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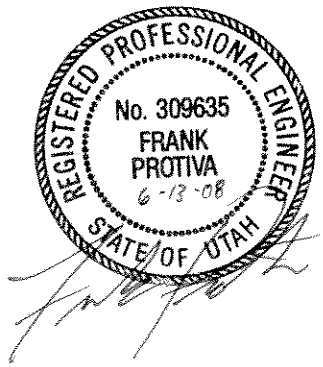
HYDROLOGY and HYDRAULICS NARRATIVE FOR UTAH ENERGY CORPORATION DANEROS URANIUM MINE

The project is located at
110 11' .2.835" W and 37 35'54.194"N

SWI Project No. 08268

Prepared On:
June 13, 2008

Prepared For:
Mr. John Hasleby
Utah Energy Corporation
P.O. Box 1346
Moab, Utah 84532



HYDROLOGY and HYDRAULICS NARRATIVE
FOR
UTAH ENERGY CORPORATION
DANEROS URANIUM MINE

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INTRODUCTION

The Daneros Uranium Mine will be an underground mine in a rural region of southeast Utah, between Fry and Red Canyons. This report evaluates existing drainage characteristics of the watersheds adjacent to the mine for the purpose of designing a diversion channel for the spoils area, and for affirming a safe low-water crossing design, and to verify runoff from the design storm will flow at a safe freeboard distance below the mine portal and spoil pile locations.

Existing drainage patterns generally cross the access and internal roads from west to east. Slopes vary from gentle to steep across the drainage basins and vegetation is a mix of shrubs and small trees with fair to poor ground cover.

OBJECTIVES AND PROCEDURES

The hydrology was developed in two locations. The larger basin was evaluated to determine peak flows in the main wash adjacent to the portal and spoil locations. The smaller basin lies within the larger basin and was evaluated to determine the size of intercept ditch needed to divert upslope flows around the proposed spoil stockpile.

Soils data was obtained from a USDA – Natural Resouces Conservation Service soil survey for southern Utah (USDA-NRCS Tabular Data Version 3, 12-07-2006) and is the source for vegetation coverage data and hydrologic soil groups. A copy of the relevant pages is included in this report and the exhibit in Appendix Fshows the soil group areas.

Topographic information for the larger watershed is based on USGS National Elevation Database. Topographic information for the smaller watershed and area around the mine was obtained from Cartographic Edge of Grand Junction, Colorado. Both of these sources were used as the basis for determining watershed boundaries, time of concentration pathways and drainage basin slopes. Times of concentration and runoff curve numbers were calculated using the SCS TR-55 Methodology. The storm intensity, duration and frequency information was taken from the National Oceanographic and Atmospheric Association's (NOAA) Atlas #14 Data, provided online at the NOAA web site.

HEC-HMS was used to determine peak flows in the main wash, and HEC-RAS was used to determine flow depths at the low water crossing. PondPack V10.0 was used to determine peak flows for the tailings diversion channel.

Assumptions include: (1) vegetative cover in "fair to poor" hydrologic condition with 0-70% cover. (2) The watershed is in an undeveloped state over its entire area.

HYDROLOGY

The larger watershed covers approximately 3.37 square miles. The dominant feature of the watershed is an incised wash that forms the main drainage flowing to the southwest. Slopes within the wash are flat at the top of the mesas that divide the larger watersheds, to nearly vertical along the sides of the wash. Vegetation for the area consists of semi-desert shrub and Pinyon-Juniper tree coverage. Time of Concentration was determined using the method presented in the ADOT Hydrology manual for desert/mountain areas for use with HEC-HMS.

The smaller watershed is approximately 6 acres in size and forms a minor tributary to the main drainage for the larger watershed. It has the same characteristics of the larger watershed. Time of Concentration was determined using the TR-55 method for sheet, shallow and channel flow.

Peak flows were evaluated for both the 25-year / 24-hour storm and the 100-year / 6-hour storm. The 100-year / 6-hour storm yielded the highest runoff, approximately 751 cubic feet / second, and was therefore used as the design storm to analyze hydraulic characteristics of the wash relative to proposed mine improvements. (The 25-year / 24-hour storm yielded 553 cubic feet / second (cfs)).

HYDRAULICS

Analysis of Proposed Wash Crossing

SWI performed a hydraulic analysis of a portion of the wash within the limits of the Daneros Uranium Mine using HEC-RAS version 3.1.2 hydraulic modeling software.

Both an Existing and a Proposed conditions model were analyzed for this project, and each model incorporated 12 cross sections, located at critical areas of hydraulic concern relative to the proposed mine improvements. This analysis addressed two objectives: a) Ensure flows in the main wash provided at least 2 ft of freeboard for the portal and spoil areas; and b) Ensure the road crossing the main wash did not flow more than 2 ft deep during the design storm event.

Using the 100-year 6-hr peak flow of 750 cfs as the basis for design, the road crossing geometry was adjusted until a flow depth of less than two feet was achieved, and results of this geometry change were incorporated into the grading plan in Appendix E.

CONCLUSION

Fill material is required at the road crossing to bring an incised portion of the channel up to a more uniform cross-section. The area to be filled is shown on the attached grading plan, and is less than 1/10 acre. Stream conveyance, as verified by the HEC-RAS "Proposed Conditions" model run, is not significantly affected by the filling of this incised portion of the stream bed.

Grading of both the portal site and the spoils site was designed to ensure flow from the wash does not encroach on the locations. The proposed grading design and limits can be found in Appendix E Grading Plan. *Under the Proposed grading condition, freeboard at the portal site is at least 3.69 ft, freeboard at the spoils site is at least 8.99 ft, and the flow depth over the proposed road crossing is 1.92 ft during the design storm.*

An interceptor ditch along the northern and western boundaries of the proposed spoils site will collect any flows coming off the adjacent slope and direct it around the spoils site into the wash. The ditch will be 1 foot deep with 2:1 side slopes and be graded around its perimeter. This ditch section was designed to convey approximately 10 cfs, allowing a conservative buffer, as the design storm only produces 6.4 cfs of runoff above the spoil site.

APPENDIX CONTENTS

The Vicinity Map in Appendix A identifies the general location of the project in relation to surrounding roads and towns.

The Drainage Maps in Appendix B show the overall watershed area and the basin limits of the small watershed above the spoils area. Included on the drainage maps is a summary table showing 25 year, 24 hour and 100 year, 6 hour runoff totals.

Detailed output from HEC-HMS and PondPack is included in Appendix C. This includes the Time of Concentration calculations and SCS Curve Numbers, soil group areas, and master summary listing of the 25 and 100 year storm runoff totals identified on the Drainage Map in Appendix B.

Detailed output from HEC-RAS is included in Appendix D, with key cross-section locations flagged on the summary output tables.

Appendix E includes the grading plan for the diversion channel around the spoil pile, grading for the mine portal area and grading for the low-water road crossing.

Appendix F has excerpts from the soil report for this area that lists the Hydrologic Soil Group and Vegetation Type.

REFERENCES

Publications:
ADOT Hydrology Manual, Arizona Department of Transportation, 1993

Software:
HEC-HMS, US Army Corps of Engineers, Version 3.0.0

HEC-RAS, Us Army Corps of Engineers, Version

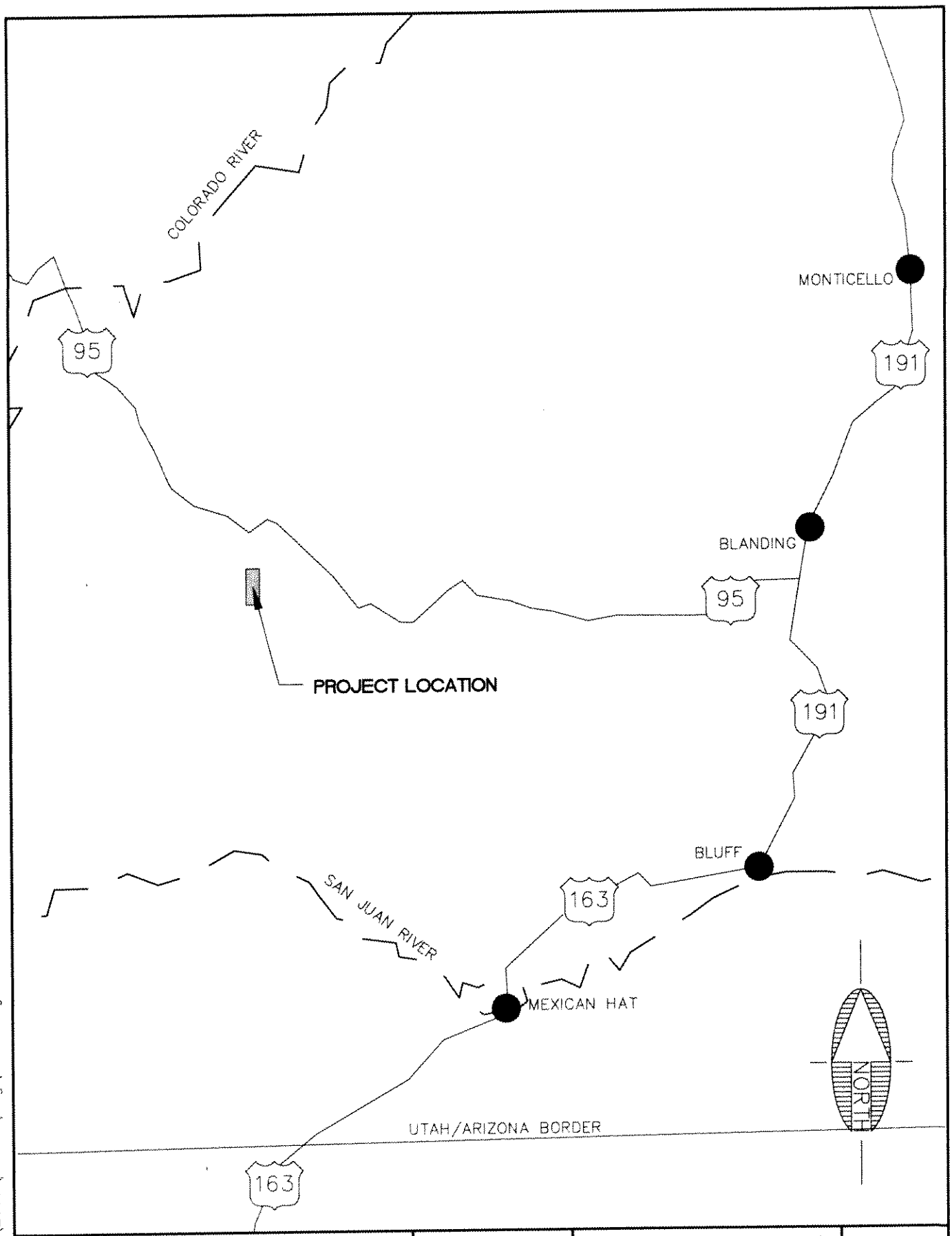
PondPack, Haestad Methods, Inc, Version 10.0

USDA Natural Resource Conservation Service, Tabular Data Version 3, 12-07-2006

HYDROLOGY NARRATIVE
FOR
UTAH ENERGY CORPORATION
DANEROS URANIUM MINE
SWI Project No. 08268

APPENDIX A

VICINITY MAP



PLOTTED: Jun 14, 2008 - 9:01am

FILE: P:\2008\08268\dwg\VMAP.dwg <<Unnamed Profile>>

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DRAWN:	MGL
DESIGN:	MGL
CHECKED:	FRP

DANEROS MINE — SAN JUAN CO UTAH

VICINITY MAP

SHEET VM1 OF 1

HYDROLOGY NARRATIVE
FOR
UTAH ENERGY CORPORATION
DANEROS URANIUM MINE
SWI Project No. 08268

APPENDIX B

DRAINAGE MAPS

HYDROLOGY NARRATIVE
FOR
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DANEROS URANIUM MINE
SWI Project No. 08268

APPENDIX C

HYDROLOGY

Basin Gross Area= 2154 acres

Soil Map Unit	Area	Soil Name	Hydro Soil Group	% Coverage	Area	Eco Class	SCS CN	COMPOSITE SCS CN
35	288.11	Myton Family	B	40%	115.244	Talus Slope-blackbrush	72	
		Skos	D	35%	100.8385	Semidesert Blackbrush	86	
		Rock Outcrop	D	10%	28.811	--	86	
		leftover			**43.22**		86	**80**
64	411.86	Strych	B	40%	164.744	Semidesert Shadscale	72	
(SMALLER WATERSHED		Skos	D	35%	144.151	Semidesert Shadscale	86	
WITHIN THIS SOIL		Badland	D	15%	61.779	--	86	
UNIT)		**leftover**			**41.19**		86	**80**
45	459.11	Rizno	D	35%	160.6885	Pinyon-Juniper	80	
		Barx	B	25%	114.7775	Sagebrush	51	
		Yarts	B	20%	91.822	Pinyon-Juniper	58	
		leftover			**91.82**		80	**68**
49	991.26	Rizno	D	65%	644.319	Pinyon-Juniper	80	
		Rock Outcrop	D	25%	247.815	--	80	
		leftover			**99.13**		80	**80**

check cell= [redacted] 2150.34 COMPOSITE CN FOR WHOLE BASIN= **78**

NOTE:Leftover is because soil report does not cover minor soil areas (less than 10% of unit coverage for minor soil types) this area is assigned highest curve number of unit

POINT PRECIPITATION FREQUENCY ESTIMATES FROM NOAA ATLAS 14

Utah 37.59839 N 110.19329 W 5846 feet

from "Precipitation-Frequency Atlas of the United States" NOAA Atlas 14, Volume 1, Version 4
G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley
NOAA, National Weather Service, Silver Spring, Maryland, 2006

Extracted: Tue Jun 10 2008

Confidence Limits | Location Maps | Other Info. | GIS data | Maps | Help | Docs | U.S. Map

Precipitation Frequency Estimates (inches)

ARI* (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	6(da
1	0.13	0.20	0.25	0.33	0.41	0.49	0.55	0.68	0.84	0.99	1.16	1.37	1.60	1.79	2.29	2.79	3.35	3.8(
2	0.17	0.26	0.32	0.43	0.53	0.63	0.69	0.85	1.06	1.24	1.46	1.73	2.02	2.26	2.89	3.53	4.23	4.8
5	0.23	0.35	0.43	0.58	0.72	0.84	0.90	1.08	1.32	1.58	1.85	2.19	2.57	2.87	3.67	4.44	5.32	6.1
10	0.28	0.43	0.54	0.72	0.89	1.04	1.09	1.27	1.54	1.84	2.17	2.57	3.01	3.34	4.28	5.15	6.17	7.0
25	0.37	0.56	0.69	0.93	1.15	1.34	1.39	1.57	1.85	2.21	2.62	3.10	3.63	4.00	5.11	6.11	7.32	8.3
50	0.44	0.67	0.82	1.11	1.38	1.61	1.66	1.82	2.10	2.50	2.98	3.51	4.12	4.51	5.76	6.85	8.19	9.3(
100	0.52	0.79	0.98	1.32	1.63	1.93	1.97	2.12	2.37	2.81	3.35	3.95	4.63	5.04	6.44	7.59	9.11	10.
200	0.61	0.93	1.16	1.56	1.93	2.30	2.34	2.49	2.70	3.13	3.75	4.40	5.17	5.59	7.13	8.36	10.04	11.
500	0.76	1.16	1.43	1.93	2.39	2.88	2.92	3.08	3.27	3.57	4.30	5.04	5.92	6.35	8.08	9.37	11.32	12.
1000	0.89	1.35	1.68	2.26	2.80	3.42	3.45	3.61	3.79	3.92	4.75	5.54	6.52	6.94	8.82	10.16	12.34	13.

* These precipitation frequency estimates are based on a partial duration series. **ARI** is the Average Recurrence Interval.
Please refer to the documentation for more information. NOTE: Formatting forces estimates near zero to appear as zero.

* Upper bound of the 90% confidence interval Precipitation Frequency Estimates (inches)

ARI** (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	6(da
1	0.15	0.23	0.29	0.39	0.48	0.57	0.62	0.76	0.93	1.10	1.29	1.53	1.80	2.01	2.58	3.15	3.79	4.3.
2	0.20	0.30	0.37	0.50	0.62	0.72	0.79	0.95	1.17	1.38	1.63	1.93	2.26	2.54	3.26	3.98	4.79	5.5(
5	0.27	0.41	0.51	0.68	0.84	0.97	1.02	1.20	1.46	1.75	2.06	2.45	2.89	3.23	4.14	5.03	6.04	6.9
10	0.33	0.51	0.63	0.85	1.05	1.19	1.24	1.42	1.70	2.04	2.41	2.87	3.39	3.77	4.84	5.83	7.00	8.0
25	0.43	0.66	0.82	1.10	1.36	1.54	1.57	1.75	2.05	2.45	2.91	3.46	4.09	4.51	5.78	6.92	8.31	9.4
50	0.52	0.79	0.98	1.32	1.63	1.86	1.89	2.04	2.33	2.78	3.31	3.93	4.65	5.10	6.52	7.76	9.33	10.
100	0.62	0.95	1.18	1.59	1.97	2.24	2.25	2.40	2.65	3.12	3.74	4.43	5.24	5.71	7.31	8.64	10.39	11.
200	0.75	1.15	1.42	1.91	2.37	2.70	2.71	2.84	3.04	3.49	4.20	4.95	5.88	6.36	8.12	9.54	11.50	12.
500	0.96	1.46	1.80	2.43	3.01	3.44	3.48	3.56	3.72	4.00	4.86	5.70	6.78	7.28	9.26	10.76	13.03	14.
1000	1.15	1.76	2.18	2.93	3.63	4.14	4.18	4.24	4.36	4.42	5.40	6.30	7.51	8.01	10.18	11.71	14.28	15.

* The **upper** bound of the confidence interval at 90% confidence level is the value which 5% of the simulated quantile values for a given frequency are **greater** than.
** These precipitation frequency estimates are based on a partial duration series. **ARI** is the Average Recurrence Interval.
Please refer to the documentation for more information. NOTE: Formatting prevents estimates near zero to appear as zero.

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Job No. 0626B
Date June 12, 2006
By CTM
Sheet No.

Subject Dareros Mine Clark Unit Hydrograph Transform

From ADOT Hydrology Page 4-2

Time of Concentration

Desert Mountain

A = Area (M.²) = 3.365506
L = Length of T_c Flowline = 16605' = 3.145 miles
S = Slope = 8.6% = .458
L_{ca} = 7926' = 1.501 miles

$$T_c = 2.4 \cdot A^{.1} \cdot L^{.29} \cdot L_{ca}^{.25} \cdot S^{-.2}$$

$$= 2.4 \cdot (3.365506)^{.1} \cdot 3.145^{.29} \cdot 1.501^{.25} \cdot .458^{-.2}$$

$$= 2.4(1.129)(1.332)(1.107)(.293)$$

$$= 1.17 \text{ hrs}$$

Storage Coefficient

$$R = .37\, T_c^{1.11}\, L^{.8}\, A^{-.57}$$

$$= .37\,(1.17)^{1.11}\,(3.145)^{.8}\,(3.365506)^{-.57}$$

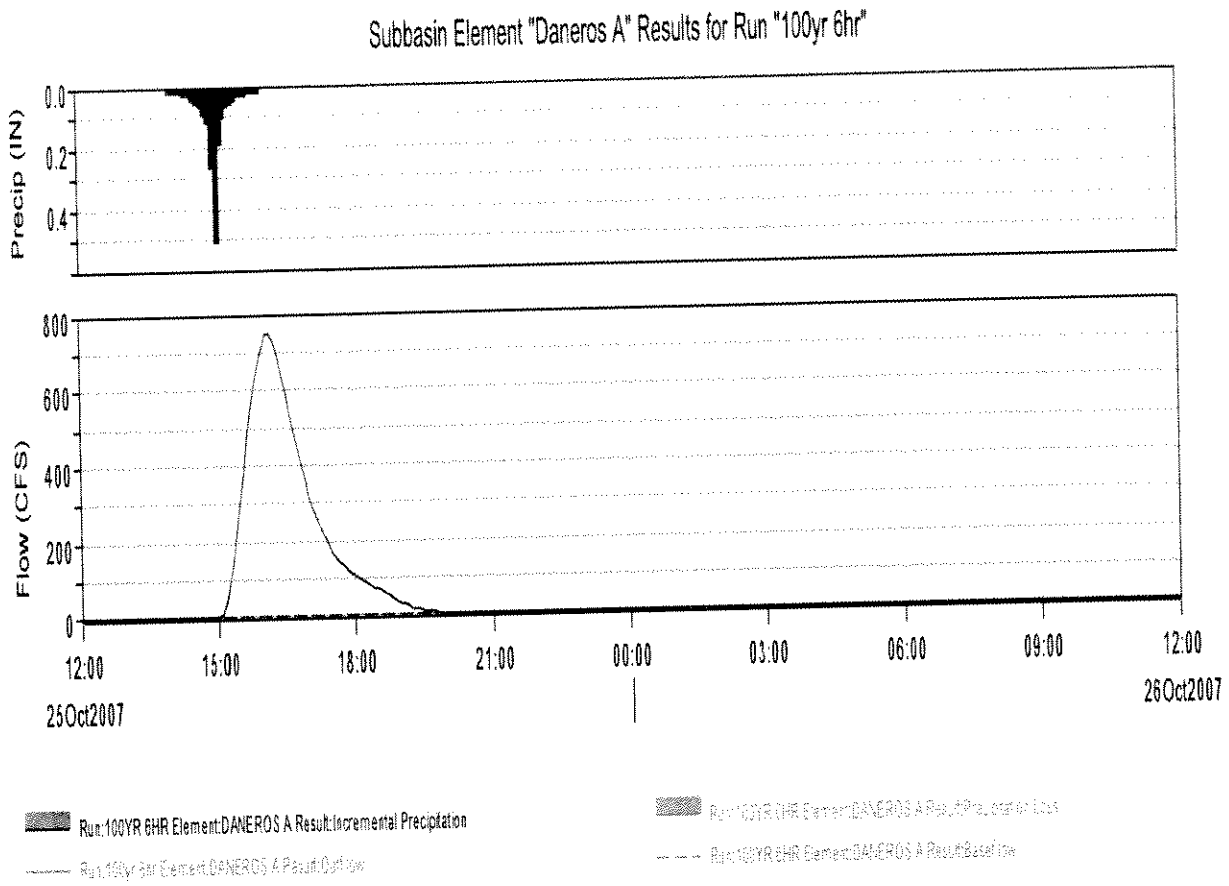
$$= .37(1.19)(2.498)(.5007)$$

$$= .5507$$

Project:	Daneros	Simulation Run:	100 Yr, 6hr
Start of Run:	10Jun2008, 12:00	Basin Model:	DANERO
End of Run:	11Jun2008, 18:00	Meteorologic Model:	100 Yr-6
Execution Time:	14Jun2008, 10:06:38	Control Specifications:	6 hr

Volume Units: IN

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Daneros A	3.3655	750.85	10Jun2008, 16:10	0.54


Subbasin Element "Daneros A" Results for Run "100yr 6hr"
Precip (IN)
0.0
0.2
0.4
Flow (CFS)
800
600
400
200
0
12:00
15:00
18:00
21:00
00:00
03:00
06:00
09:00
12:00
25Oct2007
26Oct2007
Run:100YR 6HR Element:DANEROS A Result:Incremental Precipitation

Project: Daneros	Simulation Run: 24 yr, 24 hr		
Start of Run:	10Jun2008, 12:00	Basin Model:	DANERO
End of Run:	11Jun2008, 12:00	Meteorologic Model:	25 yr 24h
Execution Time:	14Jun2008, 10:07:14	Control Specifications:	24 hr

Volume Units: IN

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Daneros A	3.3655	553.45	11Jun2008, 01:05	0.58

MASTER DESIGN STORM SUMMARY

Network Storm Collection: Daneros NOAA 24h

Return Event	Total Depth in	Rainfall Type	RNF ID
25	2.2100	Synthetic Curve	TypeII 24hr

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
*OUT 10	JCT	25	.383		12.0000	6.42		
TAILINGS AREA	AREA	25	.383		12.0000	6.42		

MASTER DESIGN STORM SUMMARY

Network Storm Collection: Daneros NOAA 6hr

Return Event	Total Depth in	Rainfall Type	RNF ID
100	2.1200	Time-Depth Curve	100yr, 6hr

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
*OUT 10	JCT	100	.351		3.0000	6.20		
TAILINGS AREA	AREA	100	.351		3.0000	6.20		

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: TR-55 Sheet

Mannings n	.1500	
Hydraulic Length	66.00	ft
2yr, 24hr P	1.2400	in
Slope	.140000	ft/ft
Avg.Velocity	.21	ft/sec

Segment #1 Time: .0864 hrs

Segment #2: Tc: TR-55 Channel

Flow Area	3.0000	sq.ft
Wetted Perimeter	12.04	ft
Hydraulic Radius	.25	ft
Slope	.250000	ft/ft
Mannings n	.0350	
Hydraulic Length	1030.00	ft
Avg.Velocity	8.43	ft/sec

Segment #2 Time: .0339 hrs

Total Tc: .1203 hrs

Type.... Tc Calcs
Name.... TAILINGS AREA

File.... P:\2008\08268\hyd\PPK\Tailings Area.ppw

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Tailings Area	80	6.630			80.00
COMPOSITE AREA & WEIGHTED CN --->		6.630			80.00 (80)

Type.... Runoff CN-Area
Name.... TAILINGS AREA

File.... P:\2008\08268\hyd\PPK\Tailings Area.ppw

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 25 year storm
Duration = 24.0000 hrs Rain Depth = 2.2100 in
Rain Dir = P:\2008\08268\hyd\PPK\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = P:\2008\08268\hyd\PPK\
HYG File - ID = - TAILINGS AREA 25
Tc = .1203 hrs
Drainage Area = 6.630 acres Runoff CN= 80

Computational Time Increment = .01604 hrs
Computed Peak Time = 11.9690 hrs
Computed Peak Flow = 6.49 cfs

Time Increment for HYG File = .1000 hrs
Peak Time, Interpolated Output = 12.0000 hrs
Peak Flow, Interpolated Output = 6.42 cfs

DRAINAGE AREA
ID:TAILINGS AREA
CN = 80
Area = 6.630 acres
S = 2.5000 in
0.2S = .5000 in

Cumulative Runoff
.6946 in
.384 ac-ft

HYG Volume... .383 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .12033 hrs (ID: TAILINGS AREA)
Computational Incr, Tm = .01604 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 62.43 cfs
Unit peak time Tp = .08022 hrs
Unit receding limb, Tr = .32088 hrs
Total unit time, Tb = .40111 hrs

HYDROLOGY NARRATIVE
FOR
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DANEROS URANIUM MINE
SWI Project No. 08268

APPENDIX D

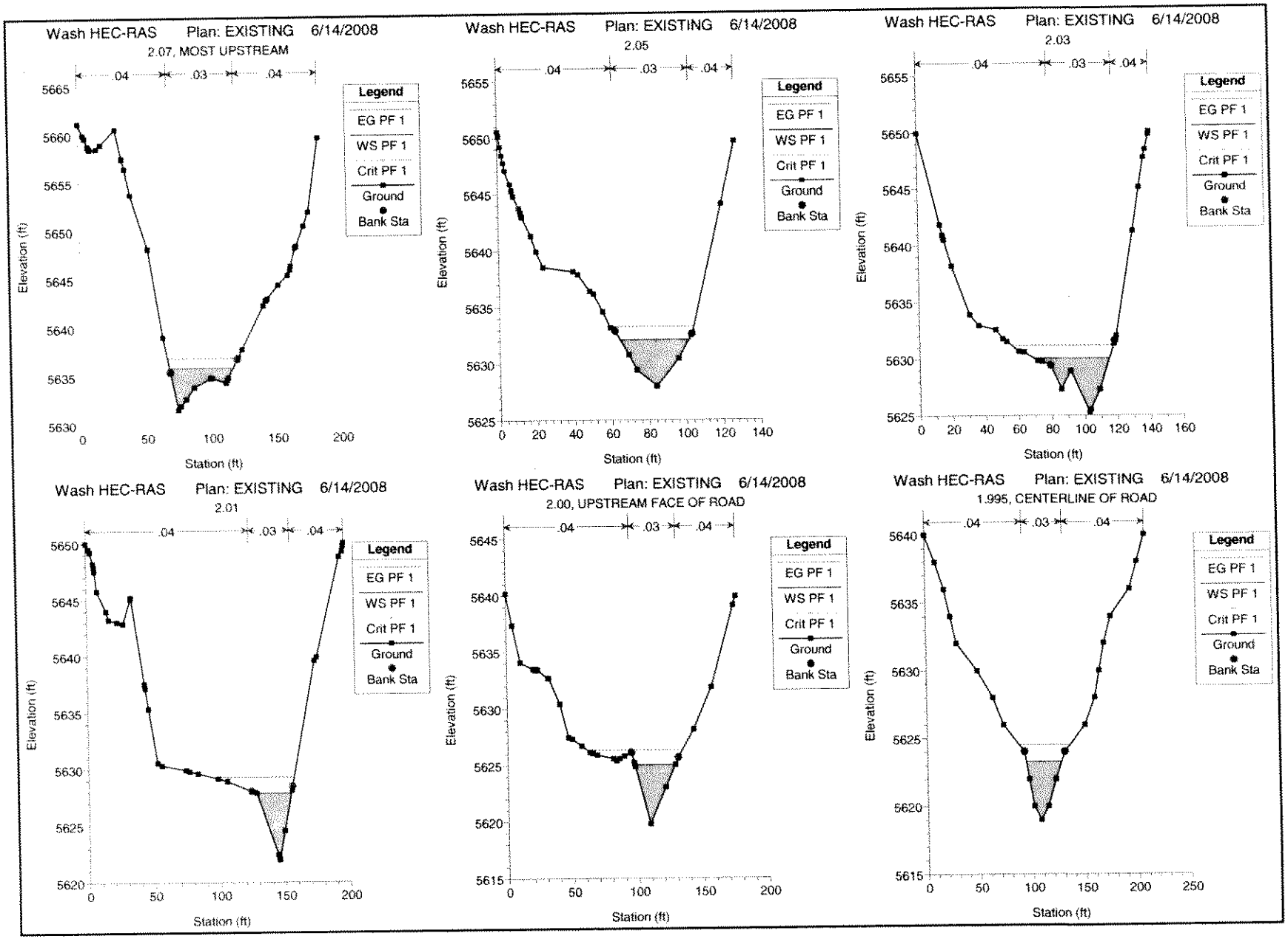
HEC-RAS SUMMARY AND HYDRUALIC CALCULATIONS

Worksheet for Tailings Diversion Channel

Project Description		
Flow Element:	Triangular Channel	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	
Input Data		
Roughness Coefficient:	0.030	
Channel Slope:	0.04100	ft/ft
Left Side Slope:	2.00	ft/ft (H:V)
Right Side Slope:	2.00	ft/ft (H:V)
Discharge:	10.00	ft^3/s
Results		
Normal Depth:	0.94	ft
Flow Area:	1.78	ft^2
Wetted Perimeter:	4.21	ft
Top Width:	3.77	ft
Critical Depth:	1.09	ft
Critical Slope:	0.01862	ft/ft
Velocity:	5.63	ft/s
Velocity Head:	0.49	ft
Specific Energy:	1.44	ft
Froude Number:	1.45	
Flow Type:	Supercritical	
GVF Input Data		
Downstream Depth:	0.00	ft
Length:	0.00	ft
Number Of Steps:	0	
GVF Output Data		
Upstream Depth:	0.00	ft
Profile Description:		
Profile Headloss:	0.00	ft
Downstream Velocity:	Infinity	ft/s
Upstream Velocity:	Infinity	ft/s
Normal Depth:	0.94	ft
Critical Depth:	1.09	ft
Channel Slope:	0.04100	ft/ft
Critical Slope:	0.01862	ft/ft

HEC-RAS Plan: EXIST River: Stream Centerli Reach: Reach 1 Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	2.07	PF 1	750.00	5631.54	5635.88	5635.88	5636.88	0.011398	8.03	93.58	48.97	1.02
Reach 1	2.05	PF 1	750.00	5627.98	5632.08	5632.08	5633.27	0.010358	8.72	85.97	36.77	1.01
Reach 1	2.03	PF 1	750.00	5625.29	5630.06	5630.06	5631.19	0.009851	8.57	90.17	45.77	0.97
Reach 1	2.01	PF 1	750.00	5621.95	5627.85	5627.85	5629.28	0.010169	9.58	78.33	26.84	0.99
Reach 1	2.00	PF 1	750.00	5619.79	5625.02	5625.02	5626.34	0.010295	9.20	81.53	31.09	1.00
Reach 1	1.995	PF 1	750.00	5619.00	5623.27	5623.27	5624.53	0.010278	9.00	83.36	33.48	1.00
Reach 1	1.99	PF 1	750.00	5617.75	5620.92	5620.92	5622.19	0.010480	9.03	83.04	33.22	1.01
Reach 1	1.97	PF 1	750.00	5615.31	5619.10	5619.10	5620.30	0.010404	8.80	85.19	35.92	1.01
Reach 1	1.95	PF 1	750.00	5610.14	5614.46	5614.46	5616.04	0.010464	10.07	74.45	23.99	1.01
Reach 1	1.93	PF 1	750.00	5607.47	5612.45	5612.45	5613.96	0.010447	9.84	76.19	25.84	1.01
Reach 1	1.91	PF 1	750.00	5603.95	5609.01	5609.01	5610.23	0.010762	8.85	84.74	35.67	1.01
Reach 1	1.89	PF 1	750.00	5601.93	5604.98	5604.98	5605.80	0.011322	7.28	102.96	62.62	1.00


Wash HEC-RAS Plan: EXISTING 6/14/2008
2.07, MOST UPSTREAM
.04 .03 .04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Wash HEC-RAS Plan: EXISTING 6/14/2008
2.05
.04 .03 .04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Wash HEC-RAS Plan: EXISTING 6/14/2008
2.03
.04 .03 .04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Wash HEC-RAS Plan: EXISTING 6/14/2008
2.01
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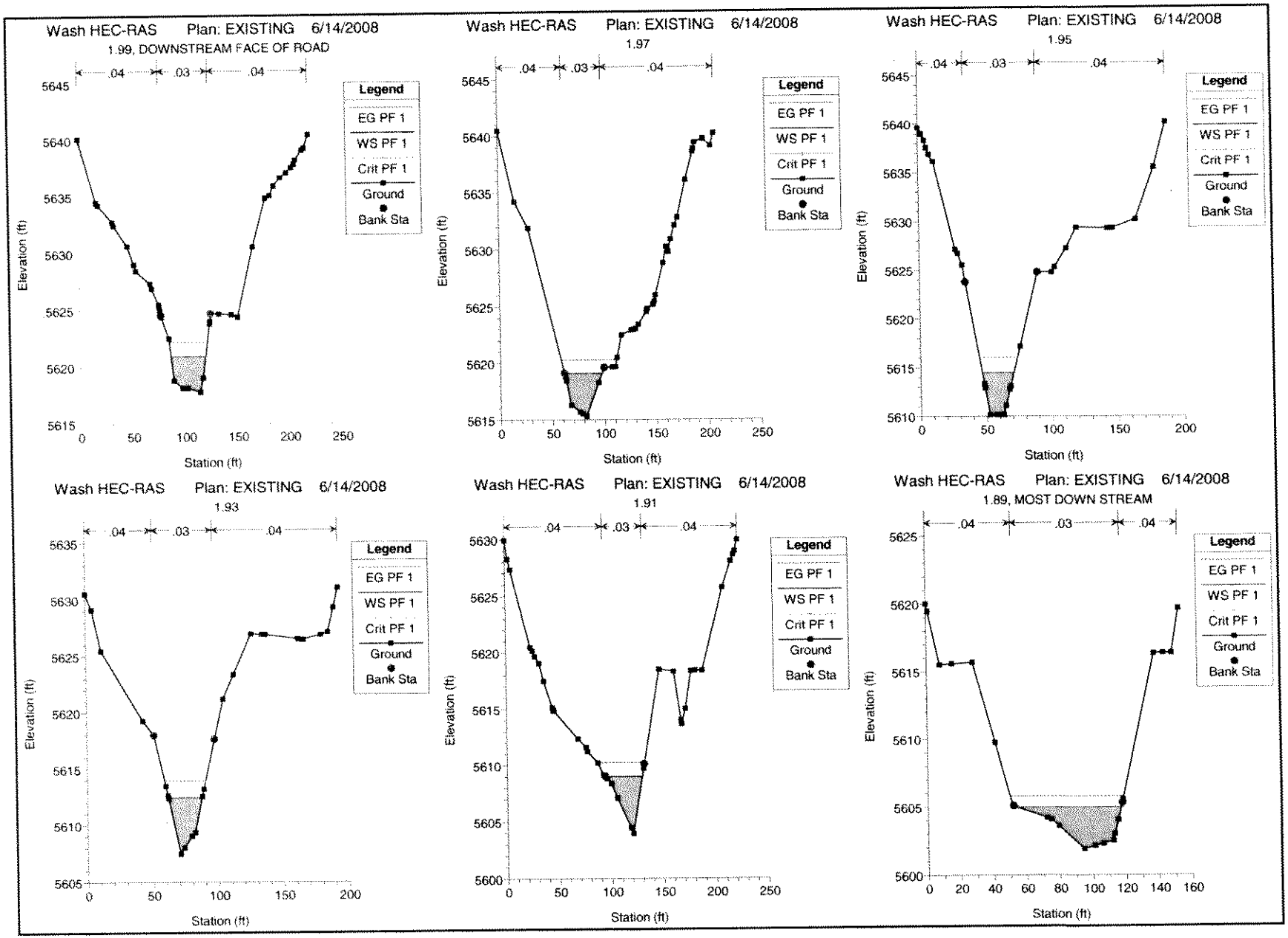
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Wash HEC-RAS Plan: EXISTING 6/14/2008
2.00, UPSTREAM FACE OF ROAD
.04 .03 .04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Wash HEC-RAS Plan: EXISTING 6/14/2008
1.995, CENTERLINE OF ROAD
.04 .03 .04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)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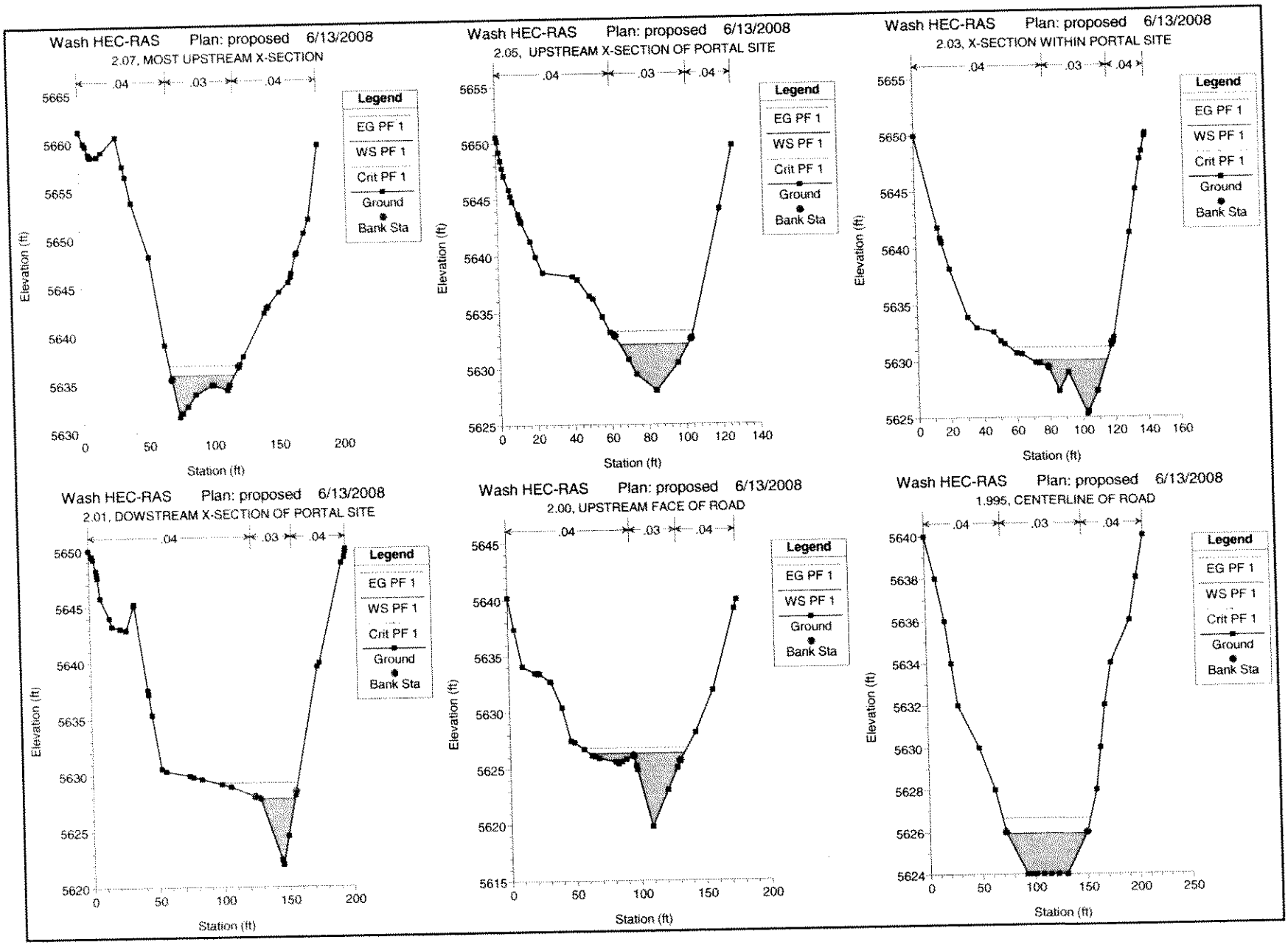
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Wash HEC-RAS Plan: EXISTING 6/14/2008
1.97
Wash HEC-RAS Plan: EXISTING 6/14/2008
1.95
Wash HEC-RAS Plan: EXISTING 6/14/2008
1.93
Wash HEC-RAS Plan: EXISTING 6/14/2008
1.91
Wash HEC-RAS Plan: EXISTING 6/14/2008
1.89, MOST DOWN STREAM

HEC-RAS Plan: pro River: Stream Centerli Reach: Reach 1 Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	2.07	PF 1	750.00	5631.54	5635.88	5635.88	5636.88	0.011398	8.03	93.58	48.97	1.02
Reach 1	2.05	PF 1	750.00	5627.98	5632.08	5632.08	5633.27	0.010358	8.72	85.97	36.77	1.01
Reach 1	2.03	PF 1	750.00	5625.29	5630.06	5630.06	5631.19	0.009851	8.57	90.17	45.77	0.97
Reach 1	2.01	PF 1	750.00	5621.95	5627.85	5627.85	5629.28	0.010176	9.58	78.27	26.81	0.99
Reach 1	2.00	PF 1	750.00	5619.79	5626.32		5626.82	0.002750	5.78	144.36	72.82	0.54
☆ Reach 1	1.995	PF 1	750.00	5624.00	5625.92	5625.92	5626.65	0.011716	6.84	109.66	75.91	1.00
Reach 1	1.99	PF 1	750.00	5617.75	5620.92	5620.92	5622.19	0.010480	9.03	83.04	33.22	1.01
Reach 1	1.97	PF 1	750.00	5615.31	5619.10	5619.10	5620.30	0.010404	8.80	85.19	35.92	1.01
Reach 1	1.95	PF 1	750.00	5610.14	5614.46	5614.46	5616.04	0.010464	10.07	74.45	23.99	1.01
Reach 1	1.93	PF 1	750.00	5607.47	5612.45	5612.45	5613.96	0.010447	9.84	76.19	25.84	1.01
Reach 1	1.91	PF 1	750.00	5603.95	5609.01	5609.01	5610.23	0.010762	8.85	84.74	35.67	1.01
Reach 1	1.89	PF 1	750.00	5601.93	5604.98	5604.98	5605.80	0.011322	7.28	102.96	62.62	1.00

★ ROAD CROSSING, PROPOSED CONDITIONS 5625.92 - 5624.00 = 1.92 FT. DEPTH OF FLOW OVER ROAD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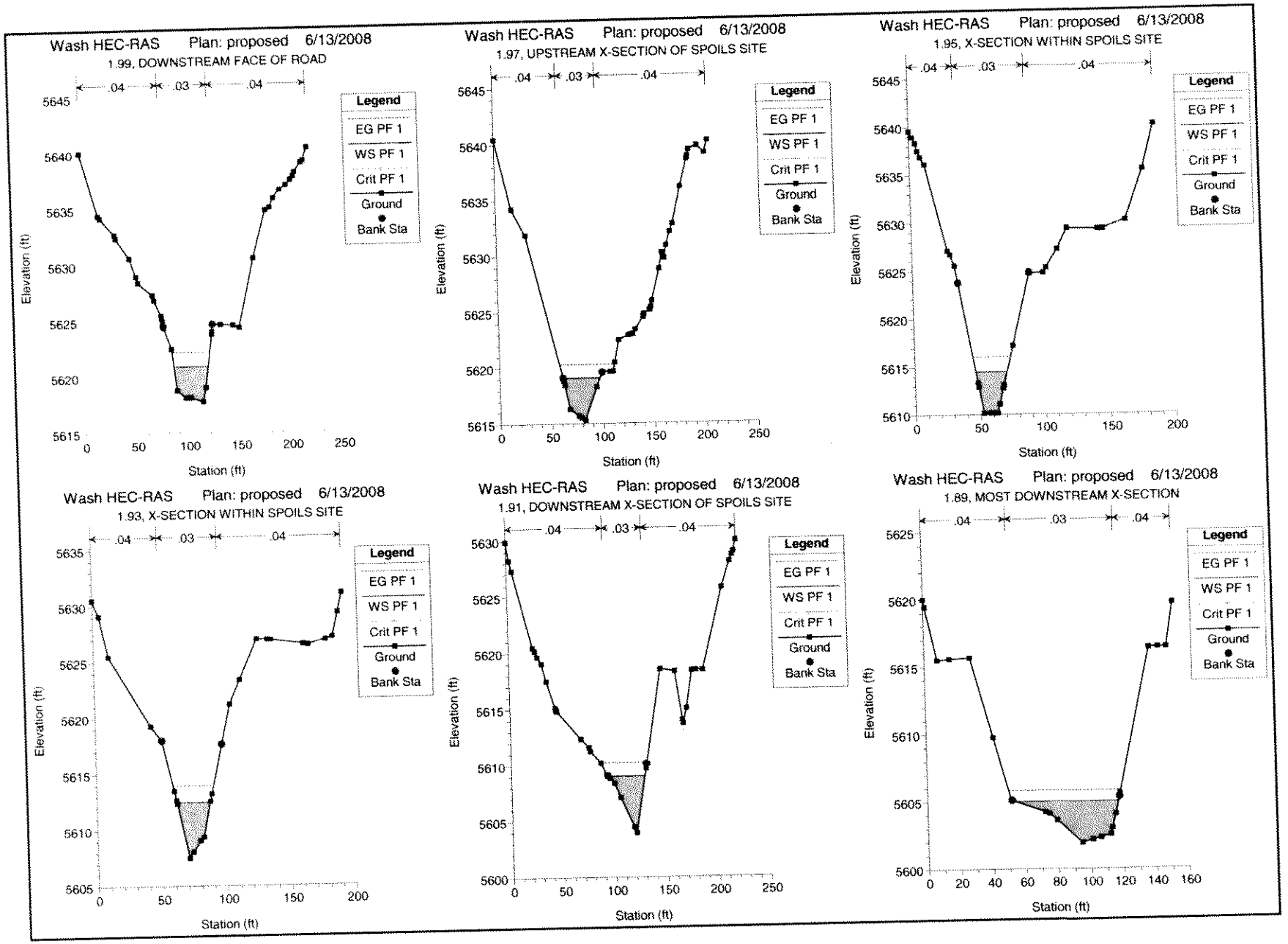
.04 .03 .04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Wash HEC-RAS Plan: proposed 6/13/2008
2.05, UPSTREAM X-SECTION OF PORTAL SITE
Wash HEC-RAS Plan: proposed 6/13/2008
2.03, X-SECTION WITHIN PORTAL SITE
Wash HEC-RAS Plan: proposed 6/13/2008
2.01, DOWSTREAM X-SECTION OF PORTAL SITE
Wash HEC-RAS Plan: proposed 6/13/2008
2.00, UPSTREAM FACE OF ROAD
Wash HEC-RAS Plan: proposed 6/13/2008
1.995, CENTERLINE OF ROAD


Wash HEC-RAS Plan: proposed 6/13/2008
1.99, DOWNSTREAM FACE OF ROAD
.04 .03 .04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Wash HEC-RAS Plan: proposed 6/13/2008
1.97, UPSTREAM X-SECTION OF SPOILS SITE
.04 .03 .04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Wash HEC-RAS Plan: proposed 6/13/2008
1.95, X-SECTION WITHIN SPOILS SITE
.04 .03 .04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Wash HEC-RAS Plan: proposed 6/13/2008
1.93, X-SECTION WITHIN SPOILS SITE
.04 .03 .04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Wash HEC-RAS Plan: proposed 6/13/2008
1.91, DOWNSTREAM X-SECTION OF SPOILS SITE
.04 .03 .04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Wash HEC-RAS Plan: proposed 6/13/2008
1.89, MOST DOWNSTREAM X-SECTION
.04 .03 .04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

APPENDIX E

GRADING PLANS

HYDROLOGY NARRATIVE
FOR
UTAH ENERGY CORPORATION
DANEROS URANIUM MINE
SWI Project No. 08268

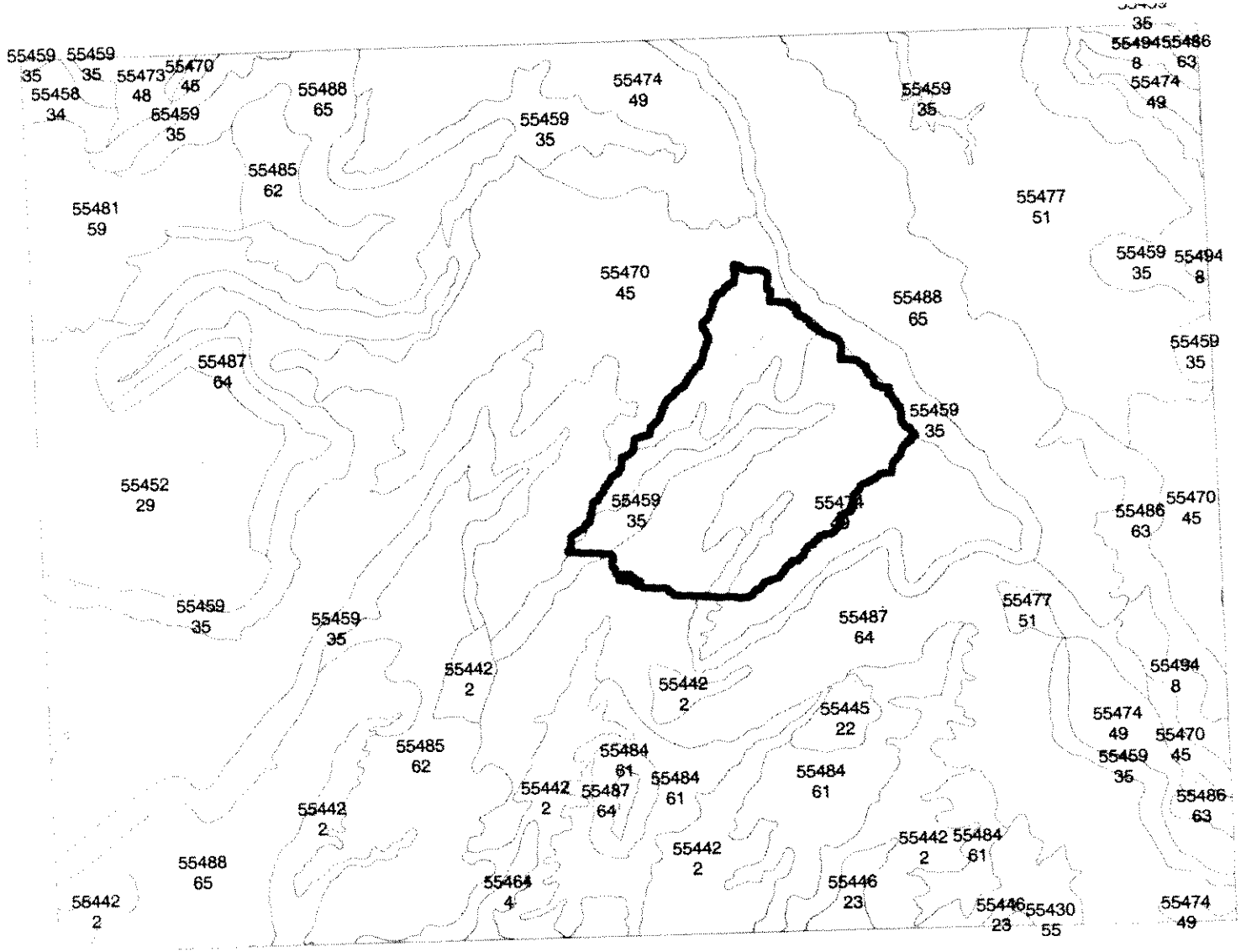
APPENDIX F

SOIL REPORT EXCERPTS

From USDA-NRCS Tabular Data Version 3, 12-07-2006

FILE: P:\2008\08268\hyd\dwg\Small drainage basin.dwg CMCEACHERN

PLOTTED: Jun 14, 2008–10:18am



Shephard Wesnitzer, Inc.	
110 West Dale Ave Flagstaff, AZ 86001 928.773.0354 928.774.8934 fax www.swiaz.com	
JOB NO: 08268	
DATE: JUNE 2008	
SCALE: N/A	
DRAWN: CTM	
DESIGN: CTM	
CHECKED: FRP	
DANEROS MINE	
SOILS REPORT AREA MAP	
SAN JUAN CO UTAH	
SHEET SO1 OF 2	

35--Myton family-Skos-Rock outcrop association

Composition

- Myton family and similar soils: 40 percent of the unit
- Skos and similar soils: 35 percent of the unit
- Rock outcrop: 10 percent of the unit

Setting

Landform(s): hillslopes, ledges
Elevation: 3701 to 6401 feet
Precipitation: 7 to 10 inches
Slope gradient: 50 to 70 percent
Air temperature: 50 to 54 °F
Frost-free period: 140 to 170 days

Characteristics of Myton family and similar soils

Average total avail. water in top 5 feet (in.): 4.2
Available water capacity class: Low
Parent material: colluvium derived from sandstone and shale
Restrictive feature(s): none
Depth to Water table: none within the soil profile
Drainage class: well drained
Flooding hazard: none
Ponding hazard: none
Soil loss tolerance (T factor): 5
Wind erodibility group (WEG): 8
Wind erodibility index (WEI): 0
Land capability class, irrigated:
Land capability class, nonirrigated: 7s
Hydric soil: no
Hydrologic group: B
Runoff class: medium
Potential frost action: low
Farm Class: Not prime farmland

Saturated hydraulic conductivity class: High

Representative soil profile:

Horizon -- Depth (inches)	Texture	Available water capacity (inches)	pH	Salinity (mmhos/cm)	SAR
C1 -- 0 to 4	Extremely bouldery loam	0.2 to 0.3	7.9 to 8.4	0.0	0
C2 -- 4 to 60	Very cobbly sandy loam	3.4 to 4.5	7.9 to 9.0	0.0 to 2.0	0

Ecological class(es): NRCS Rangeland Site - Talus Slope (Blackbrush-Shadscale)

[35--Myton family-Skos-Rock outcrop association]

Characteristics of Skos and similar soils

Average total avail. water in top 5 feet (in.): 2.0
Available water capacity class: Very low
Parent material: colluvium derived from interbedded sandstone and shale and/or residuum weathered from interbedded sandstone and shale
Restrictive feature(s): lithic bedrock at 4 to 20 inches
Depth to Water table: none within the soil profile
Drainage class: well drained
Flooding hazard: none
Ponding hazard: none

Soil loss tolerance (T factor): 1
Wind erodibility group (WEG): 5
Wind erodibility index (WEI): 56
Land capability class, irrigated:
Land capability class, nonirrigated: 7s
Hydric soil: no
Hydrologic group: D
Runoff class: high
Potential frost action: moderate
Farm Class: Not prime farmland

Saturated hydraulic conductivity class: Moderately High

Representative soil profile:

Horizon -- Depth (inches)	Texture	Available water capacity (inches)	pH	Salinity (mmhos/cm)	SAR
A -- 0 to 3	Channery sandy loam	0.2 to 0.3	7.4 to 8.4	0.0 to 2.0	1 to 5
C -- 3 to 19	Very channery sandy clay loam	1.3 to 2.0	7.9 to 8.4	0.0 to 2.0	1 to 5
R -- 19 to 23	Unweathered bedrock			Null	Null

Ecological class(es): NRCS Rangeland Site - Semidesert Shallow Sandy Loam (Blackbrush)

Characteristics of Rock outcrop

Average total avail. water in top 5 feet (in.):
Available water capacity class: NA
Parent material:
Restrictive feature(s):
Depth to Water table:
Drainage class:
Flooding hazard:
Ponding hazard:

Soil loss tolerance (T factor):
Wind erodibility group (WEG):
Wind erodibility index (WEI):
Land capability class, irrigated:
Land capability class, nonirrigated:
Hydric soil: no
Hydrologic group:
Runoff class:
Potential frost action:
Farm Class: Not prime farmland

Saturated hydraulic conductivity class: NA

45--Rizno-Barx-Yarts complex

Composition

- Rizno and similar soils: 35 percent of the unit
- Barx and similar soils: 25 percent of the unit
- Yarts and similar soils: 20 percent of the unit

Setting

Landform(s): mesas, structural benches
Elevation: 5200 to 7999 feet
Precipitation: 12 to 16 inches
Slope gradient: 3 to 15 percent
Air temperature: 46 to 50 °F
Frost-free period: 100 to 140 days

Characteristics of Rizno and similar soils

Average total avail. water in top 5 feet (in.): 2.3
Available water capacity class: Very low
Parent material: eolian deposits derived from sandstone and/or residuum weathered from sandstone
Restrictive feature(s): lithic bedrock at 4 to 20 inches
Depth to Water table: none within the soil profile
Drainage class: well drained
Flooding hazard: none
Ponding hazard: none
Soil loss tolerance (T factor): 1
Wind erodibility group (WEG): 3
Wind erodibility index (WEI): 86
Land capability class, irrigated:
Land capability class, nonirrigated: 7s
Hydric soil: no
Hydrologic group: D
Runoff class: high
Potential frost action: low
Farm Class: Not prime farmland

Saturated hydraulic conductivity class: Moderately Low

Representative soil profile:

Horizon -- Depth (inches)	Texture	Available water capacity (inches)	pH	Salinity (mmhos/cm)	SAR
A -- 0 to 5	Fine sandy loam	0.5 to 0.7	7.4 to 8.4	0.0 to 2.0	0
C -- 5 to 19	Fine sandy loam	1.4 to 1.8	7.9 to 9.0	0.0 to 2.0	0
R -- 19 to 23	Unweathered bedrock			Null	Null

Ecological class(es): NRCS Rangeland Site - Upland Shallow Loam (Pinyon-Utah Juniper)
Range Site - Upland Shallow Loam (Pinyon-Utah Juniper)

[45--Rizno-Barx-Yarts complex]

Characteristics of Barx and similar soils

Average total avail. water in top 5 feet (in.): 10.3
Available water capacity class: High
Parent material: alluvium derived from sandstone and/or eolian deposits derived from sandstone
Restrictive feature(s): none
Depth to Water table: none within the soil profile
Drainage class: well drained
Flooding hazard: none
Ponding hazard: none

Soil loss tolerance (T factor): 5
Wind erodibility group (WEG): 3
Wind erodibility index (WEI): 86
Land capability class, irrigated:
Land capability class, nonirrigated: 4e
Hydric soil: no
Hydrologic group: B
Runoff class: medium
Potential frost action: moderate
Farm Class: Not prime farmland

Saturated hydraulic conductivity class: Moderately High

Representative soil profile:

Horizon -- Depth (inches)	Texture	Available water capacity (inches)	pH	Salinity (mmhos/cm)	SAR
A -- 0 to 3	Very fine sandy loam	0.4 to 0.5	7.4 to 8.4	0.0	0 to 5
Bw -- 3 to 9	Fine sandy loam	0.6 to 0.8	7.4 to 8.4	0.0	0 to 5
Bt -- 9 to 32	Sandy clay loam	3.9 to 4.1	7.4 to 8.4	0.0	0 to 5
Btk -- 32 to 36	Sandy clay loam	0.7 to 0.7	7.9 to 8.4	0.0 to 2.0	0 to 5
Bk -- 36 to 55	Sandy clay loam	3.3 to 3.5	7.9 to 9.0	0.0 to 2.0	0 to 5
C and Ck -- 55 to 60	Sandy clay loam	0.8 to 0.9	7.9 to 9.0	0.0 to 2.0	0 to 5

Ecological class(es): NRCS Rangeland Site - Upland Loam (Basin Big Sagebrush)

[45--Rizno-Barx-Yarts complex]

Characteristics of Yarts and similar soils

Average total avail. water in top 5 feet (in.): 6.6
Available water capacity class: Moderate
Parent material: alluvium derived from sandstone and/or eolian deposits derived from sandstone
Restrictive feature(s): none
Depth to Water table: none within the soil profile
Drainage class: well drained
Flooding hazard: none
Ponding hazard: none

Soil loss tolerance (T factor): 5
Wind erodibility group (WEG): 3
Wind erodibility index (WEI): 86
Land capability class, irrigated:
Land capability class, nonirrigated: 7s
Hydric soil: no
Hydrologic group: B
Runoff class: low
Potential frost action: moderate
Farm Class: Not prime farmland

Saturated hydraulic conductivity class: High

Representative soil profile:

Horizon -- Depth (inches)	Texture	Available water capacity (inches)	pH	Salinity (mmhos/cm)	SAR
A -- 0 to 5	Fine sandy loam	0.5 to 0.6	7.4 to 8.4	0.0	1 to 5
C -- 5 to 41	Fine sandy loam	3.6 to 4.3	7.4 to 8.4	0.0	1 to 5
Ck1 -- 41 to 48	Fine sandy loam	0.7 to 0.9	7.4 to 8.4	0.0	1 to 5
Ck2 -- 48 to 60	Fine sandy loam	1.2 to 1.4	7.4 to 8.4	0.0	1 to 5

Ecological class(es): NRCS Rangeland Site - Upland Dissected Slope (Pinyon-Utah Juniper)

49--Rizno-Rock outcrop complex

Composition

- Rizno and similar soils: 65 percent of the unit
- Rock outcrop: 25 percent of the unit

Setting

Landform(s): structural benches
Elevation: 5200 to 7798 feet
Precipitation: 12 to 14 inches
Slope gradient: 3 to 15 percent
Air temperature: 46 to 50 ºF
Frost-free period: 100 to 140 days

Characteristics of Rizno and similar soils

Average total avail. water in top 5 feet (in.): 2.3
Available water capacity class: Very low
Parent material: eolian deposits derived from sandstone and/or residuum weathered from sandstone
Restrictive feature(s): lithic bedrock at 4 to 20 inches
Depth to Water table: none within the soil profile
Drainage class: well drained
Flooding hazard: none
Ponding hazard: none
Soil loss tolerance (T factor): 1
Wind erodibility group (WEG): 3
Wind erodibility index (WEI): 86
Land capability class, irrigated:
Land capability class, nonirrigated: 7s
Hydric soil: no
Hydrologic group: D
Runoff class: high
Potential frost action: low
Farm Class: Not prime farmland

Saturated hydraulic conductivity class: Moderately Low

Representative soil profile:

Horizon -- Depth (inches)	Texture	Available water capacity (inches)	pH	Salinity (mmhos/cm)	SAR
A -- 0 to 5	Fine sandy loam	0.5 to 0.7	7.4 to 8.4	0.0 to 2.0	0
C -- 5 to 19	Fine sandy loam	1.4 to 1.8	7.9 to 9.0	0.0 to 2.0	0
R -- 19 to 23	Unweathered bedrock			Null	Null

Ecological class(es): Range Site - Upland Shallow Loam (Pinyon-Utah Juniper)
NRCS Rangeland Site - Upland Shallow Loam (Pinyon-Utah Juniper)

[49--Rizno-Rock outcrop complex]

Characteristics of Rock outcrop

Average total avail. water in top 5 feet (in.):
Available water capacity class: NA
Parent material:
Restrictive feature(s):
Depth to Water table:
Drainage class:
Flooding hazard:
Ponding hazard:

Soil loss tolerance (T factor):
Wind erodibility group (WEG):
Wind erodibility index (WEI):
Land capability class, irrigated:
Land capability class, nonirrigated:
Hydric soil: no
Hydrologic group:
Runoff class:
Potential frost action:
Farm Class: Not prime farmland

Saturated hydraulic conductivity class: NA

Ecological class(es):

64--Strych-Skos-Badland complex

Composition

- Strych and similar soils: 40 percent of the unit
- Skos and similar soils: 35 percent of the unit
- Badland: 15 percent of the unit

Setting

Landform(s): structural benches
Elevation: 5400 to 6201 feet
Precipitation: 8 to 12 inches
Slope gradient: 30 to 50 percent
Air temperature: 48 to 53 ºF
Frost-free period: 120 to 150 days

Characteristics of Strych and similar soils

Average total avail. water in top 5 feet (in.): 4.3
Available water capacity class: Low
Parent material: alluvium derived from sandstone and shale and/or colluvium derived from sandstone and shale
Restrictive feature(s): none
Depth to Water table: none within the soil profile
Drainage class: well drained
Flooding hazard: none
Ponding hazard: none
Soil loss tolerance (T factor): 5
Wind erodibility group (WEG): 7
Wind erodibility index (WEI): 38
Land capability class, irrigated:
Land capability class, nonirrigated: 7s
Hydric soil: no
Hydrologic group: B
Runoff class: high
Potential frost action: low
Farm Class: Not prime farmland

Saturated hydraulic conductivity class: Moderately High

Representative soil profile:

Horizon -- Depth (inches)	Texture	Available water capacity (inches)	pH	Salinity (mmhos/cm)	SAR
A -- 0 to 3	Very stony sandy clay loam	0.3 to 0.4	7.4 to 7.8	0.0 to 2.0	0
Bk -- 3 to 60	Very cobbly fine sandy loam	3.4 to 4.5	7.4 to 8.4	0.0 to 2.0	0

Ecological class(es): NRCS Rangeland Site - Semidesert Stony Loam (Shadscale)

Brief Soil Descriptions (UT)

San Juan County, Utah, Central Part

[64--Strych-Skos-Badland complex]

Characteristics of Skos and similar soils

Average total avail. water in top 5 feet (in.): 1.6
Available water capacity class: Very low
Parent material: colluvium derived from interbedded sandstone and shale and/or residuum weathered from interbedded sandstone and shale
Restrictive feature(s): lithic bedrock at 4 to 20 inches
Depth to Water table: none within the soil profile
Drainage class: well drained
Flooding hazard: none
Ponding hazard: none

Soil loss tolerance (T factor): 1
Wind erodibility group (WEG): 6
Wind erodibility index (WEI): 48
Land capability class, irrigated:
Land capability class, nonirrigated: 7s
Hydric soil: no
Hydrologic group: D
Runoff class: high
Potential frost action: moderate
Farm Class: Not prime farmland

Saturated hydraulic conductivity class: Moderately High

Representative soil profile:

Horizon -- Depth (inches)	Texture	Available water capacity (inches)	pH	Salinity (mmhos/cm)	SAR
A -- 0 to 4	Channery loam	0.4 to 0.6	7.4 to 8.4	0.0 to 2.0	1 to 5
C -- 4 to 14	Very channery clay loam	0.8 to 1.3	7.9 to 8.4	0.0 to 2.0	1 to 5
R -- 14 to 18	Unweathered bedrock			Null	Null

Ecological class(es): NRCS Rangeland Site - Semidesert Shallow Sandy Loam (Shadscale)

Characteristics of Badland

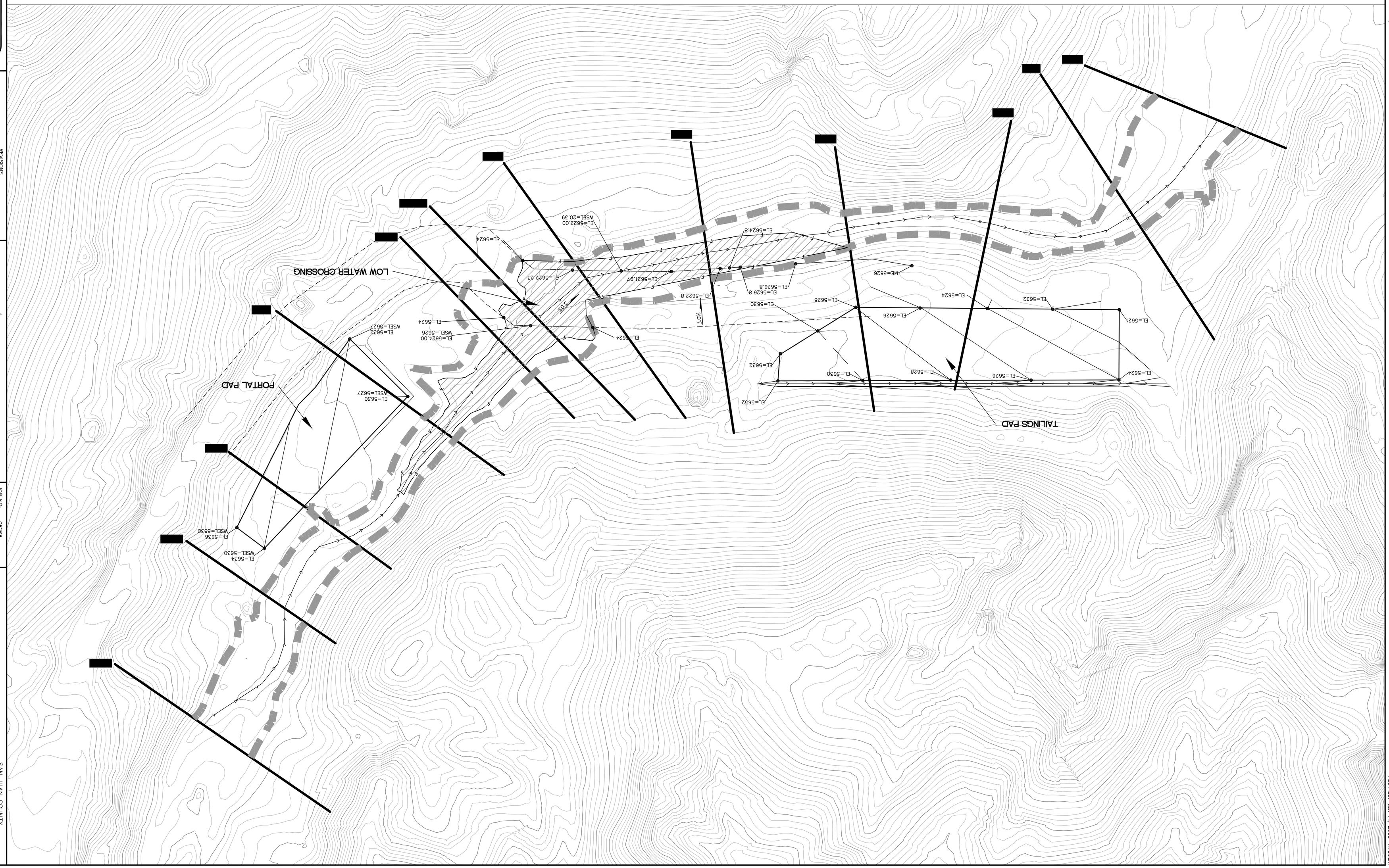
Average total avail. water in top 5 feet (in.):
Available water capacity class: NA
Parent material:
Restrictive feature(s):
Depth to Water table:
Drainage class:
Flooding hazard:
Ponding hazard:

Soil loss tolerance (T factor):
Wind erodibility group (WEG):
Wind erodibility index (WEI):
Land capability class, irrigated:
Land capability class, nonirrigated:
Hydric soil: no
Hydrologic group:
Runoff class:
Potential frost action:
Farm Class: Not prime farmland

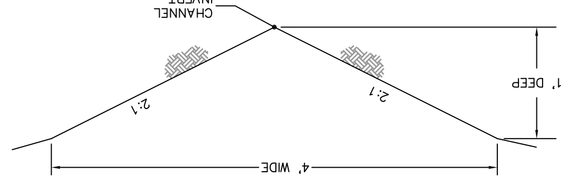
Saturated hydraulic conductivity class: NA

FILE: P:\2008\08268\dwg\GC-01 08268.dwg <<Unnamed Profile>>

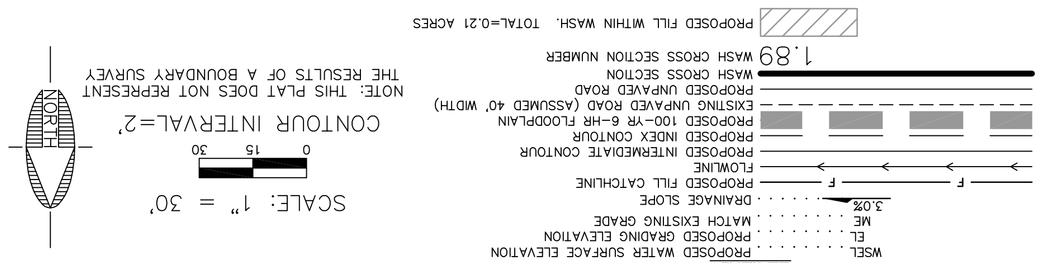
PLOTTED: Jun 14, 2008-11:56am



INTERCEPTOR DITCH TYPICAL SECTION



LEGEND



SCALE: 1" = 30'

0 15 30

CONTOUR INTERVAL=2'

NOTE: THIS PLAT DOES NOT REPRESENT THE RESULTS OF A BOUNDARY SURVEY

CALL TWO WORKING DAYS BEFORE YOU DIG
1-800-STAKE-IT

NO.	DESCRIPTION	DATE	BY
	REVISIONS		

SWI
Shephard Wesnitzer, Inc.
110 West Dale Ave
Flagstaff, AZ 86001
928.773.0354
928.774.8934 fax
www.swiaz.com

JOB NO:	08268
DATE:	JUNE 2008
SCALE:	AS SHOWN
DRAWN:	CTM
DESIGN:	MGL
CHECKED:	FRP

DRAWING NO. GC01

SHT NO. 1 OF 1

DANEROS MINE

SAN JUAN COUNTY
UTAH

GRADING, DRAINAGE AND SURVEY CONTROL PLAN