NOTICE OF INTENTION TO CONDUCT MAJOR COAL EXPLORATION HIDDEN VALLEY PROJECT

CONSOLENERGY

2006 MAJOR COAL EXPLORATION PROGRAM

August, 2006

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R645-200. Coal Exploration: Introduction.

Consolidation Coal Company (hereinafter referred to as "Consol") proposes to begin coal exploration in excess of 250 tons on Consol fee surface and private leased coal. This fee surface contains approximately 960 acres that was originally permitted as an interim program mining permit in 1979 and eventually a Mining and Reclamation Plan (ACT 015/007) with the Utah Division of Oil, Gas, and Mining (hereinafter referred to as "the Division") by Soldier Creek Mining Company (CalMet). Consol purchased the property in November of 1995 and assumed the mining permit, bond and reclamation liability. Consol also controls surface and coal in fee on 640 acres adjacent to the north boundary of the permitted area.

Consol was in the process of completing final reclamation on the site prior to the decision to investigate the mineability of the A seam. This exploration application is intended to determine if the seam is 1.) marketable, and 2.) economically mineable.

For ease of reference, this plan follows the format of the applicable portions of the rules (R645-200 through R645-203) regarding Major Coal Exploration.

R645-200-100. Scope. (Major Coal Exploration):

123. Major Coal Exploration

Consol intends to remove more than 250 tons of A seam coal from production adits developed for the purpose of determining coal marketability through test burns with potential customers. The Major Exploration Permit will also focus on determining the economic mineability of the A seam; during development, roof and floor conditions will be closely examined. If the exploration and marketing phase of this project are successful, Consol will follow up with a Mining and Reclamation Plan application submittal. Consol is hereby filing a Notice of Intention to Conduct Major Coal Exploration under the requirements of R645-201-300.

R645-200-200. Responsibilities.

210. Responsibility to Comply with Regulations.

Consol will comply with the requirements of R645-200 through R645-203

220. Responsibility of the Division to Review and Reply.

The Division will receive, review and approve or disapprove this Notice of Intention to Conduct Major Coal Exploration. The Division will review and respond to this application within 15 days of receipt.

230. Responsibility of the Division to Coordinate with Other Agencies.

The Division will coordinate review of this Notice with the appropriate government agencies.

R645-201. Coal Exploration: Requirements for Exploration Approval.
R645-201-100. Responsibilities for Coal Exploration Plan Review.

110. Coal Exploration Plan Review, Responsibility of Division.

The surface on which exploration will take place is Consol fee control. The mineral estate upon which this exploration will take place is Consol private lease control. Refer to Operations Map (MEP O).

120. Requirements of 43 CFR 3480-3487.

This control is not subject to 43 CFR Parts 3480-3487. Therefore, exploration plan review will be the responsibility of the Division.

130. Division responsibility to Coordinate with Other Agencies.

This Notice of Intention to Conduct Major Coal Exploration is being submitted to the Division as the lead agency for review and approval.

R645-201-300. Major Coal Exploration Permits

310. Division Submittal and Approval

Consol is submitting this Notice to the Division for review and approval, prior to beginning exploration work in 2006.

320. Required Applicant Information.

321. Name, Address and Telephone Number of Applicant:

APPLICANT:
Consolidation Coal Company
John Gefferth
P.O Box 566
Sesser, Illinois, 62884
618-625-2041

OPERATOR:
Consolidation Coal Company
Hidden Valley Mine
P.O Box 566
Sesser, Illinois, 62884
618-625-2041

322. Name, Address and Telephone Number of the Applicant's Representatives:

RESPONSIBLE REPRESENTATIVE:

Consolidation Coal Company
John Gefferth
P.O Box 566
Sesser, Illinois, 62884
618-625-2041

323. Description of Exploration Area. (Exploration & Reclamation Plan)

100. Narrative description and maps of Exploration Area.

General

The Emery Coal Field is located 35 miles east of Salina and 70 miles south of Price in Sevier and Emery Counties. The Field has a width ranging from 4-8 miles and a length of about 35 miles. The proposed exploration area lies within the reclaimed Hidden Valley Mine Permit ACT 015/007 and is three (3) miles east of Highway 10 and seven miles southwest of the town of Emery, Utah. The Major Exploration Area (MEP) boundary is in the northeast corner of the permitted area and totals 194 Acres, refer to operations map (MEP O).

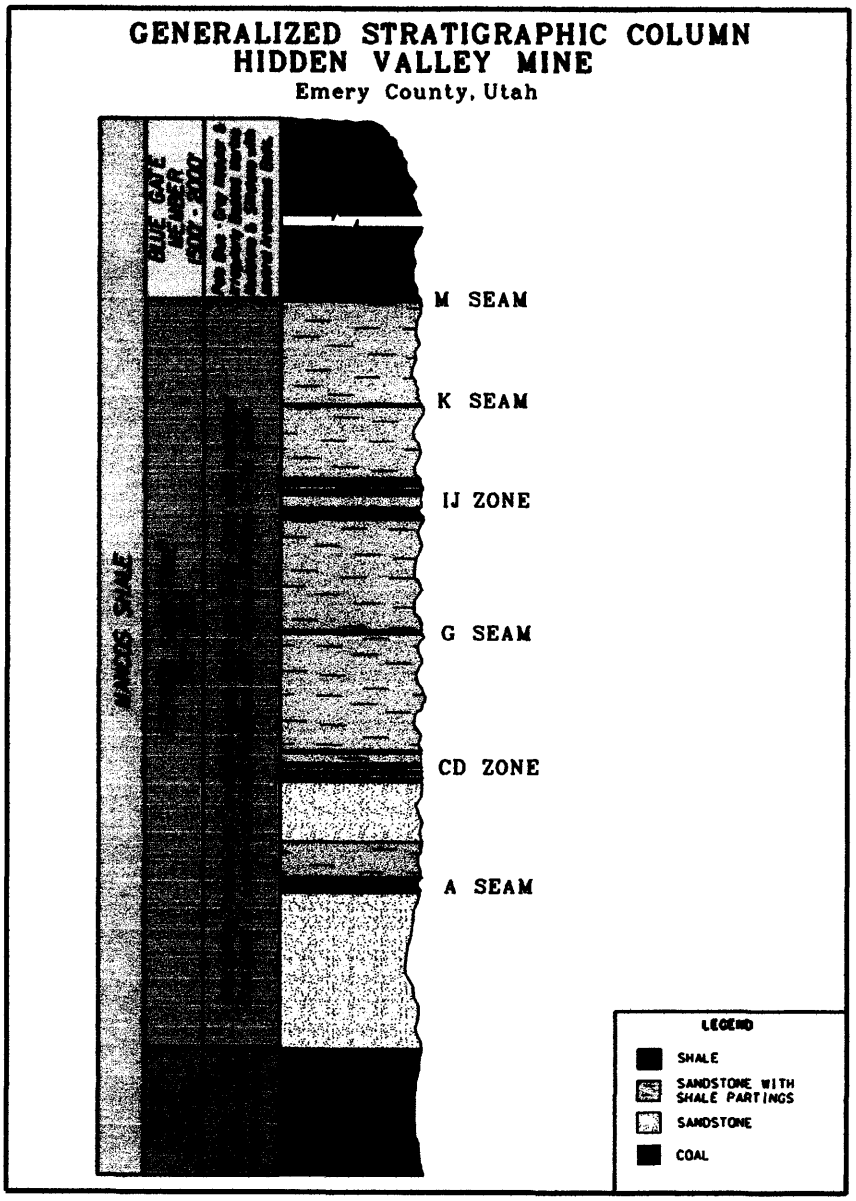
The proposed major exploration area is located within Sections 17 and 18, T26S, R6E, Salt Lake Base and Meridian, Walker Flats Quadrangle, within Emery County Utah. The proposed major exploration area lies in and adjacent to a deep canyon along Ivie Creek. The entire 960 acres (section 18, W1/2 and section 17, all) is currently under Permit ACT 015/007. Consol currently holds reclamation bond on this area. CalMet, the applicant under the original interim permit, began initial construction of an underground coal mine in the late 1970's. Approximately 6.7 acres of surface was affected by CalMet during construction of a haul road into the canyon, a buried culvert to direct unaffected surface drainage under the affected area, a sediment pond to control affected surface runoff, and four exploratory adits into both the A seam and CD Seam (CalMet called this the B seam). Topsoil was not required to be removed under the original permit. The mine never reached full production and CalMet began reclamation in 1987 under a permanent program Mining and Reclamation Plan approved by the Division. Consol purchased the property in 1995 and assumed the mining permit, bond and reclamation liability. Consol was in the process of completing final reclamation on the site until the decision was reached to investigate the mineability of the A seam.

Structurally, the Hidden Valley Mine area lies on the gently dipping west slope of the San Rafael Swell. Locally, strata dip generally at a rate of about 3 to 4 degrees to the west-northwest. The strike of the beds are mainly northeast, but as they trend beneath the volcanics at the south end of the field the strike changes to nearly east west. Strike variations do occur. Local faulting within the immediate area of the Hidden Valley Mine has not been observed or indicated through information contained within the Consol drill hole data base; however, the prominent northeast-southwest trending Joes Valley Fault Zone lies about 1 ½ miles to the west. The Fault Zone consists of two or more large displacement faults, that form a graben structure, running generally parallel to State Route 10. Displacement has been estimated at over 1,000 feet. The eastern-most fault trace marks the western extent of the Emery field.
The important coal seams of the Emery Field occur in the Ferron Sandstone Member of the Mancos Shale. The Ferron can be divided into two units on the basis of lithology. The lower Ferron consists primarily of sandstone and is typically a gray, fine-grained carbonaceous, calcareous marine sandstone and siltstone. The upper deltic units consist mainly of alternating thick to massive beds of tan, yellow-gray, medium-grained sandstone, similarly colored shaley sandstone and gray shale. The shales are clayey, silty and carbonaceous. It is within the shaley strata that the coal beds are typically found. The coal seams are lenticular, so that correlations are difficult. Thirteen coal beds have been identified in the Ferron Sandstone Member, but are not laterally persistent due to their lenticular nature.

GEOLOGY (Site Specific)

The Hidden Valley Mine site including the proposed exploration permit area is centrally located in the Emery Coal Field and is closely surrounded by the most productive part of this Field. Ivie Creek, which runs west to east, generally bisects the property, forming a substantial canyon through the Ferron Sandstone Member. It is in this canyon that the minable A seam outcrops on the property. Additional seams above the A seam also outcrop in the Canyon, including the CD seam and I seam; referred to by the previous property owner (CalMet) as the B and C seams, respectively.

A generalized columnar section of the property, shown below, shows the basic correlation between the three seams and also identifies the major lithologies present, including sandstone, shale, and sandy shale.



COAL SEAMS (General Description)

A Seam:

The A seam is the only seam considered economically mineable based upon mineability, coal thickness and marketable coal quality, as observed in drill hole data. The A seam is generally free of partings and outcrops in Section 17 along Ivie Creek. The A seam thickness is generally consistent throughout the property except in the SW¼ of Section 17 where the seam is only 3.8 ft. The overall average thickness is 10.2 ft.

CD Seam:

The CD seam is found in two splits or separate coal benches separated by 1.0 ft. to 1.6 ft. of shale parting. The combined thickness range from 7.7 ft. to 12.5 ft. with the upper split ranging from 4.0 ft. to 8.4 ft. while the lower ranges from 2.1 ft. to 3.1 ft. Unlike the A seam, the aerial extent of the thick CD seam is limited. This combined with the seam parting render the CD seam uneconomic to mine.

I Seam:

The I seam at Hidden valley correlates well with the I seam being mined at both the Emery Mine and the Dog Valley Mine. This seam is also found in two splits on the property except in drill hole 6 where the entire seam has thinned to less than a foot. In the other five holes the total seam thickness ranges from 6.4 ft. to 11.7 ft. with the upper split ranging from 1.5 ft. to 4.6 ft. and the lower from 3.4 ft. to 4.3 ft. The I seam is considered uneconomic to develop at Hidden Valley due to seam splitting.

200. Narrative description of proposed exploration activity.

General

This project proposes to use the existing County Collector Road 514 to access Consol fee surface. As previously mentioned, Consol intends to determine if the A seam is mineable from a marketing, engineering, environmental and economic standpoint. Under this exploration permit Consol proposes to re-disturb the affected, reclaimed CalMet footprint, affect some un-disturbed areas and reestablish drainage control in a similar manner that was previously approved. Consol also proposes to re-enter and develop the A seam adit, and re-enter and develop the previously developed CD (CalMet B Seam) seam adit to ramp down to the A seam, This exploration will be done under an approved MSHA roof control and ventilation plan. Due to the apparent poor condition of the initial coal, Consol proposes to stockpile the material on site with approved erosion control. This stockpile will be placed in an area that has no previous surface disturbance. Once unweathered coal is reached, the coal will either be stockpiled on the permitted surface, transported to a loadout, or transport it directly to a customer for a test burn. No commercial sale of the coal will occur under this permit, except as allowed by R645-201-400.

Detail

Standard earthmoving construction equipment will be used to re-establish the mine openings. Consol will utilize dozers, trackhoes, excavators, haul trucks and drills as the major equipment. Initially the previously reclaimed surface material will be removed and stockpiled, and the sediment pond built close to the same location that it was under the CalMet permit. The drainage culvert that conveyed unaffected drainage through the area will be put back into service. The road leading down the canyon will be built in approximately the same location and configuration as before. The adit backfill will be removed and either spread or stockpiled, depending on its geochemical quality. A material storage area and sediment pond will be built near the entrance to the canyon. This material storage area will be used to stockpile the exploration material and any backfill that can't be used in the canyon.

The exploration will be done using conventional mining techniques and equipment (continuous miner, bolter, shuttle car, underground support equipment)

Site reclamation will be achieved with standard earthmoving equipment.

300. Timetable

Once the MEP is issued, Consol intends to begin surface material removal from the previously disturbed area. This material will be stockpiled as substitute topsoil for future reclamation. Road construction, pond construction and adit face up work will follow. The topsoil will be removed and stockpiled in areas that were not previously disturbed.

500. Estimated amount of coal to be removed.

Due to the mineral estate being leased to Consol, an accurate record of the amount of coal removed will be maintained at the site. Standard engineering methods of underground surveying will be used to calculate the void mined and any coal sent offsite will be weighed with certified scales and/or acceptable volumetric survey methods. A report stating the volume and disposition of coal mined each month will be sent to the Division by the 15th day of the month following production. Consol's exploration mine layout contains 250,000 tons of recoverable coal to be mined under this application.

600. Proof of need to operate under a Major Exploration Permit

Consol is requesting to remove as much as 250,000 tons of coal, under this Major Exploration Permit, to evaluate the A seam. This amount is needed to supply prospective customers with an adequate amount of coal for test burns. The average test burn ranges from 10,000 to 20,000 tons. The existing coreholes and two independent reserve studies show that the A seam is the only seam in the area of the Major Exploration Permit that may be economically mineable. There is no known record of this seam ever being mined within the Emery Coal Field. Consol intends to develop the exploration entries far enough into the coal outcrop to determine the mining conditions and the coal quality. Consol will extend the exploration entries into the A seam outcrop and connect them to entries developed in the CD seam. This connection is necessary to establish mine ventilation. Refer to the Operations Map (MEP O).

324. Owner of record of Subsurface and Surface

Surface ownership:
Consolidation Coal Company
1800 Washington Road
Pittsburgh, Pennsylvania, 15241
412-831-4000

Mineral estate ownership:
Ivie Creek Coal Company Shareholders Trust.
c/o Jones Waldo Holbrook & Mcdonough
1500 First Interstate
Salt Lake City, Utah, 84101

325. Disturbed Area Map

Refer to the Operations Map (MEP O) and the Reclamation Map (MEP R) for the previously disturbed and proposed disturbed boundaries.

326. Legal Right to Enter The Surface and Conduct Exploration

Consol is the surface owner of record for the permit area.

330 Public Notice

Refer to Appendix A for the text and map for the public notice.

R645-201-400 Requirements for Commercial Sale

410. Application to Obtain Written Approval

With this application, Consol requests the Division's written approval that NO permit to conduct coal mining and reclamation operations is required for the sale or commercial use of coal extracted during exploration operations if such sale or commercial use is for coal testing purposes only.

420. Demonstration that Coal Testing is Needed

Coal testing is needed to determine the quality and marketability of the A seam coal. As mentioned at R645-201-323-600, the A seam has not been mined in commercial quantities. During the term of this exploration permit, Consol intends to decide if the A seam reserve can be mined and commercially sold. If this proves to be the case, Consol intends to submit a mining and reclamation plan to begin commercial mining of the coal.

430. Application to Mine Coal for Test Purposes

431. Testing Firm

If the coal removed is of sufficient quantity and quality to require testing, Consol will submit pertinent data to the Division prior to shipment.

432. End User Statement

100. End user justification for test

If Consol delivers coal to an end user for a test burn, Consol will forward a statement from the end user as to the reason for the test prior to any shipments to the end user.

200. Amount of coal required for end user test

R645-201-432-100 will contain the amount of coal needed by the end user and why a smaller amount will not suffice.

300. Description of end user test

R645-201-432-100 will give a detailed description of the required tests that the end user is requesting.

433. Future Reserve Evaluation to Support Exploration

The immediate future reserve consists of private leased coal and Consol fee coal in sections 17, 18, 7, 8. The total reserve of A seam coal within these sections is 15.5 million (leased) and 7 million (Consol fee) tons respectively .

434 Explanation as to why other means of exploration are not adequate

As explained in R645-203-323-600, this method of exploration is required due to the fact that this seam has never been mined commercially.

R645-202. Coal Exploration: Compliance Duties.

R645-202-200. Performance Standards.

230. Operational Standards.

For detailed information on surface drainage, archeology, land use, soils, vegetation and Wildlife, please refer to the following appendices:

Appendix B:	Drainage Control
Appendix C:	Archeology (confidential)
Appendix D:	Land use
Appendix E:	Soils
Appendix F:	Vegetation
Appendix G:	Wildlife

231. Non Disturbance of Habitats.

Habitats of unique or unusual high value for fish, wildlife, and other related environmental values and critical habitats of endangered or threatened species identified pursuant to the Endangered Species Act of 1973 (16 U.S.C 1531 et. Seq.) will not be disturbed during coal exploration.

Please refer to Appendix F and Appendix G

232. Utilities/Support Facilities and Road - Construction and Use.

All roads or other transportation facilities used for coal exploration will comply with the applicable provisions of R645-301-358...R645-301-762. The Canyon Entrance Road (MEP O1) is a primary road. Refer to MEP O1 for plan view, profile and cross sections. Road ditches and culverts were designed according to R645-301-742.323 and 742.423.1. As-Built drawings will be filed upon final construction. To protect the public a gate and/or a sign will be placed either at the west boundary of Consol property or at the beginning of the Canyon Entrance Road.

All coal mining and reclamation operations will be conducted in a manner which minimizes damage, destruction or disruption of services provided by oil, gas, and water wells; oil, gas, and coal slurry pipelines, railroads; electric and telephone lines and water and sewage lines which pass through the permit area. There are no facilities described above within the permit area.

The support facilities will be operated in accordance with this permit issued for the mine operation to which it is incident or from which its operation results. Plans and drawings for each support facility have been included in this application. Plans and drawings for each support facility to be constructed, used, or maintained within the proposed permit area will include a map, appropriate cross sections, design drawings, and specifications sufficient to demonstrate how each facility will comply with applicable performance standards. In addition to the other provisions of R645-301, support facilities will be located, maintained, and used in a manner that: 526.221. Prevents or controls erosion and siltation, water pollution, and damage to public or private property; and 526.222. To the extent possible using the best technology currently available - minimizes damage to fish, wildlife, and related environmental values; and minimizes additional contributions of suspended solids to streamflow or runoff outside the permit area. Any such contributions will not be in excess of limitations of Utah or Federal law;

For Support Facilities refer to:
Operations Maps (MEP O, O1, O2)
Drainage Maps (MEP D, D1, D2, D3)

233. Topsoil Removal and Storage.

Topsoil will be separately removed, stored, and redistributed on areas disturbed by coal exploration activities as necessary to assure successful revegetation or as required by the division.

Please refer to Appendix E

A portion of the area within the Major Exploration Permit was previously surface affected by Soldier Creek Coal Company (CalMet) under an interim program permit. Please refer to the Operations Map (MEP O) and the Reclamation Map (MEP R). This area was later approved and reclaimed under Mining and Reclamation Plan ACT/015/007. The best available surface material was used in lieu of topsoil for final reclamation. Consol proposes to remove, stockpile, vegetate, and protect from erosion, the top 6 inches of material from the previously affected area. Refer to the Operations Map (MEP O) and the Reclamation Map (MEP R).

On areas that have not been previously surface affected, Consol will remove, stockpile vegetate, and protect from erosion, the topsoil as it is defined in Appendix E.

234. Diversion of Overland Flows.

Diversions of overland flows and ephemeral, perennial, or intermittent streams will be made in accordance with R645-301-742.300.

Please refer to Appendix B (Drainage Control)

235. Minimizing Disturbance to Hydrologic Balance.

Coal exploration will be conducted in a manner which minimizes disturbance to the prevailing hydrologic balance in accordance with R645-301-356.300 through R645-301-763.
This entire exploration plan has been designed to minimize the area disturbed. All disturbed areas report to a sediment pond. Ponds 001 and 002 are designed by a P.E., experienced in the design and construction of impoundments. The ponds will be constructed prior to watershed disturbance. Faces of the embankments will be vegetated and or stabilized. The sediment ponds will be maintained and inspected until removal is authorized by the DOGM. Inspections will be made regularly during construction, upon completion and at least yearly until reclaimed. Any hazards will be noted on these reports. Certified reports documenting these inspections will be forwarded to the DOGM. Once removed, the ponds will be reclaimed per the approved reclamation plan. The proposed sediment ponds are below the size requirements of 30 CFR Sec. 77.216(a) (MSHA size requirements) nor do they meet the size requirements of NRCS Class B or Class C criteria for dams in TR 60.
Water monitoring will be conducted in accordance with the recently approved UPDES permit No. UTG040026

Please refer to Appendix B (Drainage Control)

236. Acid-or Toxic Forming Materials.

Acid - or toxic-forming materials will be handled and disposed of in accordance with R645-301-731.110, 731.300, and 301-553.260.

All acid or toxic forming material will be stored in the refuse disposal area. The refuse disposal area will be approximately 1 acre in size. Consol anticipates that the initial burnt coal from the adits and possible some of the original development waste from CalMet (encountered during face up) will need to be stored there. Surface runoff will be collected via small side ditches and routed to pond 002. Final reclamation of the site will consist of 4 foot of cover or hauled back into the adits as backfill material.

240. Reclamation Standards.

If the exploration and marketing phase of this project are successful, Consol will follow up with a Mining and Reclamation Plan submittal that will incorporate this phase of the operation into a much larger final reclamation plan. If however the marketing and exploration phase do not lead into a full blown mine scenario, Consol proposes to complete reclamation of the previously disturbed area (canyon road and surface disturbed area in the canyon) according to the approved MRP ACT 015/007, in a similar state that exists today. In the area at the top of the canyon, Consol will reclaim Pond 002, remove all coal from the stockpile area, cover the refuse area with 4 feet of non toxic material or haul it back into the adits, and replace the topsoil.

241. Excavations.

If excavations, artificially flat areas, or embankments are created during exploration, these areas will be returned to the approximate original contour promptly after such features are no longer needed for coal exploration unless needed for full-scale mining should the work authorized by this MEP prove that the A seam can be commercially mined.

242. Re-Vegetation.

All areas disturbed by coal exploration activities will be revegetated in a manner that encourages prompt revegetation and recovery of a diverse, effective, and permanent vegetative cover. Revegetation will be accomplished in accordance with the following:

Please refer to Appendix F (Vegetation)

242.1 Re-Seeding.

All areas disturbed by coal exploration activities will be seeded or planted to the same seasonal variety native to the areas disturbed. If the land use of the exploration area is intensive agriculture, planting of the crops normally grown will meet the requirements of R645-202-242.100.

Please refer to Appendix F (Vegetation)

242.2 Soil Surface Stability.

The vegetative cover will be capable of stabilizing the soil surface from erosion.

Please refer to Appendix F (Vegetation)

243. Reclamation of Boreholes.

Each exploration hole, borehole, well, or other exposed underground opening created during exploration will be reclaimed in accordance with R645-301-529, R645-301-551, R645-301-631, R645-301-738, and R645-301-765.

244. Removal of Equipment.

All facilities and equipment will be promptly removed from the exploration area when they are no longer needed for exploration, except for those facilities and equipment that the Division determines may remain to:

244.1 Provide additional environmental data;

244.2 Reduce or control the on-site and off-site effects of the exploration activities;

244.3 Facilitate future coal mining and reclamation operations by the person conducting the exploration.

All equipment will be removed from the exploration site.

R645-203. Coal Exploration: Public Availability of Information.
R645-203-100. Public Records.

Except as provided in R645-203-200, all information submitted to the Division under R645-200 will be made available for public inspection and copying at the Division.

R645-203-200 Confidentiality
The Division will not make information available for public inspection, if the person submitting it requests in writing, at the time of submission, that it not be disclosed and the information concerns trade secrets or is privileged commercial or financial information relating to the competitive rights of the persons intending to conduct coal exploration.

APPENDIX A

HIDDEN VALLEY MINE

PUBLIC NOTICE

NOTICE

Notice is hereby given that Consolidation Coal Company, 1800 Washington Road, Pittsburgh, Pennsylvania 15241, has filed application with the State of Utah, Department of Natural Resources, Division of Oil, Gas and Mining for a Major Coal Exploration Permit to commence exploration at the Hidden Valley Mine under the provisions of the Utah Coal Mining and Reclamation Act and the Utah R645-200-123 Coal Mining Rules.

The permit area, as shown on the map below, is located on U.S. Geological Survey 7.5 minute Walker Flat quadrangle map as follows:

Sections 17 and 18, Township 23S, Range 6E, of the Walker Flat Quadrangle;

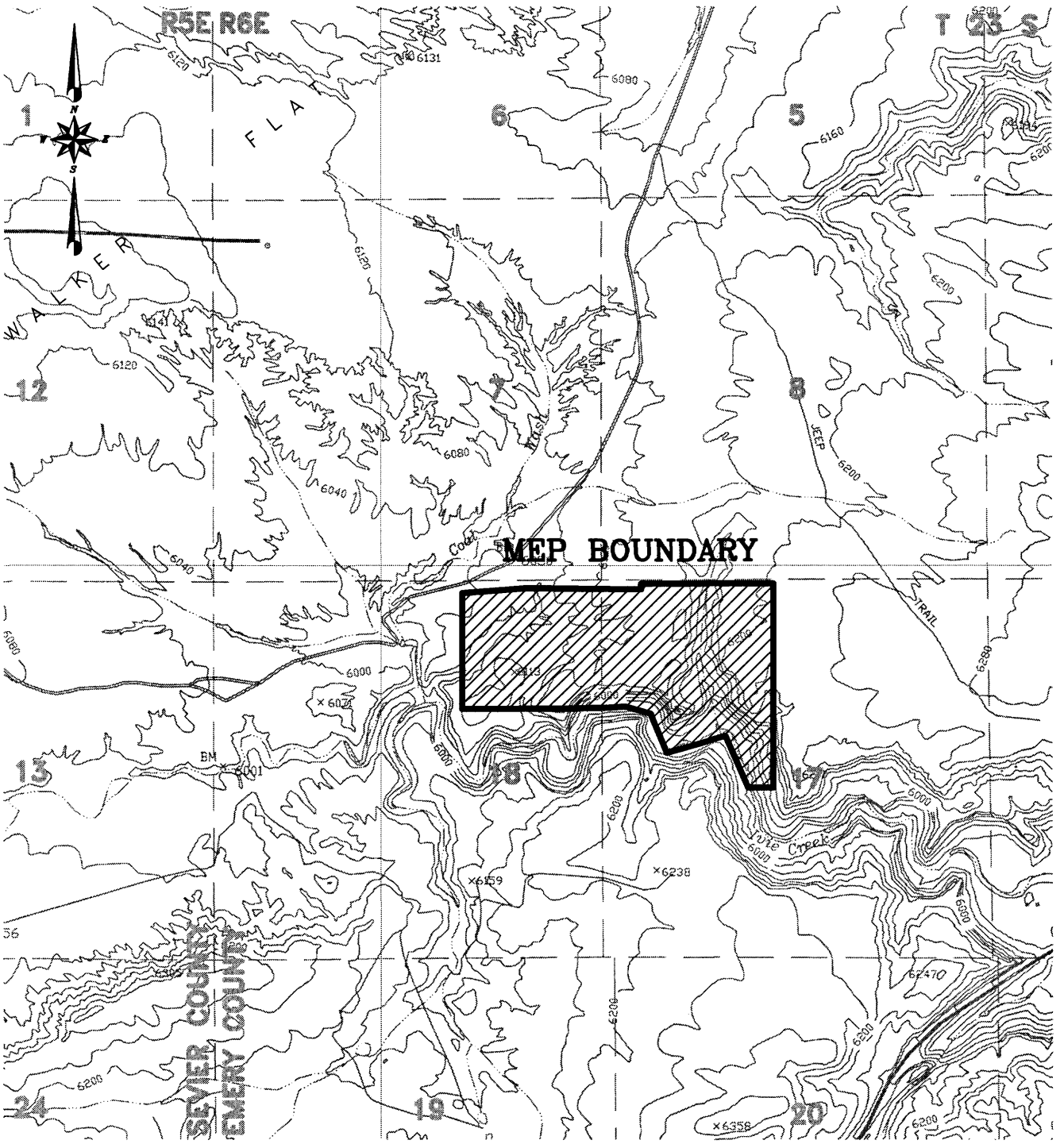
(Insert Map)

Copies of the application for this permit are available for inspection at:

Emery County Recorder's Office
Emery County Courthouse
Castle Dale, Utah 84513

Utah Division of Oil, Gas and Mining
Coal Program
1594 West North Temple, Suite 1210
P.O. Box 145801
Salt Lake City, Utah 84114-5801

Written comments on this application should be submitted to the State of Utah, Division of Oil, gas & Mining at the above address. Such comments should be filed within thirty (30) days from the date of the last publication of this notice.



Consolidation Coal Company
Hidden Valley Mine
Major Exploration Permit

QUADRANGLE LOCATION

BASE MAP:
U.S.G.S 7.5 MINUTE QUADRANGLE'S.
WALKER FLAT 1968, PHOTO REVISED 1978.

1" 2000'

SCALE: 1"=2000'
CONTOUR INTERVAL 40 FEET
DATUM IS MEAN SEA LEVEL

APPENDIX B

HIDDEN VALLEY MINE

DRAINAGE CONTROL PLAN

HIDDEN VALLEY MINE
MAJOR EXPLORATION PERMIT
DRAINAGE CONTROL PLAN

The proposed Major Exploration Permit (MEP) consists of approximately 194 surface acres. The site is located immediately adjacent to Ivie Creek, a perennial stream, approximately 2 miles upstream from its confluence with Quitchupah Creek. Figure A-1 shows the surface hydrology surrounding the MEP. The MEP is bisected by an ephemeral drainage which is proposed to be diverted through a culvert under the mine's B-Side Portal Area. For hydrologic analysis, the MEP has been broken up into 4 distinct watersheds, appropriately named Watersheds 1 thru Watershed 4, see Figure A-2. As needed, these 4 watersheds were then broken down into sub-watersheds to design individual features within the main watershed. Watersheds 1 and 2 flow into proposed Sediment Ponds (001) & (002) respectively. The ponds then discharge into Ivie Creek. Watershed 3 is diverted around the mine's A-Side Portal Area, and discharges directly into Ivie Creek. However to accommodate possible future plans, Pond (001) is sized such to handle the design storm events from Watershed 3. Watershed 4 contains the diverted ephemeral drainage and the proposed Canyon Entrance Road. Of the total MEP permit area, it is anticipated that only 19 surface acres will be disturbed, requiring sediment control.

Hydrology

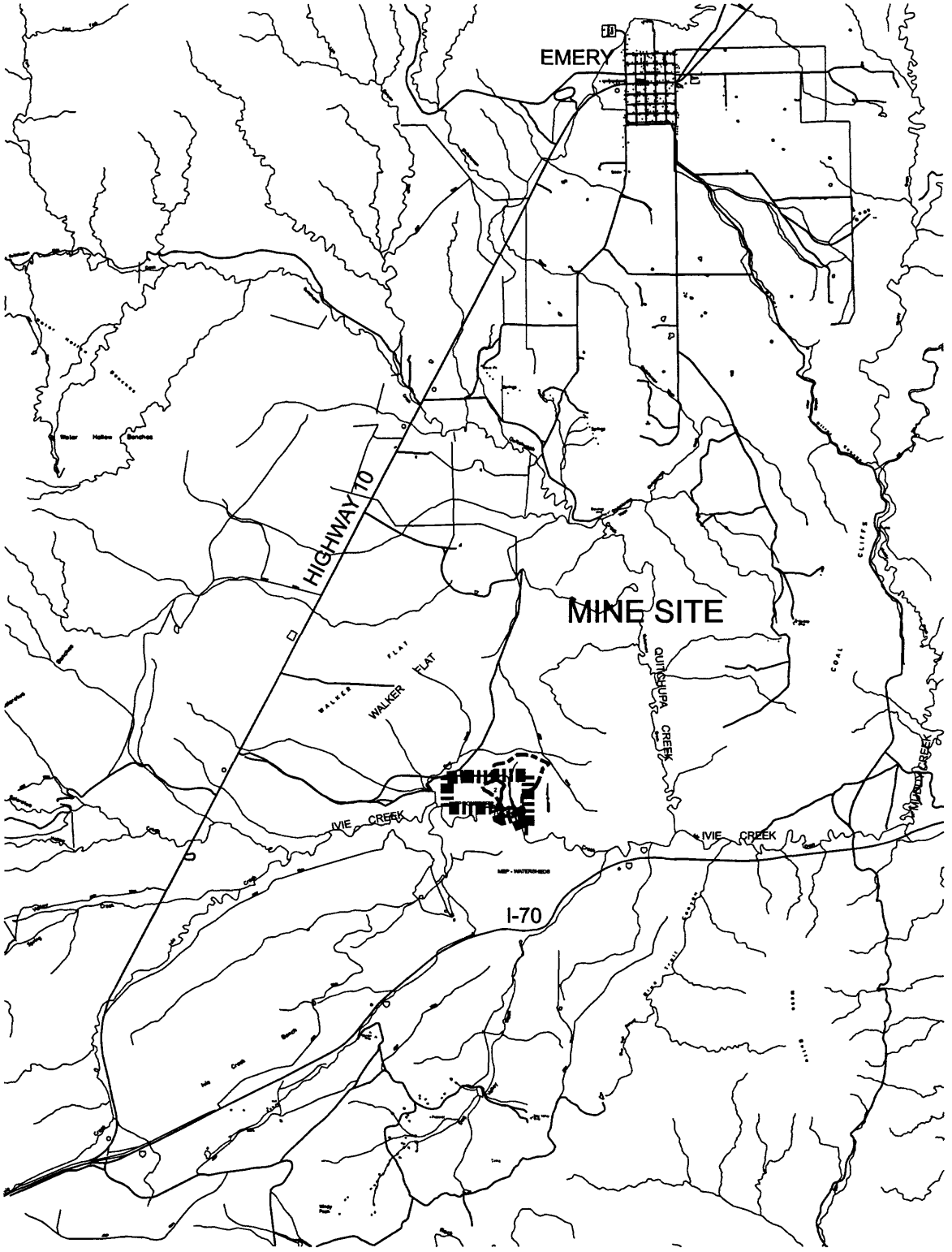
Per Utah Department of Natural Resources regulations (742.223, 742.221.33), Pond 001 and Pond 002 discharge structures have been designed using a 25-year, 6-hour storm event. Total rainfall for this event was 1.6 inches using the SCS Type II distribution. Both impoundments are sized to fully contain the runoff attributable to the 10-year, 24 hour storm event of 1.7 inches. Loss rate calculations are made using SCS Curve Number method. Weighted curve numbers for each subbasin are shown in the **Design Calculation** section. The curve number, along with physical characteristics of the subbasin, is used to determine the lag time.

Per Utah Department of Natural Resources regulations (742.323, 742.423.1), road ditches and culverts are designed using a 10-year, 6-hour storm event. This Major Exploration Permit proposes a limited Refuse Disposal Area. The ditches surrounding this structure are designed to pass the peak discharge from the 100-year, 6hour storm event per 746.213. Other miscellaneous and temporary structures are designed to handle the 2-year, 6-hour storm event per 742.333.

The Corps of Engineers Hydrologic Modeling System (HMS) program was used to calculate peak discharge rates. The public version of the HMS software has extremely limited print out capabilities. Therefore, results of these models were captured as a screen image and pasted into the text in each section where appropriate. Upon request, Consol will supply the reviewer the electronic files.

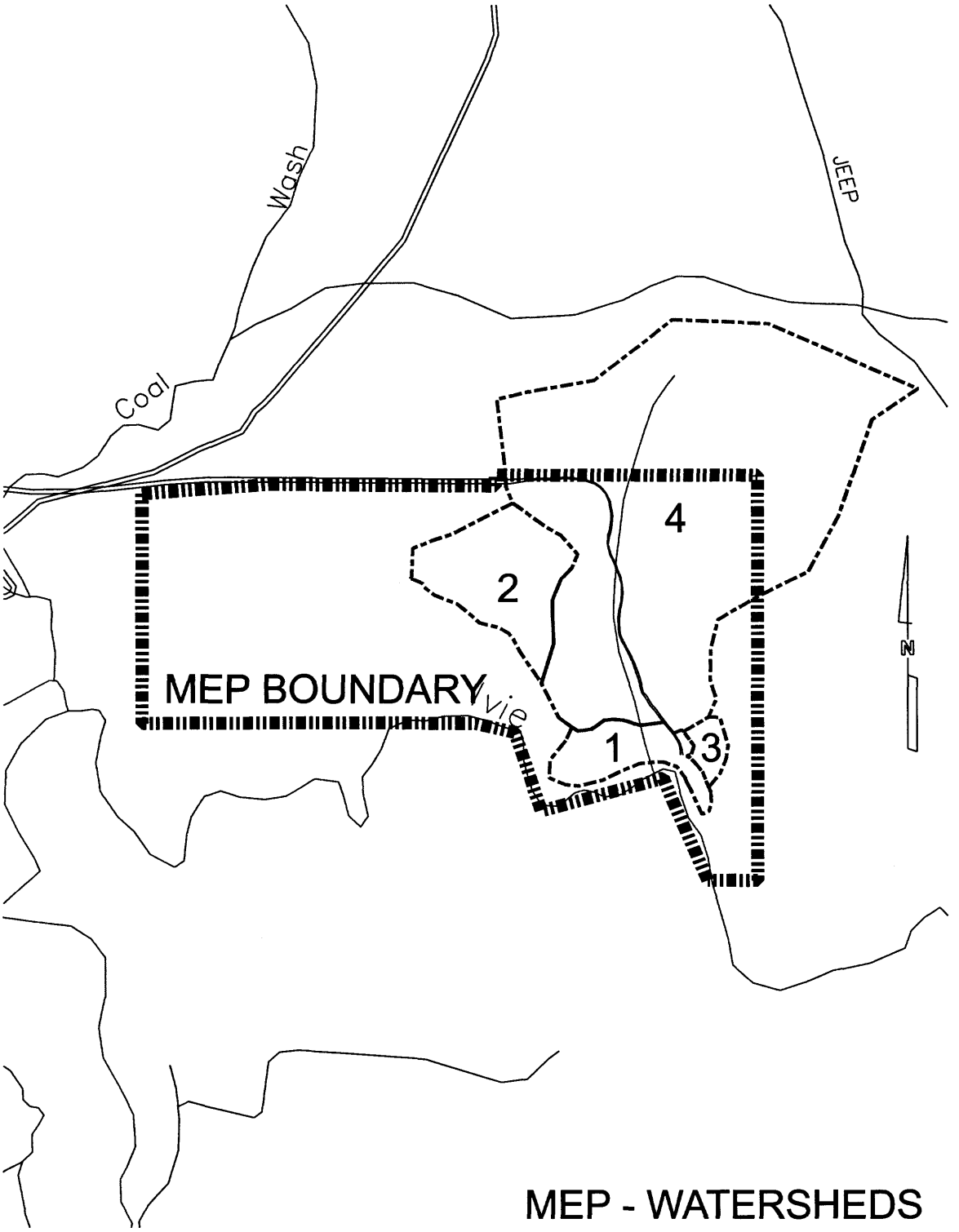
Hydraulics

Discharges from ponds are through a combination of pipes and open-channel emergency spillways. Flow ratings for pipe conduits were generated by using the appropriate discharge nomograph. A table was generated with headwater depths, stage and discharge rates. For open channel spillways, typically, a relatively flat section of the spillway will serve as the control section with the stage-discharge relationship based on flow at this point. Manning's equation for open-channel flow was used to calculate flow rates through the control section. The total spillway rating was then calculated by summing the flow through the individual structures at a given stage. These details are presented in the **Design Calculation** section. Flow rate and flood storage for a given stage were input into HMS.



General Location Map --------- Surface Water Hydrology ---------- Figure B-1

Appendix B-iii



MEP ---------- General Watershed Location Map ---------- Figure B-2

Appendix B-iiii

DRAINAGE STRUCTURE DESIGN

Project: Hidden Valley Mine - Major Exploration Permit

Company: Consolidation Coal Company

Site: Hidden Valley Mine

Project Description: Hydraulics and Hydrology Drainage Designs for Sediment Ponds, Miscellaneous Flows, and Road Ditches

Using Corps of Engineers HMS computer program.

Design Storms: 25-yr, 6-hr event for structures according to 742.223
(Pond 001, Pond 002 Spillways)
10-yr, 24-hr event for structures according to 742.221.33
(Pond 001, Pond 002 Treatment Volume)
10-yr, 6-hr event for structures according to 742.323 & 742.423.1
(Road Ditches & Culverts)
2-yr, 6-hr event for structures according to 742.333
(Other Miscellaneous Flows)
100-yr, 6-hr event for structures according to 746.213
(Refuse Area Drainage)

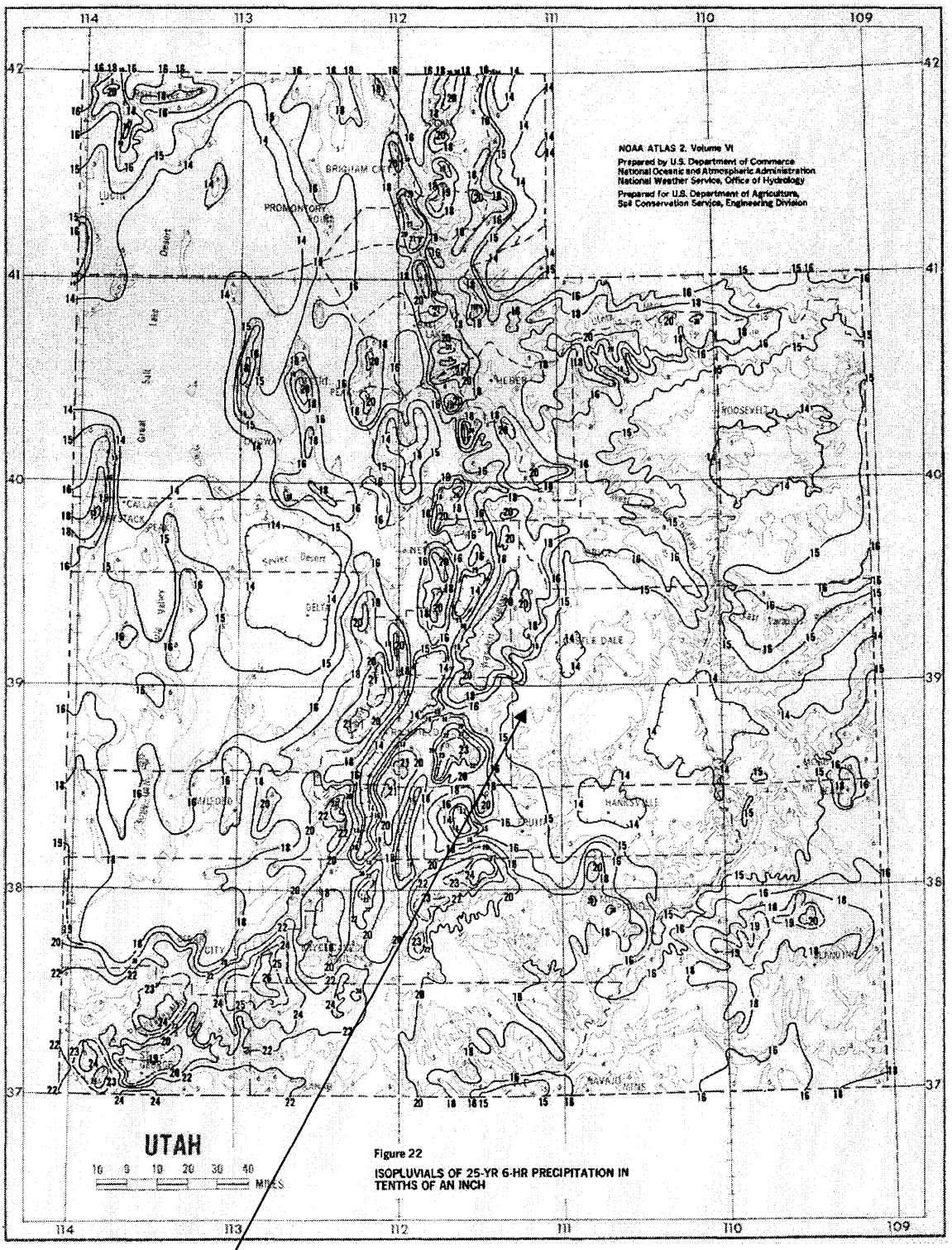
Distribution: SCS Type II

Total Rainfall: [1] 25-yr, 6-hr -- 1.6 inches
10-yr, 24-hr -- 1.7 inches
10-yr, 6-hr -- 1.2 inches
2-yr, 6-hr – 0.8 inches
100-yr, 6-hr – 1.8 inches

NOAA Figure references are attached on the following pages.

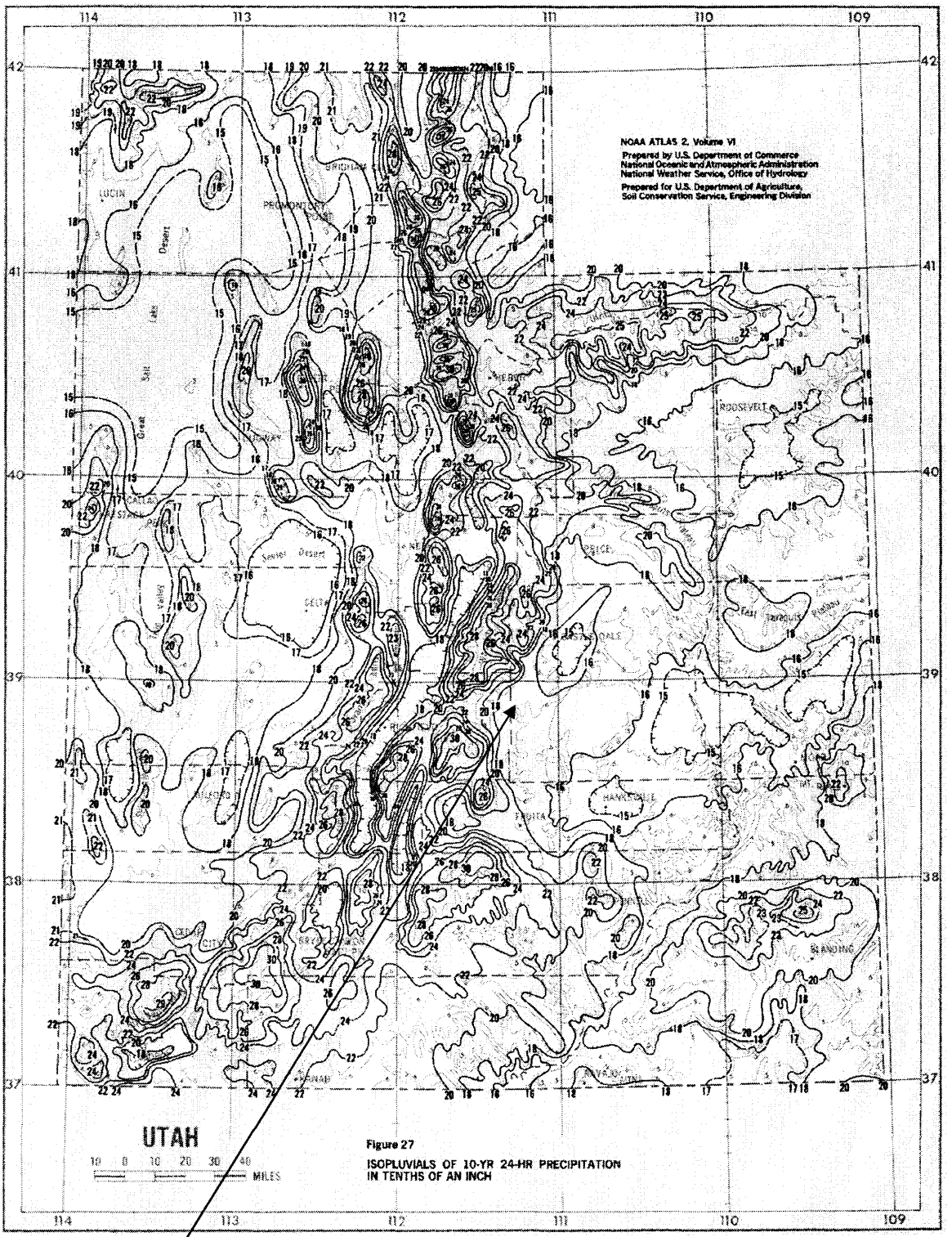
[1] NOAA Atlas 2, Volume VI UTAH

NOAA Figure 22 – Isopluvials of 25-yr 6hr Precipitation Event

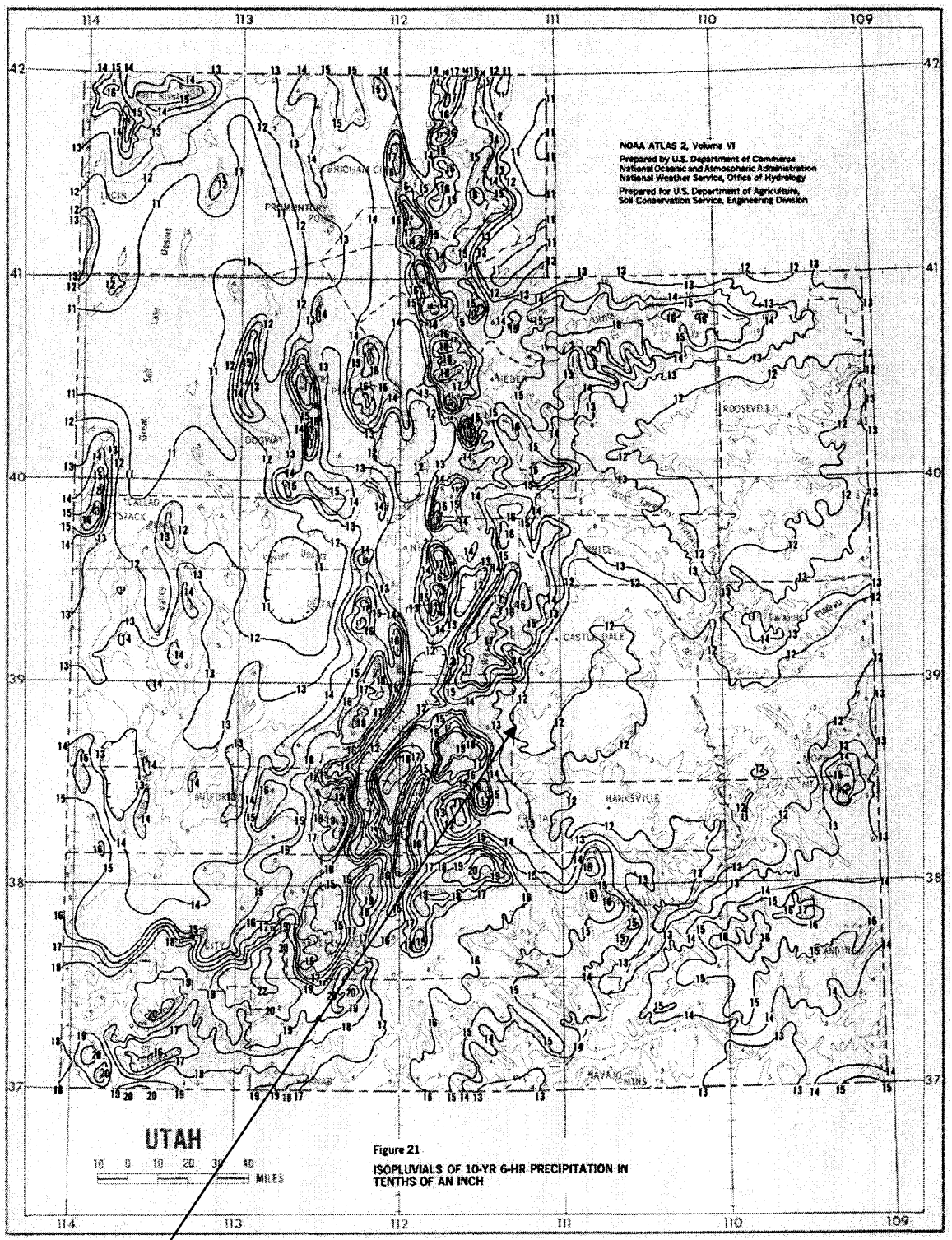


Project Site

NOAA Figure 27 – Isopluvials of 10-yr 24hr Precipitation Event

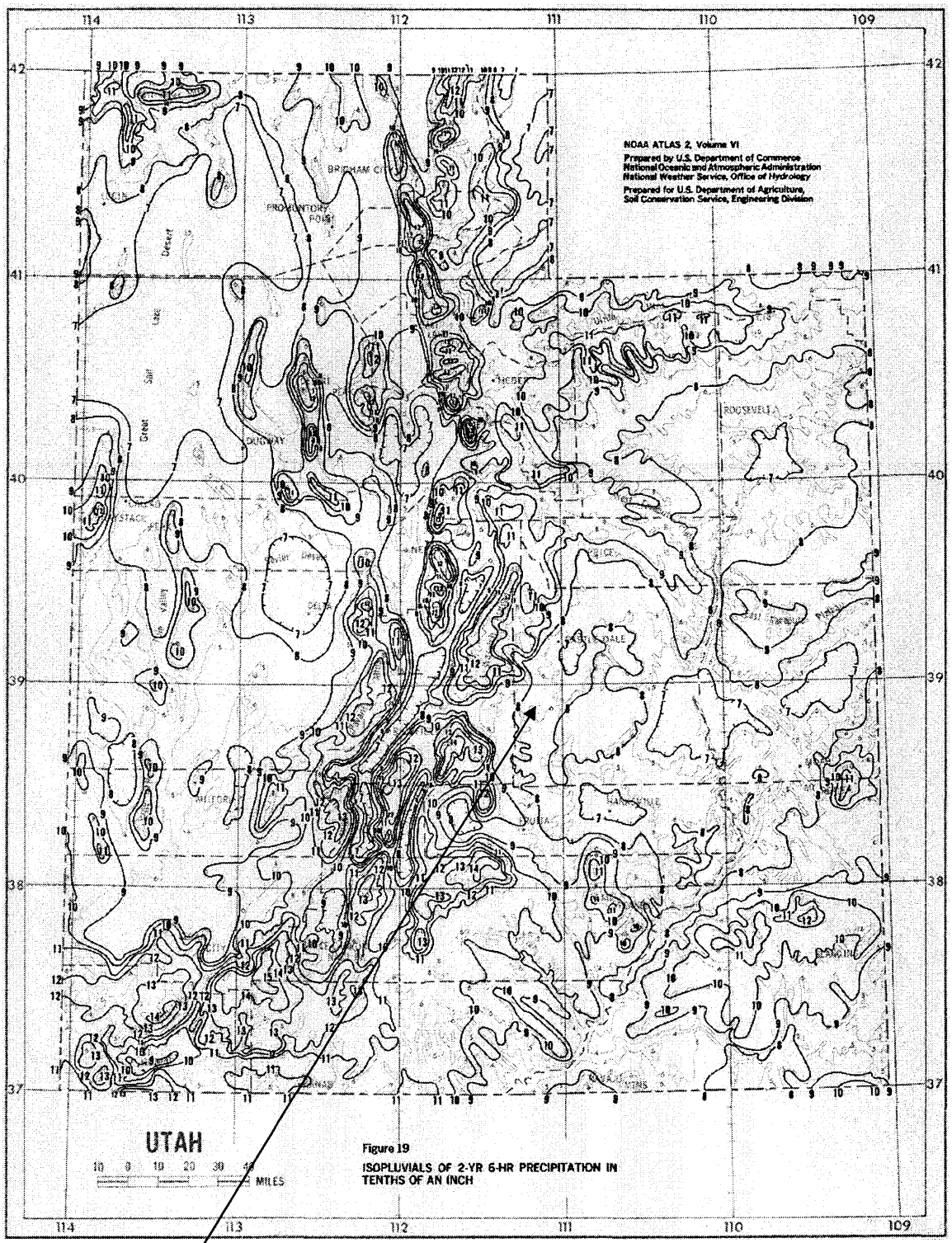


NOAA Figure 21 – Isopluvials of 10-yr 6hr Precipitation Event



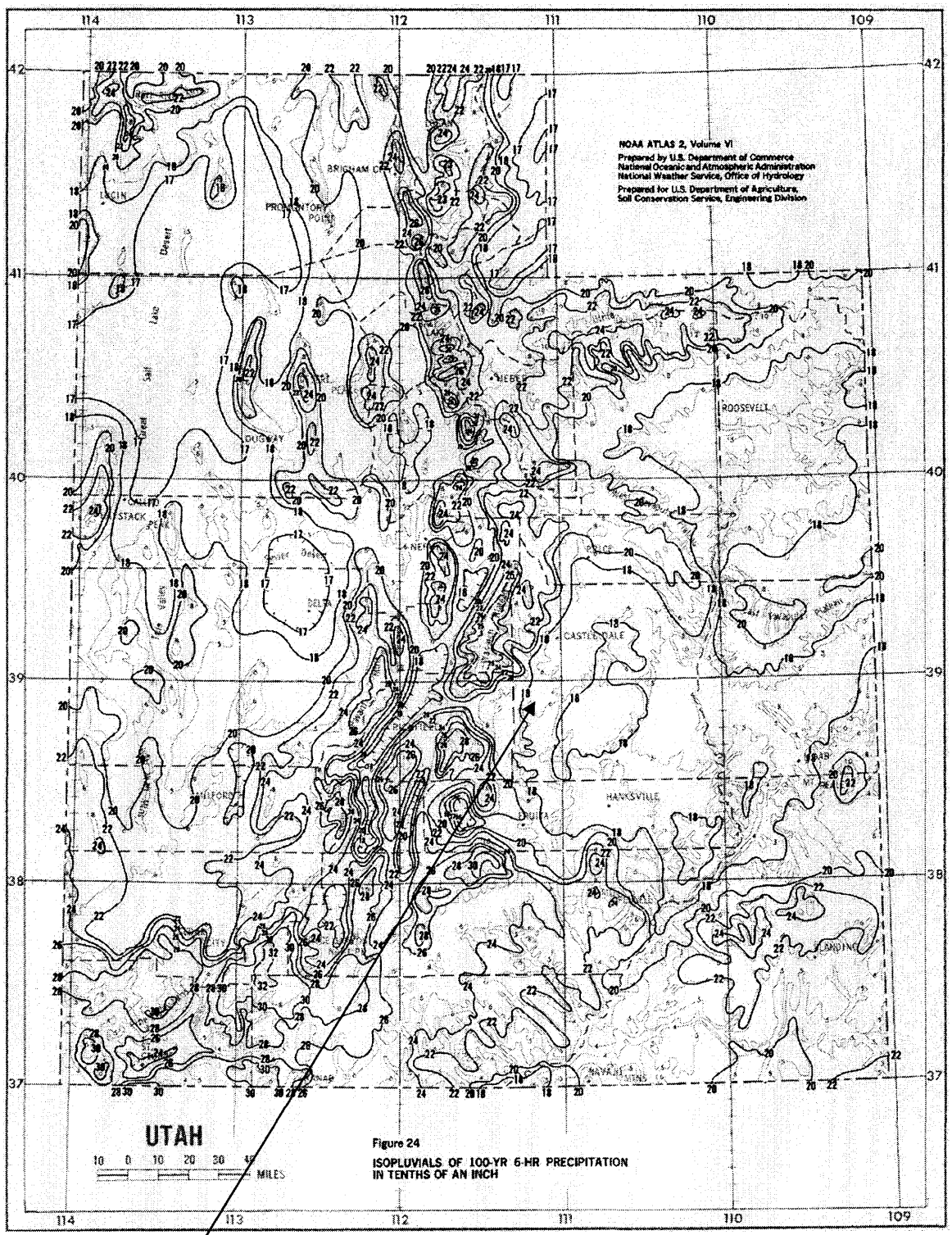
Project Site

NOAA Figure 19 – Isopluvials of 2-yr 6hr Precipitation Event



Project Site

NOAA Figure 24 – Isopluvials of 100-yr 6hr Precipitation Event



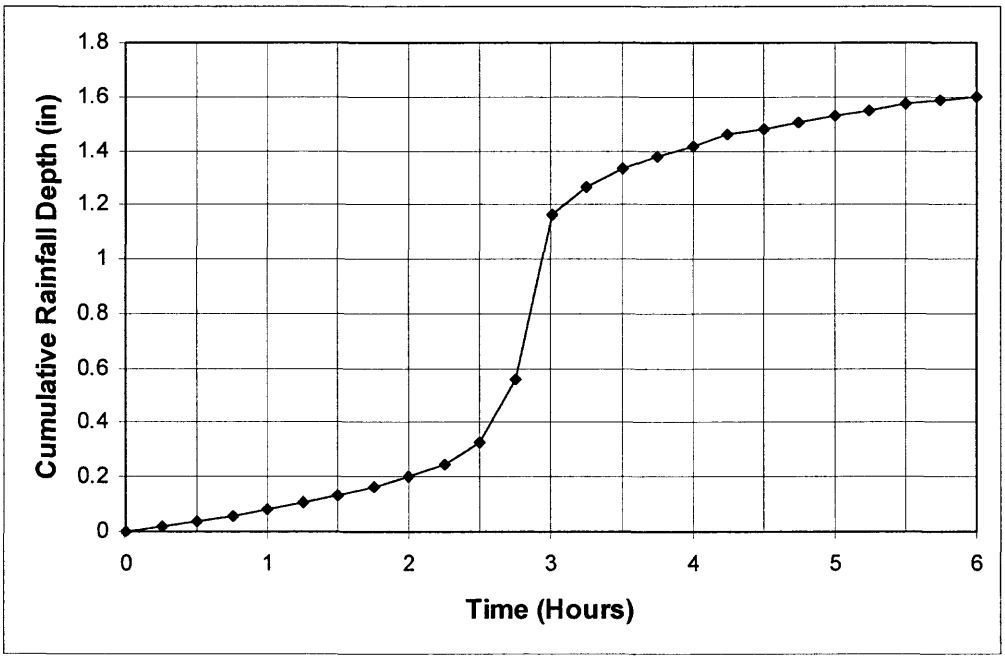
Project Site

Storm Distributions

The Corps of Engineers HMS computer program does not contain an SCS - 6 hour storm distribution as part of the selection set for building a meteorological model. A numerical interpretation of the SCS Type II Unit Storm Distribution was input into a spreadsheet in 15 minute time increments. Next, the total rainfall amount for the required design storm was used to develop a rainfall hyetograph for the SCS Type II - 6 hour design storm. This calculation was then input into HMS as a rain gage in order to model the storm. The numeric time series distribution and graph of the rainfall distributions are given below.

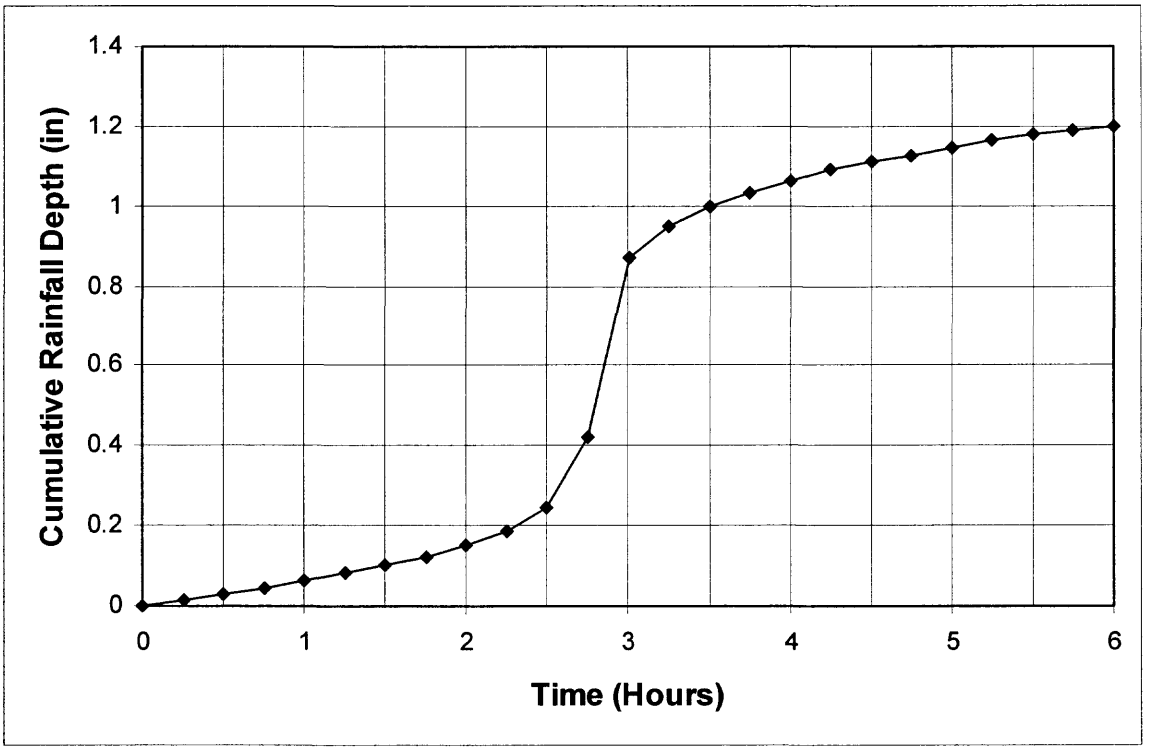
Design Storm: 25-yr, 6-hr -- 1.6 inches

Hour	Min	SCS Type II Cumulative Storm Dist.	25 yr/6 hr Rainfall (in) 1.6	Hour	Min	SCS Type II Cumulative Storm Dist.	25 yr/6 hr Rainfall (in) 1.6
0	0	0	0	3	0	0.728	1.165
	15	0.011	0.018		15	0.791	1.266
	30	0.023	0.037		30	0.834	1.334
	45	0.037	0.059		45	0.862	1.379
1	0	0.053	0.085	4	0	0.887	1.419
	15	0.068	0.109		15	0.911	1.458
	30	0.084	0.134		30	0.926	1.482
	45	0.104	0.166		45	0.940	1.504
2	0	0.125	0.200	5	0	0.955	1.528
	15	0.153	0.245		15	0.969	1.550
	30	0.203	0.325		30	0.983	1.573
	45	0.352	0.563		45	0.992	1.587
				6	0	1.000	1.6



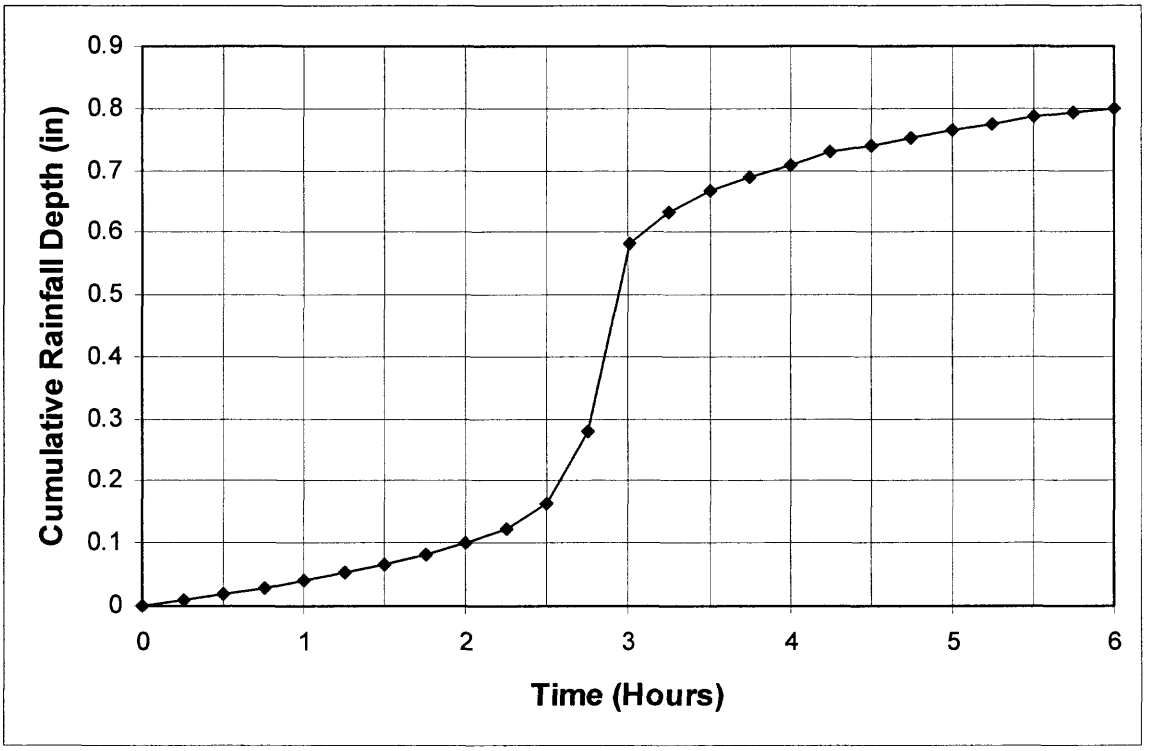
Design Storm: 10-yr, 6-hr -- 1.2 inches

Hour	Min	SCS Type II Cumulative Storm Dist.	10 yr/6 hr Rainfall (in) 1.2	Hour	Min	SCS Type II Cumulative Storm Dist.	10 yr/6 hr Rainfall (in) 1.2
0	0	0	0	3	0	0.728	0.874
	15	0.011	0.013		15	0.791	0.949
	30	0.023	0.028		30	0.834	1.001
	45	0.037	0.044		45	0.862	1.034
1	0	0.053	0.064	4	0	0.887	1.064
	15	0.068	0.082		15	0.911	1.093
	30	0.084	0.101		30	0.926	1.111
	45	0.104	0.125		45	0.940	1.128
2	0	0.125	0.150	5	0	0.955	1.146
	15	0.153	0.184		15	0.969	1.163
	30	0.203	0.244		30	0.983	1.180
	45	0.352	0.422		45	0.992	1.190
				6	0	1.000	1.2



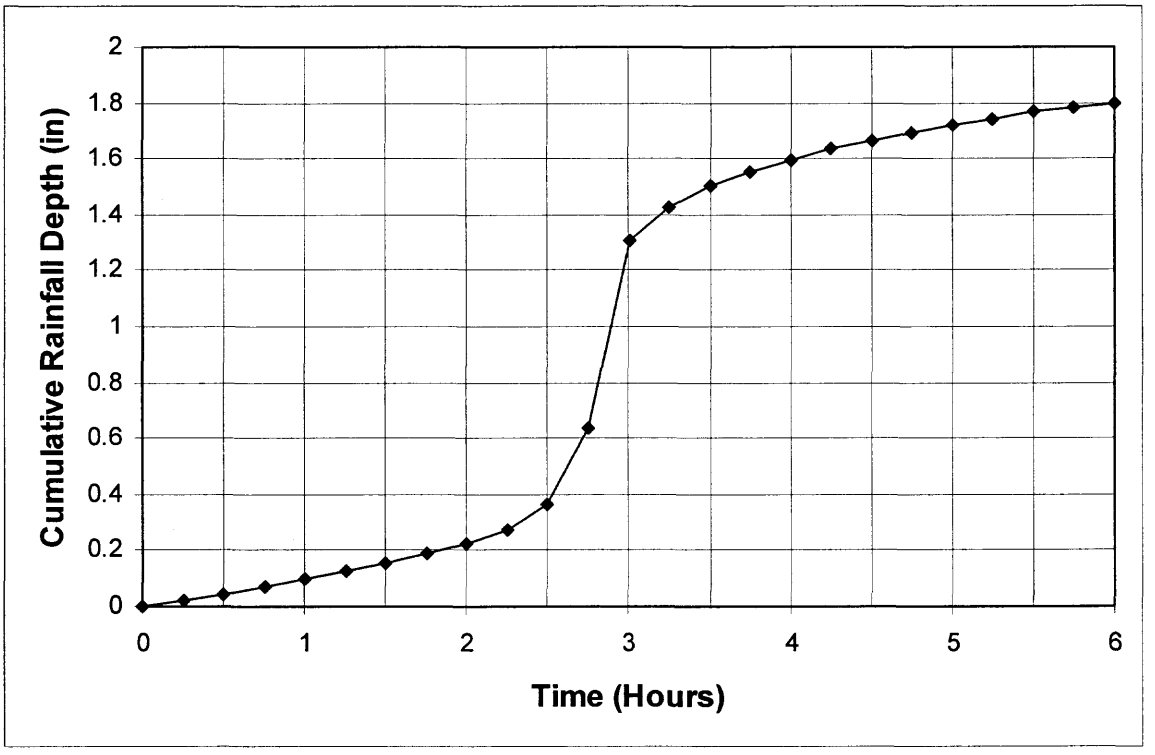
Design Storm: 2-yr, 6-hr – 0.8 inches

Hour	Min	SCS Type II Cumulative Storm Dist.	2 yr/6 hr Rainfall (in) 0.8	Hour	Min	SCS Type II Cumulative Storm Dist.	2 yr/6 hr Rainfall (in) 0.8
0	0	0	0	3	0	0.728	0.582
	15	0.011	0.009		15	0.791	0.633
	30	0.023	0.018		30	0.834	0.667
	45	0.037	0.030		45	0.862	0.690
1	0	0.053	0.042	4	0	0.887	0.710
	15	0.068	0.054		15	0.911	0.729
	30	0.084	0.067		30	0.926	0.741
	45	0.104	0.083		45	0.940	0.752
2	0	0.125	0.100	5	0	0.955	0.764
	15	0.153	0.122		15	0.969	0.775
	30	0.203	0.162		30	0.983	0.786
	45	0.352	0.282		45	0.992	0.794
				6	0	1.000	0.8



Design Storm: 100-yr, 6-hr – 1.8 inches

Hour	Min	SCS Type II Cumulative Storm Dist.	100 yr/6 hr Rainfall (in) 1.8	Hour	Min	SCS Type II Cumulative Storm Dist.	100 yr/6 hr Rainfall (in) 1.8
0	0	0	0	3	0	0.728	1.310
	15	0.011	0.020		15	0.791	1.424
	30	0.023	0.041		30	0.834	1.501
	45	0.037	0.067		45	0.862	1.552
1	0	0.053	0.095	4	0	0.887	1.597
	15	0.068	0.122		15	0.911	1.640
	30	0.084	0.151		30	0.926	1.667
	45	0.104	0.187		45	0.940	1.692
2	0	0.125	0.225	5	0	0.955	1.719
	15	0.153	0.275		15	0.969	1.744
	30	0.203	0.365		30	0.983	1.769
	45	0.352	0.634		45	0.992	1.786
				6	0	1.000	1.8



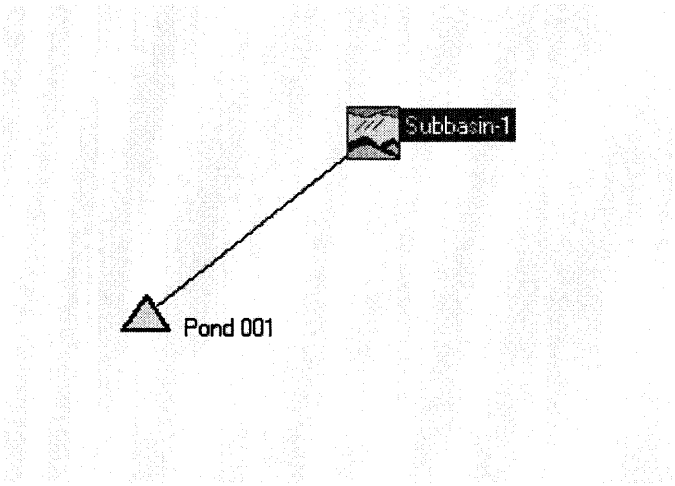
SUBBASIN HYDROLOGY

HMS Subbasin ID: Subbasin 1

Description: Watershed to Pond 001

Subbasin Area: 8.0 acres = 0.0125 sq. miles

HMS Network Diagram:



Loss Rate Method: SCS Curve Number

Area	Area (acres)	Landuse	Soil Type	Slope	Hydrologic Soil Group	Curve Number
1	8.0	Rocky Ledges	Ry	0-80%	-	85 *
Total	8.0		Weighted Average Curve Number			**85**

Soil Types are from Permit ACT/015/007

* SCS surveys for the Carbon-Emery and Emery County Areas were consulted to determine an appropriate Cn for the Ry soil group. No reference areas were found to have been studied. The Cn value of 85 was assumed. This value represents an almost impervious condition that is conservative. Previous permit applications at this site have been approved using Cn's $\leq$ 80 for the 'Rocky Ledges' soil type areas.

Runoff Method: SCS Lag [1]

Lag Time (l_T) = $(L^{0.8} (S+1)^{0.7})/ (1900 Y^{0.5})$

L = 1265 (Hydraulic Length of Watershed in feet)

S = (1000/CN) – 10 = 1.7647

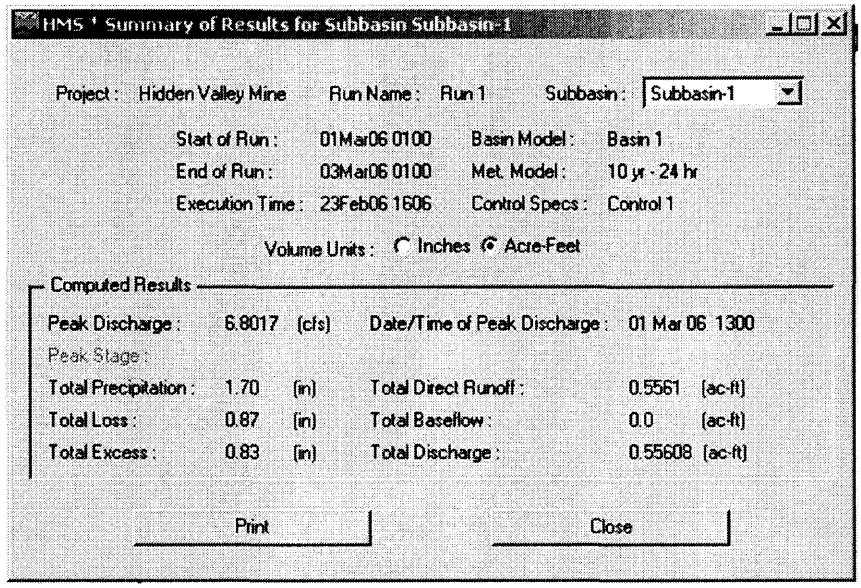
Y = 23 (Average land slope in percent)

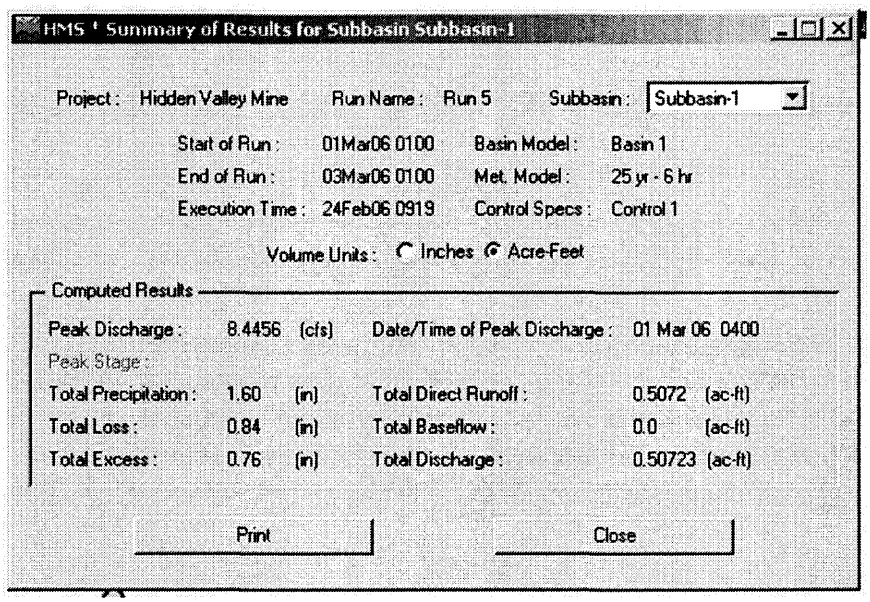
l_T = 0.0677 hours = 4 minutes

DESIGN STORM: 10-yr, 24-hr -- 1.7 inches

HMS Peak Runoff Flow: Qp = 6.8 cfs

HMS Total Discharge: Vt = 0.556 ac-ft





(1) *Applied Hydrology and Sedimentology for Disturbed Areas*, B. J. Barfield, R. C. Warner, and C. T. Haan, p. 102, 1985.

SEDIMENT POND DESIGN

Sediment Storage Volume: USLE

A = (R)(K)(LS)(CP)
A = Average Soil Loss (tons/ac-yr)
R = Rainfall Erosivity Factor (Annual) = 20
K = Soil Erodibility Factor = 0.35 (No local reference found. Value from ACT 015/015)
LS = Slope Length and Steepness Factor [1] = 18
Slope Length = 100, S = 50%
CP = Control Practice Factor[2] = 0.6 (average estimate for disturbed area and rock slopes)

A = (20)(0.35)(18)(0.6) = 75.6tons/ac-yr
A = (75.6)(8) = 604.8 tons/yr

Assume average soil density of 68 pounds per cubic foot (lb/cf)
Total Sediment Volume Vs = (604.8tons)(2000 lb/ton)/((68 lb/cf)(43560 cf/ac-ft))
Vs = 0.41 ac-ft/yr

Pond Sizing:

Minimum pond size criteria to design for can be determined as such:
Design pool volume to contain the 10yr/24 hr event + 1 year estimated sediment storage volume.

V_{pool} = Vt+(Vs) = 0.556+(0.41) = 0.966 ac-ft. = ~1.0 ac-ft

Pool Volume

From the Stage-Area-Storage Relationship on the following page, it can be determined to set the elevation of the Primary Spillway at 5878.0 ft msl, thus creating a pool volume of 1.26 ac-ft. This volume is 0.2 ac-ft (*) above that which is required to fully contain the 10 yr 24 hr event plus an estimated one year's worth of sediment volume. The emergency spillway elevation is set at 5879.0 ft msl.

(*) Note, the 0.2 ac-ft additional capacity is planned, and is adequate to contain additional runoff from the 10yr/24 hr event from watershed #3, if necessary. This design element may be used in the future.

Design Pool Clean Out Criteria

Sediment Pond 001 will have the volume surveyed as required by regulations. Any sediment buildup will be removed (by conventional excavating methods) to restore the design volume of 1.26 ac-ft below the invert of the principal spillway.

(1) *Applied Hydrology and Sedimentology for Disturbed Areas*, B. J. Barfield, R. C. Warner, and C. T. Haan, p. 334, 1985.
(2) *Applied Hydrology and Sedimentology for Disturbed Areas*, B. J. Barfield, R. C. Warner, and C. T. Haan, p. 390, 1985.

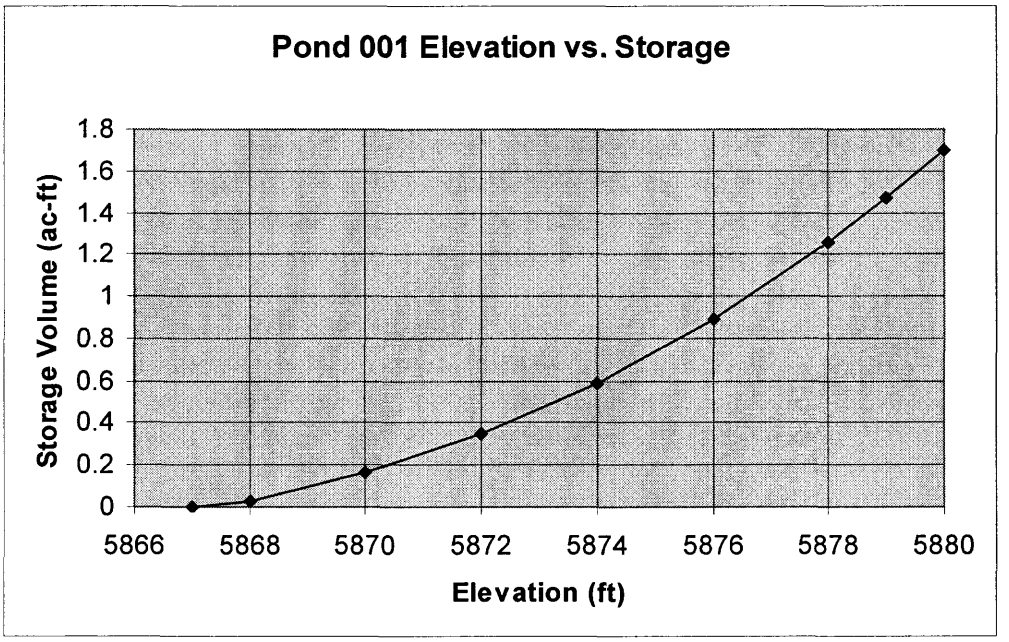
STAGE-AREA-STORAGE RELATIONSHIP

HMS Structure ID: Pond 001

Impounding Structure: Partially - Incised Impoundment

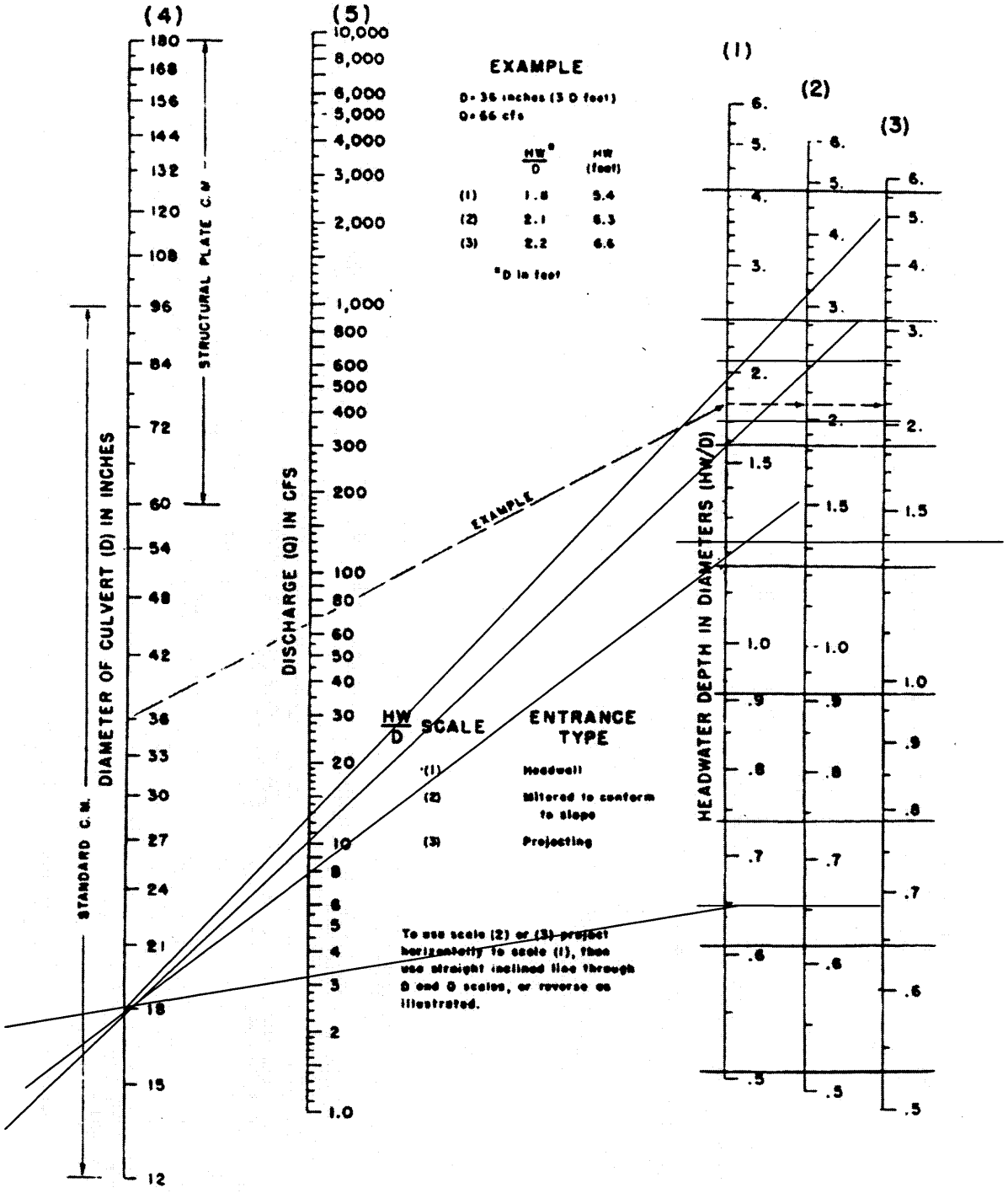
Elevation (MSL)	Stage (feet)	Area (*) (acres)	Average Area (acres)	Incremental Volume (acre-feet)	Cumulative Volume (acre-feet)
5867	0	0		0	0
			0.0284		
5868	1	0.0568		0.0284	0.0284
			0.06835		
5870	3	0.0799		0.1367	0.1651
			0.09285		
5872	5	0.1058		0.1857	0.3508
			0.1201		
5874	7	0.1344		0.2402	0.591
			0.1501		
5876	9	0.1658		0.3002	0.8912
			0.18305		
5878	11	0.2003		0.3661	1.2573
			0.209575		
5879	12	0.21885		0.209575	1.466875
			0.228125		
5880	13	0.2374		0.228125	1.695

(*)Note: The area at even numbered elevations are measured, odd numbers are calculated by ratio & proportion.



DISCHARGE STRUCTURE HYDRAULICS

HMS Structure ID: Pond 001
Description: 18" Diameter CM Culvert As Principal Spillway [1]
Flow Determination:



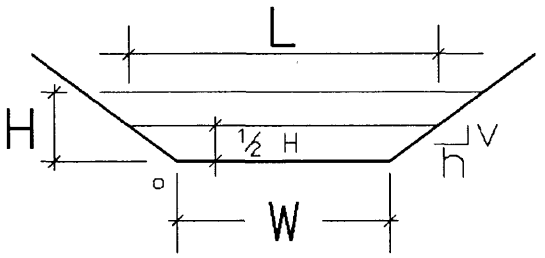
[1] Exhibit 3-10 Headwater depth for CM pipe culverts with inlet control (Ref. Hyd. Eng. Cir. No. 5, USBPR, 1965) Copy attached.

Emergency Spillway Design

HMS Structure ID: Pond 001
Description: Open Channel Emergency Spillway

Emergency Spillway:

Bottom Width W = 5 feet
Weir Coefficient C = 3.1
Side Slopes = 3h:1v
Starting Elevation = 5879.5



Flow Calculation:

$Q = C\ L\ H^{1.5}$

where

Q = flow in cfs
C = weir coefficient
L = width of the weir * L = Avg. Length (at ½ head depth)
H = depth of flow over weir

Elevation-Depth-Discharge Relationship

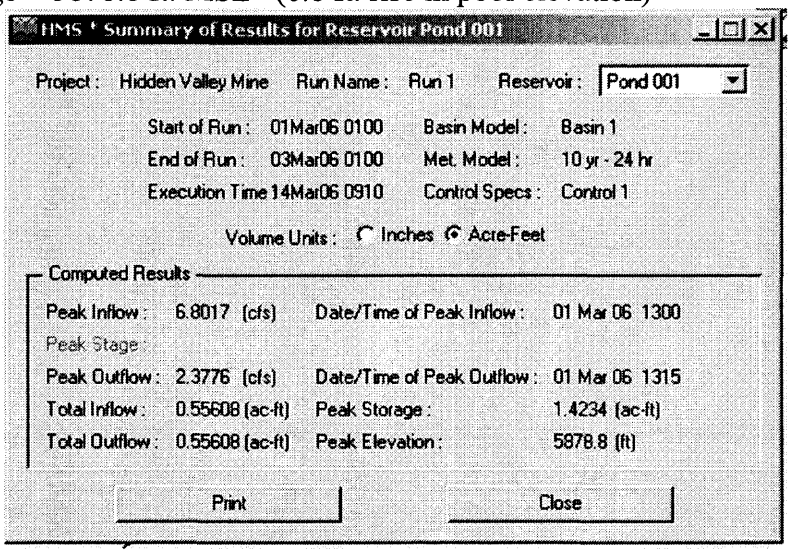
	Principal Spillway			Emergency Spillway			
Elevation (MSL)	**Flow Depth (ft)**	**HW/D**	**Discharge (cfs)**	**Flow Depth (ft)**	**L (ft)**	**Discharge (cfs)**	**Total Flow (cfs)**
5878.0	0.0	0.00	0	0.0	-	-	0.0
5879.0	1.0	0.67	3	0.0	0	0	3.0
5880.0	2.0	1.33	8	1.0	8.0	24.8	32.8

ROUTING RESULTS

HMS Structure ID: Pond 001
HMS Subbasin ID: Subbasin 1

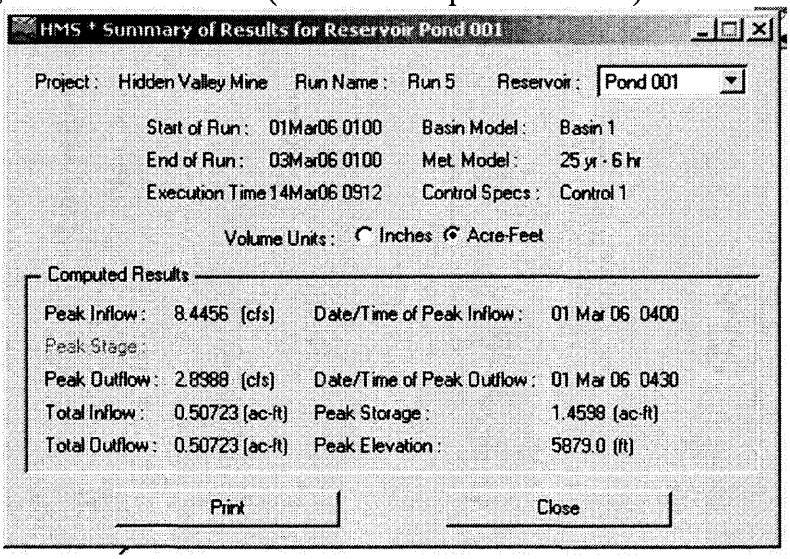
For : 10-yr, 24-hr Design Storm Event:

Peak Inflow to Pond 001 = 6.8 cfs
Total Runoff Volume Vt = 0.56 ac-ft
Peak Discharge Flow = 2.4 cfs
Peak Stage = 5878.8 ft. MSL (0.8 ft. rise in pool elevation)



For : 25-yr, 6-hr Design Storm Event:

Peak Inflow to Pond 001 = 8.45 cfs
Total Runoff Volume Vt= 0.51 ac-ft
Peak Discharge Flow = 2.9 cfs
Peak Stage = 5879.0 ft. MSL (1.0 ft. rise in pool elevation)



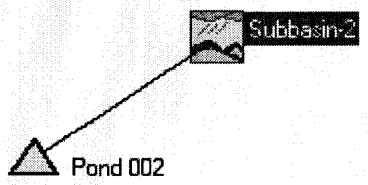
SUBBASIN HYDROLOGY

HMS Subbasin ID: Subbasin 2

Description: Watershed to Pond 002

Subbasin Area: 16.8 acres = 0.0263 sq. miles

HMS Network Diagram:



Loss Rate Method: SCS Curve Number

Area	Area (acres)	Landuse	Soil Type	Slope	Hydrologic Soil Group	Curve Number
1	16.8	Rangeland, Unmanaged	CeE2	0-9%	D	80*
Total	16.8		Weighted Average Curve Number			**80**

Soil Types are from Permit ACT/015/007

SCS surveys for the Carbon-Emery and Emery County Areas were consulted to determine an appropriate Cn for the CeE2 soil group. No references were found. The Cn value of 80 was assumed. This value is considered conservative since previous permit applications at this site have been approved using Cn's < 80 for this soil type.

Runoff Method: SCS Lag [1]

Lag Time (l_T) = $(L^{0.8}(S+1)^{0.7})/(1900\ Y^{0.5})$

L = 1100 (Hydraulic Length of Watershed in feet)

S = (1000/CN) – 10 = 2.5

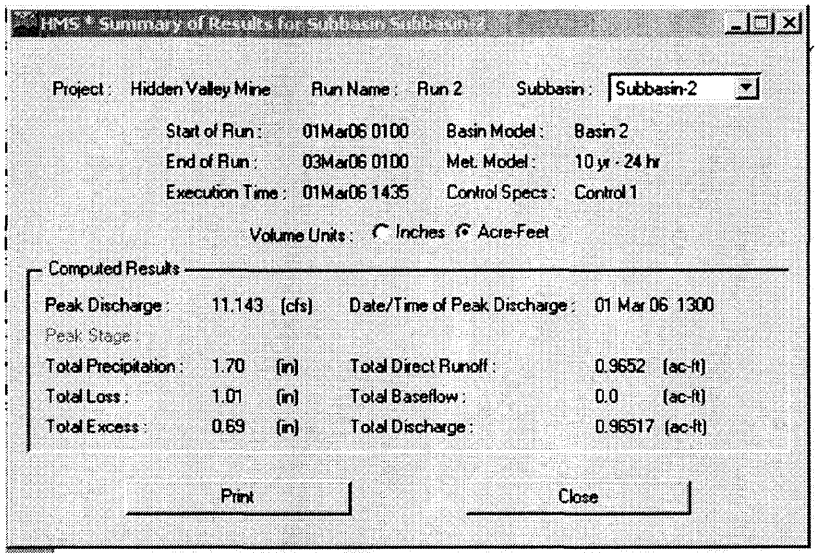
Y = 6 (Average land slope in percent)

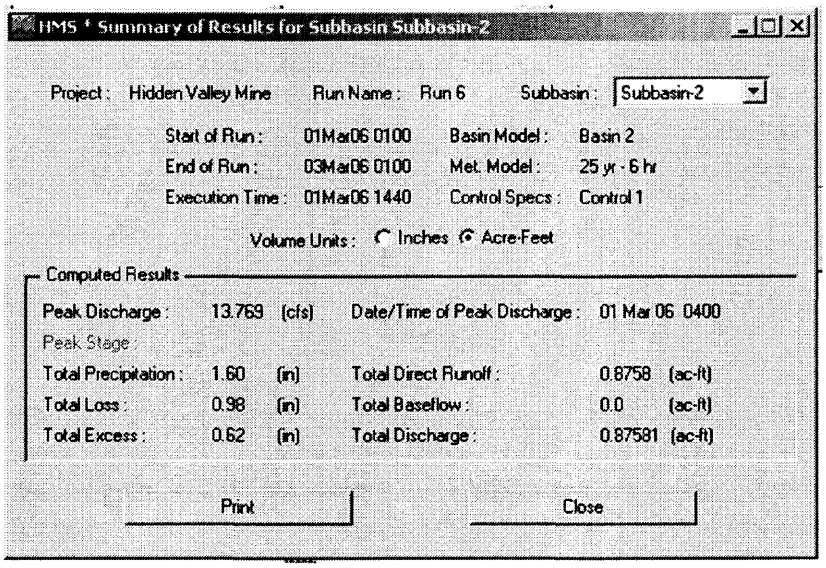
l_T = 0.14 hours = 8.4 minutes

Design Storm: 10-yr, 24-hr -- 1.7 inches

HMS Peak Runoff Flow: Qp = 11.1 cfs

HMS Total Discharge: Vt = 0.965 ac-ft





[1] *Applied Hydrology and Sedimentology for Disturbed Areas*, B. J. Barfield, R. C. Warner, and C. T. Haan, p. 102, 1985.

SEDIMENT POND DESIGN

Sediment Storage Volume: USLE

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

A = Average Soil Loss (tons/ac-yr)
R = Rainfall Erosivity Factor (Annual) = 20
K = Soil Erodibility Factor = 0.35 (No local reference found. Value from ACT 015/015)
LS = Slope Length and Steepness Factor [1] = 5.2
Slope Length = 80, S = 25%
CP = Control Practice Factor[2] = 0.6
(average estimate for 11 ac disturbed area seeded (0.9) and 5.8 ac undisturbed (0.05)

A = (20)(0.35)(5.2)(0.6) = 21.8 tons/ac-yr
A = (21.8)(16.8) = 366 tons/yr

Assume average soil density of 68 pounds per cubic foot (lb/cf)
Total Sediment Volume Vs = (366tons)(2000 lb/ton)/((68 lb/cf)(43560 cf/ac-ft))
Vs = 0.25 ac-ft/yr

Pond Sizing:

Minimum pond size criteria to design for can be determined as such:
Design pool volume to contain the 10yr/24 hr event + 2 years estimated sediment storage volume.

V_{pool} = Vt+2(Vs) = 0.965+2(0.25) = 1.47 ac-ft.

Pool Volume
From the Stage-Area-Storage Relationship on the following page, it can be determined to set the elevation of the Primary Spillway at 6099.0 ft msl, and the Emergency Spillway at 6101.0 ft msl. This creates a normal pool volume of 1.38 ac-ft, sufficient enough to fully contain the 10 yr 24 hr event (plus an estimated two year's worth of sediment volume). If the pool elevation is at normal pool when the design storm arrives, the impoundment can hold the design storm volume prior to its discharge thru the Emergency Spillway.

Design Pool Clean Out Criteria
Sediment Pond 002 will have the volume surveyed as required by regulations. Any sediment buildup will be removed (by conventional excavating methods) to restore the design volume of 1.38 ac-ft below the invert of the principal spillway.

(1) *Applied Hydrology and Sedimentology for Disturbed Areas*, B. J. Barfield, R. C. Warner, and C. T. Haan, p. 334, 1985.
(2) *Applied Hydrology and Sedimentology for Disturbed Areas*, B. J. Barfield, R. C. Warner, and C. T. Haan, p. 390, 1985.

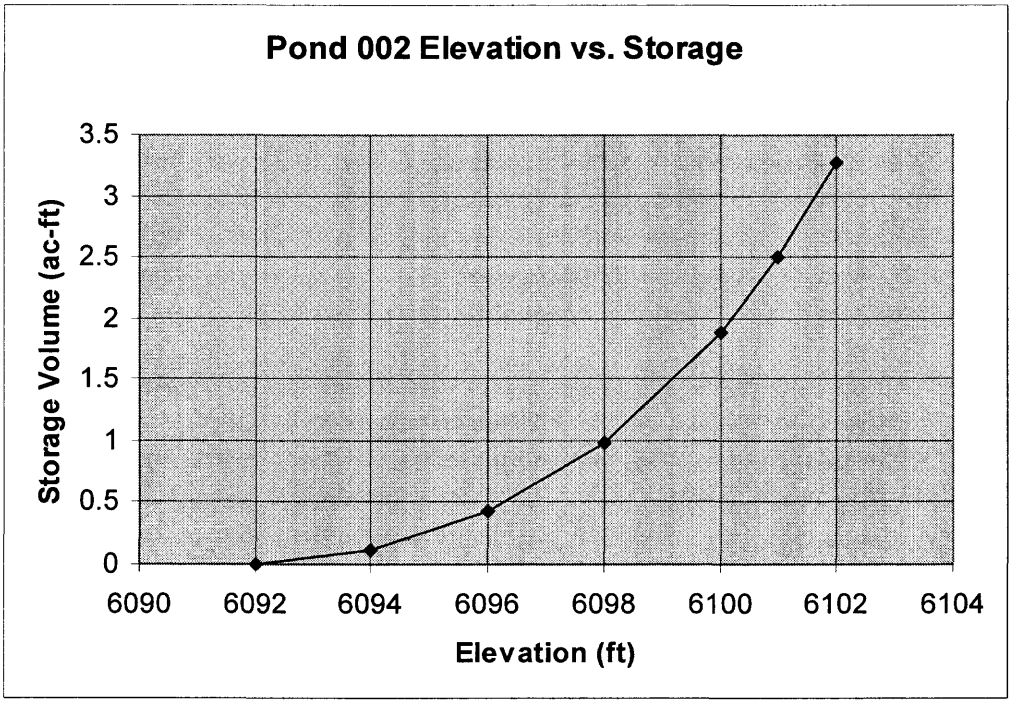
STAGE-AREA-STORAGE RELATIONSHIP

HMS Structure ID: Pond 002

Impounding Structure: Cross Valley Impoundment

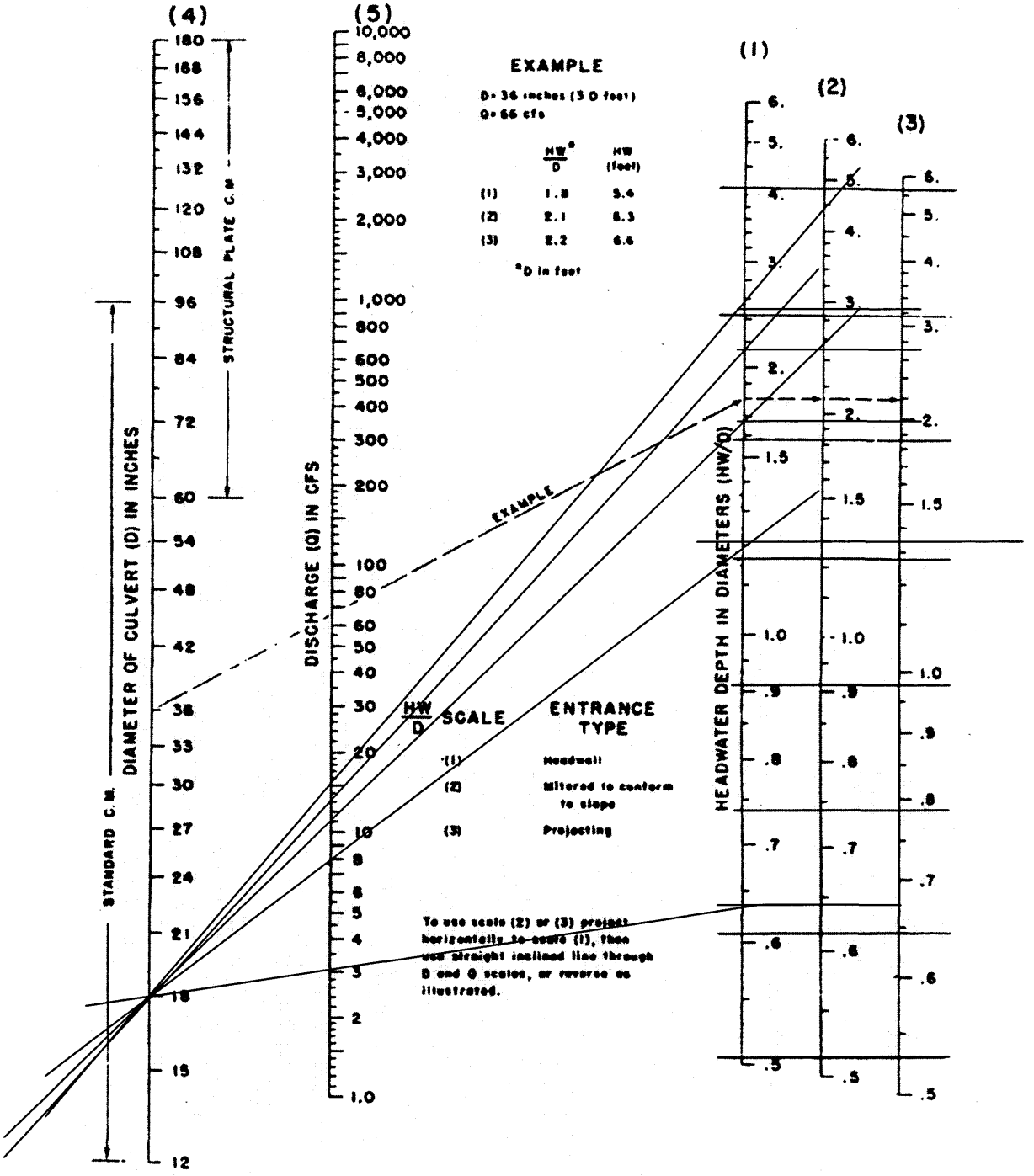
Elevation (MSL)	Stage (feet)	Area (*) (acres)	Average Area (acres)	Incremental Volume (acre-feet)	Cumulative Volume (acre-feet)
6092	0	0.0137		0	0
			0.0566		
6094	2	0.0995		0.1132	0.1132
			0.15575		
6096	4	0.212		0.3115	0.4247
			0.28075		
6098	6	0.3495		0.5615	0.9862
			0.399675		
6099	7	0.44985		0.399675	1.385875
			0.500025		
6100	8	0.5502		0.500025	1.8859
			0.62145		
6101	9	0.6927		0.62145	2.50735
			0.76395		
6102	10	0.8352		0.76395	3.2713

(*)Note: The area at even numbered elevations are measured, odd numbers are calculated by ratio & proportion.



DISCHARGE STRUCTURE HYDRAULICS

HMS Structure ID: Pond 002
Description: 18" Diameter CM Culvert As Principal Spillway [1]
Flow Determination:



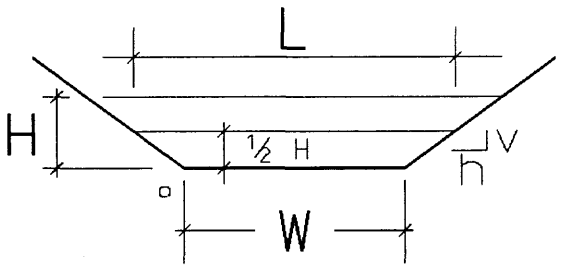
[1] Exhibit 3-10 Headwater depth for CM pipe culverts with inlet control (Ref. Hyd. Eng. Cir. No. 5, USBPR, 1965) Copy attached.

Emergency Spillway Design

HMS Structure ID: Pond 002
Description: Open Channel Emergency Spillway

Emergency Spillway:

Bottom Width W = 5 feet
Weir Coefficient C = 3.1
Side Slopes = 3h:1v
Starting Elevation = 6101.0



Flow Calculation:

$Q = C\ L\ H^{1.5}$

where

Q = flow in cfs
C = weir coefficient
L = width of the weir * L = Avg. Length (at ½ head depth)
H = depth of flow over weir

Elevation-Depth-Discharge Relationship

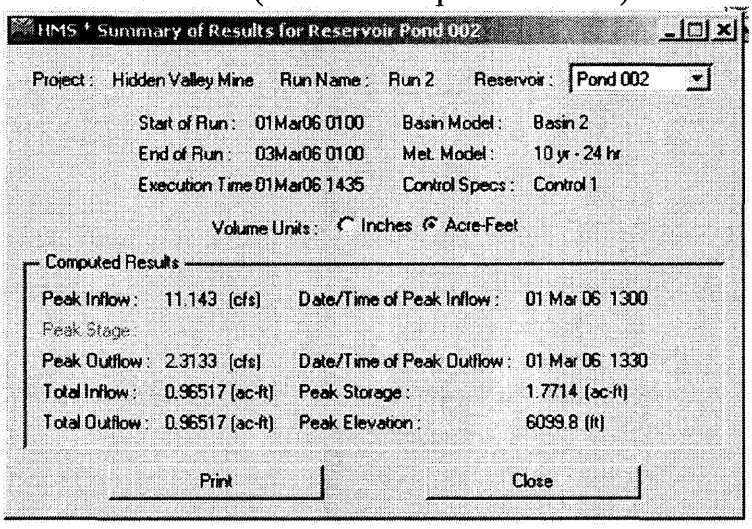
	Principal Spillway			Emergency Spillway			
Elevation (MSL)	**Flow Depth (ft)**	**HW/D**	**Discharge (cfs)**	**Flow Depth (ft)**	**L (ft)**	**Discharge (cfs)**	**Total Flow (cfs)**
6099.0	0.0	0.00	0	-	-	-	0
6100.0	1.0	0.67	3	-	-	-	3
6101.0	2.0	1.33	8	0.0	0	0	8
6102.0	3.0	2.00	11	1.0	8.0	24.8	35.8
6103.0	4.0	2.67	13	2.0	11.0	96.4	109.4

ROUTING RESULTS

HMS Structure ID: Pond 002
HMS Subbasin ID: Subbasin 2

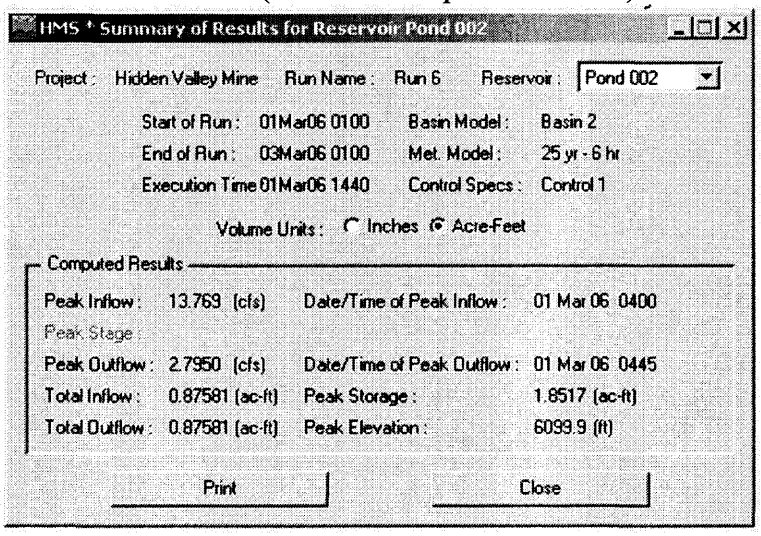
For : 10-yr, 24-hr Design Storm Event:

Peak Inflow to Pond 002 = 11.1 cfs
Total Runoff Volume Vt = 0.965 ac-ft
Peak Discharge Flow = 2.31 cfs
Peak Stage = 6099.8 ft. MSL (0.8 ft. rise in pool elevation)



For : 25-yr, 6-hr Design Storm Event:

Peak Inflow to Pond 002 = 13.77 cfs
Total Runoff Volume Vt= 0.876 ac-ft
Peak Discharge Flow = 2.78 cfs
Peak Stage = 6099.9 ft. MSL (0.9 ft. rise in pool elevation)



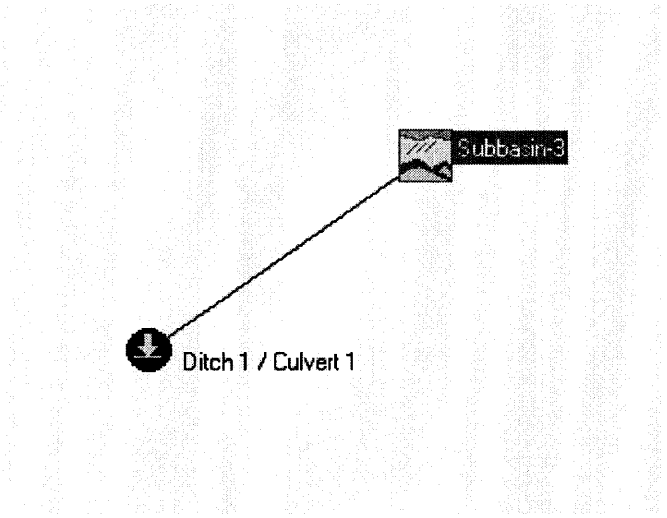
SUBBASIN HYDROLOGY

HMS Subbasin ID: Subbasin 3

Description: Watershed to Ditch D1- Diversion Above A Seam Portal

Subbasin Area: 2.1 acres = 0.00328 sq. miles

HMS Network Diagram:



Loss Rate Method: SCS Curve Number

Area	Area (acres)	Landuse	Soil Type	Slope	Hydrologic Soil Group	Curve Number
1	2.0	Rocky Ledges	Ry	0-85%	D	85
2	0.1	Rangeland, Unmanaged	CeE2	0-8%	D	80
Total	2.1		Weighted Average Curve Number			**84.7**

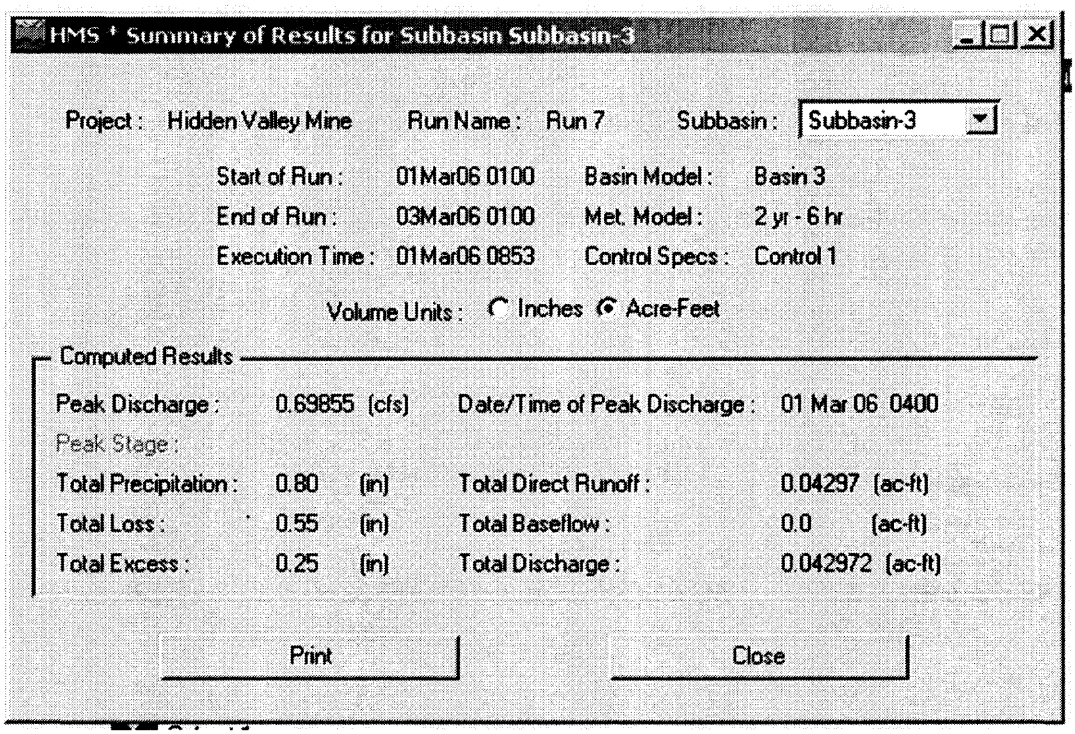
Soil Types are from Permit ACT/015/007

Runoff Method: SCS Lag [1]

Lag Time (l_T) = $(L^{0.8}(S+1)^{0.7})/(1900\ Y^{0.5})$
L = 265 (Hydraulic Length of Watershed in feet)
S = (1000/CN) – 10 = 1.806
Y = 61 (Average land slope in percent)
l_T = 0.012 hours = 1 minutes

Design Storm: 2-yr, 6-hr – 0.8 inches

HMS Peak Runoff Flow: Qp = 0.7 cfs
HMS Total Discharge: Vt = 0.04 ac-ft

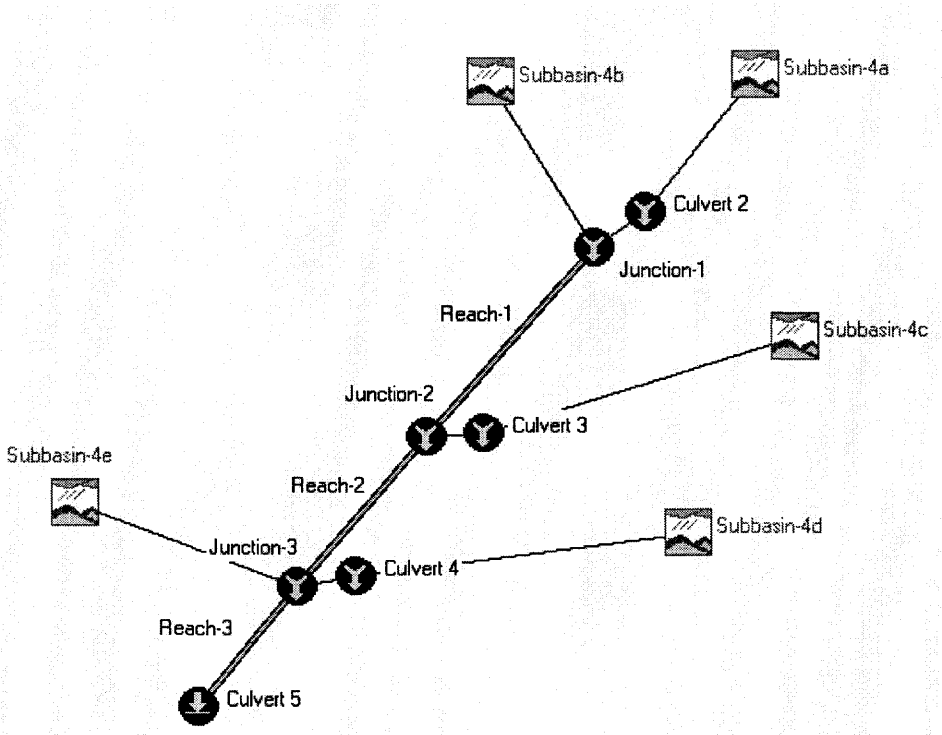


[1] *Applied Hydrology and Sedimentology for Disturbed Areas*, B. J. Barfield, R. C. Warner, and C. T. Haan, p. 102, 1985.

SUBBASIN HYDROLOGY

HMS Subbasin ID: Subbasin 4

Description: Watershed of the Ephemeral Channel



Watershed 4 has been divided into 5 sub-watersheds connected with 3 reaches for hydrologic analysis. The hydrologic result from each watershed is then used to design the hydraulic capacities of the respective ditch and / or culverts within the entire watershed.

Watershed 4 also contains the hydraulic features of the Canyon Entrance Road. All of the culverts and constructed road ditches will be designed to pass the peak discharges from the 10-yr, 6-hr storm event per 742.323 and 742.423.1.

HMS Subbasin ID: Subbasin 4a

Description: Watershed to Culvert 2

Subbasin Area: 80.2 acres = 0.1253 sq. miles

Loss Rate Method: SCS Curve Number

Area	Area (acres)	Landuse	Soil Type	Slope	Hydrologic Soil Group	Curve Number
1	21.9	Rocky Ledges	Ry	0-85%	D	85
2	58.3	Rangeland, Unmanaged	CeE2	0-8%	D	80
Total	80.2		Weighted Average Curve Number			**81.4**

Soil Types are from Permit ACT/015/007

Runoff Method: SCS Lag [1]

Lag Time (l_T) = $(L^{0.8}(S+1)^{0.7})/(1900\ Y^{0.5})$
L = 1825 (Hydraulic Length of Watershed in feet)
S = (1000/CN) – 10 = 2.285
Y = 6 (Average land slope in percent)
l_T = 0.2008 hours = 12 minutes

Design Storm: 10-yr, 6-hr – 1.2 inches (design event per 742.323 and 742.423.1)

HMS Peak Runoff Flow: 34.0 cfs
HMS Total Discharge: 2.76 ac-ft

(1) *Applied Hydrology and Sedimentology for Disturbed Areas*, B. J. Barfield, R. C. Warner, and C. T. Haan, p. 102, 1985.

SUBBASIN HYDROLOGY

HMS Subbasin ID: Subbasin 4b

Description: Watershed to Junction 1

Subbasin Area: 6.7 acres = 0.0105 sq. miles

Loss Rate Method: SCS Curve Number

Area	Area (acres)	Landuse	Soil Type	Slope	Hydrologic Soil Group	Curve Number
1	3.4	Rocky Ledges	Ry	0-85%	D	85
2	3.3	Rangeland, Unmanaged	CeE2	0-8%	D	80
Total	6.7		Weighted Average Curve Number			**82.5**

Soil Types are from Permit ACT/015/007

Runoff Method: SCS Lag [1]

Lag Time (l_T) = $(L^{0.8}(S+1)^{0.7})/(1900\ Y^{0.5})$
L = 1045 (Hydraulic Length of Watershed in feet)
S = (1000/CN) – 10 = 2.151
Y = 9 (Average land slope in percent)
l_T = 0.1013 hours = 6 minutes

Design Storm: 10-yr, 6-hr – 1.2 inches (design event per 742.323 and 742.423.1)

HMS Peak Runoff Flow: 4.0 cfs
HMS Total Discharge: 0.24 ac-ft

(1) *Applied Hydrology and Sedimentology for Disturbed Areas*, B. J. Barfield, R. C. Warner, and C. T. Haan, p. 102, 1985.

SUBBASIN HYDROLOGY

HMS Subbasin ID: Subbasin 4c

Description: Watershed to Culvert 3

Subbasin Area: 8.3 acres = 0.001297 sq. miles

Loss Rate Method: SCS Curve Number

Area	Area (acres)	Landuse	Soil Type	Slope	Hydrologic Soil Group	Curve Number
1	4.2	Rocky Ledges	Ry	0-85%	D	85
2	4.1	Rangeland, Unmanaged	CeE2	0-8%	D	80
Total	8.3		Weighted Average Curve Number			**82.5**

Soil Types are from Permit ACT/015/007

Runoff Method: SCS Lag [1]

Lag Time (l_T) = $(L^{0.8}(S+1)^{0.7})/(1900\ Y^{0.5})$
L = 870 (Hydraulic Length of Watershed in feet)
S = (1000/CN) – 10 = 2.121
Y = 17 (Average land slope in percent)
l_T = 0.0636 hours = 4 minutes

Design Storm: 10-yr, 6-hr – 1.2 inches (design event per 742.323 and 742.423.1)

HMS Peak Runoff Flow: 0.49 cfs
HMS Total Discharge: 0.03 ac-ft

(1) *Applied Hydrology and Sedimentology for Disturbed Areas*, B. J. Barfield, R. C. Warner, and C. T. Haan, p. 102, 1985.

SUBBASIN HYDROLOGY

HMS Subbasin ID: Subbasin 4d

Description: Watershed to Culvert 4

Subbasin Area: 5.8 acres = 0.009063 sq. miles

Loss Rate Method: SCS Curve Number

Area	Area (acres)	Landuse	Soil Type	Slope	Hydrologic Soil Group	Curve Number
1	3.9	Rocky Ledges	Ry	0-85%	D	85
2	1.9	Rangeland, Unmanaged	CeE2	0-8%	D	80
Total	5.8		Weighted Average Curve Number			**83.4**

Soil Types are from Permit ACT/015/007

Runoff Method: SCS Lag [1]

Lag Time (l_T) = $(L^{0.8}(S+1)^{0.7})/(1900\ Y^{0.5})$
L = 555 (Hydraulic Length of Watershed in feet)
S = (1000/CN) – 10 = 1.990
Y = 39 (Average land slope in percent)
l_T = 0.0285 hours = 2 minutes

Design Storm: 10-yr, 6-hr – 1.2 inches (design event per 742.323 and 742.423.1)

HMS Peak Runoff Flow: 3.6 cfs
HMS Total Discharge: 0.22 ac-ft

(1) *Applied Hydrology and Sedimentology for Disturbed Areas*, B. J. Barfield, R. C. Warner, and C. T. Haan, p. 102, 1985.

SUBBASIN HYDROLOGY

HMS Subbasin ID: Subbasin 4e

Description: Watershed to Junction 3

Subbasin Area: 13.9 acres = 0.02172 sq. miles

Loss Rate Method: SCS Curve Number

Area	Area (acres)	Landuse	Soil Type	Slope	Hydrologic Soil Group	Curve Number
1	10.3	Rocky Ledges	Ry	0-85%	D	85
2	3.6	Rangeland, Unmanaged	CeE2	0-8%	D	80
Total	13.9		Weighted Average Curve Number			**83.7**

Soil Types are from Permit ACT/015/007

Runoff Method: SCS Lag [1]

Lag Time (l_T) = $(L^{0.8}(S+1)^{0.7})/(1900\ Y^{0.5})$
L = 1245 (Hydraulic Length of Watershed in feet)
S = (1000/CN) – 10 = 1.947
Y = 20 (Average land slope in percent)
l_T = 0.0751 hours = 5 minutes

Design Storm: 10-yr, 6-hr – 1.2 inches (design event per 742.323 and 742.423.1)

HMS Peak Runoff Flow: 8.7 cfs
HMS Total Discharge: 0.53 ac-ft

(1) *Applied Hydrology and Sedimentology for Disturbed Areas*, B. J. Barfield, R. C. Warner, and C. T. Haan, p. 102, 1985.

REACH HYDROLOGY

HMS Structure ID: Reach 1
Description: Ephemeral Channel - Junction #1 to Junction #2

Lag Time Determination: SCS Lag [1]

Lag Time (l_T) = $(L^{0.8}(S+1)^{0.7})/(1900\ Y^{0.5})$
L = 585 (Hydraulic Length in feet)
S = (1000/CN) – 10 = 1.765 Cn = 85 (Ry soil type)
Y = 8.5 (Average land slope in percent)
l_T = 0.0602 hours = 3.6 minutes

HMS Structure ID: Reach 2
Description: Ephemeral Channel - Junction #2 to Junction #3

Lag Time Determination: SCS Lag [1]

Lag Time (l_T) = $(L^{0.8}(S+1)^{0.7})/(1900\ Y^{0.5})$
L = 430 (Hydraulic Length in feet)
S = (1000/CN) – 10 = 1.765 Cn = 85 (Ry soil type)
Y = 12.8 (Average land slope in percent)
l_T = 0.0383 hours = 2.3 minutes

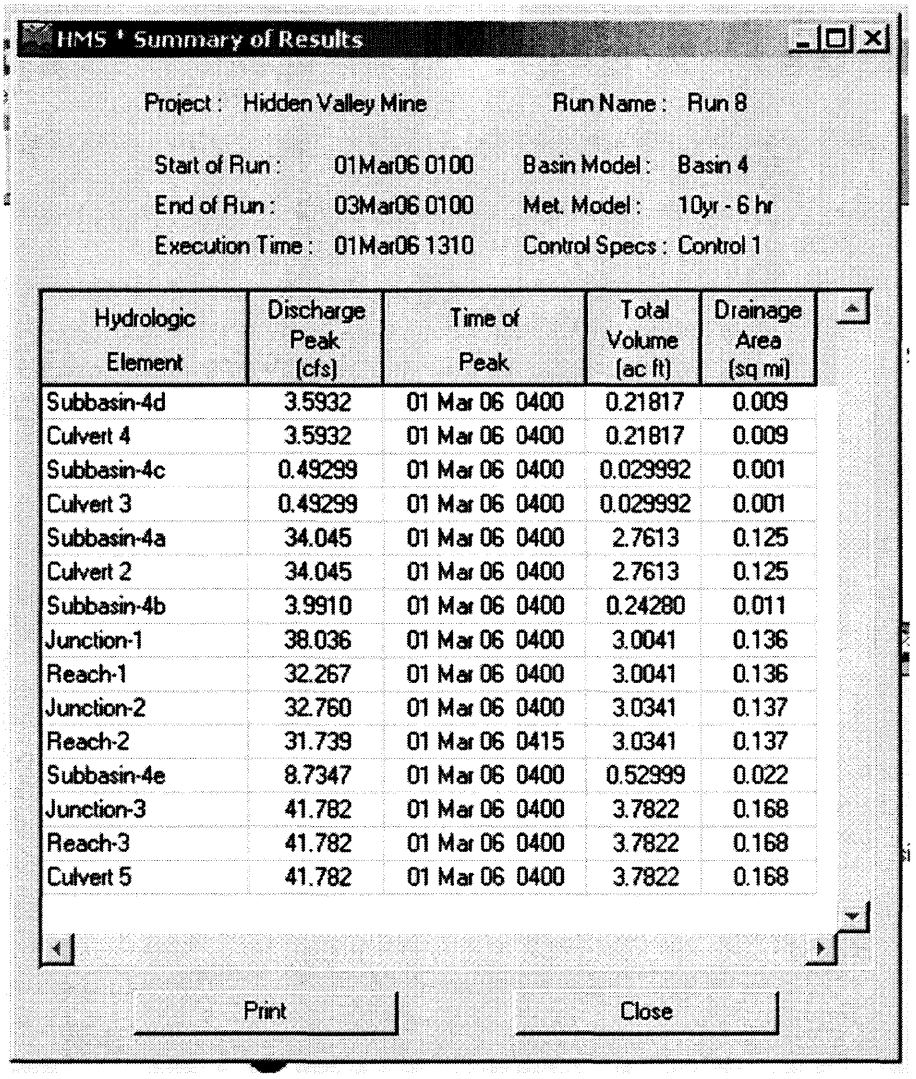
HMS Structure ID: Reach 3
Description: Ephemeral Channel - Junction #3 to Culvert #5

Lag Time Determination: SCS Lag [1]

Lag Time (l_T) = $(L^{0.8}(S+1)^{0.7})/(1900\ Y^{0.5})$
L = 110 (Hydraulic Length in feet)
S = (1000/CN) – 10 = 1.765 Cn = 85 (Ry soil type)
Y = 40.9 (Average land slope in percent)
l_T = 0.0072 hours = 0.4 minutes

(1) *Applied Hydrology and Sedimentology for Disturbed Areas*, B. J. Barfield, R. C. Warner, and C. T. Haan, p. 102, 1985.

HMS Output – Summary of Results – Subbasin 4



HMS ' Summary of Results

Project : Hidden Valley Mine Run Name : Run 8

Start of Run : 01Mar06 0100 Basin Model : Basin 4

End of Run : 03Mar06 0100 Met. Model : 10yr - 6 hr

Execution Time : 01Mar06 1310 Control Specs : Control 1

Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Total Volume (ac ft)	Drainage Area (sq mi)
Subbasin-4d	3.5932	01 Mar 06 0400	0.21817	0.009
Culvert 4	3.5932	01 Mar 06 0400	0.21817	0.009
Subbasin-4c	0.49299	01 Mar 06 0400	0.029992	0.001
Culvert 3	0.49299	01 Mar 06 0400	0.029992	0.001
Subbasin-4a	34.045	01 Mar 06 0400	2.7613	0.125
Culvert 2	34.045	01 Mar 06 0400	2.7613	0.125
Subbasin-4b	3.9910	01 Mar 06 0400	0.24280	0.011
Junction-1	38.036	01 Mar 06 0400	3.0041	0.136
Reach-1	32.267	01 Mar 06 0400	3.0041	0.136
Junction-2	32.760	01 Mar 06 0400	3.0341	0.137
Reach-2	31.739	01 Mar 06 0415	3.0341	0.137
Subbasin-4e	8.7347	01 Mar 06 0400	0.52999	0.022
Junction-3	41.782	01 Mar 06 0400	3.7822	0.168
Reach-3	41.782	01 Mar 06 0400	3.7822	0.168
Culvert 5	41.782	01 Mar 06 0400	3.7822	0.168

Print Close

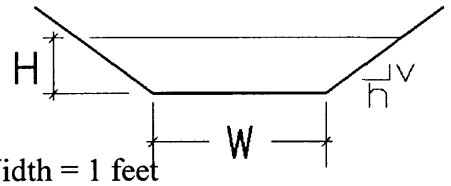
DITCH /CULVERT DESIGNS - STRUCTURE HYDRAULICS

HMS Structure ID: Ditch D1 / Culvert 1

Description: Ditch D1 – Diversion above A Seam Portal

Ditch D1 is an existing structure approved under ACT015/007. This design is presented only to ascertain a minimum acceptable size. No changes to the existing structure is planned.

Design Flow = 0.7 cfs (Peak Discharge from Subbasin 3)



Using Manning's Equation where $Q = (1.49/n)\,(A)(R)^{.67}\,(S)^{0.5}$

Q = flow in cfs
n = Manning's n = 0.04
R = hydraulic radius
S = Slope = 0.005 ft/ft

Bottom Width = 1 feet
Side Slopes = 2.0h:1v
Area = cross sectional area
P = wetted perimeter

Depth-Area-Flow-Velocity Determination

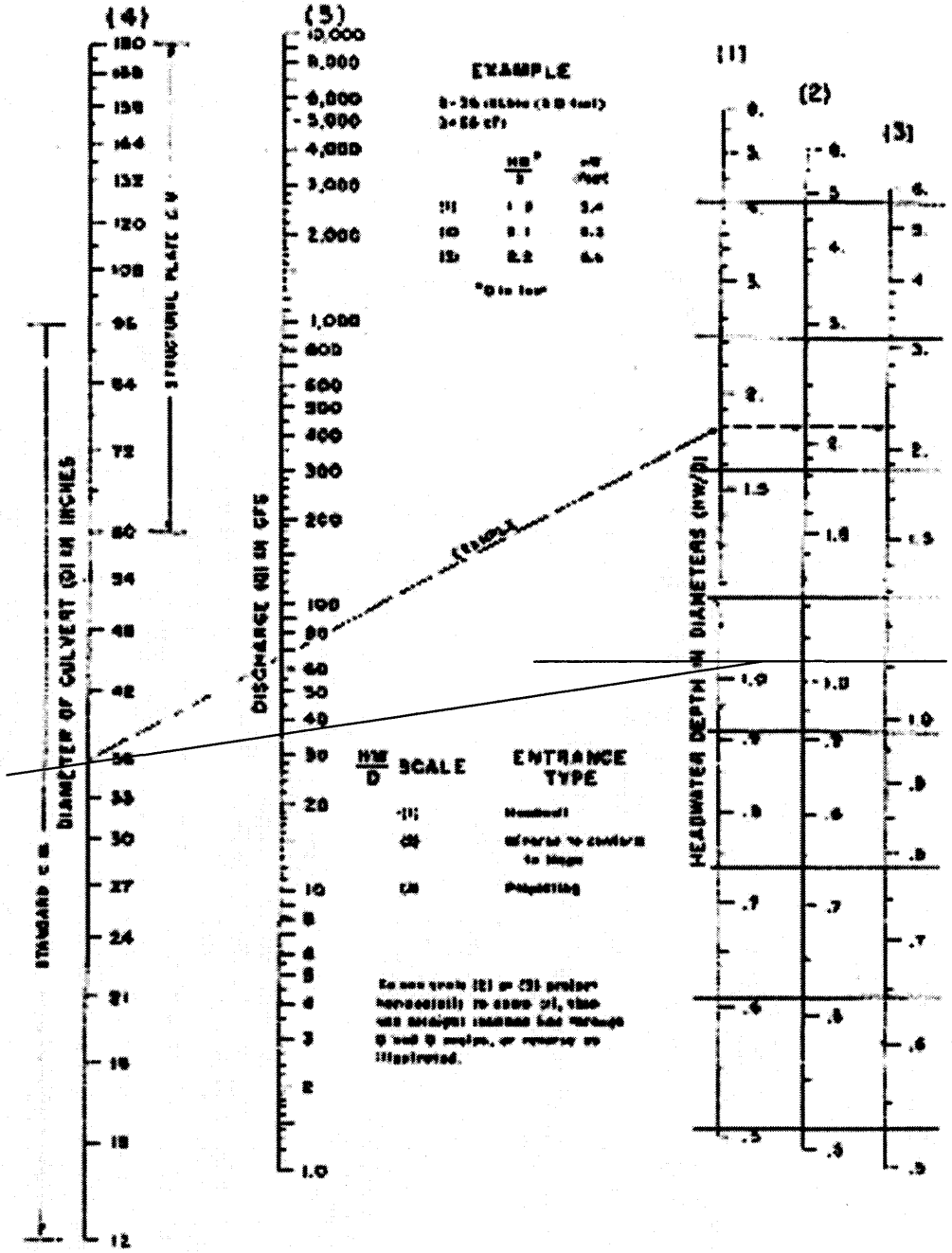
Depth (ft.)	Area (sq. ft.)	P (ft.)	R (ft.)	Top Width (ft.)	Q (cfs)	V (fps)
0.00	0	1.00	0.000	1.0	0.0	0.0
0.10	0.12	1.45	0.083	1.4	0.1	0.5
0.20	0.28	1.89	0.148	1.8	0.2	0.7
0.30	0.48	2.34	0.205	2.2	0.4	0.9
0.40	0.72	2.79	0.258	2.6	0.8	1.1
0.50	1.00	3.24	0.309	3.0	1.2	1.2
0.60	1.32	3.68	0.358	3.4	1.7	1.3
0.70	1.68	4.13	0.407	3.8	2.4	1.4
0.80	2.08	4.58	0.454	4.2	3.2	1.6

Design Depth of Flow $\leq$ 0.4 feet OK
Design Maximum Velocity $\leq$ 1.1 fps OK

Description: Hydraulic Capacity for Culvert 1

Use an 18" Diameter CMP.... From the discharge structure hydraulics previously presented in this document, it is shown that an 18" diameter cmp can pass a 3 cfs peak flow at a flow depth of 1 ft (hw/d = 0.67). It is obvious that this size culvert is adequate to pass the 0.7 cfs peak flow.

HMS Structure ID: Culvert 2
Description: Culvert Crossing on the Canyon Entrance Road
Design Flow = 34.0 cfs (Peak Discharge from Subbasin 4a)



Description: Hydraulic Capacity for Culvert 2

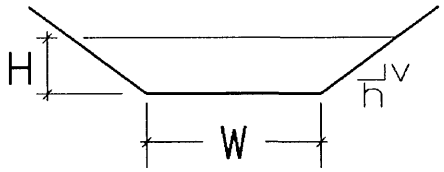
Use a 36" Diameter CMP…. From the chart above, a 36" cmp will pass 35 cfs at a HW/D = 1.1 (approx 40 in.).

(1) Exhibit 3-10 Headwater depth for CM pipe culverts with inlet control (Ref. Hyd. Eng. Cir. No. 5, USBPR, 1965) Copy attached.

HMS Structure ID: Ditch D2

Description: Ditch D2 – Road Ditch

Design Flow = 4.0 cfs (Peak Discharge from Subbasin 4b)



Using Manning's Equation where $Q = (1.49/n)\ (A)(R)^{.67}\ (S)^{0.5}$

Q = flow in cfs
n = Manning's n = 0.04
R = hydraulic radius
S = Slope = 0.067 ft/ft

Bottom Width = 3 feet
Side Slopes = 2.0h:1v
Area = cross sectional area
P = wetted perimeter

Depth-Area-Flow-Velocity Determination

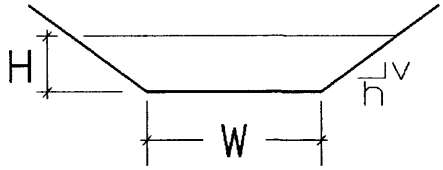
Depth (ft.)	Area (sq. ft.)	P (ft.)	R (ft.)	Top Width (ft.)	Q (cfs)	V (fps)
0.00	0	3.00	0.000	3.0	0.0	0.0
0.10	0.32	3.45	0.093	3.4	0.6	2.0
0.20	0.68	3.89	0.175	3.8	2.0	3.0
0.30	1.08	4.34	0.249	4.2	4.1	3.8
0.40	1.52	4.79	0.317	4.6	6.8	4.5
0.50	2.00	5.24	0.382	5.0	10.1	5.1
0.60	2.52	5.68	0.443	5.4	14.1	5.6
0.70	3.08	6.13	0.502	5.8	18.7	6.1
0.80	3.68	6.58	0.559	6.2	24.0	6.5

Design Depth of Flow $\leq$ 0.3 feet OK
Design Maximum Velocity $\leq$ 4.0 fps OK

HMS Structure ID: Ditch D3 / Culvert 3

Description: Ditch D3

Design Flow = 0.5 cfs (Peak Discharge from Subbasin 4c)



Using Manning's Equation where $Q = (1.49/n)\ (A)(R)^{.67}\ (S)^{0.5}$

Q = flow in cfs
n = Manning's n = 0.04
R = hydraulic radius
S = Slope = 0.068 ft/ft

Bottom Width = 2 feet
Side Slopes = 2.0h:1v
Area = cross sectional area
P = wetted perimeter

Depth-Area-Flow-Velocity Determination

Depth (ft.)	Area (sq. ft.)	P (ft.)	R (ft.)	Top Width (ft.)	Q (cfs)	V (fps)
0.00	0	3.00	0.000	3.0	0.0	0.0
0.10	0.32	3.45	0.093	3.4	0.6	2.0
0.20	0.68	3.89	0.175	3.8	2.1	3.0
0.30	1.08	4.34	0.249	4.2	4.1	3.8
0.40	1.52	4.79	0.317	4.6	6.8	4.5
0.50	2.00	5.24	0.382	5.0	10.2	5.1
0.60	2.52	5.68	0.443	5.4	14.2	5.6
0.70	3.08	6.13	0.502	5.8	18.9	6.1
0.80	3.68	6.58	0.559	6.2	24.2	6.6

Design Depth of Flow $\leq$ 0.1 feet OK
Design Maximum Velocity $\leq$ 2.0 fps OK

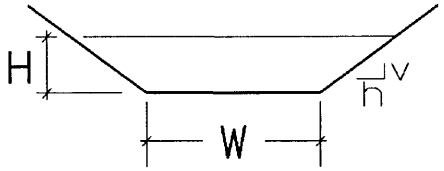
Description: Culvert 3

Use an 18" Diameter CMP.... From the discharge structure hydraulics previously presented in this document, it is shown that an 18" diameter cmp can pass a 3 cfs peak flow at a flow depth of 1 ft. (hw/d = 0.67). It is obvious that this size culvert is adequate to pass the 0.5 cfs peak flow.

HMS Structure ID: Ditch D4 / Culvert 4

Description: Ditch D4

Design Flow = 3.6 cfs (Peak Discharge from Subbasin 4d)



Using Manning's Equation where $Q = (1.49/n)\ (A)(R)^{.67}\ (S)^{0.5}$

Q = flow in cfs
n = Manning's n = 0.04
R = hydraulic radius
S = Slope = 0.127 ft/ft

Bottom Width = 3 feet
Side Slopes = 2.0h:1v
Area = cross sectional area
P = wetted perimeter

Depth-Area-Flow-Velocity Determination

Depth (ft.)	Area (sq. ft.)	P (ft.)	R (ft.)	Top Width (ft.)	Q (cfs)	V (fps)
0.00	0	3.00	0.000	3.0	0.0	0.0
0.05	0.16	3.22	0.048	3.2	0.3	1.7
0.10	0.32	3.45	0.093	3.4	0.9	2.7
0.15	0.50	3.67	0.135	3.6	1.7	3.5
0.20	0.68	3.89	0.175	3.8	2.8	4.1
0.25	0.88	4.12	0.212	4.0	4.1	4.7
0.30	1.08	4.34	0.249	4.2	5.6	5.2
0.35	1.30	4.57	0.284	4.4	7.4	5.7
0.40	1.52	4.79	0.317	4.6	9.4	6.2

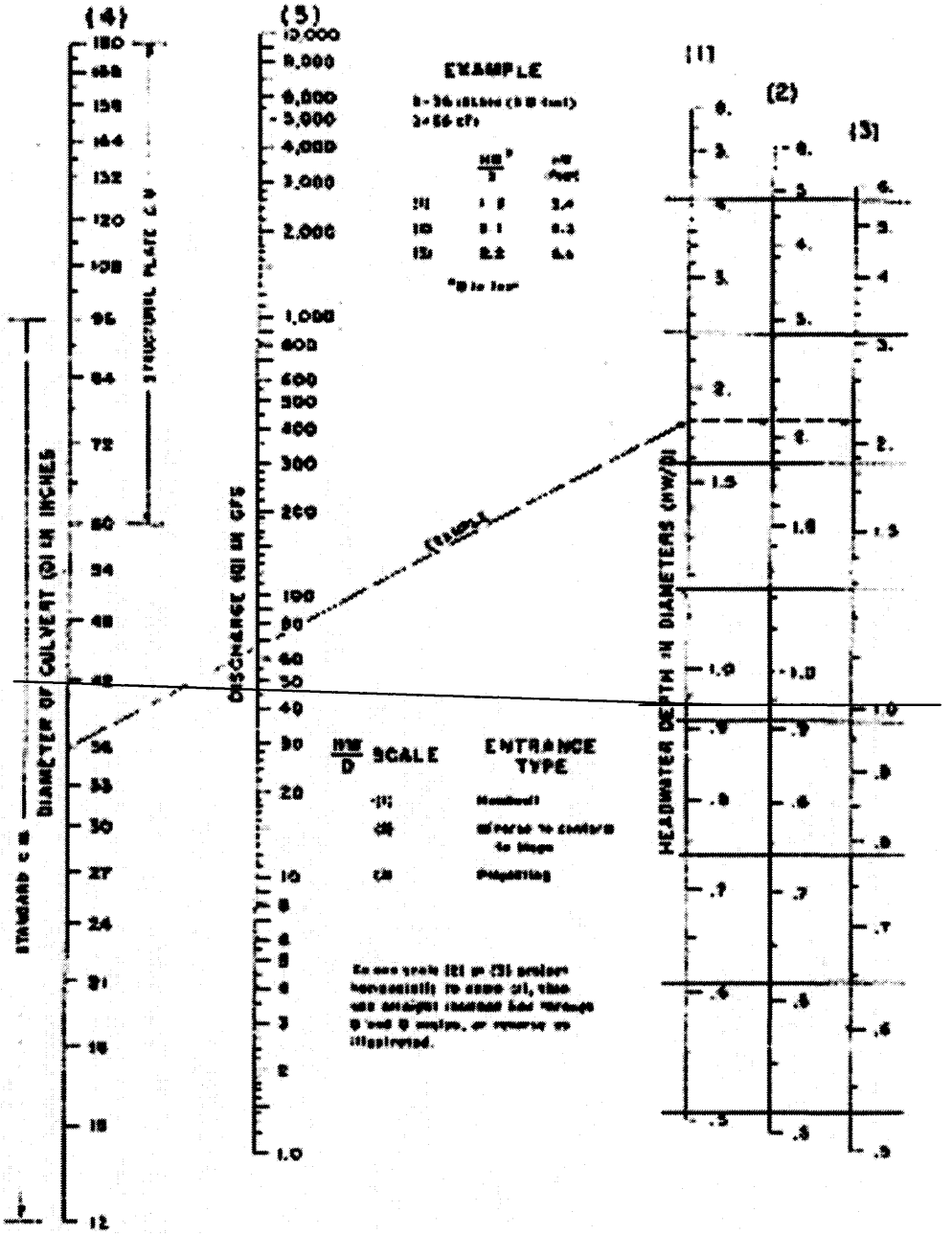
Design Depth of Flow $\leq$ 0.25 feet OK
Design Maximum Velocity $\leq$ 4.7 fps OK

Description: Culvert 4

Use an 18" Diameter CMP.... From the discharge structure hydraulics previously presented in this document, it is shown that an 18" diameter cmp can pass a 8 cfs peak flow at a flow depth of 2 ft. (hw/d = 1.33).

HMS Structure ID: Culvert 5

Description: Culvert 5 – Ephemeral Channel Diversion - Under B seam Pad
Design Flow = 42 cfs (Peak Discharge from Reach 3)



Description: Hydraulic Capacity for Culvert 5

Use an 42" Diameter CMP…. From the chart above, a 42" cmp will pass ~ 48 cfs at a HW/D = 1.0 (42 in).

(1) Exhibit 3-10 Headwater depth for CM pipe culverts with inlet control (Ref. Hyd. Eng. Cir. No. 5, USBPR, 1965) Copy attached.

MISCELLANEOUS DITCH DESIGNS

SUBBASIN HYDROLOGY

Description: Watershed to **Ditch D-5**
HMS Subbasin ID: Subbasin 2a (Sub area a of Subbasin 2)
Subbasin Area: 1.9 acres = 0.00297 sq. miles

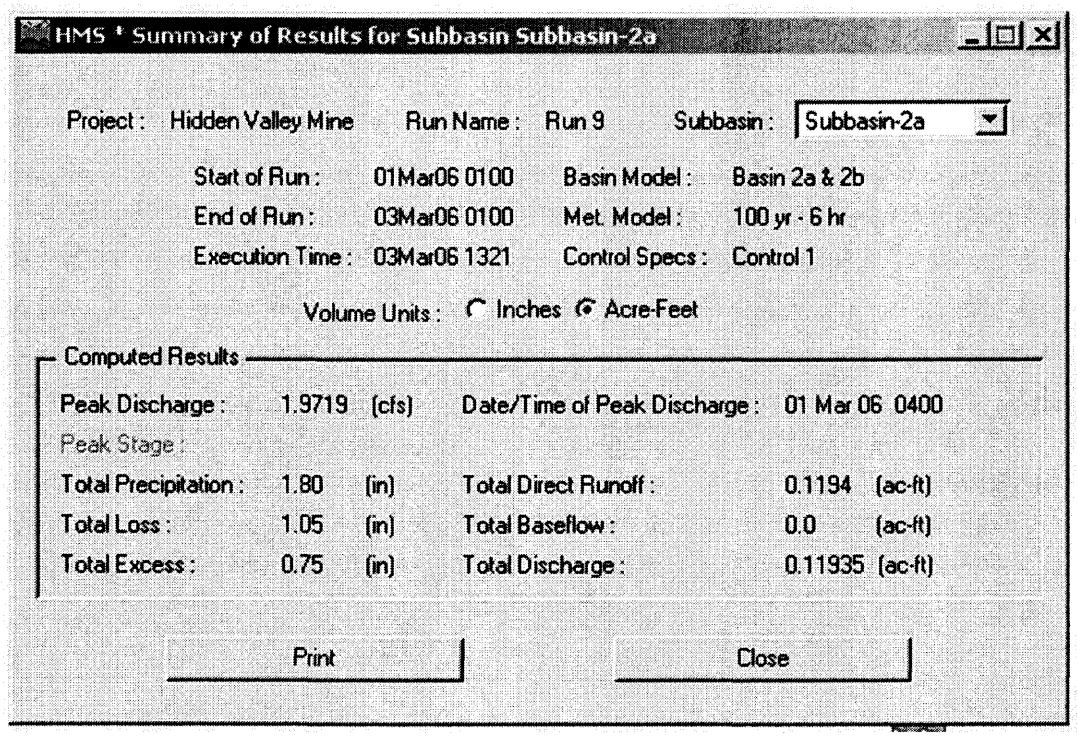
Loss Rate Method: SCS Curve Number

Area (acres)	Landuse	Soil Type	Slope	Hydrologic Soil Group	Curve Number
1.9	Rangeland, Unmanaged	CeE2	0-6%	D	80

Runoff Method: SCS Lag [1]

Lag Time (l_T) = $(L^{0.8}(S+1)^{0.7})/(1900\ Y^{0.5})$
L = 680 (Hydraulic Length of Watershed in feet)
S = (1000/CN) – 10 = 2.5
Y = 5.8 (Average land slope in percent)
l_T = 0.1169 hours = 7 minutes

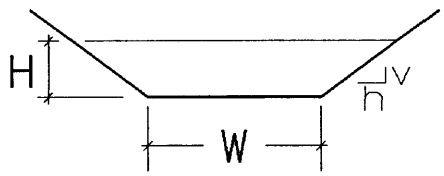
Design Storm: 100-yr, 6-hr – 1.8 inches (design event per 746.213)
HMS Peak Runoff Flow: 1.97 cfs



[1] *Applied Hydrology and Sedimentology for Disturbed Areas*, B. J. Barfield, R. C. Warner, and C. T. Haan, p. 102, 1985.

MISCELLANEOUS DITCH DESIGNS

Structure ID: Ditch D5



Design Flow = 1.97 cfs (Peak Discharge from Subbasin 2a)

Using Manning's Equation where $Q = (1.49/n)\ (A)(R)^{.67}\ (S)^{0.5}$

Q = flow in cfs
n = Manning's n = 0.04
R = hydraulic radius
S = Slope = 0.058 ft/ft

Bottom Width = 3 feet
Side Slopes = 2.0h:1v
Area = cross sectional area
P = wetted perimeter

Depth-Area-Flow-Velocity Determination

Depth (ft.)	Area (sq. ft.)	P (ft.)	R (ft.)	Top Width (ft.)	Q (cfs)	V (fps)
0.00	0	3.00	0.000	3.0	0.0	0.0
0.10	0.32	3.45	0.093	3.4	0.6	1.8
0.20	0.68	3.89	0.175	3.8	1.9	2.8
0.30	1.08	4.34	0.249	4.2	3.8	3.5
0.40	1.52	4.79	0.317	4.6	6.3	4.2
0.50	2.00	5.24	0.382	5.0	9.4	4.7
0.60	2.52	5.68	0.443	5.4	13.1	5.2
0.70	3.08	6.13	0.502	5.8	17.4	5.7
0.80	3.68	6.58	0.559	6.2	22.4	6.1

Design Depth of Flow = 0.20 feet OK
Design Maximum Velocity = 2.8 fps OK

MISCELLANEOUS DITCH DESIGNS

SUBBASIN HYDROLOGY

Description: Watershed to **Ditch D-6**
HMS Subbasin ID: Subbasin 2b (Sub area b of Subbasin 2)
Subbasin Area: 1.9 acres = 0.00297 sq. miles

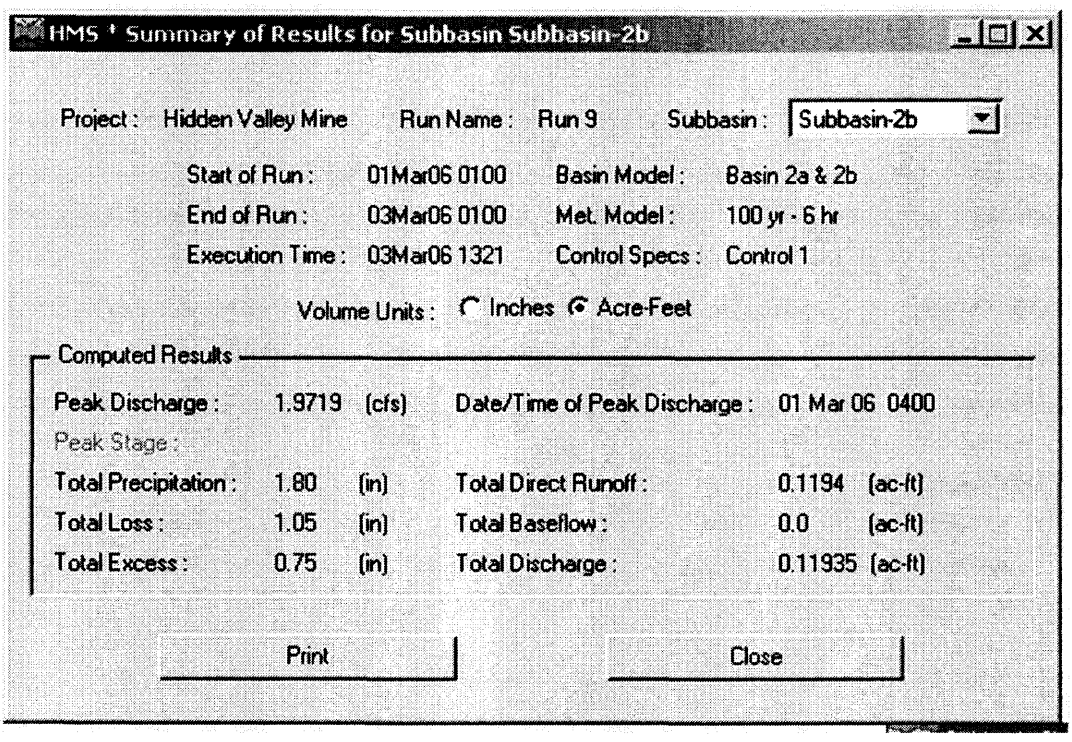
Loss Rate Method: SCS Curve Number

Area (acres)	Landuse	Soil Type	Slope	Hydrologic Soil Group	Curve Number
1.9	Rangeland, Unmanaged	CeE2	0-8%	D	80

Runoff Method: SCS Lag [1]

Lag Time (l_T) = $(L^{0.8}(S+1)^{0.7})/(1900\ Y^{0.5})$
L = 507 (Hydraulic Length of Watershed in feet)
S = (1000/CN) – 10 = 2.5
Y = 7.4 (Average land slope in percent)
l_T = 0.0678 hours = 4 minutes

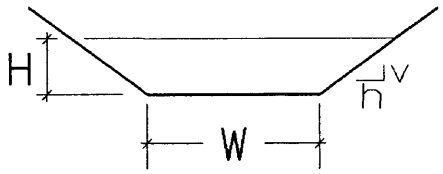
Design Storm: 100-yr, 6-hr – 1.8 inches (design event per 746.213)
HMS Peak Runoff Flow: 1.97 cfs



[1] *Applied Hydrology and Sedimentology for Disturbed Areas, B. J. Barfield, R. C. Warner, and C. T. Haan, p. 102, 1985.*

MISCELLANEOUS DITCH DESIGNS

Structure ID: Ditch D6



Design Flow = 1.97 cfs (Peak Discharge from Subbasin 2b)

Using Manning's Equation where $Q = (1.49/n)\ (A)(R)^{.67}\ (S)^{0.5}$

Q = flow in cfs
n = Manning's n = 0.04
R = hydraulic radius
S = Slope = 0.074 ft/ft (Section 2)
S = Slope = 0.01 ft/ft (Section 1&3)

Bottom Width = 3 feet
Side Slopes = 2.0h:1v
Area = cross sectional area
P = wetted perimeter

Depth-Area-Flow-Velocity Determination

Sections 1&3

Depth (ft.)	Area (sq. ft.)	P (ft.)	R (ft.)	Top Width (ft.)	Q (cfs)	V (fps)
0.00	0	3.00	0.000	3.0	0.0	0.0
0.10	0.32	3.45	0.093	3.4	0.7	2.1
0.20	0.68	3.89	0.175	3.8	2.1	3.1
0.30	1.08	4.34	0.249	4.2	4.3	4.0

Design Depth of Flow ≤ 0.20 feet OK
Design Maximum Velocity ≤ 3.1 fps OK

Section 2

Depth (ft.)	Area (sq. ft.)	P (ft.)	R (ft.)	Top Width (ft.)	Q (cfs)	V (fps)
0.00	0	3.00	0.000	3.0	0.0	0.0
0.10	0.32	3.45	0.093	3.4	0.2	0.8
0.20	0.68	3.89	0.175	3.8	0.8	1.2
0.30	1.08	4.34	0.249	4.2	1.6	1.5
0.40	1.52	4.79	0.317	4.6	2.6	1.7

Design Depth of Flow ≤ 0.40 feet OK
Design Maximum Velocity ≤ 1.7 fps OK

MISCELLANEOUS DITCH DESIGNS

SUBBASIN HYDROLOGY

Description: Watershed to **Ditch D-7**
HMS Subbasin ID: Subbasin 2c (Sub area c of Subbasin 2)
Subbasin Area: 8.2 acres = 0.0128 sq. miles

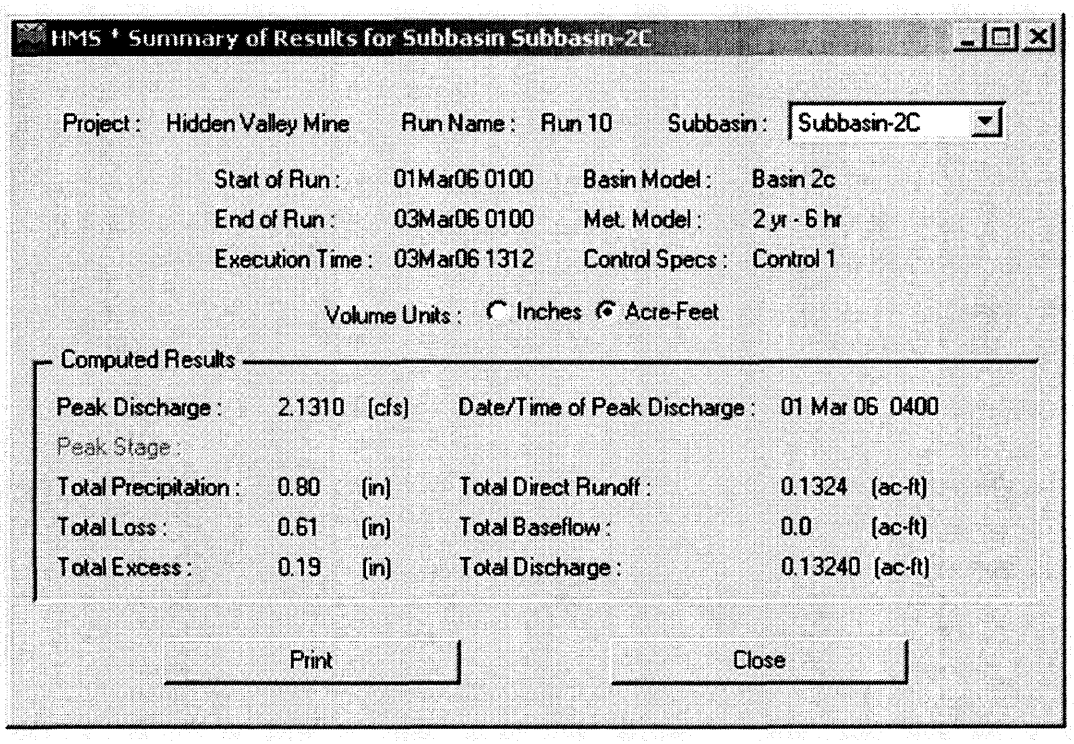
Loss Rate Method: SCS Curve Number

Area (acres)	Landuse	Soil Type	Slope	Hydrologic Soil Group	Curve Number
1.9	Rangeland, Unmanaged	CeE2	0-6%	D	80

Runoff Method: SCS Lag [1]

Lag Time (l_T) = $(L^{0.8}(S+1)^{0.7})/(1900\ Y^{0.5})$
L = 950 (Hydraulic Length of Watershed in feet)
S = (1000/CN) – 10 = 2.5
Y = 6.1 (Average land slope in percent)
l_T = 0.1235 hours = 7.4 minutes

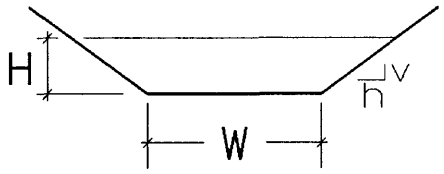
Design Storm: 2-yr, 6-hr – 0.8 inches
HMS Peak Runoff Flow: 2.13 cfs



[1] *Applied Hydrology and Sedimentology for Disturbed Areas, B. J. Barfield, R. C. Warner, and C. T. Haan, p. 102, 1985.*

MISCELLANEOUS DITCH DESIGNS

Structure ID: Ditch D7



Design Flow = 2.13 cfs (Peak Discharge from Subbasin 2c)

Using Manning's Equation where $Q = (1.49/n)\ (A)(R)^{.67}\ (S)^{0.5}$

Q = flow in cfs
n = Manning's n = 0.04
R = hydraulic radius
S = Slope = 0.061 ft/ft

Bottom Width = 3 feet
Side Slopes = 2.0h:1v
Area = cross sectional area
P = wetted perimeter

Depth-Area-Flow-Velocity Determination

Depth (ft.)	Area (sq. ft.)	P (ft.)	R (ft.)	Top Width (ft.)	Q (cfs)	V (fps)
0.00	0	3.00	0.000	3.0	0.0	0.0
0.10	0.32	3.45	0.093	3.4	0.6	1.9
0.20	0.68	3.89	0.175	3.8	1.9	2.9
0.30	1.08	4.34	0.249	4.2	3.9	3.6
0.40	1.52	4.79	0.317	4.6	6.5	4.3
0.50	2.00	5.24	0.382	5.0	9.7	4.8
0.60	2.52	5.68	0.443	5.4	13.4	5.3
0.70	3.08	6.13	0.502	5.8	17.9	5.8
0.80	3.68	6.58	0.559	6.2	22.9	6.2

Design Depth of Flow $\leq$ 0.30 feet OK
Design Maximum Velocity $\leq$ 3.6 fps OK

APPENDIX C

HIDDEN VALLEY MINE

ARCHEOLOGY REPORT

Placed in "Confidential" File

CULTURAL RESOURCE INVENTORY OF CONSOL ENERGY'S 200 ACRE HIDDEN VALLEY MINE EXPLORATION PARCEL, EMERY COUNTY, UTAH (TOWNSHIP 23S, RANGE 6E, SECTIONS 17 AND 18)

By:

Rigden A. Glaab
and
Michele A. Martz

Prepared For:

Division of Oil, Gas & Mining
Salt Lake City, UT

Prepared Under Contract With:

CONSOL Energy
P.O. Box 566, Route 148 North
Sesser, IL 62959

Prepared By:

Montgomery Archaeological Consultants, Inc.
P.O. Box 147
Moab, Utah 84532

MOAC Report 06-22

March 14, 2006

United States Department of Interior (FLPMA)
Permit No. 05-UT-60122

State of Utah Antiquities Project (Survey)
Permit No. U-06-MQ-0289p

APPENDIX D

HIDDEN VALLEY MINE

LAND USE

APPENDIX E

HIDDEN VALLEY MINE

SOILS

APPENDIX E

SOILS OF THE
HIDDEN VALLEY PROJECT
MAJOR COAL EXPLORATION AREA

for

CONSOL ENERGY

Prepared by

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May 2006

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SOILS OF THE
HIDDEN VALLEY PROJECT
MAJOR COAL EXPLORATION AREA

INTRODUCTION

Consolidation Coal Company (Consol) has applied for a major exploration permit (MEP) in the Hidden Valley area. This area is located approximately 70 miles south of the town of Price in Emery County, Utah. More specifically, the study area is located in sections 17 and 18, T23S, R6E, Salt Lake Base & Meridian (Walker Flat 7.5 minute series USGS quadrangle map). The total acreage of the study area was 194 acres. This report has been prepared to address the existing soil resources within the project area.

METHODS

Soil information was compiled using information that was available from previous studies of the Hidden Valley and Emery Mine areas. The soil map delineations were mapped previously by the Natural Resources Conservation Service (NRCS, formerly SCS). These map units were digitized from that source by Consol. The soil map unit descriptions in this document were prepared in part by using a report by *Mt. Nebo Scientific, Inc.* (Nyenhuis, 2002) from a study of the nearby the Emery Mine that had the same soil types. Some of the map unit descriptions of that report were taken verbatim from the Emery Mine's, Mining & Reclamation Plan (MRP).

RESULTS

The following map units for the Hidden Valley MEP are shown in the Soils Map included in this report. Descriptions of these soils are provided below.

Map Unit CeE2, Castle Valley extremely stony very fine sandy loam, 0 to 20% slopes, eroded

Map Unit Description

This map unit is on steep to gently sloping soils on upland benches, mesas and piedmont surfaces. The slope range is 0 to 20 percent. The native vegetation is mainly pinyon, juniper, galleta grass, and Indian ricegrass.

Included in this map unit is about 15 percent rock outcrop, rockland and areas with less than 4 inches of soil overlying bedrock, and some soils deeper than 20 inches.

The Castle Valley soil is shallow, calcareous, well drained, and medium to coarse textured. It is formed in weathered material derived from interbedded shale and sandstone. The surface layer is an extremely stony very fine sandy loam about 4 inches thick. The subsoil is a brown to brownish yellow very fine sandy loam or gravelly very fine sandy loam about 8 inches thick. Sandstone bedrock is at a depth of 8 to 18 inches. In places wind erosion has removed as much as half the surface layer.

Permeability of the Castle Valley soil is moderately rapid. Available water capacity is moderately high. Effective rooting depth is about 8 to 18 inches; some roots spread horizontally above hard bedrock. Runoff is slow to moderate; in rocky areas it is high. The erosion hazard for water is slight to high. Wind erosion hazard is slight to severe.

The unit is mainly used for spring and fall range. It is also used for wildlife habitat. Fenceposts are cut from juniper in favorable sites. The potential productivity is 725/500/325 pounds of air-dry vegetation in favorable/normal/ and unfavorable years, respectively. This map unit is in capability unit VIIs (non-irrigated), semi-desert shallow loam range site.

Castle Valley Typical Soil Profile Description

The Castle Valley typical soil profile was taken from section VII.A.3.6 of the Emery Mine MRP. Castle Valley, as a soil type, has been recorrelated to the Hideout soil series (Sasser, 2002).

The Castle Valley soil name is retained for this report because it was the name used at the time of an earlier soil survey. However, the Hideout soil series is the more accurate soil name and the most recent, official NRCS soil series description for Hideout, dated August 1998. The Hideout soil is classified as a "Loamy, mixed, superactive, calcareous, mesic Lithic Ustic Torriorthent".

Castle Valley Soil Suitability Evaluation & Salvage Depth Recommendation

A detailed soil suitability evaluation and salvage depth recommendation for Castle Valley was previously done and included in the nearby Emery Mine MRP and in the Nyenhuis report (2002). All parameters were rated good, fair, or marginal with only coarse fragment content below 10 inches in depth rated poor. The overall rating was considered "marginal to fair", and the recommended salvage depth of suitable material was 6 inches.

Map Unit PCE2, Persayo-Chipeta complex, 1 to 20% slopes

Map Unit Description

This map unit is on nearly level to steep fans, terraces, uplands, and shale knolls. The slope range is 1 to 20 percent. The native vegetation is mat saltbush, shadscale, Indian rice grass and galleta grass.

This unit is 40 percent Persayo eroded and non-eroded very fine sandy clay loams and sandy clay loams and 40 percent Chipeta silty clay loam. The two soils are intermingled and occur in an unidentifiable pattern on the landscape. Persayo is usually in the depression areas and draws, but occurs on the broad fans with the Chipeta soil. Included in this map unit is about 20 percent Badland.

The **Persayo** soil is shallow, well drained, and moderately fine-textured. It is formed in residuum that weathered from shale. Typically, the surface layer is a light brownish gray loam to very fine sandy clay loam about 1 to 4 inches thick. The underlying material is a light brownish gray or pale brown silty clay loam, loam, or clay overlying soft, weathered shale at a depth of 10 to 20 inches. This is a weak to moderately strong gypsic horizon.

Permeability of the Persayo soil is moderate. Available water holding capacity is moderately high. Effective rooting depth is dependent on depth to bedrock. Runoff is medium to rapid, and the erosion hazard for water is moderate to high. Wind erosion hazard is moderate.

The **Chipeta** soil is shallow, somewhat poorly to moderately well drained, and moderately fine-textured. It is formed in residuum derived from marine gypsum-bearing shale. Typically, a paralithic contact is encountered at about 17 to 19 inches. The surface horizons are highly eroded and severely cracked when dry; the surface soil is thin, about 2 inches thick. Light gray and light grayish brown heavy silty clay loams and silty clays overlie soft weathered shale.

Permeability of the Chipeta soil is moderately slow. Available water capacity is moderate. Effective rooting depth is about 12 to 16 inches. Runoff is rapid, and the erosion hazard for water is high and active. Wind erosion hazard is moderate to high.

The unit is mainly used for spring and fall range. The Chipeta soil is in the VIIe (non-irrigated) capability unit; the Persayo soil in the VIIe (non-irrigated) capability unit. The Chipeta soil is in the desert shallow range site. The Persayo is in the desert loamy shale range site.

Persayo and Chipeta Typical Soil Profile Description

The Persayo and Chipeta typical soil profile descriptions were described using the aformentioned Nyenhuis (2002) report. The Persayo soil series is currently classified as a "Loamy, mixed, calcareous, mesic, shallow Typic Torriorthent". The Chipeta soil series is currently classified as a "Clayey, mixed, active, calcareous, mesic, shallow Typic Torriorthent". The most recent official NRCS soil series description for Persayo was dated February 1997, and for Chipeta, dated July 1998.

Persayo and Chipeta Soil Suitability Evaluation and Salvage Depth Recommendation

Soils from this type are not proposed for disturbance for the Hidden Valley MEP project, therefore, no salvage recommendations have been made.

Map Unit RY, Rock Land

Map Unit Description

This map unit is on nearly level to steep sloping broad terraces and cliffs. The

native vegetation is mainly a sparse cover of pinyon, juniper and sagebrush. Elevation range is 5,900 to 6,400 feet.

This unit is a miscellaneous land type formed from sandstone. About 55 percent of the surface is covered by stones, boulders, and outcrops of sandstone. Some shale outcrops are found. About 20 percent of the land has 4 inches or less of aeolian deposited soil overlying bedrock. Most of this map unit is moderately to severely eroded.

Included in the map unit are gently sloping, moderately deep to deep, fine sandy loams intermingled with the sandstone outcrops. Inclusions of Castle Valley fine sandy loam also occur. Included areas make up about 25 percent of the total acreage.

Rock Land Typical Soil Profile Description

Rock Land not a soil type, and does not have a typical soil profile description.

Rock Land Soil Suitability Evaluation and Salvage Depth Recommendation.

Rock Land has no soil available for salvage.

Map Unit D, Disturbed Land

Map Unit Description

This map unit was located in the area that had been previously disturbed by mining and reclamation activities. It is therefore not been described by a map unit description, however prior to disturbances, this area was fully contained within the Map Unit RY described above.

Disturbed Land Typical Soil Profile Description

Disturbed Land not a soil type, and does not have a typical soil profile description.

Disturbed Land Soil Suitability Evaluation and Salvage Depth Recommendation.

The Disturbed Land soil salvage plan has been discussed in Consol's permit application in the "Topsoil Removal and Storage" section.

APPENDIX F

HIDDEN VALLEY MINE

VEGETATION

APPENDIX F

VEGETATION OF THE HIDDEN VALLEY PROJECT MAJOR COAL EXPLORATION AREA

for

CONSOL ENERGY

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May 2006

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VEGETATION OF THE HIDDEN VALLEY PROJECT MAJOR COAL EXPLORATION AREA

INTRODUCTION

Consolidation Coal Company (Consol) has applied for a major exploration permit (MEP) in the Hidden Valley area. This area is located approximately 70 miles south of the town of Price in Emery County, Utah. More specifically, the study area is located in sections 17 and 18, T23S, R6E, Salt Lake Base & Meridian (Walker Flat 7.5 minute series USGS quadrangle map). The total acreage of the study area Is 194 acres. This report has been prepared to address the plant communities and threatened and endangered plant species within the project area.

METHODS

The major plant communities of the Hidden Valley project area was mapped in the field by walking the area and using 1'=200' aerial photographs and maps provided by Consol. The field work was conducted on two different occasions – February 15, 2006 and April 29, 2006.

Threatened and endangered species lists were compiled after consulting with the U.S. Fish & Wildlife Service, Salt Lake City, Utah and files located at *Mt. Nebo Scientific, Inc.*, Springville, Utah.

RESULTS

There were four major plant community types located in the Hidden Valley MEP project area including: pinyon-juniper, shadscale, disturbed (reclaimed), and riparian, areas. These communities and areas are shown on the vegetation map included in this report. A brief description of each of the communities follows below. Color photographs of each community type have also been included in this report.

Pinyon-Juniper

The pinyon-juniper communities were located in the upper elevations of the study area (see Vegetation Map and Photographs of the Plant Communities). The dominant tree species in these communities were Utah Juniper *(Juniperus osteosperma)* and pinyon pine (*Pinus edulis*). Dominant shrubs included shadscale *(Atriplex confertifolia)*, black sagebrush (*Artemisia nova*) and broom snakeweed (*Gutierrezia sarothrae*). The dominant grass species included galleta (*Hilaria jamesii*), Indian ricegrass (*Stipa hymenoides*), and blue grama (*Bouteloua gracilis*). Forb species were not an important component in the composition of the pinyon-juniper communities in the study area.

Shadscale

Basically, two types of the shadscale community existed within the study area. As the elevation

decreased below the pinyon-juniper zone, shadscale communities can be found in the project area. First, shadscale communities existed on the steeper slopes surrounding the drainage bottomlands that dissects by Ivie Creek. These communities could be considered more of a shadescale/Salina wildrye community, because Salina wildrye *(Elymus salinus)* was often the dominant grass species there. These shadscale communities were located in the northeast and southeast portions of the study area (see Vegetation Map and Photographs of the Plant Communities).

Secondly, other shadscale communities, also located in somewhat lower elevations when compared to the pinyon-juniper communities, were supported in the western portions of the project area on more gentle slopes. These shadscale areas were often comprised of a different dominant understory grass species, or galleta rather than Salina wildrye (see Vegetation Map and Photographs of the Plant Communities).

Although the two shadscale communities described above differed somewhat by their species composition, they both shared other common plant species including woody species such as shadscale, black sagebrush, broom snakeweed, Fremont's buckwheat (*Eriogonum corymbosum*), Gardner saltbush (*Atriplex gardneri*), and scattered pinyon pine and Utah juniper trees. The dominant grass species in the shadscale communities included salina wildrye, galleta, and alkali saccaton (*Sporobolus airoides*). Again, forbs were not an important component in the species composition of these communities, but species such as Crytanth (*Cryptantha* spp.), milkvetch (*Astragalus* spp.), and Prince's plume *(Stanleya pinnata)* were observed.

Disturbed/Reclaimed

Another decrease in elevation from the pinyon-juniper and shadscale communities gave rise to areas that were once disturbed by mining activities and later reclaimed and re-seeded. These areas began on the old access road to the bottom of the drainage and terminated at some of the lowest elevations of the study area (see Vegetation Map and Photographs of the Plant Communities).

Many "weedy" or exotic plant species such as five-hook bassia (*Bassia hyssopifolia*), halogeton (*Halogeton glomeratus*), Russian thistle (*Salsola pestifer*), and cheatgrass (*Bromus tectorum*) were common, even dominant, in some of these areas. There was also a good representation of more desirable plant species in the disturbed/reclaimed areas. For example, woody species like shadscale, fourwing saltbush (*Atriplex canescens*), Gardner saltbush, big sagebrush (*Artemisia tridentata*), Fremont's buckwheat, and broom snakeweed were common here as well as grass species such as bromegrasses (*Bromus* spp.), Russian wheatgrass (*Elymus junceus*), crested wheatgrass (*Agropyron cristatum*), and Indian ricegrass.

Riparian

Finally, the lowest elevations of the project area supported some riparian species adjacent to Ivie Creek (see Vegetation Map and Photographs of the Plant Communities). Although the riparian communities appeared only in very small parcels of the project area, they supported a different array of plant species compared to the upland areas. Ivie Creek is a perennial stream, and

although it supports a riparian plant community, it was not a particularly diverse or well-developed community suggesting that its flows are often relatively low. Nonetheless, species such as willow (*Salix* spp), salt-cedar (*Tamarix chinensis*) and common reed grass (*Phragmites australis*) were present here, but were often not the dominant species.

Threatened & Endangered Species

There are several federally listed plant species that are known to occur in Emery County, Utah (Table 1). However, there is only a slight chance that some of these species would occur within the study area boundaries. Also, with the exception of the upper areas proposed for disturbance by Consol (coal storage, refuse disposal, soil pile area), most of the areas proposed for new disturbance had already been disturbed by previous mining activities (the aforementioned disturbed/reclaimed areas). The species in Table 1 have very little chance of occurring in the previously disturbed areas; they have more of a chance to occur in the upper undisturbed areas. That said, the T&E plant survey was performed in both areas, but concentrated in those areas proposed for new surface disturbance,

Table 1: Potential Threatened or Endangered Plant Species of the Hidden Valley MEP Project Area

Scientific Name	Common Name	Status
Pediocactus winkleri	Winkler Footcactus	T
Pediocactus despainii	Despain Footcactus	E
Schoencrambe barnebyi	Barneby's schoencrambe	E
Sclerocactus wrightiae	Wright Fishhook Cactus	E
Townsendia aprica	Last Chance Townsendia	T
Erigeron maguirei	Maguire Daisy	T
Cycladenia humilis var. jonesii	Jones Cycladenia	T

E = Federal Protection, Endangered
T = Federal Protection, Threatened

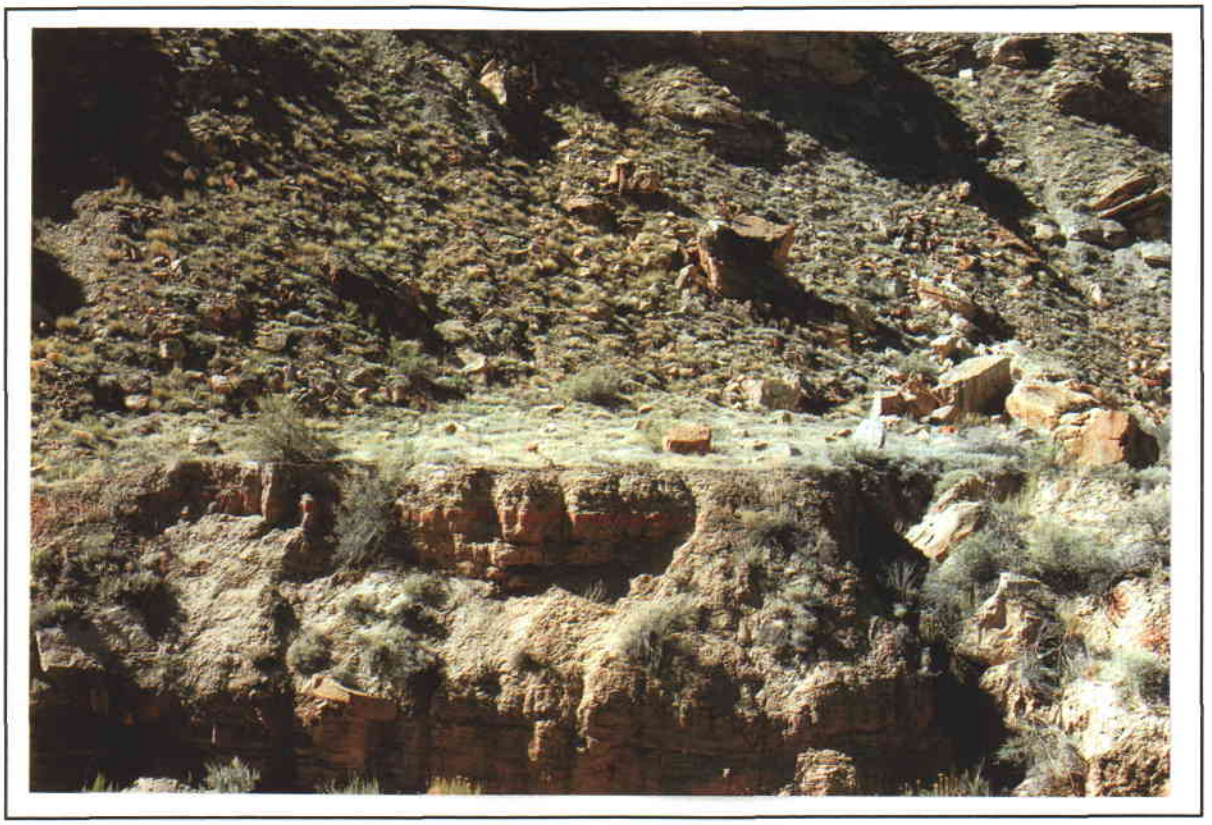
especially the upper-elevation (undisturbed) areas.

No threatened or endangered plant species were found in this area. However, although the survey was conducted during an appropriate time for identification of these species (April 29, 2006), it was on the earlier side of the time period when most of these species are flowering and most noticeably and identifiable. Accordingly, another survey will be performed later in the spring of 2006, and prior to any disturbance to this area, thus insuring a more comprehensive time-period window for survey.

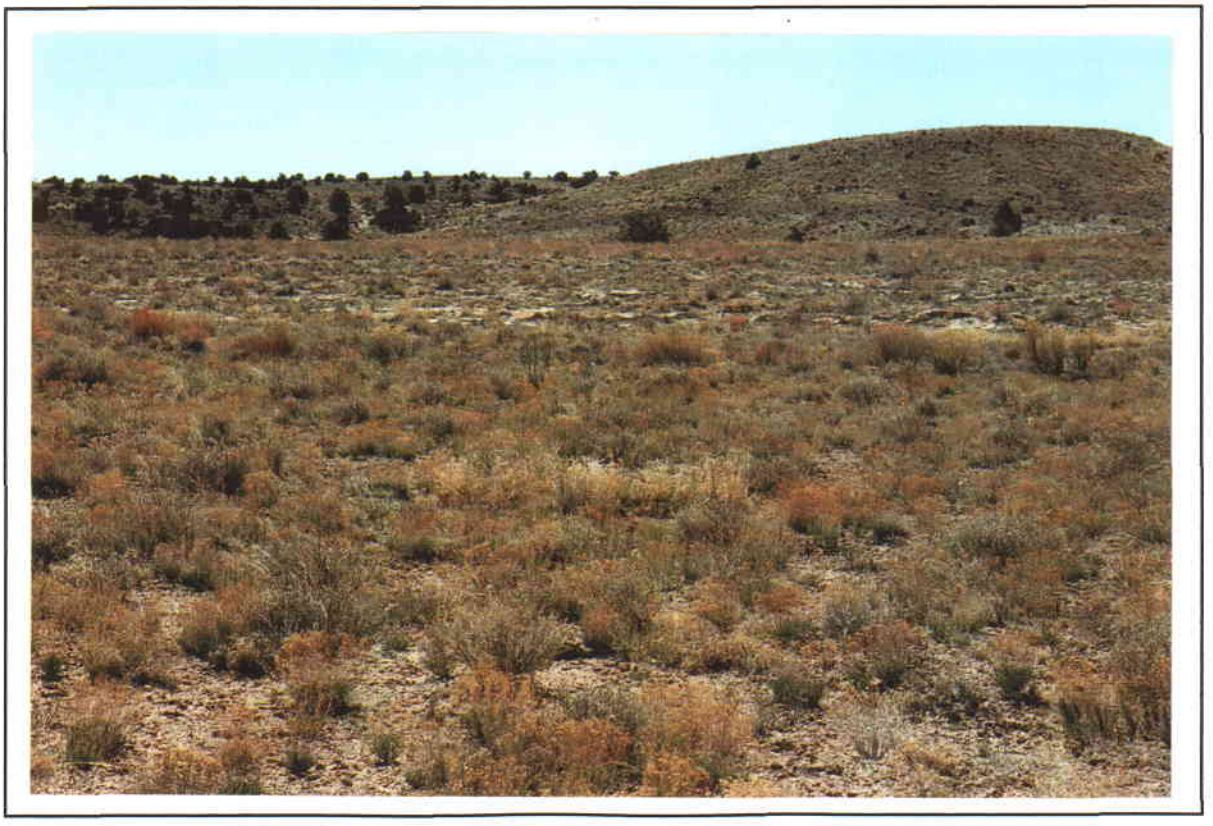
COLOR PHOTOGRAPHS of the PLANT COMMUNITIES

Pinyon-Juniper Community in the Hidden Valley MEP Area

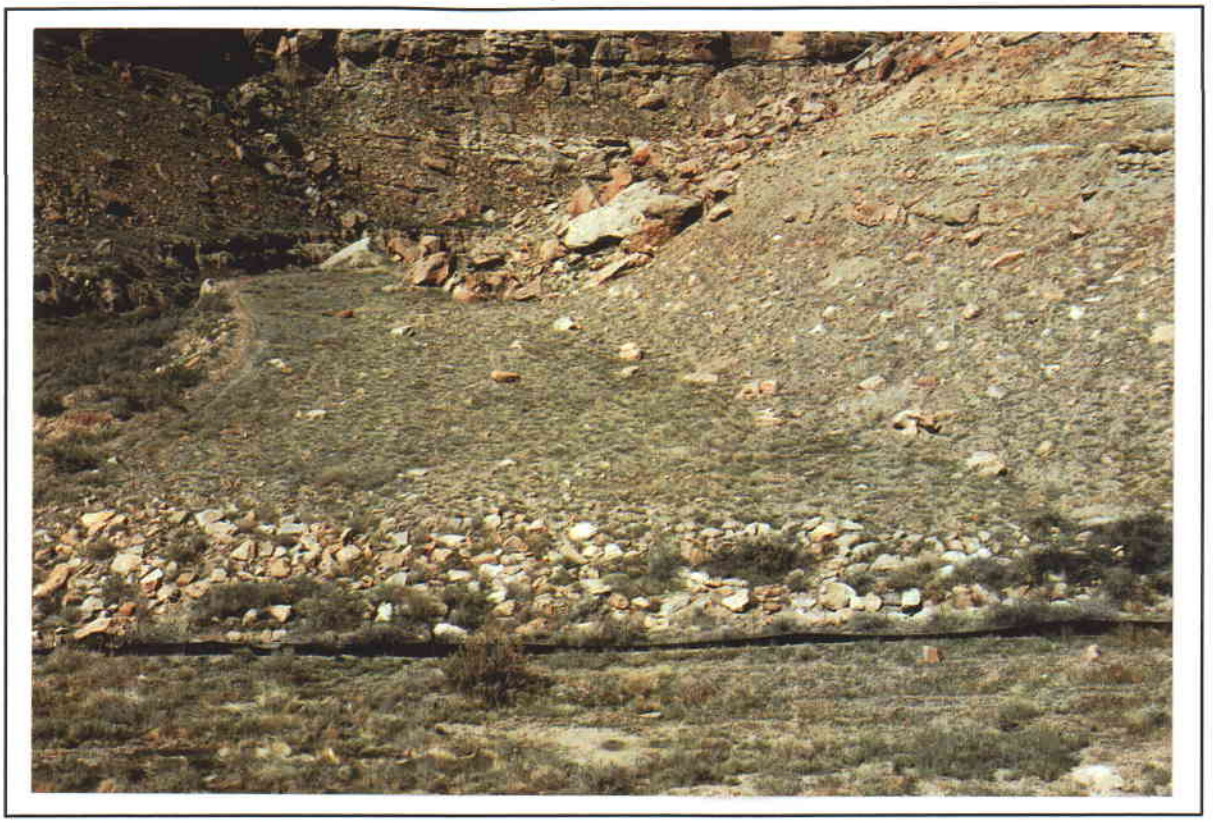
Pinyon-Juniper Community in the Hidden Valley MEP Area



Shadscale Community in the Hidden Valley MEP Area (steep slope areas)

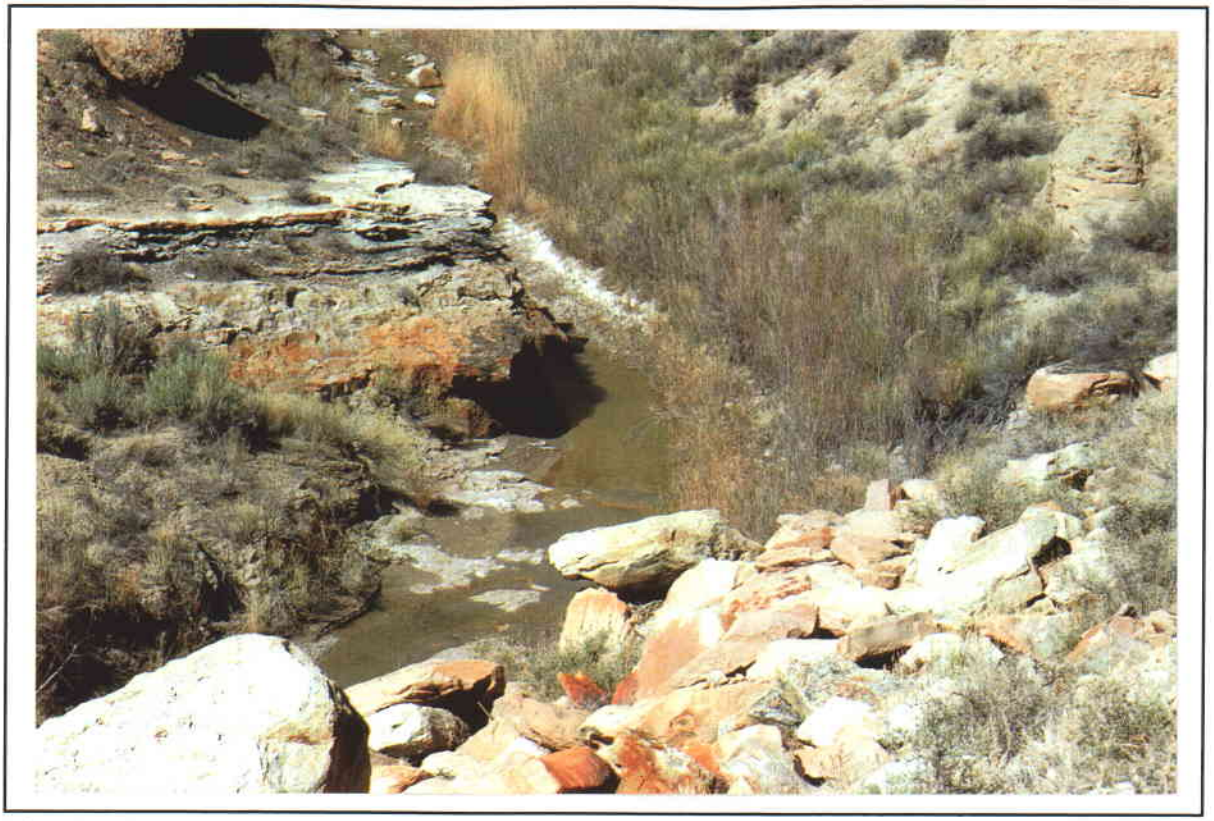


Shadscale Community in the Hidden Valley MEP Area (gentle slope areas)

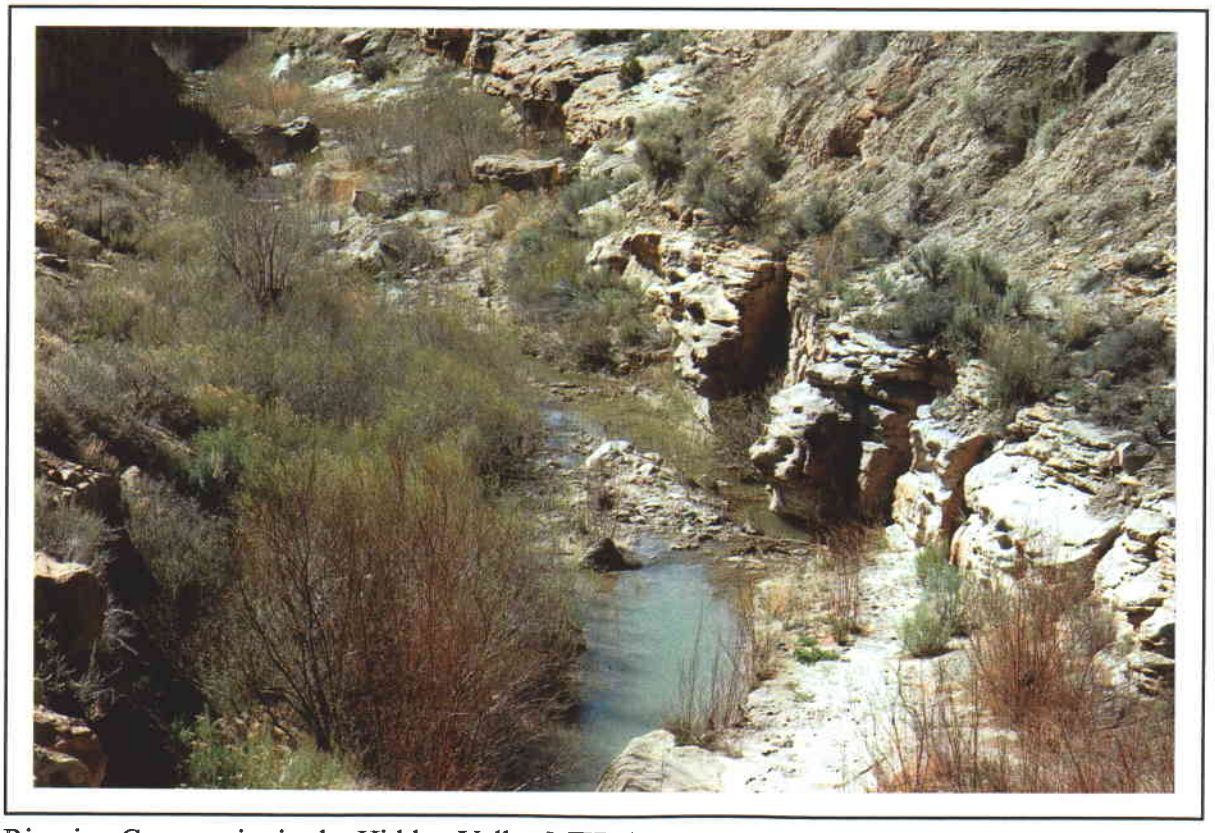


Disturbed (Reclaimed) Areas in the Hidden Valley MEP

Disturbed (Reclaimed) Areas in the Hidden Valley MEP



Riparian Community in the Hidden Valley MEP Area



Riparian Community in the Hidden Valley MEP Area

APPENDIX G

HIDDEN VALLEY MINE

WILDLIFE

APPENDIX G

WILDLIFE OF THE
HIDDEN VALLEY PROJECT
MAJOR COAL EXPLORATION AREA

for

CONSOL ENERGY

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WILDLIFE OF THE
HIDDEN VALLEY PROJECT
MAJOR COAL EXPLORATION AREA

INTRODUCTION

Consolidation Coal Company (Consol) has applied for a major exploration permit (MEP) in the Hidden Valley area. This area is located approximately 70 miles south of the town of Price in Emery County, Utah. More specifically, the study area is located in sections 17 and 18, T23S, R6E, Salt Lake Base & Meridian (Walker Flat 7.5 minute series USGS quadrangle map). The total acreage of the study area was 194 acres. This report has been prepared to address any potential critical wildlife habitat within the project area.

METHODS

Wildlife habitats of special concern by the State of Utah, Division of Wildlife Resources (DWR) were reviewed in the state's GIS database system. Threatened and endangered species lists were compiled after consulting with the U.S. Fish & Wildlife Service, Salt Lake City, Utah and files located at *Mt. Nebo Scientific, Inc.*, Springville, Utah.

RESULTS

A geographic information system (GIS) database that provides information from the State of Utah, Division of Wildlife Resources (DWR) suggested the Hidden Valley MEP project area is not critical habitat for pronghorn, elk, mule deer, or rocky mountain bighorn sheep. No other critical wildlife habitat in known for the area.

In 2001, state biologists from DWR along with representatives from Consol visited the nearby Emery Mine areas. At that meeting it was suggested that there was a low probability of raptor occurrence in the general area [refer to: "Biological Impacts at the 4th East Portal Area at the Emery Deep Mine.", *Mt. Nebo Scientific, Inc.* (2002)]. Since that time Consol has participated in some of the annual raptor surveys conducted by DWR and all coal operators in the area. A raptor survey with representatives from Consol and DWR has again been scheduled for late-May 2006.

Table 1: Threatened or Endangered Animal Species of Emery County, Utah

Scientific Name	Common Name	Status
Gilia elegans	Bonytail	E
Ptychocheilus lucius	Colorado Pike minnow	E
Gila cypha	Humpback Chub	E
Xyrauchen texanus	Razorback Sucker	E
Haliaeetus leucocephalus	Bald Eagle	T
Strix occidentalis lucida	Mexican Spotted Owl	T
Mustela nigripes	Black-footed Ferret	E
Empidonax traillii extimus	Southwestern Willow Flycatcher	E
Coccyzus americanus occidentalis	Western Yellow-billed Cuckoo	C

E = Federal Protection, Endangered
T = Federal Protection, Threatened
C = Candidate

Threatened and Endangered Species

There are several federally listed animal species that are known to occur in Emery County, Utah (Table 1). However, there is almost no chance of these species occurring directly in the study area for lack of habitat.

MAPS

Operations Map	MEP O
Canyon Entrance Road Map	MEP O1
Refuse Area Map	MEP O2
Drainage Map	MEP D
Pond 001 pln\profl\xsec	MEP D1
Pond 002 pln\profl\xsec	MEP D2
Misc. Ditches Plan Views,	MEP D3 – 1 of 2
Profiles & Cross Sections	MEP D3 – 2 of 2
Reclamation Map	MEP R