,016	11.60	8.24
	7	0.215	100.00	9.40	0.2650	1.0000	20	260.8	46,174	22.03	15.54
	8	0.201	100.00	8.10	0.2960	1.0000	13	112.4	37,044	17.77	12.36
	9	0.208	280.00	2.70	0.2120	1.0000	15	71.8	13,495	5.30	3.71
	10	0.225	200.00	4.50	0.2540	1.0000	14	189.4	32,198	15.27	10.49
	11	0.198	100.00	9.20	0.2450	1.0000	6	112.6	41,616	19.32	13.13
	12	0.198	209.00	5.00	0.2430	1.0000	17	50.2	29,680	14.78	10.04
	13	0.198	209.00	5.00	0.2430	1.0000	17	89.5	25,764	11.01	7.60
	14	0.198	209.00	5.00	0.2430	1.0000	17	70.9	29,507	14.36	9.87
	15	0.198	209.00	5.00	0.2430	1.0000	17	161.2	25,453	10.16	7.09
	16	0.198	209.00	5.00	0.2430	1.0000	17	160.6	26,076	10.66	7.41
	17	0.198	209.00	5.00	0.2430	1.0000	17	203.1	27,383	11.50	8.02
	18	0.198	209.00	5.00	0.2430	1.0000	17	254.3	26,066	10.22	7.18
	19	0.198	209.00	5.00	0.2430	1.0000	17	118.1	26,711	11.45	7.88
	20	0.198	209.00	5.00	0.2430	1.0000	17	84.3	24,668	10.15	7.01
	21	0.198	209.00	5.00	0.2430	1.0000	17	45.8	22,177	8.78	6.10
	Σ							**15,566.0**	**25,161**	**2.75**	**1.08**
#9	1	0.206	130.00	7.80	0.1800	1.0000	16	0.0	1	0.00	0.00
	2	0.189	100.00	11.10	0.2450	1.0000	6	654.4	46,803	17.66	12.82
	3	0.177	100.00	8.30	0.2330	1.0000	6	130.4	23,063	8.40	6.07
	4	0.161	100.00	10.00	0.2220	1.0000	5	611.6	31,711	10.98	7.84
	5	0.175	200.00	5.90	0.2450	1.0000	6	783.8	30,074	11.03	7.70
	Σ							**16,470.1**	**31,817**	**2.98**	**0.92**

Subwatershed Time of Concentration Details:

General Information

Storm Information:

Storm Type:	Type II-70
Design Storm:	100 yr - 6 hr
Rainfall Depth:	2.040 inches

Particle Size Distribution:

Size (mm)	P1	P2	P3	P4	P5	P6	P7
0.4250	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%
0.2500	85.529%	83.954%	83.494%	79.684%	74.336%	71.800%	68.824%
0.1500	72.267%	70.070%	68.714%	64.718%	55.514%	53.158%	47.671%
0.0750	58.134%	56.187%	54.477%	51.673%	42.977%	40.816%	35.579%
0.0159	49.962%	48.376%	46.844%	44.689%	37.721%	35.600%	31.445%
0.0100	38.953%	37.808%	36.471%	35.083%	30.403%	28.065%	25.380%
0.0050	9.675%	9.683%	9.177%	10.018%	9.205%	9.529%	8.929%
0.0020	6.279%	6.204%	5.875%	6.237%	5.303%	5.591%	4.938%
0.0010	6.010%	5.917%	5.567%	5.908%	4.905%	5.155%	4.462%
0.0004	4.942%	4.914%	4.659%	5.035%	4.387%	4.686%	4.216%

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc. (ml/l)	24VW (ml/l)
#10	282.000	282.000	258.22	17.33	425.5	31,083	15.82	11.34
#3	3,941.300	3,941.300	876.33	192.61	4,916.8	31,298	9.33	6.95
#4	3,216.300	7,157.600	1,173.11	391.73	9,742.1	45,859	9.64	4.77
#1	8,452.701	8,452.701	1,791.85	487.86	8,739.2	37,560	10.66	4.65
#2	3,838.600	12,291.300	1,950.43	818.69	13,742.3	36,236	5.59	2.37
#5	5,441.700	24,890.600	2,889.58	1,681.25	31,037.2	32,051	6.34	3.34
#6	3,064.700	27,955.300	2,864.33	1,920.96	29,386.1	27,874	3.35	1.69
#7	2,633.600	30,588.900	2,850.88	2,033.37	28,884.9	27,537	2.63	1.24
#8	5,652.000	36,240.900	2,803.11	2,420.96	28,537.9	25,280	2.92	1.25
#9	2,037.000	38,559.900	2,767.31	2,578.52	30,084.7	33,870	3.33	1.05

Particle Size Distribution(s) at Each Structure

Structure #10:

Size (mm)	In/Out
0.4250	100.000%
0.2500	98.195%
0.1500	70.652%
0.0750	53.124%
0.0159	46.704%
0.0100	37.256%
0.0050	13.319%
0.0020	7.529%
0.0010	6.846%
0.0004	6.407%

Structure #3:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	97.588%
0.0750	88.520%
0.0159	80.436%
0.0100	65.398%
0.0050	24.055%
0.0020	13.381%
0.0010	12.138%
0.0004	11.446%

Structure #4:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	96.026%
0.0159	88.750%

Size (mm)	In/Out
0.0100	77.192%
0.0050	27.210%
0.0020	15.430%
0.0010	14.081%
0.0004	13.083%

Structure #1:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	94.169%
0.0159	85.310%
0.0100	67.643%
0.0050	23.125%
0.0020	13.454%
0.0010	12.359%
0.0004	11.311%

Structure #2:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	99.051%
0.0159	95.477%
0.0100	85.227%
0.0050	27.199%
0.0020	16.315%
0.0010	15.207%
0.0004	13.444%

Structure #5:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	97.049%
0.0159	91.581%
0.0100	78.981%

Size (mm)	In/Out
0.0050	25.570%
0.0020	15.177%
0.0010	14.082%
0.0004	12.585%

Structure #6 (EAST LEASE BNDY):

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	100.000%
0.0159	100.000%
0.0100	89.835%
0.0050	28.956%
0.0020	17.240%
0.0010	16.010%
0.0004	14.281%

Structure #7:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	100.000%
0.0750	99.838%
0.0159	99.593%
0.0100	94.033%
0.0050	30.503%
0.0020	18.125%
0.0010	16.831%
0.0004	15.027%

Structure #8 (WEST LEASE BNDY):

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	98.743%
0.0750	95.399%
0.0159	93.927%
0.0100	91.297%
0.0050	34.635%

Size (mm)	In/Out
0.0020	20.522%
0.0010	19.032%
0.0004	17.048%

Structure #9:

Size (mm)	In/Out
0.4250	100.000%
0.2500	100.000%
0.1500	99.770%
0.0750	97.075%
0.0159	95.712%
0.0100	93.758%
0.0050	35.342%
0.0020	20.916%
0.0010	19.389%
0.0004	17.383%

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#10	1	58.000	0.152	0.000	0.000	83.300	M	70.03	3.563
	2	90.000	0.305	0.054	0.353	83.300	M	87.51	5.529
	3	134.000	0.290	0.121	0.360	83.300	M	133.05	8.233
	Σ	**282.000**						**258.22**	**17.326**
#3	1	790.200	1.145	1.181	0.350	80.800	M	269.35	40.911
	2	1,064.500	0.915	0.596	0.351	80.800	M	432.66	55.113
	3	428.300	0.571	0.319	0.355	81.300	M	254.30	22.963
	4	742.900	0.625	0.000	0.000	78.500	M	337.90	32.581
	5	915.400	1.119	0.000	0.000	78.800	M	273.52	41.047
	Σ	**3,941.300**						**876.33**	**192.614**
#4	1	539.800	0.726	1.710	0.319	81.700	M	278.05	29.753
	2	443.800	0.503	1.429	0.318	86.000	M	392.85	32.523
	3	890.000	0.815	0.998	0.318	82.100	M	432.99	50.421
	4	1,342.700	0.919	0.000	0.000	84.000	M	680.94	86.417
	Σ	**7,157.600**						**1,173.11**	**391.729**
#1	1	1,249.000	1.349	1.345	0.354	80.800	M	372.72	64.665
	2	1,652.000	1.465	0.849	0.360	80.300	M	443.86	82.561
	3	1,407.200	1.573	1.241	0.357	81.100	M	378.04	74.402
	4	839.600	1.102	0.977	0.364	81.000	M	299.40	44.082
	5	687.100	1.067	1.113	0.365	81.600	M	262.47	37.612
	6	1,223.200	0.778	0.596	0.352	81.800	M	603.15	67.887
	7	740.100	0.745	0.530	0.354	83.600	M	427.57	46.388
	8	654.500	0.801	0.000	0.000	92.200	M	618.10	70.263
	Σ	**8,452.701**						**1,791.85**	**487.860**
#2	1	610.100	0.668	1.219	0.340	85.700	M	438.95	43.859
	2	537.100	0.610	1.436	0.329	91.600	M	588.75	55.624
	3	455.000	0.546	1.288	0.324	82.000	M	292.68	25.601
	4	619.100	0.634	0.852	0.324	87.900	M	531.13	51.146
	5	664.000	0.452	0.453	0.315	91.200	M	846.42	67.131
	6	953.300	0.984	0.000	0.000	89.600	M	661.67	87.464
	Σ	**12,291.300**						**1,950.43**	**818.686**
#5	1	758.800	0.682	3.507	0.293	84.100	M	483.65	49.160
	2	946.400	1.117	2.231	0.289	89.200	M	580.71	84.729
	3	1,015.600	0.996	1.587	0.291	92.000	M	808.31	107.732
	4	688.700	1.908	1.255	0.291	80.800	M	153.91	35.656
	5	754.300	2.307	1.084	0.287	86.200	M	208.51	55.987
	6	623.600	0.538	0.595	0.301	93.000	M	799.68	70.217

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
	7	654.300	0.560	0.000	0.000	91.500	M	752.01	67.355
	Σ	**24,890.600**						**2,889.58**	**1,681.252**
#6	1	886.000	1.151	1.896	0.315	81.100	M	307.38	46.845
	2	1,011.200	1.871	0.166	0.287	83.500	M	278.51	62.960
	3	1,167.500	1.126	0.000	0.000	92.800	M	886.94	129.905
	Σ	**27,955.300**						**2,864.33**	**1,920.962**
#7	1	971.600	0.819	0.665	0.285	82.900	M	498.18	58.113
	2	1,467.100	2.587	0.000	0.000	75.000	M	159.36	48.991
	3	194.900	0.596	0.000	0.000	72.600	M	55.76	5.302
	Σ	**30,588.900**						**2,850.88**	**2,033.369**
#8	1	392.000	0.538	2.912	0.280	93.000	M	502.68	44.139
	2	565.000	0.734	2.659	0.279	92.400	M	573.54	61.384
	3	684.000	0.853	2.311	0.280	87.600	M	466.01	55.459
	4	716.000	1.690	2.328	0.277	76.200	M	123.57	26.334
	5	400.000	0.740	1.423	0.277	79.500	M	173.44	18.876
	6	313.000	0.436	1.168	0.285	85.600	M	294.05	22.357
	7	197.000	0.448	0.938	0.279	83.800	M	162.40	12.513
	8	112.000	0.412	0.707	0.318	83.300	M	93.81	6.881
	9	197.000	0.396	1.003	0.317	83.300	M	168.66	12.103
	10	221.000	0.388	0.417	0.339	83.300	M	191.30	13.578
	11	102.000	0.283	0.232	0.317	83.300	M	102.28	6.267
	12	64.000	0.259	0.356	0.398	83.300	M	66.31	3.932
	13	130.000	0.524	0.232	0.317	83.300	M	94.01	7.987
	14	90.000	0.301	0.443	0.321	83.300	M	88.00	5.529
	15	235.000	0.636	0.232	0.317	83.300	M	149.01	14.438
	16	229.000	0.596	0.384	0.382	83.300	M	151.93	14.069
	17	275.000	0.552	0.503	0.312	83.300	M	192.15	16.895
	18	359.000	0.666	0.503	0.312	83.300	M	220.35	22.056
	19	166.000	0.519	0.129	0.319	83.300	M	120.80	10.199
	20	128.000	0.585	0.000	0.000	83.300	M	86.01	7.864
	21	77.000	0.650	0.000	0.000	83.300	M	48.08	4.731
	Σ	**36,240.900**						**2,803.11**	**2,420.961**
#9	1	0.000	0.000	0.000	0.000	1.000	M	0.00	0.000
	2	432.000	0.633	2.204	0.256	84.900	M	306.16	29.492
	3	177.000	0.686	1.864	0.256	84.900	M	118.55	12.083
	4	565.000	0.655	0.983	0.255	85.800	M	414.82	40.878
	5	863.000	0.668	0.000	0.000	84.600	M	577.38	57.775
	Σ	**38,559.900**						**2,767.31**	**2,578.515**

Subwatershed Sedimentology Detail:

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
#10	1	0.198	209.00	5.00	0.2430	1.0000	17	89.8	32,809	17.50	12.04
	2	0.198	209.00	5.00	0.2430	1.0000	17	130.1	31,220	15.62	10.71
	3	0.198	209.00	5.00	0.2430	1.0000	17	205.6	33,067	16.65	11.46
	Σ							**425.5**	**31,083**	**15.82**	**11.34**
#3	1	0.150	100.00	9.10	0.3050	1.0000	18	944.2	29,196	9.04	6.53
	2	0.181	100.00	10.10	0.3050	1.0000	13	2,117.3	48,796	18.44	13.19
	3	0.151	200.00	5.50	0.3050	1.0000	18	538.0	30,715	13.35	9.30
	4	0.183	130.00	7.60	0.3160	1.0000	12	1,058.1	42,735	17.38	12.04
	5	0.185	100.00	8.30	0.2760	1.0000	6	921.2	28,850	7.20	5.12
	Σ							**4,916.8**	**31,298**	**9.33**	**6.95**
#4	1	0.173	130.00	7.00	0.2850	1.0000	7	710.4	30,409	12.07	8.66
	2	0.148	100.00	12.00	0.2220	1.0000	5	1,130.5	44,011	17.95	12.88
	3	0.185	75.00	13.60	0.2740	1.0000	17	2,335.9	58,459	21.96	15.76
	4	0.213	100.00	10.60	0.2330	1.0000	6	3,383.4	49,899	16.49	11.75
	Σ							**9,742.1**	**45,859**	**9.64**	**4.77**
#1	1	0.220	280.00	2.20	0.2960	1.0000	13	651.4	12,772	3.85	2.80
	2	0.202	240.00	3.30	0.2960	1.0000	13	1,043.4	16,025	4.47	3.24
	3	0.206	280.00	2.60	0.2960	1.0000	13	772.7	13,126	3.52	2.56
	4	0.188	200.00	5.10	0.2960	1.0000	13	955.3	27,534	9.50	6.84
	5	0.124	240.00	3.60	0.3130	1.0000	18	352.2	11,975	3.95	2.84
	6	0.178	130.00	7.90	0.2850	1.0000	7	2,010.2	37,985	14.67	10.43
	7	0.191	100.00	9.20	0.2540	1.0000	6	1,414.9	39,176	14.33	10.17
	8	0.199	75.00	15.10	0.1510	1.0000	2	2,323.4	41,957	11.86	8.51
	Σ							**8,739.2**	**37,560**	**10.66**	**4.65**
#2	1	0.188	130.00	7.30	0.2120	1.0000	5	959.4	27,956	10.20	7.29
	2	0.199	75.00	12.60	0.1510	1.0000	2	1,572.9	35,644	11.65	8.43
	3	0.200	100.00	8.60	0.2020	1.0000	11	615.2	30,911	9.78	6.95
	4	0.193	75.00	12.30	0.1730	1.0000	4	1,524.5	38,060	12.46	8.90
	5	0.187	75.00	14.00	0.1590	1.0000	3	2,429.6	46,047	17.56	12.55
	6	0.198	75.00	13.70	0.1680	1.0000	4	2,671.1	38,762	9.82	7.05
	Σ							**13,742.3**	**36,236**	**5.59**	**2.37**
#5	1	0.213	130.00	6.30	0.2330	1.0000	6	1,167.7	29,579	11.34	8.32
	2	0.209	130.00	7.10	0.1680	1.0000	4	1,391.9	20,593	4.52	3.31
	3	0.191	100.00	8.40	0.1500	1.0000	2	1,659.6	19,371	4.53	3.31
	4	0.235	200.00	4.90	0.2870	1.0000	9	682.0	23,913	5.33	3.91
	5	0.220	240.00	3.70	0.1900	1.0000	16	427.4	9,582	0.64	0.47
	6	0.200	130.00	7.30	0.1410	1.0000	1	1,236.2	22,488	7.72	5.54
	7	0.204	200.00	4.70	0.1560	1.0000	2	1,074.0	20,603	6.99	4.96

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
	Σ							**31,037.2**	**32,051**	**6.34**	**3.34**
#6	1	0.228	280.00	2.70	0.2870	1.0000	9	589.8	15,915	5.46	3.97
	2	0.226	280.00	2.40	0.2330	1.0000	6	476.5	9,605	1.45	1.05
	3	0.200	200.00	4.20	0.1460	1.0000	1	1,404.6	13,767	2.69	1.94
	Σ							**29,386.1**	**27,874**	**3.35**	**1.69**
#7	1	0.197	280.00	2.70	0.2330	1.0000	5	611.7	13,556	4.20	2.99
	2	0.204	420.00	1.80	0.3270	1.0000	19	336.0	8,651	0.38	0.28
	3	0.171	280.00	2.40	0.3380	1.0000	10	53.2	13,557	4.44	3.01
	Σ							**28,884.9**	**27,537**	**2.63**	**1.24**
#8	1	0.200	280.00	2.70	0.1410	1.0000	1	323.8	9,111	3.13	2.32
	2	0.204	280.00	2.30	0.1550	1.0000	3	406.9	8,308	2.64	1.94
	3	0.173	280.00	3.00	0.2220	1.0000	6	528.8	12,021	4.42	3.22
	4	0.204	280.00	3.00	0.3180	1.0000	19	279.9	13,300	2.31	1.69
	5	0.187	200.00	5.90	0.2960	1.0000	12	499.9	33,691	12.98	9.31
	6	0.167	200.00	4.20	0.2740	1.0000	8	442.8	25,261	12.57	9.00
	7	0.215	100.00	9.40	0.2650	1.0000	20	479.3	48,901	24.13	17.16
	8	0.201	100.00	8.10	0.2960	1.0000	13	208.4	39,136	19.42	13.65
	9	0.208	280.00	2.70	0.2120	1.0000	15	133.1	14,271	5.89	4.16
	10	0.225	200.00	4.50	0.2540	1.0000	14	350.8	33,823	16.59	11.56
	11	0.198	100.00	9.20	0.2450	1.0000	6	207.0	43,271	20.73	14.34
	12	0.198	209.00	5.00	0.2430	1.0000	17	92.0	30,745	15.69	10.86
	13	0.198	209.00	5.00	0.2430	1.0000	17	166.4	27,323	12.23	8.52
	14	0.198	209.00	5.00	0.2430	1.0000	17	130.5	30,870	15.47	10.78
	15	0.198	209.00	5.00	0.2430	1.0000	17	300.1	27,091	11.41	8.01
	16	0.198	209.00	5.00	0.2430	1.0000	17	299.0	27,731	11.94	8.36
	17	0.198	209.00	5.00	0.2430	1.0000	17	377.8	29,103	12.83	9.01
	18	0.198	209.00	5.00	0.2430	1.0000	17	473.6	27,760	11.51	8.13
	19	0.198	209.00	5.00	0.2430	1.0000	17	219.6	28,299	12.70	8.83
	20	0.198	209.00	5.00	0.2430	1.0000	17	157.0	26,191	11.35	7.90
	21	0.198	209.00	5.00	0.2430	1.0000	17	85.3	23,575	9.86	6.90
	Σ							**28,537.9**	**25,280**	**2.92**	**1.25**
#9	1	0.206	130.00	7.80	0.1800	1.0000	16	0.0	1	0.00	0.00
	2	0.189	100.00	11.10	0.2450	1.0000	6	1,178.9	49,732	19.86	14.50
	3	0.177	100.00	8.30	0.2330	1.0000	6	234.9	24,548	9.50	6.89
	4	0.161	100.00	10.00	0.2220	1.0000	5	1,081.1	33,631	12.39	8.89
	5	0.175	200.00	5.90	0.2450	1.0000	6	1,420.8	31,951	12.44	8.74
	Σ							**30,084.7**	**33,870**	**3.33**	**1.05**

Subwatershed Time of Concentration Details:

Attachment 41.D-2

Cottonwood Arroyo Post-reclamation Hydrology and Sedimentology

SEDCAD™ Model Output

Cottonwood Arroyo Post-mine Hydrology and Sedimentology

The drainage subdivisions used to model the hydrology is shown on Exhibit 41.2-1.

Revised February 19, 2012

Art O'Hayre

General Information

Storm Information:

Storm Type:	Type II-70
Design Storm:	2 yr - 6 hr
Rainfall Depth:	0.850 inches

Particle Size Distribution:

Size (mm)	PostMine-LoamySand	PreMine-LoamySand	PreMine-Badlands	LoamySand Postmining
2.0000	100.000%	100.000%	100.000%	0.000%
0.1000	26.500%	30.000%	83.500%	0.000%
0.0500	14.000%	17.000%	77.000%	0.000%
0.0020	11.000%	11.000%	56.000%	0.000%
0.0010	0.000%	0.000%	0.000%	0.000%

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Null	#1	==>	#2	0.961	0.307	
Null	#2	==>	#3	0.068	0.331	
Null	#3	==>	#4	0.000	0.000	
Null	#4	==>	#9	0.718	0.281	
Null	#5	==>	#6	1.205	0.328	
Null	#6	==>	#7	0.189	0.304	
Null	#7	==>	#8	0.000	0.000	
Null	#8	==>	#10	0.989	0.300	
Null	#9	==>	#11	0.000	0.000	
Null	#10	==>	#11	0.000	0.000	
Null	#11	==>	#21	0.495	0.453	
Null	#12	==>	#13	0.076	0.330	
Null	#13	==>	#14	3.790	0.314	
Null	#14	==>	#16	1.198	0.286	
Null	#15	==>	#16	1.198	0.286	
Null	#16	==>	#20	1.087	0.273	
Null	#17	==>	#19	0.000	0.000	
Null	#18	==>	#19	0.000	0.000	
Null	#19	==>	#20	0.915	0.252	
Null	#20	==>	#22	0.000	0.000	End of Middle Fork
Null	#21	==>	#22	0.000	0.000	End of South Fork
Null	#22	==>	#23	0.811	0.247	
Null	#23	==>	#35	0.000	0.000	
Null	#24	==>	#25	0.964	0.340	
Null	#25	==>	#27	1.454	0.333	
Null	#26	==>	#27	1.454	0.333	
Null	#27	==>	#29	0.800	0.323	
Null	#28	==>	#29	0.800	0.323	
Null	#29	==>	#32	0.479	0.298	
Null	#30	==>	#32	0.479	0.298	
Null	#31	==>	#33	0.000	0.000	
Null	#32	==>	#33	0.000	0.000	
Null	#33	==>	#34	1.348	0.294	Inlet to North Fork Diversion
Null	#34	==>	#35	0.000	0.000	End of North Fork
Null	#35	==>	#36	0.735	0.251	all forks
Null	#36	==>	#37	3.388	0.246	
Null	#37	==>	End	0.000	0.000	

#30
Null

#28 Null
#26 Null
#24 Null
#25 Null
#27 Null
#29 Null
#32 Null
#31 Null
#33 Null
#34 Null
#5 Null
#6 Null
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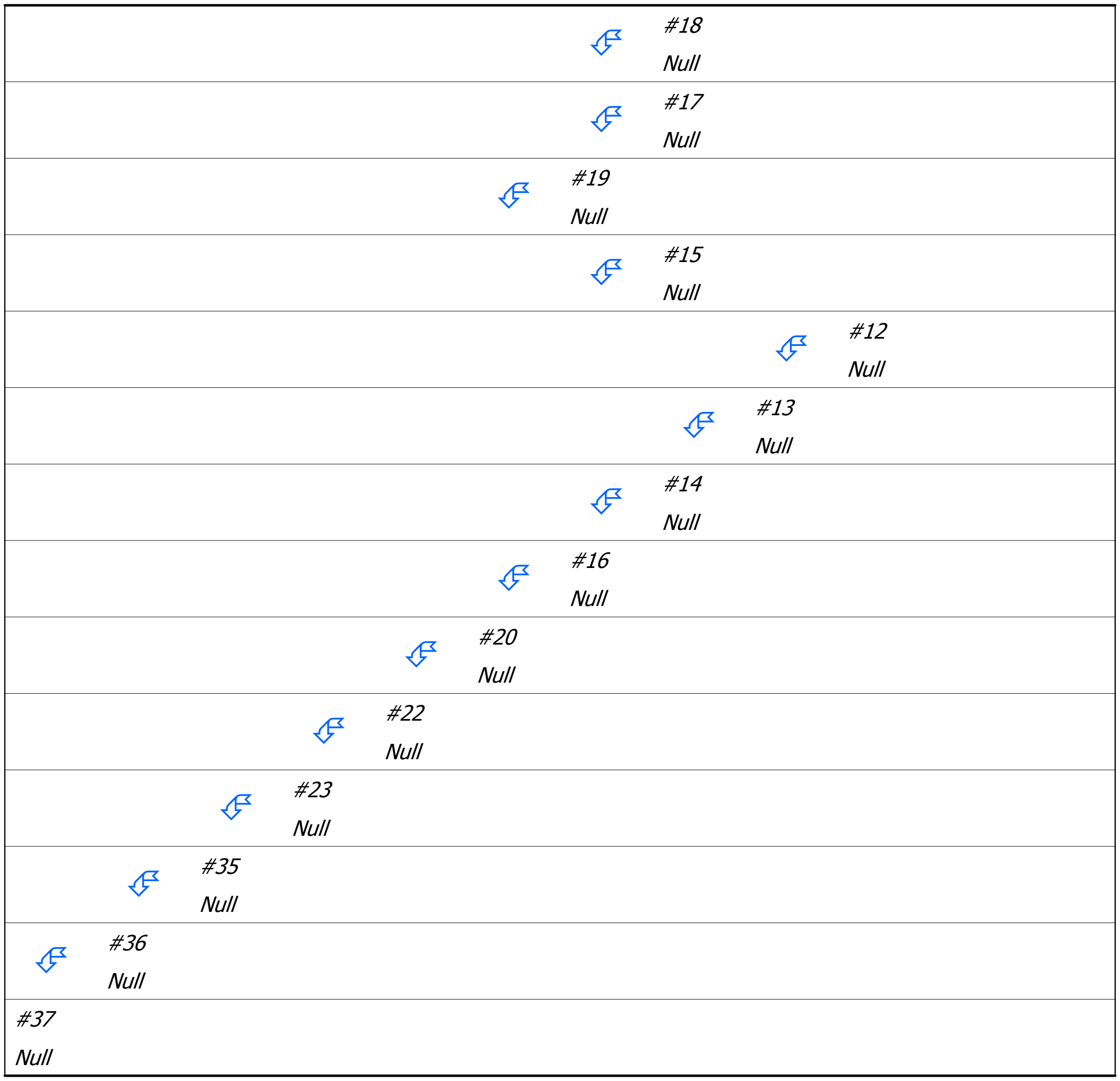
#2 Null
#3 Null
#4 Null
#9 Null
#11 Null
#21 Null



Structure Routing Details:

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	8. Large gullies, diversions, and low flowing streams	0.81	76.00	9,347.00	2.70	0.961
#1	**Muskingum K:**					**0.961**
#2	8. Large gullies, diversions, and low flowing streams	1.23	10.00	814.00	3.32	0.068
#2	**Muskingum K:**					**0.068**
#3	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.00	0.000
#3	**Muskingum K:**					**0.000**
#4	8. Large gullies, diversions, and low flowing streams	0.53	30.00	5,637.00	2.18	0.718
#4	**Muskingum K:**					**0.718**

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#5	8. Large gullies, diversions, and low flowing streams	1.17	165.00	14,065.00	3.24	1.205
#5	**Muskingum K:**					**1.205**
#6	8. Large gullies, diversions, and low flowing streams	0.78	14.00	1,799.25	2.64	0.189
#6	**Muskingum K:**					**0.189**
#8	8. Large gullies, diversions, and low flowing streams	0.72	65.00	9,046.00	2.54	0.989
#8	**Muskingum K:**					**0.989**
#11	8. Large gullies, diversions, and low flowing streams	30.00	8,801.00	29,336.66	16.43	0.495
#11	**Muskingum K:**					**0.495**
#12	8. Large gullies, diversions, and low flowing streams	1.21	11.00	906.00	3.30	0.076
#12	**Muskingum K:**					**0.076**
#13	8. Large gullies, diversions, and low flowing streams	0.92	363.00	39,301.00	2.88	3.790
#13	**Muskingum K:**					**3.790**
#14	8. Large gullies, diversions, and low flowing streams	0.58	57.00	9,834.00	2.28	1.198
#14	**Muskingum K:**					**1.198**
#15	8. Large gullies, diversions, and low flowing streams	0.58	57.00	9,834.00	2.28	1.198
#15	**Muskingum K:**					**1.198**
#16	8. Large gullies, diversions, and low flowing streams	0.46	37.00	7,984.00	2.04	1.087
#16	**Muskingum K:**					**1.087**
#19	8. Large gullies, diversions, and low flowing streams	0.33	19.00	5,699.00	1.73	0.915
#19	**Muskingum K:**					**0.915**
#22	8. Large gullies, diversions, and low flowing streams	0.31	15.00	4,852.00	1.66	0.811
#22	**Muskingum K:**					**0.811**
#24	8. Large gullies, diversions, and low flowing streams	1.46	184.00	12,568.00	3.62	0.964
#24	**Muskingum K:**					**0.964**
#25	8. Large gullies, diversions, and low flowing streams	1.28	228.00	17,755.00	3.39	1.454
#25	**Muskingum K:**					**1.454**
#26	8. Large gullies, diversions, and low flowing streams	1.28	228.00	17,755.62	3.39	1.454
#26	**Muskingum K:**					**1.454**
#27	8. Large gullies, diversions, and low flowing streams	1.07	96.00	8,938.00	3.10	0.800
#27	**Muskingum K:**					**0.800**
#28	8. Large gullies, diversions, and low flowing streams	1.07	96.00	8,938.00	3.10	0.800
#28	**Muskingum K:**					**0.800**
#29	8. Large gullies, diversions, and low flowing streams	0.70	30.00	4,313.00	2.50	0.479

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#29	**Muskingum K:**					**0.479**
#30	8. Large gullies, diversions, and low flowing streams	0.70	30.00	4,313.00	2.50	0.479
#30	**Muskingum K:**					**0.479**
#33	8. Large gullies, diversions, and low flowing streams	0.66	77.00	11,748.55	2.42	1.348
#33	**Muskingum K:**					**1.348**
#35	8. Large gullies, diversions, and low flowing streams	0.33	15.00	4,556.50	1.72	0.735
#35	**Muskingum K:**					**0.735**
#36	8. Large gullies, diversions, and low flowing streams	0.30	60.00	20,005.00	1.64	3.388
#36	**Muskingum K:**					**3.388**

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc. (ml/l)	24VW (ml/l)
#30	476.400	476.400	0.42	0.11	0.4	2,965	1.82	1.55
#28	1,217.900	1,217.900	168.77	19.36	939.7	51,228	0.00	0.00
#26	2,486.400	2,486.400	8.59	2.86	13.1	4,375	0.55	0.42
#24	8,061.800	8,061.800	11.17	6.64	17.5	2,885	0.18	0.12
#25	1,015.700	9,077.500	43.84	10.83	65.0	15,544	6.38	1.81
#27	1,783.700	13,347.600	76.77	20.93	211.6	23,424	10.13	3.20
#29	966.000	15,531.500	221.98	55.19	2,116.8	64,602	2.94	1.26
#32	293.700	16,301.600	225.12	61.87	2,217.3	56,165	0.00	0.00
#31	957.100	957.100	186.43	19.66	773.0	37,599	0.40	0.30
#33	0.000	17,258.700	306.26	81.53	2,990.3	46,265	0.13	0.07
#34	1,156.300	18,415.000	307.96	88.07	2,839.7	41,499	0.10	0.06
#5	2,023.000	2,023.000	229.14	23.65	597.2	35,964	1.23	0.63
#6	1,743.200	3,766.200	265.00	46.82	1,157.6	32,037	0.18	0.10
#7	2,395.300	6,161.500	489.93	97.92	3,569.8	40,794	0.00	0.00
#8	0.000	6,161.500	489.93	97.92	3,569.8	40,794	0.00	0.00
#10	1,053.200	7,214.700	502.27	115.36	3,462.9	36,660	0.05	0.03
#1	2,411.100	2,411.100	145.59	19.69	601.9	34,411	2.97	1.92
#2	1,497.000	3,908.100	219.24	47.99	985.9	22,860	0.13	0.09
#3	828.500	4,736.600	271.89	59.69	1,096.5	18,456	0.04	0.03
#4	0.000	4,736.600	271.89	59.69	1,096.5	18,456	0.04	0.03
#9	712.000	5,448.600	271.65	63.85	1,098.9	16,918	0.50	0.37
#11	0.000	12,663.300	699.49	179.21	4,561.8	30,844	0.25	0.15
#21	646.500	13,309.800	706.72	185.25	4,574.0	30,940	0.26	0.15
#18	848.500	848.500	87.84	11.61	118.2	12,305	0.00	0.00
#17	182.200	182.200	65.14	4.08	55.0	14,274	0.37	0.26
#19	0.000	1,030.700	148.60	15.69	173.2	11,407	0.09	0.07
#15	1,992.700	1,992.700	180.77	24.60	857.0	40,282	0.20	0.12
#12	3,494.500	3,494.500	54.37	8.31	106.0	14,291	5.52	3.61
#13	2,720.700	6,215.200	99.03	15.37	234.3	16,928	7.34	4.83
#14	5,096.800	11,312.000	214.75	67.68	1,681.9	69,242	0.58	0.15
#16	1,022.000	14,326.700	406.07	113.86	3,182.5	46,086	0.51	0.23
#20	577.100	15,934.500	413.71	140.15	3,440.0	40,783	0.29	0.13
#22	0.000	29,244.300	1,054.85	325.39	8,014.0	30,472	0.24	0.14
#23	291.000	29,535.300	1,047.17	326.62	7,987.1	30,379	0.15	0.09
#35	0.000	47,950.300	1,291.59	414.69	10,826.8	29,765	0.13	0.08
#36	509.000	48,459.300	1,282.21	416.85	10,781.6	36,751	0.11	0.05
#37	1,661.000	50,120.300	1,248.55	428.44	10,662.2	36,588	0.13	0.06

Particle Size Distribution(s) at Each Structure

Structure #30:

Size (mm)	In/Out
2.0000	100.000%
0.1000	48.542%
0.0500	27.507%
0.0020	17.799%
0.0010	0.000%

Structure #28:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	100.000%
0.0010	0.000%

Structure #26:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	98.959%
0.0020	67.283%
0.0010	0.000%

Structure #24:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	82.732%
0.0010	0.000%

Structure #25:

Size (mm)	In/Out
2.0000	100.000%
0.1000	75.513%
0.0500	54.568%
0.0020	41.304%
0.0010	0.000%

Structure #27:

Size (mm)	In/Out
2.0000	100.000%
0.1000	83.173%
0.0500	53.471%
0.0020	36.649%
0.0010	0.000%

Structure #29:

Size (mm)	In/Out
2.0000	100.000%
0.1000	98.336%
0.0500	95.367%
0.0020	92.998%
0.0010	0.000%

Structure #32:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	100.000%
0.0010	0.000%

Structure #31:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	96.996%
0.0010	0.000%

Structure #33 (Inlet to North Fork Diversion):

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	99.223%
0.0010	0.000%

Structure #34 (End of North Fork):

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.866%
0.0500	99.706%
0.0020	99.668%
0.0010	0.000%

Structure #5:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	97.321%
0.0020	93.713%
0.0010	0.000%

Structure #6:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	98.421%
0.0010	0.000%

Structure #7:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	100.000%
0.0010	0.000%

Structure #8:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	100.000%
0.0010	0.000%

Structure #10:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	99.874%
0.0020	99.781%
0.0010	0.000%

Structure #1:

Size (mm)	In/Out
2.0000	100.000%
0.1000	98.279%
0.0500	91.147%
0.0020	86.784%
0.0010	0.000%

Structure #2:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	98.388%
0.0010	0.000%

Structure #3:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	99.427%
0.0010	0.000%

Structure #4:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	99.427%
0.0010	0.000%

Structure #9:

Size (mm)	In/Out
2.0000	98.240%
0.1000	97.694%
0.0500	96.550%
0.0020	96.022%
0.0010	0.000%

Structure #11:

Size (mm)	In/Out
2.0000	99.576%
0.1000	99.445%
0.0500	99.073%
0.0020	98.876%
0.0010	0.000%

Structure #21 (End of South Fork):

Size (mm)	In/Out
2.0000	99.399%
0.1000	99.240%
0.0500	99.019%
0.0020	98.822%
0.0010	0.000%

Structure #18:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	100.000%
0.0010	0.000%

Structure #17:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	92.667%
0.0010	0.000%

Structure #19:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	97.672%
0.0010	0.000%

Structure #15:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	98.619%
0.0010	0.000%

Structure #12:

Size (mm)	In/Out
2.0000	100.000%
0.1000	91.000%
0.0500	61.522%
0.0020	39.808%
0.0010	0.000%

Structure #13:

Size (mm)	In/Out
2.0000	100.000%
0.1000	87.425%
0.0500	54.448%
0.0020	35.231%
0.0010	0.000%

Structure #14:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	97.642%
0.0010	0.000%

Structure #16:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	96.858%
0.0010	0.000%

Structure #20 (End of Middle Fork):

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	97.979%
0.0010	0.000%

Structure #22:

Size (mm)	In/Out
2.0000	99.657%
0.1000	99.566%
0.0500	99.440%
0.0020	98.460%
0.0010	0.000%

Structure #23:

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.890%
0.0500	99.789%
0.0020	98.882%
0.0010	0.000%

Structure #35 (all forks):

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.884%
0.0500	99.767%
0.0020	99.088%
0.0010	0.000%

Structure #36:

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.776%
0.0500	99.681%
0.0020	99.587%
0.0010	0.000%

Structure #37:

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.805%
0.0500	99.611%
0.0020	99.482%
0.0010	0.000%

Structure Detail:

Structure #30 (Null)

Structure #28 (Null)

Structure #26 (Null)

Structure #24 (Null)

Structure #25 (Null)

Structure #27 (Null)

Structure #29 (Null)

Structure #32 (Null)

Structure #31 (Null)

Structure #33 (Null)

Inlet to North Fork Diversion

Structure #34 (Null)

End of North Fork

Structure #5 (Null)

Structure #6 (Null)

Structure #7 (Null)

Structure #8 (Null)

Structure #10 (Null)

Structure #1 (Null)

Structure #2 (Null)

Structure #3 (Null)

Structure #4 (Null)

Structure #9 (Null)

Structure #11 (Null)

Structure #21 (Null)

End of South Fork

Structure #18 (Null)

Structure #17 (Null)

Structure #19 (Null)

Structure #15 (Null)

Structure #12 (Null)

Structure #13 (Null)

Structure #14 (Null)

Structure #16 (Null)

Structure #20 (Null)

End of Middle Fork

Structure #22 (Null)

Structure #23 (Null)

Structure #35 (Null)

all forks

Structure #36 (Null)

Structure #37 (Null)

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#30	1	476.400	1.131	0.000	0.000	73.100	M	0.42	0.108
	Σ	**476.400**						**0.42**	**0.108**
#28	1	772.300	0.657	0.523	0.334	90.400	M	154.33	12.273
	2	445.600	0.587	0.000	0.000	90.400	M	96.41	7.084
	Σ	**1,217.900**						**168.77**	**19.357**
#26	1	447.600	2.192	0.000	0.000	74.200	M	0.63	0.195
	2	2,038.800	3.000	0.000	0.000	77.000	M	7.95	2.663
	Σ	**2,486.400**						**8.59**	**2.858**
#24	1	2,607.500	5.367	2.377	0.305	75.200	M	3.53	1.798
	2	2,331.900	4.813	2.431	0.304	74.700	M	2.75	1.295
	3	1,758.500	2.231	1.788	0.297	76.200	M	6.20	1.768
	4	1,363.900	2.618	0.000	0.000	77.000	M	5.82	1.781
	Σ	**8,061.800**						**11.17**	**6.642**
#25	1	515.200	0.990	0.342	0.357	78.200	M	6.68	0.949
	2	130.500	0.787	0.342	0.357	78.100	M	1.94	0.234
	3	370.000	0.516	0.000	0.000	85.700	M	43.63	3.000
	Σ	**9,077.500**						**43.84**	**10.825**
#27	1	354.400	0.612	1.233	0.337	83.100	M	22.90	1.867
	2	305.200	0.529	1.054	0.328	84.000	M	26.16	1.879
	3	289.800	0.692	0.551	0.328	75.500	M	1.46	0.226
	4	253.000	0.361	0.551	0.328	79.400	M	10.21	0.631
	5	581.300	0.980	0.000	0.000	82.300	M	22.25	2.645
	Σ	**13,347.600**						**76.77**	**20.932**
#29	1	508.800	0.409	0.416	0.312	89.500	M	123.40	7.174
	2	233.200	0.521	0.291	0.312	91.600	M	64.31	4.349
	3	224.000	0.467	0.000	0.000	90.000	M	53.48	3.373
	Σ	**15,531.500**						**221.98**	**55.186**
#32	1	293.700	0.576	0.000	0.000	93.000	M	91.29	6.575
	Σ	**16,301.600**						**225.12**	**61.868**
#31	1	431.100	0.588	0.450	0.336	91.500	M	108.09	7.934
	2	325.800	0.432	0.149	0.327	93.000	M	121.15	7.302
	3	200.200	0.373	0.000	0.000	92.900	M	79.56	4.422
	Σ	**957.100**						**186.43**	**19.658**
#33	Σ	**17,258.700**						**306.26**	**81.526**

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#34	1	250.000	0.423	1.019	0.292	90.500	M	67.74	4.035
	2	219.100	0.611	0.267	0.322	80.000	M	7.03	0.625
	3	246.200	0.688	0.466	0.293	80.000	M	7.21	0.702
	4	441.000	0.370	0.000	0.000	79.700	M	19.00	1.177
	Σ	**18,415.000**						**307.96**	**88.066**
#5	1	503.600	0.618	0.000	0.000	87.600	M	70.38	5.418
	2	406.500	0.388	0.501	0.350	84.800	M	50.23	2.856
	3	439.600	0.342	0.681	0.347	87.800	M	93.95	4.893
	4	162.600	0.280	0.681	0.347	86.000	M	29.90	1.385
	5	294.100	0.375	1.021	0.348	92.000	M	104.07	5.773
	6	216.600	0.272	1.018	0.348	90.100	M	70.08	3.321
	Σ	**2,023.000**						**229.14**	**23.646**
#6	1	149.100	0.331	0.000	0.000	92.600	M	60.49	3.180
	2	245.000	0.529	0.192	0.328	88.100	M	41.26	2.835
	3	276.200	0.450	0.461	0.319	89.500	M	63.13	3.884
	4	158.400	0.380	1.385	0.185	93.000	M	63.13	3.542
	5	206.200	0.402	0.796	0.320	89.400	M	49.86	2.867
	6	414.000	0.430	1.066	0.323	87.200	M	70.28	4.213
	7	294.300	0.535	1.066	0.323	86.400	M	37.89	2.654
	Σ	**3,766.200**						**265.00**	**46.822**
#7	1	731.700	1.274	0.000	0.000	93.000	M	125.32	16.354
	2	445.800	1.043	0.000	0.000	93.000	M	89.59	9.961
	3	270.800	0.804	0.000	0.000	93.000	M	66.41	6.053
	4	78.900	0.267	1.035	0.328	93.000	M	36.64	1.774
	5	154.900	0.310	1.071	0.326	93.000	M	67.89	3.478
	6	101.400	0.288	1.164	0.328	92.900	M	45.26	2.246
	7	117.700	0.298	1.344	0.329	92.200	M	47.63	2.379
	8	494.100	0.518	1.344	0.329	91.300	M	131.34	8.857
	Σ	**6,161.500**						**489.93**	**97.922**
#8	1	0.000	0.000	0.000	0.000	1.000	0.00	0.000	
	Σ	**6,161.500**						**489.93**	**97.922**
#10	1	355.500	1.286	0.000	0.000	93.000	M	60.42	7.944
	2	307.100	1.282	0.668	0.305	83.200	M	11.38	1.645
	3	147.300	1.245	0.517	0.303	90.600	M	18.52	2.401
	4	126.400	0.585	0.517	0.303	93.000	M	38.88	2.830
	5	116.900	1.179	0.621	0.305	93.000	M	21.32	2.613
	Σ	**7,214.700**						**502.27**	**115.355**
#1	1	557.400	0.941	0.000	0.000	83.600	M	28.55	3.202
	2	169.600	1.616	0.677	0.333	93.000	M	23.89	3.790
	3	636.400	1.842	0.729	0.333	81.000	M	11.02	2.246

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
	4	223.400	0.846	1.005	0.336	84.100	M	13.64	1.398
	5	77.700	0.330	1.392	0.341	81.400	M	5.49	0.299
	6	746.600	0.678	1.392	0.341	88.200	M	106.62	8.758
	Σ	**2,411.100**						**145.59**	**19.692**
#2	1	257.000	0.423	0.000	0.000	93.000	M	96.72	5.764
	2	180.500	0.562	0.478	0.281	91.800	M	48.62	3.452
	3	200.700	0.687	0.574	0.283	93.000	M	55.21	4.488
	4	438.600	0.811	0.574	0.283	93.000	M	106.86	9.806
	5	420.200	1.247	0.801	0.293	88.000	M	36.13	4.787
	Σ	**3,908.100**						**219.24**	**47.989**
#3	1	172.600	0.443	0.000	0.000	93.000	M	63.26	3.862
	2	277.000	0.890	0.000	0.000	88.900	M	35.65	3.583
	3	378.900	0.632	0.209	0.314	87.900	M	54.50	4.256
	Σ	**4,736.600**						**271.89**	**59.690**
#4	Σ	**4,736.600**						**271.89**	**59.690**
#9	1	288.000	0.987	0.000	0.000	85.800	M	21.04	2.368
	2	236.000	0.436	0.000	0.000	81.900	M	15.30	0.998
	3	106.000	0.324	0.297	0.268	81.900	M	8.43	0.449
	4	82.000	0.315	0.666	0.300	81.900	M	6.64	0.347
	Σ	**5,448.600**						**271.65**	**63.851**
#11	Σ	**12,663.300**						**699.49**	**179.206**
#21	1	146.000	0.819	0.000	0.000	86.900	M	14.78	1.418
	2	137.000	0.213	0.249	0.263	81.900	M	14.06	0.581
	3	182.500	0.289	0.878	0.256	91.300	M	66.90	3.277
	4	70.000	0.939	0.878	0.256	81.900	M	2.54	0.295
	5	111.000	0.297	0.947	0.263	81.900	M	9.33	0.470
	Σ	**13,309.800**						**706.72**	**185.247**
#18	1	301.700	0.652	0.000	0.000	93.000	M	86.12	6.753
	2	546.800	0.768	0.561	0.320	86.300	M	52.82	4.856
	Σ	**848.500**						**87.84**	**11.608**
#17	1	182.200	0.462	0.000	0.000	93.000	M	65.14	4.077
	Σ	**182.200**						**65.14**	**4.077**
#19	Σ	**1,030.700**						**148.60**	**15.685**
#15	1	437.400	0.803	0.000	0.000	91.300	M	85.27	7.826
	2	549.000	0.637	0.654	0.327	91.300	M	126.59	9.828
	3	1,006.300	1.023	0.768	0.331	84.700	M	59.01	6.949
	Σ	**1,992.700**						**180.77**	**24.603**

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#12	1	517.800	0.791	0.000	0.000	81.900	M	21.49	2.184
	2	229.000	0.571	0.043	0.418	80.100	M	7.95	0.669
	3	592.700	0.706	0.044	0.417	81.500	M	24.57	2.314
	4	1,806.900	1.542	0.487	0.362	76.700	M	9.77	2.147
	5	348.100	0.618	0.487	0.362	80.000	11.07	0.993	
	Σ	**3,494.500**						**54.37**	**8.307**
#13	1	411.600	0.725	0.000	0.000	79.700	M	10.68	1.098
	2	636.400	0.774	0.322	0.336	80.700	M	20.37	2.112
	3	319.000	0.575	0.685	0.318	85.500	M	33.59	2.506
	4	231.700	0.314	0.923	0.328	80.400	M	13.44	0.724
	5	1,122.000	1.308	0.923	0.328	74.700	M	2.63	0.623
	Σ	**6,215.200**						**99.03**	**15.370**
#14	1	405.900	0.384	0.000	0.000	90.800	M	121.19	6.801
	2	411.100	0.452	0.707	0.308	90.700	M	109.89	6.798
	3	787.400	0.658	0.975	0.307	91.400	M	179.88	14.295
	4	144.200	0.341	1.716	0.310	86.200	M	24.38	1.267
	5	343.800	0.289	1.970	0.312	86.500	M	66.96	3.155
	6	392.800	0.806	2.107	0.316	81.900	M	16.07	1.657
	7	528.200	0.518	2.544	0.316	87.200	M	78.91	5.369
	8	890.900	1.253	2.544	0.316	83.500	M	35.63	5.030
	9	741.400	1.076	3.047	0.316	84.800	M	42.51	5.204
	10	451.100	0.916	3.354	0.316	83.900	M	24.97	2.728
	Σ	**11,312.000**						**214.75**	**67.675**
#16	1	475.100	1.721	0.000	0.000	92.400	M	58.55	9.819
	2	348.400	0.542	0.951	0.283	92.500	M	105.55	7.299
	3	198.500	0.266	1.384	0.278	93.000	M	92.31	4.462
	Σ	**14,326.700**						**406.07**	**113.858**
#20	1	271.100	0.667	0.000	0.000	89.400	M	46.63	3.761
	2	306.000	0.713	0.410	0.287	93.000	M	81.95	6.842
	Σ	**15,934.500**						**413.71**	**140.147**
#22	Σ	**29,244.300**						**1,054.85**	**325.394**
#23	1	291.000	0.564	0.000	0.000	81.900	M	15.63	1.228
	Σ	**29,535.300**						**1,047.17**	**326.622**
#35	Σ	**47,950.300**						**1,291.59**	**414.688**
#36	1	308.000	0.606	0.000	0.000	81.900	M	15.67	1.301
	2	45.000	0.159	0.470	0.263	81.900	M	5.24	0.194
	3	156.000	0.158	0.000	0.000	81.900	M	18.18	0.672
	Σ	**48,459.300**						**1,282.21**	**416.855**

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#37	1	344.000	1.756	0.000	0.000	84.800	M	13.24	2.414
	2	300.000	0.415	1.870	0.241	87.800	M	56.95	3.334
	3	185.000	0.332	1.493	0.241	85.500	M	28.46	1.459
	4	246.000	0.363	2.653	0.246	81.900	M	18.12	1.041
	5	157.000	0.611	2.512	0.242	84.100	M	12.31	0.983
	6	76.000	0.095	2.512	0.242	84.100	M	27.98	0.595
	7	243.000	0.673	1.814	0.241	83.000	M	14.34	1.258
	8	81.000	0.151	0.095	0.383	81.900	M	9.44	0.349
	9	29.000	0.118	1.721	0.298	81.900	M	7.97	0.153
	Σ	**50,120.300**						**1,248.55**	**428.439**

Subwatershed Sedimentology Detail:

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
#30	1	0.095	200.00	3.80	0.3720	1.0000	2	0.4	2,965	1.82	1.55
	Σ							**0.4**	**2,965**	**1.82**	**1.55**
#28	1	0.187	100.00	10.10	0.3750	1.0000	3	739.2	61,682	0.00	0.00
	2	0.196	100.00	10.20	0.3930	1.0000	3	465.2	68,043	0.00	0.00
	Σ							**939.7**	**51,228**	**0.00**	**0.00**
#26	1	0.155	400.00	1.40	0.3480	1.0000	2	0.5	2,388	0.74	0.59
	2	0.155	300.00	2.40	0.3340	1.0000	2	12.6	4,534	0.54	0.41
	Σ							**13.1**	**4,375**	**0.55**	**0.42**
#24	1	0.128	300.00	2.30	0.3360	1.0000	2	5.1	2,784	0.20	0.15
	2	0.136	300.00	2.70	0.3440	1.0000	2	4.7	3,502	0.38	0.29
	3	0.107	300.00	2.30	0.3330	1.0000	2	5.8	3,108	0.51	0.39
	4	0.163	400.00	1.60	0.3210	1.0000	2	6.5	3,508	0.46	0.36
	Σ							**17.5**	**2,885**	**0.18**	**0.12**
#25	1	0.125	400.00	1.90	0.3440	1.0000	2	4.7	5,072	1.86	1.34
	2	0.124	300.00	2.60	0.3280	1.0000	2	1.2	5,507	2.23	1.57
	3	0.122	175.00	4.90	0.2660	1.0000	2	43.0	15,659	8.76	5.86
	Σ							**65.0**	**15,544**	**6.38**	**1.81**
#27	1	0.127	175.00	5.90	0.3160	1.0000	2	33.9	19,102	9.87	6.86
	2	0.122	150.00	7.50	0.2920	1.0000	2	37.9	21,382	11.60	7.99
	3	0.070	125.00	8.40	0.3270	1.0000	2	1.5	6,752	2.44	1.82
	4	0.097	125.00	9.60	0.3170	1.0000	2	13.5	23,951	12.80	8.34
	5	0.126	125.00	8.90	0.3290	1.0000	2	56.1	22,130	9.81	6.86

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
	Σ							**211.6**	**23,424**	**10.13**	**3.20**
#29	1	0.190	125.00	9.80	0.3930	1.0000	3	532.0	77,172	0.75	0.52
	2	0.203	125.00	8.90	0.3940	1.0000	3	258.7	61,430	0.00	0.00
	3	0.193	125.00	8.40	0.3940	1.0000	3	175.6	54,954	0.00	0.00
	Σ							**2,116.8**	**64,602**	**2.94**	**1.26**
#32	1	0.210	150.00	7.70	0.3990	1.0000	3	371.2	58,211	0.00	0.00
	Σ							**2,217.3**	**56,165**	**0.00**	**0.00**
#31	1	0.204	125.00	8.70	0.3620	1.0000	3	431.7	55,950	0.00	0.00
	2	0.210	150.00	7.30	0.3990	1.0000	3	438.0	62,096	2.06	1.43
	3	0.210	175.00	4.50	0.3980	1.0000	3	177.9	42,351	1.96	1.35
	Σ							**773.0**	**37,599**	**0.40**	**0.30**
#33	Σ							**2,990.3**	**46,265**	**0.13**	**0.07**
#34	1	0.193	200.00	3.84	0.2460	1.0000	3	65.9	16,977	0.23	0.16
	2	0.100	200.00	3.66	0.2540	1.0000	1	3.3	5,779	2.98	2.02
	3	0.100	300.00	2.54	0.2540	1.0000	1	2.9	4,419	2.21	1.53
	4	0.100	200.00	3.50	0.2540	1.0000	1	8.0	7,963	4.51	2.81
	Σ							**2,839.7**	**41,499**	**0.10**	**0.06**
#5	1	0.149	75.00	12.50	0.3230	1.0000	3	233.9	45,624	0.00	0.00
	2	0.133	75.00	15.80	0.3190	1.0000	2	160.7	60,621	35.07	23.47
	3	0.103	100.00	11.00	0.2030	1.0000	3	112.4	24,558	0.41	0.28
	4	0.093	75.00	13.80	0.2130	1.0000	2	31.5	24,650	15.01	10.10
	5	0.123	100.00	11.00	0.1370	1.0000	3	105.5	18,986	0.74	0.52
	6	0.149	75.00	14.70	0.1990	1.0000	3	134.3	42,024	2.19	1.53
	Σ							**597.2**	**35,964**	**1.23**	**0.63**
#6	1	0.208	175.00	4.30	0.3980	1.0000	3	120.1	39,925	2.16	1.49
	2	0.183	175.00	5.40	0.3910	1.0000	3	97.6	36,476	0.00	0.00
	3	0.188	150.00	7.60	0.3900	1.0000	3	194.4	52,428	0.00	0.00
	4	0.210	150.00	6.30	0.3990	1.0000	3	176.3	49,309	2.24	1.64
	5	0.185	125.00	8.10	0.3860	1.0000	3	136.3	49,341	0.54	0.38
	6	0.104	100.00	11.30	0.2240	1.0000	3	101.7	25,411	0.00	0.00
	7	0.164	100.00	11.20	0.3740	1.0000	3	144.7	56,415	0.00	0.00
	Σ							**1,157.6**	**32,037**	**0.18**	**0.10**
#7	1	0.208	150.00	7.80	0.3780	1.0000	3	702.2	43,218	0.00	0.00
	2	0.209	100.00	10.20	0.3940	1.0000	3	578.3	58,417	0.00	0.00
	3	0.210	150.00	6.70	0.3990	1.0000	3	259.8	43,870	0.00	0.00
	4	0.210	100.00	11.50	0.3990	1.0000	3	160.1	89,864	6.44	4.62
	5	0.210	150.00	7.10	0.3990	1.0000	3	203.3	58,980	3.65	2.61
	6	0.209	150.00	7.90	0.3990	1.0000	3	139.9	62,665	4.16	2.98

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
	7	0.206	75.00	15.50	0.3990	1.0000	3	266.1	110,381	6.55	4.71
	8	0.202	75.00	14.50	0.3980	1.0000	3	883.3	99,436	0.00	0.00
	Σ							**3,569.8**	**40,794**	**0.00**	**0.00**
#8	1	0.000	0.00	0.00	0.0000	1.0000	0	0.0	1	0.00	0.00
	Σ							**3,569.8**	**40,794**	**0.00**	**0.00**
#10	1	0.190	300.00	2.70	0.1930	1.0000	3	57.1	7,337	0.00	0.00
	2	0.153	200.00	3.50	0.3610	1.0000	2	15.7	9,695	3.99	2.88
	3	0.189	200.00	3.70	0.3190	1.0000	3	29.3	12,402	0.00	0.00
	4	0.190	300.00	2.10	0.1940	1.0000	3	20.0	7,361	0.00	0.00
	5	0.201	300.00	2.00	0.3030	1.0000	3	21.7	8,433	0.00	0.00
	Σ							**3,462.9**	**36,660**	**0.05**	**0.03**
#1	1	0.157	150.00	6.80	0.3830	1.0000	2	82.5	26,888	12.53	8.75
	2	0.210	150.00	6.60	0.3990	1.0000	3	111.1	29,342	0.00	0.00
	3	0.149	200.00	3.90	0.3870	1.0000	2	21.2	9,384	2.84	2.10
	4	0.169	175.00	4.70	0.3950	1.0000	2	28.9	21,381	10.40	7.35
	5	0.157	100.00	10.10	0.3940	1.0000	2	12.5	44,935	25.37	17.19
	6	0.175	75.00	12.60	0.2840	1.0000	3	403.0	47,055	0.00	0.00
	Σ							**601.9**	**34,411**	**2.97**	**1.92**
#2	1	0.190	150.00	7.90	0.1930	1.0000	3	159.6	29,198	1.03	0.71
	2	0.184	175.00	4.80	0.2010	1.0000	3	55.3	16,688	0.00	0.00
	3	0.202	200.00	3.90	0.3220	1.0000	3	86.9	19,896	0.00	0.00
	4	0.203	150.00	7.40	0.3220	1.0000	3	381.1	39,430	0.00	0.00
	5	0.181	175.00	5.10	0.3710	1.0000	3	108.1	22,816	0.00	0.00
	Σ							**985.9**	**22,860**	**0.13**	**0.09**
#3	1	0.190	175.00	5.20	0.1930	1.0000	3	72.9	19,971	0.61	0.42
	2	0.177	175.00	4.20	0.2560	1.0000	3	51.3	14,914	0.00	0.00
	3	0.166	175.00	4.30	0.2290	1.0000	3	61.4	15,297	0.00	0.00
	Σ							**1,096.5**	**18,456**	**0.04**	**0.03**
#4	Σ							**1,096.5**	**18,456**	**0.04**	**0.03**
#9	1	0.212	175.00	4.17	0.2490	1.0000	2	35.0	15,407	7.45	5.23
	2	0.100	200.00	4.50	0.2540	1.0000	4	10.0	11,310	9.05	5.86
	3	0.100	200.00	4.50	0.2540	1.0000	4	4.6	11,415	9.13	5.95
	4	0.100	200.00	6.50	0.2540	1.0000	4	4.9	15,624	12.50	8.26
	Σ							**1,098.9**	**16,918**	**0.50**	**0.37**
#11	Σ							**4,561.8**	**30,844**	**0.25**	**0.15**
#21	1	0.206	175.00	4.44	0.2560	1.0000	2	22.8	16,944	8.78	6.11
	2	0.100	175.00	14.00	0.2540	1.0000	4	27.6	53,823	43.06	27.47
	3	0.185	300.00	2.70	0.2180	1.0000	3	40.4	12,743	0.71	0.50

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
	4	0.100	300.00	8.00	0.2540	1.0000	1	3.9	13,584	6.59	4.71
	5	0.100	200.00	5.00	0.2540	1.0000	1	5.5	12,579	7.59	5.14
	Σ							**4,574.0**	**30,940**	**0.26**	**0.15**
#18	1	0.193	300.00	2.80	0.2200	1.0000	3	76.0	11,763	0.00	0.00
	2	0.173	175.00	4.70	0.3880	1.0000	3	124.7	26,650	0.00	0.00
	Σ							**118.2**	**12,305**	**0.00**	**0.00**
#17	1	0.196	300.00	2.60	0.2600	1.0000	3	55.0	14,274	0.37	0.26
	Σ							**55.0**	**14,274**	**0.37**	**0.26**
#19	Σ							**173.2**	**11,407**	**0.09**	**0.07**
#15	1	0.201	125.00	8.20	0.3960	1.0000	3	368.1	48,226	0.00	0.00
	2	0.161	100.00	11.40	0.3060	1.0000	3	487.2	50,739	0.00	0.00
	3	0.118	100.00	10.20	0.2850	1.0000	2	152.8	22,483	10.48	7.48
	Σ							**857.0**	**40,282**	**0.20**	**0.12**
#12	1	0.124	150.00	6.30	0.3070	1.0000	2	33.4	16,317	7.66	5.26
	2	0.132	200.00	3.60	0.3500	1.0000	2	6.7	11,058	5.41	3.57
	3	0.136	175.00	5.00	0.3330	1.0000	2	38.4	17,881	8.59	5.82
	4	0.188	200.00	3.40	0.3570	1.0000	2	19.8	8,880	2.17	1.65
	5	0.228	175.00	4.10	0.3640	1.0000	2	23.2	25,014	11.93	8.15
	Σ							**106.0**	**14,291**	**5.52**	**3.61**
#13	1	0.128	150.00	6.90	0.3390	1.0000	2	19.1	18,713	8.41	5.72
	2	0.130	175.00	5.70	0.3300	1.0000	2	35.2	17,524	7.99	5.56
	3	0.191	175.00	6.00	0.2890	1.0000	2	69.3	29,144	15.93	11.00
	4	0.122	175.00	5.10	0.3460	1.0000	2	13.5	20,608	11.54	7.65
	5	0.137	175.00	4.20	0.3530	1.0000	2	4.8	7,061	2.12	1.69
	Σ							**234.3**	**16,928**	**7.34**	**4.83**
#14	1	0.196	100.00	10.20	0.3980	1.0000	3	523.7	80,672	2.17	1.48
	2	0.193	150.00	6.70	0.4020	1.0000	3	340.2	51,669	0.39	0.28
	3	0.169	75.00	13.80	0.3240	1.0000	3	881.1	62,374	0.00	0.00
	4	0.114	100.00	11.00	0.2980	1.0000	3	40.3	32,851	0.11	0.08
	5	0.078	100.00	10.10	0.1830	1.0000	3	44.0	14,425	0.35	0.25
	6	0.084	150.00	7.10	0.2700	1.0000	2	16.3	10,073	4.71	3.36
	7	0.087	100.00	10.00	0.1840	1.0000	3	69.6	13,279	0.00	0.00
	8	0.126	150.00	6.70	0.2740	1.0000	2	68.1	13,578	5.70	4.16
	9	0.117	150.00	7.30	0.2600	1.0000	2	73.3	14,162	6.51	4.74
	10	0.115	125.00	8.50	0.2610	1.0000	2	41.0	15,152	7.17	5.20
	Σ							**1,681.9**	**69,242**	**0.58**	**0.15**
#16	1	0.201	300.00	2.78	0.3030	1.0000	3	107.7	11,117	0.00	0.00
	2	0.204	150.00	6.00	0.3630	1.0000	3	297.4	41,540	0.09	0.06

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
	3	0.210	150.00	6.10	0.3990	1.0000	3	240.0	53,468	3.85	2.79
	Σ							**3,182.5**	**46,086**	**0.51**	**0.23**
#20	1	0.186	175.00	3.19	0.2130	1.0000	3	34.7	9,786	0.00	0.00
	2	0.194	200.00	3.42	0.2330	1.0000	3	84.4	12,734	0.00	0.00
	Σ							**3,440.0**	**40,783**	**0.29**	**0.13**
#22	Σ							**8,014.0**	**30,472**	**0.24**	**0.14**
#23	1	0.100	350.00	8.00	0.2540	1.0000	1	26.0	23,218	12.70	8.44
	Σ							**7,987.1**	**30,379**	**0.15**	**0.09**
#35	Σ							**10,826.8**	**29,765**	**0.13**	**0.08**
#36	1	0.100	200.00	3.14	0.2540	1.0000	1	6.8	5,783	3.12	2.08
	2	0.100	450.00	13.00	0.2540	1.0000	1	13.6	77,483	49.29	32.09
	3	0.100	300.00	10.00	0.2540	1.0000	1	26.0	46,315	29.46	17.84
	Σ							**10,781.6**	**36,751**	**0.11**	**0.05**
#37	1	0.196	200.00	3.80	0.3980	1.0000	2	32.3	13,558	5.09	3.68
	2	0.194	200.00	3.42	0.4020	1.0000	3	79.3	24,132	0.00	0.00
	3	0.173	150.00	7.10	0.2770	1.0000	3	43.9	31,001	0.00	0.00
	4	0.100	175.00	5.00	0.2540	1.0000	1	11.6	11,361	6.68	4.80
	5	0.171	150.00	6.50	0.2990	1.0000	3	21.6	22,285	0.00	0.00
	6	0.171	150.00	6.50	0.2990	1.0000	3	22.8	39,070	10.14	7.23
	7	0.100	300.00	1.20	0.2540	1.0000	1	3.1	2,554	1.38	0.98
	8	0.100	300.00	10.00	0.2540	1.0000	1	12.5	43,027	27.37	16.50
	9	0.100	250.00	10.00	0.2540	1.0000	1	5.8	40,668	28.41	19.29
	Σ							**10,662.2**	**36,588**	**0.13**	**0.06**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	3.65	50.00	1,369.00	1.910	0.199
		8. Large gullies, diversions, and low flowing streams	1.57	157.00	10,030.00	3.750	0.742
#1	**1**	**Time of Concentration:**					**0.941**
#1	2	5. Nearly bare and untilled, and alluvial valley fans	6.63	70.00	1,056.00	2.570	0.114
		5. Nearly bare and untilled, and alluvial valley fans	1.98	150.00	7,573.00	1.400	1.502
#1	**2**	**Time of Concentration:**					**1.616**
#1	3	5. Nearly bare and untilled, and alluvial valley fans	1.65	117.00	7,070.00	1.280	1.534

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	2.43	126.00	5,188.00	4.670	0.308
#1	**3**	**Time of Concentration:**					**1.842**
#1	4	5. Nearly bare and untilled, and alluvial valley fans	5.77	260.00	4,506.00	2.400	0.521
		8. Large gullies, diversions, and low flowing streams	2.84	168.00	5,924.00	5.050	0.325
#1	**4**	**Time of Concentration:**					**0.846**
#1	5	5. Nearly bare and untilled, and alluvial valley fans	19.93	180.00	903.00	4.460	0.056
		8. Large gullies, diversions, and low flowing streams	3.30	178.00	5,393.00	5.450	0.274
#1	**5**	**Time of Concentration:**					**0.330**
#1	6	5. Nearly bare and untilled, and alluvial valley fans	13.43	105.00	782.00	3.660	0.059
		8. Large gullies, diversions, and low flowing streams	2.62	283.00	10,822.00	4.850	0.619
#1	**6**	**Time of Concentration:**					**0.678**
#2	1	5. Nearly bare and untilled, and alluvial valley fans	6.84	70.00	1,024.00	2.610	0.108
		8. Large gullies, diversions, and low flowing streams	1.62	70.00	4,325.00	3.810	0.315
#2	**1**	**Time of Concentration:**					**0.423**
#2	2	5. Nearly bare and untilled, and alluvial valley fans	5.56	45.00	810.00	2.350	0.095
		8. Large gullies, diversions, and low flowing streams	0.86	40.00	4,663.00	2.770	0.467
#2	**2**	**Time of Concentration:**					**0.562**
#2	3	5. Nearly bare and untilled, and alluvial valley fans	5.89	50.00	849.00	2.420	0.097
		8. Large gullies, diversions, and low flowing streams	1.17	80.00	6,862.00	3.230	0.590
#2	**3**	**Time of Concentration:**					**0.687**
#2	4	5. Nearly bare and untilled, and alluvial valley fans	12.63	95.00	752.00	3.550	0.058
		8. Large gullies, diversions, and low flowing streams	1.40	135.00	9,630.00	3.550	0.753
#2	**4**	**Time of Concentration:**					**0.811**
#2	5	5. Nearly bare and untilled, and alluvial valley fans	11.02	70.00	635.00	3.320	0.053
		8. Large gullies, diversions, and low flowing streams	0.46	40.00	8,732.00	2.030	1.194
#2	**5**	**Time of Concentration:**					**1.247**
#3	1	5. Nearly bare and untilled, and alluvial valley fans	1.24	10.00	805.00	1.110	0.201
		8. Large gullies, diversions, and low flowing streams	1.33	40.00	3,017.00	3.450	0.242
#3	**1**	**Time of Concentration:**					**0.443**
#3	2	5. Nearly bare and untilled, and alluvial valley fans	0.68	10.00	1,478.00	0.820	0.500

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	1.78	100.00	5,622.00	4.000	0.390
#3	**2**	**Time of Concentration:**					**0.890**
#3	3	5. Nearly bare and untilled, and alluvial valley fans	4.66	70.00	1,501.00	2.150	0.193
		8. Large gullies, diversions, and low flowing streams	1.17	60.00	5,126.00	3.240	0.439
#3	**3**	**Time of Concentration:**					**0.632**
#5	1	5. Nearly bare and untilled, and alluvial valley fans	19.06	285.00	1,495.00	4.360	0.095
		8. Large gullies, diversions, and low flowing streams	2.64	242.00	9,174.00	4.870	0.523
#5	**1**	**Time of Concentration:**					**0.618**
#5	2	5. Nearly bare and untilled, and alluvial valley fans	14.27	105.00	736.00	3.770	0.054
		8. Large gullies, diversions, and low flowing streams	4.08	297.00	7,279.00	6.050	0.334
#5	**2**	**Time of Concentration:**					**0.388**
#5	3	5. Nearly bare and untilled, and alluvial valley fans	8.27	35.00	423.00	2.870	0.040
		8. Large gullies, diversions, and low flowing streams	3.44	208.00	6,049.00	5.560	0.302
#5	**3**	**Time of Concentration:**					**0.342**
#5	4	5. Nearly bare and untilled, and alluvial valley fans	14.58	85.00	583.00	3.810	0.042
		8. Large gullies, diversions, and low flowing streams	4.53	248.00	5,473.00	6.380	0.238
#5	**4**	**Time of Concentration:**					**0.280**
#5	5	5. Nearly bare and untilled, and alluvial valley fans	5.07	70.00	1,382.00	2.250	0.170
		8. Large gullies, diversions, and low flowing streams	3.89	170.00	4,375.00	5.910	0.205
#5	**5**	**Time of Concentration:**					**0.375**
#5	6	5. Nearly bare and untilled, and alluvial valley fans	12.48	90.00	721.00	3.530	0.056
		8. Large gullies, diversions, and low flowing streams	5.16	274.00	5,308.02	6.810	0.216
#5	**6**	**Time of Concentration:**					**0.272**
#6	1	5. Nearly bare and untilled, and alluvial valley fans	5.36	75.00	1,399.00	2.310	0.168
		8. Large gullies, diversions, and low flowing streams	2.41	66.00	2,742.00	4.650	0.163
#6	**1**	**Time of Concentration:**					**0.331**
#6	2	5. Nearly bare and untilled, and alluvial valley fans	3.39	80.00	2,359.00	1.840	0.356
		8. Large gullies, diversions, and low flowing streams	2.63	80.00	3,039.00	4.860	0.173
#6	**2**	**Time of Concentration:**					**0.529**
#6	3	5. Nearly bare and untilled, and alluvial valley fans	4.60	34.00	739.00	2.140	0.095

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	2.33	136.00	5,845.00	4.570	0.355
#6	**3**	**Time of Concentration:**					**0.450**
#6	4	5. Nearly bare and untilled, and alluvial valley fans	6.06	85.00	1,402.00	2.460	0.158
		8. Large gullies, diversions, and low flowing streams	2.52	96.00	3,810.00	4.760	0.222
#6	**4**	**Time of Concentration:**					**0.380**
#6	5	5. Nearly bare and untilled, and alluvial valley fans	7.24	70.00	967.00	2.690	0.099
		8. Large gullies, diversions, and low flowing streams	2.34	117.00	5,003.00	4.580	0.303
#6	**5**	**Time of Concentration:**					**0.402**
#6	6	5. Nearly bare and untilled, and alluvial valley fans	31.83	183.00	575.00	5.640	0.028
		8. Large gullies, diversions, and low flowing streams	3.38	270.00	7,990.00	5.510	0.402
#6	**6**	**Time of Concentration:**					**0.430**
#6	7	5. Nearly bare and untilled, and alluvial valley fans	23.08	325.00	1,408.00	4.800	0.081
		8. Large gullies, diversions, and low flowing streams	2.88	240.00	8,327.00	5.090	0.454
#6	**7**	**Time of Concentration:**					**0.535**
#7	1	5. Nearly bare and untilled, and alluvial valley fans	11.42	90.00	788.00	3.370	0.064
		8. Large gullies, diversions, and low flowing streams	1.46	230.00	15,769.00	3.620	1.210
#7	**1**	**Time of Concentration:**					**1.274**
#7	2	5. Nearly bare and untilled, and alluvial valley fans	10.97	60.00	547.00	3.310	0.045
		8. Large gullies, diversions, and low flowing streams	1.61	220.00	13,660.00	3.800	0.998
#7	**2**	**Time of Concentration:**					**1.043**
#7	3	5. Nearly bare and untilled, and alluvial valley fans	6.40	60.00	938.00	2.520	0.103
		8. Large gullies, diversions, and low flowing streams	1.72	171.00	9,931.00	3.930	0.701
#7	**3**	**Time of Concentration:**					**0.804**
#7	4	5. Nearly bare and untilled, and alluvial valley fans	19.23	80.00	416.00	4.380	0.026
		8. Large gullies, diversions, and low flowing streams	2.45	100.00	4,083.00	4.690	0.241
#7	**4**	**Time of Concentration:**					**0.267**
#7	5	5. Nearly bare and untilled, and alluvial valley fans	6.09	67.00	1,101.00	2.460	0.124
		8. Large gullies, diversions, and low flowing streams	2.51	80.00	3,184.00	4.750	0.186
#7	**5**	**Time of Concentration:**					**0.310**
#7	6	5. Nearly bare and untilled, and alluvial valley fans	5.93	63.00	1,062.00	2.430	0.121

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	2.74	82.00	2,993.00	4.960	0.167
#7	**6**	**Time of Concentration:**					**0.288**
#7	7	5. Nearly bare and untilled, and alluvial valley fans	7.97	65.00	816.00	2.820	0.080
		8. Large gullies, diversions, and low flowing streams	3.48	153.00	4,400.00	5.590	0.218
#7	**7**	**Time of Concentration:**					**0.298**
#7	8	5. Nearly bare and untilled, and alluvial valley fans	6.60	50.00	758.00	2.560	0.082
		8. Large gullies, diversions, and low flowing streams	4.66	473.00	10,157.00	6.470	0.436
#7	**8**	**Time of Concentration:**					**0.518**
#9	1	5. Nearly bare and untilled, and alluvial valley fans	3.01	55.00	1,829.00	1.730	0.293
		8. Large gullies, diversions, and low flowing streams	0.76	50.00	6,548.00	2.620	0.694
#9	**1**	**Time of Concentration:**					**0.987**
#9	2	5. Nearly bare and untilled, and alluvial valley fans	4.67	70.00	1,500.02	2.160	0.192
		8. Large gullies, diversions, and low flowing streams	1.43	45.00	3,150.15	3.580	0.244
#9	**2**	**Time of Concentration:**					**0.436**
#9	3	5. Nearly bare and untilled, and alluvial valley fans	4.44	40.00	900.00	2.100	0.119
		8. Large gullies, diversions, and low flowing streams	1.48	40.00	2,700.14	3.650	0.205
#9	**3**	**Time of Concentration:**					**0.324**
#9	4	5. Nearly bare and untilled, and alluvial valley fans	6.50	65.00	1,000.00	2.540	0.109
		8. Large gullies, diversions, and low flowing streams	1.00	20.00	2,000.00	3.000	0.185
		9. Small streams flowing bankfull	2.92	35.00	1,200.00	15.370	0.021
#9	**4**	**Time of Concentration:**					**0.315**
#10	1	5. Nearly bare and untilled, and alluvial valley fans	1.24	41.00	3,317.00	1.110	0.830
		8. Large gullies, diversions, and low flowing streams	0.70	29.00	4,125.00	2.510	0.456
#10	**1**	**Time of Concentration:**					**1.286**
#10	2	5. Nearly bare and untilled, and alluvial valley fans	2.25	125.00	5,554.00	1.500	1.028
		8. Large gullies, diversions, and low flowing streams	2.13	85.00	3,997.00	4.370	0.254
#10	**2**	**Time of Concentration:**					**1.282**
#10	3	5. Nearly bare and untilled, and alluvial valley fans	1.39	68.00	4,904.00	1.170	1.164
		8. Large gullies, diversions, and low flowing streams	4.73	90.00	1,904.00	6.520	0.081
#10	**3**	**Time of Concentration:**					**1.245**
#10	4	5. Nearly bare and untilled, and alluvial valley fans	3.76	51.00	1,357.00	1.930	0.195

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	0.65	22.00	3,385.00	2.410	0.390
#10	**4**	**Time of Concentration:**					**0.585**
#10	5	5. Nearly bare and untilled, and alluvial valley fans	1.63	88.00	5,391.16	1.270	1.179
#10	**5**	**Time of Concentration:**					**1.179**
#12	1	5. Nearly bare and untilled, and alluvial valley fans	4.50	75.00	1,667.00	2.120	0.218
		8. Large gullies, diversions, and low flowing streams	1.85	155.00	8,400.00	4.070	0.573
#12	**1**	**Time of Concentration:**					**0.791**
#12	2	5. Nearly bare and untilled, and alluvial valley fans	2.99	50.00	1,674.03	1.720	0.270
		8. Large gullies, diversions, and low flowing streams	1.67	70.00	4,201.17	3.870	0.301
#12	**2**	**Time of Concentration:**					**0.571**
#12	3	5. Nearly bare and untilled, and alluvial valley fans	4.04	57.00	1,411.00	2.000	0.195
		8. Large gullies, diversions, and low flowing streams	1.55	107.00	6,884.00	3.740	0.511
#12	**3**	**Time of Concentration:**					**0.706**
#12	4	5. Nearly bare and untilled, and alluvial valley fans	2.23	84.00	3,771.04	1.490	0.703
		8. Large gullies, diversions, and low flowing streams	1.62	186.00	11,515.60	3.810	0.839
#12	**4**	**Time of Concentration:**					**1.542**
#12	5	5. Nearly bare and untilled, and alluvial valley fans	3.68	53.00	1,442.00	1.910	0.209
		8. Large gullies, diversions, and low flowing streams	1.95	120.00	6,155.00	4.180	0.409
#12	**5**	**Time of Concentration:**					**0.618**
#13	1	5. Nearly bare and untilled, and alluvial valley fans	4.62	62.00	1,342.00	2.140	0.174
		8. Large gullies, diversions, and low flowing streams	1.91	157.00	8,225.00	4.140	0.551
#13	**1**	**Time of Concentration:**					**0.725**
#13	2	5. Nearly bare and untilled, and alluvial valley fans	2.91	50.00	1,717.00	1.700	0.280
		8. Large gullies, diversions, and low flowing streams	2.28	183.00	8,039.00	4.520	0.494
#13	**2**	**Time of Concentration:**					**0.774**
#13	3	5. Nearly bare and untilled, and alluvial valley fans	6.18	95.00	1,537.00	2.480	0.172
		8. Large gullies, diversions, and low flowing streams	2.13	135.00	6,347.00	4.370	0.403
#13	**3**	**Time of Concentration:**					**0.575**
#13	4	5. Nearly bare and untilled, and alluvial valley fans	3.17	10.00	315.00	1.780	0.049
		8. Large gullies, diversions, and low flowing streams	2.30	100.00	4,344.00	4.550	0.265
#13	**4**	**Time of Concentration:**					**0.314**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#13	5	5. Nearly bare and untilled, and alluvial valley fans	3.10	70.00	2,255.00	1.760	0.355
		8. Large gullies, diversions, and low flowing streams	1.23	140.00	11,392.00	3.320	0.953
#13	**5**	**Time of Concentration:**					**1.308**
#14	1	5. Nearly bare and untilled, and alluvial valley fans	10.59	63.00	595.00	3.250	0.050
		8. Large gullies, diversions, and low flowing streams	2.60	151.00	5,808.00	4.830	0.334
#14	**1**	**Time of Concentration:**					**0.384**
#14	2	5. Nearly bare and untilled, and alluvial valley fans	7.28	67.00	920.00	2.690	0.095
		8. Large gullies, diversions, and low flowing streams	2.17	123.00	5,670.00	4.410	0.357
#14	**2**	**Time of Concentration:**					**0.452**
#14	3	5. Nearly bare and untilled, and alluvial valley fans	21.46	150.00	699.00	4.630	0.041
		8. Large gullies, diversions, and low flowing streams	3.10	364.00	11,728.00	5.280	0.617
#14	**3**	**Time of Concentration:**					**0.658**
#14	4	5. Nearly bare and untilled, and alluvial valley fans	3.39	35.00	1,032.00	1.840	0.155
		8. Large gullies, diversions, and low flowing streams	2.97	103.00	3,470.00	5.160	0.186
#14	**4**	**Time of Concentration:**					**0.341**
#14	5	5. Nearly bare and untilled, and alluvial valley fans	28.15	125.00	444.00	5.300	0.023
		8. Large gullies, diversions, and low flowing streams	4.18	246.00	5,886.00	6.130	0.266
#14	**5**	**Time of Concentration:**					**0.289**
#14	6	5. Nearly bare and untilled, and alluvial valley fans	3.18	40.00	1,257.00	1.780	0.196
		8. Large gullies, diversions, and low flowing streams	2.29	228.00	9,963.00	4.530	0.610
#14	**6**	**Time of Concentration:**					**0.806**
#14	7	5. Nearly bare and untilled, and alluvial valley fans	16.72	100.00	598.00	4.080	0.040
		8. Large gullies, diversions, and low flowing streams	2.81	243.00	8,649.00	5.020	0.478
#14	**7**	**Time of Concentration:**					**0.518**
#14	8	5. Nearly bare and untilled, and alluvial valley fans	1.70	47.00	2,765.00	1.300	0.590
		8. Large gullies, diversions, and low flowing streams	2.44	274.00	11,208.00	4.690	0.663
#14	**8**	**Time of Concentration:**					**1.253**
#14	9	5. Nearly bare and untilled, and alluvial valley fans	2.87	105.00	3,657.00	1.690	0.601
		8. Large gullies, diversions, and low flowing streams	2.43	194.00	7,991.00	4.670	0.475
#14	**9**	**Time of Concentration:**					**1.076**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#14	10	5. Nearly bare and untilled, and alluvial valley fans	2.75	80.00	2,907.00	1.650	0.489
		8. Large gullies, diversions, and low flowing streams	2.41	172.00	7,149.00	4.650	0.427
#14	**10**	**Time of Concentration:**					**0.916**
#15	1	5. Nearly bare and untilled, and alluvial valley fans	12.80	54.00	422.00	3.570	0.032
		8. Large gullies, diversions, and low flowing streams	1.68	181.00	10,781.00	3.880	0.771
#15	**1**	**Time of Concentration:**					**0.803**
#15	2	5. Nearly bare and untilled, and alluvial valley fans	44.22	260.00	588.00	6.640	0.024
		8. Large gullies, diversions, and low flowing streams	2.45	254.00	10,354.24	4.690	0.613
#15	**2**	**Time of Concentration:**					**0.637**
#15	3	5. Nearly bare and untilled, and alluvial valley fans	10.04	85.00	847.00	3.160	0.074
		8. Large gullies, diversions, and low flowing streams	2.34	366.00	15,663.00	4.580	0.949
#15	**3**	**Time of Concentration:**					**1.023**
#16	1	5. Nearly bare and untilled, and alluvial valley fans	2.26	117.00	5,179.00	1.500	0.959
		8. Large gullies, diversions, and low flowing streams	0.46	26.00	5,601.00	2.040	0.762
#16	**1**	**Time of Concentration:**					**1.721**
#16	2	5. Nearly bare and untilled, and alluvial valley fans	8.70	62.00	713.00	2.940	0.067
		8. Large gullies, diversions, and low flowing streams	1.99	144.00	7,241.00	4.230	0.475
#16	**2**	**Time of Concentration:**					**0.542**
#16	3	5. Nearly bare and untilled, and alluvial valley fans	6.88	32.00	465.00	2.620	0.049
		8. Large gullies, diversions, and low flowing streams	2.29	81.00	3,543.00	4.530	0.217
#16	**3**	**Time of Concentration:**					**0.266**
#17	1	5. Nearly bare and untilled, and alluvial valley fans	9.37	65.00	694.00	3.060	0.062
		8. Large gullies, diversions, and low flowing streams	1.19	56.00	4,712.00	3.270	0.400
#17	**1**	**Time of Concentration:**					**0.462**
#18	1	5. Nearly bare and untilled, and alluvial valley fans	9.00	60.00	667.00	2.990	0.061
		8. Large gullies, diversions, and low flowing streams	0.97	61.00	6,287.00	2.950	0.591
#18	**1**	**Time of Concentration:**					**0.652**
#18	2	5. Nearly bare and untilled, and alluvial valley fans	2.47	33.00	1,336.00	1.570	0.236
		8. Large gullies, diversions, and low flowing streams	2.01	164.00	8,154.00	4.250	0.532
#18	**2**	**Time of Concentration:**					**0.768**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#20	1	5. Nearly bare and untilled, and alluvial valley fans	11.87	45.00	379.00	3.440	0.030
		8. Large gullies, diversions, and low flowing streams	0.75	45.00	5,969.00	2.600	0.637
#20	**1**	**Time of Concentration:**					**0.667**
#20	2	5. Nearly bare and untilled, and alluvial valley fans	5.40	45.00	833.00	2.320	0.099
		8. Large gullies, diversions, and low flowing streams	1.30	98.00	7,547.00	3.410	0.614
#20	**2**	**Time of Concentration:**					**0.713**
#21	1	5. Nearly bare and untilled, and alluvial valley fans	4.09	60.00	1,467.02	2.020	0.201
		8. Large gullies, diversions, and low flowing streams	0.93	60.00	6,433.62	2.890	0.618
#21	**1**	**Time of Concentration:**					**0.819**
#21	2	5. Nearly bare and untilled, and alluvial valley fans	3.85	50.00	1,300.00	1.960	0.184
		8. Large gullies, diversions, and low flowing streams	42.86	900.00	2,100.00	19.630	0.029
#21	**2**	**Time of Concentration:**					**0.213**
#21	3	5. Nearly bare and untilled, and alluvial valley fans	1.70	15.00	881.00	1.300	0.188
		9. Small streams flowing bankfull	1.49	60.00	4,014.18	11.000	0.101
#21	**3**	**Time of Concentration:**					**0.289**
#21	4	5. Nearly bare and untilled, and alluvial valley fans	2.21	40.00	1,811.02	1.480	0.339
		8. Large gullies, diversions, and low flowing streams	0.84	50.00	5,949.54	2.750	0.600
#21	**4**	**Time of Concentration:**					**0.939**
#21	5	5. Nearly bare and untilled, and alluvial valley fans	4.00	30.00	750.00	2.000	0.104
		8. Large gullies, diversions, and low flowing streams	2.34	75.00	3,200.06	4.590	0.193
#21	**5**	**Time of Concentration:**					**0.297**
#23	1	5. Nearly bare and untilled, and alluvial valley fans	8.00	80.00	1,000.00	2.820	0.098
		8. Large gullies, diversions, and low flowing streams	2.74	85.00	3,100.00	4.960	0.173
		8. Large gullies, diversions, and low flowing streams	0.40	8.00	2,000.00	1.890	0.293
#23	**1**	**Time of Concentration:**					**0.564**
#24	1	5. Nearly bare and untilled, and alluvial valley fans	1.71	430.00	25,118.00	1.300	5.367
#24	**1**	**Time of Concentration:**					**5.367**
#24	2	5. Nearly bare and untilled, and alluvial valley fans	1.84	430.00	23,393.00	1.350	4.813
#24	**2**	**Time of Concentration:**					**4.813**
#24	3	5. Nearly bare and untilled, and alluvial valley fans	1.82	155.00	8,498.00	1.350	1.748
		8. Large gullies, diversions, and low flowing streams	0.84	40.00	4,771.00	2.740	0.483

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#24	**3**	**Time of Concentration:**					**2.231**
#24	4	5. Nearly bare and untilled, and alluvial valley fans	1.24	50.00	4,042.00	1.110	1.011
		8. Large gullies, diversions, and low flowing streams	0.49	60.00	12,150.00	2.100	1.607
#24	**4**	**Time of Concentration:**					**2.618**
#25	1	5. Nearly bare and untilled, and alluvial valley fans	0.51	10.00	1,950.00	0.710	0.762
		8. Large gullies, diversions, and low flowing streams	1.81	60.00	3,322.00	4.030	0.228
#25	**1**	**Time of Concentration:**					**0.990**
#25	2	5. Nearly bare and untilled, and alluvial valley fans	1.11	25.00	2,254.00	1.050	0.596
		8. Large gullies, diversions, and low flowing streams	2.36	75.00	3,178.00	4.600	0.191
#25	**2**	**Time of Concentration:**					**0.787**
#25	3	5. Nearly bare and untilled, and alluvial valley fans	3.23	30.00	929.00	1.790	0.144
		8. Large gullies, diversions, and low flowing streams	2.45	154.00	6,297.00	4.690	0.372
#25	**3**	**Time of Concentration:**					**0.516**
#26	1	5. Nearly bare and untilled, and alluvial valley fans	1.20	103.00	8,602.00	1.090	2.192
#26	**1**	**Time of Concentration:**					**2.192**
#26	2	5. Nearly bare and untilled, and alluvial valley fans	1.23	120.00	9,780.00	1.100	2.469
		8. Large gullies, diversions, and low flowing streams	2.18	184.00	8,454.00	4.420	0.531
#26	**2**	**Time of Concentration:**					**3.000**
#27	1	5. Nearly bare and untilled, and alluvial valley fans	4.32	50.00	1,158.02	2.070	0.155
		8. Large gullies, diversions, and low flowing streams	2.53	198.00	7,838.16	4.760	0.457
#27	**1**	**Time of Concentration:**					**0.612**
#27	2	5. Nearly bare and untilled, and alluvial valley fans	5.26	30.00	570.00	2.290	0.069
		8. Large gullies, diversions, and low flowing streams	3.15	278.00	8,822.00	5.320	0.460
#27	**2**	**Time of Concentration:**					**0.529**
#27	3	5. Nearly bare and untilled, and alluvial valley fans	16.33	80.00	490.00	4.040	0.033
		8. Large gullies, diversions, and low flowing streams	2.15	225.00	10,443.00	4.400	0.659
#27	**3**	**Time of Concentration:**					**0.692**
#27	4	5. Nearly bare and untilled, and alluvial valley fans	12.43	65.00	523.00	3.520	0.041
		8. Large gullies, diversions, and low flowing streams	3.49	225.00	6,454.00	5.600	0.320
#27	**4**	**Time of Concentration:**					**0.361**
#27	5	5. Nearly bare and untilled, and alluvial valley fans	9.40	25.00	266.00	3.060	0.024

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	2.32	364.00	15,700.00	4.560	0.956
#27	**5**	**Time of Concentration:**					**0.980**
#28	1	5. Nearly bare and untilled, and alluvial valley fans	5.25	40.00	762.00	2.290	0.092
		8. Large gullies, diversions, and low flowing streams	2.96	310.00	10,479.34	5.150	0.565
#28	**1**	**Time of Concentration:**					**0.657**
#28	2	5. Nearly bare and untilled, and alluvial valley fans	25.86	105.00	406.00	5.080	0.022
		8. Large gullies, diversions, and low flowing streams	2.96	310.00	10,479.34	5.150	0.565
#28	**2**	**Time of Concentration:**					**0.587**
#29	1	5. Nearly bare and untilled, and alluvial valley fans	11.58	30.00	259.00	3.400	0.021
		8. Large gullies, diversions, and low flowing streams	3.61	288.00	7,976.00	5.700	0.388
#29	**1**	**Time of Concentration:**					**0.409**
#29	2	5. Nearly bare and untilled, and alluvial valley fans	8.06	40.00	496.00	2.830	0.048
		8. Large gullies, diversions, and low flowing streams	2.90	252.00	8,693.55	5.100	0.473
#29	**2**	**Time of Concentration:**					**0.521**
#29	3	5. Nearly bare and untilled, and alluvial valley fans	7.25	25.00	345.00	2.690	0.035
		8. Large gullies, diversions, and low flowing streams	2.26	158.00	7,001.00	4.500	0.432
#29	**3**	**Time of Concentration:**					**0.467**
#30	1	5. Nearly bare and untilled, and alluvial valley fans	4.93	35.00	710.00	2.220	0.088
		8. Large gullies, diversions, and low flowing streams	1.67	243.00	14,540.00	3.870	1.043
#30	**1**	**Time of Concentration:**					**1.131**
#31	1	5. Nearly bare and untilled, and alluvial valley fans	2.91	15.00	515.00	1.700	0.084
		8. Large gullies, diversions, and low flowing streams	2.74	247.00	9,006.00	4.960	0.504
#31	**1**	**Time of Concentration:**					**0.588**
#31	2	5. Nearly bare and untilled, and alluvial valley fans	7.46	25.00	335.00	2.730	0.034
		8. Large gullies, diversions, and low flowing streams	2.18	138.00	6,335.00	4.420	0.398
#31	**2**	**Time of Concentration:**					**0.432**
#31	3	5. Nearly bare and untilled, and alluvial valley fans	3.84	20.00	521.00	1.950	0.074
		8. Large gullies, diversions, and low flowing streams	2.24	108.00	4,826.00	4.480	0.299
#31	**3**	**Time of Concentration:**					**0.373**
#32	1	5. Nearly bare and untilled, and alluvial valley fans	3.48	22.00	632.00	1.860	0.094

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	1.56	101.00	6,494.00	3.740	0.482
#32	**1**	**Time of Concentration:**					**0.576**
#34	1	5. Nearly bare and untilled, and alluvial valley fans	2.28	35.00	1,538.00	1.500	0.284
		8. Large gullies, diversions, and low flowing streams	2.89	74.00	2,560.00	5.100	0.139
#34	**1**	**Time of Concentration:**					**0.423**
#34	2	5. Nearly bare and untilled, and alluvial valley fans	2.69	38.00	1,415.00	1.630	0.241
		8. Large gullies, diversions, and low flowing streams	1.60	81.00	5,052.00	3.790	0.370
#34	**2**	**Time of Concentration:**					**0.611**
#34	3	5. Nearly bare and untilled, and alluvial valley fans	3.80	56.00	1,474.00	1.940	0.211
		8. Large gullies, diversions, and low flowing streams	0.70	30.00	4,293.00	2.500	0.477
#34	**3**	**Time of Concentration:**					**0.688**
#34	4	5. Nearly bare and untilled, and alluvial valley fans	4.17	35.00	840.00	2.040	0.114
		8. Large gullies, diversions, and low flowing streams	1.89	72.00	3,807.00	4.120	0.256
#34	**4**	**Time of Concentration:**					**0.370**
#36	1	5. Nearly bare and untilled, and alluvial valley fans	3.21	90.00	2,800.00	1.790	0.434
		8. Large gullies, diversions, and low flowing streams	2.54	33.00	1,300.00	4.770	0.075
		9. Small streams flowing bankfull	0.40	8.00	2,000.00	5.690	0.097
#36	**1**	**Time of Concentration:**					**0.606**
#36	2	5. Nearly bare and untilled, and alluvial valley fans	6.92	90.00	1,300.00	2.630	0.137
		8. Large gullies, diversions, and low flowing streams	47.06	800.00	1,700.00	20.570	0.022
#36	**2**	**Time of Concentration:**					**0.159**
#36	3	5. Nearly bare and untilled, and alluvial valley fans	90.00	900.00	1,000.00	9.480	0.029
		8. Large gullies, diversions, and low flowing streams	3.70	100.00	2,700.00	5.770	0.129
#36	**3**	**Time of Concentration:**					**0.158**
#37	1	5. Nearly bare and untilled, and alluvial valley fans	4.68	129.00	2,754.05	2.160	0.354
		8. Large gullies, diversions, and low flowing streams	0.16	10.00	6,108.73	1.210	1.402
#37	**1**	**Time of Concentration:**					**1.756**
#37	2	5. Nearly bare and untilled, and alluvial valley fans	5.17	44.97	869.82	2.270	0.106
		8. Large gullies, diversions, and low flowing streams	2.01	95.23	4,737.81	4.250	0.309
#37	**2**	**Time of Concentration:**					**0.415**
#37	3	5. Nearly bare and untilled, and alluvial valley fans	3.52	30.00	853.00	1.870	0.126

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	4.02	179.85	4,474.00	6.010	0.206
#37	**3**	**Time of Concentration:**					**0.332**
#37	4	5. Nearly bare and untilled, and alluvial valley fans	3.18	34.82	1,095.00	1.780	0.170
		8. Large gullies, diversions, and low flowing streams	1.49	37.90	2,544.00	3.660	0.193
#37	**4**	**Time of Concentration:**					**0.363**
#37	5	5. Nearly bare and untilled, and alluvial valley fans	2.59	40.00	1,543.00	1.610	0.266
		8. Large gullies, diversions, and low flowing streams	1.48	67.00	4,529.00	3.640	0.345
#37	**5**	**Time of Concentration:**					**0.611**
#37	6	8. Large gullies, diversions, and low flowing streams	3.42	65.00	1,900.00	5.540	0.095
#37	**6**	**Time of Concentration:**					**0.095**
#37	7	5. Nearly bare and untilled, and alluvial valley fans	6.00	30.00	500.00	2.440	0.056
		8. Large gullies, diversions, and low flowing streams	1.36	45.00	3,300.00	3.500	0.261
		8. Large gullies, diversions, and low flowing streams	1.11	45.00	4,050.00	3.160	0.356
#37	**7**	**Time of Concentration:**					**0.673**
#37	8	5. Nearly bare and untilled, and alluvial valley fans	8.33	50.00	600.00	2.880	0.057
		8. Large gullies, diversions, and low flowing streams	6.00	150.00	2,500.00	7.340	0.094
#37	**8**	**Time of Concentration:**					**0.151**
#37	9	5. Nearly bare and untilled, and alluvial valley fans	7.00	70.00	1,000.00	2.640	0.105
		8. Large gullies, diversions, and low flowing streams	12.00	60.00	500.00	10.390	0.013
#37	**9**	**Time of Concentration:**					**0.118**

Subwatershed Muskingum Routing Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	2	8. Large gullies, diversions, and low flowing streams	1.29	107.00	8,294.00	3.400	0.677
#1	**2**	**Muskingum K:**					**0.677**
#1	3	8. Large gullies, diversions, and low flowing streams	1.27	113.00	8,880.00	3.380	0.729
#1	**3**	**Muskingum K:**					**0.729**
#1	4	8. Large gullies, diversions, and low flowing streams	1.35	171.00	12,634.00	3.490	1.005
#1	**4**	**Muskingum K:**					**1.005**
#1	5	8. Large gullies, diversions, and low flowing streams	1.49	274.00	18,349.00	3.660	1.392

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	**5**	**Muskingum K:**					**1.392**
#1	6	8. Large gullies, diversions, and low flowing streams	1.49	274.00	18,349.00	3.660	1.392
#1	**6**	**Muskingum K:**					**1.392**
#2	2	8. Large gullies, diversions, and low flowing streams	0.53	20.00	3,756.00	2.180	0.478
#2	**2**	**Muskingum K:**					**0.478**
#2	3	8. Large gullies, diversions, and low flowing streams	0.55	25.00	4,570.00	2.210	0.574
#2	**3**	**Muskingum K:**					**0.574**
#2	4	8. Large gullies, diversions, and low flowing streams	0.55	25.00	4,570.00	2.210	0.574
#2	**4**	**Muskingum K:**					**0.574**
#2	5	8. Large gullies, diversions, and low flowing streams	0.65	45.00	6,955.00	2.410	0.801
#2	**5**	**Muskingum K:**					**0.801**
#3	3	8. Large gullies, diversions, and low flowing streams	0.92	20.00	2,168.00	2.880	0.209
#3	**3**	**Muskingum K:**					**0.209**
#5	1	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.000	0.000
#5	**1**	**Muskingum K:**					**0.000**
#5	2	8. Large gullies, diversions, and low flowing streams	1.75	125.00	7,149.00	3.960	0.501
#5	**2**	**Muskingum K:**					**0.501**
#5	3	8. Large gullies, diversions, and low flowing streams	1.65	155.00	9,418.00	3.840	0.681
#5	**3**	**Muskingum K:**					**0.681**
#5	4	8. Large gullies, diversions, and low flowing streams	1.65	155.00	9,418.00	3.840	0.681
#5	**4**	**Muskingum K:**					**0.681**
#5	5	8. Large gullies, diversions, and low flowing streams	1.67	239.00	14,273.00	3.880	1.021
#5	**5**	**Muskingum K:**					**1.021**
#5	6	8. Large gullies, diversions, and low flowing streams	1.68	239.00	14,223.00	3.880	1.018
#5	**6**	**Muskingum K:**					**1.018**
#7	1	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.000	0.000
#7	**1**	**Muskingum K:**					**0.000**
#7	2	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.000	0.000
#7	**2**	**Muskingum K:**					**0.000**
#7	4	8. Large gullies, diversions, and low flowing streams	1.16	140.00	12,037.00	3.230	1.035
#7	**4**	**Muskingum K:**					**1.035**
#7	5	8. Large gullies, diversions, and low flowing streams	1.14	140.00	12,307.69	3.190	1.071
#7	**5**	**Muskingum K:**					**1.071**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#7	6	8. Large gullies, diversions, and low flowing streams	1.17	158.00	13,546.00	3.230	1.164
#7	**6**	**Muskingum K:**					**1.164**
#7	7	8. Large gullies, diversions, and low flowing streams	1.18	187.00	15,784.00	3.260	1.344
#7	**7**	**Muskingum K:**					**1.344**
#7	8	8. Large gullies, diversions, and low flowing streams	1.18	187.00	15,784.00	3.260	1.344
#7	**8**	**Muskingum K:**					**1.344**
#9	3	8. Large gullies, diversions, and low flowing streams	0.43	9.00	2,100.00	1.960	0.297
#9	**3**	**Muskingum K:**					**0.297**
#9	4	8. Large gullies, diversions, and low flowing streams	1.01	20.00	1,975.00	3.010	0.182
		8. Large gullies, diversions, and low flowing streams	0.60	24.30	4,050.00	2.320	0.484
#9	**4**	**Muskingum K:**					**0.666**
#10	3	8. Large gullies, diversions, and low flowing streams	0.76	37.00	4,861.00	2.610	0.517
#10	**3**	**Muskingum K:**					**0.517**
#10	4	8. Large gullies, diversions, and low flowing streams	0.76	37.00	4,861.00	2.610	0.517
#10	**4**	**Muskingum K:**					**0.517**
#10	5	8. Large gullies, diversions, and low flowing streams	0.79	47.00	5,956.00	2.660	0.621
#10	**5**	**Muskingum K:**					**0.621**
#12	2	8. Large gullies, diversions, and low flowing streams	8.24	111.00	1,347.00	8.610	0.043
#12	**2**	**Muskingum K:**					**0.043**
#12	3	8. Large gullies, diversions, and low flowing streams	8.01	109.00	1,360.00	8.490	0.044
#12	**3**	**Muskingum K:**					**0.044**
#12	4	8. Large gullies, diversions, and low flowing streams	2.24	176.00	7,866.00	4.480	0.487
#12	**4**	**Muskingum K:**					**0.487**
#12	5	8. Large gullies, diversions, and low flowing streams	2.24	176.00	7,866.00	4.480	0.487
#12	**5**	**Muskingum K:**					**0.487**
#13	2	8. Large gullies, diversions, and low flowing streams	1.34	54.00	4,025.00	3.470	0.322
#13	**2**	**Muskingum K:**					**0.322**
#13	3	8. Large gullies, diversions, and low flowing streams	0.98	72.00	7,333.00	2.970	0.685
#13	**3**	**Muskingum K:**					**0.685**
#13	4	8. Large gullies, diversions, and low flowing streams	1.18	127.00	10,806.00	3.250	0.923
#13	**4**	**Muskingum K:**					**0.923**
#13	5	8. Large gullies, diversions, and low flowing streams	1.18	127.00	10,806.00	3.250	0.923
#13	**5**	**Muskingum K:**					**0.923**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#14	1	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.000	0.000
#14	**1**	**Muskingum K:**					**0.000**
#14	2	8. Large gullies, diversions, and low flowing streams	0.83	58.00	6,957.00	2.730	0.707
#14	**2**	**Muskingum K:**					**0.707**
#14	3	8. Large gullies, diversions, and low flowing streams	0.81	77.00	9,480.00	2.700	0.975
#14	**3**	**Muskingum K:**					**0.975**
#14	4	8. Large gullies, diversions, and low flowing streams	0.86	147.00	17,117.00	2.770	1.716
#14	**4**	**Muskingum K:**					**1.716**
#14	5	8. Large gullies, diversions, and low flowing streams	0.88	175.00	19,934.00	2.810	1.970
#14	**5**	**Muskingum K:**					**1.970**
#14	6	8. Large gullies, diversions, and low flowing streams	0.95	211.00	22,155.00	2.920	2.107
#14	**6**	**Muskingum K:**					**2.107**
#14	7	8. Large gullies, diversions, and low flowing streams	0.96	257.00	26,835.00	2.930	2.544
#14	**7**	**Muskingum K:**					**2.544**
#14	8	8. Large gullies, diversions, and low flowing streams	0.96	257.00	26,835.00	2.930	2.544
#14	**8**	**Muskingum K:**					**2.544**
#14	9	8. Large gullies, diversions, and low flowing streams	0.95	307.00	32,146.59	2.930	3.047
#14	**9**	**Muskingum K:**					**3.047**
#14	10	8. Large gullies, diversions, and low flowing streams	0.96	339.00	35,382.00	2.930	3.354
#14	**10**	**Muskingum K:**					**3.354**
#15	2	8. Large gullies, diversions, and low flowing streams	1.14	86.00	7,535.26	3.200	0.654
#15	**2**	**Muskingum K:**					**0.654**
#15	3	8. Large gullies, diversions, and low flowing streams	1.25	115.00	9,236.00	3.340	0.768
#15	**3**	**Muskingum K:**					**0.768**
#16	2	8. Large gullies, diversions, and low flowing streams	0.55	42.00	7,608.00	2.220	0.951
#16	**2**	**Muskingum K:**					**0.951**
#16	3	8. Large gullies, diversions, and low flowing streams	0.51	54.00	10,615.00	2.130	1.384
#16	**3**	**Muskingum K:**					**1.384**
#17	1	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.000	0.000
#17	**1**	**Muskingum K:**					**0.000**
#18	1	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.000	0.000
#18	**1**	**Muskingum K:**					**0.000**
#18	2	8. Large gullies, diversions, and low flowing streams	1.02	62.00	6,103.00	3.020	0.561

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#18	**2**	**Muskingum K:**					**0.561**
#20	2	8. Large gullies, diversions, and low flowing streams	0.59	20.00	3,400.00	2.300	0.410
#20	**2**	**Muskingum K:**					**0.410**
#21	1	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.000	0.000
#21	**1**	**Muskingum K:**					**0.000**
#21	2	8. Large gullies, diversions, and low flowing streams	0.40	6.80	1,700.00	1.890	0.249
#21	**2**	**Muskingum K:**					**0.249**
#21	3	8. Large gullies, diversions, and low flowing streams	0.36	20.00	5,627.46	1.780	0.878
#21	**3**	**Muskingum K:**					**0.878**
#21	4	8. Large gullies, diversions, and low flowing streams	0.36	20.00	5,627.46	1.780	0.878
#21	**4**	**Muskingum K:**					**0.878**
#21	5	8. Large gullies, diversions, and low flowing streams	0.40	25.80	6,450.00	1.890	0.947
#21	**5**	**Muskingum K:**					**0.947**
#24	1	8. Large gullies, diversions, and low flowing streams	0.79	180.00	22,769.00	2.660	2.377
#24	**1**	**Muskingum K:**					**2.377**
#24	2	8. Large gullies, diversions, and low flowing streams	0.78	180.00	23,111.00	2.640	2.431
#24	**2**	**Muskingum K:**					**2.431**
#24	4	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.000	0.000
#24	**4**	**Muskingum K:**					**0.000**
#25	1	8. Large gullies, diversions, and low flowing streams	1.99	104.00	5,220.00	4.230	0.342
#25	**1**	**Muskingum K:**					**0.342**
#25	2	8. Large gullies, diversions, and low flowing streams	1.99	104.00	5,220.00	4.230	0.342
#25	**2**	**Muskingum K:**					**0.342**
#25	3	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.000	0.000
#25	**3**	**Muskingum K:**					**0.000**
#27	1	8. Large gullies, diversions, and low flowing streams	1.38	216.00	15,629.00	3.520	1.233
#27	**1**	**Muskingum K:**					**1.233**
#27	2	8. Large gullies, diversions, and low flowing streams	1.17	144.00	12,301.00	3.240	1.054
#27	**2**	**Muskingum K:**					**1.054**
#27	3	8. Large gullies, diversions, and low flowing streams	1.18	76.00	6,454.00	3.250	0.551
#27	**3**	**Muskingum K:**					**0.551**
#27	4	8. Large gullies, diversions, and low flowing streams	1.18	76.00	6,454.00	3.250	0.551
#27	**4**	**Muskingum K:**					**0.551**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#28	1	8. Large gullies, diversions, and low flowing streams	1.30	84.00	6,445.17	3.420	0.523
#28	**1**	**Muskingum K:**					**0.523**
#29	1	8. Large gullies, diversions, and low flowing streams	0.88	37.00	4,210.00	2.810	0.416
#29	**1**	**Muskingum K:**					**0.416**
#29	2	8. Large gullies, diversions, and low flowing streams	0.88	26.00	2,949.00	2.810	0.291
#29	**2**	**Muskingum K:**					**0.291**
#31	1	8. Large gullies, diversions, and low flowing streams	1.35	76.00	5,639.00	3.480	0.450
#31	**1**	**Muskingum K:**					**0.450**
#31	2	8. Large gullies, diversions, and low flowing streams	1.15	20.00	1,734.00	3.220	0.149
#31	**2**	**Muskingum K:**					**0.149**
#34	1	8. Large gullies, diversions, and low flowing streams	0.64	56.00	8,773.00	2.390	1.019
#34	**1**	**Muskingum K:**					**1.019**
#34	2	8. Large gullies, diversions, and low flowing streams	1.05	31.00	2,957.00	3.070	0.267
#34	**2**	**Muskingum K:**					**0.267**
#34	3	8. Large gullies, diversions, and low flowing streams	0.64	26.00	4,031.00	2.400	0.466
#34	**3**	**Muskingum K:**					**0.466**
#37	2	8. Large gullies, diversions, and low flowing streams	0.28	29.79	10,639.28	1.580	1.870
#37	**2**	**Muskingum K:**					**1.870**
#37	3	8. Large gullies, diversions, and low flowing streams	0.28	23.78	8,493.00	1.580	1.493
#37	**3**	**Muskingum K:**					**1.493**
#37	4	8. Large gullies, diversions, and low flowing streams	0.30	46.99	15,665.00	1.640	2.653
#37	**4**	**Muskingum K:**					**2.653**
#37	5	8. Large gullies, diversions, and low flowing streams	0.28	29.10	10,392.85	1.580	1.827
		8. Large gullies, diversions, and low flowing streams	0.30	12.15	4,050.00	1.640	0.685
#37	**5**	**Muskingum K:**					**2.512**
#37	6	8. Large gullies, diversions, and low flowing streams	0.28	29.10	10,396.00	1.580	1.827
		8. Large gullies, diversions, and low flowing streams	0.30	12.15	4,050.00	1.640	0.685
#37	**6**	**Muskingum K:**					**2.512**
#37	7	8. Large gullies, diversions, and low flowing streams	0.28	28.89	10,320.00	1.580	1.814
#37	**7**	**Muskingum K:**					**1.814**
#37	8	8. Large gullies, diversions, and low flowing streams	3.42	65.00	1,900.00	5.540	0.095
#37	**8**	**Muskingum K:**					**0.095**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#37	9	8. Large gullies, diversions, and low flowing streams	2.37	90.00	3,800.00	4.610	0.228
		8. Large gullies, diversions, and low flowing streams	0.28	23.78	8,493.00	1.580	1.493
#37	**9**	**Muskingum K:**					**1.721**

Cottonwood Arroyo Post-mine Hydrology and Sedimentology

The drainage subdivisions used to model the hydrology is shown on Exhibit 41.2-1.

Revised February 19, 2012

Art O'Hayre

General Information

Storm Information:

Storm Type:	Type II-70
Design Storm:	10 yr - 6 hr
Rainfall Depth:	1.280 inches

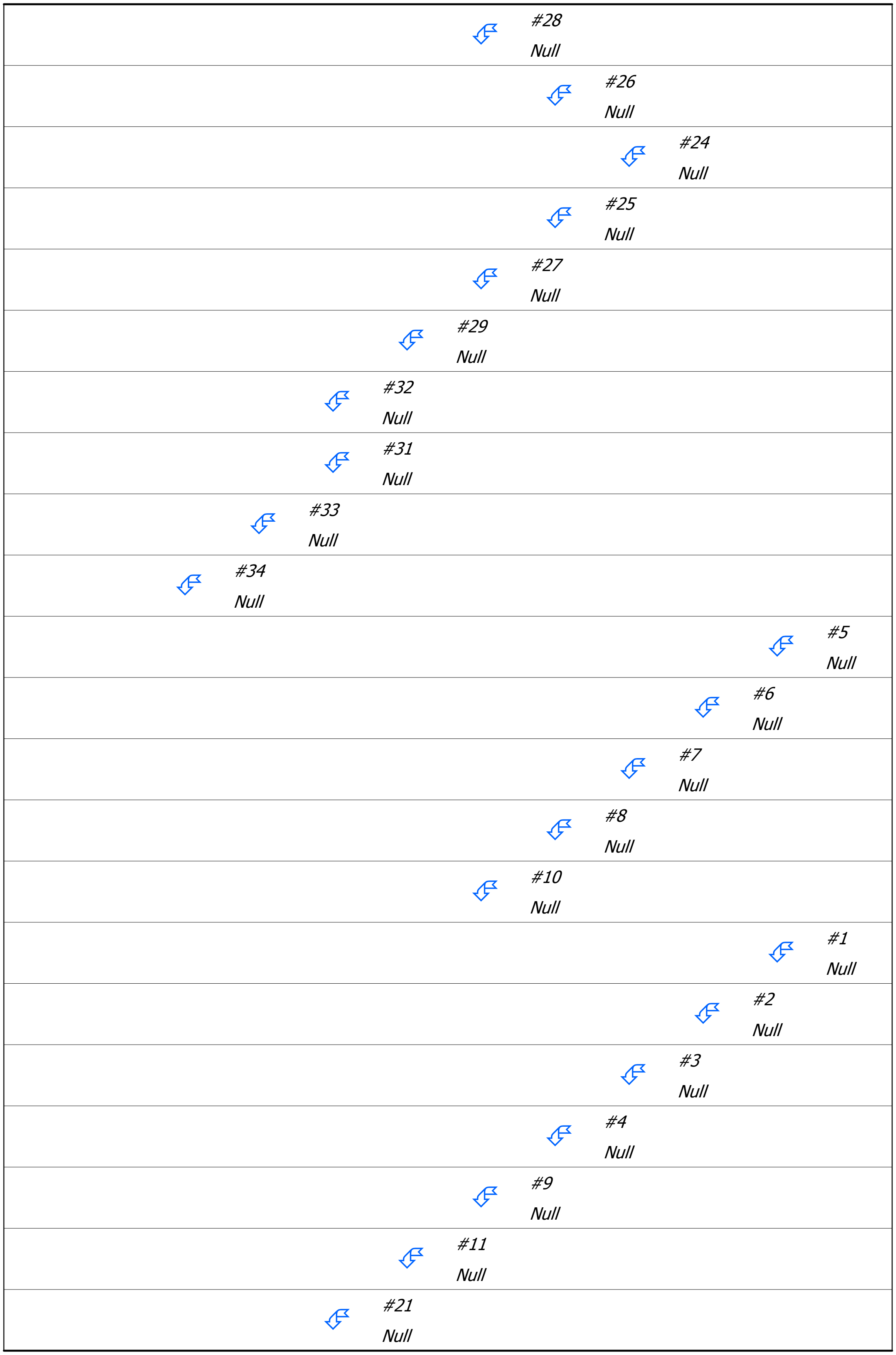
Particle Size Distribution:

Size (mm)	PostMine-LoamySand	PreMine-LoamySand	PreMine-Badlands	LoamySand Postmining
2.0000	100.000%	100.000%	100.000%	0.000%
0.1000	26.500%	30.000%	83.500%	0.000%
0.0500	14.000%	17.000%	77.000%	0.000%
0.0020	11.000%	11.000%	56.000%	0.000%
0.0010	0.000%	0.000%	0.000%	0.000%

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Null	#1	==>	#2	0.961	0.307	
Null	#2	==>	#3	0.068	0.331	
Null	#3	==>	#4	0.000	0.000	
Null	#4	==>	#9	0.718	0.281	
Null	#5	==>	#6	1.205	0.328	
Null	#6	==>	#7	0.189	0.304	
Null	#7	==>	#8	0.000	0.000	
Null	#8	==>	#10	0.989	0.300	
Null	#9	==>	#11	0.000	0.000	
Null	#10	==>	#11	0.000	0.000	
Null	#11	==>	#21	0.495	0.453	
Null	#12	==>	#13	0.076	0.330	
Null	#13	==>	#14	3.790	0.314	
Null	#14	==>	#16	1.198	0.286	
Null	#15	==>	#16	1.198	0.286	
Null	#16	==>	#20	1.087	0.273	
Null	#17	==>	#19	0.000	0.000	
Null	#18	==>	#19	0.000	0.000	
Null	#19	==>	#20	0.915	0.252	
Null	#20	==>	#22	0.000	0.000	End of Middle Fork
Null	#21	==>	#22	0.000	0.000	End of South Fork
Null	#22	==>	#23	0.811	0.247	
Null	#23	==>	#35	0.000	0.000	
Null	#24	==>	#25	0.964	0.340	
Null	#25	==>	#27	1.454	0.333	
Null	#26	==>	#27	1.454	0.333	
Null	#27	==>	#29	0.800	0.323	
Null	#28	==>	#29	0.800	0.323	
Null	#29	==>	#32	0.479	0.298	
Null	#30	==>	#32	0.479	0.298	
Null	#31	==>	#33	0.000	0.000	
Null	#32	==>	#33	0.000	0.000	
Null	#33	==>	#34	1.348	0.294	Inlet to North Fork Diversion
Null	#34	==>	#35	0.000	0.000	End of North Fork
Null	#35	==>	#36	0.735	0.251	all forks
Null	#36	==>	#37	3.388	0.246	
Null	#37	==>	End	0.000	0.000	

#30
Null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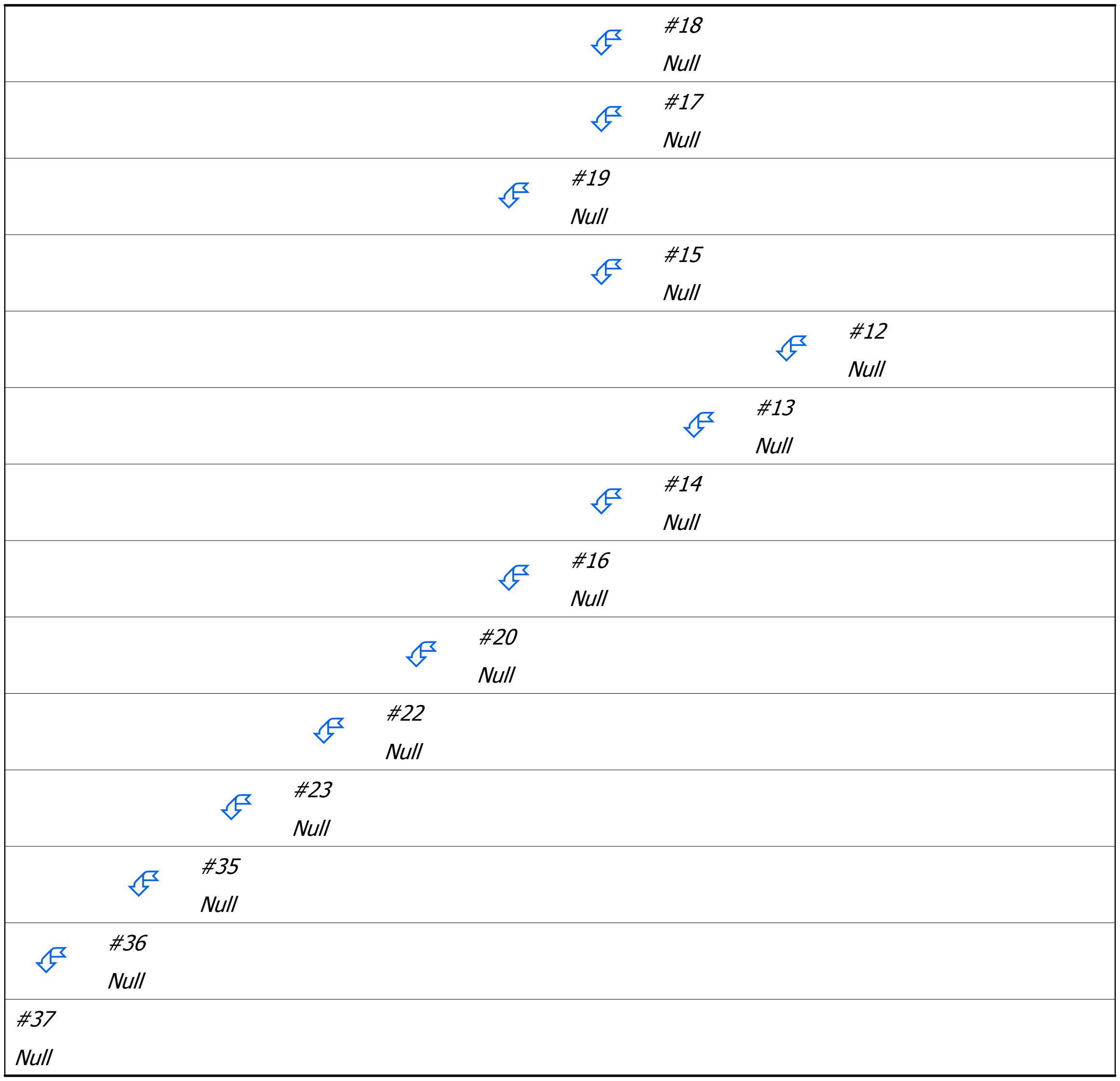


Structure Routing Details:

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	8. Large gullies, diversions, and low flowing streams	0.81	76.00	9,347.00	2.70	0.961
#1	**Muskingum K:**					**0.961**
#2	8. Large gullies, diversions, and low flowing streams	1.23	10.00	814.00	3.32	0.068
#2	**Muskingum K:**					**0.068**
#3	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.00	0.000
#3	**Muskingum K:**					**0.000**
#4	8. Large gullies, diversions, and low flowing streams	0.53	30.00	5,637.00	2.18	0.718
#4	**Muskingum K:**					**0.718**

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#5	8. Large gullies, diversions, and low flowing streams	1.17	165.00	14,065.00	3.24	1.205
#5	**Muskingum K:**					**1.205**
#6	8. Large gullies, diversions, and low flowing streams	0.78	14.00	1,799.25	2.64	0.189
#6	**Muskingum K:**					**0.189**
#8	8. Large gullies, diversions, and low flowing streams	0.72	65.00	9,046.00	2.54	0.989
#8	**Muskingum K:**					**0.989**
#11	8. Large gullies, diversions, and low flowing streams	30.00	8,801.00	29,336.66	16.43	0.495
#11	**Muskingum K:**					**0.495**
#12	8. Large gullies, diversions, and low flowing streams	1.21	11.00	906.00	3.30	0.076
#12	**Muskingum K:**					**0.076**
#13	8. Large gullies, diversions, and low flowing streams	0.92	363.00	39,301.00	2.88	3.790
#13	**Muskingum K:**					**3.790**
#14	8. Large gullies, diversions, and low flowing streams	0.58	57.00	9,834.00	2.28	1.198
#14	**Muskingum K:**					**1.198**
#15	8. Large gullies, diversions, and low flowing streams	0.58	57.00	9,834.00	2.28	1.198
#15	**Muskingum K:**					**1.198**
#16	8. Large gullies, diversions, and low flowing streams	0.46	37.00	7,984.00	2.04	1.087
#16	**Muskingum K:**					**1.087**
#19	8. Large gullies, diversions, and low flowing streams	0.33	19.00	5,699.00	1.73	0.915
#19	**Muskingum K:**					**0.915**
#22	8. Large gullies, diversions, and low flowing streams	0.31	15.00	4,852.00	1.66	0.811
#22	**Muskingum K:**					**0.811**
#24	8. Large gullies, diversions, and low flowing streams	1.46	184.00	12,568.00	3.62	0.964
#24	**Muskingum K:**					**0.964**
#25	8. Large gullies, diversions, and low flowing streams	1.28	228.00	17,755.00	3.39	1.454
#25	**Muskingum K:**					**1.454**
#26	8. Large gullies, diversions, and low flowing streams	1.28	228.00	17,755.62	3.39	1.454
#26	**Muskingum K:**					**1.454**
#27	8. Large gullies, diversions, and low flowing streams	1.07	96.00	8,938.00	3.10	0.800
#27	**Muskingum K:**					**0.800**
#28	8. Large gullies, diversions, and low flowing streams	1.07	96.00	8,938.00	3.10	0.800
#28	**Muskingum K:**					**0.800**
#29	8. Large gullies, diversions, and low flowing streams	0.70	30.00	4,313.00	2.50	0.479

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#29	**Muskingum K:**					**0.479**
#30	8. Large gullies, diversions, and low flowing streams	0.70	30.00	4,313.00	2.50	0.479
#30	**Muskingum K:**					**0.479**
#33	8. Large gullies, diversions, and low flowing streams	0.66	77.00	11,748.55	2.42	1.348
#33	**Muskingum K:**					**1.348**
#35	8. Large gullies, diversions, and low flowing streams	0.33	15.00	4,556.50	1.72	0.735
#35	**Muskingum K:**					**0.735**
#36	8. Large gullies, diversions, and low flowing streams	0.30	60.00	20,005.00	1.64	3.388
#36	**Muskingum K:**					**3.388**

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc. (ml/l)	24VW (ml/l)
#30	476.400	476.400	15.70	2.21	15.3	7,167	2.78	1.97
#28	1,217.900	1,217.900	382.70	43.31	2,332.2	55,472	0.03	0.02
#26	2,486.400	2,486.400	68.99	19.67	120.6	6,040	1.43	1.06
#24	8,061.800	8,061.800	94.96	55.80	195.1	4,045	0.42	0.27
#25	1,015.700	9,077.500	129.82	70.58	313.3	15,699	4.37	0.91
#27	1,783.700	13,347.600	257.18	116.43	1,048.4	28,391	12.12	2.82
#29	966.000	15,531.500	568.72	193.37	5,787.1	69,501	6.28	1.96
#32	293.700	16,301.600	577.68	208.81	6,155.4	61,380	1.79	0.62
#31	957.100	957.100	385.29	40.58	1,766.9	40,461	0.55	0.43
#33	0.000	17,258.700	689.75	249.39	7,922.3	52,770	1.36	0.59
#34	1,156.300	18,415.000	694.74	269.35	7,417.4	46,386	0.28	0.12
#5	2,023.000	2,023.000	569.83	57.97	1,713.8	40,068	2.73	1.47
#6	1,743.200	3,766.200	653.56	112.46	3,159.4	35,226	0.20	0.12
#7	2,395.300	6,161.500	1,113.99	216.70	8,668.6	44,368	0.00	0.00
#8	0.000	6,161.500	1,113.99	216.70	8,668.6	44,368	0.00	0.00
#10	1,053.200	7,214.700	1,133.41	254.36	8,439.1	40,320	0.08	0.05
#1	2,411.100	2,411.100	392.20	53.71	1,765.4	36,630	4.79	3.12
#2	1,497.000	3,908.100	470.12	113.29	2,437.6	23,770	0.18	0.12
#3	828.500	4,736.600	588.89	140.28	2,714.9	18,899	0.05	0.04
#4	0.000	4,736.600	588.89	140.28	2,714.9	18,899	0.05	0.04
#9	712.000	5,448.600	597.84	153.38	2,725.8	17,034	0.79	0.60
#11	0.000	12,663.300	1,525.11	407.74	11,164.9	33,578	0.43	0.26
#21	646.500	13,309.800	1,542.37	423.41	11,265.1	33,584	0.46	0.26
#18	848.500	848.500	183.01	26.77	311.1	14,117	0.05	0.03
#17	182.200	182.200	129.55	8.20	119.5	15,200	0.69	0.49
#19	0.000	1,030.700	301.05	34.98	430.6	13,250	0.20	0.14
#15	1,992.700	1,992.700	432.94	58.72	2,203.9	44,481	1.26	0.77
#12	3,494.500	3,494.500	233.63	38.33	558.4	16,053	6.71	4.46
#13	2,720.700	6,215.200	410.93	68.61	1,149.1	17,747	8.09	5.58
#14	5,096.800	11,312.000	521.22	201.24	4,568.2	78,905	1.23	0.26
#16	1,022.000	14,326.700	924.77	304.15	8,191.0	51,775	1.22	0.46
#20	577.100	15,934.500	936.87	361.68	8,780.1	45,715	0.72	0.28
#22	0.000	29,244.300	2,320.66	785.09	20,045.2	33,645	0.49	0.27
#23	291.000	29,535.300	2,319.38	789.54	20,055.4	33,567	0.46	0.25
#35	0.000	47,950.300	2,926.49	1,058.90	27,472.8	32,515	0.38	0.22
#36	509.000	48,459.300	2,909.68	1,066.75	27,367.7	35,978	0.32	0.17
#37	1,661.000	50,120.300	2,847.17	1,101.07	26,929.2	39,756	0.24	0.11

Particle Size Distribution(s) at Each Structure

Structure #30:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	61.212%
0.0020	39.608%
0.0010	0.000%

Structure #28:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	99.873%
0.0010	0.000%

Structure #26:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	84.182%
0.0020	54.470%
0.0010	0.000%

Structure #24:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	93.900%
0.0020	78.509%
0.0010	0.000%

Structure #25:

Size (mm)	In/Out
2.0000	100.000%
0.1000	80.536%
0.0500	68.489%
0.0020	61.153%
0.0010	0.000%

Structure #27:

Size (mm)	In/Out
2.0000	100.000%
0.1000	75.292%
0.0500	52.665%
0.0020	39.110%
0.0010	0.000%

Structure #29:

Size (mm)	In/Out
2.0000	100.000%
0.1000	95.561%
0.0500	91.462%
0.0020	85.260%
0.0010	0.000%

Structure #32:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	99.320%
0.0020	92.619%
0.0010	0.000%

Structure #31:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	96.135%
0.0010	0.000%

Structure #33 (Inlet to North Fork Diversion):

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	99.472%
0.0020	93.403%
0.0010	0.000%

Structure #34 (End of North Fork):

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.585%
0.0500	99.307%
0.0020	99.155%
0.0010	0.000%

Structure #5:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	93.455%
0.0020	88.980%
0.0010	0.000%

Structure #6:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	98.364%
0.0010	0.000%

Structure #7:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	100.000%
0.0010	0.000%

Structure #8:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	100.000%
0.0010	0.000%

Structure #10:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	99.801%
0.0020	99.663%
0.0010	0.000%

Structure #1:

Size (mm)	In/Out
2.0000	100.000%
0.1000	95.498%
0.0500	85.914%
0.0020	80.819%
0.0010	0.000%

Structure #2:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	97.862%
0.0010	0.000%

Structure #3:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	99.188%
0.0010	0.000%

Structure #4:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	99.188%
0.0010	0.000%

Structure #9:

Size (mm)	In/Out
2.0000	96.893%
0.1000	95.763%
0.0500	94.454%
0.0020	93.850%
0.0010	0.000%

Structure #11:

Size (mm)	In/Out
2.0000	99.241%
0.1000	98.966%
0.0500	98.496%
0.0020	98.244%
0.0010	0.000%

Structure #21 (End of South Fork):

Size (mm)	In/Out
2.0000	98.962%
0.1000	98.675%
0.0500	98.408%
0.0020	98.164%
0.0010	0.000%

Structure #18:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	99.023%
0.0010	0.000%

Structure #17:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	87.184%
0.0010	0.000%

Structure #19:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	95.736%
0.0010	0.000%

Structure #15:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	98.087%
0.0020	94.423%
0.0010	0.000%

Structure #12:

Size (mm)	In/Out
2.0000	100.000%
0.1000	83.026%
0.0500	56.746%
0.0020	36.718%
0.0010	0.000%

Structure #13:

Size (mm)	In/Out
2.0000	100.000%
0.1000	80.507%
0.0500	51.093%
0.0020	33.060%
0.0010	0.000%

Structure #14:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	95.592%
0.0010	0.000%

Structure #16:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	99.498%
0.0020	94.016%
0.0010	0.000%

Structure #20 (End of Middle Fork):

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	95.530%
0.0010	0.000%

Structure #22:

Size (mm)	In/Out
2.0000	99.416%
0.1000	99.255%
0.0500	99.105%
0.0020	97.010%
0.0010	0.000%

Structure #23:

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.521%
0.0500	99.222%
0.0020	97.092%
0.0010	0.000%

Structure #35 (all forks):

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.538%
0.0500	99.245%
0.0020	97.649%
0.0010	0.000%

Structure #36:

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.588%
0.0500	99.450%
0.0020	98.146%
0.0010	0.000%

Structure #37:

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.653%
0.0500	99.363%
0.0020	99.097%
0.0010	0.000%

Structure Detail:

Structure #30 (Null)

Structure #28 (Null)

Structure #26 (Null)

Structure #24 (Null)

Structure #25 (Null)

Structure #27 (Null)

Structure #29 (Null)

Structure #32 (Null)

Structure #31 (Null)

Structure #33 (Null)

Inlet to North Fork Diversion

Structure #34 (Null)

End of North Fork

Structure #5 (Null)

Structure #6 (Null)

Structure #7 (Null)

Structure #8 (Null)

Structure #10 (Null)

Structure #1 (Null)

Structure #2 (Null)

Structure #3 (Null)

Structure #4 (Null)

Structure #9 (Null)

Structure #11 (Null)

Structure #21 (Null)

End of South Fork

Structure #18 (Null)

Structure #17 (Null)

Structure #19 (Null)

Structure #15 (Null)

Structure #12 (Null)

Structure #13 (Null)

Structure #14 (Null)

Structure #16 (Null)

Structure #20 (Null)

End of Middle Fork

Structure #22 (Null)

Structure #23 (Null)

Structure #35 (Null)

all forks

Structure #36 (Null)

Structure #37 (Null)

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#30	1	476.400	1.131	0.000	0.000	73.100	M	15.70	2.214
	Σ	**476.400**						**15.70**	**2.214**
#28	1	772.300	0.657	0.523	0.334	90.400	M	348.71	27.461
	2	445.600	0.587	0.000	0.000	90.400	M	217.35	15.851
	Σ	**1,217.900**						**382.70**	**43.312**
#26	1	447.600	2.192	0.000	0.000	74.200	M	10.72	2.498
	2	2,038.800	3.000	0.000	0.000	77.000	M	59.31	17.168
	Σ	**2,486.400**						**68.99**	**19.666**
#24	1	2,607.500	5.367	2.377	0.305	75.200	M	35.68	16.987
	2	2,331.900	4.813	2.431	0.304	74.700	M	32.19	14.077
	3	1,758.500	2.231	1.788	0.297	76.200	M	57.92	13.255
	4	1,363.900	2.618	0.000	0.000	77.000	M	44.42	11.485
	Σ	**8,061.800**						**94.96**	**55.804**
#25	1	515.200	0.990	0.342	0.357	78.200	M	44.10	5.083
	2	130.500	0.787	0.342	0.357	78.100	M	13.16	1.271
	3	370.000	0.516	0.000	0.000	85.700	M	125.08	8.421
	Σ	**9,077.500**						**129.82**	**70.579**
#27	1	354.400	0.612	1.233	0.337	83.100	M	81.00	6.173
	2	305.200	0.529	1.054	0.328	84.000	M	85.27	5.846
	3	289.800	0.692	0.551	0.328	75.500	M	21.73	1.976
	4	253.000	0.361	0.551	0.328	79.400	M	53.79	2.908
	5	581.300	0.980	0.000	0.000	82.300	M	84.68	9.284
	Σ	**13,347.600**						**257.18**	**116.433**
#29	1	508.800	0.409	0.416	0.312	89.500	M	285.47	16.691
	2	233.200	0.521	0.291	0.312	91.600	M	136.95	9.256
	3	224.000	0.467	0.000	0.000	90.000	M	121.81	7.678
	Σ	**15,531.500**						**568.72**	**193.370**
#32	1	293.700	0.576	0.000	0.000	93.000	M	183.24	13.227
	Σ	**16,301.600**						**577.68**	**208.811**
#31	1	431.100	0.588	0.450	0.336	91.500	M	232.24	16.956
	2	325.800	0.432	0.149	0.327	93.000	M	240.11	14.690
	3	200.200	0.373	0.000	0.000	92.900	M	157.01	8.931
	Σ	**957.100**						**385.29**	**40.576**
#33	**Σ**	**17,258.700**						**689.75**	**249.387**

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#34	1	250.000	0.423	1.019	0.292	90.500	M	150.52	8.990
	2	219.100	0.611	0.267	0.322	80.000	M	34.70	2.699
	3	246.200	0.688	0.466	0.293	80.000	M	35.65	3.031
	4	441.000	0.370	0.000	0.000	79.700	M	95.82	5.246
	Σ	**18,415.000**						**694.74**	**269.353**
#5	1	503.600	0.618	0.000	0.000	87.600	M	181.32	13.768
	2	406.500	0.388	0.501	0.350	84.800	M	150.41	8.450
	3	439.600	0.342	0.681	0.347	87.800	M	231.97	12.313
	4	162.600	0.280	0.681	0.347	86.000	M	79.58	3.825
	5	294.100	0.375	1.021	0.348	92.000	M	213.88	12.088
	6	216.600	0.272	1.018	0.348	90.100	M	154.07	7.526
	Σ	**2,023.000**						**569.83**	**57.970**
#6	1	149.100	0.331	0.000	0.000	92.600	M	120.20	6.499
	2	245.000	0.529	0.192	0.328	88.100	M	103.04	7.033
	3	276.200	0.450	0.461	0.319	89.500	M	146.70	9.035
	4	158.400	0.380	1.385	0.185	93.000	M	124.15	7.126
	5	206.200	0.402	0.796	0.320	89.400	M	115.74	6.701
	6	414.000	0.430	1.066	0.323	87.200	M	181.89	10.921
	7	294.300	0.535	1.066	0.323	86.400	M	104.00	7.171
	Σ	**3,766.200**						**653.56**	**112.457**
#7	1	731.700	1.274	0.000	0.000	93.000	M	255.12	32.900
	2	445.800	1.043	0.000	0.000	93.000	M	182.08	20.038
	3	270.800	0.804	0.000	0.000	93.000	M	134.47	12.176
	4	78.900	0.267	1.035	0.328	93.000	M	71.04	3.568
	5	154.900	0.310	1.071	0.326	93.000	M	132.26	6.996
	6	101.400	0.288	1.164	0.328	92.900	M	88.35	4.536
	7	117.700	0.298	1.344	0.329	92.200	M	95.91	4.942
	8	494.100	0.518	1.344	0.329	91.300	M	283.54	19.084
	Σ	**6,161.500**						**1,113.99**	**216.697**
#8	1	0.000	0.000	0.000	0.000	1.000	0.00	0.000	
	Σ	**6,161.500**						**1,113.99**	**216.697**
#10	1	355.500	1.286	0.000	0.000	93.000	M	123.01	15.981
	2	307.100	1.282	0.668	0.305	83.200	M	39.93	5.401
	3	147.300	1.245	0.517	0.303	90.600	M	41.73	5.327
	4	126.400	0.585	0.517	0.303	93.000	M	78.09	5.694
	5	116.900	1.179	0.621	0.305	93.000	M	43.37	5.257
	Σ	**7,214.700**						**1,133.41**	**254.357**
#1	1	557.400	0.941	0.000	0.000	83.600	M	97.16	10.228
	2	169.600	1.616	0.677	0.333	93.000	M	48.64	7.624
	3	636.400	1.842	0.729	0.333	81.000	M	47.29	8.792

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
	4	223.400	0.846	1.005	0.336	84.100	M	44.68	4.320
	5	77.700	0.330	1.392	0.341	81.400	M	22.18	1.129
	6	746.600	0.678	1.392	0.341	88.200	M	267.03	21.621
	Σ	**2,411.100**						**392.20**	**53.715**
#2	1	257.000	0.423	0.000	0.000	93.000	M	191.46	11.596
	2	180.500	0.562	0.478	0.281	91.800	M	102.88	7.288
	3	200.700	0.687	0.574	0.283	93.000	M	111.40	9.029
	4	438.600	0.811	0.574	0.283	93.000	M	216.42	19.727
	5	420.200	1.247	0.801	0.293	88.000	M	92.44	11.930
	Σ	**3,908.100**						**470.12**	**113.285**
#3	1	172.600	0.443	0.000	0.000	93.000	M	125.54	7.770
	2	277.000	0.890	0.000	0.000	88.900	M	86.67	8.563
	3	378.900	0.632	0.209	0.314	87.900	M	138.33	10.658
	Σ	**4,736.600**						**588.89**	**140.275**
#4	Σ	**4,736.600**						**588.89**	**140.275**
#9	1	288.000	0.987	0.000	0.000	85.800	M	61.17	6.609
	2	236.000	0.436	0.000	0.000	81.900	M	59.80	3.615
	3	106.000	0.324	0.297	0.268	81.900	M	32.32	1.626
	4	82.000	0.315	0.666	0.300	81.900	M	25.41	1.258
	Σ	**5,448.600**						**597.84**	**153.384**
#11	Σ	**12,663.300**						**1,525.11**	**407.741**
#21	1	146.000	0.819	0.000	0.000	86.900	M	40.00	3.733
	2	137.000	0.213	0.249	0.263	81.900	M	51.49	2.104
	3	182.500	0.289	0.878	0.256	91.300	M	140.04	7.061
	4	70.000	0.939	0.878	0.256	81.900	M	10.06	1.070
	5	111.000	0.297	0.947	0.263	81.900	M	35.52	1.703
	Σ	**13,309.800**						**1,542.37**	**423.410**
#18	1	301.700	0.652	0.000	0.000	93.000	M	173.54	13.585
	2	546.800	0.768	0.561	0.320	86.300	M	148.05	13.189
	Σ	**848.500**						**183.01**	**26.774**
#17	1	182.200	0.462	0.000	0.000	93.000	M	129.55	8.202
	Σ	**182.200**						**129.55**	**8.202**
#19	Σ	**1,030.700**						**301.05**	**34.976**
#15	1	437.400	0.803	0.000	0.000	91.300	M	185.92	16.863
	2	549.000	0.637	0.654	0.327	91.300	M	275.19	21.177
	3	1,006.300	1.023	0.768	0.331	84.700	M	185.11	20.683
	Σ	**1,992.700**						**432.94**	**58.723**

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#12	1	517.800	0.791	0.000	0.000	81.900	M	85.06	7.915
	2	229.000	0.571	0.043	0.418	80.100	M	38.64	2.855
	3	592.700	0.706	0.044	0.417	81.500	M	101.30	8.668
	4	1,806.900	1.542	0.487	0.362	76.700	M	86.99	14.604
	5	348.100	0.618	0.487	0.362	80.000	54.66	4.285	
	Σ	**3,494.500**						**233.63**	**38.327**
#13	1	411.600	0.725	0.000	0.000	79.700	M	55.06	4.891
	2	636.400	0.774	0.322	0.336	80.700	M	91.95	8.503
	3	319.000	0.575	0.685	0.318	85.500	M	98.20	7.115
	4	231.700	0.314	0.923	0.328	80.400	M	60.73	3.000
	5	1,122.000	1.308	0.923	0.328	74.700	M	44.53	6.775
	Σ	**6,215.200**						**410.93**	**68.612**
#14	1	405.900	0.384	0.000	0.000	90.800	M	263.85	14.961
	2	411.100	0.452	0.707	0.308	90.700	M	242.63	15.020
	3	787.400	0.658	0.975	0.307	91.400	M	389.56	30.676
	4	144.200	0.341	1.716	0.310	86.200	M	65.46	3.461
	5	343.800	0.289	1.970	0.312	86.500	M	173.76	8.480
	6	392.800	0.806	2.107	0.316	81.900	M	63.61	6.004
	7	528.200	0.518	2.544	0.316	87.200	M	206.25	13.918
	8	890.900	1.253	2.544	0.316	83.500	M	122.07	16.175
	9	741.400	1.076	3.047	0.316	84.800	M	132.42	15.394
	10	451.100	0.916	3.354	0.316	83.900	M	83.00	8.542
	Σ	**11,312.000**						**521.22**	**201.243**
#16	1	475.100	1.721	0.000	0.000	92.400	M	122.19	20.231
	2	348.400	0.542	0.951	0.283	92.500	M	216.12	14.980
	3	198.500	0.266	1.384	0.278	93.000	M	178.92	8.977
	Σ	**14,326.700**						**924.77**	**304.153**
#20	1	271.100	0.667	0.000	0.000	89.400	M	110.20	8.789
	2	306.000	0.713	0.410	0.287	93.000	M	165.52	13.765
	Σ	**15,934.500**						**936.87**	**361.682**
#22	**Σ**	**29,244.300**						**2,320.66**	**785.093**
#23	1	291.000	0.564	0.000	0.000	81.900	M	61.62	4.451
	Σ	**29,535.300**						**2,319.38**	**789.544**
#35	**Σ**	**47,950.300**						**2,926.49**	**1,058.896**
#36	1	308.000	0.606	0.000	0.000	81.900	M	61.88	4.714
	2	45.000	0.159	0.470	0.263	81.900	M	18.72	0.702
	3	156.000	0.158	0.000	0.000	81.900	M	64.91	2.434
	Σ	**48,459.300**						**2,909.68**	**1,066.746**

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#37	1	344.000	1.756	0.000	0.000	84.800	M	41.06	7.140
	2	300.000	0.415	1.870	0.241	87.800	M	142.61	8.390
	3	185.000	0.332	1.493	0.241	85.500	M	79.71	4.141
	4	246.000	0.363	2.653	0.246	81.900	M	70.10	3.772
	5	157.000	0.611	2.512	0.242	84.100	M	40.04	3.037
	6	76.000	0.095	2.512	0.242	84.100	M	69.96	1.841
	7	243.000	0.673	1.814	0.241	83.000	M	51.21	4.189
	8	81.000	0.151	0.095	0.383	81.900	M	33.70	1.264
	9	29.000	0.118	1.721	0.298	81.900	M	22.71	0.555
	Σ	**50,120.300**						**2,847.17**	**1,101.075**

Subwatershed Sedimentology Detail:

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
#30	1	0.095	200.00	3.80	0.3720	1.0000	2	15.3	7,167	2.78	1.97
	Σ							**15.3**	**7,167**	**2.78**	**1.97**
#28	1	0.187	100.00	10.10	0.3750	1.0000	3	1,831.9	67,442	0.00	0.00
	2	0.196	100.00	10.20	0.3930	1.0000	3	1,151.2	74,204	0.07	0.05
	Σ							**2,332.2**	**55,472**	**0.03**	**0.02**
#26	1	0.155	400.00	1.40	0.3480	1.0000	2	10.2	4,082	1.09	0.81
	2	0.155	300.00	2.40	0.3340	1.0000	2	110.4	6,393	1.49	1.10
	Σ							**120.6**	**6,040**	**1.43**	**1.06**
#24	1	0.128	300.00	2.30	0.3360	1.0000	2	66.0	3,840	0.35	0.26
	2	0.136	300.00	2.70	0.3440	1.0000	2	70.5	4,930	0.50	0.37
	3	0.107	300.00	2.30	0.3330	1.0000	2	62.4	4,664	1.37	1.02
	4	0.163	400.00	1.60	0.3210	1.0000	2	57.9	5,031	1.35	0.99
	Σ							**195.1**	**4,045**	**0.42**	**0.27**
#25	1	0.125	400.00	1.90	0.3440	1.0000	2	34.8	7,104	3.32	2.35
	2	0.124	300.00	2.60	0.3280	1.0000	2	9.3	7,737	3.85	2.68
	3	0.122	175.00	4.90	0.2660	1.0000	2	138.2	17,512	10.27	7.04
	Σ							**313.3**	**15,699**	**4.37**	**0.91**
#27	1	0.127	175.00	5.90	0.3160	1.0000	2	134.4	22,614	12.66	8.90
	2	0.122	150.00	7.50	0.2920	1.0000	2	138.7	24,759	14.29	9.99
	3	0.070	125.00	8.40	0.3270	1.0000	2	23.7	12,704	6.26	4.32
	4	0.097	125.00	9.60	0.3170	1.0000	2	80.5	30,075	17.67	11.85
	5	0.126	125.00	8.90	0.3290	1.0000	2	239.4	26,689	13.37	9.42

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
	Σ							**1,048.4**	**28,391**	**12.12**	**2.82**
#29	1	0.190	125.00	9.80	0.3930	1.0000	3	1,365.3	83,318	3.07	2.16
	2	0.203	125.00	8.90	0.3940	1.0000	3	603.0	66,304	1.59	1.12
	3	0.193	125.00	8.40	0.3940	1.0000	3	441.4	59,660	1.55	1.08
	Σ							**5,787.1**	**69,501**	**6.28**	**1.96**
#32	1	0.210	150.00	7.70	0.3990	1.0000	3	811.1	62,434	1.37	0.97
	Σ							**6,155.4**	**61,380**	**1.79**	**0.62**
#31	1	0.204	125.00	8.70	0.3620	1.0000	3	1,013.7	60,814	0.53	0.37
	2	0.210	150.00	7.30	0.3990	1.0000	3	950.2	65,819	3.41	2.41
	3	0.210	175.00	4.50	0.3980	1.0000	3	385.8	44,601	2.82	1.98
	Σ							**1,766.9**	**40,461**	**0.55**	**0.43**
#33	Σ							**7,922.3**	**52,770**	**1.36**	**0.59**
#34	1	0.193	200.00	3.84	0.2460	1.0000	3	161.4	18,389	0.72	0.52
	2	0.100	200.00	3.66	0.2540	1.0000	1	18.5	7,338	4.20	2.88
	3	0.100	300.00	2.54	0.2540	1.0000	1	16.2	5,649	3.17	2.20
	4	0.100	200.00	3.50	0.2540	1.0000	1	45.5	9,751	5.97	3.89
	Σ							**7,417.4**	**46,386**	**0.28**	**0.12**
#5	1	0.149	75.00	12.50	0.3230	1.0000	3	670.0	50,428	0.00	0.00
	2	0.133	75.00	15.80	0.3190	1.0000	2	545.2	67,505	40.75	28.02
	3	0.103	100.00	11.00	0.2030	1.0000	3	312.6	26,590	1.17	0.81
	4	0.093	75.00	13.80	0.2130	1.0000	2	96.3	26,589	16.60	11.46
	5	0.123	100.00	11.00	0.1370	1.0000	3	238.9	20,258	1.18	0.84
	6	0.149	75.00	14.70	0.1990	1.0000	3	330.1	44,599	3.21	2.28
	Σ							**1,713.8**	**40,068**	**2.73**	**1.47**
#6	1	0.208	175.00	4.30	0.3980	1.0000	3	263.3	41,902	2.95	2.07
	2	0.183	175.00	5.40	0.3910	1.0000	3	271.1	40,223	0.00	0.00
	3	0.188	150.00	7.60	0.3900	1.0000	3	500.1	56,955	1.53	1.07
	4	0.210	150.00	6.30	0.3990	1.0000	3	380.9	52,378	3.26	2.41
	5	0.185	125.00	8.10	0.3860	1.0000	3	351.4	53,638	2.03	1.44
	6	0.104	100.00	11.30	0.2240	1.0000	3	295.4	27,989	0.49	0.34
	7	0.164	100.00	11.20	0.3740	1.0000	3	444.3	63,189	0.00	0.00
	Σ							**3,159.4**	**35,226**	**0.20**	**0.12**
#7	1	0.208	150.00	7.80	0.3780	1.0000	3	1,546.4	47,076	0.00	0.00
	2	0.209	100.00	10.20	0.3940	1.0000	3	1,272.4	63,450	0.00	0.00
	3	0.210	150.00	6.70	0.3990	1.0000	3	570.4	47,474	0.00	0.00
	4	0.210	100.00	11.50	0.3990	1.0000	3	343.1	94,143	8.06	5.87
	5	0.210	150.00	7.10	0.3990	1.0000	3	436.9	62,203	4.78	3.45
	6	0.209	150.00	7.90	0.3990	1.0000	3	301.6	65,955	5.34	3.87

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
	7	0.206	75.00	15.50	0.3990	1.0000	3	593.0	116,344	8.81	6.42
	8	0.202	75.00	14.50	0.3980	1.0000	3	2,089.2	107,811	2.44	1.76
	Σ							**8,668.6**	**44,368**	**0.00**	**0.00**
#8	1	0.000	0.00	0.00	0.0000	1.0000	0	0.0	1	0.00	0.00
	Σ							**8,668.6**	**44,368**	**0.00**	**0.00**
#10	1	0.190	300.00	2.70	0.1930	1.0000	3	125.7	8,003	0.00	0.00
	2	0.153	200.00	3.50	0.3610	1.0000	2	61.7	11,607	5.45	3.93
	3	0.189	200.00	3.70	0.3190	1.0000	3	72.2	13,712	0.00	0.00
	4	0.190	300.00	2.10	0.1940	1.0000	3	43.8	7,943	0.16	0.11
	5	0.201	300.00	2.00	0.3030	1.0000	3	47.8	9,191	0.00	0.00
	Σ							**8,439.1**	**40,320**	**0.08**	**0.05**
#1	1	0.157	150.00	6.80	0.3830	1.0000	2	313.9	31,708	16.32	11.49
	2	0.210	150.00	6.60	0.3990	1.0000	3	244.8	32,032	0.00	0.00
	3	0.149	200.00	3.90	0.3870	1.0000	2	102.9	11,753	4.57	3.34
	4	0.169	175.00	4.70	0.3950	1.0000	2	105.8	25,092	13.31	9.47
	5	0.157	100.00	10.10	0.3940	1.0000	2	57.7	53,203	32.06	22.27
	6	0.175	75.00	12.60	0.2840	1.0000	3	1,117.8	52,264	0.00	0.00
	Σ							**1,765.4**	**36,630**	**4.79**	**3.12**
#2	1	0.190	150.00	7.90	0.1930	1.0000	3	346.0	30,942	1.66	1.16
	2	0.184	175.00	4.80	0.2010	1.0000	3	127.8	18,066	0.30	0.21
	3	0.202	200.00	3.90	0.3220	1.0000	3	190.3	21,517	0.00	0.00
	4	0.203	150.00	7.40	0.3220	1.0000	3	837.0	42,735	0.00	0.00
	5	0.181	175.00	5.10	0.3710	1.0000	3	305.1	25,752	0.00	0.00
	Σ							**2,437.6**	**23,770**	**0.18**	**0.12**
#3	1	0.190	175.00	5.20	0.1930	1.0000	3	158.4	21,221	1.05	0.74
	2	0.177	175.00	4.20	0.2560	1.0000	3	137.3	16,531	0.00	0.00
	3	0.166	175.00	4.30	0.2290	1.0000	3	173.0	16,953	0.00	0.00
	Σ							**2,714.9**	**18,899**	**0.05**	**0.04**
#4	Σ							**2,714.9**	**18,899**	**0.05**	**0.04**
#9	1	0.212	175.00	4.17	0.2490	1.0000	2	113.1	17,678	9.23	6.53
	2	0.100	200.00	4.50	0.2540	1.0000	4	44.0	13,348	10.68	7.12
	3	0.100	200.00	4.50	0.2540	1.0000	4	19.9	13,303	10.64	7.17
	4	0.100	200.00	6.50	0.2540	1.0000	4	21.4	18,201	14.56	9.92
	Σ							**2,725.8**	**17,034**	**0.79**	**0.60**
#11	Σ							**11,164.9**	**33,578**	**0.43**	**0.26**
#21	1	0.206	175.00	4.44	0.2560	1.0000	2	68.6	19,080	10.47	7.37
	2	0.100	175.00	14.00	0.2540	1.0000	4	117.3	59,945	47.96	32.16
	3	0.185	300.00	2.70	0.2180	1.0000	3	93.9	13,519	0.99	0.72

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
	4	0.100	300.00	8.00	0.2540	1.0000	1	17.4	16,608	8.94	6.39
	5	0.100	200.00	5.00	0.2540	1.0000	1	23.8	14,698	9.30	6.47
	Σ							**11,265.1**	**33,584**	**0.46**	**0.26**
#18	1	0.193	300.00	2.80	0.2200	1.0000	3	166.4	12,680	0.08	0.06
	2	0.173	175.00	4.70	0.3880	1.0000	3	388.7	30,310	0.00	0.00
	Σ							**311.1**	**14,117**	**0.05**	**0.03**
#17	1	0.196	300.00	2.60	0.2600	1.0000	3	119.5	15,200	0.69	0.49
	Σ							**119.5**	**15,200**	**0.69**	**0.49**
#19	Σ							**430.6**	**13,250**	**0.20**	**0.14**
#15	1	0.201	125.00	8.20	0.3960	1.0000	3	875.5	52,729	0.00	0.00
	2	0.161	100.00	11.40	0.3060	1.0000	3	1,156.8	55,407	0.00	0.00
	3	0.118	100.00	10.20	0.2850	1.0000	2	533.7	26,236	13.40	9.61
	Σ							**2,203.9**	**44,481**	**1.26**	**0.77**
#12	1	0.124	150.00	6.30	0.3070	1.0000	2	148.5	19,741	10.37	7.20
	2	0.132	200.00	3.60	0.3500	1.0000	2	36.4	13,817	7.60	5.13
	3	0.136	175.00	5.00	0.3330	1.0000	2	177.8	21,738	11.65	8.02
	4	0.188	200.00	3.40	0.3570	1.0000	2	197.1	13,622	5.15	3.73
	5	0.228	175.00	4.10	0.3640	1.0000	2	128.9	31,777	17.19	11.85
	Σ							**558.4**	**16,053**	**6.71**	**4.46**
#13	1	0.128	150.00	6.90	0.3390	1.0000	2	110.5	23,979	12.49	8.59
	2	0.130	175.00	5.70	0.3300	1.0000	2	178.6	21,951	11.41	7.97
	3	0.191	175.00	6.00	0.2890	1.0000	2	226.5	33,049	19.05	13.35
	4	0.122	175.00	5.10	0.3460	1.0000	2	69.8	24,833	14.95	10.22
	5	0.137	175.00	4.20	0.3530	1.0000	2	88.6	13,184	5.06	3.67
	Σ							**1,149.1**	**17,747**	**8.09**	**5.58**
#14	1	0.196	100.00	10.20	0.3980	1.0000	3	1,259.0	86,487	4.31	3.00
	2	0.193	150.00	6.70	0.4020	1.0000	3	826.2	56,062	1.89	1.34
	3	0.169	75.00	13.80	0.3240	1.0000	3	2,082.9	67,952	0.00	0.00
	4	0.114	100.00	11.00	0.2980	1.0000	3	122.8	36,090	1.27	0.91
	5	0.078	100.00	10.10	0.1830	1.0000	3	130.6	15,659	0.79	0.57
	6	0.084	150.00	7.10	0.2700	1.0000	2	72.2	12,296	6.43	4.61
	7	0.087	100.00	10.00	0.1840	1.0000	3	203.3	14,793	0.00	0.00
	8	0.126	150.00	6.70	0.2740	1.0000	2	261.0	16,178	7.68	5.60
	9	0.117	150.00	7.30	0.2600	1.0000	2	254.1	16,557	8.36	6.10
	10	0.115	125.00	8.50	0.2610	1.0000	2	152.1	17,901	9.30	6.77
	Σ							**4,568.2**	**78,905**	**1.23**	**0.26**
#16	1	0.201	300.00	2.78	0.3030	1.0000	3	243.8	12,178	0.00	0.00
	2	0.204	150.00	6.00	0.3630	1.0000	3	664.4	44,793	1.14	0.82

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
	3	0.210	150.00	6.10	0.3990	1.0000	3	514.2	56,224	4.83	3.55
	Σ							**8,191.0**	**51,775**	**1.22**	**0.46**
#20	1	0.186	175.00	3.19	0.2130	1.0000	3	90.5	10,762	0.00	0.00
	2	0.194	200.00	3.42	0.2330	1.0000	3	185.1	13,793	0.00	0.00
	Σ							**8,780.1**	**45,715**	**0.72**	**0.28**
#22	**Σ**							**20,045.2**	**33,645**	**0.49**	**0.27**
#23	1	0.100	350.00	8.00	0.2540	1.0000	1	115.1	27,737	16.34	11.10
	Σ							**20,055.4**	**33,567**	**0.46**	**0.25**
#35	**Σ**							**27,472.8**	**32,515**	**0.38**	**0.22**
#36	1	0.100	200.00	3.14	0.2540	1.0000	1	30.4	6,939	4.04	2.76
	2	0.100	450.00	13.00	0.2540	1.0000	1	57.1	85,391	55.98	38.15
	3	0.100	300.00	10.00	0.2540	1.0000	1	109.0	50,144	32.87	21.24
	Σ							**27,367.7**	**35,978**	**0.32**	**0.17**
#37	1	0.196	200.00	3.80	0.3980	1.0000	2	111.8	15,857	6.83	4.93
	2	0.194	200.00	3.42	0.4020	1.0000	3	222.2	26,570	0.67	0.49
	3	0.173	150.00	7.10	0.2770	1.0000	3	140.2	34,187	1.16	0.84
	4	0.100	175.00	5.00	0.2540	1.0000	1	50.8	13,547	8.42	6.13
	5	0.171	150.00	6.50	0.2990	1.0000	3	78.8	26,024	0.00	0.00
	6	0.171	150.00	6.50	0.2990	1.0000	3	71.7	38,780	10.07	7.34
	7	0.100	300.00	1.20	0.2540	1.0000	1	12.5	3,046	1.76	1.26
	8	0.100	300.00	10.00	0.2540	1.0000	1	52.3	46,163	30.26	19.66
	9	0.100	250.00	10.00	0.2540	1.0000	1	21.5	39,809	27.81	19.65
	Σ							**26,929.2**	**39,756**	**0.24**	**0.11**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	3.65	50.00	1,369.00	1.910	0.199
		8. Large gullies, diversions, and low flowing streams	1.57	157.00	10,030.00	3.750	0.742
#1	**1**	**Time of Concentration:**					**0.941**
#1	2	5. Nearly bare and untilled, and alluvial valley fans	6.63	70.00	1,056.00	2.570	0.114
		5. Nearly bare and untilled, and alluvial valley fans	1.98	150.00	7,573.00	1.400	1.502
#1	**2**	**Time of Concentration:**					**1.616**
#1	3	5. Nearly bare and untilled, and alluvial valley fans	1.65	117.00	7,070.00	1.280	1.534

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	2.43	126.00	5,188.00	4.670	0.308
#1	**3**	**Time of Concentration:**					**1.842**
#1	4	5. Nearly bare and untilled, and alluvial valley fans	5.77	260.00	4,506.00	2.400	0.521
		8. Large gullies, diversions, and low flowing streams	2.84	168.00	5,924.00	5.050	0.325
#1	**4**	**Time of Concentration:**					**0.846**
#1	5	5. Nearly bare and untilled, and alluvial valley fans	19.93	180.00	903.00	4.460	0.056
		8. Large gullies, diversions, and low flowing streams	3.30	178.00	5,393.00	5.450	0.274
#1	**5**	**Time of Concentration:**					**0.330**
#1	6	5. Nearly bare and untilled, and alluvial valley fans	13.43	105.00	782.00	3.660	0.059
		8. Large gullies, diversions, and low flowing streams	2.62	283.00	10,822.00	4.850	0.619
#1	**6**	**Time of Concentration:**					**0.678**
#2	1	5. Nearly bare and untilled, and alluvial valley fans	6.84	70.00	1,024.00	2.610	0.108
		8. Large gullies, diversions, and low flowing streams	1.62	70.00	4,325.00	3.810	0.315
#2	**1**	**Time of Concentration:**					**0.423**
#2	2	5. Nearly bare and untilled, and alluvial valley fans	5.56	45.00	810.00	2.350	0.095
		8. Large gullies, diversions, and low flowing streams	0.86	40.00	4,663.00	2.770	0.467
#2	**2**	**Time of Concentration:**					**0.562**
#2	3	5. Nearly bare and untilled, and alluvial valley fans	5.89	50.00	849.00	2.420	0.097
		8. Large gullies, diversions, and low flowing streams	1.17	80.00	6,862.00	3.230	0.590
#2	**3**	**Time of Concentration:**					**0.687**
#2	4	5. Nearly bare and untilled, and alluvial valley fans	12.63	95.00	752.00	3.550	0.058
		8. Large gullies, diversions, and low flowing streams	1.40	135.00	9,630.00	3.550	0.753
#2	**4**	**Time of Concentration:**					**0.811**
#2	5	5. Nearly bare and untilled, and alluvial valley fans	11.02	70.00	635.00	3.320	0.053
		8. Large gullies, diversions, and low flowing streams	0.46	40.00	8,732.00	2.030	1.194
#2	**5**	**Time of Concentration:**					**1.247**
#3	1	5. Nearly bare and untilled, and alluvial valley fans	1.24	10.00	805.00	1.110	0.201
		8. Large gullies, diversions, and low flowing streams	1.33	40.00	3,017.00	3.450	0.242
#3	**1**	**Time of Concentration:**					**0.443**
#3	2	5. Nearly bare and untilled, and alluvial valley fans	0.68	10.00	1,478.00	0.820	0.500

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	1.78	100.00	5,622.00	4.000	0.390
#3	**2**	**Time of Concentration:**					**0.890**
#3	3	5. Nearly bare and untilled, and alluvial valley fans	4.66	70.00	1,501.00	2.150	0.193
		8. Large gullies, diversions, and low flowing streams	1.17	60.00	5,126.00	3.240	0.439
#3	**3**	**Time of Concentration:**					**0.632**
#5	1	5. Nearly bare and untilled, and alluvial valley fans	19.06	285.00	1,495.00	4.360	0.095
		8. Large gullies, diversions, and low flowing streams	2.64	242.00	9,174.00	4.870	0.523
#5	**1**	**Time of Concentration:**					**0.618**
#5	2	5. Nearly bare and untilled, and alluvial valley fans	14.27	105.00	736.00	3.770	0.054
		8. Large gullies, diversions, and low flowing streams	4.08	297.00	7,279.00	6.050	0.334
#5	**2**	**Time of Concentration:**					**0.388**
#5	3	5. Nearly bare and untilled, and alluvial valley fans	8.27	35.00	423.00	2.870	0.040
		8. Large gullies, diversions, and low flowing streams	3.44	208.00	6,049.00	5.560	0.302
#5	**3**	**Time of Concentration:**					**0.342**
#5	4	5. Nearly bare and untilled, and alluvial valley fans	14.58	85.00	583.00	3.810	0.042
		8. Large gullies, diversions, and low flowing streams	4.53	248.00	5,473.00	6.380	0.238
#5	**4**	**Time of Concentration:**					**0.280**
#5	5	5. Nearly bare and untilled, and alluvial valley fans	5.07	70.00	1,382.00	2.250	0.170
		8. Large gullies, diversions, and low flowing streams	3.89	170.00	4,375.00	5.910	0.205
#5	**5**	**Time of Concentration:**					**0.375**
#5	6	5. Nearly bare and untilled, and alluvial valley fans	12.48	90.00	721.00	3.530	0.056
		8. Large gullies, diversions, and low flowing streams	5.16	274.00	5,308.02	6.810	0.216
#5	**6**	**Time of Concentration:**					**0.272**
#6	1	5. Nearly bare and untilled, and alluvial valley fans	5.36	75.00	1,399.00	2.310	0.168
		8. Large gullies, diversions, and low flowing streams	2.41	66.00	2,742.00	4.650	0.163
#6	**1**	**Time of Concentration:**					**0.331**
#6	2	5. Nearly bare and untilled, and alluvial valley fans	3.39	80.00	2,359.00	1.840	0.356
		8. Large gullies, diversions, and low flowing streams	2.63	80.00	3,039.00	4.860	0.173
#6	**2**	**Time of Concentration:**					**0.529**
#6	3	5. Nearly bare and untilled, and alluvial valley fans	4.60	34.00	739.00	2.140	0.095

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	2.33	136.00	5,845.00	4.570	0.355
#6	**3**	**Time of Concentration:**					**0.450**
#6	4	5. Nearly bare and untilled, and alluvial valley fans	6.06	85.00	1,402.00	2.460	0.158
		8. Large gullies, diversions, and low flowing streams	2.52	96.00	3,810.00	4.760	0.222
#6	**4**	**Time of Concentration:**					**0.380**
#6	5	5. Nearly bare and untilled, and alluvial valley fans	7.24	70.00	967.00	2.690	0.099
		8. Large gullies, diversions, and low flowing streams	2.34	117.00	5,003.00	4.580	0.303
#6	**5**	**Time of Concentration:**					**0.402**
#6	6	5. Nearly bare and untilled, and alluvial valley fans	31.83	183.00	575.00	5.640	0.028
		8. Large gullies, diversions, and low flowing streams	3.38	270.00	7,990.00	5.510	0.402
#6	**6**	**Time of Concentration:**					**0.430**
#6	7	5. Nearly bare and untilled, and alluvial valley fans	23.08	325.00	1,408.00	4.800	0.081
		8. Large gullies, diversions, and low flowing streams	2.88	240.00	8,327.00	5.090	0.454
#6	**7**	**Time of Concentration:**					**0.535**
#7	1	5. Nearly bare and untilled, and alluvial valley fans	11.42	90.00	788.00	3.370	0.064
		8. Large gullies, diversions, and low flowing streams	1.46	230.00	15,769.00	3.620	1.210
#7	**1**	**Time of Concentration:**					**1.274**
#7	2	5. Nearly bare and untilled, and alluvial valley fans	10.97	60.00	547.00	3.310	0.045
		8. Large gullies, diversions, and low flowing streams	1.61	220.00	13,660.00	3.800	0.998
#7	**2**	**Time of Concentration:**					**1.043**
#7	3	5. Nearly bare and untilled, and alluvial valley fans	6.40	60.00	938.00	2.520	0.103
		8. Large gullies, diversions, and low flowing streams	1.72	171.00	9,931.00	3.930	0.701
#7	**3**	**Time of Concentration:**					**0.804**
#7	4	5. Nearly bare and untilled, and alluvial valley fans	19.23	80.00	416.00	4.380	0.026
		8. Large gullies, diversions, and low flowing streams	2.45	100.00	4,083.00	4.690	0.241
#7	**4**	**Time of Concentration:**					**0.267**
#7	5	5. Nearly bare and untilled, and alluvial valley fans	6.09	67.00	1,101.00	2.460	0.124
		8. Large gullies, diversions, and low flowing streams	2.51	80.00	3,184.00	4.750	0.186
#7	**5**	**Time of Concentration:**					**0.310**
#7	6	5. Nearly bare and untilled, and alluvial valley fans	5.93	63.00	1,062.00	2.430	0.121

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	2.74	82.00	2,993.00	4.960	0.167
#7	**6**	**Time of Concentration:**					**0.288**
#7	7	5. Nearly bare and untilled, and alluvial valley fans	7.97	65.00	816.00	2.820	0.080
		8. Large gullies, diversions, and low flowing streams	3.48	153.00	4,400.00	5.590	0.218
#7	**7**	**Time of Concentration:**					**0.298**
#7	8	5. Nearly bare and untilled, and alluvial valley fans	6.60	50.00	758.00	2.560	0.082
		8. Large gullies, diversions, and low flowing streams	4.66	473.00	10,157.00	6.470	0.436
#7	**8**	**Time of Concentration:**					**0.518**
#9	1	5. Nearly bare and untilled, and alluvial valley fans	3.01	55.00	1,829.00	1.730	0.293
		8. Large gullies, diversions, and low flowing streams	0.76	50.00	6,548.00	2.620	0.694
#9	**1**	**Time of Concentration:**					**0.987**
#9	2	5. Nearly bare and untilled, and alluvial valley fans	4.67	70.00	1,500.02	2.160	0.192
		8. Large gullies, diversions, and low flowing streams	1.43	45.00	3,150.15	3.580	0.244
#9	**2**	**Time of Concentration:**					**0.436**
#9	3	5. Nearly bare and untilled, and alluvial valley fans	4.44	40.00	900.00	2.100	0.119
		8. Large gullies, diversions, and low flowing streams	1.48	40.00	2,700.14	3.650	0.205
#9	**3**	**Time of Concentration:**					**0.324**
#9	4	5. Nearly bare and untilled, and alluvial valley fans	6.50	65.00	1,000.00	2.540	0.109
		8. Large gullies, diversions, and low flowing streams	1.00	20.00	2,000.00	3.000	0.185
		9. Small streams flowing bankfull	2.92	35.00	1,200.00	15.370	0.021
#9	**4**	**Time of Concentration:**					**0.315**
#10	1	5. Nearly bare and untilled, and alluvial valley fans	1.24	41.00	3,317.00	1.110	0.830
		8. Large gullies, diversions, and low flowing streams	0.70	29.00	4,125.00	2.510	0.456
#10	**1**	**Time of Concentration:**					**1.286**
#10	2	5. Nearly bare and untilled, and alluvial valley fans	2.25	125.00	5,554.00	1.500	1.028
		8. Large gullies, diversions, and low flowing streams	2.13	85.00	3,997.00	4.370	0.254
#10	**2**	**Time of Concentration:**					**1.282**
#10	3	5. Nearly bare and untilled, and alluvial valley fans	1.39	68.00	4,904.00	1.170	1.164
		8. Large gullies, diversions, and low flowing streams	4.73	90.00	1,904.00	6.520	0.081
#10	**3**	**Time of Concentration:**					**1.245**
#10	4	5. Nearly bare and untilled, and alluvial valley fans	3.76	51.00	1,357.00	1.930	0.195

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	0.65	22.00	3,385.00	2.410	0.390
#10	**4**	**Time of Concentration:**					**0.585**
#10	5	5. Nearly bare and untilled, and alluvial valley fans	1.63	88.00	5,391.16	1.270	1.179
#10	**5**	**Time of Concentration:**					**1.179**
#12	1	5. Nearly bare and untilled, and alluvial valley fans	4.50	75.00	1,667.00	2.120	0.218
		8. Large gullies, diversions, and low flowing streams	1.85	155.00	8,400.00	4.070	0.573
#12	**1**	**Time of Concentration:**					**0.791**
#12	2	5. Nearly bare and untilled, and alluvial valley fans	2.99	50.00	1,674.03	1.720	0.270
		8. Large gullies, diversions, and low flowing streams	1.67	70.00	4,201.17	3.870	0.301
#12	**2**	**Time of Concentration:**					**0.571**
#12	3	5. Nearly bare and untilled, and alluvial valley fans	4.04	57.00	1,411.00	2.000	0.195
		8. Large gullies, diversions, and low flowing streams	1.55	107.00	6,884.00	3.740	0.511
#12	**3**	**Time of Concentration:**					**0.706**
#12	4	5. Nearly bare and untilled, and alluvial valley fans	2.23	84.00	3,771.04	1.490	0.703
		8. Large gullies, diversions, and low flowing streams	1.62	186.00	11,515.60	3.810	0.839
#12	**4**	**Time of Concentration:**					**1.542**
#12	5	5. Nearly bare and untilled, and alluvial valley fans	3.68	53.00	1,442.00	1.910	0.209
		8. Large gullies, diversions, and low flowing streams	1.95	120.00	6,155.00	4.180	0.409
#12	**5**	**Time of Concentration:**					**0.618**
#13	1	5. Nearly bare and untilled, and alluvial valley fans	4.62	62.00	1,342.00	2.140	0.174
		8. Large gullies, diversions, and low flowing streams	1.91	157.00	8,225.00	4.140	0.551
#13	**1**	**Time of Concentration:**					**0.725**
#13	2	5. Nearly bare and untilled, and alluvial valley fans	2.91	50.00	1,717.00	1.700	0.280
		8. Large gullies, diversions, and low flowing streams	2.28	183.00	8,039.00	4.520	0.494
#13	**2**	**Time of Concentration:**					**0.774**
#13	3	5. Nearly bare and untilled, and alluvial valley fans	6.18	95.00	1,537.00	2.480	0.172
		8. Large gullies, diversions, and low flowing streams	2.13	135.00	6,347.00	4.370	0.403
#13	**3**	**Time of Concentration:**					**0.575**
#13	4	5. Nearly bare and untilled, and alluvial valley fans	3.17	10.00	315.00	1.780	0.049
		8. Large gullies, diversions, and low flowing streams	2.30	100.00	4,344.00	4.550	0.265
#13	**4**	**Time of Concentration:**					**0.314**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#13	5	5. Nearly bare and untilled, and alluvial valley fans	3.10	70.00	2,255.00	1.760	0.355
		8. Large gullies, diversions, and low flowing streams	1.23	140.00	11,392.00	3.320	0.953
#13	**5**	**Time of Concentration:**					**1.308**
#14	1	5. Nearly bare and untilled, and alluvial valley fans	10.59	63.00	595.00	3.250	0.050
		8. Large gullies, diversions, and low flowing streams	2.60	151.00	5,808.00	4.830	0.334
#14	**1**	**Time of Concentration:**					**0.384**
#14	2	5. Nearly bare and untilled, and alluvial valley fans	7.28	67.00	920.00	2.690	0.095
		8. Large gullies, diversions, and low flowing streams	2.17	123.00	5,670.00	4.410	0.357
#14	**2**	**Time of Concentration:**					**0.452**
#14	3	5. Nearly bare and untilled, and alluvial valley fans	21.46	150.00	699.00	4.630	0.041
		8. Large gullies, diversions, and low flowing streams	3.10	364.00	11,728.00	5.280	0.617
#14	**3**	**Time of Concentration:**					**0.658**
#14	4	5. Nearly bare and untilled, and alluvial valley fans	3.39	35.00	1,032.00	1.840	0.155
		8. Large gullies, diversions, and low flowing streams	2.97	103.00	3,470.00	5.160	0.186
#14	**4**	**Time of Concentration:**					**0.341**
#14	5	5. Nearly bare and untilled, and alluvial valley fans	28.15	125.00	444.00	5.300	0.023
		8. Large gullies, diversions, and low flowing streams	4.18	246.00	5,886.00	6.130	0.266
#14	**5**	**Time of Concentration:**					**0.289**
#14	6	5. Nearly bare and untilled, and alluvial valley fans	3.18	40.00	1,257.00	1.780	0.196
		8. Large gullies, diversions, and low flowing streams	2.29	228.00	9,963.00	4.530	0.610
#14	**6**	**Time of Concentration:**					**0.806**
#14	7	5. Nearly bare and untilled, and alluvial valley fans	16.72	100.00	598.00	4.080	0.040
		8. Large gullies, diversions, and low flowing streams	2.81	243.00	8,649.00	5.020	0.478
#14	**7**	**Time of Concentration:**					**0.518**
#14	8	5. Nearly bare and untilled, and alluvial valley fans	1.70	47.00	2,765.00	1.300	0.590
		8. Large gullies, diversions, and low flowing streams	2.44	274.00	11,208.00	4.690	0.663
#14	**8**	**Time of Concentration:**					**1.253**
#14	9	5. Nearly bare and untilled, and alluvial valley fans	2.87	105.00	3,657.00	1.690	0.601
		8. Large gullies, diversions, and low flowing streams	2.43	194.00	7,991.00	4.670	0.475
#14	**9**	**Time of Concentration:**					**1.076**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#14	10	5. Nearly bare and untilled, and alluvial valley fans	2.75	80.00	2,907.00	1.650	0.489
		8. Large gullies, diversions, and low flowing streams	2.41	172.00	7,149.00	4.650	0.427
#14	**10**	**Time of Concentration:**					**0.916**
#15	1	5. Nearly bare and untilled, and alluvial valley fans	12.80	54.00	422.00	3.570	0.032
		8. Large gullies, diversions, and low flowing streams	1.68	181.00	10,781.00	3.880	0.771
#15	**1**	**Time of Concentration:**					**0.803**
#15	2	5. Nearly bare and untilled, and alluvial valley fans	44.22	260.00	588.00	6.640	0.024
		8. Large gullies, diversions, and low flowing streams	2.45	254.00	10,354.24	4.690	0.613
#15	**2**	**Time of Concentration:**					**0.637**
#15	3	5. Nearly bare and untilled, and alluvial valley fans	10.04	85.00	847.00	3.160	0.074
		8. Large gullies, diversions, and low flowing streams	2.34	366.00	15,663.00	4.580	0.949
#15	**3**	**Time of Concentration:**					**1.023**
#16	1	5. Nearly bare and untilled, and alluvial valley fans	2.26	117.00	5,179.00	1.500	0.959
		8. Large gullies, diversions, and low flowing streams	0.46	26.00	5,601.00	2.040	0.762
#16	**1**	**Time of Concentration:**					**1.721**
#16	2	5. Nearly bare and untilled, and alluvial valley fans	8.70	62.00	713.00	2.940	0.067
		8. Large gullies, diversions, and low flowing streams	1.99	144.00	7,241.00	4.230	0.475
#16	**2**	**Time of Concentration:**					**0.542**
#16	3	5. Nearly bare and untilled, and alluvial valley fans	6.88	32.00	465.00	2.620	0.049
		8. Large gullies, diversions, and low flowing streams	2.29	81.00	3,543.00	4.530	0.217
#16	**3**	**Time of Concentration:**					**0.266**
#17	1	5. Nearly bare and untilled, and alluvial valley fans	9.37	65.00	694.00	3.060	0.062
		8. Large gullies, diversions, and low flowing streams	1.19	56.00	4,712.00	3.270	0.400
#17	**1**	**Time of Concentration:**					**0.462**
#18	1	5. Nearly bare and untilled, and alluvial valley fans	9.00	60.00	667.00	2.990	0.061
		8. Large gullies, diversions, and low flowing streams	0.97	61.00	6,287.00	2.950	0.591
#18	**1**	**Time of Concentration:**					**0.652**
#18	2	5. Nearly bare and untilled, and alluvial valley fans	2.47	33.00	1,336.00	1.570	0.236
		8. Large gullies, diversions, and low flowing streams	2.01	164.00	8,154.00	4.250	0.532
#18	**2**	**Time of Concentration:**					**0.768**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#20	1	5. Nearly bare and untilled, and alluvial valley fans	11.87	45.00	379.00	3.440	0.030
		8. Large gullies, diversions, and low flowing streams	0.75	45.00	5,969.00	2.600	0.637
#20	**1**	**Time of Concentration:**					**0.667**
#20	2	5. Nearly bare and untilled, and alluvial valley fans	5.40	45.00	833.00	2.320	0.099
		8. Large gullies, diversions, and low flowing streams	1.30	98.00	7,547.00	3.410	0.614
#20	**2**	**Time of Concentration:**					**0.713**
#21	1	5. Nearly bare and untilled, and alluvial valley fans	4.09	60.00	1,467.02	2.020	0.201
		8. Large gullies, diversions, and low flowing streams	0.93	60.00	6,433.62	2.890	0.618
#21	**1**	**Time of Concentration:**					**0.819**
#21	2	5. Nearly bare and untilled, and alluvial valley fans	3.85	50.00	1,300.00	1.960	0.184
		8. Large gullies, diversions, and low flowing streams	42.86	900.00	2,100.00	19.630	0.029
#21	**2**	**Time of Concentration:**					**0.213**
#21	3	5. Nearly bare and untilled, and alluvial valley fans	1.70	15.00	881.00	1.300	0.188
		9. Small streams flowing bankfull	1.49	60.00	4,014.18	11.000	0.101
#21	**3**	**Time of Concentration:**					**0.289**
#21	4	5. Nearly bare and untilled, and alluvial valley fans	2.21	40.00	1,811.02	1.480	0.339
		8. Large gullies, diversions, and low flowing streams	0.84	50.00	5,949.54	2.750	0.600
#21	**4**	**Time of Concentration:**					**0.939**
#21	5	5. Nearly bare and untilled, and alluvial valley fans	4.00	30.00	750.00	2.000	0.104
		8. Large gullies, diversions, and low flowing streams	2.34	75.00	3,200.06	4.590	0.193
#21	**5**	**Time of Concentration:**					**0.297**
#23	1	5. Nearly bare and untilled, and alluvial valley fans	8.00	80.00	1,000.00	2.820	0.098
		8. Large gullies, diversions, and low flowing streams	2.74	85.00	3,100.00	4.960	0.173
		8. Large gullies, diversions, and low flowing streams	0.40	8.00	2,000.00	1.890	0.293
#23	**1**	**Time of Concentration:**					**0.564**
#24	1	5. Nearly bare and untilled, and alluvial valley fans	1.71	430.00	25,118.00	1.300	5.367
#24	**1**	**Time of Concentration:**					**5.367**
#24	2	5. Nearly bare and untilled, and alluvial valley fans	1.84	430.00	23,393.00	1.350	4.813
#24	**2**	**Time of Concentration:**					**4.813**
#24	3	5. Nearly bare and untilled, and alluvial valley fans	1.82	155.00	8,498.00	1.350	1.748
		8. Large gullies, diversions, and low flowing streams	0.84	40.00	4,771.00	2.740	0.483

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#24	**3**	**Time of Concentration:**					**2.231**
#24	4	5. Nearly bare and untilled, and alluvial valley fans	1.24	50.00	4,042.00	1.110	1.011
		8. Large gullies, diversions, and low flowing streams	0.49	60.00	12,150.00	2.100	1.607
#24	**4**	**Time of Concentration:**					**2.618**
#25	1	5. Nearly bare and untilled, and alluvial valley fans	0.51	10.00	1,950.00	0.710	0.762
		8. Large gullies, diversions, and low flowing streams	1.81	60.00	3,322.00	4.030	0.228
#25	**1**	**Time of Concentration:**					**0.990**
#25	2	5. Nearly bare and untilled, and alluvial valley fans	1.11	25.00	2,254.00	1.050	0.596
		8. Large gullies, diversions, and low flowing streams	2.36	75.00	3,178.00	4.600	0.191
#25	**2**	**Time of Concentration:**					**0.787**
#25	3	5. Nearly bare and untilled, and alluvial valley fans	3.23	30.00	929.00	1.790	0.144
		8. Large gullies, diversions, and low flowing streams	2.45	154.00	6,297.00	4.690	0.372
#25	**3**	**Time of Concentration:**					**0.516**
#26	1	5. Nearly bare and untilled, and alluvial valley fans	1.20	103.00	8,602.00	1.090	2.192
#26	**1**	**Time of Concentration:**					**2.192**
#26	2	5. Nearly bare and untilled, and alluvial valley fans	1.23	120.00	9,780.00	1.100	2.469
		8. Large gullies, diversions, and low flowing streams	2.18	184.00	8,454.00	4.420	0.531
#26	**2**	**Time of Concentration:**					**3.000**
#27	1	5. Nearly bare and untilled, and alluvial valley fans	4.32	50.00	1,158.02	2.070	0.155
		8. Large gullies, diversions, and low flowing streams	2.53	198.00	7,838.16	4.760	0.457
#27	**1**	**Time of Concentration:**					**0.612**
#27	2	5. Nearly bare and untilled, and alluvial valley fans	5.26	30.00	570.00	2.290	0.069
		8. Large gullies, diversions, and low flowing streams	3.15	278.00	8,822.00	5.320	0.460
#27	**2**	**Time of Concentration:**					**0.529**
#27	3	5. Nearly bare and untilled, and alluvial valley fans	16.33	80.00	490.00	4.040	0.033
		8. Large gullies, diversions, and low flowing streams	2.15	225.00	10,443.00	4.400	0.659
#27	**3**	**Time of Concentration:**					**0.692**
#27	4	5. Nearly bare and untilled, and alluvial valley fans	12.43	65.00	523.00	3.520	0.041
		8. Large gullies, diversions, and low flowing streams	3.49	225.00	6,454.00	5.600	0.320
#27	**4**	**Time of Concentration:**					**0.361**
#27	5	5. Nearly bare and untilled, and alluvial valley fans	9.40	25.00	266.00	3.060	0.024

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	2.32	364.00	15,700.00	4.560	0.956
#27	**5**	**Time of Concentration:**					**0.980**
#28	1	5. Nearly bare and untilled, and alluvial valley fans	5.25	40.00	762.00	2.290	0.092
		8. Large gullies, diversions, and low flowing streams	2.96	310.00	10,479.34	5.150	0.565
#28	**1**	**Time of Concentration:**					**0.657**
#28	2	5. Nearly bare and untilled, and alluvial valley fans	25.86	105.00	406.00	5.080	0.022
		8. Large gullies, diversions, and low flowing streams	2.96	310.00	10,479.34	5.150	0.565
#28	**2**	**Time of Concentration:**					**0.587**
#29	1	5. Nearly bare and untilled, and alluvial valley fans	11.58	30.00	259.00	3.400	0.021
		8. Large gullies, diversions, and low flowing streams	3.61	288.00	7,976.00	5.700	0.388
#29	**1**	**Time of Concentration:**					**0.409**
#29	2	5. Nearly bare and untilled, and alluvial valley fans	8.06	40.00	496.00	2.830	0.048
		8. Large gullies, diversions, and low flowing streams	2.90	252.00	8,693.55	5.100	0.473
#29	**2**	**Time of Concentration:**					**0.521**
#29	3	5. Nearly bare and untilled, and alluvial valley fans	7.25	25.00	345.00	2.690	0.035
		8. Large gullies, diversions, and low flowing streams	2.26	158.00	7,001.00	4.500	0.432
#29	**3**	**Time of Concentration:**					**0.467**
#30	1	5. Nearly bare and untilled, and alluvial valley fans	4.93	35.00	710.00	2.220	0.088
		8. Large gullies, diversions, and low flowing streams	1.67	243.00	14,540.00	3.870	1.043
#30	**1**	**Time of Concentration:**					**1.131**
#31	1	5. Nearly bare and untilled, and alluvial valley fans	2.91	15.00	515.00	1.700	0.084
		8. Large gullies, diversions, and low flowing streams	2.74	247.00	9,006.00	4.960	0.504
#31	**1**	**Time of Concentration:**					**0.588**
#31	2	5. Nearly bare and untilled, and alluvial valley fans	7.46	25.00	335.00	2.730	0.034
		8. Large gullies, diversions, and low flowing streams	2.18	138.00	6,335.00	4.420	0.398
#31	**2**	**Time of Concentration:**					**0.432**
#31	3	5. Nearly bare and untilled, and alluvial valley fans	3.84	20.00	521.00	1.950	0.074
		8. Large gullies, diversions, and low flowing streams	2.24	108.00	4,826.00	4.480	0.299
#31	**3**	**Time of Concentration:**					**0.373**
#32	1	5. Nearly bare and untilled, and alluvial valley fans	3.48	22.00	632.00	1.860	0.094

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	1.56	101.00	6,494.00	3.740	0.482
#32	**1**	**Time of Concentration:**					**0.576**
#34	1	5. Nearly bare and untilled, and alluvial valley fans	2.28	35.00	1,538.00	1.500	0.284
		8. Large gullies, diversions, and low flowing streams	2.89	74.00	2,560.00	5.100	0.139
#34	**1**	**Time of Concentration:**					**0.423**
#34	2	5. Nearly bare and untilled, and alluvial valley fans	2.69	38.00	1,415.00	1.630	0.241
		8. Large gullies, diversions, and low flowing streams	1.60	81.00	5,052.00	3.790	0.370
#34	**2**	**Time of Concentration:**					**0.611**
#34	3	5. Nearly bare and untilled, and alluvial valley fans	3.80	56.00	1,474.00	1.940	0.211
		8. Large gullies, diversions, and low flowing streams	0.70	30.00	4,293.00	2.500	0.477
#34	**3**	**Time of Concentration:**					**0.688**
#34	4	5. Nearly bare and untilled, and alluvial valley fans	4.17	35.00	840.00	2.040	0.114
		8. Large gullies, diversions, and low flowing streams	1.89	72.00	3,807.00	4.120	0.256
#34	**4**	**Time of Concentration:**					**0.370**
#36	1	5. Nearly bare and untilled, and alluvial valley fans	3.21	90.00	2,800.00	1.790	0.434
		8. Large gullies, diversions, and low flowing streams	2.54	33.00	1,300.00	4.770	0.075
		9. Small streams flowing bankfull	0.40	8.00	2,000.00	5.690	0.097
#36	**1**	**Time of Concentration:**					**0.606**
#36	2	5. Nearly bare and untilled, and alluvial valley fans	6.92	90.00	1,300.00	2.630	0.137
		8. Large gullies, diversions, and low flowing streams	47.06	800.00	1,700.00	20.570	0.022
#36	**2**	**Time of Concentration:**					**0.159**
#36	3	5. Nearly bare and untilled, and alluvial valley fans	90.00	900.00	1,000.00	9.480	0.029
		8. Large gullies, diversions, and low flowing streams	3.70	100.00	2,700.00	5.770	0.129
#36	**3**	**Time of Concentration:**					**0.158**
#37	1	5. Nearly bare and untilled, and alluvial valley fans	4.68	129.00	2,754.05	2.160	0.354
		8. Large gullies, diversions, and low flowing streams	0.16	10.00	6,108.73	1.210	1.402
#37	**1**	**Time of Concentration:**					**1.756**
#37	2	5. Nearly bare and untilled, and alluvial valley fans	5.17	44.97	869.82	2.270	0.106
		8. Large gullies, diversions, and low flowing streams	2.01	95.23	4,737.81	4.250	0.309
#37	**2**	**Time of Concentration:**					**0.415**
#37	3	5. Nearly bare and untilled, and alluvial valley fans	3.52	30.00	853.00	1.870	0.126

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	4.02	179.85	4,474.00	6.010	0.206
#37	**3**	**Time of Concentration:**					**0.332**
#37	4	5. Nearly bare and untilled, and alluvial valley fans	3.18	34.82	1,095.00	1.780	0.170
		8. Large gullies, diversions, and low flowing streams	1.49	37.90	2,544.00	3.660	0.193
#37	**4**	**Time of Concentration:**					**0.363**
#37	5	5. Nearly bare and untilled, and alluvial valley fans	2.59	40.00	1,543.00	1.610	0.266
		8. Large gullies, diversions, and low flowing streams	1.48	67.00	4,529.00	3.640	0.345
#37	**5**	**Time of Concentration:**					**0.611**
#37	6	8. Large gullies, diversions, and low flowing streams	3.42	65.00	1,900.00	5.540	0.095
#37	**6**	**Time of Concentration:**					**0.095**
#37	7	5. Nearly bare and untilled, and alluvial valley fans	6.00	30.00	500.00	2.440	0.056
		8. Large gullies, diversions, and low flowing streams	1.36	45.00	3,300.00	3.500	0.261
		8. Large gullies, diversions, and low flowing streams	1.11	45.00	4,050.00	3.160	0.356
#37	**7**	**Time of Concentration:**					**0.673**
#37	8	5. Nearly bare and untilled, and alluvial valley fans	8.33	50.00	600.00	2.880	0.057
		8. Large gullies, diversions, and low flowing streams	6.00	150.00	2,500.00	7.340	0.094
#37	**8**	**Time of Concentration:**					**0.151**
#37	9	5. Nearly bare and untilled, and alluvial valley fans	7.00	70.00	1,000.00	2.640	0.105
		8. Large gullies, diversions, and low flowing streams	12.00	60.00	500.00	10.390	0.013
#37	**9**	**Time of Concentration:**					**0.118**

Subwatershed Muskingum Routing Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	2	8. Large gullies, diversions, and low flowing streams	1.29	107.00	8,294.00	3.400	0.677
#1	**2**	**Muskingum K:**					**0.677**
#1	3	8. Large gullies, diversions, and low flowing streams	1.27	113.00	8,880.00	3.380	0.729
#1	**3**	**Muskingum K:**					**0.729**
#1	4	8. Large gullies, diversions, and low flowing streams	1.35	171.00	12,634.00	3.490	1.005
#1	**4**	**Muskingum K:**					**1.005**
#1	5	8. Large gullies, diversions, and low flowing streams	1.49	274.00	18,349.00	3.660	1.392

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	**5**	**Muskingum K:**					**1.392**
#1	6	8. Large gullies, diversions, and low flowing streams	1.49	274.00	18,349.00	3.660	1.392
#1	**6**	**Muskingum K:**					**1.392**
#2	2	8. Large gullies, diversions, and low flowing streams	0.53	20.00	3,756.00	2.180	0.478
#2	**2**	**Muskingum K:**					**0.478**
#2	3	8. Large gullies, diversions, and low flowing streams	0.55	25.00	4,570.00	2.210	0.574
#2	**3**	**Muskingum K:**					**0.574**
#2	4	8. Large gullies, diversions, and low flowing streams	0.55	25.00	4,570.00	2.210	0.574
#2	**4**	**Muskingum K:**					**0.574**
#2	5	8. Large gullies, diversions, and low flowing streams	0.65	45.00	6,955.00	2.410	0.801
#2	**5**	**Muskingum K:**					**0.801**
#3	3	8. Large gullies, diversions, and low flowing streams	0.92	20.00	2,168.00	2.880	0.209
#3	**3**	**Muskingum K:**					**0.209**
#5	1	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.000	0.000
#5	**1**	**Muskingum K:**					**0.000**
#5	2	8. Large gullies, diversions, and low flowing streams	1.75	125.00	7,149.00	3.960	0.501
#5	**2**	**Muskingum K:**					**0.501**
#5	3	8. Large gullies, diversions, and low flowing streams	1.65	155.00	9,418.00	3.840	0.681
#5	**3**	**Muskingum K:**					**0.681**
#5	4	8. Large gullies, diversions, and low flowing streams	1.65	155.00	9,418.00	3.840	0.681
#5	**4**	**Muskingum K:**					**0.681**
#5	5	8. Large gullies, diversions, and low flowing streams	1.67	239.00	14,273.00	3.880	1.021
#5	**5**	**Muskingum K:**					**1.021**
#5	6	8. Large gullies, diversions, and low flowing streams	1.68	239.00	14,223.00	3.880	1.018
#5	**6**	**Muskingum K:**					**1.018**
#7	1	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.000	0.000
#7	**1**	**Muskingum K:**					**0.000**
#7	2	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.000	0.000
#7	**2**	**Muskingum K:**					**0.000**
#7	4	8. Large gullies, diversions, and low flowing streams	1.16	140.00	12,037.00	3.230	1.035
#7	**4**	**Muskingum K:**					**1.035**
#7	5	8. Large gullies, diversions, and low flowing streams	1.14	140.00	12,307.69	3.190	1.071
#7	**5**	**Muskingum K:**					**1.071**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#7	6	8. Large gullies, diversions, and low flowing streams	1.17	158.00	13,546.00	3.230	1.164
#7	**6**	**Muskingum K:**					**1.164**
#7	7	8. Large gullies, diversions, and low flowing streams	1.18	187.00	15,784.00	3.260	1.344
#7	**7**	**Muskingum K:**					**1.344**
#7	8	8. Large gullies, diversions, and low flowing streams	1.18	187.00	15,784.00	3.260	1.344
#7	**8**	**Muskingum K:**					**1.344**
#9	3	8. Large gullies, diversions, and low flowing streams	0.43	9.00	2,100.00	1.960	0.297
#9	**3**	**Muskingum K:**					**0.297**
#9	4	8. Large gullies, diversions, and low flowing streams	1.01	20.00	1,975.00	3.010	0.182
		8. Large gullies, diversions, and low flowing streams	0.60	24.30	4,050.00	2.320	0.484
#9	**4**	**Muskingum K:**					**0.666**
#10	3	8. Large gullies, diversions, and low flowing streams	0.76	37.00	4,861.00	2.610	0.517
#10	**3**	**Muskingum K:**					**0.517**
#10	4	8. Large gullies, diversions, and low flowing streams	0.76	37.00	4,861.00	2.610	0.517
#10	**4**	**Muskingum K:**					**0.517**
#10	5	8. Large gullies, diversions, and low flowing streams	0.79	47.00	5,956.00	2.660	0.621
#10	**5**	**Muskingum K:**					**0.621**
#12	2	8. Large gullies, diversions, and low flowing streams	8.24	111.00	1,347.00	8.610	0.043
#12	**2**	**Muskingum K:**					**0.043**
#12	3	8. Large gullies, diversions, and low flowing streams	8.01	109.00	1,360.00	8.490	0.044
#12	**3**	**Muskingum K:**					**0.044**
#12	4	8. Large gullies, diversions, and low flowing streams	2.24	176.00	7,866.00	4.480	0.487
#12	**4**	**Muskingum K:**					**0.487**
#12	5	8. Large gullies, diversions, and low flowing streams	2.24	176.00	7,866.00	4.480	0.487
#12	**5**	**Muskingum K:**					**0.487**
#13	2	8. Large gullies, diversions, and low flowing streams	1.34	54.00	4,025.00	3.470	0.322
#13	**2**	**Muskingum K:**					**0.322**
#13	3	8. Large gullies, diversions, and low flowing streams	0.98	72.00	7,333.00	2.970	0.685
#13	**3**	**Muskingum K:**					**0.685**
#13	4	8. Large gullies, diversions, and low flowing streams	1.18	127.00	10,806.00	3.250	0.923
#13	**4**	**Muskingum K:**					**0.923**
#13	5	8. Large gullies, diversions, and low flowing streams	1.18	127.00	10,806.00	3.250	0.923
#13	**5**	**Muskingum K:**					**0.923**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#14	1	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.000	0.000
#14	**1**	**Muskingum K:**					**0.000**
#14	2	8. Large gullies, diversions, and low flowing streams	0.83	58.00	6,957.00	2.730	0.707
#14	**2**	**Muskingum K:**					**0.707**
#14	3	8. Large gullies, diversions, and low flowing streams	0.81	77.00	9,480.00	2.700	0.975
#14	**3**	**Muskingum K:**					**0.975**
#14	4	8. Large gullies, diversions, and low flowing streams	0.86	147.00	17,117.00	2.770	1.716
#14	**4**	**Muskingum K:**					**1.716**
#14	5	8. Large gullies, diversions, and low flowing streams	0.88	175.00	19,934.00	2.810	1.970
#14	**5**	**Muskingum K:**					**1.970**
#14	6	8. Large gullies, diversions, and low flowing streams	0.95	211.00	22,155.00	2.920	2.107
#14	**6**	**Muskingum K:**					**2.107**
#14	7	8. Large gullies, diversions, and low flowing streams	0.96	257.00	26,835.00	2.930	2.544
#14	**7**	**Muskingum K:**					**2.544**
#14	8	8. Large gullies, diversions, and low flowing streams	0.96	257.00	26,835.00	2.930	2.544
#14	**8**	**Muskingum K:**					**2.544**
#14	9	8. Large gullies, diversions, and low flowing streams	0.95	307.00	32,146.59	2.930	3.047
#14	**9**	**Muskingum K:**					**3.047**
#14	10	8. Large gullies, diversions, and low flowing streams	0.96	339.00	35,382.00	2.930	3.354
#14	**10**	**Muskingum K:**					**3.354**
#15	2	8. Large gullies, diversions, and low flowing streams	1.14	86.00	7,535.26	3.200	0.654
#15	**2**	**Muskingum K:**					**0.654**
#15	3	8. Large gullies, diversions, and low flowing streams	1.25	115.00	9,236.00	3.340	0.768
#15	**3**	**Muskingum K:**					**0.768**
#16	2	8. Large gullies, diversions, and low flowing streams	0.55	42.00	7,608.00	2.220	0.951
#16	**2**	**Muskingum K:**					**0.951**
#16	3	8. Large gullies, diversions, and low flowing streams	0.51	54.00	10,615.00	2.130	1.384
#16	**3**	**Muskingum K:**					**1.384**
#17	1	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.000	0.000
#17	**1**	**Muskingum K:**					**0.000**
#18	1	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.000	0.000
#18	**1**	**Muskingum K:**					**0.000**
#18	2	8. Large gullies, diversions, and low flowing streams	1.02	62.00	6,103.00	3.020	0.561

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#18	**2**	**Muskingum K:**					**0.561**
#20	2	8. Large gullies, diversions, and low flowing streams	0.59	20.00	3,400.00	2.300	0.410
#20	**2**	**Muskingum K:**					**0.410**
#21	1	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.000	0.000
#21	**1**	**Muskingum K:**					**0.000**
#21	2	8. Large gullies, diversions, and low flowing streams	0.40	6.80	1,700.00	1.890	0.249
#21	**2**	**Muskingum K:**					**0.249**
#21	3	8. Large gullies, diversions, and low flowing streams	0.36	20.00	5,627.46	1.780	0.878
#21	**3**	**Muskingum K:**					**0.878**
#21	4	8. Large gullies, diversions, and low flowing streams	0.36	20.00	5,627.46	1.780	0.878
#21	**4**	**Muskingum K:**					**0.878**
#21	5	8. Large gullies, diversions, and low flowing streams	0.40	25.80	6,450.00	1.890	0.947
#21	**5**	**Muskingum K:**					**0.947**
#24	1	8. Large gullies, diversions, and low flowing streams	0.79	180.00	22,769.00	2.660	2.377
#24	**1**	**Muskingum K:**					**2.377**
#24	2	8. Large gullies, diversions, and low flowing streams	0.78	180.00	23,111.00	2.640	2.431
#24	**2**	**Muskingum K:**					**2.431**
#24	4	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.000	0.000
#24	**4**	**Muskingum K:**					**0.000**
#25	1	8. Large gullies, diversions, and low flowing streams	1.99	104.00	5,220.00	4.230	0.342
#25	**1**	**Muskingum K:**					**0.342**
#25	2	8. Large gullies, diversions, and low flowing streams	1.99	104.00	5,220.00	4.230	0.342
#25	**2**	**Muskingum K:**					**0.342**
#25	3	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.000	0.000
#25	**3**	**Muskingum K:**					**0.000**
#27	1	8. Large gullies, diversions, and low flowing streams	1.38	216.00	15,629.00	3.520	1.233
#27	**1**	**Muskingum K:**					**1.233**
#27	2	8. Large gullies, diversions, and low flowing streams	1.17	144.00	12,301.00	3.240	1.054
#27	**2**	**Muskingum K:**					**1.054**
#27	3	8. Large gullies, diversions, and low flowing streams	1.18	76.00	6,454.00	3.250	0.551
#27	**3**	**Muskingum K:**					**0.551**
#27	4	8. Large gullies, diversions, and low flowing streams	1.18	76.00	6,454.00	3.250	0.551
#27	**4**	**Muskingum K:**					**0.551**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#28	1	8. Large gullies, diversions, and low flowing streams	1.30	84.00	6,445.17	3.420	0.523
#28	**1**	**Muskingum K:**					**0.523**
#29	1	8. Large gullies, diversions, and low flowing streams	0.88	37.00	4,210.00	2.810	0.416
#29	**1**	**Muskingum K:**					**0.416**
#29	2	8. Large gullies, diversions, and low flowing streams	0.88	26.00	2,949.00	2.810	0.291
#29	**2**	**Muskingum K:**					**0.291**
#31	1	8. Large gullies, diversions, and low flowing streams	1.35	76.00	5,639.00	3.480	0.450
#31	**1**	**Muskingum K:**					**0.450**
#31	2	8. Large gullies, diversions, and low flowing streams	1.15	20.00	1,734.00	3.220	0.149
#31	**2**	**Muskingum K:**					**0.149**
#34	1	8. Large gullies, diversions, and low flowing streams	0.64	56.00	8,773.00	2.390	1.019
#34	**1**	**Muskingum K:**					**1.019**
#34	2	8. Large gullies, diversions, and low flowing streams	1.05	31.00	2,957.00	3.070	0.267
#34	**2**	**Muskingum K:**					**0.267**
#34	3	8. Large gullies, diversions, and low flowing streams	0.64	26.00	4,031.00	2.400	0.466
#34	**3**	**Muskingum K:**					**0.466**
#37	2	8. Large gullies, diversions, and low flowing streams	0.28	29.79	10,639.28	1.580	1.870
#37	**2**	**Muskingum K:**					**1.870**
#37	3	8. Large gullies, diversions, and low flowing streams	0.28	23.78	8,493.00	1.580	1.493
#37	**3**	**Muskingum K:**					**1.493**
#37	4	8. Large gullies, diversions, and low flowing streams	0.30	46.99	15,665.00	1.640	2.653
#37	**4**	**Muskingum K:**					**2.653**
#37	5	8. Large gullies, diversions, and low flowing streams	0.28	29.10	10,392.85	1.580	1.827
		8. Large gullies, diversions, and low flowing streams	0.30	12.15	4,050.00	1.640	0.685
#37	**5**	**Muskingum K:**					**2.512**
#37	6	8. Large gullies, diversions, and low flowing streams	0.28	29.10	10,396.00	1.580	1.827
		8. Large gullies, diversions, and low flowing streams	0.30	12.15	4,050.00	1.640	0.685
#37	**6**	**Muskingum K:**					**2.512**
#37	7	8. Large gullies, diversions, and low flowing streams	0.28	28.89	10,320.00	1.580	1.814
#37	**7**	**Muskingum K:**					**1.814**
#37	8	8. Large gullies, diversions, and low flowing streams	3.42	65.00	1,900.00	5.540	0.095
#37	**8**	**Muskingum K:**					**0.095**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#37	9	8. Large gullies, diversions, and low flowing streams	2.37	90.00	3,800.00	4.610	0.228
		8. Large gullies, diversions, and low flowing streams	0.28	23.78	8,493.00	1.580	1.493
#37	**9**	**Muskingum K:**					**1.721**

Cottonwood Arroyo Post-mine Hydrology and Sedimentology

The drainage subdivisions used to model the hydrology is shown on Exhibit 41.2-1.

Revised February 19, 2012

Art O'Hayre

General Information

Storm Information:

Storm Type:	Type II-70
Design Storm:	25 yr - 6 hr
Rainfall Depth:	1.560 inches

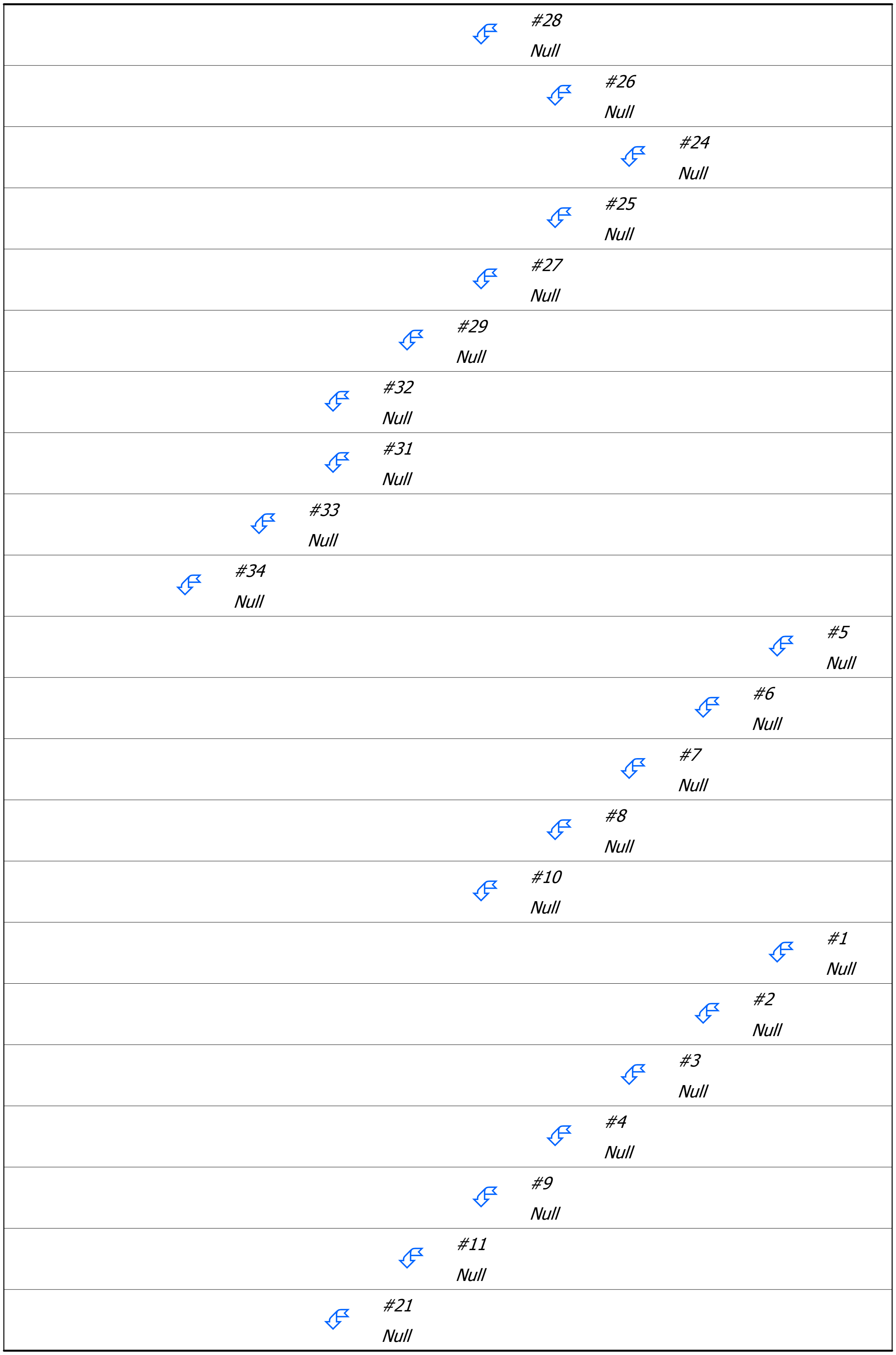
Particle Size Distribution:

Size (mm)	PostMine-LoamySand	PreMine-LoamySand	PreMine-Badlands	LoamySand Postmining
2.0000	100.000%	100.000%	100.000%	0.000%
0.1000	26.500%	30.000%	83.500%	0.000%
0.0500	14.000%	17.000%	77.000%	0.000%
0.0020	11.000%	11.000%	56.000%	0.000%
0.0010	0.000%	0.000%	0.000%	0.000%

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Null	#1	==>	#2	0.961	0.307	
Null	#2	==>	#3	0.068	0.331	
Null	#3	==>	#4	0.000	0.000	
Null	#4	==>	#9	0.718	0.281	
Null	#5	==>	#6	1.205	0.328	
Null	#6	==>	#7	0.189	0.304	
Null	#7	==>	#8	0.000	0.000	
Null	#8	==>	#10	0.989	0.300	
Null	#9	==>	#11	0.000	0.000	
Null	#10	==>	#11	0.000	0.000	
Null	#11	==>	#21	0.495	0.453	
Null	#12	==>	#13	0.076	0.330	
Null	#13	==>	#14	3.790	0.314	
Null	#14	==>	#16	1.198	0.286	
Null	#15	==>	#16	1.198	0.286	
Null	#16	==>	#20	1.087	0.273	
Null	#17	==>	#19	0.000	0.000	
Null	#18	==>	#19	0.000	0.000	
Null	#19	==>	#20	0.915	0.252	
Null	#20	==>	#22	0.000	0.000	End of Middle Fork
Null	#21	==>	#22	0.000	0.000	End of South Fork
Null	#22	==>	#23	0.811	0.247	
Null	#23	==>	#35	0.000	0.000	
Null	#24	==>	#25	0.964	0.340	
Null	#25	==>	#27	1.454	0.333	
Null	#26	==>	#27	1.454	0.333	
Null	#27	==>	#29	0.800	0.323	
Null	#28	==>	#29	0.800	0.323	
Null	#29	==>	#32	0.479	0.298	
Null	#30	==>	#32	0.479	0.298	
Null	#31	==>	#33	0.000	0.000	
Null	#32	==>	#33	0.000	0.000	
Null	#33	==>	#34	1.348	0.294	Inlet to North Fork Diversion
Null	#34	==>	#35	0.000	0.000	End of North Fork
Null	#35	==>	#36	0.735	0.251	all forks
Null	#36	==>	#37	3.388	0.246	
Null	#37	==>	End	0.000	0.000	

#30
Null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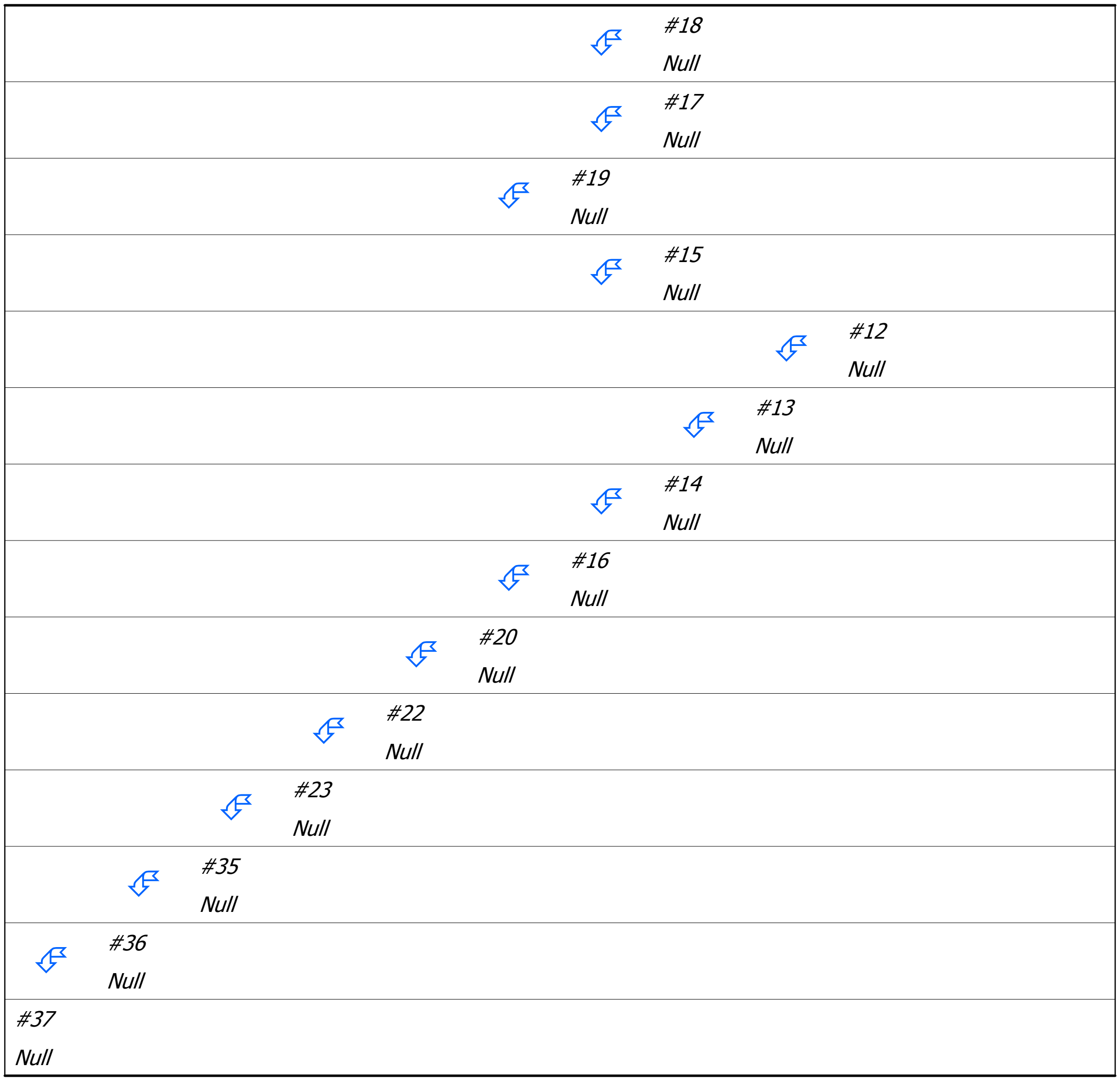


Structure Routing Details:

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	8. Large gullies, diversions, and low flowing streams	0.81	76.00	9,347.00	2.70	0.961
#1	**Muskingum K:**					**0.961**
#2	8. Large gullies, diversions, and low flowing streams	1.23	10.00	814.00	3.32	0.068
#2	**Muskingum K:**					**0.068**
#3	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.00	0.000
#3	**Muskingum K:**					**0.000**
#4	8. Large gullies, diversions, and low flowing streams	0.53	30.00	5,637.00	2.18	0.718
#4	**Muskingum K:**					**0.718**

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#5	8. Large gullies, diversions, and low flowing streams	1.17	165.00	14,065.00	3.24	1.205
#5	**Muskingum K:**					**1.205**
#6	8. Large gullies, diversions, and low flowing streams	0.78	14.00	1,799.25	2.64	0.189
#6	**Muskingum K:**					**0.189**
#8	8. Large gullies, diversions, and low flowing streams	0.72	65.00	9,046.00	2.54	0.989
#8	**Muskingum K:**					**0.989**
#11	8. Large gullies, diversions, and low flowing streams	30.00	8,801.00	29,336.66	16.43	0.495
#11	**Muskingum K:**					**0.495**
#12	8. Large gullies, diversions, and low flowing streams	1.21	11.00	906.00	3.30	0.076
#12	**Muskingum K:**					**0.076**
#13	8. Large gullies, diversions, and low flowing streams	0.92	363.00	39,301.00	2.88	3.790
#13	**Muskingum K:**					**3.790**
#14	8. Large gullies, diversions, and low flowing streams	0.58	57.00	9,834.00	2.28	1.198
#14	**Muskingum K:**					**1.198**
#15	8. Large gullies, diversions, and low flowing streams	0.58	57.00	9,834.00	2.28	1.198
#15	**Muskingum K:**					**1.198**
#16	8. Large gullies, diversions, and low flowing streams	0.46	37.00	7,984.00	2.04	1.087
#16	**Muskingum K:**					**1.087**
#19	8. Large gullies, diversions, and low flowing streams	0.33	19.00	5,699.00	1.73	0.915
#19	**Muskingum K:**					**0.915**
#22	8. Large gullies, diversions, and low flowing streams	0.31	15.00	4,852.00	1.66	0.811
#22	**Muskingum K:**					**0.811**
#24	8. Large gullies, diversions, and low flowing streams	1.46	184.00	12,568.00	3.62	0.964
#24	**Muskingum K:**					**0.964**
#25	8. Large gullies, diversions, and low flowing streams	1.28	228.00	17,755.00	3.39	1.454
#25	**Muskingum K:**					**1.454**
#26	8. Large gullies, diversions, and low flowing streams	1.28	228.00	17,755.62	3.39	1.454
#26	**Muskingum K:**					**1.454**
#27	8. Large gullies, diversions, and low flowing streams	1.07	96.00	8,938.00	3.10	0.800
#27	**Muskingum K:**					**0.800**
#28	8. Large gullies, diversions, and low flowing streams	1.07	96.00	8,938.00	3.10	0.800
#28	**Muskingum K:**					**0.800**
#29	8. Large gullies, diversions, and low flowing streams	0.70	30.00	4,313.00	2.50	0.479

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#29	**Muskingum K:**					**0.479**
#30	8. Large gullies, diversions, and low flowing streams	0.70	30.00	4,313.00	2.50	0.479
#30	**Muskingum K:**					**0.479**
#33	8. Large gullies, diversions, and low flowing streams	0.66	77.00	11,748.55	2.42	1.348
#33	**Muskingum K:**					**1.348**
#35	8. Large gullies, diversions, and low flowing streams	0.33	15.00	4,556.50	1.72	0.735
#35	**Muskingum K:**					**0.735**
#36	8. Large gullies, diversions, and low flowing streams	0.30	60.00	20,005.00	1.64	3.388
#36	**Muskingum K:**					**3.388**

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc. (ml/l)	24VW (ml/l)
#30	476.400	476.400	36.53	4.76	37.8	8,241	3.58	2.53
#28	1,217.900	1,217.900	540.05	60.99	3,425.4	57,102	0.35	0.25
#26	2,486.400	2,486.400	132.85	36.83	246.5	6,616	1.86	1.38
#24	8,061.800	8,061.800	184.75	107.97	413.0	4,459	0.52	0.33
#25	1,015.700	9,077.500	200.88	132.08	562.2	15,586	3.88	0.78
#27	1,783.700	13,347.600	411.67	211.75	1,874.9	29,782	12.71	2.77
#29	966.000	15,531.500	846.18	320.24	8,836.4	71,508	7.80	2.18
#32	293.700	16,301.600	861.61	342.94	9,450.3	63,077	3.78	1.20
#31	957.100	957.100	527.85	55.53	2,515.1	41,599	0.63	0.49
#33	0.000	17,258.700	979.82	398.47	11,965.4	54,725	2.76	1.10
#34	1,156.300	18,415.000	987.58	429.85	11,156.6	47,836	0.53	0.21
#5	2,023.000	2,023.000	837.11	84.35	2,651.8	41,867	3.61	1.97
#6	1,743.200	3,766.200	956.02	162.51	4,812.4	36,662	0.21	0.12
#7	2,395.300	6,161.500	1,580.25	304.55	12,662.2	45,945	0.00	0.00
#8	0.000	6,161.500	1,580.25	304.55	12,662.2	45,945	0.00	0.00
#10	1,053.200	7,214.700	1,604.48	357.12	12,343.9	41,885	0.11	0.07
#1	2,411.100	2,411.100	588.72	81.15	2,757.0	37,715	5.52	3.62
#2	1,497.000	3,908.100	655.37	163.33	3,613.2	24,179	0.19	0.13
#3	828.500	4,736.600	821.07	201.79	4,017.4	19,114	0.06	0.05
#4	0.000	4,736.600	821.07	201.79	4,017.4	19,114	0.06	0.05
#9	712.000	5,448.600	838.44	222.40	4,034.4	17,221	0.91	0.70
#11	0.000	12,663.300	2,167.19	579.51	16,378.3	34,733	0.52	0.31
#21	646.500	13,309.800	2,182.31	602.82	16,377.7	34,019	0.52	0.30
#18	848.500	848.500	268.00	38.22	496.6	15,750	0.12	0.07
#17	182.200	182.200	174.08	11.12	167.2	15,582	0.82	0.58
#19	0.000	1,030.700	409.10	49.34	663.8	14,808	0.28	0.18
#15	1,992.700	1,992.700	627.55	84.79	3,281.0	46,290	1.92	1.17
#12	3,494.500	3,494.500	397.28	66.53	1,024.9	16,872	7.34	4.90
#13	2,720.700	6,215.200	697.21	118.62	2,079.9	18,344	8.61	6.01
#14	5,096.800	11,312.000	857.46	314.10	7,163.1	83,325	1.79	0.35
#16	1,022.000	14,326.700	1,313.19	459.17	12,440.3	53,249	1.64	0.61
#20	577.100	15,934.500	1,328.30	539.74	13,313.7	47,195	0.99	0.38
#22	0.000	29,244.300	3,288.80	1,142.56	29,691.5	34,631	0.62	0.34
#23	291.000	29,535.300	3,281.54	1,149.81	29,680.1	34,483	0.56	0.30
#35	0.000	47,950.300	4,161.61	1,579.66	40,836.7	33,253	0.49	0.28
#36	509.000	48,459.300	4,140.25	1,592.46	40,689.5	35,606	0.44	0.23
#37	1,661.000	50,120.300	4,058.47	1,645.47	40,053.7	40,768	0.29	0.13

Particle Size Distribution(s) at Each Structure

Structure #30:

Size (mm)	In/Out
2.0000	100.000%
0.1000	95.919%
0.0500	54.354%
0.0020	35.170%
0.0010	0.000%

Structure #28:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	98.281%
0.0010	0.000%

Structure #26:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	77.468%
0.0020	50.127%
0.0010	0.000%

Structure #24:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	92.408%
0.0020	76.427%
0.0010	0.000%

Structure #25:

Size (mm)	In/Out
2.0000	100.000%
0.1000	81.751%
0.0500	71.783%
0.0020	65.170%
0.0010	0.000%

Structure #27:

Size (mm)	In/Out
2.0000	100.000%
0.1000	74.104%
0.0500	52.366%
0.0020	39.498%
0.0010	0.000%

Structure #29:

Size (mm)	In/Out
2.0000	100.000%
0.1000	94.550%
0.0500	89.938%
0.0020	81.883%
0.0010	0.000%

Structure #32:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	96.350%
0.0020	87.710%
0.0010	0.000%

Structure #31:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	95.759%
0.0010	0.000%

Structure #33 (Inlet to North Fork Diversion):

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	97.117%
0.0020	89.402%
0.0010	0.000%

Structure #34 (End of North Fork):

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.457%
0.0500	99.140%
0.0020	97.985%
0.0010	0.000%

Structure #5:

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.651%
0.0500	91.884%
0.0020	85.871%
0.0010	0.000%

Structure #6:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	98.370%
0.0010	0.000%

Structure #7:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	100.000%
0.0010	0.000%

Structure #8:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	100.000%
0.0010	0.000%

Structure #10:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	99.748%
0.0020	99.586%
0.0010	0.000%

Structure #1:

Size (mm)	In/Out
2.0000	100.000%
0.1000	94.414%
0.0500	84.026%
0.0020	78.767%
0.0010	0.000%

Structure #2:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	97.735%
0.0010	0.000%

Structure #3:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	99.126%
0.0010	0.000%

Structure #4:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	99.126%
0.0010	0.000%

Structure #9:

Size (mm)	In/Out
2.0000	96.384%
0.1000	95.017%
0.0500	93.667%
0.0020	93.044%
0.0010	0.000%

Structure #11:

Size (mm)	In/Out
2.0000	99.109%
0.1000	98.772%
0.0500	98.250%
0.0020	97.975%
0.0010	0.000%

Structure #21 (End of South Fork):

Size (mm)	In/Out
2.0000	98.787%
0.1000	98.493%
0.0500	98.209%
0.0020	97.963%
0.0010	0.000%

Structure #18:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	97.922%
0.0010	0.000%

Structure #17:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	85.172%
0.0010	0.000%

Structure #19:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	94.709%
0.0010	0.000%

Structure #15:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	96.507%
0.0020	92.676%
0.0010	0.000%

Structure #12:

Size (mm)	In/Out
2.0000	100.000%
0.1000	80.910%
0.0500	54.212%
0.0020	35.079%
0.0010	0.000%

Structure #13:

Size (mm)	In/Out
2.0000	100.000%
0.1000	78.331%
0.0500	49.080%
0.0020	31.758%
0.0010	0.000%

Structure #14:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	93.935%
0.0010	0.000%

Structure #16:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	99.091%
0.0020	92.456%
0.0010	0.000%

Structure #20 (End of Middle Fork):

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	94.059%
0.0010	0.000%

Structure #22:

Size (mm)	In/Out
2.0000	99.331%
0.1000	99.169%
0.0500	99.012%
0.0020	96.212%
0.0010	0.000%

Structure #23:

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.558%
0.0500	99.235%
0.0020	96.395%
0.0010	0.000%

Structure #35 (all forks):

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.530%
0.0500	99.209%
0.0020	96.829%
0.0010	0.000%

Structure #36:

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.518%
0.0500	99.366%
0.0020	97.314%
0.0010	0.000%

Structure #37:

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.578%
0.0500	99.269%
0.0020	98.942%
0.0010	0.000%

Structure Detail:

Structure #30 (Null)

Structure #28 (Null)

Structure #26 (Null)

Structure #24 (Null)

Structure #25 (Null)

Structure #27 (Null)

Structure #29 (Null)

Structure #32 (Null)

Structure #31 (Null)

Structure #33 (Null)

Inlet to North Fork Diversion

Structure #34 (Null)

End of North Fork

Structure #5 (Null)

Structure #6 (Null)

Structure #7 (Null)

Structure #8 (Null)

Structure #10 (Null)

Structure #1 (Null)

Structure #2 (Null)

Structure #3 (Null)

Structure #4 (Null)

Structure #9 (Null)

Structure #11 (Null)

Structure #21 (Null)

End of South Fork

Structure #18 (Null)

Structure #17 (Null)

Structure #19 (Null)

Structure #15 (Null)

Structure #12 (Null)

Structure #13 (Null)

Structure #14 (Null)

Structure #16 (Null)

Structure #20 (Null)

End of Middle Fork

Structure #22 (Null)

Structure #23 (Null)

Structure #35 (Null)

all forks

Structure #36 (Null)

Structure #37 (Null)

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#30	1	476.400	1.131	0.000	0.000	73.100	M	36.53	4.764
	Σ	**476.400**						**36.53**	**4.764**
#28	1	772.300	0.657	0.523	0.334	90.400	M	491.68	38.669
	2	445.600	0.587	0.000	0.000	90.400	M	305.95	22.321
	Σ	**1,217.900**						**540.05**	**60.991**
#26	1	447.600	2.192	0.000	0.000	74.200	M	23.11	5.111
	2	2,038.800	3.000	0.000	0.000	77.000	M	112.68	31.721
	Σ	**2,486.400**						**132.85**	**36.832**
#24	1	2,607.500	5.367	2.377	0.305	75.200	M	71.74	33.393
	2	2,331.900	4.813	2.431	0.304	74.700	M	66.31	28.216
	3	1,758.500	2.231	1.788	0.297	76.200	M	113.95	25.140
	4	1,363.900	2.618	0.000	0.000	77.000	M	84.58	21.220
	Σ	**8,061.800**						**184.75**	**107.969**
#25	1	515.200	0.990	0.342	0.357	78.200	M	81.39	9.063
	2	130.500	0.787	0.342	0.357	78.100	M	24.40	2.273
	3	370.000	0.516	0.000	0.000	85.700	M	190.15	12.775
	Σ	**9,077.500**						**200.88**	**132.080**
#27	1	354.400	0.612	1.233	0.337	83.100	M	129.85	9.820
	2	305.200	0.529	1.054	0.328	84.000	M	133.52	9.142
	3	289.800	0.692	0.551	0.328	75.500	M	44.45	3.841
	4	253.000	0.361	0.551	0.328	79.400	M	93.60	5.022
	5	581.300	0.980	0.000	0.000	82.300	M	139.19	15.009
	Σ	**13,347.600**						**411.67**	**211.747**
#29	1	508.800	0.409	0.416	0.312	89.500	M	404.67	23.823
	2	233.200	0.521	0.291	0.312	91.600	M	188.69	12.806
	3	224.000	0.467	0.000	0.000	90.000	M	171.82	10.877
	Σ	**15,531.500**						**846.18**	**320.244**
#32	1	293.700	0.576	0.000	0.000	93.000	M	247.25	17.930
	Σ	**16,301.600**						**861.61**	**342.938**
#31	1	431.100	0.588	0.450	0.336	91.500	M	321.18	23.493
	2	325.800	0.432	0.149	0.327	93.000	M	322.14	19.913
	3	200.200	0.373	0.000	0.000	92.900	M	210.22	12.124
	Σ	**957.100**						**527.85**	**55.530**
#33	Σ	**17,258.700**						**979.82**	**398.468**

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#34	1	250.000	0.423	1.019	0.292	90.500	M	210.04	12.641
	2	219.100	0.611	0.267	0.322	80.000	M	60.29	4.592
	3	246.200	0.688	0.466	0.293	80.000	M	62.05	5.158
	4	441.000	0.370	0.000	0.000	79.700	M	165.34	8.992
	Σ	**18,415.000**						**987.58**	**429.850**
#5	1	503.600	0.618	0.000	0.000	87.600	M	268.07	20.239
	2	406.500	0.388	0.501	0.350	84.800	M	230.58	13.021
	3	439.600	0.342	0.681	0.347	87.800	M	336.99	18.042
	4	162.600	0.280	0.681	0.347	86.000	M	118.70	5.772
	5	294.100	0.375	1.021	0.348	92.000	M	290.40	16.627
	6	216.600	0.272	1.018	0.348	90.100	M	214.22	10.646
	Σ	**2,023.000**						**837.11**	**84.347**
#6	1	149.100	0.331	0.000	0.000	92.600	M	161.30	8.862
	2	245.000	0.529	0.192	0.328	88.100	M	150.59	10.257
	3	276.200	0.450	0.461	0.319	89.500	M	208.50	12.896
	4	158.400	0.380	1.385	0.185	93.000	M	166.02	9.660
	5	206.200	0.402	0.796	0.320	89.400	M	164.26	9.578
	6	414.000	0.430	1.066	0.323	87.200	M	269.04	16.158
	7	294.300	0.535	1.066	0.323	86.400	M	156.53	10.750
	Σ	**3,766.200**						**956.02**	**162.509**
#7	1	731.700	1.274	0.000	0.000	93.000	M	346.80	44.600
	2	445.800	1.043	0.000	0.000	93.000	M	247.27	27.164
	3	270.800	0.804	0.000	0.000	93.000	M	182.24	16.506
	4	78.900	0.267	1.035	0.328	93.000	M	94.49	4.837
	5	154.900	0.310	1.071	0.326	93.000	M	176.25	9.484
	6	101.400	0.288	1.164	0.328	92.900	M	117.81	6.157
	7	117.700	0.298	1.344	0.329	92.200	M	129.29	6.777
	8	494.100	0.518	1.344	0.329	91.300	M	392.49	26.519
	Σ	**6,161.500**						**1,580.25**	**304.553**
#8	1	0.000	0.000	0.000	0.000	1.000	0.00	0.000	
	Σ	**6,161.500**						**1,580.25**	**304.553**
#10	1	355.500	1.286	0.000	0.000	93.000	M	167.23	21.664
	2	307.100	1.282	0.668	0.305	83.200	M	64.37	8.575
	3	147.300	1.245	0.517	0.303	90.600	M	58.93	7.480
	4	126.400	0.585	0.517	0.303	93.000	M	105.39	7.719
	5	116.900	1.179	0.621	0.305	93.000	M	58.93	7.126
	Σ	**7,214.700**						**1,604.48**	**357.116**
#1	1	557.400	0.941	0.000	0.000	83.600	M	155.00	16.115
	2	169.600	1.616	0.677	0.333	93.000	M	66.17	10.336
	3	636.400	1.842	0.729	0.333	81.000	M	80.29	14.616

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
	4	223.400	0.846	1.005	0.336	84.100	M	70.44	6.742
	5	77.700	0.330	1.392	0.341	81.400	M	36.23	1.860
	6	746.600	0.678	1.392	0.341	88.200	M	391.01	31.484
	Σ	**2,411.100**						**588.72**	**81.153**
#2	1	257.000	0.423	0.000	0.000	93.000	M	256.73	15.720
	2	180.500	0.562	0.478	0.281	91.800	M	141.48	10.054
	3	200.700	0.687	0.574	0.283	93.000	M	150.71	12.240
	4	438.600	0.811	0.574	0.283	93.000	M	293.34	26.741
	5	420.200	1.247	0.801	0.293	88.000	M	135.94	17.427
	Σ	**3,908.100**						**655.37**	**163.335**
#3	1	172.600	0.443	0.000	0.000	93.000	M	168.52	10.532
	2	277.000	0.890	0.000	0.000	88.900	M	125.68	12.334
	3	378.900	0.632	0.209	0.314	87.900	M	203.46	15.593
	Σ	**4,736.600**						**821.07**	**201.793**
#4	**Σ**	**4,736.600**						**821.07**	**201.793**
#9	1	288.000	0.987	0.000	0.000	85.800	M	93.35	10.008
	2	236.000	0.436	0.000	0.000	81.900	M	97.67	5.893
	3	106.000	0.324	0.297	0.268	81.900	M	52.05	2.651
	4	82.000	0.315	0.666	0.300	81.900	M	40.86	2.051
	Σ	**5,448.600**						**838.44**	**222.397**
#11	**Σ**	**12,663.300**						**2,167.19**	**579.513**
#21	1	146.000	0.819	0.000	0.000	86.900	M	59.84	5.549
	2	137.000	0.213	0.249	0.263	81.900	M	81.55	3.429
	3	182.500	0.289	0.878	0.256	91.300	M	191.31	9.811
	4	70.000	0.939	0.878	0.256	81.900	M	16.70	1.745
	5	111.000	0.297	0.947	0.263	81.900	M	56.97	2.776
	Σ	**13,309.800**						**2,182.31**	**602.824**
#18	1	301.700	0.652	0.000	0.000	93.000	M	234.61	18.415
	2	546.800	0.768	0.561	0.320	86.300	M	223.53	19.804
	Σ	**848.500**						**268.00**	**38.220**
#17	1	182.200	0.462	0.000	0.000	93.000	M	174.08	11.118
	Σ	**182.200**						**174.08**	**11.118**
#19	**Σ**	**1,030.700**						**409.10**	**49.338**
#15	1	437.400	0.803	0.000	0.000	91.300	M	258.94	23.432
	2	549.000	0.637	0.654	0.327	91.300	M	382.26	29.427
	3	1,006.300	1.023	0.768	0.331	84.700	M	288.75	31.930
	Σ	**1,992.700**						**627.55**	**84.789**

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#12	1	517.800	0.791	0.000	0.000	81.900	M	140.91	12.902
	2	229.000	0.571	0.043	0.418	80.100	M	66.83	4.847
	3	592.700	0.706	0.044	0.417	81.500	M	169.25	14.252
	4	1,806.900	1.542	0.487	0.362	76.700	M	168.42	27.242
	5	348.100	0.618	0.487	0.362	80.000	94.98	7.291	
	Σ	**3,494.500**						**397.28**	**66.533**
#13	1	411.600	0.725	0.000	0.000	79.700	M	96.79	8.384
	2	636.400	0.774	0.322	0.336	80.700	M	157.14	14.233
	3	319.000	0.575	0.685	0.318	85.500	M	149.91	10.830
	4	231.700	0.314	0.923	0.328	80.400	M	101.73	5.057
	5	1,122.000	1.308	0.923	0.328	74.700	M	94.33	13.581
	Σ	**6,215.200**						**697.21**	**118.618**
#14	1	405.900	0.384	0.000	0.000	90.800	M	365.33	20.943
	2	411.100	0.452	0.707	0.308	90.700	M	338.08	21.056
	3	787.400	0.658	0.975	0.307	91.400	M	540.50	42.565
	4	144.200	0.341	1.716	0.310	86.200	M	98.01	5.205
	5	343.800	0.289	1.970	0.312	86.500	M	257.38	12.690
	6	392.800	0.806	2.107	0.316	81.900	M	105.39	9.788
	7	528.200	0.518	2.544	0.316	87.200	M	306.31	20.592
	8	890.900	1.253	2.544	0.316	83.500	M	195.49	25.534
	9	741.400	1.076	3.047	0.316	84.800	M	206.21	23.723
	10	451.100	0.916	3.354	0.316	83.900	M	131.53	13.383
	Σ	**11,312.000**						**857.46**	**314.097**
#16	1	475.100	1.721	0.000	0.000	92.400	M	167.82	27.665
	2	348.400	0.542	0.951	0.283	92.500	M	293.69	20.454
	3	198.500	0.266	1.384	0.278	93.000	M	237.98	12.169
	Σ	**14,326.700**						**1,313.19**	**459.175**
#20	1	271.100	0.667	0.000	0.000	89.400	M	158.02	12.563
	2	306.000	0.713	0.410	0.287	93.000	M	224.02	18.659
	Σ	**15,934.500**						**1,328.30**	**539.735**
#22	**Σ**	**29,244.300**						**3,288.80**	**1,142.559**
#23	1	291.000	0.564	0.000	0.000	81.900	M	101.45	7.256
	Σ	**29,535.300**						**3,281.54**	**1,149.815**
#35	**Σ**	**47,950.300**						**4,161.61**	**1,579.665**
#36	1	308.000	0.606	0.000	0.000	81.900	M	102.05	7.684
	2	45.000	0.159	0.470	0.263	81.900	M	29.51	1.145
	3	156.000	0.158	0.000	0.000	81.900	M	102.29	3.968
	Σ	**48,459.300**						**4,140.25**	**1,592.461**

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#37	1	344.000	1.756	0.000	0.000	84.800	M	64.04	11.003
	2	300.000	0.415	1.870	0.241	87.800	M	208.41	12.295
	3	185.000	0.332	1.493	0.241	85.500	M	120.54	6.303
	4	246.000	0.363	2.653	0.246	81.900	M	113.59	6.149
	5	157.000	0.611	2.512	0.242	84.100	M	62.79	4.740
	6	76.000	0.095	2.512	0.242	84.100	M	100.66	2.874
	7	243.000	0.673	1.814	0.241	83.000	M	82.44	6.677
	8	81.000	0.151	0.095	0.383	81.900	M	53.11	2.060
	9	29.000	0.118	1.721	0.298	81.900	M	33.80	0.906
	Σ	**50,120.300**						**4,058.47**	**1,645.467**

Subwatershed Sedimentology Detail:

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
#30	1	0.095	200.00	3.80	0.3720	1.0000	2	37.8	8,241	3.58	2.53
	Σ							**37.8**	**8,241**	**3.58**	**2.53**
#28	1	0.187	100.00	10.10	0.3750	1.0000	3	2,689.8	70,014	0.00	0.00
	2	0.196	100.00	10.20	0.3930	1.0000	3	1,688.7	76,821	0.95	0.67
	Σ							**3,425.4**	**57,102**	**0.35**	**0.25**
#26	1	0.155	400.00	1.40	0.3480	1.0000	2	23.5	4,623	1.48	1.08
	2	0.155	300.00	2.40	0.3340	1.0000	2	223.0	7,027	1.94	1.43
	Σ							**246.5**	**6,616**	**1.86**	**1.38**
#24	1	0.128	300.00	2.30	0.3360	1.0000	2	142.6	4,234	0.49	0.37
	2	0.136	300.00	2.70	0.3440	1.0000	2	156.0	5,467	0.69	0.51
	3	0.107	300.00	2.30	0.3330	1.0000	2	130.5	5,163	1.74	1.28
	4	0.163	400.00	1.60	0.3210	1.0000	2	117.0	5,534	1.71	1.25
	Σ							**413.0**	**4,459**	**0.52**	**0.33**
#25	1	0.125	400.00	1.90	0.3440	1.0000	2	67.8	7,753	3.82	2.71
	2	0.124	300.00	2.60	0.3280	1.0000	2	18.3	8,435	4.40	3.07
	3	0.122	175.00	4.90	0.2660	1.0000	2	220.7	18,283	10.89	7.52
	Σ							**562.2**	**15,586**	**3.88**	**0.78**
#27	1	0.127	175.00	5.90	0.3160	1.0000	2	227.1	23,856	13.64	9.65
	2	0.122	150.00	7.50	0.2920	1.0000	2	229.0	25,945	15.24	10.73
	3	0.070	125.00	8.40	0.3270	1.0000	2	51.3	14,063	7.33	5.09
	4	0.097	125.00	9.60	0.3170	1.0000	2	149.1	31,802	19.09	12.97
	5	0.126	125.00	8.90	0.3290	1.0000	2	413.8	28,401	14.71	10.41

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
	Σ							**1,874.9**	**29,782**	**12.71**	**2.77**
#29	1	0.190	125.00	9.80	0.3930	1.0000	3	2,025.8	86,051	4.01	2.83
	2	0.203	125.00	8.90	0.3940	1.0000	3	865.3	68,289	2.28	1.62
	3	0.193	125.00	8.40	0.3940	1.0000	3	650.4	61,594	2.23	1.56
	Σ							**8,836.4**	**71,508**	**7.80**	**2.18**
#32	1	0.210	150.00	7.70	0.3990	1.0000	3	1,137.5	64,212	1.95	1.39
	Σ							**9,450.3**	**63,077**	**3.78**	**1.20**
#31	1	0.204	125.00	8.70	0.3620	1.0000	3	1,459.0	62,828	1.19	0.85
	2	0.210	150.00	7.30	0.3990	1.0000	3	1,328.3	67,409	3.95	2.81
	3	0.210	175.00	4.50	0.3980	1.0000	3	539.2	45,502	3.16	2.24
	Σ							**2,515.1**	**41,599**	**0.63**	**0.49**
#33	Σ							**11,965.4**	**54,725**	**2.76**	**1.10**
#34	1	0.193	200.00	3.84	0.2460	1.0000	3	235.4	18,993	0.92	0.66
	2	0.100	200.00	3.66	0.2540	1.0000	1	34.0	7,872	4.62	3.19
	3	0.100	300.00	2.54	0.2540	1.0000	1	29.8	6,067	3.50	2.44
	4	0.100	200.00	3.50	0.2540	1.0000	1	83.6	10,268	6.40	4.24
	Σ							**11,156.6**	**47,836**	**0.53**	**0.21**
#5	1	0.149	75.00	12.50	0.3230	1.0000	3	1,034.7	52,699	0.00	0.00
	2	0.133	75.00	15.80	0.3190	1.0000	2	882.3	70,193	42.92	29.78
	3	0.103	100.00	11.00	0.2030	1.0000	3	477.2	27,418	1.49	1.04
	4	0.093	75.00	13.80	0.2130	1.0000	2	151.7	27,429	17.29	12.07
	5	0.123	100.00	11.00	0.1370	1.0000	3	338.9	20,783	1.35	0.97
	6	0.149	75.00	14.70	0.1990	1.0000	3	482.1	45,729	3.62	2.59
	Σ							**2,651.8**	**41,867**	**3.61**	**1.97**
#6	1	0.208	175.00	4.30	0.3980	1.0000	3	369.3	42,677	3.27	2.31
	2	0.183	175.00	5.40	0.3910	1.0000	3	414.2	41,856	0.48	0.34
	3	0.188	150.00	7.60	0.3900	1.0000	3	743.1	58,940	2.20	1.55
	4	0.210	150.00	6.30	0.3990	1.0000	3	531.4	53,736	3.69	2.72
	5	0.185	125.00	8.10	0.3860	1.0000	3	522.2	55,347	2.64	1.88
	6	0.104	100.00	11.30	0.2240	1.0000	3	458.0	29,084	0.88	0.62
	7	0.164	100.00	11.20	0.3740	1.0000	3	700.8	65,996	0.00	0.00
	Σ							**4,812.4**	**36,662**	**0.21**	**0.12**
#7	1	0.208	150.00	7.80	0.3780	1.0000	3	2,177.7	48,781	0.00	0.00
	2	0.209	100.00	10.20	0.3940	1.0000	3	1,790.8	65,658	0.00	0.00
	3	0.210	150.00	6.70	0.3990	1.0000	3	801.8	49,036	0.00	0.00
	4	0.210	100.00	11.50	0.3990	1.0000	3	477.3	96,068	8.73	6.38
	5	0.210	150.00	7.10	0.3990	1.0000	3	608.5	63,520	5.23	3.80
	6	0.209	150.00	7.90	0.3990	1.0000	3	420.5	67,295	5.82	4.25

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
	7	0.206	75.00	15.50	0.3990	1.0000	3	836.5	118,836	9.71	7.12
	8	0.202	75.00	14.50	0.3980	1.0000	3	3,013.5	111,222	3.59	2.60
	Σ							**12,662.2**	**45,945**	**0.00**	**0.00**
#8	1	0.000	0.00	0.00	0.0000	1.0000	0	0.0	1	0.00	0.00
	Σ							**12,662.2**	**45,945**	**0.00**	**0.00**
#10	1	0.190	300.00	2.70	0.1930	1.0000	3	177.0	8,298	0.00	0.00
	2	0.153	200.00	3.50	0.3610	1.0000	2	104.5	12,354	6.02	4.35
	3	0.189	200.00	3.70	0.3190	1.0000	3	105.9	14,296	0.00	0.00
	4	0.190	300.00	2.10	0.1940	1.0000	3	61.5	8,188	0.23	0.17
	5	0.201	300.00	2.00	0.3030	1.0000	3	67.2	9,536	0.00	0.00
	Σ							**12,343.9**	**41,885**	**0.11**	**0.07**
#1	1	0.157	150.00	6.80	0.3830	1.0000	2	525.9	33,536	17.76	12.57
	2	0.210	150.00	6.60	0.3990	1.0000	3	344.9	33,236	0.00	0.00
	3	0.149	200.00	3.90	0.3870	1.0000	2	184.0	12,655	5.25	3.82
	4	0.169	175.00	4.70	0.3950	1.0000	2	175.1	26,524	14.42	10.30
	5	0.157	100.00	10.10	0.3940	1.0000	2	100.5	55,458	33.92	23.86
	6	0.175	75.00	12.60	0.2840	1.0000	3	1,708.1	54,643	0.00	0.00
	Σ							**2,757.0**	**37,715**	**5.52**	**3.62**
#2	1	0.190	150.00	7.90	0.1930	1.0000	3	483.6	31,655	1.91	1.35
	2	0.184	175.00	4.80	0.2010	1.0000	3	182.9	18,684	0.49	0.35
	3	0.202	200.00	3.90	0.3220	1.0000	3	267.3	22,234	0.20	0.14
	4	0.203	150.00	7.40	0.3220	1.0000	3	1,176.7	44,218	0.00	0.00
	5	0.181	175.00	5.10	0.3710	1.0000	3	468.2	26,988	0.00	0.00
	Σ							**3,613.2**	**24,179**	**0.19**	**0.13**
#3	1	0.190	175.00	5.20	0.1930	1.0000	3	221.4	21,734	1.23	0.87
	2	0.177	175.00	4.20	0.2560	1.0000	3	207.4	17,282	0.00	0.00
	3	0.166	175.00	4.30	0.2290	1.0000	3	265.7	17,717	0.00	0.00
	Σ							**4,017.4**	**19,114**	**0.06**	**0.05**
#4	Σ							**4,017.4**	**19,114**	**0.06**	**0.05**
#9	1	0.212	175.00	4.17	0.2490	1.0000	2	180.8	18,570	9.92	7.06
	2	0.100	200.00	4.50	0.2540	1.0000	4	76.1	13,975	11.18	7.56
	3	0.100	200.00	4.50	0.2540	1.0000	4	34.2	13,816	11.05	7.55
	4	0.100	200.00	6.50	0.2540	1.0000	4	36.6	18,921	15.14	10.44
	Σ							**4,034.4**	**17,221**	**0.91**	**0.70**
#11	Σ							**16,378.3**	**34,733**	**0.52**	**0.31**
#21	1	0.206	175.00	4.44	0.2560	1.0000	2	107.3	19,975	11.18	7.90
	2	0.100	175.00	14.00	0.2540	1.0000	4	199.4	61,350	49.08	33.53
	3	0.185	300.00	2.70	0.2180	1.0000	3	134.5	13,858	1.11	0.80

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
	4	0.100	300.00	8.00	0.2540	1.0000	1	30.4	17,732	9.82	7.04
	5	0.100	200.00	5.00	0.2540	1.0000	1	40.7	15,245	9.75	6.87
	Σ							**16,377.7**	**34,019**	**0.52**	**0.30**
#18	1	0.193	300.00	2.80	0.2200	1.0000	3	233.6	13,072	0.20	0.15
	2	0.173	175.00	4.70	0.3880	1.0000	3	614.7	31,763	0.00	0.00
	Σ							**496.6**	**15,750**	**0.12**	**0.07**
#17	1	0.196	300.00	2.60	0.2600	1.0000	3	167.2	15,582	0.82	0.58
	Σ							**167.2**	**15,582**	**0.82**	**0.58**
#19	Σ							**663.8**	**14,808**	**0.28**	**0.18**
#15	1	0.201	125.00	8.20	0.3960	1.0000	3	1,267.2	54,687	0.00	0.00
	2	0.161	100.00	11.40	0.3060	1.0000	3	1,671.9	57,370	0.43	0.31
	3	0.118	100.00	10.20	0.2850	1.0000	2	873.0	27,740	14.56	10.46
	Σ							**3,281.0**	**46,290**	**1.92**	**1.17**
#12	1	0.124	150.00	6.30	0.3070	1.0000	2	259.1	20,985	11.35	7.93
	2	0.132	200.00	3.60	0.3500	1.0000	2	66.5	14,727	8.34	5.68
	3	0.136	175.00	5.00	0.3330	1.0000	2	313.0	23,102	12.74	8.84
	4	0.188	200.00	3.40	0.3570	1.0000	2	404.6	15,016	6.20	4.48
	5	0.228	175.00	4.10	0.3640	1.0000	2	236.6	33,971	18.96	13.17
	Σ							**1,024.9**	**16,872**	**7.34**	**4.90**
#13	1	0.128	150.00	6.90	0.3390	1.0000	2	205.0	25,757	13.91	9.63
	2	0.130	175.00	5.70	0.3300	1.0000	2	321.8	23,501	12.64	8.87
	3	0.191	175.00	6.00	0.2890	1.0000	2	363.2	34,639	20.30	14.29
	4	0.122	175.00	5.10	0.3460	1.0000	2	124.9	26,092	15.97	11.02
	5	0.137	175.00	4.20	0.3530	1.0000	2	199.0	14,832	6.29	4.55
	Σ							**2,079.9**	**18,344**	**8.61**	**6.01**
#14	1	0.196	100.00	10.20	0.3980	1.0000	3	1,823.8	88,626	5.13	3.60
	2	0.193	150.00	6.70	0.4020	1.0000	3	1,202.1	57,829	2.49	1.77
	3	0.169	75.00	13.80	0.3240	1.0000	3	3,005.9	70,417	0.28	0.20
	4	0.114	100.00	11.00	0.2980	1.0000	3	193.5	37,483	1.77	1.28
	5	0.078	100.00	10.10	0.1830	1.0000	3	203.9	16,212	0.99	0.72
	6	0.084	150.00	7.10	0.2700	1.0000	2	126.0	13,104	7.06	5.08
	7	0.087	100.00	10.00	0.1840	1.0000	3	315.9	15,469	0.14	0.10
	8	0.126	150.00	6.70	0.2740	1.0000	2	438.7	17,197	8.46	6.18
	9	0.117	150.00	7.30	0.2600	1.0000	2	414.9	17,508	9.09	6.64
	10	0.115	125.00	8.50	0.2610	1.0000	2	253.2	18,957	10.12	7.38
	Σ							**7,163.1**	**83,325**	**1.79**	**0.35**
#16	1	0.201	300.00	2.78	0.3030	1.0000	3	347.0	12,660	0.00	0.00
	2	0.204	150.00	6.00	0.3630	1.0000	3	939.3	46,151	1.58	1.14

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
	3	0.210	150.00	6.10	0.3990	1.0000	3	715.4	57,437	5.23	3.86
	Σ							**12,440.3**	**53,249**	**1.64**	**0.61**
#20	1	0.186	175.00	3.19	0.2130	1.0000	3	135.2	11,203	0.00	0.00
	2	0.194	200.00	3.42	0.2330	1.0000	3	260.0	14,249	0.06	0.04
	Σ							**13,313.7**	**47,195**	**0.99**	**0.38**
#22	Σ							**29,691.5**	**34,631**	**0.62**	**0.34**
#23	1	0.100	350.00	8.00	0.2540	1.0000	1	200.0	29,263	17.58	12.06
	Σ							**29,680.1**	**34,483**	**0.56**	**0.30**
#35	Σ							**40,836.7**	**33,253**	**0.49**	**0.28**
#36	1	0.100	200.00	3.14	0.2540	1.0000	1	52.9	7,338	4.37	3.00
	2	0.100	450.00	13.00	0.2540	1.0000	1	96.9	87,291	57.62	39.93
	3	0.100	300.00	10.00	0.2540	1.0000	1	184.8	50,855	33.57	22.24
	Σ							**40,689.5**	**35,606**	**0.44**	**0.23**
#37	1	0.196	200.00	3.80	0.3980	1.0000	2	182.6	16,794	7.54	5.45
	2	0.194	200.00	3.42	0.4020	1.0000	3	340.3	27,613	1.02	0.74
	3	0.173	150.00	7.10	0.2770	1.0000	3	223.7	35,623	1.65	1.20
	4	0.100	175.00	5.00	0.2540	1.0000	1	87.6	14,244	8.97	6.56
	5	0.171	150.00	6.50	0.2990	1.0000	3	130.1	27,414	0.00	0.00
	6	0.171	150.00	6.50	0.2990	1.0000	3	112.8	38,722	10.05	7.40
	7	0.100	300.00	1.20	0.2540	1.0000	1	21.1	3,225	1.90	1.37
	8	0.100	300.00	10.00	0.2540	1.0000	1	88.7	46,751	30.86	20.58
	9	0.100	250.00	10.00	0.2540	1.0000	1	35.4	39,677	27.72	19.80
	Σ							**40,053.7**	**40,768**	**0.29**	**0.13**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	3.65	50.00	1,369.00	1.910	0.199
		8. Large gullies, diversions, and low flowing streams	1.57	157.00	10,030.00	3.750	0.742
#1	**1**	**Time of Concentration:**					**0.941**
#1	2	5. Nearly bare and untilled, and alluvial valley fans	6.63	70.00	1,056.00	2.570	0.114
		5. Nearly bare and untilled, and alluvial valley fans	1.98	150.00	7,573.00	1.400	1.502
#1	**2**	**Time of Concentration:**					**1.616**
#1	3	5. Nearly bare and untilled, and alluvial valley fans	1.65	117.00	7,070.00	1.280	1.534

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	2.43	126.00	5,188.00	4.670	0.308
#1	**3**	**Time of Concentration:**					**1.842**
#1	4	5. Nearly bare and untilled, and alluvial valley fans	5.77	260.00	4,506.00	2.400	0.521
		8. Large gullies, diversions, and low flowing streams	2.84	168.00	5,924.00	5.050	0.325
#1	**4**	**Time of Concentration:**					**0.846**
#1	5	5. Nearly bare and untilled, and alluvial valley fans	19.93	180.00	903.00	4.460	0.056
		8. Large gullies, diversions, and low flowing streams	3.30	178.00	5,393.00	5.450	0.274
#1	**5**	**Time of Concentration:**					**0.330**
#1	6	5. Nearly bare and untilled, and alluvial valley fans	13.43	105.00	782.00	3.660	0.059
		8. Large gullies, diversions, and low flowing streams	2.62	283.00	10,822.00	4.850	0.619
#1	**6**	**Time of Concentration:**					**0.678**
#2	1	5. Nearly bare and untilled, and alluvial valley fans	6.84	70.00	1,024.00	2.610	0.108
		8. Large gullies, diversions, and low flowing streams	1.62	70.00	4,325.00	3.810	0.315
#2	**1**	**Time of Concentration:**					**0.423**
#2	2	5. Nearly bare and untilled, and alluvial valley fans	5.56	45.00	810.00	2.350	0.095
		8. Large gullies, diversions, and low flowing streams	0.86	40.00	4,663.00	2.770	0.467
#2	**2**	**Time of Concentration:**					**0.562**
#2	3	5. Nearly bare and untilled, and alluvial valley fans	5.89	50.00	849.00	2.420	0.097
		8. Large gullies, diversions, and low flowing streams	1.17	80.00	6,862.00	3.230	0.590
#2	**3**	**Time of Concentration:**					**0.687**
#2	4	5. Nearly bare and untilled, and alluvial valley fans	12.63	95.00	752.00	3.550	0.058
		8. Large gullies, diversions, and low flowing streams	1.40	135.00	9,630.00	3.550	0.753
#2	**4**	**Time of Concentration:**					**0.811**
#2	5	5. Nearly bare and untilled, and alluvial valley fans	11.02	70.00	635.00	3.320	0.053
		8. Large gullies, diversions, and low flowing streams	0.46	40.00	8,732.00	2.030	1.194
#2	**5**	**Time of Concentration:**					**1.247**
#3	1	5. Nearly bare and untilled, and alluvial valley fans	1.24	10.00	805.00	1.110	0.201
		8. Large gullies, diversions, and low flowing streams	1.33	40.00	3,017.00	3.450	0.242
#3	**1**	**Time of Concentration:**					**0.443**
#3	2	5. Nearly bare and untilled, and alluvial valley fans	0.68	10.00	1,478.00	0.820	0.500

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	1.78	100.00	5,622.00	4.000	0.390
#3	**2**	**Time of Concentration:**					**0.890**
#3	3	5. Nearly bare and untilled, and alluvial valley fans	4.66	70.00	1,501.00	2.150	0.193
		8. Large gullies, diversions, and low flowing streams	1.17	60.00	5,126.00	3.240	0.439
#3	**3**	**Time of Concentration:**					**0.632**
#5	1	5. Nearly bare and untilled, and alluvial valley fans	19.06	285.00	1,495.00	4.360	0.095
		8. Large gullies, diversions, and low flowing streams	2.64	242.00	9,174.00	4.870	0.523
#5	**1**	**Time of Concentration:**					**0.618**
#5	2	5. Nearly bare and untilled, and alluvial valley fans	14.27	105.00	736.00	3.770	0.054
		8. Large gullies, diversions, and low flowing streams	4.08	297.00	7,279.00	6.050	0.334
#5	**2**	**Time of Concentration:**					**0.388**
#5	3	5. Nearly bare and untilled, and alluvial valley fans	8.27	35.00	423.00	2.870	0.040
		8. Large gullies, diversions, and low flowing streams	3.44	208.00	6,049.00	5.560	0.302
#5	**3**	**Time of Concentration:**					**0.342**
#5	4	5. Nearly bare and untilled, and alluvial valley fans	14.58	85.00	583.00	3.810	0.042
		8. Large gullies, diversions, and low flowing streams	4.53	248.00	5,473.00	6.380	0.238
#5	**4**	**Time of Concentration:**					**0.280**
#5	5	5. Nearly bare and untilled, and alluvial valley fans	5.07	70.00	1,382.00	2.250	0.170
		8. Large gullies, diversions, and low flowing streams	3.89	170.00	4,375.00	5.910	0.205
#5	**5**	**Time of Concentration:**					**0.375**
#5	6	5. Nearly bare and untilled, and alluvial valley fans	12.48	90.00	721.00	3.530	0.056
		8. Large gullies, diversions, and low flowing streams	5.16	274.00	5,308.02	6.810	0.216
#5	**6**	**Time of Concentration:**					**0.272**
#6	1	5. Nearly bare and untilled, and alluvial valley fans	5.36	75.00	1,399.00	2.310	0.168
		8. Large gullies, diversions, and low flowing streams	2.41	66.00	2,742.00	4.650	0.163
#6	**1**	**Time of Concentration:**					**0.331**
#6	2	5. Nearly bare and untilled, and alluvial valley fans	3.39	80.00	2,359.00	1.840	0.356
		8. Large gullies, diversions, and low flowing streams	2.63	80.00	3,039.00	4.860	0.173
#6	**2**	**Time of Concentration:**					**0.529**
#6	3	5. Nearly bare and untilled, and alluvial valley fans	4.60	34.00	739.00	2.140	0.095

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	2.33	136.00	5,845.00	4.570	0.355
#6	**3**	**Time of Concentration:**					**0.450**
#6	4	5. Nearly bare and untilled, and alluvial valley fans	6.06	85.00	1,402.00	2.460	0.158
		8. Large gullies, diversions, and low flowing streams	2.52	96.00	3,810.00	4.760	0.222
#6	**4**	**Time of Concentration:**					**0.380**
#6	5	5. Nearly bare and untilled, and alluvial valley fans	7.24	70.00	967.00	2.690	0.099
		8. Large gullies, diversions, and low flowing streams	2.34	117.00	5,003.00	4.580	0.303
#6	**5**	**Time of Concentration:**					**0.402**
#6	6	5. Nearly bare and untilled, and alluvial valley fans	31.83	183.00	575.00	5.640	0.028
		8. Large gullies, diversions, and low flowing streams	3.38	270.00	7,990.00	5.510	0.402
#6	**6**	**Time of Concentration:**					**0.430**
#6	7	5. Nearly bare and untilled, and alluvial valley fans	23.08	325.00	1,408.00	4.800	0.081
		8. Large gullies, diversions, and low flowing streams	2.88	240.00	8,327.00	5.090	0.454
#6	**7**	**Time of Concentration:**					**0.535**
#7	1	5. Nearly bare and untilled, and alluvial valley fans	11.42	90.00	788.00	3.370	0.064
		8. Large gullies, diversions, and low flowing streams	1.46	230.00	15,769.00	3.620	1.210
#7	**1**	**Time of Concentration:**					**1.274**
#7	2	5. Nearly bare and untilled, and alluvial valley fans	10.97	60.00	547.00	3.310	0.045
		8. Large gullies, diversions, and low flowing streams	1.61	220.00	13,660.00	3.800	0.998
#7	**2**	**Time of Concentration:**					**1.043**
#7	3	5. Nearly bare and untilled, and alluvial valley fans	6.40	60.00	938.00	2.520	0.103
		8. Large gullies, diversions, and low flowing streams	1.72	171.00	9,931.00	3.930	0.701
#7	**3**	**Time of Concentration:**					**0.804**
#7	4	5. Nearly bare and untilled, and alluvial valley fans	19.23	80.00	416.00	4.380	0.026
		8. Large gullies, diversions, and low flowing streams	2.45	100.00	4,083.00	4.690	0.241
#7	**4**	**Time of Concentration:**					**0.267**
#7	5	5. Nearly bare and untilled, and alluvial valley fans	6.09	67.00	1,101.00	2.460	0.124
		8. Large gullies, diversions, and low flowing streams	2.51	80.00	3,184.00	4.750	0.186
#7	**5**	**Time of Concentration:**					**0.310**
#7	6	5. Nearly bare and untilled, and alluvial valley fans	5.93	63.00	1,062.00	2.430	0.121

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	2.74	82.00	2,993.00	4.960	0.167
#7	**6**	**Time of Concentration:**					**0.288**
#7	7	5. Nearly bare and untilled, and alluvial valley fans	7.97	65.00	816.00	2.820	0.080
		8. Large gullies, diversions, and low flowing streams	3.48	153.00	4,400.00	5.590	0.218
#7	**7**	**Time of Concentration:**					**0.298**
#7	8	5. Nearly bare and untilled, and alluvial valley fans	6.60	50.00	758.00	2.560	0.082
		8. Large gullies, diversions, and low flowing streams	4.66	473.00	10,157.00	6.470	0.436
#7	**8**	**Time of Concentration:**					**0.518**
#9	1	5. Nearly bare and untilled, and alluvial valley fans	3.01	55.00	1,829.00	1.730	0.293
		8. Large gullies, diversions, and low flowing streams	0.76	50.00	6,548.00	2.620	0.694
#9	**1**	**Time of Concentration:**					**0.987**
#9	2	5. Nearly bare and untilled, and alluvial valley fans	4.67	70.00	1,500.02	2.160	0.192
		8. Large gullies, diversions, and low flowing streams	1.43	45.00	3,150.15	3.580	0.244
#9	**2**	**Time of Concentration:**					**0.436**
#9	3	5. Nearly bare and untilled, and alluvial valley fans	4.44	40.00	900.00	2.100	0.119
		8. Large gullies, diversions, and low flowing streams	1.48	40.00	2,700.14	3.650	0.205
#9	**3**	**Time of Concentration:**					**0.324**
#9	4	5. Nearly bare and untilled, and alluvial valley fans	6.50	65.00	1,000.00	2.540	0.109
		8. Large gullies, diversions, and low flowing streams	1.00	20.00	2,000.00	3.000	0.185
		9. Small streams flowing bankfull	2.92	35.00	1,200.00	15.370	0.021
#9	**4**	**Time of Concentration:**					**0.315**
#10	1	5. Nearly bare and untilled, and alluvial valley fans	1.24	41.00	3,317.00	1.110	0.830
		8. Large gullies, diversions, and low flowing streams	0.70	29.00	4,125.00	2.510	0.456
#10	**1**	**Time of Concentration:**					**1.286**
#10	2	5. Nearly bare and untilled, and alluvial valley fans	2.25	125.00	5,554.00	1.500	1.028
		8. Large gullies, diversions, and low flowing streams	2.13	85.00	3,997.00	4.370	0.254
#10	**2**	**Time of Concentration:**					**1.282**
#10	3	5. Nearly bare and untilled, and alluvial valley fans	1.39	68.00	4,904.00	1.170	1.164
		8. Large gullies, diversions, and low flowing streams	4.73	90.00	1,904.00	6.520	0.081
#10	**3**	**Time of Concentration:**					**1.245**
#10	4	5. Nearly bare and untilled, and alluvial valley fans	3.76	51.00	1,357.00	1.930	0.195

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	0.65	22.00	3,385.00	2.410	0.390
#10	**4**	**Time of Concentration:**					**0.585**
#10	5	5. Nearly bare and untilled, and alluvial valley fans	1.63	88.00	5,391.16	1.270	1.179
#10	**5**	**Time of Concentration:**					**1.179**
#12	1	5. Nearly bare and untilled, and alluvial valley fans	4.50	75.00	1,667.00	2.120	0.218
		8. Large gullies, diversions, and low flowing streams	1.85	155.00	8,400.00	4.070	0.573
#12	**1**	**Time of Concentration:**					**0.791**
#12	2	5. Nearly bare and untilled, and alluvial valley fans	2.99	50.00	1,674.03	1.720	0.270
		8. Large gullies, diversions, and low flowing streams	1.67	70.00	4,201.17	3.870	0.301
#12	**2**	**Time of Concentration:**					**0.571**
#12	3	5. Nearly bare and untilled, and alluvial valley fans	4.04	57.00	1,411.00	2.000	0.195
		8. Large gullies, diversions, and low flowing streams	1.55	107.00	6,884.00	3.740	0.511
#12	**3**	**Time of Concentration:**					**0.706**
#12	4	5. Nearly bare and untilled, and alluvial valley fans	2.23	84.00	3,771.04	1.490	0.703
		8. Large gullies, diversions, and low flowing streams	1.62	186.00	11,515.60	3.810	0.839
#12	**4**	**Time of Concentration:**					**1.542**
#12	5	5. Nearly bare and untilled, and alluvial valley fans	3.68	53.00	1,442.00	1.910	0.209
		8. Large gullies, diversions, and low flowing streams	1.95	120.00	6,155.00	4.180	0.409
#12	**5**	**Time of Concentration:**					**0.618**
#13	1	5. Nearly bare and untilled, and alluvial valley fans	4.62	62.00	1,342.00	2.140	0.174
		8. Large gullies, diversions, and low flowing streams	1.91	157.00	8,225.00	4.140	0.551
#13	**1**	**Time of Concentration:**					**0.725**
#13	2	5. Nearly bare and untilled, and alluvial valley fans	2.91	50.00	1,717.00	1.700	0.280
		8. Large gullies, diversions, and low flowing streams	2.28	183.00	8,039.00	4.520	0.494
#13	**2**	**Time of Concentration:**					**0.774**
#13	3	5. Nearly bare and untilled, and alluvial valley fans	6.18	95.00	1,537.00	2.480	0.172
		8. Large gullies, diversions, and low flowing streams	2.13	135.00	6,347.00	4.370	0.403
#13	**3**	**Time of Concentration:**					**0.575**
#13	4	5. Nearly bare and untilled, and alluvial valley fans	3.17	10.00	315.00	1.780	0.049
		8. Large gullies, diversions, and low flowing streams	2.30	100.00	4,344.00	4.550	0.265
#13	**4**	**Time of Concentration:**					**0.314**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#13	5	5. Nearly bare and untilled, and alluvial valley fans	3.10	70.00	2,255.00	1.760	0.355
		8. Large gullies, diversions, and low flowing streams	1.23	140.00	11,392.00	3.320	0.953
#13	**5**	**Time of Concentration:**					**1.308**
#14	1	5. Nearly bare and untilled, and alluvial valley fans	10.59	63.00	595.00	3.250	0.050
		8. Large gullies, diversions, and low flowing streams	2.60	151.00	5,808.00	4.830	0.334
#14	**1**	**Time of Concentration:**					**0.384**
#14	2	5. Nearly bare and untilled, and alluvial valley fans	7.28	67.00	920.00	2.690	0.095
		8. Large gullies, diversions, and low flowing streams	2.17	123.00	5,670.00	4.410	0.357
#14	**2**	**Time of Concentration:**					**0.452**
#14	3	5. Nearly bare and untilled, and alluvial valley fans	21.46	150.00	699.00	4.630	0.041
		8. Large gullies, diversions, and low flowing streams	3.10	364.00	11,728.00	5.280	0.617
#14	**3**	**Time of Concentration:**					**0.658**
#14	4	5. Nearly bare and untilled, and alluvial valley fans	3.39	35.00	1,032.00	1.840	0.155
		8. Large gullies, diversions, and low flowing streams	2.97	103.00	3,470.00	5.160	0.186
#14	**4**	**Time of Concentration:**					**0.341**
#14	5	5. Nearly bare and untilled, and alluvial valley fans	28.15	125.00	444.00	5.300	0.023
		8. Large gullies, diversions, and low flowing streams	4.18	246.00	5,886.00	6.130	0.266
#14	**5**	**Time of Concentration:**					**0.289**
#14	6	5. Nearly bare and untilled, and alluvial valley fans	3.18	40.00	1,257.00	1.780	0.196
		8. Large gullies, diversions, and low flowing streams	2.29	228.00	9,963.00	4.530	0.610
#14	**6**	**Time of Concentration:**					**0.806**
#14	7	5. Nearly bare and untilled, and alluvial valley fans	16.72	100.00	598.00	4.080	0.040
		8. Large gullies, diversions, and low flowing streams	2.81	243.00	8,649.00	5.020	0.478
#14	**7**	**Time of Concentration:**					**0.518**
#14	8	5. Nearly bare and untilled, and alluvial valley fans	1.70	47.00	2,765.00	1.300	0.590
		8. Large gullies, diversions, and low flowing streams	2.44	274.00	11,208.00	4.690	0.663
#14	**8**	**Time of Concentration:**					**1.253**
#14	9	5. Nearly bare and untilled, and alluvial valley fans	2.87	105.00	3,657.00	1.690	0.601
		8. Large gullies, diversions, and low flowing streams	2.43	194.00	7,991.00	4.670	0.475
#14	**9**	**Time of Concentration:**					**1.076**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#14	10	5. Nearly bare and untilled, and alluvial valley fans	2.75	80.00	2,907.00	1.650	0.489
		8. Large gullies, diversions, and low flowing streams	2.41	172.00	7,149.00	4.650	0.427
#14	**10**	**Time of Concentration:**					**0.916**
#15	1	5. Nearly bare and untilled, and alluvial valley fans	12.80	54.00	422.00	3.570	0.032
		8. Large gullies, diversions, and low flowing streams	1.68	181.00	10,781.00	3.880	0.771
#15	**1**	**Time of Concentration:**					**0.803**
#15	2	5. Nearly bare and untilled, and alluvial valley fans	44.22	260.00	588.00	6.640	0.024
		8. Large gullies, diversions, and low flowing streams	2.45	254.00	10,354.24	4.690	0.613
#15	**2**	**Time of Concentration:**					**0.637**
#15	3	5. Nearly bare and untilled, and alluvial valley fans	10.04	85.00	847.00	3.160	0.074
		8. Large gullies, diversions, and low flowing streams	2.34	366.00	15,663.00	4.580	0.949
#15	**3**	**Time of Concentration:**					**1.023**
#16	1	5. Nearly bare and untilled, and alluvial valley fans	2.26	117.00	5,179.00	1.500	0.959
		8. Large gullies, diversions, and low flowing streams	0.46	26.00	5,601.00	2.040	0.762
#16	**1**	**Time of Concentration:**					**1.721**
#16	2	5. Nearly bare and untilled, and alluvial valley fans	8.70	62.00	713.00	2.940	0.067
		8. Large gullies, diversions, and low flowing streams	1.99	144.00	7,241.00	4.230	0.475
#16	**2**	**Time of Concentration:**					**0.542**
#16	3	5. Nearly bare and untilled, and alluvial valley fans	6.88	32.00	465.00	2.620	0.049
		8. Large gullies, diversions, and low flowing streams	2.29	81.00	3,543.00	4.530	0.217
#16	**3**	**Time of Concentration:**					**0.266**
#17	1	5. Nearly bare and untilled, and alluvial valley fans	9.37	65.00	694.00	3.060	0.062
		8. Large gullies, diversions, and low flowing streams	1.19	56.00	4,712.00	3.270	0.400
#17	**1**	**Time of Concentration:**					**0.462**
#18	1	5. Nearly bare and untilled, and alluvial valley fans	9.00	60.00	667.00	2.990	0.061
		8. Large gullies, diversions, and low flowing streams	0.97	61.00	6,287.00	2.950	0.591
#18	**1**	**Time of Concentration:**					**0.652**
#18	2	5. Nearly bare and untilled, and alluvial valley fans	2.47	33.00	1,336.00	1.570	0.236
		8. Large gullies, diversions, and low flowing streams	2.01	164.00	8,154.00	4.250	0.532
#18	**2**	**Time of Concentration:**					**0.768**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#20	1	5. Nearly bare and untilled, and alluvial valley fans	11.87	45.00	379.00	3.440	0.030
		8. Large gullies, diversions, and low flowing streams	0.75	45.00	5,969.00	2.600	0.637
#20	**1**	**Time of Concentration:**					**0.667**
#20	2	5. Nearly bare and untilled, and alluvial valley fans	5.40	45.00	833.00	2.320	0.099
		8. Large gullies, diversions, and low flowing streams	1.30	98.00	7,547.00	3.410	0.614
#20	**2**	**Time of Concentration:**					**0.713**
#21	1	5. Nearly bare and untilled, and alluvial valley fans	4.09	60.00	1,467.02	2.020	0.201
		8. Large gullies, diversions, and low flowing streams	0.93	60.00	6,433.62	2.890	0.618
#21	**1**	**Time of Concentration:**					**0.819**
#21	2	5. Nearly bare and untilled, and alluvial valley fans	3.85	50.00	1,300.00	1.960	0.184
		8. Large gullies, diversions, and low flowing streams	42.86	900.00	2,100.00	19.630	0.029
#21	**2**	**Time of Concentration:**					**0.213**
#21	3	5. Nearly bare and untilled, and alluvial valley fans	1.70	15.00	881.00	1.300	0.188
		9. Small streams flowing bankfull	1.49	60.00	4,014.18	11.000	0.101
#21	**3**	**Time of Concentration:**					**0.289**
#21	4	5. Nearly bare and untilled, and alluvial valley fans	2.21	40.00	1,811.02	1.480	0.339
		8. Large gullies, diversions, and low flowing streams	0.84	50.00	5,949.54	2.750	0.600
#21	**4**	**Time of Concentration:**					**0.939**
#21	5	5. Nearly bare and untilled, and alluvial valley fans	4.00	30.00	750.00	2.000	0.104
		8. Large gullies, diversions, and low flowing streams	2.34	75.00	3,200.06	4.590	0.193
#21	**5**	**Time of Concentration:**					**0.297**
#23	1	5. Nearly bare and untilled, and alluvial valley fans	8.00	80.00	1,000.00	2.820	0.098
		8. Large gullies, diversions, and low flowing streams	2.74	85.00	3,100.00	4.960	0.173
		8. Large gullies, diversions, and low flowing streams	0.40	8.00	2,000.00	1.890	0.293
#23	**1**	**Time of Concentration:**					**0.564**
#24	1	5. Nearly bare and untilled, and alluvial valley fans	1.71	430.00	25,118.00	1.300	5.367
#24	**1**	**Time of Concentration:**					**5.367**
#24	2	5. Nearly bare and untilled, and alluvial valley fans	1.84	430.00	23,393.00	1.350	4.813
#24	**2**	**Time of Concentration:**					**4.813**
#24	3	5. Nearly bare and untilled, and alluvial valley fans	1.82	155.00	8,498.00	1.350	1.748
		8. Large gullies, diversions, and low flowing streams	0.84	40.00	4,771.00	2.740	0.483

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#24	**3**	**Time of Concentration:**					**2.231**
#24	4	5. Nearly bare and untilled, and alluvial valley fans	1.24	50.00	4,042.00	1.110	1.011
		8. Large gullies, diversions, and low flowing streams	0.49	60.00	12,150.00	2.100	1.607
#24	**4**	**Time of Concentration:**					**2.618**
#25	1	5. Nearly bare and untilled, and alluvial valley fans	0.51	10.00	1,950.00	0.710	0.762
		8. Large gullies, diversions, and low flowing streams	1.81	60.00	3,322.00	4.030	0.228
#25	**1**	**Time of Concentration:**					**0.990**
#25	2	5. Nearly bare and untilled, and alluvial valley fans	1.11	25.00	2,254.00	1.050	0.596
		8. Large gullies, diversions, and low flowing streams	2.36	75.00	3,178.00	4.600	0.191
#25	**2**	**Time of Concentration:**					**0.787**
#25	3	5. Nearly bare and untilled, and alluvial valley fans	3.23	30.00	929.00	1.790	0.144
		8. Large gullies, diversions, and low flowing streams	2.45	154.00	6,297.00	4.690	0.372
#25	**3**	**Time of Concentration:**					**0.516**
#26	1	5. Nearly bare and untilled, and alluvial valley fans	1.20	103.00	8,602.00	1.090	2.192
#26	**1**	**Time of Concentration:**					**2.192**
#26	2	5. Nearly bare and untilled, and alluvial valley fans	1.23	120.00	9,780.00	1.100	2.469
		8. Large gullies, diversions, and low flowing streams	2.18	184.00	8,454.00	4.420	0.531
#26	**2**	**Time of Concentration:**					**3.000**
#27	1	5. Nearly bare and untilled, and alluvial valley fans	4.32	50.00	1,158.02	2.070	0.155
		8. Large gullies, diversions, and low flowing streams	2.53	198.00	7,838.16	4.760	0.457
#27	**1**	**Time of Concentration:**					**0.612**
#27	2	5. Nearly bare and untilled, and alluvial valley fans	5.26	30.00	570.00	2.290	0.069
		8. Large gullies, diversions, and low flowing streams	3.15	278.00	8,822.00	5.320	0.460
#27	**2**	**Time of Concentration:**					**0.529**
#27	3	5. Nearly bare and untilled, and alluvial valley fans	16.33	80.00	490.00	4.040	0.033
		8. Large gullies, diversions, and low flowing streams	2.15	225.00	10,443.00	4.400	0.659
#27	**3**	**Time of Concentration:**					**0.692**
#27	4	5. Nearly bare and untilled, and alluvial valley fans	12.43	65.00	523.00	3.520	0.041
		8. Large gullies, diversions, and low flowing streams	3.49	225.00	6,454.00	5.600	0.320
#27	**4**	**Time of Concentration:**					**0.361**
#27	5	5. Nearly bare and untilled, and alluvial valley fans	9.40	25.00	266.00	3.060	0.024

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	2.32	364.00	15,700.00	4.560	0.956
#27	**5**	**Time of Concentration:**					**0.980**
#28	1	5. Nearly bare and untilled, and alluvial valley fans	5.25	40.00	762.00	2.290	0.092
		8. Large gullies, diversions, and low flowing streams	2.96	310.00	10,479.34	5.150	0.565
#28	**1**	**Time of Concentration:**					**0.657**
#28	2	5. Nearly bare and untilled, and alluvial valley fans	25.86	105.00	406.00	5.080	0.022
		8. Large gullies, diversions, and low flowing streams	2.96	310.00	10,479.34	5.150	0.565
#28	**2**	**Time of Concentration:**					**0.587**
#29	1	5. Nearly bare and untilled, and alluvial valley fans	11.58	30.00	259.00	3.400	0.021
		8. Large gullies, diversions, and low flowing streams	3.61	288.00	7,976.00	5.700	0.388
#29	**1**	**Time of Concentration:**					**0.409**
#29	2	5. Nearly bare and untilled, and alluvial valley fans	8.06	40.00	496.00	2.830	0.048
		8. Large gullies, diversions, and low flowing streams	2.90	252.00	8,693.55	5.100	0.473
#29	**2**	**Time of Concentration:**					**0.521**
#29	3	5. Nearly bare and untilled, and alluvial valley fans	7.25	25.00	345.00	2.690	0.035
		8. Large gullies, diversions, and low flowing streams	2.26	158.00	7,001.00	4.500	0.432
#29	**3**	**Time of Concentration:**					**0.467**
#30	1	5. Nearly bare and untilled, and alluvial valley fans	4.93	35.00	710.00	2.220	0.088
		8. Large gullies, diversions, and low flowing streams	1.67	243.00	14,540.00	3.870	1.043
#30	**1**	**Time of Concentration:**					**1.131**
#31	1	5. Nearly bare and untilled, and alluvial valley fans	2.91	15.00	515.00	1.700	0.084
		8. Large gullies, diversions, and low flowing streams	2.74	247.00	9,006.00	4.960	0.504
#31	**1**	**Time of Concentration:**					**0.588**
#31	2	5. Nearly bare and untilled, and alluvial valley fans	7.46	25.00	335.00	2.730	0.034
		8. Large gullies, diversions, and low flowing streams	2.18	138.00	6,335.00	4.420	0.398
#31	**2**	**Time of Concentration:**					**0.432**
#31	3	5. Nearly bare and untilled, and alluvial valley fans	3.84	20.00	521.00	1.950	0.074
		8. Large gullies, diversions, and low flowing streams	2.24	108.00	4,826.00	4.480	0.299
#31	**3**	**Time of Concentration:**					**0.373**
#32	1	5. Nearly bare and untilled, and alluvial valley fans	3.48	22.00	632.00	1.860	0.094

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	1.56	101.00	6,494.00	3.740	0.482
#32	**1**	**Time of Concentration:**					**0.576**
#34	1	5. Nearly bare and untilled, and alluvial valley fans	2.28	35.00	1,538.00	1.500	0.284
		8. Large gullies, diversions, and low flowing streams	2.89	74.00	2,560.00	5.100	0.139
#34	**1**	**Time of Concentration:**					**0.423**
#34	2	5. Nearly bare and untilled, and alluvial valley fans	2.69	38.00	1,415.00	1.630	0.241
		8. Large gullies, diversions, and low flowing streams	1.60	81.00	5,052.00	3.790	0.370
#34	**2**	**Time of Concentration:**					**0.611**
#34	3	5. Nearly bare and untilled, and alluvial valley fans	3.80	56.00	1,474.00	1.940	0.211
		8. Large gullies, diversions, and low flowing streams	0.70	30.00	4,293.00	2.500	0.477
#34	**3**	**Time of Concentration:**					**0.688**
#34	4	5. Nearly bare and untilled, and alluvial valley fans	4.17	35.00	840.00	2.040	0.114
		8. Large gullies, diversions, and low flowing streams	1.89	72.00	3,807.00	4.120	0.256
#34	**4**	**Time of Concentration:**					**0.370**
#36	1	5. Nearly bare and untilled, and alluvial valley fans	3.21	90.00	2,800.00	1.790	0.434
		8. Large gullies, diversions, and low flowing streams	2.54	33.00	1,300.00	4.770	0.075
		9. Small streams flowing bankfull	0.40	8.00	2,000.00	5.690	0.097
#36	**1**	**Time of Concentration:**					**0.606**
#36	2	5. Nearly bare and untilled, and alluvial valley fans	6.92	90.00	1,300.00	2.630	0.137
		8. Large gullies, diversions, and low flowing streams	47.06	800.00	1,700.00	20.570	0.022
#36	**2**	**Time of Concentration:**					**0.159**
#36	3	5. Nearly bare and untilled, and alluvial valley fans	90.00	900.00	1,000.00	9.480	0.029
		8. Large gullies, diversions, and low flowing streams	3.70	100.00	2,700.00	5.770	0.129
#36	**3**	**Time of Concentration:**					**0.158**
#37	1	5. Nearly bare and untilled, and alluvial valley fans	4.68	129.00	2,754.05	2.160	0.354
		8. Large gullies, diversions, and low flowing streams	0.16	10.00	6,108.73	1.210	1.402
#37	**1**	**Time of Concentration:**					**1.756**
#37	2	5. Nearly bare and untilled, and alluvial valley fans	5.17	44.97	869.82	2.270	0.106
		8. Large gullies, diversions, and low flowing streams	2.01	95.23	4,737.81	4.250	0.309
#37	**2**	**Time of Concentration:**					**0.415**
#37	3	5. Nearly bare and untilled, and alluvial valley fans	3.52	30.00	853.00	1.870	0.126

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	4.02	179.85	4,474.00	6.010	0.206
#37	**3**	**Time of Concentration:**					**0.332**
#37	4	5. Nearly bare and untilled, and alluvial valley fans	3.18	34.82	1,095.00	1.780	0.170
		8. Large gullies, diversions, and low flowing streams	1.49	37.90	2,544.00	3.660	0.193
#37	**4**	**Time of Concentration:**					**0.363**
#37	5	5. Nearly bare and untilled, and alluvial valley fans	2.59	40.00	1,543.00	1.610	0.266
		8. Large gullies, diversions, and low flowing streams	1.48	67.00	4,529.00	3.640	0.345
#37	**5**	**Time of Concentration:**					**0.611**
#37	6	8. Large gullies, diversions, and low flowing streams	3.42	65.00	1,900.00	5.540	0.095
#37	**6**	**Time of Concentration:**					**0.095**
#37	7	5. Nearly bare and untilled, and alluvial valley fans	6.00	30.00	500.00	2.440	0.056
		8. Large gullies, diversions, and low flowing streams	1.36	45.00	3,300.00	3.500	0.261
		8. Large gullies, diversions, and low flowing streams	1.11	45.00	4,050.00	3.160	0.356
#37	**7**	**Time of Concentration:**					**0.673**
#37	8	5. Nearly bare and untilled, and alluvial valley fans	8.33	50.00	600.00	2.880	0.057
		8. Large gullies, diversions, and low flowing streams	6.00	150.00	2,500.00	7.340	0.094
#37	**8**	**Time of Concentration:**					**0.151**
#37	9	5. Nearly bare and untilled, and alluvial valley fans	7.00	70.00	1,000.00	2.640	0.105
		8. Large gullies, diversions, and low flowing streams	12.00	60.00	500.00	10.390	0.013
#37	**9**	**Time of Concentration:**					**0.118**

Subwatershed Muskingum Routing Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	2	8. Large gullies, diversions, and low flowing streams	1.29	107.00	8,294.00	3.400	0.677
#1	**2**	**Muskingum K:**					**0.677**
#1	3	8. Large gullies, diversions, and low flowing streams	1.27	113.00	8,880.00	3.380	0.729
#1	**3**	**Muskingum K:**					**0.729**
#1	4	8. Large gullies, diversions, and low flowing streams	1.35	171.00	12,634.00	3.490	1.005
#1	**4**	**Muskingum K:**					**1.005**
#1	5	8. Large gullies, diversions, and low flowing streams	1.49	274.00	18,349.00	3.660	1.392

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	**5**	**Muskingum K:**					**1.392**
#1	6	8. Large gullies, diversions, and low flowing streams	1.49	274.00	18,349.00	3.660	1.392
#1	**6**	**Muskingum K:**					**1.392**
#2	2	8. Large gullies, diversions, and low flowing streams	0.53	20.00	3,756.00	2.180	0.478
#2	**2**	**Muskingum K:**					**0.478**
#2	3	8. Large gullies, diversions, and low flowing streams	0.55	25.00	4,570.00	2.210	0.574
#2	**3**	**Muskingum K:**					**0.574**
#2	4	8. Large gullies, diversions, and low flowing streams	0.55	25.00	4,570.00	2.210	0.574
#2	**4**	**Muskingum K:**					**0.574**
#2	5	8. Large gullies, diversions, and low flowing streams	0.65	45.00	6,955.00	2.410	0.801
#2	**5**	**Muskingum K:**					**0.801**
#3	3	8. Large gullies, diversions, and low flowing streams	0.92	20.00	2,168.00	2.880	0.209
#3	**3**	**Muskingum K:**					**0.209**
#5	1	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.000	0.000
#5	**1**	**Muskingum K:**					**0.000**
#5	2	8. Large gullies, diversions, and low flowing streams	1.75	125.00	7,149.00	3.960	0.501
#5	**2**	**Muskingum K:**					**0.501**
#5	3	8. Large gullies, diversions, and low flowing streams	1.65	155.00	9,418.00	3.840	0.681
#5	**3**	**Muskingum K:**					**0.681**
#5	4	8. Large gullies, diversions, and low flowing streams	1.65	155.00	9,418.00	3.840	0.681
#5	**4**	**Muskingum K:**					**0.681**
#5	5	8. Large gullies, diversions, and low flowing streams	1.67	239.00	14,273.00	3.880	1.021
#5	**5**	**Muskingum K:**					**1.021**
#5	6	8. Large gullies, diversions, and low flowing streams	1.68	239.00	14,223.00	3.880	1.018
#5	**6**	**Muskingum K:**					**1.018**
#7	1	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.000	0.000
#7	**1**	**Muskingum K:**					**0.000**
#7	2	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.000	0.000
#7	**2**	**Muskingum K:**					**0.000**
#7	4	8. Large gullies, diversions, and low flowing streams	1.16	140.00	12,037.00	3.230	1.035
#7	**4**	**Muskingum K:**					**1.035**
#7	5	8. Large gullies, diversions, and low flowing streams	1.14	140.00	12,307.69	3.190	1.071
#7	**5**	**Muskingum K:**					**1.071**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#7	6	8. Large gullies, diversions, and low flowing streams	1.17	158.00	13,546.00	3.230	1.164
#7	**6**	**Muskingum K:**					**1.164**
#7	7	8. Large gullies, diversions, and low flowing streams	1.18	187.00	15,784.00	3.260	1.344
#7	**7**	**Muskingum K:**					**1.344**
#7	8	8. Large gullies, diversions, and low flowing streams	1.18	187.00	15,784.00	3.260	1.344
#7	**8**	**Muskingum K:**					**1.344**
#9	3	8. Large gullies, diversions, and low flowing streams	0.43	9.00	2,100.00	1.960	0.297
#9	**3**	**Muskingum K:**					**0.297**
#9	4	8. Large gullies, diversions, and low flowing streams	1.01	20.00	1,975.00	3.010	0.182
		8. Large gullies, diversions, and low flowing streams	0.60	24.30	4,050.00	2.320	0.484
#9	**4**	**Muskingum K:**					**0.666**
#10	3	8. Large gullies, diversions, and low flowing streams	0.76	37.00	4,861.00	2.610	0.517
#10	**3**	**Muskingum K:**					**0.517**
#10	4	8. Large gullies, diversions, and low flowing streams	0.76	37.00	4,861.00	2.610	0.517
#10	**4**	**Muskingum K:**					**0.517**
#10	5	8. Large gullies, diversions, and low flowing streams	0.79	47.00	5,956.00	2.660	0.621
#10	**5**	**Muskingum K:**					**0.621**
#12	2	8. Large gullies, diversions, and low flowing streams	8.24	111.00	1,347.00	8.610	0.043
#12	**2**	**Muskingum K:**					**0.043**
#12	3	8. Large gullies, diversions, and low flowing streams	8.01	109.00	1,360.00	8.490	0.044
#12	**3**	**Muskingum K:**					**0.044**
#12	4	8. Large gullies, diversions, and low flowing streams	2.24	176.00	7,866.00	4.480	0.487
#12	**4**	**Muskingum K:**					**0.487**
#12	5	8. Large gullies, diversions, and low flowing streams	2.24	176.00	7,866.00	4.480	0.487
#12	**5**	**Muskingum K:**					**0.487**
#13	2	8. Large gullies, diversions, and low flowing streams	1.34	54.00	4,025.00	3.470	0.322
#13	**2**	**Muskingum K:**					**0.322**
#13	3	8. Large gullies, diversions, and low flowing streams	0.98	72.00	7,333.00	2.970	0.685
#13	**3**	**Muskingum K:**					**0.685**
#13	4	8. Large gullies, diversions, and low flowing streams	1.18	127.00	10,806.00	3.250	0.923
#13	**4**	**Muskingum K:**					**0.923**
#13	5	8. Large gullies, diversions, and low flowing streams	1.18	127.00	10,806.00	3.250	0.923
#13	**5**	**Muskingum K:**					**0.923**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#14	1	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.000	0.000
#14	**1**	**Muskingum K:**					**0.000**
#14	2	8. Large gullies, diversions, and low flowing streams	0.83	58.00	6,957.00	2.730	0.707
#14	**2**	**Muskingum K:**					**0.707**
#14	3	8. Large gullies, diversions, and low flowing streams	0.81	77.00	9,480.00	2.700	0.975
#14	**3**	**Muskingum K:**					**0.975**
#14	4	8. Large gullies, diversions, and low flowing streams	0.86	147.00	17,117.00	2.770	1.716
#14	**4**	**Muskingum K:**					**1.716**
#14	5	8. Large gullies, diversions, and low flowing streams	0.88	175.00	19,934.00	2.810	1.970
#14	**5**	**Muskingum K:**					**1.970**
#14	6	8. Large gullies, diversions, and low flowing streams	0.95	211.00	22,155.00	2.920	2.107
#14	**6**	**Muskingum K:**					**2.107**
#14	7	8. Large gullies, diversions, and low flowing streams	0.96	257.00	26,835.00	2.930	2.544
#14	**7**	**Muskingum K:**					**2.544**
#14	8	8. Large gullies, diversions, and low flowing streams	0.96	257.00	26,835.00	2.930	2.544
#14	**8**	**Muskingum K:**					**2.544**
#14	9	8. Large gullies, diversions, and low flowing streams	0.95	307.00	32,146.59	2.930	3.047
#14	**9**	**Muskingum K:**					**3.047**
#14	10	8. Large gullies, diversions, and low flowing streams	0.96	339.00	35,382.00	2.930	3.354
#14	**10**	**Muskingum K:**					**3.354**
#15	2	8. Large gullies, diversions, and low flowing streams	1.14	86.00	7,535.26	3.200	0.654
#15	**2**	**Muskingum K:**					**0.654**
#15	3	8. Large gullies, diversions, and low flowing streams	1.25	115.00	9,236.00	3.340	0.768
#15	**3**	**Muskingum K:**					**0.768**
#16	2	8. Large gullies, diversions, and low flowing streams	0.55	42.00	7,608.00	2.220	0.951
#16	**2**	**Muskingum K:**					**0.951**
#16	3	8. Large gullies, diversions, and low flowing streams	0.51	54.00	10,615.00	2.130	1.384
#16	**3**	**Muskingum K:**					**1.384**
#17	1	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.000	0.000
#17	**1**	**Muskingum K:**					**0.000**
#18	1	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.000	0.000
#18	**1**	**Muskingum K:**					**0.000**
#18	2	8. Large gullies, diversions, and low flowing streams	1.02	62.00	6,103.00	3.020	0.561

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#18	**2**	**Muskingum K:**					**0.561**
#20	2	8. Large gullies, diversions, and low flowing streams	0.59	20.00	3,400.00	2.300	0.410
#20	**2**	**Muskingum K:**					**0.410**
#21	1	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.000	0.000
#21	**1**	**Muskingum K:**					**0.000**
#21	2	8. Large gullies, diversions, and low flowing streams	0.40	6.80	1,700.00	1.890	0.249
#21	**2**	**Muskingum K:**					**0.249**
#21	3	8. Large gullies, diversions, and low flowing streams	0.36	20.00	5,627.46	1.780	0.878
#21	**3**	**Muskingum K:**					**0.878**
#21	4	8. Large gullies, diversions, and low flowing streams	0.36	20.00	5,627.46	1.780	0.878
#21	**4**	**Muskingum K:**					**0.878**
#21	5	8. Large gullies, diversions, and low flowing streams	0.40	25.80	6,450.00	1.890	0.947
#21	**5**	**Muskingum K:**					**0.947**
#24	1	8. Large gullies, diversions, and low flowing streams	0.79	180.00	22,769.00	2.660	2.377
#24	**1**	**Muskingum K:**					**2.377**
#24	2	8. Large gullies, diversions, and low flowing streams	0.78	180.00	23,111.00	2.640	2.431
#24	**2**	**Muskingum K:**					**2.431**
#24	4	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.000	0.000
#24	**4**	**Muskingum K:**					**0.000**
#25	1	8. Large gullies, diversions, and low flowing streams	1.99	104.00	5,220.00	4.230	0.342
#25	**1**	**Muskingum K:**					**0.342**
#25	2	8. Large gullies, diversions, and low flowing streams	1.99	104.00	5,220.00	4.230	0.342
#25	**2**	**Muskingum K:**					**0.342**
#25	3	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.000	0.000
#25	**3**	**Muskingum K:**					**0.000**
#27	1	8. Large gullies, diversions, and low flowing streams	1.38	216.00	15,629.00	3.520	1.233
#27	**1**	**Muskingum K:**					**1.233**
#27	2	8. Large gullies, diversions, and low flowing streams	1.17	144.00	12,301.00	3.240	1.054
#27	**2**	**Muskingum K:**					**1.054**
#27	3	8. Large gullies, diversions, and low flowing streams	1.18	76.00	6,454.00	3.250	0.551
#27	**3**	**Muskingum K:**					**0.551**
#27	4	8. Large gullies, diversions, and low flowing streams	1.18	76.00	6,454.00	3.250	0.551
#27	**4**	**Muskingum K:**					**0.551**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#28	1	8. Large gullies, diversions, and low flowing streams	1.30	84.00	6,445.17	3.420	0.523
#28	**1**	**Muskingum K:**					**0.523**
#29	1	8. Large gullies, diversions, and low flowing streams	0.88	37.00	4,210.00	2.810	0.416
#29	**1**	**Muskingum K:**					**0.416**
#29	2	8. Large gullies, diversions, and low flowing streams	0.88	26.00	2,949.00	2.810	0.291
#29	**2**	**Muskingum K:**					**0.291**
#31	1	8. Large gullies, diversions, and low flowing streams	1.35	76.00	5,639.00	3.480	0.450
#31	**1**	**Muskingum K:**					**0.450**
#31	2	8. Large gullies, diversions, and low flowing streams	1.15	20.00	1,734.00	3.220	0.149
#31	**2**	**Muskingum K:**					**0.149**
#34	1	8. Large gullies, diversions, and low flowing streams	0.64	56.00	8,773.00	2.390	1.019
#34	**1**	**Muskingum K:**					**1.019**
#34	2	8. Large gullies, diversions, and low flowing streams	1.05	31.00	2,957.00	3.070	0.267
#34	**2**	**Muskingum K:**					**0.267**
#34	3	8. Large gullies, diversions, and low flowing streams	0.64	26.00	4,031.00	2.400	0.466
#34	**3**	**Muskingum K:**					**0.466**
#37	2	8. Large gullies, diversions, and low flowing streams	0.28	29.79	10,639.28	1.580	1.870
#37	**2**	**Muskingum K:**					**1.870**
#37	3	8. Large gullies, diversions, and low flowing streams	0.28	23.78	8,493.00	1.580	1.493
#37	**3**	**Muskingum K:**					**1.493**
#37	4	8. Large gullies, diversions, and low flowing streams	0.30	46.99	15,665.00	1.640	2.653
#37	**4**	**Muskingum K:**					**2.653**
#37	5	8. Large gullies, diversions, and low flowing streams	0.28	29.10	10,392.85	1.580	1.827
		8. Large gullies, diversions, and low flowing streams	0.30	12.15	4,050.00	1.640	0.685
#37	**5**	**Muskingum K:**					**2.512**
#37	6	8. Large gullies, diversions, and low flowing streams	0.28	29.10	10,396.00	1.580	1.827
		8. Large gullies, diversions, and low flowing streams	0.30	12.15	4,050.00	1.640	0.685
#37	**6**	**Muskingum K:**					**2.512**
#37	7	8. Large gullies, diversions, and low flowing streams	0.28	28.89	10,320.00	1.580	1.814
#37	**7**	**Muskingum K:**					**1.814**
#37	8	8. Large gullies, diversions, and low flowing streams	3.42	65.00	1,900.00	5.540	0.095
#37	**8**	**Muskingum K:**					**0.095**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#37	9	8. Large gullies, diversions, and low flowing streams	2.37	90.00	3,800.00	4.610	0.228
		8. Large gullies, diversions, and low flowing streams	0.28	23.78	8,493.00	1.580	1.493
#37	**9**	**Muskingum K:**					**1.721**

Cottonwood Arroyo Post-mine Hydrology and Sedimentology

The drainage subdivisions used to model the hydrology is shown on Exhibit 41.2-1.

Revised February 19, 2012

Art O'Hayre

General Information

Storm Information:

Storm Type:	Type II-70
Design Storm:	100 yr - 6 hr
Rainfall Depth:	2.040 inches

Particle Size Distribution:

Size (mm)	PostMine-LoamySand	PreMine-LoamySand	PreMine-Badlands	LoamySand Postmining
2.0000	100.000%	100.000%	100.000%	0.000%
0.1000	26.500%	30.000%	83.500%	0.000%
0.0500	14.000%	17.000%	77.000%	0.000%
0.0020	11.000%	11.000%	56.000%	0.000%
0.0010	0.000%	0.000%	0.000%	0.000%

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Null	#1	==>	#2	0.961	0.307	
Null	#2	==>	#3	0.068	0.331	
Null	#3	==>	#4	0.000	0.000	
Null	#4	==>	#9	0.718	0.281	
Null	#5	==>	#6	1.205	0.328	
Null	#6	==>	#7	0.189	0.304	
Null	#7	==>	#8	0.000	0.000	
Null	#8	==>	#10	0.989	0.300	
Null	#9	==>	#11	0.000	0.000	
Null	#10	==>	#11	0.000	0.000	
Null	#11	==>	#21	0.495	0.453	
Null	#12	==>	#13	0.076	0.330	
Null	#13	==>	#14	3.790	0.314	
Null	#14	==>	#16	1.198	0.286	
Null	#15	==>	#16	1.198	0.286	
Null	#16	==>	#20	1.087	0.273	
Null	#17	==>	#19	0.000	0.000	
Null	#18	==>	#19	0.000	0.000	
Null	#19	==>	#20	0.915	0.252	
Null	#20	==>	#22	0.000	0.000	End of Middle Fork
Null	#21	==>	#22	0.000	0.000	End of South Fork
Null	#22	==>	#23	0.811	0.247	
Null	#23	==>	#35	0.000	0.000	
Null	#24	==>	#25	0.964	0.340	
Null	#25	==>	#27	1.454	0.333	
Null	#26	==>	#27	1.454	0.333	
Null	#27	==>	#29	0.800	0.323	
Null	#28	==>	#29	0.800	0.323	
Null	#29	==>	#32	0.479	0.298	
Null	#30	==>	#32	0.479	0.298	
Null	#31	==>	#33	0.000	0.000	
Null	#32	==>	#33	0.000	0.000	
Null	#33	==>	#34	1.348	0.294	Inlet to North Fork Diversion
Null	#34	==>	#35	0.000	0.000	End of North Fork
Null	#35	==>	#36	0.735	0.251	all forks
Null	#36	==>	#37	3.388	0.246	
Null	#37	==>	End	0.000	0.000	

#30
Null

#28 Null

#26 Null

#24 Null

#25 Null

#27 Null

#29 Null

#32 Null

#31 Null

#33 Null

#34 Null

#5 Null

#6 Null

#7 Null

#8 Null

#10 Null

#1 Null

#2 Null

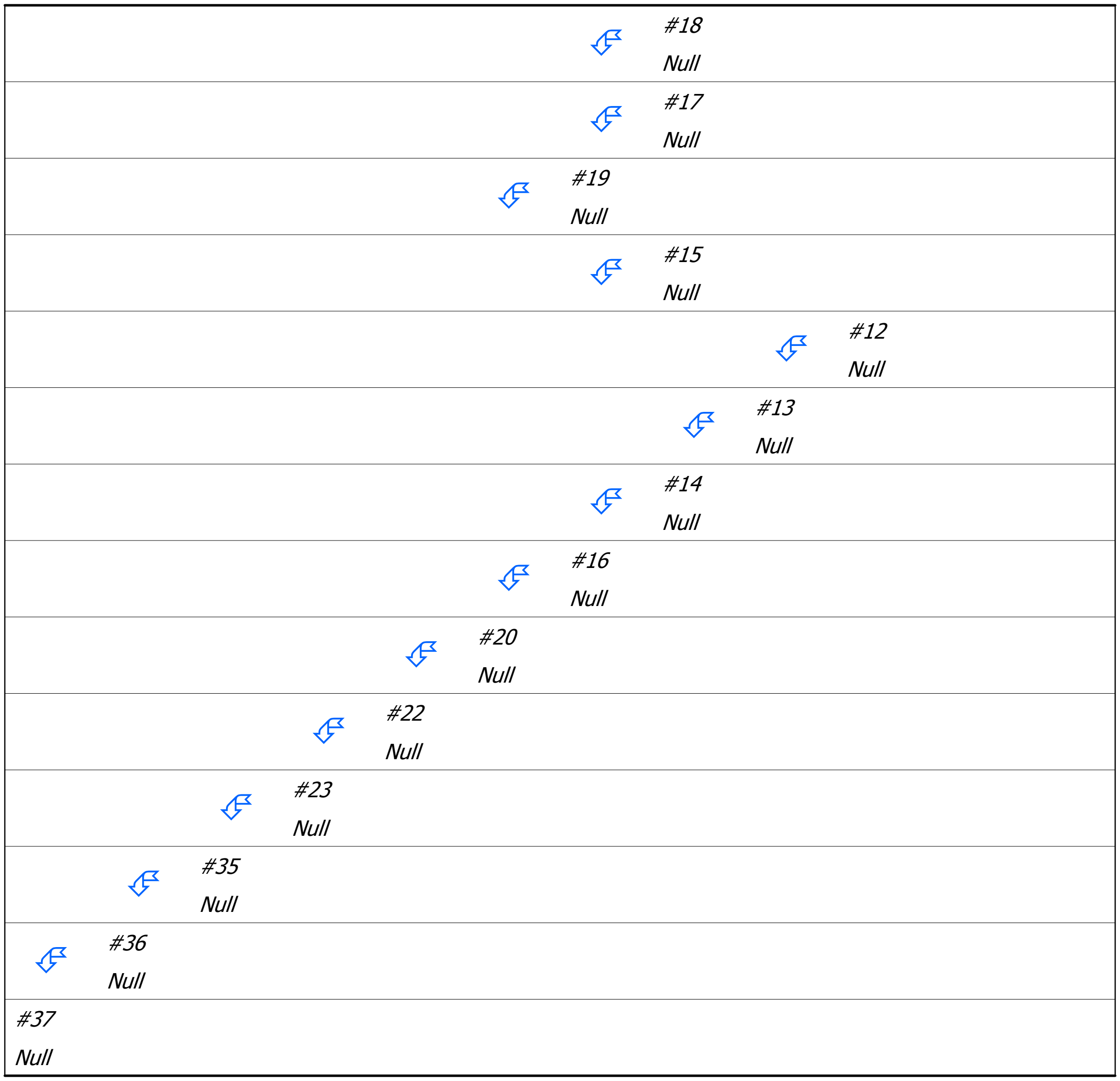
#3 Null

#4 Null

#9 Null

#11 Null

#21 Null



Structure Routing Details:

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	8. Large gullies, diversions, and low flowing streams	0.81	76.00	9,347.00	2.70	0.961
#1	**Muskingum K:**					**0.961**
#2	8. Large gullies, diversions, and low flowing streams	1.23	10.00	814.00	3.32	0.068
#2	**Muskingum K:**					**0.068**
#3	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.00	0.000
#3	**Muskingum K:**					**0.000**
#4	8. Large gullies, diversions, and low flowing streams	0.53	30.00	5,637.00	2.18	0.718
#4	**Muskingum K:**					**0.718**

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#5	8. Large gullies, diversions, and low flowing streams	1.17	165.00	14,065.00	3.24	1.205
#5	**Muskingum K:**					**1.205**
#6	8. Large gullies, diversions, and low flowing streams	0.78	14.00	1,799.25	2.64	0.189
#6	**Muskingum K:**					**0.189**
#8	8. Large gullies, diversions, and low flowing streams	0.72	65.00	9,046.00	2.54	0.989
#8	**Muskingum K:**					**0.989**
#11	8. Large gullies, diversions, and low flowing streams	30.00	8,801.00	29,336.66	16.43	0.495
#11	**Muskingum K:**					**0.495**
#12	8. Large gullies, diversions, and low flowing streams	1.21	11.00	906.00	3.30	0.076
#12	**Muskingum K:**					**0.076**
#13	8. Large gullies, diversions, and low flowing streams	0.92	363.00	39,301.00	2.88	3.790
#13	**Muskingum K:**					**3.790**
#14	8. Large gullies, diversions, and low flowing streams	0.58	57.00	9,834.00	2.28	1.198
#14	**Muskingum K:**					**1.198**
#15	8. Large gullies, diversions, and low flowing streams	0.58	57.00	9,834.00	2.28	1.198
#15	**Muskingum K:**					**1.198**
#16	8. Large gullies, diversions, and low flowing streams	0.46	37.00	7,984.00	2.04	1.087
#16	**Muskingum K:**					**1.087**
#19	8. Large gullies, diversions, and low flowing streams	0.33	19.00	5,699.00	1.73	0.915
#19	**Muskingum K:**					**0.915**
#22	8. Large gullies, diversions, and low flowing streams	0.31	15.00	4,852.00	1.66	0.811
#22	**Muskingum K:**					**0.811**
#24	8. Large gullies, diversions, and low flowing streams	1.46	184.00	12,568.00	3.62	0.964
#24	**Muskingum K:**					**0.964**
#25	8. Large gullies, diversions, and low flowing streams	1.28	228.00	17,755.00	3.39	1.454
#25	**Muskingum K:**					**1.454**
#26	8. Large gullies, diversions, and low flowing streams	1.28	228.00	17,755.62	3.39	1.454
#26	**Muskingum K:**					**1.454**
#27	8. Large gullies, diversions, and low flowing streams	1.07	96.00	8,938.00	3.10	0.800
#27	**Muskingum K:**					**0.800**
#28	8. Large gullies, diversions, and low flowing streams	1.07	96.00	8,938.00	3.10	0.800
#28	**Muskingum K:**					**0.800**
#29	8. Large gullies, diversions, and low flowing streams	0.70	30.00	4,313.00	2.50	0.479

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#29	**Muskingum K:**					**0.479**
#30	8. Large gullies, diversions, and low flowing streams	0.70	30.00	4,313.00	2.50	0.479
#30	**Muskingum K:**					**0.479**
#33	8. Large gullies, diversions, and low flowing streams	0.66	77.00	11,748.55	2.42	1.348
#33	**Muskingum K:**					**1.348**
#35	8. Large gullies, diversions, and low flowing streams	0.33	15.00	4,556.50	1.72	0.735
#35	**Muskingum K:**					**0.735**
#36	8. Large gullies, diversions, and low flowing streams	0.30	60.00	20,005.00	1.64	3.388
#36	**Muskingum K:**					**3.388**

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc. (ml/l)	24VW (ml/l)
#30	476.400	476.400	86.92	10.78	97.1	9,320	4.41	3.12
#28	1,217.900	1,217.900	832.25	93.54	5,541.5	59,612	0.74	0.53
#26	2,486.400	2,486.400	275.55	74.66	548.8	7,278	2.35	1.74
#24	8,061.800	8,061.800	386.57	224.86	949.6	4,970	0.73	0.46
#25	1,015.700	9,077.500	393.25	268.09	1,191.0	16,037	3.71	0.76
#27	1,783.700	13,347.600	724.52	419.60	3,785.8	31,465	13.44	2.82
#29	966.000	15,531.500	1,383.20	586.28	15,028.9	74,082	9.74	2.44
#32	293.700	16,301.600	1,413.07	623.43	16,153.4	65,499	6.15	1.77
#31	957.100	957.100	785.51	82.54	3,927.1	43,239	0.95	0.75
#33	0.000	17,258.700	1,524.15	705.97	20,080.5	57,140	4.56	1.65
#34	1,156.300	18,415.000	1,537.36	760.30	18,652.5	49,440	1.45	0.54
#5	2,023.000	2,023.000	1,349.47	134.18	4,549.4	44,265	4.91	2.73
#6	1,743.200	3,766.200	1,527.16	256.62	8,096.8	38,322	0.26	0.15
#7	2,395.300	6,161.500	2,444.68	466.74	20,364.5	47,914	0.00	0.00
#8	0.000	6,161.500	2,444.68	466.74	20,364.5	47,914	0.00	0.00
#10	1,053.200	7,214.700	2,478.16	546.78	19,889.8	43,819	0.14	0.09
#1	2,411.100	2,411.100	969.41	134.57	4,774.2	39,132	6.43	4.23
#2	1,497.000	3,908.100	1,059.91	257.90	6,201.8	25,453	0.21	0.14
#3	828.500	4,736.600	1,247.07	317.71	6,683.3	20,156	0.07	0.05
#4	0.000	4,736.600	1,247.07	317.71	6,683.3	20,156	0.07	0.05
#9	712.000	5,448.600	1,281.45	353.21	6,698.9	18,280	1.09	0.82
#11	0.000	12,663.300	3,364.59	900.00	26,588.8	36,212	0.63	0.37
#21	646.500	13,309.800	3,387.26	938.04	26,635.1	35,473	0.61	0.36
#18	848.500	848.500	434.05	59.62	885.6	17,901	0.19	0.12
#17	182.200	182.200	254.12	16.35	256.5	16,193	1.00	0.71
#19	0.000	1,030.700	603.09	75.97	1,142.2	16,875	0.37	0.24
#15	1,992.700	1,992.700	996.33	133.89	5,389.3	48,450	2.83	1.71
#12	3,494.500	3,494.500	739.31	126.25	2,083.8	17,988	8.18	5.49
#13	2,720.700	6,215.200	1,297.09	224.49	4,212.9	19,549	9.55	6.69
#14	5,096.800	11,312.000	1,550.26	540.08	12,523.1	88,409	3.02	0.57
#16	1,022.000	14,326.700	2,034.74	763.28	20,984.3	56,492	2.43	0.86
#20	577.100	15,934.500	2,055.27	886.28	22,429.6	49,543	1.52	0.56
#22	0.000	29,244.300	5,099.96	1,824.32	49,064.7	36,169	0.84	0.46
#23	291.000	29,535.300	5,084.30	1,837.28	49,022.4	36,000	0.76	0.41
#35	0.000	47,950.300	6,475.79	2,597.57	67,675.0	34,821	0.82	0.45
#36	509.000	48,459.300	6,445.55	2,620.42	67,437.1	35,290	0.74	0.39
#37	1,661.000	50,120.300	6,330.69	2,710.14	66,395.8	41,648	0.37	0.16

Particle Size Distribution(s) at Each Structure

Structure #30:

Size (mm)	In/Out
2.0000	100.000%
0.1000	85.557%
0.0500	48.482%
0.0020	31.371%
0.0010	0.000%

Structure #28:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	96.519%
0.0010	0.000%

Structure #26:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	70.975%
0.0020	45.925%
0.0010	0.000%

Structure #24:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	91.071%
0.0020	70.221%
0.0010	0.000%

Structure #25:

Size (mm)	In/Out
2.0000	100.000%
0.1000	83.911%
0.0500	74.943%
0.0020	66.192%
0.0010	0.000%

Structure #27:

Size (mm)	In/Out
2.0000	100.000%
0.1000	73.455%
0.0500	52.323%
0.0020	39.424%
0.0010	0.000%

Structure #29:

Size (mm)	In/Out
2.0000	100.000%
0.1000	93.369%
0.0500	88.046%
0.0020	77.951%
0.0010	0.000%

Structure #32:

Size (mm)	In/Out
2.0000	100.000%
0.1000	98.137%
0.0500	93.021%
0.0020	82.294%
0.0010	0.000%

Structure #31:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	93.833%
0.0010	0.000%

Structure #33 (Inlet to North Fork Diversion):

Size (mm)	In/Out
2.0000	100.000%
0.1000	98.501%
0.0500	94.386%
0.0020	84.551%
0.0010	0.000%

Structure #34 (End of North Fork):

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.308%
0.0500	98.951%
0.0020	93.027%
0.0010	0.000%

Structure #5:

Size (mm)	In/Out
2.0000	100.000%
0.1000	97.755%
0.0500	89.765%
0.0020	81.593%
0.0010	0.000%

Structure #6:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	98.101%
0.0010	0.000%

Structure #7:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	100.000%
0.0010	0.000%

Structure #8:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	100.000%
0.0010	0.000%

Structure #10:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	99.680%
0.0020	99.493%
0.0010	0.000%

Structure #1:

Size (mm)	In/Out
2.0000	100.000%
0.1000	92.714%
0.0500	81.846%
0.0020	76.465%
0.0010	0.000%

Structure #2:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	97.685%
0.0010	0.000%

Structure #3:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	99.068%
0.0010	0.000%

Structure #4:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	99.068%
0.0010	0.000%

Structure #9:

Size (mm)	In/Out
2.0000	95.855%
0.1000	94.219%
0.0500	92.857%
0.0020	92.229%
0.0010	0.000%

Structure #11:

Size (mm)	In/Out
2.0000	98.956%
0.1000	98.544%
0.0500	97.961%
0.0020	97.662%
0.0010	0.000%

Structure #21 (End of South Fork):

Size (mm)	In/Out
2.0000	98.606%
0.1000	98.259%
0.0500	97.962%
0.0020	97.703%
0.0010	0.000%

Structure #18:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	96.995%
0.0010	0.000%

Structure #17:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	82.629%
0.0010	0.000%

Structure #19:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	93.769%
0.0010	0.000%

Structure #15:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	94.463%
0.0020	90.477%
0.0010	0.000%

Structure #12:

Size (mm)	In/Out
2.0000	100.000%
0.1000	78.989%
0.0500	51.223%
0.0020	33.145%
0.0010	0.000%

Structure #13:

Size (mm)	In/Out
2.0000	100.000%
0.1000	75.521%
0.0500	46.241%
0.0020	29.921%
0.0010	0.000%

Structure #14:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	99.633%
0.0020	90.833%
0.0010	0.000%

Structure #16:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	98.398%
0.0020	89.896%
0.0010	0.000%

Structure #20 (End of Middle Fork):

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	99.851%
0.0020	91.563%
0.0010	0.000%

Structure #22:

Size (mm)	In/Out
2.0000	99.243%
0.1000	99.055%
0.0500	98.825%
0.0020	94.896%
0.0010	0.000%

Structure #23:

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.524%
0.0500	99.113%
0.0020	95.137%
0.0010	0.000%

Structure #35 (all forks):

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.465%
0.0500	99.068%
0.0020	94.556%
0.0010	0.000%

Structure #36:

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.444%
0.0500	99.278%
0.0020	95.035%
0.0010	0.000%

Structure #37:

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.494%
0.0500	99.169%
0.0020	98.547%
0.0010	0.000%

Structure Detail:

Structure #30 (Null)

Structure #28 (Null)

Structure #26 (Null)

Structure #24 (Null)

Structure #25 (Null)

Structure #27 (Null)

Structure #29 (Null)

Structure #32 (Null)

Structure #31 (Null)

Structure #33 (Null)

Inlet to North Fork Diversion

Structure #34 (Null)

End of North Fork

Structure #5 (Null)

Structure #6 (Null)

Structure #7 (Null)

Structure #8 (Null)

Structure #10 (Null)

Structure #1 (Null)

Structure #2 (Null)

Structure #3 (Null)

Structure #4 (Null)

Structure #9 (Null)

Structure #11 (Null)

Structure #21 (Null)

End of South Fork

Structure #18 (Null)

Structure #17 (Null)

Structure #19 (Null)

Structure #15 (Null)

Structure #12 (Null)

Structure #13 (Null)

Structure #14 (Null)

Structure #16 (Null)

Structure #20 (Null)

End of Middle Fork

Structure #22 (Null)

Structure #23 (Null)

Structure #35 (Null)

all forks

Structure #36 (Null)

Structure #37 (Null)

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#30	1	476.400	1.131	0.000	0.000	73.100	M	86.92	10.783
	Σ	**476.400**						**86.92**	**10.783**
#28	1	772.300	0.657	0.523	0.334	90.400	M	752.74	59.308
	2	445.600	0.587	0.000	0.000	90.400	M	467.33	34.234
	Σ	**1,217.900**						**832.25**	**93.542**
#26	1	447.600	2.192	0.000	0.000	74.200	M	52.15	11.131
	2	2,038.800	3.000	0.000	0.000	77.000	M	230.69	63.525
	Σ	**2,486.400**						**275.55**	**74.655**
#24	1	2,607.500	5.367	2.377	0.305	75.200	M	153.86	70.433
	2	2,331.900	4.813	2.431	0.304	74.700	M	144.95	60.455
	3	1,758.500	2.231	1.788	0.297	76.200	M	240.04	51.476
	4	1,363.900	2.618	0.000	0.000	77.000	M	173.49	42.495
	Σ	**8,061.800**						**386.57**	**224.858**
#25	1	515.200	0.990	0.342	0.357	78.200	M	161.95	17.593
	2	130.500	0.787	0.342	0.357	78.100	M	48.57	4.423
	3	370.000	0.516	0.000	0.000	85.700	M	316.29	21.215
	Σ	**9,077.500**						**393.25**	**268.089**
#27	1	354.400	0.612	1.233	0.337	83.100	M	227.69	17.118
	2	305.200	0.529	1.054	0.328	84.000	M	229.89	15.662
	3	289.800	0.692	0.551	0.328	75.500	M	96.22	8.028
	4	253.000	0.361	0.551	0.328	79.400	M	174.11	9.470
	5	581.300	0.980	0.000	0.000	82.300	M	249.37	26.582
	Σ	**13,347.600**						**724.52**	**419.604**
#29	1	508.800	0.409	0.416	0.312	89.500	M	621.45	37.080
	2	233.200	0.521	0.291	0.312	91.600	M	281.23	19.263
	3	224.000	0.467	0.000	0.000	90.000	M	262.75	16.791
	Σ	**15,531.500**						**1,383.20**	**586.280**
#32	1	293.700	0.576	0.000	0.000	93.000	M	361.60	26.368
	Σ	**16,301.600**						**1,413.07**	**623.431**
#31	1	431.100	0.588	0.450	0.336	91.500	M	480.90	35.394
	2	325.800	0.432	0.149	0.327	93.000	M	469.94	29.285
	3	200.200	0.373	0.000	0.000	92.900	M	306.19	17.858
	Σ	**957.100**						**785.51**	**82.537**
#33	Σ	**17,258.700**						**1,524.15**	**705.968**

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#34	1	250.000	0.423	1.019	0.292	90.500	M	317.28	19.356
	2	219.100	0.611	0.267	0.322	80.000	M	113.14	8.541
	3	246.200	0.688	0.466	0.293	80.000	M	116.82	9.593
	4	441.000	0.370	0.000	0.000	79.700	M	305.93	16.839
	Σ	**18,415.000**						**1,537.36**	**760.296**
#5	1	503.600	0.618	0.000	0.000	87.600	M	431.41	32.518
	2	406.500	0.388	0.501	0.350	84.800	M	387.10	21.979
	3	439.600	0.342	0.681	0.347	87.800	M	530.42	28.890
	4	162.600	0.280	0.681	0.347	86.000	M	192.17	9.534
	5	294.100	0.375	1.021	0.348	92.000	M	427.35	24.849
	6	216.600	0.272	1.018	0.348	90.100	M	322.06	16.408
	Σ	**2,023.000**						**1,349.47**	**134.179**
#6	1	149.100	0.331	0.000	0.000	92.600	M	234.00	13.116
	2	245.000	0.529	0.192	0.328	88.100	M	239.24	16.340
	3	276.200	0.450	0.461	0.319	89.500	M	321.32	20.072
	4	158.400	0.380	1.385	0.185	93.000	M	241.78	14.207
	5	206.200	0.402	0.796	0.320	89.400	M	252.54	14.933
	6	414.000	0.430	1.066	0.323	87.200	M	431.96	26.139
	7	294.300	0.535	1.066	0.323	86.400	M	256.99	17.634
	Σ	**3,766.200**						**1,527.16**	**256.621**
#7	1	731.700	1.274	0.000	0.000	93.000	M	510.48	65.589
	2	445.800	1.043	0.000	0.000	93.000	M	363.36	39.948
	3	270.800	0.804	0.000	0.000	93.000	M	267.12	24.274
	4	78.900	0.267	1.035	0.328	93.000	M	135.40	7.113
	5	154.900	0.310	1.071	0.326	93.000	M	253.21	13.947
	6	101.400	0.288	1.164	0.328	92.900	M	169.28	9.070
	7	117.700	0.298	1.344	0.329	92.200	M	188.00	10.096
	8	494.100	0.518	1.344	0.329	91.300	M	588.05	40.082
	Σ	**6,161.500**						**2,444.68**	**466.740**
#8	1	0.000	0.000	0.000	0.000	1.000	0.00	0.000	
	Σ	**6,161.500**						**2,444.68**	**466.740**
#10	1	355.500	1.286	0.000	0.000	93.000	M	246.17	31.859
	2	307.100	1.282	0.668	0.305	83.200	M	113.34	14.918
	3	147.300	1.245	0.517	0.303	90.600	M	90.51	11.434
	4	126.400	0.585	0.517	0.303	93.000	M	154.15	11.351
	5	116.900	1.179	0.621	0.305	93.000	M	86.70	10.480
	Σ	**7,214.700**						**2,478.16**	**546.782**
#1	1	557.400	0.941	0.000	0.000	83.600	M	269.99	27.820
	2	169.600	1.616	0.677	0.333	93.000	M	97.53	15.200
	3	636.400	1.842	0.729	0.333	81.000	M	148.68	26.594

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
	4	223.400	0.846	1.005	0.336	84.100	M	121.50	11.530
	5	77.700	0.330	1.392	0.341	81.400	M	64.44	3.356
	6	746.600	0.678	1.392	0.341	88.200	M	623.33	50.074
	Σ	**2,411.100**						**969.41**	**134.574**
#2	1	257.000	0.423	0.000	0.000	93.000	M	374.44	23.118
	2	180.500	0.562	0.478	0.281	91.800	M	210.48	15.074
	3	200.700	0.687	0.574	0.283	93.000	M	220.68	18.000
	4	438.600	0.811	0.574	0.283	93.000	M	429.99	39.326
	5	420.200	1.247	0.801	0.293	88.000	M	218.78	27.811
	Σ	**3,908.100**						**1,059.91**	**257.902**
#3	1	172.600	0.443	0.000	0.000	93.000	M	245.91	15.489
	2	277.000	0.890	0.000	0.000	88.900	M	198.52	19.389
	3	378.900	0.632	0.209	0.314	87.900	M	325.75	24.926
	Σ	**4,736.600**						**1,247.07**	**317.706**
#4	Σ	**4,736.600**						**1,247.07**	**317.706**
#9	1	288.000	0.987	0.000	0.000	85.800	M	156.16	16.590
	2	236.000	0.436	0.000	0.000	81.900	M	174.01	10.523
	3	106.000	0.324	0.297	0.268	81.900	M	91.67	4.734
	4	82.000	0.315	0.666	0.300	81.900	M	71.86	3.662
	Σ	**5,448.600**						**1,281.45**	**353.215**
#11	Σ	**12,663.300**						**3,364.59**	**899.997**
#21	1	146.000	0.819	0.000	0.000	86.900	M	98.01	9.024
	2	137.000	0.213	0.249	0.263	81.900	M	139.52	6.123
	3	182.500	0.289	0.878	0.256	91.300	M	282.23	14.830
	4	70.000	0.939	0.878	0.256	81.900	M	30.17	3.115
	5	111.000	0.297	0.947	0.263	81.900	M	99.84	4.956
	Σ	**13,309.800**						**3,387.26**	**938.045**
#18	1	301.700	0.652	0.000	0.000	93.000	M	343.42	27.082
	2	546.800	0.768	0.561	0.320	86.300	M	370.15	32.542
	Σ	**848.500**						**434.05**	**59.624**
#17	1	182.200	0.462	0.000	0.000	93.000	M	254.12	16.351
	Σ	**182.200**						**254.12**	**16.351**
#19	Σ	**1,030.700**						**603.09**	**75.975**
#15	1	437.400	0.803	0.000	0.000	91.300	M	391.26	35.417
	2	549.000	0.637	0.654	0.327	91.300	M	575.39	44.478
	3	1,006.300	1.023	0.768	0.331	84.700	M	492.78	53.997
	Σ	**1,992.700**						**996.33**	**133.892**

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#12	1	517.800	0.791	0.000	0.000	81.900	M	253.96	23.036
	2	229.000	0.571	0.043	0.418	80.100	M	124.82	8.994
	3	592.700	0.706	0.044	0.417	81.500	M	307.18	25.658
	4	1,806.900	1.542	0.487	0.362	76.700	M	350.97	55.002
	5	348.100	0.618	0.487	0.362	80.000	178.31	13.561	
	∑	**3,494.500**						**739.31**	**126.252**
#13	1	411.600	0.725	0.000	0.000	79.700	M	183.88	15.700
	2	636.400	0.774	0.322	0.336	80.700	M	291.36	26.065
	3	319.000	0.575	0.685	0.318	85.500	M	251.02	18.050
	4	231.700	0.314	0.923	0.328	80.400	M	183.82	9.322
	5	1,122.000	1.308	0.923	0.328	74.700	M	210.47	29.098
	∑	**6,215.200**						**1,297.09**	**224.487**
#14	1	405.900	0.384	0.000	0.000	90.800	M	546.94	31.913
	2	411.100	0.452	0.707	0.308	90.700	M	510.03	32.137
	3	787.400	0.658	0.975	0.307	91.400	M	812.59	64.232
	4	144.200	0.341	1.716	0.310	86.200	M	159.03	8.568
	5	343.800	0.289	1.970	0.312	86.500	M	413.08	20.780
	6	392.800	0.806	2.107	0.316	81.900	M	190.01	17.476
	7	528.200	0.518	2.544	0.316	87.200	M	494.68	33.311
	8	890.900	1.253	2.544	0.316	83.500	M	341.95	44.165
	9	741.400	1.076	3.047	0.316	84.800	M	351.34	40.044
	10	451.100	0.916	3.354	0.316	83.900	M	227.77	22.972
	∑	**11,312.000**						**1,550.26**	**540.085**
#16	1	475.100	1.721	0.000	0.000	92.400	M	250.03	41.080
	2	348.400	0.542	0.951	0.283	92.500	M	432.31	30.323
	3	198.500	0.266	1.384	0.278	93.000	M	340.98	17.895
	∑	**14,326.700**						**2,034.74**	**763.276**
#20	1	271.100	0.667	0.000	0.000	89.400	M	246.39	19.587
	2	306.000	0.713	0.410	0.287	93.000	M	328.13	27.441
	∑	**15,934.500**						**2,055.27**	**886.278**
#22	**∑**	**29,244.300**						**5,099.96**	**1,824.322**
#23	1	291.000	0.564	0.000	0.000	81.900	M	181.86	12.955
	∑	**29,535.300**						**5,084.30**	**1,837.278**
#35	**∑**	**47,950.300**						**6,475.79**	**2,597.573**
#36	1	308.000	0.606	0.000	0.000	81.900	M	183.18	13.720
	2	45.000	0.159	0.470	0.263	81.900	M	50.25	2.043
	3	156.000	0.158	0.000	0.000	81.900	M	174.21	7.084
	∑	**48,459.300**						**6,445.55**	**2,620.421**

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#37	1	344.000	1.756	0.000	0.000	84.800	M	109.22	18.572
	2	300.000	0.415	1.870	0.241	87.800	M	330.38	19.687
	3	185.000	0.332	1.493	0.241	85.500	M	198.10	10.506
	4	246.000	0.363	2.653	0.246	81.900	M	201.08	10.979
	5	157.000	0.611	2.512	0.242	84.100	M	108.10	8.105
	6	76.000	0.095	2.512	0.242	84.100	M	156.43	4.916
	7	243.000	0.673	1.814	0.241	83.000	M	144.99	11.662
	8	81.000	0.151	0.095	0.383	81.900	M	90.45	3.678
	9	29.000	0.118	1.721	0.298	81.900	M	54.34	1.618
	Σ	**50,120.300**						**6,330.69**	**2,710.143**

Subwatershed Sedimentology Detail:

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
#30	1	0.095	200.00	3.80	0.3720	1.0000	2	97.1	9,320	4.41	3.12
	Σ							**97.1**	**9,320**	**4.41**	**3.12**
#28	1	0.187	100.00	10.10	0.3750	1.0000	3	4,338.2	73,262	0.83	0.60
	2	0.196	100.00	10.20	0.3930	1.0000	3	2,720.2	80,011	2.01	1.43
	Σ							**5,541.5**	**59,612**	**0.74**	**0.53**
#26	1	0.155	400.00	1.40	0.3480	1.0000	2	57.3	5,194	1.90	1.38
	2	0.155	300.00	2.40	0.3340	1.0000	2	491.5	7,755	2.47	1.81
	Σ							**548.8**	**7,278**	**2.35**	**1.74**
#24	1	0.128	300.00	2.30	0.3360	1.0000	2	331.9	4,689	0.69	0.52
	2	0.136	300.00	2.70	0.3440	1.0000	2	370.4	6,080	1.07	0.79
	3	0.107	300.00	2.30	0.3330	1.0000	2	295.9	5,731	2.16	1.59
	4	0.163	400.00	1.60	0.3210	1.0000	2	258.2	6,111	2.13	1.55
	Σ							**949.6**	**4,970**	**0.73**	**0.46**
#25	1	0.125	400.00	1.90	0.3440	1.0000	2	144.5	8,472	4.38	3.12
	2	0.124	300.00	2.60	0.3280	1.0000	2	39.0	9,182	4.99	3.51
	3	0.122	175.00	4.90	0.2660	1.0000	2	389.9	19,291	11.68	8.13
	Σ							**1,191.0**	**16,037**	**3.71**	**0.76**
#27	1	0.127	175.00	5.90	0.3160	1.0000	2	424.5	25,447	14.88	10.58
	2	0.122	150.00	7.50	0.2920	1.0000	2	419.7	27,541	16.50	11.70
	3	0.070	125.00	8.40	0.3270	1.0000	2	119.4	15,575	8.52	5.95
	4	0.097	125.00	9.60	0.3170	1.0000	2	301.0	33,444	20.45	14.14
	5	0.126	125.00	8.90	0.3290	1.0000	2	789.9	30,401	16.28	11.59

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
	Σ							**3,785.8**	**31,465**	**13.44**	**2.82**
#29	1	0.190	125.00	9.80	0.3930	1.0000	3	3,300.2	89,222	5.11	3.64
	2	0.203	125.00	8.90	0.3940	1.0000	3	1,359.9	71,018	3.10	2.22
	3	0.193	125.00	8.40	0.3940	1.0000	3	1,052.2	63,883	3.03	2.14
	Σ							**15,028.9**	**74,082**	**9.74**	**2.44**
#32	1	0.210	150.00	7.70	0.3990	1.0000	3	1,746.7	66,745	2.70	1.93
	Σ							**16,153.4**	**65,499**	**6.15**	**1.77**
#31	1	0.204	125.00	8.70	0.3620	1.0000	3	2,300.9	65,305	1.98	1.42
	2	0.210	150.00	7.30	0.3990	1.0000	3	2,036.7	70,003	4.74	3.39
	3	0.210	175.00	4.50	0.3980	1.0000	3	826.7	47,117	3.68	2.62
	Σ							**3,927.1**	**43,239**	**0.95**	**0.75**
#33	Σ							**20,080.5**	**57,140**	**4.56**	**1.65**
#34	1	0.193	200.00	3.84	0.2460	1.0000	3	376.5	19,714	1.15	0.83
	2	0.100	200.00	3.66	0.2540	1.0000	1	68.5	8,450	5.08	3.54
	3	0.100	300.00	2.54	0.2540	1.0000	1	60.1	6,541	3.87	2.72
	4	0.100	200.00	3.50	0.2540	1.0000	1	167.6	10,761	6.81	4.62
	Σ							**18,652.5**	**49,440**	**1.45**	**0.54**
#5	1	0.149	75.00	12.50	0.3230	1.0000	3	1,761.5	55,417	0.26	0.18
	2	0.133	75.00	15.80	0.3190	1.0000	2	1,581.0	73,701	45.73	32.04
	3	0.103	100.00	11.00	0.2030	1.0000	3	800.7	28,422	1.85	1.32
	4	0.093	75.00	13.80	0.2130	1.0000	2	263.1	28,361	18.06	12.80
	5	0.123	100.00	11.00	0.1370	1.0000	3	527.0	21,481	1.58	1.14
	6	0.149	75.00	14.70	0.1990	1.0000	3	771.8	47,043	4.10	2.97
	Σ							**4,549.4**	**44,265**	**4.91**	**2.73**
#6	1	0.208	175.00	4.30	0.3980	1.0000	3	566.5	43,809	3.67	2.62
	2	0.183	175.00	5.40	0.3910	1.0000	3	696.7	43,787	1.15	0.81
	3	0.188	150.00	7.60	0.3900	1.0000	3	1,212.9	61,278	2.99	2.13
	4	0.210	150.00	6.30	0.3990	1.0000	3	814.1	55,762	4.31	3.20
	5	0.185	125.00	8.10	0.3860	1.0000	3	852.0	57,331	3.34	2.40
	6	0.104	100.00	11.30	0.2240	1.0000	3	781.6	30,493	1.34	0.95
	7	0.164	100.00	11.20	0.3740	1.0000	3	1,220.4	69,527	1.18	0.84
	Σ							**8,096.8**	**38,322**	**0.26**	**0.15**
#7	1	0.208	150.00	7.80	0.3780	1.0000	3	3,355.9	50,966	0.00	0.00
	2	0.209	100.00	10.20	0.3940	1.0000	3	2,757.2	68,474	0.00	0.00
	3	0.210	150.00	6.70	0.3990	1.0000	3	1,232.8	51,046	0.00	0.00
	4	0.210	100.00	11.50	0.3990	1.0000	3	724.5	98,573	9.53	7.00
	5	0.210	150.00	7.10	0.3990	1.0000	3	925.0	65,247	5.79	4.23
	6	0.209	150.00	7.90	0.3990	1.0000	3	640.0	69,035	6.39	4.69

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
	7	0.206	75.00	15.50	0.3990	1.0000	3	1,289.7	122,298	10.82	7.97
	8	0.202	75.00	14.50	0.3980	1.0000	3	4,762.8	115,519	4.96	3.61
	Σ							**20,364.5**	**47,914**	**0.00**	**0.00**
#8	1	0.000	0.00	0.00	0.0000	1.0000	0	0.0	1	0.00	0.00
	Σ							**20,364.5**	**47,914**	**0.00**	**0.00**
#10	1	0.190	300.00	2.70	0.1930	1.0000	3	272.9	8,677	0.00	0.00
	2	0.153	200.00	3.50	0.3610	1.0000	2	195.6	13,269	6.72	4.86
	3	0.189	200.00	3.70	0.3190	1.0000	3	170.7	15,060	0.00	0.00
	4	0.190	300.00	2.10	0.1940	1.0000	3	94.4	8,517	0.33	0.24
	5	0.201	300.00	2.00	0.3030	1.0000	3	103.6	9,977	0.00	0.00
	Σ							**19,889.8**	**43,819**	**0.14**	**0.09**
#1	1	0.157	150.00	6.80	0.3830	1.0000	2	974.2	35,729	19.48	13.87
	2	0.210	150.00	6.60	0.3990	1.0000	3	531.9	34,819	0.00	0.00
	3	0.149	200.00	3.90	0.3870	1.0000	2	363.4	13,724	6.05	4.41
	4	0.169	175.00	4.70	0.3950	1.0000	2	321.0	28,267	15.78	11.32
	5	0.157	100.00	10.10	0.3940	1.0000	2	193.1	58,434	36.30	25.77
	6	0.175	75.00	12.60	0.2840	1.0000	3	2,876.0	57,530	0.00	0.00
	Σ							**4,774.2**	**39,132**	**6.43**	**4.23**
#2	1	0.190	150.00	7.90	0.1930	1.0000	3	741.4	32,869	2.28	1.62
	2	0.184	175.00	4.80	0.2010	1.0000	3	286.7	19,447	0.71	0.51
	3	0.202	200.00	3.90	0.3220	1.0000	3	410.8	23,164	0.46	0.33
	4	0.203	150.00	7.40	0.3220	1.0000	3	1,809.1	46,104	0.00	0.00
	5	0.181	175.00	5.10	0.3710	1.0000	3	794.1	28,621	0.00	0.00
	Σ							**6,201.8**	**25,453**	**0.21**	**0.14**
#3	1	0.190	175.00	5.20	0.1930	1.0000	3	339.6	22,578	1.48	1.05
	2	0.177	175.00	4.20	0.2560	1.0000	3	345.2	18,214	0.00	0.00
	3	0.166	175.00	4.30	0.2290	1.0000	3	449.8	18,658	0.06	0.04
	Σ							**6,683.3**	**20,156**	**0.07**	**0.05**
#4	Σ							**6,683.3**	**20,156**	**0.07**	**0.05**
#9	1	0.212	175.00	4.17	0.2490	1.0000	2	320.1	19,740	10.83	7.73
	2	0.100	200.00	4.50	0.2540	1.0000	4	145.5	14,757	11.81	8.09
	3	0.100	200.00	4.50	0.2540	1.0000	4	64.9	14,519	11.62	8.03
	4	0.100	200.00	6.50	0.2540	1.0000	4	69.5	19,781	15.82	11.09
	Σ							**6,698.9**	**18,280**	**1.09**	**0.82**
#11	Σ							**26,588.8**	**36,212**	**0.63**	**0.37**
#21	1	0.206	175.00	4.44	0.2560	1.0000	2	185.8	21,160	12.10	8.59
	2	0.100	175.00	14.00	0.2540	1.0000	4	372.8	63,185	50.55	35.07
	3	0.185	300.00	2.70	0.2180	1.0000	3	210.7	14,269	1.25	0.91

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
	4	0.100	300.00	8.00	0.2540	1.0000	1	58.5	19,066	10.85	7.81
	5	0.100	200.00	5.00	0.2540	1.0000	1	77.2	16,022	10.37	7.37
	Σ							**26,635.1**	**35,473**	**0.61**	**0.36**
#18	1	0.193	300.00	2.80	0.2200	1.0000	3	358.9	13,605	0.36	0.26
	2	0.173	175.00	4.70	0.3880	1.0000	3	1,076.7	33,688	0.00	0.00
	Σ							**885.6**	**17,901**	**0.19**	**0.12**
#17	1	0.196	300.00	2.60	0.2600	1.0000	3	256.5	16,193	1.00	0.71
	Σ							**256.5**	**16,193**	**1.00**	**0.71**
#19	Σ							**1,142.2**	**16,875**	**0.37**	**0.24**
#15	1	0.201	125.00	8.20	0.3960	1.0000	3	2,012.4	57,137	0.00	0.00
	2	0.161	100.00	11.40	0.3060	1.0000	3	2,649.4	59,791	1.19	0.85
	3	0.118	100.00	10.20	0.2850	1.0000	2	1,580.5	29,583	15.98	11.51
	Σ							**5,389.3**	**48,450**	**2.83**	**1.71**
#12	1	0.124	150.00	6.30	0.3070	1.0000	2	498.5	22,410	12.48	8.80
	2	0.132	200.00	3.60	0.3500	1.0000	2	133.4	15,703	9.13	6.31
	3	0.136	175.00	5.00	0.3330	1.0000	2	607.5	24,640	13.97	9.79
	4	0.188	200.00	3.40	0.3570	1.0000	2	904.7	16,633	7.42	5.37
	5	0.228	175.00	4.10	0.3640	1.0000	2	476.5	36,486	20.95	14.66
	Σ							**2,083.8**	**17,988**	**8.18**	**5.49**
#13	1	0.128	150.00	6.90	0.3390	1.0000	2	417.2	27,706	15.46	10.81
	2	0.130	175.00	5.70	0.3300	1.0000	2	638.1	25,298	14.04	9.91
	3	0.191	175.00	6.00	0.2890	1.0000	2	645.3	36,645	21.88	15.51
	4	0.122	175.00	5.10	0.3460	1.0000	2	245.0	27,365	17.00	11.90
	5	0.137	175.00	4.20	0.3530	1.0000	2	478.0	16,624	7.66	5.54
	Σ							**4,212.9**	**19,549**	**9.55**	**6.69**
#14	1	0.196	100.00	10.20	0.3980	1.0000	3	2,894.3	91,132	6.10	4.33
	2	0.193	150.00	6.70	0.4020	1.0000	3	1,917.7	59,949	3.20	2.29
	3	0.169	75.00	13.80	0.3240	1.0000	3	4,755.6	73,522	1.21	0.87
	4	0.114	100.00	11.00	0.2980	1.0000	3	335.5	39,158	2.35	1.70
	5	0.078	100.00	10.10	0.1830	1.0000	3	350.3	16,865	1.22	0.89
	6	0.084	150.00	7.10	0.2700	1.0000	2	242.5	14,080	7.82	5.64
	7	0.087	100.00	10.00	0.1840	1.0000	3	540.9	16,298	0.40	0.29
	8	0.126	150.00	6.70	0.2740	1.0000	2	815.5	18,458	9.42	6.89
	9	0.117	150.00	7.30	0.2600	1.0000	2	749.6	18,705	10.00	7.32
	10	0.115	125.00	8.50	0.2610	1.0000	2	466.0	20,278	11.14	8.14
	Σ							**12,523.1**	**88,409**	**3.02**	**0.57**
#16	1	0.201	300.00	2.78	0.3030	1.0000	3	541.3	13,279	0.00	0.00
	2	0.204	150.00	6.00	0.3630	1.0000	3	1,454.1	47,970	2.12	1.53

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
	3	0.210	150.00	6.10	0.3990	1.0000	3	1,085.9	59,002	5.71	4.24
	Σ							**20,984.3**	**56,492**	**2.43**	**0.86**
#20	1	0.186	175.00	3.19	0.2130	1.0000	3	222.4	11,743	0.05	0.03
	2	0.194	200.00	3.42	0.2330	1.0000	3	399.5	14,838	0.22	0.16
	Σ							**22,429.6**	**49,543**	**1.52**	**0.56**
#22	Σ							**49,064.7**	**36,169**	**0.84**	**0.46**
#23	1	0.100	350.00	8.00	0.2540	1.0000	1	383.7	31,062	19.03	13.21
	Σ							**49,022.4**	**36,000**	**0.76**	**0.41**
#35	Σ							**67,675.0**	**34,821**	**0.82**	**0.45**
#36	1	0.100	200.00	3.14	0.2540	1.0000	1	101.5	7,803	4.74	3.29
	2	0.100	450.00	13.00	0.2540	1.0000	1	180.7	89,161	59.25	41.93
	3	0.100	300.00	10.00	0.2540	1.0000	1	344.6	51,559	34.26	23.37
	Σ							**67,437.1**	**35,290**	**0.74**	**0.39**
#37	1	0.196	200.00	3.80	0.3980	1.0000	2	330.1	17,944	8.41	6.09
	2	0.194	200.00	3.42	0.4020	1.0000	3	573.4	28,879	1.43	1.05
	3	0.173	150.00	7.10	0.2770	1.0000	3	393.3	37,272	2.22	1.62
	4	0.100	175.00	5.00	0.2540	1.0000	1	166.8	15,080	9.63	7.10
	5	0.171	150.00	6.50	0.2990	1.0000	3	238.1	29,210	0.00	0.00
	6	0.171	150.00	6.50	0.2990	1.0000	3	195.1	38,774	10.07	7.48
	7	0.100	300.00	1.20	0.2540	1.0000	1	39.6	3,449	2.08	1.50
	8	0.100	300.00	10.00	0.2540	1.0000	1	165.4	47,498	31.57	21.63
	9	0.100	250.00	10.00	0.2540	1.0000	1	63.8	39,497	27.59	20.01
	Σ							**66,395.8**	**41,648**	**0.37**	**0.16**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	3.65	50.00	1,369.00	1.910	0.199
		8. Large gullies, diversions, and low flowing streams	1.57	157.00	10,030.00	3.750	0.742
#1	**1**	**Time of Concentration:**					**0.941**
#1	2	5. Nearly bare and untilled, and alluvial valley fans	6.63	70.00	1,056.00	2.570	0.114
		5. Nearly bare and untilled, and alluvial valley fans	1.98	150.00	7,573.00	1.400	1.502
#1	**2**	**Time of Concentration:**					**1.616**
#1	3	5. Nearly bare and untilled, and alluvial valley fans	1.65	117.00	7,070.00	1.280	1.534

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	2.43	126.00	5,188.00	4.670	0.308
#1	**3**	**Time of Concentration:**					**1.842**
#1	4	5. Nearly bare and untilled, and alluvial valley fans	5.77	260.00	4,506.00	2.400	0.521
		8. Large gullies, diversions, and low flowing streams	2.84	168.00	5,924.00	5.050	0.325
#1	**4**	**Time of Concentration:**					**0.846**
#1	5	5. Nearly bare and untilled, and alluvial valley fans	19.93	180.00	903.00	4.460	0.056
		8. Large gullies, diversions, and low flowing streams	3.30	178.00	5,393.00	5.450	0.274
#1	**5**	**Time of Concentration:**					**0.330**
#1	6	5. Nearly bare and untilled, and alluvial valley fans	13.43	105.00	782.00	3.660	0.059
		8. Large gullies, diversions, and low flowing streams	2.62	283.00	10,822.00	4.850	0.619
#1	**6**	**Time of Concentration:**					**0.678**
#2	1	5. Nearly bare and untilled, and alluvial valley fans	6.84	70.00	1,024.00	2.610	0.108
		8. Large gullies, diversions, and low flowing streams	1.62	70.00	4,325.00	3.810	0.315
#2	**1**	**Time of Concentration:**					**0.423**
#2	2	5. Nearly bare and untilled, and alluvial valley fans	5.56	45.00	810.00	2.350	0.095
		8. Large gullies, diversions, and low flowing streams	0.86	40.00	4,663.00	2.770	0.467
#2	**2**	**Time of Concentration:**					**0.562**
#2	3	5. Nearly bare and untilled, and alluvial valley fans	5.89	50.00	849.00	2.420	0.097
		8. Large gullies, diversions, and low flowing streams	1.17	80.00	6,862.00	3.230	0.590
#2	**3**	**Time of Concentration:**					**0.687**
#2	4	5. Nearly bare and untilled, and alluvial valley fans	12.63	95.00	752.00	3.550	0.058
		8. Large gullies, diversions, and low flowing streams	1.40	135.00	9,630.00	3.550	0.753
#2	**4**	**Time of Concentration:**					**0.811**
#2	5	5. Nearly bare and untilled, and alluvial valley fans	11.02	70.00	635.00	3.320	0.053
		8. Large gullies, diversions, and low flowing streams	0.46	40.00	8,732.00	2.030	1.194
#2	**5**	**Time of Concentration:**					**1.247**
#3	1	5. Nearly bare and untilled, and alluvial valley fans	1.24	10.00	805.00	1.110	0.201
		8. Large gullies, diversions, and low flowing streams	1.33	40.00	3,017.00	3.450	0.242
#3	**1**	**Time of Concentration:**					**0.443**
#3	2	5. Nearly bare and untilled, and alluvial valley fans	0.68	10.00	1,478.00	0.820	0.500

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	1.78	100.00	5,622.00	4.000	0.390
#3	**2**	**Time of Concentration:**					**0.890**
#3	3	5. Nearly bare and untilled, and alluvial valley fans	4.66	70.00	1,501.00	2.150	0.193
		8. Large gullies, diversions, and low flowing streams	1.17	60.00	5,126.00	3.240	0.439
#3	**3**	**Time of Concentration:**					**0.632**
#5	1	5. Nearly bare and untilled, and alluvial valley fans	19.06	285.00	1,495.00	4.360	0.095
		8. Large gullies, diversions, and low flowing streams	2.64	242.00	9,174.00	4.870	0.523
#5	**1**	**Time of Concentration:**					**0.618**
#5	2	5. Nearly bare and untilled, and alluvial valley fans	14.27	105.00	736.00	3.770	0.054
		8. Large gullies, diversions, and low flowing streams	4.08	297.00	7,279.00	6.050	0.334
#5	**2**	**Time of Concentration:**					**0.388**
#5	3	5. Nearly bare and untilled, and alluvial valley fans	8.27	35.00	423.00	2.870	0.040
		8. Large gullies, diversions, and low flowing streams	3.44	208.00	6,049.00	5.560	0.302
#5	**3**	**Time of Concentration:**					**0.342**
#5	4	5. Nearly bare and untilled, and alluvial valley fans	14.58	85.00	583.00	3.810	0.042
		8. Large gullies, diversions, and low flowing streams	4.53	248.00	5,473.00	6.380	0.238
#5	**4**	**Time of Concentration:**					**0.280**
#5	5	5. Nearly bare and untilled, and alluvial valley fans	5.07	70.00	1,382.00	2.250	0.170
		8. Large gullies, diversions, and low flowing streams	3.89	170.00	4,375.00	5.910	0.205
#5	**5**	**Time of Concentration:**					**0.375**
#5	6	5. Nearly bare and untilled, and alluvial valley fans	12.48	90.00	721.00	3.530	0.056
		8. Large gullies, diversions, and low flowing streams	5.16	274.00	5,308.02	6.810	0.216
#5	**6**	**Time of Concentration:**					**0.272**
#6	1	5. Nearly bare and untilled, and alluvial valley fans	5.36	75.00	1,399.00	2.310	0.168
		8. Large gullies, diversions, and low flowing streams	2.41	66.00	2,742.00	4.650	0.163
#6	**1**	**Time of Concentration:**					**0.331**
#6	2	5. Nearly bare and untilled, and alluvial valley fans	3.39	80.00	2,359.00	1.840	0.356
		8. Large gullies, diversions, and low flowing streams	2.63	80.00	3,039.00	4.860	0.173
#6	**2**	**Time of Concentration:**					**0.529**
#6	3	5. Nearly bare and untilled, and alluvial valley fans	4.60	34.00	739.00	2.140	0.095

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	2.33	136.00	5,845.00	4.570	0.355
#6	**3**	**Time of Concentration:**					**0.450**
#6	4	5. Nearly bare and untilled, and alluvial valley fans	6.06	85.00	1,402.00	2.460	0.158
		8. Large gullies, diversions, and low flowing streams	2.52	96.00	3,810.00	4.760	0.222
#6	**4**	**Time of Concentration:**					**0.380**
#6	5	5. Nearly bare and untilled, and alluvial valley fans	7.24	70.00	967.00	2.690	0.099
		8. Large gullies, diversions, and low flowing streams	2.34	117.00	5,003.00	4.580	0.303
#6	**5**	**Time of Concentration:**					**0.402**
#6	6	5. Nearly bare and untilled, and alluvial valley fans	31.83	183.00	575.00	5.640	0.028
		8. Large gullies, diversions, and low flowing streams	3.38	270.00	7,990.00	5.510	0.402
#6	**6**	**Time of Concentration:**					**0.430**
#6	7	5. Nearly bare and untilled, and alluvial valley fans	23.08	325.00	1,408.00	4.800	0.081
		8. Large gullies, diversions, and low flowing streams	2.88	240.00	8,327.00	5.090	0.454
#6	**7**	**Time of Concentration:**					**0.535**
#7	1	5. Nearly bare and untilled, and alluvial valley fans	11.42	90.00	788.00	3.370	0.064
		8. Large gullies, diversions, and low flowing streams	1.46	230.00	15,769.00	3.620	1.210
#7	**1**	**Time of Concentration:**					**1.274**
#7	2	5. Nearly bare and untilled, and alluvial valley fans	10.97	60.00	547.00	3.310	0.045
		8. Large gullies, diversions, and low flowing streams	1.61	220.00	13,660.00	3.800	0.998
#7	**2**	**Time of Concentration:**					**1.043**
#7	3	5. Nearly bare and untilled, and alluvial valley fans	6.40	60.00	938.00	2.520	0.103
		8. Large gullies, diversions, and low flowing streams	1.72	171.00	9,931.00	3.930	0.701
#7	**3**	**Time of Concentration:**					**0.804**
#7	4	5. Nearly bare and untilled, and alluvial valley fans	19.23	80.00	416.00	4.380	0.026
		8. Large gullies, diversions, and low flowing streams	2.45	100.00	4,083.00	4.690	0.241
#7	**4**	**Time of Concentration:**					**0.267**
#7	5	5. Nearly bare and untilled, and alluvial valley fans	6.09	67.00	1,101.00	2.460	0.124
		8. Large gullies, diversions, and low flowing streams	2.51	80.00	3,184.00	4.750	0.186
#7	**5**	**Time of Concentration:**					**0.310**
#7	6	5. Nearly bare and untilled, and alluvial valley fans	5.93	63.00	1,062.00	2.430	0.121

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	2.74	82.00	2,993.00	4.960	0.167
#7	**6**	**Time of Concentration:**					**0.288**
#7	7	5. Nearly bare and untilled, and alluvial valley fans	7.97	65.00	816.00	2.820	0.080
		8. Large gullies, diversions, and low flowing streams	3.48	153.00	4,400.00	5.590	0.218
#7	**7**	**Time of Concentration:**					**0.298**
#7	8	5. Nearly bare and untilled, and alluvial valley fans	6.60	50.00	758.00	2.560	0.082
		8. Large gullies, diversions, and low flowing streams	4.66	473.00	10,157.00	6.470	0.436
#7	**8**	**Time of Concentration:**					**0.518**
#9	1	5. Nearly bare and untilled, and alluvial valley fans	3.01	55.00	1,829.00	1.730	0.293
		8. Large gullies, diversions, and low flowing streams	0.76	50.00	6,548.00	2.620	0.694
#9	**1**	**Time of Concentration:**					**0.987**
#9	2	5. Nearly bare and untilled, and alluvial valley fans	4.67	70.00	1,500.02	2.160	0.192
		8. Large gullies, diversions, and low flowing streams	1.43	45.00	3,150.15	3.580	0.244
#9	**2**	**Time of Concentration:**					**0.436**
#9	3	5. Nearly bare and untilled, and alluvial valley fans	4.44	40.00	900.00	2.100	0.119
		8. Large gullies, diversions, and low flowing streams	1.48	40.00	2,700.14	3.650	0.205
#9	**3**	**Time of Concentration:**					**0.324**
#9	4	5. Nearly bare and untilled, and alluvial valley fans	6.50	65.00	1,000.00	2.540	0.109
		8. Large gullies, diversions, and low flowing streams	1.00	20.00	2,000.00	3.000	0.185
		9. Small streams flowing bankfull	2.92	35.00	1,200.00	15.370	0.021
#9	**4**	**Time of Concentration:**					**0.315**
#10	1	5. Nearly bare and untilled, and alluvial valley fans	1.24	41.00	3,317.00	1.110	0.830
		8. Large gullies, diversions, and low flowing streams	0.70	29.00	4,125.00	2.510	0.456
#10	**1**	**Time of Concentration:**					**1.286**
#10	2	5. Nearly bare and untilled, and alluvial valley fans	2.25	125.00	5,554.00	1.500	1.028
		8. Large gullies, diversions, and low flowing streams	2.13	85.00	3,997.00	4.370	0.254
#10	**2**	**Time of Concentration:**					**1.282**
#10	3	5. Nearly bare and untilled, and alluvial valley fans	1.39	68.00	4,904.00	1.170	1.164
		8. Large gullies, diversions, and low flowing streams	4.73	90.00	1,904.00	6.520	0.081
#10	**3**	**Time of Concentration:**					**1.245**
#10	4	5. Nearly bare and untilled, and alluvial valley fans	3.76	51.00	1,357.00	1.930	0.195

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	0.65	22.00	3,385.00	2.410	0.390
#10	**4**	**Time of Concentration:**					**0.585**
#10	5	5. Nearly bare and untilled, and alluvial valley fans	1.63	88.00	5,391.16	1.270	1.179
#10	**5**	**Time of Concentration:**					**1.179**
#12	1	5. Nearly bare and untilled, and alluvial valley fans	4.50	75.00	1,667.00	2.120	0.218
		8. Large gullies, diversions, and low flowing streams	1.85	155.00	8,400.00	4.070	0.573
#12	**1**	**Time of Concentration:**					**0.791**
#12	2	5. Nearly bare and untilled, and alluvial valley fans	2.99	50.00	1,674.03	1.720	0.270
		8. Large gullies, diversions, and low flowing streams	1.67	70.00	4,201.17	3.870	0.301
#12	**2**	**Time of Concentration:**					**0.571**
#12	3	5. Nearly bare and untilled, and alluvial valley fans	4.04	57.00	1,411.00	2.000	0.195
		8. Large gullies, diversions, and low flowing streams	1.55	107.00	6,884.00	3.740	0.511
#12	**3**	**Time of Concentration:**					**0.706**
#12	4	5. Nearly bare and untilled, and alluvial valley fans	2.23	84.00	3,771.04	1.490	0.703
		8. Large gullies, diversions, and low flowing streams	1.62	186.00	11,515.60	3.810	0.839
#12	**4**	**Time of Concentration:**					**1.542**
#12	5	5. Nearly bare and untilled, and alluvial valley fans	3.68	53.00	1,442.00	1.910	0.209
		8. Large gullies, diversions, and low flowing streams	1.95	120.00	6,155.00	4.180	0.409
#12	**5**	**Time of Concentration:**					**0.618**
#13	1	5. Nearly bare and untilled, and alluvial valley fans	4.62	62.00	1,342.00	2.140	0.174
		8. Large gullies, diversions, and low flowing streams	1.91	157.00	8,225.00	4.140	0.551
#13	**1**	**Time of Concentration:**					**0.725**
#13	2	5. Nearly bare and untilled, and alluvial valley fans	2.91	50.00	1,717.00	1.700	0.280
		8. Large gullies, diversions, and low flowing streams	2.28	183.00	8,039.00	4.520	0.494
#13	**2**	**Time of Concentration:**					**0.774**
#13	3	5. Nearly bare and untilled, and alluvial valley fans	6.18	95.00	1,537.00	2.480	0.172
		8. Large gullies, diversions, and low flowing streams	2.13	135.00	6,347.00	4.370	0.403
#13	**3**	**Time of Concentration:**					**0.575**
#13	4	5. Nearly bare and untilled, and alluvial valley fans	3.17	10.00	315.00	1.780	0.049
		8. Large gullies, diversions, and low flowing streams	2.30	100.00	4,344.00	4.550	0.265
#13	**4**	**Time of Concentration:**					**0.314**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#13	5	5. Nearly bare and untilled, and alluvial valley fans	3.10	70.00	2,255.00	1.760	0.355
		8. Large gullies, diversions, and low flowing streams	1.23	140.00	11,392.00	3.320	0.953
#13	**5**	**Time of Concentration:**					**1.308**
#14	1	5. Nearly bare and untilled, and alluvial valley fans	10.59	63.00	595.00	3.250	0.050
		8. Large gullies, diversions, and low flowing streams	2.60	151.00	5,808.00	4.830	0.334
#14	**1**	**Time of Concentration:**					**0.384**
#14	2	5. Nearly bare and untilled, and alluvial valley fans	7.28	67.00	920.00	2.690	0.095
		8. Large gullies, diversions, and low flowing streams	2.17	123.00	5,670.00	4.410	0.357
#14	**2**	**Time of Concentration:**					**0.452**
#14	3	5. Nearly bare and untilled, and alluvial valley fans	21.46	150.00	699.00	4.630	0.041
		8. Large gullies, diversions, and low flowing streams	3.10	364.00	11,728.00	5.280	0.617
#14	**3**	**Time of Concentration:**					**0.658**
#14	4	5. Nearly bare and untilled, and alluvial valley fans	3.39	35.00	1,032.00	1.840	0.155
		8. Large gullies, diversions, and low flowing streams	2.97	103.00	3,470.00	5.160	0.186
#14	**4**	**Time of Concentration:**					**0.341**
#14	5	5. Nearly bare and untilled, and alluvial valley fans	28.15	125.00	444.00	5.300	0.023
		8. Large gullies, diversions, and low flowing streams	4.18	246.00	5,886.00	6.130	0.266
#14	**5**	**Time of Concentration:**					**0.289**
#14	6	5. Nearly bare and untilled, and alluvial valley fans	3.18	40.00	1,257.00	1.780	0.196
		8. Large gullies, diversions, and low flowing streams	2.29	228.00	9,963.00	4.530	0.610
#14	**6**	**Time of Concentration:**					**0.806**
#14	7	5. Nearly bare and untilled, and alluvial valley fans	16.72	100.00	598.00	4.080	0.040
		8. Large gullies, diversions, and low flowing streams	2.81	243.00	8,649.00	5.020	0.478
#14	**7**	**Time of Concentration:**					**0.518**
#14	8	5. Nearly bare and untilled, and alluvial valley fans	1.70	47.00	2,765.00	1.300	0.590
		8. Large gullies, diversions, and low flowing streams	2.44	274.00	11,208.00	4.690	0.663
#14	**8**	**Time of Concentration:**					**1.253**
#14	9	5. Nearly bare and untilled, and alluvial valley fans	2.87	105.00	3,657.00	1.690	0.601
		8. Large gullies, diversions, and low flowing streams	2.43	194.00	7,991.00	4.670	0.475
#14	**9**	**Time of Concentration:**					**1.076**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#14	10	5. Nearly bare and untilled, and alluvial valley fans	2.75	80.00	2,907.00	1.650	0.489
		8. Large gullies, diversions, and low flowing streams	2.41	172.00	7,149.00	4.650	0.427
#14	**10**	**Time of Concentration:**					**0.916**
#15	1	5. Nearly bare and untilled, and alluvial valley fans	12.80	54.00	422.00	3.570	0.032
		8. Large gullies, diversions, and low flowing streams	1.68	181.00	10,781.00	3.880	0.771
#15	**1**	**Time of Concentration:**					**0.803**
#15	2	5. Nearly bare and untilled, and alluvial valley fans	44.22	260.00	588.00	6.640	0.024
		8. Large gullies, diversions, and low flowing streams	2.45	254.00	10,354.24	4.690	0.613
#15	**2**	**Time of Concentration:**					**0.637**
#15	3	5. Nearly bare and untilled, and alluvial valley fans	10.04	85.00	847.00	3.160	0.074
		8. Large gullies, diversions, and low flowing streams	2.34	366.00	15,663.00	4.580	0.949
#15	**3**	**Time of Concentration:**					**1.023**
#16	1	5. Nearly bare and untilled, and alluvial valley fans	2.26	117.00	5,179.00	1.500	0.959
		8. Large gullies, diversions, and low flowing streams	0.46	26.00	5,601.00	2.040	0.762
#16	**1**	**Time of Concentration:**					**1.721**
#16	2	5. Nearly bare and untilled, and alluvial valley fans	8.70	62.00	713.00	2.940	0.067
		8. Large gullies, diversions, and low flowing streams	1.99	144.00	7,241.00	4.230	0.475
#16	**2**	**Time of Concentration:**					**0.542**
#16	3	5. Nearly bare and untilled, and alluvial valley fans	6.88	32.00	465.00	2.620	0.049
		8. Large gullies, diversions, and low flowing streams	2.29	81.00	3,543.00	4.530	0.217
#16	**3**	**Time of Concentration:**					**0.266**
#17	1	5. Nearly bare and untilled, and alluvial valley fans	9.37	65.00	694.00	3.060	0.062
		8. Large gullies, diversions, and low flowing streams	1.19	56.00	4,712.00	3.270	0.400
#17	**1**	**Time of Concentration:**					**0.462**
#18	1	5. Nearly bare and untilled, and alluvial valley fans	9.00	60.00	667.00	2.990	0.061
		8. Large gullies, diversions, and low flowing streams	0.97	61.00	6,287.00	2.950	0.591
#18	**1**	**Time of Concentration:**					**0.652**
#18	2	5. Nearly bare and untilled, and alluvial valley fans	2.47	33.00	1,336.00	1.570	0.236
		8. Large gullies, diversions, and low flowing streams	2.01	164.00	8,154.00	4.250	0.532
#18	**2**	**Time of Concentration:**					**0.768**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#20	1	5. Nearly bare and untilled, and alluvial valley fans	11.87	45.00	379.00	3.440	0.030
		8. Large gullies, diversions, and low flowing streams	0.75	45.00	5,969.00	2.600	0.637
#20	**1**	**Time of Concentration:**					**0.667**
#20	2	5. Nearly bare and untilled, and alluvial valley fans	5.40	45.00	833.00	2.320	0.099
		8. Large gullies, diversions, and low flowing streams	1.30	98.00	7,547.00	3.410	0.614
#20	**2**	**Time of Concentration:**					**0.713**
#21	1	5. Nearly bare and untilled, and alluvial valley fans	4.09	60.00	1,467.02	2.020	0.201
		8. Large gullies, diversions, and low flowing streams	0.93	60.00	6,433.62	2.890	0.618
#21	**1**	**Time of Concentration:**					**0.819**
#21	2	5. Nearly bare and untilled, and alluvial valley fans	3.85	50.00	1,300.00	1.960	0.184
		8. Large gullies, diversions, and low flowing streams	42.86	900.00	2,100.00	19.630	0.029
#21	**2**	**Time of Concentration:**					**0.213**
#21	3	5. Nearly bare and untilled, and alluvial valley fans	1.70	15.00	881.00	1.300	0.188
		9. Small streams flowing bankfull	1.49	60.00	4,014.18	11.000	0.101
#21	**3**	**Time of Concentration:**					**0.289**
#21	4	5. Nearly bare and untilled, and alluvial valley fans	2.21	40.00	1,811.02	1.480	0.339
		8. Large gullies, diversions, and low flowing streams	0.84	50.00	5,949.54	2.750	0.600
#21	**4**	**Time of Concentration:**					**0.939**
#21	5	5. Nearly bare and untilled, and alluvial valley fans	4.00	30.00	750.00	2.000	0.104
		8. Large gullies, diversions, and low flowing streams	2.34	75.00	3,200.06	4.590	0.193
#21	**5**	**Time of Concentration:**					**0.297**
#23	1	5. Nearly bare and untilled, and alluvial valley fans	8.00	80.00	1,000.00	2.820	0.098
		8. Large gullies, diversions, and low flowing streams	2.74	85.00	3,100.00	4.960	0.173
		8. Large gullies, diversions, and low flowing streams	0.40	8.00	2,000.00	1.890	0.293
#23	**1**	**Time of Concentration:**					**0.564**
#24	1	5. Nearly bare and untilled, and alluvial valley fans	1.71	430.00	25,118.00	1.300	5.367
#24	**1**	**Time of Concentration:**					**5.367**
#24	2	5. Nearly bare and untilled, and alluvial valley fans	1.84	430.00	23,393.00	1.350	4.813
#24	**2**	**Time of Concentration:**					**4.813**
#24	3	5. Nearly bare and untilled, and alluvial valley fans	1.82	155.00	8,498.00	1.350	1.748
		8. Large gullies, diversions, and low flowing streams	0.84	40.00	4,771.00	2.740	0.483

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#24	**3**	**Time of Concentration:**					**2.231**
#24	4	5. Nearly bare and untilled, and alluvial valley fans	1.24	50.00	4,042.00	1.110	1.011
		8. Large gullies, diversions, and low flowing streams	0.49	60.00	12,150.00	2.100	1.607
#24	**4**	**Time of Concentration:**					**2.618**
#25	1	5. Nearly bare and untilled, and alluvial valley fans	0.51	10.00	1,950.00	0.710	0.762
		8. Large gullies, diversions, and low flowing streams	1.81	60.00	3,322.00	4.030	0.228
#25	**1**	**Time of Concentration:**					**0.990**
#25	2	5. Nearly bare and untilled, and alluvial valley fans	1.11	25.00	2,254.00	1.050	0.596
		8. Large gullies, diversions, and low flowing streams	2.36	75.00	3,178.00	4.600	0.191
#25	**2**	**Time of Concentration:**					**0.787**
#25	3	5. Nearly bare and untilled, and alluvial valley fans	3.23	30.00	929.00	1.790	0.144
		8. Large gullies, diversions, and low flowing streams	2.45	154.00	6,297.00	4.690	0.372
#25	**3**	**Time of Concentration:**					**0.516**
#26	1	5. Nearly bare and untilled, and alluvial valley fans	1.20	103.00	8,602.00	1.090	2.192
#26	**1**	**Time of Concentration:**					**2.192**
#26	2	5. Nearly bare and untilled, and alluvial valley fans	1.23	120.00	9,780.00	1.100	2.469
		8. Large gullies, diversions, and low flowing streams	2.18	184.00	8,454.00	4.420	0.531
#26	**2**	**Time of Concentration:**					**3.000**
#27	1	5. Nearly bare and untilled, and alluvial valley fans	4.32	50.00	1,158.02	2.070	0.155
		8. Large gullies, diversions, and low flowing streams	2.53	198.00	7,838.16	4.760	0.457
#27	**1**	**Time of Concentration:**					**0.612**
#27	2	5. Nearly bare and untilled, and alluvial valley fans	5.26	30.00	570.00	2.290	0.069
		8. Large gullies, diversions, and low flowing streams	3.15	278.00	8,822.00	5.320	0.460
#27	**2**	**Time of Concentration:**					**0.529**
#27	3	5. Nearly bare and untilled, and alluvial valley fans	16.33	80.00	490.00	4.040	0.033
		8. Large gullies, diversions, and low flowing streams	2.15	225.00	10,443.00	4.400	0.659
#27	**3**	**Time of Concentration:**					**0.692**
#27	4	5. Nearly bare and untilled, and alluvial valley fans	12.43	65.00	523.00	3.520	0.041
		8. Large gullies, diversions, and low flowing streams	3.49	225.00	6,454.00	5.600	0.320
#27	**4**	**Time of Concentration:**					**0.361**
#27	5	5. Nearly bare and untilled, and alluvial valley fans	9.40	25.00	266.00	3.060	0.024

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	2.32	364.00	15,700.00	4.560	0.956
#27	**5**	**Time of Concentration:**					**0.980**
#28	1	5. Nearly bare and untilled, and alluvial valley fans	5.25	40.00	762.00	2.290	0.092
		8. Large gullies, diversions, and low flowing streams	2.96	310.00	10,479.34	5.150	0.565
#28	**1**	**Time of Concentration:**					**0.657**
#28	2	5. Nearly bare and untilled, and alluvial valley fans	25.86	105.00	406.00	5.080	0.022
		8. Large gullies, diversions, and low flowing streams	2.96	310.00	10,479.34	5.150	0.565
#28	**2**	**Time of Concentration:**					**0.587**
#29	1	5. Nearly bare and untilled, and alluvial valley fans	11.58	30.00	259.00	3.400	0.021
		8. Large gullies, diversions, and low flowing streams	3.61	288.00	7,976.00	5.700	0.388
#29	**1**	**Time of Concentration:**					**0.409**
#29	2	5. Nearly bare and untilled, and alluvial valley fans	8.06	40.00	496.00	2.830	0.048
		8. Large gullies, diversions, and low flowing streams	2.90	252.00	8,693.55	5.100	0.473
#29	**2**	**Time of Concentration:**					**0.521**
#29	3	5. Nearly bare and untilled, and alluvial valley fans	7.25	25.00	345.00	2.690	0.035
		8. Large gullies, diversions, and low flowing streams	2.26	158.00	7,001.00	4.500	0.432
#29	**3**	**Time of Concentration:**					**0.467**
#30	1	5. Nearly bare and untilled, and alluvial valley fans	4.93	35.00	710.00	2.220	0.088
		8. Large gullies, diversions, and low flowing streams	1.67	243.00	14,540.00	3.870	1.043
#30	**1**	**Time of Concentration:**					**1.131**
#31	1	5. Nearly bare and untilled, and alluvial valley fans	2.91	15.00	515.00	1.700	0.084
		8. Large gullies, diversions, and low flowing streams	2.74	247.00	9,006.00	4.960	0.504
#31	**1**	**Time of Concentration:**					**0.588**
#31	2	5. Nearly bare and untilled, and alluvial valley fans	7.46	25.00	335.00	2.730	0.034
		8. Large gullies, diversions, and low flowing streams	2.18	138.00	6,335.00	4.420	0.398
#31	**2**	**Time of Concentration:**					**0.432**
#31	3	5. Nearly bare and untilled, and alluvial valley fans	3.84	20.00	521.00	1.950	0.074
		8. Large gullies, diversions, and low flowing streams	2.24	108.00	4,826.00	4.480	0.299
#31	**3**	**Time of Concentration:**					**0.373**
#32	1	5. Nearly bare and untilled, and alluvial valley fans	3.48	22.00	632.00	1.860	0.094

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	1.56	101.00	6,494.00	3.740	0.482
#32	**1**	**Time of Concentration:**					**0.576**
#34	1	5. Nearly bare and untilled, and alluvial valley fans	2.28	35.00	1,538.00	1.500	0.284
		8. Large gullies, diversions, and low flowing streams	2.89	74.00	2,560.00	5.100	0.139
#34	**1**	**Time of Concentration:**					**0.423**
#34	2	5. Nearly bare and untilled, and alluvial valley fans	2.69	38.00	1,415.00	1.630	0.241
		8. Large gullies, diversions, and low flowing streams	1.60	81.00	5,052.00	3.790	0.370
#34	**2**	**Time of Concentration:**					**0.611**
#34	3	5. Nearly bare and untilled, and alluvial valley fans	3.80	56.00	1,474.00	1.940	0.211
		8. Large gullies, diversions, and low flowing streams	0.70	30.00	4,293.00	2.500	0.477
#34	**3**	**Time of Concentration:**					**0.688**
#34	4	5. Nearly bare and untilled, and alluvial valley fans	4.17	35.00	840.00	2.040	0.114
		8. Large gullies, diversions, and low flowing streams	1.89	72.00	3,807.00	4.120	0.256
#34	**4**	**Time of Concentration:**					**0.370**
#36	1	5. Nearly bare and untilled, and alluvial valley fans	3.21	90.00	2,800.00	1.790	0.434
		8. Large gullies, diversions, and low flowing streams	2.54	33.00	1,300.00	4.770	0.075
		9. Small streams flowing bankfull	0.40	8.00	2,000.00	5.690	0.097
#36	**1**	**Time of Concentration:**					**0.606**
#36	2	5. Nearly bare and untilled, and alluvial valley fans	6.92	90.00	1,300.00	2.630	0.137
		8. Large gullies, diversions, and low flowing streams	47.06	800.00	1,700.00	20.570	0.022
#36	**2**	**Time of Concentration:**					**0.159**
#36	3	5. Nearly bare and untilled, and alluvial valley fans	90.00	900.00	1,000.00	9.480	0.029
		8. Large gullies, diversions, and low flowing streams	3.70	100.00	2,700.00	5.770	0.129
#36	**3**	**Time of Concentration:**					**0.158**
#37	1	5. Nearly bare and untilled, and alluvial valley fans	4.68	129.00	2,754.05	2.160	0.354
		8. Large gullies, diversions, and low flowing streams	0.16	10.00	6,108.73	1.210	1.402
#37	**1**	**Time of Concentration:**					**1.756**
#37	2	5. Nearly bare and untilled, and alluvial valley fans	5.17	44.97	869.82	2.270	0.106
		8. Large gullies, diversions, and low flowing streams	2.01	95.23	4,737.81	4.250	0.309
#37	**2**	**Time of Concentration:**					**0.415**
#37	3	5. Nearly bare and untilled, and alluvial valley fans	3.52	30.00	853.00	1.870	0.126

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	4.02	179.85	4,474.00	6.010	0.206
#37	**3**	**Time of Concentration:**					**0.332**
#37	4	5. Nearly bare and untilled, and alluvial valley fans	3.18	34.82	1,095.00	1.780	0.170
		8. Large gullies, diversions, and low flowing streams	1.49	37.90	2,544.00	3.660	0.193
#37	**4**	**Time of Concentration:**					**0.363**
#37	5	5. Nearly bare and untilled, and alluvial valley fans	2.59	40.00	1,543.00	1.610	0.266
		8. Large gullies, diversions, and low flowing streams	1.48	67.00	4,529.00	3.640	0.345
#37	**5**	**Time of Concentration:**					**0.611**
#37	6	8. Large gullies, diversions, and low flowing streams	3.42	65.00	1,900.00	5.540	0.095
#37	**6**	**Time of Concentration:**					**0.095**
#37	7	5. Nearly bare and untilled, and alluvial valley fans	6.00	30.00	500.00	2.440	0.056
		8. Large gullies, diversions, and low flowing streams	1.36	45.00	3,300.00	3.500	0.261
		8. Large gullies, diversions, and low flowing streams	1.11	45.00	4,050.00	3.160	0.356
#37	**7**	**Time of Concentration:**					**0.673**
#37	8	5. Nearly bare and untilled, and alluvial valley fans	8.33	50.00	600.00	2.880	0.057
		8. Large gullies, diversions, and low flowing streams	6.00	150.00	2,500.00	7.340	0.094
#37	**8**	**Time of Concentration:**					**0.151**
#37	9	5. Nearly bare and untilled, and alluvial valley fans	7.00	70.00	1,000.00	2.640	0.105
		8. Large gullies, diversions, and low flowing streams	12.00	60.00	500.00	10.390	0.013
#37	**9**	**Time of Concentration:**					**0.118**

Subwatershed Muskingum Routing Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	2	8. Large gullies, diversions, and low flowing streams	1.29	107.00	8,294.00	3.400	0.677
#1	**2**	**Muskingum K:**					**0.677**
#1	3	8. Large gullies, diversions, and low flowing streams	1.27	113.00	8,880.00	3.380	0.729
#1	**3**	**Muskingum K:**					**0.729**
#1	4	8. Large gullies, diversions, and low flowing streams	1.35	171.00	12,634.00	3.490	1.005
#1	**4**	**Muskingum K:**					**1.005**
#1	5	8. Large gullies, diversions, and low flowing streams	1.49	274.00	18,349.00	3.660	1.392

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	**5**	**Muskingum K:**					**1.392**
#1	6	8. Large gullies, diversions, and low flowing streams	1.49	274.00	18,349.00	3.660	1.392
#1	**6**	**Muskingum K:**					**1.392**
#2	2	8. Large gullies, diversions, and low flowing streams	0.53	20.00	3,756.00	2.180	0.478
#2	**2**	**Muskingum K:**					**0.478**
#2	3	8. Large gullies, diversions, and low flowing streams	0.55	25.00	4,570.00	2.210	0.574
#2	**3**	**Muskingum K:**					**0.574**
#2	4	8. Large gullies, diversions, and low flowing streams	0.55	25.00	4,570.00	2.210	0.574
#2	**4**	**Muskingum K:**					**0.574**
#2	5	8. Large gullies, diversions, and low flowing streams	0.65	45.00	6,955.00	2.410	0.801
#2	**5**	**Muskingum K:**					**0.801**
#3	3	8. Large gullies, diversions, and low flowing streams	0.92	20.00	2,168.00	2.880	0.209
#3	**3**	**Muskingum K:**					**0.209**
#5	1	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.000	0.000
#5	**1**	**Muskingum K:**					**0.000**
#5	2	8. Large gullies, diversions, and low flowing streams	1.75	125.00	7,149.00	3.960	0.501
#5	**2**	**Muskingum K:**					**0.501**
#5	3	8. Large gullies, diversions, and low flowing streams	1.65	155.00	9,418.00	3.840	0.681
#5	**3**	**Muskingum K:**					**0.681**
#5	4	8. Large gullies, diversions, and low flowing streams	1.65	155.00	9,418.00	3.840	0.681
#5	**4**	**Muskingum K:**					**0.681**
#5	5	8. Large gullies, diversions, and low flowing streams	1.67	239.00	14,273.00	3.880	1.021
#5	**5**	**Muskingum K:**					**1.021**
#5	6	8. Large gullies, diversions, and low flowing streams	1.68	239.00	14,223.00	3.880	1.018
#5	**6**	**Muskingum K:**					**1.018**
#7	1	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.000	0.000
#7	**1**	**Muskingum K:**					**0.000**
#7	2	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.000	0.000
#7	**2**	**Muskingum K:**					**0.000**
#7	4	8. Large gullies, diversions, and low flowing streams	1.16	140.00	12,037.00	3.230	1.035
#7	**4**	**Muskingum K:**					**1.035**
#7	5	8. Large gullies, diversions, and low flowing streams	1.14	140.00	12,307.69	3.190	1.071
#7	**5**	**Muskingum K:**					**1.071**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#7	6	8. Large gullies, diversions, and low flowing streams	1.17	158.00	13,546.00	3.230	1.164
#7	**6**	**Muskingum K:**					**1.164**
#7	7	8. Large gullies, diversions, and low flowing streams	1.18	187.00	15,784.00	3.260	1.344
#7	**7**	**Muskingum K:**					**1.344**
#7	8	8. Large gullies, diversions, and low flowing streams	1.18	187.00	15,784.00	3.260	1.344
#7	**8**	**Muskingum K:**					**1.344**
#9	3	8. Large gullies, diversions, and low flowing streams	0.43	9.00	2,100.00	1.960	0.297
#9	**3**	**Muskingum K:**					**0.297**
#9	4	8. Large gullies, diversions, and low flowing streams	1.01	20.00	1,975.00	3.010	0.182
		8. Large gullies, diversions, and low flowing streams	0.60	24.30	4,050.00	2.320	0.484
#9	**4**	**Muskingum K:**					**0.666**
#10	3	8. Large gullies, diversions, and low flowing streams	0.76	37.00	4,861.00	2.610	0.517
#10	**3**	**Muskingum K:**					**0.517**
#10	4	8. Large gullies, diversions, and low flowing streams	0.76	37.00	4,861.00	2.610	0.517
#10	**4**	**Muskingum K:**					**0.517**
#10	5	8. Large gullies, diversions, and low flowing streams	0.79	47.00	5,956.00	2.660	0.621
#10	**5**	**Muskingum K:**					**0.621**
#12	2	8. Large gullies, diversions, and low flowing streams	8.24	111.00	1,347.00	8.610	0.043
#12	**2**	**Muskingum K:**					**0.043**
#12	3	8. Large gullies, diversions, and low flowing streams	8.01	109.00	1,360.00	8.490	0.044
#12	**3**	**Muskingum K:**					**0.044**
#12	4	8. Large gullies, diversions, and low flowing streams	2.24	176.00	7,866.00	4.480	0.487
#12	**4**	**Muskingum K:**					**0.487**
#12	5	8. Large gullies, diversions, and low flowing streams	2.24	176.00	7,866.00	4.480	0.487
#12	**5**	**Muskingum K:**					**0.487**
#13	2	8. Large gullies, diversions, and low flowing streams	1.34	54.00	4,025.00	3.470	0.322
#13	**2**	**Muskingum K:**					**0.322**
#13	3	8. Large gullies, diversions, and low flowing streams	0.98	72.00	7,333.00	2.970	0.685
#13	**3**	**Muskingum K:**					**0.685**
#13	4	8. Large gullies, diversions, and low flowing streams	1.18	127.00	10,806.00	3.250	0.923
#13	**4**	**Muskingum K:**					**0.923**
#13	5	8. Large gullies, diversions, and low flowing streams	1.18	127.00	10,806.00	3.250	0.923
#13	**5**	**Muskingum K:**					**0.923**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#14	1	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.000	0.000
#14	**1**	**Muskingum K:**					**0.000**
#14	2	8. Large gullies, diversions, and low flowing streams	0.83	58.00	6,957.00	2.730	0.707
#14	**2**	**Muskingum K:**					**0.707**
#14	3	8. Large gullies, diversions, and low flowing streams	0.81	77.00	9,480.00	2.700	0.975
#14	**3**	**Muskingum K:**					**0.975**
#14	4	8. Large gullies, diversions, and low flowing streams	0.86	147.00	17,117.00	2.770	1.716
#14	**4**	**Muskingum K:**					**1.716**
#14	5	8. Large gullies, diversions, and low flowing streams	0.88	175.00	19,934.00	2.810	1.970
#14	**5**	**Muskingum K:**					**1.970**
#14	6	8. Large gullies, diversions, and low flowing streams	0.95	211.00	22,155.00	2.920	2.107
#14	**6**	**Muskingum K:**					**2.107**
#14	7	8. Large gullies, diversions, and low flowing streams	0.96	257.00	26,835.00	2.930	2.544
#14	**7**	**Muskingum K:**					**2.544**
#14	8	8. Large gullies, diversions, and low flowing streams	0.96	257.00	26,835.00	2.930	2.544
#14	**8**	**Muskingum K:**					**2.544**
#14	9	8. Large gullies, diversions, and low flowing streams	0.95	307.00	32,146.59	2.930	3.047
#14	**9**	**Muskingum K:**					**3.047**
#14	10	8. Large gullies, diversions, and low flowing streams	0.96	339.00	35,382.00	2.930	3.354
#14	**10**	**Muskingum K:**					**3.354**
#15	2	8. Large gullies, diversions, and low flowing streams	1.14	86.00	7,535.26	3.200	0.654
#15	**2**	**Muskingum K:**					**0.654**
#15	3	8. Large gullies, diversions, and low flowing streams	1.25	115.00	9,236.00	3.340	0.768
#15	**3**	**Muskingum K:**					**0.768**
#16	2	8. Large gullies, diversions, and low flowing streams	0.55	42.00	7,608.00	2.220	0.951
#16	**2**	**Muskingum K:**					**0.951**
#16	3	8. Large gullies, diversions, and low flowing streams	0.51	54.00	10,615.00	2.130	1.384
#16	**3**	**Muskingum K:**					**1.384**
#17	1	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.000	0.000
#17	**1**	**Muskingum K:**					**0.000**
#18	1	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.000	0.000
#18	**1**	**Muskingum K:**					**0.000**
#18	2	8. Large gullies, diversions, and low flowing streams	1.02	62.00	6,103.00	3.020	0.561

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#18	**2**	**Muskingum K:**					**0.561**
#20	2	8. Large gullies, diversions, and low flowing streams	0.59	20.00	3,400.00	2.300	0.410
#20	**2**	**Muskingum K:**					**0.410**
#21	1	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.000	0.000
#21	**1**	**Muskingum K:**					**0.000**
#21	2	8. Large gullies, diversions, and low flowing streams	0.40	6.80	1,700.00	1.890	0.249
#21	**2**	**Muskingum K:**					**0.249**
#21	3	8. Large gullies, diversions, and low flowing streams	0.36	20.00	5,627.46	1.780	0.878
#21	**3**	**Muskingum K:**					**0.878**
#21	4	8. Large gullies, diversions, and low flowing streams	0.36	20.00	5,627.46	1.780	0.878
#21	**4**	**Muskingum K:**					**0.878**
#21	5	8. Large gullies, diversions, and low flowing streams	0.40	25.80	6,450.00	1.890	0.947
#21	**5**	**Muskingum K:**					**0.947**
#24	1	8. Large gullies, diversions, and low flowing streams	0.79	180.00	22,769.00	2.660	2.377
#24	**1**	**Muskingum K:**					**2.377**
#24	2	8. Large gullies, diversions, and low flowing streams	0.78	180.00	23,111.00	2.640	2.431
#24	**2**	**Muskingum K:**					**2.431**
#24	4	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.000	0.000
#24	**4**	**Muskingum K:**					**0.000**
#25	1	8. Large gullies, diversions, and low flowing streams	1.99	104.00	5,220.00	4.230	0.342
#25	**1**	**Muskingum K:**					**0.342**
#25	2	8. Large gullies, diversions, and low flowing streams	1.99	104.00	5,220.00	4.230	0.342
#25	**2**	**Muskingum K:**					**0.342**
#25	3	8. Large gullies, diversions, and low flowing streams	0.00	0.00	0.00	0.000	0.000
#25	**3**	**Muskingum K:**					**0.000**
#27	1	8. Large gullies, diversions, and low flowing streams	1.38	216.00	15,629.00	3.520	1.233
#27	**1**	**Muskingum K:**					**1.233**
#27	2	8. Large gullies, diversions, and low flowing streams	1.17	144.00	12,301.00	3.240	1.054
#27	**2**	**Muskingum K:**					**1.054**
#27	3	8. Large gullies, diversions, and low flowing streams	1.18	76.00	6,454.00	3.250	0.551
#27	**3**	**Muskingum K:**					**0.551**
#27	4	8. Large gullies, diversions, and low flowing streams	1.18	76.00	6,454.00	3.250	0.551
#27	**4**	**Muskingum K:**					**0.551**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#28	1	8. Large gullies, diversions, and low flowing streams	1.30	84.00	6,445.17	3.420	0.523
#28	**1**	**Muskingum K:**					**0.523**
#29	1	8. Large gullies, diversions, and low flowing streams	0.88	37.00	4,210.00	2.810	0.416
#29	**1**	**Muskingum K:**					**0.416**
#29	2	8. Large gullies, diversions, and low flowing streams	0.88	26.00	2,949.00	2.810	0.291
#29	**2**	**Muskingum K:**					**0.291**
#31	1	8. Large gullies, diversions, and low flowing streams	1.35	76.00	5,639.00	3.480	0.450
#31	**1**	**Muskingum K:**					**0.450**
#31	2	8. Large gullies, diversions, and low flowing streams	1.15	20.00	1,734.00	3.220	0.149
#31	**2**	**Muskingum K:**					**0.149**
#34	1	8. Large gullies, diversions, and low flowing streams	0.64	56.00	8,773.00	2.390	1.019
#34	**1**	**Muskingum K:**					**1.019**
#34	2	8. Large gullies, diversions, and low flowing streams	1.05	31.00	2,957.00	3.070	0.267
#34	**2**	**Muskingum K:**					**0.267**
#34	3	8. Large gullies, diversions, and low flowing streams	0.64	26.00	4,031.00	2.400	0.466
#34	**3**	**Muskingum K:**					**0.466**
#37	2	8. Large gullies, diversions, and low flowing streams	0.28	29.79	10,639.28	1.580	1.870
#37	**2**	**Muskingum K:**					**1.870**
#37	3	8. Large gullies, diversions, and low flowing streams	0.28	23.78	8,493.00	1.580	1.493
#37	**3**	**Muskingum K:**					**1.493**
#37	4	8. Large gullies, diversions, and low flowing streams	0.30	46.99	15,665.00	1.640	2.653
#37	**4**	**Muskingum K:**					**2.653**
#37	5	8. Large gullies, diversions, and low flowing streams	0.28	29.10	10,392.85	1.580	1.827
		8. Large gullies, diversions, and low flowing streams	0.30	12.15	4,050.00	1.640	0.685
#37	**5**	**Muskingum K:**					**2.512**
#37	6	8. Large gullies, diversions, and low flowing streams	0.28	29.10	10,396.00	1.580	1.827
		8. Large gullies, diversions, and low flowing streams	0.30	12.15	4,050.00	1.640	0.685
#37	**6**	**Muskingum K:**					**2.512**
#37	7	8. Large gullies, diversions, and low flowing streams	0.28	28.89	10,320.00	1.580	1.814
#37	**7**	**Muskingum K:**					**1.814**
#37	8	8. Large gullies, diversions, and low flowing streams	3.42	65.00	1,900.00	5.540	0.095
#37	**8**	**Muskingum K:**					**0.095**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#37	9	8. Large gullies, diversions, and low flowing streams	2.37	90.00	3,800.00	4.610	0.228
		8. Large gullies, diversions, and low flowing streams	0.28	23.78	8,493.00	1.580	1.493
#37	**9**	**Muskingum K:**					**1.721**

Attachment 41.D-3

Unnamed Tributary to Chaco River Post-reclamation

Hydrology and Sedimentology SEDCAD™ Model Output

UNNAMED TRIBUTARY TO CHACO MINE OPERATIONS HYDROLOGY AND SEDIMENTOLOGY

2-yr, 6-hour PRECIPITATION

BHP Billiton

General Information

Storm Information:

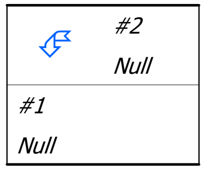
Storm Type:	Type II-70
Design Storm:	2 yr - 6 hr
Rainfall Depth:	0.850 inches

Particle Size Distribution:

Size (mm)	PostMine-LoamySand	PreMine-LoamySand	PreMine-Badlands	LoamySand Postmining
2.0000	100.000%	100.000%	100.000%	0.000%
0.1000	26.500%	30.000%	83.500%	0.000%
0.0500	14.000%	17.000%	77.000%	0.000%
0.0020	11.000%	11.000%	56.000%	0.000%
0.0010	0.000%	0.000%	0.000%	0.000%

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Null	#1	==>	End	0.000	0.000	Unnamed Tributary to Chaco CHA S2 SW1
Null	#2	==>	#1	0.120	0.335	CHA S1



Structure Routing Details:

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#2	8. Large gullies, diversions, and low flowing streams	1.33	20.00	1,500.00	3.46	0.120
#2	**Muskingum K:**					**0.120**

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc. (ml/l)	24VW (ml/l)
#2	552.600	552.600	0.00	0.00	0.0	1	0.00	0.00
#1	44.400	597.000	7.19	0.35	18.7	59,631	0.59	0.38

Particle Size Distribution(s) at Each Structure

Structure #2 (CHA S1):

Size (mm)	In/Out
2.0000	0.000%
0.1000	0.000%
0.0500	0.000%
0.0020	0.000%
0.0010	0.000%

Structure #1:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	97.203%
0.0010	0.000%

Structure Detail:

Structure #2 (Null)

CHA S1

Structure #1 (Null)

Unnamed Tributary to Chaco CHA S2 SW1

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#2	1	134.400	1.061	0.000	0.000	1.000	M	0.00	0.000
	2	307.500	0.669	0.097	0.351	1.000	M	0.00	0.000
	3	110.700	0.514	0.000	0.000	1.000	M	0.00	0.000
	Σ	**552.600**						**0.00**	**0.000**
#1	1	44.400	0.305	0.000	0.000	85.500	M	7.19	0.350
	Σ	**597.000**						**7.19**	**0.350**

Subwatershed Sedimentology Detail:

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
#2	1	0.100	275.00	7.50	0.2540	1.0000	1	0.0	1	0.00	0.00
	2	0.100	700.00	9.00	0.2540	1.0000	1	0.0	1	0.00	0.00
	3	0.100	800.00	10.00	0.2540	1.0000	1	0.0	1	0.00	0.00
	Σ							**0.0**	**1**	**0.00**	**0.00**
#1	1	0.151	1,000.00	7.30	0.2450	1.0000	3	18.7	59,631	0.59	0.38
	Σ							**18.7**	**59,631**	**0.59**	**0.38**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	3.85	50.00	1,300.00	1.960	0.184
		8. Large gullies, diversions, and low flowing streams	1.30	19.49	1,500.00	3.420	0.121
#1	**1**	**Time of Concentration:**					**0.305**
#2	1	5. Nearly bare and untilled, and alluvial valley fans	3.89	35.00	900.02	1.970	0.126
		5. Nearly bare and untilled, and alluvial valley fans	1.03	35.00	3,400.00	1.010	0.935
#2	**1**	**Time of Concentration:**					**1.061**
#2	2	5. Nearly bare and untilled, and alluvial valley fans	3.93	55.00	1,400.00	1.980	0.196
		8. Large gullies, diversions, and low flowing streams	1.04	54.00	5,200.00	3.050	0.473
#2	**2**	**Time of Concentration:**					**0.669**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#2	3	5. Nearly bare and untilled, and alluvial valley fans	5.00	50.00	1,000.00	2.230	0.124
		8. Large gullies, diversions, and low flowing streams	0.82	31.00	3,800.00	2.700	0.390
#2	**3**	**Time of Concentration:**					**0.514**

Subwatershed Muskingum Routing Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#2	2	8. Large gullies, diversions, and low flowing streams	1.79	25.00	1,400.00	4.000	0.097
#2	**2**	**Muskingum K:**					**0.097**

UNNAMED TRIBUTARY TO CHACO POST-MINE HYDROLOGY AND SEDIMENTOLOGY

POST-MINE 10-yr, 6-hour PRECIPITATION

BHP Billiton

General Information

Storm Information:

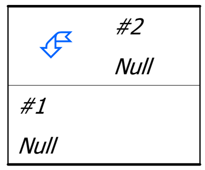
Storm Type:	Type II-70
Design Storm:	10 yr - 6 hr
Rainfall Depth:	1.280 inches

Particle Size Distribution:

Size (mm)	PostMine-LoamySand	PreMine-LoamySand	PreMine-Badlands	LoamySand Postmining
2.0000	100.000%	100.000%	100.000%	0.000%
0.1000	26.500%	30.000%	83.500%	0.000%
0.0500	14.000%	17.000%	77.000%	0.000%
0.0020	11.000%	11.000%	56.000%	0.000%
0.0010	0.000%	0.000%	0.000%	0.000%

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Null	#1	==>	End	0.000	0.000	Unnamed Tributary to Chaco CHA S2 SW1
Null	#2	==>	#1	0.120	0.335	CHA S1



Structure Routing Details:

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#2	8. Large gullies, diversions, and low flowing streams	1.33	20.00	1,500.00	3.46	0.120
#2	**Muskingum K:**					**0.120**

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc. (ml/l)	24VW (ml/l)
#2	552.600	552.600	88.99	8.46	289.4	37,449	20.91	13.89
#1	44.400	597.000	92.42	9.45	331.4	43,151	19.55	11.54

Particle Size Distribution(s) at Each Structure

Structure #2 (CHA S1):

Size (mm)	In/Out
2.0000	100.000%
0.1000	63.146%
0.0500	33.360%
0.0020	26.212%
0.0010	0.000%

Structure #1:

Size (mm)	In/Out
2.0000	100.000%
0.1000	73.083%
0.0500	47.072%
0.0020	38.724%
0.0010	0.000%

Structure Detail:

Structure #2 (Null)

CHA S1

Structure #1 (Null)

Unnamed Tributary to Chaco CHA S2 SW1

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#2	1	134.400	1.061	0.000	0.000	81.900	M	17.53	2.054
	2	307.500	0.669	0.097	0.351	81.900	M	57.40	4.706
	3	110.700	0.514	0.000	0.000	81.900	M	25.05	1.695
	Σ	**552.600**						**88.99**	**8.456**
#1	1	44.400	0.305	0.000	0.000	85.500	M	19.96	0.993
	Σ	**597.000**						**92.42**	**9.449**

Subwatershed Sedimentology Detail:

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
#2	1	0.100	275.00	7.50	0.2540	1.0000	1	30.8	15,514	8.12	5.74
	2	0.100	700.00	9.00	0.2540	1.0000	1	194.0	43,286	24.84	17.16
	3	0.100	800.00	10.00	0.2540	1.0000	1	86.2	54,287	32.40	21.92
	Σ							**289.4**	**37,449**	**20.91**	**13.89**
#1	1	0.151	1,000.00	7.30	0.2450	1.0000	3	59.5	63,897	2.66	1.80
	Σ							**331.4**	**43,151**	**19.55**	**11.54**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	3.85	50.00	1,300.00	1.960	0.184
		8. Large gullies, diversions, and low flowing streams	1.30	19.49	1,500.00	3.420	0.121
#1	**1**	**Time of Concentration:**					**0.305**
#2	1	5. Nearly bare and untilled, and alluvial valley fans	3.89	35.00	900.02	1.970	0.126
		5. Nearly bare and untilled, and alluvial valley fans	1.03	35.00	3,400.00	1.010	0.935
#2	**1**	**Time of Concentration:**					**1.061**
#2	2	5. Nearly bare and untilled, and alluvial valley fans	3.93	55.00	1,400.00	1.980	0.196
		8. Large gullies, diversions, and low flowing streams	1.04	54.00	5,200.00	3.050	0.473
#2	**2**	**Time of Concentration:**					**0.669**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#2	3	5. Nearly bare and untilled, and alluvial valley fans	5.00	50.00	1,000.00	2.230	0.124
		8. Large gullies, diversions, and low flowing streams	0.82	31.00	3,800.00	2.700	0.390
#2	**3**	**Time of Concentration:**					**0.514**

Subwatershed Muskingum Routing Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#2	2	8. Large gullies, diversions, and low flowing streams	1.79	25.00	1,400.00	4.000	0.097
#2	**2**	**Muskingum K:**					**0.097**

UNNAMED TRIBUTARY TO CHACO POST-MINE HYDROLOGY AND SEDIMENTOLOGY

POST-MINE 25-yr, 6-hour PRECIPITATION

BHP Billiton

General Information

Storm Information:

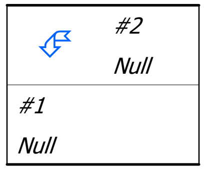
Storm Type:	Type II-70
Design Storm:	25 yr - 6 hr
Rainfall Depth:	1.560 inches

Particle Size Distribution:

Size (mm)	PostMine-LoamySand	PreMine-LoamySand	PreMine-Badlands	LoamySand Postmining
2.0000	100.000%	100.000%	100.000%	0.000%
0.1000	26.500%	30.000%	83.500%	0.000%
0.0500	14.000%	17.000%	77.000%	0.000%
0.0020	11.000%	11.000%	56.000%	0.000%
0.0010	0.000%	0.000%	0.000%	0.000%

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Null	#1	==>	End	0.000	0.000	Unnamed Tributary to Chaco CHA S2 SW1
Null	#2	==>	#1	0.120	0.335	CHA S1



Structure Routing Details:

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#2	8. Large gullies, diversions, and low flowing streams	1.33	20.00	1,500.00	3.46	0.120
#2	**Muskingum K:**					**0.120**

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc. (ml/l)	24VW (ml/l)
#2	552.600	552.600	148.03	13.78	505.7	39,836	22.82	15.26
#1	44.400	597.000	152.78	15.30	572.4	42,793	20.36	12.92

Particle Size Distribution(s) at Each Structure

Structure #2 (CHA S1):

Size (mm)	In/Out
2.0000	100.000%
0.1000	59.382%
0.0500	31.372%
0.0020	24.649%
0.0010	0.000%

Structure #1:

Size (mm)	In/Out
2.0000	100.000%
0.1000	69.003%
0.0500	44.256%
0.0020	35.846%
0.0010	0.000%

Structure Detail:

Structure #2 (Null)

CHA S1

Structure #1 (Null)

Unnamed Tributary to Chaco CHA S2 SW1

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#2	1	134.400	1.061	0.000	0.000	81.900	M	29.11	3.349
	2	307.500	0.669	0.097	0.351	81.900	M	94.85	7.671
	3	110.700	0.514	0.000	0.000	81.900	M	41.14	2.763
	Σ	**552.600**						**148.03**	**13.784**
#1	1	44.400	0.305	0.000	0.000	85.500	M	30.09	1.512
	Σ	**597.000**						**152.78**	**15.296**

Subwatershed Sedimentology Detail:

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
#2	1	0.100	275.00	7.50	0.2540	1.0000	1	53.7	16,560	8.94	6.34
	2	0.100	700.00	9.00	0.2540	1.0000	1	338.0	45,842	26.89	18.72
	3	0.100	800.00	10.00	0.2540	1.0000	1	149.6	57,093	34.70	23.75
	Σ							**505.7**	**39,836**	**22.82**	**15.26**
#1	1	0.151	1,000.00	7.30	0.2450	1.0000	3	94.7	66,005	3.51	2.40
	Σ							**572.4**	**42,793**	**20.36**	**12.92**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	3.85	50.00	1,300.00	1.960	0.184
		8. Large gullies, diversions, and low flowing streams	1.30	19.49	1,500.00	3.420	0.121
#1	**1**	**Time of Concentration:**					**0.305**
#2	1	5. Nearly bare and untilled, and alluvial valley fans	3.89	35.00	900.02	1.970	0.126
		5. Nearly bare and untilled, and alluvial valley fans	1.03	35.00	3,400.00	1.010	0.935
#2	**1**	**Time of Concentration:**					**1.061**
#2	2	5. Nearly bare and untilled, and alluvial valley fans	3.93	55.00	1,400.00	1.980	0.196
		8. Large gullies, diversions, and low flowing streams	1.04	54.00	5,200.00	3.050	0.473
#2	**2**	**Time of Concentration:**					**0.669**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#2	3	5. Nearly bare and untilled, and alluvial valley fans	5.00	50.00	1,000.00	2.230	0.124
		8. Large gullies, diversions, and low flowing streams	0.82	31.00	3,800.00	2.700	0.390
#2	**3**	**Time of Concentration:**					**0.514**

Subwatershed Muskingum Routing Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#2	2	8. Large gullies, diversions, and low flowing streams	1.79	25.00	1,400.00	4.000	0.097
#2	**2**	**Muskingum K:**					**0.097**

UNNAMED TRIBUTARY TO CHACO POST-MINE HYDROLOGY AND SEDIMENTOLOGY

POST-MINE 100-yr, 6-hour PRECIPITATION

BHP Billiton

General Information

Storm Information:

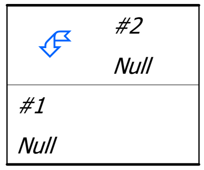
Storm Type:	Type II-70
Design Storm:	100 yr - 6 hr
Rainfall Depth:	2.040 inches

Particle Size Distribution:

Size (mm)	PostMine-LoamySand	PreMine-LoamySand	PreMine-Badlands	LoamySand Postmining
2.0000	100.000%	100.000%	100.000%	0.000%
0.1000	26.500%	30.000%	83.500%	0.000%
0.0500	14.000%	17.000%	77.000%	0.000%
0.0020	11.000%	11.000%	56.000%	0.000%
0.0010	0.000%	0.000%	0.000%	0.000%

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Null	#1	==>	End	0.000	0.000	Unnamed Tributary to Chaco CHA S2 SW1
Null	#2	==>	#1	0.120	0.335	CHA S1



Structure Routing Details:

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#2	8. Large gullies, diversions, and low flowing streams	1.33	20.00	1,500.00	3.46	0.120
#2	**Muskingum K:**					**0.120**

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc. (ml/l)	24VW (ml/l)
#2	552.600	552.600	267.70	24.61	974.1	42,546	24.98	16.86
#1	44.400	597.000	276.22	27.13	1,093.9	43,061	21.48	14.59

Particle Size Distribution(s) at Each Structure

Structure #2 (CHA S1):

Size (mm)	In/Out
2.0000	100.000%
0.1000	55.632%
0.0500	29.391%
0.0020	23.093%
0.0010	0.000%

Structure #1:

Size (mm)	In/Out
2.0000	100.000%
0.1000	64.732%
0.0500	41.363%
0.0020	32.966%
0.0010	0.000%

Structure Detail:

Structure #2 (Null)

CHA S1

Structure #1 (Null)

Unnamed Tributary to Chaco CHA S2 SW1

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#2	1	134.400	1.061	0.000	0.000	81.900	M	52.68	5.980
	2	307.500	0.669	0.097	0.351	81.900	M	170.50	13.697
	3	110.700	0.514	0.000	0.000	81.900	M	73.61	4.934
	Σ	**552.600**						**267.70**	**24.611**
#1	1	44.400	0.305	0.000	0.000	85.500	M	49.31	2.520
	Σ	**597.000**						**276.22**	**27.131**

Subwatershed Sedimentology Detail:

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
#2	1	0.100	275.00	7.50	0.2540	1.0000	1	103.6	17,781	9.90	7.05
	2	0.100	700.00	9.00	0.2540	1.0000	1	649.3	48,877	29.30	20.57
	3	0.100	800.00	10.00	0.2540	1.0000	1	286.6	60,456	37.42	25.92
	Σ							**974.1**	**42,546**	**24.98**	**16.86**
#1	1	0.151	1,000.00	7.30	0.2450	1.0000	3	166.2	68,464	4.50	3.12
	Σ							**1,093.9**	**43,061**	**21.48**	**14.59**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	3.85	50.00	1,300.00	1.960	0.184
		8. Large gullies, diversions, and low flowing streams	1.30	19.49	1,500.00	3.420	0.121
#1	**1**	**Time of Concentration:**					**0.305**
#2	1	5. Nearly bare and untilled, and alluvial valley fans	3.89	35.00	900.02	1.970	0.126
		5. Nearly bare and untilled, and alluvial valley fans	1.03	35.00	3,400.00	1.010	0.935
#2	**1**	**Time of Concentration:**					**1.061**
#2	2	5. Nearly bare and untilled, and alluvial valley fans	3.93	55.00	1,400.00	1.980	0.196
		8. Large gullies, diversions, and low flowing streams	1.04	54.00	5,200.00	3.050	0.473
#2	**2**	**Time of Concentration:**					**0.669**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#2	3	5. Nearly bare and untilled, and alluvial valley fans	5.00	50.00	1,000.00	2.230	0.124
		8. Large gullies, diversions, and low flowing streams	0.82	31.00	3,800.00	2.700	0.390
#2	**3**	**Time of Concentration:**					**0.514**

Subwatershed Muskingum Routing Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#2	2	8. Large gullies, diversions, and low flowing streams	1.79	25.00	1,400.00	4.000	0.097
#2	**2**	**Muskingum K:**					**0.097**