FILE IN Expandable 03072007

Refer to Record No. 0108
in C0070013, 2007, INCOMING
for additional information

Appendix 7-4
Lila Canyon Mine
Sedimentation and Drainage Control Plan

UTAH REGISTERED PROFESSIONAL ENGINEER
#154168
DAN W. GUY

REGISTERED PROFESSIONAL ENGINEER
152606
R. JAY MARSHALL
3/6/07
STATE OF UTAH

Revised
January 2001
October 2002 RJM
February 2007 TJS

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

SEDIMENTATION AND DRAINAGE CONTROL PLAN

TABLE OF CONTENTS

Section **Page Number**

1- Introduction: . . . . . Page -1-

2- Design of Drainage Control Structures: . . . . . Page -3-

3- Design of Sediment Control Structures: . . . . . Page -24-

4- Design of Drainage Control Structures for Reclamation: . . . . . Page -34-

5- Alternate Sediment Control for Fan Site . . . . . Page -39-

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

SEDIMENTATION AND DRAINAGE CONTROL PLAN

1- Introduction

The Sedimentation and Drainage Control Plan for the Lila Canyon Mine has been designed according to the State of Utah R645- Coal Mining Rules, November 1, 1996. All design criteria and construction will be certified by a Utah Registered Professional Engineer.

This plan has been divided into the following three sections:

1) Design of Drainage Control Structures for the Proposed Construction

2) Design of Sediment Control Structures

3) Design of Drainage Control Structures for Reclamation

The general surface water control plan for this project will consist of the following:

(a) This is a new site construction. All areas proposed for disturbance will be sloped to drain to surface ditches and/or culverts where runoff will be carried to the sediment pond. All minesite drainage controls and watersheds are shown on Plate 7-5 "Proposed Sediment Control Map".

(b) The majority of undisturbed runoff will be diverted around the minesite and beneath the pond by properly sized culverts. Undisturbed diversion culvert UC-1, is located on the northwest end of the site. This diversion will allow the majority of undisturbed runoff from the Right Fork of Lila Canyon to bypass the mine area beneath the sediment pond. All undisturbed diversions are designed to carry runoff from a 100 year - 6 hour precipitation event. UC-1 is oversized at 60" diameter.

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

(c) A single, adequately sized sediment pond will be constructed at the lower end of the site. This pond is sized to contain and treat the runoff from all of the disturbed area and any contributing undisturbed areas for a 10 year - 24 hour precipitation event. The pond will be equipped with a C.M.P. culvert principle spillway and decant, and a second CMP culvert emergency spillway sized to safely pass runoff from a 25 year - 6 hour precipitation event. Spillways will discharge into a 60" CMP culvert running beneath the pond. This culvert will discharge onto an engineered discharge structure and into the Right Fork of Lila Canyon channel below the minesite.

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

DESIGN OF DRAINAGE CONTROL STRUCTURES

Design Parameters:

2.1 Precipitation
2.2 Flow
2.3 Velocity
2.4 Drainage Areas
2.5 Slope Lengths
2.6 Runoff
2.7 Runoff Curve Numbers
2.8 Culvert Sizing
2.9 Culverts
2.10 Main Canyon Culvert - Outlet Structure
2.11 Ditches

Tables:

Table 1 Undisturbed Watershed Summary
Table 2 Disturbed Watershed Summary
Table 3 Watershed Parameters
Table 4 Runoff Summary - Undisturbed Watershed (Not Draining to Pond)
Table 5 Runoff Summary - Watersheds Draining to Sediment Pond
Table 6 Runoff Control Structure - Watershed Summary
Table 7 Runoff Control Structure - Flow Summary
Table 8 Disturbed Ditch Design Summary
Table 9 Disturbed Culvert Design Summary
Table 10 Undisturbed Culvert Design Summary

Figures:

Figure 1 Culvert Nomograph
Figure 2 Rip-Rap Chart
Figure 3 Disturbed Ditch Typical Section
Figure 4 Trash Rack - Culvert Inlet - Typical Section
Figure 4A UC-1 Culvert Outlet

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

Design Parameters

2.1 Precipitation

The precipitation-frequency values for the area were taken from the approved Mining and Reclamation Plan, Horse Canyon Mine, Emery County, Utah, Volume III, submitted by I.P.A.

Frequency - Duration	Precipitation
10 year - 6 hour	1.30"
10 year - 24 hour	1.90"
25 year - 6 hour	1.50"
100 year - 6 hour	1.90"

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

2.2 Flow

Peak flows, flow depths, areas and velocities were calculated using the computer program "Office of Surface Mining Watershed Model", Storm Version 6.21 by Gary E. McIntosh. All flows are based on the SCS - TR55 Method for both SCS 6-hour and NOAA Type II, 24-hour storms.

Time of concentration of storm events was calculated for each drainage area using the SCS upland curve method included as part of the Storm software. For the undisturbed areas UA-1 through UA-4 the watershed type was set at forested and the curve condition was set at bare ground. For UA-5 and UA-6a, b, &c and all DA watersheds, the watershed type was set as disturbed and the curve condition was set at bare ground.

2.3 Velocity

Flow velocities for each ditch structure were calculated using the Storm computer program with Manning's Formula:

$$V = \frac{1.49}{n} R^{2/3} S^{1/3}$$

where:	V	=	Velocity (fps)
	R	=	Hydraulic Radius (ft.)
	S	=	Slope (ft. per ft.)
	n	=	Manning's n; Table 3.1, p. 159,

"Applied Hydrology and Sedimentology for Disturbed Areas", Barfield, Warner & Haan, 1983.

Note: The following Manning's n were used in the calculations:

Structure	Manning's n
Culverts (cmp)	0.025
Unlined Disturbed Area Ditches	0.035

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

2.4 Drainage Areas

All drainage areas were planimetered directly from Plate 7-1, "Permit Area Hydrology Map", and Plate 7-2, "Disturbed Area Hydrology/Watershed".

2.5 Slopes, Lengths

All slopes and lengths were measured directly from the topography on Plates 7-1 and 7-2.

2.6 Runoff Volume

Runoff was calculated using the SCS Formula for NOAA Type II, 24-hour storms; using the Storm Version 6.21 computer program:

$$Q = \frac{(P - 0.2\,S)^2}{P + 0.8\,S}$$

where:

CN	=	Runoff Curve Number
Q	=	Runoff in inches
P	=	Precipitation in inches
S	=	$\frac{1000}{CN} - 10$

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

2.7 Runoff Curve Numbers

Two curve numbers were utilized for the undisturbed areas. Areas with milder slopes (less than 30%) were given a runoff curve number of 75. All other undisturbed areas (30% slope or greater) were given a runoff curve number of 83. These numbers were taken directly from the approved "Mining and Reclamation Plan, Horse Canyon Mine, Emery County, Utah, Volume III", submitted by I.P.A. The numbers in that plan were based on vegetation and soils data from on-site.

Two other runoff curve numbers have been used in the calculations. A runoff CN of 90 is used for all disturbed areas (including the areas designated as undisturbed which lie within the disturbed area boundary (See Plate 7-2), and a runoff CN of 95 is used for paved areas. These numbers are based on commonly used and approved values and from Table 2.20, (p. 82, Barfield, et al, 1983).

The following is a summary of runoff curve numbers used in these calculations:

Watershed	Runoff CN
Undisturbed (<30% slopes):	75
Undisturbed (>30% slopes):	83
Disturbed:	90
Paved:	95

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

2.8 Culvert Sizing

Minimum culvert sizing is based on the following Manning's Equation; using the Haestad Methods, Flowmaster, Version 6.0 computer program:

$$D = \left(\frac{2.16\ Q\ n}{\sqrt{s}}\right)^{0.35}$$

where:	D	=	Required Diameter (feet)
	Q	=	QP = Peak Discharge (cfs)
	n	=	Roughness Factor (0.025 for CMP)
	S	=	Slope (ft. per ft.)

Using the above formula, minimum required culvert barrel sizes were calculated for each applicable area. Culverts were then evaluated for inlet control conditions to determine if additional pipe size was required above the pipe flow minimum. The Culvert Nomograph included as Figure 1 of this report was used for this evaluation.

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

2.9 Culverts

Culverts have been sized according to the calculations previously described, and are shown on Plate 7-5, "Proposed Sediment Control Map". Culverts carrying undisturbed drainages are designated with UC- Letters (i.e. UC-1). All undisturbed area drainage culverts will be fitted with trash racks to minimize plugging by rocks or other debris.

Trash racks will be provided at the inlet for all undisturbed drainage culverts. These will consist of 3/4" steel bars welded on 6" centers across the flared inlet structures of each culvert. Bars will be sloped from the front of the inlet structure up to the top of the culvert. This ramp configuration will allow trash, branches and other potential obstructions to be swept up and away from the inlet rather than being impinged against the grates during a flow event. Rip rap will be placed around the flared inlet structure and above it to a height of at least 6" above the required headwall for each culvert. (See Figure 4 for details). Trash racks will be checked on a routine schedule and following precipitation events and all trash, branches and other obstructions will be removed.

It should be noted that all undisturbed area culverts are adequately sized to handle the expected runoff from a 100 year - 6 hour event for maximum protection of the mine area, sediment pond and undisturbed drainage. This is well in excess of the 10 year - 6 hour event required by the regulations and is proposed as an extra measure of safety.

Disturbed area culverts and ditches are shown on the "Sediment Control Map", Plate 7-5. Culverts carrying disturbed drainage are designated with a DC-number (i.e. DC-1). Calculations for all disturbed area culverts and ditches are also included with this report, along with design criteria. Disturbed drainage areas draining to culverts and ditches are marked with a DA-number (i.e. DA-1). Undisturbed drainage areas are marked with a UA-number (i.e. UA-1).

Culverts will be inspected regularly, and cleaned as necessary to provide for passage of drainage flows. Inlets and outlets shall also be maintained so as to prevent plugging or undue restriction of water flow.

All disturbed area culverts are temporary, and will be removed upon final reclamation.

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

2.10 Main Canyon Culvert - Outlet Structure

The outlet of the 5' diameter culvert UC-1 has been designed to flow onto a rip-rap apron to protect against souring and to allow for energy dissipation. The rip-rap apron is designed to fit the natural channel configuration as closely as possible, and will allow runoff to re-enter the natural channel at a reduced velocity which is no greater than natural flow conditions. Runoff from the 100 year - 6 hour precipitation event in the canyon below the minesite has been calculated at 63.16 cfs, including sediment pond overflow.

The rip-rap apron design is based on Figure 7-26, Design of Outlet Protection - Maximum Tailwater Condition, "Applied Hydrology and Sedimentology for Disturbed Areas", Barfield, Warner and Haan, 1983. Based on the figure, the apron should be a minimum of 15' in length, widening from 5' to 9', with a 0% slope. The proposed length has been increased to 20', to ensure adequate time for velocity reduction. The apron slope is kept at 0%. Rip-rap size is conservatively placed at 12" D_{50}. Rip-rap will be placed to a depth of 1.5 D_{50} and will be placed on a 6" layer of 2" drain rock filter. Rip-rap will also be placed on 2H:1V side slopes to the height of the culvert (5') at the culvert outlet tapering to 2' at the outlet of the apron. This rip-rap apron has been sized and designed to adequately dissipate energy from flow velocities of a 100 year - 6 hour precipitation event and resist dislodgement. The drain rock filter bed will also serve to secure the rip-rap boulders firmly in place, to add an additional element of stability, and prevent scouring underneath the armored apron. (See Figure 4A for construction details). The natural channel has a gradient of approximately 7.76%. When the flow is routed from the culvert across the apron to the natural channel, the velocity is reduced from 12.66 fps at the culvert outlet to 4.12 fps at the outlet of the apron. (See Culvert Outlet Rip-Rap Apron Flow Velocity Calculations in Appendix 1.)

It should be noted that these calculations are based on a <u>100 year - 6 hour event</u>.

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

2.11 Ditches

All ditches will carry disturbed area drainage to the pond. Ditches are shown on the Proposed Sediment Control Map, Map 7-5, and are designated with a DD-number (i.e. DD-1 for Disturbed Area Ditches) or UD-number (i.e. UD-1 for Undisturbed Area Ditches).

All ditches are designed to carry the expected runoff from a 10 year - 6 hour event with a minimum freeboard of 0.5' (See Table 8 and Figure 3).

Ditches which exhibit expected flow velocities of 5 fps or greater will be lined with rip-rap. Typical cross-sections, flow depths and areas for all lined and unlined ditches are shown on Figure 3 of this report.

Ditch slopes have been determined from Plates 7-2 and 7-5.

All ditches will be inspected regularly, and maintained to the minimum dimensions to provide adequate capacity for the design flow. All ditches are temporary and will be removed as described under the reclamation hydrology section. (Section 4)

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

TABLE 1

Table 1 Undisturbed Watershed Summary				
Watershed	CN	Acres	Drains To	Final
UA-1	75	248.41	UC-1	Lila Canyon
UA-2	83	11.74	DD-2	Sediment Pond
UA-3	83	5.98	DD-5	Sediment Pond
UA-4	83	7.20	Sediment Pond	Sediment Pond
UA-5	90	12.27	UC-1	Lila Canyon
UA-6a	90	1.60	DD-12	Sediment Pond
UA-6b	90	2.55	DD-11	Sediment Pond
UA-6c	75	2.61	ASCA Area	Sediment Pond

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

TABLE 2

Table 2 Disturbed Watershed Summary				
Watershed	CN	Acres	Drains To	Final
DA-2	90	2.45	DD-2	Sediment Pond
DA-3	90	2.92	DD-3	Sediment Pond
DA-4	90	2.63	DD-14	Sediment Pond
DA-5	90	0.56	DD-5	Sediment Pond
DA-6	95	5.10	DC-8	Sediment Pond
DA-7	95	6.86	DD-10	Sediment Pond
DA-8	90	0.58	DD-13	Sediment Pond
Total		40.13		

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

TABLE 3

Table 3 Watershed Parameters					
Watershed	Area (Acre)	Hydraulic Length (ft.)	Elevation Change (ft.)	% Slope	CN
Undisturbed Watersheds					
UA-1	248.41	5200	1480	28.46	75
UA-2	11.74	1500	1000	66.67	83
UA-3	5.98	650	165	25.39	83
UA-4	7.20	1250	595	47.76	83
UA-5	12.27	1400	600	42.86	90
UA-6a	1.60	470	40	8.51	90
UA-6b	2.55	840	60	7.14	90
UA-6c	2.61	650	40	6.15	90
Disturbed Watersheds					
DA-2	2.45	1520	190	12.50	90
DA-3a	1.34	350	40	6.15	90
DA-3b	2.15	675	95	14.07	90
DA-4	2.63	330	25	7.58	90
DA-5	0.56	240	30	12.50	90
DA-6	5.10	550	50	9.09	95
DA-7	6.86	700	50	7.14	95
DA-8	0.58	350	25	7.14	90

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

TABLE 4

Table 4 Runoff Summary Undisturbed Watersheds (Not Draining to Pond)					
Watershed	**10 yr. / 6 hr. Peak Flow - cfs**	**25 yr. / 6 hr. Peak Flow - cfs**	**100 yr. / 6 hr. Peak Flow - cfs**	**10 yr. / 24 hr. Peak Flow - cfs**	**10 yr. / 24 hr. Volume - ac.ft.**
UA-1	7.02	10.31	20.48	25.53	6.90
UA-5	5.94	7.65	11.24	12.14	1.03
Totals	12.96	17.96	31.72	37.67	7.93

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

TABLE 5

Table 5 Runoff Summary Watersheds Draining to Sediment Pond				
Watershed	10 yr. / 6 hr. Peak Flow - cfs	25 yr. / 6 hr. Peak Flow - cfs	10 yr. / 24 hr. Peak Flow - cfs	10 yr. / 24 hr. Volume - ac.ft.
DA-2	1.11	1.45	2.34	0.21
DA-3a	0.55	0.71	1.12	0.11
DA-3b	1.04	1.34	2.12	0.19
DA-4	1.12	1.44	2.28	0.22
DA-5	0.20	0.26	0.41	0.05
DA-6	3.05	3.69	5.17	0.59
DA-7	4.55	5.49	7.70	0.79
DA-8	0.25	0.33	0.52	0.05
UA-2	1.49	2.30	5.02	0.61
UA-3	0.77	1.19	2.58	0.31
UA-4	0.91	1.41	3.08	0.38
UA-6a	0.74	0.95	1.51	0.13
UA-6b	1.25	1.62	2.58	0.21
UA-6c	1.25	1.61	2.57	0.21
Totals	18.28	23.79	39.00	4.06

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

TABLE 6

Table 6 Runoff Control Structure Watershed Summary		
Structure	Type	Contributing Watersheds/Structures
UC-1	Culvert	UA-1, UA-5, Sediment Pond Overflow
DD-2	Ditch	DA-2, UA-2
DD-3	Ditch	DA-3b
DD-4	Ditch	DA-3a
DD-5	Ditch	DA-5, UA-3
DD-6	Ditch	DD-2, DD-4, DD-5
DD-7	Ditch	DD-3, DD-6
DD-8	Ditch	DA-6
DD-9	Ditch	DC-8
DD-10	Ditch	DA-7, DA-8
DD-11	Ditch	DD-9, DD-10, UA-6b
DD-12	Ditch	DD-7, UA-6a
DD-13	Ditch	DA-8
DD-14	Ditch	DA-4
DC-4	Culvert	DD-2
DC-5	Culvert	DD-5, DC-4
DC-6	Culvert	DD-3, DD-6
DC-7	Culvert	DD-7
DC-8	Culvert	DD-8, DD-14
DC-9	Culvert	DD-13

DD-1 does not exist.

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

TABLE 7

Table 7 Runoff Control Structure Flow Summary					
Structure	Type	10 yr. / 6 hr. Peak Flow - cfs	10 yr. / 24 hr. Peak Flow - cfs	25 yr. / 6 hr. Peak Flow - cfs	100 yr. / 6 hr. Peak Flow - cfs
UC-1	Culvert	44.40	69.11	49.40	63.16
DD-2	Ditch	2.60	7.36	3.75	-
DD-3	Ditch	1.04	2.12	1.34	-
DD-4	Ditch	0.55	1.12	0.71	-
DD-5	Ditch	0.97	2.99	1.45	-
DD-6	Ditch	4.12	11.47	5.91	-
DD-7	Ditch	5.16	13.59	7.25	-
DD-8	Ditch	3.05	5.17	3.69	-
DD-9	Ditch	4.17	7.49	5.13	-
DD-10	Ditch	4.80	8.22	5.82	-
DD-11	Ditch	10.22	18.29	12.57	-
DD-12	Ditch	5.90	16.17	8.20	-
DD-13	Ditch	0.25	0.52	0.33	-
DD-14	Ditch	1.12	2.28	1.44	-
DC-4	Culvert	2.60	7.36	3.75	-
DC-5	Culvert	3.57	10.35	5.20	-
DC-6	Culvert	5.16	13.59	7.25	-
DC-7	Culvert	5.16	13.59	7.25	-
DC-8	Culvert	4.17	7.45	5.13	-
DC-9	Culvert	0.25	0.52	0.33	-

DD-1 does not exist.
UC-1flow values include 25yr-6hr sediment pond peak flow 31.44 cfs.

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

TABLE 8

Table 8 Disturbed Ditch Design Summary						
Ditch	DD-2	DD-3	DD-4	DD-5	DD-6	DD-7
Slope (%)	12.50	14.60	20.70	15.30	5.00	7.40
Length (ft.)	1291	788	675	326	205	337
Manning's No.	0.035	0.035	0.035	0.035	0.035	0.035
Side Slope (H:V)	2:1	2:1	2:1	2:1	2:1	2:1
*Bottom Width (ft.)	2.00	2.00	1.00	1.00	2.00	2.50
Peak Flow 10/6 (cfs)	2.60	1.04	0.55	0.97	4.12	5.16
Peak Flow 10/24 (cfs)	7.36	2.12	1.12	2.99	11.47	13.59
Flow Depth (ft.) 10/6	0.22	0.12	0.11	0.17	0.37	0.34
Flow Depth (ft.) 10/24	0.40	0.19	0.17	0.31	0.64	0.58
Flow Area ($ft.^2$) 10/6	0.54	0.28	0.14	0.23	1.02	1.08
Flow Area ($ft.^2$) 10/24	1.11	0.45	0.23	0.51	2.11	2.11
Velocity (fps) 10/6	4.80	3.71	3.95	4.25	4.05	4.80
Velocity (fps) 10/24	6.63	4.73	4.93	5.90	5.43	6.43
Rip-Rap Req'd (Y/N)	N	N	N	N	N	N
Rip-Rap D_{50}	-	-	-	-	-	-
Note: Slope/Lengths from Plate 7-2.						

DD-1 does not exsit.

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

TABLE 8 (Continued)

Table 8 (Continued) Disturbed Ditch Design Summary							
Ditch	DD-8	DD-9	DD-10	DD-11	DD-12	DD-13	DD-14
Slope (%)	6.90	3.00	4.00	5.90	6.80	7.14	7.58
Length (ft.)	360	380	500	425	440	350	330
Manning's No.	0.035	0.035	0.035	0.035	0.035	0.035	0.035
Side Slope (H:V)	2:1	2:1	2:1	2:1	2:1	2:1	2:1
*Bottom Width (ft.)	2.00	2.50	2.00	3.00	3.00	0.00	1.00
Peak Flow 10/6 (cfs)	3.05	4.17	4.80	10.22	5.90	0.25	1.12
Peak Flow 10/24 (cfs)	5.17	7.49	8.22	18.29	16.17	0.52	2.28
Flow Depth (ft.) 10/6	0.29	0.39	0.43	0.48	0.34	0.23	0.22
Flow Depth (ft.) 10/24	0.39	0.53	0.57	0.67	0.60	0.30	0.33
Flow Area ($ft.^2$) 10/6	0.74	1.27	1.23	1.92	1.25	0.10	0.32
Flow Area ($ft.^2$) 10/24	1.07	1.91	1.80	2.88	2.51	0.18	0.54
Velocity (fps) 10/6	4.13	3.29	3.91	5.33	4.71	2.46	3.47
Velocity (fps) 10/24	4.85	3.93	4.57	6.34	6.43	2.95	4.24
Rip-Rap Req'd (Y/N)	N	N	N	Y	N	N	N
Rip-Rap D_{50}	-	-	-	6"	-	-	-
Note: Slope/Lengths from Plate 7-2.							

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

TABLE 9

Table 9 Disturbed Culvert Design Summary						
Culvert	DC-4	DC-5	DC-6	DC-7	DC-8	DC-9
Slope (%)	5.00	5.00	5.00	8.00	3.00	3.00
Length (ft.)	40	40	60	40	40	40
Manning's No.	.025	0.025	0.025	0.025	0.025	0.025
Peak Flow 10/6 (cfs)	2.60	3.57	5.16	5.16	4.17	0.25
Peak Flow 10/24 (cfs)	7.36	10.35	13.59	13.59	7.45	0.52
Min. Diam. Req'd (ft.) 10/6	0.84	0.95	1.09	0.99	1.10	0.38
Min. Diam. Req'd (ft.) 10/24	1.24	1.41	1.56	1.43	1.37	0.51
Diam. Proposed (ft.)	1.50	1.50	2.00	2.00	1.50	1.50
Velocity (fps) 10/6	4.69	5.08	5.57	6.65	4.36	2.16
Velocity (fps) 10/24	6.09	6.63	7.10	8.47	5.04	2.59
Rip-Rap D_{50}	N/A	6"	6"	6"	N/A	N/A

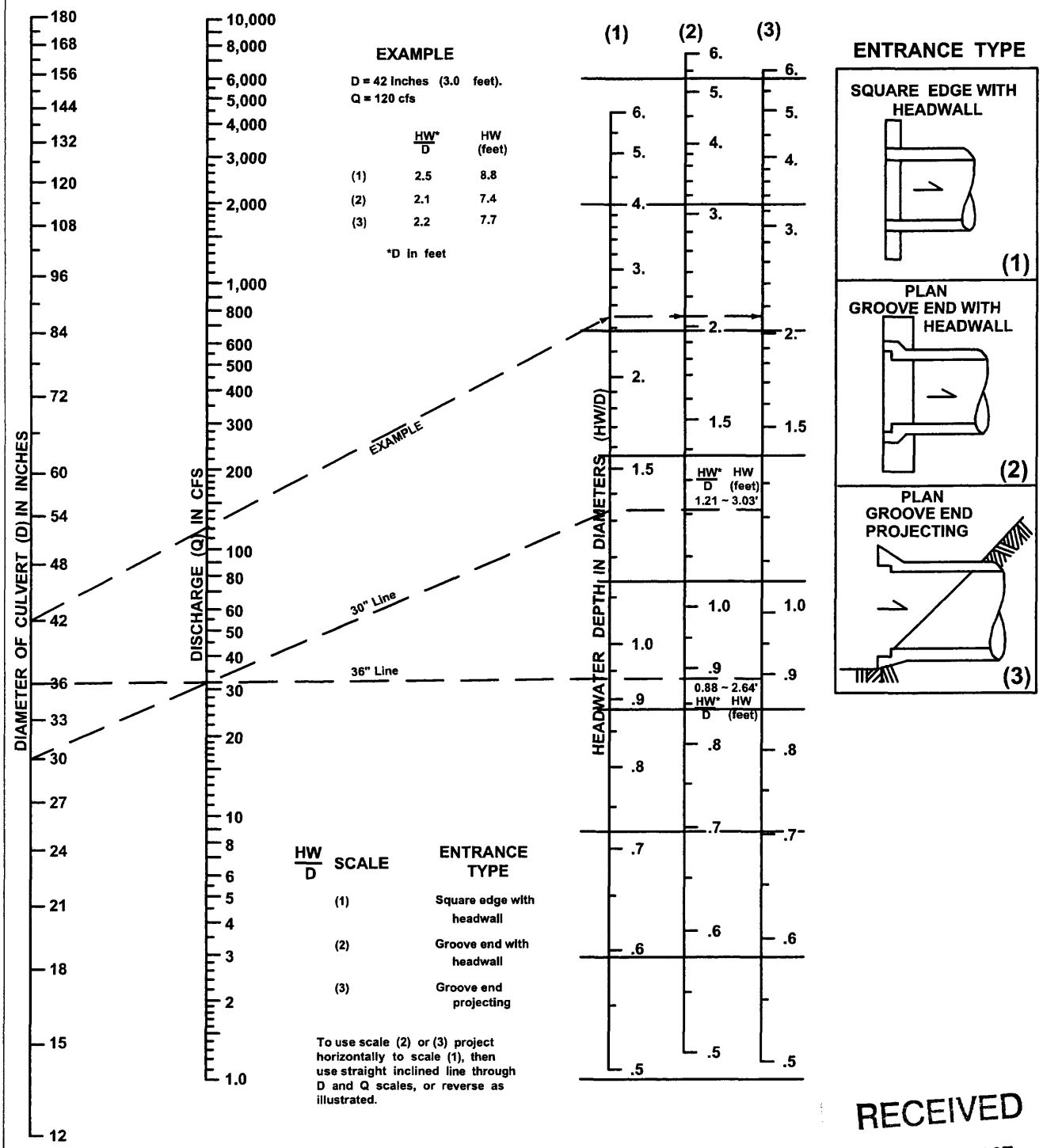
Note: Slope/Lengths from Plate 7-5.
Source: (Haestad Methods, Flowmaster, Version 6.0)

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

TABLE 10

Table 10 Undisturbed Culvert Design Summary		
Culvert	UC-1	
Slope (%)	5.56	
Length (ft.)	535	
Manning's No.	0.025	
Peak Flow 10/6 (cfs)	44.40	
Peak Flow 100/6 (cfs)	63.16	
Min. Diam. Req'd (ft.) 10/6	2.39	
Min. Diam. Req'd (ft) 100/6	2.72	
Diam. Proposed (ft.)	5.00	
Velocity (fps) 10/6	9.93	
Velocity (fps) 100/6	10.85	
* Note: Peak Flows include 25 year - 6 hour design overflow 31.44 cfs from sediment pond.		

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING



EXAMPLE

D = 42 Inches (3.0 feet).
Q = 120 cfs

	HW*/D	HW (feet)
(1)	2.5	8.8
(2)	2.1	7.4
(3)	2.2	7.7

*D in feet

HW/D SCALE	ENTRANCE TYPE
(1)	Square edge with headwall
(2)	Groove end with headwall
(3)	Groove end projecting

To use scale (2) or (3) project horizontally to scale (1), then use straight inclined line through D and Q scales, or reverse as illustrated.

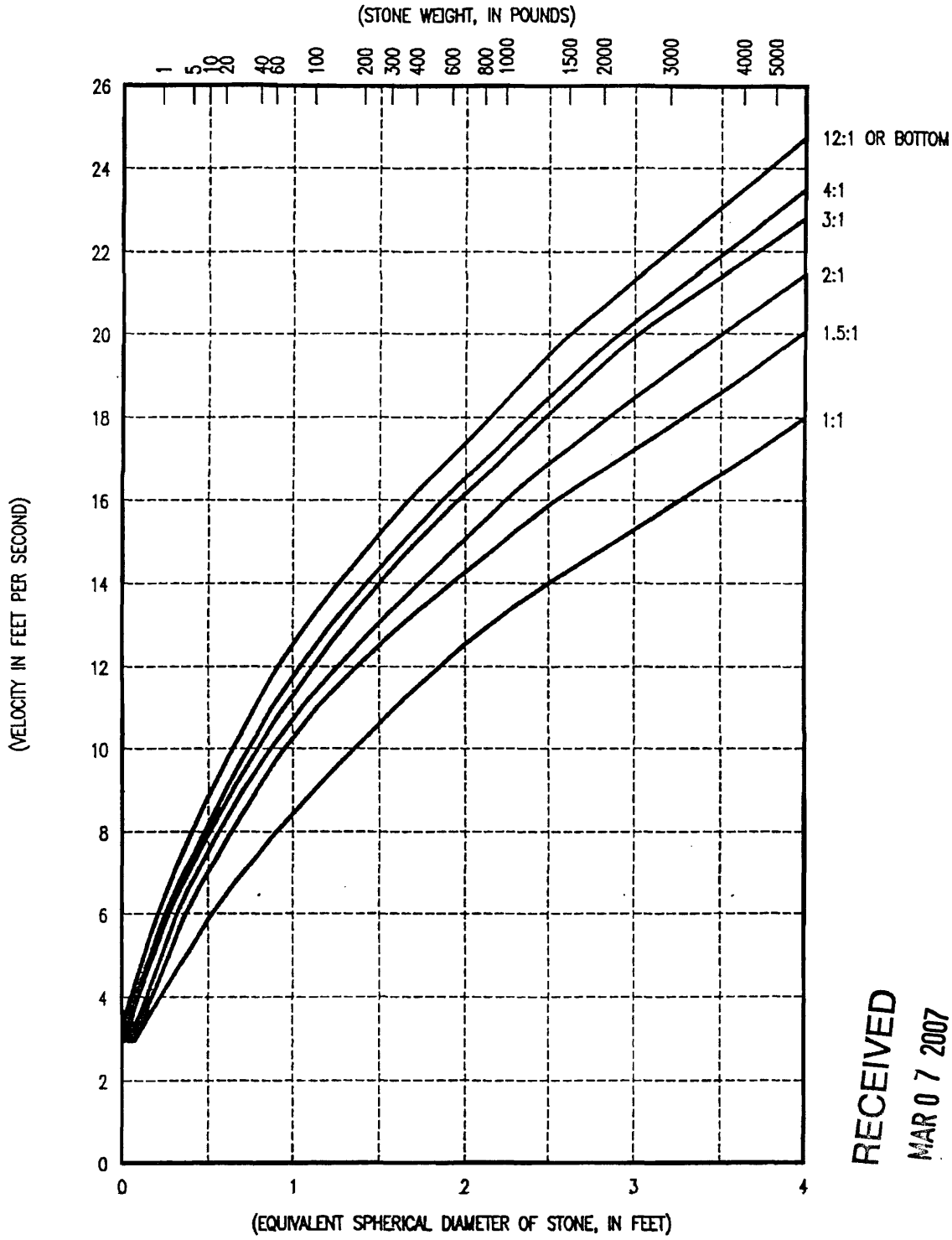
Headwater Depth for Smooth Interior Pipe Culverts with Inlet Control

RECEIVED
MAR 0 7 2007
DIV. OF

0' NTS

FIGURE 1. HEADWATER DEPTH NOMOGRAPH

RIP-RAP CHART



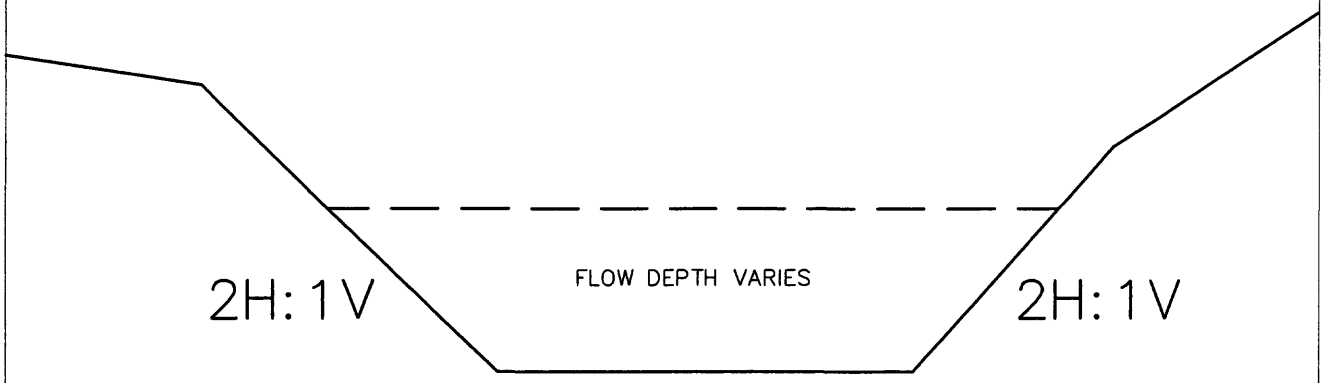
RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

SIZE OF STONE THAT WILL RESIST DISPLACEMENT FOR VARIOUS VELOCITIES AND SIDE SLOPES

NOTE:

ADAPTED FROM REPORT OF SUBCOMMITTE ON SLOPE PROTECTION, AM. SOC. CIVIL ENGINEERS PROC. JUNE 1948.
FOR STONE WEIGHING 165 LBS. PER CUBIC FEET.

Figure 2



DITCH				
DITCH	FLOW DEPTH (ft)	FLOW AREA (ft^2)	BOTTOM WIDTH (ft)	RIP-RAP D_{50}
DD-2	0.22	0.54	2	–
DD-3	0.12	0.28	2	–
DD-4	0.11	0.14	1	–
DD-5	0.17	0.23	1	–
DD-6	0.37	1.02	2	–
DD-7	0.34	1.08	2.5	–
DD-8	0.29	0.74	2	–
DD-9	0.39	1.27	2.5	–
DD-10	0.43	1.23	2	–
DD-11	0.48	1.92	3	6"
DD-12	0.34	1.25	3	–
DD-13	0.23	0.10	0	–

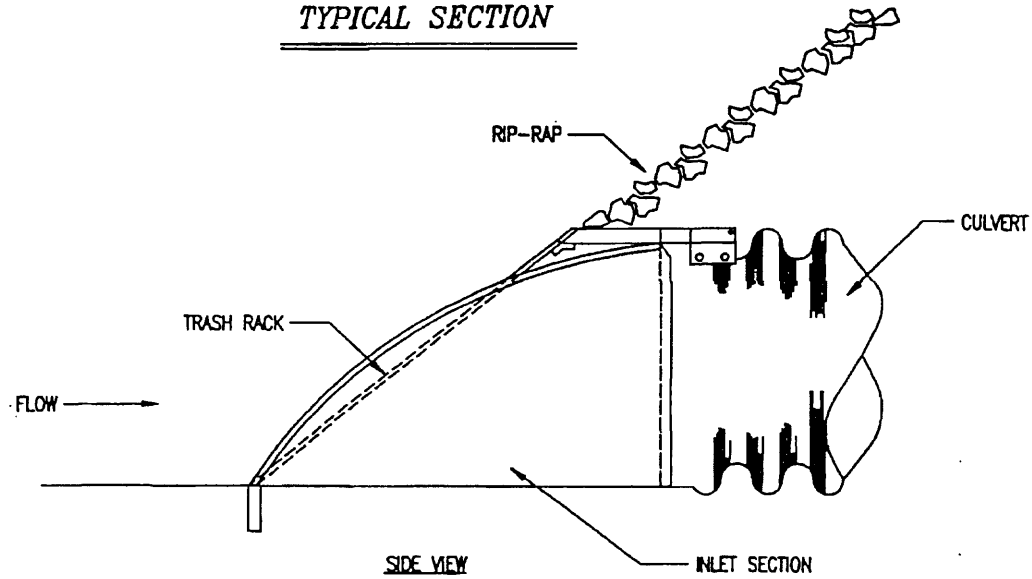
NOTE: FLOW DEPTH AND AREA BASED ON RUNOF FROM A 10 YEAR-6 HUR EVENT.

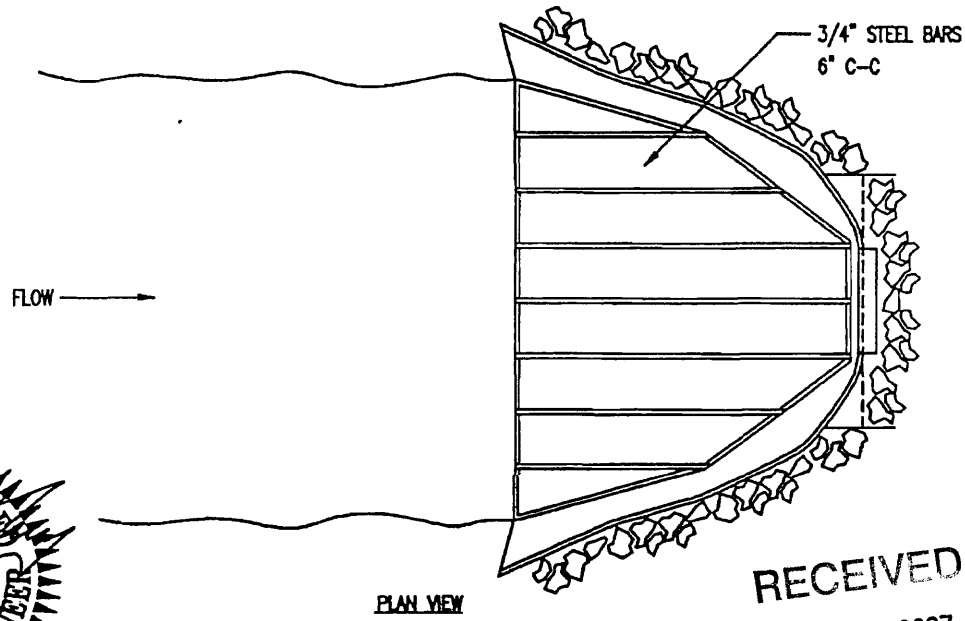
RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

0' NTS

FIGURE 3. DISTURBED DITCH SECTIONS

UNDISTURBED CULVERT INLET TYPICAL SECTION



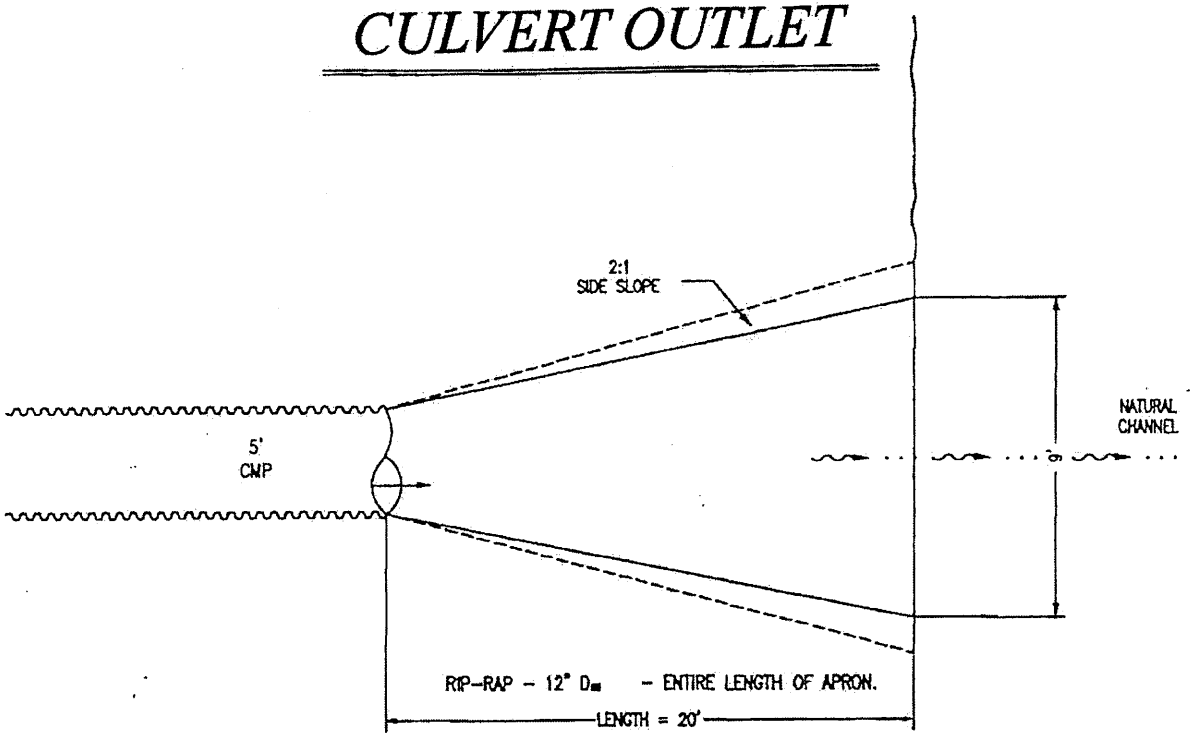


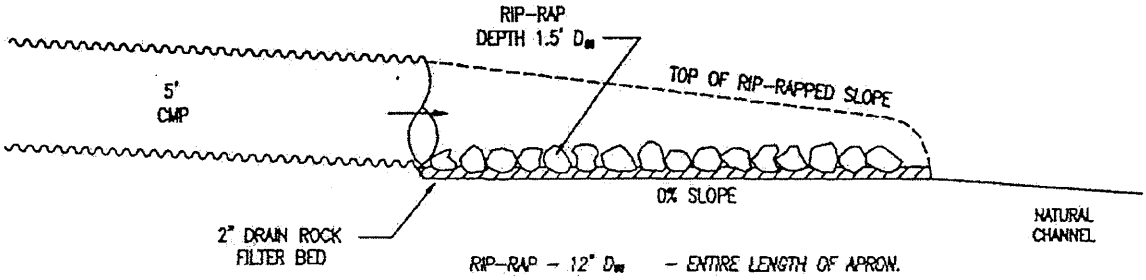
UTAH REGISTERED
#154168
DAN W. GUY
9/11/00
PROFESSIONAL ENGINEER

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

Figure 4

UC-1
CULVERT OUTLET





* DESIGN BASED ON FIGURE 7-26, DESIGN OF OUTLET PROTECTION – MAXIMUM TAILWATER CONDITION, "APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS", BARFIELD, WARNER & HAAN, 1983.

UTAH REGISTERED
#154168
DAN W. GUY
9/11/00
PROFESSIONAL ENGINEER

Figure 4A

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

DESIGN OF SEDIMENT CONTROL STRUCTURES

Design Specifications:

3.1 Design and Construction Specifications for Sedimentation Pond
3.2 Sediment Yield
3.3 Sediment Pond Volume

Tables:

Table 11 Sediment Pond Design
Table 12 Sediment Pond - Stage Volume Data
Table 13 Sediment Pond - Stage Discharge Data

3.4 Sediment Pond Summary

Figures:

Figure 5 Sediment Pond Stage-Volume Curve
Figure 6 Sediment Pond Stage-Discharge Curve
Figure 7 Removed

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

3.1 Design and Construction Specifications for Sedimentation Pond

a) All construction of sedimentation ponds will be performed under the direction of a qualified, registered professional engineer.

b) The sediment pond will be located in an existing low area where the Right Fork of Lila Canyon passes beneath the existing road. The existing road fill and culvert will be removed, and the pond embankment (road fill) will be reconstructed and compacted. The existing culvert will be replaced with UC-1 which will extend approximately 300' up the Right Fork of Lila Canyon. This culvert will be equipped with an inlet section and trash rack, and will allow undisturbed runoff and treated access road drainage to pass beneath the sediment pond. The majority of the pond will be in an existing channel area, and is therefore considered incised. The embankment will be reconstructed to a maximum of 2h:1v slopes, with the total of inside and outside slopes not less than 5h:1v. The pond will be equipped with a culvert riser principal spillway with an oil skimmer, a decant, and a second culvert riser emergency spillway with an oil skimmer. Both spillways will discharge to the oversized (60") CMP culvert running beneath the pond.

c) The area of pond constructed shall be examined for topsoil, and where present in removable quantities, such soil shall be removed separately and stored in an approved topsoil storage location.

d) In areas where fill is to be placed for the pond impoundment structures, natural ground shall be removed to at least 12" below the base of the structure.

e) Native materials shall be used where practical. Fill will be placed in lifts not to exceed 6" and compacted prior to placement of next lift. Compaction of all fill materials shall be at least 95%.

f) Rip-rap or other protection (culverts, concrete, etc.) will be placed at all inlets and outlets to prevent scouring. Rip-rap will consist of substantial, angular (non-slaking) rock material of adequate size.

g) Decanting of the pond, as required, will be accomplished by use of a decant pipe with an inverted inlet as shown on Plate 7-6. Samples will be collected prior to decanting of the pond. If the quality of the water meets

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

the requirements of the U.P.D.E.S. Permit, decanting will proceed. Discharge samples will be collected as per the approved U.P.D.E.S. Discharge Permit.

h) Slopes of the embankments shall not be steeper than 2h:1v, inside or outside, with a total of the inslope and outslope not less than 5h:1v, except where areas of the pond are incised.

i) External slopes of the impoundment will be planted with an approved seed mix to help prevent erosion and promote stability.

j) Top width of the embankment shall be not less than (H+35)/5, where H = Height of Dam in feet.

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

3.2 Sediment Yield

The Universal Soil Equation (USLE) was used to estimate sediment yield from disturbed areas. All soil loss from this area was assumed to be delivered to, and deposited in the sedimentation pond.

Erosion rate (A) in tons-per-acre-per-year is determined using the USLE as follows:

$$A = (R)\ (K)\ (LS)\ (CP)$$

Where the variables R, K, LS, and CP are defined as follows:

Variable "R" is the rainfall factor which can be estimated from $R = 27P^{2.2}$; where P is the 2-year, 6-hour precipitation value. P for the Lila Canyon area is 0.75" as shown in Figure 5.4, page 315, Barfield, et.al. 1983. Therefore, the estimated value of "R" for this area is 14.34.

Variable "K" is the soil erodibility factor. For disturbed areas, the "K" value is conservatively estimated to be 0.5. For disturbed runoff, but uncompacted and ungraded areas, "K" is estimated at 0.320. "K" is estimated to be 0.035 for undisturbed areas.

Variable "LS" is the length-slope factor. This figure was determined by applying the slope length and percentage for each sub-drainage area to the chart in Figure 5.15, p. 334, "Applied Hydrology and Sedimentology for Disturbed Areas", Barfield, Warner and Haan, 1983.

Variable "CP" is the control practice factor, which can be divided into a cover and practice factor. Values were determined from Appendix 5A, Barfield, et.al., 1983.

Site	CP Factor
Compacted Areas	1.20
Disturbed/Uncompacted Areas	0.20
Undisturbed Areas	0.15

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

The sediment volume is based on a density of 100 pounds per cubic foot of sediment.

SEDIMENT YIELD CALCULATIONS - USLE

Drainage	R	K	Acres	Slope Length Feet	Slope (%)	LS	CP	A	Yield
DA-2	14.34	0.500	2.45	1520	12.50	7.45	1.20	64.10	0.072
DA-3(total)	14.34	0.500	2.92	650	15.39	6.50	1.20	55.93	0.075
DA-4	14.34	0.500	2.63	330	7.58	1.60	1.20	13.77	0.017
DA-5	14.34	0.500	0.56	240	12.50	3.00	1.20	25.81	0.007
DA-6**	14.34	0.001	5.10	550	9.09	2.70	0.01	0.0004	-
DA-7**	14.34	0.001	6.86	700	7.14	2.20	0.01	0.0003	-
DA-8	14.34	0.500	0.58	350	7.14	1.50	1.20	12.91	0.003
UA-2	14.34	0.035	11.74	1500	66.67	102.68	0.15	7.73	0.042
UA-3	14.34	0.035	5.98	650	25.39	27.55	0.15	2.07	0.006
UA-4	14.34	0.035	7.20	12.50	47.76	58.50	0.15	4.40	0.015
UA-5	14.34	0.320	12.27	600	42.86	34.33	0.20	31.51	0.178
UA-6(total)	14.34	0.500	6.76	625	8.00	2.45	0.20	3.51	0.011

Total Sediment 1 year (ac.ft.) 0.426

Total Sediment 3 years (ac. ft.) 1.278

* Disturbed Runoff / Uncompacted Area

** Paved Areas

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

3.3 Sediment Pond Volume

The volumes shown in Table 11 are from the volumes calculated from the precipitation, runoff and sediment yield for a 10 year-24 hour precipitation event. The volumes were calculated based on the disturbed areas (and contributing undisturbed areas) runoff values, developed using the design parameters described in this section.

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

TABLE 11

Table 11 Sediment Pond Design	
1. Use 1.90" for 10 year - 24 hour event.	
2. Runoff Volume (from Table 5, 10 yr/24 hr) =	5.09 ac. ft. (1)
3. Sediment Storage Volume USLE 1.289 ac.ft./yr. x 3 yrs. =	1.278 ac. ft.
4. Direct Precipitation into Pond 1.076 acres x 1.90" / 12 in./ft. =	0.184 ac. ft.
5. Total Required Pond Volume 5.090 + 1.278 + 0.184 =	6.552 ac. ft.
6. * Peak Flow (25 yr. - 6 hr. event) =	31.44 cfs (2)
7. Pond Design Volume @ Principle Spillway = (See Table 12)	8.537 ac. ft.
* Peak Flow values from Table 5, sum of all contributing watersheds plus possible future flow from UA-5.	

(1) Capacity is 1.03 ac. Ft. higher than Table 5. This is to allow for the flow from UA-5. There is a possibility that UA-5 may be needed if the surface facilities were to be expanded.

(2) Peak flow is 7.65 cfs higher that Table 5. This is to allow for flow from UA-5. There is a possibility that UA-5 may be needed if the surface facilities were to be expanded.

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

TABLE 12

Table 12 Sediment Pond Stage/Volume Data				
Elevation	Area (ac.)	Volume (ac. ft.)	Acc. Volume (ac. ft.)	Remarks
5830	.6477	0.000	0.000	Bottom of Pond
5831	.6862	0.667	0.667	
5832	.7254	0.706	1.373	
5833	.7657	0.746	2.119	Sediment Cleanout Level
5834	.8070	0.786	2.905	Decant
5835	.8493	0.828	3.733	
5836	.8927	0.871	4.604	
5837	.9370	0.915	5.519	
5838	.9824	0.960	6.479	
5839	1.0287	1.006	7.485	
5840	1.0759	1.052	8.537	Principal Spillway
5841	1.1230	1.100	9.637	Emergency Spillway
5842	1.1708	1.147	10.784	
5843	1.2587	1.215	11.999	Top of Embankment

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

TABLE 13

Table 13 Sediment Pond Stage/Discharge Data			
Head (ft.)	Q (cfs) Weir Controlled	Q (cfs) Orfice Controlled	Q (cfs) Pipe Flow Controlled
0.0	-	-	-
0.2	2.53	15.22	74.10
0.4	7.15	21.53	74.89
0.6	13.14	26.36	75.67
0.8	20.23	30.44	76.43
1.0	28.27	34.04	77.19
1.2	37.17	37.28	77.95
1.4	46.84	40.27	78.69
1.6	57.22	43.05	79.43
1.8	68.28	45.66	80.16
2.0	79.97	48.13	80.89

Note: 1- 25 year - 6 hour flow = 31.44 cfs.
2- Flow will be weir controlled at a head of 1.07' over riser inlet.

Weir Controlled

$Q = CLH^{1.5}$; where: C= 3.0, L= Circumference of Riser = 9.4248', R=1.5'

Orfice Controlled

$Q = C'a\,(2gH)^{0.5}$; where: C= 0.6, a= Area of Riser = 7.0686 ft^2, R=1.5', g= 32.2 ft/sec^2

Pipe Flow Controlled

$Q = \frac{a\,(2gH')^{0.5}}{(1+Ke+Kb+KcL)^{0.5}}$; where

a = Area of Pipe = 7.07 ft^2, R = 1.5'
H' = Head = H + 9.2 (At outlet of Riser)
Ke = 1.0
Kb = 0.5
Kc = 0.043
L = 70'

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

3.4 Sediment Pond Summary

a) The sedimentation pond has been designed to contain the disturbed area (and contributing undisturbed area) runoff from a 10 year-24 hour precipitation event, along with 3 years of sediment storage capacity. Runoff to the pond will be directed by various ditches and culverts as described in the plan.

b) The required volume for the sediment pond is calculated at 6.552 acre feet, including 3 years of sediment storage. The existing sediment pond size will be a volume of approximately 8.537 acre feet (at the principal spillway), which is more than adequate.

c) The pond will meet a theoretical detention time of 24 hours. It is equipped with a decant, a culvert principal spillway and a culvert emergency spillway. Any discharge from the pond will be in accordance with the approved UPDES Permit.

d) The pond inlets will be protected from erosion, and the spillway will discharge into the main drainage.

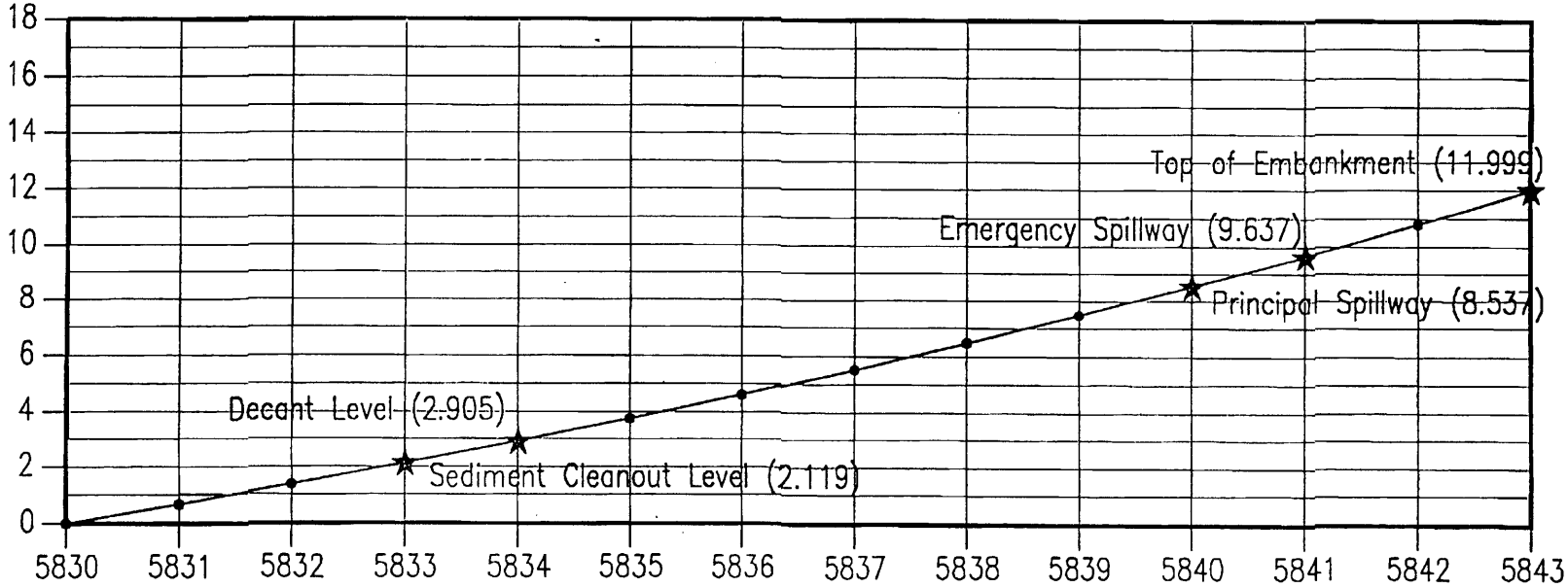
e) The pond is temporary, and will be removed upon final reclamation of the property.

f) The pond will be constructed according to the regulations and under supervision of a Registered, Professional Engineer.

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

STAGE VOLUME

SEDIMENT POND



Accumulated Volume

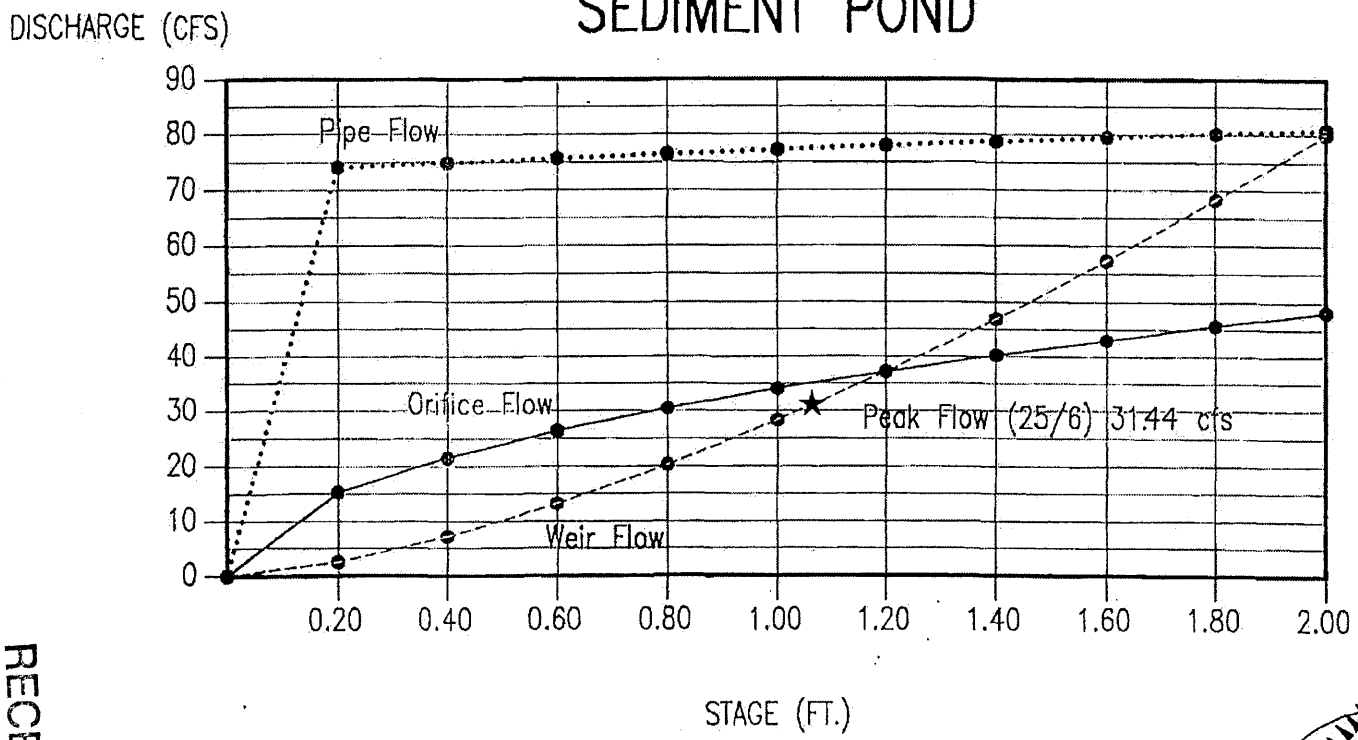
UTAH REGISTERED PROFESSIONAL ENGINEER #154168 DAN W. GUY 9/11/00

FIGURE 5

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

STAGE - DISCHARGE CURVE

SEDIMENT POND



------- Weir Flow	——— Orifice Flow	..... Pipe Flow

Note: Weir Controlled at H = 1.07'.

FIGURE 6

UTAH REGISTERED PROFESSIONAL ENGINEER #154168 DAN W. GUY 9/11/00

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

DESIGN OF DRAINAGE CONTROL STRUCTURES FOR RECLAMATION

Reclamation Hydrology:

4.1 General
4.2 Reclamation Area Drainage Control

Tables:

Table 14 Final Reclamation - Drainage Areas Contributing to Structures
Table 15 Final Reclamation - Drainage Structure Flow Summary
Table 16 Final Reclamation - Reclamation Structure Design Parameters
Table 17 Final Reclamation - Reclamation Structure Flow Calculations

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

Reclamation Hydrology

4.1 General

Upon completion of operations at the Lila Canyon Minesite, the portals will be sealed and backfilled and all structures will be removed except for the sediment pond, bypass culvert UC-1, reclamation ditches and temporary sediment controls such as silt fences or straw bales.

Any refuse or mine development waste previously deposited under the approved plan will also be left in place. Concrete will be buried beneath at least 2' of non-toxic, non-acid material. Any potentially toxic or acid-forming material buried on site will be covered with a minimum of 4' of material.

The sediment pond, and all remaining drainage controls will be removed upon completion of Phase II Bond Release.

4.2 Reclamation Area Drainage Control

During the initial phase of reclamation, all drainage controls will be removed with the exception of the sediment pond, bypass culvert UC-1, reclaimed ditches RD-1 and RD-2 and temporary sediment controls such as straw bales or silt fences installed in the undisturbed drainages.

As undisturbed drainage culverts are removed, a minimum of two straw bale or silt fence barriers will be installed downstream of each location for sediment control purposes.

Disturbed area ditches DD-10, DD-11 and DD-12 will be cleaned and enlarged as necessary, and redesignated as reclaimed ditches RD-1 (DD-10 and DD-11) and RD-2 (DD-12), respectively (see Plate 5-6).

When the vegetation and sediment contribution levels meet requirements for Phase II Bond Release, a series of at least thre straw bale or silt fence barriers will be placed downstream of the sediment pond outlet. All upstream sediment controls will be removed. Reclaimed ditches RD-1 and RD-2 will also be removed, regraded and reseeded. Culvert UC-1 will be cut off at the location of the principal pond spillway.

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

The portion of culvert UC-1 remaining beneath the road will be left as a permanent drainage control. The culvert will be equipped with an inlet section and rip-rapped headwall. The culvert is adequately sized to safely pass runoff from a 100 year - 6 hour event, as shown in Table 10. To ensure that state of the art technology is incorporated, the final reclamation plans for the sedimentation pond area will be submitted prior to commencement of final reclamation of this area.

The remainder of culvert UC-1 will be removed, and the natural channel restored through the sediment pond area. The sediment pond structures will also be removed, the pond area regraded as necessary and reseeded. The pond embankment will remain as a permanent feature, since the existing (and proposed future) road through the area passes over the embankment.

Following the successful establishment of vegetation and when affluent standards are met, the sediment pond will be removed. The same methodologies relative to recontouring, top soil application and seeding will be utilized in grading and revegetating the pond area as outlined in Chapters 2, 5, and Appendix 5-8.

The pond embankment will be narrowed to facilitate the even character of the Lila Canyon Road. The 60 inch bypass culvert (UC-1) will be removed to within six feet of the road embankment. A newly formed channel will be constructed at an approximate four percent grade to intercept the inlet of the culvert at its intersection of the road. The road embankment and associated new channel will be armored by the Operator with an underlayment of filter gravel, with D_{50}-30 inch rip-rap. The new area of disturbance including the newly formed channel will have top soil spread in and around the rip-rap. The Operator will use the same seeding and mulching methods described in Appendix 5-8 will be used on this area as well. See Figure 4 for a detailed design.

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

TABLE 14

Table 14 Final Reclamation Drainage Areas Contributing to Structures	
Channel	*Contributing Watershed/Structure
RD-1	DD-11
RD-2	DD-12
UC-1	UA-1, RD-1, and RD-2

* Taken from Table 6.

TABLE 15

Table 15 Final Reclamation Drainage Structure Flow Summary	
Channel	*10/6 Flow (cfs)
RD-1	11.91
RD-2	12.83
UC-1	**65.08

* Antecedent Moisture Condition III.
** 100/6 Flow.

TABLE 16

Table 16 Final Reclamation Reclamation Structure Design Parameters					
Channel	Bottom Width (ft.)	Side Slope H:V	Slope %	Reclaimed Depth (ft.)	Manning's No.
RD-1	3	2:1	5.00	1.5	0.035
RD-2	3	2:1	10.00	1.5	0.035
UC-1	60" Diam.	-	5.56	60" Diam.	0.025

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

TABLE 17

Table 17 Final Reclamation Reclamation Structure Flow Calculations			
Channel	RD-1	RD-2	UC-1
100 year - 6 hour event (in.)	-	-	1.90
10 year - 6 hour event (in.)	1.30	1.30	-
Peak Flow (cfs)	11.91	12.83	65.08
Velocity (fps)	5.28	6.87	12.77
Required Area ($ft.^2$)	2.26	1.87	5.10
Flow Depth (ft.)	0.55	0.47	1.53

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

Alternate Sediment Control for Fan Site and Topsoil Storage Area

Sediment Control at the fan and topsoil storage area sites will be accomplished with a combination of one or more of the following: berms, silt fences, and straw bales. The topsoil collected from the fan and topsoil storage area sites will be located down dip from the sites and will be used in the construction of the berm. The berm will be constructed a minimum of two feet high and have 2:1 side slopes. The berm will control the flow from a 10 year-24 hour precipitation event. Silt fence will be selectively placed to help control run-off. The berm will be stabilized with vegetation to prevent erosion. As much as practical, the vegetation techniques used on the main topsoil pile will be utilized on the fan topsoil berm.

The outside of the berm will be protected with a silt fence or gravel. The gravel, if used, would help augment the revegetation. Construction details of the silt fence/filter fence are shown if Figure 8.

Due to lack of final engineering details, the exact location of the berm and subsequent erosion techniques will be determined in field with the approval of UDOGM. The final determination will be made prior to the start of topsoil removal.

Run-off Calculations

Fan Site

Acreage:	0.716 acres
Design Storm:10 year/24 hour:	1.90"
CN:	90
S:	1.111

$Q = \frac{(P-0.25S)^2}{P+0.8S} = 1.01$" of runoff

Total run-off = 0.06 acre feet

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

Topsoil Storage Area

Acreage:	2.61 acres
Design Storm:10 year/24 hour:	1.90"
CN:	90
S:	1.111

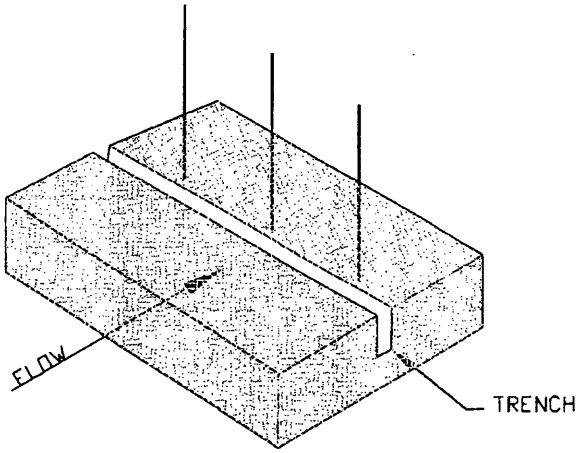
$$Q = \frac{(P-0.25S)^2}{P+0.8S} = 1.01\text{" of runoff}$$

Total run-off = 0.22 acre feet

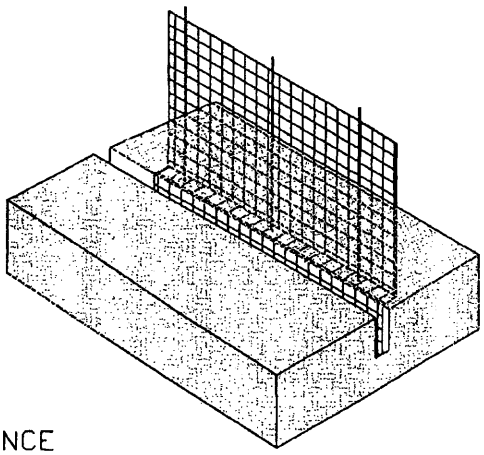
RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

FILTER FENCE CONSTRUCTION

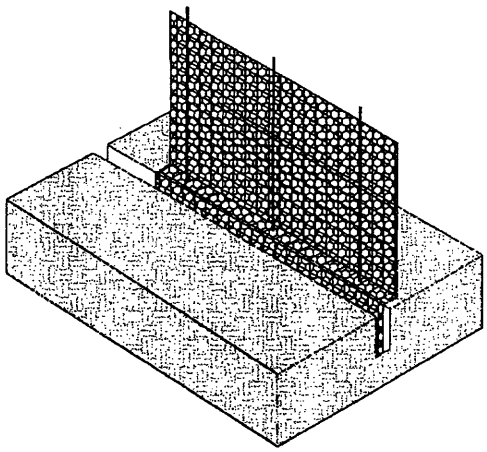
1. SET POSTS, EXCAVATE TRENCH



2. TIE WIRE FENCING TO POST



3. ATTACH FILTER FABRIC TO WIRE FENCE
WIRE AND FABRIC EXTENDS INTO TRENCH



4. BACKFILL AND COMPACT SOIL

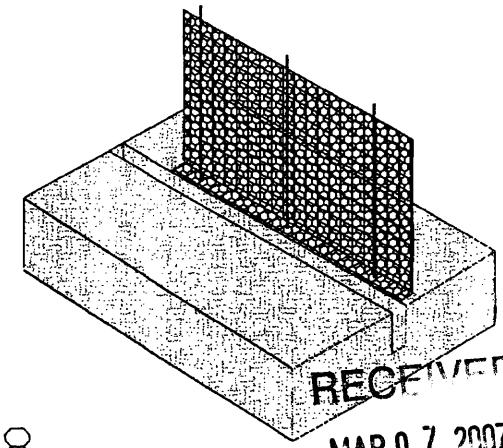


FIGURE 8

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

State of Utah
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WATER RIGHTS

Michael O. Leavitt
Governor
Kathleen Clarke
Executive Director
Robert L. Morgan
State Engineer

1594 West North Temple, Suite 220
PO Box 146300
Salt Lake City, Utah 84114-6300
801-538-7240
801-538-7467 (Fax)

RECEIVED SEP 21

September 16, 1999

Utah American Energy
P.O. Box 986
Price, UT 84501

Re: Regulating Reservoir Application Number 99-91-73MD/UT21742

We have approved your "Application for a Dam not Requiring Submission of Formal Plans Under Section 73-5A-202". Conditions on the approval are as follows:

1. Any storage of water in the reservoir created is subject to all vested water rights.

2. All design and construction activities undertaken shall be commensurate with state-of-the-art standards.

3. Notification of the inspector and contractor for the project shall be submitted to this office prior to the beginning of any construction.

4. All inspectors' journals and results of material testing performed during construction should be submitted to this office.

This Decision is subject to the provisions of Rule R655-6 of the Division of Water Rights and to Sections 63-46b-13 and 73-3-14 of the Utah Code Annotated, 1953 as amended, which provide for filing either a Request for Reconsideration with the State Engineer, or an appeal with the appropriate District Court. A Request for Reconsideration must be filed with the State Engineer within 20 days of the date of this Decision. However, a Request for Reconsideration is not a prerequisite for a court appeal. A court appeal must be filed within 30 days after the date of this Request, or if a Request for Reconsideration has been filed, within 30 days after the date the Request for Reconsideration is denied. A Request for Reconsideration is considered denied when no action is taken 20 days after the Request is filed.

If you have any questions or need further clarification, please feel free to contact me or Mark Page in our Price Regional Office.

Sincerely,

Richard B. Hall P.E.
Assistant State Engineer

RBH/jm

Enclosure

pc: Mark Page - Regional Engineer

RECEIVED
MAR 07 2007
DIV. OF OIL, GAS & MINING

Form R-69
3/92

UT 21742

APPLICATION FOR A DAM NOT REQUIRING SUBMISSION OF FORMAL PLANS UNDER SECTION 73-5A-202

Application No 99-91-73 NE
Received
Entered

STATE OF UTAH

The following application is submitted pursuant to Section 73-5a-204 for a dam meeting the exclusion under Section 73-5a-202(1) (dam under 20 acre-feet not constituting a threat to human life) or the waiver under Section 73-5a-202(3) (dams over 20 acre-feet not constituting a threat to human life or property not held by the owner of the dam).

1. **APPLICANT INFORMATION**
Name(s): Utah American Energy
Address: P.O. Box 986
City: Price State: Utah Zip Code: 84501

2. **PURPOSE OF DAM**
Stock Pond ____ Regulating Res. ____ Diversion Dam ____
Irrigation ____ Debris Basin ____ Flood Control ____
Sedimentation X Tailings Pond ____ Recreation ____
Other (describe) ____

3. **LOCATION OF DAM**
County Emery Quarter/Quarter (i.e. NESW) SESW Section 15
Township 16 S. Range 14 E Base & Meridian S.L.B.&M.

4. **PROPOSED DAM**
Dam Height (vertical distance) 13.0 feet
Crest Length (length of top of dam) 160 feet
Crest Width (width of top of dam) 24 feet
Upstream slope 1 vertical on 3 horizontal
Downstream slope 1 vertical on 3 horizontal
Water surface area at spillway crest 1.076 acres
Reservoir capacity at spillway crest 8.537 ac-ft.
Type of dam (i.e. earthfill, concrete, etc.) Earthfill

5. **PROPOSED OUTLET**
Inside diameter 24 inches Length 14 feet
Type of pipe (i.e. concrete, steel, etc.) C.M.P.
Type of gate or valve N/A - Open Vertical Riser with Oil Skimmer.
Location of gate (upstream, downstream, center, etc.) N/A - Flows to ~~36~~" C.M.P. Below 60" Pipe

6. **PROPOSED SPILLWAY**
Crest Length (width of bottom of spillway) 5 feet
Depth (from bottom of spillway to top of dam) 2 feet
Type (i.e. earth channel, pipe, etc.) Rip-rapped Earth Channel.
Control (i.e. gates, flashboards, etc.) N/A - Open-Channel

7. **WATER RIGHTS**
Describe (see instructions) N/A - Sediment Control Only.

RECEIVED
MAR 07 2007
DIV. OF OIL, GAS & MINING

8. COMMENTS

This is a sedimentation pond, designed to contain and treat runoff from the proposed minesite disturbed area for the Lila Canyon Mine. The majority of the pond will be incised within the existing channel. Undisturbed runoff from above will be diverted beneath the pond and road through a ~~36"~~ 60" R/Fr C.M.P. culvert. The road and portion of culvert are existing.

9. PLANS

Attach plans sketches or diagrams to clarify the information given on this application.

(Attached)

The undersigned acknowledge they have read the instructions included with this application, and are aware no construction is to begin until this application has been approved by the Utah State Engineer.

7/11/99
Date

R. Jay Marshall
Signature of Applicant

Water Rights in Order By MP Date 9-1-99
Area Engineer's Hazard Rating low
Reviewed by Dam Safety By [illegible] Date 9/3/99
Comments

Date of Approval September 3, 1999

Robert L. Morgan, P.E.
For State Engineer

RECEIVED
MAR 07 2007
DIV. OF OIL, GAS & MINING

Lila Canyon Mine
Watershed Calculations

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

```
Project Title        = LILA CANYON UA - 1 (10/6)
WATERSHED HYDROGRAPH
     Inflow into structure # 1
     Structure type:     Null


-- Watershed data for watershed # 1
     Curve number              =    75.0
     Area                      =    248.4 acres
     Hydraulic length          =    5200.0 Feet
     Elevation change          =    1480.0 feet
     Concentration time        =    0.27 hours
     Concentration time type   =    SCS Upland Curves
     Unit Hydrograph type      =    Forested

-- Total Area            =    248.4 acres

-- Storm Data
     Total precipitation =    1.3 inches
     Storm type          =    SCS 6 hour design storm
     Peak Discharge      =    7.02 cfs
     Discharge volume    =    2.09 acre ft
```

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

```
Project Title        = LILA CANYON UA - 1 (10/24)
WATERSHED HYDROGRAPH
     Inflow into structure # 1
     Structure type:     Null


-- Watershed data for watershed # 1
     Curve number              =    75.0
     Area                      =    248.4 acres
     Hydraulic length          =    5200.0 Feet
     Elevation change          =    1480.0 feet
     Concentration time        =    0.27 hours
     Concentration time type   =    SCS Upland Curves
     Unit Hydrograph type      =    Forested

-- Total Area            =    248.4 acres

-- Storm Data
     Total precipitation =    1.9 inches
     Storm type          =    SCS Type 2 storm, 24 hour storm
     Peak Discharge      =    25.53 cfs
     Discharge volume    =    6.90 acre ft
```

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

```
Project Title        = LILA CANYON UA - 1 (100/6)
WATERSHED HYDROGRAPH
     Inflow into structure # 1
     Structure type:     Null


-- Watershed data for watershed # 1
     Curve number              =    75.0
     Area                      =    248.4 acres
     Hydraulic length          =    5200.0 Feet
     Elevation change          =    1480.0 feet
     Concentration time        =    0.27 hours
     Concentration time type   =    SCS Upland Curves
     Unit Hydrograph type      =    Forested

-- Total Area            =    248.4 acres

-- Storm Data
     Total precipitation =    1.9 inches
     Storm type          =    SCS 6 hour design storm
     Peak Discharge      =    20.48 cfs
     Discharge volume    =    6.90 acre ft
```

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

```
Project Title        = LILA CANYON UA - 1 (25/6)
WATERSHED HYDROGRAPH
     Inflow into structure # 1
     Structure type:     Null


-- Watershed data for watershed # 1
     Curve number              =    75.0
     Area                      =    248.4 acres
     Hydraulic length          =    5200.0 Feet
     Elevation change          =    1480.0 feet
     Concentration time        =    0.27 hours
     Concentration time type   =    SCS Upland Curves
     Unit Hydrograph type      =    Forested

-- Total Area            =    248.4 acres

-- Storm Data
     Total precipitation =    1.5 inches
     Storm type          =    SCS 6 hour design storm
     Peak Discharge      =    10.31 cfs
     Discharge volume    =    3.45 acre ft
```

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

```
Project Title        = LILA CANYON UA - 2 (10/6)
WATERSHED HYDROGRAPH
     Inflow into structure # 1
     Structure type:     Null


-- Watershed data for watershed # 1
     Curve number              =    83.0
     Area                      =    11.7 acres
     Hydraulic length          =    1500.0 Feet
     Elevation change          =    1000.0 feet
     Concentration time        =    0.08 hours
     Concentration time type   =    SCS Upland Curves
     Unit Hydrograph type      =    Forested

-- Total Area            =    11.7 acres

-- Storm Data
     Total precipitation =    1.3 inches
     Storm type          =    SCS 6 hour design storm
     Peak Discharge      =    1.49 cfs
     Discharge volume    =    0.26 acre ft
```

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

```
Project Title        = LILA CANYON UA - 2 (10/24)
WATERSHED HYDROGRAPH
     Inflow into structure # 1
     Structure type:     Null


-- Watershed data for watershed # 1
     Curve number              =    83.0
     Area                      =    11.7 acres
     Hydraulic length          =    1500.0 Feet
     Elevation change          =    1000.0 feet
     Concentration time        =    0.08 hours
     Concentration time type   =    SCS Upland Curves
     Unit Hydrograph type      =    Forested

-- Total Area            =    11.7 acres

-- Storm Data
     Total precipitation =    1.9 inches
     Storm type          =    SCS Type 2 storm, 24 hour storm
     Peak Discharge      =    5.02 cfs
     Discharge volume    =    0.61 acre ft
```

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

```
Project Title        = LILA CANYON UA - 2 (100/6)
WATERSHED HYDROGRAPH
     Inflow into structure # 1
     Structure type:     Null


-- Watershed data for watershed # 1
     Curve number                =    83.0
     Area                        =    11.7 acres
     Hydraulic length            =    1500.0 Feet
     Elevation change            =    1000.0 feet
     Concentration time          =    0.08 hours
     Concentration time type     =    SCS Upland Curves
     Unit Hydrograph type        =    Forested

-- Total Area              =    11.7 acres

-- Storm Data
     Total precipitation =    1.9 inches
     Storm type          =    SCS 6 hour design storm
     Peak Discharge      =    4.02 cfs
     Discharge volume    =    0.61 acre ft
```

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

```
Project Title        = LILA CANYON UA - 2 (25/6)
WATERSHED HYDROGRAPH
     Inflow into structure # 1
     Structure type:     Null


-- Watershed data for watershed # 1
     Curve number              =    83.0
     Area                      =    11.7 acres
     Hydraulic length          =    1500.0 Feet
     Elevation change          =    1000.0 feet
     Concentration time        =    0.08 hours
     Concentration time type   =    SCS Upland Curves
     Unit Hydrograph type      =    Forested

-- Total Area            =    11.7 acres

-- Storm Data
     Total precipitation =    1.5 inches
     Storm type          =    SCS 6 hour design storm
     Peak Discharge      =    2.30 cfs
     Discharge volume    =    0.37 acre ft
```

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

```
Project Title          = LILA CANYON UA-3 (10/6)
WATERSHED HYDROGRAPH
     Inflow into structure #  1
     Structure type:          Null


-- Watershed data for watershed # 1
    Curve number              =    83.0
    Area                      =     6.0 acres
    Hydraulic length          =  650.00 Feet
    Elevation change          =   165.0 feet.
    Concentration time        =    0.04 hours
    Concentration time type = SCS Upland Curves
    Unit hydrograph type      = Forested

-- Total Area            =     6.0 acres

-- Storm data
    Total precipitation  =     1.3 inches
    Storm type           = SCS 6 hour design storm
    Peak Discharge       =    0.77 cfs
    Discharge volume     =    0.13 acre ft
```

```
Project Title          = LILA CANYON UA-3 (10/24)
WATERSHED HYDROGRAPH
     Inflow into structure #  1
     Structure type:          Null


-- Watershed data for watershed # 1
    Curve number              =    83.0
    Area                      =     6.0 acres
    Hydraulic length          =  650.00 Feet
    Elevation change          =   165.0 feet.
    Concentration time        =    0.04 hours
    Concentration time type = SCS Upland Curves
    Unit hydrograph type      = Forested

-- Total Area            =     6.0 acres

-- Storm data
    Total precipitation  =     1.9 inches
    Storm type           = SCS Type 2 storm, 24 hour storm
    Peak Discharge       =    2.58 cfs
    Discharge volume     =    0.31 acre ft
```

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

```
Project Title          = LILA CANYON UA-3 (25/6)
WATERSHED HYDROGRAPH
     Inflow into structure #  1
     Structure type:          Null


-- Watershed data for watershed # 1
    Curve number              =    83.0
    Area                      =     6.0 acres
    Hydraulic length          =  650.00 Feet
    Elevation change          =   165.0 feet.
    Concentration time        =    0.04 hours
    Concentration time type   = SCS Upland Curves
    Unit hydrograph type      = Forested

-- Total Area            =     6.0 acres

-- Storm data
    Total precipitation   =     1.5 inches
    Storm type            = SCS 6 hour design storm
    Peak Discharge        =    1.19 cfs
    Discharge volume      =    0.19 acre ft
```

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

```
Project Title          = LILA CANYON UA-3 (100/6)
WATERSHED HYDROGRAPH
     Inflow into structure #  1
     Structure type:          Null


-- Watershed data for watershed # 1
    Curve number              =    83.0
    Area                      =     6.0 acres
    Hydraulic length          =  650.00 Feet
    Elevation change          =   165.0 feet.
    Concentration time        =    0.04 hours
    Concentration time type   = SCS Upland Curves
    Unit hydrograph type      = Forested

-- Total Area            =     6.0 acres

-- Storm data
    Total precipitation   =     1.9 inches
    Storm type            = SCS 6 hour design storm
    Peak Discharge        =    2.17 cfs
    Discharge volume      =    0.31 acre ft
```

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

```
Project Title          = LILA CANYON UA-4 (10/6)
WATERSHED HYDROGRAPH
     Inflow into structure #  1
     Structure type:          Null


-- Watershed data for watershed # 1
    Curve number              =    83.0
    Area                      =     7.2 acres
    Hydraulic length          = 1250.00 Feet
    Elevation change          =   595.0 feet.
    Concentration time        =    0.05 hours
    Concentration time type = SCS Upland Curves
    Unit hydrograph type      = Forested

-- Total Area            =     7.2 acres

-- Storm data
    Total precipitation  =     1.3 inches
    Storm type           = SCS 6 hour design storm
    Peak Discharge       =    0.91 cfs
    Discharge volume     =    0.16 acre ft
```

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

Project Title = LILA CANYON UA-4 (10/24)
WATERSHED HYDROGRAPH
Inflow into structure # 1
Structure type: Null

-- Watershed data for watershed # 1

Curve number	=	83.0
Area	=	7.2 acres
Hydraulic length	=	1250.00 Feet
Elevation change	=	595.0 feet.
Concentration time	=	0.05 hours
Concentration time type	=	SCS Upland Curves
Unit hydrograph type	=	Forested

-- Total Area = 7.2 acres

-- Storm data

Total precipitation	=	1.9 inches
Storm type	=	SCS Type 2 storm, 24 hour storm
Peak Discharge	=	3.08 cfs
Discharge volume	=	0.38 acre ft

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

```
Project Title          = LILA CANYON UA-4 (100/6)
WATERSHED HYDROGRAPH
     Inflow into structure #  1
     Structure type:          Null


-- Watershed data for watershed # 1
    Curve number              =    83.0
    Area                      =     7.2 acres
    Hydraulic length          = 1250.00 Feet
    Elevation change          =   595.0 feet.
    Concentration time        =    0.05 hours
    Concentration time type = SCS Upland Curves
    Unit hydrograph type      = Forested

-- Total Area            =     7.2 acres

-- Storm data
    Total precipitation  =     1.9 inches
    Storm type           = SCS 6 hour design storm
    Peak Discharge       =    2.58 cfs
    Discharge volume     =    0.38 acre ft
```

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

```
Project Title          = LILA CANYON UA-4 (25/6)
WATERSHED HYDROGRAPH
     Inflow into structure #  1
     Structure type:          Null


-- Watershed data for watershed # 1
    Curve number              =    83.0
    Area                      =     7.2 acres
    Hydraulic length          = 1250.00 Feet
    Elevation change          =   595.0 feet.
    Concentration time        =    0.05 hours
    Concentration time type = SCS Upland Curves
    Unit hydrograph type      = Forested

-- Total Area            =     7.2 acres

-- Storm data
    Total precipitation  =     1.5 inches
    Storm type           = SCS 6 hour design storm
    Peak Discharge       =    1.41 cfs
    Discharge volume     =    0.23 acre ft
```

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

App 7-4

```
Project Title          = LILA CANYON UA-5 (10/6)
WATERSHED HYDROGRAPH
     Inflow into structure #  1
     Structure type:          Null


-- Watershed data for watershed # 1
    Curve number              =    90.0
    Area                      =    12.3 acres
    Hydraulic length          = 1400.00 Feet
    Elevation change          =   600.0 feet.
    Concentration time        =    0.06 hours
    Concentration time type = SCS Upland Curves
    Unit hydrograph type      = Disturbed

-- Total Area            =    12.3 acres

-- Storm data
    Total precipitation  =     1.3 inches
    Storm type           = SCS 6 hour design storm
    Peak Discharge       =    5.94 cfs
    Discharge volume     =    0.54 acre ft
```

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

```
?roject Title          = LILA CANYON UA-5 (10/24)
VATERSHED HYDROGRAPH
    Inflow into structure #  1
    Structure type:          Null


-- Watershed data for watershed # 1
    Curve number              =    90.0
    Area                      =    12.3 acres
    Hydraulic length          = 1400.00 Feet
    Elevation change          =   600.0 feet.
    Concentration time        =    0.06 hours
    Concentration time type = SCS Upland Curves
    Unit hydrograph type      = Disturbed

-- Total Area            =    12.3 acres

-- Storm data
    Total precipitation  =     1.9 inches
    Storm type           = SCS Type 2 storm, 24 hour storm
    Peak Discharge       =   12.14 cfs
    Discharge volume     =    1.03 acre ft
```

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

```
Project Title          = LILA CANYON UA-5 (25/6)
WATERSHED HYDROGRAPH
   Inflow into structure #  1
   Structure type:          Null


-- Watershed data for watershed # 1
    Curve number              =    90.0
    Area                      =    12.3 acres
    Hydraulic length          = 1400.00 Feet
    Elevation change          =   600.0 feet.
    Concentration time        =    0.06 hours
    Concentration time type = SCS Upland Curves
    Unit hydrograph type      = Disturbed

-- Total Area            =    12.3 acres

-- Storm data
    Total precipitation  =     1.5 inches
    Storm type           = SCS 6 hour design storm
    Peak Discharge       =    7.65 cfs
    Discharge volume     =    0.70 acre ft
```

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

'roject Title = LILA CANYON UA-5 (100/6)
/ATERSHED HYDROGRAPH
Inflow into structure # 1
Structure type: Null

-- Watershed data for watershed # 1
Curve number = 90.0
Area = 12.3 acres
Hydraulic length = 1400.00 Feet
Elevation change = 600.0 feet.
Concentration time = 0.06 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Total Area = 12.3 acres

-- Storm data
Total precipitation = 1.9 inches
Storm type = SCS 6 hour design storm
Peak Discharge = 11.24 cfs
Discharge volume = 1.03 acre ft

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

```
Project Title        = LILA CANYON UA - 6a (10/6)
WATERSHED HYDROGRAPH
     Inflow into structure # 1
     Structure type:     Null


-- Watershed data for watershed # 1
     Curve number              =    90.0
     Area                      =    1.6 acres
     Hydraulic length          =    470.0 Feet
     Elevation change          =    40.0 feet
     Concentration time        =    0.04 hours
     Concentration time type   =    SCS Upland Curves
     Unit Hydrograph type      =    Disturbed

-- Total Area            =    1.6 acres

-- Storm Data
     Total precipitation =    1.3 inches
     Storm type          =    SCS 6 hour design storm
     Peak Discharge      =    0.74 cfs
     Discharge volume    =    0.07 acre ft
```

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

```
Project Title        = LILA CANYON UA - 6a (10/24)
WATERSHED HYDROGRAPH
     Inflow into structure # 1
     Structure type:     Null


-- Watershed data for watershed # 1
     Curve number              =    90.0
     Area                      =    1.6 acres
     Hydraulic length          =    470.0 Feet
     Elevation change          =    40.0 feet
     Concentration time        =    0.04 hours
     Concentration time type   =    SCS Upland Curves
     Unit Hydrograph type      =    Disturbed

-- Total Area            =    1.6 acres

-- Storm Data
     Total precipitation =    1.9 inches
     Storm type          =    SCS Type 2 storm, 24 hour storm
     Peak Discharge      =    1.51 cfs
     Discharge volume    =    0.13 acre ft
```

RECEIVED
MAR 07 2007
DIV. OF OIL, GAS & MINING

```
Project Title        = LILA CANYON UA - 6a (25/6)
WATERSHED HYDROGRAPH
     Inflow into structure # 1
     Structure type:     Null


-- Watershed data for watershed # 1
     Curve number              =    90.0
     Area                      =    1.6 acres
     Hydraulic length          =    470.0 Feet
     Elevation change          =    40.0 feet
     Concentration time        =    0.04 hours
     Concentration time type   =    SCS Upland Curves
     Unit Hydrograph type      =    Disturbed

-- Total Area            =    1.6 acres

-- Storm Data
     Total precipitation =    1.5 inches
     Storm type          =    SCS 6 hour design storm
     Peak Discharge      =    0.95 cfs
     Discharge volume    =    0.09 acre ft
```

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MI...

```
Project Title        = LILA CANYON UA - 6b (10/6)
WATERSHED HYDROGRAPH
     Inflow into structure # 1
     Structure type:     Null


-- Watershed data for watershed # 1
     Curve number              =    90.0
     Area                      =    2.6 acres
     Hydraulic length          =    840.0 Feet
     Elevation change          =    60.0 feet
     Concentration time        =    0.09 hours
     Concentration time type   =    SCS Upland Curves
     Unit Hydrograph type      =    Disturbed

-- Total Area            =    2.6 acres

-- Storm Data
     Total precipitation =    1.3 inches
     Storm type          =    SCS 6 hour design storm
     Peak Discharge      =    1.25 cfs
     Discharge volume    =    0.11 acre ft
```

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

```
Project Title        = LILA CANYON UA - 6b (10/24)
WATERSHED HYDROGRAPH
     Inflow into structure # 1
     Structure type:     Null


-- Watershed data for watershed # 1
     Curve number              =    90.0
     Area                      =    2.6 acres
     Hydraulic length          =    840.0 Feet
     Elevation change          =    60.0 feet
     Concentration time        =    0.09 hours
     Concentration time type   =    SCS Upland Curves
     Unit Hydrograph type      =    Disturbed

-- Total Area            =    2.6 acres

-- Storm Data
     Total precipitation =    1.9 inches
     Storm type          =    SCS Type 2 storm, 24 hour storm
     Peak Discharge      =    2.58 cfs
     Discharge volume    =    0.21 acre ft
```

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

```
Project Title        = LILA CANYON UA - 6b (25/6)
WATERSHED HYDROGRAPH
     Inflow into structure # 1
     Structure type:     Null


-- Watershed data for watershed # 1
     Curve number              =    90.0
     Area                      =    2.6 acres
     Hydraulic length          =    840.0 Feet
     Elevation change          =    60.0 feet
     Concentration time        =    0.09 hours
     Concentration time type   =    SCS Upland Curves
     Unit Hydrograph type      =    Disturbed

-- Total Area            =    2.6 acres

-- Storm Data
     Total precipitation =    1.5 inches
     Storm type          =    SCS 6 hour design storm
     Peak Discharge      =    1.62 cfs
     Discharge volume    =    0.15 acre ft
```

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

```
Project Title        = LILA CANYON UA - 6c (10/6)
WATERSHED HYDROGRAPH
     Inflow into structure # 1
     Structure type:     Null


-- Watershed data for watershed # 1
     Curve number              =    90.0
     Area                      =    2.6 acres
     Hydraulic length          =    650.0 Feet
     Elevation change          =    40.0 feet
     Concentration time        =    0.07 hours
     Concentration time type   =    SCS Upland Curves
     Unit Hydrograph type      =    Disturbed

-- Total Area            =    2.6 acres

-- Storm Data
     Total precipitation =    1.3 inches
     Storm type          =    SCS 6 hour design storm
     Peak Discharge      =    1.25 cfs
     Discharge volume    =    0.11 acre ft
```

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

```
Project Title       = LILA CANYON UA - 6c (10/24)
WATERSHED HYDROGRAPH
     Inflow into structure # 1
     Structure type:     Null


-- Watershed data for watershed # 1
     Curve number              =    90.0
     Area                      =    2.6 acres
     Hydraulic length          =    650.0 Feet
     Elevation change          =    40.0 feet
     Concentration time        =    0.07 hours
     Concentration time type   =    SCS Upland Curves
     Unit Hydrograph type      =    Disturbed

-- Total Area            =    2.6 acres

-- Storm Data
     Total precipitation =    1.9 inches
     Storm type          =    SCS Type 2 storm, 24 hour storm
     Peak Discharge      =    2.57 cfs
     Discharge volume    =    0.21 acre ft
```

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & ...

```
Project Title        = LILA CANYON UA - 6c (25/6)
WATERSHED HYDROGRAPH
     Inflow into structure # 1
     Structure type:     Null


-- Watershed data for watershed # 1
     Curve number              =    90.0
     Area                      =    2.6 acres
     Hydraulic length          =    650.0 Feet
     Elevation change          =    40.0 feet
     Concentration time        =    0.07 hours
     Concentration time type   =    SCS Upland Curves
     Unit Hydrograph type      =    Disturbed

-- Total Area            =    2.6 acres

-- Storm Data
     Total precipitation =    1.5 inches
     Storm type          =    SCS 6 hour design storm
     Peak Discharge      =    1.61 cfs
     Discharge volume    =    0.15 acre ft
```

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

Project Title = LILA CANYON DA-2 (10/6)
WATERSHED HYDROGRAPH
Inflow into structure # 1
Structure type: Null

-- Watershed data for watershed # 1

Curve number	=	90.0
Area	=	2.5 acres
Hydraulic length	=	1520.00 Feet
Elevation change	=	190.0 feet.
Concentration time	=	0.12 hours
Concentration time type	=	SCS Upland Curves
Unit hydrograph type	=	Disturbed

-- Total Area = 2.5 acres

-- Storm data

Total precipitation	=	1.3 inches
Storm type	=	SCS 6 hour design storm
Peak Discharge	=	1.11 cfs
Discharge volume	=	0.11 acre ft

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS

```
Project Title          = LILA CANYON DA-2 (10/24)
WATERSHED HYDROGRAPH
     Inflow into structure #  1
     Structure type:         Null


-- Watershed data for watershed # 1
    Curve number              =    90.0
    Area                      =     2.5 acres
    Hydraulic length          = 1520.00 Feet
    Elevation change          =   190.0 feet.
    Concentration time        =    0.12 hours
    Concentration time type = SCS Upland Curves
    Unit hydrograph type      = Disturbed

-- Total Area            =     2.5 acres

-- Storm data
    Total precipitation  =     1.9 inches
    Storm type           = SCS Type 2 storm, 24 hour storm
    Peak Discharge       =    2.34 cfs
    Discharge volume     =    0.21 acre ft
```

RECEIVED
MAR 07 2007
DIV. OF OIL, GAS & MINING

```
Project Title          = LILA CANYON DA-2 (25/6)
WATERSHED HYDROGRAPH
     Inflow into structure #  1
     Structure type:          Null


-- Watershed data for watershed # 1
    Curve number              =    90.0
    Area                      =     2.5 acres
    Hydraulic length          = 1520.00 Feet
    Elevation change          =   190.0 feet.
    Concentration time        =    0.12 hours
    Concentration time type   = SCS Upland Curves
    Unit hydrograph type      = Disturbed

-- Total Area            =     2.5 acres

-- Storm data
    Total precipitation   =     1.5 inches
    Storm type            = SCS 6 hour design storm
    Peak Discharge        =    1.45 cfs
    Discharge volume      =    0.14 acre ft
```

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MIN.

```
Project Title        = LILA CANYON DA - 3a (10/6)
WATERSHED HYDROGRAPH
     Inflow into structure # 1
     Structure type:     Null


-- Watershed data for watershed # 1
     Curve number              =    90.0
     Area                      =    1.3 acres
     Hydraulic length          =    350.0 Feet
     Elevation change          =    40.0 feet
     Concentration time        =    0.03 hours
     Concentration time type   =    SCS Upland Curves
     Unit Hydrograph type      =    Disturbed

-- Total Area            =    1.3 acres

-- Storm Data
     Total precipitation =    1.3 inches
     Storm type          =    SCS 6 hour design storm
     Peak Discharge      =    0.55 cfs
     Discharge volume    =    0.06 acre ft
```

RECEIVED
MAR 07 2007
DIV. OF OIL, GAS & MINING

```
Project Title        = LILA CANYON DA - 3a (10/24)
WATERSHED HYDROGRAPH
     Inflow into structure # 1
     Structure type:     Null


-- Watershed data for watershed # 1
     Curve number              =    90.0
     Area                      =    1.3 acres
     Hydraulic length          =    350.0 Feet
     Elevation change          =    40.0 feet
     Concentration time        =    0.03 hours
     Concentration time type   =    SCS Upland Curves
     Unit Hydrograph type      =    Disturbed

-- Total Area            =    1.3 acres

-- Storm Data
     Total precipitation =    1.9 inches
     Storm type          =    SCS Type 2 storm, 24 hour storm
     Peak Discharge      =    1.12 cfs
     Discharge volume    =    0.11 acre ft
```

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & ...

```
Project Title        = LILA CANYON DA - 3a (25/6)
WATERSHED HYDROGRAPH
     Inflow into structure # 1
     Structure type:     Null


-- Watershed data for watershed # 1
     Curve number              =    90.0
     Area                      =    1.3 acres
     Hydraulic length          =    350.0 Feet
     Elevation change          =    40.0 feet
     Concentration time        =    0.03 hours
     Concentration time type   =    SCS Upland Curves
     Unit Hydrograph type      =    Disturbed

-- Total Area            =    1.3 acres

-- Storm Data
     Total precipitation =    1.5 inches
     Storm type          =    SCS 6 hour design storm
     Peak Discharge      =    0.71 cfs
     Discharge volume    =    0.08 acre ft
```

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

```
Project Title        = LILA CANYON DA - 3b (10/6)
WATERSHED HYDROGRAPH
     Inflow into structure # 1
     Structure type:     Null


-- Watershed data for watershed # 1
     Curve number              =    90.0
     Area                      =    2.2 acres
     Hydraulic length          =    675.0 Feet
     Elevation change          =    95.0 feet
     Concentration time        =    0.05 hours
     Concentration time type   =    SCS Upland Curves
     Unit Hydrograph type      =    Disturbed

-- Total Area            =    2.2 acres

-- Storm Data
     Total precipitation =    1.3 inches
     Storm type          =    SCS 6 hour design storm
     Peak Discharge      =    1.04 cfs
     Discharge volume    =    0.10 acre ft
```

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

```
Project Title        = LILA CANYON DA - 3b (10/24)
WATERSHED HYDROGRAPH
     Inflow into structure # 1
     Structure type:     Null


-- Watershed data for watershed # 1
     Curve number              =    90.0
     Area                      =    2.2 acres
     Hydraulic length          =    675.0 Feet
     Elevation change          =    95.0 feet
     Concentration time        =    0.05 hours
     Concentration time type   =    SCS Upland Curves
     Unit Hydrograph type      =    Disturbed

-- Total Area            =    2.2 acres

-- Storm Data
     Total precipitation =    1.9 inches
     Storm type          =    SCS Type 2 storm, 24 hour storm
     Peak Discharge      =    2.12 cfs
     Discharge volume    =    0.19 acre ft
```

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

```
Project Title        = LILA CANYON DA - 3b (25/6)
WATERSHED HYDROGRAPH
     Inflow into structure # 1
     Structure type:     Null


-- Watershed data for watershed # 1
     Curve number              =    90.0
     Area                      =    2.2 acres
     Hydraulic length          =    675.0 Feet
     Elevation change          =    95.0 feet
     Concentration time        =    0.05 hours
     Concentration time type   =    SCS Upland Curves
     Unit Hydrograph type      =    Disturbed

-- Total Area            =    2.2 acres

-- Storm Data
     Total precipitation =    1.5 inches
     Storm type          =    SCS 6 hour design storm
     Peak Discharge      =    1.34 cfs
     Discharge volume    =    0.13 acre ft
```

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

```
Project Title          = LILA CANYON DA-4 (10/6)
WATERSHED HYDROGRAPH
     Inflow into structure #  1
     Structure type:          Null


-- Watershed data for watershed # 1
    Curve number              =    90.0
    Area                      =     2.6 acres
    Hydraulic length          =  330.00 Feet
    Elevation change          =    25.0 feet.
    Concentration time        =    0.03 hours
    Concentration time type = SCS Upland Curves
    Unit hydrograph type    = Disturbed

-- Total Area            =     2.6 acres

-- Storm data
    Total precipitation  =     1.3 inches
    Storm type           = SCS 6 hour design storm
    Peak Discharge       =    1.12 cfs
    Discharge volume     =    0.12 acre ft
```

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

```
Project Title          = LILA CANYON DA-4 (10/24)
WATERSHED HYDROGRAPH
     Inflow into structure #  1
     Structure type:          Null


-- Watershed data for watershed # 1
    Curve number              =    90.0
    Area                      =     2.6 acres
    Hydraulic length          =  330.00 Feet
    Elevation change          =    25.0 feet.
    Concentration time        =    0.03 hours
    Concentration time type = SCS Upland Curves
    Unit hydrograph type    = Disturbed

-- Total Area           =     2.6 acres

-- Storm data
    Total precipitation  =     1.9 inches
    Storm type           = SCS Type 2 storm, 24 hour storm
    Peak Discharge       =    2.28 cfs
    Discharge volume     =    0.22 acre ft
```

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

```
Project Title          = LILA CANYON DA-4 (25/6)
WATERSHED HYDROGRAPH
     Inflow into structure #  1
     Structure type:          Null


-- Watershed data for watershed # 1
    Curve number              =    90.0
    Area                      =     2.6 acres
    Hydraulic length          =  330.00 Feet
    Elevation change          =    25.0 feet.
    Concentration time        =    0.03 hours
    Concentration time type = SCS Upland Curves
    Unit hydrograph type    = Disturbed

-- Total Area            =     2.6 acres

-- Storm data
    Total precipitation  =     1.5 inches
    Storm type           = SCS 6 hour design storm
    Peak Discharge       =    1.44 cfs
    Discharge volume     =    0.15 acre ft
```

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

```
Project Title          = LILA CANYON DA-5 (10/6)
WATERSHED HYDROGRAPH
     Inflow into structure #  1
     Structure type:          Null


-- Watershed data for watershed # 1
    Curve number              =    90.0
    Area                      =     0.6 acres
    Hydraulic length          =  240.00 Feet
    Elevation change          =    30.0 feet.
    Concentration time        =    0.02 hours
    Concentration time type = SCS Upland Curves
    Unit hydrograph type    = Disturbed

-- Total Area            =     0.6 acres

-- Storm data
    Total precipitation  =     1.3 inches
    Storm type           = SCS 6 hour design storm
    Peak Discharge       =    0.20 cfs
    Discharge volume     =    0.02 acre ft
```

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

```
Project Title          = LILA CANYON DA-5 (10/24)
WATERSHED HYDROGRAPH
     Inflow into structure #  1
     Structure type:         Null


-- Watershed data for watershed # 1
    Curve number              =    90.0
    Area                      =     0.6 acres
    Hydraulic length          =  240.00 Feet
    Elevation change          =    30.0 feet.
    Concentration time        =    0.02 hours
    Concentration time type = SCS Upland Curves
    Unit hydrograph type    = Disturbed

-- Total Area            =     0.6 acres

-- Storm data
    Total precipitation  =     1.9 inches
    Storm type           = SCS Type 2 storm, 24 hour storm
    Peak Discharge       =    0.41 cfs
    Discharge volume     =    0.05 acre ft
```

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

```
Project Title          = LILA CANYON DA-5 (25/6)
WATERSHED HYDROGRAPH
     Inflow into structure #  1
     Structure type:          Null


-- Watershed data for watershed # 1
    Curve number              =    90.0
    Area                      =     0.6 acres
    Hydraulic length          =  240.00 Feet
    Elevation change          =    30.0 feet.
    Concentration time        =    0.02 hours
    Concentration time type = SCS Upland Curves
    Unit hydrograph type     = Disturbed

-- Total Area            =     0.6 acres

-- Storm data
    Total precipitation  =     1.5 inches
    Storm type           = SCS 6 hour design storm
    Peak Discharge       =    0.26 cfs
    Discharge volume     =    0.03 acre ft
```

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

```
Project Title          = LILA CANYON DA-6 (10/6)
WATERSHED HYDROGRAPH
     Inflow into structure #  1
     Structure type:          Null


-- Watershed data for watershed # 1
     Curve number              =    95.0
     Area                      =     5.1 acres
     Hydraulic length          =  550.00 Feet
     Elevation change          =    50.0 feet.
     Concentration time        =    0.03 hours
     Concentration time type = SCS Upland Curves
     Unit hydrograph type      = Disturbed

-- Total Area            =     5.1 acres

-- Storm data
     Total precipitation  =     1.3 inches
     Storm type           = SCS 6 hour design storm
     Peak Discharge       =    3.05 cfs
     Discharge volume     =    0.35 acre ft
```

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

```
Project Title          = LILA CANYON DA-6 (10/24)
WATERSHED HYDROGRAPH
     Inflow into structure #  1
     Structure type:          Null


-- Watershed data for watershed # 1
    Curve number              =    95.0
    Area                      =     5.1 acres
    Hydraulic length          =  550.00 Feet
    Elevation change          =    50.0 feet.
    Concentration time        =    0.03 hours
    Concentration time type = SCS Upland Curves
    Unit hydrograph type    = Disturbed

-- Total Area            =     5.1 acres

-- Storm data
    Total precipitation  =     1.9 inches
    Storm type           = SCS Type 2 storm, 24 hour storm
    Peak Discharge       =    5.17 cfs
    Discharge volume     =    0.59 acre ft
```

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

```
Project Title          = LILA CANYON DA-6 (25/6)
WATERSHED HYDROGRAPH
     Inflow into structure #  1
     Structure type:          Null


-- Watershed data for watershed # 1
    Curve number              =    95.0
    Area                      =     5.1 acres
    Hydraulic length          =  550.00 Feet
    Elevation change          =    50.0 feet.
    Concentration time        =    0.03 hours
    Concentration time type = SCS Upland Curves
    Unit hydrograph type      = Disturbed

-- Total Area            =     5.1 acres

-- Storm data
    Total precipitation  =     1.5 inches
    Storm type           = SCS 6 hour design storm
    Peak Discharge       =    3.69 cfs
    Discharge volume     =    0.43 acre ft
```

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

```
Project Title          = LILA CANYON DA-7 (10/6)
WATERSHED HYDROGRAPH
     Inflow into structure #  1
     Structure type:          Null


-- Watershed data for watershed # 1
    Curve number              =    95.0
    Area                      =     6.9 acres
    Hydraulic length          =  700.00 Feet
    Elevation change          =    50.0 feet.
    Concentration time        =    0.04 hours
    Concentration time type = SCS Upland Curves
    Unit hydrograph type    = Disturbed

-- Total Area            =     6.9 acres

-- Storm data
    Total precipitation  =     1.3 inches
    Storm type           = SCS 6 hour design storm
    Peak Discharge       =    4.55 cfs
    Discharge volume     =    0.47 acre ft
```

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

```
Project Title          = LILA CANYON DA-7 (10/24)
WATERSHED HYDROGRAPH
     Inflow into structure #  1
     Structure type:          Null


-- Watershed data for watershed # 1
    Curve number              =    95.0
    Area                      =     6.9 acres
    Hydraulic length          =  700.00 Feet
    Elevation change          =    50.0 feet.
    Concentration time        =    0.04 hours
    Concentration time type = SCS Upland Curves
    Unit hydrograph type      = Disturbed

-- Total Area            =     6.9 acres

-- Storm data
    Total precipitation  =     1.9 inches
    Storm type           = SCS Type 2 storm, 24 hour storm
    Peak Discharge       =    7.70 cfs
    Discharge volume     =    0.79 acre ft
```

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

```
Project Title          = LILA CANYON DA-7 (25/6)
WATERSHED HYDROGRAPH
     Inflow into structure #  1
     Structure type:          Null


-- Watershed data for watershed # 1
    Curve number              =    95.0
    Area                      =     6.9 acres
    Hydraulic length          =  700.00 Feet
    Elevation change          =    50.0 feet.
    Concentration time        =    0.04 hours
    Concentration time type = SCS Upland Curves
    Unit hydrograph type      = Disturbed

-- Total Area            =     6.9 acres

-- Storm data
    Total precipitation  =     1.5 inches
    Storm type           = SCS 6 hour design storm
    Peak Discharge       =    5.49 cfs
    Discharge volume     =    0.58 acre ft
```

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

```
Project Title          = LILA CANYON DA-8 (10/6)
WATERSHED HYDROGRAPH
     Inflow into structure #  1
     Structure type:          Null


-- Watershed data for watershed # 1
    Curve number              =    90.0
    Area                      =     0.6 acres
    Hydraulic length          =  350.00 Feet
    Elevation change          =    25.0 feet.
    Concentration time        =    0.04 hours
    Concentration time type = SCS Upland Curves
    Unit hydrograph type    = Disturbed

-- Total Area            =     0.6 acres

-- Storm data
    Total precipitation  =     1.3 inches
    Storm type           = SCS 6 hour design storm
    Peak Discharge       =    0.25 cfs
    Discharge volume     =    0.03 acre ft
```

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

```
Project Title          = LILA CANYON DA-8 (10/24)
WATERSHED HYDROGRAPH
     Inflow into structure #  1
     Structure type:          Null


-- Watershed data for watershed # 1
    Curve number              =    90.0
    Area                      =     0.6 acres
    Hydraulic length          =  350.00 Feet
    Elevation change          =    25.0 feet.
    Concentration time        =    0.04 hours
    Concentration time type = SCS Upland Curves
    Unit hydrograph type      = Disturbed

-- Total Area            =     0.6 acres

-- Storm data
    Total precipitation  =     1.9 inches
    Storm type           = SCS Type 2 storm, 24 hour storm
    Peak Discharge       =    0.52 cfs
    Discharge volume     =    0.05 acre ft
```

RECEIVED
MAR 07 2007
DIV. OF OIL, GAS & MINING

```
Project Title          = LILA CANYON DA-8 (25/6)
WATERSHED HYDROGRAPH
     Inflow into structure #  1
     Structure type:          Null


-- Watershed data for watershed # 1
    Curve number              =    90.0
    Area                      =     0.6 acres
    Hydraulic length          =  350.00 Feet
    Elevation change          =    25.0 feet.
    Concentration time        =    0.04 hours
    Concentration time type = SCS Upland Curves
    Unit hydrograph type      = Disturbed

-- Total Area            =     0.6 acres

-- Storm data
    Total precipitation  =     1.5 inches
    Storm type           = SCS 6 hour design storm
    Peak Discharge       =    0.33 cfs
    Discharge volume     =    0.03 acre ft
```

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

Lila Canyon Mine
Ditch Calculations

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

DD-2 - (10/24)
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	DD-2 - (10/24)
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.035	
Slope	0.125000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	2.00	ft
Discharge	7.36	cfs

Results		
Depth	0.40	ft
Flow Area	1.11	ft²
Wetted Perimeter	3.78	ft
Top Width	3.59	ft
Critical Depth	0.61	ft
Critical Slope	0.025498	ft/ft
Velocity	6.63	ft/s
Velocity Head	0.68	ft
Specific Energy	1.08	ft
Froude Number	2.10	
Flow Type	Supercritical	

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

Lila Canyon
Worksheet for Trapezoidal Channel

Project Description		
Worksheet	DD-2 - (10/6)	
Flow Element	Trapezoidal Channel	
Method	Manning's Formula	
Solve For	Channel Depth	

Input Data		
Mannings Coefficient	0.035	
Slope	0.125000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	2.00	ft
Discharge	2.60	cfs

Results		
Depth	0.22	ft
Flow Area	0.54	ft²
Wetted Perimeter	2.99	ft
Top Width	2.89	ft
Critical Depth	0.33	ft
Critical Slope	0.029498	ft/ft
Velocity	4.80	ft/s
Velocity Head	0.36	ft
Specific Energy	0.58	ft
Froude Number	1.96	
Flow Type	Supercritical	

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

Lila Canyon
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	DD-3 - (10/24)
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.035	
Slope	0.146000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	2.00	ft
Discharge	2.12	cfs

Results		
Depth	0.19	ft
Flow Area	0.45	ft^2
Wetted Perimeter	2.84	ft
Top Width	2.75	ft
Critical Depth	0.29	ft
Critical Slope	0.030412	ft/ft
Velocity	4.73	ft/s
Velocity Head	0.35	ft
Specific Energy	0.54	ft
Froude Number	2.07	
Flow Type	Supercritical	

RECEIVED
MAR 07 2007
DIV. OF OIL, GAS & MINING

Lila Canyon
Worksheet for Trapezoidal Channel

Project Description		
Worksheet	DD-3 - (10/6)	
Flow Element	Trapezoidal Channel	
Method	Manning's Formula	
Solve For	Channel Depth	

Input Data		
Mannings Coefficient	0.035	
Slope	0.146000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	2.00	ft
Discharge	1.04	cfs

Results		
Depth	0.12	ft
Flow Area	0.28	ft^2
Wetted Perimeter	2.56	ft
Top Width	2.50	ft
Critical Depth	0.19	ft
Critical Slope	0.034034	ft/ft
Velocity	3.71	ft/s
Velocity Head	0.21	ft
Specific Energy	0.34	ft
Froude Number	1.96	
Flow Type	Supercritical	

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

Lila Canyon
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	DD-4 - (10/24)
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.035	
Slope	0.207000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	1.00	ft
Discharge	1.12	cfs

Results		
Depth	0.17	ft
Flow Area	0.23	ft^2
Wetted Perimeter	1.76	ft
Top Width	1.68	ft
Critical Depth	0.28	ft
Critical Slope	0.032780	ft/ft
Velocity	4.93	ft/s
Velocity Head	0.38	ft
Specific Energy	0.55	ft
Froude Number	2.37	
Flow Type	Supercritical	

RECEIVED
MAR 07 2007
DIV. OF OIL, GAS & MINING

Lila Canyon
Worksheet for Trapezoidal Channel

Project Description		
Worksheet	DD-4 - (10/6)	
Flow Element	Trapezoidal Channel	
Method	Manning's Formula	
Solve For	Channel Depth	

Input Data		
Mannings Coefficient	0.035	
Slope	0.207000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	1.00	ft
Discharge	0.55	cfs

Results		
Depth	0.11	ft
Flow Area	0.14	ft^2
Wetted Perimeter	1.51	ft
Top Width	1.45	ft
Critical Depth	0.19	ft
Critical Slope	0.036203	ft/ft
Velocity	3.95	ft/s
Velocity Head	0.24	ft
Specific Energy	0.36	ft
Froude Number	2.25	
Flow Type	Supercritical	

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

Lila Canyon
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	DD-5 - (10/24)
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.035	
Slope	0.153000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	1.00	ft
Discharge	2.99	cfs

Results		
Depth	0.31	ft
Flow Area	0.51	ft^2
Wetted Perimeter	2.40	ft
Top Width	2.25	ft
Critical Depth	0.48	ft
Critical Slope	0.028815	ft/ft
Velocity	5.90	ft/s
Velocity Head	0.54	ft
Specific Energy	0.85	ft
Froude Number	2.19	
Flow Type	Supercritical	

RECEIVED
MAR 07 2007
DIV. OF OIL, GAS & MINING

Lila Canyon
Worksheet for Trapezoidal Channel

Project Description		
Worksheet	DD-5 - (10/6)	
Flow Element	Trapezoidal Channel	
Method	Manning's Formula	
Solve For	Channel Depth	

Input Data		
Mannings Coefficient	0.035	
Slope	0.153000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	1.00	ft
Discharge	0.97	cfs

Results		
Depth	0.17	ft
Flow Area	0.23	ft^2
Wetted Perimeter	1.76	ft
Top Width	1.68	ft
Critical Depth	0.26	ft
Critical Slope	0.033427	ft/ft
Velocity	4.25	ft/s
Velocity Head	0.28	ft
Specific Energy	0.45	ft
Froude Number	2.03	
Flow Type	Supercritical	

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

Lila Canyon
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	DD-6 - (10/24)
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.035	
Slope	0.050000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	2.00	ft
Discharge	11.47	cfs

Results		
Depth	0.64	ft
Flow Area	2.11	ft^2
Wetted Perimeter	4.87	ft
Top Width	4.57	ft
Critical Depth	0.78	ft
Critical Slope	0.024048	ft/ft
Velocity	5.43	ft/s
Velocity Head	0.46	ft
Specific Energy	1.10	ft
Froude Number	1.41	
Flow Type	Supercritical	

RECEIVED
MAR 07 2007
DIV. OF OIL, GAS & MINING

Lila Canyon
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	DD-6 - (10/6)
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.035	
Slope	0.050000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	2.00	ft
Discharge	4.12	cfs

Results		
Depth	0.37	ft
Flow Area	1.02	ft^2
Wetted Perimeter	3.66	ft
Top Width	3.49	ft
Critical Depth	0.44	ft
Critical Slope	0.027606	ft/ft
Velocity	4.05	ft/s
Velocity Head	0.25	ft
Specific Energy	0.63	ft
Froude Number	1.32	
Flow Type	Supercritical	

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

Lila Canyon
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	DD-7 - (10/24)
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.035	
Slope	0.074000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	2.50	ft
Discharge	13.59	cfs

Results		
Depth	0.58	ft
Flow Area	2.11	ft^2
Wetted Perimeter	5.08	ft
Top Width	4.81	ft
Critical Depth	0.78	ft
Critical Slope	0.023496	ft/ft
Velocity	6.43	ft/s
Velocity Head	0.64	ft
Specific Energy	1.22	ft
Froude Number	1.71	
Flow Type	Supercritical	

RECEIVED
MAR 07 2007
DIV. OF OIL, GAS & MINING

Lila Canyon
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	DD-8 - (10/24)
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.035	
Slope	0.069000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	2.00	ft
Discharge	5.17	cfs

Results		
Depth	0.39	ft
Flow Area	1.07	ft^2
Wetted Perimeter	3.72	ft
Top Width	3.54	ft
Critical Depth	0.50	ft
Critical Slope	0.026749	ft/ft
Velocity	4.85	ft/s
Velocity Head	0.37	ft
Specific Energy	0.75	ft
Froude Number	1.56	
Flow Type	Supercritical	

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

Lila Canyon
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	DD-8 - (10/6)
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.035	
Slope	0.069000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	2.00	ft
Discharge	3.05	cfs

Results		
Depth	0.29	ft
Flow Area	0.74	ft^2
Wetted Perimeter	3.28	ft
Top Width	3.15	ft
Critical Depth	0.37	ft
Critical Slope	0.028817	ft/ft
Velocity	4.13	ft/s
Velocity Head	0.26	ft
Specific Energy	0.55	ft
Froude Number	1.50	
Flow Type	Supercritical	

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

Lila Canyon
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	DD-9 - (10/24)
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.035	
Slope	0.030000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	2.50	ft
Discharge	7.49	cfs

Results		
Depth	0.53	ft
Flow Area	1.91	ft²
Wetted Perimeter	4.89	ft
Top Width	4.64	ft
Critical Depth	0.56	ft
Critical Slope	0.025485	ft/ft
Velocity	3.93	ft/s
Velocity Head	0.24	ft
Specific Energy	0.77	ft
Froude Number	1.08	
Flow Type	Supercritical	

RECEIVED
MAR 07 2007
DIV. OF OIL, GAS & MINING

Lila Canyon
Worksheet for Trapezoidal Channel

Project Description		
Worksheet	DD-9 - (10/6)	
Flow Element	Trapezoidal Channel	
Method	Manning's Formula	
Solve For	Channel Depth	

Input Data		
Mannings Coefficient	0.035	
Slope	0.030000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	2.50	ft
Discharge	4.17	cfs

Results		
Depth	0.39	ft
Flow Area	1.27	ft^2
Wetted Perimeter	4.23	ft
Top Width	4.05	ft
Critical Depth	0.40	ft
Critical Slope	0.027733	ft/ft
Velocity	3.29	ft/s
Velocity Head	0.17	ft
Specific Energy	0.56	ft
Froude Number	1.04	
Flow Type	Supercritical	

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

Lila Canyon
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	DD-10 - (10/24)
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.035	
Slope	0.040000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	2.00	ft
Discharge	8.22	cfs

Results		
Depth	0.57	ft
Flow Area	1.80	ft^2
Wetted Perimeter	4.56	ft
Top Width	4.29	ft
Critical Depth	0.65	ft
Critical Slope	0.025125	ft/ft
Velocity	4.57	ft/s
Velocity Head	0.32	ft
Specific Energy	0.90	ft
Froude Number	1.24	
Flow Type	Supercritical	

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

Lila Canyon
Worksheet for Trapezoidal Channel

Project Description		
Worksheet	DD-10 - (10/6)	
Flow Element	Trapezoidal Channel	
Method	Manning's Formula	
Solve For	Channel Depth	

Input Data		
Mannings Coefficient	0.035	
Slope	0.040000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	2.00	ft
Discharge	4.80	cfs

Results		
Depth	0.43	ft
Flow Area	1.23	ft^2
Wetted Perimeter	3.92	ft
Top Width	3.72	ft
Critical Depth	0.48	ft
Critical Slope	0.027025	ft/ft
Velocity	3.91	ft/s
Velocity Head	0.24	ft
Specific Energy	0.67	ft
Froude Number	1.20	
Flow Type	Supercritical	

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

Lila Canyon
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	DD-11 - (10/24)
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.035	
Slope	0.059000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	3.00	ft
Discharge	18.29	cfs

Results		
Depth	0.67	ft
Flow Area	2.88	ft^2
Wetted Perimeter	5.98	ft
Top Width	5.66	ft
Critical Depth	0.86	ft
Critical Slope	0.022586	ft/ft
Velocity	6.34	ft/s
Velocity Head	0.63	ft
Specific Energy	1.29	ft
Froude Number	1.57	
Flow Type	Supercritical	

RECEIVED
MAR 0 7 2007
OIL, GAS & MINING

Lila Canyon
Worksheet for Trapezoidal Channel

Project Description		
Worksheet	DD-11 - (10/6)	
Flow Element	Trapezoidal Channel	
Method	Manning's Formula	
Solve For	Channel Depth	

Input Data		
Mannings Coefficient	0.035	
Slope	0.059000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	3.00	ft
Discharge	10.22	cfs

Results		
Depth	0.48	ft
Flow Area	1.92	ft²
Wetted Perimeter	5.16	ft
Top Width	4.93	ft
Critical Depth	0.62	ft
Critical Slope	0.024478	ft/ft
Velocity	5.33	ft/s
Velocity Head	0.44	ft
Specific Energy	0.92	ft
Froude Number	1.51	
Flow Type	Supercritical	

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

Lila Canyon
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	DD-12 - (10/24)
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.035	
Slope	0.068000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	3.00	ft
Discharge	16.17	cfs

Results		
Depth	0.60	ft
Flow Area	2.51	ft^2
Wetted Perimeter	5.68	ft
Top Width	5.40	ft
Critical Depth	0.80	ft
Critical Slope	0.022966	ft/ft
Velocity	6.43	ft/s
Velocity Head	0.64	ft
Specific Energy	1.24	ft
Froude Number	1.66	
Flow Type	Supercritical	

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

Lila Canyon
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	DD-12 - (10/6)
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.035	
Slope	0.068000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	3.00	ft
Discharge	5.90	cfs

Results		
Depth	0.34	ft
Flow Area	1.25	ft^2
Wetted Perimeter	4.52	ft
Top Width	4.36	ft
Critical Depth	0.44	ft
Critical Slope	0.026527	ft/ft
Velocity	4.71	ft/s
Velocity Head	0.34	ft
Specific Energy	0.68	ft
Froude Number	1.55	
Flow Type	Supercritical	

RECEIVED
MAR 07 2007
DIV. OF OIL, GAS & MINING

Lila Canyon
Worksheet for Triangular Channel

Project Description		
Worksheet	DD-13 - (10/24)	
Flow Element	Triangular Channel	
Method	Manning's Formula	
Solve For	Channel Depth	

Input Data		
Mannings Coefficient	0.035	
Slope	0.071400	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Discharge	0.52	cfs

Results		
Depth	0.30	ft
Flow Area	0.18	ft^2
Wetted Perimeter	1.33	ft
Top Width	1.19	ft
Critical Depth	0.33	ft
Critical Slope	0.037587	ft/ft
Velocity	2.95	ft/s
Velocity Head	0.14	ft
Specific Energy	0.43	ft
Froude Number	1.35	
Flow Type	Supercritical	

RECEIVED
MAR 07 2007
DIV. OF OIL, GAS & MINING

Lila Canyon
Worksheet for Triangular Channel

Project Description		
Worksheet	DD-13 - (10/6)	
Flow Element	Triangular Channel	
Method	Manning's Formula	
Solve For	Channel Depth	

Input Data		
Mannings Coefficient	0.035	
Slope	0.071400	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Discharge	0.25	cfs

Results		
Depth	0.23	ft
Flow Area	0.10	ft^2
Wetted Perimeter	1.01	ft
Top Width	0.90	ft
Critical Depth	0.25	ft
Critical Slope	0.041442	ft/ft
Velocity	2.46	ft/s
Velocity Head	0.09	ft
Specific Energy	0.32	ft
Froude Number	1.29	
Flow Type	Supercritical	

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

Lila Canyon
Worksheet for Trapezoidal Channel

Project Description		
Worksheet	DD-14 - (10/24)	
Flow Element	Trapezoidal Channel	
Method	Manning's Formula	
Solve For	Channel Depth	

Input Data		
Mannings Coefficient	0.035	
Slope	0.075800	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	1.00	ft
Discharge	2.28	cfs

Results		
Depth	0.33	ft
Flow Area	0.54	ft^2
Wetted Perimeter	2.46	ft
Top Width	2.30	ft
Critical Depth	0.41	ft
Critical Slope	0.029840	ft/ft
Velocity	4.24	ft/s
Velocity Head	0.28	ft
Specific Energy	0.61	ft
Froude Number	1.55	
Flow Type	Supercritical	

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

Lila Canyon
Worksheet for Trapezoidal Channel

Project Description		
Worksheet	DD-14 - (10/6)	
Flow Element	Trapezoidal Channel	
Method	Manning's Formula	
Solve For	Channel Depth	

Input Data		
Mannings Coefficient	0.035	
Slope	0.075800	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	1.00	ft
Discharge	1.12	cfs

Results		
Depth	0.22	ft
Flow Area	0.32	ft^2
Wetted Perimeter	2.00	ft
Top Width	1.89	ft
Critical Depth	0.28	ft
Critical Slope	0.032781	ft/ft
Velocity	3.47	ft/s
Velocity Head	0.19	ft
Specific Energy	0.41	ft
Froude Number	1.48	
Flow Type	Supercritical	

RECEIVED
MAR 07 2007
DIV. OF OIL, GAS & MINING

Title of run: DITCH RD-1 (10/6)

```
   Solving for................= Depth Normal
Trapedeziod
   Flow depth (ft)............=    0.55
   First Side slope...........=     2.0
   Second Side slope..........=     2.0
   Bottom width (ft)..........=    3.00
   Slope of diversion.........=  0.0500
   Manning"s n................=   0.035
   CFS........................=   11.91
   Cross section area (sqft)..=    2.26
   Hydrualic radius...........=    0.41
   fps........................=    5.28
   Froude number..............=    1.45
```

RECEIVED
MAR 07 2007
DIV. OF OIL, GAS & MINING

Title of r

```
   Solving for................= Depth Normal
Trapedeziod
   Flow depth (ft)............=    0.47
   First Side slope...........=     2.0
   Second Side slope..........=     2.0
   Bottom width (ft)..........=    3.00
   Slope of diversion.........=  0.1000
   Manning"s n................=   0.035
   CFS........................=   12.83
   Cross section area (sqft)..=    1.87
   Hydrualic radius...........=    0.36
   fps........................=    6.87
   Froude number..............=    2.01
```

RECEIVED
MAR 07 2007
DIV. OF OIL, GAS & MINING

Lila Canyon Mine
Culvert Calculations

RECEIVED
MAR 07 2007
DIV. OF OIL, GAS & MINING

Lila Canyon
Worksheet for Circular Channel

Project Description	
Worksheet	DC-4 - (10/24)
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Diameter

Input Data		
Mannings Coefficient	0.025	
Slope	0.050000	ft/ft
Discharge	7.36	cfs

Results		
Depth	1.24	ft
Diameter	15	in
Flow Area	1.2	ft^2
Wetted Perimeter	0.00	ft
Top Width	0.00	ft
Critical Depth	1.08	ft
Percent Full	100.0	%
Critical Slope	0.045499	ft/ft
Velocity	6.09	ft/s
Velocity Head	0.58	ft
Specific Energy	1.82	ft
Froude Number	0.00	
Maximum Discharge	7.92	cfs
Discharge Full	7.36	cfs
Slope Full	0.050000	ft/ft
Flow Type	N/A	

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS

Lila Canyon
Worksheet for Circular Channel

Project Description	
Worksheet	DC-4 - (10/6)
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Diameter

Input Data		
Mannings Coefficient	0.025	
Slope	0.050000	ft/ft
Discharge	2.60	cfs

Results		
Depth	0.84	ft
Diameter	10	in
Flow Area	0.6	ft^2
Wetted Perimeter	0.00	ft
Top Width	0.00	ft
Critical Depth	0.71	ft
Percent Full	100.0	%
Critical Slope	0.047149	ft/ft
Velocity	4.69	ft/s
Velocity Head	0.34	ft
Specific Energy	1.18	ft
Froude Number	0.00	
Maximum Discharge	2.80	cfs
Discharge Full	2.60	cfs
Slope Full	0.050000	ft/ft
Flow Type	N/A	

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

Lila Canyon
Worksheet for Circular Channel

Project Description		
Worksheet	DC-5 - (10/24)	
Flow Element	Circular Channel	
Method	Manning's Formula	
Solve For	Full Flow Diameter	

Input Data		
Mannings Coefficient	0.025	
Slope	0.050000	ft/ft
Discharge	10.35	cfs

Results		
Depth	1.41	ft
Diameter	17	in
Flow Area	1.6	ft²
Wetted Perimeter	0.00	ft
Top Width	0.00	ft
Critical Depth	1.24	ft
Percent Full	100.0	%
Critical Slope	0.045067	ft/ft
Velocity	6.63	ft/s
Velocity Head	0.68	ft
Specific Energy	2.09	ft
Froude Number	0.00	
Maximum Discharge	11.13	cfs
Discharge Full	10.35	cfs
Slope Full	0.050000	ft/ft
Flow Type	N/A	

RECEIVED
MAR 07 2007
DIV. OF OIL, GAS & MINING

Lila Canyon
Worksheet for Circular Channel

Project Description	
Worksheet	DC-5 - (10/6)
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Diameter

Input Data		
Mannings Coefficient	0.025	
Slope	0.050000	ft/ft
Discharge	3.57	cfs

Results		
Depth	0.95	ft
Diameter	11	in
Flow Area	0.7	ft^2
Wetted Perimeter	0.00	ft
Top Width	0.00	ft
Critical Depth	0.81	ft
Percent Full	100.0	%
Critical Slope	0.046569	ft/ft
Velocity	5.08	ft/s
Velocity Head	0.40	ft
Specific Energy	1.35	ft
Froude Number	0.00	
Maximum Discharge	3.84	cfs
Discharge Full	3.57	cfs
Slope Full	0.050000	ft/ft
Flow Type	N/A	

RECEIVED
MAR 07 2007
DIV. OF OIL, GAS & MINING

Lila Canyon
Worksheet for Circular Channel

Project Description	
Worksheet	DC-6 - (10/24)
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Diameter

Input Data		
Mannings Coefficient	0.025	
Slope	0.050000	ft/ft
Discharge	13.59	cfs

Results		
Depth	1.56	ft
Diameter	19	in
Flow Area	1.9	ft^2
Wetted Perimeter	0.00	ft
Top Width	0.00	ft
Critical Depth	1.38	ft
Percent Full	100.0	%
Critical Slope	0.044772	ft/ft
Velocity	7.10	ft/s
Velocity Head	0.78	ft
Specific Energy	2.34	ft
Froude Number	0.00	
Maximum Discharge	14.62	cfs
Discharge Full	13.59	cfs
Slope Full	0.050000	ft/ft
Flow Type	N/A	

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

Lila Canyon
Worksheet for Circular Channel

Project Description	
Worksheet	DC-6 - (10/6)
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Diameter

Input Data		
Mannings Coefficient	0.025	
Slope	0.050000	ft/ft
Discharge	5.16	cfs

Results		
Depth	1.09	ft
Diameter	13	in
Flow Area	0.9	ft^2
Wetted Perimeter	0.00	ft
Top Width	0.00	ft
Critical Depth	0.94	ft
Percent Full	100.0	%
Critical Slope	0.045999	ft/ft
Velocity	5.57	ft/s
Velocity Head	0.48	ft
Specific Energy	1.57	ft
Froude Number	0.00	
Maximum Discharge	5.55	cfs
Discharge Full	5.16	cfs
Slope Full	0.050000	ft/ft
Flow Type	N/A	

RECEIVED
MAR 07 2007
DIV. OF OIL, GAS & MINING

Lila Canyon
Worksheet for Circular Channel

Project Description		
Worksheet	DC-7 - (10/24)	
Flow Element	Circular Channel	
Method	Manning's Formula	
Solve For	Full Flow Diameter	

Input Data		
Mannings Coefficient	0.025	
Slope	0.080000	ft/ft
Discharge	13.59	cfs

Results		
Depth	1.43	ft
Diameter	17	in
Flow Area	1.6	ft²
Wetted Perimeter	0.00	ft
Top Width	0.00	ft
Critical Depth	1.35	ft
Percent Full	100.0	%
Critical Slope	0.069148	ft/ft
Velocity	8.47	ft/s
Velocity Head	1.11	ft
Specific Energy	2.54	ft
Froude Number	0.00	
Maximum Discharge	14.62	cfs
Discharge Full	13.59	cfs
Slope Full	0.080000	ft/ft
Flow Type	N/A	

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

Lila Canyon
Worksheet for Circular Channel

Project Description		
Worksheet	DC-7 - (10/6)	
Flow Element	Circular Channel	
Method	Manning's Formula	
Solve For	Full Flow Diameter	

Input Data		
Mannings Coefficient	0.025	
Slope	0.080000	ft/ft
Discharge	5.16	cfs

Results		
Depth	0.99	ft
Diameter	12	in
Flow Area	0.8	ft^2
Wetted Perimeter	0.00	ft
Top Width	0.00	ft
Critical Depth	0.92	ft
Percent Full	100.0	%
Critical Slope	0.069232	ft/ft
Velocity	6.65	ft/s
Velocity Head	0.69	ft
Specific Energy	1.68	ft
Froude Number	0.00	
Maximum Discharge	5.55	cfs
Discharge Full	5.16	cfs
Slope Full	0.080000	ft/ft
Flow Type	N/A	

RECEIVED
MAR 07 2007
DIV. OF OIL, GAS & MINING

Lila Canyon
Worksheet for Circular Channel

Project Description		
Worksheet	DC-8 - (10/24)	
Flow Element	Circular Channel	
Method	Manning's Formula	
Solve For	Full Flow Diameter	

Input Data		
Mannings Coefficient	0.025	
Slope	0.030000	ft/ft
Discharge	7.45	cfs

Results		
Depth	1.37	ft
Diameter	16	in
Flow Area	1.5	ft^2
Wetted Perimeter	0.00	ft
Top Width	0.00	ft
Critical Depth	1.08	ft
Percent Full	100.0	%
Critical Slope	0.032468	ft/ft
Velocity	5.04	ft/s
Velocity Head	0.40	ft
Specific Energy	1.77	ft
Froude Number	0.00	
Maximum Discharge	8.01	cfs
Discharge Full	7.45	cfs
Slope Full	0.030000	ft/ft
Flow Type	N/A	

RECEIVED
MAR 07 2007
DIV. OF OIL, GAS & MINING

Lila Canyon
Worksheet for Circular Channel

Project Description		
Worksheet	DC-8 - (10/6)	
Flow Element	Circular Channel	
Method	Manning's Formula	
Solve For	Full Flow Diameter	

Input Data		
Mannings Coefficient	0.025	
Slope	0.030000	ft/ft
Discharge	4.17	cfs

Results		
Depth	1.10	ft
Diameter	13	in
Flow Area	1.0	ft^2
Wetted Perimeter	0.00	ft
Top Width	0.00	ft
Critical Depth	0.85	ft
Percent Full	100.0	%
Critical Slope	0.033676	ft/ft
Velocity	4.36	ft/s
Velocity Head	0.30	ft
Specific Energy	1.40	ft
Froude Number	0.00	
Maximum Discharge	4.49	cfs
Discharge Full	4.17	cfs
Slope Full	0.030000	ft/ft
Flow Type	N/A	

RECEIVED
MAR 07 2007
DIV. OF OIL, GAS & MINING

Lila Canyon
Worksheet for Circular Channel

Project Description	
Worksheet	DC-9 - (10/24)
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Diameter

Input Data		
Mannings Coefficient	0.025	
Slope	0.030000	ft/ft
Discharge	0.52	cfs

Results		
Depth	0.51	ft
Diameter	6	in
Flow Area	0.2	ft^2
Wetted Perimeter	0.00	ft
Top Width	0.00	ft
Critical Depth	0.37	ft
Percent Full	100.0	%
Critical Slope	0.039054	ft/ft
Velocity	2.59	ft/s
Velocity Head	0.10	ft
Specific Energy	0.61	ft
Froude Number	0.00	
Maximum Discharge	0.56	cfs
Discharge Full	0.52	cfs
Slope Full	0.030000	ft/ft
Flow Type	N/A	

RECEIVED
MAR 07 2007
DIV. OF OIL, GAS & MINING

Lila Canyon
Worksheet for Circular Channel

Project Description	
Worksheet	DC-9 - (10/6)
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Diameter

Input Data		
Mannings Coefficient	0.025	
Slope	0.030000	ft/ft
Discharge	0.25	cfs

Results		
Depth	0.38	ft
Diameter	5	in
Flow Area	0.1	ft^2
Wetted Perimeter	0.00	ft
Top Width	0.00	ft
Critical Depth	0.27	ft
Percent Full	100.0	%
Critical Slope	0.041346	ft/ft
Velocity	2.16	ft/s
Velocity Head	0.07	ft
Specific Energy	0.46	ft
Froude Number	0.00	
Maximum Discharge	0.27	cfs
Discharge Full	0.25	cfs
Slope Full	0.030000	ft/ft
Flow Type	N/A	

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

Lila Canyon
Worksheet for Circular Channel

Project Description	
Worksheet	UC-1 - (100/6)
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Diameter

Input Data		
Mannings Coefficient	0.025	
Slope	0.055600	ft/ft
Discharge	63.16	cfs

Results		
Depth	2.72	ft
Diameter	33	in
Flow Area	5.8	ft²
Wetted Perimeter	0.00	ft
Top Width	0.00	ft
Critical Depth	2.52	ft
Percent Full	100.0	%
Critical Slope	0.048168	ft/ft
Velocity	10.85	ft/s
Velocity Head	1.83	ft
Specific Energy	4.55	ft
Froude Number	0.00	
Maximum Discharge	67.94	cfs
Discharge Full	63.16	cfs
Slope Full	0.055600	ft/ft
Flow Type	N/A	

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

Lila Canyon
Worksheet for Circular Channel

Project Description		
Worksheet	UC-1 - (10/6)	
Flow Element	Circular Channel	
Method	Manning's Formula	
Solve For	Full Flow Diameter	

Input Data		
Mannings Coefficient	0.025	
Slope	0.055600	ft/ft
Discharge	44.40	cfs

Results		
Depth	2.39	ft
Diameter	29	in
Flow Area	4.5	ft^2
Wetted Perimeter	0.00	ft
Top Width	0.00	ft
Critical Depth	2.19	ft
Percent Full	100.0	%
Critical Slope	0.048281	ft/ft
Velocity	9.93	ft/s
Velocity Head	1.53	ft
Specific Energy	3.92	ft
Froude Number	0.00	
Maximum Discharge	47.76	cfs
Discharge Full	44.40	cfs
Slope Full	0.055600	ft/ft
Flow Type	N/A	

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

Lila Canyon
Worksheet for Circular Channel

Project Description		
Worksheet	UC-1 Reclaimed - (100/6)	
Flow Element	Circular Channel	
Method	Manning's Formula	
Solve For	Channel Depth	

Input Data		
Mannings Coefficient	0.025	
Slope	0.055600	ft/ft
Diameter	60	in
Discharge	65.08	cfs

Results		
Depth	1.53	ft
Flow Area	5.1	ft^2
Wetted Perimeter	5.86	ft
Top Width	4.61	ft
Critical Depth	2.27	ft
Percent Full	30.6	%
Critical Slope	0.012831	ft/ft
Velocity	12.77	ft/s
Velocity Head	2.53	ft
Specific Energy	4.06	ft
Froude Number	2.14	
Maximum Discharge	343.50	cfs
Discharge Full	319.32	cfs
Slope Full	0.002309	ft/ft
Flow Type	Supercritical	

RECEIVED
MAR 07 2007
DIV. OF OIL, GAS & MINING

Lila Canyon Mine
APPENDIX 1 - Culvert Outlet Rip-Rap Apron Flow Velocity Calculations

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

Lila Canyon
Worksheet for Circular Channel

Project Description	
Worksheet	UC-1 - Outlet Velocity - (100/6)
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.025	
Slope	0.055600	ft/ft
Diameter	60	in
Discharge	63.16	cfs

Results		
Depth	1.51	ft
Flow Area	5.0	ft^2
Wetted Perimeter	5.81	ft
Top Width	4.59	ft
Critical Depth	2.24	ft
Percent Full	30.2	%
Critical Slope	0.012770	ft/ft
Velocity	12.66	ft/s
Velocity Head	2.49	ft
Specific Energy	4.00	ft
Froude Number	2.14	
Maximum Discharge	343.50	cfs
Discharge Full	319.32	cfs
Slope Full	0.002175	ft/ft
Flow Type	Supercritical	

RECEIVED
MAR 07 2007
DIV. OF OIL, GAS & MINING

Lila Canyon
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	UC-1 - Apron Outlet - (100/6)
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.045	
Slope	0.015000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	9.00	ft
Discharge	63.16	cfs

Results		
Depth	1.32	ft
Flow Area	15.32	ft^2
Wetted Perimeter	14.89	ft
Top Width	14.27	ft
Critical Depth	1.06	ft
Critical Slope	0.032223	ft/ft
Velocity	4.12	ft/s
Velocity Head	0.26	ft
Specific Energy	1.58	ft
Froude Number	0.70	
Flow Type	Subcritical	

RECEIVED
MAR 07 2007
DIV. OF OIL, GAS & MINING

APPENDIX 7-9

Right Fork of Lila Canyon Flow and Geomorphic Evaluation

Hydrologic Design

Thomas J. Suchoski

Modified March 2007

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

INTRODUCTION:

On January 31, 2004 a stream evaluation was conducted of the Right Fork of Lila Canyon downstream of the proposed mine facilities toward the Price River. The purpose of the study was to determine the impact of a continuous discharge of 500 gpm from the mine would have on the downstream channel. A series of cross-section measurements were taken to characterize the channel configuration and the channel bed and bank materials. At each cross-section a series of station and elevation shots were taken with a Trimble 4800 GPS unit. These shots were intended to provide a base condition description of the channel cross-section shape and width of the channel for input into the stream transmission loss modeling. No graphical cross-sections were prepared of the data. Additionally, photographs were taken of each cross-section location looking upstream and downstream to help visualize the conditions at the cross-section. Additional photographs of the bed and bank materials were taken to aid in classifying the material type. The photographs are presented in Attachment #1 to this Appendix. A listing of the survey points is presented in Attachment #2.

Figure 1 shows the location of the cross-section sites. The original plan was to collect cross-sections at one-half mile spacings along the channel alignment between the mine site and the Price River. However, at the third cross-section location, a recent diversion structure was found which diverted the normal flow of the Right Fork of Lila Canyon. Previously, the flow from the Right Fork joined with the flows from Grassy Wash. However, with the diversion, the entire flow of the Right Fork was diverted to a diversion channel. The location of the diversion dam and alignment of the diversion channel is presented in Figure 1. Ultimately, the diversion channel will convey the flow to a stock pond located in the SW/4, SW/4 of Section 28, T. 16 S., R. 14 E.

This stock pond was assumed to be a BLM pond. The work appeared to be part of implementation of a range improvement program in the area of the pond. As part of this program, the embankment had been improved and raised, the outlet riprapped, and the diversion structure moved upstream and improved to collect additional flows. However, the pond area was still filled with silt or sediment.

The result of this range improvement project was that the flows from the Right Fork of Lila Canyon would be diverted to the stock pond. If the pond fills, any excess water will be released back to Grassy Wash. Based on the size of the pond, if cleaned, it appears that the pond will hold about 5 to 7 acre-feet.

Subsequent to the field work, discussions were held with the BLM regarding the diversion and stock pond improvements. They indicated that they had no knowledge of them. A few months following the meeting, during other field work in

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

the area, it was discovered that the diversion on the Right Fork of Lila Canyon had been breached and the flow channel reestablished to Grassy Wash.

Results:

Channel sections

The Right Fork of Lila Canyon is an ephemeral channel which is incised into the pediment surface below the Book Cliffs. At cross-section location 1, the channel is incised about 25 to 30 feet and has a top width of approximately 75 to 100 feet. The channel has a low-flow component that consists of a general trapezoidal shape with 1V:1.5 to 2H slopes, a bottom width of about 5 feet, and a low flow channel depth of almost 1.5 feet. Channel material consists of fine to coarse gravels and fine sands and few silts.

At cross section location 2, the channel is transitioning from the incised section to a broader section at the confluence of the Right Fork with Grassy Wash. In this reach, the channel is incised about 10 to 15 feet and has a top width of approximately 250 to 300 feet. The channel has a low-flow component that consists of a swale shape with gentle sideslopes, a bottom width of about 7.5 to 10 feet, and a low flow channel depth of almost 1.0 foot. Channel material consists of fine to coarse gravels and fine sands and silts.

Upstream of the confluence, at cross-section 3, Grassy Wash consists of a braided channel with several flow channels. The predominant channel has a top width of 10 to 12 feet with a bottom width of 8 or 9 feet and steep side slopes. The depth of this channel is approximately 2.5 feet deep. The overall channel is approximately 50 to 75 feet wide. Channel material consists of fine to coarse gravels and fine sands and silts.

Downstream of the confluence with the Right Fork, at cross-section 4, Grassy Wash is again an incised channel. The channel is approximately 10 to 15 feet wide with a depth of 5 to 6 feet. The channel bends to the west and flow is directed against the outer bank. This results in a steep slope on the outer bank and a gentler slope on the inner bank. Channel materials consist of fine to coarse gravels and fine sands and silts.

Downstream of the pond at cross-section 5, Grassy Wash is a moderately incised channel. The channel is approximately 10 to 15 feet wide with a depth of 4 to 5 feet. Channel materials consist of fine to coarse gravels and fine sands and silts.

RECEIVED
MAR 0 7 2007
DIV OF OIL, GAS & MINING

Stream Transmission Loss Modeling

Based on the DOGM estimate for mine discharge, an evaluation was conducted to determine if flow would reach the Price River. This evaluation is based on the concepts presented in the U.S. Soil Conservation Service National Engineering Handbook Chapter 19 - Transmission Losses (1985). The actual method is based on regression equations derived from Arizona and New Mexico conditions. While the current site is similar, the specific conditions were different. Therefore, the current site was modeled using similar concepts.

The estimated mine discharge was assumed to be introduced to the channel immediately below the mine site. The soil designations of the channel area were determined from preliminary soils maps developed by the NRCS Price Office for the Emery County Soil Survey (personnel communication, Leland Sasser, 2004) (a copy of the preliminary map is presented in Attachment 3). The length of channel crossing each different soil type was determined from this map. Permeability estimates of the soils were determined from the SCS Emery and Carbon County Soil Survey, engineering properties table. Estimates of channel width and depth and valley fill width and depth were derived from the photos and cross-section information. The depth of the valley fill was determined during field investigations based on the site conditions. These data along with the length of soil sections and permeability data were input into the spreadsheet presented in Table 1. No evaporation was assumed to provide a conservative estimate. Based on the discharge to the channel and the estimates of infiltration and permeability loss over the flow length, an estimate of the distance that the flow would be conveyed was determined.

Given the soils in the area, the constant 500 gpm flow from the mine would be expected to flow a distance of approximately 18,300 feet or 3.4 miles. All values used for the modeling, presented in Table 1 including the mine water discharge rate, are considered to be conservative values. The distance to the Price River from the mine is about 9.5 miles. Therefore, the flow from the mine will not reach the Price River.

Flow Characteristics

The results of the calculations channel capacity calculations (Attachment 4) show that the 500 gpm constant mine discharge (1.1 cfs) would have a flow depth at cross-section 1 of about 0.8 feet. This is significantly less than the bank full conditions flow depth expected at this cross-section below the mine site (2.55 feet).

Many reseachers consider the bankfull flow to be the major channel forming flow, due to its probability of occurrence and its channel forming energy. Given the

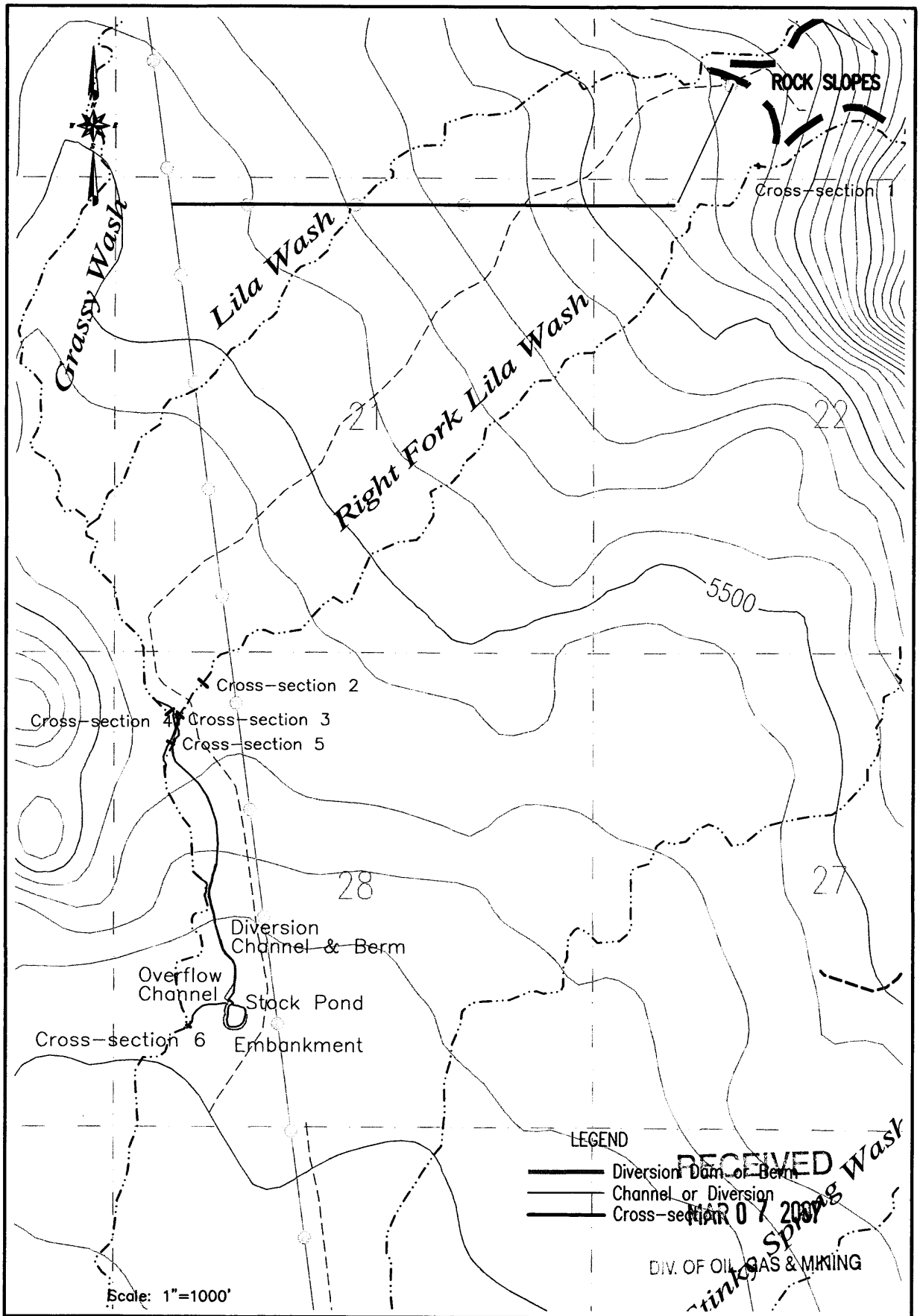
RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

fact that the mine water flow is significantly below this flow, its is not likely that the mine discharge flow will have any significant negative impact on the channel conditions.

The cross-section data has been collected as a baseline to comply with the statement under Section 728.333. UEI has a concern that subsequent surveys made to determine the impact of the mine water discharge on the channel form and shape would not necessarily show that the mine water was impacting the stream channel. This would be not be a viable approach as natural rainfall runoff events would likely have a higher peak flow, based on the flow simulations that have been conducted in Appendix 7-10 and in Appendix 7-4. These higher flows would likely result in channel form and shape changes that had nothing to do with the mine water discharge flows. Therefore, there would be no way to differentiate the changes in the channel between mine water and runoff induced changes.

It is likely that the constant low flow condition within the channel will result in the establishment of a vegetative community adjacent to the channel for the short distance that flow will exist above ground. Additionally, the development of such a community, would increase the evapotranspiration along the flow corridor which would decrease the available flow and ultimately result in a shorter flow distance below the mine.

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING



RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

	FIGURE 1. Cross-section Locations Diversion Dam & Channel Alignment	UtahAmerican Price, Utah	LILA CANYON MINE Price, Utah

FIGURE1.DWG UA 2/2004

Table 1

Utah American Energy, Inc. - Lila Extension
Mine Discharge Flow Modeling

Day	Discharge (gpm)	a Discharge (ac-ft/day)	Reach ID	Channel Length (ft)	Channel Width (ft)	Valley Fill Depth (ft)	Valley Fill Width (ft)	Fill Porosity	b Fill Storage Volume (ac-ft)	Infiltration Rate (in/hr)	c Potential Infiltration to Storage (ac-ft)	d Estimated Infiltration to Storage (ac-ft)	e Excess Flow (ac-ft)	f Percolation Rate from Storage (in/hr)	g Potential Percolation from Storage (ac-ft)	h Estimated Percolation from Storage (ac-ft)	i Total Outflow from Reach (ac-ft)	j
1	500	2.21	1	6251	5	5	15	0.2	2.15	2	2.87	2.15	0.06	8.33E-03	0.72	0.72	0.72	Excess flow, Continue Simulation
				6251														
2	500	2.21	1	6251	5	5	15	0.2	2.15	2	2.87	0.72	1.49	8.33E-03	0.72	0.72	0.72	Excess flow, Continue Simulation
		1.49	2	727	7.5	5	22.5	0.2	0.38	2	0.50	0.38	1.12	8.33E-03	0.11	0.11	0.83	Excess flow, Continue Simulation
		1.12	3	206	10	5	30	0.2	0.14	2	0.19	0.14	0.97	8.33E-03	0.04	0.04	0.86	Excess flow, Continue Simulation
		0.97	4	3760	10	5	30	0.2	2.59	2	3.45	0.97	0.00	8.33E-03	0.69	0.69	1.55	Excess flow, Continue Simulation
				10944														
3	500	2.21	1	6251	5	5	15	0.2	2.15	2	2.87	0.72	1.49	8.33E-03	0.72	0.72	0.72	Excess flow, Continue Simulation
		1.49	2	727	7.5	5	22.5	0.2	0.38	2	0.50	0.11	1.38	8.33E-03	0.11	0.11	0.83	Excess flow, Continue Simulation
		1.38	3	206	10	5	30	0.2	0.14	2	0.19	0.04	1.35	8.33E-03	0.04	0.04	0.86	Excess flow, Continue Simulation
		1.35	4	3760	10	5	30	0.2	2.59	2	3.45	0.69	0.66	8.33E-03	0.69	0.69	1.55	Excess flow, Continue Simulation
		0.66	5	7127	10	5	30	0.2	4.91	2	6.54	0.66	0.00	8.33E-03	1.31	0.66	2.21	Total Outflow Loss > Discharge, Stop
				18071														
4	500	2.21	1	6251	5	5	15	0.2	2.15	2	2.87	0.72	1.49	8.33E-03	0.72	0.72	0.72	Excess flow, Continue Simulation
		1.49	2	727	7.5	5	22.5	0.2	0.38	2	0.50	0.11	1.38	8.33E-03	0.11	0.11	0.83	Excess flow, Continue Simulation
		1.38	3	206	10	5	30	0.2	0.14	2	0.19	0.04	1.35	8.33E-03	0.04	0.04	0.86	Excess flow, Continue Simulation
		1.35	4	3760	10	5	30	0.2	2.59	2	3.45	0.69	0.66	8.33E-03	0.69	0.69	1.55	Excess flow, Continue Simulation
		0.66	5	7127	10	5	30	0.2	4.91	2	6.54	1.31	0.00	8.33E-03	1.31	1.31	2.86	Total Outflow Loss > Discharge, Stop
				18071														
5	500	2.21	1	6251	5	5	15	0.2	2.15	2	2.87	0.72	1.49	8.33E-03	0.72	0.72	0.72	Excess flow, Continue Simulation
		1.49	2	727	7.5	5	22.5	0.2	0.38	2	0.50	0.11	1.38	8.33E-03	0.11	0.11	0.83	Excess flow, Continue Simulation
		1.38	3	206	10	5	30	0.2	0.14	2	0.19	0.04	1.35	8.33E-03	0.04	0.04	0.86	Excess flow, Continue Simulation
		1.35	4	3760	10	5	30	0.2	2.59	2	3.45	0.69	0.66	8.33E-03	0.69	0.69	1.55	Excess flow, Continue Simulation
		0.66	5	7127	10	5	30	0.2	4.91	2	6.54	1.31	0.00	8.33E-03	1.31	1.31	2.86	Total Outflow Loss > Discharge, Stop
				18071														

Calculation Method:

Column

a Input discharge in ac-ft or transfer excess flow from previous reach.

b Multiply valley fill width and depth and reach length by porosity of soil.

c Convert infiltration rate to volume in ac-ft. Assume that infiltration will occur across channel width and along reach length.

d Compare infiltration potential to available fill volume. If infiltration potential is less than available fill volume, then use infiltration potential. If infiltration potential is greter than available fill volume, then use available fill volume. However, if prior storage already filled, then available fill volume is limited to the flux out of storage by percolation.

e Excess flow is the discharge (a) - infiltration (d).

Percolation rate includes movement of stored water into adjacent soils, bedrock, and consumption by plants and is estimated to be 5% of the infiltration rate.

Convert percolation rate to volume in ac-ft. Assume that 2 times depth plus width of valley fill estimate is the percolation flux surface.

Compare estimated infiltration to potential percolation. If estimated infiltration is greater than potential percolation, use potential percolation. If not then use infiltration.

Add up the outflow from each reach by summing the percolation outflows.

Compare the total outflow versus the discharge to the channel. When the total outflow from the channel is equal to or greater than the discharge, then the flow will not continue downstream.

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

ATTACHMENT #1

PHOTOGRAPHS

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

X-section 1 Looking Upstream

X-Section 1 Looking Downstream

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

X-Section 1 Bed Materials

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

X-Section 2 - Looking Upstream

X-section 2 Bed Materials

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

X-section 3 Looking Upstream

X-section 4 Looking Upstream
Diversion Dam center and
Diversion Channel to Right

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

X-section 4 looking upstream
Diversion channel in center

Diversion Channel above stock pond

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

ATTACHMENT #2

LISTING OF SURVEY POINTS

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

CROSS-SECTION 1

Number	Northing	Easting	Elevation	Raw Desc	Full Desc
1000	399364.4480	2325338.5220	5817.99	GND	GND
1001	399368.6210	2325337.9550	5818.23	GND	GND
1002	399372.2770	2325337.0980	5818.23	GND	GND
1003	399375.0710	2325336.4520	5818.44	GND	GND
1004	399377.0990	2325335.6640	5818.33	GND	GND
1005	399378.6020	2325335.1630	5816.04	GND	GND
1006	399379.9900	2325334.6410	5815.81	GND	GND
1007	399380.7850	2325334.2340	5815.65	GND	GND
1008	399382.3520	2325333.6680	5816.17	GND	GND
1009	399383.8040	2325333.3990	5816.06	GND	GND
1010	399385.6430	2325332.9680	5815.86	GND	GND
1011	399386.5900	2325333.1920	5816.11	GND	GND
1012	399387.5690	2325333.1110	5818.03	GND	GND
1013	399389.6760	2325332.7330	5820.52	GND	GND
1014	399392.8950	2325330.7280	5821.19	GND	GND
1015	399395.5650	2325330.1960	5821.56	GND	GND
1016	399397.8080	2325329.7560	5822.93	GND	GND

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

CROSS-SECTION 2

Number	Northing	Easting	Elevation	Raw Desc	Full Desc
1017	393565.9960	2319257.2620	5344.98	GND	GND
1018	393572.1990	2319250.3510	5344.45	GND	GND
1019	393577.5300	2319244.0850	5343.97	GND	GND
1020	393583.3810	2319237.2090	5343.97	GND	GND
1021	393587.9980	2319231.5870	5344.32	GND	GND
1022	393592.9990	2319225.5060	5344.74	GND	GND
1023	393598.3430	2319219.9410	5344.48	GND	GND
1024	393601.7280	2319216.1570	5344.29	GND	GND
1025	393604.0430	2319214.3070	5343.96	GND	GND
1026	393604.4510	2319213.7920	5343.80	GND	GND
1027	393604.9680	2319213.2980	5343.38	GND	GND
1028	393605.5190	2319212.8550	5341.55	GND	GND
1029	393605.9210	2319212.5200	5341.42	GND	GND
1030	393606.9240	2319211.5160	5341.52	GND	GND
1031	393607.5840	2319211.0300	5341.66	GND	GND
1032	393608.2590	2319210.4580	5341.58	GND	GND
1033	393608.7110	2319210.0450	5341.65	GND	GND
1034	393609.0100	2319209.7950	5341.84	GND	GND
1035	393609.2460	2319209.1830	5342.91	GND	GND
1036	393609.8710	2319208.3370	5342.64	GND	GND
1037	393610.6600	2319207.6900	5343.00	GND	GND
1038	393612.4830	2319206.0910	5343.39	GND	GND
1039	393613.2580	2319205.2820	5343.70	GND	GND
1040	393617.6100	2319201.1830	5343.76	GND	GND
1041	393620.4100	2319198.3390	5344.52	GND	GND
1042	393623.6320	2319195.2180	5344.25	GND	GND
1043	393626.2330	2319191.9810	5343.82	GND	GND
1044	393628.6830	2319190.0300	5343.07	GND	GND
1045	393629.0910	2319189.1870	5343.85	GND	GND
1046	393632.6560	2319186.0720	5343.67	GND	GND
1047	393634.3610	2319184.4410	5343.39	GND	GND
1048	393635.0110	2319184.0200	5343.56	GND	GND
1049	393637.2770	2319181.6860	5342.66	GND	GND
1050	393638.2920	2319180.6290	5342.57	GND	GND
1051	393640.9190	2319178.0040	5342.53	GND	GND
1052	393641.5340	2319177.4430	5343.14	GND	GND
1053	393642.7930	2319175.7480	5343.55	GND	GND
1054	393647.3640	2319171.7630	5343.69	GND	GND
1055	393650.8390	2319167.5780	5344.07	GND	GND
1056	393652.0130	2319165.9270	5344.34	GND	GND

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

CROSS-SECTION 3

Number	Northing	Easting	Elevation	Raw Desc	Full Desc
1057	393221.4530	2318985.8290	5324.44	CROSS3	CROSS3
1058	393223.4750	2318983.5430	5324.70	CROSS3	CROSS3
1059	393229.4060	2318977.1600	5325.16	CROSS3	CROSS3
1060	393235.0290	2318971.4480	5325.54	CROSS3	CROSS3
1061	393241.9480	2318964.3670	5325.67	CROSS3	CROSS3
1062	393246.6200	2318958.9300	5325.65	CROSS3	CROSS3
1063	393249.0040	2318956.1810	5325.49	CROSS3	CROSS3
1064	393250.2310	2318954.6680	5324.77	CROSS3	CROSS3
1065	393251.6470	2318952.4860	5323.72	CROSS3	CROSS3
1066	393253.4510	2318950.1270	5322.87	CROSS3	CROSS3
1067	393255.1050	2318947.7010	5322.07	CROSS3	CROSS3
1068	393255.7690	2318946.8890	5321.97	CROSS3	CROSS3
1069	393257.7440	2318944.9500	5322.12	CROSS3	CROSS3
1070	393258.6740	2318944.0230	5322.20	CROSS3	CROSS3
1071	393260.3910	2318942.3420	5322.53	CROSS3	CROSS3
1072	393262.1080	2318940.5200	5322.55	CROSS3	CROSS3
1073	393262.6960	2318939.7230	5322.69	CROSS3	CROSS3
1077	393268.2200	2318933.7690	5323.92	CROSS3	CROSS3
1078	393272.1740	2318930.2030	5324.12	CROSS3	CROSS3
1079	393275.6830	2318926.6600	5324.93	CROSS3	CROSS3
1080	393282.3840	2318920.4800	5325.24	CROSS3	CROSS3
1081	393286.6220	2318916.8720	5325.20	CROSS3	CROSS3
1082	393296.6640	2318908.1940	5325.76	CROSS3	CROSS3
1083	393306.1250	2318900.7980	5325.90	CROSS3	CROSS3
1084	393313.6170	2318893.8360	5326.29	CROSS3	CROSS3
1085	393320.7990	2318886.9310	5326.30	CROSS3	CROSS3
1086	393324.8570	2318883.0000	5326.00	CROSS3	CROSS3
1087	393322.1270	2318878.4250	5325.93	CROSS3	CROSS3
1088	393318.6140	2318873.6190	5325.48	CROSS3	CROSS3
1089	393317.5130	2318872.3420	5326.10	CROSS3	CROSS3
1090	393316.0770	2318870.3080	5325.89	CROSS3	CROSS3
1091	393314.7220	2318868.2040	5325.28	CROSS3	CROSS3
1092	393314.4360	2318867.3740	5323.35	CROSS3	CROSS3
1093	393314.2440	2318866.9060	5323.01	CROSS3	CROSS3
1094	393313.6850	2318865.9140	5322.57	CROSS3	CROSS3
1095	393313.1050	2318864.8370	5322.36	CROSS3	CROSS3
1096	393311.6920	2318863.1200	5322.10	CROSS3	CROSS3
1097	393310.7730	2318861.7790	5322.13	CROSS3	CROSS3
1098	393309.6520	2318860.9020	5321.91	CROSS3	CROSS3
1099	393309.5590	2318860.7550	5321.95	CROSS3	CROSS3
1100	393308.6880	2318859.5590	5321.82	CROSS3	CROSS3
1101	393307.5490	2318858.1410	5321.81	CROSS3	CROSS3
1102	393306.5330	2318856.7770	5322.02	CROSS3	CROSS3
1103	393305.7140	2318855.8160	5322.85	CROSS3	CROSS3
1104	393304.7890	2318854.8280	5323.56	CROSS3	CROSS3
1105	393302.5030	2318852.4810	5323.86	CROSS3	CROSS3

RECEIVED

MAR 0 7 2007

DIV. OF OIL, GAS & MINING

1106	393300.3110	2318850.4120	5323.55	CROSS3	CROSS3
1107	393298.4130	2318848.5250	5323.16	CROSS3	CROSS3
1108	393297.4950	2318847.8080	5322.95	CROSS3	CROSS3
1109	393296.0120	2318846.4280	5322.93	CROSS3	CROSS3
1110	393294.9520	2318845.2070	5322.52	CROSS3	CROSS3
1111	393294.6830	2318844.7640	5322.44	CROSS3	CROSS3
1112	393293.7580	2318843.1880	5322.48	CROSS3	CROSS3
1113	393292.6250	2318842.3080	5322.32	CROSS3	CROSS3
1114	393291.8140	2318840.9910	5322.42	CROSS3	CROSS3
1115	393289.9180	2318839.4930	5322.47	CROSS3	CROSS3
1116	393289.0810	2318838.6590	5322.62	CROSS3	CROSS3
1117	393288.5280	2318837.8390	5322.59	CROSS3	CROSS3
1118	393287.7910	2318837.1500	5322.34	CROSS3	CROSS3
1119	393287.3460	2318836.4500	5322.74	CROSS3	CROSS3
1120	393286.6420	2318835.8610	5323.11	CROSS3	CROSS3
1121	393285.9460	2318834.8390	5323.10	CROSS3	CROSS3
1122	393285.1460	2318834.0560	5323.04	CROSS3	CROSS3
1123	393284.7290	2318833.7030	5323.19	CROSS3	CROSS3
1124	393283.0180	2318832.3810	5322.43	CROSS3	CROSS3
1125	393281.9540	2318831.8480	5322.63	CROSS3	CROSS3
1126	393281.3610	2318831.5890	5322.53	CROSS3	CROSS3
1127	393280.4880	2318831.0670	5322.47	CROSS3	CROSS3
1128	393279.8840	2318830.2260	5323.14	CROSS3	CROSS3
1129	393278.6650	2318829.4370	5323.64	CROSS3	CROSS3
1130	393277.4850	2318828.3360	5323.84	CROSS3	CROSS3
1131	393273.4480	2318823.8620	5323.28	CROSS3	CROSS3
1132	393272.2590	2318822.4250	5323.18	CROSS3	CROSS3
1133	393271.4170	2318820.1500	5323.54	CROSS3	CROSS3
1134	393269.6520	2318818.1330	5323.98	CROSS3	CROSS3
1135	393268.3330	2318815.5700	5324.37	CROSS3	CROSS3
1136	393266.2560	2318811.9030	5324.41	CROSS3	CROSS3
1137	393266.0700	2318809.9310	5324.98	CROSS3	CROSS3
1138	393264.5590	2318805.5970	5324.88	CROSS3	CROSS3
1139	393263.2520	2318801.5320	5325.05	CROSS3	CROSS3

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

CROSS-SECTION 4

Number	Northing	Easting	Elevation	Raw Desc	Full Desc
1140	392964.4610	2318810.3780	5317.71	CROSS4	CROSS4
1141	392962.3780	2318813.4770	5317.20	CROSS4	CROSS4
1142	392960.7770	2318815.8900	5316.97	CROSS4	CROSS4
1143	392958.2680	2318820.0470	5316.91	CROSS4	CROSS4
1144	392957.0770	2318821.8240	5316.61	CROSS4	CROSS4
1145	392956.0270	2318823.4750	5316.27	CROSS4	CROSS4
1146	392955.2370	2318824.6610	5315.75	CROSS4	CROSS4
1147	392954.6800	2318825.4210	5314.22	CROSS4	CROSS4
1148	392953.9450	2318826.1730	5314.11	CROSS4	CROSS4
1149	392953.2530	2318826.7810	5311.52	CROSS4	CROSS4
1150	392953.1080	2318827.3430	5311.19	CROSS4	CROSS4
1151	392952.2410	2318828.5390	5311.26	CROSS4	CROSS4
1152	392951.4690	2318829.4050	5311.22	CROSS4	CROSS4
1153	392950.9540	2318829.8610	5311.19	CROSS4	CROSS4
1154	392949.9560	2318831.6390	5310.25	CROSS4	CROSS4
1155	392949.7000	2318832.1390	5310.40	CROSS4	CROSS4
1156	392949.1610	2318833.2860	5310.79	CROSS4	CROSS4
1157	392948.5780	2318834.5910	5310.71	CROSS4	CROSS4
1158	392948.1660	2318835.4130	5310.95	CROSS4	CROSS4
1159	392947.7950	2318836.1700	5313.69	CROSS4	CROSS4
1160	392947.4660	2318836.7460	5314.68	CROSS4	CROSS4
1161	392946.7950	2318837.5720	5315.20	CROSS4	CROSS4
1162	392945.1380	2318839.9400	5315.94	CROSS4	CROSS4
1163	392942.9740	2318842.3500	5316.73	CROSS4	CROSS4
1164	392941.1030	2318844.9550	5317.28	CROSS4	CROSS4
1165	392938.6200	2318849.1100	5317.11	CROSS4	CROSS4
1166	392938.3180	2318850.0790	5317.62	CROSS4	CROSS4
1167	392937.4280	2318852.0420	5318.74	CROSS4	CROSS4
1168	392936.2540	2318854.6440	5318.86	CROSS4	CROSS4
1169	392935.5790	2318856.8650	5318.42	CROSS4	CROSS4
1170	392935.0280	2318858.3150	5318.00	CROSS4	CROSS4
1171	392934.9810	2318859.2290	5318.00	CROSS4	CROSS4
1172	392933.9490	2318862.2320	5316.53	CROSS4	CROSS4
1173	392933.9090	2318862.2360	5316.80	CROSS4	CROSS4
1174	392933.3500	2318865.3550	5315.58	CROSS4	CROSS4
1175	392932.7360	2318868.6070	5315.22	CROSS4	CROSS4
1176	392932.6240	2318869.1000	5315.43	CROSS4	CROSS4
1177	392932.2520	2318870.9480	5316.59	CROSS4	CROSS4
1178	392930.1600	2318876.0780	5318.69	CROSS4	CROSS4

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

CROSS-SECTION 5

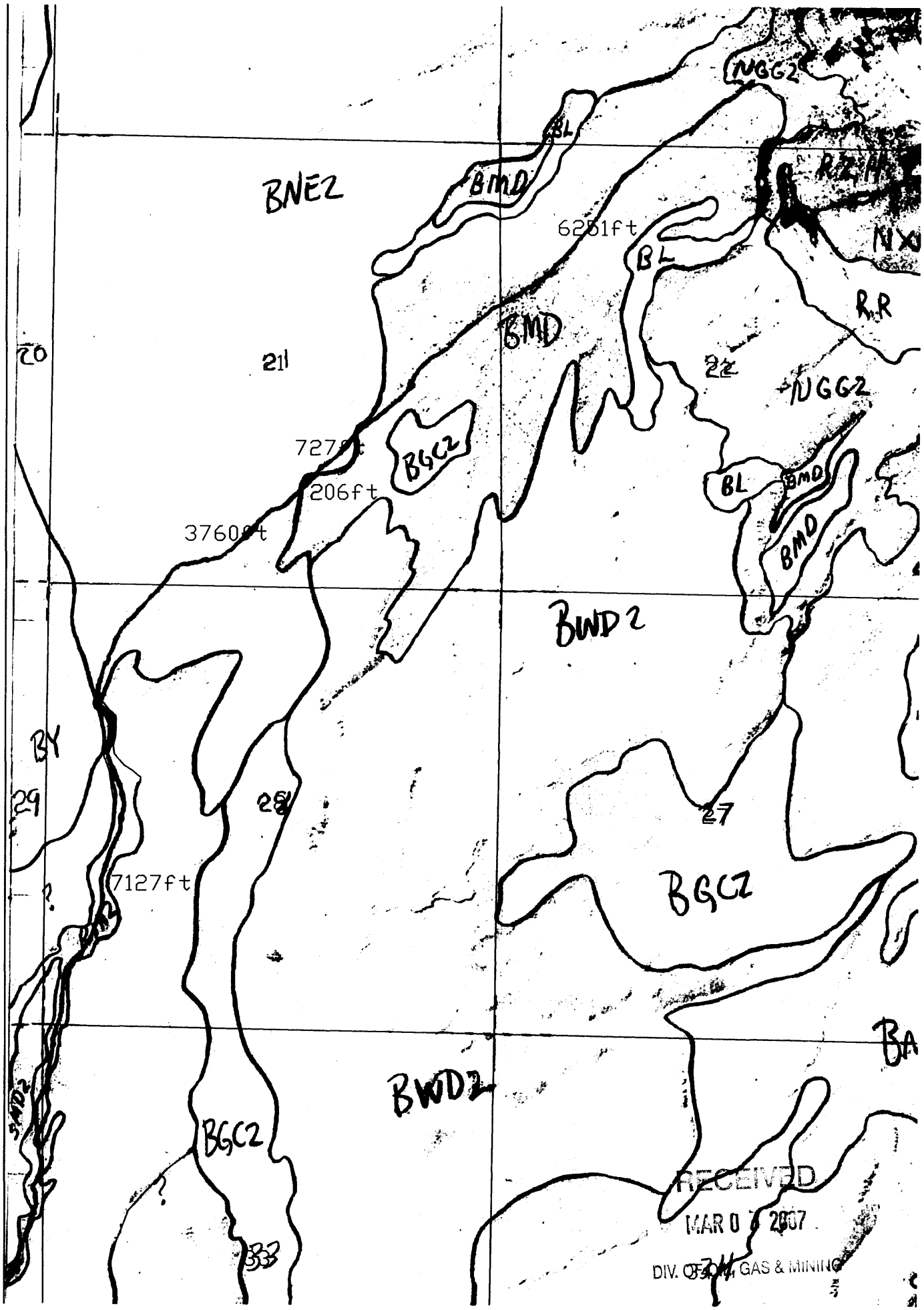
Number	Northing	Easting	Elevation	Raw Desc	Full Desc
1332	389801.6240	2318995.2770	5238.92	CLGRASSY	CLGRASSY
1333	389804.2980	2318969.1070	5244.39	CROSS5	CROSS5
1334	389802.0370	2318971.9160	5244.03	CROSS5	CROSS5
1335	389799.5680	2318974.7690	5243.28	CROSS5	CROSS5
1336	389798.0300	2318976.9190	5241.87	CROSS5	CROSS5
1337	389796.7530	2318978.6890	5241.15	CROSS5	CROSS5
1338	389794.9630	2318980.7640	5240.20	CROSS5	CROSS5
1339	389794.4800	2318981.8340	5240.37	CROSS5	CROSS5
1340	389793.1940	2318983.4660	5239.42	CROSS5	CROSS5
1341	389791.8520	2318986.1290	5238.98	CROSS5	CROSS5
1342	389790.1170	2318989.0880	5238.88	CROSS5	CROSS5
1343	389788.6590	2318990.9630	5238.75	CROSS5	CROSS5
1344	389786.9230	2318993.3760	5240.92	CROSS5	CROSS5
1345	389785.8540	2318994.9120	5241.39	CROSS5	CROSS5
1346	389784.7280	2318996.7810	5242.05	CROSS5	CROSS5
1347	389783.2460	2318999.4690	5242.82	CROSS5	CROSS5
1348	389780.9710	2319004.7340	5243.13	CROSS5	CROSS5

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

ATTACHMENT #3

NRCS PRELIMINARY SOILS MAP

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING



RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

ATTACHMENT #4

CHANNEL STAGE CALCULATIONS

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

Channel Report

Hydraflow Express by Intelisolve

Friday, Jan 12 2007

Lila Canyon Below Mine

User-defined

Invert Elev (ft)	= 15.65
Slope (%)	= 0.01
N-Value	= Composite

Calculations

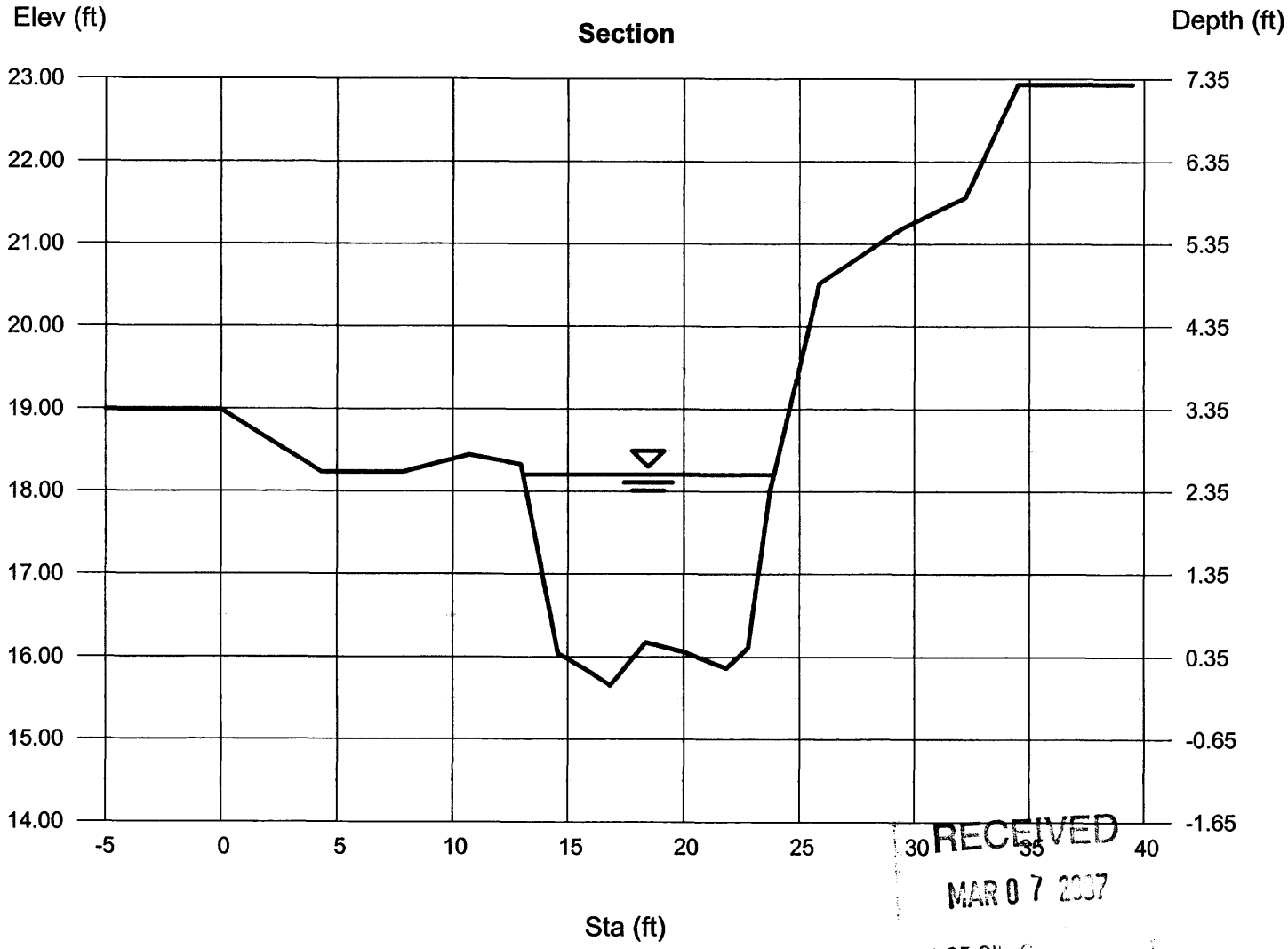
Compute by:	Q vs Depth
No. Increments	= 40

Highlighted

Depth (ft)	= 2.55
Q (cfs)	= 12.23
Area (sqft)	= 21.18
Velocity (ft/s)	= 0.58
Wetted Perim (ft)	= 13.40
Crit Depth, Yc (ft)	= 0.68
Top Width (ft)	= 10.85
EGL (ft)	= 2.55

(Sta, El, n)-(Sta, El, n)...

(0.00, 18.99)-(4.34, 18.23, 0.035)-(7.83, 18.23, 0.035)-(10.70, 18.44, 0.035)-(12.96, 18.32, 0.035)-(14.59, 16.04, 0.035)-(16.00, 15.81, 0.035)-(16.86, 15.65, 0.035)-(18.40, 16.17, 0.035)-(20.01, 16.06, 0.035)-(21.86, 15.86, 0.035)-(22.80, 16.11, 0.035)-(23.75, 18.02, 0.035)-(25.87, 20.52, 0.035)-(29.49, 21.19, 0.035)-(32.23, 21.56, 0.035)-(34.50, 22.93, 0.035)



RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

Depth (ft)	Q (cfs)	Area (sqft)	Veloc (ft/s)	Wp (ft)	Yc (ft)	TopWidth (ft)	Energy (ft)
0.18	0.012	0.138	0.08	1.58	0.01	1.53	0.18
0.36	0.081	0.722	0.11	5.31	0.06	5.19	0.36
0.55	0.320	1.999	0.16	8.66	0.12	8.36	0.55
0.73	0.803	3.542	0.23	9.09	0.21	8.58	0.73
0.91	1.442	5.124	0.28	9.52	0.30	8.81	0.91
1.09	2.215	6.747	0.33	9.94	0.36	9.03	1.09
1.27	3.110	8.410	0.37	10.37	0.41	9.25	1.28
1.46	4.116	10.11	0.41	10.80	0.46	9.47	1.46
1.64	5.229	11.86	0.44	11.23	0.50	9.69	1.64
1.82	6.443	13.64	0.47	11.65	0.54	9.91	1.82
2.00	7.753	15.46	0.50	12.08	0.58	10.13	2.01
2.18	9.158	17.33	0.53	12.51	0.61	10.35	2.19
2.37	10.65	19.23	0.55	12.93	0.65	10.57	2.37
2.55	12.23	21.18	0.58	13.40	0.68	10.85	2.55
2.73	11.01	23.95	0.46	21.33	0.72	18.62	2.73
2.91	12.80	27.75	0.46	24.58	0.69	21.77	2.92
3.09	15.53	31.82	0.49	25.87	0.73	22.96	3.10
3.28	18.56	36.11	0.51	27.17	0.79	24.15	3.28
3.46	22.22	40.57	0.55	27.78	0.85	24.67	3.46
3.64	26.33	45.08	0.58	28.01	0.92	24.83	3.65
3.82	30.71	49.61	0.62	28.25	0.99	24.98	3.83
4.00	35.36	54.17	0.65	28.49	1.06	25.14	4.01
4.19	40.27	58.76	0.69	28.73	1.13	25.29	4.19
4.37	45.43	63.37	0.72	28.97	1.21	25.44	4.38
4.55	50.84	68.02	0.75	29.21	1.28	25.60	4.56
4.73	56.49	72.69	0.78	29.45	1.35	25.75	4.74
4.91	62.12	77.40	0.80	29.87	1.43	26.11	4.92
5.10	67.24	82.24	0.82	30.87	1.50	27.09	5.11
5.28	72.65	87.26	0.83	31.87	1.56	28.07	5.29
5.46	78.38	92.46	0.85	32.87	1.62	29.06	5.47
5.64	84.10	97.85	0.86	34.07	1.69	30.25	5.65
5.82	89.94	103.5	0.87	35.43	1.75	31.59	5.84

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING

Depth (ft)	Q (cfs)	Area (sqft)	Veloc (ft/s)	Wp (ft)	Yc (ft)	TopWidth (ft)	Energy (ft)
6.01	97.06	109.3	0.89	36.26	1.82	32.39	6.02
6.19	105.3	115.2	0.91	36.61	1.89	32.69	6.20
6.37	113.8	121.2	0.94	36.96	1.98	32.99	6.38
6.55	122.7	127.3	0.96	37.32	2.06	33.29	6.57
6.73	131.8	133.3	0.99	37.67	2.15	33.60	6.75
6.92	141.2	139.5	1.01	38.02	2.23	33.90	6.93
7.10	150.8	145.7	1.04	38.37	2.32	34.20	7.11
7.28	160.8	151.9	1.06	38.72	2.40	34.50	7.30

RECEIVED
MAR 0 7 2007
DIV. OF OIL, GAS & MINING