

**CROW BUTTE RESOURCES, INC.**

**CROW BUTTE MINE  
DAWES COUNTY, NEBRASKA**

**1996 POND INSPECTION REPORT**

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## TABLE OF CONTENTS

1.0	General .....	1
2.0	Review of Inspection Data .....	2
3.0	Technical Evaluation .....	4
4.0	Conclusions .....	5

### Tables

Table 1	-	Pond 1 1993 Data
Table 1A	-	Pond 1 1994 Data
Table 1B	-	Pond 1 1995 Data
Table 1C	-	Pond 1 1996 Data
Table 2	-	Pond 3 1993 Data
Table 2A	-	Pond 3 1994 Data
Table 2B	-	Pond 3 1995 Data
Table 2C	-	Pond 3 1996 Data
Table 3	-	Pond 4 1993 Data
Table 3A	-	Pond 4 1994 Data
Table 3B	-	Pond 4 1995 Data
Table 3C	-	Pond 4 1996 Data
Table 4	-	R&D Cells 1 and 2 1993 Data
Table 4A	-	R&D Cells 1 and 2 1994 Data
Table 4B	-	R&D Cells 1 and 2 1995 Data
Table 4C	-	R&D Cells 1 and 2 1996 Data

### Figures

Figure 1	-	Commercial Pond Layout
Figure 2	-	R&D Pond Layout
Figure 3	-	Pond 1 1996 Repair Sketch

### Attachments

Attachment 1	-	1996 Annual Survey Data
Attachment 2	-	Ditch Flow Analysis

## 1.0 GENERAL

An annual inspection of the Crow Butte ISL Mine pond system is required under license condition no. 53 of NRC License SUA-1534. Crow Butte Resources, Inc. (CBR) submitted an Evaporation Pond Onsite Inspection Program dated December 1992 (Revised February 26, 1993, August 30, 1993 and February 5, 1996) to the NRC. The inspection program provides for systematic inspections and an annual technical evaluation and inspection report which compares field inspection data with engineering design reports to assess structural stability and hydraulic and hydrologic capacities.

The 1996 annual report covers the time period of November 1, 1995 through November 1, 1996. During that period five evaporation ponds were in use, two R&D ponds (Cells 1 and 2) and three commercial ponds (Ponds 1, 3 and 4). The Evaporation Pond Onsite Inspection Program was revised during that period to modify the frequency of the underdrain inspections from daily to weekly.

The R&D pond design report was prepared by Klohn Leonoff Consulting Engineers in 1983 and construction of R&D cells 1 and 2 was completed in 1985. The R&D ponds have two to one horizontal to vertical (2H:1V) interior and exterior embankment slopes with a 34 mil interior hypalon liner placed on top of six inches of sand. The underdrain leak detection system piping is located beneath the pond liner and reports to two six inch monitor stand pipes. The overall depth of the R&D ponds is 15 feet and the maximum operating level is 12 feet which provides three feet of freeboard.

The commercial evaporation pond design report was prepared by Western Water Consultants, Inc. in 1988. Construction of ponds 3 and 4 was completed in 1990 and construction of pond 1 was completed in 1992. The exterior slopes of these ponds are 2 ½ H:1V and the interior slopes are 2H:1V. Ponds 3 and 4 have a 20 mil PVC bottom liner, an intermediate geonet and a 60 mil high density polyethylene (HDPE) top liner. In pond 1, a 30 mil very low density polyethylene (VLDPE) bottom liner was installed with an intermediate geonet and 60 mil HDPE top liner. Each pond has a leak detection system consisting of six separate perforated four inch pipes which report to leak detection standpipes located on the interior slopes.

The overall depth of Pond 1 is 17 feet from crest to pond bottom and the maximum operating level is 12 feet which provides five feet of freeboard. The overall depth of Ponds 3 and 4 is 17.5 feet with a maximum operating level of 12.5 feet which once again provides five feet of freeboard.

CBR is required by license condition no. 53 to train field personnel performing the systematic inspections of the ponds on an annual basis. On April 15 and 16, 1996, training sessions were held for field personnel. The Inspection Program was discussed in light of changes made to the plan in the February 5, 1996 submittal by CBR.

## **2.0 REVIEW OF INSPECTION DATA**

The Evaporation Pond Onsite Inspection Program dated December 1992 (revised February 26, 1993, August 30, 1993 and February 5, 1996) calls for systematic inspections on a daily, weekly, monthly and quarterly basis. Data from the inspection reports are summarized in Tables 1 through 4C which shows the pond depths and underdrain measurements and ~~conductivity~~ activities on a weekly basis.

Two groundwater monitor wells are installed in the uppermost aquifer in the commercial pond area and one groundwater monitor well in the R&D pond area. The wells are sampled quarterly for indications of leaks in the ponds that may have bypassed the pond leak detection systems. A review of the assay data was done and all parameters were near baseline conditions.

Following are comments based on a review of available inspection data for the ponds.

### Commercial Pond 1

Pond 1 was in service all year and had a maximum water depth of 11.4 feet and a minimum depth of 9.9 feet for the reporting period. All of the underdrain water levels have been stable and due to the small amount of water in the standpipes, conductivity readings haven't been taken.



Earthwork repair work was done to the west embankment during August. A track loader was used to fill the areas of erosion with soil. The area was then seeded and covered with straw. Additionally, a silt fence was placed on the slope to prevent future erosion. A sketch of the work is shown on Figure 3.

The depth markers were repainted this year and gopher poison was applied as necessary in the pond area.

#### Commercial Pond 3

Pond 3 was in service all year and had a maximum water depth of 11.2 feet and a minimum depth of 9.9 feet.

The depth markers were repainted this year and gopher poison was applied as necessary in the pond area.

#### Commercial Pond 4

Pond 4 was in service all year and had a maximum water depth of 5.6 feet and a minimum of 3.8 feet.

The depth markers were repainted this year and gopher poison was applied as necessary in the pond area.

#### R&D Cells 1 and 2

The R&D Cells were in service all year. Cell 1 had a maximum depth of 10.6 feet and a minimum depth of 8.5 feet. Cell 2 had a maximum depth of 11.1 feet and a minimum of 8.4 feet. No problems were detected through the leak detection system.

### 3.0 TECHNICAL EVALUATION

The technical evaluation of the Crow Butte Mine ponds utilizes data from the systematic inspection reports, results of the annual survey and a visual inspection of the ponds to assess the hydraulic capacities and structural stability of the ponds.

A review of the inspection data was performed and a summary of the data is presented on Tables 1 through 4C. Maintenance items such as filling in rills on embankments, poisoning gophers and repairing ditches were reported. Nothing was found during the review to indicate stability problems with the ponds.

The annual survey was done in September and compared with previous annual survey data. No problems were indicated from a review of the survey information. The elevation differences were generally within  $\pm 0.2$  ft. which is the range expected using an EDM survey instrument.

Results of the annual survey are included in Attachment 1.

A visual inspection of the pond was done on September 24, 1996. A walk through of the pond embankments and ditches was done and the rip-rapped areas were inspected. No signs of sloughing of the embankments or movement of the embankments was seen. No seepage was detected in the embankments. The ditches are in generally good condition and rip-rap in the ditches is controlling erosion in those areas.

Vegetation on ponds 3 and 4 outslopes is moderate to good and pond 1 growth is moderate with growth starting on the newly repaired west slope.

Pictures of the ponds were taken for comparison with previous years pictures. No problems in embankment alignment or sloughing were detected.

Attachment 2 contains calculations of ditch flow capacities for the commercial ponds. A USBR one hour thunderstorm, zone 3 was used as the design storm. Two types of ditches are installed in the pond

area, trapezoidal ditches and v-ditches. Attachment 2 and Figures 1 and 2 shows the ditch locations, type of ditch and flow depth during the design storm. The installed ditches are capable of containing the design storm flow with adequate freeboard.

As of November 1, 1996 the pond system contained 98.6 acre-feet (AF) of stored water. The allowable storage capacity of the five ponds is 122.4 AF which allows transfer of any one pond to the pond system in the event of an emergency.

#### **4.0 CONCLUSIONS**

Review of the available inspection reports and data and a visual inspection of the Crow Butte evaporation ponds indicate the ponds are operating as per the engineering design reports.

Nothing was detected during the annual inspection and review which would indicate slope stability problems. The calculated minimum safety factors of 1.7 for dynamic conditions and 1.9 for static conditions as detailed in the commercial pond engineering report are still valid. The 1.7 static safety factor in the R&D pond is likewise still valid.

The pond system is operating within its designed storage capacity. Adequate freeboard existed in each pond throughout the year and capacity was available in the system to transfer the contents of any one pond to the pond system.

Diversion ditches in the pond areas are capable of containing the design flood. Routine maintenance of the embankments and ditches was performed during the year.

CROW BUTTE MINE  
COMMERCIAL POND 1  
1993 DATA

TABLE 1

DATE	DEPTH of WATER (ft)	UNDERDRAIN MEASUREMENTS (ft)						CONDUCTIVITY (umhos/cm)						NOTES
		NE	NM	NW	SE	SM	SW	NE	NM	NW	SE	SM	SW	
06-Jan														
13-Jan														
20-Jan														
27-Jan														
03-Feb														
10-Feb														
17-Feb														
24-Feb														
03-Mar														
10-Mar														
17-Mar														
24-Mar														
31-Mar														
07-Apr														
14-Apr														
21-Apr														
28-Apr														
05-May														
12-May														
19-May														
26-May														
02-Jun														
09-Jun														
16-Jun														
23-Jun														
30-Jun														
07-Jul														
14-Jul	0.5	0.2	0.2	0.2	0.0	0.0	0.2							(1) (2)
21-Jul	2.3	0.0	0.2	0.1	0.1	0.0	0.2							
28-Jul	3.0	0.0	0.2	0.2	0.1	0.0	0.2							
04-Aug	3.2	0.0	0.2	0.2	0.1	0.0	0.2							
11-Aug	3.2	0.2	0.2	0.2	0.1	0.0	0.2							
18-Aug	3.3	0.2	0.2	0.2	0.1	0.0	0.2							
25-Aug	3.2	0.2	0.2	0.2	0.1	0.0	0.2							
01-Sep	3.3	0.2	0.2	0.2	0.1	0.0	0.2							
08-Sep	3.3	0.2	0.2	0.2	0.1	0.0	0.2							
15-Sep	3.3	0.2	0.2	0.2	0.1	0.0	0.2							
22-Sep	3.5	0.2	0.2	0.2	0.3	0.0	0.2							
29-Sep	3.6	0.2	0.2	0.2	0.1	0.0	0.2							
06-Oct	3.8	0.2	0.2	0.2	0.1	0.0	0.2							
13-Oct	4.1	0.2	0.2	0.2	0.1	0.0	0.2							
20-Oct	4.4	0.2	0.2	0.2	0.1	0.0	0.2							
27-Oct	4.5	0.2	0.2	0.2	0.1	0.0	0.2							
03-Nov	4.8	0.2	0.2	0.2	0.1	0.0	0.2							
10-Nov	4.8	0.2	0.2	0.2	0.0	0.0	0.2							
17-Nov	5.2	0.2	0.2	0.2	0.1	0.0	0.2							
24-Nov	5.2	0.2	0.2	0.2	0.1	0.0	0.2							
01-Dec	5.3	0.2	0.2	0.2	0.1	0.0	0.2							
08-Dec	5.3	0.2	0.2	0.2	0.1	0.0	0.2							
15-Dec	5.5	0.2	0.2	0.2	0.0	0.0	0.2							
22-Dec	5.8	0.2	0.2	0.2	0.1	0.0	0.2							
29-Dec	6.0	0.2	0.2	0.2	0.1	0.0	0.2							

Minimum	0.5	0.0	0.2	0.1	0.0	0.0	0.2
Maximum	6.0	0.2	0.2	0.2	0.3	0.0	0.2
Std Dev		0.1	0.0	0.0	0.0	0.0	0.0

Pond Contents	MIN	MAX
Conductivity (umhos/cm)	30,520	42,385

- NOTES:
- (1) Pond 1 put into service on 7-8-93.
  - (2) Not enough water in underdrains to measure conductivity.
  - (3) Underdrain measurements are revised to show vertical readings instead of slope readings per NRC License Condition 25, Amendment 26 (Dec. 29, 1994)

CROW BUTTE MINE  
COMMERCIAL POND 1  
1994 DATA

TABLE 1A

DATE	DEPTH of WATER (ft)	UNDERDRAIN MEASUREMENTS (ft)						CONDUCTIVITY (umhos/cm)						NOTES
		NE	NM	NW	SE	SM	SW	NE	NM	NW	SE	SM	SW	
05-Jan	6.2	0.2	0.2	0.2	0.1	0.0	0.2							(1)
12-Jan	6.3	0.2	0.2	0.2	0.1	0.0	0.2							
19-Jan	6.5	0.2	0.2	0.2	0.1	0.0	0.2							
26-Jan	6.8	0.2	0.2	0.2	0.1	0.0	0.2							
02-Feb	7.0	0.2	0.2	0.2	0.1	0.0	0.2							
09-Feb	7.4	0.2	0.2	0.2	0.1	0.0	0.2							
16-Feb	7.5	0.2	0.2	0.2	0.1	0.0	0.2							
23-Feb	7.5	0.2	0.2	0.2	0.1	0.0	0.2							
02-Mar	8.0	0.2	0.2	0.2	0.1	0.0	0.2							
09-Mar	8.3	0.2	0.2	0.2	0.1	0.0	0.2							
16-Mar	8.5	0.2	0.2	0.2	0.1	0.0	0.2							
23-Mar	8.8	0.2	0.2	0.2	0.1	0.0	0.2							
30-Mar	8.8	0.2	0.2	0.2	0.1	0.0	0.2							
06-Apr	8.8	0.2	0.2	0.2	0.1	0.0	0.2							
13-Apr	9.2	0.2	0.2	0.2	0.1	0.0	0.2							
20-Apr	9.3	0.2	0.2	0.2	0.1	0.0	0.2							
27-Apr	9.3	0.2	0.2	0.2	0.1	0.0	0.2							
03-May	9.3	0.2	0.2	0.2	0.1	0.0	0.2							
10-May	9.4	0.2	0.2	0.2	0.1	0.0	0.2							
17-May	9.4	0.2	0.2	0.2	0.1	0.0	0.2							
24-May	9.6	0.2	0.2	0.2	0.1	0.0	0.2							
31-May	9.6	0.2	0.2	0.2	0.1	0.0	0.2							
07-Jun	9.5	0.2	0.2	0.2	0.1	0.0	0.2							
14-Jun	9.4	0.2	0.2	0.2	0.1	0.0	0.2							
21-Jun	9.2	0.2	0.2	0.2	0.1	0.0	0.2							
28-Jun	9.3	0.2	0.2	0.2	0.1	0.0	0.2							
05-Jul	9.0	0.2	0.2	0.2	0.1	0.0	0.2							
12-Jul	8.9	0.2	0.2	0.2	0.1	0.0	0.2							
19-Jul	8.8	0.2	0.2	0.2	0.1	0.0	0.2							
26-Jul	8.6	0.2	0.2	0.2	0.1	0.0	0.2							
02-Aug	8.5	0.2	0.2	0.2	0.1	0.0	0.2							
09-Aug	8.4	0.2	0.2	0.2	0.1	0.0	0.2							
16-Aug	8.3	0.2	0.2	0.2	0.1	0.0	0.2							
23-Aug	8.0	0.2	0.2	0.2	0.1	0.0	0.2							
30-Aug	7.9	0.2	0.2	0.2	0.1	0.0	0.2							
06-Sep	7.8	0.2	0.2	0.2	0.1	0.0	0.2							
13-Sep	7.6	0.2	0.2	0.2	0.1	0.0	0.2							
20-Sep	7.5	0.2	0.2	0.2	0.1	0.0	0.2							
27-Sep	7.5	0.2	0.2	0.2	0.1	0.0	0.2							
04-Oct	7.4	0.2	0.2	0.2	0.1	0.0	0.2							
11-Oct	7.5	0.2	0.2	0.2	0.1	0.0	0.1							
18-Oct	7.5	0.2	0.2	0.2	0.1	0.0	0.2							
25-Oct	7.5	0.2	0.2	0.2	0.1	0.0	0.2							
01-Nov	7.4	0.2	0.2	0.2	0.1	0.0	0.2							
08-Nov	7.4	0.2	0.2	0.2	0.1	0.0	0.2							
15-Nov	7.4	0.2	0.2	0.2	0.1	0.0	0.2							
22-Nov	7.4	0.2	0.1	0.1	0.1	0.0	0.1							
29-Nov	7.3	0.2	0.2	0.2	0.1	0.0	0.2							
06-Dec	7.3	0.2	0.2	0.2	0.1	0.0	0.2							
13-Dec	7.3	0.2	0.2	0.2	0.1	0.0	0.2							
20-Dec	7.7	0.2	0.2	0.2	0.1	0.0	0.1							
27-Dec	8.1	0.2	0.2	0.2	0.1	0.0	0.1							

Minimum	6.2	0.2	0.1	0.1	0.1	0.0	0.1
Maximum	9.6	0.2	0.2	0.2	0.1	0.0	0.2
Std Dev		0.0	0.0	0.0	0.0	0.0	0.0

Pond Contents	MIN	MAX
Conductivity (umhos/cm)	32,200	53,650

NOTES: (1) Not enough water in underdrains to measure conductivity.  
(2) Underdrain measurements are revised to show vertical readings instead of slope readings per NRC License Condition 25, Amendment 26 (Dec. 29, 1994).

CROW BUTTE MINE  
COMMERCIAL POND 1  
1995 DATA

TABLE 1B

DATE	DEPTH of WATER (ft)	UNDERDRAIN MEASUREMENTS (ft)						CONDUCTIVITY (umhos/cm)						NOTES
		NE	NM	NW	SE	SM	SW	NE	NM	NW	SE	SM	SW	
03-Jan	8.2	0.2	0.2	0.2	0.1	0.0	0.2							
10-Jan	8.6	0.2	0.2	0.2	0.1	0.0	0.2							
17-Jan	8.9	0.2	0.2	0.2	0.1	0.0	0.1							
24-Jan	8.9	0.2	0.2	0.2	0.1	0.0	0.1							
31-Jan	9.4	0.2	0.2	0.2	0.1	0.0	0.1							
07-Feb	9.5	0.2	0.2	0.2	0.1	0.0	0.1							
14-Feb	9.5	0.0	0.0	0.0	0.1	0.0	0.1							
21-Feb	9.5	0.2	0.2	0.2	0.1	0.0	0.1							
28-Feb	9.6	0.2	0.2	0.2	0.1	0.0	0.1							
07-Mar	9.7	0.2	0.2	0.2	0.1	0.0	0.1							
14-Mar	9.8	0.2	0.2	0.2	0.1	0.0	0.1							
21-Mar	10.0	0.2	0.2	0.2	0.1	0.0	0.1							
28-Mar	10.0	0.2	0.2	0.2	0.1	0.0	0.1							
04-Apr	10.0	0.2	0.2	0.2	0.1	0.0	0.1							
11-Apr	10.3	0.2	0.2	0.2	0.1	0.0	0.1							
18-Apr	10.3	0.2	0.2	0.2	0.1	0.0	0.1							
25-Apr	10.4	0.2	0.2	0.2	0.1	0.0	0.1							
02-May	10.7	0.2	0.2	0.2	0.1	0.0	0.1							
09-May	11.0	0.2	0.2	0.2	0.1	0.0	0.1							
16-May	11.1	0.2	0.2	0.2	0.1	0.0	0.1							
23-May	11.3	0.2	0.2	0.2	0.1	0.0	0.1							
30-May	11.5	0.2	0.2	0.2	0.1	0.0	0.1							
06-Jun	11.6	0.2	0.2	0.2	0.1	0.0	0.1							
13-Jun	11.8	0.2	0.2	0.2	0.1	0.0	0.1							
20-Jun	11.6	0.2	0.2	0.2	0.1	0.0	0.1							
27-Jun	11.4	0.2	0.2	0.2	0.1	0.0	0.1							
04-Jul	11.4	0.2	0.2	0.2	0.1	0.0	0.1							
11-Jul	11.2	0.2	0.2	0.2	0.1	0.0	0.1							
18-Jul	11.2	0.2	0.2	0.2	0.1	0.0	0.1							
25-Jul	11.1	0.2	0.2	0.2	0.1	0.0	0.1							
01-Aug	11.0	0.2	0.2	0.2	0.1	0.0	0.1							
08-Aug	10.8	0.2	0.2	0.2	0.1	0.0	0.1							
15-Aug	10.8	0.2	0.2	0.2	0.1	0.0	0.1							
22-Aug	10.5	0.2	0.2	0.2	0.1	0.0	0.1							
29-Aug	10.4	0.2	0.2	0.2	0.1	0.0	0.1							
05-Sep	10.3	0.2	0.2	0.2	0.1	0.0	0.1							
12-Sep	10.2	0.2	0.2	0.2	0.1	0.0	0.1							
19-Sep	10.0	0.2	0.2	0.2	0.1	0.0	0.1							
26-Sep	10.0	0.2	0.2	0.2	0.1	0.0	0.1							
03-Oct	10.0	0.2	0.2	0.2	0.1	0.0	0.1							
10-Oct	10.0	0.2	0.2	0.2	0.1	0.0	0.1							
17-Oct	10.0	0.2	0.2	0.2	0.1	0.0	0.1							
24-Oct	9.9	0.2	0.2	0.2	0.1	0.0	0.1							
31-Oct	9.9	0.2	0.2	0.2	0.1	0.0	0.1							
07-Nov	9.9	0.2	0.2	0.2	0.1	0.0	0.1							
14-Nov	9.9	0.2	0.2	0.2	0.1	0.0	0.1							
21-Nov	9.9	0.2	0.2	0.2	0.1	0.0	0.1							
28-Nov	9.9	0.2	0.2	0.2	0.1	0.0	0.1							
05-Dec	9.9	0.2	0.2	0.2	0.1	0.0	0.1							
12-Dec	9.9	0.2	0.2	0.2	0.1	0.0	0.1							
19-Dec	9.9	0.2	0.2	0.2	0.1	0.0	0.1							
26-Dec	9.9	0.2	0.2	0.2	0.1	0.0	0.1							

Minimum	8.2	0.0	0.0	0.0	0.1	0.0	0.1
Maximum	11.8	0.2	0.2	0.2	0.1	0.0	0.2
Std Dev		0.0	0.0	0.0	0.0	0.0	0.0

Pond Contents	MIN	MAX
Conductivity (umhos/cm)	44,280	66,025

NOTES: (1) Not enough water in underdrains to measure conductivity.  
(2) Underdrain measurements are revised to show vertical readings instead of slope readings per NRC License Condition 25, Amendment 26 (Dec. 29, 1994).



CROW BUTTE MINE  
COMMERCIAL POND 1  
1996 DATA

TABLE 1C

DATE	DEPTH of WATER (ft)	UNDERDRAIN MEASUREMENTS (ft)						CONDUCTIVITY (umhos/cm)						NOTES
		NE	NM	NW	SE	SM	SW	NE	NM	NW	SE	SM	SW	
02-Jan	9.9	0.2	0.2	0.2	0.1	0.0	0.1							
09-Jan	9.9	0.2	0.2	0.2	0.1	0.0	0.1							
16-Jan	9.9	0.2	0.2	0.2	0.1	0.0	0.1							
23-Jan	9.9	0.2	0.2	0.2	0.1	0.0	0.1							
30-Jan	9.9	0.2	0.2	0.2	0.1	0.0	0.1							
06-Feb	10.2	0.2	0.2	0.2	0.1	0.0	0.1							
13-Feb	10.2	0.2	0.2	0.2	0.1	0.0	0.1							
20-Feb	10.2	0.2	0.2	0.2	0.1	0.0	0.1							
27-Feb	10.2	0.2	0.2	0.2	0.1	0.0	0.1							
05-Mar	10.2	0.2	0.2	0.2	0.1	0.0	0.1							
12-Mar	10.2	0.2	0.2	0.2	0.1	0.0	0.1							
19-Mar	10.3	0.2	0.2	0.2	0.1	0.0	0.1							
26-Mar	10.4	0.2	0.2	0.2	0.1	0.0	0.1							
02-Apr	10.4	0.2	0.2	0.2	0.1	0.0	0.1							
09-Apr	10.5	0.2	0.2	0.2	0.1	0.0	0.1							
16-Apr	10.5	0.2	0.2	0.2	0.1	0.0	0.1							
23-Apr	10.5	0.2	0.2	0.2	0.1	0.0	0.1							
30-Apr	10.6	0.2	0.2	0.2	0.1	0.0	0.1							
07-May	10.6	0.2	0.2	0.2	0.1	0.0	0.1							
14-May	10.6	0.2	0.2	0.2	0.1	0.0	0.1							
21-May	10.6	0.2	0.2	0.2	0.1	0.0	0.1							
28-May	11.0	0.2	0.2	0.2	0.1	0.0	0.1							
04-Jun	11.0	0.2	0.2	0.2	0.1	0.0	0.1							
11-Jun	11.0	0.2	0.2	0.2	0.1	0.0	0.1							
18-Jun	11.0	0.2	0.2	0.2	0.1	0.0	0.1							
25-Jun	11.0	0.2	0.2	0.2	0.1	0.0	0.1							
02-Jul	11.1	0.2	0.2	0.2	0.1	0.0	0.1							
09-Jul	11.0	0.2	0.2	0.2	0.1	0.0	0.1							
16-Jul	11.0	0.2	0.2	0.2	0.1	0.0	0.1							
23-Jul	11.0	0.2	0.2	0.2	0.1	0.0	0.1							
30-Jul	11.0	0.2	0.2	0.2	0.1	0.0	0.1							
06-Aug	11.0	0.2	0.2	0.2	0.1	0.1	0.1							
13-Aug	10.9	0.2	0.2	0.2	0.1	0.1	0.1							
20-Aug	10.9	0.2	0.2	0.2	0.1	0.0	0.1							
27-Aug	10.9	0.2	0.2	0.2	0.1	0.0	0.1							
03-Sep	10.9	0.2	0.2	0.2	0.1	0.0	0.1							
10-Sep	10.9	0.2	0.2	0.2	0.1	0.0	0.1							
17-Sep	10.9	0.2	0.2	0.2	0.1	0.0	0.1							
24-Sep	11.0	0.2	0.2	0.2	0.1	0.0	0.1							
01-Oct	11.0	0.2	0.2	0.2	0.1	0.0	0.1							
08-Oct	11.0	0.2	0.2	0.2	0.1	0.0	0.1							
15-Oct	11.0	0.2	0.2	0.2	0.1	0.0	0.1							
22-Oct	11.0	0.2	0.2	0.2	0.1	0.0	0.1							
29-Oct	11.4	0.2	0.2	0.2	0.1	0.0	0.0							
05-Nov														
12-Nov														
19-Nov														
26-Nov														
03-Dec														
10-Dec														
17-Dec														
24-Dec														
31-Dec														

Minimum	9.9	0.2	0.2	0.2	0.1	0.0	0.0
Maximum	11.4	0.2	0.2	0.2	0.1	0.1	0.1
Std Dev		0.0	0.0	0.0	0.0	0.0	0.0

Pond Contents	MIN	MAX
Conductivity (umhos/cm)	43,710	66,500

NOTES: (1) Not enough water in underdrains to measure conductivity.

CROW BUTTE MINE  
COMMERCIAL POND 3  
1993 DATA

TABLE 2

DATE	DEPTH of WATER (ft)	UNDERDRAIN MEASUREMENTS (ft)						CONDUCTIVITY (umhos/cm)						NOTES
		NE	NM	NW	SE	SM	SW	NE	NM	NW	SE	SM	SW	
06-Jan	8.8	0.5	0.7	0.2	0.1	0.4	0.8	640	800	442		655	640	
13-Jan	9.6	0.5	0.7	0.2	0.1	0.4	0.8	640	815	765		660	672	
20-Jan	9.8	0.5	0.7	0.2	0.1	0.4	0.8	652	815	865		672	612	
27-Jan	9.8	0.6	0.7	0.2	0.1	0.3	0.8	652	825	857		672	680	
03-Feb	10.0	0.6	0.7	0.2	0.1	0.4	0.8	652	815	858		672	672	
10-Feb	10.0	0.6	0.7	0.2	0.1	0.4	0.9	632	790	816		652	627	
17-Feb	10.0	0.6	0.7	0.2	0.1	0.4	0.9	632	632	664		505	512	
24-Feb	10.2	0.6	0.7	0.2	0.1	0.4	0.9	632	768	832		652	660	
03-Mar	10.4	0.6	0.7	0.3	0.1	0.4	0.9	672	800	815		660	742	
10-Mar	10.7	0.6	0.7	0.3	0.1	0.4	0.9	616	632	603		605	640	
17-Mar	11.0	0.6	0.7	0.2	0.1	0.4	0.8	616	766	1248		587	684	
24-Mar	11.2	0.6	0.7	0.2	0.1	0.4	0.8	632	733	668		638	756	
31-Mar	11.2	0.6	0.7	0.2	0.1	0.4	0.8	632	720	12640		619	700	
07-Apr	11.0	0.6	0.7	0.3	0.1	0.4	0.8	648	717	7644		603	727	
14-Apr	11.1	0.6	0.7	0.3	0.1	0.4	0.9	647	733	5220		632	766	
21-Apr	11.1	0.6	0.7	0.3	0.1	0.4	0.9	631	717	11550		652	807	
28-Apr	11.0	0.6	0.7	0.3	0.1	0.4	0.9	745	741	11907		1014	782	
05-May	11.0	0.6	0.7	0.3	0.1	0.4	0.9	640	550	11440		626	718	
12-May	11.0	0.7	0.7	0.2	0.1	0.4	0.8	501	741	11645		501	834	
19-May	10.9	0.7	0.8	0.3	0.1	0.4	0.9	616	822	11305		602	780	
26-May	11.2	0.7	0.8	0.3	0.1	0.4	0.9	611	931	11050		620	896	
02-Jun	11.1	0.7	0.8	0.3	0.1	0.4	0.9	611	960	10710		617	868	
09-Jun	11.3	0.7	0.8	0.3	0.1	0.4	0.9	602	889	7620		622	819	
16-Jun	11.4	0.7	0.8	0.3	0.1	0.4	0.9	704	876	9828		685	793	
23-Jun	11.4	0.7	0.8	0.3	0.1	0.4	0.9	603	930	9680		613	854	
30-Jun	11.3	0.7	0.8	0.2	0.1	0.4	0.9	570	907	9440		726	786	
07-Jul	11.2	0.7	0.8	0.2	0.2	0.4	0.9	574	870	8625		696	812	
14-Jul	10.7	0.7	0.8	0.2	0.1	0.4	0.9	726	870	8700		696	812	
21-Jul	10.2	0.7	0.8	0.2	0.1	0.4	0.9	786	944	8850		767	930	
28-Jul	9.7	0.7	0.8	0.2	0.1	0.4	0.9	708	920	8625		690	805	
04-Aug	9.5	0.7	0.8	0.2	0.1	0.4	0.9	660	912	7910		678	791	
11-Aug	9.3	0.7	0.8	0.2	0.1	0.4	0.9	540	912	7840		728	832	
18-Aug	9.3	0.7	0.8	0.2	0.1	0.4	0.9	754	2280	7770		672	847	
25-Aug	9.2	0.7	0.8	0.2	0.1	0.4	0.9	747	952	7980		684	791	
01-Sep	9.0	0.7	0.8	0.3	0.1	0.4	0.9	666	864	7020		654	702	
08-Sep	9.0	0.7	0.8	0.3	0.1	0.4	0.9	696	1450	8050		678	805	
15-Sep	8.9	0.7	0.8	0.3	0.1	0.4	0.9	754	944	7080		708	812	
22-Sep	9.0	0.7	0.8	0.3	0.1	0.4	0.9	877	1507	6720		616	728	
29-Sep	8.9	0.7	0.8	0.3	0.1	0.4	0.9	744	1008	7560		698	806	
06-Oct	8.9	0.7	0.8	0.3	0.1	0.4	0.9	756	960	7560		627	819	
13-Oct	9.0	0.7	0.8	0.2	0.1	0.4	0.9	819	910	7150		633	845	
20-Oct	9.0	0.7	0.8	0.2	0.1	0.4	0.9	627	864	7150		611	792	
27-Oct	9.0	0.6	0.8	0.2	0.1	0.4	0.9	780	903	7645		643	834	
03-Nov	9.0	0.5	0.7	0.2	0.1	0.4	0.8	638	916	8470		643	834	(1)
10-Nov	9.0	0.5	0.7	0.2	0.1	0.4	0.8	637	939	7003		623	896	
17-Nov	9.0	0.5	0.7	0.2	0.1	0.4	0.8	606	936	6622		624	836	
24-Nov	9.0	0.5	0.7	0.2	0.1	0.4	0.8	617	980	6873		610	724	
01-Dec	9.0	0.5	0.7	0.2	0.1	0.4	0.8	699	1008	6864		621	752	
08-Dec	9.0	0.5	0.7	0.2	0.1	0.4	0.8	631	990	7335		638	798	
15-Dec	9.0	0.5	0.7	0.2	0.1	0.4	0.8	648	840	7335		603	752	
22-Dec	9.0	0.5	0.8	0.2	0.1	0.4	0.8	631	978	7189		635	758	
29-Dec	9.0	0.5	0.8	0.2	0.1	0.4	0.8	592	978	7440		603	768	
Minimum	8.8	0.5	0.7	0.2	0.1	0.3	0.8	501.0	550.0	442.0		501.0	512.0	
Maximum	11.4	0.7	0.8	0.3	0.2	0.4	0.9	877.0	2280.0	12640.0		1014.0	930.0	
Std Dev		0.1	0.1	0.0	0.0	0.0	0.0	70.0	249.0	3591.0		69.0	80.4	

Pond Contents	MIN	MAX
Conductivity (umhos/cm)	30,940	40,480

- NOTES: (1) All underdrains pumped on 11/2.  
(2) Underdrain measurements are revised to show vertical readings instead of slope readings per NRC License Condition 25, Amendment 26 (Dec. 29, 1994)



CROW BUTTE MINE  
COMMERCIAL POND 3  
1994 DATA

TABLE 2A

DATE	DEPTH of WATER (ft)	UNDERDRAIN MEASUREMENTS (ft)						CONDUCTIVITY (umhos/cm)						NOTES
		NE	NM	NW	SE	SM	SW	NE	NM	NW	SE	SM	SW	
05-Jan	9.0	0.5	0.8	0.2	0.1	0.4	0.9	554	978	7824		635	768	
12-Jan	9.0	0.5	0.8	0.2	0.1	0.4	0.9	624	1008	7755		646	790	
19-Jan	9.0	0.5	0.8	0.2	0.1	0.4	0.9	600	847	7812		595	767	
26-Jan	9.0	0.5	0.8	0.2	0.1	0.4	0.9	584	816	7990		640	789	
02-Feb	9.0	0.5	0.8	0.2	0.1	0.4	0.9	627	821	5536		623	790	
09-Feb	9.1	0.5	0.8	0.2	0.1	0.4	0.9	635	774	5017		623	739	
16-Feb	9.1	0.5	0.7	0.2	0.0	0.3	0.7	635	813	8448		605	739	
23-Feb	9.1	0.5	0.8	0.2	0.0	0.4	0.7	627	792	7352		640	761	
02-Mar	9.2	0.5	0.8	0.2	0.1	0.4	0.9	652	833	7476		640	782	
09-Mar	9.8	0.5	0.8	0.2	0.1	0.4	0.9	624	990	9600		643	775	
16-Mar	9.8	0.5	0.8	0.2	0.1	0.4	0.9	647	948	10010		647	784	(1)
23-Mar	9.1	0.6	0.8	0.3	0.1	0.4	0.9	631	912	10430		646	858	
30-Mar	9.1	0.5	0.7	0.2	0.1	0.4	0.8	506	754	10010		646	847	
06-Apr	9.1	0.5	0.6	0.2	0.1	0.5	0.8	608	764	10010		646	702	
13-Apr	9.0	0.5	0.7	0.3	0.1	0.4	0.7	631	739	10640		684	739	
20-Apr	9.0	0.4	0.7	0.3	0.1	0.4	0.7	610	720	10875		653	812	
27-Apr	9.0	0.5	0.6	0.3	0.1	0.4	0.7	580	698	10960		657	690	
03-May	9.0	0.5	0.7	0.3	0.1	0.5	0.7	564	700	11280		657	786	
10-May	9.0	0.4	0.6	0.3	0.1	0.4	0.7	578	822	9590		667	846	
17-May	9.0	0.5	0.7	0.3	0.1	0.4	0.7	561	845	10900		780	864	
24-May	8.8	0.4	0.7	0.3	0.1	0.4	0.8	572	762	10795		762	910	
31-May	8.6	0.5	0.6	0.3	0.1	0.4	0.7	468	868	11160		806	762	
07-Jun	8.4	0.5	0.7	0.3	0.1	0.4	0.7	558	847	8470		726	868	
14-Jun	8.3	0.5	0.7	0.3	0.2	0.4	0.8	570	802	9204		702	811	
21-Jun	8.1	0.5	0.7	0.4	0.1	0.4	0.7	591	805	9440		833	868	
28-Jun	8.2	0.6	0.7	0.3	0.1	0.4	0.8	568	855	10350		734	708	
05-Jul	8.0	0.6	0.7	0.3	0.1	0.4	0.8	580	904	10350		791	793	
12-Jul	7.9	0.6	0.7	0.3	0.2	0.4	0.8	578	855	10350		798	767	
19-Jul	7.8	0.6	0.7	0.3	0.2	0.4	0.8	554	862	10260		798	805	
26-Jul	7.8	0.6	0.7	0.3	0.2	0.4	0.7	566	904	9990		784	812	
02-Aug	7.6	0.6	0.7	0.3	0.1	0.4	0.8	498	904	10170		805	805	
09-Aug	7.6	0.6	0.7	0.3	0.1	0.4	0.8	552	896	7560		763	777	
16-Aug	7.5	0.6	0.7	0.3	0.1	0.4	0.8	575	832	6780		721	791	
23-Aug	7.2	0.6	0.7	0.3	0.1	0.4	0.8	490	888	9040		777	777	
30-Aug	7.1	0.6	0.7	0.3	0.1	0.4	0.8	530	832	9040		672	791	
06-Sep	7.1	0.6	0.7	0.3	0.1	0.4	0.9	529	741	7980		684	798	
13-Sep	6.9	0.6	0.7	0.3	0.1	0.4	0.8	552	805	9200		791	907	
20-Sep	6.8	0.6	0.7	0.3	0.1	0.4	0.8	493	812	9280		826	696	
27-Sep	6.9	0.6	0.7	0.3	0.1	0.4	0.8	620	787	8555		666	767	
04-Oct	6.8	0.6	0.7	0.3	0.1	0.4	0.8	563	833	8260		665	826	
11-Oct	6.9	0.6	0.7	0.3	0.1	0.4	0.7	556	889	8680		604	744	
18-Oct	6.9	0.6	0.7	0.3	0.1	0.4	0.8	558	762	8890		585	762	
25-Oct	6.9	0.6	0.7	0.3	0.1	0.4	0.8	571	798	8255		780	598	
01-Nov	6.9	0.5	0.7	0.3	0.1	0.4	0.8	572	890	9590		602	798	
08-Nov	6.9	0.5	0.7	0.3	0.1	0.4	0.8	572	822	8340		606	754	
15-Nov	7.0	0.6	0.7	0.3	0.1	0.4	0.8	625	772	8338		670	834	
22-Nov	7.2	0.5	0.7	0.2	0.1	0.5	0.7	658	869	9480		647	725	
29-Nov	7.4	0.5	0.7	0.2	0.1	0.5	0.7	596	733	7700		600	774	
06-Dec	7.4	0.5	0.7	0.2	0.1	0.5	0.7	562	734	7900		587	702	
13-Dec	7.4	0.5	0.7	0.2	0.1	0.4	0.8	635	819	5712		727	487	
20-Dec	7.4	0.5	0.7	0.1	0.1	0.4	0.7	568	750	8400		638	736	
27-Dec	7.4	0.4	0.7	0.1	0.0	0.3	0.7	585	761	8400		658	734	
Minimum	6.8	0.4	0.6	0.1	0.0	0.3	0.7	468	698	5017		585	487	
Maximum	9.8	0.6	0.8	0.4	0.2	0.5	0.9	658	1008	11280		833	910	
Std Dev		0.1	0.1	0.0	0.0	0.0	0.1	43	71	1430		72	69	

Pond Contents	MIN	MAX
Conductivity (umhos/cm)	31,080	56,700

- NOTES: (1) Pond level lowered & liner area reporting to NW underdrain checked for holes, none found.  
(2) Underdrain measurements are revised to show vertical readings instead of slope readings per NRC License Condition 25, Amendment 26 (Dec. 29, 1994).

CROW BUTTE MINE  
COMMERCIAL POND 3  
1996 DATA

TABLE 2B

DATE	DEPTH of WATER (ft)	UNDERDRAIN MEASUREMENTS (ft)						CONDUCTIVITY (umhos/cm)						NOTES
		NE	NM	NW	SE	SM	SW	NE	NM	NW	SE	SM	SW	
03-Jan	7.5	0.4	0.7	0.2	0.1	0.3	0.7	570	744	7056		657	765	
10-Jan	7.7	0.4	0.7	0.2	0.1	0.4	0.7	594	727	7439		757	680	
17-Jan	8.4	0.4	0.6	0.2	0.0	0.3	0.7		727				722	
24-Jan	8.4	0.4	0.6	0.3	0.0	0.3	0.7		739				722	
31-Jan	8.5	0.5	0.7	0.3	0.0	0.4	0.7		742				726	
07-Feb	8.5	0.5	0.7	0.3	0.0	0.4	0.8		761				748	
14-Feb	8.5	0.4	0.8	0.3	0.1	0.5	0.8		783			17800	761	
21-Feb	8.5	0.4	0.7	0.2	0.1	0.4	0.7		765			16020	765	
28-Feb	8.5	0.4	0.7	0.2	0.0	0.4	0.7		748			13350	727	
07-Mar	8.4	0.5	0.7	0.3	0.1	0.4	0.7		748			16020	783	
14-Mar	8.4	0.4	0.8	0.3	0.1	0.4	0.8		714			21120	744	(1)
21-Mar	8.4	0.4	0.8	0.3	0.1	0.4	0.8		782			17930	739	
28-Mar	8.4	0.5	0.8	0.3	0.1	0.5	0.8		792			18960	798	
04-Apr	8.3	0.4	0.8	0.3	0.2	0.5	0.8		815			16800	815	
11-Apr	8.3	0.4	0.9	0.3	0.2	0.4	0.7		745			13860	739	
18-Apr	8.3	0.4	0.8	0.3	0.2	0.4	0.7		758			15400	739	
25-Apr	8.3	0.5	0.8	0.3	0.2	0.5	0.7		809			14630	770	
02-May	8.5	0.5	0.8	0.3	0.2	0.5	0.8		847			13860	770	
09-May	8.7	0.5	0.8	0.3	0.2	0.5	0.8		670			11920	820	
16-May	8.6	0.5	0.8	0.3	0.2	0.5	0.8		870			12870	808	
23-May	8.7	0.5	0.8	0.3	0.2	0.5	0.8		775			12690	775	
30-May	8.8	0.5	0.8	0.3	0.2	0.5	0.8		846			12690	754	
06-Jun	8.8	0.5	0.8	0.3	0.2	0.5	0.8		798			12150	822	
13-Jun	8.9	0.5	0.8	0.3	0.2	0.5	0.8		798			11970	798	
20-Jun	8.9	0.5	0.8	0.3	0.2	0.5	0.8		825			10160	762	
27-Jun	8.8	0.5	0.8	0.3	0.2	0.5	0.8		826			10030	806	
04-Jul	8.8	0.6	0.8	0.3	0.1	0.5	0.8		732			7735	793	
11-Jul	8.8	0.5	0.8	0.3	0.2	0.5	0.8		826			9440	774	
18-Jul	8.8	0.5	0.8	0.3	0.2	0.6	0.8		812			11500	754	
25-Jul	9.0	0.6	0.8	0.3	0.2	0.6	0.8	388	805			11500	747	
01-Aug	9.0	0.5	0.8	0.3	0.2	0.6	0.8		798			10830	741	
08-Aug	9.0	0.5	0.8	0.3	0.2	0.6	0.8	517	805			11500	805	
15-Aug	9.0	0.5	0.8	0.3	0.2	0.6	0.8	540	805			10735	798	
22-Aug	8.8	0.5	0.8	0.3	0.2	0.6	0.8	536	791			10735	791	
29-Aug	8.8	0.5	0.8	0.3	0.2	0.6	0.8	540	862			10735	791	
05-Sep	8.8	0.5	0.8	0.3	0.2	0.6	0.8	554	847			10735	791	
12-Sep	8.7	0.5	0.8	0.3	0.2	0.6	0.8	542	791			10170	791	
19-Sep	8.6	0.5	0.8	0.3	0.2	0.6	0.8	564	805			9775	741	
26-Sep	8.8	0.5	0.8	0.3	0.2	0.6	0.8	565	847			9760	773	
03-Oct	8.8	0.4	0.8	0.3	0.2	0.5	0.8	569	854			9920	793	
10-Oct	9.0	0.4	0.8	0.3	0.2	0.6	0.8	592	762			8960	756	
17-Oct	8.9	0.4	0.8	0.3	0.2	0.6	0.8	584	780			9240	896	
24-Oct	9.0	0.4	0.8	0.3	0.1	0.5	0.8	585	780			10275	780	
31-Oct	9.0	0.5	0.8	0.3	0.1	0.5	0.8	568	798			7755	731	
07-Nov	9.0	0.4	0.8	0.3	0.1	0.6	0.8		819			12160	776	
14-Nov	9.3	0.4	0.8	0.3	0.1	0.5	0.8		805			8816	725	
21-Nov	9.4	0.4	0.8	0.3	0.1	0.5	0.8		894			8940	725	
28-Nov	9.4	0.4	0.8	0.3	0.1	0.5	0.8		924			9240	894	
05-Dec	9.5	0.4	0.8	0.3	0.1	0.5	0.8		847			9240	820	
12-Dec	9.9	0.3	0.8	0.3	0.1	0.5	0.8		869			7900	770	
19-Dec	9.9	0.4	0.8	0.3	0.1	0.5	0.8		815			9780	750	
26-Dec	9.9	0.4	0.8	0.3	0.1	0.5	0.8		815			8150	727	
Minimum	7.5	0.3	0.6	0.2	0.0	0.3	0.7	388.0	670.0	7056.0		657.0	680.0	
Maximum	9.9	0.6	0.9	0.3	0.2	0.6	0.8	594.0	924.0	7439.0		21120.0	896.0	
Std Dev		0.1	0.1	0.0	0.1	0.1	0.0	47.0	48.2	191.5		3791.0	39.7	

Pond Contents	MIN	MAX
Conductivity (umhos/cm)	43,400	63,400

- NOTES: (1) Pumped SM underdrain.  
(2) Underdrain measurements are revised to show vertical readings instead of slope readings per NRC License Condition 25, Amendment 26 (Dec. 29, 1994).

CROW BUTTE MINE  
COMMERCIAL POND 3  
1996 DATA

TABLE 2C

DATE	DEPTH of WATER (ft)	UNDERDRAIN MEASUREMENTS (ft)						CONDUCTIVITY (umhos/cm)						NOTES
		NE	NM	NW	SE	SM	SW	NE	NM	NW	SE	SM	SW	
02-Jan	9.9	0.4	0.8	0.3	0.1	0.5	0.8		978			8965	750	
09-Jan	10.3	0.4	0.8	0.3	0.1	0.5	0.8		750			8150	750	
16-Jan	10.4	0.4	0.8	0.3	0.1	0.5	0.8		924			8965	750	
23-Jan	10.4	0.4	0.8	0.3	0.1	0.5	0.8		1008			8150	750	
30-Jan	10.4	0.4	0.8	0.3	0.1	0.5	0.8		1125			9780	734	
06-Feb	10.5	0.4	0.8	0.3	0.1	0.5	0.8		1008			8400	756	
13-Feb	10.5	0.4	0.8	0.3	0.1	0.5	0.8		865			6920	739	
20-Feb	10.6	0.4	0.8	0.3	0.0	0.5	0.8		1008			6920	783	
27-Feb	10.6	0.3	0.8	0.3	0.0	0.5	0.8		1008			6720	840	
05-Mar	10.6	0.3	0.8	0.3	0.0	0.5	0.8		990			6720	825	
12-Mar	10.6	0.3	0.8	0.3	0.1	0.5	0.8		815			6720	840	
19-Mar	10.8	0.4	0.8	0.3	0.1	0.5	0.8		815			6520	815	
26-Mar	10.6	0.5	0.8	0.3	0.1	0.5	0.8		815			6520	815	
02-Apr	10.6	0.4	0.8	0.3	0.1	0.5	0.8		815			6720	815	
09-Apr	10.6	0.4	0.8	0.3	0.1	0.5	0.8		770			6400	815	
16-Apr	10.6	0.4	0.8	0.3	0.1	0.5	0.8		770			6160	770	
23-Apr	10.6	0.4	0.8	0.3	0.1	0.5	0.8		775			6705	760	
30-Apr	10.6	0.4	0.8	0.3	0.1	0.5	0.8		745			6705	745	
07-May	10.6	0.4	0.8	0.3	0.1	0.6	0.8		870			7250	725	
14-May	10.6	0.5	0.7	0.3	0.1	0.4	0.8		822			7050	705	
21-May	10.6	0.4	0.9	0.3	0.1	0.6	0.8		822			6650	685	
28-May	11.1	0.4	0.8	0.3	0.1	0.5	0.8		780			6500	798	
04-Jun	11.2	0.4	0.8	0.3	0.2	0.8	0.8		798			6500	798	
11-Jun	11.1	0.3	0.8	0.3	0.1	0.4	0.8		780			6500	780	
18-Jun	11.1	0.4	0.8	0.3	0.1	0.5	0.8		744			6200	762	
25-Jun	11.0	0.4	0.8	0.3	0.1	0.5	0.8		805			5900	726	
02-Jul	11.1	0.6	0.8	0.3	0.1	0.5	0.8		791			5750	826	
09-Jul	10.9	0.4	0.8	0.3	0.1	0.5	0.8		791			6780	791	
16-Jul	10.9	0.4	0.8	0.3	0.8	0.5	0.2		791			6325	805	
23-Jul	10.6	0.4	0.8	0.3	0.1	0.5	0.8		756			6215	805	
30-Jul	10.6	0.5	1.0	0.4	0.1	0.6	0.8		777			6660	722	
06-Aug	10.5	0.3	0.8	0.4	0.1	0.5	0.8		904			6660	791	
13-Aug	10.5	0.4	0.8	0.3	0.1	0.6	0.8		777			6105	722	
20-Aug	10.3	0.4	0.8	0.3	0.1	0.6	0.8		777			7770	791	
27-Aug	10.3	0.4	0.8	0.3	0.1	0.8	0.6		832			6780	734	
03-Sep	10.3	0.4	0.8	0.2	0.1	0.8	0.6		832			6780	847	
10-Sep	10.0	0.4	0.8	0.3	0.1	0.6	0.8		777			5940	756	
17-Sep	10.0	0.4	0.8	0.3	0.1	0.8	0.6		805			6325	805	
24-Sep	10.0	0.5	0.8	0.3	0.0	0.5	0.8	578	826			6050	708	
01-Oct	10.0	0.5	0.8	1.1	0.1	0.5	0.8	605	787			6200	806	
08-Oct	10.0	0.5	0.8	0.3	0.1	0.5	0.8	620	825			6350	744	
15-Oct	9.9	0.5	0.8	0.3	0.1	0.5	0.8	825	825			7150	762	
22-Oct	9.9	0.4	0.8	0.3	0.1	0.5	0.8	762	1040			6500	1170	
29-Oct	10.0	0.5	0.8	0.3	0.1	0.6	0.8	650	846			6239	765	
05-Nov														
12-Nov														
19-Nov														
26-Nov														
03-Dec														
10-Dec														
17-Dec														
24-Dec														
31-Dec														
Minimum	9.9	0.3	0.7	0.2	0.0	0.4	0.2	578.0	744.0	ERR		5750.0	685.0	
Maximum	11.2	0.6	1.0	1.1	0.8	0.8	0.8	825.0	1125.0	ERR		9780.0	1170.0	
Std Dev		0.1	0.0	0.1	0.1	0.1	0.1	89.5	92.5	ERR		861.3	71.3	

Pond Contents	MIN	MAX
Conductivity (umhos/cm)	43,210	65,400

NOTES:

CROW BUTTE MINE  
COMMERCIAL POND 4  
1993 DATA

TABLE 3

DATE	DEPTH of WATER (ft)	UNDERDRAIN MEASUREMENTS (ft)						CONDUCTIVITY (umhos/cm)						NOTES
		NE	NM	NW	SE	SM	SW	NE	NM	NW	SE	SM	SW	
06-Jan	4.5	0.6	1.3	0.7	1.1	0.9	0.8	504	9164	957	4481	978	796	
13-Jan	4.5	0.6	1.2	0.7	1.1	0.9	0.8	462	9760	990	4717	974	850	
20-Jan	4.5	0.6	1.2	0.7	0.8	0.9	0.7	510	10595	935	6037	1008	801	
27-Jan	4.5	0.6	1.1	0.6	0.7	0.8	0.6	519	13200	935	6497	1038	801 (1)	
03-Feb	4.5	0.6	1.0	0.6	0.7	0.9	0.5	519	8568	901	6586	1038	765 (2)	
10-Feb	4.5	0.6	1.0	0.7	0.8	0.9	0.6	519	8148	979	5607	1038	515	
17-Feb	4.5	0.6	1.3	0.7	0.9	0.9	0.6	398	7560	840	4879	1038	724	
24-Feb	4.0	0.6	1.7	0.7	1.0	0.9	0.7	519	5270	867	4558	1038	760 (2)	
03-Mar	3.6	0.6	1.8	0.7	1.0	0.9	0.6	519	8650	952	6160	1038	735	
10-Mar	3.7	0.6	0.9	0.7	0.9	0.9	0.6	450	4536	830	4628	1157	651 (2)	
17-Mar	2.9	0.6	1.2	0.7	1.0	0.9	0.7	441	3192	848	4272	1211	675 (3)	
24-Mar	3.5	0.6	1.2	0.8	1.2	0.9	0.8	484	3528	830	2941	1384	692	
31-Mar	3.8	0.6	1.2	0.8	1.4	0.9	0.9	474	3318	948	1896	1467	652	
07-Apr	4.2	0.7	1.3	0.9	1.4	0.9	0.9	603	5609	1155	2370	1650	717	
14-Apr	4.3	0.7	1.3	0.8	1.4	0.9	1.0	492	5005	924	2618	1716	686	
21-Apr	4.5	0.7	1.3	0.8	1.4	0.9	1.0	506	5066	699	2533	1900	693	
28-Apr	4.4	0.7	1.3	0.8	1.4	0.9	0.9	564	4900	846	2608	1722	775	
05-May	4.4	0.7	1.4	0.9	1.5	0.9	1.0	506	5076	822	2671	1833	648	
12-May	4.5	0.7	1.3	0.8	1.4	0.9	1.0	990	4294	798	2600	1862	618	
19-May	4.8	0.8	1.3	0.9	1.4	0.9	1.0	2604	4779	832	2835	1792	621	
26-May	4.2	0.8	1.4	0.9	1.5	0.9	1.0	3465	5040	825	2728	1778	607 (4)	
02-Jun	4.1	0.8	1.4	0.9	1.5	0.9	1.0	5040	4898	805	2856	1754	714	
09-Jun	5.0	0.8	1.3	0.9	1.4	0.9	1.0	4410	4898	806	2852	1798	583	
16-Jun	5.1	0.8	1.3	0.9	1.4	0.9	1.0	5057	4736	907	2641	1817	702	
23-Jun	5.3	0.8	1.3	0.9	1.4	0.9	1.0	4012	4462	944	2773	1711	708	
30-Jun	5.3	0.8	1.3	0.9	1.5	0.9	1.0	3795	4661	920	2760	1725	690	
07-Jul	5.3	0.8	1.3	0.9	1.5	0.9	1.0	3622	4661	747	2599	1667	684	
14-Jul	5.3	0.8	1.4	0.9	1.4	0.9	1.0	3616	4485	684	2726	1725	702	
21-Jul	5.8	0.8	1.4	0.9	1.5	1.0	1.0	3335	4485	747	2850	1725	741	
28-Jul	5.7	0.8	1.3	0.8	1.5	0.9	1.0	3441	4542	734	2576	1695	734	
04-Aug	5.5	0.8	1.3	0.9	1.5	0.9	1.0	3219	4407	721	2553	1695	721	
11-Aug	5.3	0.8	1.3	0.9	1.5	0.9	1.0	3304	4463	832	2688	1695	721	
18-Aug	5.3	0.8	1.3	0.9	1.5	0.9	1.0	3192	4294	888	2497	1695	721	
25-Aug	5.3	0.8	1.3	0.9	1.5	0.9	1.0	2997	4312	777	2553	1665	666	
01-Sep	5.1	0.8	1.3	0.8	1.5	0.9	1.0	2700	3924	648	2268	1526	648	
08-Sep	5.2	0.8	1.3	0.9	1.4	0.9	0.9	2886	4294	847	2645	1840	734	
15-Sep	5.2	0.8	1.3	0.9	1.4	0.9	0.9	2832	4366	928	2618	1725	732	
22-Sep	4.9	0.8	1.3	0.9	1.4	0.9	0.9	2790	4340	840	2604	1674	682	
29-Sep	4.9	0.8	1.3	0.8	1.4	0.9	0.9	2540	4445	868	2603	1714	693	
06-Oct	4.9	0.8	1.3	0.8	1.4	0.9	0.9	2666	4381	806	2583	1778	756	
13-Oct	5.0	0.8	1.3	0.9	1.4	0.9	0.9	2710	4389	931	2877	1781	653	
20-Oct	5.0	0.8	1.3	0.9	1.4	0.9	0.9	2535	4160	896	2574	1862	792	
27-Oct	5.0	0.8	1.3	0.9	1.4	0.9	0.9	2527	4448	731	2849	1712	889	
03-Nov	5.0	0.7	1.3	0.9	1.4	0.9	0.8	2682	4636	858	2980	1788	625 (5)	
10-Nov	5.0	0.6	1.1	0.7	1.2	0.7	0.8	2156	3344	804	2212	1540	679	
17-Nov	5.0	0.6	1.2	0.7	1.3	0.8	0.8	2133	3318	499	2480	1422	664	
24-Nov	5.0	0.7	1.2	0.7	1.4	0.8	0.8	2119	3440	499	4867	1385	619	
01-Dec	5.0	0.7	1.2	0.7	1.4	0.8	0.8	2119	3504	584	4620	1485	684	
08-Dec	5.0	0.7	1.2	0.7	1.4	0.8	0.8	2080	3504	576	4890	1467	676	
15-Dec	5.0	0.6	1.2	0.6	1.3	0.8	0.8	2054	3436	616	5214	1422	648	
22-Dec	5.0	0.7	1.2	0.7	1.3	0.9	0.8	2119	3586	635	6720	1467	705	
29-Dec	5.0	0.7	1.2	0.7	1.3	0.9	0.8	2145	3504	660	8160	1512	697	

Minimum	2.9	0.6	0.9	0.6	0.7	0.7	0.5	398.0	3192.0	499.0	1896.0	974.0	515.0
Maximum	5.8	0.8	1.8	0.9	1.5	1.0	1.0	5057.0	13200.0	1155.0	8160.0	1900.0	889.0
Std Dev		0.1	0.1	0.1	0.2	0.0	0.1	1351.5	2041.8	128.9	1466.4	285.2	65.6

Pond Contents	MIN	MAX
Conductivity (umhos/cm)	22,820	41,400

- NOTES:
- (1) Patch placed on top liner near NM underdrain.
  - (2) NM underdrain pumped.
  - (3) Patch placed on top liner near NM underdrain.
  - (4) Patch placed on top liner near NE underdrain.
  - (5) All underdrains pumped on 11/3 & 11/4.
  - (6) Underdrain measurements are revised to show vertical readings instead of slope readings per NRC License Condition 25, Amendment 26 (Dec. 29, 1994)



CROW BUTTE MINE  
COMMERCIAL POND 4  
1994 DATA

TABLE 3A

DATE	DEPTH of WATER (ft)	UNDERDRAIN MEASUREMENTS (ft)						CONDUCTIVITY (umhos/cm)						NOTES
		NE	NM	NW	SE	SM	SW	NE	NM	NW	SE	SM	SW	
05-Jan	5.0	0.7	1.2	0.7	1.3	0.9	0.8	2062	3547	652	10080	1596	697	
12-Jan	5.0	0.7	1.2	0.7	1.3	0.9	0.8	2184	3586	655	7644	1530	709	
19-Jan	5.0	0.7	1.2	0.8	1.3	0.9	0.8	2249	3630	1008	8650	1615	692	
26-Jan	5.0	0.7	1.2	0.8	1.3	0.9	0.8	2100	3780	1008	8563	1530	692	
02-Feb	5.0	0.7	1.2	0.8	1.3	0.9	0.8	2125	3696	1020	9515	1557	686	
09-Feb	5.2	0.7	1.2	0.8	1.2	0.9	0.8	2162	3719	1038	10560	1672	704	
16-Feb	5.2	0.7	1.2	0.8	1.2	0.9	0.7	2076	6719	1038	6336	1584	694	
23-Feb	5.2	0.7	1.2	0.8	1.3	0.9	0.8	2184	3780	1008	10920	1700	672	
02-Mar	5.1	0.7	1.3	0.8	1.2	0.9	0.8	2119	3749	978	7253	1630	700 (1)	
09-Mar	4.1	0.7	1.3	0.8	1.3	0.9	0.9	2011	3648	924	9240	1596	699	
16-Mar	4.1	0.7	1.2	0.8	1.2	0.9	0.9	2011	3576	988	5960	1639	685	
23-Mar	4.8	0.7	1.3	0.8	1.2	0.9	0.9	1957	3552	955	7975	1617	681	
30-Mar	4.8	0.6	1.1	0.8	1.2	0.8	0.8	1540	2736	847	4389	1520	729	
06-Apr	4.8	0.6	1.1	0.7	1.2	0.8	0.8	1824	2660	847	6080	1463	693	
13-Apr	4.8	0.6	1.1	0.7	1.2	0.7	0.8	1639	2756	819	6258	1490	655	
20-Apr	4.8	0.5	1.0	0.7	1.2	0.7	0.8	1480	2679	790	4031	1551	639	
27-Apr	4.8	0.5	1.1	0.7	1.2	0.7	0.9	1330	2394	638	4655	1390	638	
03-May	4.8	0.5	1.1	0.7	1.2	0.7	0.9	1573	2431	549	4512	1692	648	
10-May	4.8	0.5	1.1	0.7	1.2	0.7	0.9	1197	2603	561	4680	1644	651	
17-May	4.7	0.5	1.0	0.7	1.3	0.7	0.9	1270	2600	364	5952	1690	762	
24-May	4.4	0.6	1.0	0.7	1.3	0.7	0.9	1426	2476	496	6655	1651	744	
31-May	4.4	0.4	1.0	0.7	1.3	0.7	0.9	1364	2480	582	5220	1612	767	
07-Jun	4.0	0.5	1.0	0.7	1.2	0.7	0.9	2006	2420	471	6325	1534	747	
14-Jun	4.0	0.5	1.1	0.7	1.3	0.8	1.0	1150	2360	702	6554	1518	678	
21-Jun	4.1	0.5	1.1	0.7	1.3	0.8	1.0	1265	2360	495	7345	1610	791	
28-Jun	4.5	0.5	0.9	0.7	1.3	0.8	0.9	1865	2300	440	7770	1582	734	
05-Jul	4.9	0.5	1.1	0.7	1.3	0.8	0.9	1265	2300	463	7940	1653	784	
12-Jul	5.0	0.6	1.1	0.7	1.3	0.8	0.9	1254	2415	429	7280	1710	734	
19-Jul	5.2	0.6	1.1	0.7	1.3	0.8	0.9	1243	2394	504	7910	1561	777	
26-Jul	5.4	0.6	1.1	0.7	1.3	0.8	0.9	1186	2260	455	7770	1609	721	
02-Aug	5.4	0.6	1.1	0.7	1.3	0.8	0.9	1243	2373	444	7770	1695	666	
09-Aug	5.4	0.6	1.1	0.7	1.3	0.8	0.9	1221	2268	424	7770	1554	756	
16-Aug	5.8	0.6	1.1	0.7	1.3	0.8	0.9	1188	2442	486	7020	1566	756	
23-Aug	5.8	0.6	1.1	0.7	1.3	0.8	0.9	1221	2373	377	7770	1469	777	
30-Aug	5.7	0.6	1.1	0.7	1.3	0.8	0.9	1243	2415	455	7840	1582	784	
06-Sep	5.7	0.6	1.1	0.7	1.3	0.8	0.8	1150	2530	373	7475	1740	776	
13-Sep	5.8	0.6	1.0	0.7	1.3	0.8	0.8	1239	2204	448	8120	1740	805	
20-Sep	5.8	0.6	1.1	0.7	1.3	0.8	0.8	1331	2360	460	7670	1593	754	
27-Sep	6.0	0.6	1.1	0.7	1.2	0.7	0.7	1220	2562	454	6820	1674	575	
04-Oct	6.2	0.6	1.1	0.7	1.2	0.7	0.7	1220	2299	436	7865	1694	459	
11-Oct	6.6	0.6	1.1	0.7	1.2	0.7	0.7	1235	2667	355	7620	1524	889	
18-Oct	6.7	0.6	1.0	0.7	1.2	0.7	0.7	1206	2413	406	7800	2080	780	
25-Oct	7.1	0.6	1.1	0.7	1.2	0.7	0.7	1330	2600	546	9310	1662	798	
01-Nov	7.3	0.6	1.1	0.7	1.3	0.7	0.7	1480	2593	798	9035	1575	877	
08-Nov	7.3	0.6	1.1	0.7	1.2	0.8	0.7	1716	2467	603	7150	1692	663	
15-Nov	7.5	0.6	1.1	0.7	1.2	0.8	0.7	2757	2320	2320	7301	1617	67	
22-Nov	7.4	0.6	1.1	0.7	1.2	0.8	0.6	5135	2587	2926	7189	1552	47	
29-Nov	7.3	0.6	1.1	0.7	1.2	0.8	0.6	6384	2771	3002	7812	1711	668	
06-Dec	7.4	0.5	1.0	0.7	1.2	0.8	0.6	8400	2445	3160	7335	1630	779	
13-Dec	7.3	0.5	1.0	0.7	1.0	0.8	0.6	7120	2475	3192	8650	1344	663	
20-Dec	7.3	0.5	1.0	0.7	0.9	0.7	0.5	10595	2445	3097	10380	1557	674	
27-Dec	7.3	0.5	0.4	0.6	0.8	0.7	0.5	10380	2520	2608	9515	1644	779	

Minimum	4.0	0.4	0.4	0.6	0.8	0.7	0.5	1150	2204	355	4031	1344	47
Maximum	7.5	0.7	1.3	0.8	1.3	0.9	1.0	10595	6719	3192	10920	2080	889
Std Dev		0.1	0.1	0.0	0.1	0.1	0.1	2194	744	808	1544	105	145

Pond Contents	MIN	MAX
Conductivity (umhos/cm)	36,505	54,560

NOTES: (1) Pond level lowered & liner area reporting to SE underdrain checked for holes, none found.  
(2) Underdrain measurements are revised to show vertical readings instead of slope readings per NRC License Condition 25, Amendment 26 (Dec. 29, 1994).

CROW BUTTE MINE  
COMMERCIAL POND 4  
1995 DATA

TABLE 3B

DATE	DEPTH of UNDERDRAIN MEASUREMENTS (ft)							CONDUCTIVITY (umhos/cm)						NOTES
	WATER (ft)	NE	NM	NW	SE	SM	SW	NE	NM	NW	SE	SM	SW	
03-Jan	7.4	0.4	1.0	0.6	1.1	0.7	0.5	17300	2520	2768	7056	1644	726	
10-Jan	7.4	0.4	0.9	0.6	1.1	0.7	0.5	17600	2725	3287	7744	1496	676	
17-Jan	6.2	0.4	1.0	0.6	0.9	0.7	0.5	18100	2595	3114	7120	1557		
24-Jan	6.2	0.3	1.0	0.5	0.9	0.7	0.4	16800	2595	2856	7958	1780		
31-Jan	5.9	0.3	1.0	0.6	1.2	0.7	0.5	13600	2520	1848	5712	1512	739	
07-Feb	6.3	0.4	1.0	0.6	1.3	0.8	0.5	12750	2550	2184	6105	1557	657	
14-Feb	6.3	0.3	1.0	0.6	1.3	0.8	0.6	11760	2768	2768	6600	1730		
21-Feb	6.3	0.3	1.0	0.6	1.3	0.8	0.5	13200	2688	2282	6930	1650		
28-Feb	6.3	0.4	1.0	0.6	1.3	0.8	0.6	12640	2608	2370	6930	1580		
07-Mar	6.3	0.4	1.0	0.7	1.3	0.8	0.7	12640	2445	2156	6952	1580		
14-Mar	6.3	0.4	1.1	0.7	1.3	0.8	0.7	11920	2618	2002	7084	1580		
21-Mar	6.3	0.3	1.1	0.7	1.3	0.8	0.7	13230	2533	2235	8940	1490		
28-Mar	6.2	0.3	1.1	0.6	1.3	0.8	0.7	11175	2340	3344	9120	1672		
04-Apr	6.2	0.3	1.1	0.6	1.3	0.8	0.6	9480	2725	2449	7900	1659	16	
11-Apr	6.1	0.3	1.0	0.5	1.3	0.7	0.6	7250	2384	1837	4647	1639	417	
18-Apr	6.1	0.3	1.1	0.5	1.3	0.8	0.6	8820	2508	2384	6240	1771	676	
25-Apr	6.1	0.3	1.0	0.6	1.3	0.8	0.6	8940	2533	1565	5800	1595	677	
02-May	6.3	0.3	1.1	0.6	1.3	0.8	0.6	8940	2458	2572	6909	1713	596	
09-May	6.6	0.3	1.1	0.6	1.3	0.8	0.7	8460	2320	2464	7150	1764	435	
16-May	6.5	0.3	1.1	0.6	1.4	0.8	0.7	8460	2574	2820	6950	1740	306	
23-May	6.7	0.3	1.1	0.6	1.3	0.8	0.7	7980	1850	1862	7980	1781	732	
30-May	6.7	0.3	1.1	0.7	1.3	0.8	0.7	7315	2466	2261	7920	1687	665	
06-Jun	6.8	0.3	1.1	0.7	1.3	0.7	0.8	6350	2460	2730	19520	1729	762	(2)
13-Jun	6.9	0.3	1.1	0.6	1.3	0.8	0.8	6350	2470	2350	5715	1755	762	
20-Jun	6.8	0.3	1.1	0.6	1.4	0.8	0.8	6655	2356	2499	6490	1694	726	
27-Jun	6.6	0.4	1.1	0.7	1.3	0.8	0.8	5750	2420	3068	8050	1770	748	
04-Jul	6.5	0.4	1.1	0.7	1.3	0.8	0.8	3680	2360	2596	8050	1711	748	
11-Jul	6.4	0.4	1.1	0.7	1.3	0.8	0.8	5700	2301	2587	8475	1667	855	
18-Jul	6.4	0.4	1.1	0.7	1.4	0.8	0.8	5550	2300	2688	9180	1695	777	
25-Jul	6.4	0.5	1.1	0.7	1.4	0.8	0.8	5550	2147	2997	9180	1783	708	
01-Aug	6.3	0.5	1.1	0.7	1.4	0.8	0.8	5550	2128	2398	9435	1792	721	
08-Aug	6.2	0.5	1.1	0.7	1.4	0.8	0.8	5550	2373	2997	9990	1695	666	
15-Aug	5.9	0.5	1.1	0.7	1.4	0.8	0.8	5995	2220	2664	9720	1792	702	
22-Aug	5.8	0.5	1.1	0.7	1.4	0.8	0.8	5995	2220	2664	9990	1972	722	
29-Aug	5.7	0.5	1.1	0.7	1.4	0.8	0.8	6480	2387	2646	10260	1832	702	
05-Sep	5.5	0.5	1.1	0.6	1.4	0.8	0.8	6480	2220	2592	10600	1776	702	
12-Sep	5.4	0.5	1.1	0.6	1.4	0.8	0.8	6720	2316	2442	10170	1808	702	
19-Sep	5.3	0.5	1.1	0.6	1.3	0.8	0.8	9040	2394	2090	10170	1710	678	
26-Sep	5.3	0.6	1.1	0.6	1.3	0.8	0.7	15860	2480	2420	9920	1860	183	
03-Oct	5.3	0.5	1.1	0.6	1.4	0.8	0.7	14520	2196	2178	9920	1860	183	
10-Oct	5.4	0.5	1.1	0.7	1.3	0.8	0.7	14300	2470	2222	10160	1820	650	
17-Oct	5.3	0.5	1.1	0.7	1.3	0.8	0.6	11700	2508	2368	9240	1792	635	
24-Oct	5.3	0.5	1.0	0.6	1.3	0.8	0.6	11970	2261	2244	9450	1663	492	
31-Oct	5.3	0.5	1.0	0.6	1.3	0.8	0.6	11280	2397	2055	10010	1833	564	
07-Nov	5.3	0.5	1.0	0.6	1.3	0.8	0.6	12160	2584	2352	10140	1863	600	
14-Nov	5.3	0.5	1.0	0.7	1.2	0.8	0.5	11856	2523	1937	9548	1854	600	
21-Nov	5.4	0.5	1.1	0.6	1.2	0.8	0.5	11025	2533	2030	9685	1937	596	
28-Nov	5.4	0.5	1.0	0.6	1.3	0.8	0.6	11175	2533	2384	10010	1863	678	
05-Dec	5.4	0.5	1.0	0.6	1.2	0.8	0.5	10640	1848	2161	9240	1848	616	
12-Dec	5.4	0.5	1.0	0.6	1.2	0.8	0.5	11410	2528	2054	10595	1738	603	
19-Dec	5.4	0.5	1.0	0.6	1.2	0.6	0.5	9780	2560	2160	9780	1793	554	
26-Dec	5.3	0.5	1.0	0.6	1.3	0.8	0.5	11410	2608	2212	8150	1793	587	
Minimum	5.3	0.3	0.9	0.5	0.9	0.7	0.4	3680.0	1848.0	1565.0	4647.0	1490.0	16.0	
Maximum	7.4	0.6	1.1	0.7	1.4	0.8	0.8	18100.0	2768.0	3344.0	19520.0	1972.0	855.0	
Std Dev		0.1	0.1	0.1	0.1	0.0	0.1	3594.8	187.6	377.1	2176.9	109.3	169.0	

Pond Contents	MIN	MAX
Conductivity (umhos/cm)	39,930	63,100

- NOTES: (1) Pond lowered and liner area reporting to NE underdrain checked for holes, none found.  
(2) Error in SE underdrain reading.  
(3) Underdrain measurements are revised to show vertical readings instead of slope readings

CROW BUTTE MINE  
COMMERCIAL POND 4  
1996 DATA

TABLE 3C

DATE	DEPTH of UNDERDRAIN MEASUREMENTS (ft)							CONDUCTIVITY (umhos/cm)						NOTES
	WATER (ft)	NE	NM	NW	SE	SM	SW	NE	NM	NW	SE	SM	SW	
02-Jan	5.3	0.5	1.0	0.6	1.3	0.8	0.5	11410	2445	2282	8400	1793	587	
09-Jan	5.4	0.5	1.0	0.6	1.2	0.8	0.5	10595	2445	2016	10080	1848	605	
16-Jan	5.4	0.5	1.0	0.6	1.1	0.8	0.5	11760	2688	2520	10920	1932	571	
23-Jan	5.4	0.5	1.1	0.6	1.1	0.8	0.5	10920	2688	3024	10200	1848	536	
30-Jan	5.4	0.5	1.1	0.6	1.0	0.8	0.5	10380	2768	2422	11245	1903	545	
06-Feb	5.5	0.5	1.0	0.6	0.9	0.8	0.5	9780	2688	2249	11440	1936	552	
13-Feb	5.5	0.4	0.8	0.4	0.6	0.6	0.3	8650	1903	2249	8650	1730	461	
20-Feb	5.6	0.5	0.8	0.5	0.8	0.7	0.4	8400	2520	2016	6720	1730	588	
27-Feb	5.6	0.5	1.0	0.5	1.2	0.8	0.5	9780	2688	2184	6520	1848	652	
05-Mar	5.5	0.5	1.1	0.6	1.3	0.8	0.6	9600	2640	1650	9240	1815	660	
12-Mar	5.5	0.6	1.1	0.6	1.3	0.8	0.6	9780	2608	1630	8150	1875	570	
19-Mar	5.5	0.5	1.1	0.6	1.3	0.8	0.6	9240	2528	2156	10780	1817	632	
26-Mar	5.4	0.5	1.0	0.6	1.3	0.8	0.5	9600	2400	1580	13040	1896	632	
02-Apr	5.4	0.6	1.1	0.6	1.3	0.8	0.7	8965	2445	2282	14670	1875	652	
09-Apr	5.4	0.5	1.0	0.6	1.3	0.8	0.6	8940	2618	1788	15400	1788	616	
16-Apr	5.5	0.5	1.0	0.6	1.1	0.8	0.6	8700	2533	2235	17290	1937	521	
23-Apr	5.5	0.5	1.0	0.6	1.1	0.8	0.6	8460	2465	1833	11280	1885	564	
30-Apr	5.5	0.6	1.1	0.6	1.3	0.8	0.7	8700	2397	1974	14100	1833	564	
07-May	5.3	0.6	1.1	0.7	1.3	0.9	0.8	8220	2397	1833	13700	1904	685	
14-May	5.3	0.5	1.0	0.6	1.3	0.7	0.5	8220	2394	1918	17290	1918	548	
21-May	5.3	0.5	1.0	0.7	1.3	0.8	0.6	8680	2470	1715	14880	1842	496	
28-May	5.5	0.5	1.1	0.6	1.3	0.8	0.5	9100	2470	1820	15600	1950	650	
04-Jun	5.5	0.6	1.1	0.7	1.3	0.8	0.8	7620	2340	1560	15600	1950	650	
11-Jun	5.4	0.5	1.0	0.6	1.3	0.8	0.5	8470	2356	1452	15730	1984	605	
18-Jun	5.3	0.5	1.1	0.5	1.0	0.7	0.5	6780	2360	1416	16950	1955	690	
25-Jun	5.3	0.6	1.1	0.7	1.2	0.8	0.6	7910	2473	1610	15820	1955	575	
02-Jul	5.2	0.6	1.1	0.7	1.3	0.8	0.5	7910	2486	1665	18498	2034	555	
09-Jul	5.2	0.6	1.1	0.7	1.2	0.8	0.5	7770	2442	1665	16650	1998	555	
16-Jul	5.1	0.6	1.0	0.5	1.3	0.8	0.6	7770	2486	1887	15540	1998	666	
23-Jul	5.1	0.6	1.1	0.7	1.3	0.8	0.6	7020	2376	2052	15540	1998	666	
30-Jul	5.0	0.7	1.1	0.7	1.3	0.8	0.8	7020	2268	2160	12960	2052	648	
06-Aug	4.9	0.5	1.0	0.6	1.3	0.8	0.5	7910	2553	1836	15540	2147	648	
13-Aug	4.9	0.6	1.1	0.7	1.3	0.8	0.8	7770	2376	1782	15120	1944	648	
20-Aug	4.7	0.7	1.1	0.7	1.3	0.8	0.7	7215	2553	1887	15120	2106	648	
27-Aug	4.4	0.7	1.2	0.7	1.3	0.8	0.8	6660	2220	1942	15120	2109	666	
03-Sep	4.3	0.7	1.1	0.7	1.3	0.8	0.7	6660	2220	1720	15540	2109	666	
10-Sep	4.0	0.7	1.1	0.7	1.3	0.8	0.7	6660	2220	2599	14430	2109	666	
17-Sep	4.3	0.7	1.1	0.7	1.3	0.8	0.7	6840	2147	1695	16385	2147	678	
24-Sep	4.0	0.7	1.1	0.7	1.3	0.8	0.7	6655	2242	2760	15730	2596	649	
01-Oct	4.0	0.6	1.1	0.7	1.3	0.8	0.7	6200	2418	1573	15500	2100	620	
08-Oct	4.0	0.6	1.1	0.6	1.3	0.8	0.8	6710	2480	2118	15500	2108	620	
15-Oct	3.8	0.7	1.1	0.7	1.3	0.8	0.8	6820	2480	2232	16120	2108	620	
22-Oct	3.9	0.7	1.0	0.7	1.3	0.8	0.7	6850	2600	1270	15600	2210	650	
29-Oct	4.0	0.6	1.0	0.7	1.3	0.8	0.6	6556	2500	1450	15510	2185	705	
05-Nov														
12-Nov														
19-Nov														
26-Nov														
03-Dec														
10-Dec														
17-Dec														
24-Dec														
31-Dec														
Minimum	3.8	0.4	0.8	0.4	0.6	0.6	0.3	6200.0	1903.0	1270.0	6520.0	1730.0	461.0	
Maximum	5.6	0.7	1.2	0.7	1.3	0.9	0.8	11760.0	2768.0	3024.0	18498.0	2596.0	705.0	
Std Dev		0.1	0.1	0.1	0.2	0.0	0.1	1409.5	162.8	368.3	3030.4	155.0	55.6	

Pond Contents	MIN	MAX
Conductivity (umhos/cm)	49,300	86,000

NOTES:

CROW BUTTE MINE  
R & D CELLS 1 & 2  
1993 DATA

TABLE 4

DATE	CELL 1 DEPTH (ft)	CELL 2 DEPTH (ft)	NOTES
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06-Jan	3.4	9.3	
13-Jan	3.8	9.5	
20-Jan	3.8	9.5	
27-Jan	3.8	9.5	
03-Feb	3.8	9.5	
10-Feb	3.8	9.5	
17-Feb	3.8	9.5	
24-Feb	4.0	9.5	
03-Mar	4.2	9.5	
10-Mar	4.5	9.5	
17-Mar	5.0	9.5	
24-Mar	5.3	9.5	
31-Mar	5.4	9.5	
07-Apr	5.6	9.8	
14-Apr	5.8	10.1	
21-Apr	6.2	10.2	
28-Apr	6.0	10.1	
05-May	6.1	10.1	
12-May	6.2	10.0	
19-May	6.3	10.0	
26-May	6.3	9.9	
02-Jun	6.2	9.8	
09-Jun	6.7	10.3	
16-Jun	6.8	10.2	
23-Jun	7.0	10.3	
30-Jun	6.8	10.3	
07-Jul	6.8	10.2	
14-Jul	6.7	10.0	
21-Jul	7.3	10.3	
28-Jul	7.4	10.4	
04-Aug	7.3	10.3	
11-Aug	7.4	10.2	
18-Aug	7.5	10.2	
25-Aug	7.6	10.0	
01-Sep	7.8	10.0	
08-Sep	7.9	9.8	
15-Sep	8.0	9.8	
22-Sep	8.3	9.9	
29-Sep	8.3	9.9	
06-Oct	8.3	9.8	
13-Oct	8.6	10.0	
20-Oct	8.8	10.0	
27-Oct	8.9	10.0	
03-Nov	9.0	10.0	
10-Nov	9.0	9.9	
17-Nov	9.0	10.0	
24-Nov	9.3	10.1	
01-Dec	9.3	10.1	
08-Dec	9.3	10.1	
15-Dec	9.6	10.1	
22-Dec	9.6	10.1	
29-Dec	9.8	10.1	

Minimum	3.4	9.3
Maximum	9.8	10.4



CROW BUTTE MINE  
R & D CELLS 1 & 2  
1994 DATA

TABLE 4A

DATE	CELL 1 DEPTH (ft)	CELL 2 DEPTH (ft)	NOTES
------	----------------------	----------------------	-------

05-Jan	9.7	10.1	
12-Jan	9.8	10.1	
19-Jan	10.0	10.1	
26-Jan	10.0	10.1	
02-Feb	10.0	10.1	
09-Feb	10.0	10.2	
16-Feb	10.0	10.2	
23-Feb	10.2	10.2	
02-Mar	10.2	10.2	
09-Mar	10.3	10.2	
16-Mar	10.3	10.2	
23-Mar	10.4	10.2	
30-Mar	10.4	10.0	
06-Apr	10.4	10.0	
13-Apr	10.5	9.9	
20-Apr	10.5	9.9	
27-Apr	10.5	9.9	
03-May	10.5	9.9	
10-May	10.5	9.9	
17-May	10.5	9.9	
24-May	10.5	9.9	
31-May	10.5	9.5	
07-Jun	10.4	9.4	
14-Jun	10.2	9.1	
21-Jun	10.1	9.0	
28-Jun	10.2	9.1	
05-Jul	10.2	9.0	
12-Jul	10.1	8.9	
19-Jul	10.2	8.9	
26-Jul	10.1	8.8	
02-Aug	10.0	8.8	
09-Aug	10.0	8.9	
16-Aug	9.9	8.8	
23-Aug	9.8	8.6	
30-Aug	9.6	8.4	
06-Sep	9.6	8.4	
13-Sep	9.5	8.3	
20-Sep	9.4	8.3	
27-Sep	9.5	8.1	
04-Oct	9.5	8.0	
11-Oct	9.5	8.0	
18-Oct	9.5	8.1	
25-Oct	9.6	8.1	
01-Nov	9.6	8.1	
08-Nov	9.6	8.1	
15-Nov	9.5	8.2	
22-Nov	9.6	8.2	
29-Nov	9.5	8.2	
06-Dec	9.5	8.2	
13-Dec	9.5	8.2	
20-Dec	9.5	8.2	
27-Dec	9.5	8.2	

Minimum	9.4	8.0
Maximum	10.5	10.2

CROW BUTTE MINE  
R & D CELLS 1 & 2  
1995 DATA

TABLE 4B

DATE	CELL 1 DEPTH (ft)	CELL 2 DEPTH (ft)	NOTES
03-Jan	9.4	8.3	
10-Jan	9.4	8.3	
17-Jan	9.4	8.3	
24-Jan	9.4	8.3	
31-Jan	10.1	8.4	
07-Feb	10.4	8.4	
14-Feb	10.4	8.4	
21-Feb	10.4	8.4	
28-Feb	10.7	8.4	
07-Mar	10.7	8.4	
14-Mar	10.5	8.4	
21-Mar	10.5	8.3	
28-Mar	10.5	8.3	
04-Apr	10.5	8.1	
11-Apr	10.6	8.2	
18-Apr	10.6	8.2	
25-Apr	10.6	8.2	
02-May	10.8	8.6	
09-May	11.0	8.8	
16-May	11.1	8.9	
23-May	11.1	9.0	
30-May	11.3	9.1	
06-Jun	11.3	9.2	
13-Jun	11.5	9.4	
20-Jun	11.3	9.3	
27-Jun	11.3	9.2	
04-Jul	11.2	9.1	
11-Jul	11.1	9.0	
18-Jul	11.1	9.0	
25-Jul	11.1	9.1	
01-Aug	11.0	9.0	
08-Aug	10.9	8.9	
15-Aug	10.8	8.8	
22-Aug	10.5	8.5	
29-Aug	10.5	8.5	
05-Sep	10.5	8.4	
12-Sep	10.4	8.3	
19-Sep	10.2	8.1	
26-Sep	10.3	8.2	
03-Oct	10.3	8.3	
10-Oct	10.3	8.3	
17-Oct	10.3	8.2	
24-Oct	10.3	8.3	
31-Oct	10.3	8.3	
07-Nov	10.3	8.3	
14-Nov	10.8	8.5	
21-Nov	10.4	8.4	
28-Nov	10.4	8.4	
05-Dec	10.4	8.4	
12-Dec	10.4	8.4	
19-Dec	10.4	8.4	
26-Dec	11.5	8.5	
Minimum	9.4	8.1	
Maximum	11.5	9.4	

NOTES:

CROW BUTTE MINE  
R & D CELLS 1 & 2  
1996 DATA

TABLE 4C

DATE	CELL 1 DEPTH (ft)	CELL 2 DEPTH (ft)	NOTES
02-Jan	8.5	10.5	
09-Jan	8.5	10.5	
16-Jan	10.5	8.5	
23-Jan	10.5	8.5	
30-Jan	10.5	8.5	
07-Feb	10.5	8.6	
13-Feb	10.5	8.6	
20-Feb	10.5	8.5	
27-Feb	10.5	8.6	
05-Mar	10.5	8.5	
12-Mar	10.5	8.5	
19-Mar	10.5	8.5	
26-Mar	10.5	8.5	
02-Apr	10.3	8.5	
09-Apr	10.3	8.4	
16-Apr	10.4	8.5	
23-Apr	10.4	8.5	
30-Apr	10.4	8.5	
07-May	10.3	8.5	
14-May	10.3	8.5	
21-May	10.4	8.6	
28-May	10.6	9.1	
04-Jun	10.6	9.3	
11-Jun	10.5	9.3	
18-Jun	10.4	9.3	
25-Jun	10.4	9.5	
02-Jul	10.4	9.6	
09-Jul	10.3	9.6	
16-Jul	10.3	9.7	
23-Jul	10.3	9.9	
30-Jul	10.1	10.0	
06-Aug	10.1	10.1	
13-Aug	10.0	10.1	
20-Aug	9.9	10.1	
27-Aug	9.9	10.2	
03-Sep	9.9	10.4	
10-Sep	9.9	10.4	
17-Sep	9.5	10.5	
24-Sep	9.5	10.6	
01-Oct	9.5	10.5	
08-Oct	9.5	10.6	
15-Oct	9.5	10.6	
22-Oct	9.5	10.8	
29-Oct	9.6	11.1	
05-Nov			
12-Nov			
19-Nov			
26-Nov			
03-Dec			
10-Dec			
17-Dec			
24-Dec			
31-Dec			

Minimum	8.5	8.4
Maximum	10.6	11.1

NOTES:

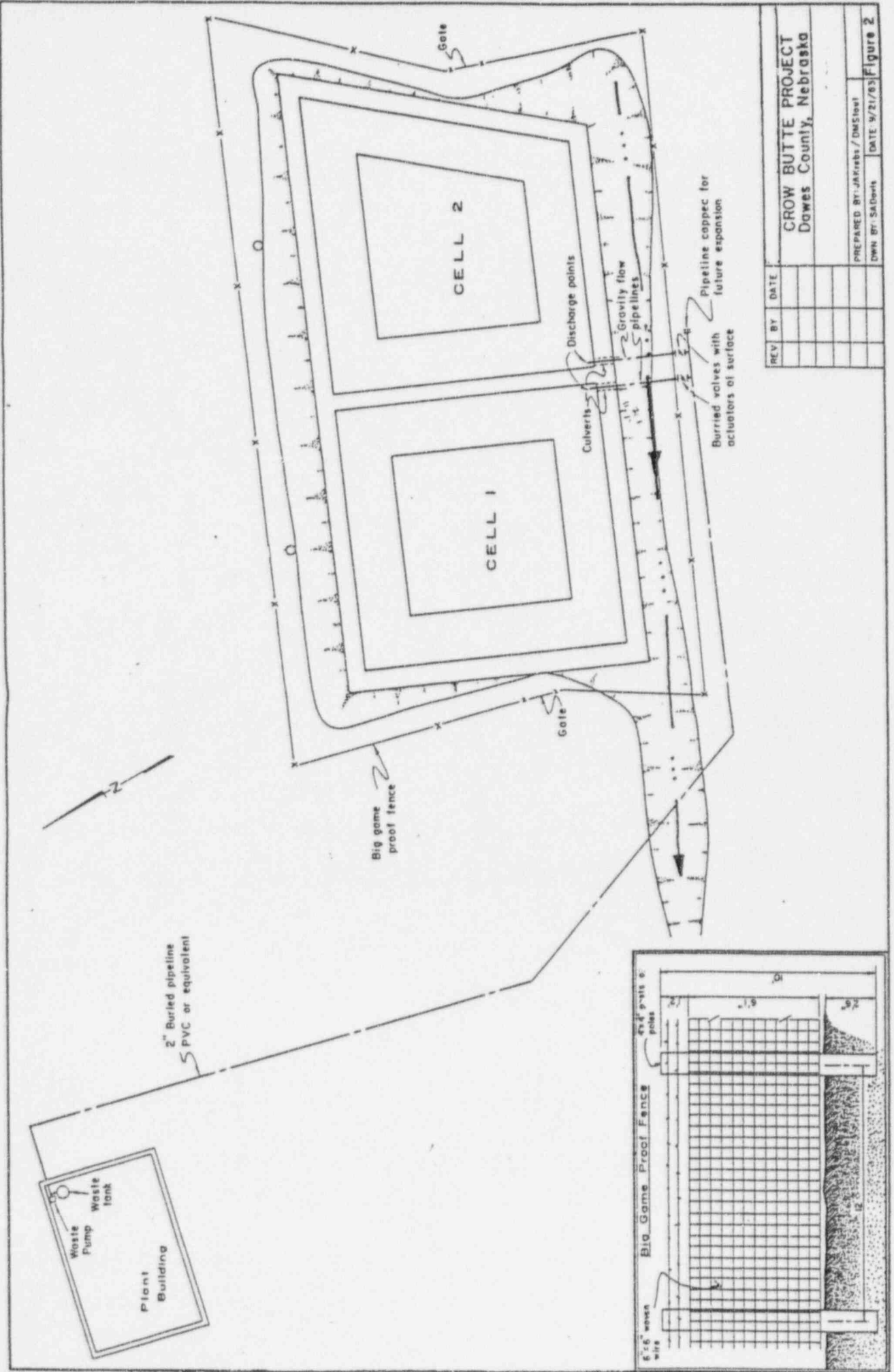
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Figure 1. The effect of the concentration of the monomer on the polymerization of *l*-lysine. The polymerization was carried out at 60°C for 24 h in the presence of 0.05 mol/L of *l*-lysine and 0.05 mol/L of *l*-phenylalanine. The concentration of the monomer was 0.05, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, and 1.0 mol/L. The polymerization was carried out in the presence of 0.05 mol/L of *l*-lysine and 0.05 mol/L of *l*-phenylalanine. The concentration of the monomer was 0.05, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, and 1.0 mol/L. The polymerization was carried out in the presence of 0.05 mol/L of *l*-lysine and 0.05 mol/L of *l*-phenylalanine. The concentration of the monomer was 0.05, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, and 1.0 mol/L.

*P. D. 2016*

[illegible]

Figure 2 R&D Pond Layout



REV	BY	DATE

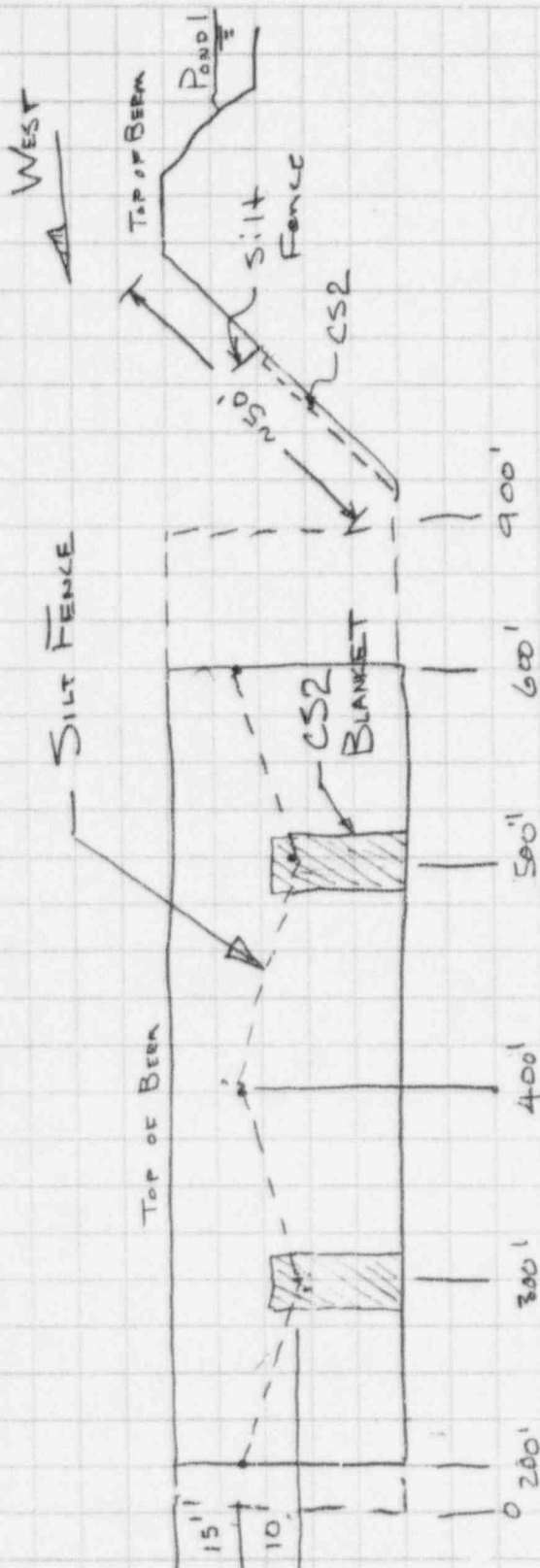
CROW BUTTE PROJECT  
Dawes County, Nebraska

PREPARED BY: JAKREBS / DMS/loft  
OWN BY: SADOERIS  
DATE: 9/21/83  
Figure 2

# FIGURE 3 CROW BUTTE RESOURCES, INC.

CC F. 10-6.009  
8-3.020  
8-3.021  
ret sm

PROJECT POND 1 REPAIRS - Design  
DATE 8-13-96 BY SM SHEET      OF     



## POND 1 REPAIRS:

1. Backfill slope w/  
native mat'l
2. Place topsoil on  
top of native
3. Apply hay
4. Install silt  
fence & CS2  
blanket as  
shown here.

WEST SLOPE - POND 1



**ATTACHMENT 1**

**1996 ANNUAL POND SURVEY**

**BY: PINE RIDGE SURVEYS**

CROW BUTTE RESOURCES, INC.  
RANGE ONE  
CROSS SECTIONS FOR PONDS  
STATION 0+00  
SEPTEMBER 3, 1996

LEFT OF BASE LINE	SEA LEVEL ELEVATION	DESCRIPTION	SHOT TAKEN ON
89.2	3850.87	Fence	Ground ✓
118.12	3852.67	Toe of Slope	Hub ✓
161.57	3866.38	Midpoint of Slope	Ground ✓
195.93	3879.93	Outside Edge Berm	Ground ✓
356.67	3880.66	Midpoint of Pond	Rebar ✓
531.89	3880.99	Outside Edge Berm	Ground ✓
538.49	3878.70	"V" of Ditch	Ground ✓
548.51	3882.96	Top of Slope	Ground ✓
554.12	3883.03	Fence	Ground ✓
579.51	3883.87	Top of Ditch	Ground ✓
584.81	3882.90	"V" of Ditch	Ground ✓
594.06	3885.68	Top of Ditch	Ground ✓



CROW BUTTE RESOURCES, INC.  
RANGE TWO  
CROSS SECTIONS FOR PONDS  
STATION 5+00  
SEPTEMBER 3, 1996

LEFT OF BASE LINE	SEA LEVEL ELEVATION	DESCRIPTION	SHOT TAKEN ON
92.58	3860.86	Fence	Ground ✓
144.07	3862.32	Toe of Slope	Hub ✓
173.70	3871.29	Midpoint of Slope	Ground ✓
199.28	3880.91	Outside Edge Berm	Rebar ✓
205.59	3881.46	Inside Edge of Berm	Liner ✓
521.66	3880.62	Inside Edge of Berm	Liner ✓
528.02	3880.43	Outside Edge of Berm	Rebar ✓
538.35	3878.71	(top of ditch) "V" of Ditch	Ground ✓
558.69	3882.25	West Edge Road	Ground ✓
577.40	3883.04	East Edge Road	Ground ✓
584.74	3884.43	Bottom of Slope	Ground ✓
608.83	3893.86	Midpoint of Slope	Ground ✓
633.89	3904.51	Outside Edge Berm	Ground ✓
636.87	3905.12	Previous Outside Edge Berm	Rebar ✓
645.95	3905.31	Inside Edge Berm	Liner ✓
907.62	3905.11	Inside Edge Berm (New Distance)	Liner ✓
909.86	3905.16	Inside Edge Berm (Old Distance)	Liner ✓
915.36	3904.94	Center Edge Berm	Rebar ✓
918.87	3904.87	(top of ditch) Outside Edge Berm	Ground ✓
934.58	3899.57	W. Edge Flat Bottom D.	Ground ✓
944.28	3899.69	E. Edge Flat Bottom D.	Ground ✓
992.91	3909.85	Fence	Ground ✓
1004.69	3912.18	Toe of Slope-1996	Ground ✓
1008.80	3915.17	W. Top of Ditch	Ground ✓
1020.75	3913.65	Bottom of Ditch	Ground ✓
1021.99	3916.14	E. Top of Ditch	Ground ✓
1033.35	3919.18	Midpoint of Slope	Ground ✓
1076.97	3929.15	Top of Slope	Ground ✓

CROW BUTTE RESOURCES, INC.  
RANGE THREE  
CROSS SECTIONS FOR PONDS  
STATION 10+00  
SEPTEMBER 3, 1996

LEFT OF BASE LINE	SEA LEVEL ELEVATION	DESCRIPTION	SHOT TAKEN ON
96.18	3868.84	Fence	Ground ✓
122.05	3870.27	Toe of Slope	Hub ✓
149.22	3880.13	Midpoint Slope	Ground ✓
174.02	3890.22	Outside Edge Berm	Rebar ✓
185.43	3890.79	Inside Edge Berm	Liner ✓
500.19	3890.73	Inside Edge Berm	Liner ✓
509.90	3889.71	Outside Edge Berm	Rebar ✓
537.37	3887.94	West Edge of Road	Ground ✓
546.87	3888.00	East Edge Road (top of ditch)	Ground ✓
552.91	3886.87	West Edge Flat Bottom D.	Ground ✓
560.40	3886.81	East Edge Flat Bottom D.	Ground ✓
569.25	3889.28	Top of Ditch	Ground ✓
598.94	3890.83	Toe of Slope	Hub ✓
617.65	3897.63	Midpoint Slope	Ground ✓
634.59	3904.91	Outside Edge Berm	Rebar ✓
644.10	3905.34	Inside Edge Berm	Liner ✓
900.82	3904.85 <del>SA</del>	Inside Edge Berm	Liner ✓
918.83	3904.87	Outside Edge Berm (top of ditch)	Rebar ✓
932.39	3900.01	W. Edge Flat Bottom D.	Ground ✓
937.92	3899.43	E. Flat Bottom Ditch	Ground ✓
942.09	3899.91	E. Edge Flat Bottom D.	Ground ✓
974.52	3910.84	Top of Ditch	Ground ✓
989.62	3911.82	Fence	Ground ✓
1014.56	3914.96	Top of Ditch	Ground ✓
1020.93	3913.07	"V" of Ditch	Ground ✓
1024.19	3914.88	Top of Ditch	Ground ✓
1038.80	3917.82	Midpoint Slope	Ground ✓
1066.69	3920.49	Top of Slope	Ground ✓
1087.48	3919.94	Low Point	Ground ✓

CROW BUTTE RESOURCES, INC.  
RANGE FOUR  
CROSS SECTIONS FOR PONDS  
STATION 15+00  
SEPTEMBER 3, 1996

LEFT OF BASE LINE	SEA LEVEL ELEVATION	DESCRIPTION	SHOT TAKEN ON
99.71	3875.47	Fence	Ground ✓
136.73	3876.08	Toe of Slope	Hub ✓
156.21	3883.51	Midpoint of Slope	Ground ✓
174.85	3890.67	Outside Edge Berm	Rebar ✓
185.94	3891.11	Inside Edge Berm	Liner ✓
498.99	3890.75	Inside Edge Berm	Liner ✓
508.46	3890.99	Outside Edge Berm	Ground ✓
515.29	3889.49	(top of "V" ditch) "V" Ditch	Ground ✓
525.08	3892.30	Top of Ditch	Ground ✓
536.20	3892.47	Fence & W. Edge Flat Bottom Ditch	Ground ✓
554.47	3892.82	E. Edge Flat Bottom D.	Ground ✓
559.25	3894.49	Top of Ditch	Ground ✓
697.71	3903.49	High Point	Ground ✓
791.57	3904.79	Low Point	Ground ✓

Note: Elevations on 1993, 1994, 1995, and 1996 surveys taken by TopCon EDM, reading Zenith angles and slope distances observing a prism pole.

## **ATTACHMENT 2**

### **DITCH SIZING CALCULATIONS**

**BY: AQUA TERRA CONSULTANTS, INC.**

(See Figure 1 for ditch locations)

Ferret Ditch No. 1

---

BASIN CHARACTERISTICS

DRAINAGE AREA (SQ. MI.)	=	0.008
STREAM LENGTH (MI.)	=	0.189
ELEVATION DIFFERENCE (FT.)	=	33.500
RUNOFF CURVE NUMBER, CN	=	87.000
MINIMUM INFILTRATION LOSS (IN./HR.)	=	0.000

PRECIPITATION FOR SELECTED STORM

ADJUSTED PRECIPITATION FOR SELECTED STORM (IN.) = 16.60

UNIT HYDROGRAPH PARAMETERS

UNADJUSTED TIME OF CONCENTRATION (HR.)	=	0.10
ADJUSTED TIME OF CONCENTRATION (HR.)	=	0.10
DURATION OF EXCESS RAINFALL, D (HR.)	=	0.01
TIME TO PEAK (HR.)	=	0.07
BASE TIME (HR.)	=	0.17
QPEAK (PEAK FLOW IN CFS FOR UNIT HYDROGRAPH)	=	59.2

RESULTANT HYDROGRAPH VALUES

PEAK DISCHARGE (CFS)	=	162.88
RUNOFF VOLUME (ACRE-Feet)	=	8.77
TIME TO PEAK DISCHARGE (HR.)	=	1.00

USED USBR 1-HR THUNDERSTORM, ZONE III

As-BUILT DITCH ANALYSIS - AQUA TERRA CWS

8-24-93

# Ferret Ditch No. 2

## BASIN CHARACTERISTICS

DRAINAGE AREA (SQ. MI.)	=	0.011
STREAM LENGTH (MI.)	=	0.320
ELEVATION DIFFERENCE (FT.)	=	46.500
RUNOFF CURVE NUMBER, CN	=	87.000
MINIMUM INFILTRATION LOSS (IN./HR.)	=	0.000

## PRECIPITATION FOR SELECTED STORM

ADJUSTED PRECIPITATION FOR SELECTED STORM (IN.) = 16.60

## UNIT HYDROGRAPH PARAMETERS

UNADJUSTED TIME OF CONCENTRATION (HR.)	=	0.16
ADJUSTED TIME OF CONCENTRATION (HR.)	=	0.16
DURATION OF EXCESS RAINFALL, D (HR.)	=	0.02
TIME TO PEAK (HR.)	=	0.11
BASE TIME (HR.)	=	0.28
QPEAK (PEAK FLOW IN CFS FOR UNIT HYDROGRAPH)	=	50.3

## RESULTANT HYDROGRAPH VALUES

PEAK DISCHARGE (CFS)	=	221.16
RUNOFF VOLUME (ACRE-Feet)	=	12.05
TIME TO PEAK DISCHARGE (HR.)	=	1.01

USED USBR 1-HR THUNDERSTORM, ZONE III

## BASIN CHARACTERISTICS

PRECIPITATION FOR SELECTED STORM

UNIT HYDROGRAPH PARAMETERS

### RESULTANT HYDROGRAPH VALUES

USED USBR 1-III THUNDERSTORM, ZONE III

# Ferret Ditch No. 3

## BASIN CHARACTERISTICS

DRAINAGE AREA (SQ. MI.)	=	0.003
STREAM LENGTH (MI.)	=	0.142
ELEVATION DIFFERENCE (FT.)	=	18.900
RUNOFF CURVE NUMBER, CN	=	87.000
MINIMUM INFILTRATION LOSS (IN./HR.)	=	0.000

## PRECIPITATION FOR SELECTED STORM

ADJUSTED PRECIPITATION FOR SELECTED STORM (IN.) = 16.60

## UNIT HYDROGRAPH PARAMETERS

UNADJUSTED TIME OF CONCENTRATION (HR.)	=	0.09
ADJUSTED TIME OF CONCENTRATION (HR.)	=	0.09
DURATION OF EXCESS RAINFALL, D (HR.)	=	0.01
TIME TO PEAK (HR.)	=	0.06
BASE TIME (HR.)	=	0.16
QPEAK (PEAK FLOW IN CFS FOR UNIT HYDROGRAPH)	=	24.8

## RESULTANT HYDROGRAPH VALUES

PEAK DISCHARGE (CFS)	=	61.11
RUNOFF VOLUME (ACRE-Feet)	=	3.29
TIME TO PEAK DISCHARGE (HR.)	=	1.00

USED USBR 1-HR THUNDERSTORM, ZONE III



Ferret Ditch No. 4

---

BASIN CHARACTERISTICS

DRAINAGE AREA (SQ. MI.)	=	0.003
STREAM LENGTH (MI.)	=	0.098
ELEVATION DIFFERENCE (FT.)	=	25.000
RUNOFF CURVE NUMBER, CN	=	87.000
MINIMUM INFILTRATION LOSS (IN./HR.)	=	0.000

PRECIPITATION FOR SELECTED STORM

ADJUSTED PRECIPITATION FOR SELECTED STORM (IN.) = 16.60

UNIT HYDROGRAPH PARAMETERS

UNADJUSTED TIME OF CONCENTRATION (HR.)	=	0.05
ADJUSTED TIME OF CONCENTRATION (HR.)	=	0.05
DURATION OF EXCESS RAINFALL, D (HR.)	=	0.01
TIME TO PEAK (HR.)	=	0.03
BASE TIME (HR.)	=	0.09
QPEAK (PEAK FLOW IN CFS FOR UNIT HYDROGRAPH)	=	42.4

RESULTANT HYDROGRAPH VALUES

PEAK DISCHARGE (CFS)	=	61.18
RUNOFF VOLUME (ACRE-Feet)	=	3.29
TIME TO PEAK DISCHARGE (HR.)	=	1.00

USED USBR 1-HR THUNDERSTORM, ZONE III

08-24-1993 12:11:44

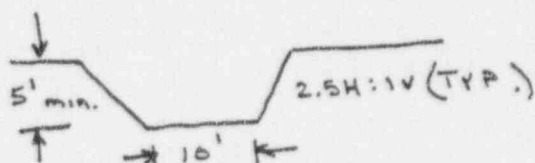
## FERRET DITCH NO. 1

\*\*\*\*\*  
TRAPEZOIDAL CHANNEL

\*\*\*\*\*

DISCHARGE	=	162.88	cfs
AREA OF FLOW	=	38.44267	sq. feet
HYDR. RADIUS	=	1.676169	feet
WETTED PERIMETER	=	22.93484	feet
VR - GRASS CHANNELS	=	7.10186	
VELOCITY	=	4.236959	fps
MANNING'S N	=	.035	
SLOPE	=	.005	ft/ft
SIDESLOPES	=	2.5	ft/ft
BOTTOM WIDTH	=	10	feet
DEPTH OF FLOW	=	2.401939	feet
THE FROUDE NUMBER IS:	=	.5649716	

\*\*\* SUBCRITICAL FLOW \*\*\*

DITCH X-SECTION

08-24-1993 12:14:20

FERRET DITCH NO. 2 UPPER SECTION S=0.005

\*\*\*\*\*

TRAPEZOIDAL CHANNEL

\*\*\*\*\*

DISCHARGE	=	221.16	cfs
AREA OF FLOW	=	47.92113	sq. feet
HYDR. RADIUS	=	1.905381	feet
WETTED PERIMETER	=	25.15042	feet
VR - GRASS CHANNELS	=	8.793493	
VELOCITY	=	4.615084	fps
MANNING'S N	=	.035	
SLOPE	=	.005	ft/ft
SIDESLOPES	=	2.5	ft/ft
BOTTOM WIDTH	=	10	feet
DEPTH OF FLOW	=	2.813362	feet
THE FROUDE NUMBER IS:		.5763647	

\*\*\* SUBCRITICAL FLOW \*\*\*

SAME X-SECTION AS DITCH 1

08-24-1993

12:18:09

FERRET DITCH NO. 2 UPPER SECTION S=0.01

\*\*\*\*\*

TRAPEZOIDAL CHANNEL

\*\*\*\*\*

DISCHARGE	=	221.16	cfs
AREA OF FLOW	=	37.33664	sq. feet
HYDR. RADIUS	=	1.647496	feet
WETTED PERIMETER	=	22.66266	feet
VR - GRASS CHANNELS	=	9.758784	
VELOCITY	=	5.923405	fps
MANNING'S N	=	.035	
SLOPE	=	.01	ft/ft
SIDESLOPES	=	2.5	ft/ft
BOTTOM WIDTH	=	10	feet
DEPTH OF FLOW	=	2.351397	feet
THE FROUDE NUMBER IS:		.7968475	

\*\*\* SUBCRITICAL FLOW \*\*\*

08-24-1993

12:21:58

FERRET DITCH NO. 2 UPPER SECTION S=0.02

\*\*\*\*\*

TRAPEZOIDAL CHANNEL

\*\*\*\*\*

DISCHARGE	=	221.16	cfs
AREA OF FLOW	=	29.15911	sq. feet
HYDR. RADIUS	=	1.419438	feet
WETTED PERIMETER	=	20.54271	feet
VR - GRASS CHANNELS	=	10.76586	
VELOCITY	=	7.584593	fps
MANNING'S N	=	.035	
SLOPE	=	.02	ft/ft
SIDESLOPES	=	2.5	ft/ft
BOTTOM WIDTH	=	10	feet
DEPTH OF FLOW	=	1.957732	feet
THE FROUDE NUMBER IS:		1.101097	

\*\*\* SUPERCRITICAL FLOW \*\*\*

08-24-1993

12:19:41

FERRET DITCH NO. 2 LOWER SECTION S=0.01

\*\*\*\*\*

TRAPEZOIDAL CHANNEL

\*\*\*\*\*

DISCHARGE	=	241.51	cfs
AREA OF FLOW	=	39.77111	sq. feet
HYDR. RADIUS	=	1.710021	feet
WETTED PERIMETER	=	23.25767	feet
VR - GRASS CHANNELS	=	10.3841	
VELOCITY	=	6.072497	fps
MANNING'S N	=	.035	
SLOPE	=	.01	ft/ft
SIDESLOPES	=	2.5	ft/ft
BOTTOM WIDTH	=	10	feet
DEPTH OF FLOW	=	2.461888	feet
THE FROUDE NUMBER IS:		.8014932	

\*\*\* SUBCRITICAL FLOW \*\*\*

SAME X-SECTION AS DITCH 1

08-24-1993

12:16:32

FERRET DITCH NO. 2 LOWER SECTION  $S=0.005$

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TRAPEZOIDAL CHANNEL

\*\*\*\*\*

DISCHARGE	=	241.51	cfs
AREA OF FLOW	=	51.07439	sq. feet
HYDR. RADIUS	=	1.976056	feet
WETTED PERIMETER	=	25.84664	feet
VR - GRASS CHANNELS	=	9.343963	
VELOCITY	=	4.728593	fps
MANNING'S N	=	.035	
SLOPE	=	.005	ft/ft
SIDESLOPES	=	2.5	ft/ft
BOTTOM WIDTH	=	10	feet
DEPTH OF FLOW	=	2.942647	feet
THE FROUDE NUMBER IS:		.5796518	

\*\*\* SUBCRITICAL FLOW \*\*\*



08-24-1993

12:24:55

## FERRET DITCH NO. 2A

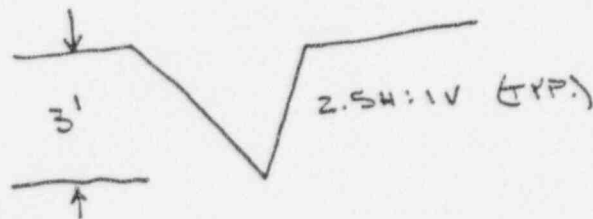
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## TRIANGULAR CHANNEL

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DISCHARGE	=	20.35	cfs
AREA OF FLOW	=	7.753137	sq. feet
HYDR. RADIUS	=	.8175414	feet
WETTED PERIMETER	=	9.483479	feet
VR - GRASS CHANNELS	=	2.145837	
VELOCITY	=	2.624744	fps
MANNING'S N	=	.035	
SLOPE	=	.005	ft/ft
SIDESLOPES	=	2.5	ft/ft
DEPTH OF FLOW	=	1.761038	feet
THE FROUDE NUMBER IS:		.492935	

\*\*\* SUBCRITICAL FLOW \*\*\*


DITCH X-SECTION

08-24-1993 12:26:19

## FERRET DITCH NO. 3

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## TRIANGULAR CHANNEL

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DISCHARGE	=	61.11	cfs
AREA OF FLOW	=	17.68502	sq. feet
HYDR. RADIUS	=	1.234735	feet
WETTED PERIMETER	=	14.32293	feet
VR - GRASS CHANNELS	=	4.266586	
VELOCITY	=	3.455467	fps
MANNING'S N	=	.035	
SLOPE	=	1.005	ft/ft
SIDESLOPES	=	2.5	ft/ft
DEPTH OF FLOW	=	2.659701	feet
THE FROUDE NUMBER IS:		.5280527	

\*\*\* SUBCRITICAL FLOW \*\*\*

SAME DITCH X-SECTION AS ZA

08-24-1993 12:28:25

FERRET DITCH NO. 4

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TRIANGULAR CHANNEL

\*\*\*\*\*

DISCHARGE	=	61.18	cfs
AREA OF FLOW	=	17.70022	sq. feet
HYDR. RADIUS	=	1.235265	feet
WETTED PERIMETER	=	14.32908	feet
VR - GRASS CHANNELS	=	4.269639	
VELOCITY	=	3.456455	fps
MANNING'S N	=	.035	
SLOPE	=	.005	ft/ft
SIDESLOPES	=	2.5	ft/ft
DEPTH OF FLOW	=	2.660843	feet
THE FROUDE NUMBER IS:		.5280904	

\*\*\* SUBCRITICAL FLOW \*\*\*

SAME DITCH X-SECTION AS ZA

08-24-1993 12:23:24

FERRET DITCH NO. 2 LOWER SECTION S=0.02

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TRAPEZOIDAL CHANNEL

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DISCHARGE	=	241.51	cfs
AREA OF FLOW	=	31.04136	sq. feet
HYDR. RADIUS	=	1.474725	feet
WETTED PERIMETER	=	21.04892	feet
VR - GRASS CHANNELS	=	11.47375	
VELOCITY	=	7.780263	fps
MANNING'S N	=	.035	
SLOPE	=	.02	ft/ft
SIDESLOPES	=	2.5	ft/ft
BOTTOM WIDTH	=	10	feet
DEPTH OF FLOW	=	2.051734	feet
THE FROUDE NUMBER IS:		1.107647	

\*\*\* SUPERCRITICAL FLOW \*\*\*