APPENDIX E — EROSION, SEDIMENT TRANSPORT AND SALINITY MODELING TECHNICAL REPORT

EROSION, SEDIMENT TRANSPORT, AND SALINITY MODELING TECHNICAL REPORT

JONAH INFILL DRILLING PROJECT SUBLETTE COUNTY, WYOMING

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1. INTRODUCTION

The potential for environmental impacts associated with sediment transport and salinity has been identified as an issue for further investigation in the environmental impact statement (EIS) for the proposed Jonah Infill Drilling Project (JIDP). The Bureau of Land Management (BLM) is preparing an EIS for the JIDP (BLM 2005). The purpose of this report is to describe the conceptual model of watershed hydrology, to summarize the hydrologic transport modeling methods, and to present modeling results quantifying potential JIDP impacts resulting from sedimentation and salinity.

1.1 Modeling Objectives

The goal of the sediment transport and salinity modeling was to quantify sediment loss and loading at the JIDP area (JIDPA) boundary and the potential for salinity loading in the Green River. The modeling quantified sediment loading under the following four conditions:

- assuming no disturbance in the JIDPA;
- under the EIS-described No Action condition;
- under the EIS-described Proposed Action condition; and
- under the EIS-described Preferred Alternative condition.

The quantitative impacts from alternatives that were not explicitly modeled can be interpolated from the conditions that were modeled. The results of the watershed modeling were expressed in tons of sediment per year per watershed, so those alternatives can be directly compared.

1.2 Modeling Approach

The watershed modeling was performed using the Kinematic Runoff and Erosion Model (KINEROS2), developed by the U.S. Department of Agriculture (USDA) (2005). KINEROS2 is an event-oriented physically based model that describes the processes of interception, infiltration, surface runoff, and erosion from small agricultural and urban watersheds.

Seven sixth-level watersheds were modeled. Each watershed was represented by a cascade of planes and channels, and the partial differential equations describing overland flow, channel flow, erosion, and sediment transport were solved in KINEROS2 using finite-difference techniques. The input of spatial variation in soils, infiltration, runoff, and erosion parameters was accomplished using a Geographic Information System (GIS) interface.

1.3 Impact Analysis Approach

The following conditions/alternatives were modeled:

- an undisturbed condition;
- No Action;
- Proposed Action; and
- Preferred Alternative.

Mitigation measures such as engineered retention structures were not modeled.

2 PROJECT DESCRIPTION

The JIDPA is located in south-central Sublette County approximately 32 miles southeast of Pinedale and 28 miles northwest of Farson, Wyoming (Map 1). Drilling is proposed in Townships 28 and 29 North, Ranges 107 through 109 West, 6th Principal Meridian, on a total project area of approximately 30,500 acres. Natural gas developers (Operators) propose to expand development of natural gas resources in the JIDPA over a period of about 25 years.

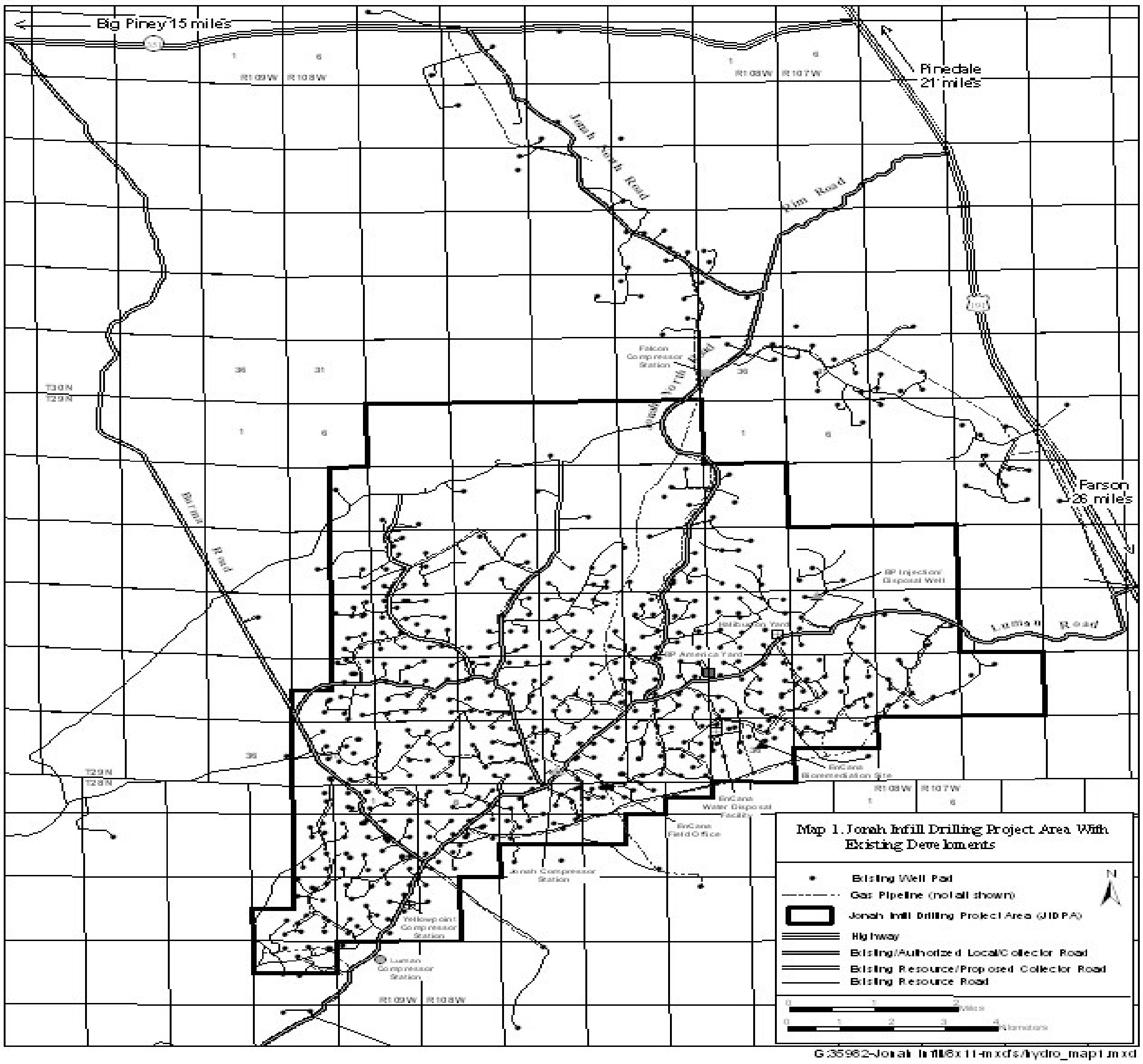
The original development proposal to drill 450 wells in addition to the 47 existing wells was approved by the BLM in the *Environmental Assessment and Finding of No Significant Impact for the Modified Jonah Field II Natural Gas Project* (BLM 2000) (Modified Jonah Field II EA). The Operators now propose to drill up to 3,100 additional wells on a minimum of 64 well pads per section within the JIDPA and to explore further for natural gas in known productive formations, as well as deeper formations beneath the area (Proposed Action).

The planned development would include the following associated structures and facilities in addition to the proposed wells: well pad separators, dehydrators, and storage tanks; collector, local, and resource roads and road improvements; a system of gathering pipelines; compressor station expansions; five additional water wells; and other ancillary facilities (e.g., water disposal facilities, ware yards).

The EIS-described alternatives included for this analysis are as follows:

- No Action – 533 wells from 497 well pads on 4,209 acres of initial surface disturbance. Well pad density = 1 pad/40 acres (16 pads/section). Estimated total initial surface disturbance is approximately 14% of the JIDPA; the estimated Life of Project (LOP) surface disturbance is approximately 5% of the JIDPA.

- Proposed Action – Up to 3,100 new wells on up to 16,200 acres of new initial surface disturbance. Well pad density = a minimum of 64 well pads/section, or 1 pad/10 acres Estimated total initial surface disturbance is approximately 67% of the JIDPA; estimated LOP surface disturbance is approximately 20% of the JIDPA.



Map 1 Jonah Infill Drilling Project Area with Existing Developments.

- Preferred Alternative – Up to 3,100 new wells on approximately 8,316 acres of new initial disturbance. Well pad densities would likely vary across the JIDPA depending upon surface disturbance acreage allowances (Map 2). Estimated total initial surface disturbance is 41% of the JIDPA; estimated LOP surface disturbance is approximately 13% of the JIDPA.

3 CONCEPTUAL MODEL OF SEDIMENT TRANPORT AND SALT LOADING

3.1 Watershed Hydrology

All drainages in the JIDPA are ephemeral, flowing only in response to snowmelt and rain storms. Drainage is predominantly to the west within Sand Draw, Alkali Creek tributaries, and Granite Wash, which flow to the Green River; to the southeast in Long Draw and Bull Draw, which flow to the Big Sandy River, a tributary of the Green River; to the southeast in Jonah Gulch and an unnamed drainage (watershed 140401040603 [104]), which flow to a closed basin; and to the south in Buckhorn Draw, which flows to the Green River (Map 3).

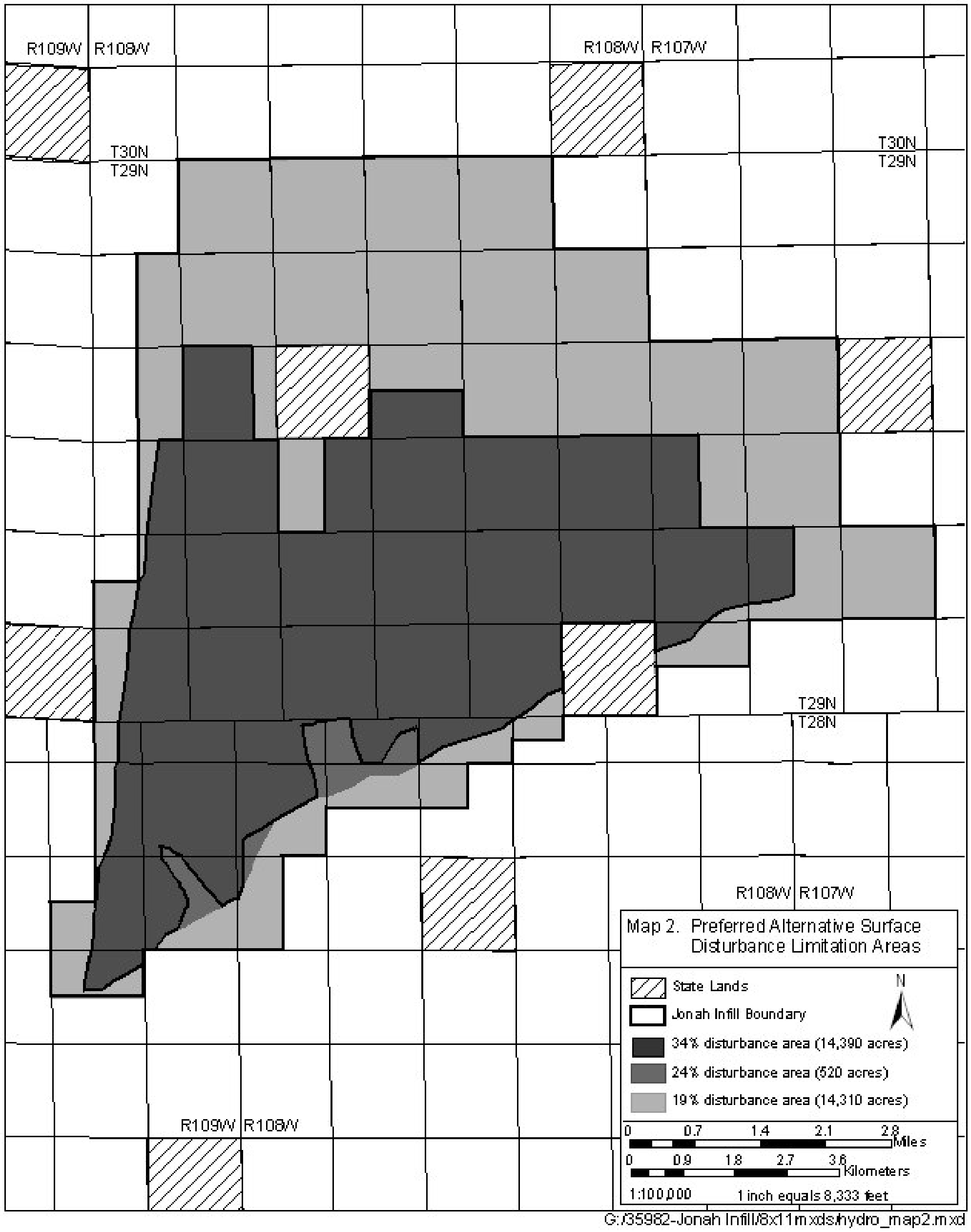
Eight sixth-level watersheds intersect the JIDPA (Table 1, Map 4), and seven of these watersheds were modeled. Not modeled was Jonah Gulch, as it covers only a small part of the JIDPA (318 acres or 1.0%), which would make numeric modeling unreliable. Additionally, Jonah Gulch drains into a closed basin such that overland flow does not reach the Green River system.

Table 1 Watershed Areas

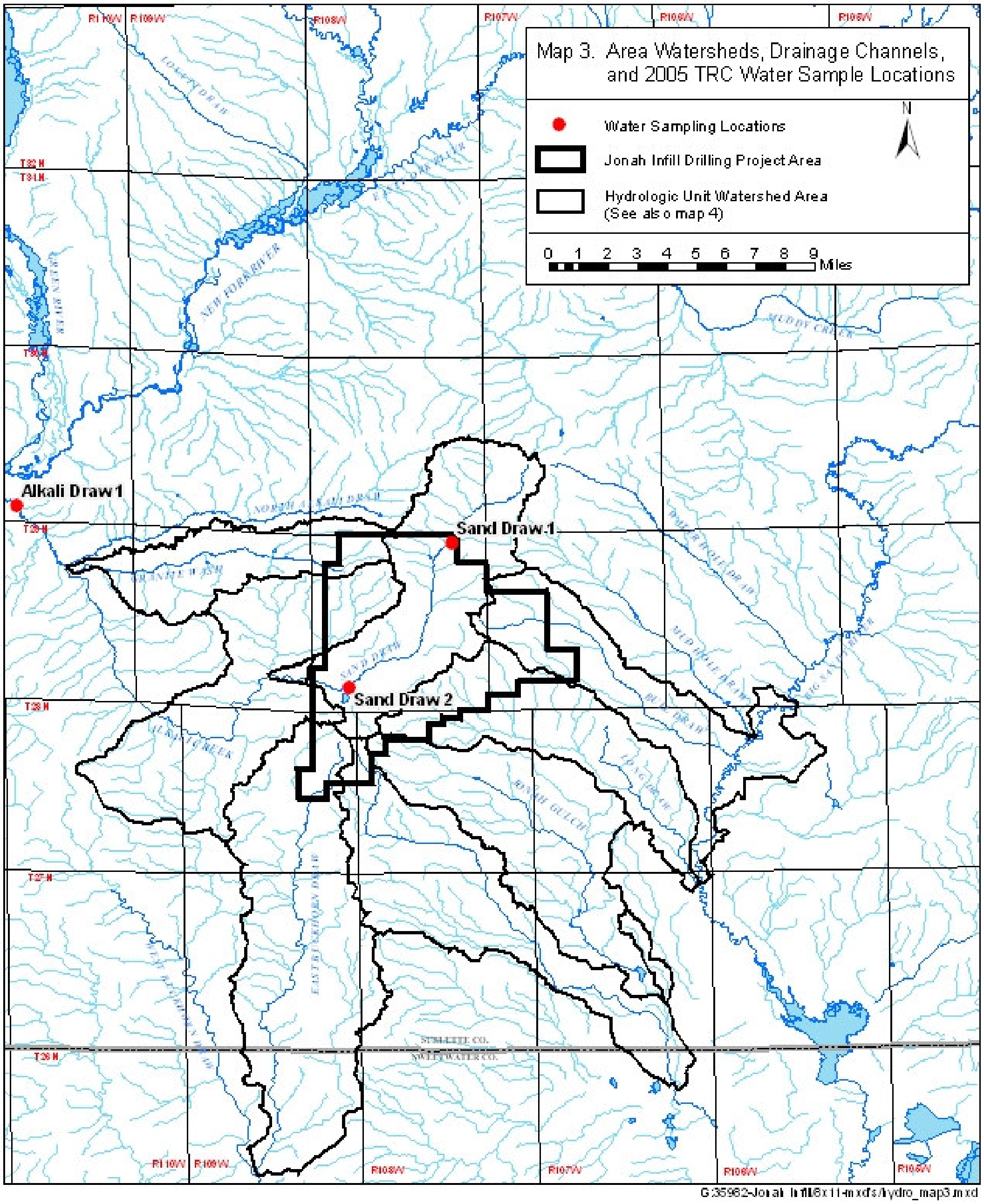
Watershed	Acreage within JIDPA	Total Acreage
Sand Draw	13,724	23,373
Granite Wash	1,312	12,212
Upper Alkali Creek	3,782	26,355
Upper Eighteenmile Canyon	1,958	35,212
Bull Draw	3,630	19,760
Long Draw	5,028	18,521
Jonah Gulch	318	22,652
140401040603 (140)	748	24,558

3.2 Erosion, Sediment Transport, and Salt Loading

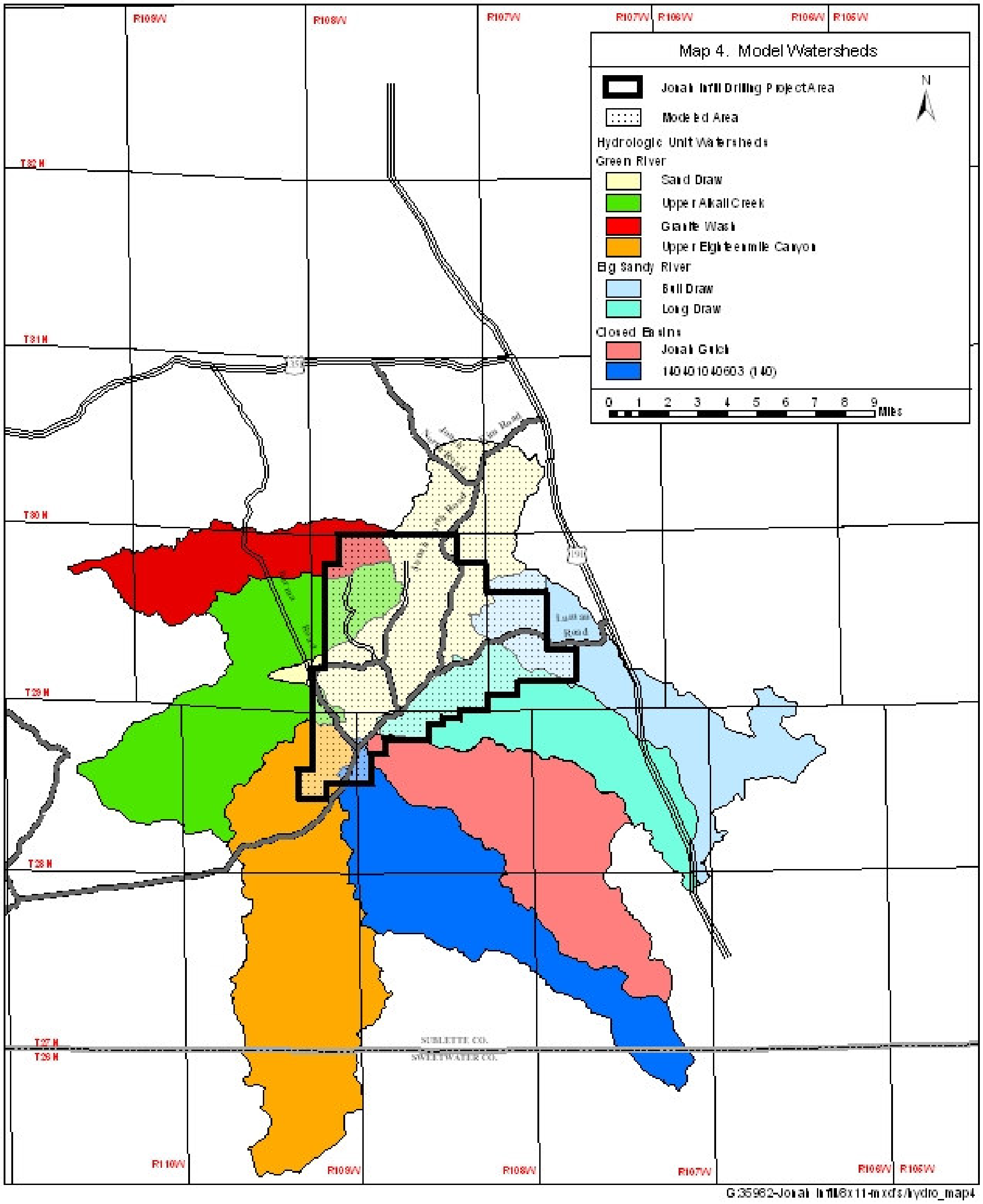
Much of the JIDPA has shallow soils, lime- or salt-affected soils, and sandy soils that are subject to water erosion and difficult to reclaim. Project activities may increase the potential erosion of these soils due to the large amount of proposed surface disturbance. After major storm events, disturbed soils could be eroded and transported into live streams, if unchecked by appropriate erosion control measures (e.g., reclamation, retention structures).



Map 2 Preferred Alternative Surface Disturbance Limitation Areas.



Map 3 Area Watersheds, Drainage Channels, and 2005 TRC Water Sample Locations.



Map 4 Model Watersheds.

Increased erosion and sediment transport could lead to increased salinity in the Green and Big Sandy Rivers; significant precipitation events could move the dissolved salt to these receiving waters. The Green River and the Big Sandy River are Class IIAB waters (Wyoming Department of Environmental Quality [WDEQ] 2001). Salt loading is an issue in the Colorado/Green River system; therefore, any salt loading associated with this project could have implications concerning the *Colorado River Basin Salinity Control Act*.

4 MODEL SETUP

4.1 KINEROS2

The watershed modeling was performed using KINEROS2, which is an event-oriented, physically based model describing the processes of interception, infiltration, surface runoff, and erosion from small agricultural and urban watersheds. Watersheds are represented by a cascade of planes and channels; the partial differential equations describing overland flow, channel flow, erosion, and sediment transport are solved by finite difference techniques. The spatial variation of rainfall, infiltration, runoff, and erosion parameters can be accommodated within the program. KINEROS2 may be used to determine the effects of various artificial features--such as urban developments, small detention reservoirs, or lined channels--on flood hydrographs and sediment yield.

The KINEROS2 model was operated using a public-domain GIS interface, called Automated Geospatial Watershed Assessment or AGWA. AGWA was developed by the USDA, Agricultural Research Service, Southwest Watershed Research Center, in cooperation with the U.S. Environmental Protection Agency Office of Research and Development (Burns et al. 2004). AGWA operates in ArcView 3.x GIS and was used to perform the automated parameterization of KINEROS2 for a specified watershed.

KINEROS2 uses a version of the Universal Soil Loss Equation (USLE) to compute erosion (USDA 2005). The USLE (Wischmeier and Smith 1965, 1978) and the Modified Universal Soil Loss Equation (MUSLE) (Williams 1975) are the most commonly used methods for computing erosion caused by rainfall and runoff. USLE predicts average annual gross erosion as a function of rainfall energy. In MUSLE, the rainfall energy factor is replaced with a runoff factor. MUSLE is documented in Neitsch et al. (2002). Although several models exist to simulate erosion using the USLE or MUSLE, KINEROS2 was selected because it is a public domain code that interfaces easily with the ArcView GIS data compiled for the JIDP EIS.

USLE is implemented in the following manner in KINEROS2 (USDA 2005). For upland surfaces, Erosion e is assumed to be composed of two major components: 1) production of eroded soil by splash of rainfall on bare soil and 2) hydraulic erosion (or deposition) due to the interplay between the shearing force of water on the loose soil bed and the tendency of soil particles to settle under the force of gravity. Thus e may be positive (increasing concentration in the water) or negative (deposition). Net erosion is a sum of splash erosion rate as e_s and hydraulic erosion rate as e_h.

Splash Erosion. Based on limited experimental evidence, the splash erosion rate can be approximated as a function of the square of the rainfall rate (r) (Meyer and Wischmeier 1969). This relationship in KINEROS estimates the splash erosion rate as follows:

$$e_s = c_f\, k(h)\, r^2$$

in which c_f is a constant related to soil and surface properties, and $k(h)$ is a reduction factor representing the reduction in splash erosion caused by increasing depth of water.

Hydraulic Erosion. The hydraulic erosion rate e_h represents the rate of exchange of sediment between the flowing water and the soil over which it flows and may be either positive or negative. KINEROS assumes that, for any given surface water flow condition (velocity, depth, slope, etc.), there is an equilibrium concentration of sediment that can be carried if that flow continues steadily. Hydraulic erosion rate (e_h) is estimated as being linearly dependent on the difference between the equilibrium concentration and the current sediment concentration. In other words, hydraulic erosion/deposition is modeled as a kinetic transfer process:

$$e_h = c_g\, (C_m - C_s)\, A$$

in which C_m is the concentration at equilibrium transport capacity, C_s is the current local sediment concentration, c_g is a transfer rate coefficient, and A is the cross-sectional area of flow.

Clearly, the transport capacity is important in determining hydraulic erosion, as is the selection of transfer rate coefficient. Conceptually, when deposition is occurring, c_g is theoretically equal to the particle settling velocity divided by the hydraulic depth, h. For erosion conditions on cohesive soils, the value of c_g must be reduced.

4.2 Storm Events

Most runoff, sedimentation, and loading occur during major storm events. Storm runoff events were modeled for 24-hour storms having the following recurrence intervals:

- 5-year,
- 10-year,
- 20-year,
- 50-year,
- 100-year, and
- 150-year.

Modeled but not presented were 2-year storm events, as these storms did not generate enough precipitation for flow to occur in most ephemeral channels in the JIDPA. Precipitation depth for the 2-year through 100-year storm events were obtained from the National Oceanic and Atmospheric Administration (NOAA) Atlas for Western Precipitation Frequency Maps (NOAA 1973). Precipitation depth for the 150-year storm event was extrapolated from the NOAA data using a semi-log plot (Figure 1). Precipitation depths for all storm events are given in Table 2.

Figure 1 Storm Magnitude

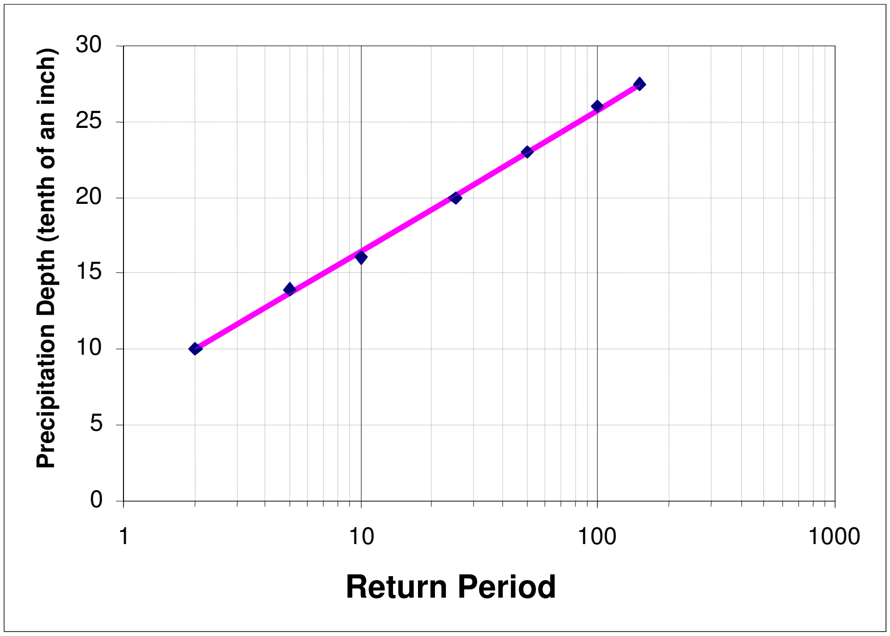


Table 2 Recurrence Interval and Magnitude of 24-hour Precipitation Event

Recurrence Interval T (Years)	Annual Probability	Storm Magnitude x_T (inches)
2	0.5	1.0
5	0.2	1.4
10	0.1	1.6
20	0.04	2.0
50	0.02	2.3
100	0.01	2.6
150	0.0067	2.7

Using AGWA, the precipitation depth is converted to a hyetograph using the Soil Conservation Service (SCS) methodology (SCS 1973) and a type II storm distribution. The precipitation input files for KINEROS2 give the rainfall depth over time, and a sample is shown in Appendix A.

4.3 Elevation Data and Watershed Delineation

KINEROS2 calculates flow and erosion in a watershed by assuming each watershed is a connected series of planes and channels. AGWA calculates the planes and channels necessary for KINEROS2 input from digital elevation data. Elevation data from the National Elevation Dataset were downloaded from the U.S. Geological Survey (USGS) EROS Data Center (USGS 2005a).

The following elevation data were used: National Elevation Dataset (NED) 1/3 Arc Second, downloaded in ArcGrid NAD 83 Geographic format (vertical datum is GRS 80), for the area bounded by the latitudes 42.6249 to 42.375, and the longitudes 109.875 to 109.501. This area covers six USGS quadrangle maps: Gobblers Knob, Olsen Ranch, Sugar Loaf NE, Stud Horse Butte, Square Top, and Bull Draw. For this dataset, the cell size is 0.00009 degrees or 10 m. The elevation data were converted to NAD 1983, UTM Zone 12, in meters.

AGWA was then used to delineate the watersheds covering the JIDPA and to divide the watersheds into planes and channels for KINEROS2 input. This process is described in the AGWA manual (Burns et al. 2004). First, any sinks in the NED data are filled. Sinks are isolated depressions in the elevation surface that can cause flow routing problems. Next, a flow direction grid is created for the entire topographic surface. Then a flow accumulation grid is created. The user then selects a watershed outlet, and the watershed is delineated according to the elevations in the NED file. Ponds or internal gages can be created but were not used for this project. Lastly, a size for the contributing source area (CSA) of 2.5% of the watershed size was selected for all watersheds. CSA is the area that is required before flow becomes channelized. Smaller numbers result in a larger number of smaller planes and vice versa, so the CSA is a measure of the geometric complexity at which the watershed is delineated. The default value is 2.5% of the watershed area and is recommended in the AGWA manual, as it provides the best results in a preliminary analysis. The watersheds delineated and used in the model are shown in Maps 3 and 4. The Jonah Gulch watershed was not modeled because the stream lengths in that watershed in the JIDPA was too short to be modeled numerically. Channel reaches upstream but outside of the JIDPA in the Sand Draw and Bull Draw drainages were included in the modeling, as they produce water inflow into the JIDPA and thus can influence sediment transport in the area.

Discrete channels were created within AGWA, and AGWA-created model channels were generally consistent with the mapped drainage channels shown on Map 3. Channel geometry was defined by using the model-default hydraulic geometry relationship options for the channel geometries. These relationships are known as bankfull hydraulic geometry relationships, and they define the bankfull channel width and depth based on watershed size. Bankfull hydraulic geometry relationships are useful in that they define channel topography with minimal input from the user and when actual channel topography is not known or known only for a small portion of actual channels in the watershed (Burns et al. 2004). The channels defined for the JIDPA varied in width from 2 to 34 meters, with an average width of 10 meters. Channel lengths varied from 13 to 4,600 meters, with an average length of 1,000 meters. Channel slopes varied from 0.001 to 0.05, with an average of 0.01, and channel depth varied from 0.25 to 0.82 meters, with an average of 0.45 meters. Detailed channel geometries were generated for the KINEROS2 input files, and an example is provided in Appendix A.

4.4 Soils

Properties of the soils in the watersheds can provide estimated input parameters, such as infiltration, water flow, and sediment routing, for KINEROS2. The following parameters are estimated for each channel and plane element of each watershed from the soil properties:

- Ks - saturated hydraulic conductivity, in mm/hr or inches/hr;
- CV - Coefficient of variation of Ks;
- G - mean capillary drive, in mm or inches (a zero value sets the infiltration rate to a constant value of Ks);
- Distribution - pore size distribution index (or Brooks and Corey Lambda) (This is a parameter used for redistribution of soil moisture during intervals of no flow.);
- Porosity;
- Rock - volumetric rock fraction, if any;
- Splash - rain splash coefficient (for plane elements only);
- Cohesion - cohesion coefficient of bed material; and
- Fractions - list of particle class fractions that must sum to one.

AGWA estimates these parameters from the State Soil Geographic (Statsgo) database (Burns et al. 2004). However, more detailed soil data are available for the JIDPA from the Burma Road Soil Survey (ERO Resources Corporation 1988; BLM 2005). In consultation with Professor Scott Miller, Ph.D. from the University of Wyoming, Laramie, who is one of the authors of AGWA (Burns et al. 2004), JIDPA-specific soil data were put in a database format equivalent to the Statsgo data format. Statsgo soils data were added to the new database for areas not covered by the Burma Road Soil Survey. The Statsgo data were for Region 14, Upper Colorado, and downloaded from the USGS website (USGS 2005b). The database tables created from JIDPA soils and surrounding Statsgo soils are shown in Appendix B. The newly created database tables were then used within AGWA to estimate the parameters listed above, and an example input file is provided in Appendix A. The range and average of the parameters estimated from the soils data are shown in Table 3.

Table 3 KINEROS2 Input Parameters Derived from Soil Properties

	Channel (Constant)	Plane Average	Plane Minimum	Plane Maximum
Ks (mm/hr)	210	13.3	1.6	27.0
CV	0	1.1	0.4	1.5
G (mm)	101	160	108	293
Distribution	0.545	0.34	0.25	0.43
Porosity	0.44	0.45	0.42	0.47
Rock	0	0.12	0.03	0.24
Splash	--	100	69	124
Cohesion	0.005	0.006	0.004	0.008
Sand Fraction	0.9	0.54	0.38	0.67
Silt Fraction	0.05	0.26	0.15	0.39
Clay Fraction	0.05	0.20	0.15	0.36

4.5 Landcover

Landcover and vegetation can be used to estimate infiltration parameters and Manning roughness for KINEROS2. The following parameters have to be estimated for each plane element of each watershed:

- Canopy - cover fraction of surface covered by intercepting cover (rainfall intensity is reduced by this fraction until the specified interception depth has accumulated);
- Interception - interception depth in mm or inches; and
- Manning - Manning roughness coefficient (for plane and channel elements).

AGWA estimates these parameters from the Multi-Resolution Land Characteristics (MRLC) Consortium National Land Cover Data (NLCD). To use AGWA routine, the detailed JIDPA-specific vegetation data (BLM 2005) were developed as grid files. NLCD vegetation data were added to the grid for areas not covered by the detailed JIDPA vegetation data. JIDPA vegetation types were added to the AGWA lookup table and used within AGWA to estimate the above parameters. The NLCD data were downloaded from the same site as the elevation data (see Section 4.3). The AGWA look-up table for vegetation data is shown in Appendix C.

The range and average of the parameters estimated from landcover data are shown in Table 4.

Table 4 KINEROS2 Input Parameters Derived from Landcover Properties

	Channel (Constant)	Plane Average	Plane Minimum	Plane Maximum
Canopy (no disturbance case)	--	0.2500	0.2475	0.2525
Interception (no disturbance case)	--	3.00	2.97	3.03
Manning (no disturbance case)	0.035	0.055	0.054	0.056
Canopy (disturbance cases)	--	0.150	0.087	0.2525
Interception (disturbance cases)	--	1.69	0.87	3.03
Manning (disturbance cases)	0.035	0.035	0.023	0.056

Detailed parameters for each channel and plane were developed for the KINEROS2 input files; an example is provided in Appendix A.

4.6 Disturbance

Disturbance from JIDP developments was simulated for modeling purposes by changing the land cover to equal bare ground. The AGWA Land-Cover Modification Tool was used to create a random pattern grid with different amounts of bare soil and pre-existing vegetation types in the JIDPA. The following amount of bare soil occurs in the modeled alternatives (BLM 2005):

- No Disturbance case - 0% disturbed ground;
- No Action - 14% disturbed ground;
- Proposed Action - 67% disturbed ground; and
- Preferred Alternative - three zones, with 33%, 38%, and 48% disturbance.

Disturbance zones for the Preferred Alternative can be seen on Map 2. The disturbance estimates identified in Map 2 for the Preferred Alternative are for new disturbances only and do not include the 14% disturbance of the No Action Alternative. However, the No Action disturbance was combined with the new disturbance in the model runs for the Preferred Alternative.

4.7 Salt Loading

In the Burma Road soil survey (ERO Resources Corporation 1988), chemical analyses of seven soil profiles were performed. Six of the soil profiles were performed in soils present in the JIDPA. The chemical properties of the top layer of saturated soil are given in Table 5.

Table 5 Soil Profile Chemical Analysis (ERO Resources Corporation 1988)

Soil Name	Depth (inches)	Electric Conductivity (µS/cm)	Ca (meq/l)	Mg (meq/l)	Na (meq/l)	Sodium Adsorption Ration
Fraddle	0-4	300	1.4	0.7	0.3	0.3
Quard Variant	0-4	500	1.2	0.7	3.2	3.3
Dines	0-4	400	1.0	0.4	3.0	3.5
Vermillion Variant	0-3	300	1.4	1.1	0.3	0.3
Baston	0-3	500	0.8	0.5	4.7	6.0
Langspring Variant	0-3	400	4.4	1.1	0.3	0.2

Electric conductivity was measured with the saturation extract method or saturated paste method. In this method, water is added to the soil until the soil is saturated and just reaches the flow point. This condition is referred to as a saturated paste. The saturated paste is allowed to sit for approximately two hours to reach equilibrium. At that time, the water present in the paste is extracted. This extract is referred to as the saturation extract. The electrical conductivity of this extract is then measured. The higher the salt concentration in a specific soil, the higher the conductivity of the saturation extract.

In ERO Resources Corporation (1988), an estimated electric conductivity is given for all soils present in the JIDPA (see also BLM 2005). Estimated average electric conductivity for each soil series and the derived electric conductivity for each soil complex or map unit and for each watershed are shown in Appendix D. The estimated electric conductivities are higher than the measured electric conductivities in the soil profiles.

Electric conductivity for the 1988 analyzed profiles using the saturated paste method averages 400 µS/cm. The estimated electric conductivity for all watersheds except for the closed-basin watersheds is 2,000 µS/cm.

Electric conductivity, which is closely related to total dissolved solids (TDS), can be used as a measure of salinity. A commonly used conversion states that the TDS in mg/l is roughly equal to 0.67 times the electric conductivity in µS/cm (Hem 1989), thus the average salinity as expressed in TDS for soil water extract is about 268 mg/L for the measured profile average and 1,340 mg/L for the estimated salinity average.

5 MODEL RESULTS

5.1 Sediment Transport to Project Boundary

Disturbance of vegetation (conversion to bare ground) notably increases the sediment transport in channels in the JIDPA. When compared to no disturbance, sediment transport increases the most for the Proposed Action and the least for the No Action Alternative (see Table 6 - 12 and Figure 2 - 9). The percentage increase in sediment yield from undisturbed to disturbed soil conditions is greatest for the 5-year storm (Figure 9). In the 150-year storm event, even the no disturbance case produces a large amount of sediment runoff; thus, the percent increase in sediment runoff is proportionally not as large, even though the total amount of sediment transported is largest for the 150-year storm.

Table 6 Sediment Yield Upper Eighteenmile Canyon

Storm Return Period (years)	Sediment Yield (kg)			
	No Disturbance	No Action	Proposed Action	Preferred Alternative
5	171.5	405.5	3,153.9	1,766.8
10	2,691.5	3,580.1	18,122.2	11,078.1
25	39,106.3	45,735.2	89,204.6	68,180.1
50	94,900.7	109,592.2	185,947.7	152,678.9
100	183,518.3	204,172.5	299,607.8	258,022.4
150	219,184.7	240,983.8	341,312.8	296,913.0

Table 7 Sediment Yield 140401040603Watershed

Storm Return Period (years)	Sediment Yield (kg)			
	No Disturbance	No Action	Proposed Action	Preferred Alternative
5	1,202.8	1,687.7	7,109.8	3,066.3
10	5,966.9	7,628.3	20,251.4	11,594.3
25	35,097.3	42,463.0	78,287.1	57,556.3
50	84,748.2	94,873.2	141,112.1	115,482.5
100	147,692.1	159,872.3	214,009.8	182,395.8
150	170,172.7	182,220.2	238,605.5	205,547.9

Table 8 Sediment Yield Bull Draw

Storm Return Period (years)	Sediment Yield (kg)			
	No Disturbance	No Action	Proposed Action	Preferred Alternative
5	1,443.5	2,943.8	36,797.9	10,846.8
10	19,211.8	29,722.2	142,846.4	62,882.5
25	231,075.2	298,784.7	749,269.9	444,537.2
50	681,779.9	811,244.1	1,541,332.7	1,062,556.2
100	1,364,158.6	1,547,113.6	2,523,421.5	1,895,932.0
150	1,638,146.6	1,835,340.0	2,878,763.9	2,210,098.0

Table 9 Sediment Yield Granite Wash

Storm Return Period (years)	Sediment Yield (kg)			
	No Disturbance	No Action	Proposed Action	Preferred Alternative
5	19.8	26.9	2,429.7	417.8
10	2,657.0	3,669.5	9,343.7	5,254.1
25	22,712.5	28,101.3	71,558.5	40,477.8
50	76,665.0	92,257.3	188,792.2	119,575.6
100	189,132.3	220,672.8	397,484.5	275,972.8
150	243,820.1	286,727.2	478,231.9	348,078.3

Table 10 Sediment Yield Long Draw

Storm Return Period (years)	Sediment Yield (kg)			
	No Disturbance	No Action	Proposed Action	Preferred Alternative
5	7,122.6	15,331.2	175,511.5	73,390.8
10	97,459.6	151,779.2	659,835.4	391,828.4
25	987,919.3	1,225,348.9	2,539,526.5	1,929,420.4
50	2,364,237.9	2,713,609.8	4,526,261.1	3,671,069.7
100	4,093,360.8	4,546,820.0	6,793,543.8	5,711,533.6
150	4,730,072.4	5,181,675.3	7,472,308.5	6,479,504.8

Table 11 Sediment Yield Sand Draw

Storm Return Period (years)	Sediment Yield (kg)			
	No Disturbance	No Action	Proposed Action	Preferred Alternative
5	0.0	0.0	0.1	0.0
10	1.3	1.7	5.7	2.7
25	321.7	2,066.0	79,285.7	31,481.8
50	39,925.3	66,290.4	330,637.7	172,380.2
100	195,787.7	283,179.9	1,032,544.6	594,299.3
150	320,822.3	439,567.3	1,433,121.8	848,886.8

Table 12 Sediment Yield Alkali Draw

Storm Return Period (years)	Sediment Yield (kg)			
	No Disturbance	No Action	Proposed Action	Preferred Alternative
5	6,150.1	7,485.3	26,511.7	12,012.8
10	18,762.9	26,826.7	98,332.2	52,452.5
25	173,917.1	218,680.3	473,012.2	308,554.1
50	483,665.8	556,970.3	932,709.2	698,082.8
100	901,809.5	998,242.2	1,437,397.1	1,160,826.0
150	1,052,956.4	1,156,586.4	1,624,999.1	1,326,865.6

Figure 2 Sediment Transport to Project Boundary in Granite Wash

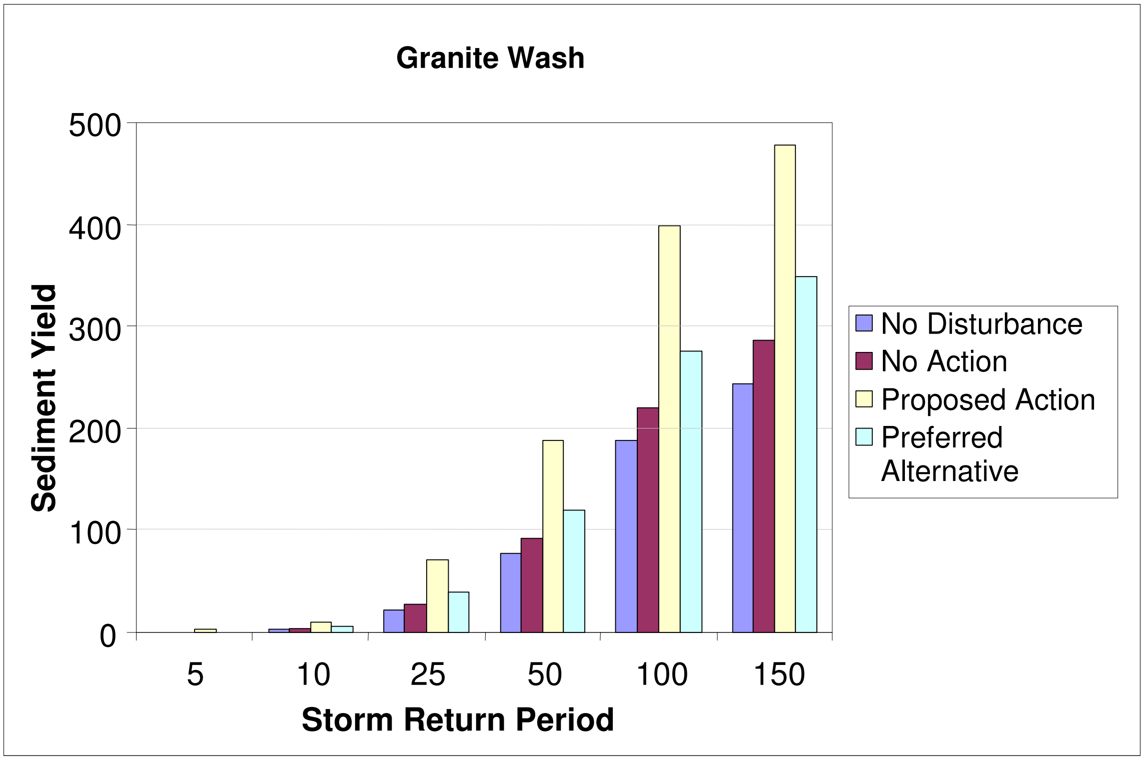


Figure 3 Sediment Transport to Project Boundary in Long Draw

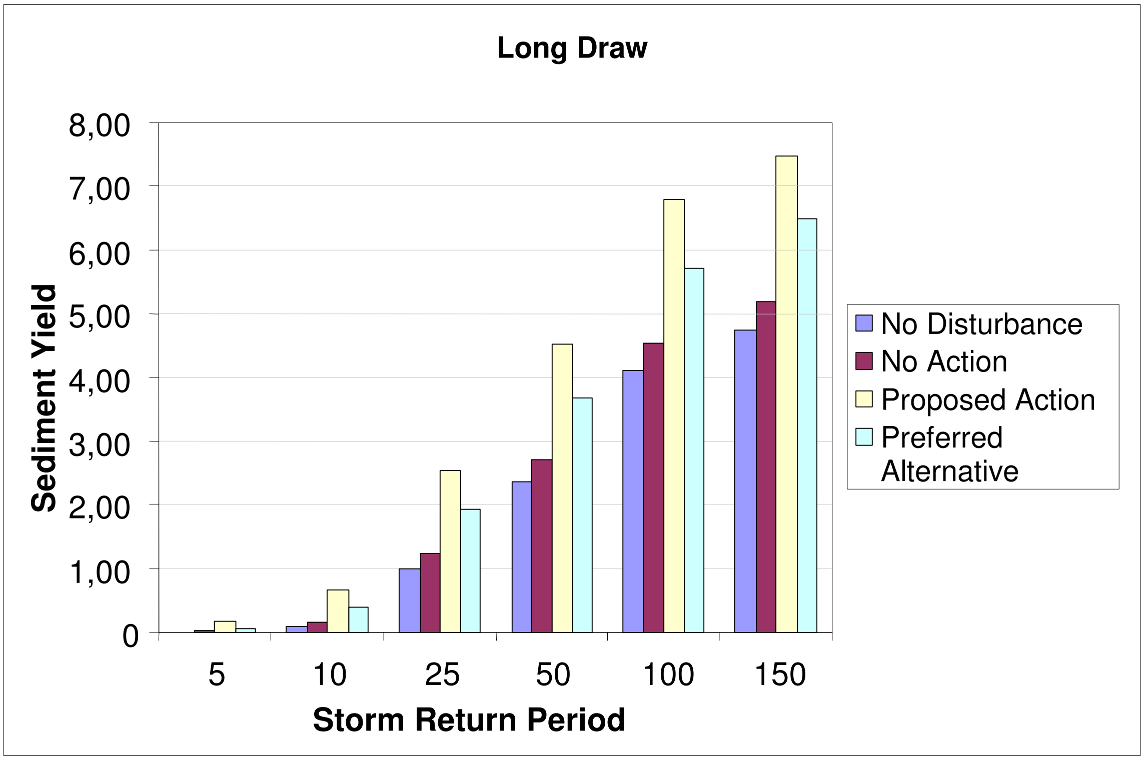


Figure 4 Sediment Transport to Project Boundary in Sand Draw

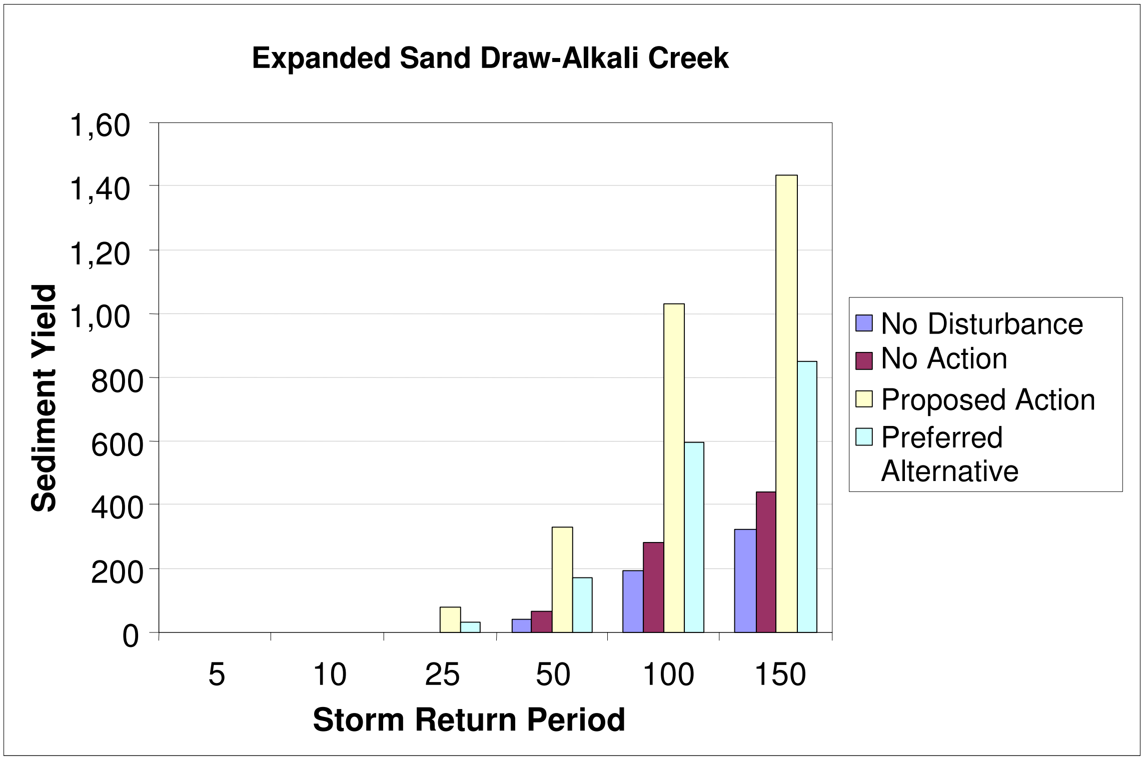


Figure 5 Sediment Transport to Project Boundary in Bull Draw

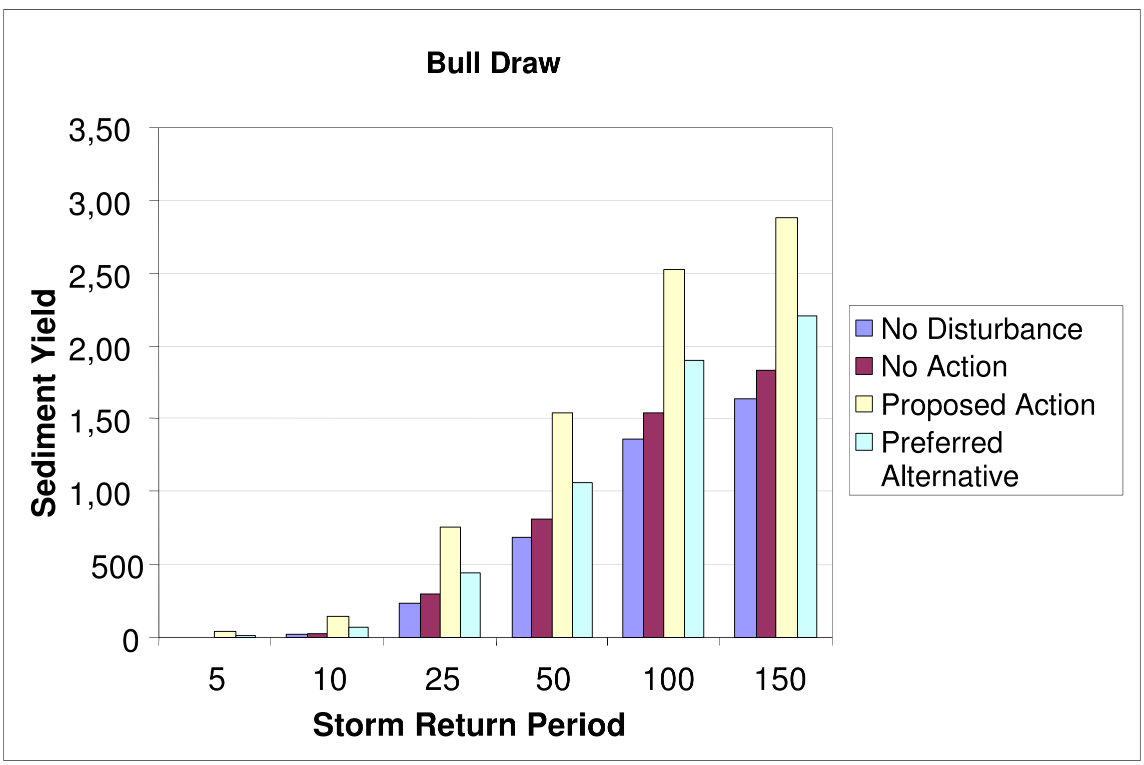


Figure 6 Sediment Transport to Project Boundary in Upper Eighteenmile Canyon

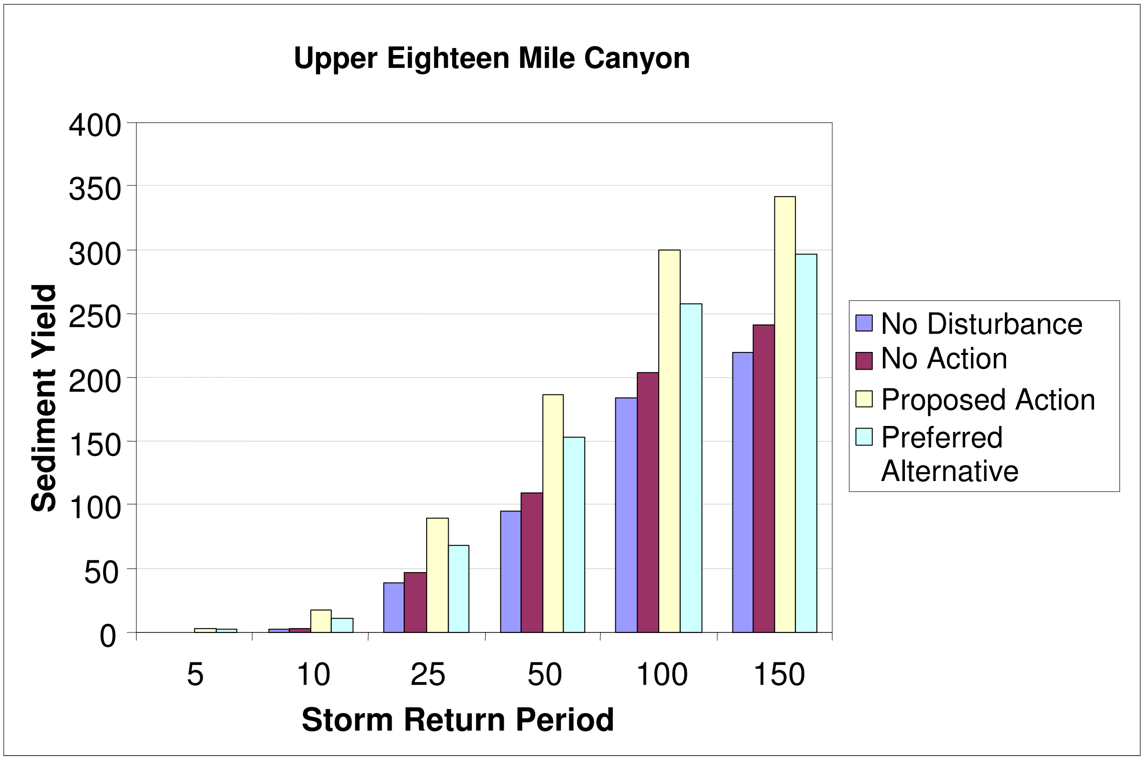


Figure 7 Sediment Transport to Project Boundary in 140401040603 Watershed

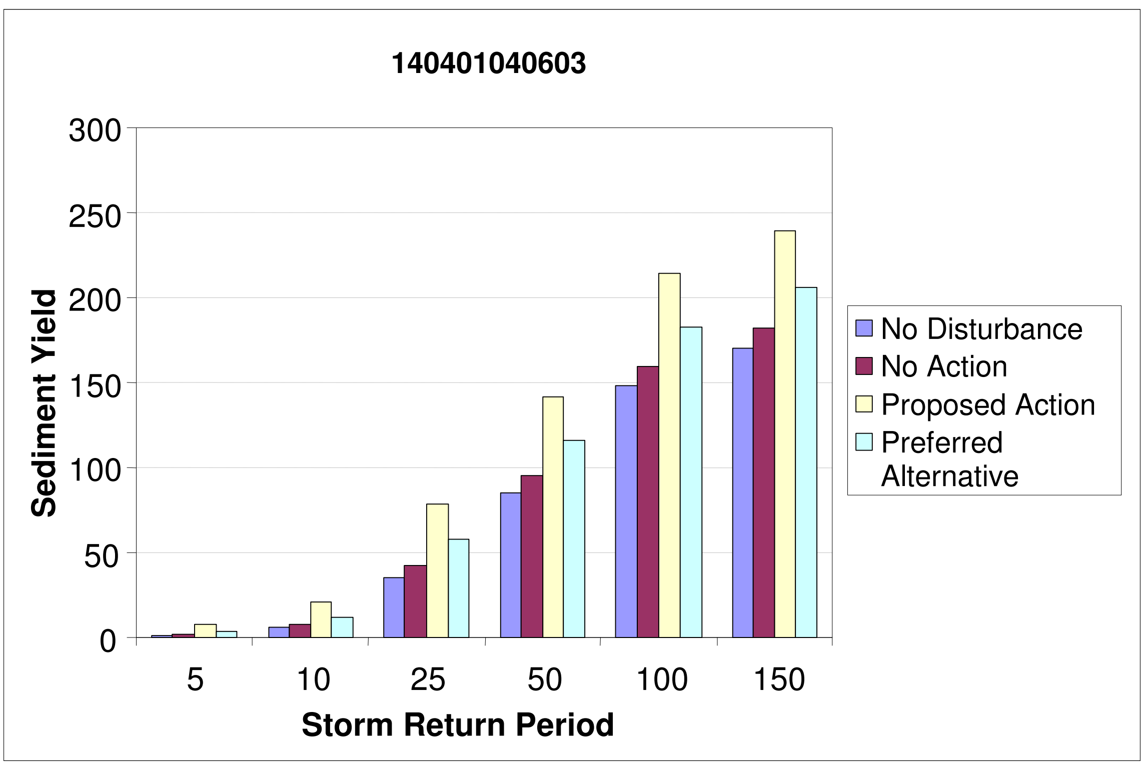


Figure 8 Sediment Transport to Project Boundary in Upper Alkali Creek

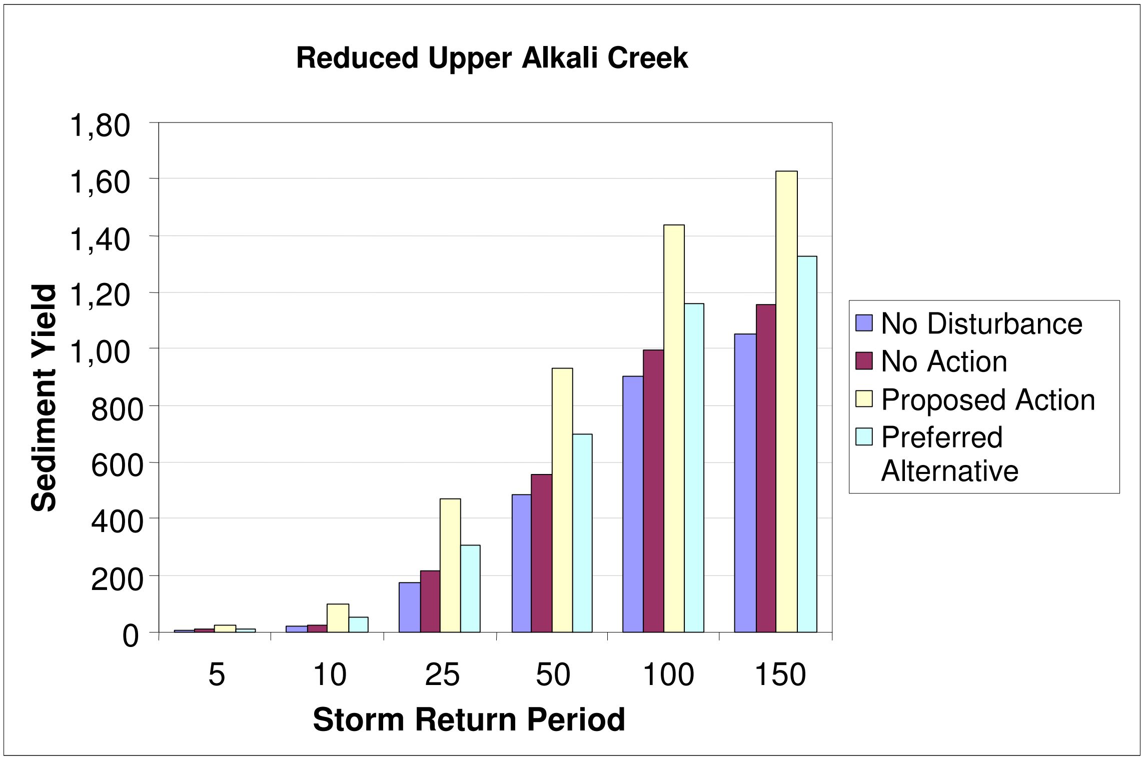
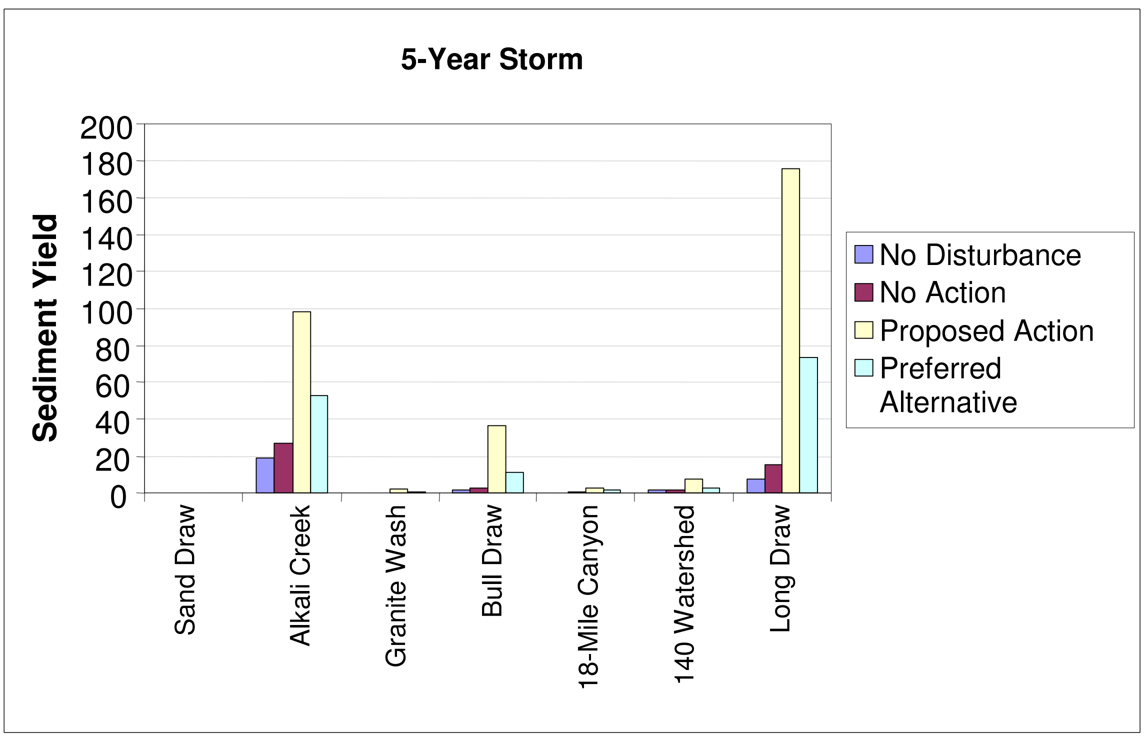


Figure 9 Sediment Transport for 5-Year Storm Event



Sediment yields from all channels reaching the JIDPA boundary were combined; however, large amounts of sediment mobilized inside the JIDPA were re-deposited before leaving the area. Thus, Long Draw shows a much larger sediment yield than Sand Draw. While a large amount of sediment is mobilized in Sand Draw, much of this sediment is re-deposited as tributary drainages come together and before the single drainage leaves the JIDPA. In Long Draw, however, many separate small drainages reach the JIDPA boundary; therefore, considerably less mobilized sediment in the Long Draw Watershed gets deposited while still within the JIDPA. Thus, the modeled volume of sediment at the JIDPA boundary is much larger for Long Draw than for Sand Draw.

All modeling is based on assumptions, and many simplifications are inherent when creating input parameters for KINEROS2. Thus, the actual values of sediment transported should be considered with caution. However, the differences in model-derived sediment transport volumes among the analyzed cases/alternatives and among precipitation events provide an approximate value suitable for comparison. Specific monitoring and sampling in the JIDPA channels would provide more accurate data of environmental conditions, and if conducted these data could be compared with the model results presented herein for verification.

5.2 Salt Loading at Project Boundary

Salinity in all waters leaving the JIDPA was estimated as ranging from approximately 300 to 1,300 mg/L as TDS. Salinity at the project boundary can be estimated from the measured soil saturation extract salinity or electric conductivity. The saturation extract salinity is assumed to be the maximum salinity of water in contact with sediment. Actual salinity may be lower, if the contact time between water and sediment is not long enough to reach equilibrium or if only a portion of the water volume is in contact with the sediment; both conditions are likely during most storm events. Saturation extract salinity has been measured for only six of the roughly 25 identified soil series within the JIDPA and was estimated for the other soil series, so only a rough estimate for the maximum salinity for all watersheds can be provided.

5.3 Salt Loading to Green and Big Sandy Rivers

No salt loading to the Colorado via the Green or Big Sandy Rivers is predicted to occur. KINEROS2 was run to estimate the amount of water leaving the JIDPA through Sand Draw and reaching the Green River for a 150-year storm event. The Sand Draw watershed covers the largest part of the JIDPA, and runoff from a 150-year storm over this watershed was calculated. Runoff from this event was routed along the approximate 32-kilometer length of the Sand Draw and Alkali Creek drainage to the point where Alkali Creek flows into the Green River. No other inflows into Alkali Creek were considered. Under these conditions, all water leaving the JIDPA infiltrates or evaporates along the drainage before it reaches the Green River.

This modeling result is supported by 2005 field observations: snowmelt runoff in Sand Draw was entering the JIDPA from upstream sources at approximately 0.18 cfs; however, no flow was leaving the area (Hart 2005). Water chemistry samples taken from three sampling points indicate low salinity values as TDS (90-150 mg/L) for the snow melt water (Table 13).

Table 13 Water Quality Analysis Sand Draw and Alkali Creek Snow Melt Runoff

	Sand Draw 1	Sand Draw 2	Alkali Draw 1
Boron, diss. (mg/l)	0.02	0.03	0.03
Calcium, diss. (mg/l)	7.3	12.1	15.6
Magnesium, diss. (mg/l)	1.4	1.9	4.4
Potassium, diss. (mg/l)	3.0	3.5	4.4
Sodium, diss. (mg/l)	3.0	3.2	27.4
Acidity as CaCO3 (mg/l)	<2	<2	<2
Alkalinity as CaCO3 (mg/l)	<2	<2	<2
Bicarbonate as CaCO3 (mg/l)	34	46	134
Carbonate as CaCO3 (mg/l)	<2	<2	<2
Hydroxide as CaCO3 (mg/l)	<2	<2	<2
Total Alkalinity (mg/l)	34	46	134
Conductivity (µS/cm)	64	93	247
pH (lab)	7.8	7.8	8.1
Filterable Residue TDS (mg/l)	90	100	150
Non-Filterable Residue TSS (mg/)	56	70	430
Settleable Matter Residue SS (m/L/h)	<0.1	<0.1	<0.1
Turbidity (NTU)	125	136	944

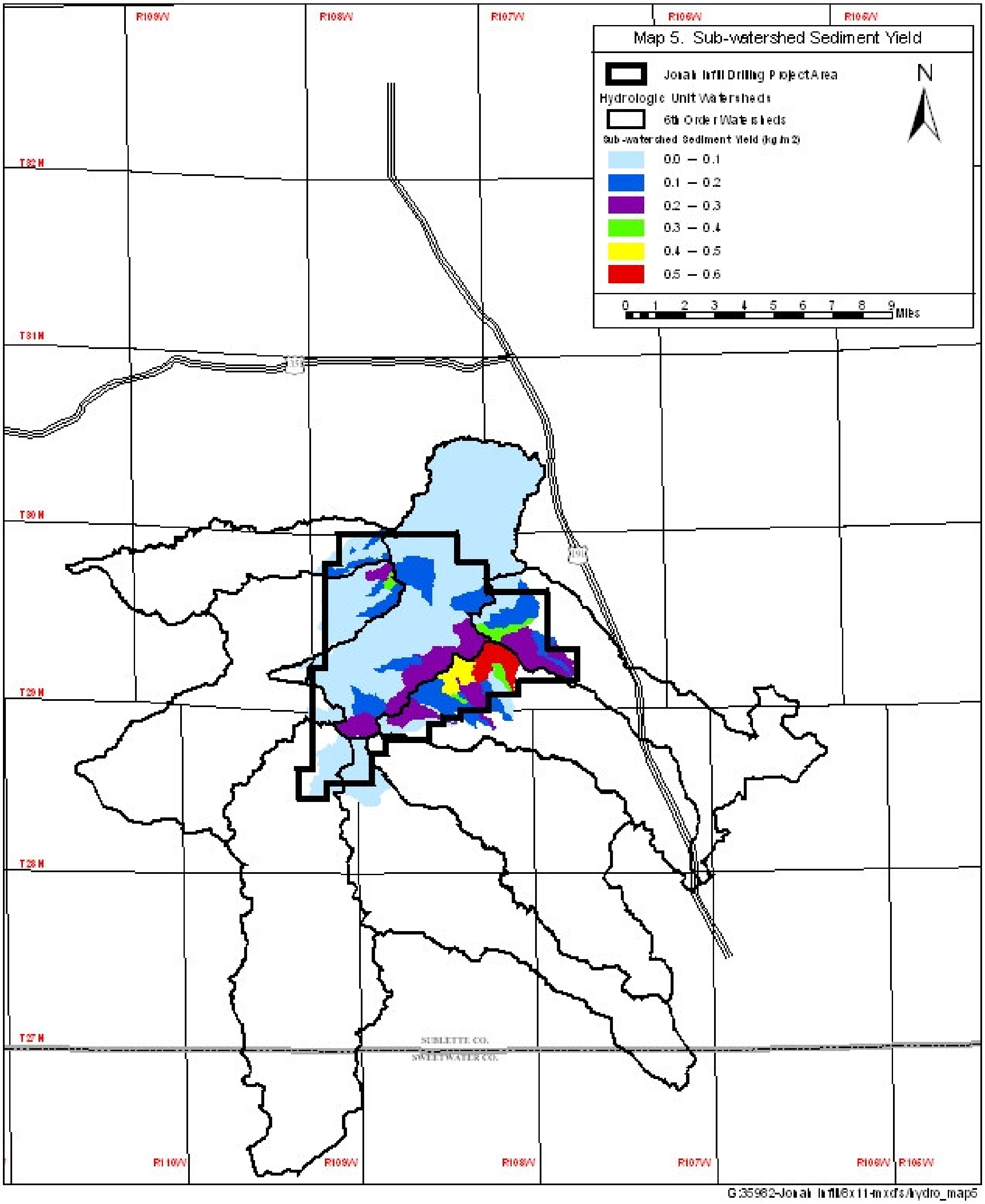
Adapted from Hart (2005).

It can be assumed that none of the other watersheds will create enough flow to reach the Green River either from a 150-year or shorter-duration storm. Water from the JIDPA will only reach the Green River when it mixes with water from other downstream sources, and even then, a large part of the JIDPA runoff water will have infiltrated, while the remainder will be diluted, thus, any salinity transported from the JIDPA would likely be negligible.

5.4 Areas Most Susceptible to Erosion

Erosion potential depends on slope, soil, and vegetation cover. To delineate areas within the JIDPA with the greatest potential for erosion, sub-watersheds were analyzed for their sediment yield under the Proposed Action for a 150-year storm. This analysis provided the worst case scenario with the largest sediment yields for each sub-watershed; however, the ranking of the sub-watersheds across alternatives with respect to erosion potential would not change under any other rainfall scenario. For this analysis, Proposed Action disturbance was distributed over the entire JIDPA.

Areas (sub-watersheds) along the watershed boundaries between Long Draw and Sand Draw, and Long Draw and Bull Draw--draining to the Big Sandy River--have the greatest potential for erosion after disturbance (Map 5). These areas appear to be the most susceptible due to the somewhat steeper gradients found in this area. Map 5 illustrates the potential for erosion in the JIDPA. The areas with the highest sediment yield are the most prone to erosion.



Map 5 Sub-watershed Sediment Yields.

6 CONCLUSIONS

All alternatives increase erosion and sediment transport in and from the JIDPA. Modeled erosion and sediment transport is largest for the Proposed Action and smallest for the no disturbance case. Erosion and sediment transport also increase with rainfall intensity. However, no impacts are expected to occur on the Green and Big Sandy Rivers. There are several reasons for this conclusion:

- The area is dry, and even storm events do not produce large amounts of rainfall.
- The topography of the area is fairly flat, and all ephemeral drainages in the JIDPA have gradual slopes.
- The JIDPA is drained in multiple directions along multiple small channels, without one single major drainage direction.

Thus, only small accumulations of flow occur in the area. Very sandy soils and the presence of playas and catchment structures (livestock watering reservoirs) both in and down channel of the JIDPA drainages also cause water to infiltrate and evaporate rather than flow downstream for small rainfall events. For storms with a precipitation less than a 5-year storm, not enough water flows in channels for any water to leave the JIDPA. Even for larger storms, much of the sediment mobilized is re-deposited in flat areas along the drainages. Nonetheless, given the 40-plus-year life of the project and the identified increase in sediment production resulting from disturbance, multiple repeated runoff events may create an effect on down-channel waterways over time.

The modeling assumed that no measures were taken to prevent erosion and sediment transport. However, Best Management Practices (e.g., revegetation, sediment control structures) are and would continue to be used to prevent erosion and sediment transport; thus, any increase in sediment transport from the JIDPA is likely to be much smaller than that modeled. Areas and sub-watersheds that are most susceptible to erosion, and create the largest amount of sediment have been identified, and these areas are recommended to receive the most aggressive monitoring (e.g., photo-point, vegetation, channel cross section, first flush) and soil erosion control measures/treatments.

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APPENDIX A: KINEROS2 INPUT FILES

Precipitation Input File:

Only a sample input file for 2 year storm is presented here.

```
! Design storm computed from the AGWA database dsgnstrm.dbf using the SCS Methodology with a type II distribution
! Storm generated for the wSan watershed using the design storm for Jonah
! Return Period (frequency) = 2 years, Duration = 24.00 hours.
! ** Return period depth has NOT been reduced for watershed area.
BEGIN RG1
N = 145
      TIME     DEPTH
!     (min)    (mm)
      0      0.00
      10     0.04
      20     0.09
      30     0.14
      40     0.18
      50     0.23
      60     0.27
      70     0.32
      80     0.37
      90     0.42
      100    0.47
      110    0.52
      120    0.57
      130    0.62
      140    0.67
      150    0.72
      160    0.78
      170    0.83
      180    0.89
      190    0.94
      200    1.00
      210    1.05
      220    1.11
      230    1.17
      240    1.23
      250    1.29
      260    1.35
      270    1.42
      280    1.48
      290    1.54
      300    1.61
      310    1.68
      320    1.75
      330    1.82
      340    1.89
      350    1.96
      360    2.03
      370    2.11
      380    2.19
      390    2.27
      400    2.35
      410    2.43
      420    2.51
      430    2.60
      440    2.69
      450    2.78
      460    2.88
      470    2.97
      480    3.07
      490    3.18
      500    3.28
      510    3.40
      520    3.51
```

530	3.63
540	3.75
550	3.88
560	4.02
570	4.16
580	4.31
590	4.47
600	4.64
610	4.81
620	5.01
630	5.21
640	5.44
650	5.69
660	5.97
670	6.29
680	6.66
690	7.12
700	7.73
710	8.69
720	12.70
730	16.71
740	17.67
750	18.28
760	18.74
770	19.11
780	19.43
790	19.71
800	19.96
810	20.19
820	20.39
830	20.59
840	20.76
850	20.93
860	21.09
870	21.24
880	21.38
890	21.52
900	21.65
910	21.77
920	21.89
930	22.00
940	22.12
950	22.22
960	22.33
970	22.43
980	22.52
990	22.62
1000	22.71
1010	22.80
1020	22.89
1030	22.97
1040	23.05
1050	23.13
1060	23.21
1070	23.29
1080	23.37
1090	23.44
1100	23.51
1110	23.58
1120	23.65
1130	23.72
1140	23.79
1150	23.86
1160	23.92
1170	23.98
1180	24.05
1190	24.11
1200	24.17
1210	24.23

```
    1220  24.29
    1230  24.35
    1240  24.40
    1250  24.46
    1260  24.51
    1270  24.57
    1280  24.62
    1290  24.68
    1300  24.73
    1310  24.78
    1320  24.83
    1330  24.88
    1340  24.93
    1350  24.98
    1360  25.03
    1370  25.08
    1380  25.13
    1390  25.17
    1400  25.22
    1410  25.26
    1420  25.31
    1430  25.36
    1440  25.40
SA = 0.2
END
```

Parameter Input File Sand Draw/No Action:

Only the input file for the No Action Alternative for Sand Draw is presented here

```
! File Info
!   Watershed:          wSan
!   Land Cover:         Noactionlc
!   Soils:              Jonah Soils
!   Number of Channels:  25
!   Number of Planes:    63
!   Contrib Source Area: 575 Acres
!   DEM Grid Size:       8.94594 m
!   Total Drainage Area: 22997 Acres (9307 ha)
!   AGWA Version:        ta b
!   Creation date/time:  05/17/2005 10:12
! End of File Info

BEGIN GLOBAL
  CLEN = 10, UNITS = METRIC
  DIAMS = 0.25, 0.033, 0.004 ! mm
  DENSITY = 2.65, 2.65, 2.65 ! g/cc
  TEMP = 33 !deg C
  NELE = 88
END GLOBAL

BEGIN PLANE
  ID = 71, LEN = 582.6, AREA = 2476102.2
  SL = 0.031, MAN = 0.055, X = 611248.7, Y = 4706550.5
  CV = 1.43, PRINT = 1
  KS = 16.59, G = 143.59, DIST = 0.37, POR = 0.449, ROCK = 0.15
  FR = 0.60, 0.24, 0.16, SPLASH = 104.21, COH = 0.006, SMAX = 0.90
  INTER = 2.97, CANOPY = 0.2477, PAVE = 0.05
END PLANE

BEGIN PLANE
  ID = 72, LEN = 261.8, AREA = 1099471.0
  SL = 0.061, MAN = 0.050, X = 610023.6, Y = 4705494.5
  CV = 1.15, PRINT = 1
  KS = 20.11, G = 171.66, DIST = 0.39, POR = 0.439, ROCK = 0.12
  FR = 0.60, 0.20, 0.20, SPLASH = 96.09, COH = 0.006, SMAX = 0.88
```

```
 INTER = 2.67, CANOPY = 0.2245, PAVE = 0.02
END PLANE

BEGIN PLANE
 ID = 73, LEN = 584.5, AREA = 2464401.8
 SL = 0.029, MAN = 0.049, X = 609228.8, Y = 4705873.5
 CV = 1.11, PRINT = 1
 KS = 13.48, G = 193.87, DIST = 0.40, POR = 0.419, ROCK = 0.12
 FR = 0.63, 0.16, 0.21, SPLASH = 84.30, COH = 0.005, SMAX = 0.86
 INTER = 2.61, CANOPY = 0.2201, PAVE = 0.00
END PLANE

BEGIN CHANNEL
 ID = 74, PRINT = 1
 LAT =  72 73
 UP =  71
 LEN = 2890.51, SLOPE = 0.0060, X = 609496.853, Y = 4705358.142
 WIDTH = 9.50, 13.03, DEPTH = 0.47, 0.54
 MAN = 0.035, SS1 = 1.00, SS2 = 1.00
 WOOL = Yes
 CV = 0.00, KSAT = 210, G = 101
 DIST = 0.5450, POR = 0.4400, ROCK = 0.00
 FR = 0.9000, 0.0500, 0.0500, SP = 63.00, COH = 0.0050
END CHANNEL

BEGIN PLANE
 ID = 81, LEN = 586.3, AREA = 2346437.6
 SL = 0.048, MAN = 0.049, X = 609739.7, Y = 4704515.5
 CV = 1.05, PRINT = 1
 KS = 12.23, G = 200.20, DIST = 0.37, POR = 0.430, ROCK = 0.08
 FR = 0.58, 0.19, 0.23, SPLASH = 92.54, COH = 0.006, SMAX = 0.87
 INTER = 2.61, CANOPY = 0.2201, PAVE = 0.00
END PLANE

BEGIN PLANE
 ID = 82, LEN = 51.0, AREA = 13969.7
 SL = 0.055, MAN = 0.049, X = 608509.9, Y = 4704652.5
 CV = 1.10, PRINT = 1
 KS = 13.70, G = 211.02, DIST = 0.39, POR = 0.419, ROCK = 0.09
 FR = 0.61, 0.16, 0.23, SPLASH = 89.37, COH = 0.005, SMAX = 0.86
 INTER = 2.58, CANOPY = 0.2178, PAVE = 0.00
END PLANE

BEGIN PLANE
 ID = 83, LEN = 67.1, AREA = 34530.5
 SL = 0.035, MAN = 0.049, X = 608460.7, Y = 4704491.0
 CV = 1.10, PRINT = 1
 KS = 13.73, G = 211.02, DIST = 0.39, POR = 0.419, ROCK = 0.09
 FR = 0.61, 0.16, 0.23, SPLASH = 89.37, COH = 0.005, SMAX = 0.86
 INTER = 2.61, CANOPY = 0.2201, PAVE = 0.00
END PLANE

BEGIN CHANNEL
 ID = 84, PRINT = 1
 LAT =  82 83
 UP =  81
 LEN = 210.66, SLOPE = 0.0086, X = 608467.596, Y = 4704605.167
 WIDTH = 9.32, 9.39, DEPTH = 0.47, 0.47
 MAN = 0.035, SS1 = 1.00, SS2 = 1.00
 WOOL = Yes
 CV = 0.00, KSAT = 210, G = 101
 DIST = 0.5450, POR = 0.4400, ROCK = 0.00
 FR = 0.9000, 0.0500, 0.0500, SP = 63.00, COH = 0.0050
END CHANNEL

BEGIN PLANE
 ID = 192, LEN = 189.6, AREA = 320672.4
 SL = 0.018, MAN = 0.049, X = 608101.3, Y = 4704823.5
 CV = 1.23, PRINT = 1
```

```
  KS = 20.53, G = 168.15, DIST = 0.43, POR = 0.429, ROCK = 0.24
  FR = 0.67, 0.15, 0.18, SPLASH = 68.83, COH = 0.004, SMAX = 0.88
  INTER = 2.58, CANOPY = 0.2178, PAVE = 0.00
END PLANE

BEGIN PLANE
  ID = 193, LEN = 228.1, AREA = 323424.3
  SL = 0.034, MAN = 0.049, X = 608140.9, Y = 4704296.0
  CV = 0.90, PRINT = 1
  KS = 13.50, G = 180.69, DIST = 0.35, POR = 0.432, ROCK = 0.10
  FR = 0.56, 0.22, 0.22, SPLASH = 99.23, COH = 0.006, SMAX = 0.88
  INTER = 2.58, CANOPY = 0.2178, PAVE = 0.00
END PLANE

BEGIN CHANNEL
  ID = 194, PRINT = 1
  LAT =  192 193
  UP =  74 84
  LEN = 992.34, SLOPE = 0.0053, X = 607926.695, Y = 4704492.900
  WIDTH = 14.66, 15.05, DEPTH = 0.57, 0.58
  MAN = 0.035, SS1 = 1.00, SS2 = 1.00
  WOOL = Yes
  CV = 0.00, KSAT = 210, G = 101
  DIST = 0.5450, POR = 0.4400, ROCK = 0.00
  FR = 0.9000, 0.0500, 0.0500, SP = 63.00, COH = 0.0050
END CHANNEL

BEGIN PLANE
  ID = 11, LEN = 606.3, AREA = 4098891.7
  SL = 0.044, MAN = 0.055, X = 610615.6, Y = 4712615.0
  CV = 1.45, PRINT = 1
  KS = 16.90, G = 140.47, DIST = 0.37, POR = 0.450, ROCK = 0.16
  FR = 0.60, 0.24, 0.16, SPLASH = 104.79, COH = 0.006, SMAX = 0.91
  INTER = 3.00, CANOPY = 0.25, PAVE = 0.05
END PLANE

BEGIN PLANE
  ID = 12, LEN = 381.1, AREA = 1222654.8
  SL = 0.040, MAN = 0.055, X = 610875.8, Y = 4711062.0
  CV = 1.45, PRINT = 1
  KS = 16.90, G = 140.47, DIST = 0.37, POR = 0.450, ROCK = 0.16
  FR = 0.60, 0.24, 0.16, SPLASH = 104.79, COH = 0.006, SMAX = 0.91
  INTER = 3.00, CANOPY = 0.25, PAVE = 0.05
END PLANE

BEGIN PLANE
  ID = 13, LEN = 691.5, AREA = 2804714.8
  SL = 0.034, MAN = 0.055, X = 609799.6, Y = 4711491.5
  CV = 1.45, PRINT = 1
  KS = 16.90, G = 140.47, DIST = 0.37, POR = 0.450, ROCK = 0.16
  FR = 0.60, 0.24, 0.16, SPLASH = 104.79, COH = 0.006, SMAX = 0.91
  INTER = 3.00, CANOPY = 0.25, PAVE = 0.05
END PLANE

BEGIN CHANNEL
  ID = 14, PRINT = 1
  LAT =  12 13
  UP =  11
  LEN = 2530.13, SLOPE = 0.0060, X = 610401.384, Y = 4710914.995
  WIDTH = 11.36, 14.47, DEPTH = 0.51, 0.57
  MAN = 0.035, SS1 = 1.00, SS2 = 1.00
  WOOL = Yes
  CV = 0.00, KSAT = 210, G = 101
  DIST = 0.5450, POR = 0.4400, ROCK = 0.00
  FR = 0.9000, 0.0500, 0.0500, SP = 63.00, COH = 0.0050
END CHANNEL

BEGIN PLANE
  ID = 21, LEN = 734.6, AREA = 2493322.7
```

```
  SL = 0.031, MAN = 0.055, X = 612700.9, Y = 4711388.5
  CV = 1.45, PRINT = 1
  KS = 16.90, G = 140.47, DIST = 0.37, POR = 0.450, ROCK = 0.16
  FR = 0.60, 0.24, 0.16, SPLASH = 104.79, COH = 0.006, SMAX = 0.91
  INTER = 3.00, CANOPY = 0.25, PAVE = 0.05
END PLANE

BEGIN PLANE
  ID = 22, LEN = 389.2, AREA = 1476337.3
  SL = 0.037, MAN = 0.055, X = 611755.2, Y = 4709817.0
  CV = 1.45, PRINT = 1
  KS = 16.90, G = 140.47, DIST = 0.37, POR = 0.450, ROCK = 0.16
  FR = 0.60, 0.24, 0.16, SPLASH = 104.79, COH = 0.006, SMAX = 0.91
  INTER = 3.00, CANOPY = 0.25, PAVE = 0.05
END PLANE

BEGIN PLANE
  ID = 23, LEN = 510.1, AREA = 1591225.4
  SL = 0.024, MAN = 0.055, X = 611453.3, Y = 4710549.5
  CV = 1.45, PRINT = 1
  KS = 16.90, G = 140.47, DIST = 0.37, POR = 0.450, ROCK = 0.16
  FR = 0.60, 0.24, 0.16, SPLASH = 104.79, COH = 0.006, SMAX = 0.91
  INTER = 3.00, CANOPY = 0.25, PAVE = 0.05
END PLANE

BEGIN CHANNEL
  ID = 24, PRINT = 1
  LAT =  22 23
  UP =  21
  LEN = 2676.92, SLOPE = 0.0048, X = 611469.946, Y = 4709902.664
  WIDTH = 9.52, 12.66, DEPTH = 0.47, 0.53
  MAN = 0.035, SS1 = 1.00, SS2 = 1.00
  WOOL = Yes
  CV = 0.00, KSAT = 210, G = 101
  DIST = 0.5450, POR = 0.4400, ROCK = 0.00
  FR = 0.9000, 0.0500, 0.0500, SP = 63.00, COH = 0.0050
END CHANNEL

BEGIN PLANE
  ID = 142, LEN = 144.8, AREA = 125612.0
  SL = 0.023, MAN = 0.055, X = 610017.3, Y = 4709732.0
  CV = 1.45, PRINT = 1
  KS = 16.90, G = 140.47, DIST = 0.37, POR = 0.450, ROCK = 0.16
  FR = 0.60, 0.24, 0.16, SPLASH = 104.79, COH = 0.006, SMAX = 0.91
  INTER = 3.00, CANOPY = 0.25, PAVE = 0.05
END PLANE

BEGIN PLANE
  ID = 143, LEN = 284.0, AREA = 567544.3
  SL = 0.040, MAN = 0.055, X = 610388.2, Y = 4709359.0
  CV = 1.45, PRINT = 1
  KS = 16.90, G = 140.47, DIST = 0.37, POR = 0.450, ROCK = 0.16
  FR = 0.60, 0.24, 0.16, SPLASH = 104.79, COH = 0.006, SMAX = 0.91
  INTER = 3.00, CANOPY = 0.25, PAVE = 0.05
END PLANE

BEGIN CHANNEL
  ID = 144, PRINT = 1
  LAT =  142 143
  UP =  14 24
  LEN = 847.29, SLOPE = 0.0032, X = 610034.004, Y = 4709591.911
  WIDTH = 17.38, 17.68, DEPTH = 0.61, 0.62
  MAN = 0.035, SS1 = 1.00, SS2 = 1.00
  WOOL = Yes
  CV = 0.00, KSAT = 210, G = 101
  DIST = 0.5450, POR = 0.4400, ROCK = 0.00
  FR = 0.9000, 0.0500, 0.0500, SP = 63.00, COH = 0.0050
END CHANNEL
```

```
BEGIN PLANE
  ID = 31, LEN = 670.2, AREA = 2327293.2
  SL = 0.051, MAN = 0.055, X = 608118.6, Y = 4712034.0
  CV = 1.45, PRINT = 1
  KS = 16.90, G = 140.47, DIST = 0.37, POR = 0.450, ROCK = 0.16
  FR = 0.60, 0.24, 0.16, SPLASH = 104.79, COH = 0.006, SMAX = 0.91
  INTER = 3.00, CANOPY = 0.25, PAVE = 0.05
END PLANE

BEGIN PLANE
  ID = 32, LEN = 297.3, AREA = 955804.1
  SL = 0.036, MAN = 0.055, X = 609463.4, Y = 4710502.0
  CV = 1.45, PRINT = 1
  KS = 16.90, G = 140.47, DIST = 0.37, POR = 0.450, ROCK = 0.16
  FR = 0.60, 0.24, 0.16, SPLASH = 104.79, COH = 0.006, SMAX = 0.91
  INTER = 3.00, CANOPY = 0.25, PAVE = 0.05
END PLANE

BEGIN PLANE
  ID = 33, LEN = 525.0, AREA = 2162363.1
  SL = 0.037, MAN = 0.055, X = 608426.0, Y = 4710569.5
  CV = 1.45, PRINT = 1
  KS = 16.90, G = 140.47, DIST = 0.37, POR = 0.450, ROCK = 0.16
  FR = 0.60, 0.24, 0.16, SPLASH = 104.79, COH = 0.006, SMAX = 0.91
  INTER = 3.00, CANOPY = 0.25, PAVE = 0.05
END PLANE

BEGIN CHANNEL
  ID = 34, PRINT = 1
  LAT =  32 33
  UP =  31
  LEN = 2476.57, SLOPE = 0.0064, X = 609290.928, Y = 4710376.587
  WIDTH = 9.29, 12.56, DEPTH = 0.47, 0.53
  MAN = 0.035, SS1 = 1.00, SS2 = 1.00
  WOOL = Yes
  CV = 0.00, KSAT = 210, G = 101
  DIST = 0.5450, POR = 0.4400, ROCK = 0.00
  FR = 0.9000, 0.0500, 0.0500, SP = 63.00, COH = 0.0050
END CHANNEL

BEGIN PLANE
  ID = 152, LEN = 387.0, AREA = 909543.5
  SL = 0.036, MAN = 0.055, X = 609668.3, Y = 4708726.0
  CV = 1.45, PRINT = 1
  KS = 16.90, G = 140.47, DIST = 0.37, POR = 0.450, ROCK = 0.16
  FR = 0.60, 0.24, 0.16, SPLASH = 104.79, COH = 0.006, SMAX = 0.91
  INTER = 3.00, CANOPY = 0.25, PAVE = 0.05
END PLANE

BEGIN PLANE
  ID = 153, LEN = 698.9, AREA = 3167789.8
  SL = 0.028, MAN = 0.055, X = 608397.6, Y = 4709336.5
  CV = 1.45, PRINT = 1
  KS = 16.90, G = 140.47, DIST = 0.37, POR = 0.450, ROCK = 0.16
  FR = 0.60, 0.24, 0.16, SPLASH = 104.79, COH = 0.006, SMAX = 0.91
  INTER = 3.00, CANOPY = 0.25, PAVE = 0.05
END PLANE

BEGIN CHANNEL
  ID = 154, PRINT = 1
  LAT =  152 153
  UP =  34 144
  LEN = 2149.99, SLOPE = 0.0035, X = 609185.295, Y = 4708693.185
  WIDTH = 19.79, 21.13, DEPTH = 0.65, 0.67
  MAN = 0.035, SS1 = 1.00, SS2 = 1.00
  WOOL = Yes
  CV = 0.00, KSAT = 210, G = 101
  DIST = 0.5450, POR = 0.4400, ROCK = 0.00
  FR = 0.9000, 0.0500, 0.0500, SP = 63.00, COH = 0.0050
```

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END CHANNEL

BEGIN PLANE
  ID = 41, LEN = 563.1, AREA = 2409884.5
  SL = 0.026, MAN = 0.055, X = 611611.4, Y = 4708277.5
  CV = 1.45, PRINT = 1
  KS = 16.90, G = 140.47, DIST = 0.37, POR = 0.450, ROCK = 0.16
  FR = 0.60, 0.24, 0.16, SPLASH = 104.79, COH = 0.006, SMAX = 0.91
  INTER = 3.00, CANOPY = 0.25, PAVE = 0.05
END PLANE

BEGIN PLANE
  ID = 42, LEN = 328.1, AREA = 1028592.1
  SL = 0.035, MAN = 0.055, X = 610085.6, Y = 4707546.5
  CV = 1.45, PRINT = 1
  KS = 16.90, G = 140.47, DIST = 0.37, POR = 0.450, ROCK = 0.16
  FR = 0.60, 0.24, 0.16, SPLASH = 104.79, COH = 0.006, SMAX = 0.91
  INTER = 3.00, CANOPY = 0.25, PAVE = 0.05
END PLANE

BEGIN PLANE
  ID = 43, LEN = 501.2, AREA = 1564747.8
  SL = 0.033, MAN = 0.055, X = 610403.3, Y = 4708357.0
  CV = 1.45, PRINT = 1
  KS = 16.90, G = 140.47, DIST = 0.37, POR = 0.450, ROCK = 0.16
  FR = 0.60, 0.24, 0.16, SPLASH = 104.79, COH = 0.006, SMAX = 0.91
  INTER = 3.00, CANOPY = 0.25, PAVE = 0.05
END PLANE

BEGIN CHANNEL
  ID = 44, PRINT = 1
  LAT =  42 43
  UP =  41
  LEN = 2103.02, SLOPE = 0.0051, X = 609936.544, Y = 4707873.760
  WIDTH = 9.41, 12.19, DEPTH = 0.47, 0.53
  MAN = 0.035, SS1 = 1.00, SS2 = 1.00
  WOOL = Yes
  CV = 0.00, KSAT = 210, G = 101
  DIST = 0.5450, POR = 0.4400, ROCK = 0.00
  FR = 0.9000, 0.0500, 0.0500, SP = 63.00, COH = 0.0050
END CHANNEL

BEGIN PLANE
  ID = 162, LEN = 165.5, AREA = 167427.9
  SL = 0.020, MAN = 0.049, X = 608621.5, Y = 4707910.5
  CV = 1.17, PRINT = 1
  KS = 12.31, G = 195.50, DIST = 0.38, POR = 0.428, ROCK = 0.08
  FR = 0.60, 0.18, 0.22, SPLASH = 92.90, COH = 0.006, SMAX = 0.87
  INTER = 2.61, CANOPY = 0.2201, PAVE = 0.01
END PLANE

BEGIN PLANE
  ID = 163, LEN = 275.0, AREA = 434481.5
  SL = 0.042, MAN = 0.053, X = 608973.1, Y = 4707537.0
  CV = 1.36, PRINT = 1
  KS = 17.62, G = 147.73, DIST = 0.37, POR = 0.449, ROCK = 0.14
  FR = 0.59, 0.24, 0.17, SPLASH = 102.59, COH = 0.006, SMAX = 0.90
  INTER = 2.88, CANOPY = 0.2408, PAVE = 0.04
END PLANE

BEGIN CHANNEL
  ID = 164, PRINT = 1
  LAT =  162 163
  UP =  154 44
  LEN = 845.34, SLOPE = 0.0049, X = 608667.152, Y = 4707743.863
  WIDTH = 22.58, 22.74, DEPTH = 0.69, 0.69
  MAN = 0.035, SS1 = 1.00, SS2 = 1.00
  WOOL = Yes
  CV = 0.00, KSAT = 210, G = 101
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```
  DIST = 0.5450, POR = 0.4400, ROCK = 0.00
  FR = 0.9000, 0.0500, 0.0500, SP = 63.00, COH = 0.0050
END CHANNEL

BEGIN PLANE
  ID = 51, LEN = 597.1, AREA = 2400419.4
  SL = 0.039, MAN = 0.055, X = 607041.5, Y = 4709230.0
  CV = 1.45, PRINT = 1
  KS = 16.90, G = 140.47, DIST = 0.37, POR = 0.450, ROCK = 0.16
  FR = 0.60, 0.24, 0.16, SPLASH = 104.79, COH = 0.006, SMAX = 0.91
  INTER = 3.00, CANOPY = 0.25, PAVE = 0.05
END PLANE

BEGIN PLANE
  ID = 52, LEN = 260.5, AREA = 360680.8
  SL = 0.025, MAN = 0.051, X = 608183.3, Y = 4708147.0
  CV = 1.23, PRINT = 1
  KS = 13.51, G = 184.30, DIST = 0.38, POR = 0.433, ROCK = 0.10
  FR = 0.59, 0.20, 0.21, SPLASH = 96.90, COH = 0.006, SMAX = 0.88
  INTER = 2.73, CANOPY = 0.2293, PAVE = 0.02
END PLANE

BEGIN PLANE
  ID = 53, LEN = 192.3, AREA = 769129.1
  SL = 0.031, MAN = 0.053, X = 607057.3, Y = 4708287.0
  CV = 1.33, PRINT = 1
  KS = 15.11, G = 164.97, DIST = 0.38, POR = 0.439, ROCK = 0.12
  FR = 0.61, 0.21, 0.18, SPLASH = 99.60, COH = 0.006, SMAX = 0.89
  INTER = 2.85, CANOPY = 0.2385, PAVE = 0.03
END PLANE

BEGIN CHANNEL
  ID = 54, PRINT = 1
  LAT =  52 53
  UP =  51
  LEN = 974.82, SLOPE = 0.0052, X = 608071.722, Y = 4707949.219
  WIDTH = 9.40, 10.78, DEPTH = 0.47, 0.50
  MAN = 0.035, SS1 = 1.00, SS2 = 1.00
  WOOL = Yes
  CV = 0.00, KSAT = 210, G = 101
  DIST = 0.5450, POR = 0.4400, ROCK = 0.00
  FR = 0.9000, 0.0500, 0.0500, SP = 63.00, COH = 0.0050
END CHANNEL

BEGIN PLANE
  ID = 172, LEN = 217.9, AREA = 400941.3
  SL = 0.019, MAN = 0.049, X = 607797.4, Y = 4707438.0
  CV = 1.09, PRINT = 1
  KS = 10.94, G = 210.57, DIST = 0.38, POR = 0.422, ROCK = 0.06
  FR = 0.60, 0.17, 0.23, SPLASH = 89.56, COH = 0.006, SMAX = 0.86
  INTER = 2.58, CANOPY = 0.2178, PAVE = 0.00
END PLANE

BEGIN PLANE
  ID = 173, LEN = 285.5, AREA = 566052.6
  SL = 0.037, MAN = 0.048, X = 608257.9, Y = 4707125.5
  CV = 1.08, PRINT = 1
  KS = 13.77, G = 201.12, DIST = 0.38, POR = 0.427, ROCK = 0.07
  FR = 0.59, 0.18, 0.23, SPLASH = 91.02, COH = 0.006, SMAX = 0.87
  INTER = 2.55, CANOPY = 0.2155, PAVE = 0.00
END PLANE

BEGIN CHANNEL
  ID = 174, PRINT = 1
  LAT =  172 173
  UP =  54 164
  LEN = 1223.69, SLOPE = 0.0032, X = 607941.251, Y = 4707210.729
  WIDTH = 23.65, 23.89, DEPTH = 0.70, 0.70
  MAN = 0.035, SS1 = 1.00, SS2 = 1.00
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```
  WOOL = Yes
  CV = 0.00, KSAT = 210, G = 101
  DIST = 0.5450, POR = 0.4400, ROCK = 0.00
  FR = 0.9000, 0.0500, 0.0500, SP = 63.00, COH = 0.0050
END CHANNEL

BEGIN PLANE
  ID = 61, LEN = 600.2, AREA = 2333206.0
  SL = 0.034, MAN = 0.049, X = 605869.6, Y = 4707417.0
  CV = 1.00, PRINT = 1
  KS = 9.84, G = 215.74, DIST = 0.37, POR = 0.425, ROCK = 0.07
  FR = 0.57, 0.18, 0.25, SPLASH = 94.41, COH = 0.006, SMAX = 0.86
  INTER = 2.61, CANOPY = 0.2201, PAVE = 0.00
END PLANE

BEGIN PLANE
  ID = 62, LEN = 120.8, AREA = 134880.7
  SL = 0.022, MAN = 0.048, X = 607199.8, Y = 4706923.0
  CV = 1.09, PRINT = 1
  KS = 11.07, G = 210.96, DIST = 0.38, POR = 0.421, ROCK = 0.06
  FR = 0.60, 0.17, 0.23, SPLASH = 89.55, COH = 0.006, SMAX = 0.86
  INTER = 2.55, CANOPY = 0.2155, PAVE = 0.00
END PLANE

BEGIN PLANE
  ID = 63, LEN = 299.7, AREA = 1460580.5
  SL = 0.032, MAN = 0.051, X = 606591.2, Y = 4707964.0
  CV = 1.12, PRINT = 1
  KS = 10.75, G = 203.58, DIST = 0.36, POR = 0.430, ROCK = 0.09
  FR = 0.57, 0.20, 0.23, SPLASH = 96.90, COH = 0.006, SMAX = 0.86
  INTER = 2.70, CANOPY = 0.227, PAVE = 0.02
END PLANE

BEGIN CHANNEL
  ID = 64, PRINT = 1
  LAT =  62 63
  UP =  61
  LEN = 518.11, SLOPE = 0.0059, X = 607433.920, Y = 4706983.024
  WIDTH = 9.30, 11.19, DEPTH = 0.47, 0.51
  MAN = 0.035, SS1 = 1.00, SS2 = 1.00
  WOOL = Yes
  CV = 0.00, KSAT = 210, G = 101
  DIST = 0.5450, POR = 0.4400, ROCK = 0.00
  FR = 0.9000, 0.0500, 0.0500, SP = 63.00, COH = 0.0050
END CHANNEL

BEGIN PLANE
  ID = 182, LEN = 439.5, AREA = 2539341.3
  SL = 0.030, MAN = 0.051, X = 608390.8, Y = 4706199.5
  CV = 1.18, PRINT = 1
  KS = 15.43, G = 182.86, DIST = 0.39, POR = 0.431, ROCK = 0.12
  FR = 0.61, 0.18, 0.21, SPLASH = 89.79, COH = 0.006, SMAX = 0.88
  INTER = 2.70, CANOPY = 0.227, PAVE = 0.01
END PLANE

BEGIN PLANE
  ID = 183, LEN = 860.9, AREA = 3723140.7
  SL = 0.032, MAN = 0.049, X = 606672.9, Y = 4705924.5
  CV = 0.91, PRINT = 1
  KS = 8.04, G = 227.21, DIST = 0.33, POR = 0.432, ROCK = 0.08
  FR = 0.52, 0.21, 0.27, SPLASH = 95.98, COH = 0.006, SMAX = 0.85
  INTER = 2.58, CANOPY = 0.2178, PAVE = 0.00
END PLANE

BEGIN CHANNEL
  ID = 184, PRINT = 1
  LAT =  182 183
  UP =  64 174
  LEN = 3046.35, SLOPE = 0.0039, X = 607588.378, Y = 4705547.990
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```
  WIDTH = 24.82, 26.18, DEPTH = 0.72, 0.73
  MAN = 0.035, SS1 = 1.00, SS2 = 1.00
  WOOL = Yes
  CV = 0.00, KSAT = 210, G = 101
  DIST = 0.5450, POR = 0.4400, ROCK = 0.00
  FR = 0.9000, 0.0500, 0.0500, SP = 63.00, COH = 0.0050
END CHANNEL

BEGIN PLANE
  ID = 202, LEN = 493.2, AREA = 3086306.0
  SL = 0.015, MAN = 0.049, X = 606640.7, Y = 4703529.0
  CV = 1.13, PRINT = 1
  KS = 14.45, G = 201.29, DIST = 0.39, POR = 0.438, ROCK = 0.17
  FR = 0.59, 0.18, 0.23, SPLASH = 80.80, COH = 0.005, SMAX = 0.88
  INTER = 2.58, CANOPY = 0.2178, PAVE = 0.00
END PLANE

BEGIN PLANE
  ID = 203, LEN = 713.7, AREA = 3409428.9
  SL = 0.033, MAN = 0.049, X = 607923.6, Y = 4703111.0
  CV = 0.86, PRINT = 1
  KS = 13.22, G = 162.89, DIST = 0.34, POR = 0.446, ROCK = 0.13
  FR = 0.53, 0.26, 0.21, SPLASH = 99.56, COH = 0.006, SMAX = 0.91
  INTER = 2.58, CANOPY = 0.2178, PAVE = 0.00
END PLANE

BEGIN CHANNEL
  ID = 204, PRINT = 1
  LAT =  202 203
  UP =  184 194
  LEN = 3468.84, SLOPE = 0.0028, X = 607101.844, Y = 4702928.341
  WIDTH = 27.94, 29.07, DEPTH = 0.75, 0.77
  MAN = 0.035, SS1 = 1.00, SS2 = 1.00
  WOOL = Yes
  CV = 0.00, KSAT = 210, G = 101
  DIST = 0.5450, POR = 0.4400, ROCK = 0.00
  FR = 0.9000, 0.0500, 0.0500, SP = 63.00, COH = 0.0050
END CHANNEL

BEGIN PLANE
  ID = 91, LEN = 606.0, AREA = 2611850.9
  SL = 0.049, MAN = 0.049, X = 609494.1, Y = 4702355.5
  CV = 0.86, PRINT = 1
  KS = 9.59, G = 159.52, DIST = 0.30, POR = 0.459, ROCK = 0.11
  FR = 0.47, 0.32, 0.22, SPLASH = 97.41, COH = 0.006, SMAX = 0.91
  INTER = 2.58, CANOPY = 0.2178, PAVE = 0.00
END PLANE

BEGIN PLANE
  ID = 92, LEN = 371.3, AREA = 839227.6
  SL = 0.027, MAN = 0.049, X = 608364.6, Y = 4702288.0
  CV = 0.67, PRINT = 1
  KS = 11.26, G = 157.42, DIST = 0.28, POR = 0.460, ROCK = 0.11
  FR = 0.44, 0.33, 0.23, SPLASH = 99.86, COH = 0.006, SMAX = 0.91
  INTER = 2.58, CANOPY = 0.2178, PAVE = 0.00
END PLANE

BEGIN PLANE
  ID = 93, LEN = 613.1, AREA = 1780986.1
  SL = 0.052, MAN = 0.049, X = 607910.1, Y = 4701411.0
  CV = 1.05, PRINT = 1
  KS = 10.06, G = 167.78, DIST = 0.32, POR = 0.444, ROCK = 0.12
  FR = 0.52, 0.27, 0.21, SPLASH = 86.55, COH = 0.005, SMAX = 0.88
  INTER = 2.58, CANOPY = 0.2178, PAVE = 0.00
END PLANE

BEGIN CHANNEL
  ID = 94, PRINT = 1
  LAT =  92 93
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```
  UP =  91
  LEN = 2774.45, SLOPE = 0.0049, X = 607564.248, Y = 4702004.125
  WIDTH = 9.68, 12.39, DEPTH = 0.48, 0.53
  MAN = 0.035, SS1 = 1.00, SS2 = 1.00
  WOOL = Yes
  CV = 0.00, KSAT = 210, G = 101
  DIST = 0.5450, POR = 0.4400, ROCK = 0.00
  FR = 0.9000, 0.0500, 0.0500, SP = 63.00, COH = 0.0050
END CHANNEL

BEGIN PLANE
  ID = 212, LEN = 333.1, AREA = 944545.6
  SL = 0.013, MAN = 0.049, X = 605498.6, Y = 4701571.0
  CV = 1.17, PRINT = 1
  KS = 15.98, G = 171.90, DIST = 0.38, POR = 0.440, ROCK = 0.19
  FR = 0.59, 0.21, 0.20, SPLASH = 75.06, COH = 0.004, SMAX = 0.89
  INTER = 2.58, CANOPY = 0.2178, PAVE = 0.00
END PLANE

BEGIN PLANE
  ID = 213, LEN = 320.7, AREA = 1228710.5
  SL = 0.054, MAN = 0.049, X = 605771.1, Y = 4701070.5
  CV = 1.16, PRINT = 1
  KS = 12.39, G = 171.88, DIST = 0.35, POR = 0.445, ROCK = 0.14
  FR = 0.55, 0.24, 0.21, SPLASH = 82.07, COH = 0.005, SMAX = 0.89
  INTER = 2.58, CANOPY = 0.2178, PAVE = 0.00
END PLANE

BEGIN CHANNEL
  ID = 214, PRINT = 1
  LAT =  212 213
  UP =  204 94
  LEN = 2772.00, SLOPE = 0.0028, X = 605368.047, Y = 4701318.175
  WIDTH = 29.93, 30.28, DEPTH = 0.78, 0.78
  MAN = 0.035, SS1 = 1.00, SS2 = 1.00
  WOOL = Yes
  CV = 0.00, KSAT = 210, G = 101
  DIST = 0.5450, POR = 0.4400, ROCK = 0.00
  FR = 0.9000, 0.0500, 0.0500, SP = 63.00, COH = 0.0050
END CHANNEL

BEGIN PLANE
  ID = 101, LEN = 827.9, AREA = 2721899.2
  SL = 0.020, MAN = 0.049, X = 605720.3, Y = 4703524.0
  CV = 0.74, PRINT = 1
  KS = 3.41, G = 269.39, DIST = 0.28, POR = 0.442, ROCK = 0.07
  FR = 0.42, 0.24, 0.33, SPLASH = 103.36, COH = 0.007, SMAX = 0.84
  INTER = 2.58, CANOPY = 0.2178, PAVE = 0.00
END PLANE

BEGIN PLANE
  ID = 102, LEN = 192.4, AREA = 374926.0
  SL = 0.031, MAN = 0.049, X = 605362.8, Y = 4701989.0
  CV = 0.95, PRINT = 1
  KS = 8.96, G = 232.57, DIST = 0.33, POR = 0.443, ROCK = 0.12
  FR = 0.50, 0.22, 0.28, SPLASH = 90.01, COH = 0.006, SMAX = 0.86
  INTER = 2.58, CANOPY = 0.2178, PAVE = 0.00
END PLANE

BEGIN PLANE
  ID = 103, LEN = 192.3, AREA = 584583.9
  SL = 0.014, MAN = 0.049, X = 604895.3, Y = 4701801.0
  CV = 0.86, PRINT = 1
  KS = 11.38, G = 183.07, DIST = 0.31, POR = 0.450, ROCK = 0.13
  FR = 0.48, 0.28, 0.24, SPLASH = 87.59, COH = 0.005, SMAX = 0.89
  INTER = 2.58, CANOPY = 0.2178, PAVE = 0.00
END PLANE

BEGIN CHANNEL
```

```
 ID = 104, PRINT = 1
 LAT =  102 103
 UP =  101
 LEN = 2570.18, SLOPE = 0.0033, X = 604885.161, Y = 4701795.368
 WIDTH = 9.83, 10.94, DEPTH = 0.48, 0.50
 MAN = 0.035, SS1 = 1.00, SS2 = 1.00
 WOOL = Yes
 CV = 0.00, KSAT = 210, G = 101
 DIST = 0.5450, POR = 0.4400, ROCK = 0.00
 FR = 0.9000, 0.0500, 0.0500, SP = 63.00, COH = 0.0050
END CHANNEL

BEGIN PLANE
 ID = 232, LEN = 183.4, AREA = 480196.7
 SL = 0.013, MAN = 0.049, X = 604044.5, Y = 4700479.5
 CV = 1.23, PRINT = 1
 KS = 19.72, G = 167.79, DIST = 0.42, POR = 0.432, ROCK = 0.23
 FR = 0.65, 0.16, 0.19, SPLASH = 69.30, COH = 0.004, SMAX = 0.89
 INTER = 2.61, CANOPY = 0.2201, PAVE = 0.00
END PLANE

BEGIN PLANE
 ID = 233, LEN = 197.6, AREA = 480293.3
 SL = 0.018, MAN = 0.049, X = 603731.5, Y = 4700763.0
 CV = 1.03, PRINT = 1
 KS = 11.63, G = 174.31, DIST = 0.33, POR = 0.450, ROCK = 0.13
 FR = 0.51, 0.27, 0.22, SPLASH = 83.29, COH = 0.005, SMAX = 0.89
 INTER = 2.58, CANOPY = 0.2178, PAVE = 0.00
END PLANE

BEGIN CHANNEL
 ID = 234, PRINT = 1
 LAT =  232 233
 UP =  104 214
 LEN = 1979.61, SLOPE = 0.0035, X = 603699.042, Y = 4700543.440
 WIDTH = 30.84, 30.99, DEPTH = 0.79, 0.79
 MAN = 0.035, SS1 = 1.00, SS2 = 1.00
 WOOL = Yes
 CV = 0.00, KSAT = 210, G = 101
 DIST = 0.5450, POR = 0.4400, ROCK = 0.00
 FR = 0.9000, 0.0500, 0.0500, SP = 63.00, COH = 0.0050
END CHANNEL

BEGIN PLANE
 ID = 121, LEN = 520.0, AREA = 3150196.5
 SL = 0.047, MAN = 0.049, X = 606288.0, Y = 4699860.0
 CV = 0.84, PRINT = 1
 KS = 9.69, G = 165.49, DIST = 0.31, POR = 0.434, ROCK = 0.12
 FR = 0.49, 0.29, 0.22, SPLASH = 89.20, COH = 0.005, SMAX = 0.87
 INTER = 2.58, CANOPY = 0.2178, PAVE = 0.00
END PLANE

BEGIN PLANE
 ID = 122, LEN = 392.3, AREA = 1201784.7
 SL = 0.022, MAN = 0.049, X = 604512.6, Y = 4699623.0
 CV = 0.63, PRINT = 1
 KS = 12.85, G = 150.54, DIST = 0.28, POR = 0.467, ROCK = 0.10
 FR = 0.43, 0.37, 0.20, SPLASH = 123.63, COH = 0.008, SMAX = 0.93
 INTER = 2.58, CANOPY = 0.2178, PAVE = 0.00
END PLANE

BEGIN PLANE
 ID = 123, LEN = 469.1, AREA = 1649449.2
 SL = 0.035, MAN = 0.049, X = 605015.1, Y = 4700152.0
 CV = 1.07, PRINT = 1
 KS = 13.88, G = 173.37, DIST = 0.35, POR = 0.453, ROCK = 0.15
 FR = 0.53, 0.27, 0.20, SPLASH = 92.14, COH = 0.005, SMAX = 0.90
 INTER = 2.58, CANOPY = 0.2178, PAVE = 0.00
END PLANE
```

```
BEGIN CHANNEL
  ID = 124, PRINT = 1
  LAT =  122 123
  UP =  121
  LEN = 3517.27, SLOPE = 0.0038, X = 604568.475, Y = 4700090.337
  WIDTH = 10.35, 13.00, DEPTH = 0.49, 0.54
  MAN = 0.035, SS1 = 1.00, SS2 = 1.00
  WOOL = Yes
  CV = 0.00, KSAT = 210, G = 101
  DIST = 0.5450, POR = 0.4400, ROCK = 0.00
  FR = 0.9000, 0.0500, 0.0500, SP = 63.00, COH = 0.0050
END CHANNEL

BEGIN PLANE
  ID = 242, LEN = 51.0, AREA = 27647.4
  SL = 0.037, MAN = 0.049, X = 603077.1, Y = 4699958.0
  CV = 0.82, PRINT = 1
  KS = 7.05, G = 174.81, DIST = 0.26, POR = 0.462, ROCK = 0.07
  FR = 0.41, 0.35, 0.25, SPLASH = 93.23, COH = 0.006, SMAX = 0.89
  INTER = 2.58, CANOPY = 0.2178, PAVE = 0.00
END PLANE

BEGIN PLANE
  ID = 243, LEN = 122.6, AREA = 101308.6
  SL = 0.014, MAN = 0.048, X = 602978.6, Y = 4700104.0
  CV = 1.21, PRINT = 1
  KS = 13.90, G = 176.72, DIST = 0.38, POR = 0.442, ROCK = 0.16
  FR = 0.57, 0.22, 0.21, SPLASH = 76.62, COH = 0.004, SMAX = 0.88
  INTER = 2.52, CANOPY = 0.2132, PAVE = 0.00
END PLANE

BEGIN CHANNEL
  ID = 244, PRINT = 1
  LAT =  242 243
  UP =  234 124
  LEN = 414.89, SLOPE = 0.0022, X = 603054.609, Y = 4699985.980
  WIDTH = 31.86, 31.88, DEPTH = 0.80, 0.80
  MAN = 0.035, SS1 = 1.00, SS2 = 1.00
  WOOL = Yes
  CV = 0.00, KSAT = 210, G = 101
  DIST = 0.5450, POR = 0.4400, ROCK = 0.00
  FR = 0.9000, 0.0500, 0.0500, SP = 63.00, COH = 0.0050
END CHANNEL

BEGIN PLANE
  ID = 131, LEN = 684.7, AREA = 2442666.6
  SL = 0.044, MAN = 0.049, X = 603521.9, Y = 4697664.5
  CV = 0.75, PRINT = 1
  KS = 8.52, G = 186.46, DIST = 0.31, POR = 0.449, ROCK = 0.12
  FR = 0.48, 0.28, 0.24, SPLASH = 93.90, COH = 0.006, SMAX = 0.90
  INTER = 2.58, CANOPY = 0.2178, PAVE = 0.00
END PLANE

BEGIN PLANE
  ID = 132, LEN = 208.7, AREA = 418773.3
  SL = 0.025, MAN = 0.049, X = 603021.2, Y = 4698733.0
  CV = 1.02, PRINT = 1
  KS = 8.79, G = 177.67, DIST = 0.32, POR = 0.446, ROCK = 0.07
  FR = 0.51, 0.27, 0.22, SPLASH = 96.67, COH = 0.006, SMAX = 0.89
  INTER = 2.61, CANOPY = 0.2201, PAVE = 0.00
END PLANE

BEGIN PLANE
  ID = 133, LEN = 524.6, AREA = 2022567.5
  SL = 0.044, MAN = 0.049, X = 603994.4, Y = 4698907.0
  CV = 0.93, PRINT = 1
  KS = 10.24, G = 166.40, DIST = 0.31, POR = 0.448, ROCK = 0.10
  FR = 0.50, 0.29, 0.21, SPLASH = 96.09, COH = 0.006, SMAX = 0.90
```

```
  INTER = 2.58, CANOPY = 0.2178, PAVE = 0.00
END PLANE

BEGIN CHANNEL
  ID = 134, PRINT = 1
  LAT =  132 133
  UP =  131
  LEN = 1976.30, SLOPE = 0.0044, X = 603298.310, Y = 4699129.960
  WIDTH = 9.45, 12.09, DEPTH = 0.47, 0.52
  MAN = 0.035, SS1 = 1.00, SS2 = 1.00
  WOOL = Yes
  CV = 0.00, KSAT = 210, G = 101
  DIST = 0.5450, POR = 0.4400, ROCK = 0.00
  FR = 0.9000, 0.0500, 0.0500, SP = 63.00, COH = 0.0050
END CHANNEL

BEGIN PLANE
  ID = 252, LEN = 218.6, AREA = 420652.3
  SL = 0.014, MAN = 0.049, X = 602240.4, Y = 4699966.5
  CV = 1.22, PRINT = 1
  KS = 16.91, G = 172.12, DIST = 0.40, POR = 0.437, ROCK = 0.20
  FR = 0.61, 0.19, 0.20, SPLASH = 72.85, COH = 0.004, SMAX = 0.88
  INTER = 2.58, CANOPY = 0.2178, PAVE = 0.00
END PLANE

BEGIN PLANE
  ID = 253, LEN = 467.5, AREA = 1519593.7
  SL = 0.028, MAN = 0.049, X = 602362.6, Y = 4699308.5
  CV = 0.91, PRINT = 1
  KS = 10.58, G = 192.05, DIST = 0.30, POR = 0.446, ROCK = 0.11
  FR = 0.45, 0.29, 0.25, SPLASH = 92.58, COH = 0.006, SMAX = 0.88
  INTER = 2.58, CANOPY = 0.2178, PAVE = 0.00
END PLANE

BEGIN CHANNEL
  ID = 254, PRINT = 1
  LAT =  252 253
  UP =  244 134
  LEN = 2452.62, SLOPE = 0.0018, X = 602149.694, Y = 4699738.665
  WIDTH = 32.56, 32.82, DEPTH = 0.81, 0.81
  MAN = 0.035, SS1 = 1.00, SS2 = 1.00
  WOOL = Yes
  CV = 0.00, KSAT = 210, G = 101
  DIST = 0.5450, POR = 0.4400, ROCK = 0.00
  FR = 0.9000, 0.0500, 0.0500, SP = 63.00, COH = 0.0050
END CHANNEL

BEGIN PLANE
  ID = 111, LEN = 787.8, AREA = 2999924.5
  SL = 0.020, MAN = 0.049, X = 604211.7, Y = 4702392.0
  CV = 0.60, PRINT = 1
  KS = 9.19, G = 164.56, DIST = 0.25, POR = 0.463, ROCK = 0.09
  FR = 0.38, 0.37, 0.25, SPLASH = 95.45, COH = 0.006, SMAX = 0.90
  INTER = 2.58, CANOPY = 0.2178, PAVE = 0.00
END PLANE

BEGIN PLANE
  ID = 112, LEN = 504.2, AREA = 1629392.6
  SL = 0.012, MAN = 0.049, X = 602766.6, Y = 4700746.5
  CV = 0.90, PRINT = 1
  KS = 14.84, G = 164.49, DIST = 0.34, POR = 0.447, ROCK = 0.17
  FR = 0.52, 0.27, 0.21, SPLASH = 82.09, COH = 0.005, SMAX = 0.89
  INTER = 2.58, CANOPY = 0.2178, PAVE = 0.00
END PLANE

BEGIN PLANE
  ID = 113, LEN = 421.5, AREA = 1794577.9
  SL = 0.010, MAN = 0.049, X = 602509.0, Y = 4701530.0
  CV = 0.65, PRINT = 1
```

```
  KS = 10.16, G = 163.16, DIST = 0.26, POR = 0.461, ROCK = 0.10
  FR = 0.41, 0.36, 0.24, SPLASH = 93.50, COH = 0.006, SMAX = 0.90
  INTER = 2.58, CANOPY = 0.2178, PAVE = 0.00
END PLANE

BEGIN CHANNEL
  ID = 114, PRINT = 1
  LAT =  112 113
  UP =  111
  LEN = 2732.86, SLOPE = 0.0025, X = 602382.087, Y = 4700990.770
  WIDTH = 10.17, 13.32, DEPTH = 0.49, 0.55
  MAN = 0.035, SS1 = 1.00, SS2 = 1.00
  WOOL = Yes
  CV = 0.00, KSAT = 210, G = 101
  DIST = 0.5450, POR = 0.4400, ROCK = 0.00
  FR = 0.9000, 0.0500, 0.0500, SP = 63.00, COH = 0.0050
END CHANNEL

BEGIN PLANE
  ID = 222, LEN = 185.9, AREA = 280617.9
  SL = 0.008, MAN = 0.053, X = 600900.8, Y = 4700068.0
  CV = 1.12, PRINT = 1
  KS = 12.47, G = 155.25, DIST = 0.32, POR = 0.456, ROCK = 0.12
  FR = 0.51, 0.29, 0.20, SPLASH = 99.55, COH = 0.006, SMAX = 0.90
  INTER = 2.85, CANOPY = 0.2385, PAVE = 0.03
END PLANE

BEGIN PLANE
  ID = 223, LEN = 470.6, AREA = 1587202.5
  SL = 0.015, MAN = 0.053, X = 601133.9, Y = 4700946.0
  CV = 1.16, PRINT = 1
  KS = 14.75, G = 150.33, DIST = 0.34, POR = 0.452, ROCK = 0.14
  FR = 0.54, 0.27, 0.19, SPLASH = 98.38, COH = 0.006, SMAX = 0.90
  INTER = 2.85, CANOPY = 0.2385, PAVE = 0.03
END PLANE

BEGIN CHANNEL
  ID = 224, PRINT = 3, FILE = C:\AGWA_PROJ\jonahsan\simulations\kin_sims\noac5yr.sim
  LAT =  222 223
  UP =  114 254
  LEN = 1064.51, SLOPE = 0.0010, X = 600947.551, Y = 4700171.482
  WIDTH = 33.67, 33.90, DEPTH = 0.82, 0.82
  MAN = 0.035, SS1 = 1.00, SS2 = 1.00
  WOOL = Yes
  CV = 0.00, KSAT = 210, G = 101
  DIST = 0.5450, POR = 0.4400, ROCK = 0.00
  FR = 0.9000, 0.0500, 0.0500, SP = 63.00, COH = 0.0050
END CHANNEL
```

APPENDIX B: SOIL DATABASE TABLES

Soil data from the Burma Soil Survey (ERO 1988) were put into Statsgo format, in order to allow AGWA to read the data and use it to estimate the infiltration, runoff, and sediment transport parameters. The first soil database table from the Statsgo data which AGWA reads is called comp.dbf. This file contains the following fields:

STSSAID	State Soil Survey Area ID
MUID	Map Unit Identification
SEQNUM	Sequence Number
MUSYM	Map Unit Symbol
COMPNAME	Component Name
S5ID	Soil Interpretations Record Number
COMPPCT	Component Percent
SLOPEL	Soil Slope (Minimum)
SLOPEH	Soil Slope (Maximum)
SURFTEX	Surface Soil Texture
OTHERPH	Phase Class (other than slope or texture)
COMPKIND	Kind of Component (S=Series, F=Family, V=Variant, M=Miscellaneous)
COMPACRE	Component Acres
CLASCODE	Taxonomic Classification Code
ANFLOOD	Annual Flooding Frequency (Descriptive)
ANFLODUR	Flood Duration Class (Descriptive)
ANFLOBEG	Month in which annual flooding begins in a normal year
ANFLOEND	Month in which annual flooding ends in a normal year
GSFLOOD	Growing Season Flooding (Descriptive)
GSFLODUR	Growing Season Flood Duration (Descriptive)
GSFLOBEG	Month in which annual flooding begins during growing season
GSFLOEND	Month in which annual flooding ends during growing season
WTDEPL	Depth to high Water Table (Minimum)
WTDEPH	Depth to high Water Table (Maximum)
WTKIND	Water Table Kind (Artesian, Perched, Apparent)
WTBEG	Month in which seasonal water table occurs at the depth specified in a normal year
WTEND	Month in which seasonal water table subsides below the normal year depth
PNDDEPL	Ponding Depth (Minimum)
PNDDEPH	Ponding Depth (Maximum)
PNDDUR	Ponding Duration
PNDBEG	
PNDEND	
ROCKDEPL	Depth to Bedrock (Minimum) Inches
ROCKDEPH	Depth to Bedrock (Maximum) Inches
ROCKHARD	Bedrock Hardness (Descriptive)
PANDEPL	Depth to Cemented Pan (Minimum) Inches
PANDEPH	Depth to Cemented Pan (Maximum) Inches
PANHARD	Cemented Pan Thickness (Descriptive)

SUBINITL	Min. value in initial subsidence when drained, in inches (organic soils only)
SUBINITH	Max. value in initial subsidence when drained, in inches (organic soils only)
SUBTOTL	Min. value in total subsidence when drained, in inches (organic soils only)
SUBTOTH	Max. value in total subsidence when drained, in inches (organic soils only)
HYDGRP	Hydrologic Group
FROSTACT	Potential Frost Action (Descriptive)
DRAINAGE	Code identifying the natural soil drainage condition. Example: Well Drained (W); Excessive (E); Moderately Well (MW); Poorly (P); Somewhat Excessively (SE); Somewhat Poorly (SP)
HYDRIC	Hydric Soil Rating
CORCON	A rating of concrete susceptibility to corrosion when in contact with the soil
CORSTEEL	A rating of the uncoated steel susceptibility to corrosion when in contact with soil
CLNIRR	A rating of the soil for nonirrigated agricultural use
CLIRR	Irrigated Capability Class
SCLNIRR	Irrigated Capability Subclass
SCLIRR	Irrigated Capability Subclass
PRIMFML	Prime Farmland Classification

From this table, AGWA reads the composition percentages and surface texture for each soil. Table B-1 presents the part of the comp.dbf table read by AGWA and populated with data from the Burma Soil Survey.

Table B-1: Composition percentages and Textures for Jonah Soils

MUID	SEQNUM	COMPNAME	COMPPCT	SURFTEX	ROCKDEPL	ROCKDEPH
JOW	1	WATER	100		0	0
JO102	1	Langspring Variant	72	L	20	40
JO102	2	Langspring	28	L	40	60
JO104	1	Chrisman	100	SiC	60	60
JO106	1	Monte	67	L	60	60
JO106	2	Leckman	33	L	60	60
JO108	1	Dines	45	L	60	60
JO108	2	Clowers	33	L	60	60
JO108	3	Quealman	22	L	60	60
JO110	1	Fraddle	72	L	20	40
JO110	2	Tresano	28	L	40	60
JO113	1	Haterton	53	L	20	40
JO113	2	Garsid	47	L	20	40
JO114	1	Ouard	35	L	10	20
JO114	2	Ouard Variant	35	C	10	20
JO114	3	Boltus	30	Sh	4	20
JO116	1	Huguston	44	L	4	20
JO116	2	Horsley	39	Sh	3	10
JO116	3	Terada	17	L	20	40
JO119	1	Garsid	53	L	20	40
JO119	2	Monte	47	L	60	60
JO121	1	Garsid	47	L	20	40
JO121	2	Terada	29	L	20	40
JO121	3	Langspring Variant	24	L	20	40

JO122	1	Baston	44	C	20	40
JO122	2	Boltus	31	Sh	4	20
JO122	3	Chrisman	25	C	60	60
JO123	1	Spool Variant	41	S	3	20
JO123	2	Ouard Variant	41	C	10	20
JO123	3	San Arcacio Variant	18	L	20	40
JO124	1	Fraddle	35	L	20	40
JO124	2	Ouard	35	L	10	20
JO124	3	San Arcacio Variant	30	L	20	40
JO125	1	San Arcacio	56	LS	60	60
JO125	2	Saguache	44	SL	60	60
JO127	1	Vermillion Variant	39	L	20	40
JO127	2	Seedskadee	39	L	10	20
JO127	3	Fraddle	22	L	20	40
JO128	1	Fraddle	56	L	20	40
JO128	2	Ouard	22	L	10	20
JO128	3	San Arcacio Variant	22	L	20	40
JO139	1	HUGUSTON	20	FSL	10	20
JO139	2	WINT	10	CN-SL	6	20
JO139	3	HATERTON	10	L	10	20
JO139	4	TASSELMAN	10	SL	10	20
JO139	5	ROCK OUTCROP	5	UWB	0	0
JO139	6	ROGRUBE	10	L	60	60
JO139	7	WESTVACO	10	FSL	20	40
JO139	8	TEAGULF	20	FSL	20	40
JO139	9	KANDALY	5	FS	60	60

The second soil database table from the Statsgo data, which AGWA reads in order to estimate the infiltration, runoff, and sediment transport parameters, is called layer.dbf. This file contains the following fields:

STSSAID State Soil Survey Area ID
MUID Map Unit Identification
SEQNUM Sequence Number
S5ID Soil Interpretations Record Number
LAYERNUM Layer Number
LAYERID convention to identify the original layers on the Number SOI-5 record. Example: layerid 11 for the first surface of a multisurface record, 12 for the second surface layer, 2 through 9 for subsurface layers
LAYDEPL depth to upper boundary of soil layer, inches
LAYDEPH depth to lower boundary of soil layer, inches
TEXTURE1
TEXTURE2
TEXTURE3
KFACT Soil Erodibility Factor, includes adjustment for rock fragments
KFFACT Soil Erodibility Factor, without adjustment for rock fragments Used in SWAT
TFACT Soil loss tolerance factor.
WEG Wind Erodibility Group
INCH10L weight of the rock fragments greater than 10 inches size, in percent (minimum)

INCH10H	weight of the rock fragments greater than 10 inches size, in percent (maximum)
INCH3L	weight of the rock fragments 3 to 10 inches size, in percent (minimum)
INCH3H	weight of the rock fragments 3 to 10 inches size, in percent (maximum)
NO4L	Percent Passing Sieve Number 4 (Minimum)
NO4H	Percent Passing Sieve Number 4 (Maximum)
NO10L	Percent Passing Sieve Number 10 (Minimum)
NO10H	Percent Passing Sieve Number 10 (Maximum)
NO40L	Percent Passing Sieve Number 40 (Minimum)
NO40H	Percent Passing Sieve Number 40 (Maximum)
NO200L	Percent Passing Sieve Number 200 (Minimum)
NO200H	Percent Passing Sieve Number 200 (Maximum)
CLAYL	Clay Content of Material less than 2 mm in size (Minimum)
CLAYH	Clay Content of Material less than 2 mm in size (Maximum)
LLL	Liquid Limit in percent moisture by weight (Minimum)
LLH	Liquid Limit in percent moisture by weight (Minimum)
PIL	Plasticity Index (Minimum)
PIH	Plasticity Index (Maximum)
UNIFIED1	Unified Soil Classification (engineering)
UNIFIED2	Unified Soil Classification (engineering)
UNIFIED3	Unified Soil Classification (engineering)
UNIFIED4	Unified Soil Classification (engineering)
AASHTO1	AASHTO (American Assoc. of State Highway Classification and Transportation Officials) group classification
AASHTO2	AASHTO (American Assoc. of State Highway Classification and Transportation Officials) group classification
AASHTO3	AASHTO (American Assoc. of State Highway Classification and Transportation Officials) group classification
AASHTO4	AASHTO (American Assoc. of State Highway Classification and Transportation Officials) group classification
AASHIND	A AASHTO (American Assoc. of State Highway Classification and Transportation Officials) group index
AWCL	Available Water Capacity (Minimum)
AWCH	Available Water Capacity (Maximum)
BDL	Bulk Density (Minimum)
BDH	Bulk Density (Maximum)
OML	Organic Matter, percent by weight (Minimum)
OMH	Organic Matter, percent by weight (Maximum)
PHL	Soil Reaction (pH) (Minimum)
PHH	Soil Reaction (pH) (Maximum)
SALINL	Salinity (Minimum)
SALINH	Salinity (Maximum)
SARL	Sodium Absorption Ratio (Minimum)
SARH	Sodium Absorption Ratio (Maximum)
CECL	Cation Exchange Capacity (Minimum)
CECH	Cation Exchange Capacity (Maximum)
CACO3L	Carbonate as $CaCO_3$, percent (Minimum)

CACO3H Carbonate as CaCO3, percent (Maximum)
GYPSUML Sulfates as CaSO4 (gypsum), percent (Maximum)
GYPSUMH Sulfates as CaSO4 (gypsum), percent (Minimum)
PERML Permeability Rate inches/hour (Minimum)
PERMH Permeability Rate inches/hour (Minimum)
SHRINKSW Shrink-Swell Potential

This file, showing only the populated fields for the soils of the Jonah project, is in shown in Table B-2.

Table B-2: Layer Composition for Jonah Soils

MUID	SE QN UM	LA YE RN UM	LA YE RID	LA YD EP L	LA YD EP H	TEXT URE 1	TEXT URE 2	TEX TUR E3	KFAC T	KFFAC T	INC H10 L	INC H10 H	INC H3L	INC H3 H	NO 4L	NO 4H	NO 10L	NO 10H	NO 40L	NO 40H	NO 200 L	NO 200 H	CL AYL	CL AY H	LLL	LLH	AW CL	AWC H	BDL	BDH
JO102	1	1	11	0	3	L			0.32	0.32	0	0	0	0	95	100	85	100	80	90	65	80	18	34	25	30	0.14	0.17	1.30	1.40
JO102	1	2	2	3	22	CL	SCL	L	0.32	0.32	0	0	0	0	80	100	75	100	65	85	50	75	18	34	25	30	0.13	0.16	1.30	1.40
JO102	2	1	11	0	4	L			0.32	0.32	0	0	0	0	95	100	85	100	80	90	65	80	18	27	25	30	0.14	0.17	1.30	1.40
JO102	2	2	2	4	9	L			0.32	0.32	0	0	0	0	95	100	85	100	80	90	65	80	18	27	25	30	0.14	0.17	1.30	1.40
JO102	2	3	3	9	40	SCL	L	SL	0.32	0.32	0	0	0	0	80	100	75	100	65	85	50	75	15	27	25	30	0.13	0.16	1.30	1.40
JO104	1	1	11	0	2	SIC	C	SICL	0.37	0.37	0	0	0	0	95	100	95	100	95	100	90	100	35	60	40	60	0.15	0.17	1.30	1.40
JO104	1	2	2	2	60	SIC	C	SICL	0.37	0.37	0	0	0	0	95	100	95	100	95	100	90	100	35	60	40	60	0.10	0.15	1.30	1.40
JO106	1	1	11	0	2	L			0.24	0.24	0	0	0	10	95	100	90	100	75	95	55	75	15	25	30	40	0.16	0.18	1.30	1.40
JO106	1	2	2	2	60	CL	L	SL	0.24	0.24	0	0	0	10	95	100	90	100	65	95	45	75	15	34	30	40	0.16	0.18	1.30	1.40
JO106	2	1	11	0	3	FSL	VFSL		0.32	0.32	0	0	0	0	100	100	100	100	85	95	50	65	10	20	20	25	0.15	0.17	1.30	1.40
JO106	2	2	2	3	60	FSL	VFSL		0.32	0.32	0	0	0	0	100	100	100	100	85	95	50	65	10	20	20	25	0.15	0.17	1.30	1.40
JO108	1	1	11	0	4	SIL			0.37	0.37	0	0	0	0	100	100	100	100	95	100	80	100	18	27	25	40	0.09	0.11	1.30	1.40
JO108	1	2	2	4	60	SIL	SICL		0.37	0.37	0	0	0	0	100	100	100	100	95	100	80	100	37	35	25	40	0.09	0.16	1.30	1.40
JO108	2	1	11	0	1	L			0.37	0.37	0	0	0	0	80	100	80	100	80	90	60	75	18	28	25	35	0.12	0.14	1.30	1.40
JO108	2	2	2	1	60	CL			0.49	0.49	0	0	0	0	80	100	75	100	65	90	50	75	20	40	25	35	0.12	0.14	1.30	1.40
JO108	3	1	11	0	2	FSL	L	CL	0.32	0.32	0	0	0	0	75	100	75	100	50	75	25	50	10	34	0	0	0.11	0.15	1.30	1.40
JO108	3	2	2	2	60	SR-LS	L	FSL	0.37	0.37	0	0	0	0	90	100	80	100	40	75	20	35	10	34	15	25	0.10	0.13	1.30	1.40
JO110	1	1	11	0	4	SL			0.24	0.24	0	0	0	0	90	100	90	100	55	80	30	50	10	20	15	25	0.11	0.13	1.30	1.40
JO110	1	2	2	4	22	SCL			0.28	0.28	0	0	0	0	90	100	90	100	75	85	35	50	18	34	30	40	0.14	0.16	1.30	1.40
JO110	2	1	11	0	2	SL			0.24	0.24	0	0	0	0	80	100	75	90	50	60	25	35	10	20	20	30	0.11	0.13	1.30	1.40
JO110	2	2	2	2	16	SCL			0.28	0.28	0	0	0	0	80	100	75	90	60	80	35	50	20	30	20	30	0.14	0.16	1.30	1.40
JO113	1	1	11	0	3	L			0.37	0.37	0	0	0	0	75	100	75	100	70	100	50	70	18	27	25	30	0.16	0.18	1.30	1.40
JO113	1	2	2	3	12	L			0.43	0.43	0	0	0	0	75	100	75	100	60	75	50	60	18	27	20	30	0.16	0.18	1.30	1.40
JO113	2	1	11	0	4	L	CL		0.32	0.32	0	0	0	0	75	100	75	100	75	100	55	75	18	35	20	30	0.16	0.18	1.30	1.40
JO113	2	2	2	4	22	L	CL		0.32	0.32	0	0	0	0	75	100	75	100	75	100	55	75	18	35	20	30	0.16	0.18	1.30	1.40
JO114	1	1	11	0	1	SL	SCL		0.24	0.24	0	0	0	0	100	100	100	100	60	70	30	40	18	34	0	0	0.11	0.13	1.30	1.40
JO114	1	2	2	1	11	SCL			0.28	0.28	0	0	0	0	100	100	100	100	75	90	35	50	18	34	25	35	0.14	0.16	1.30	1.40
JO114	2	1	11	0	4	CL	L		0.32	0.32	0	0	0	0	95	100	90	100	75	95	55	80	6	25	35	45	0.17	0.21	1.30	1.40
JO114	2	2	2	4	13	CL	C		0.37	0.37	0	0	0	0	95	100	90	100	90	100	75	95	35	50	35	45	0.19	0.21	1.30	1.40
JO114	3	1	11	0	3	C	CL		0.32	0.32	0	0	0	0	90	100	75	100	75	100	70	100	35	60	35	50	0.08	0.10	1.30	1.40
JO114	3	2	2	3	11	C	CL		0.32	0.32	0	0	0	0	90	100	75	100	75	100	70	100	35	60	35	50	0.08	0.10	1.30	1.40
JO116	1	1	11	0	2	SL	FSL		0.32	0.32	0	0	0	0	75	100	75	100	55	75	30	40	5	12	0	0	0.13	0.15	1.30	1.40
JO116	1	2	2	2	9	SL	FSL		0.32	0.32	0	0	0	0	75	100	75	100	55	75	30	40	5	12	0	0	0.13	0.15	1.30	1.40
JO116	1	3	3	9	60	UWB			0.32	0.32	0	0	0	0									5	12	0	0			1.30	1.40
JO116	2	1	11	0	3	L			0.15	0.15	0	0	0	0	50	75	50	75	45	65	35	50	18	27	25	35	0.11	0.15	1.30	1.40

JO116	2	2	2	3	9	L	CL	SCL	0.37	0.37	0	0	0	0	90	100	75	100	60	80	50	60	18	35	25	40	0.15	0.20	1.30	1.40
JO116	2	3	3	9	60	SH			0.37	0.37	0	0	0	0															1.30	1.40
JO116	3	1	11	0	7	VFSL	FSL	SL	0.32	0.32	0	0	0	0	100	100	100	100	85	95	50	65	5	18	20	25	0.15	0.17	1.30	1.40
JO116	3	2	2	7	34	VFSL	FSL		0.32	0.32	0	0	0	0	100	100	100	100	85	95	50	65	5	18	20	25	0.15	0.17	1.30	1.40
JO119	1	1	11	0	4	L	CL		0.32	0.32	0	0	0	0	75	100	75	100	75	100	55	75	18	35	20	30	0.16	0.18	1.30	1.40
JO119	1	2	2	4	22	L	CL		0.32	0.32	0	0	0	0	75	100	75	100	75	100	55	75	18	35	20	30	0.16	0.18	1.30	1.40
JO119	2	1	11	0	2	L			0.24	0.24	0	0	0	10	95	100	90	100	75	95	55	75	15	25	30	40	0.16	0.18	1.30	1.40
JO119	2	2	2	2	60	CL	L	SL	0.24	0.24	0	0	0	10	95	100	90	100	65	95	45	75	15	34	30	40	0.16	0.18	1.30	1.40
JO121	1	1	11	0	4	L	CL		0.32	0.32	0	0	0	0	75	100	75	100	75	100	55	75	18	35	20	30	0.16	0.18	1.30	1.40
JO121	1	2	2	4	22	L	CL		0.32	0.32	0	0	0	0	75	100	75	100	75	100	55	75	18	35	20	30	0.16	0.18	1.30	1.40
JO121	2	1	11	0	7	VFSL	FSL	SL	0.32	0.32	0	0	0	0	100	100	100	100	85	95	50	65	5	18	20	25	0.15	0.17	1.30	1.40
JO121	2	2	2	7	34	VFSL	FSL		0.32	0.32	0	0	0	0	100	100	100	100	85	95	50	65	5	18	20	25	0.15	0.17	1.30	1.40
JO121	3	1	11	0	3	L			0.32	0.32	0	0	0	0	95	100	85	100	80	90	65	80	18	34	25	30	0.14	0.17	1.30	1.40
JO121	3	2	2	3	22	CL	SCL	L	0.32	0.32	0	0	0	0	80	100	75	100	65	85	50	75	18	34	25	30	0.13	0.16	1.30	1.40
JO122	1	1	11	0	3	FSCL			0.37	0.37	0	0	0	0	90	100	90	100	75	85	35	50	20	35	30	40	0.14	0.16	1.30	1.40
JO122	1	2	2	3	28	C			0.37	0.37	0	0	0	0	75	100	75	100	70	90	65	90	35	50	40	60	0.11	0.13	1.30	1.40
JO122	2	1	11	0	3	C	CL		0.32	0.32	0	0	0	0	90	100	75	100	75	100	70	100	35	60	35	50	0.08	0.10	1.30	1.40
JO122	2	2	2	3	11	C	CL		0.32	0.32	0	0	0	0	90	100	75	100	75	100	70	100	35	60	35	50	0.08	0.10	1.30	1.40
JO122	3	1	11	0	3	SIC	C	SICL	0.37	0.37	0	0	0	0	95	100	95	100	95	100	90	100	35	60	40	60	0.15	0.17	1.30	1.40
JO122	3	2	2	3	60	SIC	C	SICL	0.37	0.37	0	0	0	0	95	100	95	100	95	100	90	100	35	60	40	60	0.10	0.15	1.30	1.40
JO123	1	1	11	0	6	LFS	GR-SL		0.20	0.20	0	0	0	10	85	100	80	100	65	95	15	30	5	12	15	25	0.08	0.11	1.30	1.40
JO123	1	2	2	6	12	LFS	CN-LFS	GR-SL	0.28	0.28	0	0	0	10	70	90	65	90	60	90	10	30	5	12	15	25	0.06	0.11	1.30	1.40
JO123	2	1	11	0	4	CL	L		0.32	0.32	0	0	0	0	95	100	90	100	75	95	55	80	6	25	35	45	0.17	0.21	1.30	1.40
JO123	2	2	2	4	13	CL	C		0.37	0.37	0	0	0	0	95	100	90	100	90	100	75	95	35	50	35	45	0.19	0.21	1.30	1.40
JO123	3	1	11	0	4	SL			0.24	0.24	0	0	0	0	80	100	75	95	50	65	25	50	10	20	20	30	0.11	0.13	1.30	1.40
JO123	3	2	2	4	14	SCL	SL		0.28	0.28	0	0	0	0	80	100	75	95	60	85	35	50	18	35	30	40	0.14	0.16	1.30	1.40
JO124	1	1	11	0	4	SL			0.24	0.24	0	0	0	0	90	100	90	100	55	80	30	50	10	20	15	25	0.11	0.13	1.30	1.40
JO124	1	2	2	4	22	SCL			0.28	0.28	0	0	0	0	90	100	90	100	75	85	35	50	18	34	30	40	0.14	0.16	1.30	1.40
JO124	2	1	11	0	1	SL	SCL		0.24	0.24	0	0	0	0	100	100	100	100	60	70	30	40	18	34	0	0	0.11	0.13	1.30	1.40
JO124	2	2	2	1	11	SCL			0.28	0.28	0	0	0	0	100	100	100	100	75	90	35	50	18	34	25	35	0.14	0.16	1.30	1.40
JO124	3	1	11	0	4	SL			0.24	0.24	0	0	0	0	80	100	75	95	50	65	25	50	10	20	20	30	0.11	0.13	1.30	1.40
JO124	3	2	2	4	14	SCL	SL		0.28	0.28	0	0	0	0	80	100	75	95	60	85	35	50	18	35	30	40	0.14	0.16	1.30	1.40
JO125	1	1	11	0	3	SL	COSL		0.24	0.24	0	0	0	0	80	100	75	95	50	65	25	50	10	20	20	30	0.11	0.13	1.30	1.40
JO125	1	2	2	3	14	SCL	SL		0.28	0.28	0	0	0	0	80	100	75	95	60	85	35	50	18	35	30	40	0.14	0.16	1.30	1.40
JO125	2	1	11	0	6	SL	COSL	GR-SL	0.15	0.15	0	0	0	10	75	100	50	100	40	75	25	45	5	18	15	30	0.11	0.18	1.30	1.40
JO125	2	2	2	6	19	GRV-S	COSL	GRV-LS	0.05	0.05	0	0	10	40	25	50	25	50	10	30	0	10	0	5	0	0	0.03	0.05	1.30	1.40
JO127	1	1	11	0	3	L			0.37	0.37	0	0	0	0	95	100	95	100	80	90	60	70	15	30	20	25	0.16	0.18	1.30	1.40
JO127	1	2	2	3	8	CN-L	CN-CL		0.15	0.15	0	0	0	10	70	85	65	75	55	65	40	50	18	34	25	35	0.10	0.13	1.30	1.40
JO127	1	3	3	8	27	FLX-L	FLV-CL	FLV-L	0.10	0.10	0	0	45	60	70	85	40	50	30	40	20	30	18	30	25	35	0.07	0.09	1.30	1.40
JO127	2	1	11	0	2	L			0.24	0.24	0	0	0	10	85	100	70	100	45	90	20	50	18	34	15	35	0.10	0.15	1.30	1.40
JO127	2	2	2	2	14	SCL	L	SL	0.24	0.24	0	0	0	10	85	100	70	100	45	90	20	50	18	34	15	35	0.10	0.15	1.30	1.40
JO127	3	1	11	0	4	SL			0.24	0.24	0	0	0	0	90	100	90	100	55	80	30	50	10	20	15	25	0.11	0.13	1.30	1.40
JO127	3	2	2	4	22	SCL			0.28	0.28	0	0	0	0	90	100	90	100	75	85	35	50	18	34	30	40	0.14	0.16	1.30	1.40
JO128	1	1	11	0	4	SL			0.24	0.24	0	0	0	0	90	100	90	100	55	80	30	50	10	20	15	25	0.11	0.13	1.30	1.40
JO128	1	2	2	4	22	SCL			0.28	0.28	0	0	0	0	90	100	90	100	75	85	35	50	18	34	30	40	0.14	0.16	1.30	1.40
JO128	2	1	11	0	1	SL	SCL		0.24	0.24	0	0	0	0	100	100	100	100	60	70	30	40	18	34	0	0	0.11	0.13	1.30	1.40
JO128	2	2	2	1	11	SCL			0.28	0.28	0	0	0	0	100	100	100	100	75	90	35	50	18	34	25	35	0.14	0.16	1.30	1.40
JO128	3	1	11	0	4	SL			0.24	0.24	0	0	0	0	80	100	75	95	50	65	25	50	10	20	20	30	0.11	0.13	1.30	1.40
JO128	3	2	2	4	14	SCL	SL		0.28	0.28	0	0	0	0	80	100	75	95	60	85	35	50	18	35	30	40	0.14	0.16	1.30	1.40
JO139	1	1	11	0	16	FSL			0.32	0.32	0	0	0	0	75	100	75	100	55	75	30	40	5	12	0	0	0.13	0.15	1.25	1.35

JO139	1	2	2	16	20	UWB			0.00	0.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
JO139	2	1	11	0	1	CN-SL			0.15	0.32	0	0	0	10	60	85	50	75	30	50	15	30	5	18	20	25	0.06	0.07	1.25	1.35
JO139	2	2	2	1	5	CNV-SL	CNX-SL		0.05	0.20	0	0	10	15	30	60	20	55	15	35	10	20	5	18	20	25	0.01	0.05	1.35	1.45
JO139	2	3	3	5	18	FLX-SL			0.02	0.00	0	0	50	60	70	90	60	80	40	55	20	30	5	18	20	25	0.01	0.03	1.35	1.45
JO139	2	4	4	18	22	UWB			0.00	0.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00
JO139	3	1	11	0	2	L			0.37	0.37	0	0	0	0	75	100	75	100	70	100	50	70	18	27	25	30	0.16	0.18	1.25	1.35
JO139	3	2	2	2	10	L			0.43	0.43	0	0	0	0	75	100	75	100	60	75	50	60	10	18	20	30	0.16	0.18	1.35	1.45
JO139	3	3	3	10	14	CN-L			0.17	0.32	0	0	0	0	50	75	50	75	45	70	40	50	10	18	20	30	0.09	0.13	1.35	1.45
JO139	3	4	4	14	18	UWB			0.00	0.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00
JO139	4	1	11	0	3	SL			0.24	0.24	0	0	0	0	80	100	75	100	55	75	35	50	5	18	0	0	0.11	0.13	1.25	1.35
JO139	4	2	2	3	14	GR-SL	CN-SL		0.10	0.20	0	0	0	0	55	80	50	75	35	55	15	30	5	18	0	0	0.07	0.11	1.35	1.45
JO139	4	3	3	14	18	UWB			0.00	0.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00
JO139	5	1	11	0	60	UWB			0.00	0.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00
JO139	6	1	11	0	3	L			0.28	0.28	0	0	0	0	100	100	100	100	80	90	60	80	15	25	20	25	0.14	0.18	1.20	1.30
JO139	6	2	2	3	28	CL	SICL		0.43	0.43	0	0	0	0	100	100	100	100	85	100	70	80	27	35	30	35	0.17	0.21	1.25	1.35
JO139	6	3	3	28	60	SCL	CL	SICL	0.43	0.43	0	0	0	0	100	100	90	100	80	100	55	80	20	35	25	35	0.12	0.17	1.30	1.40
JO139	7	1	11	0	2	FSL			0.32	0.32	0	0	0	5	80	100	75	100	50	80	10	40	10	20	20	30	0.09	0.12	1.25	1.35
JO139	7	2	2	2	18	SCL	CL		0.37	0.37	0	0	0	0	100	100	75	100	60	80	50	60	20	35	25	40	0.10	0.15	1.25	1.35
JO139	7	3	3	18	30	SCL	SL		0.32	0.32	0	0	0	0	100	100	75	100	60	80	45	55	15	25	25	40	0.06	0.10	1.30	1.40
JO139	7	4	4	30	34	UWB			0.00	0.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00
JO139	8	1	12	0	3	FSL			0.24	0.24	0	0	0	5	80	100	75	100	50	80	25	50	5	18	15	25	0.11	0.14	1.25	1.35
JO139	8	2	2	3	10	FSL	SL		0.28	0.28	0	0	0	5	80	100	75	100	50	80	25	50	5	18	15	25	0.09	0.11	1.35	1.45
JO139	8	3	3	10	35	FSL	SL		0.28	0.28	0	0	0	5	80	100	75	100	50	80	25	50	5	18	15	25	0.09	0.11	1.35	1.45
JO139	8	4	4	35	39	UWB			0.00	0.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00
JO139	9	1	11	0	6	FS			0.28	0.28	0	0	0	0	100	100	100	100	75	90	5	30	0	7	0	0	0.05	0.07	1.35	1.45
JO139	9	2	2	6	60	FS	LS		0.28	0.28	0	0	0	0	100	100	100	100	75	90	5	30	0	7	0	0	0.05	0.07	1.45	1.60
JO139	9	3	3	60	70	LFS			0.32	0.32	0	0	0	0	100	100	100	100	75	95	20	35	0	10	0	0	0.08	0.10	1.45	1.60

Soil properties to a depth of 9 inches are averaged.
The percent passing designated sieves in this table is used to calculate the KINEROS parameter for the rock fraction in the soil.

From the averaged layers and percentage composition of soils for each map unit, a texture is determined. From this texture, the other KINEROS parameters are estimated in AGWA, according to the kin-lut.dbf table (Table B-3).

Table B-3: AGWA Conversion from Soil Texture to KINEROS Input

TEXTURE	KS	G	POR	SMAX	CV	SAND	SILT	CLAY	DIST	KFF
C	0.600	407.0	0.475	0.810	0.500	27.00	23.00	50.00	0.160	0.340
CBV	210.000	46.0	0.437	0.950	0.690	91.00	1.00	8.00	0.690	0.050
CEM	0.000	0.0	0.000	0.000	0.000	0.00	0.00	0.00	0.000	0.280
CIND	210.000	46.0	0.437	0.950	0.690	91.00	1.00	8.00	0.690	0.020
CL	2.300	259.0	0.464	0.840	0.940	32.00	34.00	34.00	0.240	0.390
COS	210.000	46.0	0.437	0.950	0.690	91.00	1.00	8.00	0.690	0.150
COSL	26.000	127.0	0.453	0.910	1.900	65.00	23.00	12.00	0.380	0.240
FB	0.600	407.0	0.475	0.810	0.500	27.00	23.00	50.00	0.160	0.050
FRAG	210.000	46.0	0.437	0.950	0.690	91.00	1.00	8.00	0.690	0.050
FS	210.000	46.0	0.437	0.950	0.690	91.00	1.00	8.00	0.690	0.200

FSL	26.000	127.0	0.453	0.910	1.900	65.00	23.00	12.00	0.380	0.350
G	210.000	46.0	0.437	0.950	0.690	27.00	23.00	50.00	0.160	0.150
GYP	0.000	0.0	0.000	0.000	0.000	0.00	0.00	0.00	0.000	0.050
HM	0.600	407.0	0.475	0.810	0.500	27.00	23.00	50.00	0.160	0.020
ICE	0.000	0.0	0.000	0.000	0.000	0.00	0.00	0.00	0.000	0.000
IND	0.300	100.0	0.200	0.300	0.200	0.00	0.00	0.00	0.000	0.250
L	13.000	108.0	0.463	0.940	0.400	42.00	39.00	19.00	0.250	0.420
LCOS	61.000	63.0	0.437	0.920	0.850	83.00	7.00	10.00	0.550	0.180
LFS	61.000	63.0	0.437	0.920	0.850	83.00	7.00	10.00	0.550	0.250
LS	61.000	63.0	0.437	0.920	0.850	83.00	7.00	10.00	0.550	0.230
LVFS	61.000	63.0	0.437	0.920	0.850	83.00	7.00	10.00	0.550	0.440
MUCK	0.600	407.0	0.475	0.810	0.500	27.00	23.00	50.00	0.160	0.020
PC	26.000	127.0	0.453	0.910	1.900	65.00	23.00	12.00	0.380	0.320
PEAT	0.600	407.0	0.475	0.810	0.500	27.00	23.00	50.00	0.160	0.020
S	210.000	46.0	0.437	0.950	0.690	91.00	1.00	8.00	0.690	0.180
SC	1.200	302.0	0.430	0.750	1.000	50.00	4.00	46.00	0.340	0.360
SCL	4.300	263.0	0.398	0.830	0.600	59.00	11.00	30.00	0.400	0.360
SI	3.000	260.0	0.450	0.920	0.550	8.00	81.00	11.00	0.130	0.430
SIC	0.900	375.0	0.479	0.880	0.920	9.00	45.00	46.00	0.150	0.310
SICL	1.500	345.0	0.471	0.920	0.480	12.00	54.00	34.00	0.180	0.400
SIL	6.800	203.0	0.501	0.970	0.500	23.00	61.00	16.00	0.230	0.490
SL	26.000	127.0	0.453	0.910	1.900	65.00	23.00	12.00	0.380	0.320
SPM	0.600	407.0	0.475	0.810	0.500	27.00	23.00	50.00	0.160	0.020
SR	26.000	127.0	0.453	0.910	1.900	65.00	23.00	12.00	0.380	0.330
UWB	0.000	0.0	0.000	0.000	0.000	0.00	0.00	0.00	0.000	0.020
VAR	0.000	0.0	0.000	0.000	0.000	0.00	0.00	0.00	0.000	0.550
VFS	210.000	46.0	0.437	0.950	0.690	91.00	1.00	8.00	0.690	0.460
VFSL	26.000	127.0	0.453	0.910	1.900	65.00	23.00	12.00	0.380	0.500
WB	0.000	0.0	0.000	0.000	0.000	0.00	0.00	0.00	0.000	0.020
MPT	0.600	407.0	0.475	0.810	0.500	27.00	23.00	50.00	0.160	0.020
COARSE	67.100	92.7	0.445	0.920	1.357	75.16	14.15	10.69	0.486	0.268
MEDIUM	9.056	205.7	0.463	0.917	0.738	36.57	42.98	20.45	0.272	0.416
FINE	0.824	382.8	0.470	0.818	0.610	27.02	25.41	47.57	0.181	0.345
D/SS	210.000	46.0	0.437	0.950	0.690	91.00	1.00	8.00	0.690	0.180
SALT	0.000	0.0	0.000	0.000	0.000	0.00	0.00	0.00	0.000	0.050
ROCK	0.000	0.0	0.000	0.000	0.000	0.00	0.00	0.00	0.000	0.020
GLACIER	0.000	0.0	0.000	0.000	0.000	0.00	0.00	0.00	0.000	0.000
WATER	0.000	0.0	0.000	0.000	0.000	0.00	0.00	0.00	0.000	0.000
NO DATA	0.000	0.0	0.000	0.000	0.000	0.00	0.00	0.00	0.000	0.000

APPENDIX C: LANDCOVER DATABASE TABLES

CLASS	NAME	A	B	C	D	COVER	INT	N	IMPERV
11	Open Water	100	100	100	100	0	0.00	0.000	0.00
12	Perennial Ice/Snow	98	98	98	98	0	0.00	0.000	0.00
21	Low Intensity Residential	77	85	90	92	15	0.10	0.150	0.40
22	High Intensity Residential	81	88	91	93	10	0.08	0.120	0.75
23	Commercial/Industrial/Transportation	89	92	94	95	2	0.05	0.010	0.80
31	Bare Rock/Sand/Clay	96	96	96	96	2	0.00	0.010	0.00
32	Quarries/Strip Mines/Gravel Pits	78	85	90	92	2	0.00	0.010	0.00
33	Transitional	72	82	87	90	20	0.00	0.010	0.00
41	Deciduous Forest	55	55	75	80	50	1.15	0.015	0.00
42	Evergreen Forest	55	55	70	77	50	1.15	0.015	0.00
43	Mixed Forest	55	55	75	80	50	1.15	0.015	0.00
51	Shrubland	63	77	85	88	25	3.00	0.055	0.00
52	Shrubland Basin Big Sagebrush High Density	63	77	85	88	25	3.00	0.055	0.00
53	Shrubland Moderate Density	63	77	85	88	25	3.00	0.055	0.00
54	Shrubland Basin Low Density	63	77	85	88	25	3.00	0.055	0.00
55	Shrubland Basin Scattered / No Sagebrush	63	77	85	88	25	3.00	0.055	0.00
61	Orchards/Vineyards/Other	77	77	84	88	70	2.80	0.040	0.00
71	Grasslands/Herbaceous	49	69	79	84	25	2.00	0.015	0.00
81	Pasture/Hay	68	79	86	89	70	2.80	0.040	0.00
82	Row Crops	72	81	88	91	50	0.76	0.040	0.00
83	Small Grains	65	76	84	88	90	4.00	0.040	0.00
84	Fallow	76	85	90	93	30	0.50	0.040	0.00
85	Urban/Recreational Grasses	68	79	86	89	90	2.50	0.040	0.01
91	Woody Wetlands	85	85	90	92	70	1.15	0.060	0.00
92	Emergent Herbaceous Wetlands	77	77	84	90	70	1.15	0.060	0.00

APPENDIX D: SALINITY ESTIMATION

Table D-1: Salinity per Map Unit

Map Unit ID (MUID)	Soil Series	Soil Series Percent Composition per Map Unit	Estimated Salinity for Soil Series (ERO 1988) (mS/cm)	Estimated Numeric Value for Salinity (µS/cm)	Average Salinity (µS/cm) for Map Unit
JO102	Langspring Variant	72%	<2	1000	1000
	Langspring	28%	<2	1000	
JO104	Chrisman	100%	<2	1000	1000
JO106	Monte	67%	<2	1000	1000
	Leckman	33%	<2	1000	
JO108	Dines	45%	8-16	12000	7600
	Clowers	33%	4-8	6000	
	Quealman	22%	<2	1000	
JO110	Fraddle	72%	<2	1000	1000
	Tresano	28%	<2	1000	
JO113	Haterton	53%	2-4	3000	3000
	Garsid	47%	2-4	3000	
JO114	Ouard	35%	<2	1000	4300
	Ouard Variant	35%	<2	1000	
	Boltus	30%	8-16	12000	
JO116	Huguston	44%	2-4	3000	2660
	Horsley	39%	2-4	3000	
	Terada	17%	<2	1000	
JO119	Garsid	53%	2-4	3000	2060
	Monte	47%	<2	1000	
JO121	Garsid	47%	2-4	3000	1940
	Terada	29%	<2	1000	
	Langspring Variant	24%	<2	1000	
JO122	Baston	44%	<2	1000	4410
	Boltus	31%	8-16	12000	
	Chrisman	25%	<2	1000	
JO123	Spool Variant	41%	<2	1000	1540
	Ouard Variant	41%	<2	1000	
	San Arcacio Variant	18%	<8	4000	
JO124	Fraddle	35%	<2	1000	1900
	Ouard	35%	<2	1000	
	San Arcacio Variant	30%	<8	4000	
JO125	San Arcacio	56%	<8	4000	2680
	Saguache	44%	<2	1000	
JO127	Vermillion Variant	39%	<2	1000	1000
	Seedskadee	39%	<2	1000	
	Fraddle	22%	<2	1000	
JO128	Fraddle	56%	<2	1000	1660
	Ouard	22%	<2	1000	
	San Arcacio Variant	22%	<8	4000	

Table D-2: Salinity per Hydrologic Unit Watershed.

Watershed Name	Watershed Area (Acres)	Map Unit	Map Unit Area (acres)	Map Unit Area percentage of Watershed	Average Salinity (µS/cm) per Map Unit	Average Salinity (µS/cm) per Watershed
140401040603	730	JO114	99	13.6%	4300	1000
		JO127	631	86.4%	1000	
Big Sandy River-Bull Draw	3567	JO102	149	4.2%	1000	2000
		JO106	521	14.6%	1000	
		JO110	268	7.5%	1000	
		JO113	58	1.6%	3000	
		JO114	328	9.2%	4300	
		JO116	207	5.8%	2660	
		JO123	303	8.5%	1540	
		JO124	1600	44.8%	1900	
		JO125	4	0.1%	2680	
		JO127	129	3.6%	1000	
Expanded Sand Draw-Alkali Creek	13725	JO104	42	0.3%	1000	2000
		JO106	1509	11.0%	1000	
		JO108	268	2.0%	7600	
		JO110	575	4.2%	1000	
		JO113	1012	7.4%	3000	
		JO114	1315	9.6%	4300	
		JO116	542	3.9%	2660	
		JO119	2074	15.1%	2060	
		JO121	84	0.6%	1940	
		JO123	282	2.1%	1540	
		JO124	1209	8.8%	1900	
		JO125	2270	16.5%	2680	
		JO127	1147	8.4%	1000	
		JO128	1395	10.2%	1660	
Granite Wash	1344	JO106	289	21.5%	1000	2000
		JO108	1	0.1%	7600	
		JO110	22	1.6%	1000	
		JO113	116	8.6%	3000	
		JO114	2	0.2%	4300	
		JO119	3	0.2%	2060	
		JO121	11	0.8%	1940	
		JO123	680	50.6%	1540	
		JO124	221	16.5%	1900	
Jonah Gulch	294	JO114	286	97.5%	4300	4000
		JO127	7	2.5%	1000	
Long Draw	4987	JO106	1183	23.7%	1000	2000
		JO110	302	6.1%	1000	
		JO114	354	7.1%	4300	
		JO116	976	19.6%	2660	
		JO124	229	4.6%	1900	
		JO127	1943	39.0%	1000	
Reduced Upper Alkali Creek-Green River	3855	JO106	91	2.3%	1000	2000
		JO110	376	9.7%	1000	
		JO113	430	11.2%	3000	
		JO114	738	19.1%	4300	
		JO116	14	0.4%	2660	
		JO119	1011	26.2%	2060	
		JO121	959	24.9%	1940	
		JO125	34	0.9%	2680	
		JO127	9	0.2%	1000	
		JO128	194	5.0%	1660	
Upper Eighteenmile Canyon	2006	JO106	305	15.2%	1000	2000
		JO113	485	24.2%	3000	
		JO116	371	18.5%	2660	
		JO121	205	10.2%	1940	
		JO122	86	4.3%	4410	
		JO127	554	27.6%	1000	