APPENDIX J.

REGIONAL EXAMPLE SHOWING BASELINE INFORMATION FOR GEOLOGY AND HYDROLOGY

WESTERN SEMIARID SITE

The number of locations at which site-specific baseline data for geology, overburden, surface water and ground water needs to be collected depends on many variables. Rather than presenting and attempting to rationalize minimum or maximum numbers and locations for surface-water stations, boreholes for overburden data, ground-water observation wells and frequency and duration of water sampling, we have included summaries of baseline information for geology and hydrology as it exists in planned or actual permits. We refer to these summaries as regional examples of baseline data requirements. In this context, regional can refer to hydrologic issues as may exist in one region but not all regions of the country and for which precise kinds and amounts of data are needed to establish, for example, the potential for acid mine drainage formation. Regional may also refer to differences in philosophy and technical approach to sampling and standards deemed acceptable for baseline geology and hydrology information from one state or region to another.

The three examples of baseline information collection from different regions of the country are presented in Appendices H, I, and J.

- The eastern permit example which is presented in Appendix J represents an area surface mine in a temperate humid region.

- The mid-continent permit example which is presented in Appendix I represents an area lignite mine in temperate continental region.

- The following western example summarizes an actual work plan for baseline data collection for an area mine in a semiarid region. The plan was developed by the operator in close cooperation with the RA. The work plan illustrates how the need for new ground- and surface-water stations and data collection was based on an evaluation of existing information from nearby mines.

The proposed WR Mine site covers approximately 3,500 acres and is located approximately 35 miles south of Chindeton on lands of the Chinde Reservation. (See Figure J-1.) It is in the arid and semiarid climatic region of the Colorado Plateau physiographic province of the Western U. S., geographically

west of the 100th meridian west longitude. Elevation ranges from 5,000 to 5,700 feet above sea level. The average annual precipitation is 8.00 inches with an average net evaporation rate of 55 inches. Native vegetation is characteristic of the Colorado Plateau salt-desert shrub ecosystem. This ecosystem contains a large number of salt tolerant species, such as saltbrush, and a significant shrub component. Land use is characterized by very low intensity livestock grazing, with a few scattered dwellings and few primitive roads crossing the area.

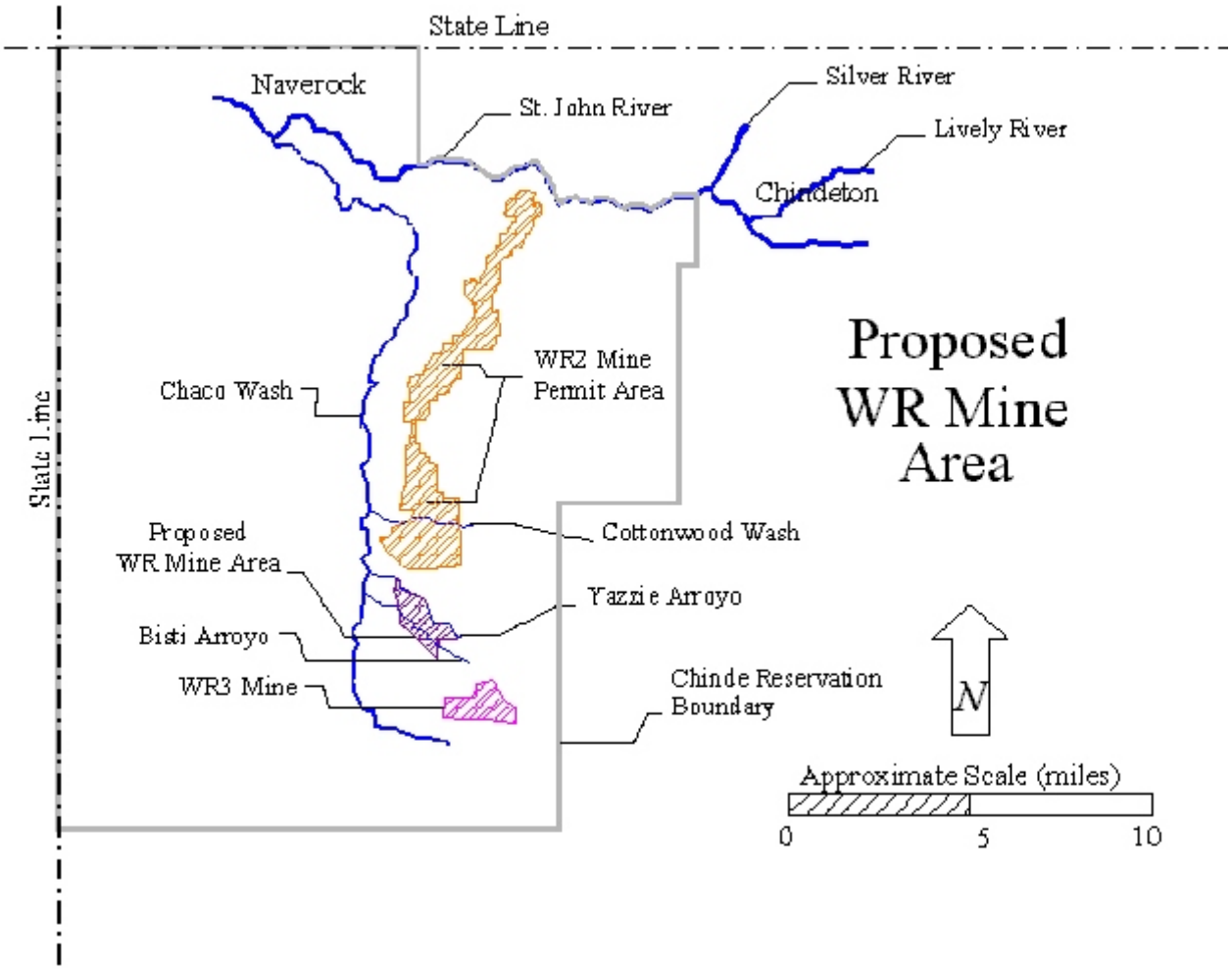

Figure J-1. Location of the Chinde Mine and other mines in vicinity.

A. Geologic Setting

The proposed mine site is along the western flank of the San Juan Basin, a northwest trending structural basin. The basin is bounded on the northwest by the Hogback mononcline and on the north by the San Juan Uplift. The eastern rim is formed by the Brazos Uplift and the Nacimiento Uplift. The Zuni Uplift and the Chaco Slope form the southern margin of the basin and the Defiance Uplift and Four Corners Platform complete the northwestern rim of the basin (Fasset and Hinds, 1971).

Rock strata strike north-south and dip an average of 2 degrees to the east. No major faults cut the area, although minor low-angle compaction faults and slumps up to seven feet in displacement are common. The area is seismically stable. There have been no historically recorded earthquakes of sufficient magnitude to damage structures (U.S.D.I., Bureau of Reclamation, 1975).

The stratigraphic section reflects the Late Cretaceous transition of shallow marine depositional environment to terrestrial fluvial depositional environment. Major stratigraphic units, in ascending order, are the Lewis Shale, the Pictured Cliffs Sandstone, the Fruitland Formation and the Kirtland Shale. Also, deposits of Quaternary alluvial and eolian sands occur within the proposed permit area.

The Lewis Shale consists of gray to black shale with some interbedded sandy limestone, brown sandstone and bentonite. The Pictured Cliffs Sandstone conformably overlies and intertongues with the Lewis Shale. The upper two-thirds of the Pictured Cliffs consists of a generally coarsening upward sequence of light gray, fine to medium grained sandstone. The lower one-third consists of interbedded shale and sandstone. The Fruitland Formation conformably overlies the Pictured Cliffs and consists of thinly bedded fine to medium grained sandstones, siltstones, sandy and silty claystones, carbonaceous claystones, bentonitic claystones and coal. The Kirtland Shale conformably overlies the Fruitland Formation and is divided into two units, the upper and lower shale members. The lower shale member is composed of gray claystone shales that are interbedded with a few thin sandstones and siltstones. The upper shale member consists of purple, green, white and gray claystone shales interbedded with sandstone lenses.

The economically important stratigraphic interval is the lower 250 feet of the Fruitland Formation where 11 different minable coal seams occur. These coal seams are very lenticular in nature and are minable in very localized areas only. The coal seam to be mined at the proposed WR Mine is the B Seam.

The following work plan for baseline data collection describes the individual tasks involved in collecting geology/overburden, ground-water and surface-water data needed for the permit application.

B. Work Plan For Baseline Data Collection

1. Geology/Overburden

The following 3 tasks will be undertaken to develop the baseline information for geology/overburden:

- Assemble existing geology and overburden information
- Collect additional geology and overburden information
- Describe the baseline geology

a. Task 1

Available geologic and mineral resource data that pertain to the proposed WR Mine area will be obtained. The data will be reviewed and verified. Information from the nearby WR2 Mine will also be reviewed, because of its close proximity to the proposed project and the similarities in geology and minerals. Additional information will be gathered from Federal, Tribal, and State agencies.

Available geologic and seismic maps of the proposed project and nearby areas will be researched and coal geology, surficial geology, active faults, seismic areas, overburden characteristics, and geochemical characteristics will be described. Geochemical characterization of overburden material test data will be reviewed for adequacy. Available aerial photographs will be reviewed in an effort to evaluate present and past mine disturbance. All other existing or available geologic data or appropriate data from WR2 Mine will be reviewed.

b. Task 2

(1) Drilling Program Description

Rotary drilling will be used to retrieve continuous overburden cores. The holes will be drilled with a 5-1/8" to 5-5/8" diameter bit. Core diameter will be 3 inches. All holes will be drilled with a rubber-tired exploration drill. The drilling medium used will be air or air-water mist. The use of drilling mud is not anticipated during the project. However, if it becomes necessary, a self-contained trough will be used as a repository for the mud. Any such mud will be disposed of at an approved facility. Cutting logs, core logs, and geophysical logs will be kept for all drill holes.

The drilling plan consists of up to 22 drill locations in a two-phase program. Phase I consists of 14 holes, of which 10 are continuous core holes for overburden characterization and 4 are rotary core pairs to define coal structure. The continuous core holes will average 150 feet in depth. The rotary core pairs will average 170 feet in depth and will consist of a plug-drilled hole to locate the seams and a combination plug and core drilled hole for recovery of the coal samples. Holes are generally expected to intersect 15-35 feet of coal spread over three to eight seams with a maximum single seam

thickness of about ten feet. Phase II will be drilled only if additional overburden drill data are required and coal information will be collected.

(2) Analysis of Phase I Drilling

The following outline specifies steps that will be taken for the statistical analysis of data collected during Phase I drilling. If clear decisions can be made regarding overburden suitability from the first phase analysis, then further data analysis will not be conducted.

(3) Outline of Proposed Statistical and Geostatistical Characterization of Overburden at the Proposed WR Mine

I. Preliminary analysis of existing data from 4 cores drilled near theWR Mine site

   a. Investigation of vertical spatial correlation

   b. Investigation of horizontal spatial correlation assuming similarity within lithologic layers and similar formative processes across lithologic layers

II. Analysis of 10 cores from the WR Mine site for estimating means and totals

   1. Investigation of spatial correlations in vertical direction.

   2. Parameter statistical means

      - Estimates for entire mine site
      - Estimates stratified by lithologic layer
      - Optionally, estimates stratified by lithologic layer and spatial subregions
      - Investigation of sample adequacy based on precision of estimates

3. Proportion of overburden material which is suitable for reclamation

    - Methods are based on estimating binomial proportions for each parameter of interest

    - Sample adequacy is judged based on precision of estimates

4. Probability of hot-spots, if none were detected in samples collected

III. Spatial mapping

    - Kriging can be employed to develop point estimates in two or three dimensions

IV. Discussion of adequacy and further drilling needs. If mine planning and economic decisions cannot be made with adequately low probability of error, then additional drilling would be required in order to refine spatial resolution of the overburden characteristics.

(4) Data Analysis

Analysis of overburden material will follow the methods shown below to determine whether acid-or-toxic-forming materials exist and if special handling procedures will be required. Geochemical analysis will be conducted for the parameters listed in Table 1. Verbal communications with the OSM indicated that metals are not an issue in this area. Therefore, analysis of metals for theWR Mine area will not be conducted.

The overburden strata, including coal strata that would not be mined, and the strata up to 5 feet below the lowest coal seam to be mined will be analyzed. Sampled intervals shall be a minimum of 1-foot length of 3-inch diameter core, and a maximum of 5 feet length based on OSM guidelines. Each sample will represent a single lithologic unit except where intervening strata are less than one foot in thickness. Strata thicker than 5 feet may be represented by one or more samples.

Table J-1. Overburden Parameters

Parameters	Sample Method Reference
Sodium Absorption Ratio (SAR) - saturated paste Electrical conductivity Extractable calcium, magnesium, and sodium	Page, 1982
Boron - hot water soluble	Page, 1982
Selenium - hot water soluble	Page, 1982
Selenium - Total	Bajo, 1978. (The Bajo Method of total digestion is followed by the hydride method of detection)
Acid-Base Potential (ABP)	Skousen, et al, 1997 Sobek, 1978 (Sulfur fractionation will be performed if the ABP $\leq$ -5)
Calcium carbonate percentage	U.S. Salinity Laboratory Staff, 1954
Saturation percentage	Page, 1982
Exchangeable Sodium Percentage (ESP) (ESP will be determined for 25% of samples with SAR values >18)	Page, 1982
Texture	Page, 1982
pH	Page, 1982

c. Task 3

Description of the baseline geology will involve compiling a detailed geologic map and description of general geology, surficial geology, seismic areas (if available), and geochemical characteristics of overburden material, in the proposed project and cumulative effects areas. Known geologic features such as faults and fractures in the project and cumulative effects areas will be described. One or more cross-sections will be provided showing stratigraphy (i.e., coal seams, shale, and sandstone units).

Known active or potentially active faults will be described on maps and discussed in the environmental impact statement. The seismic environment of the area will be described.

Abandoned and past mining activity in the general area will be summarized. This will be presented in tabular form, along with known existing plans, proximity to the proposed project, BLM or Tribal number (if available), operator, type of operation and acres of disturbed land. Where possible, aerial maps will be used to determine existing disturbance.

2. Ground-Water Baseline

The following 3 tasks that will be undertaken to develop the ground-water baseline:

- Assemble existing ground-water information
- Collect additional ground-water information
- Identify all water rights and determine present water use

a. Task 1

The baseline ground water assessment will consist of an evaluation of the prevailing ground-water hydrology. Considerable hydrologic information currently exists in the vicinity of the proposed project, including information on ground water from the nearby surface mining operation at theWR2 Mine, ground-water information associated with a proposed underground coal gasification project located immediately west of the proposed WR Mine (U.S.D.I., FES 76-2), regional hydrologic information from the U.S. Geological Survey and the New Mexico Bureau of Mines and Mineral Resources, and information associated with mining and reclamation at the nearby WR3 Mine.

In the vicinity of the proposed mine permit area, the hydrogeologic units which may yield water include the:

- The coal units of the Fruitland Formation
- Picture Cliffs Sandstone, located below the B Coal Seam
- Alluvium of the Yazzie and Bisti Arroyos

(1) Coal Units of the Fruitland Formation

Based on data contained in the WR2 Mine permit application, the flow directions within the Fruitland coal seams are primarily down dip toward the east. Aquifer testing of wells completed in the coal units at the WR2 Mine have shown very low values for transmissivity and hydraulic conductivity. The highest hydraulic conductivities, 1.80 ft/day and 0.25 ft/day, were observed in the H and I Coal Seams, respectively. The lowest hydraulic conductivities, 0.005 ft/day, were observed in the E, F and G seams.

Water-quality monitoring data from the WR2 permit application, show the coal seams to be of a sodium-bicarbonate-chloride type with very high concentrations of total dissolved solids (TDS). TDS concentrations have been found to range from about 4,400 mg/L to over 49,000 mg/L, with the lower concentrations within the mine area and closer to the outcrop. Sampling of coal baseline wells will be combined with information from the coal wells at the WR2 Mine to define the baseline water quality of the Fruitland Formation coal seams in the permit area.

Based on the mining experience at the WR2 Mine, the overburden and interburden in the Fruitland Formation is not expected to yield much water during mining. The saturated sands that occur are of limited extent and only yield significant water when supplied by water from the nearby Chinde Agricultural Products, Inc. (CAPI) irrigation project. CAPI irrigation project influences are not expected to extend into the stream drainages at the proposed WR2 Mine. Also, direct recharge of overburden and coal seams is expected to be low because of the low average annual precipitation and the high evaporation rates. What little recharge that does occur is expected to occur primarily along the arroyos and at surface depressions and impoundments. No springs or seeps are known to occur within the permit area.

(2) Picture Cliffs Sandstone

The Picture Cliffs Sandstone is the first water bearing unit below the lowest coal seam to be mined (the B coal). Based on data contained in the WR2 mine permit application, the Picture Cliffs Sandstone is nearly 120 feet thick and dips toward the east. The sandstone is a well-cemented marine sand with relatively low permeability. Aquifer testing of wells completed in the Picture Cliffs Sandstone at the WR2 Mine showed very low values for transmissivity (1.2 and 0.8 gal/day/ft) and an average hydraulic conductivity of 0.0014 ft/day. Aquifer testing of Well O-1 completed in the Picture Cliffs Sandstone at the WR3 Mine showed slightly higher values for transmissivity of 6.3 gal/day/ft and for hydraulic conductivity of 0.0094 ft/day.

Based on water elevations from seven wells completed in the Picture Cliffs Sandstone within the vicinity of the proposed WR Mine permit area, the ground water flow direction is primarily toward the northwest. Most of these Picture Cliffs Sandstone wells were completed to monitor a proposed underground coal gasification project located immediately west of the WR Mine permit area.

The water quality of the Picture Cliffs Sandstone is a sodium sulfate type with high TDS concentrations. The TDS concentrations measured in Picture Cliffs Sandstone wells at the WR2 Mine have varied from 5,100 mg/L to 16,500 mg/L.

(3) Alluvium of Yazzie Arroyo and Bisti Arroyo

Alluvial fill deposits occur in the valley bottoms of Yazzie Arroyo and Bisti Arroyo. Portions of the alluvium of Yazzie Arroyo are saturated and will yield water to wells, as evidenced by the two dug wells located within the permit area. The alluvium of Bisti Arroyo was found to be dry based on an alluvial monitoring well installed for the proposed underground coal gasification project downstream of the proposed WR Mine permit area.

b. Task 2

(1) Wells

A program for collection of additional ground-water baseline data is proposed to supplement ground-water information available from other sources. The program will include construction of two wells (Wells1 and 2) screened in the B Coal Seam. Water elevations in these wells and the oxidized coal boundary will be used to determine the potentiometric surface in the B seam. Sampling and analysis of these wells will also be used to verify and supplement the water-quality results obtained for the coal units at the nearby WR2 Mine. If the results from the two B Coal Seam wells exhibit a water quality and yield adequate to support domestic or agricultural use, then an additional B seam well would be completed. One well will also be constructed and screened in the Picture Cliffs Sandstone (Well 3), the first water yielding unit below the coal seams.

One well screened in the first saturated bedrock unit will be constructed at a site adjacent to the Yazzie Arroyo alluvium (Well 4). This well will be constructed at the edge of the buffer zone along Yazzie Arroyo and near the alluvial monitoring well. The purpose of this well is to help quantify any drawdown influence in the alluvium of Yazzie Arroyo that may result from proposed mining. The well will determine the depth to saturated bedrock adjacent to the alluvium. Also, a pumping test of the well will be performed to determine the hydrogeologic properties of the saturated bedrock and to identify any response in the alluvial aquifer due to pumping the saturated bedrock. Sampling and analysis of the well will also be performed to enable a geochemical evaluation of the water quality of the saturated bedrock relative to the alluvium.

The anticipated well depths and screened intervals for the bedrock wells are as follows:

Location	Unit	Total Depth	Screened Interval
1	C Coal	100 feet	10 feet
2	C Coal	200 feet	10 feet
3	Picture Cliffs SS	165 feet	85 feet
4	Yazzie Arroyo	35-50 feet	10 feet

In addition, two wells will also be constructed and screened in the alluvium of Yazzie Arroyo (Wells Y1 and Y2) and two wells will be constructed and screened in the alluvium of Bisti Arroyo (Wells B1 and B2).

Given the projected depth of the proposed wells, Schedule 80 PVC casing will be used. Well screens will be installed using 4-inch diameter (ID) slotted Schedule 80 PVC screen with a slot size of 0.010 inches and fitted with a threaded end-cap. The remainder of the riser pipe of the well will be made up of 4-inch diameter (ID), flush-threaded Schedule 80 PVC. The annular space between the borehole wall and the well will be back-filled with 10-20 silica sand to a depth of one to two feet above screen.

A minimum two-foot thick bentonite slurry plug will be placed above the sand pack and the remainder of the annulus will then be filled with cement grout mixed with 2% to 5% bentonite.

The well will be developed using a combination of bailing, surging, and air-lift pumping until cuttings in the produced water are minimal. The water produced by air lifting will be contained nearby to prevent channeling or erosion and allowed to infiltrate and evaporate

The wells to be completed in the alluvium of Yazzie Arroyo and in the alluvium of Bisti Arroyo will be drilled using hollow stem augers. Given the projected depth of the proposed wells of 30 feet or less, Schedule 40 PVC casing will be used. Wells will be constructed with 2-inch diameter mill-slotted, Schedule 40 PVC screen with a slot size of 0.010 inches and fitted with a threaded endcap. The remainder of the riser pipe of the well will be made up of 2-inch diameter, flush-threaded Schedule 40 PVC. A sand pack comprised of 10-20 silica sand will be placed around the screened interval of the monitoring wells through the annular space of the hollow-stem auger to a depth of approximately one to two feet above the screened internal. A two-foot bentonite seal will then be placed above the sand pack, and the remainder of the annulus will be filled with a Portland cement/bentonite grout slurry to ground surface.

The alluvial wells will be developed by bailing and surging until cuttings in the produced water are minimal. The water produced by air lifting will be contained nearby to prevent channeling or erosion and allowed to infiltrate and evaporate.

(4) Pumping Tests

A single-well pump test or slug test will be conducted at each installed well. If the water produced during well development indicates relatively low transmissivity for the well screened interval, slug tests will be conducted with interpretations based on recovery measurements. Otherwise, a constant rate pumping test will be conducted with interpretations obtained using both drawdown and recovery data.

Single-well tests will be run a sufficient length of time so that wellbore storage effects will not significantly influence the test results. Discharged water will be piped beyond the area of influence of the pumping well and released on the ground. Discharged water will be directed onto a sheet of plastic with rock baffles to spread the flow and avoid erosion of soil, at sufficient distance from the wells to avoid any measurable recharge during the course of the test. Discharge flow will be measured by a totalizing meter at the wellhead, and by a weir or flume at the discharge end of the line. Water levels will be monitored in the pumped well with a probe. Water levels will also be monitored after pumping ceases until the water level has recovered to at least 90 percent of pre-pumping levels.

(5) Data Collection

Data collection will be for a period of one year. The ground-water baseline data collection will include quarterly measurement of ground-water levels and water-quality sampling in all baseline wells. Field readings of pH, temperature and conductivity will be taken at the time of sampling. All water samples will be analyzed for the parameters listed below including cation/anion balance to check laboratory

accuracy. All ground-water sampling and analysis will include sample collection and chain-of-custody documentation.

Table J-2. Ground-water quality parameters

pH	Sulfate	Mercury
Calcium	Barium	Bicarbonate-meq/L
Potassium	Magnesium	Chloride
TDS	Selenium	Nitrate
Fluoride	Zinc	Carbonate-meq/L
Conductivity	Copper	Silver
Iron (dissolved)	Radium 228	Arsenic
Iron (total)	Cadmium	Boron
Manganese (disssolved)	Radium 226	Lead
Manganese (total)	Chromium	Cation/Anion Balance
	Sodium	

Sampling will be performed using dedicated pumps or bailers. Prior to collecting a sample, the water in the wells will be purged until field parameters stabilize. Alternately, a mini-purge procedure using a low pumping rate may be adopted for collecting a sample of formation water from the screen interval without having to purge several casing volumes.

c. Task 3

An inventory of all water-supply wells located within three miles of the permit area will be conducted by reviewing records from the Department of Water Resources Management of the WR Nation. The tabulation will include descriptive information from the records, if provided, including: the user, total depth, producing interval and unit, date of completion, well elevation, specified use, water quality information, and production or yield. Identified wells will be located on a map. An attempt will be made to verify whether the well exists and is in use.

3. Surface-Water Baseline

The following 3 tasks will be undertaken to develop the surface-water baseline:

- Assemble existing surface-water information.
- Collect additional surface-water information.
- Identify all surface water rights and determine present surface water use.

a. Task 1

The baseline hydrology assessment will consist of an evaluation of the prevailing surface water hydrology. Considerable hydrologic information currently exists in the vicinity of the proposed project, including information from the nearby WR2 and WR3 Mines and regional hydrologic information from the U.S. Geological Survey and the New Mexico Bureau of Mines and Mineral Resources.

The surface-water baseline will provide a description of surface-water flow and water-quality conditions which currently exist within the permit and adjacent areas. Ephemeral streams within the proposed permit area and adjacent area include Bisti Arroyo and Yazzie Arroyo. Watershed descriptions and general basin characteristics for Yazzie Arroyo and Bisti Arroyo will be based primarily on existing data supplemented with additional information from activities described in Task 2.

The drainage basin areas for Yazzie Arroyo and Bisti Arroyo where they exit the lease area are 56.2 square miles and 8.4 square miles, respectively. The drainage basin area for Bisti Arroyo upstream of the lease is 1.9 square miles. Although the flow in both Yazzie Arroyo and Bisti Arroyo is ephemeral, the streams are defined by OSM regulations as perennial or intermittent because the drainage basin area is greater than 1 square mile. Yazzie Arroyo and Bisti Arroyo have not yet been monitored.

Flow and water-quality characteristics from neighboring streams will be used to characterize the flow regime and water-quality characteristics for surface water in the vicinity of the proposed mine. Cottonwood Arroyo, located immediately north of Yazzie Arroyo, is monitored for flow and water quality by the WR2 Mine. Brimhall Wash, located immediately south of Bisti Arroyo, is monitored for flow and water quality by theWR3 Mine. In addition, surface-water monitoring of Yazzie Arroyo and Bisti Arroyo will be implemented under Task 2 to obtain site-specific information from the mine permit area to supplement the regional hydrologic information.

Watershed evaluations of pre-mine flow and erosion will also be performed using the SEDCAD surface water hydrology program to determine expected storm runoff volumes, channel velocities and sediment yields.

b. Task 2

Although considerable baseline hydrology information is currently available for the surface mine operation, additional field data will be needed to support the proposed permit application.

The methods that will be used to collect this data are:

(1) Installation of Crest Stage Gauges and Sediment Samplers

As indicated in Task 1, watershed descriptions and general basin characteristics for the Yazzie Arroyo and Bisti Arroyo drainages will be based primarily on existing data. However, crest stage gauges and single stage sediment samplers will be installed at a suitable location near where these channels enter and exit the permit area, as shown in Figure 3 Surveyed channel profiles and cross sections will be established at the crest-stage gauge locations. Stage-discharge relationships will be developed for both crest gauge locations using Manning's equation and estimates of site-specific roughness coefficients.

The surface impoundment located on Bisti Arroyo just above the point where the Burnham Road crosses the channel will also be monitored with a staff gauge. The impoundment will be surveyed to establish a stage-capacity relationship.

(2) Channel Stability Evaluation

A channel stability evaluation will be prepared to describe pre-mining conditions for the main channels of Yazzie Arroyo and Bisti Arroyo. Key channel features that will be identified include road crossings, culverts, dams, tributary junctions, bedrock outcrops, and head cuts, knickpoints, and other erosional features. Locations of convex segments in the channel profile will also be identified and related to surficial geology features. The condition of the channel along its course will be described, including the vegetation conditions on the channel bottom and banks, the occurrence of steep bank slopes and evidence of bank failure, extent of scouring and deposition along the stream, and the classification of stream bed sediments. Photo documentation of the channel conditions will be included in the channel stability survey.

(3) Data Collection

The following items comprise the proposed surface-water data collection program:

- Data collection will be for a period of one year. The monitoring stations on Yazzie Arroyo and on Bisti Arroyo will be visited monthly and within one week following major storm runoff events to record and reset the crest gauges and to collect water samples from the single stage sediment samplers. Samples will be taken of any water found within the impoundment or stream channels during the baseline monitoring visits.

- Flows will be estimated with crest stage recordings in the channels and Manning's equation.

- Channel profiles and cross sections at the crest gauge locations will be surveyed at the beginning and end of the one year baseline monitoring program.

- All water samples obtained will be measured for pH, temperature and electrical conductivity in the field.

- All water samples will be analyzed for the list of analyses currently approved by OSM for sampling of surface water at the nearby WR2 Mine, including cation/anion balance to check lab accuracy. These analyses are listed below.

- All surface water sampling and analysis will include sample collection and chain of custody documentation**.**

Table J-3. Surface-water quality monitoring parameters

pH	Magnesium	Bicarbonate
TDS (180˚C)	Manganese (dissolved)	Chloride
Conductivity	Manganese (total)	Calcium
Boron	Potassium	Fluoride
Iron (dissolved)	Selenium	Carbonate
Iron (total)	Sodium	Total Suspended Solids
Sulfate	SAR	Settleable Solids
		Cation/Anion Balance

c. Task 3

Surface-water rights in the permit area and within 3 miles of the permit area will be inventoried and tabulated using records from the Department of Water Resources Management of the Chinde Nation.

C. References

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