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Golder Associates
CONSULTING GEOTECHNICAL AND MINING ENGINEERS

Report on

# PUMP TEST AND ANALYSES

# CRANDON PROJECT

# WASTE DISPOSAL SYSTEM

# PROJECT REPORT 4

STATE DOCUMENTS
DEPOSITORY
SEP 17 1984
University of Wisconsin, LRC
Stevens Point, Wisconsin

Submitted to:

Exxon Minerals Company
Post Office Box 813
Rhinelander, Wisconsin 54501

DISTRIBUTION

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786085

September, 1981

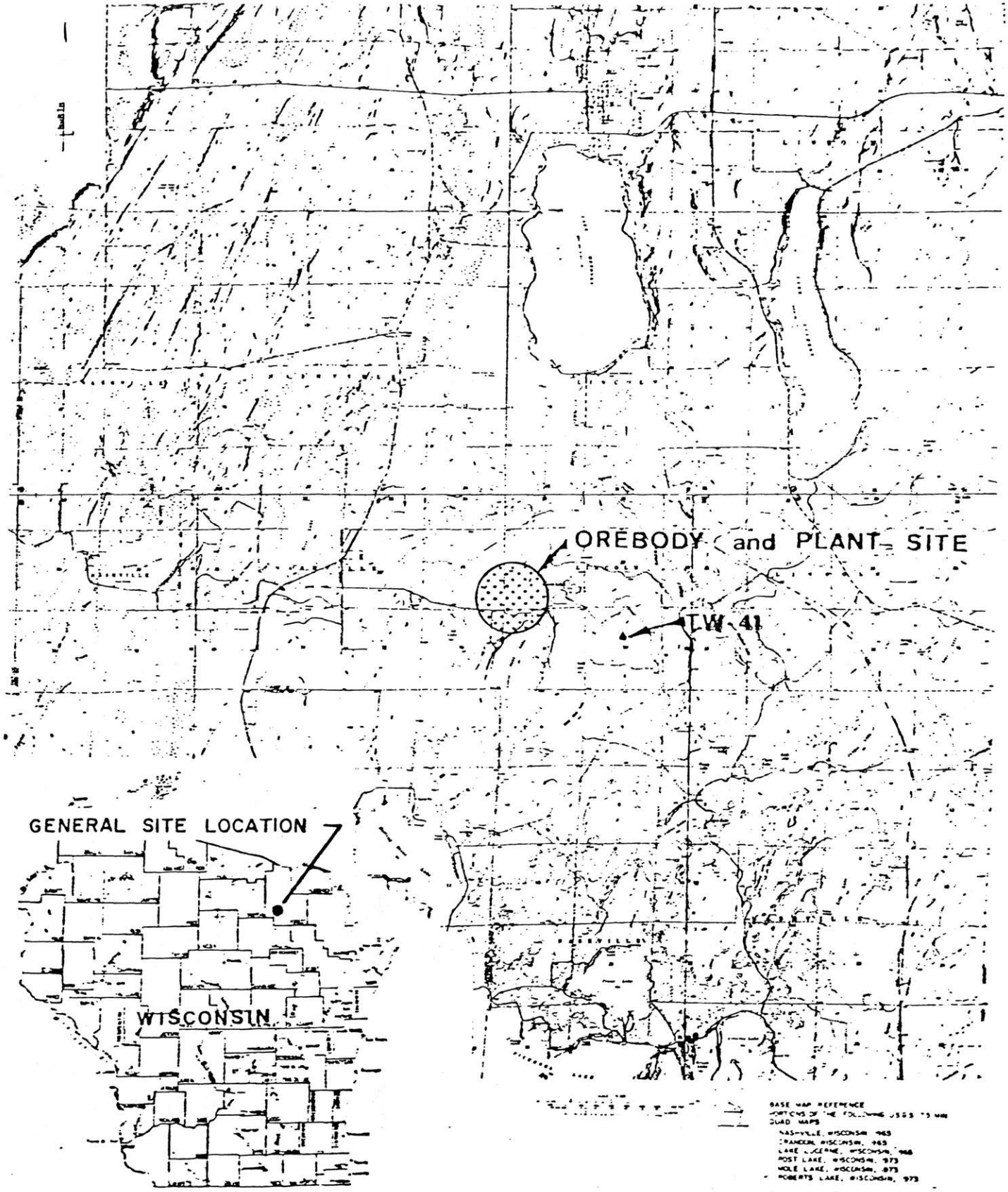
## MANAGEMENT SUMMARY

Exxon Minerals Company is evaluating the feasibility of developing a waste disposal facility for a copper/lead/zinc mine and mill complex in an area south of Crandon, Wisconsin. As a part of the investigation of the geohydrologic system a major pump test was conducted in the summer of 1980 at one of the potential disposal areas known as Site 41. The location of the test site is shown on Figure S-1.

The geology of the pump test site is essentially as follows:

- An upper layer of till, 190 ft. (57.9 meters) thick, of which the lower 80 ft. (24.4 meters) is saturated.
- A middle layer of stratified drift, 70 ft. (21.3 meters) thick, of higher hydraulic conductivity than the till.
- A lower layer of till, and some fine stratified drift, 70 ft. (21.3 meters) thick, of lower hydraulic conductivity than the middle layer.
- A base of bedrock, of substantially lower hydraulic conductivity than any of the granular materials overlying it.

The installations for the pump test were comprised of a test well, 13 primary observation wells which were read regularly, and 16 secondary observation wells which were read less frequently. The test well and most of the primary observation wells were installed specifically for the test, while the remainder of the observation wells had been installed as part of previous subsurface exploration and monitoring programs. The test well and observation well locations are shown on Figure S-2.




SITE LOCATION PLAN

FIGURE S-1

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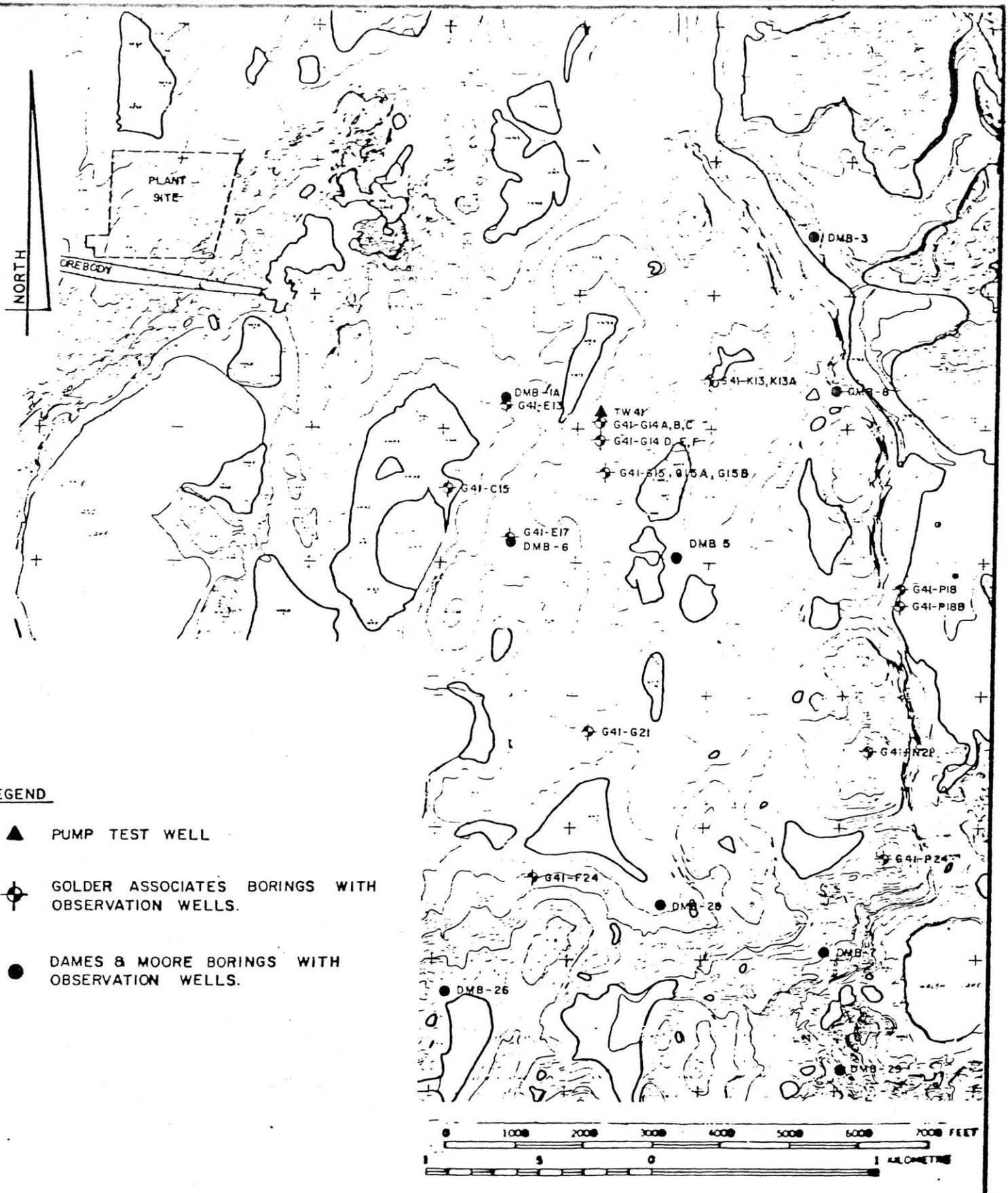


PUMP TEST LOCATION PLAN

FIGURE S-2

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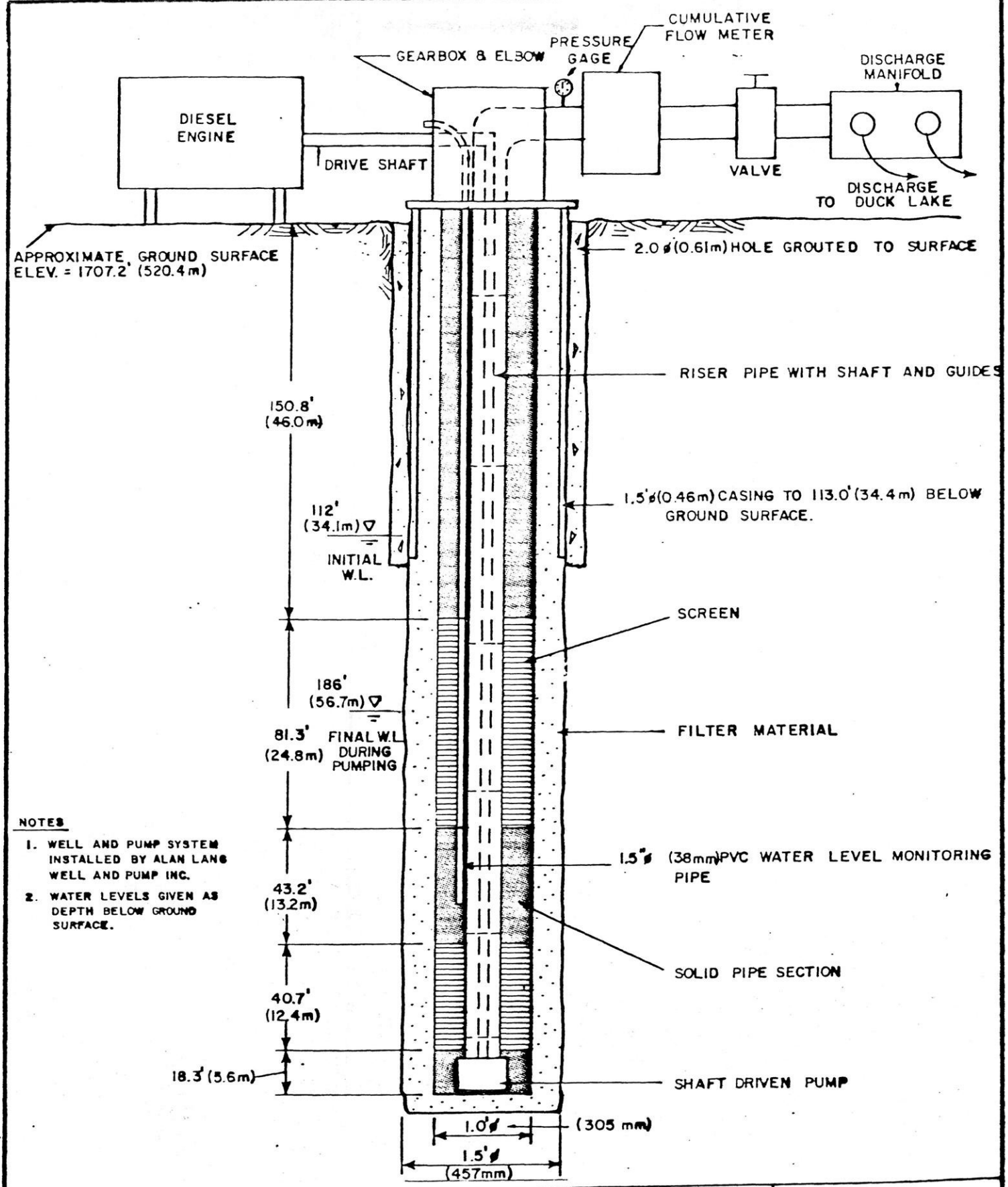
The test well construction and pump arrangement are shown in Figure S-3. The well is screened over essentially the full depth of saturated material, gravel packed, and has grouted surface casing through the unsaturated till material. A shaft driven diesel powered pump with a flow capacity of 1500 gpm (0.095 cubic meters per second) was used in the main test, while a smaller, nominal 400 gpm (0.025 cubic meters per second), submersible electric pump was used in preliminary testing.

Observation wells were completed at various elevations and various distances from the test well so as to observe the behavior of the entire system during the test. Some observation wells were completed so as to monitor water pressures at essentially one level in the groundwater system, by sealing a screened standpipe tip at that location. Typical installation details are shown in Figure S-4.

Prior to the beginning of the main pump test, a flow velocity profile of the test well was obtained in order to evaluate the hydraulic conductivity of the materials penetrated by the well. This test was performed on June 6, 1980, using the Johnson flow profiler at a well production of about 530 gpm (0.033 cubic meters per second).

The main well test was conducted over the period from June 6, 1980 to September 10, 1980. The well was pumped at an average rate of 1420 gpm (0.090 cubic meters per second) for 24 days, starting on June 27, 1980, producing a maximum drawdown of 73 ft. (22 meters) at the well. The observation




NOTES

1. WELL AND PUMP SYSTEM INSTALLED BY ALAN LANG WELL AND PUMP INC.
2. WATER LEVELS GIVEN AS DEPTH BELOW GROUND SURFACE.

# SCHEMATIC OF TEST WELL SETUP

FIGURE S-3

Scale AS SHOWN
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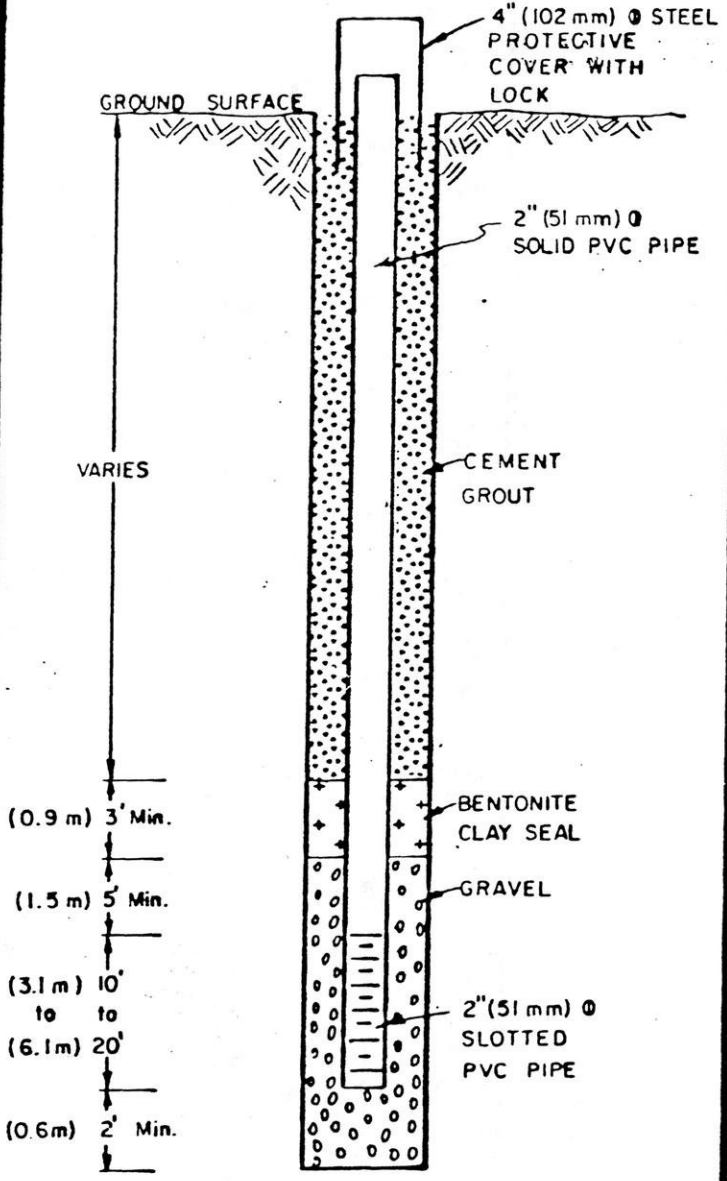
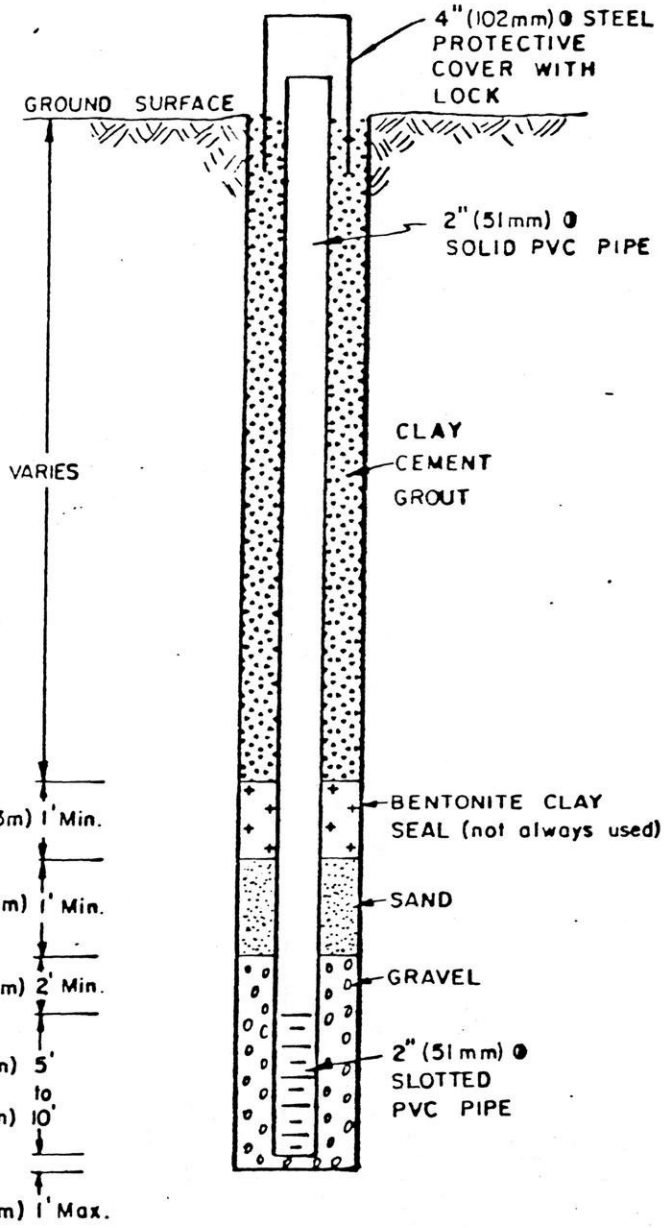



## Dames & Moore




# TYPICAL OBSERVATION WELL INSTALLATIONS

FIGURE S-4

Scale Not to Scale
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Checked M.R.B
Reviewed J.F.C.

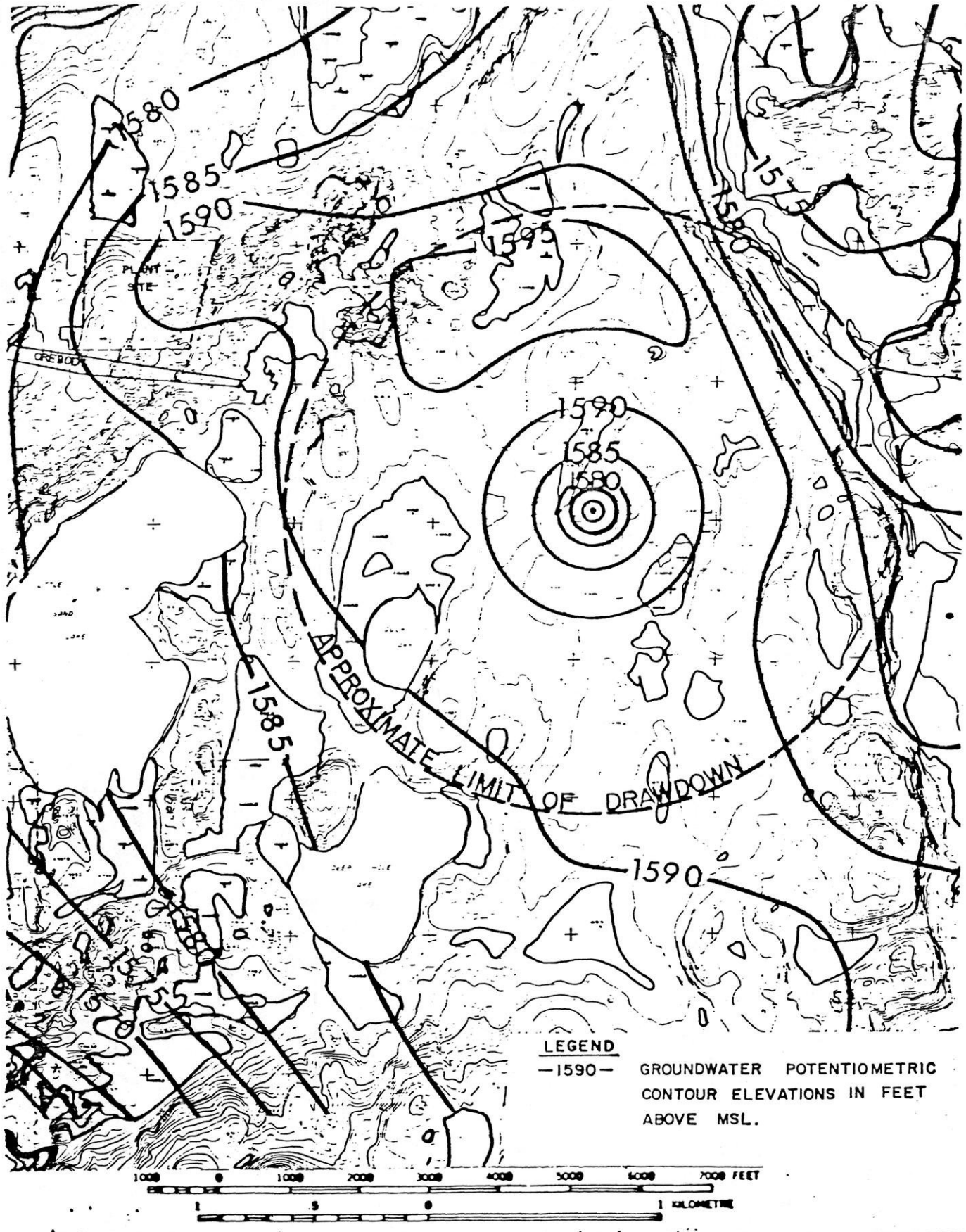
wells responded to the pumping for a distance up to 4000 ft. (1220 meters) from the well. The approximate potentiometric map in the stratified drift layer at the end of the pumping period for the test is shown on Figure S-5. Recovery was monitored for 52 days after the pump was turned off.

Detailed analyses of all the data collected during the test was performed to develop an understanding of the dynamic behavior of the groundwater system at the site, and to develop the hydrogeologic parameters which characterize each material. The results of these analyses were then combined to produce a geohydrologic model of the test site, which is presented in Figure S-6.

The performance of this pump test and analyses of the results has:

- established the geohydrologic conditions at the test site for use in regional model calibration and local seepage studies,
- demonstrated the feasibility of altering the potentiometric surface by well pumping,
- demonstrated the availability of a sustained yield of up to 950 gpm (0.060 cubic meters per second) of water from the test well, and a maximum yield of 3000 gpm (0.189 cubic meters per second),
- provided a monitoring system in one potential disposal area near the mine site.

The method of performance of the tests, and the extensive instrumentation of the groundwater system allow a high degree of confidence in the results.




EFFECT OF PUMP TEST ON POTENTIOMETRIC MAP | FIGURE S-5

Scale GRAPHIC
Date 2-17-81
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Checked JFC
Reviewed GHC

| A. ENGLISH UNITS | | | | | |
|---|---|---|---|---|---|
| GEOLOGY | THICKNESS (ft.) | PARAMETERS | | | |
| | | $k_h$ (ft./sec.) | $k_v$ (ft./sec.) | $S_s$ ($ft.^{-1}$) | $n_d$ (%) |
| TILL ▽ | 110 | ABOVE NATURAL GROUNDWATER LEVEL | | | |
| TILL | 80 | $9.3 \times 10^{-6}$ | $3.1 \times 10^{-6}$ | $4.6 \times 10^{-6}$ | 5.4 |
| COARSE GRAINED STRATIFIED DRIFT | 70 | $4.3 \times 10^{-4}$ | $4.3 \times 10^{-5}$ | $4.6 \times 10^{-6}$ | 7.0 |
| TILL | 70 | $9.3 \times 10^{-6}$ | $3.1 \times 10^{-6}$ | $4.6 \times 10^{-6}$ | 5.4 |
| BEDROCK | | FUNCTIONALLY IMPERMEABLE | | | |

| B. SYSTEM INTERNATIONAL | | | | | |
|---|---|---|---|---|---|
| GEOLOGY | THICKNESS (m) | PARAMETERS | | | |
| | | $k_h$ (m/s) | $k_v$ (m/s) | $S_s$ ($m^{-1}$) | $n_d$ (%) |
| TILL ▽ | 35 | ABOVE NATURAL GROUNDWATER LEVEL | | | |
| TILL | 25 | $2.8 \times 10^{-8}$ | $9.4 \times 10^{-7}$ | $1.5 \times 10^{-5}$ | 5.4 |
| COARSE GRAINED STRATIFIED DRIFT | 20 | $1.3 \times 10^{-4}$ | $1.3 \times 10^{-5}$ | $1.5 \times 10^{-5}$ | 7.0 |
| TILL | 20 | $2.8 \times 10^{-6}$ | $9.4 \times 10^{-7}$ | $1.5 \times 10^{-5}$ | 5.4 |
| BEDROCK | | FUNCTIONALLY IMPERMEABLE | | | |

LEGEND:

(1) $k_h$ = horizontal hydraulic conductivity
$k_v$ = vertical hydraulic conductivity
$S_s$ = specific storage
$n_d$ = drainable porosity (specific yield)

(2) Unshaded Values: Results obtained directly from pump test
Shaded Values: Inferred or estimated from the pump test results

BEHAVIORAL PARAMETERS AND HYDROGEOLOGIC MODEL

FIGURE S-6

Scale NO SCALE
Date 2-17-81
Job No. 786085

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**Golder Associates**
CONSULTING GEOTECHNICAL AND MINING ENGINEERS

# PUMP TEST AND ANALYSES

# CRANDON PROJECT

# WASTE DISPOSAL SYSTEM

# PROJECT REPORT 4

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786085

September, 1981

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## 1.0 INTRODUCTION

Exxon Minerals Company proposes to mine a copper/lead/zinc orebody near Crandon, Wisconsin using underground techniques. Golder Associates was retained by Exxon to develop preliminary designs for the waste disposal facilities. A long term pumping test was performed to provide an understanding of the groundwater system parameters and aquifer characteristics in support of the geohydrologic modeling and evaluation for the Crandon Project. This report presents the details, performance, analysis, and results of this pump test.

The well extended 334 feet (101.8 m) below the ground surface, and tapped all but a small section of the saturated glacial strata. The well was pumped for 24 days at an average rate of 1420 gpm (0.090 $m^3/s$). Prior to, during, and after the pumping period, the groundwater levels were monitored through a series of observation wells. The data from the test have been analyzed to provide an understanding of the behavior of groundwater regime.

## 2.0 PERMIT REQUIREMENTS

A request for approval of the well and pump installation was made on March 7, 1980, to the Private Water Supply Section of the Bureau of Water Quality of the Wisconsin Department of Natural Resources as required by Wisconsin Administrative Code NR 112.26(1) High Capacity Well Approvals. This application was subsequently approved by letter dated April 29, 1980, from Mr. Kevin Kessler of the Private Water Supply Section to Mr. Robert L. Russell, Manager, Crandon Project.

An inquiry determination of need for a WPDES permit for test well water discharge was submitted with a completed WPDES Wastewater Discharge Permit Application on April 15, 1980, to Mr. Kenneth Wiesner, Industrial Wastewater Section, Bureau of Water Quality, Wisconsin Department of Natural Resources. A discharge permit was not required for the test well discharge as confirmed by letter dated May 16, 1980, from Ms. Stephanie Regal, Bureau of Water Quality Permit Coordinator to Mr. Robert L. Russell.

## 3.0 SITE CONDITIONS

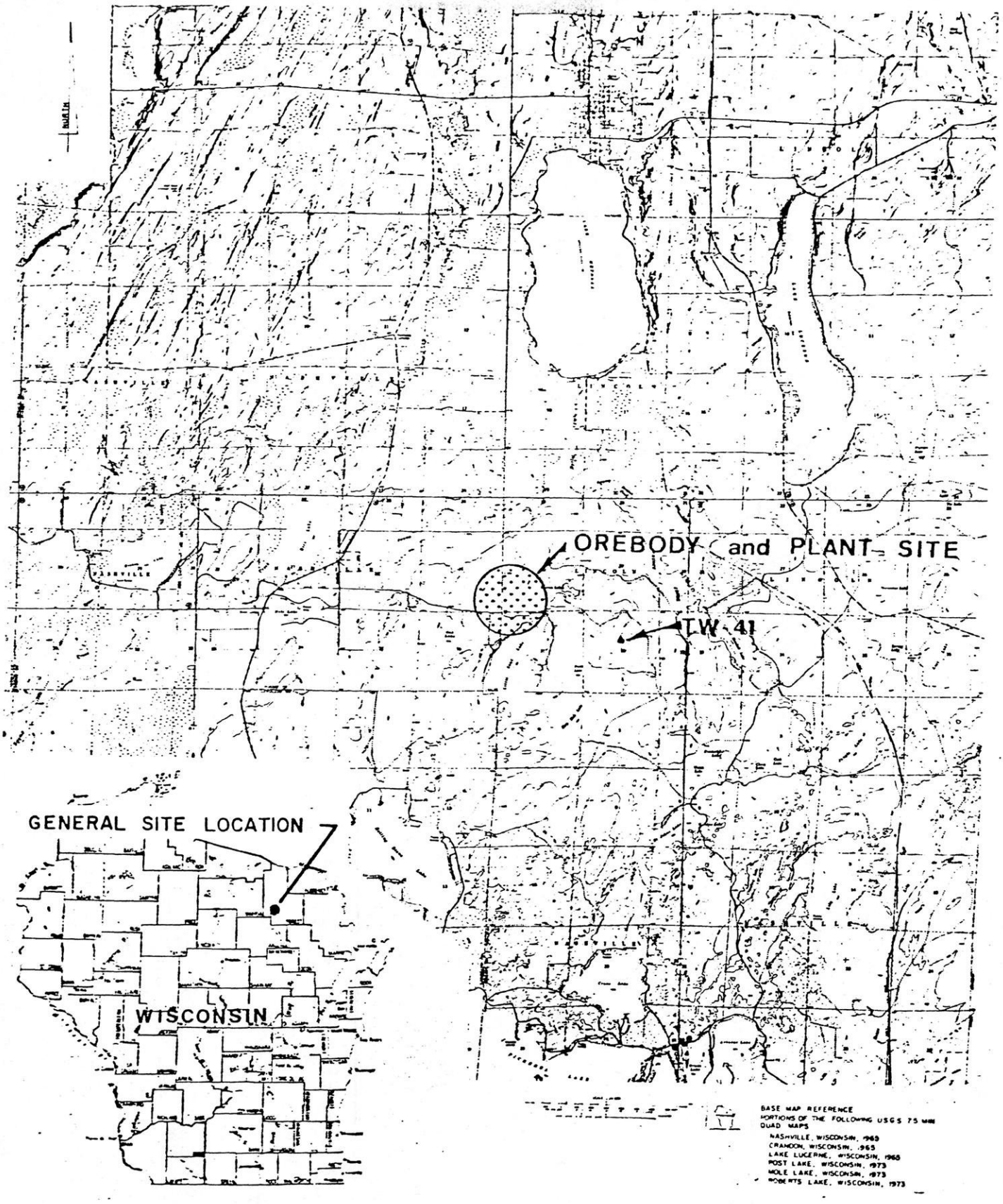
### 3.1 Location

The Crandon orebody is located about 6.2 miles (10 km) south of Crandon, Wisconsin as shown on Figure 3.1. The test well is located within the proposed Site 41 waste disposal area, and is shown on Figure 3.2. This area was selected for the test well because Site 41 is presently considered the preferred waste disposal site, based on earlier siting studies. The test well was situated on a topographic ridge in order to minimize the potential of future disturbance of the well during site development. It is planned that this well will be available as a water supply well and/or a groundwater monitoring well for the project.

The test well was also located so that some of the groundwater observation wells installed during the initial subsurface exploration programs for the waste disposal area could be used for monitoring. Several additional observation wells, G41-G14A through F, were installed specifically for pump test monitoring. The locations of the groundwater observation wells used in monitoring the pump test program are shown on Figure 3.2. Observation wells used for frequent monitoring were those within about 1500 feet (457.2 m) of the test well and those with screened openings in the various subsurface materials below the groundwater level. The detailed locations of these 13 primary observation wells are shown on Figure 3.3. The test well is far enough from the lakes and major wetlands so that the test was not significantly influenced by their presence.

### 3.2 Subsurface Materials

The overburden soils in the Crandon Project area are predominantly very dense glacial till, stratified drift, and outwash. Below the glacial soils the basement rock is pri-




SITE LOCATION PLAN

FIGURE 3.1

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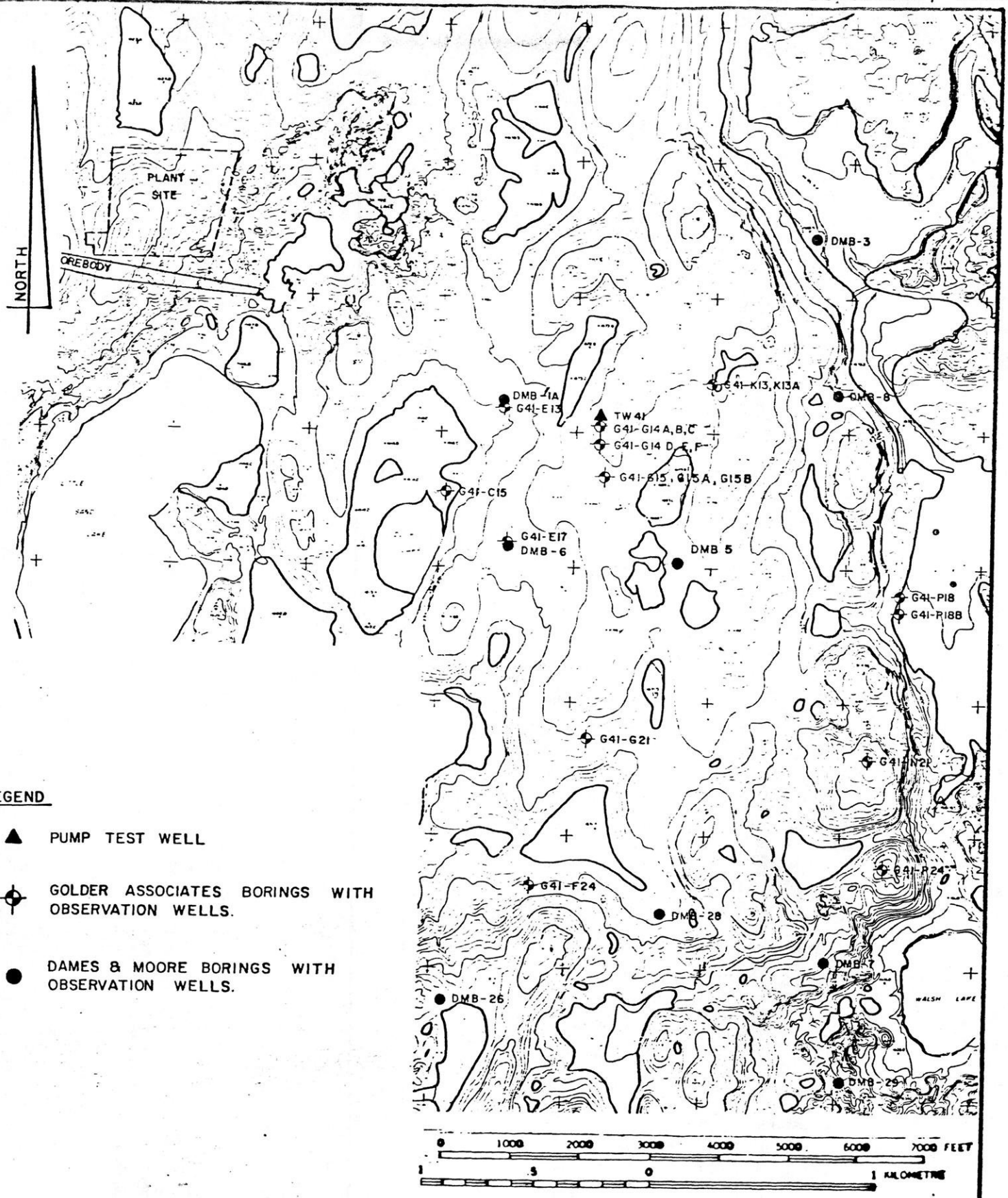


LEGEND

- ▲ PUMP TEST WELL
- ⊕ GOLDER ASSOCIATES BORINGS WITH OBSERVATION WELLS.
- ● DAMES & MOORE BORINGS WITH OBSERVATION WELLS.

PUMP TEST LOCATION PLAN

FIGURE 3.2

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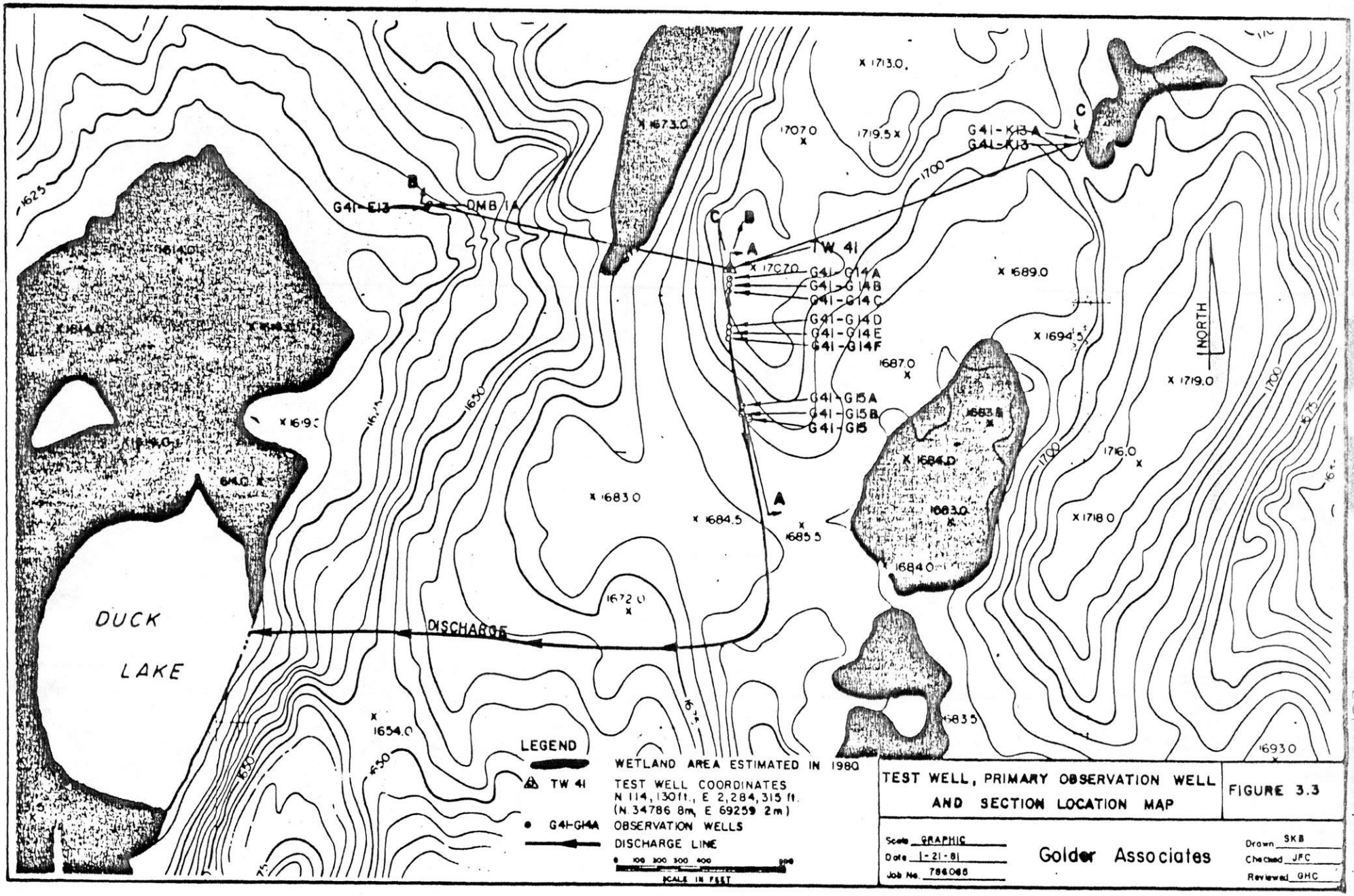
DUCK
LAKE
DISCHARGE
G41-E13
OMB 1A
TW 41
G41-G14A
G41-G14B
G41-G14C
G41-G14D
G41-G14E
G41-G14F
G41-G15A
G41-G15B
G41-G15
G41-K13A
G41-K13
A
B
C
NORTH
LEGEND
WETLAND AREA ESTIMATED IN 1980
TW 41
TEST WELL COORDINATES
N 114,130ft., E 2,284,315 ft.
(N 34786 8m, E 69259 2m)
G41-GI4A
OBSERVATION WELLS
DISCHARGE LINE
SCALE IN FEET
TEST WELL, PRIMARY OBSERVATION WELL AND SECTION LOCATION MAP
FIGURE 3.3
Scale GRAPHIC
Date 1-21-81
Job No. 786068
Golder Associates
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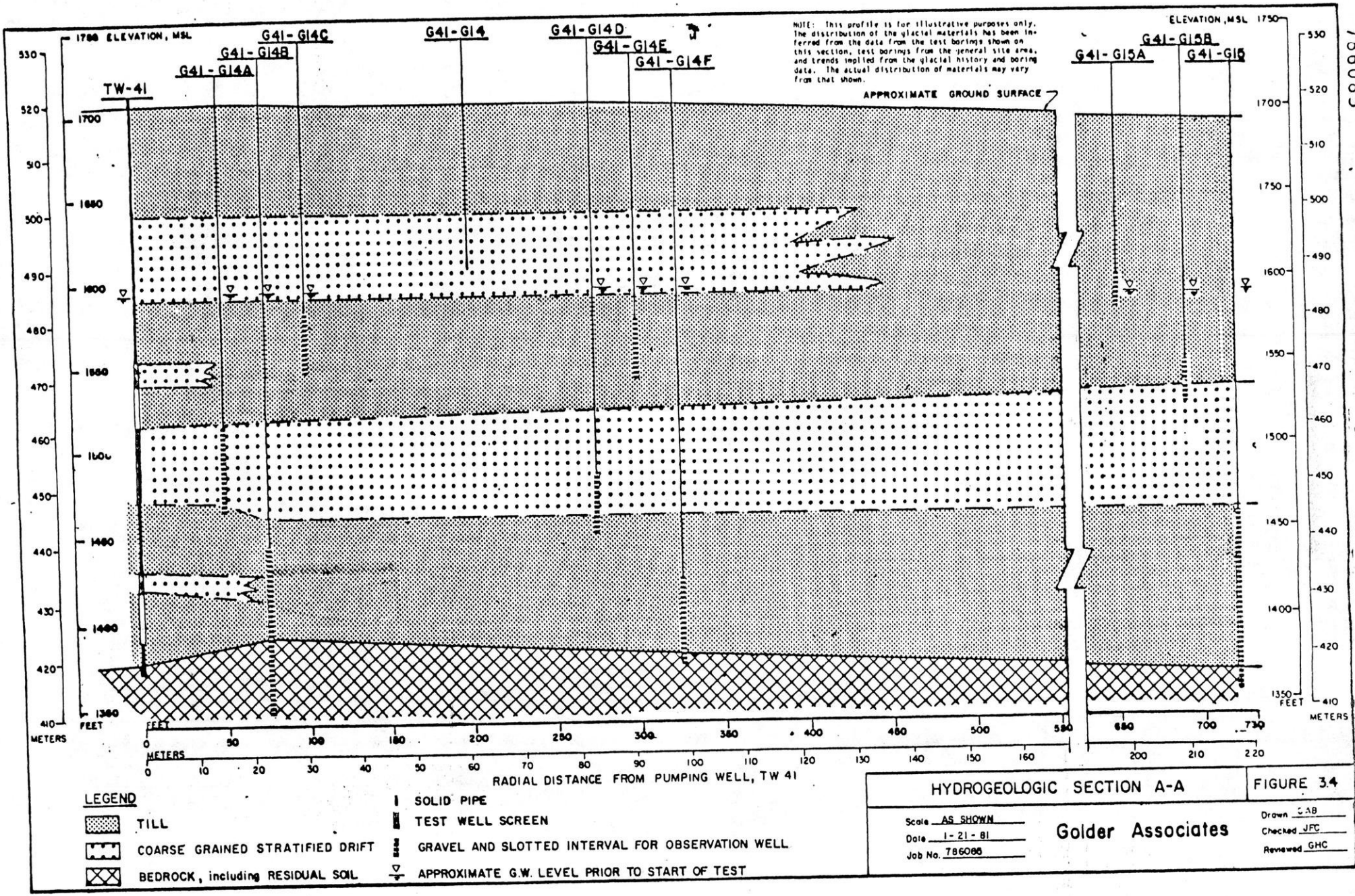
marily metavolcanic tuff with its upper surface weathered to a clayey soil in some areas.

At Site 41, the succession of glacial soils was found to be till underlain by coarse grained stratified drift which is underlain by till and/or fine grained stratified drift. The outwash material has been mapped primarily in the low lying wetlands surrounding the Project area but has not been encountered beneath the surface within the proposed waste disposal areas. In general, the coarse grained stratified drift has less than 10 percent fines (silts and clays, which are those materials finer than a #200 U.S. Standard sieve screen opening). The fine grained stratified drift and till characteristically have a range of 10 to 40 percent fines but most samples contained 15 to 20 percent fines. Boring data suggests the coarse grained stratified drift material extends over the entire Crandon Project area and is continuous with the coarse grained stratified drift and the outwash mapped at the surface in most low lying areas.

In the vicinity of the pump test well, primary observation wells, and along the ridge line next to Ground Hemlock Slough glacial till was found beneath the coarse grained stratified drift and it extended to bedrock. Exploration in other areas of Site 41 encountered fine grained stratified drift between the coarse grained stratified drift and bedrock. Based on the grain size characteristics of the fine grained stratified drift and the till, their hydraulic conductivities are not expected to be equal, but both are expected to be significantly lower than the hydraulic conductivity of the coarse grained stratified drift. Therefore, these two materials below the coarse grained stratified drift have not been differentiated in the

analysis of this pump test. A more comprehensive description of the site geology and subsurface conditions, including interpretative geologic sections, are presented in Reference 1.

Geologic profiles from the test well to the primary groundwater observation wells are shown on Figures 3.4, 3.5, and 3.6. The plan location of these profiles is shown on Figure 3.3. These profiles show the interpreted stratigraphy between the primary observation wells and the test well, the groundwater level prior to pumping, and the vertical location of the slotted sections and gravel pack in each observation well.




HYDROGEOLOGIC SECTION A-A

FIGURE 3.4

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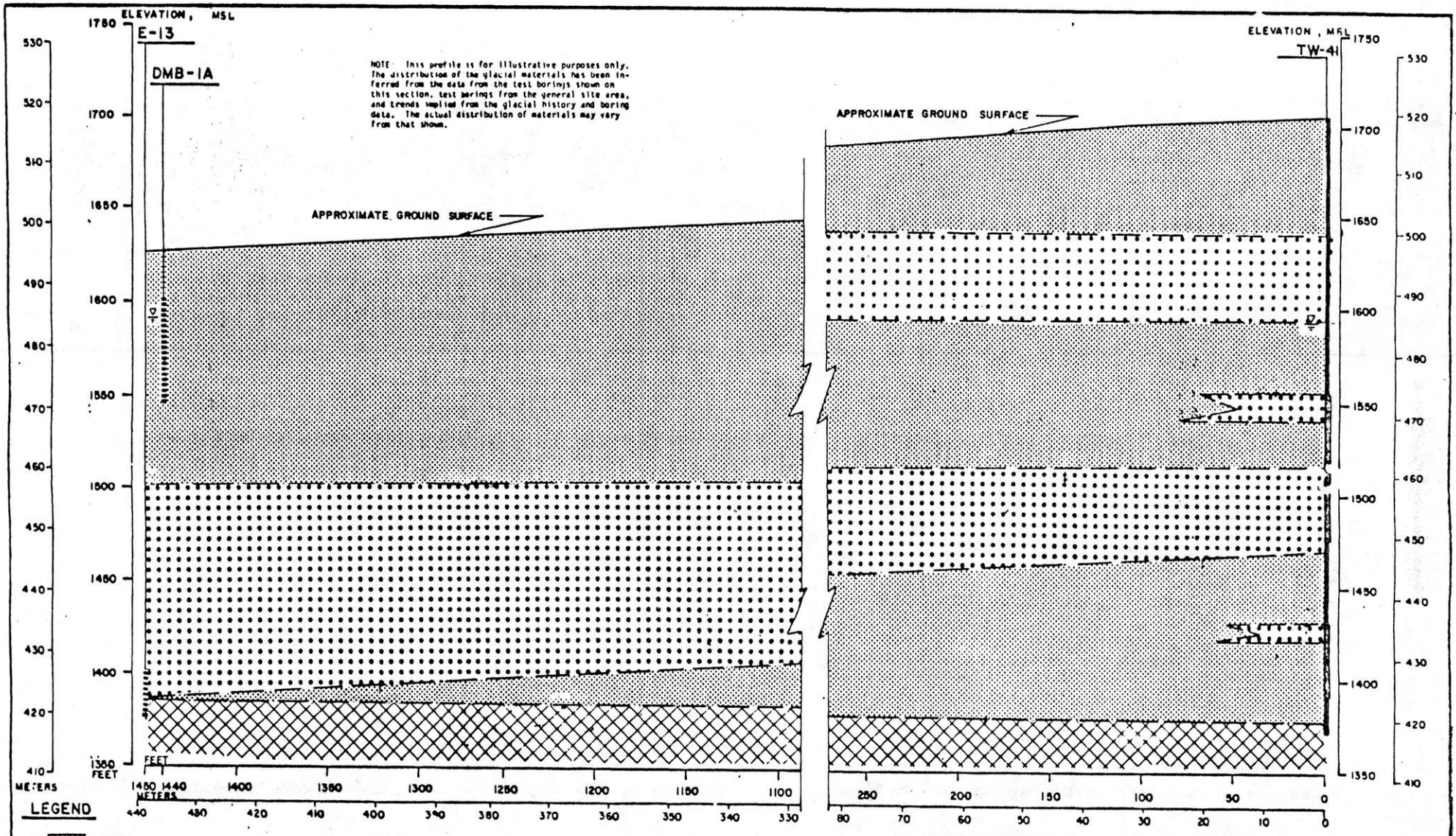


HYDROGEOLOGIC SECTION B - B

FIGURE 3.5

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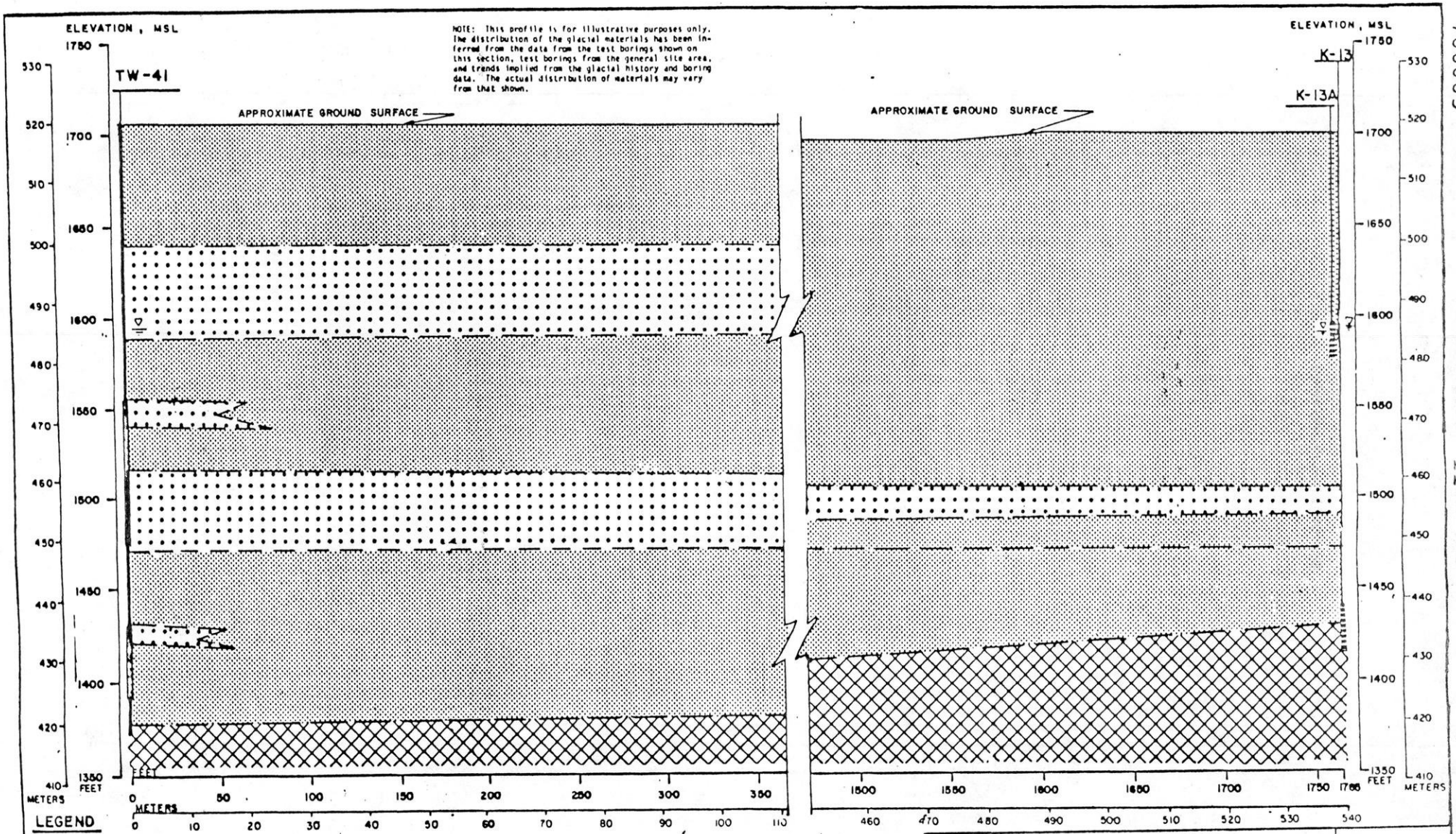

ELEVATION, MSL
TW-41
APPROXIMATE GROUND SURFACE
NOTE: This profile is for illustrative purposes only. The distribution of the glacial materials has been inferred from the data from the test borings shown on this section, test borings from the general site area, and trends implied from the glacial history and boring data. The actual distribution of materials may vary from that shown.
K-13
K-13A
APPROXIMATE GROUND SURFACE
ELEVATION, MSL
1750
1700
1650
1600
1550
1500
1450
1400
1350 FEET
530
520
510
500
490
480
470
460
450
440
430
420
410 METERS
0 50 100 150 200 250 300 350 FEET
0 10 20 30 40 50 60 70 80 90 100 110 METERS
1500 1550 1600 1650 1700 1750 1765
460 470 480 490 500 510 520 530 540
LEGEND
TILL
COARSE GRAINED STRATIFIED DRIFT
BEDROCK, including RESIDUAL SOIL
NOTE: SEE SECTION A-A FOR WELL LEGEND
RADIAL DISTANCE FROM PUMPING WELL, TW 41
HYDROGEOLOGIC SECTION C-C
FIGURE 3.6
Scale AS SHOWN
Date 1-21-80
Job No. 786085
Golder Associates
Drawn CAB
Checked JFC
Reviewed GHG

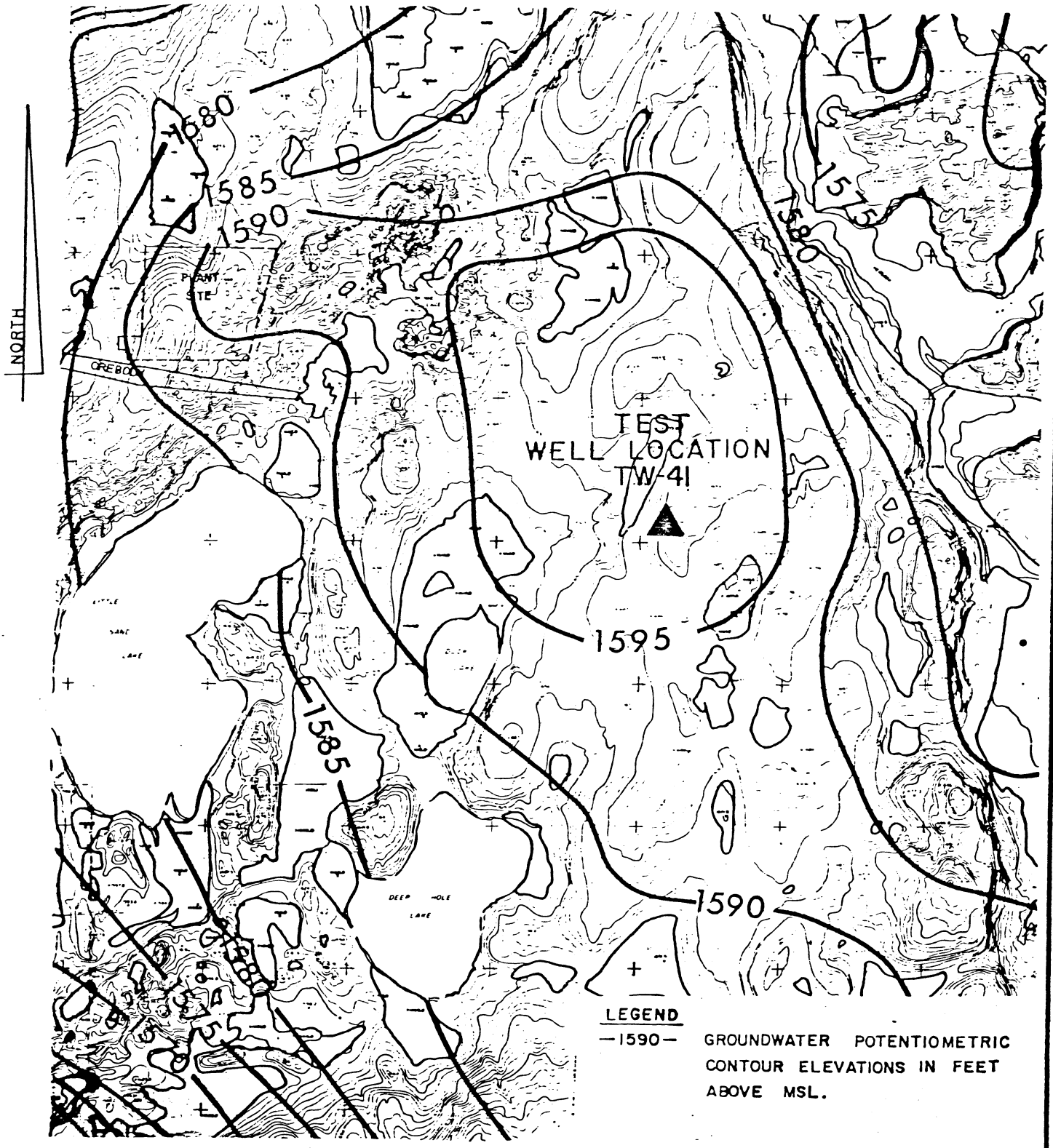
### 3.3 Groundwater

Groundwater levels over the Crandon Project site have been primarily determined by measurements in observation wells installed in test borings. Groundwater observation wells have been installed at various times over the past 3 years under the supervision of Golder Associates and Dames & Moore. These observation wells have been installed at various depths and locations to evaluate the groundwater conditions at the site. Many of the observation wells have been monitored over long periods to measure fluctuations in groundwater levels and groundwater chemistry. The results of these activities have been assembled by Dames & Moore and are reported in References 2 and 3. A brief review of the groundwater hydrology system is presented below to establish the context for the pump test.

The glacial soils at the test site may be considered to be a connected system of granular materials of varying hydraulic conductivity. Water from precipitation infiltrates from the surface and flows essentially vertically in an unsaturated mode to the water table. While some perched groundwater tables in the region are believed to exist (References 2 and 3), generally the undisturbed water pressures exhibit hydrostatic conditions with a defined water table.

Once water has entered the saturated portion of the groundwater system it flows essentially horizontally from the recharge areas of the system to discharge areas. This lateral flow is concentrated in the materials which exhibit the higher hydraulic conductivities, in the coarse grained stratified drift materials. Some water also enters the bedrock groundwater system, but this pathway is not generally believed to carry a significant portion of the groundwater flow.

A detailed evaluation of the potentiometric conditions in the glacial material has been made in order to define the undisturbed groundwater conditions onsite (Reference 6). The relevant portion of this potentiometric map for the pump test site is shown on Figure 3.7. As can be seen from this map, the test well is located at a potentiometric high point in the system, with natural groundwater flow moving away from the site in all directions. This water eventually discharges to Swamp Creek, Ground Hemlock Creek, Upper Pickerel Creek, Rice Lake, Rolling Stone Lake, Crane Lake, Ground Hemlock Lake, the wetlands associated with these features, and the extensive wetland between Rolling Stone Lake and Mole Lake. The lakes and wetlands nearer the pump test site than these features are believed to be perched above the water table, and thus not discharge points for groundwater (Reference 2 and 3). These nearer features include Skunk, Oak, Little Sand, Duck, and Deep Hole Lakes, and their associated wetlands.




NOTE: GROUNDWATER POTENTIOMETRIC CONTOURS SHOWN ARE THOSE PRIOR TO PUMPING. (REF. NO. 6)

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 .0 1 KILOMETRE

GROUNDWATER POTENTIOMETRIC MAP OF PUMP TEST SITE

FIGURE 3.7

Scale GRAPHIC
Date 9-28-81
Job No. 786085

Golder Associates

Drawn S.K.B.
Checked JFC
Reviewed GHC

## 4.0 TEST AND OBSERVATION WELL DETAILS

### 4.1 Test Well Details

The test well was constructed in two sections; an upper 18 inch (457 mm) diameter section and a full depth 12 inch (305 mm) diameter section. Details of the well construction and stratigraphy based on visual identification of the material washed from the hole during drilling are shown on Figure 4.1. The upper section of the hole was drilled at a diameter of about 24 inches (610 mm), using bentonite drilling mud, to a depth of approximately 115 feet (35.0 m) below the ground surface. This section of the hole was then cased with 113 feet (34.4 m) of 18 inch (457 mm) diameter steel pipe casing. The annulus between the hole and the casing was then fully grouted using Type I Portland Cement.

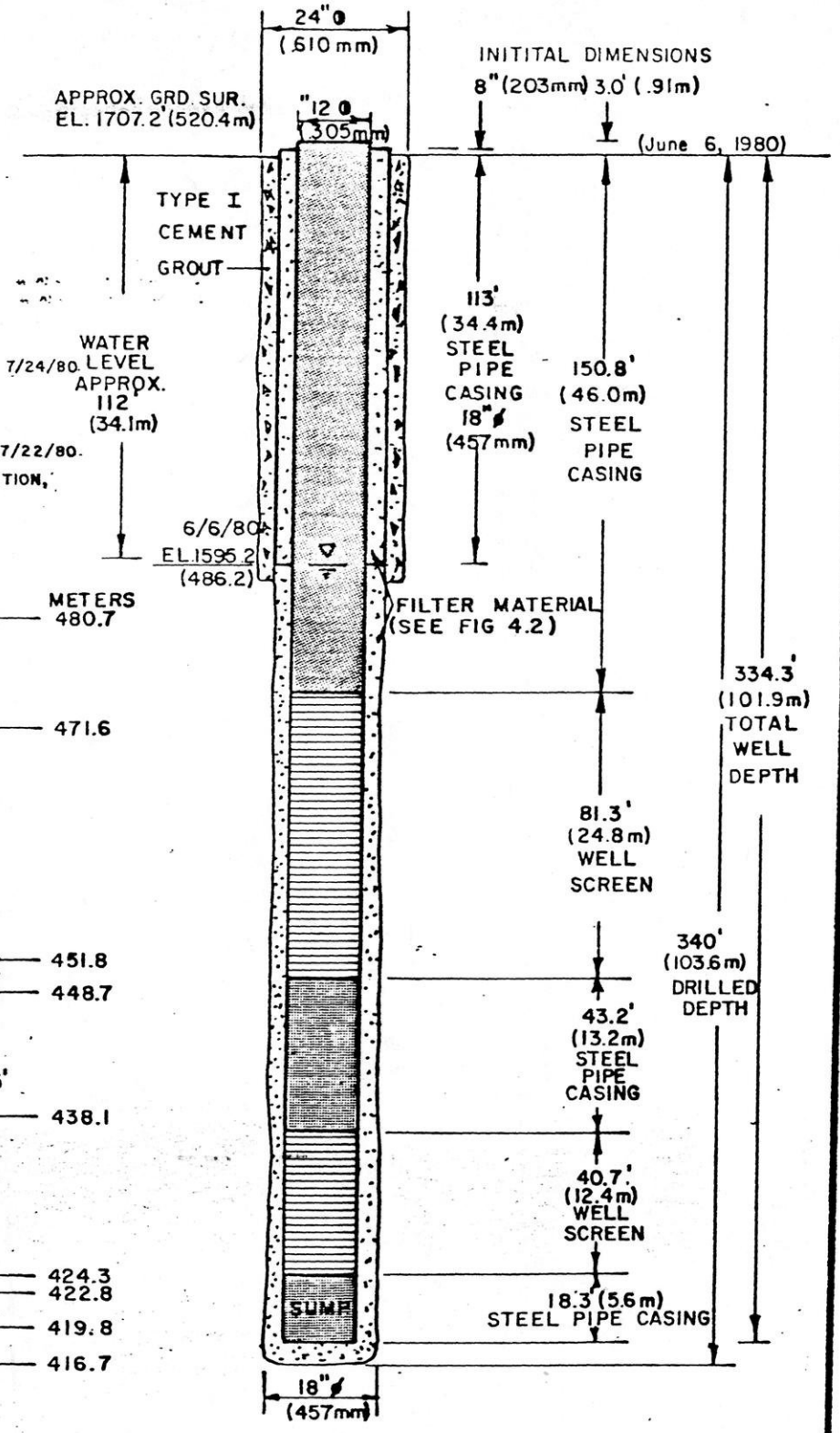
The lower hole was drilled about 18 inches (457 mm) in diameter to a depth of 340 feet (103.6 m) by the reverse circulation method. Liquid chlorine was added to the circulating fluid in the mud pit under the direction of the DNR field representative. The hole was then cased with a 12 inch (305 mm) diameter string of solid casing and well screen extending from above the surface to about 6 feet (1.8 m) from the bottom of the hole. The lowest portion of solid casing was used as a sump during the drawdown pump test. The solid casing is 3/8 inch (9.5 mm) thick steel pipe meeting ASTM A53 specifications. The bottom of the 12 inch (305 mm) diameter pipe has a steel plate cover welded in place. Watermark, Type 304, 0.060 inch slot well screen (by Johnson Division, Universal Oil Products, Inc.) was installed from 151 feet to 232 feet (46.0 to 70.7 m) and 274 feet to 315 feet (83.5 to 96.0 m) below the ground surface. This well screen is spiral wrapped stainless steel with slot sizes of 0.06 inches (1.5 mm).

NOTES:

1. WELL SYSTEM INSTALLED BY ALAN LANG WELL AND PUMP, INC.
2. WELLSCREEN IS WATERMARK, NO. 60, TYPE 304 STAINLESS STEEL MANUFACTURED BY JOHNSON DIVISION, UNIVERSAL OIL PRODUCTS CO.
3. PIPE CASING IS 3/8" STEEL MEETING ASTM A53 SPECS. MFG. BY LaBARGE TUBULAR CO.
4. WATER LEVEL MEASUREMENT REFERENCE ELEVATIONS:
   - A. 1709.02 – TOP 12"ø PIPE, 6/4/80 TO 7/24/80. EXCEPT AS NOTED IN B AND C.
   - B. 1713.00 – TOP OF PVC; 6/6/80.
   - C. 1709.71 – TOP OF PVC, 6/24/80 TO 7/22/80.
   - D. 1708.73 – TOP 12"ø PIPE AT COMPLETION, AFTER 7/25/80.

| APPROX. ELEVATION FEET | GENERAL DESCRIPTION | METERS |
|---|---|---|
| 1577.2 | | 480.7 |
| | Fine to coarse SAND, some to trace silt | |
| 1547.2 | | 471.6 |
| | Fine to coarse SAND, trace to some fine gravel, siltly to trace silt. | |
| 1482.2 | Silty fine to medium SAND, to, fine to coarse SAND and SILT | 451.8 |
| 1472.2 | | 448.7 |
| | Fine to fine to medium SAND and SILT with clay layers between 260' and 265' | |
| 1437.2 | | 438.1 |
| | Fine to coarse SAND, some silt, trace to some fine gravel | |
| 1392.2 | Fine to coarse SAND, some clay, some silt | 424.3 |
| 1387.2 | | 422.8 |
| 1377.2 | Fine to medium SAND, some to trace silt | 419.8 |
| 1367.2 | Weathered Rock fragments and clay (residual). | 416.7 |
| | BOTTOM OF BORING | |

SCALE:
VERTICAL: 1"= 50'
HORIZONTAL : NONE




# WELL STRATIGRAPHY AND CONSTRUCTION

FIGURE 4.1

Scale AS SHOWN
Date 1-29-81
Job No. 786085

Golder Associates

Drawn S.K.B, C.A.B.
Checked J.F.C.
Approved G.H.C

Solid pipe was installed between the upper and lower screen sections because of the fine grained nature of the soil encountered at that depth. Granular filter material was placed around the 12 inch (305 mm) diameter pipe for its full length. A plot of the filter gradation is shown on Figure 4.2.

Following the initial filter material placement the well was fully developed by first surging with air and then jetting. Air development was performed by flushing air down the hole and then sucking water out through the screen. This was done for the entire length of the screened sections in 2 foot (0.6 m) increments for about 5 minutes per increment. After development by air, the well was developed by jetting with water at about 250 psi (1700 kPa). The jetting was done for approximately 15 minutes for each 20 feet (6.1 m) of installed screen. The well was then flushed after completion of development and filter material was added to top off the filter column. After the pump test was completed, the pump was removed, the annulus around the 12 inch (305 mm) diameter pipe topped off with filter material, and the well capped with a hinged overlapping steel cover which was locked.

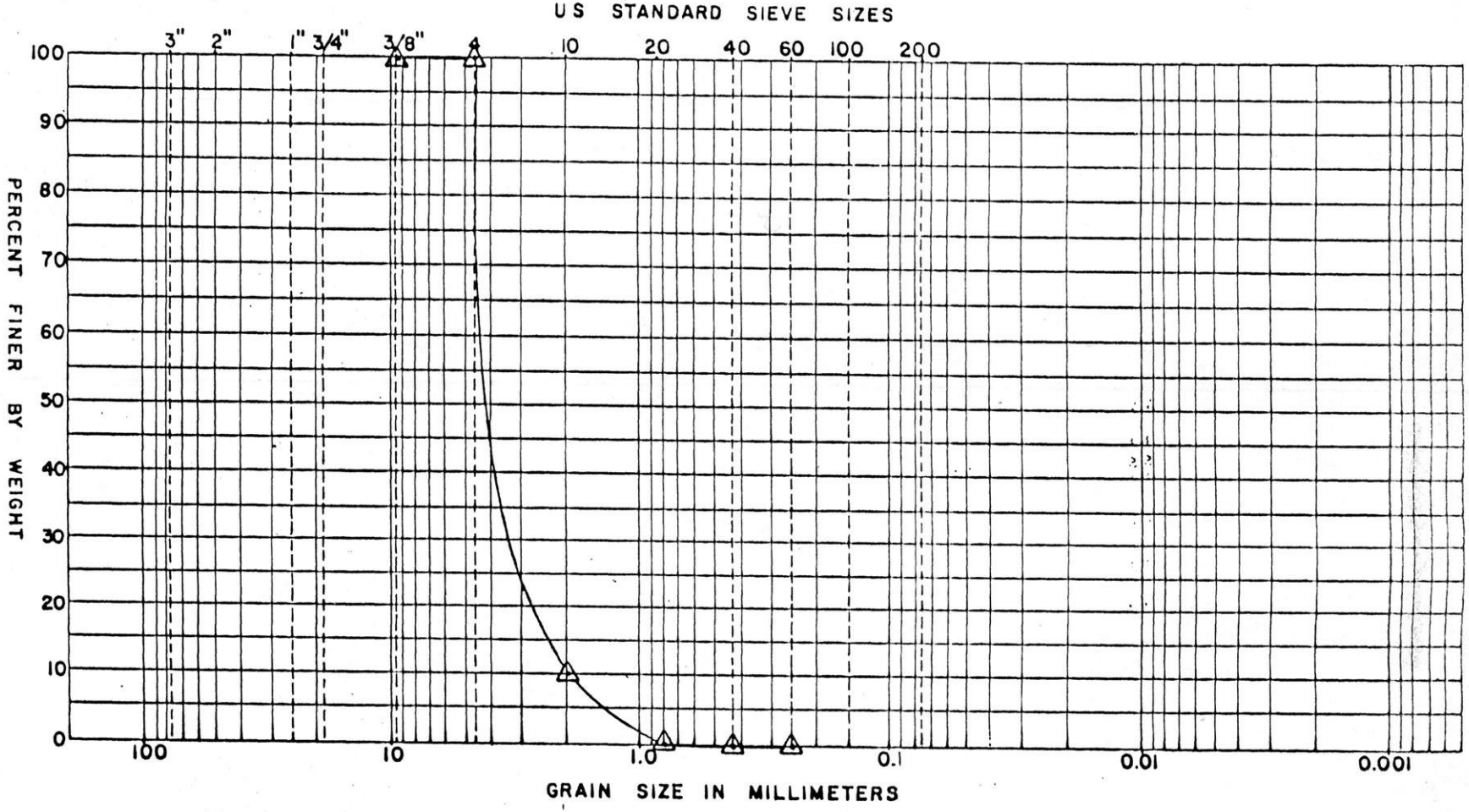
## 4.2 Observation Well Details

Groundwater observation wells were installed in boreholes and their installation was supervised by either Dames & Moore (boring identification starting with the letter DM) or Golder Associates personnel (boring identification starting with the letter G). The observation wells are 2 inch (50 mm) diameter PVC pipe with the lower 5 to 20 feet (1.5 to 6.1 m) slotted and surrounded by gravel. Most observation wells had bentonite seals above the gravel and all were grouted to the surface. Each observation well has a

Date 1-21-81
Job No. 786085

Golder Associates

# GRAIN SIZE DISTRIBUTION OF FILTER MATERIAL




| COBBLES | GRAVEL | | SAND | | | FINES | |
|---|---|---|---|---|---|---|---|
| | COARSE | FINE | COARSE | MEDIUM | FINE | SILT SIZES | CLAY SIZES |

| BORING NO. | ELEV. OR DEPTH | $W_n$ | $W_L$ | $W_p$ | $I_p$ | DESCRIPTION OR CLASSIFICATION |
|---|---|---|---|---|---|---|
| TW 41 Filter | | - | - | - | - | Medium to coarse SAND (SP) |

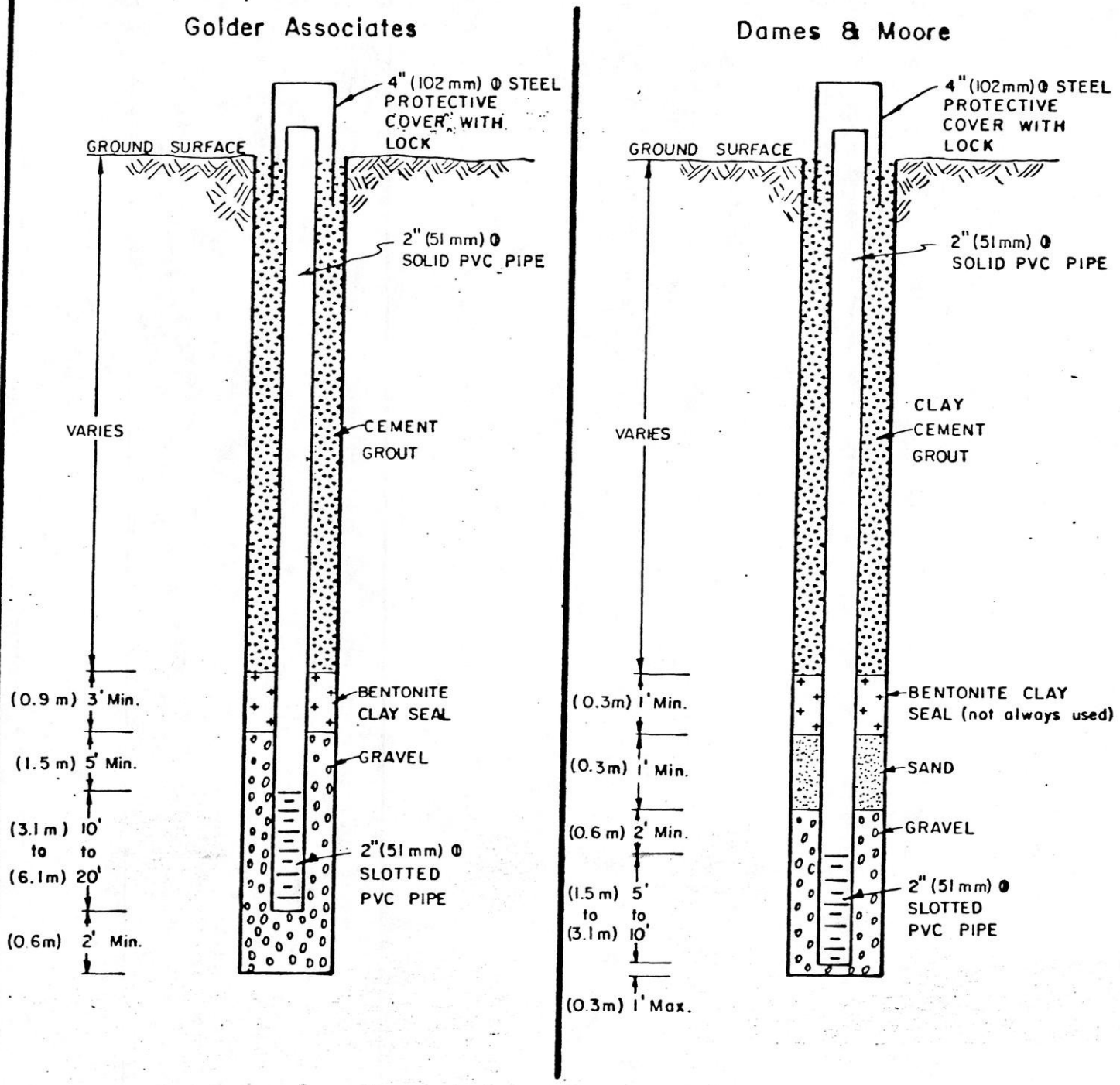
FIGURE 4.2

Drawn CAB
Checked JFC
Reviewed GHC

4 inch (100 mm) diameter protective cap with a lock. Typical installation details are shown on Figure 4.3. Specific details for each of the primary observation wells (locations of which were shown on Figures 3.2 and 3.3) are included with the boring logs in Appendix B. Table 4.1 includes salient information about all of the wells used during the pump test.

It should be pointed out that there exists the possibility of a misunderstanding developing over the use of the term "observation well" to describe the installations shown in Figure 4.3. The installations measure the groundwater head or pressure conditions over a relatively small section of the total saturated thickness of the glacial materials, and might therefore be more properly described as "piezometers". However, they utilize the pore fluid of the formation (water) as the measuring device rather than directly measuring water pressure in the formation so that some authorities would call them wells. In this report the term "observation well" is used for this type of installation, and this term has also been used in proceeding reports (References 1, 2, 3, and 7).

The primary observation wells were located so that a single line of observation points would extend south from the well. Observation wells were located in groups of three; one with a completion just above bedrock, one completed in the coarse grained stratified drift layer near the center of the saturated material, and one a little below the top of the saturated material. The groups were spaced approximately 75, 300, and 700 feet (23, 91 and 213 meters) from the test well. In addition, two pairs of wells were located approximately on an east-west line through the test well; one pair about 1450 feet (442 m) to the west and the other about 1760 feet (536 m) to the east. Completions were




TYPICAL OBSERVATION WELL INSTALLATIONS

FIGURE 4.3

Scale Not to Scale
Date 1-20-81
Job No. 786085

**Golder Associates**

Drawn S.K.B
Checked M.R.B
Reviewed J F.C.

TABLE 4.1 SUMMARY OF GROUNDWATER OBSERVATION WELL COMPLETIONS

| Observation Well No. | Distance from TW 41 ft. (m) | Coordinates | | Elevation ft. (m) (above MSL) | | | | |
|---|---|---|---|---|---|---|---|---|
| | | North ft. (m) | East ft. (m) | Ground Surface | Top of Casing | Screened Interval | Gravel Interval | Bottom of Boring |
| G41-C15 | 2450 (746.8) | 113135 (34483.5) | 2282080 (695578.0) | 1615.61 (492.44) | 1617.30 (492.95) | 1411-1421 (429.8-432.2) | 1398-1426 (426.1-434.6) | 1398 (426.1) |
| G41-E13* | 1450 (442.0) | 114395 (34867.6) | 2282890 (695824.9) | 1627.28 (495.99) | 1629.45 (496.66) | 1390-1400 (423.7-426.7) | 1377-1402 (419.7-427.3) | 1377 (419.7) |
| G41-E17 | 2180 (664.5) | 112385 (34254.9) | 2283005 (695860.0) | 1666.36 (507.91) | 1668.49 (508.56) | 1421-1431 (433.1-436.2) | 1406-1438 (428.5-438.3) | 1406 (428.5) |
| G41-F24 | 6930 (2112.3) | 107255 (32691.3) | 2283465 (696000.1) | 1653.50 (503.99) | 1656.61 (504.93) | 1560-1570 (475.5-478.5) | 1411-1578 (430.1-481.3) | 1411 (430.1) |
| G41-G14A* | 50 (15.2) | 114080 (34771.6) | 2284315 (696259.2) | 1706.91 (520.27) | 1708.62 (520.79) | 1466-1486 (446.8-452.9) | HOLE(1) CAVED | 1466 (446.8) |
| G41-G14B* | 75 (22.9) | 114055 (34764.0) | 2284315 (696259.2) | 1706.80 (520.23) | 1708.87 (520.86) | 1415-1435 (431.3-437.4) | 1347-1444 (410.6-440.1) | 1347 (410.6) |
| G41-G14C* | 100 (30.5) | 114030 (34756.3) | 2284315 (696259) | 1706.33 (520.09) | 1708.68 (520.86) | 1555-1575 (474.-480.1) | 1556-1582(2) (474.3-482.2) | 1546 (471.2) |
| G41-G14D* | 275 (83.8) | 113855 (34703.0) | 2284315 (696259.2) | 1705.56 (519.85) | 1707.60 (520.48) | 1464-1484 (446.2-452.3) | 1464-1491 (446.2-454.5) | 1449 (441.7) |
| G41-G14E* | 300 (91.4) | 113830 (34695.4) | 2284315 (696259.2) | 1705.61 (519.87) | 1708.00 (520.60) | 1552-1572 (473.-479.1) | 1552-1577 (473.-480.7) | 1541 (469.7) |
| G41-G14F* | 325 (99.1) | 113805 (34688.7) | 2284315 (696259.2) | 1703.47 (519.22) | 1706.92 (520.27) | 1394-1414 (424.9-430.7) | 1404-1423(3) (428.-433.4) | 1372 (418.2) |

*Observation wells monitored frequently during pump tests.

(1) Caved in material around PVC from 1466 to 1517 feet (466.8 to 462.4 m).

(2) Bottom 1.0 ft. (0.3 m) of screen in caved in material.

(3) Bottom 10.0 ft. (3.0 m) of screen in caved in material.

TABLE 4.1 SUMMARY OF GROUNDWATER OBSERVATION WELL COMPLETIONS (Continued)

| Observation Well No. | Distance from TW 41 ft. (m) | Coordinates | | Elevation ft. (m) (above MSL) | | | | |
|---|---|---|---|---|---|---|---|---|
| | | North ft. (m) | East ft. (m) | Ground Surface | Top of Casing | Screened Interval | Gravel Interval | Bottom of Boring |
| G41-G15* | 720 (219.5) | 113415 (34568.9) | 2284420 (696291.2) | 1691.47 (515.56) | 1694.24 (516.41) | 1442-1452 (439.2-442.3) | 1354-1458 (412.7-444.1) | 1354 (418.2) |
| G41-G15A* | 650 (198.1) | 113480 (34588.7) | 2284390 (696282.1) | 1692.75 (515.95) | 1695.71 (516.85) | 1581-1591 (481.9-484.9) | 1580-1601 (481.6-488.) | 1580 (481.6) |
| G41-G15B* | 690 (210.3) | 113440 (34576.5) | 2284385 (696280.6) | 1692.09 (515.75) | 1694.72 (516.55) | 1524-1534 (464.5-467.6) | 1522-1546 (463.9-471.2) | 1522 (463.9) |
| G41-G21 | 4640 (1414.3) | 109495 (33374.1) | 2284265 (696244.0) | 1664.83 (507.44) | 1666.91 (508.07) | 1566-1575 (477.3-480.0) | 1564-1598 (476.7-487.1) | 1564 (476.7) |
| G41-K13* | 1765 (538.0) | 114755 (34977.3) | 2285965 (696762.1) | 1699.67 (518.06) | 1702.92 (519.05) | 1430-1440 (435.9-438.9) | 1415-1460 (431.3-445.) | 1415 (431.3) |
| G41-K13A* | 1760 (536.4) | 114770 (34981.9) | 2285955 (696759.1) | 1699.87 (518.12) | 1702.99 (519.07) | 1581-1591 (481.9-484.9) | 1578-1594 (481.0-485.9) | 1578 (481.0) |
| G41-N21 | 6432 (1960.5) | 109170 (33275.0) | 2288410 (697507.4) | 1727.36 (526.50) | 1729.50 (527.15) | 1579-1589 (481.3-484.3) | 1629-1651(4) (496.5-503.2) | 1577 (480.7) |
| G41-P18 | 5149 (1569.5) | 111645 (34029.4) | 2288825 (697633.9) | 1588.88 (484.29) | 1591.51 (485.09) | 1479-1489 (450.8-453.8) | 1459-1494 (444.7-455.4) | 1459 (444.7) |
| G41-P18B | 5273 (1607.2) | 111390 (33951.7) | 2288820 (697632.3) | 1589.05 (484.34) | 1591.27 (485.02) | 1549-1554 (472.1-473.7) | 1549-1556 (472.1-474.3) | 1544 (470.6) |
| G41-P24 | 7885 (2403.4) | 107550 (32781.2) | 2288660 (697583.3) | 1681.95 (512.66) | 1684.37 (513.40) | 1569-1579 (478.2-481.3) | 1337-1587 407.5-483.7) | 1337 (407.5) |

*Observation wells monitored frequently during pump tests.
(4) Caved in material from 1577 to 1629 feet (480.7 to 496.5 m).

TABLE 4.1 SUMMARY OF GROUNDWATER OBSERVATION WELL COMPLETIONS (Continued)

| Observation Well No. | Distance from TW 41 ft. (m) | Coordinates | | Elevation ft. (m) (above MSL) | | | | |
|---|---|---|---|---|---|---|---|---|
| | | North ft. (m) | East ft. (m) | Ground Surface | Top of Casing | Screened Interval | Gravel Interval | Bottom of Boring |
| DMB 1A* | 1440 (438.9) | 114405 (34870.6) | 2282900 (695827.3) | 1627.94 (496.20) | 1629.70 (496.73) | 1549-1559 (472.1-475.2) | 1549-1598 (472.1-487.1) | 1549 (472.1) |
| DMB 3 | 4191 (1277.4) | 116895 (35629.6) | 2287465 (697219.3) | 1587.93 (484.00) | 1589.48 (484.47) | 1528-1533 (465.7-467.3) | 1527-1538 (465.4-468.8) | 1526 (484.6) |
| DMB 5 | 2341 (713.6) | 112135 (34178.7) | 2285540 (696632.6) | 1688.77 (514.74) | 1690.37 (515.22) | 1590-1600 (484.6-488.0) | 1590-1621 (484.6-494.1) | 1590 (484.6) |
| DMB 6 | 2176 (663.2) | 112385 (34254.9) | 2283015 (695863.0) | 1666.47 (507.94) | 1668.26 (508.49) | 1581-1591 (481.9-484.9) | 1581-1605 (481.9-489.2) | 1581 (481.9) |
| DMB 7 | 8726 (2659.7) | 106150 (32354.5) | 2287845 (697335.2) | 1653.67 (504.04) | 1655.08 (504.5) | 1575-1585 (480.1-483.1) | 1575-1595 (480.1-486.2) | 1575 (480.1) |
| DMB 8 | 3556 (1083.7) | 114595 (34928.6) | 2287840 (697333.6) | 1622.74 (494.61) | 1624.57 (495.17) | 1573-1578 (479.5-481.0) | 1573-1583 (479.5-482.5) | 1572 (479.1) |
| DMB 26 | 8854 (2698.8) | 105520 (32162.5) | 2282250 (695629.8) | 1712.98 (522.1) | 1714.49 (522.6) | 1579-1589 (481.3-484.3) | 1579-1596 (481.3-486.5) | 1579 (481.3) |
| DMB 28 | 7374 (2247.6) | 106840 (32564.8) | 2285425 (696597.5) | 1642.13 (500.22) | 1643.88 (501.05) | 1573-1578 (479.4-480.9) | 1572-1579 (479.2-481.3) | 1572 (479.2) |
| DMB 29 | 10458 (3176.6) | 104385 (31816.5) | 2288110 (697415.9) | 1629.98 (496.82) | 1631.48 (497.28) | 1561-1566 (475.8-477.3) | 1562-1570 (476.1-478.5) | 1562 (476.1) |

*Observation wells monitored frequently during pump tests.

at different levels for each pair. These 13 observation wells were monitored intensively and constitute the primary source of data for the pump tests. In addition to these 13 primary observation wells, occasional measurements were taken in other observation wells located in the Site 41 test area.

The observation well network described above provided a detailed three dimensional view of the behavior of the groundwater system around the test well, both prior to the test and during the pumping and recovery periods. The detailed data from the 13 primary observation wells were used to help understand the behavior of the saturated soil system. Data from the other observation wells were used to help understand the extent of pumping effects, and how gradients distant from the well were affected by the test.

## 5.0 FLOW VELOCITY TEST

### 5.1 Purpose

A flow velocity test was performed on June 6, 1980, before the main pumping test. This test was performed to aid evaluation of the well with respect to flow contribution.

Because the well is screened over almost the full length of the saturated material it is not possible to determine the quantity of flow from each strata in a standard well test. In a properly constructed well the results of a flow velocity test define the relative permeability of the material adjacent to the hole. This test was performed by the Johnson Well Division of Universal Oil Products, Inc. Their report and the operations manual for the test are presented in Appendix A to this report.

### 5.2 Test Description and Equipment Calibration

The flow velocity test measured the vertical velocity of water flowing in the well casing/screen as the well was being pumped. The equipment for this test was the Johnson Velocity Meter System which uses a turbine type flow meter. The water velocity was measured at various depths in the well with the total flow from the well being held constant. The results were obtained as a relationship between flow and depth which indicated the relative contribution to total flow from each measured increment.

The Johnson Velocity Meter System turbine flow meter probe is set in a centralizer. The probe consists of a 6 inch (152 mm) diameter impeller mounted in jewelled bearings. A magnetic switch is activated for each revolution of the probe shaft. The probe is connected to a surface con-

sole by a logging cable. The surface console records the number of revolutions and elapsed time. A schematic diagram of the test set-up is shown on Figure 5.1.

Flow rates were obtained by relating the revolutions per minute of the probe during pumping to a previous calibration. The probe was calibrated by lowering it a distance of 25 feet (7.6 m) at different time rates thus providing a velocity. The revolutions of the probe for this time increment were then calibrated directly to velocity. Since the well casing has a constant cross-section area, the flow for any velocity can be calculated, thus providing the conversion from revolutions per minute to flow rate.

The rate of decent (velocity) was progressively decreased until the threshold of the instrument (velocity so slow that readings could no longer be obtained) was reached. This threshold velocity was 0.056 ft./sec. (0.017 m/s). The instrument was calibrated both before and after the test with excellent correlation. The calibration curve for the flow velocity test is shown on Figure 5.2.

## 5.3 Test Procedure

The velocity probe was placed at the bottom of the well and the pump placed about 5 feet (1.5 m) above the top screen section. The well was pumped for approximately 3 hours. During this time the probe was raised in 5 foot (1.5 m) increments through the screened sections of the well and the revolutions for a one minute duration counted to determine flow rate. The total flow was obtained by taking a measurement in the solid casing above the top screen. These measurements are shown as Segment 1 of the flow versus depth plot shown on Figure 5.3. Following this initial sur-

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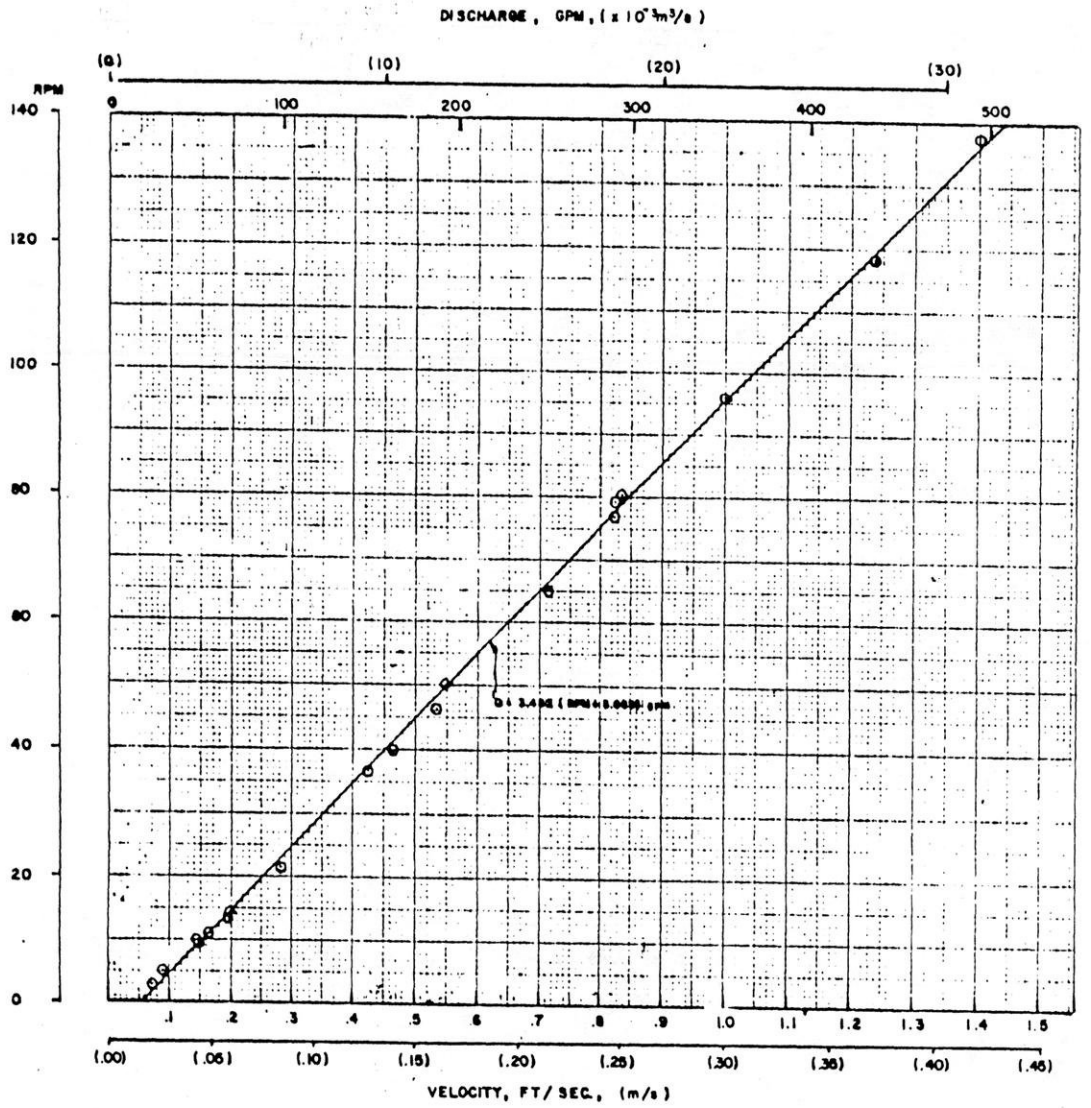



LEGEND

- ○ INITIAL CALIBRATION
- ⊡ FINAL CALIBRATION

NOTE

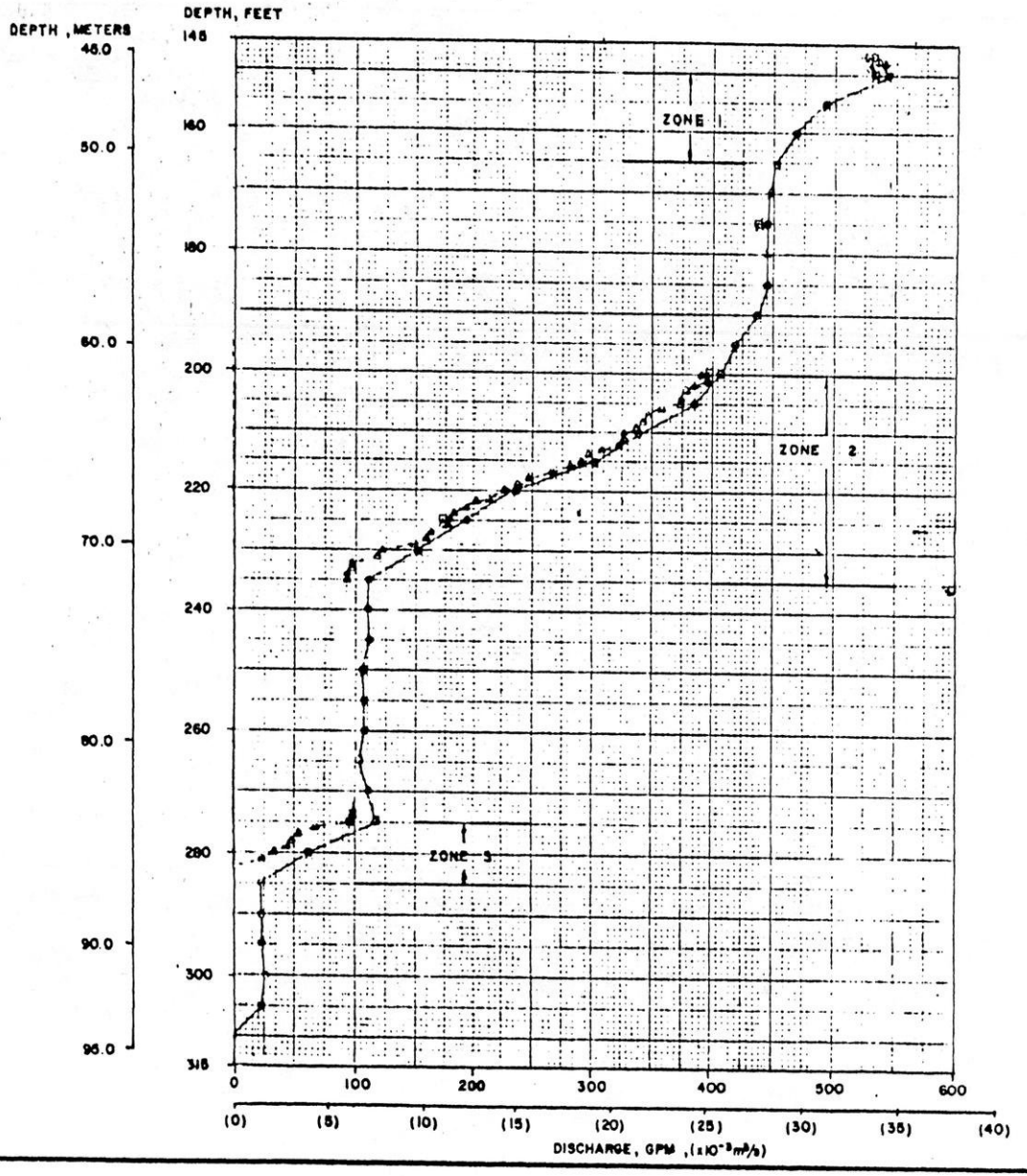
FLOW TEST SETUP AND CALIBRATION PERFORMED BY REPRESENTATIVE OF:
JOHNSON DIVISION, UNIVERSAL OIL PRODUCTS, INC., JUNE 6, 1980

"THRESHOLD" FOR SPINNER (TURBINE)

V = 0.056 fps (0.017 m /s)

Q = 19.7 gpm (1.24 x $10^{-3}$ $m^3$/s)

| | | |
|---|---|---|
| FLOW VELOCITY METER CALIBRATION | | FIGURE 5.2 |
| Scale AS SHOWN<br>Date 2-16-81<br>Job No. 786085 | Golder Associates | Drawn CAB<br>Checked JFC<br>Reviewed GHC |




SEGMENT LEGEND

⊙ SEGMENT 1 - INITIAL VELOCITY SURVEY FROM BOTTOM OF WELL SCREEN (315 ft.) TO TOP OF WELL SCREEN (150 ft.) AT 5 ft. INTERVALS.

△ SEGMENT 2 - DETAIL VELOCITY SURVEY AT 1 ft. INTERVALS THROUGH SECTIONS OF HIGH FLOW INDICATED IN THE SEGMENT 1 SURVEY.

DUE TO A CHANGE IN THE PUMP DISCHARGE ARRANGEMENT THE FLOWS IN SEGMENT 2 WERE DIFFERENT THAN IN SEGMENT 1.

⊡ SEGMENT 3 - FINAL CHECK ON FLOWS FROM SEGMENT 2. DISCHARGE ARE THE SAME AS FOR SEGMENT 2.

NOTE

FLOW VELOCITY TEST SETUP, CALIBRATION AND PERFORMED BY REPRESENTATIVE OF: JOHNSON DIVISION, UNIVERSAL OIL PRODUCTS, INC. JUNE 6, 1980.

FLOW VELOCITY TEST RESULTS

FIGURE 5.3

Scale AS SHOWN
Date 2-16-80
Job No. 786086

Golder Associates

Drawn CAB
Checked JFC
Reviewed GHC

vey the probe was lowered in 1 foot (0.3 m) increments through the screened sections identified in Segment 1 as being main contributors to the total flow from the well. This more detailed survey at 1 foot (0.3 m) increments is identified as Segment 2 on Figure 5.3 and was performed as the probe was lowered to the bottom of the well. The flow rate for Segment 1 was 540 gpm (0.034 $m^3/s$). Due to a change in the pump discharge arrangement during the test the flow rate for Segment 2 was 530 gpm (0.033 $m^3/s$). Because of this arrangement change and the resulting flow change an additional survey (Segment 3) was performed at the same flow rate as Segment 2, as a check, again raising the probe from the bottom of the well.

## 5.4 Results

Figure 5.3 shows three zones of significant flow velocity, as indicated by rapidly increasing flow to the well. These velocities can be converted into hydraulic conductivities using the approximate laminar flow formula:

$$k = \frac{\Delta Q}{LH}$$

where

k = hydraulic conductivity
$\Delta Q$ = flow from a given portion of the well
L = length of the well portion
H = head drop in well

The head drop in the well was between 18 and 24 feet (5.5 and 7.3 m) during the test. Hydraulic conductivity estimates were made for the high permeability zones using the above formula and are included in Table 5.1. These estimates were made using the data shown on Figure 5.3, and the maximum drawdown in the test well produced during the

TABLE 5.1
FLOW-VELOCITY HYDRAULIC CONDUCTIVITY ESTIMATES

A. ENGLISH UNITS

| Zone # | Well Portion Depth Interval ft. | Flow Q gpm | Length L ft. | Hydraulic Conductivity k ft./sec. |
|---|---|---|---|---|
| 1 | 150 to 165 | 90 | 15 | $5.6 \times 10^{-4}$ |
| 2 | 200 to 235 | 300 | 35 | $8.0 \times 10^{-4}$ |
| 3 | 275 to 285 | 100 | 10 | $9.3 \times 10^{-4}$ |

B. SYSTEM INTERNATIONAL UNITS

| Zone # | Well Portion Depth Interval m | Flow Q $m^3/s$ | Length L m | Hydraulic Conductivity k m/s |
|---|---|---|---|---|
| 1 | 45.7 to 50.3 | 0.0057 | 4.6 | $1.7 \times 10^{-4}$ |
| 2 | 61.0 to 71.6 | 0.0189 | 10.7 | $2.4 \times 10^{-4}$ |
| 3 | 83.8 to 86.9 | 0.0631 | 3.0 | $2.9 \times 10^{-4}$ |

velocity test. The remainder of the material has hydraulic conductivities at least a factor of five lower than these values.

In addition to evaluating the hydraulic conductivity of the formation in which the well was completed, the test allowed an assessment of the maximum flow which could be produced from the well on a sustained basis. Using the available drawdown produced, peak flow estimates range from 2400 gpm to 2900 gpm (0.15 $m^3/s$ to 0.18 $m^3/s$). This was well beyond the capacity of readily available pumps which would fit in the installed well screen.

## 6.0 PUMP TEST DESCRIPTION & RESULTS

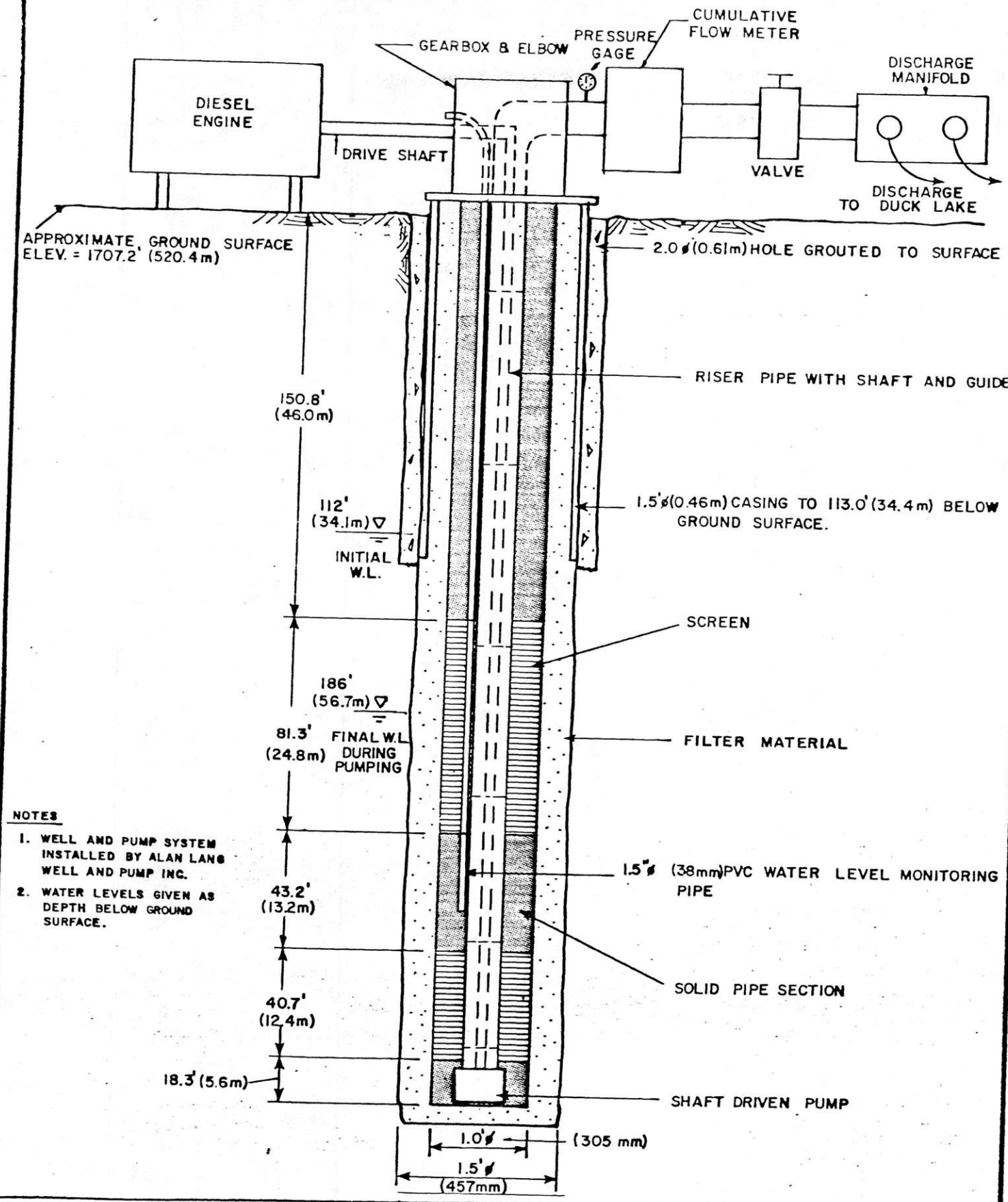
### 6.1 Pretest Period

Before the main test was performed, water levels in all the observation wells in the vicinity of the test location were measured. The water levels in the thirteen observation wells in which repeated water level measurements were to be taken during the test were monitored on a number of occasions to evaluate any trends in the groundwater levels in the area of the test. This period extended from the end of the flow velocity test on June 6, 1980, to the beginning of the pump test on June 27, 1980. In addition, numerous wells were observed periodically from mid-April to September, 1980, to evaluate long term trends and the impact of the pump test.

The arrangement of the test well equipment is shown on Figures 6.1 and 6.2. Water was pumped from the well with a 1500 gpm (0.095 $m^3/s$) capacity, shaft driven pump. The water then passed through a cumulative flowmeter, valve, and manifold, and was piped to Duck Lake in two 6 inch (152 mm) diameter, lightweight pipes. This pipeline was about 0.8 miles (1.4 km) in length. A plan view of this arrangement is shown on Figure 6.2.

At Duck Lake the discharge system was arranged to distribute a spray of water over a large area, permitting aeration. Lake levels, flows, and water quality were monitored by representatives of the Wisconsin Department of Natural Resource (DNR) and by Exxon's environmental consultants.

Climatic monitoring equipment was located at the pump test site to document meteorologic effects. Data collected




NOTES

1. WELL AND PUMP SYSTEM INSTALLED BY ALAN LANG WELL AND PUMP INC.
2. WATER LEVELS GIVEN AS DEPTH BELOW GROUND SURFACE.

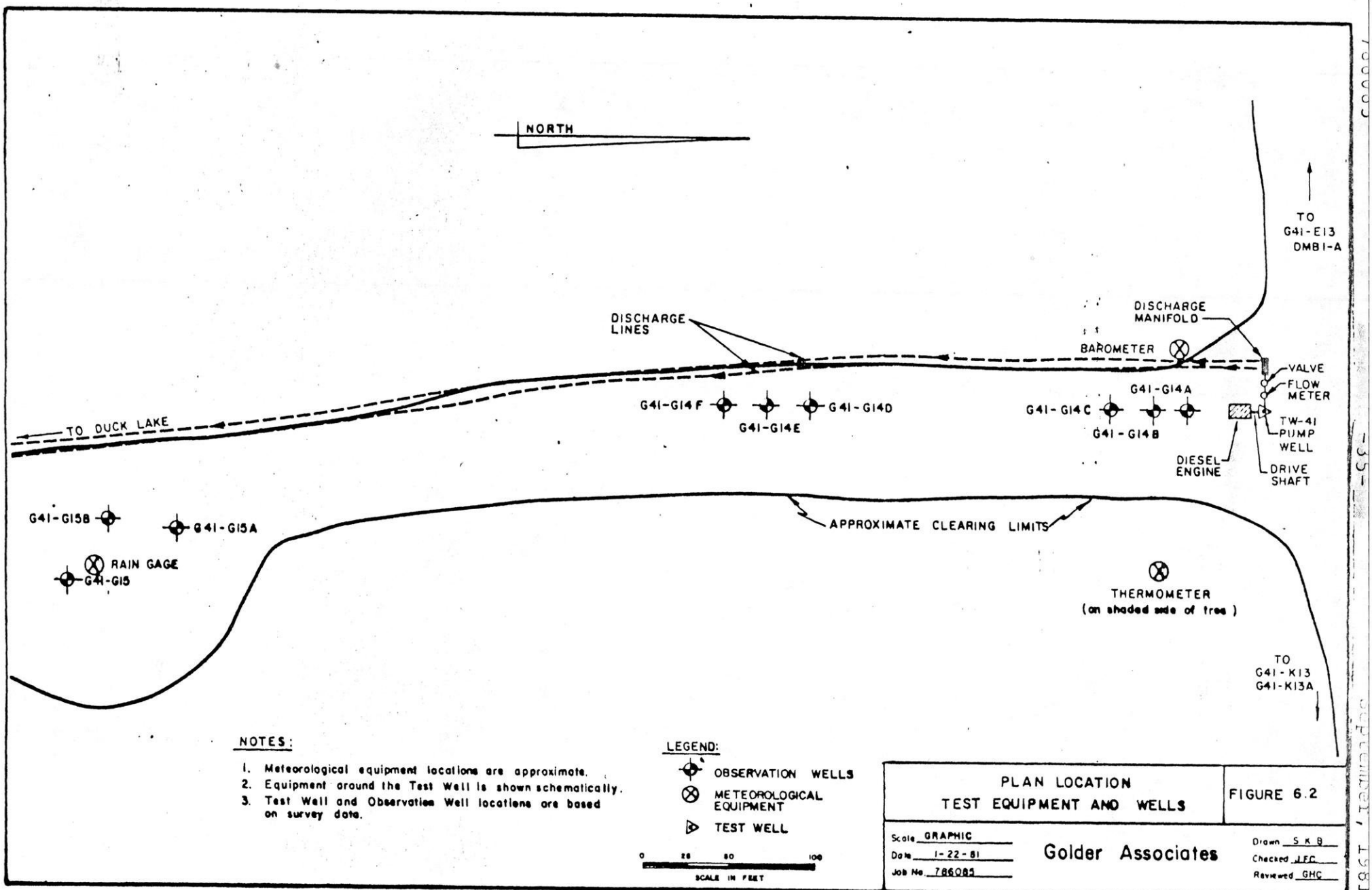
## SCHEMATIC OF TEST WELL SETUP

FIGURE 6.1

Scale AS SHOWN
Date 1-21-81
Job No. 786085

**Golder Associates**

Drawn CAB
Checked JFC
Reviewed GHC




NOTES:

1. Meteorological equipment locations are approximate.
2. Equipment around the Test Well is shown schematically.
3. Test Well and Observation Well locations are based on survey data.

LEGEND:

- OBSERVATION WELLS
- METEOROLOGICAL EQUIPMENT
- TEST WELL

0 25 50 100
SCALE IN FEET

PLAN LOCATION
TEST EQUIPMENT AND WELLS

FIGURE 6.2

Scale GRAPHIC
Date 1-22-81
Job No. 786085

Golder Associates

Drawn S K B
Checked J.E.C.
Reviewed G.H.C.

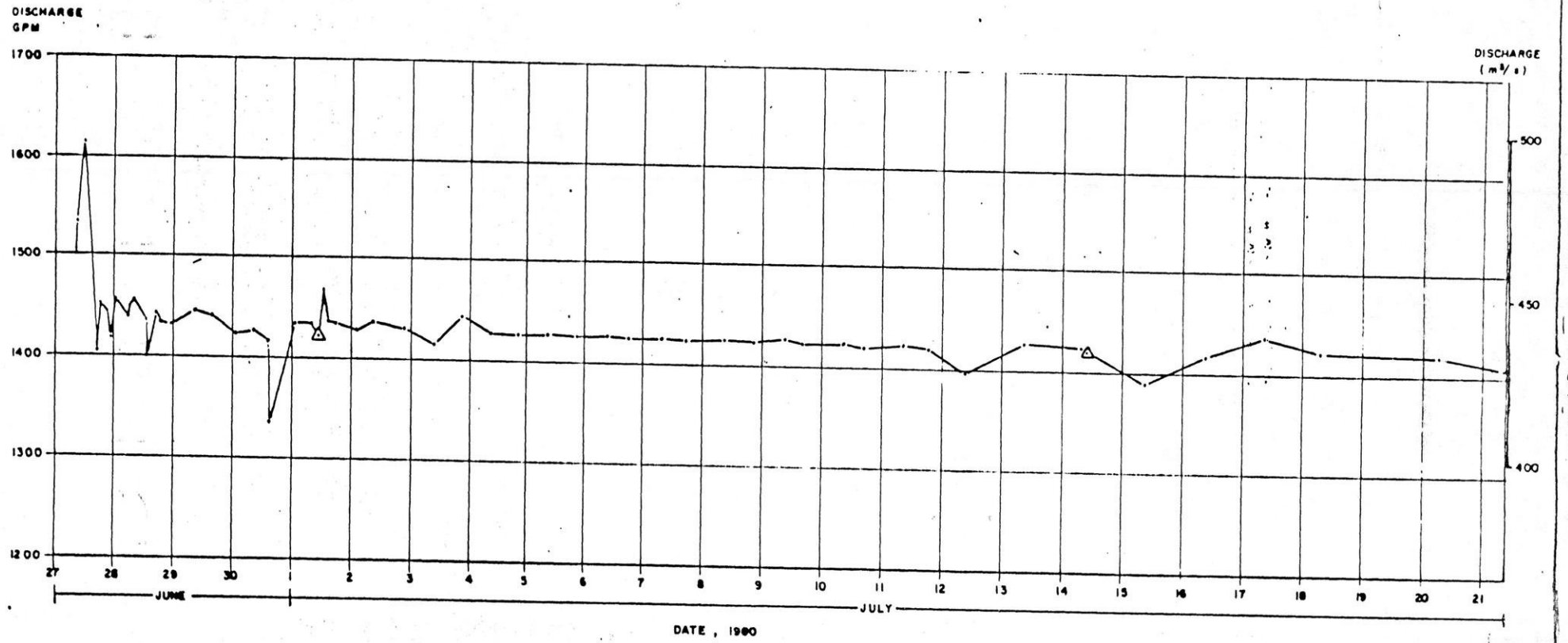
CONFIDENTIAL TEST

included rainfall, temperature, and barometric pressure. These equipment locations are shown on Figure 6.2.

Water level sounders (electric continuity meters) with graduated cables were used to determine the depth to water in each well. The cable was lowered downhole until the tip was in contact with the water, thus completing the electrical circuit and causing a meter at the surface to register. The depth was then read from the marked cable. Each cable was calibrated on the surface using a metal measuring tape which was accurate to 0.01 feet. Checks using various instruments to measure the same water levels generally showed a reproducability of readings to within $\pm$0.01 feet. Absolute accuracy of the water level readings was not directly evaluated. To speed measurements and reduce errors, cables were permanently located in the G41-G14 series and G41-G15 series observation wells. G41-E13 and DMA-1A observation wells also had instruments placed in them when the pump test began, but they were removed after one week. Other observation well measurements were obtained using the same type sounders on cables that were reeled down and up the observation well each time water levels were measured. Water level indicator calibration constants are included in Appendix B.

## 6.2 The Drawdown Period

The pump was started at 10:05 AM on June 27, 1980 at a flow rate approaching 1500 gpm (0.095 $m^3/s$). This rate dropped quickly to about 1440 gpm (0.091 $m^3/s$) and then gradually reduced with time over the length of the test to 1420 gpm (0.090 $m^3/s$). The flow rate is plotted on Figure 6.3 and the total flow on Figure 6.4. Data for these plots are contained in Table B.2 of Appendix B. A total volume at about 49 million gallons ($1.9 \times 10^5$ $m^3$) was removed from the ground during the period of pumping.




NOTE:

1. DATA PLOTTED FROM TABLE C-2.
2. TEST BEGAN JUNE 27, 1980 AT 10:05 AM. AND ENDED JULY 21, 1980 AT 10:06 AM.

LEGEND:

⚠ PUMP SHUT OFF FOR OIL CHANGE

PUMP DISCHARGE RATE

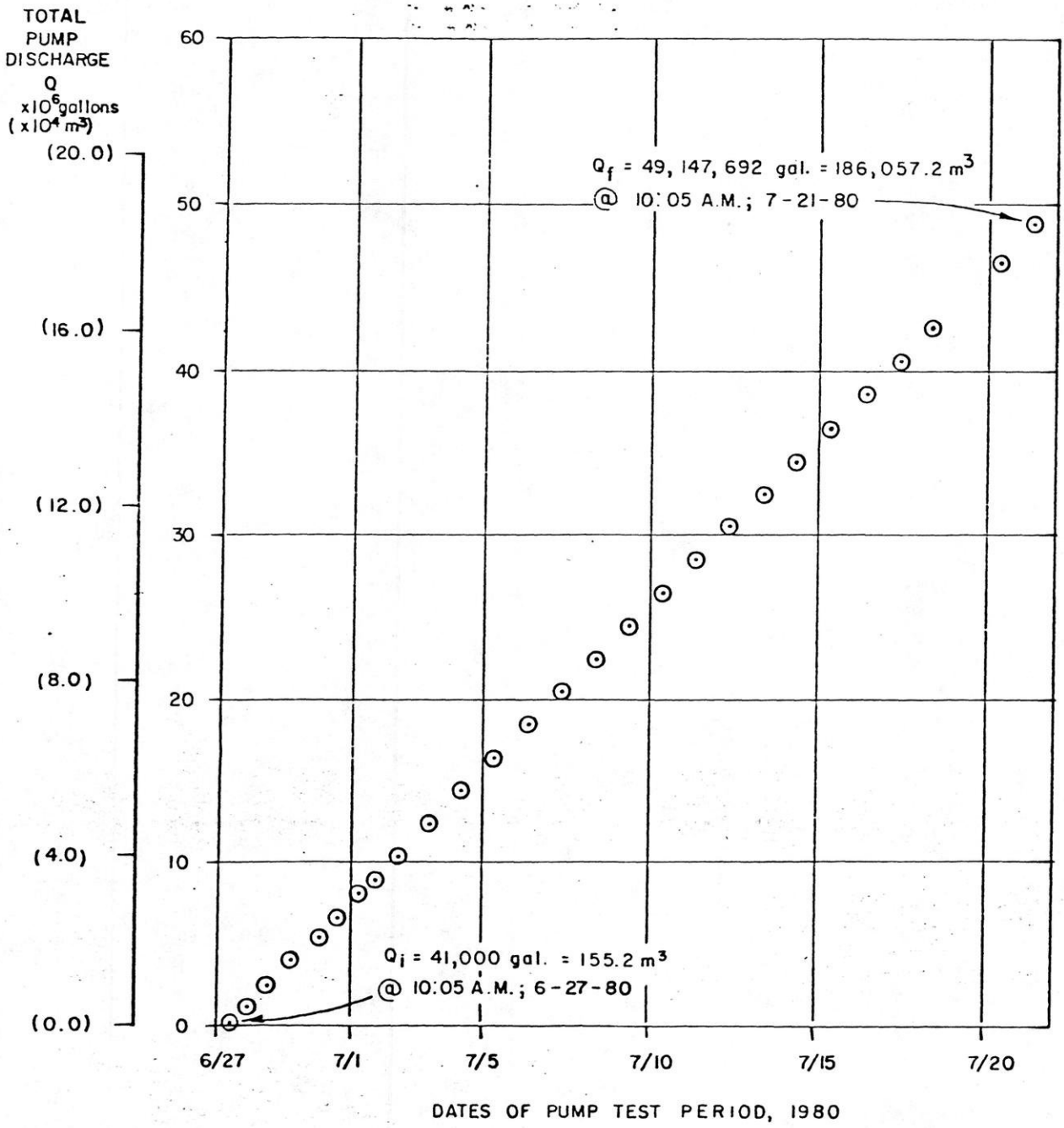
FIGURE 6.3

Scale AS SHOWN
Date 1-29-80
Job No. 786085

Golder Associates

Drawn S.K.B.
Checked J.F.C.
Reviewed G.H.C.

786085 -31- September, 1981




CUMULATIVE DISCHARGE FROM PUMP TEST

FIGURE 6.4

Scale AS SHOWN
Date 11-24-80
Job No. 786065

Golder Associates

Drawn S.K.B.
Checked J.F.C.
Reviewed GHC

The pumping well and primary observation wells were monitored frequently during pumping, starting with measurements every few minutes, and reducing to about one measurement per several days at the end of the pumping period. Details are given in Appendix B.

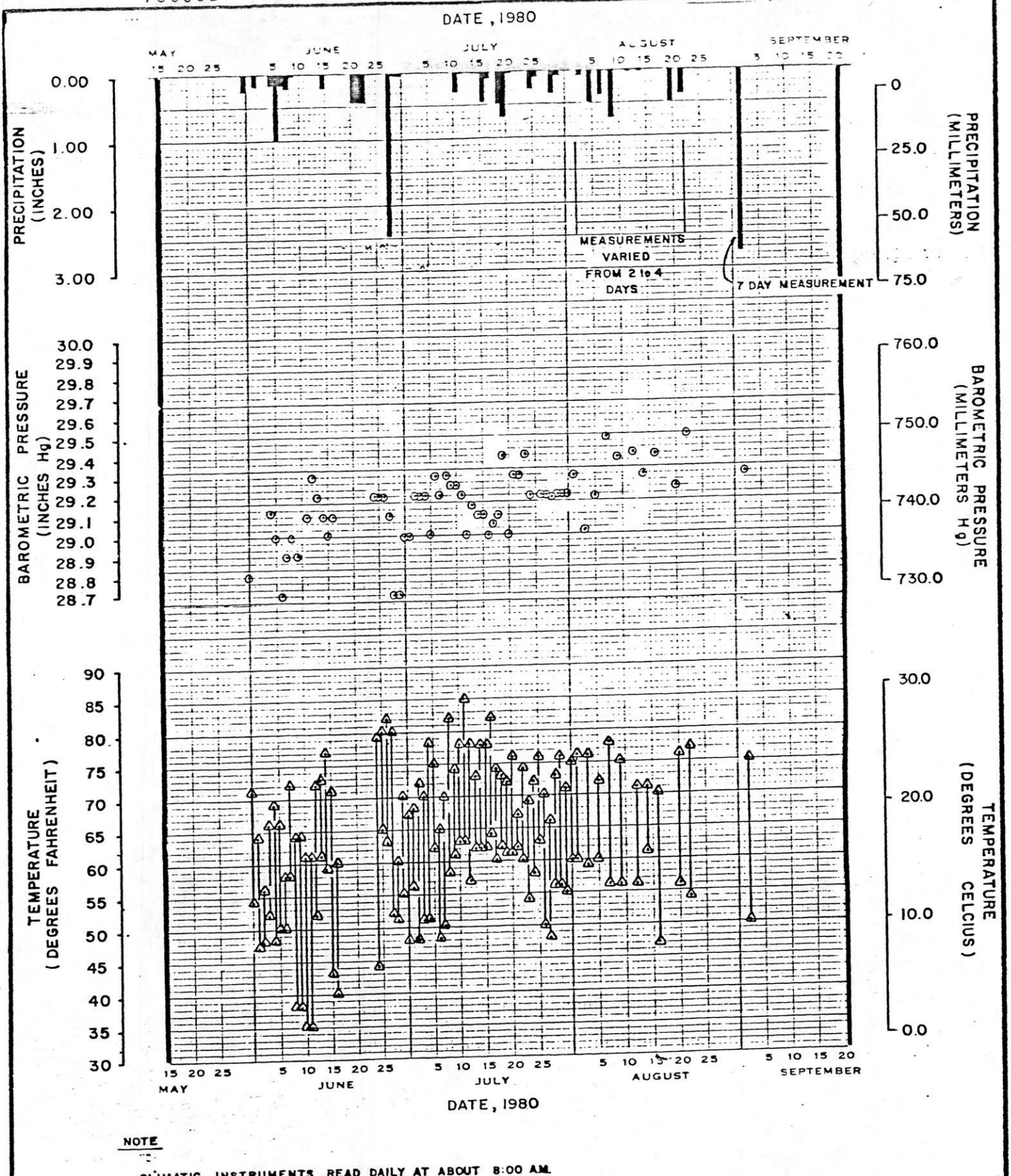
The test was stopped on July 21, 1980 at 10:05 AM, after 24 days. The reason for halting the test short of the planned 30 day duration was that the water level in Duck Lake had risen nearly 1 foot (0.3 m); the pre-determined maximum level acceptable to the Wisconsin DNR.

## 6.3 The Recovery Period

Data were collected during the recovery period on a similar but somewhat less detailed basis as that used for the drawdown period. As part of this program data collection continued for 52 days (approximately twice the pumping period), until September 10, 1980. On September 10 and 11, 1980, personnel from Golder Associates and Dames & Moore obtained water level measurements from all of the accessable observation wells installed as of that date. The water level response during recovery is discussed in Sections 6.6 and 7.2 of this report. Plots of the water levels during part of the recovery period are shown on Figures 6.6 and 6.11. The recovery period measurements and data analyses are provided for each of the primary observation wells in Appendix B.

## 6.4 Climatic Monitoring

Measurements of rainfall, maximum and minimum temperature, and barometric pressure were taken daily using relatively simple equipment which was located as shown on Figure 6.2. Data are presented in Appendix B and shown graphically on Figure 6.5.




NOTE

CLIMATIC INSTRUMENTS READ DAILY AT ABOUT 8:00 AM.

# CLIMATOLOGICAL DATA

FIGURE 6.5

Scale AS SHOWN
Date 1-21-81
Job No. 786085

Golder Associates

Drawn CAB
Checked JFC
Approved GHC

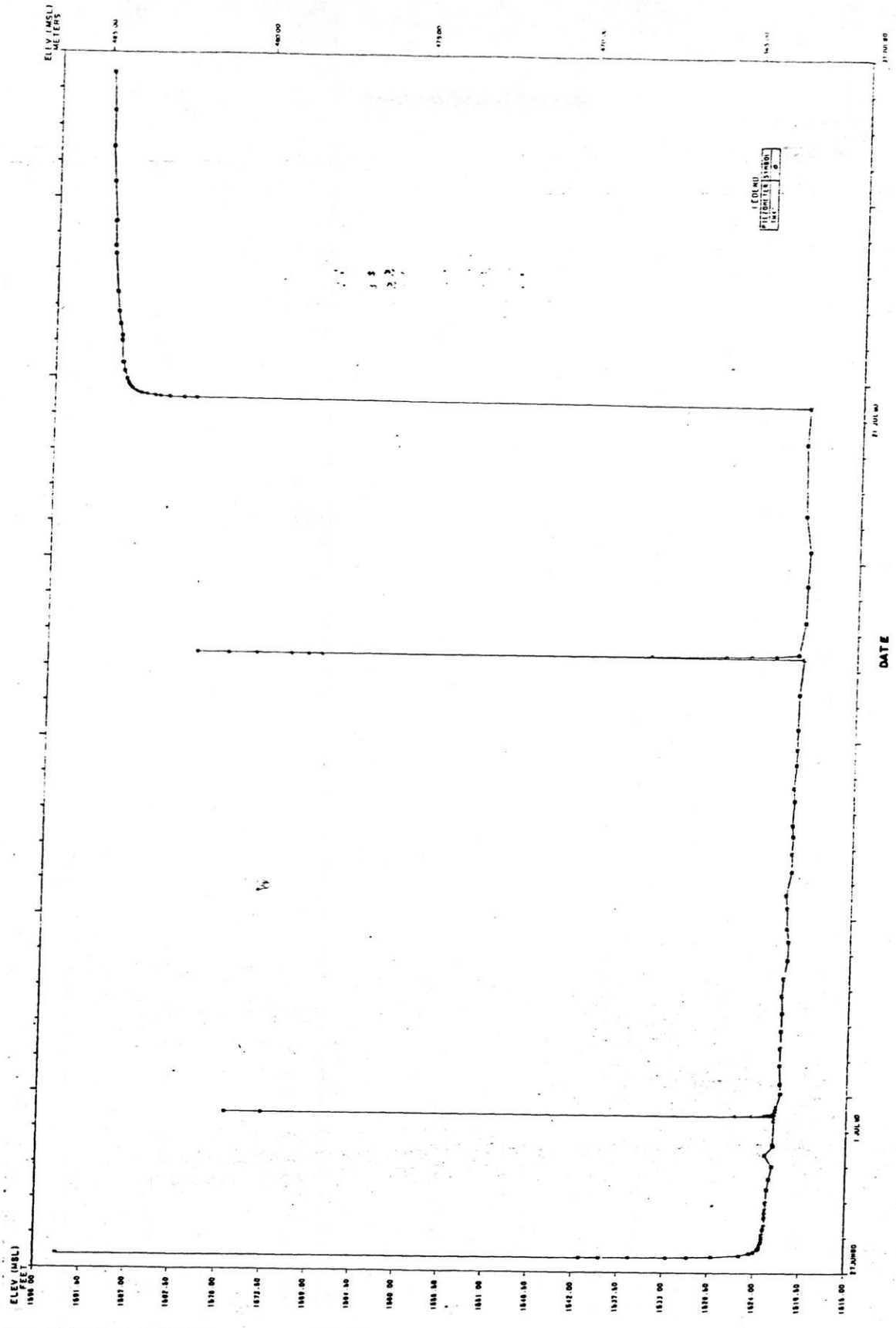
## 6.5 Pumping Well and Observation Well Results

Water level measurements and other data collected are presented in Appendix B. Plots of water elevations versus time have been prepared for each group of observation wells located at various distances from the test well and with completions in different strata. The well groups were generally at distances of 75 feet (23 mm), 300 feet (91 m),700 feet (213 m), 1450 feet (442 m), and 1760 feet (536 m) from the test well. These data are grouped and presented as follows:

Figure 6.6 Water Level History; Pumping Well TW-41
Figure 6.7 Water Level History; G41-G14A, B & C
Figure 6.8 Water Level History; G41-G14D, E & F
Figure 6.9 Water Level History; G41-G15, G15A & B
Figure 6.10 Water Level History; G41-E13 & DMB-1A
Figure 6.11 Water Level History; G41-K13 & K13A

These data are largely as expected. The well drew down a total of about 73 feet (22 m), and the nearby observation wells drew down by lesser amounts depending on the distance of the observation well from test well and the depth at which the observation well was completed. The variation of drawdown with distance was normal, approximately logarithmic, and therefore needs little detailed explanation. Detailed analyses for aquifer parameters are presented in Section 7. The vertical variation in drawdown is less well appreciated in pump tests of this sort, and is explained in the following paragraph.

When a well is fully open to the formation, water is drawn from the entire section. The response of any given point in the formation to this hydraulic stress is dependent



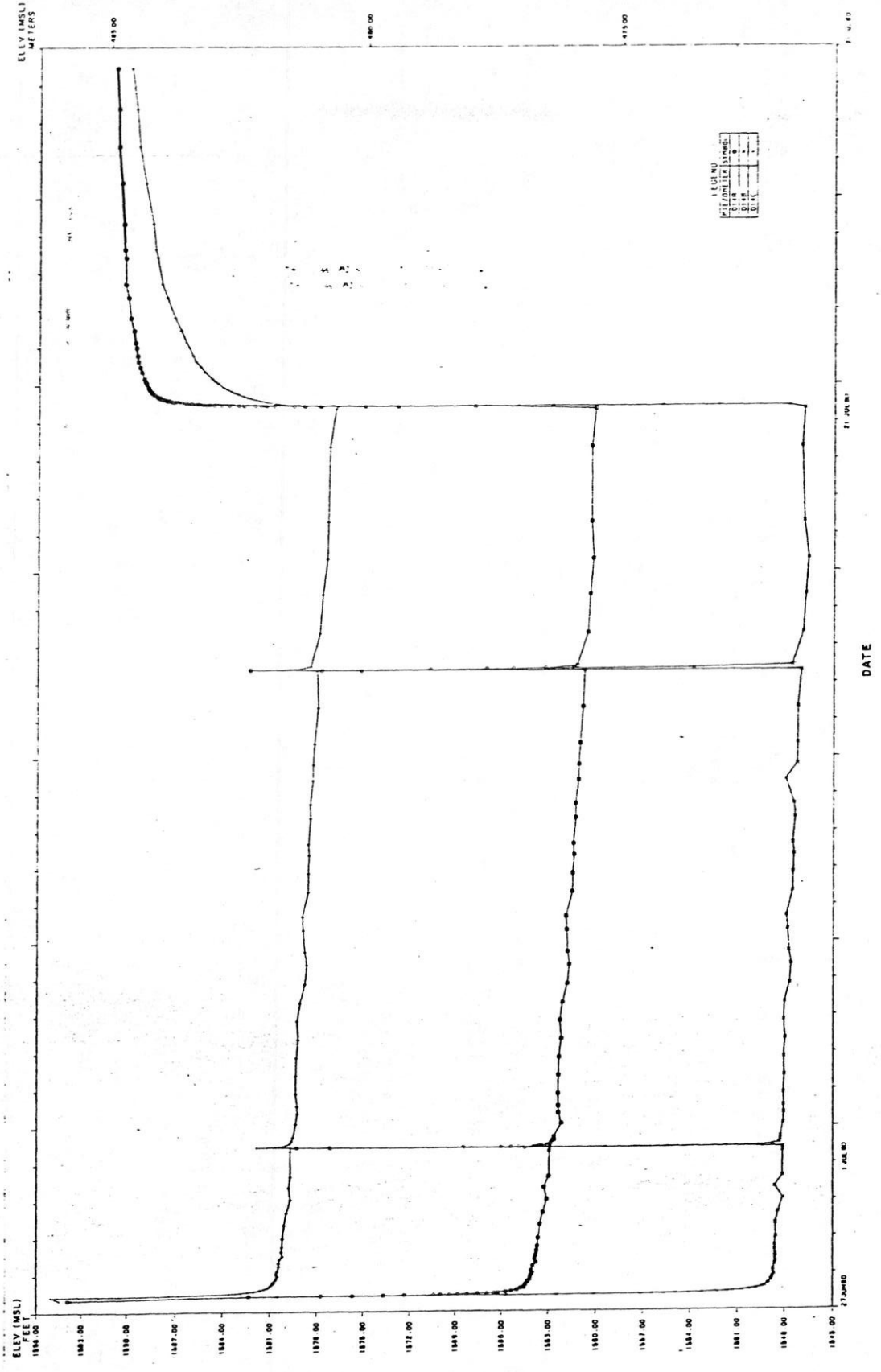

WATER LEVEL HISTORY PUMPING WELL TW-41

FIGURE 6.6

Scale AS SHOWN
Date 2-27-81
Job No. 786085

Golder Associates

Drawn CAB
Checked JFC
Reviewed GHC



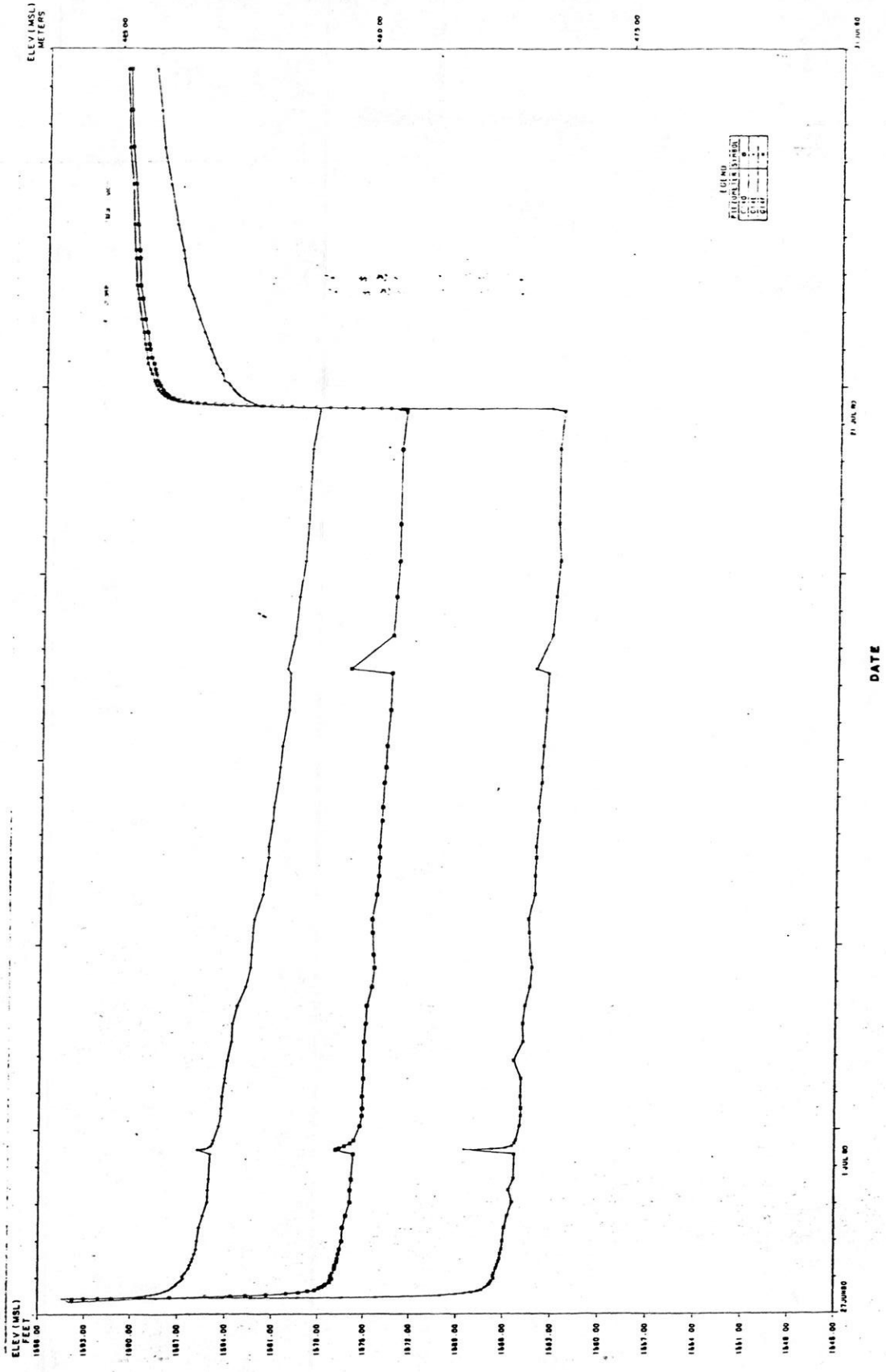

WATER LEVEL HISTORY; G41-G14A,B & C

FIGURE 6.7

Scale AS SHOWN
Date 2-27-81
Job No. 786085

Golder Associates

Drawn CAB
Checked JFC
Reviewed GHC




WATER LEVEL HISTORY; G41-G14D, E & F

FIGURE 6.8

Scale AS SHOWN
Date 2-27-81
Job No. 786085

Golder Associates

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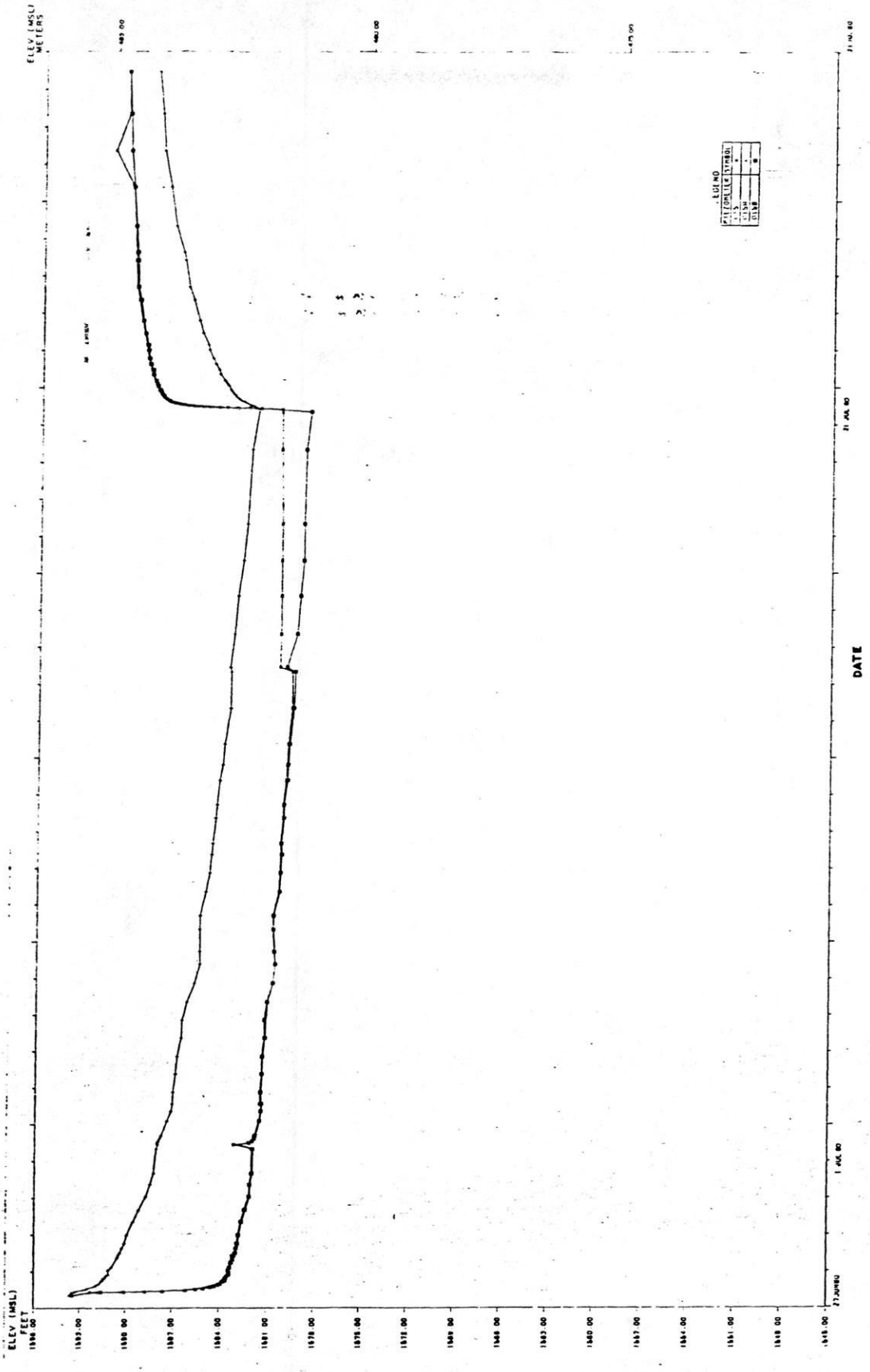


WATER LEVEL HISTORY; G41-G15, G15A, B

FIGURE 6.9

Scale AS SHOWN

Date 2-27-81

Job No. 786085

Golder Associates

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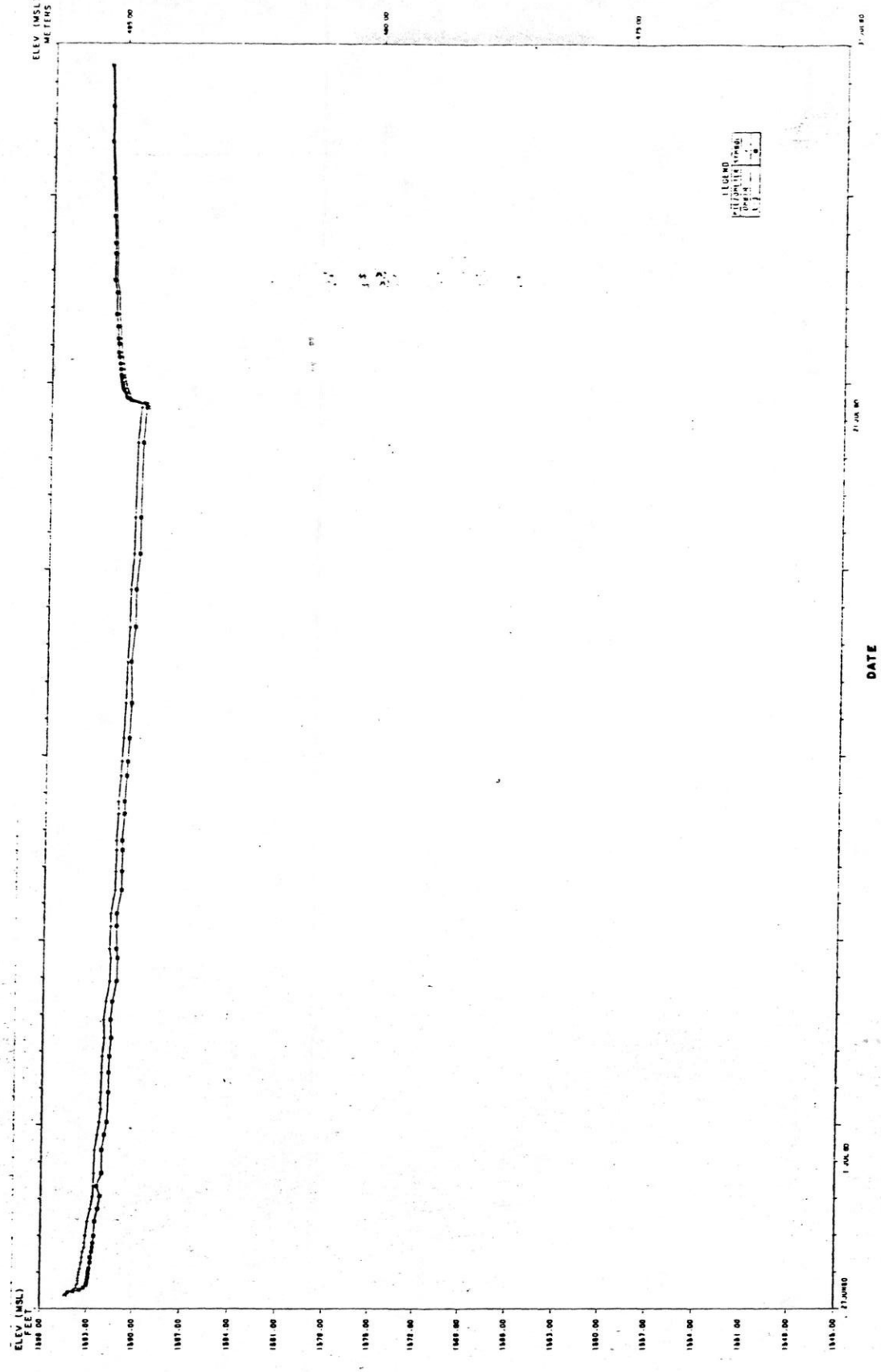
Reviewed GHC



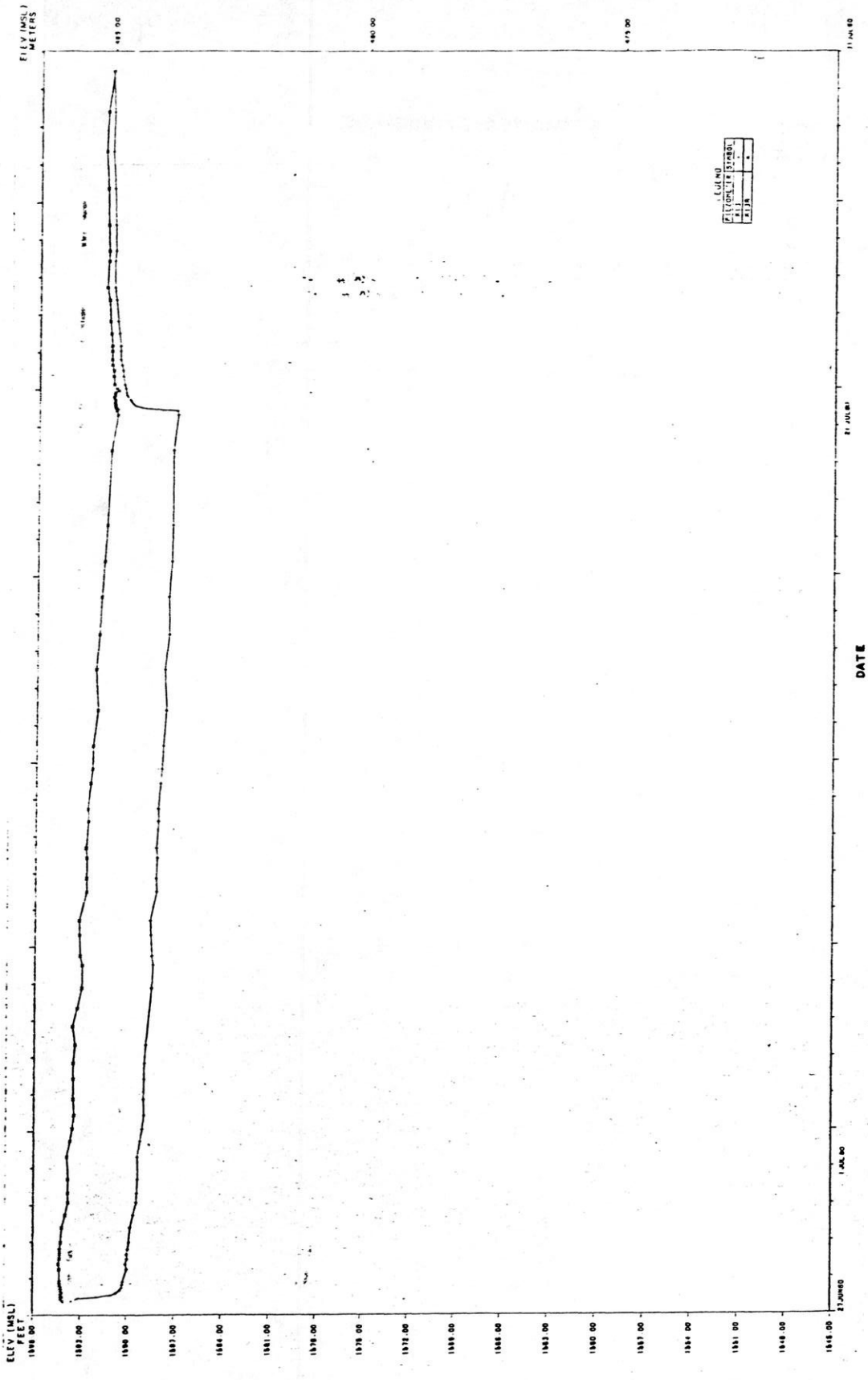

WATER LEVEL HISTORY; G41-E13 & DMB-IA

FIGURE 6.10

Scale AS SHOWN
Date 2-27-81
Job No. 786085

Golder Associates

Drawn CAB
Checked JFC
Reviewed GHC




WATER LEVEL HISTORY; G41-K13 & K13A

FIGURE 6.11

Scale AS SHOWN
Date 2-27-81
Job No. 786085

Golder Associates

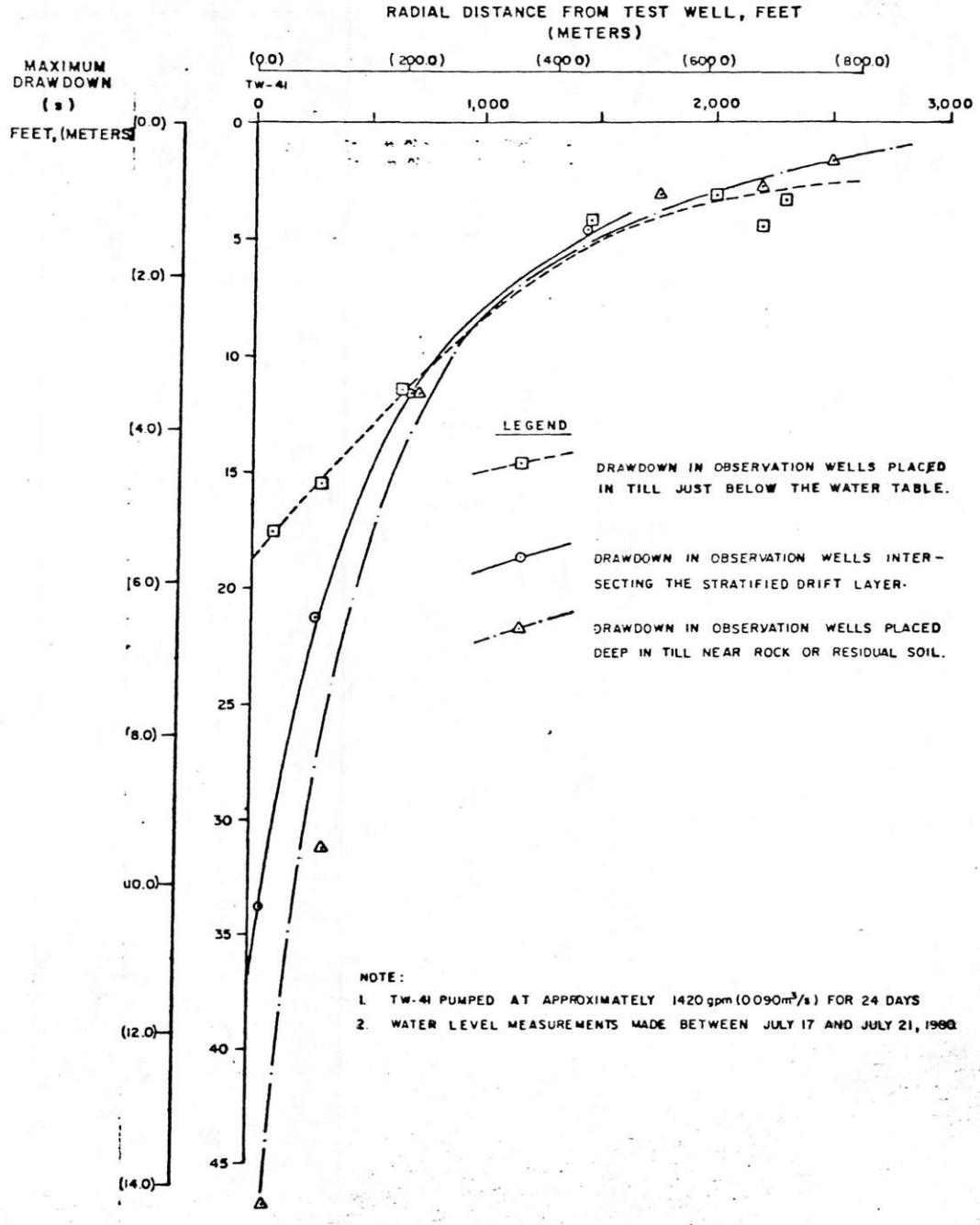
Drawn CAB
Checked JFC
Reviewed GHC

on the depth of that point below the top of the saturated zone. Near the top of the saturated zone the system behaves like a water table aquifer and draws down very slowly due to the large quantity of water which must be removed from this part of the system in order to physically desaturate the formation. Deeper in the system, however, the degree of confinement is considerably greater so that head changes are propogated laterally more quickly and further due to the limited impact of the water table on these strata. Thus, at any given plan location, drawdowns tend to be greater with increasing depth. This effect is more marked in systems where the horizontal hydraulic conductivity is very much higher than the vertical hydraulic conductivity, and is more marked close to the pumping well. This effect can be used to evaluate vertical hydraulic conductivity.

### 6.6 Drawdown Pattern

The drawdown pattern with depth has been evaluated for the end of the 24th day of pumping, and is presented in Figure 6.12. This data shows remarkable consistency and also indicates the phenomenon of differing drawdowns with depth close to the well. An approximate drawdown cone for the coarse grained stratified drift layer has been drawn on a plan of the project area; presented as Figure 6.13. This cone, produced after a relatively short pumping period, has reversed the groundwater gradient for a radius of at least 2000 feet (610 m) from the well. This causes groundwater to flow towards the well from an area which is comparable in size to much of the area of the proposed tailings disposal facility.

The approximate radius of influence for this pump test was about 4000 feet (1220 m). This can be seen on Figure 6.14, where water levels before the test started, at




DRAWDOWN WITH DEPTH vs. DISTANCE FROM TEST WELL

FIGURE 6.12

Scale AS SHOWN
Date 2-16-81
Job No. 786085

Golder Associates

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Checked JFC
Reviewed GHC

NOTE RADIAL DRAWDOWN PATTERNS IN FEET. DATA SHOWN ON FIGURE 6.12.

# ESTIMATED RADIAL DRAWDOWN PATTERN AT END OF PUMP TEST IN STRATIFIED DRIFT

FIGURE 6.13

Scale GRAPHIC
Date 2-17-81
Job No. 786085

Golder Associates

Drawn CAB
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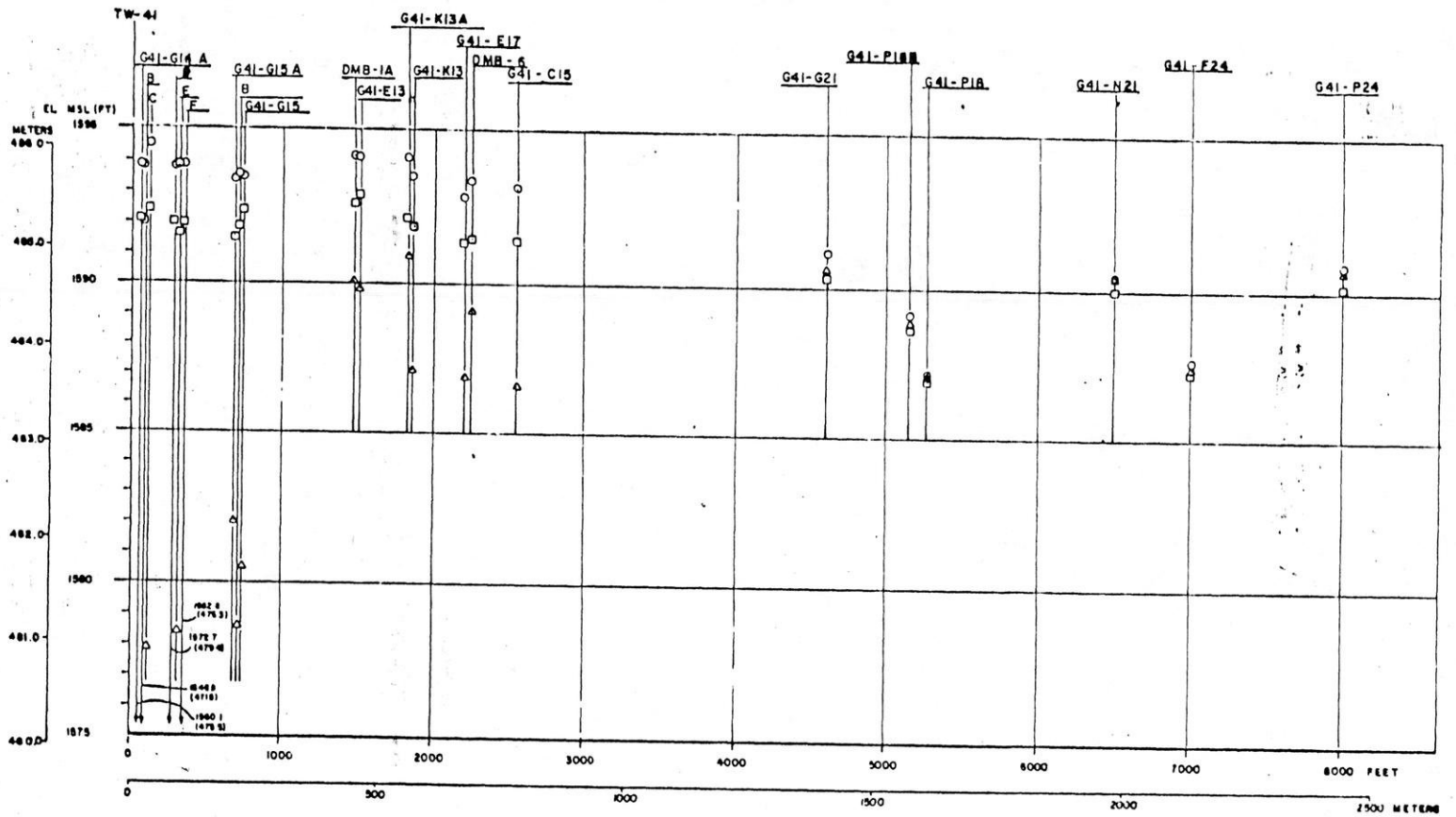
Reviewed GHC




NOTES

PUMPING STARTED : 6/27/80
STOPPED : 7/21/80
AVG. RATE = 1420 gpm (0.090 m³/s)

⊙ WATER ELEVATION NEAR START OF PUMPING ( 5/22/80 - 6/28/80)

△ WATER ELEVATION NEAR TIME OF MAXIMUM DRAWDOWN (7/17/80 - 7/21/80)

⊡ WATER ELEVATION ON SEPT. 10, 1980

LOWEST AND HIGHEST WATER LEVELS DURING PUMPING PERIOD

FIGURE 6.14

Scale AS SHOWN
Date 1-21-81
Job No 786086

Golder Associates

Drawn CAB
Checked JFC
Reviewed GHC

September, 1981

-51-

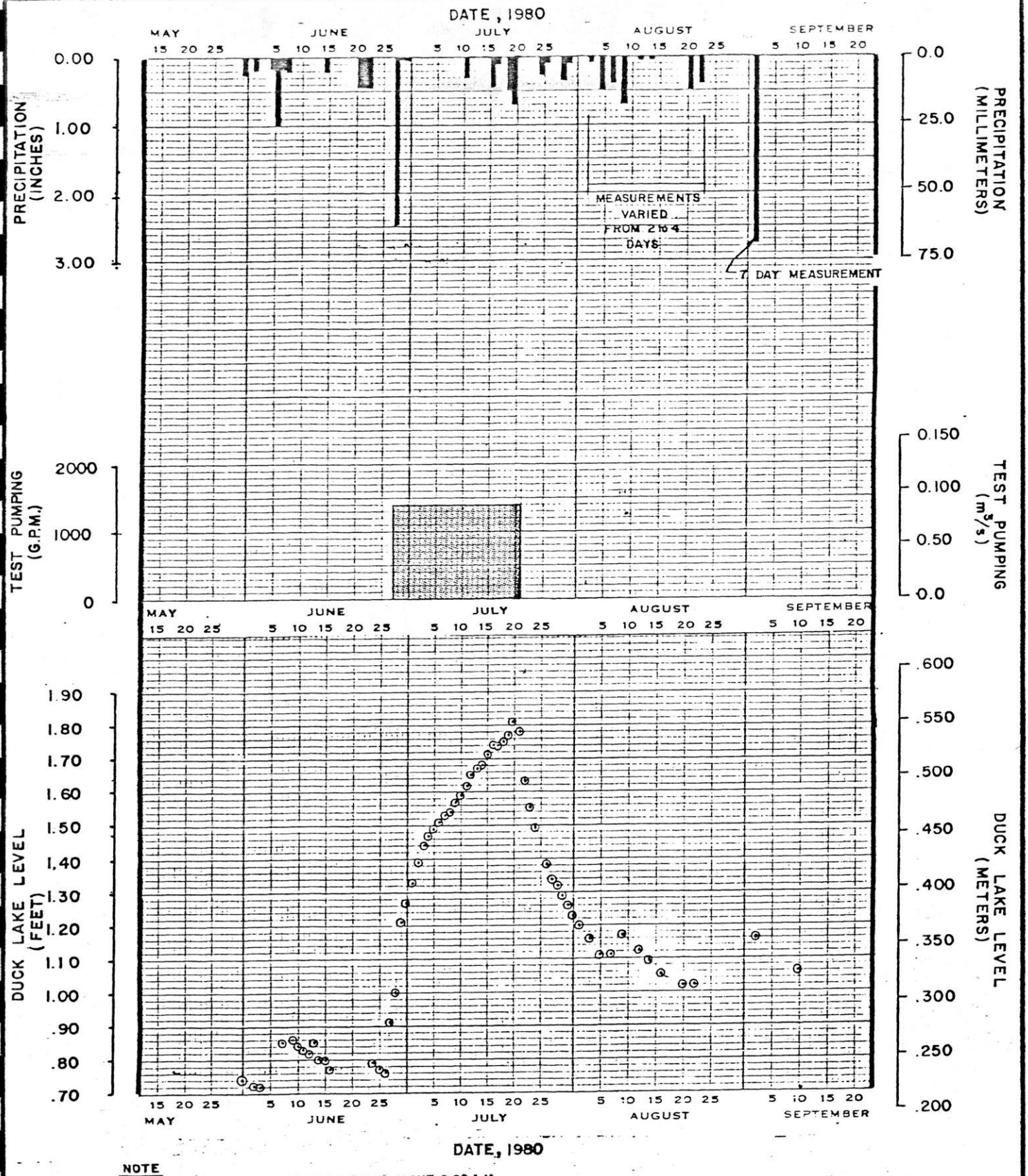
pump shut down, and at a period well into recovery were plotted to ascertain the radial distance affected by pumping.

As is also shown in Figure 6.14, very small changes which were observed at distances greater than 4000 feet (1220 m) seemed to be within the range of apparent normal water level deviations.

Figure 6.14 also indicates that wells significantly affected by the pump test did not fully recover during the 52 day recovery monitoring period. There was about a 1.5 ft. to 2.5 ft. (0.5 m to 0.8 m) difference after pumping. With a 4000 foot (1220 m) radius of influence, an assumed drainable porosity of 6%, and a 2.0 foot (0.6 m) average water level drop, the volume of water removed was calculated to be about 45 million gallons ($1.7 \times 10^5$ $m^3$). This is very close to the measured 49 million gallons ($1.9 \times 10^5$ $m^3$) removed.

## 6.7 Behavior of Duck Lake

The behavior of Duck Lake during the test was monitored about daily using a staff gage installed by Golder Associates. As shown in Figure 6.15, the water level rose in response to precipitation and in response to the considerable inflow from the pump test.




NOTE
CLIMATIC INSTRUMENTS READ DAILY ABOUT 8:00 A.M.

# DUCK LAKE RESPONSE TO PRECIPITATION AND PUMP TEST DISCHARGE

FIGURE 6.15

Scale AS SHOWN
Date 1-21-80
Job No. 786085

Golder Associates

Drawn CAB
Checked JFC
Approved GHC

# 7.0 PARAMETER ANALYSES

## 7.1 Data Reduction

Data from the pump test were input to a computer program developed by Golder Associates to reduce pump test data. The program, using the data directly from the field books, reduces the measurements to elevations, plots elevation against time, and prepares report printouts. The data and analysis plots for the main 13 wells analyzed are shown in Appendix B.

## 7.2 Water Level Changes

The plots of water levels versus time show large initial changes in almost all observation wells. Deep observation well water levels dropped rapidly for the first few days, but afterwards all water levels dropped at about the same rate.

During the periods of pump shutdown for oil changes on July 2 and July 14, large fluctuations in the nine observation wells south of the test well were observed. Small water level fluctuations can be seen in all the primary observation wells.

Recovery curves were generally similar to the drawdown curves. The observation wells placed at medium depths (generally in the coarse grained stratified drift) and the deep observation wells behaved almost identically and the recovery curves were almost inverses of the drawdown curves. The shallow observation wells, installed to just below the original groundwater level, indicated a distinctly different response during recovery as compared to the drawdown response. This reflects the different mechanism of desaturation and re-saturation.

Drawdown values were estimated from the last water level measurements before the beginning of the pumping test, at 10:05 AM on June 27, 1980. Long term plots of water levels in observation wells over a period of about 6 months (Figure 7.1) show little change in the water level unless directly impacted by the pump test. Therefore, for the period of the pump test, 24 days, the base line water level was considered constant for each observation well.

The recovery test was treated as a constant recharge superimposed on the discharge at the same location as the pump well. Water level changes were estimated as the difference between the measured water levels and projections of the drawdown curves from the pump test. This technique is considered valid for short periods after pumping ceases, and was therefore only used to evaluate the period between July 21, and July 31, 1980.

## 7.3 Parameters

Analyses were performed primarily to evaluate the parameters which describe the simplified system shown in Figure 7.2. These parameters are:

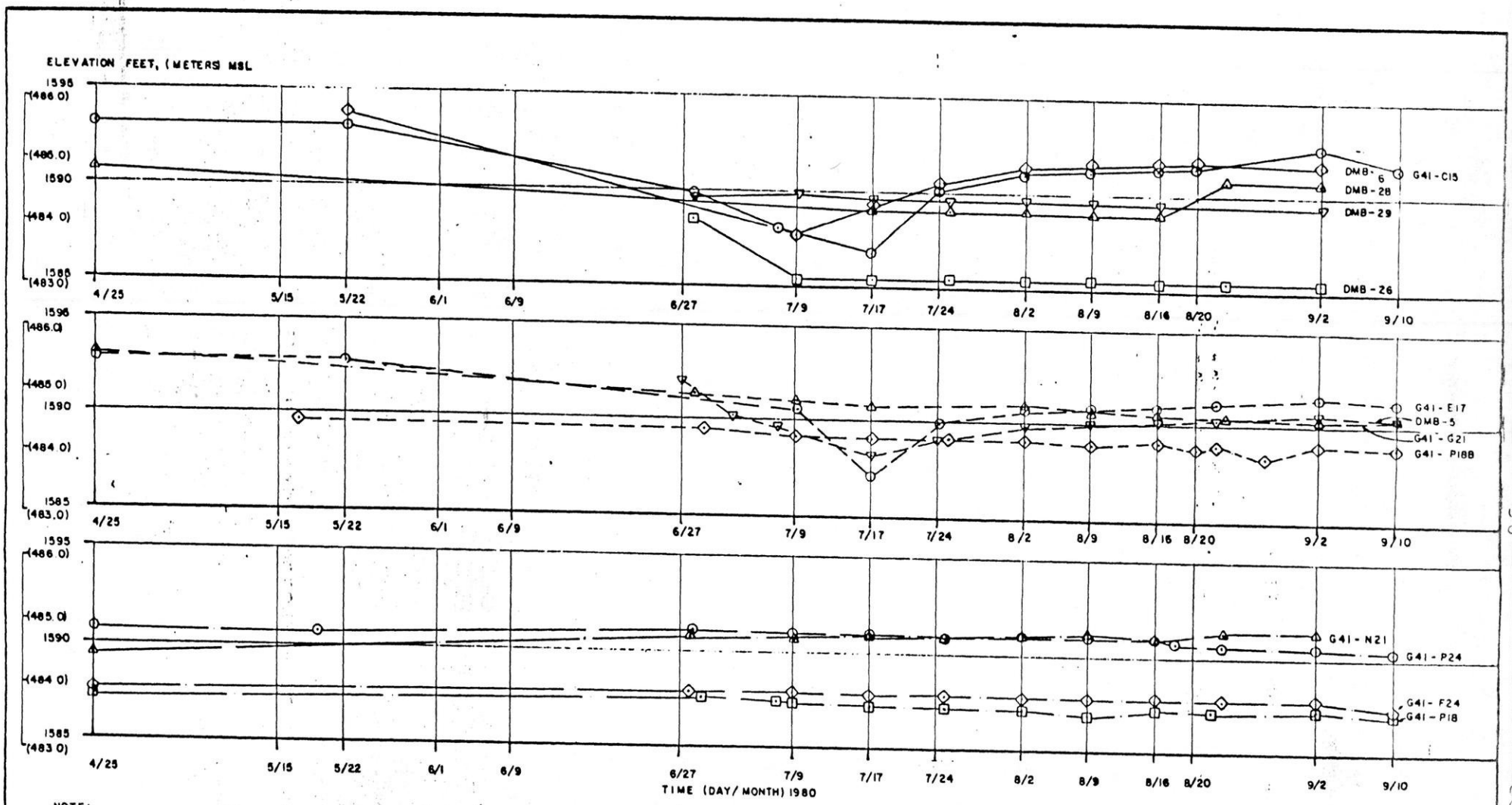
a) Horizontal hydraulic conductivity of the primary contributing layer

b) Vertical hydraulic conductivity of the confining layer

c) Specific storage of the primary contributing layer

d) Drainable porosity of the confining layer

Traditional analysis methods are generally set up to produce values for transmissivity and storage coefficient of a unit. The definitions of hydraulic conductivity, trans-




NOTE:

OBSERVATION WELLS MONITORED AND NOT HEAVILY AFFECTED BY THE PUMP TEST INCLUDE:

DMB - 28, 29: G41 - J17, P24, N21, P18B, P18

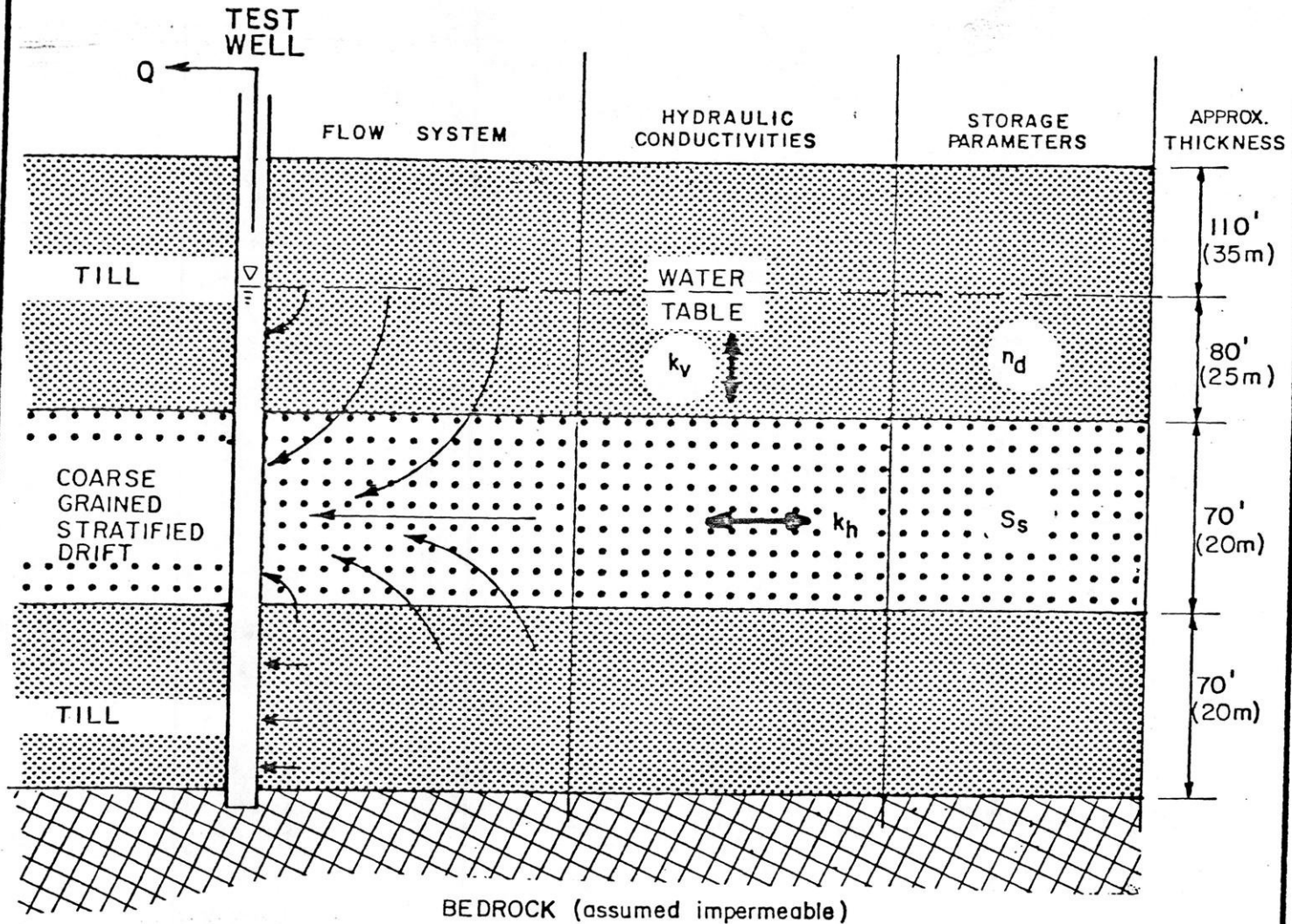
LONG TERM WATER LEVEL PLOTS FROM SELECTED OBSERVATION WELLS

FIGURE 7.1

Scale AS SHOWN
Date 1-21-81
Job No. 786085

Golder Associates

Drawn CAB
Checked VFC
Reviewed GHC




NOTES

Assumptions Made for Analysis:

1. Uniform Thickness Units of Infinite Extent.
2. Homogeneous, Laterally Isotropic Units.
3. Fully Penetrating Well.

LEGEND

(1) $k_h$ = horizontal hydraulic conductivity of primary contributing layer.

$k_v$ = vertical hydraulic conductivity of leaky layer.

$S_s$ = specific storage of primary contributing layer.

$n_d$ = drainable porosity (specific yield) of leaky layer.

CONCEPTUAL FLOW MODEL FOR PUMP TEST ANALYSIS

FIGURE 7.2

Scale NO SCALE
Date 2-16-81
Job No. 786085

Golder Associates

Drawn CAB
Checked GHC
Reviewed GHC

missivity, specific storage, storage coefficient, and drainable porosity are given below to classify the relationships between them.

- Hydraulic Conductivity (k)

  Hydraulic conductivity is a measure of the ease of movement of groundwater through aquifers and aquitards, and is defined as the rate of flow of water, through a unit cross-sectional area of the aquifer under a unit hydraulic gradient at the prevailing temperature of the water. It is the coefficient of proportionality defined in Darcy's Law, $v=ki$ where $v$ is the discharge velocity and $i$ is the hydraulic gradient. Hydraulic conductivity has the units length per unit time.

- Transmissivity (T)

  Transmissivity of an aquifer is a measure of the capacity of an aquifer to transmit water through its entire thickness and is equal to the hydraulic conductivity multiplied by the saturated thickness of the aquifer. Transmissivity is defined as the rate of flow of water through a vertical strip of the aquifer of unit width and extending the full saturated thickness under a unit hydraulic gradient at the prevailing temperature of the water. Transmissivity, has units length squared per unit time.

- Specific Storage ($S_s$)

  The specific storage is defined as the volume of water released from (taken up by) a unit volume of material, when the water head decreases (increases) by one unit. It has the units of inverse length.

o Storage Coefficient (S)

Storage coefficient of an aquifer is defined as the volume of water the aquifer releases from (takes into) storage per unit surface area of the aquifer per unit decline (rise) of head. The volume of water released from storage in the aquifer prism divided by the product of the prism's cross-sectional area and the change in head results in a dimensionless number which is the coefficient of storage. Storage coefficient is equal to the specific storage multiplied by the aquifer thickness in confined systems.

o Drainable Porosity ($n_d$)

Drainable porosity of a material is defined as the volume of water which will drain under gravity from an initially saturated unit volume of the material. It is also frequently called the specific yield ($S_y$). Drainable porosity approximately equals the storage coefficient of unconfined systems.

## 7.4 Method of Analysis

The drawdown and recovery tests were analyzed by four different methods, each discussed below. Detailed discussion of the analysis methods, equations, and development can be found in References 4 and 5 cited at the end of this report.

The data indicated the system responded as a semi-unconfined aquifer bounded by aquitards (lower permeability layers but not impervious layers). Therefore, leaky aquifer theory analysis was applied. Unconfined analysis was also performed for steady state conditions to confirm that the system acts as a leaky aquifer. In general, all of the analysis techniques make the following assumptions:

a) The aquifer has an infinite areal extent.

b) The aquifer is homogeneous, isotropic, and of uniform thickness over the area influenced by the pumping test.

c) The aquifer is pumped at a constant discharge rate.

d) The pumped well penetrates the entire aquifer and thus receives water from the entire thickness of the aquifer by horizontal flow.

The pumping test performed at Site 41 satisfies all of the above assumptions reasonably well. Assumption b), uniform thickness, heavily influenced selection of pairs of wells for the well-to-well steady state analyses and will be discussed in more detail.

Boundary effects do not appear to influence the test results. Swamp Creek and Hemlock Creek are groundwater discharge streams, but they did not influence the test because of their relatively large distance from the pumped well.

### 7.4.1 Boulton Method

The Boulton method of analysis involves fitting the observed response in piezometers to the standard type curves for a leaky, delayed yield system. Such a system behaves initially as a leaky unconfined aquifer, but as time progresses, the primary source of water becomes desaturation of the medium. In addition to the general assumptions, the Boulton Method also assumes:

a) The aquifer is unconfined but showing delayed yield phenomena or the aquifer is semi-unconfined.

b) The flow to the well is an unsteady state.

c) The diameter of the well is small, i.e., the storage in the well can be neglected.

Such an analysis closely conforms to this pump test, and allows evaluation of:

a) Horizontal hydraulic conductivity of the primary contributing layer,

b) Specific storage of the primary contributing layer (from the early test behavior),

c) Vertical hydraulic conductivity of the confining layer,

d) Drainable porosity of the confining layer.

As can be seen in Figure 7.2, these are all of the parameters of interest. Further, they are all of the physical hydrologic parameters of significance to mass transport in the saturated zone. The other important parameters relate to chemistry, dispersion, and attenuation, and unsaturated zone parameters. For this reason, the Boulton method is the primary analytical tool used for this study.

### 7.4.2 Hantush Method I

The Hantush method I is the first of three methods proposed by Hantush for analyzing pump well data. This method has the following additional assumptions.

a) The aquifer is semi-confined.

b) The flow to the well is an unsteady state, i.e. the drawdown differences with time are not negligible nor is the hydraulic gradient constant with time.

c) The water removed from storage is discharged instantaneously with decline of head.

d) The well diameter is very small, so that the storage in the well can be neglected.

e) Steady state drawdowns should be approximately known.

All of these assumptions were met in this pump test, except possibly item e. Since this technique can not consider delayed yield, this portion of the data was ignored. Therefore, estimated maximum drawdown (steady state) without delayed yield was used in the analysis. Checks with these estimated maximum drawdowns indicated accuracy within $\pm$ 0.1 feet. These maximum drawdowns were also used in the next two analysis methods.

Hantush method I uses a linear-logrithmetic plot of drawdown vs. time. The straight line portion of this plot represents the region where the well function variat (u) is less than 0.01. The slope of the straight line portion of the curve and an estimated inflection point are used to evaluate the aquifer response and to calculate T and S.

### 7.4.3 Ernst's Modification of the Thiem Method

Ernst's modification to the Thiem method has the following additional assumptions:

a) The aquifer is semi-confined.

b) The flow to the well is steady state.

c) The contribution to total flow due to leakage can be estimated.

The well discharge, Q, is assumed to be composed of a quantity of water withdrawn from the tested aquifer and a quantity of phreatic water delivered by the semi-pervious layer. Application of the Thiem formula is appropriate if

the well discharge is corrected by subtracting from the total discharge the amount of phreatic water delivered by the semi-pervious layer.

The amount of phreatic water was estimated by assuming a storage coefficient and the average drop in the phreatic surface at the end of pumping. This phreatic water (Q') is subtracted from the total discharge (Q) and then T is calculated from:

$$T = \frac{(Q-Q')\ \ln(r_2/r_1)}{2\pi\ (s_1-s_2)}$$

where

T = transmissivity

Q = flow from well

Q' = estimated flow from storage

r = radius from well

s = drawdown

Observation well to observation well data is necessary for application of this method. In addition, estimated maximum drawdowns, neglecting drainage effects, and storage coefficients from the previous two analysis methods were used in this analysis. Since the average drawdown at the end of the test was used to evaluate Q, only wells exhibiting approximately equal drawdown rates (as estimated from the slope of the time-drawdown curves) were analysed together. Finally, only wells within the same vertical section from the G14 and G15 series wells were used.

### 7.4.4 Thiem - Dupuit Method

The Thiem-Dupuit method has the following additional assumptions:

a) The velocity of flow is proportional to the tangent of the hydraulic gradient instead of the sine as is actually the case.

b) The flow is horizontal and uniform everywhere in a vertical section through the axis of the well.

c) The aquifer is unconfined.

d) The flow to the well is in steady state.

This equation fails to give an accurate description of the drawdown curve near the well, where the strong curvature of the water table contradicts the Dupuit assumptions. The influence of the seepage zone above the water level in the well, the influence of the groundwater movement in the capillary zone, and the influence of the vertical velocity components which reach their maximum in the vicinity of the well, have been ignored.

This method is a well-to-well steady state analysis technique. Estimated maximum drawdowns were used, neglecting drainage effects. Only wells at the same relative depth from the G14 and G15 series were analysed together. For selected wells the transmissivity was calculated from:

$$T = \frac{Q \ln(r_2/r_1)}{2\pi(s'_1 - s'_2)}$$

where

$s' = s - s^2/2m$

m = aquifer thickness and all other terms are as previously described

## 7.5 Results

### 7.5.1 Boulton Analysis

The results of the Boulton analyses are presented in Table 7.1. Only those piezometers located in or below the main contributing layer have been included, as the analysis is not valid for piezometers in the leaky layer. As is clear from the table, the parameters obtained are remarkably consistent, and geometric mean values are as follows:

Transmissivity = 0.030 ft.$^2$/sec. (0.0028 m$^2$/s)
Early Storage Coefficient = $3.2 \times 10^{-4}$
Late Storage Coefficient = 0.054
Vertical Hydraulic Conductivity of leaky layer = $3.1 \times 10^{-6}$ ft./sec. ($9.4 \times 10^{-7}$ m/s)

These values may be translated into the fundamental parameters using the definition and the geometry shown in Figure 7.2, to produce the results shown in Table 7.2. These values are the best estimates available from this test. In order to understand the precision of these values, a statistical range of 2 standard deviations each way from the mean has also been presented. With 95% confidence, the range between highest and lowest values, when expressed as a multiple, is as follows:

$k_h$ = 3.0
$k_v$ = 12.0
$S_s$ = 7.6
$n_d$ = 9.4

These values are generally considered acceptable for multiple piezometer analyses and in the case of the horizontal hydraulic conductivity, excellent. They give a high degree of confidence that the analytical method used is appropriate.

TABLE 7.1
SUMMARY OF RESULTS OF BOULTON ANALYSIS

| Obs. Well No. | Test | Relative Depth | Transmissivity, T $ft.^2/sec.$ | Early Storage Coef. $S_e$ $(X10^{-4})$ | Late Storage Coef. $S_1$ | Leaky Layer Vert. Hyd. Cond. | |
|---|---|---|---|---|---|---|---|
| | | | | | | ft./sec. $(X10^{-6})$ | m/s $(X10^{-6})$ |
| G41-G14A | Drawdown | M | 0.050 | 5.8 | 0.10 | 4.0 | 1.2 |
| G41-G14B | Drawdown | D | 0.025 | 5.8 | 0.58 | 3.6 | 1.1 |
| G41-G14C | Drawdown | S | — | -- | -- | -- | -- |
| G41-G14D | Drawdown | M | 0.023 | 17.0 | 0.51 | 6.9 | 2.1 |
| G41-G14E | Drawdown | S | — | — | -- | -- | -- |
| G41-G14F | Drawdown | D | 0.026 | 2.0 | 0.09 | 1.1 | 0.55 |
| G41-G15A | Drawdown | S | — | — | -- | -- | -- |
| G41-G15B | Drawdown | M | 0.028 | 2.8 | 0.07 | 3.0 | 0.92 |
| G41-G15 | Drawdown | D | 0.038 | 3.5 | 0.05 | 2.1 | 0.88 |
| G41-E13 | Drawdown | D | 0.074 | 0.57 | 0.05 | 6.3 | 1.9 |
| DMB1A | Drawdown | S | — | — | -- | -- | -- |
| G41-K13 | Drawdown | D | 0.033 | 1.8 | 0.04 | 1.9 | 0.58 |
| G41-K13A | Drawdown | S | — | — | -- | -- | -- |
| G41-G14A | Recovery | M | 0.059 | 4.9 | 0.06 | | |
| G41-G14B | Recovery | D | 0.014 | 25.0 | 1.31 | | |
| G41-G14C | Recovery | S | — | -- | — | | |
| G41-G14D | Recovery | M | 0.018 | 21.0 | 0.27 | | |
| G41-G14E | Recovery | S | — | -- | -- | | |
| G41-G14F | Recovery | D | 0.022 | 2.6 | 0.09 | | |
| G41-G15A | Recovery | S | — | -- | -- | | |
| G41-G15B | Recovery | M | 0.030 | 3.4 | 0.05 | | |
| G41-G15 | Recovery | D | 0.026 | 5.3 | 0.10 | | |
| G41-E13 | Recovery | D | 0.14 | 7.7 | 0.02 | | |
| DMB1A | Recovery | S | — | -- | — | | |
| G41-K13 | Recovery | D | 0.066 | 2.5 | 0.02 | | |
| G41-K13A | Recovery | S | -- | -- | — | | |

NOTES:
S = Shallow in Till
M = Main Stratified Drift Layer
D = Deep in Till
— = Analysis not valid for this well

TABLE 7.2
CONCLUSIONS FROM BOULTON ANALYSIS

A. ENGLISH UNITS

| Parameter(1) | Units | Geometric Mean (2) | Range (95% Confidence) | Comments |
|---|---|---|---|---|
| $k_h$ | ft./sec. | $4.3 \times 10^{-4}$ | $2.5 \times 10^{-4}$ to $7.6 \times 10^{-4}$ | Ignores G41-E13 |
| $k_v$ | ft./sec. | $3.1 \times 10^{-6}$ | $0.9 \times 10^{-6}$ to $9.9 \times 10^{-6}$ | Drawdown only |
| $S_s$ | $ft.^{-1}$ | $4.6 \times 10^{-6}$ | $1.7 \times 10^{-6}$ to $12.8 \times 10^{-6}$ | Drawdown without G41-E13 and G14D |
| $n_d$ | % | 5.4 | 1.8 to 16.7 | Ignores values greater than 20% |

B. SYSTEM INTERNATIONAL UNITS

| Parameter (1) | Units | Geometric Mean (2) | Range (95% Confidence) | Comments |
|---|---|---|---|---|
| $k_h$ | m/s | $1.3 \times 10^{-4}$ | $0.8 \times 10^{-4}$ to $2.3 \times 10^{-4}$ | Ignores G41-E13 |
| $k_v$ | m/s | $9.4 \times 10^{-7}$ | $2.7 \times 10^{-7}$ to $30.2 \times 10^{-7}$ | Drawdown only |
| $S_s$ | $m^{-1}$ | $1.5 \times 10^{-5}$ | $0.6 \times 10^{-5}$ to $4.2 \times 10^{-5}$ | Drawdown without G41-E13 and G14D |
| $n_d$ | % | 5.4 | 1.8 to 16.7 | Ignores values greater than 20% |

NOTES:

(1) $k_h$ = horizontal hydraulic conductivity of primary contributing layer
$k_v$ = vertical hydraulic conductivity of leaky layer
$S_s$ = specific storage of primary contributing layer
$n_d$ = drainable porosity (specific yield) of leaky layer

(2) Geometric mean used because all values must be greater than zero and the spread is relatively large.

### 7.5.2 Other Analyses

The results of the other analyses are presented in Tables 7.3 through 7.5, and are summarized in Table 7.6.

Based on the summary in Table 7.6, it would appear that only the mean of the Dupuit result falls outside the expected range. However, because of the high variability of the Dupuit result, the difference between it and Boulton is not statistically significant.

It would appear, therefore, that the secondary methods of analysis, each of which is less appropriate than Boulton, produce results which support the Boulton analysis.

## 7.6 Meteorological Effects

Data from the pump test was reviewed with respect to various meteorologic effects. Throughout the well drilling and pump testing period, meteorological data (precipitation, barometric pressure, temperature) was obtained on about a daily basis. Visual comparison of periods with intense rainfall and/or barometric fluctuations do not indicate appreciable water level change in any of the observation wells. Temperature effects could not be seen, as was expected. Plots of precipitation, barometric pressure, and temperature obtained during this period are shown on Figure 6.5 and the data are presented in Appendix B.

TABLE 7.3
SUMMARY OF RESULTS FOR HANTUSH (I) ANALYSIS

| Obs. Well No. | Test | Relative Depth | Transmissivity, T ft.$^2$/sec. | Early Storage Coef. $S_e$ ($\times 10^{-4}$) |
|---|---|---|---|---|
| G41-G14A | Drawdown | M | 0.059 | 4.6 |
| G41-G14B | Drawdown | D | 0.024 | 5.7 |
| G41-G14C | Drawdown | S | -- | -- |
| G41-G14D | Drawdown | M | 0.020 | 18.0 |
| G41-G14E | Drawdown | S | -- | -- |
| G41-G14F | Drawdown | D | 0.018 | 28.0 |
| G41-G15A | Drawdown | S | -- | -- |
| G41-G15B | Drawdown | M | 0.029 | 2.9 |
| G41-G15 | Drawdown | D | 0.055 | 3.3 |
| G41-E13 | Drawdown | D | 0.14 | 7.7 |
| DMB1A | Drawdown | S | -- | -- |
| G41-K13 | Drawdown | D | 0.077 | 2.5 |
| G41-K13A | Drawdown | S | -- | -- |
| G41-G14A | Recovery | M | 0.057 | 7.8 |
| G41-G14B | Recovery | D | 0.014 | 27.0 |
| G41-G14C | Recovery | S | -- | -- |
| G41-G14D | Recovery | M | 0.019 | 21.0 |
| G41-G14E | Recovery | S | -- | -- |
| G41-G14F | Recovery | D | 0.022 | 2.8 |
| G41-G15A | Recovery | S | -- | -- |
| G41-G15B | Recovery | M | 0.023 | 3.2 |
| G41-G15 | Recovery | D | 0.031 | 5.7 |
| G41-E13 | Recovery | D | 0.25 | 9.1 |
| DMB1A | Recovery | S | -- | -- |
| G41-K13 | Recovery | D | 0.07 | 2.5 |
| G41-K13A | Recovery | S | -- | -- |

NOTES:
S = Shallow in Till
M = Main Stratified Drift Layer
D = Deep in Till
-- = Analysis not valid for this well

TABLE 7.4
SUMMARY OF RESULTS FOR ERNST'S MODIFICATION TO THIEM ANALYSIS

| Obs. Well No. | Test | Relative Depth | Transmissivity, T ft.$^2$/sec. |
|---|---|---|---|
| G41-G14A & G41-G14D | Drawdown | M | 0.068 |
| G41-G14D & G41-G15B | Drawdown | M | 0.058 |
| G41-G14A & G41-G15B | Drawdown | M | 0.064 |
| G41-G14B & G41-G14F | Drawdown | D | 0.041 |
| G41-G14E & G41-G15A | Drawdown | S | -- |
| G41-G14B & G41-E13 | Recovery | D | 0.034 |
| G41-G14A & G41-G14D | Recovery | M | 0.060 |
| G41-G14D & G41-G15B | Recovery | M | 0.074 |
| G41-G14A & G41-G15B | Recovery | M | 0.065 |
| G41-G14B & G41-G15 | Recovery | D | 0.031 |
| G41-G14B & G41-G14F | Recovery | D | 0.044 |
| G41-G14F & G41-G15 | Recovery | D | 0.020 |

NOTES:
S = Shallow in Till
M = Main Stratified Drift Layer
D = Deep in Till
-- = Analysis not valid for this well
An average "leakage" flow of 100 gpm (0.0063 $m^3$/sec) was used in these analyses.

TABLE 7.5
SUMMARY OF RESULTS FOR THIEM - DUPUIT ANALYSIS

| Obs. Well No. | Test | Relative Depth | Transmissivity, T ft.$^2$/sec. |
|---|---|---|---|
| G41-G14F & G41-G15 | Drawdown | D | 0.031 |
| G41-G14D & G41-G15B | Drawdown | M | 0.079 |
| G41-G14C & G41-G14E | Drawdown | S | -- |
| G41-G14A & G41-G14D | Drawdown | M | 0.11 |
| G41-G14E & G41-G15A | Drawdown | S | -- |
| G41-G14C & G41-G15A | Drawdown | S | -- |
| G41-G14A & G41-G15 | Drawdown | M & D | 0.098 |
| G41-G14F & G41-G15 | Recovery | D | 0.029 |
| G41-G14D & G41-G15B | Recovery | M | 0.098 |
| G41-G14A & G41-G14D | Recovery | M | 0.095 |
| G41-G14A & G41-G15 | Recovery | M & D | 0.088 |

NOTES:
S = Shallow in Till
M = Main Stratified Drift Layer
D = Deep in Till
-- = Analysis not valid for this well
An aquifer thickness of 70 ft. (21 m) was used in these analyses.

TABLE 7.6
SUMMARY OF ANALYTICAL RESULTS

A. ENGLISH UNITS

| Parameter | Units | Analysis Method | | | | | |
|---|---|---|---|---|---|---|---|
| | | Boulton | | | Hantush | Ernst | Dupuit |
| | | Low | Mean | High | Mean | Mean | Mean |
| $k_h$ | ft./sec. | $2.5 \times 10^{-4}$ | $4.3 \times 10^{-4}$ | $7.6 \times 10^{-4}$ | $5.6 \times 10^{-4}$ | $6.8 \times 10^{-4}$ | $10.1 \times 10^{-4}$ |
| $k_v$ | ft./sec. | $0.9 \times 10^{-6}$ | $3.1 \times 10^{-6}$ | $9.9 \times 10^{-6}$ | --- | -- | |
| $S_s$ | $ft.^{-1}$ | $1.7 \times 10^{-6}$ | $4.6 \times 10^{-6}$ | $12.8 \times 10^{-6}$ | $7.3 \times 10^{-6}$ | -- | -- |
| $n_d$ | % | 1.8 | 5.4 | 16.7 | ---- | -- | |

B. SYSTEM INTERNATIONAL UNITS

| Parameter | Units | Analysis Method | | | | | |
|---|---|---|---|---|---|---|---|
| | | Boulton | | | Hantush | Ernst | Dupuit |
| | | Low | Mean | High | Mean | Mean | Mean |
| $k_h$ | m/s | $0.76 \times 10^{-4}$ | $1.3 \times 10^{-4}$ | $2.3 \times 10^{-4}$ | $1.7 \times 10^{-4}$ | $2.1 \times 10^{-4}$ | $3.1 \times 10^{-4}$ |
| $k_v$ | m/s | $0.27 \times 10^{-6}$ | $0.94 \times 10^{-6}$ | $3.0 \times 10^{-6}$ | -- | -- | -- |
| $S_s$ | $m^{-1}$ | $0.56 \times 10^{-5}$ | $1.5 \times 10^{-5}$ | $4.2 \times 10^{-5}$ | $2.4 \times 10^{-5}$ | -- | -- |
| $n_d$ | % | 1.8 | 5.4 | 16.7 | -- | -- | -- |

# 8.0 CONCLUSIONS

## 8.1 Model

A conceptual model of the hydrologic system around the pump test well is shown on Figure 7.2. Water flowed horizontally to the well through a reasonably uniform 70 ft. (21 m) thick layer of coarse grained stratified drift. This layer behaved as a semi-unconfined aquifer with pronounced leakage and delayed yield effects.

Leakage to the coarse grained stratified drift layer came from above and below. The leakage from below was primarily a pressure release. This lower till layer was behaving as a confined aquifer, with it's behavior controlled by the highly dominant overlying stratified drift. Because leakage was primarily due to pressure release, the head in this layer, corrected for depth and head loss, was the same as that in the coarse grained stratified drift. The pump test did not produce desaturation of the lower layer. Therefore, hydraulic conductivity and storage coefficient for this lower layer could not be directly measured from the test. However, the flow contribution per foot of thickness for the upper and lower till layers was essentially equal during the flow velocity test (Figure 5.3). Therefore, it is reasonable to use the same hydraulic characteristics for these two layers.

The upper till layer overlying the stratified drift behaved in an unconfined manner. The response of the observation wells in this layer generally indicated vertical drainage to the coarse grained stratified drift. The measured pressure release was less pronounced in these observation wells, as discussed in Section 6.6, and the main mechanism for water level change was drainage of the pore spaces.

## 8.2 Analogue Results

One objective of the test was to evaluate the degree of influence a pumped well could have on the potentiometric levels. The results of this evaluation are shown on Figure 6.13, and when combined with Figure 3.7, the potentiometric map shown in Figure 8.1 was derived. This diagram dramatically shows the area which this one well can control, even when being pumped at about half its potential maximum rate.

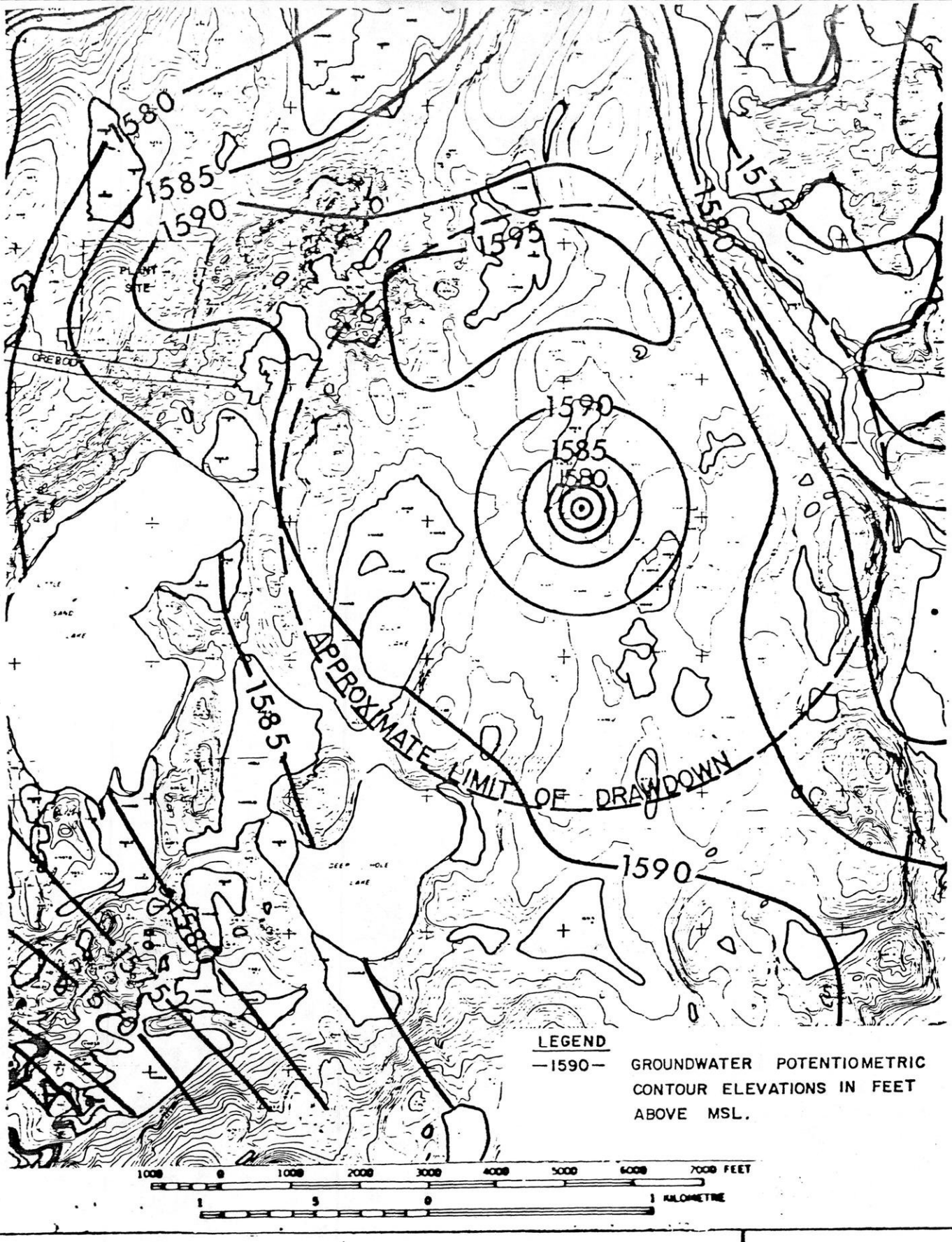
## 8.3 Parameters

The behavioral parameters for the groundwater system at Crandon are given on Figure 8.2, together with the hydrogeologic model of the conditions beneath Site 41. A British and metric unit version of the figure have been presented separately to minimize confusion.

The figure shows data from the pump test unshaded, and estimated parameters shaded. The bases for these estimates are as follows:

- Vertical Hydraulic Conductivity of the Coarse Grained Stratified Drift--This material is water deposited and stratified. It is common in groundwater hydrology to estimate the difference between vertical and horizontal hydraulic conductivity by an order of magnitude; the vertical hydraulic conductivity being the lower. Therefore, the vertical hydraulic conductivity of this layer is estimated at one tenth that of the measured horizontal hydraulic conductivity.

- Horizontal Hydraulic Conductivity of the Upper Till--The till soils are not water deposited in a layered manner. Therefore, the ratio of horizontal to vertical hydraulic conductivity for this soil will certainly not be as great as for the stratified drift. For this analysis a ratio of 3 is believed reasonable to account for some minor layering.




EFFECT OF PUMP TEST ON POTENTIOMETRIC MAP | FIGURE 8.1

Scale GRAPHIC
Date 2 - 17 - 81
Job No. 786085

**Golder Associates**

Drawn S K B
Checked JFC
Reviewed GHC

## A. ENGLISH UNITS

| GEOLOGY | THICKNESS (ft.) | PARAMETERS | | | |
|---|---|---|---|---|---|
| | | $k_h$ (ft./sec.) | $k_v$ (ft./sec.) | $S_s$ ($ft.^{-1}$) | $n_d$ (%) |
| TILL ▽ | 110 | ABOVE NATURAL GROUNDWATER LEVEL | | | |
| TILL | 80 | $9.3 \times 10^{-6}$ | $3.1 \times 10^{-6}$ | $4.6 \times 10^{-6}$ | 5.4 |
| COARSE GRAINED STRATIFIED DRIFT | 70 | $4.3 \times 10^{-4}$ | $4.3 \times 10^{-5}$ | $4.6 \times 10^{-6}$ | 7.0 |
| TILL | 70 | $9.3 \times 10^{-6}$ | $3.1 \times 10^{-6}$ | $4.6 \times 10^{-6}$ | 5.4 |
| BEDROCK | | FUNCTIONALLY IMPERMEABLE | | | |

## B. SYSTEM INTERNATIONAL

| GEOLOGY | THICKNESS (m) | PARAMETERS | | | |
|---|---|---|---|---|---|
| | | $k_h$ (m/s) | $k_v$ (m/s) | $S_s$ ($m^{-1}$) | $n_d$ (%) |
| TILL ▽ | 35 | ABOVE NATURAL GROUNDWATER LEVEL | | | |
| TILL | 25 | $2.8 \times 10^{-6}$ | $9.4 \times 10^{-7}$ | $1.5 \times 10^{-5}$ | 5.4 |
| COARSE GRAINED STRATIFIED DRIFT | 20 | $1.3 \times 10^{-4}$ | $1.3 \times 10^{-5}$ | $1.5 \times 10^{-5}$ | 7.0 |
| TILL | 20 | $2.8 \times 10^{-6}$ | $9.4 \times 10^{-7}$ | $1.5 \times 10^{-5}$ | 5.4 |
| BEDROCK | | FUNCTIONALLY IMPERMEABLE | | | |

LEGEND:

(1) $k_h$ = horizontal hydraulic conductivity
$k_v$ = vertical hydraulic conductivity
$S_s$ = specific storage
$n_d$ = drainable porosity (specific yield)

(2) Unshaded Values: Results obtained directly from pump test
Shaded Values: Inferred or estimated from the pump test results

BEHAVIORAL PARAMETERS AND HYDROGEOLOGIC MODEL

FIGURE 8.2

Scale NO SCALE
Date 2-17-81
Job No. 786085

Golder Associates

Drawn S.K.B.
Checked GHC
Reviewed GHC

- Lower Till Layer--The pump test did not directly evaluate the hydraulic parameters of the lower till layer (discussed in Section 8.1 of this report). Because the flow velocity test did show essentially equal horizontal hydraulic conductivities for the upper and lower till layers, the same values for all hydraulic parameters are used for these two layers.

- Specific Storage--The specific storage of all units was assumed to be the same, as it is largely a function of material and loading history, which are similar.

- Porosity, Drift--The coarse grained stratified drift is somewhat coarser than the till, so a slightly higher porosity was assumed.

- Bedrock--The bedrock was considered to be functionally impervious for this study. This is in line with present geological interpretation.

It is important to note that the parameters for which assumptions have been made are not of major importance to the groundwater flow system. All of the primary parameters were directly evaluated by the pump test.

## 8.4 Directional Effects

The system did not exhibit directionality with respect to material properties in plan, i.e. there was no apparent anisotropy in a north-south direction as opposed to an east-west direction. However, some noticeable differences were observed in the amounts of drawdown. Most important was the greater drawdown at G41-K13 (1,765 feet or 538 meters from the well) as compared to G41-E13 (1,450 feet or 442 meters from the well), the opposite of what would be expected from a completely uniform system. Review of the site geology indicates local vertical expansion of the coarse grained stratified drift layer at G41-E13, from about 70 feet to

about 115 feet (21 to 35 m) and also indicates local reduction in this layer thickness at G41-K13, from about 70 feet to about 15 feet (21 to 5 m). With a smaller coarse grained stratified drift thickness the well response drawdown was greater since the pressure response was more pronounced. The reverse is true for a thicker layer, explaining the apparent discrepancy in drawdown values between G41-E13 and G41-K13.

## 8.5 Conclusions

The conclusions from the pump test are:

1) Beneath Site 41 there is a 70 foot (20 m) thick sheet of coarse grained stratified drift which exhibits a hydraulic conductivity of about $4 \times 10^{-4}$ ft./sec. ($1.3 \times 10^{-4}$ m/s). This sheet appears to be very extensive.

2) This coarse grained stratified drift is overlain at the well site by about 190 feet (60 m) of till, of which about 80 feet (25 m) is saturated. This material acts as a leaky confining layer for the drift. It exhibits a vertical hydraulic conductivity of about $3 \times 10^{-6}$ ft./sec. ($9 \times 10^{-7}$ m/s) and a drainable porosity of about 5%.

3) These two units are underlain by 70 foot (20 m) glacial till (similar to the upper till) and fine grained stratified drift; and these in turn are underlain by effectively impermeable rock.

4) The behavior of this system is well understood as a result of this test.

GOLDER ASSOCIATES

Gary H. Collison, P.E.
Associate

JFC:AB:GHC:dap

## REFERENCES

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2. Dames & Moore, Crandon Project Environmental Report, Preliminary Draft #2, Section 2.2 Surface Water, September, 1980.

3. Dames & Moore, Crandon Project Environmental Report, Preliminary Draft #2, Section 2.3 Ground Water, September 29, 1980.

4. S.W. Lohman, "Ground-Water Hydraulics", U.S.G.S. Professional Paper 708, 1979.

5. G.P. Kruseman and N.A. DeRidder, Analysis and Evaluation of Pumping Test Data, Bulletin 11, International Institute for Land Reclamation and Improvement, Wageningen, the Netherlands, 1979.

6. Golder Associates, Groundwater Potentiometric Contours, Crandon Project Waste Disposal System, Project Report 7, September, 1981.

Johnson Division
P.O. Box 43118 • St. Paul, Minnesota 55164
Telephone 612-636-3900 • Telex 29-7451

June 13, 1980

Mr. John F. Clerici
Golder Associates
5125 Peachtree Road
Atlanta, Georgia 30341

Dear Mr. Clerici:

The following is my report on the water well velocity survey performed recently near Crandon, Wisconsin, by Johnson personnel.

LOCATION

Exxon Property near Crandon, Wisconsin

DATE

June 6, 1980

WELL DATA

| | | |
|---|---|---|
| Casing Dia. | - | 12 inches |
| Screen Dia. | - | 12 inches |
| Total Depth | - | 334 feet |
| Screen Settings | - | 150' to 235', 270' to 315' |
| Static Water Level | - | 111 feet |
| Pump | - | 8" Submersible |
| Pump Setting | - | 145 feet |

VELOCITY MEASURING INSTRUMENT

Prototype VL3 built by Johnson Division. Free-spinning vertical-axis water turbine mounted in sapphire bearings. Permanent magnet mounted in turbine hub actuates magnetic reed switch in probe head to indicate revolutions.

Revolution pulses counted by electro-mechanical counter in surface unit. Manual on-off switch activates counting circuit, counter, and timer in surface unit.

Surface unit connected to down-hole probe with Johnson-Keck geophysical cable.

Centralizing bows and stabilizing weight attached to probe.

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GOLDER ASSOC.



continued . . .

## CALIBRATION

Calibration of this instrument is performed by manually lowering the probe through static water a fixed distance, observing and recording the time and revolutions. This procedure is repeated at varying rates, yielding data which can be plotted as rotational speed (RPM) vs. descent speed (fps). Since the diameter of the conduit or casing is known, descent speed can be expressed as equivalent Q (GPM).

Table 1 contains calibration data as observed and computed. Figure 1 is the plot of RPM vs fps or Q. Note that calibration runs 17, 18, and 19 were made following the completion of the velocity survey. These three points are plotted as diamonds on Figure 1, and indicate that there was no appreciable change in the calibration of the instrument during the test.

## VELOCITY SURVEY

With the velocity probe suspended in the well, the pump was set at the 145-foot level. The pump discharge was stabilized at approximately 540 GPM. This rate was measured by positioning the velocity probe in the casing just beneath the pump, measuring RPM, and using the instrument calibration plot.

The survey was made in three segments: first, RPM was measured at 5-foot intervals, starting at the bottom of the lower screen and working up. Second, a reading was taken within the casing, followed by detail readings at 1-foot intervals covering the zones 200 feet to 235 feet, and 273 feet to 282 feet. Third, check readings were made at 25 foot intervals from 275 feet to 150 feet with a final reading taken within the casing.

Data for the 3 survey segments are presented in Table 2. The information is plotted in Figure 2.

## RESULTS AND COMMENTS

The primary result of the survey is that 61% of the inflow to this well is between 185 feet and 235 feet. The zone of greatest contribution is between 205 and 235 feet, in which 52% of the flow enters the well at a rate of 9.33 GPM/Ft.

continued . . .

Results and Comments (cont'd . . .)

Segments 2 and 3 of the survey generally yielded a slightly lower flow rate at any given depth. Since the recalibration of the instrument following the test virtually matched the initial calibration, this shift can be attributed to a slight change in the pump discharge caused by the rearrangement, interruption, and removal of the discharge hose following the completion of segment 1 of testing. The shift could also represent continued development of the well by pumping.

The slight increases in flow followed by decreases at 150 feet and 275 feet can be explained by the slight reduction in inside diameter at the welded joint between the screens and casing. Some turbulence exists immediately above these points, especially between 150 feet and the pump inlet at 145 feet.

Sincerely,

Ted Colburn

E. N. Colburn
Director,
Research & Development

ENC*jh

cc: Adrian Brown, c/o J.F. Clerici
Alan Lang, Lang Drilling, c/o Dana Larson
Dana Larson
Chuck Howe
Gary Erickson

Enclosures

TABLE 1 CALIBRATION DATA

Descent: 25 feet $V = .408 \frac{Q}{D^2}$

Casing I.D.: 12 inches

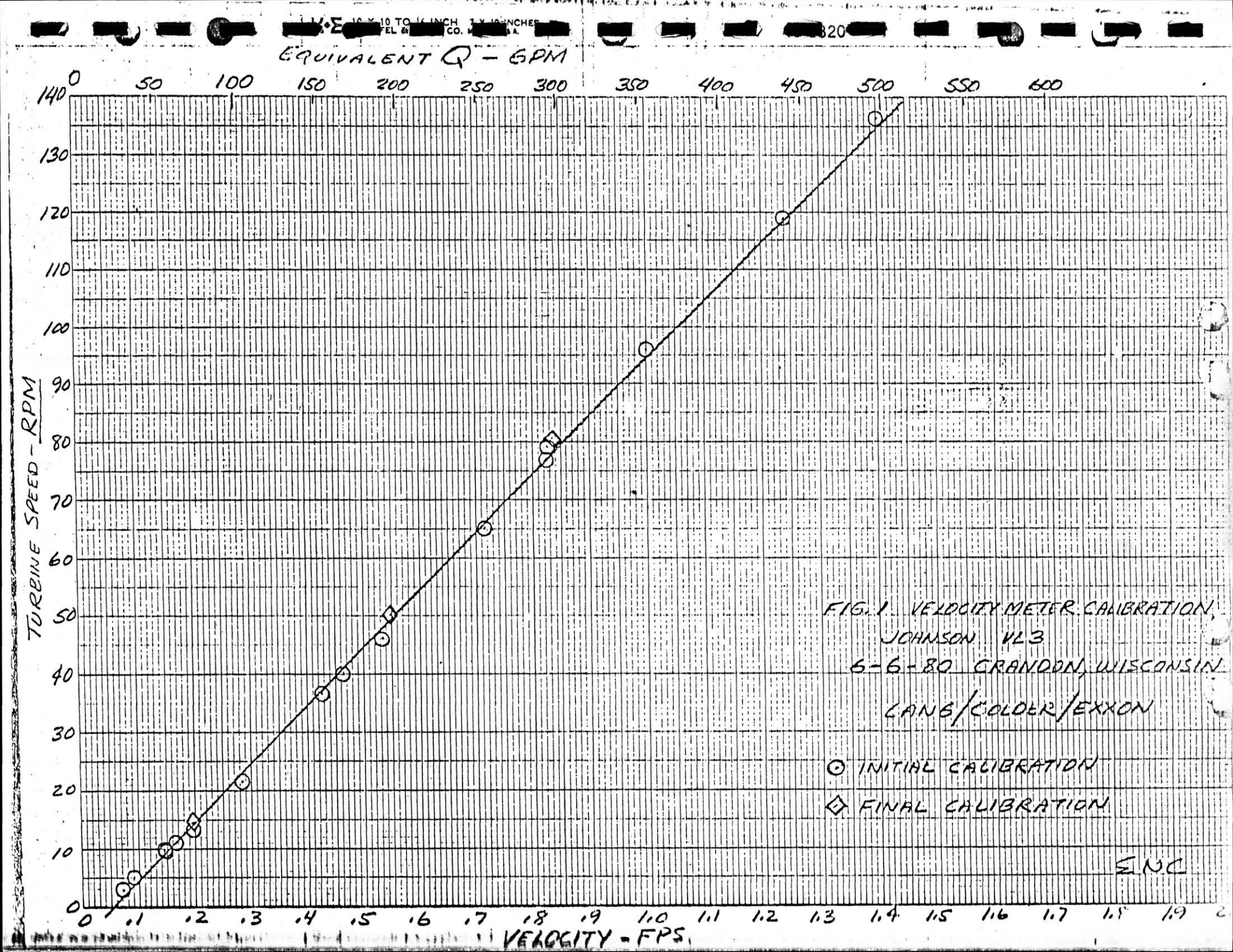
| Run | Rev | Time (sec) | RPM | Velocity (fps) | Q (GPM) |
|---|---|---|---|---|---|
| 1 | 39 | 30.4 | 77.0 | .822 | 290 |
| 2 | 36 | 58.9 | 36.7 | .424 | 150 |
| 3 | 32 | 88.7 | 21.6 | .282 | 100 |
| 4 | 40 | 20.2 | 118.8 | 1.238 | 437 |
| 5 | 29 | 128.3 | 13.6 | .195 | 69 |
| 6 | 28 | 151.8 | 11.1 | .165 | 58 |
| 7 | 27 | 168.9 | 9.6 | .148 | 52 |
| 8 | 23 | 277.7 | 5.0 | .090 | 32 |
| 9 | 17 | 351.8 | 2.9 | .071 | 25 |
| 10 | 36 | 46.9 | 46.1 | .533 | 188 |
| 11 | 36 | 54.0 | 40.0 | .463 | 163 |
| 12 | 28 | 172.1 | 9.8 | .145 | 51 |
| 13 | 41 | 17.9 | 137.4 | 1.400 | 494 |
| 14 | 40 | 30.3 | 79.2 | .825 | 291 |
| 15 | 40 | 25.0 | 96.0 | 1.000 | 353 |
| 16 | 38 | 35.0 | 65.1 | .714 | 252 |
| 17 | 40 | 29.9 | 80.3 | .836 | 295 |
| 18 | 38 | 45.5 | 50.1 | .549 | 194 |
| 19 | 30 | 126.0 | 14.3 | .198 | 70 |

E. N. Colburn
June 13, 1980

TABLE 2. VELOCITY SURVEY

| Segment 1 | | | | Segment 2 | | | | Segment 3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth (ft) | RPM | Velocity (fps) | Q (GPM) | Depth (ft) | RPM | Velocity (fps) | Q (GPM) | Depth (ft) | RPM | Velocity (fps) | Q (GPM) |
| 315 | 0 | 0 | 0 | 148 | 150 | 1.555 | 548.8 | 275 | 22 | .275 | 97.0 |
| 310 | 0 | 0 | 0 | 200 | 107 | 1.125 | 397.0 | 250 | 25 | .305 | 107.6 |
| 305 | 1 | .065 | 22.9 | 201 | 108 | 1.135 | 400.5 | 225 | 44 | .495 | 174.7 |
| 300 | 2 | .075 | 26.5 | 202 | 105 | 1.105 | 390.0 | 200 | 108 | 1.135 | 400.5 |
| 295 | 1 | .065 | 22.9 | 203 | 103 | 1.085 | 382.9 | 175 | 120 | 1.255 | 442.9 |
| 290 | 1 | .065 | 22.9 | 204 | 102 | 1.075 | 379.4 | 150 | 147 | 1.525 | 538.2 |
| 285 | 1 | .065 | 22.9 | 205 | 102 | 1.075 | 379.4 | 147 | 145 | 1.505 | 531.1 |
| 280 | 12 | .175 | 61.8 | 206 | 97 | 1.025 | 361.7 | | | | |
| 275 | 28 | .335 | 118.2 | 207 | 94 | .995 | 351.1 | | | | |
| 270 | 26 | .315 | 111.2 | 208 | 93 | .985 | 347.6 | | | | |
| 265 | 24 | .295 | 104.1 | 209 | 91 | .965 | 340.5 | | | | |
| 260 | 25 | .305 | 107.6 | 210 | 88 | .935 | 330.0 | | | | |
| 255 | 25 | .305 | 107.6 | 211 | 88 | .935 | 330.0 | | | | |
| 250 | 25 | .305 | 107.6 | 212 | 87 | .920 | 324.7 | | | | |
| 245 | 26 | .315 | 111.2 | 213 | 83 | .885 | 312.3 | | | | |
| 240 | 26 | .315 | 111.2 | 214 | 80 | .855 | 301.7 | | | | |
| 235 | 26 | .315 | 111.2 | 215 | 78 | .835 | 294.7 | | | | |
| 230 | 38 | .435 | 153.5 | 216 | 74 | .795 | 280.6 | | | | |
| 225 | 50 | .555 | 195.9 | 217 | 71 | .765 | 270.0 | | | | |
| 220 | 62 | .675 | 238.2 | 218 | 66 | .715 | 252.3 | | | | |
| 215 | 81 | .865 | 305.3 | 219 | 63 | .685 | 241.7 | | | | |
| 210 | 92 | .975 | 344.1 | 220 | 60 | .655 | 231.1 | | | | |
| 205 | 105 | 1.105 | 390.0 | 221 | 56 | .615 | 217.0 | | | | |
| 200 | 111 | 1.165 | 411.1 | 222 | 53 | .585 | 206.4 | | | | |
| 195 | 115 | 1.205 | 425.2 | 223 | 50 | .555 | 195.9 | | | | |
| 190 | 120 | 1.255 | 442.9 | 224 | 47 | .525 | 185.3 | | | | |
| 185 | 122 | 1.275 | 449.9 | 225 | 46 | .515 | 181.7 | | | | |
| 180 | 122 | 1.275 | 449.9 | 226 | 45 | .505 | 178.2 | | | | |
| 175 | 122 | 1.275 | 449.9 | 227 | 41 | .465 | 164.1 | | | | |
| 170 | 123 | 1.285 | 453.5 | 228 | 40 | .455 | 160.6 | | | | |
| 165 | 124 | 1.295 | 457.0 | 229 | 37 | .425 | 150.0 | | | | |
| 160 | 129 | 1.345 | 474.7 | 230 | 29 | .345 | 121.8 | | | | |
| 155 | 136 | 1.415 | 499.4 | 231 | 28 | .335 | 118.2 | | | | |
| 150 | 151 | 1.565 | 552.3 | 232 | 22 | .275 | 97.0 | | | | |
| 147 | 147 | 1.525 | 538.2 | 233 | 22 | .275 | 97.0 | | | | |
| 148 | 148 | 1.535 | 541.7 | 234 | 21 | .265 | 93.5 | | | | |
| 149 | 146 | 1.515 | 534.6 | 235 | 21 | .265 | 93.5 | | | | |
| | | | | 273 | 23 | .285 | 100.6 | | | | |
| | | | | 274 | 23 | .285 | 100.6 | | | | |
| | | | | 275 | 22 | .275 | 97.0 | | | | |
| | | | | 276 | 14 | .195 | 68.8 | | | | |
| | | | | 277 | 10 | .155 | 54.7 | | | | |
| | | | | 278 | 8 | .135 | 47.6 | | | | |
| | | | | 279 | 7 | .125 | 44.1 | | | | |
| | | | | 280 | 4 | .095 | 33.5 | | | | |
| | | | | 281 | 1 | .065 | 22.9 | | | | |
| | | | | 282 | 0 | 0 | 0 | | | | |

E. N. Colburn
June 13, 1980


EQUIVALENT Q - GPM
0
50
100
150
200
250
300
350
400
450
500
550
600
TURBINE SPEED - RPM
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
0
.1
.2
.3
.4
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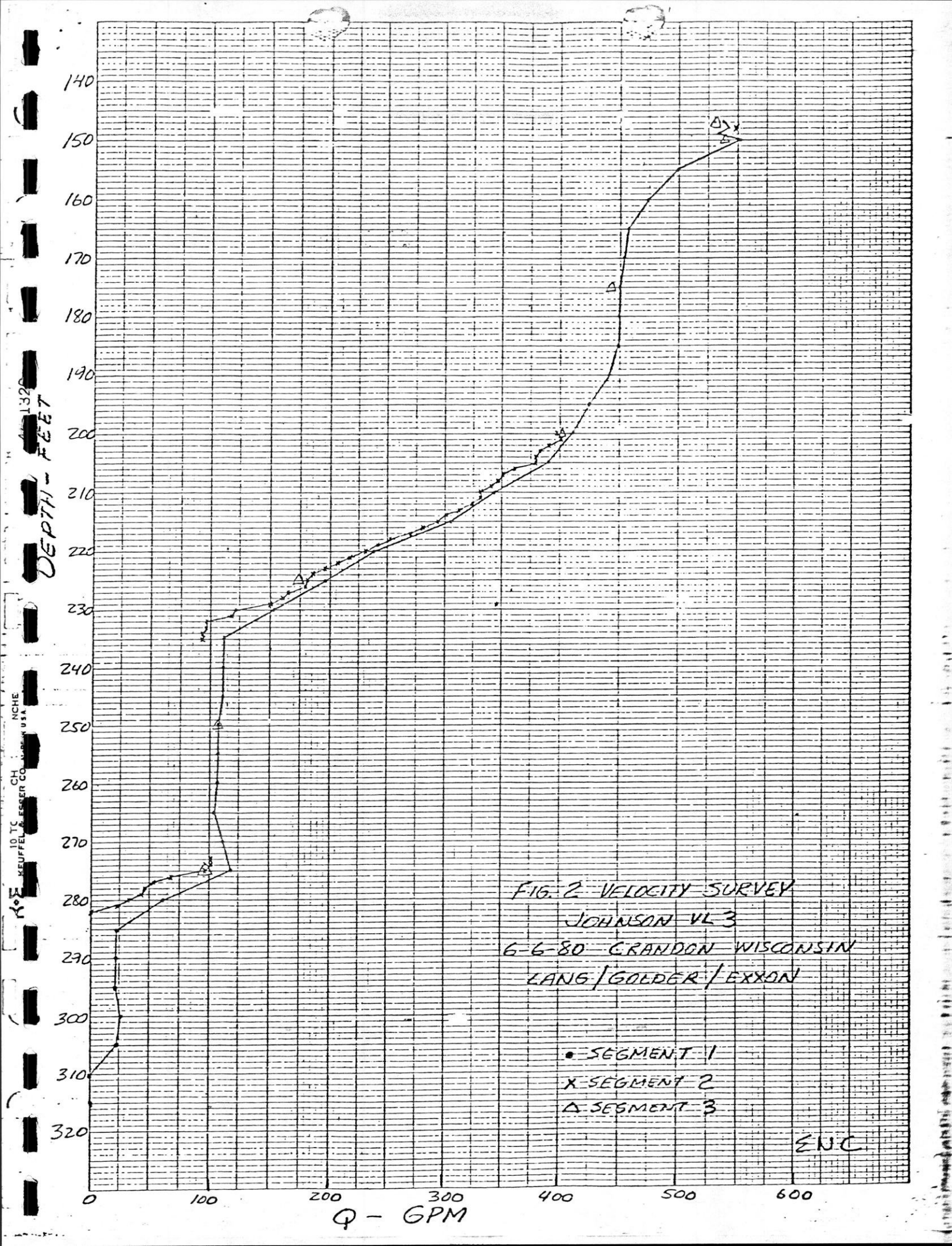
1.0
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
VELOCITY - FPS
FIG. 1 VELOCITY METER CALIBRATION
JOHNSON VL3
6-6-80 CRANDON, WISCONSIN
CANS/COLDER/EXXON
INITIAL CALIBRATION
FINAL CALIBRATION
ENC


140
150
160
170
180
190
200
210
220
230
240
250
260
270
280
290
300
310
320
DEPTH - FEET
0
100
200
300
400
500
600
Q - GPM
FIG. 2 VELOCITY SURVEY
JOHNSON VL 3
6-6-80 CRANDON WISCONSIN
LANG / GOLDER / EXXON
• SEGMENT 1
X SEGMENT 2
Δ SEGMENT 3
ENC

Johnson Division
P.O. Box 43118 • St. Paul, Minnesota 55164
Telephone 612-636-3900 • Telex 29-7451

September 20, 1979

Gary Collisen
Golder and Associates
5125 Peachtree Road
Atlanta, Georgia 30341

Dear Gary:

Thank you for your request for information concerning the Johnson Velocity Meter System. Ted and I enjoyed talking wi th you and hearing about the Exxon Project at Crandon.

Enclosed are a picture of the equipment and literature describing the parts and operation of the system.

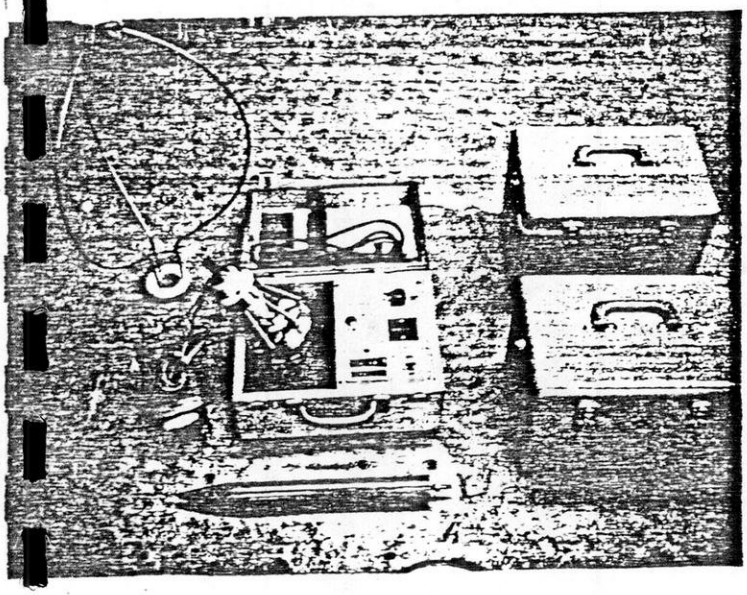
You may wish to contact Rockwell International concerning a flow meter. They have a meter called a 4" Turbo, their Model W-1000, which may be usable for this job. The phone number for their Midwest Sales Office is 312-325-8972.

Now that you've found us, we hope we can continue to be of service to you.

Very truly yours,

Dana

Dana C. Larson
Geologist



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SEP 24 1979
GOLDER ASSOC.

# JOHNSON VELOCITY METER SYSTEM

## INTRODUCTION

The Johnson Velocity Meter System is a turbine-type flow meter which can be used to measure vertical flow velocity in pumping wells. When such velocity is measured at various depths in a water-producing zone of a borehole, a plot or graph can be made showing flow versus depth. Such a graph will show the upper and lower limits of a water-producing strata, and the proportion of total flow contributed by each stratum.

The Johnson system consists of a borehole probe, or turbine unit, a logging cable, and an above-aground operator's console. The operator reads and records the turbine RPM at each desired depth while the well is being pumped. These data are later used to plot the above-mentioned graph or "velocity profile."

## SYSTEM COMPONENTS

Probe - The probe unit is 4.75 inches in diameter and contains a 5 bladed impeller, running in jewelled bearings. A magnetic reed switch is actuated once during each revolution of the shaft. The probe is connected to the logging cable by a heavy-duty sealed connector. Provision is made for attaching weights to the bottom of the probe. Corrosion-resistant materials are used throughout.

Surface Electronics Console - The probe, connecting cables and surface electronics are contained in the varnished wood case. The operator's control panel includes the revolution counter, timer, switch, and cable connections.

Logging Cable - The down-hole cable is supplied in 600 foot lengths on reels mounted in aluminum carrying cases.

Adapter - This unit includes a cable-to-probe adapter which must be used between the probe and the keck cable. The adapter is packed in the console.

Centralizer - A bow-type adjustable centralizer is supplied with the system. It may be adjusted from a maximum diameter of 15 inches to a minimum diameter of approximately 10 inches. The centralizer is to be used in wells of 12 inch diameter and larger. The centralizer is mounted above the probe unit as shown in the assembly photo. To slip the cable through the centralizer, first remove the split, threaded hub from the upper collar of the centralizer. Reassemble on the cable. The lower collar snaps on the probe head.

Connecting Cable - A short length of cable is provided to connect the winch to the console.

Counter, Timer, and Switch - The toggle switch on console activates the counting circuit. When the switch is on, the timer runs, reading in seconds, and the pulse counter indicates each revolution of the turbine shaft. Both timer and pulse counter are provided with push-button reset.

Power Cable - An electric cord is included which connects to the power input on the console and then plugs into any 110-120 VAC outlet.

Inverter - For remote applications, where 110-120 VAC power is not readily available, an inverter can be supplied as an extra cost option. This unit connects to a 12 VDC supply such as a vehicle battery, and provides power sufficient to operate the system. Specific instructions for using the inverter are packaged with the inverter.

Stabilizing Weight - A lead-filled weight is supplied. This weight is used to stabilize the probe and prevent it from rising under conditions of high flow velocity. When borehole velocities greater than 2.5 feet per second (fps) are anticipated, fix the weight to the probe by screwing the threaded center shaft of the weight into the tapped hole in the bottom of the probe frame. Secure with jam nuts. See photo of assembled system.

PREPARATION

P 1 Install weight (if necessary) on probe unit.

P 2 Determine depths and measurement intervals if possible. Generally, lengthy water-producing zones are surveyed at 5 or 10 foot intervals. Short zones may require more frequent measurements.

P 3 Remove pump from well.

P 4 Install centralizer if necessary.

P 5 Connect logging cable to probe unit securely.

P 6 Pay out length of cable sufficient for anticipated need.

P 7 Connect cable reel to console with connecting cable.

P 8 Connect power cable first to console, then to 110-120 VAC source. OBSERVE SAFETY PRECAUTION: ALWAYS connect power cord first to console, then to power source. If DC-AC inverter is used, connect leads to 12 volt vehicle battery. Run vehicle engine during testing.

P 9 Check power source by turning toggle switch on. The timer power light should come on, and the timer should start reading seconds.

P 10 Check system. With power connected, and toggle switch on, gently spin the turbine with the fingers. The pulse counter should function by counting revolutions. If the system fails to work, check to see that all cable connections are properly made. If all connections are good and the system still fails to function, a circuitry problem is indicated. If power and system check out, proceed with the following steps.

P 11 Lower the probe unit into the standing water.

P 12 Check system operation. With power connected and toggle switch on, lower unit at a rate of approximately 1 foot per second in standing water. The pulse counter should count revolutions. If system fails, retrieve probe unit and check for damage, interference, or leaky connections. If no problems are apparent, check system again manually above ground per paragraph P 10.

P 13 If the system works above ground, but fails in the well, suspect a damaged cable or leaky cable-to-probe connection. Such condition will cause a short in the down-hole circuit. This will be indicated by a half-count on the revolution counter each time the toggle switch is operated.

P 14 Lower unit to a depth 3 to 6m beneath pump setting level. Note depth markers on cable. Secure cable.

P 15 Allow cable to rest against edge of casing. It is advisable to protect cable by wrapping with rags where it bends over the edge of the casing. Be sure any such rags cannot be dropped into hole.

P 16 Set pump. Very, very carefully! It is important not to pinch, cut or otherwise damage the logging cable, nor to drop anything into the hole.

P 17 Re-check system operation per paragraph P 12. Always leave toggle switch off between operations.

P 18 Start the pump.

SURVEYING VELOCITY

S 1 When flow from well is stable, measure output as accurately as possible. Well flow at surface should be monitored during testing. If any variations in pumping rate occur, velocity readings will be affected. A good velocity survey requires a steady pumping rate from beginning to end.

S 2 Position probe unit in well at a depth where total flow occurs, and screen or borehole diameter is the same as in the producing zone to be surveyed. The probe unit should never be closer to the pump intake than 5 feet. If a screen is used of a smaller diameter than the casing, the probe unit should be positioned 1-3 feet into the top of the screen.

S 3 Zero Timer.

S 4 Zero Pulse Counter.

S 5 Note Depth.

S 6 Turn on toggle switch and observe timer. Keep switch on for exactly 60 seconds, then turn off. The timer wheels will "coast" for .1 to .3 seconds after the switch is off, but the system will be de-energized at the instant the switch is thrown.

S 7 Read the pulse counter. This will equal the number of revolutions of the turbine shaft during the time interval measured by the timer. Record pulse counter reading.

S 8 Zero Timer and Pulse Counter.

S 9 Repeat steps S 6 - S 8 several times. The operator should be able to hit 60 seconds with regularity, and pulse counts for 60 seconds should be repeatable within 1 or 2%.

S 10 Lower the probe unit to the next depth level.

S 11 Zero timer and pulse counter.

S 12 Note depth.

S 13 Read and record turbine speed per steps S6- S7.

S 14 Repeat Steps S10 - S13 until a depth is reached at which the turbine speed ceases or becomes erratic, or until entire borehole zone has been surveyed.

S 15 Repeat step P 15.

S 16 Remove pump --- carefully, please!

S 17 Retrieve probe unit from well, drying cable as it is returned to the reel.

NOTES

1. Different time intervals may be chosen for pulse counting if 60 seconds is inconvenient. It is important that whatever time interval is selected, it is consistently and accurately used throughout each test.

2. If very high velocities are anticipated, the survey should be started at about the middle of the producing zone, first working down, and then surveying the upper half of the zone by working up from the middle.

Such an operation should be carefully monitored. If, during the survey of the upper part of the zone, the counting rate should decrease, the pump should be stopped and the test cut short.

A decreasing count while raising the turbine in a pumping well indicates the turbine is being lifted by the pump. If such a case arises, reduce the pumping rate or add more weight to the turbine.

3. If a salt water well is surveyed, thoroughly wash all downhole equipment with fresh water upon completion of survey.

4. The components of this system are delicate, precision instruments, and should be treated accordingly.

5. Probe Assembly and Bearing Adjustment: When properly adjusted, a little looseness can be felt in the bearings. If dirt, grit, or damage to the cage causes the bearings to tighten, disassemble the cage to get at the bearings. Mark the two halves of the cage and the probe head to preserve alignment. Take the cage apart at its waistline, and remove the top half of the cage from the plastic probe head.

Be careful not to drop the impeller-shaft assembly to avoid bending the shaft and damaging the jewel bearing in the bottom end or the bearing point on the top end. The jewels (one in the probe head; one in the bottom end of the shaft) should be cleaned out very carefully -- use a tooth brush. The bearing points (top shaft and bottom of cage) can be cleaned with a little fine steel wool. When reassembling, make sure the cage goes back together as it was.

After reassembling, adjust bearing tightness with the lower bearing point by loosening the lock nut and turning the point one way or the other to achieve the desired tightness.

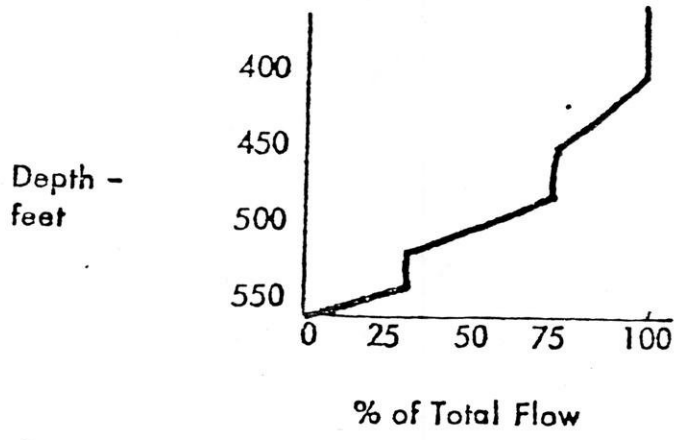
6. Avoid lengthy periods of immersion. Try to plan velocity surveys so that instrument installation, pump setting, and velocity surveying are all accomplished in a minimum span of time, preferably one day. Long periods of immersion increase exposure of the instrument to leakage and damage.

## PRESENTATION AND INTERPRETATION OF DATA

The following data will be known following a velocity meter survey:

1. Turbine RPM
2. Depth
3. Total flow rate of well
4. Casing, screen, or borehole diameters

Presentation of data is best made as a graph having depth on the vertical axis and flow rate or % of total flow rate on the horizontal axis. An example of such a graph is given below:




This graph shows that 25% of the water enters between 415 and 450 feet, 45% enters between 480 and 520 feet, and 35% enters between 550 and 565 feet.

Two basic characteristics of this instrument should be discussed at this time. They are output linearity and threshold of operation.

Laboratory tests have shown that, for any given conduit diameter, the output of the instrument is linear. That is, turbine RPM vs flow rate is a straight-line function.

Threshold of operation can be described as the least flow velocity that will actuate the turbine. In the case of the Johnson instrument, the threshold is between zero and 0.05 feet per second. For example, a flow velocity of 0.05 feet per second in a 6-inch pipe will produce a turbine speed of 8 to 10 RPM. In actual practice, this threshold of operation can be termed negligible.

The importance of the above characteristics is that, with a linear output, RPM data can be plotted directly as flow, and with a negligible threshold of operation, no "zero offset" adjustments to data need be made.

Example

The following example should help to explain the handling and presentation of data:

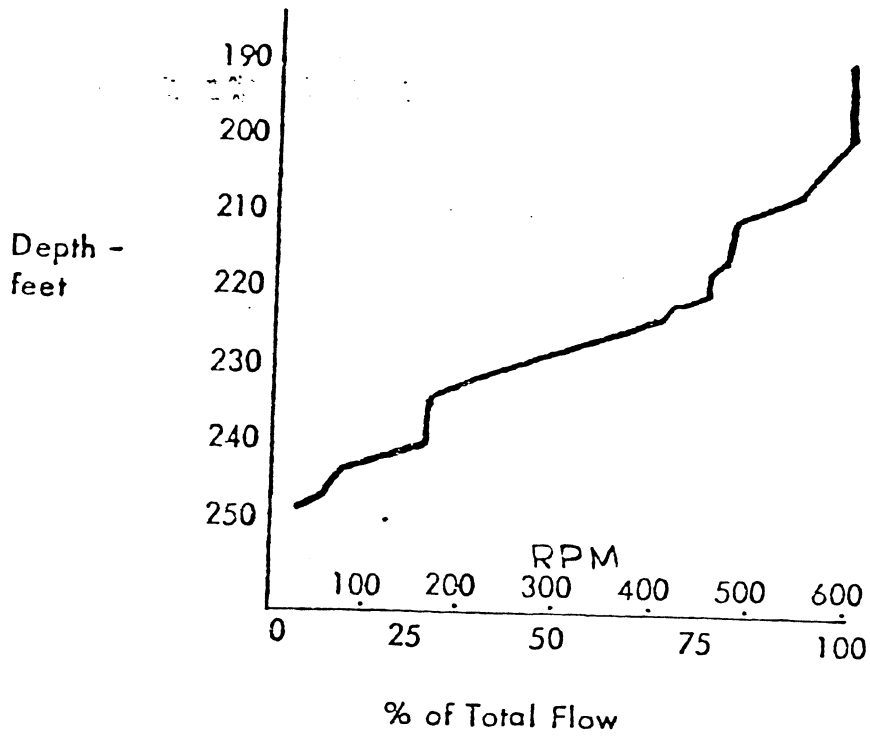
1. Observed Data

Total flow - 200 GPM
Screen inside diameter - 5 inches
Screen set from 200 to 250 feet
Measuring interval - 2 feet

| Depth | Counts per Minute (RPM) |
|---|---|
| 196 | 600 |
| 198 | 600 |
| 200 | 600 |
| 202 | 590 |
| 204 | 570 |
| 206 | 550 |
| 208 | 510 |
| 210 | 485 |
| 212 | 480 |
| 214 | 478 |
| 216 | 475 |
| 218 | 475 |
| 220 | 475 |
| 222 | 430 |
| 224 | 410 |
| 226 | 350 |
| 228 | 310 |
| 230 | 285 |
| 232 | 250 |
| 234 | 195 |
| 236 | 160 |
| 238 | 160 |
| 240 | 160 |
| 242 | 110 |
| 244 | 80 |
| 246 | 65 |
| 248 | 37 |
| 250 | -- |

Note: Because the stabilizing weight was used, the maximum instrument depth was 248 feet.

2. Plot data on graph paper to any convenient scale




Note: Since 600 RPM represents 100% of the total flow, and the instrument is known to be linear, a % scale can simply be marked off along the RPM scale. The 100% point is at 600 RPM, 50% at 300 RPM, 0% at 0 RPM, etc.

3. Interpretation

In the example, the graph shows nonproductive zones between 210 and 220 feet, and between 235 and 240 feet. The zone between 220 and 235 feet yields 55% of the total flow. Twenty per cent of the water comes from the top 10 feet of screen, and 25% from the bottom 10 feet of screen.

4. Data Conversion

If it is desired to express the flow in GPM, simply apply the various percentages to the total gallonage. In the above example, the yield between 220 and 235 feet is 110 GPM. The horizontal scale of the graph can be expressed in GPM, if desired.

Flow velocity in feet per second may be computed using the following formula:

$$V = \frac{Q}{D^2} (.408)$$

where: V = Velocity in feet per second
Q = Flow rate in U.S. gallons per minute
D = Inside diameter of pipe or screen in inches.

5. Borehole Diameter Changes

In the event of a change in borehole diameter within the production zone, a profile is drawn which is essentially a composite of profiles of producing zones of each diameter. Exact depths of diameter changes should be known. The instrument will usually indicate such changes by a rather abrupt change in RPM.

Such a hole is plotted from the top down. The uppermost zone or diameter is first plotted as in the above example. Whatever flow is present at the depth of the diameter change is then 100% of the flow of the next lower zone, which is plotted separately, but on the same graph. Successive changes in diameter are treated similarly.

A change in screen or casing diameter at a given flow rate will always cause a change in flow velocity and hence a change in RPM. The change in RPM observed may not correspond precisely to the difference in conduit diameters. This is due to different ratios of water flowing through the turbine to water bypassing the turbine in different conduit diameters. The fact remains that, for a given conduit diameter, the output of the instrument is linear over its operating range of zero to 1000 RPM. Therefore, each borehole diameter is considered separately.

TABLE B.1
CLIMATIC AND DUCK LAKE DATA

| Date | Time | Precip. Ins. | Barometric Pressure In. Hg. | Temperature °F Maximum | Minimum | Duck Lake Level** Ft. |
|---|---|---|---|---|---|---|
| 5/31/80 | 7:30 AM | 0.25 | -- | 71 | 54 | 0.74 |
| 6/1/80 | 8:00 AM | 0.00 | -- | 64 | 47 | -- |
| 6/2/80 | 8-9:00 AM | 0.18 | 28.8 | 56 | 48 | 0.725 |
| 6/3/80 | 8-9:30 AM | -- | -- | 66 | 52 | 0.72 |
| 6/4/80 | 1:30 AM | -- | 29.1 | -- | -- | -- |
| 6/4/80 | 8-9:15 AM | 0.00 | 29.2 | 69 | 48 | -- |
| 6/5/80 | 8:00 AM | 0.18 | 29.0 | 66 | 50 | -- |
| 6/6/80 | 8:00 AM | 1.08 | 28.7 | 58 | 50 | -- |
| 6/7/80 | 8:00 AM | 0.18 | 28.9 | 72 | 58 | 0.85 |
| 6/8/80 | 8-8:30 AM | 0.21 | 29.0 | 64 | 38 | -- |
| 6/9/80 | 8:00 AM | 0.015 | 28.9 | 64 | 38 | 0.86 |
| 6/10/80 | 8:00 AM | 0.00 | 29.9 | 61 | 35 | 0.84 |
| 6/11/80 | 8:00 AM | 0.00 | 29.1 | 61 | 35 | 0.83 |
| 6/12/80 | 8:00 AM | 0.00 | 29.3 | 72 | 52 | 0.82 |
| 6/13/80 | 8:00 AM | 0.00 | 29.2 | 73 | 61 | 0.85 |
| 6/14/80 | 8:00 AM | 0.00 | 29.1 | 77 | 59 | 0.80 |
| 6/15/80 | 8:00 AM | 0.22 | 29.0 | 71 | 43 | 0.80 |
| 6/16/80 | 8:00 AM | 0.00 | 29.1 | 60 | 40 | 0.77 |
| 6/24/80 | 8:00 AM | 1.30*(1) | 29.2 | 79 | 44 | 0.79 |
| 6/25/80 | 8:00 AM | 0.00 | 29.2 | 80 | 65 | 0.77 |
| 6/26/80 | 8:00 AM | 0.00 | 29.2 | 82 | 63 | 0.76 |
| 6/27/80 | 8:00 AM*(2) | 0.00 | 29.1 | 80 | 52 | 0.91 |
| 6/28/80 | 9:00 AM | 2.48 | 28.7 | 60 | 51 | 1.00 |
| 6/29/80 | 8:00 AM | 0.02 | 28.7 | 70 | 55 | 1.21 |
| 6/30/80 | 8:00 AM | 0.01 | 29.0 | 67 | 48 | 1.27 |
| 7/1/80 | 8:00 AM | 0.00 | 29.0 | 68 | 56 | 1.33 |
| 7/2/80 | 8:00 AM | 0.00 | 29.2 | 72 | 48 | 1.39 |
| 7/3/80 | 8:00 AM | 0.00 | 29.2 | 70 | 51 | 1.44 |
| 7/4/80 | 8:00 AM | 0.00 | 29.2 | 78 | 51 | 1.47 |
| 7/5/80 | 8:00 AM | 0.00 | 29.0 | 75 | 62 | 1.49 |
| 7/6/80 | 8:00 AM | 0.00 | 29.3 | 65 | 48 | 1.51 |
| 7/7/80 | 8:00 AM | 0.00 | 29.2 | 70 | 50 | 1.53 |
| 7/8/80 | 8:00 AM | 0.00 | 29.3 | 82 | 58 | 1.54 |
| 7/9/80 | 8:00 AM | 0.00 | 29.25 | 74 | 61 | 1.57 |
| 7/10/80 | 8:00 AM | 0.00 | 29.25 | 78 | 63 | 1.59 |
| 7/11/80 | 8:00 AM | 0.305 | 29.2 | 85 | 63 | 1.62 |
| 7/12/80 | 8:00 AM | 0.02 | 29.0 | 78 | 57 | 1.65 |
| 7/13/80 | 8:00 AM | 0.00 | 29.15 | 73 | 62 | 1.67 |
| 7/14/80 | 8:00 AM | 0.01 | 29.1 | 78 | 62 | 1.68 |
| 7/15/80 | 8:00 AM | 0.01 | 29.1 | 78 | 62 | 1.70 |

TABLE B.1
CLIMATIC AND DUCK LAKE DATA (Continued)

| Date | Time | Precip. Ins. | Barometric Pressure In. Hg. | Temperature °F Maximum | Minimum | Duck Lake Level** Ft. |
|---|---|---|---|---|---|---|
| 7/16/80 | 8:00 AM | 0.45 | 29.0 | 82 | 64 | 1.74 |
| 7/17/80 | 8:00 AM | 0.08 | 29.05 | 74 | 60 | 1.74 |
| 7/18/80 | 8:00 AM | 0.00 | 29.10 | 73 | 62 | 1.75 |
| 7/19/80 | 8:00 AM | 0.50 | 29.40 | 72 | 61 | 1.77 |
| 7/20/80 | 8:00 AM | 0.68 | 29.0 | 76 | 61 | 1.81 |
| 7/21/80 | 8:00 AM*(3) | 0.01 | 29.3 | 67 | 62 | 1.78 |
| 7/22/80 | 8:50 AM | -- | 29.3 | 74 | 60 | 1.63 |
| 7/23/80 | 11:00 AM | 0.00 | 29.4 | 69 | 54 | 1.55 |
| 7/24/80 | 8:00 AM | 0.00 | 29.2 | 72 | 58 | 1.49 |
| 7/25/80 | 9:30 AM | 0.26 | -- | 76 | 63 | -- |
| 7/26/80 | 8:00 AM | 0.09 | 29.2 | 70 | 50 | 1.38 |
| 7/27/80 | 9:10 AM | 0.00 | 29.20 | 66 | 48 | 1.34 |
| 7/28/80 | 9:17 AM | 0.00 | 29.19 | 73 | 56 | 1.32 |
| 7/29/80 | 9:15 AM | 0.07 | 29.2 | 76 | 56 | 1.29 |
| 7/30/80 | 11:08 AM | 0.07 | 29.2 | 71 | 55 | 1.26 |
| 7/31/80 | 2:30 PM | 0.00 | 29.2 | 75 | 60 | 1.23 |
| 8/1/80 | 12:25 PM | 0.00 | 29.3 | 76 | 60 | 1.20 |
| 8/3/80 | 7:50 AM | 0.07 | 29.05 | 76 | 54 | 1.16 |
| 8/5/80 | 2:30 PM | 0.47 | 29.19 | 72 | 60 | 1.15 |
| 8/7/80 | 2:38 PM | 0.40 | 29.49 | 78 | 56 | 1.14 |
| 8/9/80 | 9:45 AM | 0.72 | 29.37 | 75 | 56 | 1.17 |
| 8/12/80 | 1:34 PM | 0.04 | 29.42 | 71 | 56 | 1.12 |
| 8/14/80 | 11:35 AM | 0.03 | 29.30 | 71 | 61 | 1.09 |
| 8/16/80 | 11:15 AM | 0.00 | 29.40 | 70 | 47 | 1.05 |
| 8/20/80 | 2:42 PM | 0.48 | 29.23 | 76 | 56 | 1.02 |
| 8/22/80 | 1:16 PM | 0.35 | 29.50 | 77 | 54 | 1.02 |
| 9/2/80 | 9:52 AM | 2.75 | 29.30 | 75 | 50 | 1.16 |

**. Golder Associates installed staff gage to measure relative Lake levels. Elevation 0.0 on gage = approximately elevation 1601.8 feet (MSL).
*(1) Rain from 6/21 to 6/23.
*(2) Pump test begun at 10:05 AM.
*(3) Pump test stopped at 10:05 AM.

TABLE B.2
PUMP DISCHARGE

| Date | Time | Total Flow x1000 Gal. | Flow Rate GPM |
|---|---|---|---|
| 6/27 | 10:05 | 41.000 | 1500 |
| | 10:25 | 71 | 1500 |
| | 10:40 | 94 | 1533 |
| | 12:00 | 223 | 1613 |
| | 16:43 | 621 | 1406 |
| | 18:14 | 753 | 1451 |
| | 19:12 | 837 | 1448 |
| | 21:05 | 1,000 | 1442 |
| | 22:01 | 1,082 | 1464 |
| | 22:45 | 1,144 | 1409 |
| 6/28 | 00:06 | 1,262 | 1457 |
| | 5:36 | 1,737 | 1439 |
| | 6:25 | 1,808 | 1449 |
| | 8:00 | 1,946 | 1453 |
| | 13:35 | 2,426 | 1433 |
| | 13:40 | 2,433 | 1400 |
| | 13:55 | 2,454 | 1400 |
| | 14:39 | 2,517 | 1432 |
| | 16:23 | 2,667 | 1442 |
| | 16:40 | 2,691 | 1412 |
| | 18:51 | 2,879 | 1435 |
| | 23:51 | 3,309 | 1433 |
| 6/29 | 8:41 | 4,076 | 1447 |
| | 15:56 | 4,703 | 1441 |
| 6/30 | 00:30 | 5,434 | 1422 |
| | 8:12 | 6,093 | 1426 |
| | 14:01 | 6,588 | 1418 |
| | 14:21 | 6,616 | 1400 |
| | 14:30 | 6,629 | 1444 |
| | 14:51 | 6,659 | 1429 |
| | 14:54 | 6,663 | 1333 |
| 7/1 | 00:04 | 7,452 | 1435 |
| | 7:44 | 8,112 | 1435 |
| | 10:18 | 8,331 | 1422 |
| | 10:20 | PUMP SHUT OFF | -- |
| | 10:30 | PUMP TURN ON | -- |
| | 11:24 | 8,412 | -- |
| | 12:13 | 8,484 | 1469 |
| | 12:59 | 8,549 | 1413 |
| | 13:31 | 8,595 | 1438 |
| | 17:01 | 8,896 | 1433 |

TABLE B.2
PUMP DISCHARGE (Continued)

| Date | Time | Total Flow x1000 Gal. | Flow Rate GPM |
|---|---|---|---|
| 7/2 | 1:52 | 9,655 | 1429 |
| | 8:35 | 10,234 | 1437 |
| | 21:11 | 11,315 | 1430 |
| 7/3 | 8:57 | 12,315 | 1416 |
| | 20:35 | 13,322 | 1443 |
| 7/4 | 8:39 | 14,356 | 1428 |
| | 20:33 | 15,374 | 1426 |
| 7/5 | 8:05 | 16,362 | 1428 |
| | 20:37 | 17,434 | 1426 |
| 7/6 | 9:07 | 18,504 | 1427 |
| | 17:49 | 19,247 | 1423 |
| 7/7 | 7:43 | 20,435 | 1424 |
| | 16:22 | 21,173 | 1422 |
| 7/8 | 8:29 | 22,549 | 1423 |
| | 20:54 | 23,609 | 1423 |
| 7/9 | 8:40 | 24,613 | 1426 |
| | 15:57 | 25,234 | 1421 |
| 7/10 | 8:37 | 26,655 | 1421 |
| | 17:17 | 27,393 | 1419 |
| 7/11 | 8:44 | 28,710 | 1421 |
| | 19:04 | 29,590 | 1419 |
| 7/12 | 8:44 | 30.735 | 1396 |
| 7/13 | 8:12 | 32,742 | 1425 |
| 7/14 | 7:55 | 34,764 | 1421 |
| | 8:58 | PUMP TURN OFF | -- |
| | 10:48 | PUMP TURN ON | -- |
| 7/15 | 8:18 | 36,796 | 1389 |
| 7/16 | 8:58 | 38,880 | 1414 |
| 7/17 | 8:04 | 40,873 | 1432 |
| 7/18 | 7:53 | 42,888 | 1410 |

TABLE B.2
PUMP DISCHARGE (Continued)

| Date | Time | Total Flow x1000 Gal. | Flow Rate GPM |
|---|---|---|---|
| 7/20 | 7:57 | 46,945 | 1407 |
| 7/21 | 8:23 | 49,004 | 1405 |
| | 10:05 | 49,147.692 | 1409 |

## WATER LEVEL INDICATOR CALIBRATION CONSTANTS

Sixteen water level indicators were used during the pump test program. Each unit was fully calibrated over its length depending on the length of the tape needed for a particular measurement. Instrument calibrations were made by measuring on the surface, 5.00 foot increments on the water level indicators to the nearest 0.01 foot using a steel measuring tape. More than one instrument was often used to measure the water levels in a particular observation well. To reduce the field data a series of calibration constants were input to the computer along with an appropriate code number to match the field reading with the correct calibration constant. The code number is listed under the heading "CON" on each observation well. The value of each numbered constant is shown below. This value must be applied to the field reading in order to obtain the correct depth from the well collar to the water level.

| Code | Constant | Code | Constant |
|---|---|---|---|
| 1 | -.11 FEET | 46 | .02 FEET |
| 2 | .73 FEET | 47 | .03 FEET |
| 3 | .14 FEET | 48 | .04 FEET |
| 4 | -.22 FEET | 49 | .06 FEET |
| 5 | 1.00 FEET | 51 | -176.05 FEET |
| 6 | .04 FEET | 52 | -176.03 FEET |
| 7 | -158.00 FEET | 53 | -176.01 FEET |
| 8 | -234.74 FEET | 56 | -234.77 FEET |
| 9 | -.08 FEET | 61 | -.08 FEET |
| 10 | .20 FEET | 62 | -.07 FEET |
| 11 | 3.04 FEET | 64 | -.09 FEET |
| 12 | 3.45 FEET | 65 | .10 FEET |
| 13 | -.03 FEET | 66 | .14 FEET |
| 14 | 0.00 FEET | 67 | .15 FEET |
| 15 | 0.00 FEET | 68 | -.03 FEET |
| 16 | 0.00 FEET | 69 | .16 FEET |
| 17 | 0.00 FEET | 70 | .21 FEET |
| 20 | 0.00 FEET | 76 | 3.50 FEET |
| 21 | -.13 FEET | 77 | 3.56 FEET |
| 22 | -.16 FEET | 81 | -1.82 FEET |
| 23 | -.14 FEET | 82 | -.03 FEET |
| 24 | -.15 FEET | 83 | -2.29 FEET |
| 25 | .72 FEET | 84 | -2.02 FEET |
| 26 | .70 FEET | 85 | -1.91 FEET |
| 27 | .69 FEET | 86 | -.09 FEET |
| 28 | .68 FEET | 87 | -2.04 FEET |
| 29 | .66 FEET | 88 | .03 FEET |
| 30 | .64 FEET | 89 | .02 FEET |
| 31 | .21 FEET | 90 | -1.93 FEET |
| 32 | .22 FEET | 91 | -2.06 FEET |
| 33 | .03 FEET | 92 | -2.20 FEET |
| 34 | -.02 FEET | 93 | -2.21 FEET |
| 35 | -.05 FEET | 94 | -1.88 FEET |
| 36 | -.06 FEET | 95 | -2.18 FEET |
| 37 | -.12 FEET | 96 | -2.13 FEET |
| 38 | -.04 FEET | 97 | -2.58 FEET |
| 39 | 0.00 FEET | | |
| 41 | 1.02 FEET | | |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***TW4I ***

| DATE | TIME | FIRST READING | SECOND READING | A L G | C O N | TIME SINCE TEST BEGAN | WATER LEVEL ELEVATION | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| DDMONYY | HHMM.SS | FEET | FEET | | | MINUTES | FEET | |
| | | | | | | | | COLLAR ELEV 1709.71 FEET PIEZO ELEV 0.00 -NULL- |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 06JUN80 | 1000.00 | 127.80 | .69 | 1 | 69 | -30245.00 | 1581.06 | 1%CLEAR HOLE W/RIG PUMP |
| 06JUN80 | 1200.00 | 131.00 | .69 | 1 | 69 | -30125.00 | 1577.86 | 1%CLEAR HOLE W/RIG PUMP |
| 06JUN80 | 1520.00 | 119.00 | -3.29 | 1 | 67 | -29925.00 | 1593.85 | 1% BEFORE VEL TEST |
| 06JUN80 | 1540.00 | 134.00 | -3.29 | 1 | 69 | -29905.00 | 1578.84 | 1% VELOCITY TEST |
| 06JUN80 | 1600.00 | 136.00 | -3.29 | 1 | 69 | -29885.00 | 1576.84 | 1% VELOCITY TEST |
| 06JUN80 | 1658.00 | 137.00 | -3.29 | 1 | 69 | -29827.00 | 1575.84 | 1% VELOCITY TEST |
| 06JUN80 | 1715.00 | 143.00 | -3.29 | 1 | 69 | -29810.00 | 1569.84 | 1% VELOCITY TEST |
| 06JUN80 | 1832.00 | 125.00 | -3.29 | 1 | 69 | -29733.00 | 1587.84 | 1% PUMP OFF |
| 09JUN80 | 1000.00 | 114.69 | .69 | 1 | 66 | -25925.00 | 1594.19 | 1% |
| 10JUN80 | 820.00 | 114.78 | .69 | 1 | 66 | -24585.00 | 1594.10 | 1% |
| 11JUN80 | 845.00 | 114.92 | .69 | 1 | 66 | -23120.00 | 1593.96 | 1% |
| 12JUN80 | 835.00 | 114.84 | .69 | 1 | 66 | -21690.00 | 1594.04 | 1% |
| 13JUN80 | 812.00 | 114.60 | .69 | 1 | 66 | -20273.00 | 1594.28 | 1% |
| 26JUN80 | 1620.00 | 114.85 | .69 | 1 | 66 | -1065.00 | 1594.03 | 1% |
| 27JUN80 | 934.00 | 116.00 | 0.00 | 1 | 39 | -31.00 | 1593.71 | 13 BEFORE START PUMP. |
| | | | | | | | | PUMP Q=81K |
| 27JUN80 | 1008.00 | 168.50 | 0.00 | 1 | 39 | 3.00 | 1541.21 | 13 10 |
| | | | | | | | | NOTE 2.46 IN.RAIN IN 16 HRS. |
| 27JUN80 | 1010.00 | 170.50 | 0.00 | 1 | 13 | 5.00 | 1539.24 | 13 AVG FLOW 1500 GPM |
| 27JUN80 | 1014.00 | 173.41 | 0.00 | 1 | 13 | 9.00 | 1536.33 | 13 1500 GPM |
| 27JUN80 | 1025.00 | 177.17 | 0.00 | 1 | 36 | 20.00 | 1532.60 | 13 Q=71K |
| 27JUN80 | 1040.00 | 179.26 | 0.00 | 1 | 36 | 35.00 | 1530.51 | 13 Q=94K@ 1500 GPM |
| 27JUN80 | 1100.00 | 181.67 | 0.00 | 1 | 35 | 55.00 | 1528.09 | 13 Q=123K |
| 27JUN80 | 1200.00 | 184.41 | 0.00 | 1 | 35 | 115.00 | 1525.35 | 13 Q=223K |
| 27JUN80 | 1328.00 | 185.37 | 0.00 | 1 | 13 | 203.00 | 1524.37 | 13 Q=339K |
| 27JUN80 | 1423.00 | 185.79 | 0.00 | 1 | 13 | 258.00 | 1523.95 | 13 Q=420K |
| 27JUN80 | 1610.00 | 186.15 | 0.00 | 1 | 13 | 365.00 | 1523.59 | 13 Q=570K *TIME CORR. |
| 27JUN80 | 1642.00 | 186.30 | 0.00 | 1 | 13 | 397.00 | 1523.44 | 13 Q=621K |
| 27JUN80 | 1735.00 | 186.33 | 0.00 | 1 | 13 | 450.00 | 1523.41 | 13 Q=700K |
| 27JUN80 | 1912.00 | 186.39 | 0.00 | 1 | 13 | 547.00 | 1523.35 | 13 Q=837K |
| 27JUN80 | 2100.00 | 186.50 | 0.00 | 1 | 13 | 655.00 | 1523.24 | 13 Q=1000K |
| 27JUN80 | 2243.00 | 186.58 | 0.00 | 1 | 13 | 758.00 | 1523.16 | 13 Q=1144K |
| 28JUN80 | 5.00 | 186.57 | 0.00 | 1 | 13 | 840.00 | 1523.17 | 13 Q=1262K |
| 28JUN80 | 155.00 | 186.58 | 0.00 | 1 | 13 | 950.00 | 1523.16 | 13 Q=1418K |
| 28JUN80 | 536.00 | 186.67 | 0.00 | 1 | 13 | 1171.00 | 1523.07 | 13 Q=1737K |
| 28JUN80 | 800.00 | 186.78 | 0.00 | 1 | 13 | 1315.00 | 1522.96 | 13 Q=1946K |
| 28JUN80 | 1336.00 | 186.79 | 0.00 | 1 | 13 | 1651.00 | 1522.95 | 13 Q=2425K |
| 28JUN80 | 1622.00 | 186.81 | 0.00 | 1 | 13 | 1817.00 | 1522.93 | 13 Q=2666K |
| 28JUN80 | 1853.00 | 186.89 | 0.00 | 1 | 13 | 1968.00 | 1522.85 | 13 Q=2879K |
| 28JUN80 | 2354.00 | 186.90 | 0.00 | 1 | 13 | 2269.00 | 1522.84 | 13 Q=3310K |
| 29JUN80 | 845.00 | 186.97 | 0.00 | 1 | 13 | 2800.00 | 1522.77 | 13 Q=4070K AT 9 |
| 29JUN80 | 1555.00 | 187.17 | 0.00 | 1 | 13 | 3250.00 | 1522.57 | 13 Q=4703K |
| 30JUN80 | 34.00 | 187.44 | 0.00 | 1 | 13 | 3749.00 | 1522.30 | 13 Q=5434K |
| 30JUN80 | 815.00 | 186.69 | 0.00 | 1 | 13 | 4210.00 | 1523.05 | 13 |
| 30JUN80 | 1433.00 | 187.53 | 0.00 | 1 | 13 | 4588.00 | 1522.21 | 13 Q=6629K @1426GPM |

NOTE: Flow measurements indicated are at approximate time of measurement, more detailed data in Table B-2

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***TW41 ***

| DATE DDMONYY | TIME HHMM.SS | FIRST READING FEET | SECOND READING FEET | ALG | CON | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | COLLAR ELEV 1709.71 FEET PIEZO ELEV 0.00 -NULL- |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 30JUN80 | 1444.00 | 187.50 | 0.00 | 1 | 13 | 4599.00 | 1522.24 | 13 |
| 30JUN80 | 1523.00 | 187.49 | 0.00 | 1 | 13 | 4638.00 | 1522.25 | 13 |
| 01JUL80 | 745.00 | 187.57 | 0.00 | 1 | 13 | 5620.00 | 1522.17 | 13 Q=8112K |
| 01JUL80 | 1017.00 | 187.60 | 0.00 | 1 | 13 | 5772.00 | 1522.14 | 13 Q=8331K PUMP SHUTOFF |
| 01JUL80 | 1024.00 | 136.10 | 0.00 | 1 | 36 | 5779.00 | 1573.67 | 13 |
| 01JUL80 | 1029.00 | 132.48 | 0.00 | 1 | 35 | 5784.00 | 1577.28 | 13 |
| 01JUL80 | 1037.00 | 183.74 | 0.00 | 1 | 35 | 5792.00 | 1526.02 | 13 PUMP TURN ON |
| 01JUL80 | 1045.00 | 185.37 | 0.00 | 1 | 13 | 5800.00 | 1524.37 | 13 |
| 01JUL80 | 1103.00 | 186.60 | 0.00 | 1 | 13 | 5818.00 | 1523.14 | 13 |
| 01JUL80 | 1109.00 | 186.84 | 0.00 | 1 | 13 | 5824.00 | 1522.90 | 13 |
| 01JUL80 | 1119.00 | 187.06 | 0.00 | 1 | 13 | 5834.00 | 1522.68 | 13 Q=8412 K AT 11 |
| 01JUL80 | 1150.00 | 187.43 | 0.00 | 1 | 13 | 5865.00 | 1522.31 | 13 Q=8434K AT 12 |
| 01JUL80 | 1300.00 | 187.62 | 0.00 | 1 | 13 | 5935.00 | 1522.12 | 13 |
| 01JUL80 | 1457.00 | 187.67 | 0.00 | 1 | 13 | 6032.00 | 1522.07 | 13 |
| 01JUL80 | 1658.00 | 187.79 | 0.00 | 1 | 13 | 6173.00 | 1521.95 | 13 Q=8696K |
| 02JUL80 | 155.00 | 188.13 | 0.00 | 1 | 13 | 6710.00 | 1521.61 | 13 Q=9655K |
| 02JUL80 | 834.00 | 188.09 | 0.00 | 1 | 13 | 7109.00 | 1521.65 | 13 Q=10234K |
| 02JUL80 | 2113.00 | 188.00 | 0.00 | 1 | 13 | 7868.00 | 1521.74 | 13 Q=11315K |
| 03JUL80 | 858.00 | 188.04 | 0.00 | 1 | 13 | 8573.00 | 1521.70 | 13 Q=12325K |
| 03JUL80 | 2036.00 | 188.07 | 0.00 | 1 | 13 | 9271.00 | 1521.67 | 13 Q=13323K |
| 04JUL80 | 841.00 | 188.12 | 0.00 | 1 | 13 | 9996.00 | 1521.62 | 13 Q=14357K |
| 04JUL80 | 2032.00 | 188.06 | 0.00 | 1 | 13 | 10707.00 | 1521.68 | 13 Q=15374K |
| 05JUL80 | 806.00 | 188.19 | 0.00 | 1 | 13 | 11401.00 | 1521.55 | 13 Q=16362K |
| 05JUL80 | 2035.00 | 188.54 | 0.00 | 1 | 13 | 12150.00 | 1521.20 | 13 Q=17434K |
| 06JUL80 | 908.00 | 188.58 | 0.00 | 1 | 13 | 12903.00 | 1521.16 | 13 Q=18504K |
| 06JUL80 | 1748.00 | 188.40 | 0.00 | 1 | 13 | 13423.00 | 1521.34 | 13 Q=19247K |
| 07JUL80 | 744.00 | 188.38 | 0.00 | 1 | 13 | 14259.00 | 1521.36 | 13 Q=20435K |
| 07JUL80 | 1625.00 | 188.24 | 0.00 | 1 | 13 | 14780.00 | 1521.50 | 13 Q=21175K |
| 08JUL80 | 831.00 | 188.73 | 0.00 | 1 | 13 | 15746.00 | 1521.01 | 13 Q=22549K |
| 08JUL80 | 2056.00 | 188.72 | 0.00 | 1 | 13 | 16491.00 | 1521.02 | 13 Q=23609K |
| 09JUL80 | 842.00 | 188.78 | 0.00 | 1 | 13 | 17197.00 | 1520.96 | 13 Q=24615K |
| 09JUL80 | 1600.00 | 188.68 | 0.00 | 1 | 13 | 17635.00 | 1521.06 | 13 Q=25235K |
| 10JUL80 | 838.00 | 188.84 | 0.00 | 1 | 13 | 18633.00 | 1520.90 | 13 Q=26656K |
| 10JUL80 | 1718.00 | 188.75 | 0.00 | 1 | 13 | 19153.00 | 1520.99 | 13 Q=27395K |
| 11JUL80 | 848.00 | 188.95 | 0.00 | 1 | 13 | 20083.00 | 1520.79 | 13 Q=28710K |
| 11JUL80 | 1904.00 | 188.99 | 0.00 | 1 | 13 | 20699.00 | 1520.75 | 13 Q=29590K |
| 12JUL80 | 844.00 | 188.99 | 0.00 | 1 | 13 | 21519.00 | 1520.75 | 13 Q=30735K |
| 13JUL80 | 812.00 | 189.05 | 0.00 | 1 | 13 | 22927.00 | 1520.69 | 13 Q=32742K |
| 14JUL80 | 755.00 | 189.42 | 0.00 | 1 | 13 | 24350.00 | 1520.32 | 13 Q=34764K |

NOTE: Flow measurements indicated are at approximate time of measurement, more detailed data in Table B-2

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***TW41 ***

| DATE | TIME | FIRST READING | SECOND READING | A L G | C O N | TIME SINCE TEST BEGAN | WATER LEVEL ELEVATION | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| DDMONYY | HHMM.SS | FEET | FEET | | | MINUTES | FEET | COLLAR ELEV 1709.71 FEET PIEZO ELEV 0.00 -NULL- |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 14JUL80 | 820.00 | 141.23 | 0.00 | 1 | 37 | 24375.00 | 1568.60 | 13 |
| 14JUL80 | 821.00 | 139.81 | 0.00 | 1 | 36 | 24376.00 | 1569.96 | 13 |
| 14JUL80 | 823.00 | 138.08 | 0.00 | 1 | 36 | 24378.00 | 1571.69 | 13 |
| 14JUL80 | 828.00 | 134.59 | 0.00 | 1 | 35 | 24383.00 | 1575.17 | 13 |
| 14JUL80 | 834.00 | 131.78 | 0.00 | 1 | 35 | 24389.00 | 1577.98 | 13 |
| 14JUL80 | 847.00 | 128.72 | 0.00 | 1 | 34 | 24402.00 | 1581.01 | 13 |
| 14JUL80 | 858.00 | 174.30 | 0.00 | 1 | 13 | 24413.00 | 1555.44 | 13 PUMP TURN ~~ON~~ Off |
| 14JUL80 | 905.00 | 181.75 | 0.00 | 1 | 35 | 24420.00 | 1528.01 | 13 |
| 14JUL80 | 914.00 | 184.26 | 0.00 | 1 | 35 | 24429.00 | 1525.50 | 13 |
| 14JUL80 | 933.00 | 186.69 | 0.00 | 1 | 13 | 24448.00 | 1523.05 | 13 |
| 14JUL80 | 1048.00 | 188.89 | 0.00 | 1 | 13 | 24523.00 | 1520.85 | 13 PUMP TURN ~~OFF~~ On |
| 15JUL80 | 818.00 | 189.49 | 0.00 | 1 | 13 | 25813.00 | 1520.25 | 13 Q=36796K |
| 16JUL80 | 858.00 | 189.58 | 0.00 | 1 | 13 | 27293.00 | 1520.16 | 13 Q=38888K |
| 17JUL80 | 804.00 | 189.78 | 0.00 | 1 | 13 | 28679.00 | 1519.96 | 13 Q=40873K |
| 18JUL80 | 753.00 | 189.31 | 0.00 | 1 | 13 | 30108.00 | 1520.43 | 13 Q=42888K |
| 20JUL80 | 757.00 | 189.21 | 0.00 | 1 | 13 | 32992.00 | 1520.53 | 13 Q=46945K |
| 21JUL80 | 823.00 | 189.43 | 0.00 | 1 | 13 | 34458.00 | 1520.31 | 13 Q=49004K |
| 21JUL80 | 1045.00 | 127.92 | 0.00 | 1 | 34 | 34600.00 | 1581.81 | 13 PUMP OFF @ 10 |
| | | | | | | | | Q=49147692 GAL |
| 21JUL80 | 1057.00 | 126.74 | 0.00 | 1 | 34 | 34612.00 | 1582.99 | 13 |
| 21JUL80 | 1118.00 | 125.28 | 0.00 | 1 | 34 | 34633.00 | 1584.45 | 13 |
| 21JUL80 | 1141.00 | 124.29 | 0.00 | 1 | 33 | 34656.00 | 1585.39 | 13 |
| 21JUL80 | 1200.00 | 123.74 | 0.00 | 1 | 33 | 34675.00 | 1585.94 | 13 13 |
| 21JUL80 | 1247.00 | 122.91 | 0.00 | 1 | 33 | 34722.00 | 1586.77 | 13 |
| 21JUL80 | 1321.00 | 122.43 | 0.00 | 1 | 33 | 34756.00 | 1587.25 | 13 |
| 21JUL80 | 1346.00 | 122.21 | 0.00 | 1 | 33 | 34781.00 | 1587.47 | 13 |
| 21JUL80 | 1445.00 | 121.83 | 0.00 | 1 | 33 | 34840.00 | 1587.85 | 13 |
| 21JUL80 | 1619.00 | 121.47 | 0.00 | 1 | 33 | 34934.00 | 1588.21 | 13 |
| 21JUL80 | 1714.00 | 121.33 | 0.00 | 1 | 33 | 34989.00 | 1588.35 | 13 |
| 21JUL80 | 1827.00 | 121.18 | 0.00 | 1 | 33 | 35062.00 | 1588.50 | 13 |
| 21JUL80 | 1923.00 | 121.04 | 0.00 | 1 | 33 | 35118.00 | 1588.64 | 13 |
| 21JUL80 | 2020.00 | 120.99 | 0.00 | 1 | 33 | 35175.00 | 1588.69 | 13 |
| 21JUL80 | 2248.00 | 120.85 | 0.00 | 1 | 33 | 35323.00 | 1588.83 | 13 |
| 22JUL80 | 409.00 | 120.58 | 0.00 | 1 | 33 | 35644.00 | 1589.10 | 13 |
| 22JUL80 | 940.00 | 120.38 | 0.00 | 1 | 33 | 35975.00 | 1589.30 | 13 LAST READ FROM PVC |

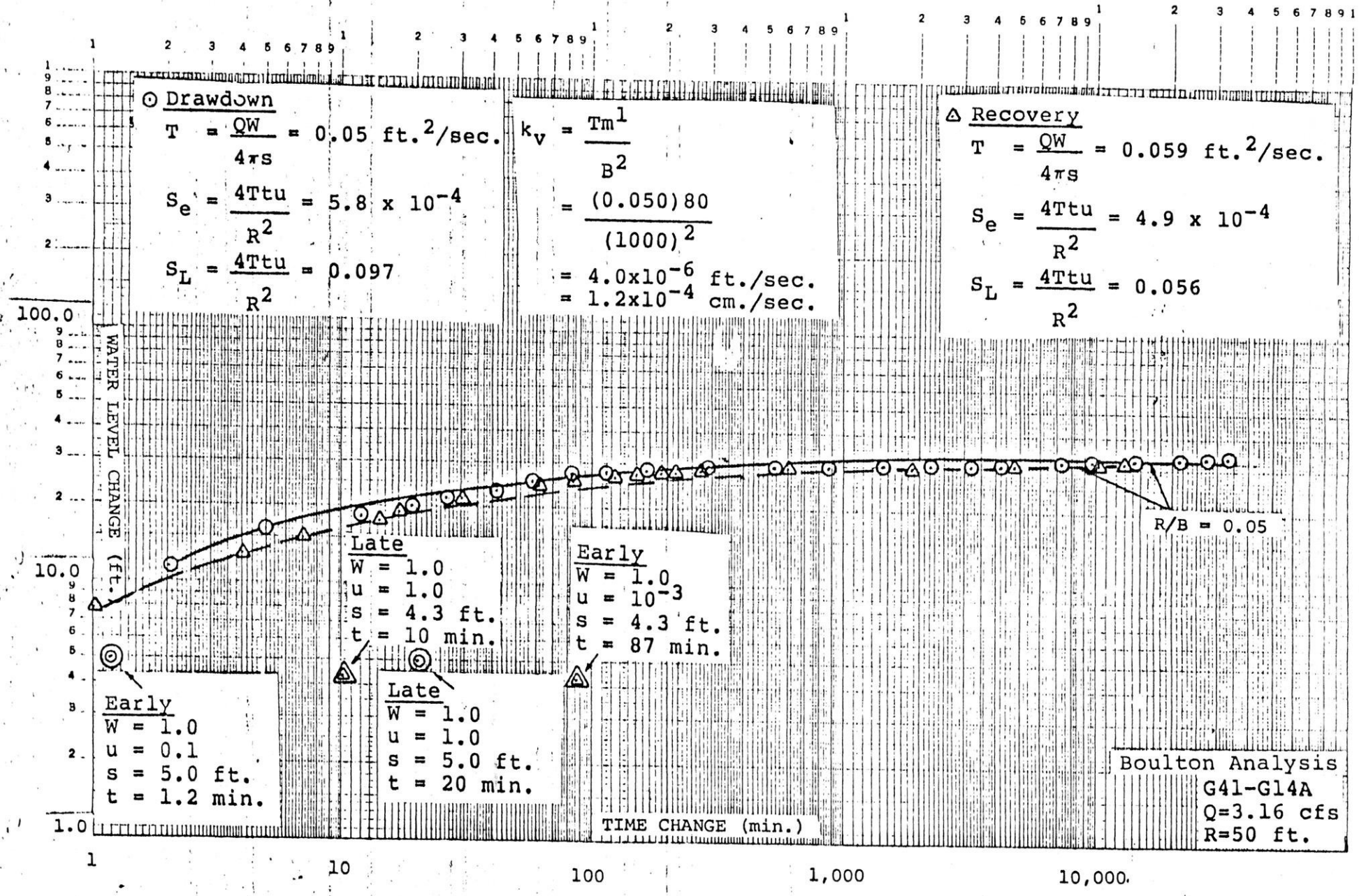
NOTE: Flow measurements indicated are at approximate time of measurement, more detailed data in Table B-2

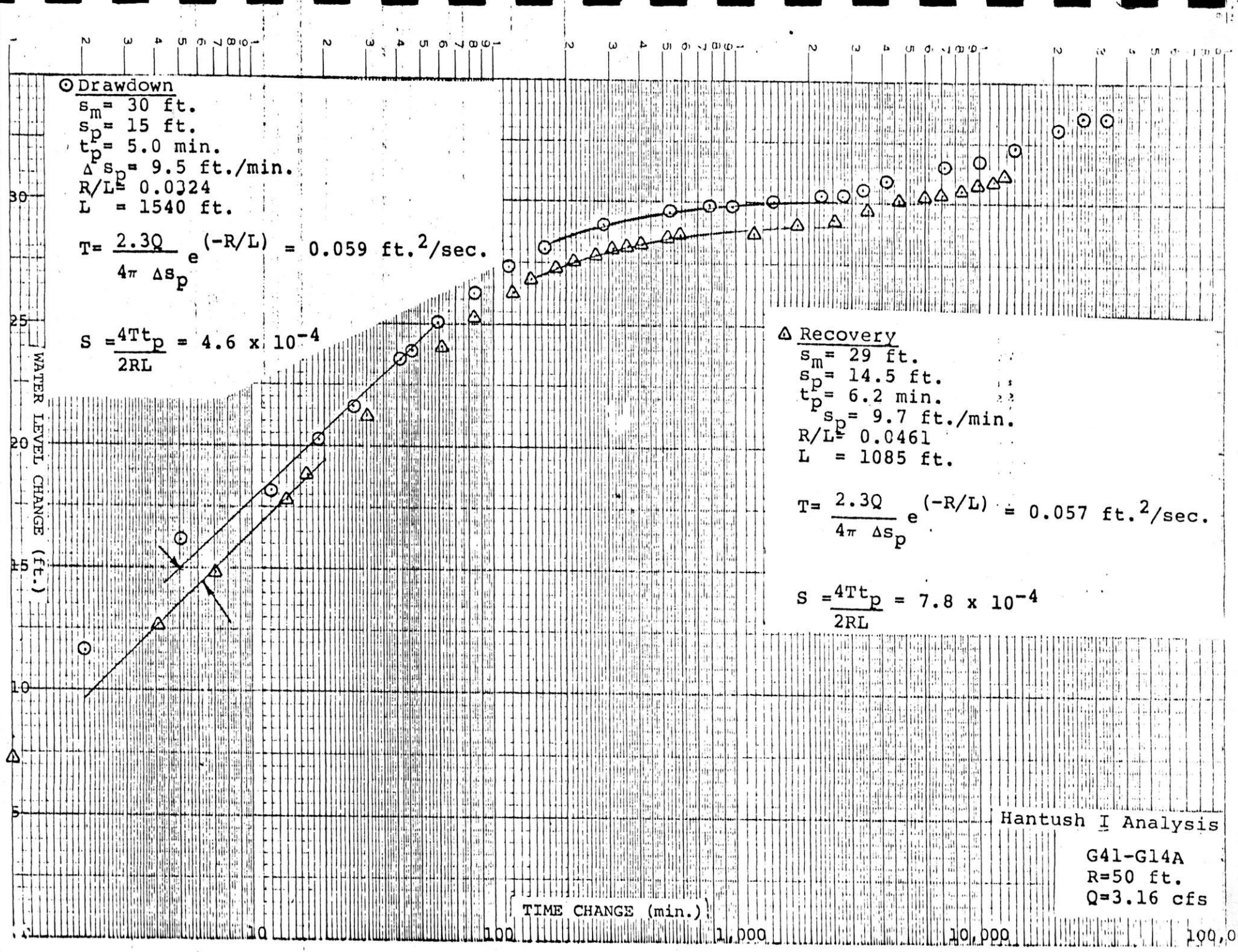
GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***TW41 ***

| DATE DDMONYY | TIME HHMM.SS | FIRST READING FEET | SECOND READING FEET | ALG | COM | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | COLLAR ELEV 1709.71 FEET PIEZO ELEV 0.00 -NULL- |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 22JUL80 | 942.00 | 119.78 | .69 | 1 | 39 | 35977.00 | 1589.24 | 13 TOP 12 INCH PIPE |
| 22JUL80 | 952.00 | 119.64 | .69 | 1 | 39 | 35987.00 | 1589.38 | 13 |
| 23JUL80 | 10.00 | 119.55 | .69 | 1 | 39 | 36845.00 | 1589.47 | 13 |
| 23JUL80 | 327.00 | 119.56 | .69 | 1 | 39 | 37042.00 | 1589.46 | 13 |
| 23JUL80 | 1105.00 | 119.34 | .69 | 1 | 39 | 37500.00 | 1589.68 | 13 |
| 23JUL80 | 1920.00 | 119.16 | .69 | 1 | 39 | 37995.00 | 1589.86 | 13 |
| 24JUL80 | 832.00 | 118.98 | .69 | 1 | 39 | 38787.00 | 1590.04 | 13 |
| 25JUL80 | 1000.00 | 118.55 | .98 | 1 | 21 | 40315.00 | 1590.31 | 1 TOP FINISHED WELL |
| 25JUL80 | 1521.00 | 118.23 | .98 | 1 | 67 | 40636.00 | 1590.35 | 14 |
| 26JUL80 | 747.00 | 118.16 | .98 | 1 | 67 | 41622.00 | 1590.42 | 14 |
| 26JUL80 | 748.00 | 120.57 | .98 | 1 | 95 | 41623.00 | 1590.34 | 15 |
| 27JUL80 | 1015.00 | 120.32 | .98 | 1 | 95 | 43210.00 | 1590.59 | 15 |
| 28JUL80 | 933.00 | 120.13 | .98 | 1 | 95 | 44606.00 | 1590.78 | 15 |
| 29JUL80 | 930.00 | 120.14 | .98 | 1 | 95 | 46045.00 | 1590.77 | 15 |
| 30JUL80 | 1055.00 | 120.00 | .98 | 1 | 95 | 47570.00 | 1590.91 | 15 |
| 31JUL80 | 1420.00 | 119.58 | .98 | 1 | 94 | 49215.00 | 1591.03 | 15 |
| 01AUG80 | 1210.00 | 119.60 | .98 | 1 | 94 | 50525.00 | 1591.01 | 15 |
| 03AUG80 | 845.00 | 119.33 | .98 | 1 | 94 | 53200.00 | 1591.28 | 15 |
| 05AUG80 | 1444.00 | 119.22 | .98 | 1 | 94 | 56439.00 | 1591.39 | 15 |
| 07AUG80 | 1446.00 | 119.15 | .98 | 1 | 94 | 59321.00 | 1591.46 | 15 |
| 09AUG80 | 1010.00 | 119.07 | .98 | 1 | 94 | 61925.00 | 1591.54 | 15 |
| 12AUG80 | 1400.00 | 119.04 | .98 | 1 | 94 | 66475.00 | 1591.57 | 15 |
| 14AUG80 | 1145.00 | 118.87 | .98 | 1 | 94 | 69220.00 | 1591.74 | 15 |
| 16AUG80 | 1133.00 | 118.87 | .98 | 1 | 94 | 72088.00 | 1591.74 | 15 |
| 20AUG80 | 1450.00 | 118.60 | .98 | 1 | 94 | 78045.00 | 1592.01 | 15 |
| 22AUG80 | 1324.00 | 118.87 | .98 | 1 | 94 | 80839.00 | 1591.74 | 15 |
| 02SEP80 | 958.00 | 118.53 | .98 | 1 | 94 | 96473.00 | 1592.08 | 15 |

NOTE: Flow measurements indicated are at approximate time of measurement, more detailed data in Table B-2


⊙ Drawdown
T = QW/4πs = 0.05 ft.²/sec.
S_e = 4Ttu/R² = 5.8 x 10⁻⁴
S_L = 4Ttu/R² = 0.097
k_v = Tm¹/B² = (0.050)80/(1000)²
= 4.0x10⁻⁶ ft./sec.
= 1.2x10⁻⁴ cm./sec.
△ Recovery
T = QW/4πs = 0.059 ft.²/sec.
S_e = 4Ttu/R² = 4.9 x 10⁻⁴
S_L = 4Ttu/R² = 0.056
R/B = 0.05
WATER LEVEL CHANGE (ft.)
100.0
10.0
1.0
Early
W = 1.0
u = 0.1
s = 5.0 ft.
t = 1.2 min.
Late
W = 1.0
u = 1.0
s = 4.3 ft.
t = 10 min.
Late
W = 1.0
u = 1.0
s = 5.0 ft.
t = 20 min.
Early
W = 1.0
u = 10⁻³
s = 4.3 ft.
t = 87 min.
TIME CHANGE (min.)
1
10
100
1,000
10,000
Boulton Analysis
G41-G14A
Q=3.16 cfs
R=50 ft.


LOGARITHMIC 5 CYCLES X 10 TO THE INCH
5TH LINES ACCENTED
WATER LEVEL CHANGE (ft.)
TIME CHANGE (min.)
30
25
20
15
10
5
10
100
1,000
10,000
100,000
⊙ Drawdown
$s_m$ = 30 ft.
$s_p$ = 15 ft.
$t_p$ = 5.0 min.
$\Delta s_p$ = 9.5 ft./min.
R/L = 0.0324
L = 1540 ft.
$T = \frac{2.3Q}{4\pi \Delta s_p} e^{(-R/L)}$ = 0.059 ft.²/sec.
$S = \frac{4Tt_p}{2RL}$ = 4.6 x $10^{-4}$
△ Recovery
$s_m$ = 29 ft.
$s_p$ = 14.5 ft.
$t_p$ = 6.2 min.
$s_p$ = 9.7 ft./min.
R/L = 0.0461
L = 1085 ft.
$T = \frac{2.3Q}{4\pi \Delta s_p} e^{(-R/L)}$ = 0.057 ft.²/sec.
$S = \frac{4Tt_p}{2RL}$ = 7.8 x $10^{-4}$
Hantush I Analysis
G41-G14A
R=50 ft.
Q=3.16 cfs

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14A ***

| DATE | TIME | FIRST READING | SECOND READING | A L G | C O N | TIME SINCE TEST BEGAN | WATER LEVEL ELEVATION | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| DDMONYY | HHMM.SS | FEET | FEET | | | MINUTES | FEET | COLLAR ELEV 1708.62 FEET PIEZO ELEV 0.00 -NULL- |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 04DEC79 | 1200.00 | 113.80 | 0.00 | 1 | 20 | -296525.00 | 1594.82 | GROUND SURFACE-CORR. TO |
| 12FEB80 | 1410.00 | 114.07 | 0.00 | 1 | 20 | -195595.00 | 1594.55 | BY D&M |
| 25APR80 | 1200.00 | 114.60 | .14 | 1 | 14 | -90605.00 | 1593.88 | 14 - TIME NOT RECORD |
| 15MAY80 | 950.00 | 114.87 | 0.00 | 1 | 20 | -61935.00 | 1593.75 | 20 D&M |
| 20MAY80 | 600.00 | 114.54 | 0.00 | 1 | 66 | -54965.00 | 1593.94 | 4 14 |
| 21MAY80 | 1200.00 | 114.56 | 0.00 | 1 | 1 | -53165.00 | 1594.17 | 1 - NO TIME |
| 29MAY80 | 930.00 | 114.53 | 0.00 | 1 | 21 | -41795.00 | 1594.22 | 4 1 -REV. CIR. |
| 30MAY80 | 1730.00 | 114.41 | 0.00 | 1 | 1 | -39875.00 | 1594.32 | 4 1 -REV. CIR. |
| 31MAY80 | 20.00 | 113.74 | 0.00 | 1 | 1 | -39465.00 | 1594.99 | 4 1 -REV. CIR. |
| 31MAY80 | 945.00 | 114.36 | 0.00 | 1 | 1 | -38900.00 | 1594.37 | 4 1 SET CASE |
| 01JUN80 | 600.00 | 114.36 | 0.00 | 1 | 1 | -37685.00 | 1594.37 | 4 1 SET CASE |
| 01JUN80 | 1525.00 | 114.34 | 0.00 | 1 | 1 | -37120.00 | 1594.39 | 4 1 GRAVEL |
| 02JUN80 | 830.00 | 114.22 | 0.00 | 1 | 1 | -36095.00 | 1594.51 | 4 1 |
| 03JUN80 | 915.00 | 114.55 | 0.00 | 1 | 1 | -34610.00 | 1594.18 | 4 1 |
| 04JUN80 | 135.00 | 115.23 | 0.00 | 1 | 1 | -33630.00 | 1593.50 | 4 1 AIR DEV. |
| 06JUN80 | 922.00 | 116.44 | 0.00 | 1 | 21 | -30283.00 | 1592.31 | 4 1 |
| 06JUN80 | 1010.00 | 119.00 | 0.00 | 1 | 21 | -30235.00 | 1589.75 | 1 PUMP SED. FROM WELL |
| 06JUN80 | 1012.00 | 119.06 | 0.00 | 1 | 21 | -30233.00 | 1589.69 | 1 PUMP SED. FROM WELL |
| 06JUN80 | 1015.00 | 119.14 | 0.00 | 1 | 21 | -30230.00 | 1589.61 | 1 " |
| 06JUN80 | 1020.00 | 119.20 | 0.00 | 1 | 21 | -30225.00 | 1589.55 | 1 " |
| 06JUN80 | 1025.00 | 119.28 | 0.00 | 1 | 21 | -30220.00 | 1589.47 | 1 " |
| 06JUN80 | 1030.00 | 119.34 | 0.00 | 1 | 21 | -30215.00 | 1589.41 | 1 PUMP SED. FROM WELL |
| 06JUN80 | 1033.00 | 118.26 | 0.00 | 1 | 21 | -30212.00 | 1590.49 | 4 1 |
| 06JUN80 | 1034.00 | 117.64 | 0.00 | 1 | 21 | -30211.00 | 1591.11 | 4 1 |
| 06JUN80 | 1036.00 | 117.24 | 0.00 | 1 | 21 | -30209.00 | 1591.51 | 4 1 |
| 06JUN80 | 1037.00 | 117.17 | 0.00 | 1 | 21 | -30208.00 | 1591.58 | 4 1 |
| 06JUN80 | 1038.00 | 116.80 | 0.00 | 1 | 21 | -30207.00 | 1591.95 | 4 1 |
| 06JUN80 | 1039.00 | 116.61 | 0.00 | 1 | 21 | -30206.00 | 1592.14 | 4 1 |
| 06JUN80 | 1040.00 | 116.47 | 0.00 | 1 | 21 | -30205.00 | 1592.28 | 4 1 |
| 06JUN80 | 1041.00 | 116.38 | 0.00 | 1 | 21 | -30204.00 | 1592.37 | 4 1 |
| 06JUN80 | 1042.00 | 116.27 | 0.00 | 1 | 21 | -30203.00 | 1592.48 | 4 1 |
| 06JUN80 | 1043.00 | 116.21 | 0.00 | 1 | 21 | -30202.00 | 1592.54 | 4 1 |
| 06JUN80 | 1044.00 | 116.12 | 0.00 | 1 | 21 | -30201.00 | 1592.63 | 4 1 |
| 06JUN80 | 1045.00 | 116.08 | 0.00 | 1 | 21 | -30200.00 | 1592.67 | 4 1 |
| 06JUN80 | 1046.00 | 116.01 | 0.00 | 1 | 21 | -30199.00 | 1592.74 | 4 1 |
| 06JUN80 | 1047.00 | 115.91 | 0.00 | 1 | 21 | -30198.00 | 1592.84 | 4 1 |
| 06JUN80 | 1048.00 | 116.01 | 0.00 | 1 | 21 | -30197.00 | 1592.74 | 4 1 |
| 06JUN80 | 1049.00 | 115.91 | 0.00 | 1 | 21 | -30196.00 | 1592.84 | 4 1 |
| 06JUN80 | 1050.00 | 115.88 | 0.00 | 1 | 21 | -30195.00 | 1592.87 | 4 1 |
| 06JUN80 | 1056.00 | 115.56 | 0.00 | 1 | 21 | -30189.00 | 1593.19 | 4 1 |
| 06JUN80 | 1100.00 | 115.47 | 0.00 | 1 | 21 | -30185.00 | 1593.28 | 4 1 |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14A ***

| DATE | TIME | FIRST READING | SECOND READING | A L G | C O N | TIME SINCE TEST BEGAN | WATER LEVEL ELEVATION | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| DD*ONYY | HHMM.SS | FEET | FEET | | | MINUTES | FEET | |
| | | | | | | | | COLLAR ELEV 1708.62 FEET PIEZO ELEV 0.00 -NULL |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 06JUN80 | 1141.00 | 114.90 | 0.00 | 1 | 1 | -30144.00 | 1593.83 | 4 1 |
| 06JUN80 | 1257.00 | 114.81 | 0.00 | 1 | 1 | -30068.00 | 1593.92 | 4 1 |
| 06JUN80 | 1624.00 | 122.00 | 0.00 | 1 | 22 | -29861.00 | 1586.78 | 4 1 VEL TEST START |
| | | | | | | | | AT 16 |
| 06JUN80 | 1630.00 | 122.21 | 0.00 | 1 | 22 | -29855.00 | 1586.57 | 4 1 VEL TEST |
| 06JUN80 | 1644.00 | 122.45 | 0.00 | 1 | 22 | -29841.00 | 1586.33 | 4 1 VEL TEST |
| 06JUN80 | 1700.00 | 116.54 | 0.00 | 1 | 21 | -29825.00 | 1592.21 | 4 1 VEL TEST |
| 06JUN80 | 1840.00 | 117.71 | 0.00 | 1 | 21 | -29725.00 | 1591.04 | 4 1 VEL TEST |
| 07JUN80 | 930.00 | 114.58 | 0.00 | 1 | 1 | -28835.00 | 1594.15 | 4 1 |
| 08JUN80 | 830.00 | 114.88 | 0.00 | 1 | 1 | -27905.00 | 1593.85 | 4 1 |
| 09JUN80 | 800.00 | 114.50 | 0.00 | 1 | 1 | -26045.00 | 1594.23 | 4 1 |
| 10JUN80 | 835.00 | 114.75 | 0.00 | 1 | 1 | -24570.00 | 1593.98 | 4 1 |
| 11JUN80 | 845.00 | 114.83 | 0.00 | 1 | 1 | -23120.00 | 1593.90 | 4 1 |
| 12JUN80 | 840.00 | 114.71 | 0.00 | 1 | 1 | -21685.00 | 1594.02 | 4 1 |
| 13JUN80 | 815.00 | 114.50 | 0.00 | 1 | 1 | -20270.00 | 1594.23 | 4 1 |
| 13JUN80 | 2115.00 | 114.46 | 0.00 | 1 | 21 | -19490.00 | 1594.29 | 4 1 DIFF. RULE |
| 14JUN80 | 815.00 | 114.53 | 0.00 | 1 | 1 | -18830.00 | 1594.20 | 4 1 |
| 14JUN80 | 1745.00 | 114.51 | 0.00 | 1 | 1 | -18260.00 | 1594.22 | 4 1 |
| 15JUN80 | 820.00 | 114.65 | 0.00 | 1 | 1 | -17385.00 | 1594.08 | 4 1 |
| 16JUN80 | 805.00 | 114.81 | 0.00 | 1 | 1 | -15960.00 | 1593.92 | 4 1 |
| 24JUN80 | 820.00 | 114.72 | 0.00 | 1 | 1 | -4425.00 | 1594.01 | 4 1 |
| 25JUN80 | 815.00 | 114.69 | 0.00 | 1 | 1 | -2990.00 | 1594.04 | 4 1 |
| 26JUN80 | 840.00 | 114.63 | 0.00 | 1 | 1 | -1525.00 | 1594.10 | 4 1 |
| 27JUN80 | 800.00 | 114.82 | 0.00 | 1 | 1 | -125.00 | 1593.91 | 1 1 BEFORE TEST |
| 27JUN80 | 1007.00 | 126.47 | 0.00 | 1 | 23 | 2.00 | 1582.29 | 1 1 |
| 27JUN80 | 1012.00 | 131.05 | 0.00 | 1 | 23 | 7.00 | 1577.71 | 1 1 |
| 27JUN80 | 1017.00 | 133.10 | 0.00 | 1 | 23 | 12.00 | 1575.66 | 1 1 |
| 27JUN80 | 1024.00 | 135.13 | 0.00 | 1 | 22 | 19.00 | 1573.65 | 1 1 |
| 27JUN80 | 1031.00 | 136.49 | 0.00 | 1 | 22 | 26.00 | 1572.29 | 1 1 START @ 10 |
| 27JUN80 | 1046.00 | 138.40 | 0.00 | 1 | 22 | 41.00 | 1570.38 | 1 1 |
| 27JUN80 | 1051.00 | 138.84 | 0.00 | 1 | 22 | 46.00 | 1569.94 | 1 1 |
| 27JUN80 | 1057.00 | 139.45 | 0.00 | 1 | 22 | 52.00 | 1569.33 | 1 1 |
| 27JUN80 | 1103.00 | 139.98 | 0.00 | 1 | 22 | 58.00 | 1568.80 | 1 1 |
| 27JUN80 | 1113.00 | 140.58 | 0.00 | 1 | 24 | 68.00 | 1568.19 | 1 1 |
| 27JUN80 | 1128.00 | 141.24 | 0.00 | 1 | 24 | 83.00 | 1567.53 | 1 1 |
| 27JUN80 | 1145.00 | 141.86 | 0.00 | 1 | 24 | 100.00 | 1566.91 | 1 1 |
| 27JUN80 | 1200.00 | 142.29 | 0.00 | 1 | 24 | 115.00 | 1566.48 | 1 1 |
| 27JUN80 | 1218.00 | 142.58 | 0.00 | 1 | 24 | 133.00 | 1566.19 | 1 1 |
| 27JUN80 | 1247.00 | 143.05 | 0.00 | 1 | 24 | 162.00 | 1565.72 | 1 1 |
| 27JUN80 | 1316.00 | 143.39 | 0.00 | 1 | 24 | 191.00 | 1565.38 | 1 1 |
| 27JUN80 | 1354.00 | 143.75 | 0.00 | 1 | 24 | 229.00 | 1565.02 | 1 1 |
| 27JUN80 | 1453.00 | 143.98 | 0.00 | 1 | 24 | 288.00 | 1564.79 | 1 1 |
| 27JUN80 | 1527.00 | 144.19 | 0.00 | 1 | 24 | 322.00 | 1564.58 | 1 1 TIME CORRECTED |
| 27JUN80 | 1652.00 | 144.28 | 0.00 | 1 | 24 | 407.00 | 1564.49 | 1 1 |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14A ***

| DATE | TIME | FIRST READING | SECOND READING | A L G | C O N | TIME SINCE TEST BEGAN | WATER LEVEL ELEVATION | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| DDMONYY | HHMM.SS | FEET | FEET | | | MINUTES | FEET | |
| 27JUN80 | 1737.00 | 144.32 | 0.00 | 1 | 24 | 452.00 | 1564.45 | 1 1 |
| 27JUN80 | 1856.00 | 144.46 | 0.00 | 1 | 24 | 531.00 | 1564.31 | 1 1 |
| 27JUN80 | 1927.00 | 144.42 | 0.00 | 1 | 24 | 562.00 | 1564.35 | 1 1 |
| 27JUN80 | 2039.00 | 144.59 | 0.00 | 1 | 24 | 634.00 | 1564.18 | 1 1 |
| 27JUN80 | 2135.00 | 144.60 | 0.00 | 1 | 24 | 690.00 | 1564.17 | 1 1 |
| 27JUN80 | 2302.00 | 144.64 | 0.00 | 1 | 24 | 777.00 | 1564.13 | 1 1 |
| 28JUN80 | 30.00 | 144.75 | 0.00 | 1 | 24 | 865.00 | 1564.02 | 1 1 |
| 28JUN80 | 220.00 | 144.67 | 0.00 | 1 | 24 | 975.00 | 1564.10 | 1 1 |
| 28JUN80 | 532.00 | 144.78 | 0.00 | 1 | 24 | 1167.00 | 1563.99 | 1 1 |
| 28JUN80 | 736.00 | 144.98 | 0.00 | 1 | 24 | 1291.00 | 1563.79 | 1 1 |
| 28JUN80 | 1007.00 | 144.91 | 0.00 | 1 | 24 | 1442.00 | 1563.86 | 1 1 |
| 28JUN80 | 1215.00 | 144.98 | 0.00 | 1 | 24 | 1570.00 | 1563.79 | 1 1 |
| 28JUN80 | 1505.00 | 145.00 | 0.00 | 1 | 21 | 1740.00 | 1563.75 | 1 1 |
| 28JUN80 | 1805.00 | 145.05 | 0.00 | 1 | 21 | 1920.00 | 1563.70 | 1 1 |
| 28JUN80 | 2327.00 | 145.12 | 0.00 | 1 | 21 | 2242.00 | 1563.63 | 1 1 |
| 29JUN80 | 816.00 | 145.23 | 0.00 | 1 | 21 | 2771.00 | 1563.52 | 1 1 |
| 29JUN80 | 1557.00 | 145.44 | 0.00 | 1 | 24 | 3232.00 | 1563.33 | 4 1 |
| 30JUN80 | 37.00 | 145.68 | 0.00 | 1 | 24 | 3752.00 | 1563.09 | 1 1 |
| 30JUN80 | 826.00 | 145.48 | 0.00 | 1 | 21 | 4221.00 | 1563.27 | 1 1 |
| 30JUN80 | 1527.00 | 145.79 | 0.00 | 1 | 21 | 4642.00 | 1562.96 | 1 1 |
| 01JUL80 | 759.00 | 145.82 | 0.00 | 1 | 21 | 5634.00 | 1562.93 | 1 1 |
| 01JUL80 | 1015.00 | 145.88 | 0.00 | 1 | 21 | 5770.00 | 1562.87 | 1 1 |
| 01JUL80 | 1020.00 | 144.20 | 0.00 | 1 | 21 | 5775.00 | 1564.55 | 1 1 STOP PUMP-OIL |
| 01JUL80 | 1025.00 | 131.63 | 0.00 | 1 | 23 | 5780.00 | 1577.13 | 1 1 STOP PUMP-OIL |
| 01JUL80 | 1030.00 | 129.48 | 0.00 | 1 | 23 | 5785.00 | 1579.28 | 1 1 RESTART PUMP |
| 01JUL80 | 1033.00 | 140.31 | 0.00 | 1 | 24 | 5788.00 | 1568.46 | 1 1 |
| 01JUL80 | 1039.00 | 142.75 | 0.00 | 1 | 24 | 5794.00 | 1566.02 | 1 1 |
| 01JUL80 | 1042.00 | 143.38 | 0.00 | 1 | 24 | 5797.00 | 1565.39 | 1 1 |
| 01JUL80 | 1046.00 | 143.90 | 0.00 | 1 | 24 | 5801.00 | 1564.87 | 1 1 |
| 01JUL80 | 1100.00 | 144.80 | 0.00 | 1 | 24 | 5815.00 | 1563.97 | 1 1 |
| 01JUL80 | 1105.00 | 144.96 | 0.00 | 1 | 24 | 5820.00 | 1563.81 | 1 1 |
| 01JUL80 | 1111.00 | 145.11 | 0.00 | 1 | 21 | 5826.00 | 1563.64 | 1 1 |
| 01JUL80 | 1120.00 | 145.31 | 0.00 | 1 | 21 | 5835.00 | 1563.44 | 1 1 |
| 01JUL80 | 1151.00 | 145.67 | 0.00 | 1 | 21 | 5866.00 | 1563.08 | 1 1 |
| 01JUL80 | 1302.00 | 145.91 | 0.00 | 1 | 21 | 5937.00 | 1562.84 | 1 1 |
| 01JUL80 | 1438.00 | 146.03 | 0.00 | 1 | 21 | 6033.00 | 1562.72 | 1 1 |
| 01JUL80 | 1505.00 | 146.14 | 0.00 | 1 | 21 | 6060.00 | 1562.61 | 1 1 |
| 01JUL80 | 1708.00 | 146.10 | 0.00 | 1 | 21 | 6183.00 | 1562.65 | 1 1 |
| 02JUL80 | 158.00 | 146.58 | 0.00 | 1 | 21 | 6713.00 | 1562.17 | 1 1 |
| 02JUL80 | 837.00 | 146.38 | 0.00 | 1 | 21 | 7112.00 | 1562.37 | 1 1 |

COLLAR ELEV 1708.62 FEET PIEZO ELEV 0.00 -NULL
TIME PUMP TEST BEGAN = 27JUN80-1005.00

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14A ***

| DATE DDMONYY | TIME HHMM.SS | FIRST READING FEET | SECOND READING FEET | A L G | C O N | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | COLLAR ELEV 1708.62 FEET PIEZO ELEV 0.00 -NULL |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 02JUL80 | 1306.00 | 146.12 | .14 | 1 | 14 | 7381.00 | 1562.36 | 16 14 COMPARE PIEZ. |
| 02JUL80 | 1307.00 | 146.38 | 0.00 | 1 | 21 | 7382.00 | 1562.37 | 1 1 COMPARE PIEZ. |
| 02JUL80 | 2113.00 | 146.36 | 0.00 | 1 | 21 | 7868.00 | 1562.39 | 1 1 |
| 03JUL80 | 901.00 | 146.38 | 0.00 | 1 | 21 | 8576.00 | 1562.37 | 1 1 |
| 03JUL80 | 2050.00 | 146.41 | 0.00 | 1 | 21 | 9285.00 | 1562.34 | 1 1 |
| 04JUL80 | 843.00 | 146.55 | 0.00 | 1 | 21 | 9998.00 | 1562.20 | 1 1 |
| 04JUL80 | 2049.00 | 146.46 | 0.00 | 1 | 21 | 10724.00 | 1562.29 | 1 1 |
| 05JUL80 | 818.00 | 146.62 | 0.00 | 1 | 21 | 11413.00 | 1562.13 | 1 1 |
| 05JUL80 | 2041.00 | 146.92 | 0.00 | 1 | 21 | 12156.00 | 1561.83 | 1 1 |
| 06JUL80 | 910.00 | 147.05 | 0.00 | 1 | 21 | 12905.00 | 1561.70 | 1 1 |
| 06JUL80 | 1746.00 | 146.94 | 0.00 | 1 | 21 | 13421.00 | 1561.81 | 1 1 |
| 07JUL80 | 747.00 | 146.88 | 0.00 | 1 | 21 | 14262.00 | 1561.87 | 1 1 |
| 07JUL80 | 1633.00 | 146.83 | 0.00 | 1 | 21 | 14788.00 | 1561.92 | 1 1 |
| 08JUL80 | 833.00 | 147.23 | 0.00 | 1 | 21 | 15748.00 | 1561.52 | 1 1 |
| 08JUL80 | 2058.00 | 147.25 | 0.00 | 1 | 21 | 16493.00 | 1561.50 | 1 1 |
| 09JUL80 | 850.00 | 147.33 | 0.00 | 1 | 21 | 17205.00 | 1561.42 | 1 1 |
| 09JUL80 | 1601.00 | 147.28 | 0.00 | 1 | 21 | 17636.00 | 1561.47 | 1 1 |
| 10JUL80 | 841.00 | 147.43 | 0.00 | 1 | 21 | 18636.00 | 1561.32 | 1 1 |
| 10JUL80 | 1740.00 | 147.41 | 0.00 | 1 | 21 | 19175.00 | 1561.34 | 1 1 |
| 11JUL80 | 913.00 | 147.60 | 0.00 | 1 | 21 | 20108.00 | 1561.15 | 1 1 |
| 11JUL80 | 1908.00 | 147.61 | 0.00 | 1 | 21 | 20703.00 | 1561.14 | 1 1 |
| 12JUL80 | 850.00 | 147.69 | 0.00 | 1 | 21 | 21525.00 | 1561.06 | 1 1 |
| 13JUL80 | 818.00 | 147.86 | 0.00 | 1 | 21 | 22933.00 | 1560.89 | 1 1 |
| 14JUL80 | 756.00 | 147.95 | 0.00 | 1 | 21 | 24351.00 | 1560.80 | 1 1 |
| 14JUL80 | 824.00 | 133.57 | 0.00 | 1 | 23 | 24379.00 | 1575.19 | 1 1 PUMP OFF-OIL |
| 14JUL80 | 829.00 | 131.00 | 0.00 | 1 | 23 | 24384.00 | 1577.76 | 1 1 |
| 14JUL80 | 849.00 | 126.45 | 0.00 | 1 | 23 | 24404.00 | 1582.31 | 1 1 |
| 14JUL80 | 900.00 | 138.08 | 0.00 | 1 | 22 | 24415.00 | 1570.70 | 1 1 PUMP ON |
| 14JUL80 | 907.00 | 141.71 | 0.00 | 1 | 24 | 24422.00 | 1567.06 | 1 1 |
| 14JUL80 | 915.00 | 143.42 | 0.00 | 1 | 24 | 24430.00 | 1565.35 | 1 1 |
| 14JUL80 | 934.00 | 145.47 | 0.00 | 1 | 21 | 24449.00 | 1563.28 | 1 1 |
| 14JUL80 | 1052.00 | 147.48 | 0.00 | 1 | 21 | 24527.00 | 1561.27 | 1 1 |
| 15JUL80 | 824.00 | 149.16 | 0.00 | 1 | 21 | 25819.00 | 1560.59 | 1 1 |
| 16JUL80 | 803.00 | 148.30 | 0.00 | 1 | 21 | 27298.00 | 1560.45 | 1 1 |
| 17JUL80 | 808.00 | 148.50 | 0.00 | 1 | 21 | 28683.00 | 1560.25 | 1 1 |
| 18JUL80 | 756.00 | 148.38 | 0.00 | 1 | 21 | 30111.00 | 1560.37 | 1 1 |
| 20JUL80 | 801.00 | 148.38 | 0.00 | 1 | 21 | 32996.00 | 1560.37 | 1 1 |
| 21JUL80 | 824.00 | 148.62 | 0.00 | 1 | 21 | 34459.00 | 1560.13 | 1 1 |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.25.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
** PIEZOMETER/WELL IDENTIFIER ***G14A ***

| DATE DDMONYY | TIME HHMM.SS | FIRST READING FEET | SECOND READING FEET | A L G | C O N | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET |
|---|---|---|---|---|---|---|---|
| 21JUL80 | 1006.00 | 140.92 | 0.00 | 1 | 24 | 34561.00 | 1567.85 |
| 21JUL80 | 1009.00 | 135.90 | 0.00 | 1 | 22 | 34564.00 | 1572.88 |
| 21JUL80 | 1012.00 | 133.76 | 0.00 | 1 | 23 | 34567.00 | 1575.00 |
| 21JUL80 | 1019.00 | 130.85 | 0.00 | 1 | 23 | 34574.00 | 1577.91 |
| 21JUL80 | 1022.00 | 129.79 | 0.00 | 1 | 23 | 34577.00 | 1578.97 |
| 21JUL80 | 1025.00 | 129.14 | 0.00 | 1 | 23 | 34580.00 | 1579.62 |
| 21JUL80 | 1032.00 | 127.88 | 0.00 | 1 | 23 | 34587.00 | 1580.88 |
| 21JUL80 | 1035.00 | 127.35 | 0.00 | 1 | 23 | 34590.00 | 1581.41 |
| 21JUL80 | 1038.00 | 127.03 | 0.00 | 1 | 23 | 34593.00 | 1581.73 |
| 21JUL80 | 1041.00 | 126.66 | 0.00 | 1 | 23 | 34596.00 | 1582.10 |
| 21JUL80 | 1047.00 | 125.97 | 0.00 | 1 | 23 | 34602.00 | 1582.79 |
| 21JUL80 | 1051.00 | 125.61 | 0.00 | 1 | 23 | 34606.00 | 1583.15 |
| 21JUL80 | 1059.00 | 125.00 | 0.00 | 1 | 23 | 34614.00 | 1583.76 |
| 21JUL80 | 1106.00 | 124.55 | 0.00 | 1 | 22 | 34621.00 | 1584.23 |
| 21JUL80 | 1112.00 | 124.10 | 0.00 | 1 | 22 | 34627.00 | 1584.68 |
| 21JUL80 | 1119.00 | 123.79 | 0.00 | 1 | 22 | 34634.00 | 1584.99 |
| 21JUL80 | 1123.00 | 123.63 | 0.00 | 1 | 22 | 34638.00 | 1585.15 |
| 21JUL80 | 1129.00 | 123.36 | 0.00 | 1 | 22 | 34644.00 | 1585.42 |
| 21JUL80 | 1133.00 | 123.24 | 0.00 | 1 | 22 | 34648.00 | 1585.54 |
| 21JUL80 | 1137.00 | 123.05 | 0.00 | 1 | 22 | 34652.00 | 1585.73 |
| 21JUL80 | 1143.00 | 122.91 | 0.00 | 1 | 22 | 34658.00 | 1585.87 |
| 21JUL80 | 1147.00 | 122.80 | 0.00 | 1 | 22 | 34662.00 | 1585.98 |
| 21JUL80 | 1151.00 | 122.64 | 0.00 | 1 | 22 | 34666.00 | 1586.14 |
| 21JUL80 | 1154.00 | 122.51 | 0.00 | 1 | 22 | 34669.00 | 1586.27 |
| 21JUL80 | 1201.00 | 122.43 | 0.00 | 1 | 22 | 34676.00 | 1586.35 |
| 21JUL80 | 1206.00 | 122.31 | 0.00 | 1 | 22 | 34681.00 | 1586.47 |
| 21JUL80 | 1212.00 | 122.19 | 0.00 | 1 | 22 | 34687.00 | 1586.59 |
| 21JUL80 | 1234.00 | 121.80 | 0.00 | 1 | 22 | 34709.00 | 1586.98 |
| 21JUL80 | 1253.00 | 121.52 | 0.00 | 1 | 22 | 34728.00 | 1587.26 |
| 21JUL80 | 1309.00 | 121.37 | 0.00 | 1 | 22 | 34744.00 | 1587.41 |
| 21JUL80 | 1324.00 | 121.24 | 0.00 | 1 | 22 | 34759.00 | 1587.54 |
| 21JUL80 | 1342.00 | 121.10 | 0.00 | 1 | 22 | 34777.00 | 1587.68 |
| 21JUL80 | 1358.00 | 121.02 | 0.00 | 1 | 22 | 34793.00 | 1587.76 |
| 21JUL80 | 1431.00 | 120.79 | 0.00 | 1 | 22 | 34826.00 | 1587.99 |
| 21JUL80 | 1459.00 | 120.65 | 0.00 | 1 | 22 | 34854.00 | 1588.13 |
| 21JUL80 | 1533.00 | 120.55 | 0.00 | 1 | 22 | 34888.00 | 1588.23 |
| 21JUL80 | 1605.00 | 120.47 | 0.00 | 1 | 22 | 34920.00 | 1588.31 |
| 21JUL80 | 1700.00 | 120.33 | 0.00 | 1 | 22 | 34975.00 | 1588.45 |
| 21JUL80 | 1812.00 | 120.16 | 0.00 | 1 | 22 | 35047.00 | 1588.62 |
| 21JUL80 | 1907.00 | 120.07 | 0.00 | 1 | 22 | 35102.00 | 1588.71 |
| 21JUL80 | 2000.00 | 120.02 | 0.00 | 1 | 22 | 35155.00 | 1588.76 |

**COMMENTS**

COLLAR ELEV 1708.62 FEET PIEZO ELEV 0.00 -NULL-
TIME PUMP TEST BEGAN = 27JUN80-1005.00

1 1 RECOVERY @ 10

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14A ***

| DATE DDMONYY | TIME HHMM.SS | FIRST READING FEET | SECOND READING FEET | ALG | CON | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET |
|---|---|---|---|---|---|---|---|
| 21JUL80 | 2118.00 | 119.91 | 0.00 | 1 | 21 | 35233.00 | 1588.84 |
| 21JUL80 | 2226.00 | 119.85 | 0.00 | 1 | 21 | 35301.00 | 1588.90 |
| 22JUL80 | 103.00 | 119.76 | 0.00 | 1 | 21 | 35458.00 | 1588.99 |
| 22JUL80 | 225.00 | 119.69 | 0.00 | 1 | 21 | 35540.00 | 1589.06 |
| 22JUL80 | 410.00 | 119.63 | 0.00 | 1 | 21 | 35645.00 | 1589.12 |
| 22JUL80 | 837.00 | 119.46 | 0.00 | 1 | 21 | 35912.00 | 1589.29 |
| 22JUL80 | 1130.00 | 119.36 | 0.00 | 1 | 21 | 36085.00 | 1589.39 |
| 22JUL80 | 1514.00 | 119.25 | 0.00 | 1 | 21 | 36309.00 | 1589.50 |
| 22JUL80 | 1856.00 | 119.20 | 0.00 | 1 | 21 | 36531.00 | 1589.55 |
| 23JUL80 | 14.00 | 119.14 | 0.00 | 1 | 21 | 36849.00 | 1589.61 |
| 23JUL80 | 329.00 | 119.08 | 0.00 | 1 | 21 | 37044.00 | 1589.67 |
| 23JUL80 | 1107.00 | 115.00 | 3.97 | 1 | 21 | 37502.00 | 1589.78 |
| 23JUL80 | 1921.00 | 115.00 | 3.75 | 1 | 21 | 37996.00 | 1590.00 |
| 24JUL80 | 833.00 | 115.00 | 3.61 | 1 | 21 | 38788.00 | 1590.14 |
| 24JUL80 | 1654.00 | 115.00 | 3.42 | 1 | 21 | 39289.00 | 1590.33 |
| 25JUL80 | 1010.00 | 115.00 | 3.42 | 1 | 21 | 40325.00 | 1590.33 |
| 25JUL80 | 1524.00 | 115.00 | 3.36 | 1 | 21 | 40639.00 | 1590.39 |
| 26JUL80 | 753.00 | 115.00 | 3.06 | 1 | 67 | 41628.00 | 1590.41 |
| 27JUL80 | 1010.00 | 120.00 | .24 | 1 | 95 | 43205.00 | 1590.56 |
| 28JUL80 | 927.00 | 120.00 | .05 | 1 | 95 | 44602.00 | 1590.75 |
| 29JUL80 | 525.00 | 120.00 | .03 | 1 | 95 | 46040.00 | 1590.77 |
| 30JUL80 | 1100.00 | 115.00 | 4.60 | 1 | 94 | 47575.00 | 1590.90 |
| 31JUL80 | 1418.00 | 115.00 | 4.48 | 1 | 94 | 49213.00 | 1591.02 |
| 01AUG80 | 1213.00 | 115.00 | 4.44 | 1 | 94 | 50528.00 | 1591.06 |
| 03AUG80 | 840.00 | 115.00 | 4.22 | 1 | 94 | 53195.00 | 1591.28 |
| 05AUG80 | 1441.00 | 115.00 | 4.17 | 1 | 94 | 56436.00 | 1591.33 |
| 07AUG80 | 1443.00 | 115.00 | 4.04 | 1 | 94 | 59318.00 | 1591.46 |
| 09AUG80 | 1005.00 | 115.00 | 4.00 | 1 | 94 | 61920.00 | 1591.50 |
| 12AUG80 | 1338.00 | 115.00 | 3.90 | 1 | 94 | 66453.00 | 1591.60 |
| 14AUG80 | 1140.00 | 115.00 | 3.71 | 1 | 94 | 69215.00 | 1591.79 |
| 16AUG80 | 1130.00 | 115.00 | 3.71 | 1 | 94 | 72085.00 | 1591.79 |
| 19AUG80 | 740.00 | 116.81 | 0.00 | 1 | 20 | 76175.00 | 1591.81 |
| 20AUG80 | 1447.00 | 118.49 | 0.00 | 1 | 94 | 78042.00 | 1592.01 |
| 22AUG80 | 1322.00 | 118.78 | 0.00 | 1 | 94 | 80837.00 | 1591.72 |
| 02SEP80 | 956.00 | 118.40 | 0.00 | 1 | 94 | 96471.00 | 1592.10 |

**COMMENTS**

COLLAR ELEV 1708.62 FEET PIEZO ELEV 0.00 -NULL-
TIME PUMP TEST BEGAN = 27JUN80-1005.00

1 1
1 1
1 1
1 1
1 1
1 1
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1 1
14 14
15 BY O. K. TO 9/2/80
15 BY O. K. TO 9/2/80
15 BY O. K. TO 9/2/80
15 BY O. K. TO 9/2/80
15 BY O. K. TO 9/2/80
15 BY O. K. TO 9/2/80
4 15
4 15
4 15
4 15
4 15
4 15
20 D&M
15
15
15

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14A ***

| DATE | TIME | FIRST READING | SECOND READING | A L G | C O N | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET |
|---|---|---|---|---|---|---|---|
| DDMONYY | HHMM.SS | FEET | FEET | | | | |
| 10SEP80 | 900.00 | 116.55 | 0.00 | 1 | 15 | 107935.00 | 1592.07 |

**COMMENTS**

COLLAR ELEV 1708.62 FEET PIEZO ELEV 0.00 -NULL
TIME PUMP TEST BEGAN = 27JUN80-1005.00

15 FOR G.W. MAP

COOR. N114080 ft. (N34772m)
E2284315 ft. (E696261m)

# BORING LOG G41-G14A

SHEET 1 OF 6

SURFACE ELEV. 1706.9 ft. (520.27m) PROJECT EXXON CRANDON TAILING DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 11/13/79 DATE COMPLETED 11/16/79

DRILL RIG Drilltech D40K DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS | BLOWS / FOOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES HAMMER BLOWS PER 6IN. (Note 1) | SAMPLES REC./ATT. (ins.) | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| 0.0 | | See boring G41-G14 for soil stratigraphy | | | | | | | |
| 30.48 | | | | - | 1 | DO | Air Hammer | 6.5/6.5 | |
| 100.0 | | Very dense, brown, fine to coarse gravelly, fine to coarse SAND, trace silt | SP-SM | | | | | | |
| 32.77 | | | | | | | | | |
| 107.5 | | Very dense, brown, fine to coarse GRAVEL and fine to coarse SAND, trace silt; frequent cobbles | GP-GM | - | 2 | DO | Air Hammer | 6/12 | ▼ 12/4/79 34.17 112.1 |
| 35.05 | | | | | | | | | |
| 115.0 | | Very dense, red-brown, silty, fine to coarse SAND, some fine to coarse gravel, trace clay to fine to coarse SAND, some silt, trace to some fine to coarse gravel, occasional to frequent cobbles | SM | - | 3 | DO | Air Hammer | 18/18 | |
| 38.10 | | | | | | | | | |
| 125.0 | | CONTINUED | | | | | | | |

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked

COOR. N114080 ft. (N34772m)
E2284315 ft. (E696261m)

# BORING LOG G41-G14A



SURFACE ELEV. 1706.9 ft. (520.27m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 11/13/79 DATE COMPLETED 11/16/79

DRILL RIG Drilltech D40K DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS. | BLOWS / FOOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES HAMMER BLOWS PER 6IN. (Note 1) | SAMPLES REC./ATT. (ins.) | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| 38.10 / 125.0 | | CONTINUED | | | | | | | |
| | | Very dense, red-brown, silty, fine to coarse SAND, some fine to coarse gravel, trace clay to fine to coarse SAND, some silt, trace to some fine to coarse gravel, occasional to frequent cobbles | SM | - | 4 | DO | Air Hammer | 12/12 | |
| | | | | - | 5 | DO | Air Hammer | 12/12 | |
| | | | | - | 6 | DO | Air Hammer | 2/4 | |
| 47.24 / 155.0 | | CONTINUED | | | | | | | |

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked

COOR. N114080 ft. (N34772m)
E2284315 ft. (E696261m)

# BORING LOG G41-G14A



SURFACE ELEV. 1706.9 ft. (520.27m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 11/13/79 DATE COMPLETED 11/16/79

DRILL RIG Drilltech D40K DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS | BLOWS / FOOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES HAMMER BLOWS PER 6IN. (Note 1) | SAMPLES REC./ATT. (ins.) | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| 47.24 | | CONTINUED | | | | | | | |
| 155.0 | | Very dense, red-brown, silty, fine to coarse SAND, some fine to coarse gravel, trace clay to fine to coarse SAND, some silt, trace to some fine to coarse gravel, occasional to frequent cobbles | SM | - | 7 | DO | Air Hammer | 6/11 | |
| 50.29 | | | | | | | | | |
| 165.0 | | Very dense, red-brown to brown, fine to coarse SAND, some silt, trace to some fine gravel, trace clay, frequent cobbles | SM | - | 8 | DO | Air Hammer | 3/12 | Grout (to surface) |
| | | | | - | 9 | DO | Air Hammer | 4/12 | 2" Solid PVC Pipe to Surface |
| 55.78 | | | | | | | | | |
| 183.0 | | | | | | | | | Bentonite Clay Seal |
| 56.69 | | | | | | | | | |
| 186.0 | | CONTINUED | | | | | | | CONTINUED |

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked

COOR. N114080 ft. (N34772m)
E2284315 ft. (E696261m)

# BORING LOG G41-G14A

SHEET 4 OF 6

SURFACE ELEV. 1706.9 ft. (520.27m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 11/13/79 DATE COMPLETED 11/16/79

DRILL RIG Drilltech D40K DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS. | BLOWS / FOOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES HAMMER BLOWS PER 6IN. (Note 1) | SAMPLES REC./ATT. (ins.) | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| 56.69 | | CONTINUED | | | | | | | CONTINUED |
| 186.0 | | Very dense, red-brown to brown, fine to coarse SAND, some silt, trace to some fine gravel, trace clay, frequent cobbles | SM | - | 10 | DO | Air Hammer | 6/12 | Bentonite Clay Seal |
| 58.67 | | | | | | | | | 57.92 |
| 192.5 | | Gravel and cobbles. Unable to retain samples | GP | - | 11 | DO | Air Hammer | 0/12 | 190.0 Caved material (Note 2) |
| | | | | - | 12 | DO | Air Hammer | 0/12 | |
| 61.57 | | | | | | | | | |
| 202.0 | | Very dense, brown, fine to coarse SAND to fine SAND, trace silt (fineness increasing with depth) | SP to SP-SM | - | 13 | DO | Air Hammer | 18/18 | 2" Solid PVC Pipe |
| | | | | - | 14 | DO | Air Hammer | 4/18 | |
| | | | | - | 15 | DO | Air Hammer | 12/18 | |
| 66.45 | | | | | | | | | |
| 218.0 | | CONTINUED | | | | | | | CONTINUED |

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked

COOR. N114080 ft. (N34772m)
E2284315 ft. (E696261m)

# BORING LOG G41-G14A

SHEET 5 OF 6

SURFACE ELEV. 1706.9 ft. (520.27m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 11/13/79 DATE COMPLETED 11/16/79

DRILL RIG Drilltech D40K DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS. | BLOWS / FOOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES HAMMER BLOWS PER 6IN. (Note 1) | SAMPLES REC./ATT. (ins.) | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| 66.45 | | CONTINUED | | | | | | | CONTINUED |
| 218.0 | | Very dense, brown, fine to coarse SAND to fine SAND, trace silt (fineness increasing with depth | SP to SP-SM | - | 16 | DO | Air Hammer | 3/16 | Caved Material (Note 2) 67.3E 221.C |
| | | | | - | 17 | DO | Air Hammer | 6/12 | 2" Slotted PVC Pipe |
| 72.39 | | | | | | | | | Caved Material (Note 2) |
| 237.5 | | Very dense, fine sandy SILT | ML | - | 18 | DO | Air Hammer | 12/12 | |
| 73.46 | | | | | | | | | |
| 241.0 | | END OF BORING | | | | | | | |

NOTES

1. Penetration Test - 3" O.D. sampler driven with air hammer. (All samples)
2. Borehole caved to 190.0 ft. after placement of the PVC well pipe. Pumped 1000 gallons of water down the well pipe to wash caved material. No water return.
3. Elevation of top of protector pipe, 1708.6 ft. (520.79m).

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jlg
Checked

COOR. N114080 ft. (N34772m)
E2284315 ft. (E696261m)

# BORING LOG G41-G14A



SURFACE ELEV. 1706.9 ft. (520.27m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 11/13/79 DATE COMPLETED 11/16/79

DRILL RIG Drilltech D40K DRILLING METHOD Mud Rotary

Table of Water Level Readings by Date. Readings Indicate Depth Below Ground Surface.

| DATE | 12/4/79 | 2/12/80 | 4/25/80 | 5/15/80 | 5/20/80 | 6/26/80* | 9/10/80* |
|---|---|---|---|---|---|---|---|
| DEPTH (m) | 34.17 | 34.26 | 34.41 | 34.50 | 34.38 | 34.38 | 34.99 |
| DEPTH (ft.) | 112.1 | 112.4 | 112.9 | 113.2 | 112.8 | 112.8 | 114.8 |

| DATE | 6/10/81 | | | | | | |
|---|---|---|---|---|---|---|---|
| DEPTH (m) | 35.02 | | | | | | |
| DEPTH (ft.) | 114.9 | | | | | | |

*Pump Test and Recovery Period Between these Dates. For Pump Test Data, Refer to PUMP TEST AND ANALYSIS, Project Report No. '

COOR. N113930 ft. (N34726m)
E2284315 ft. (E696260m)

# BORING LOG G41-G14

SHEET 1 OF 1

SURFACE ELEV 1705.1 ft. (519.73m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 3/13/79 DATE COMPLETED 3/16/79

DRILL RIG Joy R-15 DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS | BLOWS / FOOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES HAMMER BLOWS PER 6IN. (Note 1) | SAMPLES REC./ATT. (ins.) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 0.0 | | Loose, brown, silty, fine to medium SAND, trace organics | SM | 5 | 1 | DO | 3-2-3 | 15/18 | |
| 0.76 | | | | | | | | | |
| 2.5 | | | | 53 | 2 | DO | 8-27-26 | 10/18 | |
| | | | | 15 | 3 | DO | 5-5-10 | 15/18 | |
| | | Compact to very dense, red-brown to brown, fine to coarse SAND, some fine to coarse gravel, some silt | SM | 66 | 4 | DO | 9-12-54 | 18/18 | |
| | | Cobbles noted at 19.0'-19.5' | | 135 | 5 | DO | 42-35-100 | 6/18 | |
| | | | | 80 | 6 | DO | 13-39-41 | 6/8 | |
| | | | | 115/5" | 7 | DO | 115/5" | 4/5 | |
| 9.75 | | | | | | | | | |
| 32.0 | | CONTINUED | | | | | | | |

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked

CCOR. N113930 ft. (N34726m)
E2284315 ft. (E696260m)

# BORING LOG G41-G14



SURFACE ELEV. 1705.1 ft. (519.73m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 3/13/79 DATE COMPLETED 3/16/79

DRILL RIG Joy R-15 DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS | BLOWS / FOOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES HAMMER BLOWS PER 6IN. (Note 1) | SAMPLES REC./ATT. (ins.) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 9.75 | | CONTINUED | | | | | | | |
| 32.0 | | | | 150/4" | 8 | DO | 150/4" | 3/4 | |
| | | | | 130/3" | 9 | DO | 130/3" | 3/3 | |
| | | Compact to very dense, red-brown to brown, fine to coarse SAND, some fine to coarse gravel, some silt | SM | | | | | | |
| | | Cobbles and boulders noted at 41.0'-51.0' and 62.5'-64.0' | | 140/4" | 11 | DO | 140/4" | 1/4 | |
| | | | | 150/8" | 12 | DO | 100-50/2" | 6/8 | |
| | | | | 170/5" | 13 | DO | 170/5" | 5/5 | |
| 19.51 | | | | | | | | | |
| 64.0 | | | | 150/6" | 14 | DO | 150/6" | 5/6 | |
| | | See next page | | | | | | | |
| 20.42 | | | | | | | | | |
| 67.0 | | CONTINUED | | | | | | | |

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked

COOR. N113930 ft. (N34726m)
E2284315 ft. (E696260m)

# BORING LOG G41-G14



SURFACE ELEV. 1705.1 ft. (519.73m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 3/13/79 DATE COMPLETED 3/16/79

DRILL RIG Joy R-15 DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS | BLOWS / FOOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES HAMMER BLOWS PER 6IN. (Note 1) | SAMPLES REC/ATT. (ins.) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 20.42 | | CONTINUED | | | | | | | |
| 67.0 | | Very dense, brown, fine gravelly, fine to medium SAND, trace silt to brown-gray, fine to coarse GRAVEL and fine to coarse SAND, trace silt, occasional cobbles from 65'-70' | SP-SM | 150/9" | 15 | DO | 75-75/3" | 8/9 | |
| | | | | 150/5" | 16 | DO | 150/5" | 5/5 | |
| | | | | 150/2" | 17 | DO | 150/2" | 0/2 | |
| 25.15 | | | | | | | | | |
| 82.5 | | Very dense, gray-brown, medium to coarse SAND, some fine to medium gravel, trace silt | SP-SM | 100/8" | 18 | DO | 50-50/2" | 8/8 | |
| 27.13 | | | | | | | | | |
| 89.0 | | Very dense, green-black to dark brown, organic SILT, some clay, trace fine gravel | OL | 102/11" | 19 | DO | 16-41-60/5" | 17/17 | |
| 29.41 | | | | 102 | 20 | DO | 18-27-75 | 18/18 | |
| 96.5 | | END OF BORING<br>HOLE GROUTED AT COMPLETION | | | | | | | |

(See sheet 4 for notes)

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked [illegible]

COOR. N113930 ft. (N34726m)
E2284315 ft. (E696260m)

# BORING LOG G41-G14



SURFACE ELEV. 1705.1 ft. (519.73m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 3/13/79 DATE COMPLETED 3/16/79

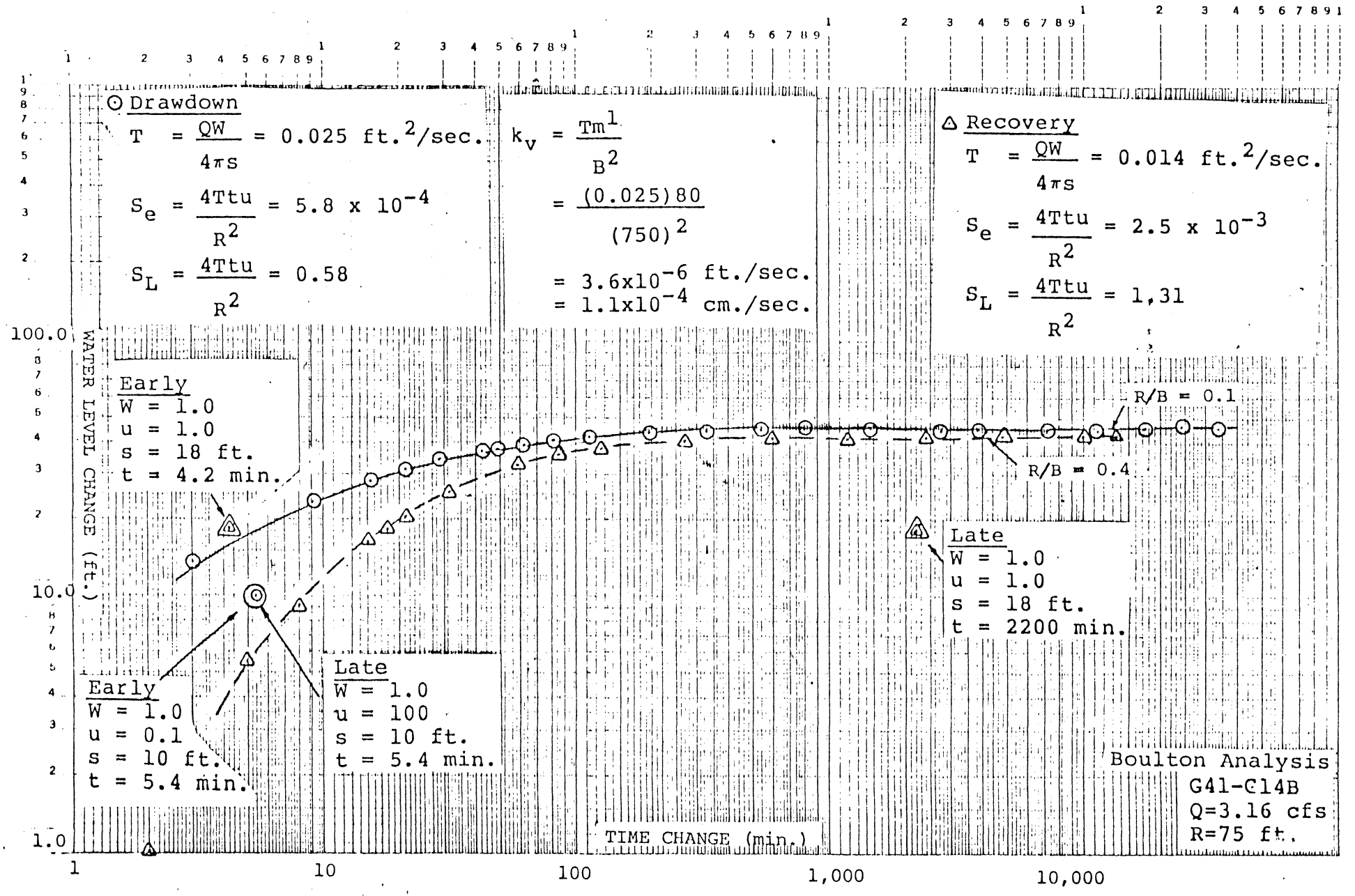
DRILL RIG Joy R-15 DRILLING METHOD Mud Rotary

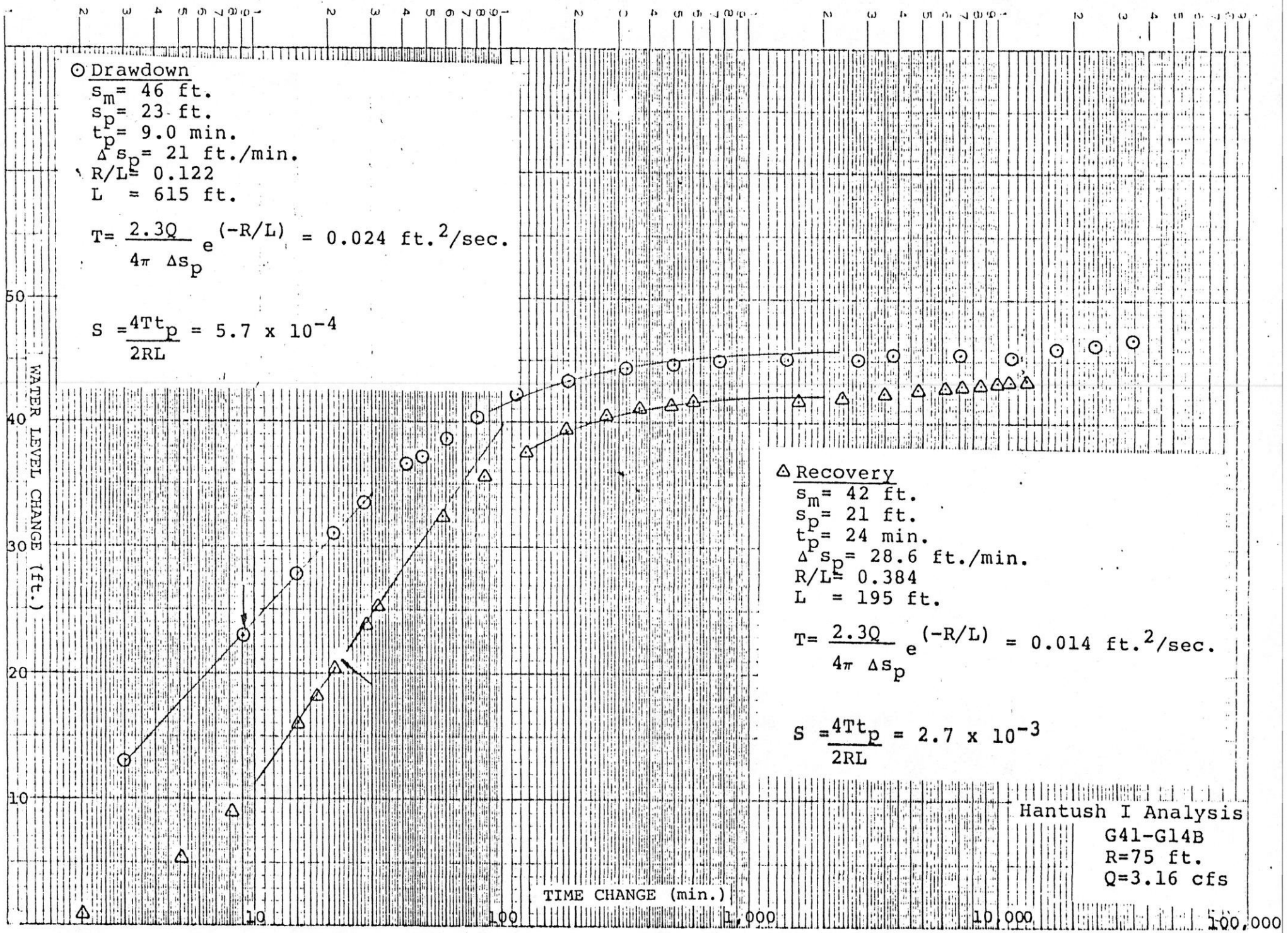
NOTES

1. Standard Penetration Test - Driving 2" O.D. sampler with 140 lb. hammer freely falling 30". (Samples 5-7, 9, 11)

   Penetration Test - Driving 3" O.D. sampler with 300 lb. hammer freely falling 20". (Samples 1-4, 8)

   Penetration Test - Driving 2" O.D. sampler with 300 lb. hammer freely falling 20". (Samples 12 - 20)


⊙ Drawdown
T = QW/4πs = 0.025 ft.²/sec.
Se = 4Ttu/R² = 5.8 x 10⁻⁴
SL = 4Ttu/R² = 0.58
kv = Tm¹/B² = (0.025)80/(750)²
= 3.6x10⁻⁶ ft./sec.
= 1.1x10⁻⁴ cm./sec.
△ Recovery
T = QW/4πs = 0.014 ft.²/sec.
Se = 4Ttu/R² = 2.5 x 10⁻³
SL = 4Ttu/R² = 1,31
Early
W = 1.0
u = 1.0
s = 18 ft.
t = 4.2 min.
R/B = 0.1
R/B = 0.4
Late
W = 1.0
u = 1.0
s = 18 ft.
t = 2200 min.
Early
W = 1.0
u = 0.1
s = 10 ft.
t = 5.4 min.
Late
W = 1.0
u = 100
s = 10 ft.
t = 5.4 min.
Boulton Analysis
G41-C14B
Q=3.16 cfs
R=75 ft.
WATER LEVEL CHANGE (ft.)
TIME CHANGE (min.)
100.0
10.0
1.0
1
10
100
1,000
10,000


⊙ Drawdown
$s_m$ = 46 ft.
$s_p$ = 23 ft.
$t_p$ = 9.0 min.
$\Delta s_p$ = 21 ft./min.
R/L = 0.122
L = 615 ft.
$T = \frac{2.3Q}{4\pi \Delta s_p} e^{(-R/L)} = 0.024$ ft.$^2$/sec.
$S = \frac{4Tt_p}{2RL} = 5.7 \times 10^{-4}$
△ Recovery
$s_m$ = 42 ft.
$s_p$ = 21 ft.
$t_p$ = 24 min.
$\Delta s_p$ = 28.6 ft./min.
R/L = 0.384
L = 195 ft.
$T = \frac{2.3Q}{4\pi \Delta s_p} e^{(-R/L)} = 0.014$ ft.$^2$/sec.
$S = \frac{4Tt_p}{2RL} = 2.7 \times 10^{-3}$
WATER LEVEL CHANGE (ft.)
10
20
30
40
50
TIME CHANGE (min.)
1
10
100
1,000
10,000
100,000
Hantush I Analysis
G41-G14B
R=75 ft.
Q=3.16 cfs

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14B ***

| DATE | TIME | FIRST READING | SECOND READING | A L G | C O N | TIME SINCE TEST BEGAN | WATER LEVEL ELEVATION | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| DDMCNYY | HHMM.SS | FEET | FEET | | | MINUTES | FEET | |
| | | | | | | | | COLLAR ELEV 1708.87 FEET PIEZO ELEV 0.00 -NULL |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 04DEC79 | 1200.00 | 112.80 | 0.00 | 1 | 20 | -296525.00 | 1596.07 | GROUND SURFACE-CORR. TO |
| 12FEB80 | 1525.00 | 114.12 | 0.00 | 1 | 20 | -195520.00 | 1594.75 | BY D&M |
| 25APR80 | 1200.00 | 114.90 | .14 | 1 | 14 | -90605.00 | 1593.83 | 14 - TIME NOT RECORD |
| 15MAY80 | 900.00 | 115.23 | 0.00 | 1 | 20 | -61985.00 | 1593.64 | 20 D&M |
| 20MAY80 | 600.00 | 114.83 | 0.00 | 1 | 66 | -54965.00 | 1593.90 | 4 14 |
| 21MAY80 | 1200.00 | 114.03 | 0.00 | 1 | 2 | -53165.00 | 1594.11 | 2 - NO TIME |
| 29MAY80 | 930.00 | 113.98 | 0.00 | 1 | 2 | -41795.00 | 1594.16 | 4 2 -REV. CIR. |
| 30MAY80 | 1730.00 | 113.96 | 0.00 | 1 | 2 | -39875.00 | 1594.18 | 4 2 -REV. CIR. |
| 31MAY80 | 20.00 | 112.16 | 0.00 | 1 | 2 | -39465.00 | 1595.98 | 4 2 -REV. CIR. |
| 31MAY80 | 945.00 | 113.60 | 0.00 | 1 | 2 | -38900.00 | 1594.54 | 4 2 SET CASE |
| 01JUN80 | 600.00 | 113.31 | 0.00 | 1 | 2 | -37685.00 | 1594.83 | 4 2 SET CASE |
| 01JUN80 | 1525.00 | 113.70 | 0.00 | 1 | 2 | -37120.00 | 1594.44 | 4 2 GRAVEL |
| 02JUN80 | 830.00 | 113.65 | 0.00 | 1 | 2 | -36095.00 | 1594.49 | 4 2 |
| 03JUN80 | 915.00 | 113.92 | 0.00 | 1 | 2 | -34610.00 | 1594.22 | 4 2 |
| 04JUN80 | 135.00 | 114.95 | 0.00 | 1 | 2 | -33630.00 | 1593.19 | 4 2 AIR DEV. |
| 06JUN80 | 925.00 | 116.93 | 0.00 | 1 | 25 | -30280.00 | 1591.22 | 4 2 |
| 06JUN80 | 1103.00 | 115.29 | 0.00 | 1 | 25 | -30182.00 | 1592.86 | 4 2 |
| 06JUN80 | 1258.00 | 114.35 | 0.00 | 1 | 2 | -30067.00 | 1593.79 | 4 2 |
| 06JUN80 | 1702.00 | 117.92 | 0.00 | 1 | 25 | -29823.00 | 1590.23 | 4 2 VEL TEST |
| 06JUN80 | 1842.00 | 118.42 | 0.00 | 1 | 25 | -29723.00 | 1589.73 | 4 2 VEL TEST |
| 07JUN80 | 930.00 | 114.04 | 0.00 | 1 | 2 | -28835.00 | 1594.10 | 4 2 |
| 08JUN80 | 830.00 | 114.36 | 0.00 | 1 | 2 | -27455.00 | 1593.78 | 4 2 |
| 09JUN80 | 800.00 | 114.06 | 0.00 | 1 | 2 | -26045.00 | 1594.08 | 4 2 |
| 10JUN80 | 635.00 | 114.19 | 0.00 | 1 | 2 | -24570.00 | 1593.95 | 4 2 |
| 11JUN80 | 845.00 | 114.38 | 0.00 | 1 | 2 | -23120.00 | 1593.76 | 4 2 |
| 12JUN80 | 840.00 | 114.26 | 0.00 | 1 | 2 | -21685.00 | 1593.88 | 4 2 |
| 13JUN80 | 815.00 | 114.07 | 0.00 | 1 | 2 | -20270.00 | 1594.07 | 4 2 |
| 13JUN80 | 2115.00 | 113.99 | 0.00 | 1 | 25 | -19490.00 | 1594.16 | 4 2 DIFF. RULE |
| 14JUN80 | 815.00 | 114.05 | 0.00 | 1 | 2 | -18830.00 | 1594.09 | 4 2 |
| 14JUN80 | 1745.00 | 114.10 | 0.00 | 1 | 2 | -18260.00 | 1594.04 | 4 2 |
| 15JUN80 | 820.00 | 114.18 | 0.00 | 1 | 2 | -17385.00 | 1593.96 | 4 2 |
| 16JUN80 | 805.00 | 114.35 | 0.00 | 1 | 2 | -15960.00 | 1593.79 | 4 2 |
| 24JUN80 | 820.00 | 114.22 | 0.00 | 1 | 2 | -4425.00 | 1593.92 | 4 2 |
| 25JUN80 | 815.00 | 114.23 | 0.00 | 1 | 2 | -2990.00 | 1593.91 | 4 2 |
| 26JUN80 | 840.00 | 114.20 | 0.00 | 1 | 2 | -1525.00 | 1593.94 | 4 2 |
| 27JUN80 | 800.00 | 114.39 | 0.00 | 1 | 2 | -125.00 | 1593.75 | 2 2 BEFORE TEST |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G148 ***

| DATE | TIME | FIRST READING | SECOND READING | A L G | C O N | TIME SINCE TEST BEGAN | WATER LEVEL ELEVATION | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| DDMONYY | HHMM.SS | FEET | FEET | | | MINUTES | FEET | |
| | | | | | | | | COLLAR ELEV 1708.87 FEET PIEZO ELEV 0.00 -NULL |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 27JUN80 | 1008.00 | 127.70 | 0.00 | 1 | 27 | 3.00 | 1580.48 | 2 2 |
| 27JUN80 | 1014.00 | 137.45 | 0.00 | 1 | 28 | 9.00 | 1570.74 | 2 2 |
| 27JUN80 | 1020.00 | 142.55 | 0.00 | 1 | 28 | 15.00 | 1565.64 | 2 2 |
| 27JUN80 | 1026.00 | 145.80 | 0.00 | 1 | 29 | 21.00 | 1562.41 | 2 2 |
| 27JUN80 | 1033.00 | 148.16 | 0.00 | 1 | 29 | 28.00 | 1560.05 | 2 2 |
| 27JUN80 | 1047.00 | 151.08 | 0.00 | 1 | 29 | 42.00 | 1557.13 | 2 2 |
| 27JUN80 | 1053.00 | 151.75 | 0.00 | 1 | 29 | 48.00 | 1556.46 | 2 2 |
| 27JUN80 | 1058.00 | 152.56 | 0.00 | 1 | 29 | 53.00 | 1555.65 | 2 2 |
| 27JUN80 | 1106.00 | 153.34 | 0.00 | 1 | 29 | 61.00 | 1554.87 | 2 2 |
| 27JUN80 | 1116.00 | 154.20 | 0.00 | 1 | 29 | 71.00 | 1554.01 | 2 2 |
| 27JUN80 | 1128.00 | 155.02 | 0.00 | 1 | 30 | 83.00 | 1553.21 | 2 2 |
| 27JUN80 | 1147.00 | 155.98 | 0.00 | 1 | 30 | 102.00 | 1552.25 | 2 2 |
| 27JUN80 | 1203.00 | 156.60 | 0.00 | 1 | 30 | 118.00 | 1551.63 | 2 2 |
| 27JUN80 | 1220.00 | 156.98 | 0.00 | 1 | 30 | 135.00 | 1551.25 | 2 2 |
| 27JUN80 | 1248.00 | 157.56 | 0.00 | 1 | 30 | 163.00 | 1550.67 | 2 2 |
| 27JUN80 | 1318.00 | 158.00 | 0.00 | 1 | 30 | 193.00 | 1550.23 | 2 2 |
| 27JUN80 | 1357.00 | 158.45 | 0.00 | 1 | 30 | 232.00 | 1549.78 | 2 2 |
| 27JUN80 | 1454.00 | 158.80 | 0.00 | 1 | 30 | 269.00 | 1549.43 | 2 2 |
| 27JUN80 | 1531.00 | 159.00 | 0.00 | 1 | 30 | 326.00 | 1549.23 | 2 2 TIME CORRECTED |
| 27JUN80 | 1654.00 | 159.17 | 0.00 | 1 | 30 | 409.00 | 1549.06 | 2 2 |
| 27JUN80 | 1739.00 | 159.24 | 0.00 | 1 | 30 | 454.00 | 1548.99 | 2 2 |
| 27JUN80 | 1855.00 | 159.30 | 0.00 | 1 | 30 | 530.00 | 1548.85 | 2 2 |
| 27JUN80 | 1928.00 | 159.30 | 0.00 | 1 | 30 | 563.00 | 1548.85 | 2 2 |
| 27JUN80 | 2042.00 | 159.45 | 0.00 | 1 | 30 | 637.00 | 1548.79 | 2 2 |
| 27JUN80 | 2137.00 | 159.46 | 0.00 | 1 | 30 | 692.00 | 1548.77 | 2 2 |
| 27JUN80 | 2304.00 | 159.56 | 0.00 | 1 | 30 | 779.00 | 1548.67 | 2 2 |
| 28JUN80 | 35.00 | 159.51 | 0.00 | 1 | 30 | 870.00 | 1548.72 | 2 2 |
| 28JUN80 | 221.00 | 159.50 | 0.00 | 1 | 30 | 976.00 | 1548.73 | 2 2 |
| 28JUN80 | 534.00 | 159.61 | 0.00 | 1 | 30 | 1169.00 | 1548.62 | 2 2 |
| 28JUN80 | 736.00 | 159.65 | 0.00 | 1 | 30 | 1293.00 | 1548.58 | 2 2 |
| 28JUN80 | 1009.00 | 159.64 | 0.00 | 1 | 30 | 1444.00 | 1548.59 | 2 2 |
| 28JUN80 | 1213.00 | 159.64 | 0.00 | 1 | 30 | 1568.00 | 1548.59 | 2 2 |
| 28JUN80 | 1508.00 | 159.61 | 0.00 | 1 | 30 | 1743.00 | 1548.62 | 2 2 |
| 28JUN80 | 1706.00 | 159.62 | 0.00 | 1 | 30 | 1921.00 | 1548.61 | 2 2 |
| 28JUN80 | 2331.00 | 159.66 | 0.00 | 1 | 30 | 2246.00 | 1548.57 | 2 2 |
| 29JUN80 | 818.00 | 159.65 | 0.00 | 1 | 30 | 2773.00 | 1548.58 | 2 2 |
| 29JUN80 | 1559.00 | 159.62 | 0.00 | 1 | 30 | 3234.00 | 1548.61 | 2 2 |
| 30JUN80 | 40.00 | 160.13 | 0.00 | 1 | 30 | 3755.00 | 1548.10 | 2 2 |
| 30JUN80 | 830.00 | 159.62 | 0.00 | 1 | 30 | 4225.00 | 1548.61 | 2 2 |
| 30JUN80 | 1528.00 | 160.10 | 0.00 | 1 | 30 | 4643.00 | 1548.13 | 2 2 |
| 01JUL80 | 800.00 | 160.12 | 0.00 | 1 | 30 | 5635.00 | 1548.11 | 2 2 |
| 01JUL80 | 1014.00 | 160.13 | 0.00 | 1 | 30 | 5769.00 | 1548.10 | 2 2 |
| 01JUL80 | 1020.00 | 158.85 | 0.00 | 1 | 30 | 5775.00 | 1549.38 | 2 2 STOP PUMP-OIL |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14B ***

| DATE | TIME | FIRST READING | SECOND READING | A L G | C O N | TIME SINCE TEST BEGAN | WATER LEVEL ELEVATION | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| DDMONYY | HHMM.SS | FEET | FEET | | | MINUTES | FEET | |
| | | | | | | | | COLLAR ELEV 1708.87 FEET PIEZO ELEV 0.00 -NULL- |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 01JUL80 | 1026.00 | 143.90 | 0.00 | 1 | 28 | 5781.00 | 1564.29 | 2 2 STOP PUMP-OIL |
| 01JUL80 | 1031.00 | 140.25 | 0.00 | 1 | 28 | 5786.00 | 1567.94 | 2 2 RESTART PUMP |
| 01JUL80 | 1035.00 | 144.11 | 0.00 | 1 | 28 | 5790.00 | 1564.08 | 2 2 |
| 01JUL80 | 1040.00 | 148.84 | 0.00 | 1 | 29 | 5795.00 | 1559.37 | 2 2 |
| 01JUL80 | 1043.00 | 150.75 | 0.00 | 1 | 29 | 5798.00 | 1557.46 | 2 2 |
| 01JUL80 | 1047.00 | 152.82 | 0.00 | 1 | 30 | 5802.00 | 1555.41 | 2 2 |
| 01JUL80 | 1101.00 | 156.54 | 0.00 | 1 | 30 | 5816.00 | 1551.69 | 2 2 |
| 01JUL80 | 1106.00 | 157.23 | 0.00 | 1 | 30 | 5821.00 | 1551.00 | 2 2 |
| 01JUL80 | 1112.00 | 157.85 | 0.00 | 1 | 30 | 5827.00 | 1550.38 | 2 2 |
| 01JUL80 | 1121.00 | 158.57 | 0.00 | 1 | 30 | 5836.00 | 1549.66 | 2 2 |
| 01JUL80 | 1152.00 | 159.48 | 0.00 | 1 | 30 | 5867.00 | 1548.75 | 2 2 |
| 01JUL80 | 1303.00 | 159.89 | 0.00 | 1 | 30 | 5938.00 | 1548.34 | 2 2 |
| 01JUL80 | 1442.00 | 159.94 | 0.00 | 1 | 30 | 6037.00 | 1548.29 | 2 2 |
| 01JUL80 | 1707.00 | 159.97 | 0.00 | 1 | 30 | 6182.00 | 1548.26 | 2 2 |
| 02JUL80 | 200.00 | 160.14 | 0.00 | 1 | 30 | 6715.00 | 1548.09 | 2 2 |
| 02JUL80 | 838.00 | 160.18 | 0.00 | 1 | 30 | 7113.00 | 1548.05 | 2 2 |
| 02JUL80 | 1311.00 | 160.66 | .14 | 1 | 14 | 7386.00 | 1548.07 | 16 14 COMPARE PIEZ. |
| 02JUL80 | 1312.00 | 160.17 | 0.00 | 1 | 30 | 7387.00 | 1548.06 | 2 2 COMPARE PIEZ. |
| 02JUL80 | 2132.00 | 160.15 | 0.00 | 1 | 30 | 7887.00 | 1548.08 | 2 2 |
| 03JUL80 | 902.00 | 160.20 | 0.00 | 1 | 30 | 8577.00 | 1548.03 | 2 2 |
| 03JUL80 | 2049.00 | 160.17 | 0.00 | 1 | 30 | 9264.00 | 1548.06 | 2 2 |
| 04JUL80 | 844.00 | 160.25 | 0.00 | 1 | 30 | 9999.00 | 1547.98 | 2 2 |
| 04JUL80 | 2048.00 | 160.15 | 0.00 | 1 | 30 | 10723.00 | 1548.08 | 2 2 |
| 05JUL80 | 820.00 | 160.21 | 0.00 | 1 | 30 | 11415.00 | 1548.02 | 2 2 |
| 05JUL80 | 2043.00 | 160.52 | 0.00 | 1 | 30 | 12158.00 | 1547.71 | 2 2 |
| 06JUL80 | 912.00 | 160.61 | 0.00 | 1 | 30 | 12907.00 | 1547.62 | 2 2 |
| 06JUL80 | 1744.00 | 160.48 | 0.00 | 1 | 30 | 13419.00 | 1547.75 | 2 2 |
| 07JUL80 | 748.00 | 160.40 | 0.00 | 1 | 30 | 14263.00 | 1547.83 | 2 2 |
| 07JUL80 | 1635.00 | 160.32 | 0.00 | 1 | 30 | 14790.00 | 1547.91 | 2 2 |
| 08JUL80 | 834.00 | 160.69 | 0.00 | 1 | 30 | 15749.00 | 1547.54 | 2 2 |
| 08JUL80 | 2059.00 | 160.72 | 0.00 | 1 | 30 | 16494.00 | 1547.51 | 2 2 |
| 09JUL80 | 851.00 | 160.77 | 0.00 | 1 | 30 | 17206.00 | 1547.46 | 2 2 |
| 09JUL80 | 1603.00 | 160.70 | 0.00 | 1 | 30 | 17638.00 | 1547.53 | 2 2 |
| 10JUL80 | 842.00 | 160.84 | 0.00 | 1 | 30 | 18637.00 | 1547.39 | 2 2 |
| 10JUL80 | 1739.00 | 160.77 | 0.00 | 1 | 30 | 19174.00 | 1547.46 | 2 2 |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 7R6085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14B ***

| DATE | TIME | FIRST READING | SECOND READING | A L G | C O N | TIME SINCE TEST BEGAN | WATER LEVEL ELEVATION | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| DDMONYY | HHMM.SS | FEET | FEET | | | MINUTES | FEET | |
| | | | | | | | | COLLAR ELEV 1708.87 FEET PIEZO ELEV 0.00 -NULL |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 11JUL80 | 914.00 | 160.96 | 0.00 | 1 | 36 | 20109.00 | 1547.97 | 2 2 |
| 11JUL80 | 1912.00 | 160.97 | 0.00 | 1 | 30 | 20707.00 | 1547.26 | 2 2 |
| 12JUL80 | 853.00 | 160.98 | 0.00 | 1 | 30 | 21528.00 | 1547.25 | 2 2 |
| 13JUL80 | 820.00 | 161.00 | 0.00 | 1 | 30 | 22935.00 | 1547.23 | 2 2 |
| 14JUL80 | 757.00 | 161.21 | 0.00 | 1 | 30 | 24352.00 | 1547.02 | 2 2 |
| 14JUL80 | 826.00 | 139.72 | 0.00 | 1 | 28 | 24381.00 | 1568.47 | 2 2 PUMP OFF-OIL |
| 14JUL80 | 852.00 | 134.23 | 0.00 | 1 | 27 | 24407.00 | 1573.95 | 2 2 PUMP ON |
| 14JUL80 | 855.00 | 127.98 | 0.00 | 1 | 27 | 24410.00 | 1580.20 | 2 2 |
| 14JUL80 | 902.00 | 135.24 | 0.00 | 1 | 28 | 24417.00 | 1572.95 | 2 2 |
| 14JUL80 | 910.00 | 141.87 | 0.00 | 1 | 28 | 24425.00 | 1566.32 | 2 2 |
| 14JUL80 | 917.00 | 146.70 | 0.00 | 1 | 29 | 24432.00 | 1561.51 | 2 2 |
| 14JUL80 | 937.00 | 154.39 | 0.00 | 1 | 29 | 24452.00 | 1553.82 | 2 2 |
| 14JUL80 | 1054.00 | 160.64 | 0.00 | 1 | 30 | 24529.00 | 1547.59 | 2 2 |
| 15JUL80 | 826.00 | 161.32 | 0.00 | 1 | 30 | 25821.00 | 1546.91 | 2 2 |
| 16JUL80 | 913.00 | 161.48 | 0.00 | 1 | 30 | 27308.00 | 1546.75 | 2 2 |
| 17JUL80 | 810.00 | 161.64 | 0.00 | 1 | 30 | 28685.00 | 1546.59 | 2 2 |
| 18JUL80 | 757.00 | 161.37 | 0.00 | 1 | 30 | 30112.00 | 1546.86 | 2 2 |
| 20JUL80 | 802.00 | 161.23 | 0.00 | 1 | 30 | 32997.00 | 1547.00 | 2 2 |
| 21JUL80 | 825.00 | 161.38 | 0.00 | 1 | 30 | 34460.00 | 1546.85 | 2 2 |
| 21JUL80 | 1007.00 | 160.42 | 0.00 | 1 | 30 | 34562.00 | 1547.81 | 2 RECOVERY @ 10 |
| 21JUL80 | 1010.00 | 155.96 | 0.00 | 1 | 30 | 34565.00 | 1552.27 | 2 2 |
| 21JUL80 | 1015.00 | 152.35 | 0.00 | 1 | 29 | 34568.00 | 1555.86 | 2 2 |
| 21JUL80 | 1020.00 | 145.35 | 0.00 | 1 | 29 | 34575.00 | 1562.86 | 2 2 |
| 21JUL80 | 1023.00 | 143.14 | 0.00 | 1 | 28 | 34578.00 | 1565.05 | 2 2 |
| 21JUL80 | 1026.00 | 141.03 | 0.00 | 1 | 28 | 34581.00 | 1567.16 | 2 2 |
| 21JUL80 | 1033.00 | 137.36 | 0.00 | 1 | 28 | 34588.00 | 1570.83 | 2 2 |
| 21JUL80 | 1036.00 | 136.07 | 0.00 | 1 | 28 | 34591.00 | 1572.12 | 2 2 |
| 21JUL80 | 1039.00 | 134.82 | 0.00 | 1 | 27 | 34594.00 | 1573.36 | 2 2 |
| 21JUL80 | 1043.00 | 133.57 | 0.00 | 1 | 27 | 34598.00 | 1574.61 | 2 2 |
| 21JUL80 | 1048.00 | 132.10 | 0.00 | 1 | 27 | 34603.00 | 1576.08 | 2 2 |
| 21JUL80 | 1052.00 | 131.05 | 0.00 | 1 | 27 | 34607.00 | 1577.13 | 2 2 |
| 21JUL80 | 1103.00 | 128.90 | 0.00 | 1 | 27 | 34618.00 | 1579.28 | 2 2 |
| 21JUL80 | 1108.00 | 128.08 | 0.00 | 1 | 27 | 34623.00 | 1580.10 | 2 2 |
| 21JUL80 | 1113.00 | 127.36 | 0.00 | 1 | 27 | 34628.00 | 1580.82 | 2 2 |
| 21JUL80 | 1120.00 | 126.54 | 0.00 | 1 | 27 | 34635.00 | 1581.64 | 2 2 |
| 21JUL80 | 1125.00 | 126.05 | 0.00 | 1 | 27 | 34640.00 | 1582.13 | 2 2 |
| 21JUL80 | 1130.00 | 125.66 | 0.00 | 1 | 27 | 34645.00 | 1582.52 | 2 2 |
| 21JUL80 | 1134.00 | 125.33 | 0.00 | 1 | 27 | 34649.00 | 1582.85 | 2 2 |
| 21JUL80 | 1138.00 | 125.02 | 0.00 | 1 | 27 | 34653.00 | 1583.16 | 2 2 |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.57.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14B ***

| DATE | TIME | FIRST READING | SECOND READING | A L G | C O N | TIME SINCE TEST BEGAN | WATER LEVEL ELEVATION | |
|---|---|---|---|---|---|---|---|---|
| DDMONYY | HHMM.SS | FEET | FEET | | | MINUTES | FEET | |
| 21JUL80 | 1144.00 | 124.68 | 0.00 | 1 | 26 | 34659.00 | 1583.49 | 2 2 |
| 21JUL80 | 1148.00 | 124.43 | 0.00 | 1 | 26 | 34663.00 | 1583.74 | 2 2 |
| 21JUL80 | 1152.00 | 124.20 | 0.00 | 1 | 26 | 34667.00 | 1583.97 | 2 2 |
| 21JUL80 | 1155.30 | 123.95 | 0.00 | 1 | 26 | 34670.00 | 1584.22 | 2 2 |
| 21JUL80 | 1202.00 | 123.68 | 0.00 | 1 | 26 | 34677.00 | 1584.49 | 2 2 |
| 21JUL80 | 1207.00 | 123.53 | 0.00 | 1 | 26 | 34682.00 | 1584.64 | 2 2 |
| 21JUL80 | 1213.00 | 123.25 | 0.00 | 1 | 26 | 34688.00 | 1584.92 | 2 2 |
| 21JUL80 | 1235.00 | 122.55 | 0.00 | 1 | 26 | 34710.00 | 1585.62 | 2 2 |
| 21JUL80 | 1254.00 | 122.10 | 0.00 | 1 | 26 | 34729.00 | 1586.07 | 2 2 |
| 21JUL80 | 1310.00 | 121.80 | 0.00 | 1 | 26 | 34745.00 | 1586.37 | 2 2 |
| 21JUL80 | 1325.00 | 121.52 | 0.00 | 1 | 26 | 34760.00 | 1586.65 | 2 2 |
| 21JUL80 | 1343.00 | 121.27 | 0.00 | 1 | 26 | 34778.00 | 1586.90 | 2 2 |
| 21JUL80 | 1359.00 | 121.06 | 0.00 | 1 | 26 | 34794.00 | 1587.09 | 2 2 |
| 21JUL80 | 1432.00 | 120.77 | 0.00 | 1 | 26 | 34827.00 | 1587.40 | 2 2 |
| 21JUL80 | 1500.00 | 120.55 | 0.00 | 1 | 26 | 34855.00 | 1587.62 | 2 2 |
| 21JUL80 | 1534.00 | 120.35 | 0.00 | 1 | 26 | 34889.00 | 1587.82 | 2 2 |
| 21JUL80 | 1606.00 | 120.19 | 0.00 | 1 | 26 | 34921.00 | 1587.98 | 2 2 |
| 21JUL80 | 1701.00 | 119.98 | 0.00 | 1 | 25 | 34976.00 | 1588.17 | 2 2 |
| 21JUL80 | 1813.00 | 119.74 | 0.00 | 1 | 25 | 35048.00 | 1588.41 | 2 2 |
| 21JUL80 | 1909.00 | 119.62 | 0.00 | 1 | 25 | 35104.00 | 1588.53 | 2 2 |
| 21JUL80 | 2001.00 | 119.53 | 0.00 | 1 | 25 | 35156.00 | 1588.62 | 2 2 |
| 21JUL80 | 2120.00 | 119.40 | 0.00 | 1 | 25 | 35235.00 | 1588.75 | 2 2 |
| 21JUL80 | 2228.00 | 119.32 | 0.00 | 1 | 25 | 35303.00 | 1588.83 | 2 2 |
| 22JUL80 | 105.00 | 119.18 | 0.00 | 1 | 25 | 35460.00 | 1588.97 | 2 2 |
| 22JUL80 | 226.00 | 119.10 | 0.00 | 1 | 25 | 35541.00 | 1589.05 | 2 2 |
| 22JUL80 | 412.00 | 119.01 | 0.00 | 1 | 25 | 35647.00 | 1589.14 | 2 2 |
| 22JUL80 | 838.00 | 118.86 | 0.00 | 1 | 25 | 35913.00 | 1589.29 | 2 2 |
| 22JUL80 | 1126.00 | 118.81 | 0.00 | 1 | 25 | 36081.00 | 1589.34 | 2 2 |
| 22JUL80 | 1515.00 | 118.65 | 0.00 | 1 | 25 | 36310.00 | 1589.50 | 2 2 |
| 22JUL80 | 1657.00 | 118.54 | 0.00 | 1 | 25 | 36532.00 | 1589.61 | 2 2 |
| 23JUL80 | 15.00 | 118.49 | 0.00 | 1 | 25 | 36850.00 | 1589.66 | 2 2 |
| 23JUL80 | 331.00 | 118.42 | 0.00 | 1 | 25 | 37046.00 | 1589.73 | 2 2 |
| 23JUL80 | 1109.00 | 115.00 | 3.33 | 1 | 25 | 37504.00 | 1589.82 | 2 2 |
| 23JUL80 | 1922.00 | 115.00 | 3.16 | 1 | 25 | 37997.00 | 1589.99 | 2 2 |
| 24JUL80 | 834.00 | 115.00 | 3.01 | 1 | 25 | 38789.00 | 1590.14 | 2 2 |
| 24JUL80 | 1655.00 | 115.00 | 2.84 | 1 | 25 | 39290.00 | 1590.31 | 2 2 |
| 25JUL80 | 1011.00 | 115.00 | 2.82 | 1 | 25 | 40326.00 | 1590.33 | 2 2 |
| 25JUL80 | 1525.00 | 115.00 | 2.74 | 1 | 25 | 40640.00 | 1590.41 | 2 2 |

**COMMENTS**

COLLAR ELEV 1708.87 FEET PIEZO ELEV 0.00 -NULL-
TIME PUMP TEST BEGAN = 27JUN80-1005.00

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CHANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14B ***

| DATE DDMONYY | TIME HHMM.SS | FIRST READING FEET | SECOND READING FEET | A L G | C O N | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | COLLAR ELEV 1708.87 FEET PIEZO ELEV 0.00 -NULL |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 26JUL80 | 755.00 | 115.00 | 3.23 | 1 | 67 | 41630.00 | 1590.49 | 14 14 |
| 27JUL80 | 1005.00 | 120.00 | .43 | 1 | 95 | 43200.00 | 1590.62 | 15 BY D. K. TO 9/2/80 |
| 28JUL80 | 923.00 | 120.00 | .23 | 1 | 95 | 44598.00 | 1590.82 | 15 BY D. K. TO 9/2/80 |
| 29JUL80 | 920.00 | 120.00 | .23 | 1 | 95 | 46035.00 | 1590.82 | 15 BY D. K. TO 9/2/80 |
| 30JUL80 | 1105.00 | 120.00 | .08 | 1 | 95 | 47580.00 | 1590.97 | 15 BY D. K. TO 9/2/80 |
| 31JUL80 | 1424.00 | 120.00 | 0.00 | 1 | 95 | 49219.00 | 1591.05 | 15 BY D. K. TO 9/2/80 |
| 01AUG80 | 1216.00 | 115.00 | 4.63 | 1 | 94 | 50531.00 | 1591.12 | 15 BY D. K. TO 9/2/80 |
| 03AUG80 | 836.00 | 115.00 | 4.50 | 1 | 94 | 53191.00 | 1591.25 | 4 15 |
| 05AUG80 | 1438.00 | 115.00 | 4.42 | 1 | 94 | 56433.00 | 1591.33 | 4 15 |
| 07AUG80 | 1442.00 | 115.00 | 4.30 | 1 | 94 | 59317.00 | 1591.45 | 4 15 |
| 09AUG80 | 1000.00 | 115.00 | 4.21 | 1 | 94 | 61915.00 | 1591.54 | 4 15 |
| 12AUG80 | 1336.00 | 115.00 | 4.18 | 1 | 94 | 66451.00 | 1591.57 | 4 15 |
| 14AUG80 | 1133.00 | 115.00 | 4.03 | 1 | 94 | 69208.00 | 1591.72 | 4 15 |
| 16AUG80 | 1128.00 | 115.00 | 4.01 | 1 | 94 | 72083.00 | 1591.74 | 4 15 |
| 19AUG80 | 745.00 | 117.10 | 0.00 | 1 | 20 | 76180.00 | 1591.77 | 20 D&M |
| 20AUG80 | 1445.00 | 118.72 | 0.00 | 1 | 94 | 78040.00 | 1592.03 | 15 |
| 22AUG80 | 1320.00 | 119.00 | 0.00 | 1 | 94 | 80835.00 | 1591.75 | 15 |
| 02SEP80 | 950.00 | 118.68 | 0.00 | 1 | 94 | 96465.00 | 1592.07 | 15 |
| 10SEP80 | 905.00 | 116.87 | 0.00 | 1 | 15 | 107940.00 | 1592.00 | 15 FOR G.W. MAP |
| 12SEP80 | 1800.00 | 116.64 | 0.00 | 1 | 15 | 111355.00 | 1592.23 | 15 FOR G.W. MAP |

COOR. N114055 ft. (N34764m)
E2284315 ft. (E696261m)

# BORING LOG G41-G14B

SHEET 1 OF 5

SURFACE ELEV. 1706.8 ft. (520.23m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 11/27/79 DATE COMPLETED 11/30/79

DRILL RIG Drilltech D40K DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS. | BLOWS/FOOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES HAMMER BLOWS PER 6IN. (Note 1) | SAMPLES REC./ATT. (ins.) | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| 0.0 | | See borings G41-G14 and G41-G41A for stratigraphy | | | | | | | 12/4/79 33.74 |
| 73.46 | | | | | | | | | 110.7 |
| 241.0 | | Very dense, brown, silty, fine SAND, trace clay | SM | - | 1 | DO | Air Hammer | 18/18 | Grout (to surface) |
| 75.44 | | | | | | | | | |
| 247.5 | | Very dense, brown, fine sandy SILT | ML | - | 2 | DO | Air Hammer | 18/18 | |
| 76.96 | | | | | | | | | |
| 252.5 | | Very dense, brown to red-brown, silty fine to coarse SAND, trace fine gravel, trace clay to fine to coarse gravelly fine to coarse SAND, some silt, occasional to frequent cobbles and boulders | SP-SM to SM | - | 3 | DO | Air Hammer | 12/12 | 2" Solid PVC Pipe; 77.72; 255.0 Bentonite Clay Seal; 80.16 |
| 81.23 | | | | - | 4 | DO | Air Hammer | 12/12 | 263.0 Pea Gravel |
| 266.5 | | CONTINUED | | | | | | | CONTINUED |

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked

COOR. N114055 ft. (N34764m)
E2284315 ft. (E696261m)

# BORING LOG G41-G14B



SURFACE ELEV. 1706.8 ft. (520.23m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 11/27/79 DATE COMPLETED 11/30/79

DRILL RIG Drilltech D40K DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS. | BLOWS / FOOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES HAMMER BLOWS PER 6 IN. (Note 1) | SAMPLES REC./ATT. (ins.) | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| 81.25 | | CONTINUED | | | | | | | CONTINUED |
| 266.5 | | Very dense, brown to red-brown, silty fine to coarse SAND, trace fine gravel, trace clay to fine to coarse gravelly fine to coarse SAND, some silt, occasional to frequent cobbles and boulders | SP-SM to SM | - | 5 | DO | Air Hammer | 3/6 | 2" Solid PVC Pipe; Pea Gravel; 82.91; 272.0 |
| | | | | - | 6 | DO | Air Hammer | 7/14 | 2" Slotted PVC Pipe; Pea Gravel; 89.00; 292.0 |
| | | | | - | 7 | DO | Air Hammer | 5/5 | Pea Gravel (to bottom of boring) |
| 91.44 | | | | | | | | | |
| 300.0 | | CONTINUED | | | | | | | |

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked

COOR. N114055 ft. (N34764m)
E2284315 ft. (E696261m)

# BORING LOG G41-G14B

SHEET 3 OF 5

SURFACE ELEV. 1706.8 ft. (520.23m) PROJECT EXXON CRANDON TAILING DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 11/27/79 DATE COMPLETED 11/30/79

DRILL RIG Drilltech D40K DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS. | BLOWS / FOOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES HAMMER BLOWS PER 6IN. (Note 1) | SAMPLES REC./ATT. (ins.) | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| 91.44 | | CONTINUED | | | | | | | |
| 300.0 | | Very dense, brown to red-brown, silty fine to coarse SAND, trace fine gravel, trace clay to fine to coarse gravelly fine to coarse SAND, some silt, occasional to frequent cobbles and boulders | SP-SM to SM | - | 8 | DO | Air Hammer | 2/8 | |
| 93.73 | | | | | | | | | |
| 307.5 | | Very dense, brown SILT, some fine sand to fine to coarse SAND and SILT, trace fine gravel | SM to ML | - | 9 | DO | Air Hammer | 4/4 | |
| 96.01 | | | | | | | | | |
| 315.0 | | Red-brown and green, highly weathered to weathered metavolcanic TUFF | | - | 10 | DO | Air Hammer | 6/6 | |
| | | | | - | 11 | DO | Air Hammer | 3/3 | |
| 101.80 | | | | | | | | | |
| 334.0 | | CONTINUED | | | | | | | |

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked

COOR. N114055 ft. (N34764m)
E2284315 ft. (E696261m)

# BORING LOG G41-G14B



SURFACE ELEV. 1706.8 ft. (520.23m) PROJECT EXXON CARNDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 11/27/79 DATE COMPLETED 11/30/79

DRILL RIG Drilltech D40K DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS. | BLOWS / FOOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES HAMMER BLOWS PER 6IN. (Note 1) | SAMPLES REC./ATT. (ins.) | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| 101.80 | | CONTINUED | | | | | | | |
| 334.0 | | | | - | 12 | DO | Air Hammer | 2/2 | |
| | | Red-brown and green, highly weathered to weathered metavolcanic TUFF | | | | | | | |
| | | | | - | 13 | DO | Air Hammer | 1.5/1.5 | |
| 109.76 | | | | | | | | | |
| 360.1 | | END OF BORING<br>HOLE GROUTED AT COMPLETION | | | | | | | |

NOTES

1. Penetration Test - 3" O.D. sampler driven with air hammer. (All samples)
2. Elevation of top of protector pipe, 1708.9 ft. (520.86m).

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked

COOR. N114055 ft. (N34764m)
E2284315 ft. (E696261m)

# BORING LOG G41-G14B

SHEET 5 OF 5

SURFACE ELEV. 1706.8 ft. (520.23m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 11/27/79 DATE COMPLETED 11/30/79

DRILL RIG Drilltech D40K DRILLING METHOD Mud Rotary

Table of Water Level Readings by Date. Readings Indicate Depth Below Ground Surface.

| DATE | 12/4/79 | 2/12/80 | 4/25/80 | 5/15/80 | 5/20/80 | 6/26/80* | 9/10/80* |
|---|---|---|---|---|---|---|---|
| DEPTH (m) | 33.74 | 34.17 | 34.38 | 34.50 | 34.38 | 34.41 | 34.99 |
| DEPTH (ft.) | 110.7 | 112.1 | 112.8 | 113.2 | 112.8 | 112.9 | 114.8 |

| DATE | 6/10/80 | | | | | | |
|---|---|---|---|---|---|---|---|
| DEPTH (m) | 35.02 | | | | | | |
| DEPTH (ft.) | 114.9 | | | | | | |

*Pump Test and Recovery Period Between these Dates. For Pump Test Data, Refer to PUMP TEST AND ANALYSIS, Project Report No. 4.

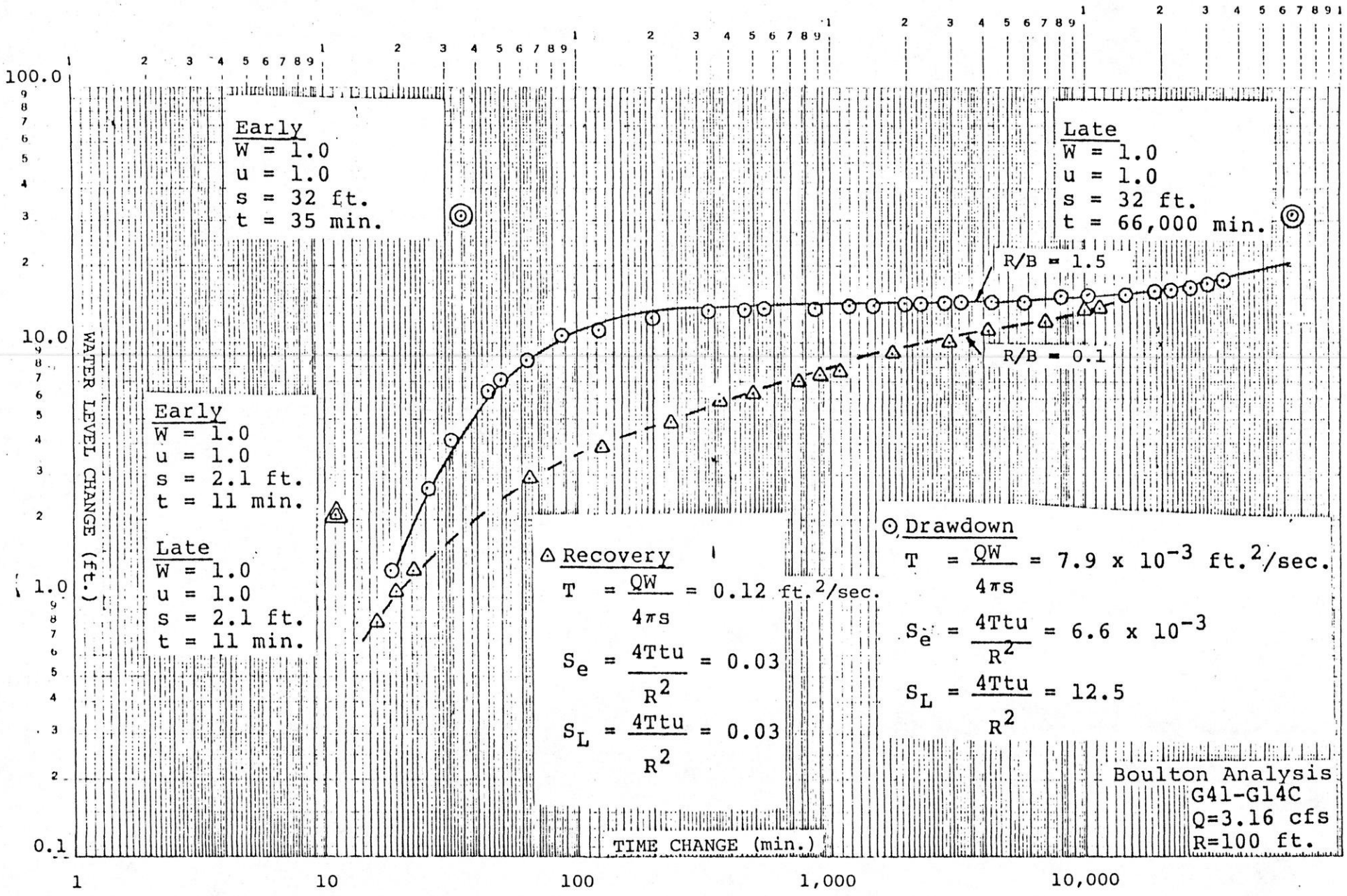
Job No. 786085
Scale 1" = 5'

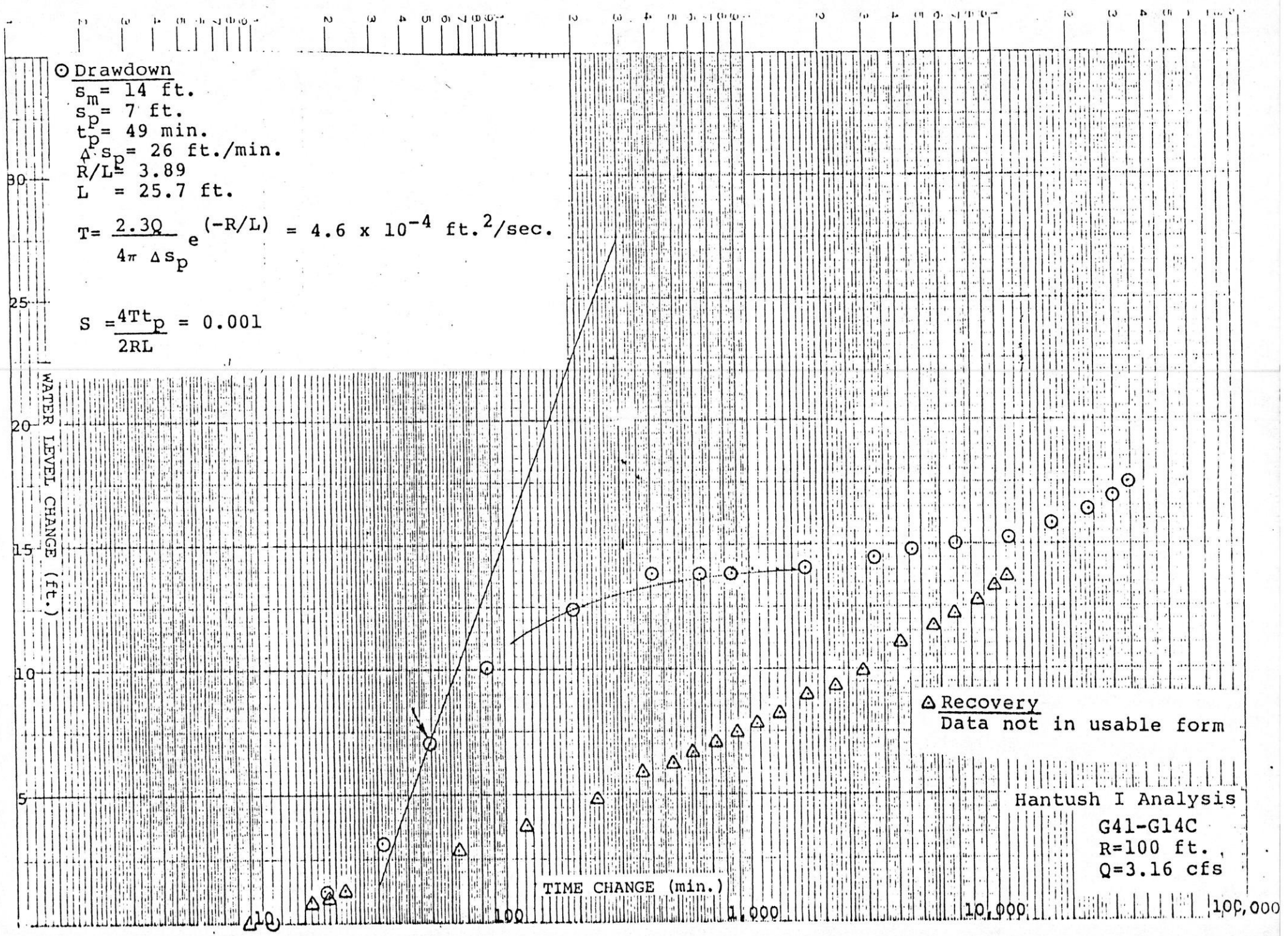
Golder Associates

Drawn JEF
Checked DPB

KEUFFEL & ESSER CO. MADE IN U.S.A.






⊙ Drawdown
$s_m$ = 14 ft.
$s_p$ = 7 ft.
$t_p$ = 49 min.
$\Delta s_p$ = 26 ft./min.
R/L = 3.89
L = 25.7 ft.
$T = \frac{2.3Q}{4\pi \Delta s_p} e^{(-R/L)} = 4.6 \times 10^{-4}$ ft.$^2$/sec.
$S = \frac{4Tt_p}{2RL} = 0.001$
WATER LEVEL CHANGE (ft.)
TIME CHANGE (min.)
30
25
20
15
10
5
1.0
100
1,000
10,000
100,000
△ Recovery
Data not in usable form
Hantush I Analysis
G41-G14C
R=100 ft.
Q=3.16 cfs

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14C ***

| DATE | TIME | FIRST READING | SECOND READING | A L G | C O N | TIME SINCE TEST BEGAN | WATER LEVEL ELEVATION | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| DDMONYY | HHMM.SS | FEET | FEET | | | MINUTES | FEET | |
| | | | | | | | | COLLAR ELEV 1708.68 FEET PIEZO ELEV 0.00 -NULL- |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 11DEC79 | 1200.00 | 113.10 | 0.00 | 1 | 20 | -286445.00 | 1595.58 | GROUND SURFACE-CORR. TO |
| 12FEB80 | 1600.00 | 113.40 | 0.00 | 1 | 20 | -195485.00 | 1595.28 | BY D&M |
| 25APR80 | 1200.00 | 113.95 | .14 | 1 | 14 | -90605.00 | 1594.59 | 14 - TIME NOT RECORD |
| 15MAY80 | 1020.00 | 114.27 | 0.00 | 1 | 20 | -61905.00 | 1594.41 | 20 D&M |
| 20MAY80 | 600.00 | 113.67 | 0.00 | 1 | 66 | -54965.00 | 1594.67 | 4 14 |
| 21MAY80 | 1200.00 | 113.75 | 0.00 | 1 | 3 | -53165.00 | 1594.79 | 3 - NO TIME |
| 29MAY80 | 930.00 | 113.49 | 0.00 | 1 | 3 | -41795.00 | 1595.05 | 4 3 -REV. CIR. |
| 30MAY80 | 1730.00 | 113.53 | 0.00 | 1 | 3 | -39875.00 | 1595.01 | 4 3 -REV. CIR. |
| 31MAY80 | 20.00 | 111.65 | 0.00 | 1 | 3 | -39465.00 | 1596.89 | 4 3 -REV. CIR. |
| 31MAY80 | 945.00 | 112.54 | 0.00 | 1 | 3 | -38900.00 | 1596.00 | 4 3 SET CASE |
| 01JUN80 | 600.00 | 112.73 | 0.00 | 1 | 3 | -37685.00 | 1595.81 | 4 3 SET CASE |
| 01JUN80 | 1525.00 | 113.15 | 0.00 | 1 | 3 | -37120.00 | 1595.39 | 4 3 GRAVEL |
| 02JUN80 | 830.00 | 113.49 | 0.00 | 1 | 3 | -36095.00 | 1595.10 | 4 3 |
| 03JUN80 | 915.00 | 113.75 | 0.00 | 1 | 3 | -34610.00 | 1594.79 | 4 3 |
| 04JUN80 | 155.00 | 114.41 | 0.00 | 1 | 3 | -33630.00 | 1594.13 | 4 3 AIR DEV. |
| 06JUN80 | 927.00 | 114.13 | 0.00 | 1 | 3 | -30278.00 | 1594.41 | 4 3 |
| 06JUN80 | 1105.00 | 114.79 | 0.00 | 1 | 3 | -30180.00 | 1593.75 | 4 3 |
| 06JUN80 | 1300.00 | 113.84 | 0.00 | 1 | 3 | -30065.00 | 1594.70 | 4 3 |
| 06JUN80 | 1703.00 | 117.04 | 0.00 | 1 | 31 | -29822.00 | 1591.43 | 4 3 VEL TEST |
| 06JUN80 | 1844.00 | 117.04 | 0.00 | 1 | 31 | -29721.00 | 1591.43 | 4 3 VEL TEST |
| 07JUN80 | 930.00 | 113.65 | 0.00 | 1 | 3 | -28835.00 | 1594.89 | 4 3 |
| 08JUN80 | 830.00 | 114.06 | 0.00 | 1 | 3 | -27455.00 | 1594.48 | 4 3 |
| 09JUN80 | 800.00 | 113.72 | 0.00 | 1 | 3 | -26045.00 | 1594.82 | 4 3 |
| 10JUN80 | 835.00 | 113.93 | 0.00 | 1 | 3 | -24570.00 | 1594.61 | 4 3 |
| 11JUN80 | 845.00 | 114.11 | 0.00 | 1 | 3 | -23120.00 | 1594.43 | 4 3 |
| 12JUN80 | 840.00 | 113.95 | 0.00 | 1 | 3 | -21685.00 | 1594.59 | 4 3 |
| 13JUN80 | 815.00 | 113.75 | 0.00 | 1 | 3 | -20270.00 | 1594.79 | 4 3 |
| 13JUN80 | 2115.00 | 113.61 | 0.00 | 1 | 31 | -19490.00 | 1594.86 | 4 3 DIFF. RULE |
| 14JUN80 | 815.00 | 113.72 | 0.00 | 1 | 3 | -18630.00 | 1594.82 | 4 3 |
| 14JUN80 | 1745.00 | 113.72 | 0.00 | 1 | 3 | -18260.00 | 1594.82 | 4 3 |
| 15JUN80 | 820.00 | 113.69 | 0.00 | 1 | 3 | -17385.00 | 1594.85 | 4 3 |
| 16JUN80 | 805.00 | 114.05 | 0.00 | 1 | 3 | -15960.00 | 1594.49 | 4 3 |
| 24JUN80 | 520.00 | 113.98 | 0.00 | 1 | 3 | -4425.00 | 1594.56 | 4 3 |
| 25JUN80 | 815.00 | 113.94 | 0.00 | 1 | 3 | -2990.00 | 1594.60 | 4 3 |
| 26JUN80 | 840.00 | 113.90 | 0.00 | 1 | 3 | -1525.00 | 1594.64 | 4 3 |
| 27JUN80 | 800.00 | 114.09 | 0.00 | 1 | 3 | -125.00 | 1594.45 | 3 3 BEFORE TEST |
| 27JUN80 | 1011.00 | 113.50 | 0.00 | 1 | 3 | 6.00 | 1595.04 | 3 3 START @ 10 |
| 27JUN80 | 1016.00 | 113.97 | 0.00 | 1 | 3 | 11.00 | 1594.57 | 3 3 |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14C ***

| DATE | TIME | FIRST READING | SECOND READING | A L G | C O N | TIME SINCE TEST BEGAN | WATER LEVEL ELEVATION | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| DDMONYY | HHMM.SS | FEET | FEET | | | MINUTES | FEET | |
| | | | | | | | | COLLAR ELEV 1708.68 FEET PIEZO ELEV 0.00 -NULL- |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 27JUN80 | 1023.00 | 115.30 | 0.00 | 1 | 31 | 18.00 | 1593.17 | 3 3 |
| 27JUN80 | 1028.00 | 116.67 | 0.00 | 1 | 31 | 23.00 | 1591.80 | 3 3 |
| 27JUN80 | 1036.00 | 118.13 | 0.00 | 1 | 31 | 31.00 | 1590.34 | 3 3 |
| 27JUN80 | 1049.00 | 120.47 | 0.00 | 1 | 31 | 44.00 | 1588.00 | 3 3 |
| 27JUN80 | 1054.00 | 121.11 | 0.00 | 1 | 31 | 49.00 | 1587.36 | 3 3 |
| 27JUN80 | 1100.00 | 121.78 | 0.00 | 1 | 31 | 55.00 | 1586.69 | 3 3 |
| 27JUN80 | 1107.00 | 122.48 | 0.00 | 1 | 31 | 62.00 | 1585.99 | 3 3 |
| 27JUN80 | 1118.00 | 123.30 | 0.00 | 1 | 31 | 73.00 | 1585.17 | 3 3 |
| 27JUN80 | 1131.00 | 124.10 | 0.00 | 1 | 31 | 86.00 | 1584.37 | 3 3 |
| 27JUN80 | 1148.00 | 124.94 | 0.00 | 1 | 31 | 103.00 | 1583.53 | 3 3 |
| 27JUN80 | 1206.00 | 125.31 | 0.00 | 1 | 31 | 121.00 | 1583.16 | 3 3 |
| 27JUN80 | 1221.00 | 125.66 | 0.00 | 1 | 31 | 136.00 | 1582.81 | 3 3 |
| 27JUN80 | 1245.00 | 126.10 | 0.00 | 1 | 31 | 160.00 | 1582.37 | 3 3 |
| 27JUN80 | 1320.00 | 126.50 | 0.00 | 1 | 31 | 195.00 | 1581.97 | 3 3 |
| 27JUN80 | 1359.00 | 126.86 | 0.00 | 1 | 31 | 234.00 | 1581.61 | 3 3 |
| 27JUN80 | 1455.00 | 127.16 | 0.00 | 1 | 31 | 290.00 | 1581.31 | 3 3 |
| 27JUN80 | 1534.00 | 127.35 | 0.00 | 1 | 31 | 329.00 | 1581.12 | 3 3 TIME CORRECTED |
| 27JUN80 | 1655.00 | 127.52 | 0.00 | 1 | 31 | 410.00 | 1580.95 | 3 3 |
| 27JUN80 | 1740.00 | 127.59 | 0.00 | 1 | 31 | 455.00 | 1580.88 | 3 3 |
| 27JUN80 | 1854.00 | 127.74 | 0.00 | 1 | 31 | 529.00 | 1580.73 | 3 3 |
| 27JUN80 | 1929.00 | 127.72 | 0.00 | 1 | 31 | 564.00 | 1580.75 | 3 3 |
| 27JUN80 | 2043.00 | 127.85 | 0.00 | 1 | 31 | 638.00 | 1580.62 | 3 3 |
| 27JUN80 | 2139.00 | 127.89 | 0.00 | 1 | 31 | 694.00 | 1580.58 | 3 3 |
| 27JUN80 | 2305.00 | 127.98 | 0.00 | 1 | 31 | 780.00 | 1580.49 | 3 3 |
| 28JUN80 | 36.00 | 127.90 | 0.00 | 1 | 31 | 871.00 | 1580.57 | 3 3 |
| 28JUN80 | 222.00 | 127.96 | 0.00 | 1 | 31 | 977.00 | 1580.51 | 3 3 |
| 28JUN80 | 537.00 | 128.06 | 0.00 | 1 | 31 | 1172.00 | 1580.41 | 3 3 |
| 28JUN80 | 742.00 | 128.06 | 0.00 | 1 | 31 | 1297.00 | 1580.41 | 3 3 |
| 28JUN80 | 1010.00 | 128.11 | 0.00 | 1 | 31 | 1445.00 | 1580.36 | 3 3 |
| 28JUN80 | 1212.00 | 128.30 | 0.00 | 1 | 31 | 1567.00 | 1580.17 | 3 3 |
| 28JUN80 | 1509.00 | 128.23 | 0.00 | 1 | 31 | 1744.00 | 1580.24 | 3 3 |
| 28JUN80 | 1809.00 | 128.26 | 0.00 | 1 | 31 | 1924.00 | 1580.21 | 3 3 |
| 28JUN80 | 2332.00 | 128.29 | 0.00 | 1 | 31 | 2247.00 | 1580.18 | 3 3 |
| 29JUN80 | 819.00 | 128.40 | 0.00 | 1 | 31 | 2774.00 | 1580.07 | 3 3 |
| 29JUN80 | 1602.00 | 128.54 | 0.00 | 1 | 31 | 3237.00 | 1579.93 | 3 3 |
| 30JUN80 | 43.00 | 126.79 | 0.00 | 1 | 31 | 3758.00 | 1579.68 | 3 3 |
| 30JUN80 | 832.00 | 128.69 | 0.00 | 1 | 31 | 4227.00 | 1579.78 | 3 3 |
| 30JUN80 | 1530.00 | 126.79 | 0.00 | 1 | 31 | 4645.00 | 1579.68 | 3 3 |
| 01JUL80 | 801.00 | 128.77 | 0.00 | 1 | 31 | 5636.00 | 1579.70 | 3 3 |
| 01JUL80 | 1012.00 | 128.80 | 0.00 | 1 | 31 | 5767.00 | 1579.67 | 3 3 |
| 01JUL80 | 1022.00 | 129.10 | 0.00 | 1 | 31 | 5777.00 | 1579.37 | 3 3 STOP PUMP-OIL |
| 01JUL80 | 1027.00 | 129.20 | 0.00 | 1 | 31 | 5782.00 | 1579.27 | 3 3 STOP PUMP-OIL |
| 01JUL80 | 1032.00 | 128.35 | 0.00 | 1 | 31 | 5787.00 | 1580.12 | 3 3 RESTART PUMP |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14C ***

| DATE DDMONYY | TIME HHMM.SS | FIRST READING FEET | SECOND READING FEET | ALG | CON | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | COLLAR ELEV 1708.68 FEET PIEZO ELEV 0.00 -NULL |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 01JUL80 | 1036.00 | 127.32 | 0.00 | 1 31 | | 5791.00 | 1581.15 | 3 3 |
| 01JUL80 | 1042.00 | 126.69 | 0.00 | 1 31 | | 5797.00 | 1581.78 | 3 3 |
| 01JUL80 | 1044.00 | 126.66 | 0.00 | 1 31 | | 5799.00 | 1581.81 | 3 3 |
| 01JUL80 | 1048.00 | 126.82 | 0.00 | 1 31 | | 5803.00 | 1581.65 | 3 3 |
| 01JUL80 | 1102.00 | 127.42 | 0.00 | 1 31 | | 5817.00 | 1581.05 | 3 3 |
| 01JUL80 | 1107.00 | 127.63 | 0.00 | 1 31 | | 5822.00 | 1580.84 | 3 3 |
| 01JUL80 | 1113.00 | 127.80 | 0.00 | 1 31 | | 5828.00 | 1580.67 | 3 3 |
| 01JUL80 | 1123.00 | 128.06 | 0.00 | 1 31 | | 5838.00 | 1580.41 | 3 3 |
| 01JUL80 | 1153.00 | 128.46 | 0.00 | 1 31 | | 5868.00 | 1580.01 | 3 3 |
| 01JUL80 | 1305.00 | 128.76 | 0.00 | 1 31 | | 5940.00 | 1579.71 | 3 3 |
| 01JUL80 | 1440.00 | 128.85 | 0.00 | 1 31 | | 6035.00 | 1579.62 | 3 3 |
| 01JUL80 | 1705.00 | 128.95 | 0.00 | 1 31 | | 6180.00 | 1579.52 | 3 3 |
| 02JUL80 | 203.00 | 129.12 | 0.00 | 1 31 | | 6718.00 | 1579.35 | 3 3 |
| 02JUL80 | 840.00 | 129.23 | 0.00 | 1 31 | | 7115.00 | 1579.24 | 3 3 |
| 02JUL80 | 1315.00 | 129.25 | .16 | 1 14 | | 7390.00 | 1579.27 | 16 14 COMPARE PIEZ. |
| 02JUL80 | 1316.00 | 129.23 | 0.00 | 1 31 | | 7391.00 | 1579.24 | 3 3 COMPARE PIEZ. |
| 02JUL80 | 2130.00 | 129.11 | 0.00 | 1 31 | | 7885.00 | 1579.36 | 3 3 |
| 03JUL80 | 903.00 | 129.12 | 0.00 | 1 31 | | 8578.00 | 1579.35 | 3 3 |
| 03JUL80 | 2046.00 | 129.16 | 0.00 | 1 31 | | 9283.00 | 1579.31 | 3 3 |
| 04JUL80 | 845.00 | 129.26 | 0.00 | 1 31 | | 10000.00 | 1579.21 | 3 3 |
| 04JUL80 | 2047.00 | 129.19 | 0.00 | 1 31 | | 10722.00 | 1579.28 | 3 3 |
| 05JUL80 | 821.00 | 129.38 | 0.00 | 1 31 | | 11416.00 | 1579.09 | 3 3 |
| 05JUL80 | 2044.00 | 129.70 | 0.00 | 1 31 | | 12159.00 | 1578.77 | 3 3 |
| 06JUL80 | 913.00 | 129.82 | 0.00 | 1 31 | | 12908.00 | 1578.65 | 3 3 |
| 06JUL80 | 1743.00 | 129.69 | 0.00 | 1 31 | | 13418.00 | 1578.78 | 3 3 |
| 07JUL80 | 749.00 | 129.58 | 0.00 | 1 31 | | 14264.00 | 1578.89 | 3 3 |
| 07JUL80 | 1636.00 | 129.53 | 0.00 | 1 31 | | 14791.00 | 1578.94 | 3 3 |
| 08JUL80 | 835.00 | 129.90 | 0.00 | 1 31 | | 15750.00 | 1578.57 | 3 3 |
| 08JUL80 | 2100.00 | 129.90 | 0.00 | 1 31 | | 16495.00 | 1578.57 | 3 3 |
| 09JUL80 | 853.00 | 129.94 | 0.00 | 1 31 | | 17208.00 | 1578.53 | 3 3 |
| 09JUL80 | 1605.00 | 129.91 | 0.00 | 1 31 | | 17640.00 | 1578.56 | 3 3 |
| 10JUL80 | 844.00 | 130.02 | 0.00 | 1 32 | | 18639.00 | 1578.44 | 3 3 |
| 10JUL80 | 1738.00 | 130.00 | 0.00 | 1 32 | | 19173.00 | 1578.46 | 3 3 |
| 11JUL80 | 916.00 | 130.17 | 0.00 | 1 32 | | 20111.00 | 1578.29 | 3 3 |
| 11JUL80 | 1915.00 | 130.18 | 0.00 | 1 32 | | 20714.00 | 1578.28 | 3 3 |
| 12JUL80 | 855.00 | 130.26 | 0.00 | 1 32 | | 21530.00 | 1578.20 | 3 3 |
| 13JUL80 | 822.00 | 130.49 | 0.00 | 1 32 | | 22937.00 | 1577.97 | 3 3 |
| 14JUL80 | 758.00 | 130.43 | 0.00 | 1 32 | | 24353.00 | 1578.03 | 3 3 |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14C ***

| DATE DDMONYY | TIME HHMM.SS | FIRST READING FEET | SECOND READING FEET | A L G | C O N | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | COLLAR ELEV 1708.68 FEET PIEZO ELEV 0.00 -NULL |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 14JUL80 | 832.00 | 129.79 | 0.00 | 1 | 31 | 24387.00 | 1578.68 | 3 3 PUMP OFF-OIL |
| 14JUL80 | 904.00 | 127.38 | 0.00 | 1 | 31 | 24419.00 | 1581.09 | 3 3 |
| 14JUL80 | 912.00 | 128.03 | 0.00 | 1 | 31 | 24427.00 | 1580.44 | 3 3 3 PUMP ON |
| 14JUL80 | 920.00 | 128.63 | 0.00 | 1 | 31 | 24435.00 | 1579.84 | 3 3 |
| 14JUL80 | 939.00 | 129.31 | 0.00 | 1 | 31 | 24454.00 | 1579.16 | 3 3 |
| 14JUL80 | 1056.00 | 130.00 | 0.00 | 1 | 32 | 24531.00 | 1578.46 | 3 3 |
| 15JUL80 | 827.00 | 130.58 | 0.00 | 1 | 32 | 25822.00 | 1577.88 | 3 3 |
| 16JUL80 | 914.00 | 130.76 | 0.00 | 1 | 32 | 27309.00 | 1577.70 | 3 3 |
| 17JUL80 | 811.00 | 131.04 | 0.00 | 1 | 32 | 28686.00 | 1577.42 | 3 3 |
| 18JUL80 | 758.00 | 131.09 | 0.00 | 1 | 32 | 30113.00 | 1577.37 | 3 3 |
| 20JUL80 | 804.00 | 131.18 | 0.00 | 1 | 32 | 32999.00 | 1577.28 | 3 3 |
| 21JUL80 | 826.00 | 131.55 | 0.00 | 1 | 32 | 34461.00 | 1576.91 | 3 3 |
| 21JUL80 | 1008.00 | 131.66 | 0.00 | 1 | 32 | 34563.00 | 1576.80 | 3 3 RECOVERY @ 10 |
| 21JUL80 | 1011.00 | 131.71 | 0.00 | 1 | 32 | 34566.00 | 1576.75 | 3 3 |
| 21JUL80 | 1014.00 | 131.47 | 0.00 | 1 | 32 | 34569.00 | 1576.99 | 3 3 |
| 21JUL80 | 1021.00 | 130.75 | 0.00 | 1 | 32 | 34576.00 | 1577.71 | 3 3 |
| 21JUL80 | 1024.00 | 130.51 | 0.00 | 1 | 32 | 34579.00 | 1577.95 | 3 3 |
| 21JUL80 | 1027.00 | 130.28 | 0.00 | 1 | 32 | 34582.00 | 1578.18 | 3 3 |
| 21JUL80 | 1034.00 | 129.84 | 0.00 | 1 | 31 | 34589.00 | 1578.63 | 3 3 |
| 21JUL80 | 1037.00 | 129.66 | 0.00 | 1 | 31 | 34592.00 | 1578.81 | 3 3 |
| 21JUL80 | 1040.00 | 129.59 | 0.00 | 1 | 31 | 34595.00 | 1578.88 | 3 3 |
| 21JUL80 | 1044.00 | 129.41 | 0.00 | 1 | 31 | 34599.00 | 1579.06 | 3 3 |
| 21JUL80 | 1049.00 | 129.21 | 0.00 | 1 | 31 | 34604.00 | 1579.26 | 3 3 |
| 21JUL80 | 1053.00 | 129.08 | 0.00 | 1 | 31 | 34608.00 | 1579.39 | 3 3 |
| 21JUL80 | 1104.00 | 128.93 | 0.00 | 1 | 31 | 34619.00 | 1579.54 | 3 3 |
| 21JUL80 | 1109.00 | 128.67 | 0.00 | 1 | 31 | 34624.00 | 1579.80 | 3 3 |
| 21JUL80 | 1114.00 | 128.60 | 0.00 | 1 | 31 | 34629.00 | 1579.87 | 3 3 |
| 21JUL80 | 1121.00 | 128.44 | 0.00 | 1 | 31 | 34636.00 | 1580.03 | 3 3 |
| 21JUL80 | 1126.00 | 128.33 | 0.00 | 1 | 31 | 34641.00 | 1580.14 | 3 3 |
| 21JUL80 | 1131.00 | 128.29 | 0.00 | 1 | 31 | 34646.00 | 1580.18 | 3 3 |
| 21JUL80 | 1135.00 | 128.21 | 0.00 | 1 | 31 | 34650.00 | 1580.26 | 3 3 |
| 21JUL80 | 1139.00 | 128.16 | 0.00 | 1 | 31 | 34654.00 | 1580.31 | 3 3 |
| 21JUL80 | 1145.00 | 128.05 | 0.00 | 1 | 31 | 34660.00 | 1580.42 | 3 3 |
| 21JUL80 | 1149.00 | 127.99 | 0.00 | 1 | 31 | 34664.00 | 1580.48 | 3 3 |
| 21JUL80 | 1153.00 | 127.93 | 0.00 | 1 | 31 | 34668.00 | 1580.54 | 3 3 |
| 21JUL80 | 1157.00 | 127.88 | 0.00 | 1 | 31 | 34672.00 | 1580.59 | 3 3 |
| 21JUL80 | 1203.00 | 127.79 | 0.00 | 1 | 31 | 34678.00 | 1580.68 | 3 3 |
| 21JUL80 | 1208.00 | 127.76 | 0.00 | 1 | 31 | 34683.00 | 1580.71 | 3 3 |
| 21JUL80 | 1214.00 | 127.68 | 0.00 | 1 | 31 | 34689.00 | 1580.79 | 3 3 |
| 21JUL80 | 1236.00 | 127.43 | 0.00 | 1 | 31 | 34711.00 | 1581.04 | 3 3 |
| 21JUL80 | 1255.00 | 127.24 | 0.00 | 1 | 31 | 34730.00 | 1581.23 | 3 3 |
| 21JUL80 | 1311.00 | 127.09 | 0.00 | 1 | 31 | 34746.00 | 1581.38 | 3 3 |
| 21JUL80 | 1326.00 | 126.97 | 0.00 | 1 | 31 | 34761.00 | 1581.50 | 3 3 |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14C ***

| DATE DDMONYY | TIME HHMM.SS | FIRST READING FEET | SECOND READING FEET | ALG | CON | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | COLLAR ELEV 1708.68 FEET PIEZO ELEV 0.00 -NULL- |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 21JUL80 | 1344.00 | 126.80 | 0.00 | 1 | 31 | 34779.00 | 1581.67 | 3 3 |
| 21JUL80 | 1400.00 | 126.68 | 0.00 | 1 | 31 | 34795.00 | 1581.79 | 3 3 |
| 21JUL80 | 1433.00 | 126.45 | 0.00 | 1 | 31 | 34828.00 | 1582.02 | 3 3 |
| 21JUL80 | 1501.00 | 126.25 | 0.00 | 1 | 31 | 34856.00 | 1582.22 | 3 3 |
| 21JUL80 | 1535.00 | 126.07 | 0.00 | 1 | 31 | 34890.00 | 1582.40 | 3 3 |
| 21JUL80 | 1607.00 | 125.88 | 0.00 | 1 | 31 | 34922.00 | 1582.59 | 3 3 |
| 21JUL80 | 1702.00 | 125.63 | 0.00 | 1 | 31 | 34977.00 | 1582.84 | 3 3 |
| 21JUL80 | 1814.00 | 125.28 | 0.00 | 1 | 31 | 35049.00 | 1583.19 | 3 3 |
| 21JUL80 | 1910.00 | 125.05 | 0.00 | 1 | 31 | 35105.00 | 1583.42 | 3 3 |
| 21JUL80 | 2002.00 | 124.86 | 0.00 | 1 | 31 | 35157.00 | 1583.61 | 3 3 |
| 21JUL80 | 2122.00 | 124.60 | 0.00 | 1 | 31 | 35237.00 | 1583.87 | 3 3 |
| 21JUL80 | 2230.00 | 124.39 | 0.00 | 1 | 31 | 35305.00 | 1584.08 | 3 3 |
| 22JUL80 | 106.00 | 124.02 | 0.00 | 1 | 31 | 35461.00 | 1584.45 | 3 3 |
| 22JUL80 | 228.00 | 123.83 | 0.00 | 1 | 31 | 35543.00 | 1584.64 | 3 3 |
| 22JUL80 | 413.00 | 123.64 | 0.00 | 1 | 31 | 35648.00 | 1584.83 | 3 3 |
| 22JUL80 | 539.00 | 123.18 | 0.00 | 1 | 31 | 35914.00 | 1585.29 | 3 3 |
| 22JUL80 | 1127.00 | 122.95 | 0.00 | 1 | 31 | 36082.00 | 1585.52 | 3 3 |
| 22JUL80 | 1516.00 | 122.61 | 0.00 | 1 | 31 | 36311.00 | 1585.86 | 3 3 |
| 22JUL80 | 1858.00 | 122.42 | 0.00 | 1 | 31 | 36533.00 | 1586.05 | 3 3 |
| 23JUL80 | 17.00 | 122.19 | 0.00 | 1 | 31 | 36852.00 | 1586.28 | 3 3 |
| 23JUL80 | 332.00 | 121.99 | 0.00 | 1 | 31 | 37047.00 | 1586.48 | 3 3 |
| 23JUL80 | 1110.00 | 120.00 | 1.06 | 1 | 31 | 37505.00 | 1586.81 | 3 3 |
| 23JUL80 | 1923.00 | 120.00 | 1.26 | 1 | 31 | 37998.00 | 1587.21 | 3 3 |
| 24JUL80 | 835.00 | 120.00 | .75 | 1 | 31 | 38790.00 | 1587.72 | 3 3 |
| 24JUL80 | 1657.00 | 120.00 | .44 | 1 | 31 | 39292.00 | 1588.03 | 3 3 |
| 25JUL80 | 1012.00 | 120.00 | .13 | 1 | 31 | 40327.00 | 1588.34 | 3 3 |
| 25JUL80 | 1526.00 | 120.00 | .02 | 1 | 31 | 40641.00 | 1588.45 | 3 3 |
| 26JUL80 | 757.00 | 115.00 | 4.92 | 1 | 67 | 41632.00 | 1588.61 | 14 14 |
| 27JUL80 | 1000.00 | 120.00 | 1.79 | 1 | 95 | 43195.00 | 1589.07 | 15 BY D. K. TO 9/2/80 |
| 28JUL80 | 920.00 | 120.00 | 1.40 | 1 | 95 | 44595.00 | 1589.46 | 15 BY D. K. TO 9/2/80 |
| 29JUL80 | 913.00 | 120.00 | 1.22 | 1 | 95 | 46028.00 | 1589.64 | 15 BY D. K. TO 9/2/80 |
| 30JUL80 | 1110.00 | 120.00 | .90 | 1 | 95 | 47585.00 | 1589.96 | 15 BY D. K. TO 9/2/80 |
| 31JUL80 | 1428.00 | 120.00 | .64 | 1 | 95 | 49223.00 | 1590.22 | 15 BY D. K. TO 9/2/80 |
| 01AUG80 | 1220.00 | 120.00 | .45 | 1 | 95 | 50535.00 | 1590.41 | 15 BY D. K. TO 9/2/80 |
| 03AUG80 | 630.00 | 120.00 | .01 | 1 | 95 | 53185.00 | 1590.85 | 4 15 |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14C ***

| DATE | TIME | FIRST READING | SECOND READING | A L G | C O N | TIME SINCE TEST BEGAN | WATER LEVEL ELEVATION | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| DDMONYY | HHMM.SS | FEET | FEET | | | MINUTES | FEET | |
| | | | | | | | | COLLAR ELEV 1708.68 FEET PIEZO ELEV 0.00 -NULL- |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 05AUG80 | 1433.00 | 115.00 | 4.55 | 1 | 94 | 56428.00 | 1591.01 | 4 15 |
| 07AUG80 | 1440.00 | 115.00 | 4.29 | 1 | 94 | 59315.00 | 1591.27 | 4 15 |
| 09AUG80 | 948.00 | 115.00 | 4.19 | 1 | 94 | 61903.00 | 1591.37 | 4 15 |
| 12AUG80 | 1331.00 | 115.00 | 3.94 | 1 | 94 | 66446.00 | 1591.62 | 4 15 |
| 14AUG80 | 1130.00 | 115.00 | 3.72 | 1 | 94 | 69205.00 | 1591.84 | 4 15 |
| 16AUG80 | 1125.00 | 115.00 | 3.72 | 1 | 94 | 72080.00 | 1591.84 | 4 15 |
| 19AUG80 | 750.00 | 116.69 | 0.00 | 1 | 20 | 76185.00 | 1591.99 | 20 O&M |
| 20AUG80 | 1438.00 | 118.31 | 0.00 | 1 | 94 | 78033.00 | 1592.25 | 15 |
| 22AUG80 | 1314.00 | 118.65 | 0.00 | 1 | 94 | 80829.00 | 1591.91 | 15 |
| 02SEP80 | 948.00 | 118.17 | 0.00 | 1 | 94 | 96463.00 | 1592.39 | 15 |
| 10SEP80 | 915.00 | 116.31 | 0.00 | 1 | 15 | 107950.00 | 1592.37 | 15 FOR G.W. MAP |

COOR. N114030 ft. (N34757m)
E2284315 ft. (E69626im)

# BORING LOG G41-G14C

SHEET 1 OF 2

SURFACE ELEV. 1706.3 ft. (520.09m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 12/2/79 DATE COMPLETED 12/4/79

DRILL RIG Drilltech D40K DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS. | BLOWS / FOOT | SAMPLES: NUMBER | SAMPLES: TYPE | SAMPLES: HAMMER BLOWS PER 6IN. | SAMPLES: REC./ATT. | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| 0.0 | | See borings G41-G14 and G41-G14A for soil stratigraphy | | | | | | | Grout (to surface) |
| | | | | | | | | | ▼12/11/79 33.56 |
| | | | | | | | | | 110.1 |
| | | | | | | | | | 35.97 |
| | | | | | | | | | 118.0 Bentonite Clay Seal |
| | | | | | | | | | 37.80 |
| | | | | | | | | | 124.0 Pea Gravel |
| | | | | | | | | | 39.93 |
| | | | | | | | | | 131.0 Pea Gravel |
| 41.45 | | | | | | | | | |
| 136.0 | | CONTINUED | | | | | | | CONTINUED |

2" Solid PVC Pipe

2" Slot Pipe

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked

COOR. N114030 ft. (N34757m)
E2284315 ft. (E696261m)

# BORING LOG G41-G14C

SHEET 2 OF 2

SURFACE ELEV. 1706.3 ft. (520.09m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 12/2/79 DATE COMPLETED 12/4/79

DRILL RIG Drilltech D40K DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS | BLOWS / FOOT | SAMPLES: NUMBER | SAMPLES: TYPE | SAMPLES: HAMMER BLOWS PER 6 IN. | SAMPLES: REC. / ATT. | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| | | CONTINUED | | | | | | | CONTINUED |
| 41.45 / 136.0 | | See borings G41-G14 and G41-G14A for soil stratigraphy | | | | | | | 12" Slotted PVC Pipe; Pea Gravel; 45.72; 150.0; 151.0; Caved Material |
| 48.77 / 160.0 | | END OF BORING | | | | | | | |

NOTES

Elevation of top of protector pipe, 1708.7 ft. (520.81m).

Table of Water Level Readings by Date. Readings Indicate Depth Below Ground Surface.

| DATE | 12/11/79 | 2/12/80 | 4/25/80 | 5/15/80 | 5/20/80 | 6/26/80* | 9/10/80* |
|---|---|---|---|---|---|---|---|
| DEPTH (m) | 33.56 | 33.86 | 34.02 | 34.11 | 33.99 | 34.05 | 34.75 |
| DEPTH (ft.) | 110.1 | 111.1 | 111.6 | 111.9 | 111.5 | 111.7 | 114.0 |

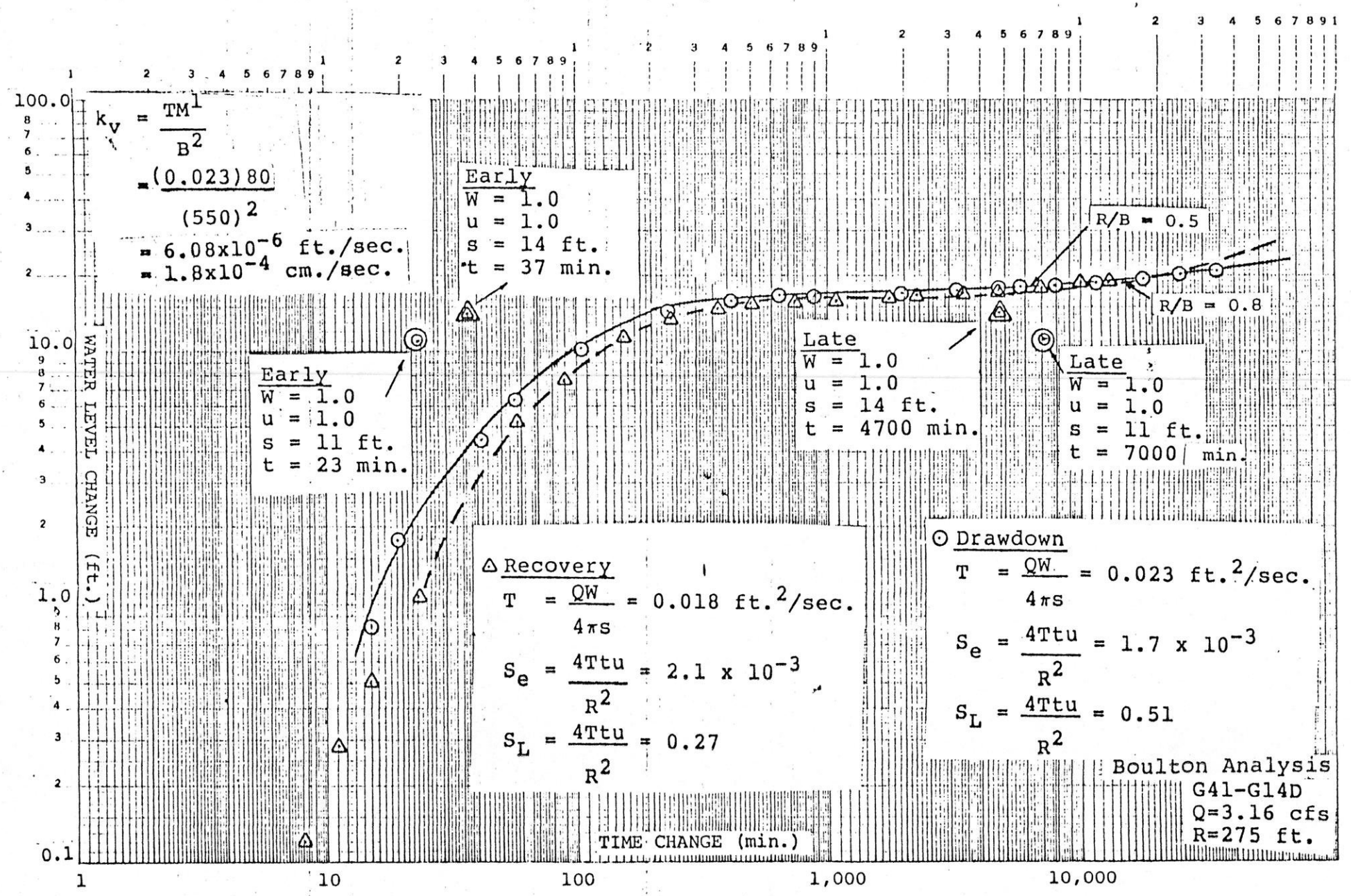
| DATE | 6/10/81 | | | | | | |
|---|---|---|---|---|---|---|---|
| DEPTH (m) | 34.75 | | | | | | |
| DEPTH (ft.) | 114.0 | | | | | | |

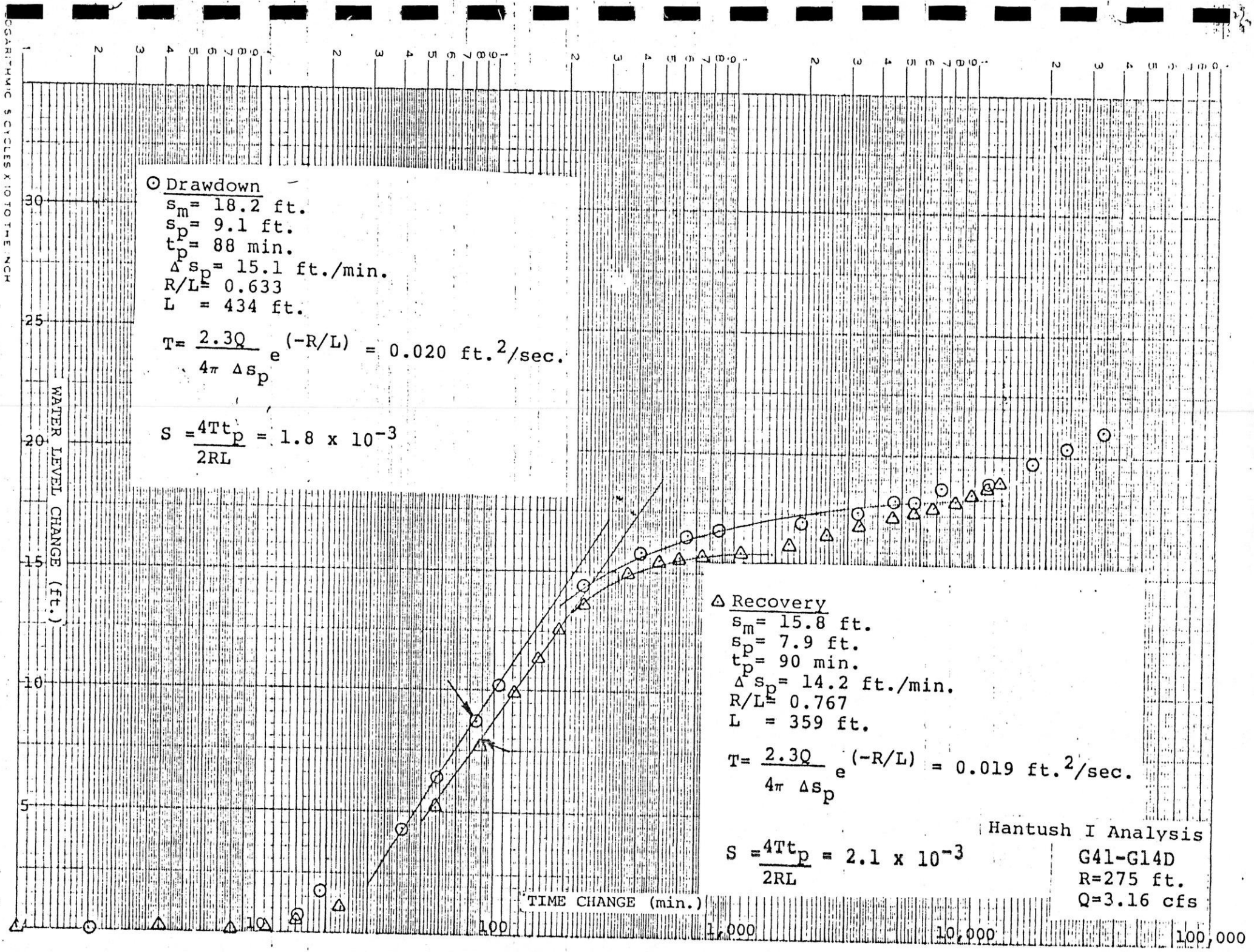
*Pump Test and Recovery Period Between these Dates. For Pump Test Data, Refer to PUMP TEST AND ANALYSIS, Project Report No. 4.

Job No. 736085
Scale 1"=5'

Golder Associates

Drawn jls
Checked


$k_v = \frac{TM^1}{B^2}$
$= \frac{(0.023)80}{(550)^2}$
$= 6.08 \times 10^{-6}$ ft./sec.
$= 1.8 \times 10^{-4}$ cm./sec.
Early
W = 1.0
u = 1.0
s = 14 ft.
t = 37 min.
R/B = 0.5
R/B = 0.8
Late
W = 1.0
u = 1.0
s = 14 ft.
t = 4700 min.
Late
W = 1.0
u = 1.0
s = 11 ft.
t = 7000 min.
Early
W = 1.0
u = 1.0
s = 11 ft.
t = 23 min.
△ Recovery
$T = \frac{QW}{4\pi s} = 0.018$ ft.$^2$/sec.
$S_e = \frac{4Ttu}{R^2} = 2.1 \times 10^{-3}$
$S_L = \frac{4Ttu}{R^2} = 0.27$
⊙ Drawdown
$T = \frac{QW}{4\pi s} = 0.023$ ft.$^2$/sec.
$S_e = \frac{4Ttu}{R^2} = 1.7 \times 10^{-3}$
$S_L = \frac{4Ttu}{R^2} = 0.51$
Boulton Analysis
G41-G14D
Q=3.16 cfs
R=275 ft.
WATER LEVEL CHANGE (ft.)
TIME CHANGE (min.)
100.0
10.0
1.0
0.1
1
10
100
1,000
10,000


LOGARITHMIC 5 CYCLES X 10 TO THE INCH
5TH LINES ACCENTED
WATER LEVEL CHANGE (ft.)
TIME CHANGE (min.)
1
10
100
1,000
10,000
100,000
5
10
15
20
25
30
⊙ Drawdown
$s_m$= 18.2 ft.
$s_p$= 9.1 ft.
$t_p$= 88 min.
$\Delta s_p$= 15.1 ft./min.
R/L= 0.633
L = 434 ft.
$T = \frac{2.3Q}{4\pi \Delta s_p} e^{(-R/L)}$ = 0.020 ft.$^2$/sec.
$S = \frac{4Tt_p}{2RL}$ = 1.8 x $10^{-3}$
△ Recovery
$s_m$= 15.8 ft.
$s_p$= 7.9 ft.
$t_p$= 90 min.
$\Delta s_p$= 14.2 ft./min.
R/L= 0.767
L = 359 ft.
$T = \frac{2.3Q}{4\pi \Delta s_p} e^{(-R/L)}$ = 0.019 ft.$^2$/sec.
$S = \frac{4Tt_p}{2RL}$ = 2.1 x $10^{-3}$
Hantush I Analysis
G41-G14D
R=275 ft.
Q=3.16 cfs

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14D ***

| DATE DDMONYY | TIME HHMM.SS | FIRST READING FEET | SECOND READING FEET | A L G | C O N | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | COLLAR ELEV 1707.60 FEET PIEZO ELEV 0.00 -NULL |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 19DEC79 | 1200.00 | 112.80 | 0.00 | 1 | 20 | -274925.00 | 1594.80 | CORRECT TO COLLAR TOP |
| 25APR80 | 1200.00 | 113.65 | .14 | 1 | 14 | -90605.00 | 1593.81 | 14 - TIME NOT RECORD |
| 20MAY80 | 600.00 | 113.59 | 0.00 | 1 | 66 | -54965.00 | 1593.87 | 4 14 |
| 21MAY80 | 1200.00 | 113.78 | 0.00 | 1 | 4 | -53165.00 | 1594.04 | 4 - NO TIME |
| 29MAY80 | 930.00 | 113.61 | 0.00 | 1 | 4 | -41795.00 | 1594.21 | 4 4 -REV. CIR. |
| 30MAY80 | 1730.00 | 113.60 | 0.00 | 1 | 4 | -39875.00 | 1594.22 | 4 4 -REV. CIR. |
| 31MAY80 | 20.00 | 113.09 | 0.00 | 1 | 4 | -39465.00 | 1594.73 | 4 4 -REV. CIR. |
| 31MAY80 | 945.00 | 113.38 | 0.00 | 1 | 4 | -38900.00 | 1594.44 | 4 4 SET CASE |
| 01JUN80 | 600.00 | 113.65 | 0.00 | 1 | 4 | -37685.00 | 1594.17 | 4 4 SET CASE |
| 01JUN80 | 1525.00 | 113.56 | 0.00 | 1 | 4 | -37120.00 | 1594.26 | 4 4 GRAVEL |
| 02JUN80 | 830.00 | 113.44 | 0.00 | 1 | 4 | -36095.00 | 1594.38 | 4 4 |
| 03JUN80 | 915.00 | 113.72 | 0.00 | 1 | 4 | -34610.00 | 1594.10 | 4 4 |
| 04JUN80 | 135.00 | 115.34 | 0.00 | 1 | 4 | -33630.00 | 1592.48 | 4 4 AIR DEV. |
| 06JUN80 | 930.00 | 113.71 | 0.00 | 1 | 4 | -30275.00 | 1594.11 | 4 4 |
| 06JUN80 | 1107.00 | 114.30 | 0.00 | 1 | 4 | -30178.00 | 1593.52 | 4 4 |
| 06JUN80 | 1304.00 | 114.18 | 0.00 | 1 | 4 | -30061.00 | 1593.64 | 4 4 |
| 06JUN80 | 1703.00 | 115.29 | 0.00 | 1 | 36 | -29822.00 | 1592.37 | 4 4 VEL TEST |
| 06JUN80 | 1846.00 | 116.25 | 0.00 | 1 | 36 | -29719.00 | 1591.41 | 4 4 VEL TEST |
| 07JUN80 | 930.00 | 113.70 | 0.00 | 1 | 4 | -28835.00 | 1594.12 | 4 4 |
| 08JUN80 | 830.00 | 114.03 | 0.00 | 1 | 4 | -27455.00 | 1593.79 | 4 4 |
| 09JUN80 | 800.00 | 113.67 | 0.00 | 1 | 4 | -26045.00 | 1594.15 | 4 4 |
| 10JUN80 | 835.00 | 113.82 | 0.00 | 1 | 4 | -24570.00 | 1594.00 | 4 4 |
| 11JUN80 | 845.00 | 113.98 | 0.00 | 1 | 4 | -23120.00 | 1593.84 | 4 4 |
| 12JUN80 | 840.00 | 113.90 | 0.00 | 1 | 4 | -21685.00 | 1593.92 | 4 4 |
| 13JUN80 | 815.00 | 113.68 | 0.00 | 1 | 4 | -20270.00 | 1594.14 | 4 4 |
| 13JUN80 | 2115.00 | 113.67 | 0.00 | 1 | 36 | -19490.00 | 1593.99 | 4 4 DIFF. RULE |
| 14JUN80 | 815.00 | 113.67 | 0.00 | 1 | 4 | -18830.00 | 1594.15 | 4 4 |
| 14JUN80 | 1745.00 | 113.65 | 0.00 | 1 | 4 | -18260.00 | 1594.17 | 4 4 |
| 15JUN80 | 820.00 | 113.83 | 0.00 | 1 | 4 | -17385.00 | 1593.99 | 4 4 |
| 16JUN80 | 805.00 | 113.97 | 0.00 | 1 | 4 | -15960.00 | 1593.85 | 4 4 |
| 24JUN80 | 820.00 | 113.87 | 0.00 | 1 | 4 | -4425.00 | 1593.95 | 4 4 |
| 25JUN80 | 815.00 | 113.84 | 0.00 | 1 | 4 | -2990.00 | 1593.98 | 4 4 |
| 26JUN80 | 840.00 | 113.78 | 0.00 | 1 | 4 | -1525.00 | 1594.04 | 4 4 |
| 27JUN80 | 800.00 | 113.98 | 0.00 | 1 | 4 | -125.00 | 1593.84 | 4 BEFORE TEST |
| 27JUN80 | 1007.00 | 114.05 | 0.00 | 1 | 4 | 2.00 | 1593.77 | 4 4 START @ 10 |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G140 ***

| DATE | TIME | FIRST READING | SECOND READING | A L G | C O N | TIME SINCE TEST BEGAN | WATER LEVEL ELEVATION | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| DDMONYY | HHMM.SS | FEET | FEET | | | MINUTES | FEET | COLLAR ELEV 1707.60 FEET PIEZO ELEV 0.00 -NULL- |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 27JUN80 | 1017.00 | 111.14 | 0.00 | 1 | 12 | 12.00 | 1593.01 | 12 12 START @ 10 |
| | | | | | | | | NEW PIEZOMETER |
| 27JUN80 | 1024.00 | 112.09 | 0.00 | 1 | 12 | 19.00 | 1592.06 | 12 12 |
| 27JUN80 | 1031.00 | 112.99 | 0.00 | 1 | 12 | 26.00 | 1591.16 | 12 REPLACE INST. |
| 27JUN80 | 1045.00 | 114.75 | 0.00 | 1 | 12 | 40.00 | 1589.40 | 12 12 |
| 27JUN80 | 1101.00 | 116.72 | 0.00 | 1 | 12 | 56.00 | 1587.43 | 12 12 |
| 27JUN80 | 1123.00 | 118.93 | 0.00 | 1 | 12 | 78.00 | 1585.22 | 12 12 |
| 27JUN80 | 1148.00 | 120.51 | 0.00 | 1 | 76 | 103.00 | 1583.59 | 4 12 |
| 27JUN80 | 1203.00 | 121.46 | 0.00 | 1 | 76 | 118.00 | 1582.64 | 12 12 |
| 27JUN80 | 1233.00 | 122.80 | 0.00 | 1 | 76 | 148.00 | 1581.30 | 5 5 |
| 27JUN80 | 1323.00 | 124.08 | 0.00 | 1 | 76 | 198.00 | 1580.02 | 12 12 |
| 27JUN80 | 1401.00 | 124.68 | 0.00 | 1 | 76 | 236.00 | 1579.22 | 12 12 |
| 27JUN80 | 1457.00 | 125.48 | 0.00 | 1 | 76 | 292.00 | 1578.62 | 12 12 |
| 27JUN80 | 1536.00 | 125.93 | 0.00 | 1 | 76 | 351.00 | 1578.17 | 12 12 TIME CORRECTED |
| 27JUN80 | 1656.00 | 126.20 | 0.00 | 1 | 76 | 411.00 | 1577.90 | 12 12 |
| 27JUN80 | 1752.00 | 126.42 | 0.00 | 1 | 76 | 467.00 | 1577.68 | 12 12 |
| 27JUN80 | 1853.00 | 126.60 | 0.00 | 1 | 76 | 528.00 | 1577.50 | 12 12 |
| 27JUN80 | 1931.00 | 126.65 | 0.00 | 1 | 76 | 566.00 | 1577.45 | 12 12 |
| 27JUN80 | 2046.00 | 126.89 | 0.00 | 1 | 76 | 641.00 | 1577.21 | 12 12 |
| 27JUN80 | 2141.00 | 126.91 | 0.00 | 1 | 76 | 696.00 | 1577.19 | 12 12 |
| 27JUN80 | 2306.00 | 127.05 | 0.00 | 1 | 76 | 781.00 | 1577.05 | 12 12 |
| 28JUN80 | 40.00 | 126.98 | 0.00 | 1 | 76 | 875.00 | 1577.12 | 12 12 |
| 28JUN80 | 226.00 | 127.08 | 0.00 | 1 | 76 | 981.00 | 1577.02 | 12 12 |
| 28JUN80 | 539.00 | 127.22 | 0.00 | 1 | 76 | 1174.00 | 1576.88 | 12 12 |
| 28JUN80 | 746.00 | 127.25 | 0.00 | 1 | 76 | 1301.00 | 1576.85 | 12 12 |
| 28JUN80 | 1011.00 | 127.36 | 0.00 | 1 | 76 | 1496.00 | 1576.74 | 12 12 |
| 28JUN80 | 1210.00 | 127.41 | 0.00 | 1 | 76 | 1565.00 | 1576.69 | 12 12 |
| 28JUN80 | 1511.00 | 127.47 | 0.00 | 1 | 76 | 1746.00 | 1576.63 | 12 12 |
| 28JUN80 | 1811.00 | 127.54 | 0.00 | 1 | 76 | 1926.00 | 1576.56 | 12 12 |
| 28JUN80 | 2334.00 | 127.69 | 0.00 | 1 | 76 | 2249.00 | 1576.41 | 12 12 |
| 29JUN80 | 022.00 | 127.74 | 0.00 | 1 | 76 | 2777.00 | 1576.36 | 12 12 |
| 29JUN80 | 1604.00 | 127.93 | 0.00 | 1 | 76 | 3239.00 | 1576.17 | 12 12 |
| 30JUN80 | 46.00 | 128.20 | 0.00 | 1 | 76 | 3761.00 | 1575.90 | 12 12 |
| 30JUN80 | 834.00 | 128.21 | 0.00 | 1 | 76 | 4229.00 | 1575.89 | 12 12 |
| 30JUN80 | 1532.00 | 128.28 | 0.00 | 1 | 76 | 4647.00 | 1575.82 | 12 12 |
| 01JUL80 | 804.00 | 128.40 | 0.00 | 1 | 76 | 5639.00 | 1575.70 | 12 12 |
| 01JUL80 | 1050.00 | 127.23 | 0.00 | 1 | 76 | 5805.00 | 1576.87 | 12 12 |
| 01JUL80 | 1114.00 | 127.25 | 0.00 | 1 | 76 | 5845.00 | 1576.85 | 12 12 |
| 01JUL80 | 1156.00 | 127.47 | 0.00 | 1 | 76 | 5871.00 | 1576.63 | 12 12 |
| 01JUL80 | 1306.00 | 127.82 | 0.00 | 1 | 76 | 5941.00 | 1576.28 | 12 12 |
| 01JUL80 | 1451.00 | 128.18 | 0.00 | 1 | 76 | 6046.00 | 1575.92 | 12 12 |
| 01JUL80 | 1655.00 | 128.41 | 0.00 | 1 | 76 | 6170.00 | 1575.69 | 12 12 |
| 02JUL80 | 206.00 | 128.83 | 0.00 | 1 | 76 | 6721.00 | 1575.27 | 12 12 |
| 02JUL80 | 442.00 | 128.95 | 0.00 | 1 | 76 | 7117.00 | 1575.15 | 12 12 |

GOLLER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.57.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G140 ***

| DATE DDMONYY | TIME HHMM.SS | FIRST READING FEET | SECOND READING FEET | A L G | C O N | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | COLLAR ELEV 1707.60 FEET PIEZO ELEV 0.00 -NULL- |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 02JUL80 | 1324.00 | 132.30 | .16 | 1 | 14 | 7399.00 | 1575.14 | 16 14 COMPARE PIEZ. |
| 02JUL80 | 1326.00 | 129.00 | 0.00 | 1 | 76 | 7401.00 | 1575.10 | 12 12 COMPARE PIEZ. |
| 02JUL80 | 2127.00 | 128.96 | 0.00 | 1 | 76 | 7882.00 | 1575.14 | 12 12 |
| 03JUL80 | 905.00 | 129.01 | 0.00 | 1 | 76 | 8580.00 | 1575.09 | 12 12 |
| 03JUL80 | 2048.00 | 129.02 | 0.00 | 1 | 76 | 9221.00 | 1575.08 | 12 12 |
| 04JUL80 | 854.00 | 129.04 | 0.00 | 1 | 76 | 10009.00 | 1575.06 | 12 12 |
| 04JUL80 | 2045.00 | 129.16 | 0.00 | 1 | 76 | 10720.00 | 1574.94 | 12 12 |
| 05JUL80 | 824.00 | 129.22 | 0.00 | 1 | 76 | 11419.00 | 1574.88 | 12 12 |
| 05JUL80 | 2046.00 | 129.55 | 0.00 | 1 | 76 | 12141.00 | 1574.55 | 12 12 |
| 06JUL80 | 914.00 | 129.71 | 0.00 | 1 | 76 | 12909.00 | 1574.39 | 12 12 |
| 06JUL80 | 1741.00 | 129.64 | 0.00 | 1 | 76 | 13416.00 | 1574.46 | 12 12 |
| 07JUL80 | 752.00 | 129.57 | 0.00 | 1 | 76 | 14267.00 | 1574.53 | 12 12 |
| 07JUL80 | 1638.00 | 129.53 | 0.00 | 1 | 76 | 14793.00 | 1574.57 | 12 12 |
| 08JUL80 | 837.00 | 129.83 | 0.00 | 1 | 76 | 15752.00 | 1574.27 | 12 12 |
| 08JUL80 | 2101.00 | 129.94 | 0.00 | 1 | 76 | 16496.00 | 1574.16 | 12 12 |
| 09JUL80 | 654.00 | 129.98 | 0.00 | 1 | 76 | 17209.00 | 1574.12 | 12 12 |
| 09JUL80 | 1608.00 | 129.97 | 0.00 | 1 | 76 | 17643.00 | 1574.13 | 12 12 |
| 10JUL80 | 847.00 | 130.05 | 0.00 | 1 | 77 | 18642.00 | 1573.99 | 12 12 |
| 10JUL80 | 1737.00 | 130.09 | 0.00 | 1 | 77 | 19172.00 | 1573.95 | 12 12 |
| 11JUL80 | 919.00 | 130.18 | 0.00 | 1 | 77 | 20114.00 | 1573.86 | 12 12 |
| 11JUL80 | 1921.00 | 130.27 | 0.00 | 1 | 77 | 20716.00 | 1573.77 | 12 12 |
| 12JUL80 | 858.00 | 130.33 | 0.00 | 1 | 77 | 21533.00 | 1573.71 | 12 12 |
| 13JUL80 | 823.00 | 130.54 | 0.00 | 1 | 77 | 22938.00 | 1573.50 | 12 12 |
| 14JUL80 | 800.00 | 130.60 | 0.00 | 1 | 77 | 24355.00 | 1573.44 | 12 12 |
| 14JUL80 | 1057.00 | 127.92 | 0.00 | 1 | 77 | 24532.00 | 1576.12 | 12 12 |
| 15JUL80 | 850.00 | 130.67 | 0.00 | 1 | 77 | 25825.00 | 1573.37 | 12 12 |
| 16JUL80 | 915.00 | 130.86 | 0.00 | 1 | 77 | 27310.00 | 1573.18 | 12 12 |
| 17JUL80 | 812.00 | 131.04 | 0.00 | 1 | 77 | 28687.00 | 1573.00 | 12 12 |
| 18JUL80 | 900.00 | 131.07 | 0.00 | 1 | 77 | 30115.00 | 1572.97 | 4 12 |
| 20JUL80 | 805.00 | 131.13 | 0.00 | 1 | 77 | 33000.00 | 1572.91 | 12 12 |
| 21JUL80 | 828.00 | 131.39 | 0.00 | 1 | 77 | 34463.00 | 1572.65 | 12 12 |
| 21JUL80 | 1006.00 | 131.39 | 0.00 | 1 | 77 | 34561.00 | 1572.65 | 12 12 RECOVERY @ 10 |
| 21JUL80 | 1009.00 | 131.36 | 0.00 | 1 | 77 | 34564.00 | 1572.68 | 12 12 |
| 21JUL80 | 1013.00 | 131.37 | 0.00 | 1 | 77 | 34568.00 | 1572.77 | 12 12 |
| 21JUL80 | 1016.00 | 131.11 | 0.00 | 1 | 77 | 34571.00 | 1572.93 | 12 12 |
| 21JUL80 | 1026.00 | 130.89 | 0.00 | 1 | 77 | 34575.00 | 1573.15 | 12 12 |
| 21JUL80 | 1026.00 | 130.32 | 0.00 | 1 | 77 | 34583.00 | 1573.72 | 12 12 |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G140 ***

| DATE DDMONYY | TIME HHMM.SS | FIRST READING FEET | SECOND READING FEET | A L G | C O N | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | COLLAR ELEV 1707.60 FEET PIEZO ELEV 0.00 -NULL- |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 21JUL80 | 1033.00 | 129.75 | 0.00 | 1 | 76 | 34588.00 | 1574.35 | 12 12 |
| 21JUL80 | 1045.00 | 128.52 | 0.00 | 1 | 76 | 34600.00 | 1575.58 | 12 12 |
| 21JUL80 | 1055.00 | 127.40 | 0.00 | 1 | 76 | 34610.00 | 1576.70 | 12 12 |
| 21JUL80 | 1103.00 | 126.33 | 0.00 | 1 | 76 | 34618.00 | 1577.77 | 12 12 |
| 21JUL80 | 1114.00 | 125.43 | 0.00 | 1 | 76 | 34629.00 | 1578.67 | 12 12 |
| 21JUL80 | 1123.00 | 124.55 | 0.00 | 1 | 76 | 34638.00 | 1579.55 | 12 12 |
| 21JUL80 | 1132.00 | 123.84 | 0.00 | 1 | 76 | 34647.00 | 1580.26 | 12 12 |
| 21JUL80 | 1140.00 | 123.20 | 0.00 | 1 | 76 | 34655.00 | 1580.90 | 12 12 |
| 21JUL80 | 1150.00 | 122.52 | 0.00 | 1 | 76 | 34665.00 | 1581.58 | 12 12 |
| 21JUL80 | 1157.00 | 121.99 | 0.00 | 1 | 76 | 34672.00 | 1582.11 | 12 12 |
| 21JUL80 | 1206.00 | 121.47 | 0.00 | 1 | 76 | 34681.00 | 1582.63 | 12 12 |
| 21JUL80 | 1216.00 | 120.92 | 0.00 | 1 | 76 | 34691.00 | 1583.18 | 12 12 |
| 21JUL80 | 1237.00 | 120.00 | 0.00 | 1 | 76 | 34712.00 | 1584.10 | 12 12 |
| 21JUL80 | 1256.00 | 119.46 | 0.00 | 1 | 12 | 34731.00 | 1584.69 | 12 12 |
| 21JUL80 | 1313.00 | 118.92 | 0.00 | 1 | 12 | 34748.00 | 1585.23 | 12 12 |
| 21JUL80 | 1337.00 | 118.27 | 0.00 | 1 | 12 | 34772.00 | 1585.88 | 12 12 |
| 21JUL80 | 1401.00 | 117.81 | 0.00 | 1 | 12 | 34796.00 | 1586.34 | 12 12 |
| 21JUL80 | 1434.00 | 117.35 | 0.00 | 1 | 12 | 34829.00 | 1586.80 | 12 12 |
| 21JUL80 | 1502.00 | 117.01 | 0.00 | 1 | 12 | 34857.00 | 1587.14 | 12 12 |
| 21JUL80 | 1537.00 | 116.70 | 0.00 | 1 | 12 | 34892.00 | 1587.45 | 12 12 |
| 21JUL80 | 1608.00 | 116.55 | 0.00 | 1 | 12 | 34923.00 | 1587.60 | 12 12 |
| 21JUL80 | 1703.00 | 116.28 | 0.00 | 1 | 12 | 34978.00 | 1587.87 | 12 12 |
| 21JUL80 | 1816.00 | 116.06 | 0.00 | 1 | 12 | 35051.00 | 1588.09 | 12 12 |
| 21JUL80 | 1911.00 | 115.92 | 0.00 | 1 | 12 | 35106.00 | 1588.23 | 12 12 |
| 21JUL80 | 2006.00 | 115.86 | 0.00 | 1 | 12 | 35161.00 | 1588.29 | 12 12 |
| 21JUL80 | 2124.00 | 115.70 | 0.00 | 1 | 12 | 35239.00 | 1588.45 | 12 12 |
| 21JUL80 | 2232.00 | 115.64 | 0.00 | 1 | 12 | 35307.00 | 1588.51 | 12 12 |
| 22JUL80 | 107.00 | 115.49 | 0.00 | 1 | 12 | 35462.00 | 1588.66 | 12 12 |
| 22JUL80 | 230.00 | 115.44 | 0.00 | 1 | 12 | 35545.00 | 1588.71 | 12 12 |
| 22JUL80 | 416.00 | 115.33 | 0.00 | 1 | 12 | 35651.00 | 1588.82 | 12 12 |
| 22JUL80 | 640.00 | 115.20 | 0.00 | 1 | 12 | 35915.00 | 1588.95 | 12 12 |
| 22JUL80 | 1131.00 | 115.14 | 0.00 | 1 | 12 | 36086.00 | 1589.01 | 12 12 |
| 22JUL80 | 1517.00 | 115.06 | 0.00 | 1 | 12 | 36312.00 | 1589.09 | 12 12 |
| 22JUL80 | 1659.00 | 114.90 | 0.00 | 1 | 12 | 36534.00 | 1589.25 | 12 12 |
| 23JUL80 | 19.00 | 114.80 | 0.00 | 1 | 12 | 36654.00 | 1589.35 | 12 12 |
| 23JUL80 | 334.00 | 114.75 | 0.00 | 1 | 12 | 37049.00 | 1589.40 | 12 12 |
| 23JUL80 | 1111.00 | 110.00 | 4.64 | 1 | 12 | 37506.00 | 1589.51 | 12 12 |
| 23JUL80 | 1925.00 | 110.00 | 4.47 | 1 | 12 | 38000.00 | 1589.68 | 12 12 |
| 24JUL80 | 437.00 | 110.00 | 4.29 | 1 | 12 | 38742.00 | 1589.86 | 12 12 |
| 24JUL80 | 1458.00 | 110.00 | 4.14 | 1 | 12 | 39283.00 | 1590.01 | 12 12 |
| 25JUL80 | 1014.00 | 110.00 | 4.08 | 1 | 12 | 40329.00 | 1590.07 | 12 12 |
| 25JUL80 | 1527.00 | 110.00 | 4.05 | 1 | 12 | 40642.00 | 1590.10 | 12 12 |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14D ***

| DATE DDMONYY | TIME HHMM.SS | FIRST READING FEET | SECOND READING FEET | ALOG | CON | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | COLLAR ELEV 1707.60 FEET PIEZO ELEV 0.00 -NULL |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 26JUL80 | 800.00 | 115.00 | 2.25 | 1 | 67 | 41635.00 | 1590.20 | 14 14 |
| 27JUL80 | 955.00 | 115.00 | 4.13 | 1 | 94 | 43190.00 | 1590.35 | 15 BY D. K. TO 9/2/80 |
| 28JUL80 | 913.00 | 115.00 | 3.92 | 1 | 94 | 44588.00 | 1590.56 | 15 BY D. K. TO 9/2/80 |
| 29JUL80 | 910.00 | 115.00 | 3.81 | 1 | 94 | 46025.00 | 1590.67 | 15 BY D. K. TO 9/2/80 |
| 30JUL80 | 1115.00 | 115.00 | 3.75 | 1 | 94 | 47590.00 | 1590.73 | 15 BY D. K. TO 9/2/80 |
| 31JUL80 | 1440.00 | 115.00 | 3.68 | 1 | 94 | 49235.00 | 1590.80 | 15 BY D. K. TO 9/2/80 |
| 01AUG80 | 1226.00 | 115.00 | 3.55 | 1 | 94 | 50541.00 | 1590.93 | 15 BY D. K. TO 9/2/80 |
| 03AUG80 | 820.00 | 115.00 | 3.32 | 1 | 94 | 53181.00 | 1591.16 | 4 15 |
| 05AUG80 | 1428.00 | 115.00 | 3.29 | 1 | 94 | 56423.00 | 1591.19 | 4 15 |
| 07AUG80 | 1456.00 | 115.00 | 3.16 | 1 | 94 | 59311.00 | 1591.32 | 4 15 |
| 09AUG80 | 943.00 | 115.00 | 3.04 | 1 | 94 | 61898.00 | 1591.44 | 4 15 |
| 12AUG80 | 1328.00 | 115.00 | 3.03 | 1 | 94 | 66443.00 | 1591.45 | 4 15 |
| 14AUG80 | 1128.00 | 115.00 | 2.83 | 1 | 94 | 69203.00 | 1591.65 | 4 15 |
| 16AUG80 | 1105.00 | 115.00 | 2.84 | 1 | 94 | 72060.00 | 1591.64 | 4 15 |
| 20AUG80 | 1435.00 | 117.61 | 0.00 | 1 | 94 | 78030.00 | 1591.87 | 15 |
| 22AUG80 | 1312.00 | 117.83 | 0.00 | 1 | 94 | 80827.00 | 1591.65 | 15 |
| 02SEP80 | 940.00 | 117.48 | 0.00 | 1 | 94 | 96961.00 | 1592.00 | 15 |
| 10SEP80 | 915.00 | 115.63 | 0.00 | 1 | 15 | 107950.00 | 1591.97 | 15 FOR G.W. MAP |

COOR. N113855 ft. (N34705m)
E2284315 ft. (E696261m)

# BORING LOG G41-G14D

SHEET 1 OF 2

SURFACE ELEV. 1705.6 ft. (519.86m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 12/10/79 DATE COMPLETED 12/11/79

DRILL RIG Joy 12B DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS. | BLOWS / FOOT | SAMPLES: NUMBER | SAMPLES: TYPE | SAMPLES: HAMMER BLOWS PER 6 IN. | SAMPLES: REC. / ATT. | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| 0.0 | | See borings G41-G14, G41-G14A and G41-G14B for soil stratigraphy | | | | | | | ▼ 12/19/79 33.59<br>110.2<br>Grout (to surface)<br>64.01<br>210.0<br>Bentonite Clay Seal<br>65.53<br>215.0<br>Pea Gravel<br>67.67<br>222.0<br>2" Solid PVC Pipe to Surface<br>2" Slotted PVC Pipe<br>Pea Gravel |
| 71.32 | | | | | | | | | |
| 234.0 | | CONTINUED | | | | | | | CONTINUED |

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked

COOR. N113855 ft. (N34705m)
E2284315 ft. (E696261m)

# BORING LOG G41-G14D

SHEET 2 OF 2

SURFACE ELEV. 1705.6 ft. (519.86m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 12/10/79 DATE COMPLETED 12/11/79

DRILL RIG Joy 12B DRILLING METHOD Mud Rotary

| DEPTH METER / FOOT | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS. | BLOWS / FOOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES HAMMER BLOWS PER 6 IN. | SAMPLES REC./ATT. | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| 71.32 | | CONTINUED | | | | | | | CONTINUED |
| 234.0 | | See boring G41-G14, G41-G14A and G41-G14B for soil stratigraphy | | | | | | | 2" Slotted PVC Pipe; Pea Gravel 73.76; 242.0; Pea Gravel 74.68; 245.0; Caved Material |
| 78.33 | | | | | | | | | |
| 257.0 | | END OF BORING | | | | | | | |

NOTES

1. Elevation of top of protector pipe, 1707.6 ft. (520.48m).

Table of Water Level Readings by Date. Readings Indicate Depth Below Ground Surface.

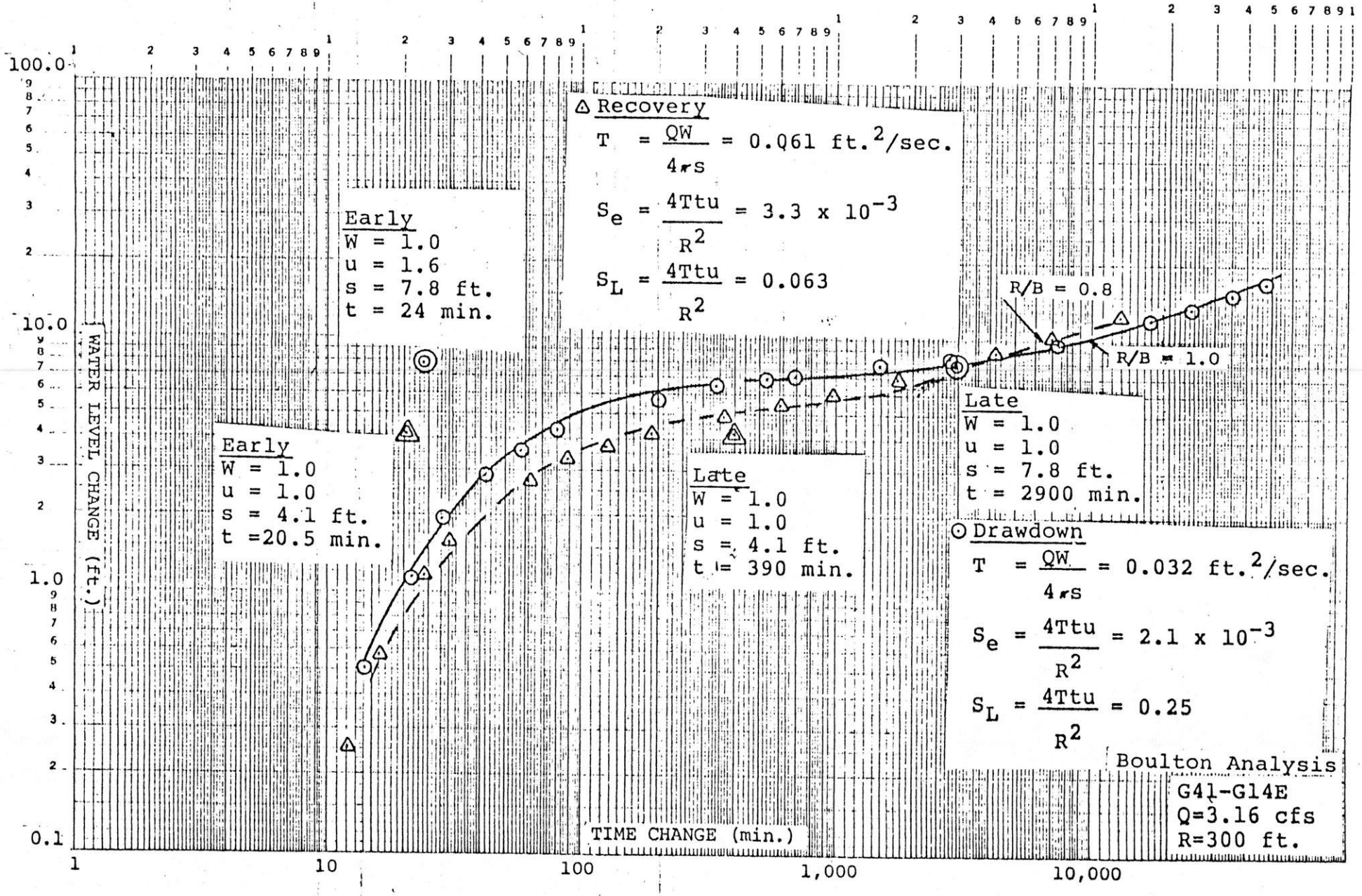
| DATE | 12/19/79 | 4/25/80 | 5/20/80 | 6/26/80* | 9/10/80* | | |
|---|---|---|---|---|---|---|---|
| DEPTH (m) | 33.59 | 34.02 | 34.02 | 34.02 | 34.63 | | |
| DEPTH (ft.) | 110.2 | 111.6 | 111.6 | 111.6 | 113.6 | | |

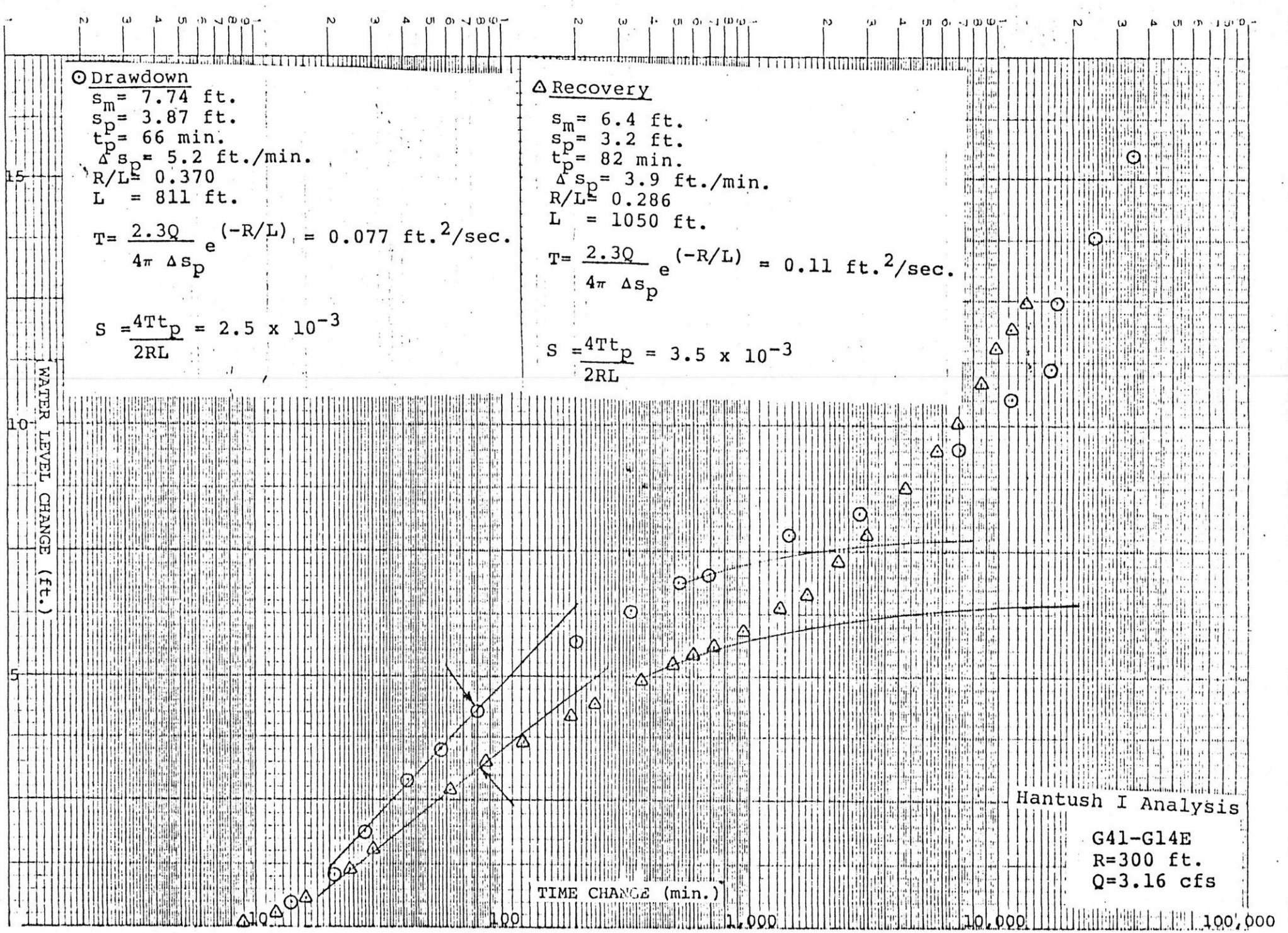
*Pump Test and Recovery Period Between these Dates. For Pump Test Data, Refer to PUMP TEST AND ANALYSIS, Project Report No. 4.

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked


Recovery
T = QW/4πs = 0.061 ft.²/sec.
Se = 4Ttu/R² = 3.3 x 10⁻³
SL = 4Ttu/R² = 0.063
Early
W = 1.0
u = 1.6
s = 7.8 ft.
t = 24 min.
Early
W = 1.0
u = 1.0
s = 4.1 ft.
t = 20.5 min.
Late
W = 1.0
u = 1.0
s = 4.1 ft.
t = 390 min.
Late
W = 1.0
u = 1.0
s = 7.8 ft.
t = 2900 min.
R/B = 0.8
R/B = 1.0
Drawdown
T = QW/4πs = 0.032 ft.²/sec.
Se = 4Ttu/R² = 2.1 x 10⁻³
SL = 4Ttu/R² = 0.25
Boulton Analysis
G41-G14E
Q=3.16 cfs
R=300 ft.
WATER LEVEL CHANGE (ft.)
TIME CHANGE (min.)
100.0
10.0
1.0
0.1
1
10
100
1,000
10,000


⊙ Drawdown
$s_m$ = 7.74 ft.
$s_p$ = 3.87 ft.
$t_p$ = 66 min.
$\Delta s_p$ = 5.2 ft./min.
R/L = 0.370
L = 811 ft.
$T = \frac{2.3Q}{4\pi \Delta s_p} e^{(-R/L)}$ = 0.077 ft.²/sec.
$S = \frac{4Tt_p}{2RL}$ = 2.5 x $10^{-3}$
△ Recovery
$s_m$ = 6.4 ft.
$s_p$ = 3.2 ft.
$t_p$ = 82 min.
$\Delta s_p$ = 3.9 ft./min.
R/L = 0.286
L = 1050 ft.
$T = \frac{2.3Q}{4\pi \Delta s_p} e^{(-R/L)}$ = 0.11 ft.²/sec.
$S = \frac{4Tt_p}{2RL}$ = 3.5 x $10^{-3}$
WATER LEVEL CHANGE (ft.)
15
10
5
TIME CHANGE (min.)
10
100
1,000
10,000
100,000
Hantush I Analysis
G41-G14E
R=300 ft.
Q=3.16 cfs

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14E ***

| DATE DDMONYY | TIME HHMM.SS | FIRST READING FEET | SECOND READING FEET | ALG | CON | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | COLLAR ELEV 1708.00 FEET PIEZO ELEV 0.00 -NULL |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 11DEC79 | 1200.00 | 112.80 | 0.00 | 1 | 20 | -286445.00 | 1595.20 | CORRECT TO COLLAR TOP |
| 25APR80 | 1200.00 | 113.70 | .14 | 1 | 14 | -90605.00 | 1594.16 | 14 - TIME NOT RECORD |
| 20MAY80 | 600.00 | 113.62 | 0.00 | 1 | 66 | -54965.00 | 1594.24 | 4 14 |
| 21MAY80 | 1200.00 | 112.63 | 0.00 | 1 | 5 | -53165.00 | 1594.37 | 5 - NO TIME |
| 29MAY80 | 930.00 | 112.49 | 0.00 | 1 | 5 | -41795.00 | 1594.51 | 4 5 -REV. CIR. |
| 30MAY80 | 1730.00 | 112.44 | 0.00 | 1 | 5 | -39875.00 | 1594.56 | 4 5 -REV. CIR. |
| 31MAY80 | 20.00 | 112.19 | 0.00 | 1 | 5 | -39465.00 | 1594.81 | 4 5 -REV. CIR. |
| 31MAY80 | 945.00 | 112.55 | 0.00 | 1 | 5 | -38900.00 | 1594.45 | 4 5 SET CASE |
| 01JUN80 | 600.00 | 112.59 | 0.00 | 1 | 5 | -37685.00 | 1594.41 | 4 5 SET CASE |
| 01JUN80 | 1525.00 | 112.42 | 0.00 | 1 | 5 | -37120.00 | 1594.58 | 4 5 GRAVEL |
| 02JUN80 | 830.00 | 112.50 | 0.00 | 1 | 5 | -36095.00 | 1594.50 | 4 5 |
| 03JUN80 | 915.00 | 112.78 | 0.00 | 1 | 5 | -34610.00 | 1594.22 | 4 5 |
| 04JUN80 | 135.00 | 113.29 | 0.00 | 1 | 5 | -33630.00 | 1593.71 | 4 5 AIR DEV. |
| 06JUN80 | 931.00 | 112.95 | 0.00 | 1 | 5 | -30274.00 | 1594.05 | 4 5 |
| 06JUN80 | 1108.00 | 113.10 | 0.00 | 1 | 5 | -30177.00 | 1593.90 | 4 5 |
| 06JUN80 | 1306.00 | 112.78 | 0.00 | 1 | 5 | -30059.00 | 1594.22 | 4 5 |
| 06JUN80 | 1704.00 | 114.04 | 0.00 | 1 | 5 | -29621.00 | 1592.96 | 4 5 VEL TEST |
| 06JUN80 | 1847.00 | 114.04 | 0.00 | 1 | 5 | -29718.00 | 1592.96 | 4 5 VEL TEST |
| 07JUN80 | 930.00 | 112.65 | 0.00 | 1 | 5 | -28835.00 | 1594.35 | 4 5 |
| 08JUN80 | 830.00 | 113.00 | 0.00 | 1 | 5 | -27455.00 | 1594.00 | 4 5 |
| 09JUN80 | 800.00 | 112.63 | 0.00 | 1 | 5 | -26045.00 | 1594.37 | 4 5 |
| 10JUN80 | 835.00 | 112.82 | 0.00 | 1 | 5 | -24570.00 | 1594.18 | 4 5 |
| 11JUN80 | 845.00 | 113.02 | 0.00 | 1 | 5 | -23120.00 | 1593.98 | 4 5 |
| 12JUN80 | 840.00 | 112.88 | 0.00 | 1 | 5 | -21685.00 | 1594.12 | 4 5 |
| 13JUN80 | 815.00 | 112.63 | 0.00 | 1 | 5 | -20270.00 | 1594.37 | 4 5 |
| 13JUN80 | 2115.00 | 112.59 | 0.00 | 1 | 5 | -19490.00 | 1594.41 | 4 5 DIFF. RULE |
| 14JUN80 | 815.00 | 112.61 | 0.00 | 1 | 5 | -18830.00 | 1594.39 | 4 5 |
| 14JUN80 | 1745.00 | 112.64 | 0.00 | 1 | 5 | -18260.00 | 1594.36 | 4 5 |
| 15JUN80 | 820.00 | 112.80 | 0.00 | 1 | 5 | -17385.00 | 1594.20 | 4 5 |
| 16JUN80 | 805.00 | 112.97 | 0.00 | 1 | 5 | -15960.00 | 1594.03 | 4 5 |
| 24JUN80 | 820.00 | 112.88 | 0.00 | 1 | 5 | -4425.00 | 1594.12 | 4 5 |
| 25JUN80 | 815.00 | 112.80 | 0.00 | 1 | 5 | -2990.00 | 1594.20 | 4 5 |
| 26JUN80 | 840.00 | 112.77 | 0.00 | 1 | 5 | -1525.00 | 1594.23 | 4 5 |
| 27JUN80 | 800.00 | 113.05 | 0.00 | 1 | 5 | -125.00 | 1593.95 | 5 5 BEFORE TEST |
| 27JUN80 | 1011.00 | 112.60 | 0.00 | 1 | 5 | 6.00 | 1594.40 | 5 5 START @ 10 |
| 27JUN80 | 1015.00 | 113.00 | 0.00 | 1 | 5 | 10.00 | 1594.00 | 5 5 |
| 27JUN80 | 1019.00 | 113.56 | 0.00 | 1 | 5 | 14.00 | 1593.44 | 5 5 START @ 10 |
| 27JUN80 | 1025.00 | 114.20 | 0.00 | 1 | 5 | 20.00 | 1592.80 | 5 5 |
| 27JUN80 | 1033.00 | 115.00 | 0.00 | 1 | 5 | 28.00 | 1592.00 | 5 5 |
| 27JUN80 | 1046.00 | 115.93 | 0.00 | 1 | 5 | 41.00 | 1591.07 | 5 5 |
| 27JUN80 | 1102.00 | 116.63 | 0.00 | 1 | 5 | 57.00 | 1590.37 | 5 5 |
| 27JUN80 | 1125.00 | 117.37 | 0.00 | 1 | 5 | 80.00 | 1589.63 | 5 5 |
| 27JUN80 | 1149.00 | 117.80 | 0.00 | 1 | 5 | 104.00 | 1589.20 | 5 5 |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.57.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14E ***

| DATE DDMONYY | TIME HHMM.SS | FIRST READING FEET | SECOND READING FEET | ALG | COM | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | COLLAR ELEV 1708.00 FEET PIEZO ELEV 0.00 -NULL- |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 27JUN80 | 1204.00 | 118.05 | 0.00 | 1 | 5 | 119.00 | 1588.95 | |
| 27JUN80 | 1240.00 | 118.40 | 0.00 | 1 | 5 | 155.00 | 1588.60 | |
| 27JUN80 | 1326.00 | 118.78 | 0.00 | 1 | 5 | 201.00 | 1588.22 | |
| 27JUN80 | 1404.00 | 119.05 | 0.00 | 1 | 5 | 239.00 | 1587.95 | |
| 27JUN80 | 1458.00 | 119.29 | 0.00 | 1 | 5 | 293.00 | 1587.71 | |
| 27JUN80 | 1539.00 | 119.49 | 0.00 | 1 | 5 | 334.00 | 1587.51 | |
| 27JUN80 | 1707.00 | 119.69 | 0.00 | 1 | 5 | 422.00 | 1587.31 | TIME CORRECTED |
| 27JUN80 | 1753.00 | 119.80 | 0.00 | 1 | 5 | 468.00 | 1587.20 | |
| 27JUN80 | 1851.00 | 119.96 | 0.00 | 1 | 5 | 526.00 | 1587.04 | |
| 27JUN80 | 1932.00 | 119.96 | 0.00 | 1 | 5 | 567.00 | 1587.04 | |
| 27JUN80 | 2048.00 | 120.09 | 0.00 | 1 | 41 | 643.00 | 1586.89 | |
| 27JUN80 | 2143.00 | 120.21 | 0.00 | 1 | 41 | 698.00 | 1586.77 | |
| 27JUN80 | 2307.00 | 120.35 | 0.00 | 1 | 41 | 782.00 | 1586.63 | |
| 28JUN80 | 42.00 | 120.30 | 0.00 | 1 | 41 | 877.00 | 1586.68 | |
| 28JUN80 | 227.00 | 120.46 | 0.00 | 1 | 41 | 982.00 | 1586.52 | |
| 28JUN80 | 542.00 | 120.70 | 0.00 | 1 | 41 | 1177.00 | 1586.28 | |
| 28JUN80 | 748.00 | 120.77 | 0.00 | 1 | 41 | 1303.00 | 1586.21 | |
| 28JUN80 | 1012.00 | 120.87 | 0.00 | 1 | 41 | 1447.00 | 1586.11 | |
| 28JUN80 | 1208.00 | 120.93 | 0.00 | 1 | 41 | 1563.00 | 1586.05 | |
| 28JUN80 | 1512.00 | 121.04 | 0.00 | 1 | 41 | 1747.00 | 1585.94 | |
| 28JUN80 | 1812.00 | 121.15 | 0.00 | 1 | 41 | 1927.00 | 1585.83 | |
| 28JUN80 | 2338.00 | 121.19 | 0.00 | 1 | 41 | 2253.00 | 1585.79 | |
| 29JUN80 | 824.00 | 121.32 | 0.00 | 1 | 41 | 2779.00 | 1585.66 | |
| 29JUN80 | 1606.00 | 121.54 | 0.00 | 1 | 41 | 3241.00 | 1585.44 | |
| 30JUN80 | 48.00 | 121.82 | 0.00 | 1 | 41 | 3763.00 | 1585.16 | |
| 30JUN80 | 838.00 | 121.85 | 0.00 | 1 | 41 | 4233.00 | 1585.13 | |
| 30JUN80 | 1558.00 | 121.91 | 0.00 | 1 | 41 | 4673.00 | 1585.07 | |
| 01JUL80 | 805.00 | 121.98 | 0.00 | 1 | 41 | 5640.00 | 1585.00 | |
| 01JUL80 | 1051.00 | 121.17 | 0.00 | 1 | 41 | 5806.00 | 1585.81 | |
| 01JUL80 | 1115.00 | 121.63 | 0.00 | 1 | 41 | 5830.00 | 1585.35 | |
| 01JUL80 | 1157.00 | 121.86 | 0.00 | 1 | 41 | 5872.00 | 1585.12 | |
| 01JUL80 | 1308.00 | 122.04 | 0.00 | 1 | 41 | 5943.00 | 1584.94 | |
| 01JUL80 | 1452.00 | 122.13 | 0.00 | 1 | 41 | 6047.00 | 1584.85 | |
| 01JUL80 | 1654.00 | 122.19 | 0.00 | 1 | 41 | 6169.00 | 1584.79 | |
| 02JUL80 | 208.00 | 122.53 | 0.00 | 1 | 41 | 6723.00 | 1584.45 | |
| 02JUL80 | 844.00 | 122.67 | 0.00 | 1 | 41 | 7119.00 | 1584.31 | |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14E ***

| DATE DDMONYY | TIME HHMM.SS | FIRST READING FEET | SECOND READING FEET | ALG | CON | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | COLLAR ELEV 1708.00 FEET PIEZO ELEV 0.00 -NULL |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 02JUL80 | 1328.00 | 123.55 | .16 | 1 14 | | 7403.00 | 1584.29 | 16 14 COMPARE PIEZ. |
| 02JUL80 | 1329.00 | 122.72 | 0.00 | 1 41 | | 7404.00 | 1584.26 | 5 5 COMPARE PIEZ. |
| 02JUL80 | 2126.00 | 122.74 | 0.00 | 1 41 | | 7881.00 | 1584.24 | 5 5 |
| 03JUL80 | 906.00 | 122.90 | 0.00 | 1 41 | | 8581.00 | 1584.08 | 5 5 |
| 03JUL80 | 2045.00 | 123.05 | 0.00 | 1 41 | | 9280.00 | 1583.93 | 5 5 |
| 04JUL80 | 855.00 | 123.31 | 0.00 | 1 41 | | 10010.00 | 1583.67 | 5 5 |
| 04JUL80 | 2044.00 | 123.36 | 0.00 | 1 41 | | 10719.00 | 1583.62 | 5 5 |
| 05JUL80 | 825.00 | 123.66 | 0.00 | 1 41 | | 11420.00 | 1583.32 | 5 5 |
| 05JUL80 | 2047.00 | 124.18 | 0.00 | 1 41 | | 12162.00 | 1582.80 | 5 5 |
| 06JUL80 | 917.00 | 124.49 | 0.00 | 1 41 | | 12912.00 | 1582.49 | 5 5 |
| 06JUL80 | 1739.00 | 124.52 | 0.00 | 1 41 | | 13414.00 | 1582.46 | 5 5 |
| 07JUL80 | 753.00 | 124.61 | 0.00 | 1 41 | | 14268.00 | 1582.37 | 5 5 |
| 07JUL80 | 1640.00 | 124.70 | 0.00 | 1 41 | | 14795.00 | 1582.28 | 5 5 |
| 08JUL80 | 840.00 | 125.25 | 0.00 | 1 41 | | 15755.00 | 1581.73 | 5 5 |
| 08JUL80 | 2102.00 | 125.40 | 0.00 | 1 41 | | 16497.00 | 1581.58 | 5 5 |
| 09JUL80 | 856.00 | 125.58 | 0.00 | 1 41 | | 17211.00 | 1581.40 | 5 5 |
| 09JUL80 | 1610.00 | -125.58 | 0.00 | 1 41 | | 17645.00 | 1581.40 | 5 5 |
| 10JUL80 | 848.00 | 125.83 | 0.00 | 1 41 | | 18643.00 | 1581.15 | 5 5 |
| 10JUL80 | 1736.00 | 125.89 | 0.00 | 1 41 | | 19171.00 | 1581.09 | 5 5 |
| 11JUL80 | 921.00 | 126.14 | 0.00 | 1 41 | | 20116.00 | 1580.84 | 5 5 |
| 11JUL80 | 1925.00 | 126.27 | 0.00 | 1 41 | | 20720.00 | 1580.71 | 5 5 |
| 12JUL80 | 900.00 | 126.40 | 0.00 | 1 41 | | 21535.00 | 1580.58 | 5 5 |
| 13JUL80 | 826.00 | 126.81 | 0.00 | 1 41 | | 22941.00 | 1580.17 | 5 5 |
| 14JUL80 | 802.00 | 126.87 | 0.00 | 1 41 | | 24357.00 | 1580.11 | 5 5 |
| 14JUL80 | 1059.00 | 126.68 | 0.00 | 1 41 | | 24534.00 | 1580.30 | 5 5 |
| 15JUL80 | 832.00 | 127.15 | 0.00 | 1 41 | | 25827.00 | 1579.83 | 5 5 |
| 16JUL80 | 916.00 | 127.40 | 0.00 | 1 41 | | 27311.00 | 1579.58 | 5 5 |
| 17JUL80 | 814.00 | 127.77 | 0.00 | 1 41 | | 28689.00 | 1579.21 | 5 5 |
| 18JUL80 | 801.00 | 127.94 | 0.00 | 1 41 | | 30116.00 | 1579.04 | 5 5 |
| 20JUL80 | 806.00 | 128.16 | 0.00 | 1 41 | | 33001.00 | 1578.82 | 5 5 |
| 21JUL80 | 830.00 | 128.57 | 0.00 | 1 41 | | 34465.00 | 1578.41 | 5 5 |
| 21JUL80 | 1007.00 | 128.60 | 0.00 | 1 41 | | 34562.00 | 1578.38 | 5 5 RECOVERY @ 10 |
| 21JUL80 | 1010.00 | 128.59 | 0.00 | 1 41 | | 34565.00 | 1578.39 | 5 5 |
| 21JUL80 | 1014.00 | 128.55 | 0.00 | 1 41 | | 34569.00 | 1578.43 | 5 5 |
| 21JUL80 | 1017.00 | 128.32 | 0.00 | 1 41 | | 34572.00 | 1578.66 | 5 5 |
| 21JUL80 | 1021.00 | 128.00 | 0.00 | 1 41 | | 34576.00 | 1578.98 | 5 5 |
| 21JUL80 | 1029.00 | 127.41 | 0.00 | 1 41 | | 34584.00 | 1579.57 | 5 5 |
| 21JUL80 | 1035.00 | 127.04 | 0.00 | 1 41 | | 34590.00 | 1579.94 | 5 5 |
| 21JUL80 | 1046.00 | 126.49 | 0.00 | 1 41 | | 34601.00 | 1580.49 | 5 5 |
| 21JUL80 | 1056.00 | 126.13 | 0.00 | 1 41 | | 34611.00 | 1580.85 | 5 5 |
| 21JUL80 | 1106.00 | 125.87 | 0.00 | 1 41 | | 34621.00 | 1581.11 | 5 5 |
| 21JUL80 | 1115.00 | 125.65 | 0.00 | 1 41 | | 34630.00 | 1581.33 | 5 5 |
| 21JUL80 | 1124.00 | 125.46 | 0.00 | 1 41 | | 34639.00 | 1581.52 | 5 5 |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G19E ***

| DATE DDMONYY | TIME HHMM.SS | FIRST READING FEET | SECOND READING FEET | ALG | CON | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | COLLAR ELEV 1708.00 FEET PIEZO ELEV 0.00 -NULL |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 21JUL80 | 1133.00 | 125.32 | 0.00 | 1 | 41 | 34648.00 | 1581.66 | 5 5 |
| 21JUL80 | 1141.00 | 125.21 | 0.00 | 1 | 41 | 34656.00 | 1581.77 | 5 5 |
| 21JUL80 | 1151.00 | 125.05 | 0.00 | 1 | 41 | 34666.00 | 1581.93 | 5 5 |
| 21JUL80 | 1158.00 | 125.00 | 0.00 | 1 | 41 | 34673.00 | 1581.98 | 5 5 |
| 21JUL80 | 1208.00 | 124.90 | 0.00 | 1 | 41 | 34683.00 | 1582.08 | 5 5 |
| 21JUL80 | 1218.00 | 124.79 | 0.00 | 1 | 41 | 34693.00 | 1582.19 | 5 5 |
| 21JUL80 | 1238.00 | 124.64 | 0.00 | 1 | 41 | 34713.00 | 1582.34 | 5 5 |
| 21JUL80 | 1257.00 | 124.50 | 0.00 | 1 | 41 | 34732.00 | 1582.48 | 5 5 |
| 21JUL80 | 1314.00 | 124.41 | 0.00 | 1 | 41 | 34749.00 | 1582.57 | 5 5 |
| 21JUL80 | 1342.00 | 124.23 | 0.00 | 1 | 41 | 34777.00 | 1582.75 | 5 5 |
| 21JUL80 | 1403.00 | 124.14 | 0.00 | 1 | 41 | 34798.00 | 1582.84 | 5 5 |
| 21JUL80 | 1436.00 | 123.99 | 0.00 | 1 | 41 | 34831.00 | 1582.99 | 5 5 |
| 21JUL80 | 1503.00 | 123.91 | 0.00 | 1 | 41 | 34858.00 | 1583.07 | 5 5 |
| 21JUL80 | 1538.00 | 123.77 | 0.00 | 1 | 41 | 34893.00 | 1583.21 | 5 5 |
| 21JUL80 | 1609.00 | 123.67 | 0.00 | 1 | 41 | 34924.00 | 1583.31 | 5 5 |
| 21JUL80 | 1705.00 | 123.58 | 0.00 | 1 | 41 | 34980.00 | 1583.40 | 5 5 |
| 21JUL80 | 1817.00 | 123.36 | 0.00 | 1 | 41 | 35052.00 | 1583.62 | 5 5 |
| 21JUL80 | 1912.00 | 123.27 | 0.00 | 1 | 41 | 35107.00 | 1583.71 | 5 5 |
| 21JUL80 | 2007.00 | 123.16 | 0.00 | 1 | 41 | 35162.00 | 1583.82 | 5 5 |
| 21JUL80 | 2125.00 | 123.03 | 0.00 | 1 | 41 | 35240.00 | 1583.95 | 5 5 |
| 21JUL80 | 2234.00 | 122.94 | 0.00 | 1 | 41 | 35309.00 | 1584.04 | 5 5 |
| 22JUL80 | 109.00 | 122.74 | 0.00 | 1 | 41 | 35464.00 | 1584.24 | 5 5 |
| 22JUL80 | 231.00 | 122.64 | 0.00 | 1 | 41 | 35546.00 | 1584.34 | 5 5 |
| 22JUL80 | 418.00 | 122.53 | 0.00 | 1 | 41 | 35653.00 | 1584.45 | 5 5 |
| 22JUL80 | 841.00 | 122.23 | 0.00 | 1 | 41 | 35916.00 | 1584.75 | 5 5 |
| 22JUL80 | 1132.00 | 122.06 | 0.00 | 1 | 41 | 36087.00 | 1584.92 | 5 5 |
| 22JUL80 | 1518.00 | 121.82 | 0.00 | 1 | 41 | 36313.00 | 1585.16 | 5 5 |
| 22JUL80 | 1901.00 | 121.66 | 0.00 | 1 | 41 | 36536.00 | 1585.32 | 5 5 |
| 23JUL80 | 20.00 | 121.46 | 0.00 | 1 | 41 | 36855.00 | 1585.52 | 5 5 |
| 23JUL80 | 336.00 | 121.33 | 0.00 | 1 | 41 | 37051.00 | 1585.65 | 5 5 |
| 23JUL80 | 1112.00 | 120.00 | 1.04 | 1 | 41 | 37507.00 | 1585.94 | 5 5 |
| 23JUL80 | 1926.00 | 120.00 | .74 | 1 | 41 | 38001.00 | 1586.24 | 5 5 |
| 24JUL80 | 836.00 | 120.00 | .33 | 1 | 41 | 38793.00 | 1586.65 | 5 5 |
| 24JUL80 | 1700.00 | 120.00 | 0.00 | 1 | 41 | 39295.00 | 1586.98 | 5 5 |
| 25JUL80 | 1015.00 | 115.00 | 4.74 | 1 | 41 | 40330.00 | 1587.24 | 5 5 |
| 25JUL80 | 1529.00 | 115.00 | 4.66 | 1 | 41 | 40644.00 | 1587.32 | 5 5 |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***GIVE ***

| DATE DDMONYY | TIME HHMM.SS | FIRST READING FEET | SECOND READING FEET | ALG | CON | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET |
|---|---|---|---|---|---|---|---|
| 26JUL80 | 803.00 | 120.00 | .17 | 1 | 69 | 41638.00 | 1587.67 |
| 27JUL80 | 950.00 | 120.00 | 2.05 | 1 | 95 | 43185.00 | 1588.13 |
| 28JUL80 | 910.00 | 120.00 | 1.61 | 1 | 95 | 44585.00 | 1588.57 |
| 29JUL80 | 905.00 | 120.00 | 1.40 | 1 | 95 | 46020.00 | 1588.78 |
| 30JUL80 | 1120.00 | 120.00 | 1.10 | 1 | 95 | 47595.00 | 1589.08 |
| 31JUL80 | 1443.00 | 120.00 | .81 | 1 | 95 | 49238.00 | 1589.37 |
| 01AUG80 | 1228.00 | 120.00 | .69 | 1 | 95 | 50543.00 | 1589.49 |
| 03AUG80 | 821.00 | 120.00 | .23 | 1 | 95 | 53176.00 | 1589.95 |
| 05AUG80 | 1425.00 | 120.00 | 0.00 | 1 | 95 | 56420.00 | 1590.18 |
| 07AUG80 | 1433.00 | 115.00 | 4.46 | 1 | 94 | 59308.00 | 1590.42 |
| 09AUG80 | 940.00 | 115.00 | 4.36 | 1 | 94 | 61895.00 | 1590.58 |
| 12AUG80 | 1326.00 | 115.00 | 4.09 | 1 | 94 | 66441.00 | 1590.79 |
| 14AUG80 | 1126.00 | 115.00 | 3.83 | 1 | 94 | 69201.00 | 1591.05 |
| 16AUG80 | 1108.00 | 115.00 | 3.86 | 1 | 94 | 72063.00 | 1591.02 |
| 20AUG80 | 1432.00 | 118.39 | 0.00 | 1 | 94 | 76027.00 | 1591.49 |
| 22AUG80 | 1310.00 | 118.72 | 0.00 | 1 | 94 | 80825.00 | 1591.16 |
| 02SEP80 | 944.00 | 118.16 | 0.00 | 1 | 94 | 96459.00 | 1591.72 |
| 10SEP80 | 925.00 | 116.29 | 0.00 | 1 | 15 | 107960.00 | 1591.71 |

**COMMENTS**

COLLAR ELEV 1708.00 FEET PIEZC ELEV 0.00 -NULL-
TIME PUMP TEST BEGAN = 27JUN80-1005.00

14 14
15 BY D. K. TO 9/2/80
15 BY D. K. TO 9/2/80
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15 BY D. K. TO 9/2/80
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15 BY D. K. TO 9/2/80
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15 FOR G.W. MAP

COOR. N113830 ft. (N34696m)
E2284315 ft. (E696261m)

# BORING LOG G41-G14E

SHEET 1 OF 2

SURFACE ELEV. 1705.6 ft. (519.87m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 12/7/79 DATE COMPLETED 12/7/79

DRILL RIG Drilltech D40K DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS. | BLOWS / FOOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES HAMMER BLOWS PER 6 IN. | SAMPLES REC. / ATT. | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| 0.0 | | See borings G41-G14 and G41-G14A for soil stratigraphy | | | | | | | ▼ 12/11/79 33.31<br>109.3<br>Grout (to surface)<br>38.40<br>126.0<br>Bentonite Clay Seal<br>39.32<br>129.0<br>Pea Gravel<br>40.84<br>134.0<br>Pea Gravel<br>2" Solid PVC Pipe<br>2" Slotted PVC Pipe |
| 42.97<br>141.0 | | CONTINUED | | | | | | | CONTINUED |

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked

COOR. N113830 ft. (N34696m)
E2284315 ft. (E696261m)

# BORING LOG G41-G14E

SHEET 2 OF 2

SURFACE ELEV. 1705.6 ft. (519.87m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 12/7/79 DATE COMPLETED 12/7/79

DRILL RIG Drilltech D40K DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS. | BLOWS / FOOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES HAMMER BLOWS PER 6 IN. | SAMPLES REC./ATT. | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| | | CONTINUED | | | | | | | CONTINUED |
| | | See borings G41-G14 and G41-G14A for soil stratigraphy | | | | | | | 2" Slotted PVC Pipe; Pea Gravel; 46.94; Caved Material; 154.0 |
| 50.29 / 165.0 | | END OF BORING | | | | | | | |

NOTES

1. Elevation of top of protector pipe, 1708.0 ft. (520.60m).

Table of Water Level Readings by Date. Readings Indicate Depth Below Ground Surface.

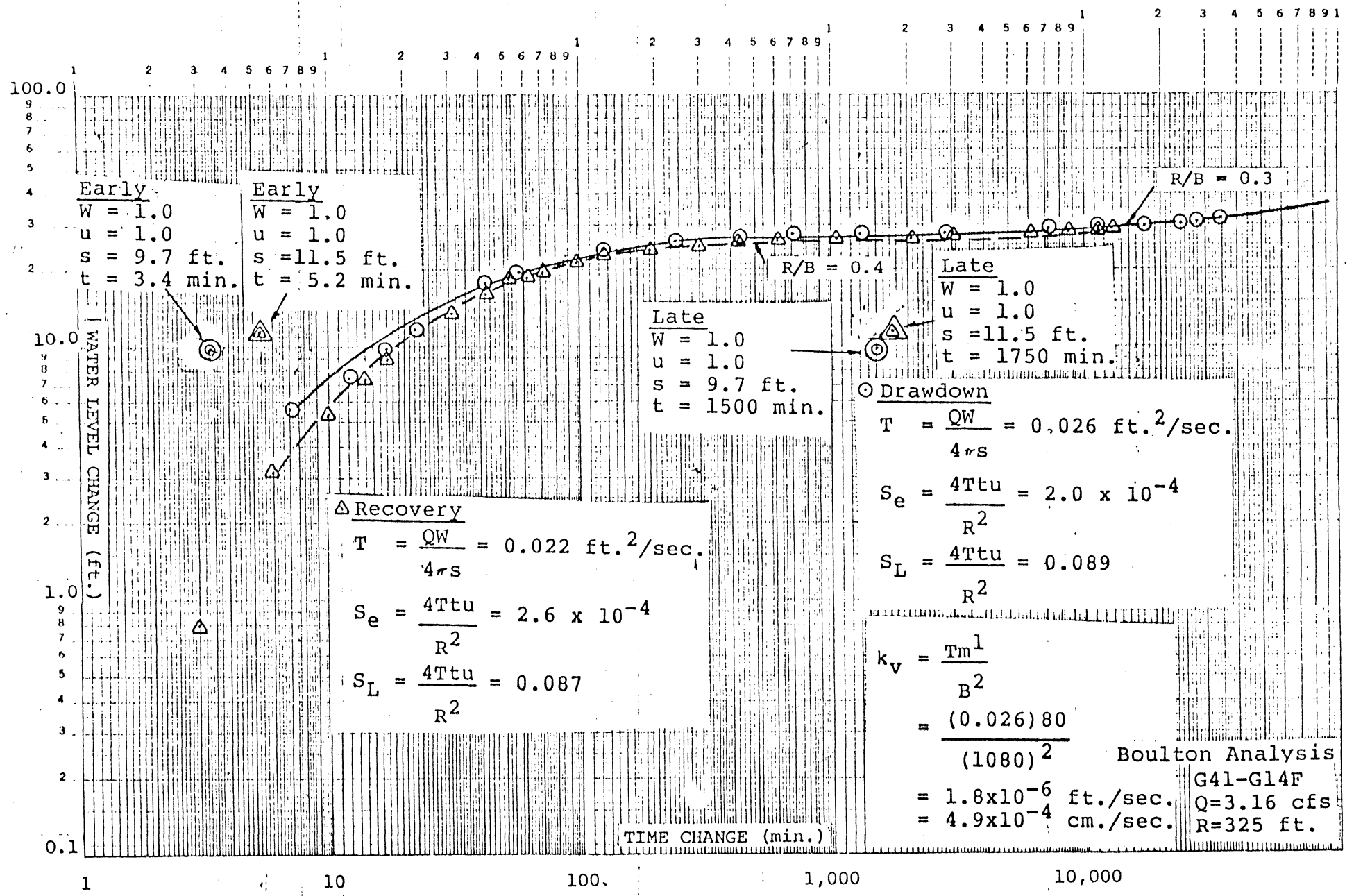
| DATE | 12/11/79 | 4/25/80 | 5/20/80 | 6/26/80* | 9/10/80* | | |
|---|---|---|---|---|---|---|---|
| DEPTH (m) | 33.31 | 33.92 | 33.89 | 33.95 | 34.72 | | |
| DEPTH (ft.) | 109.3 | 111.3 | 111.2 | 111.4 | 113.9 | | |

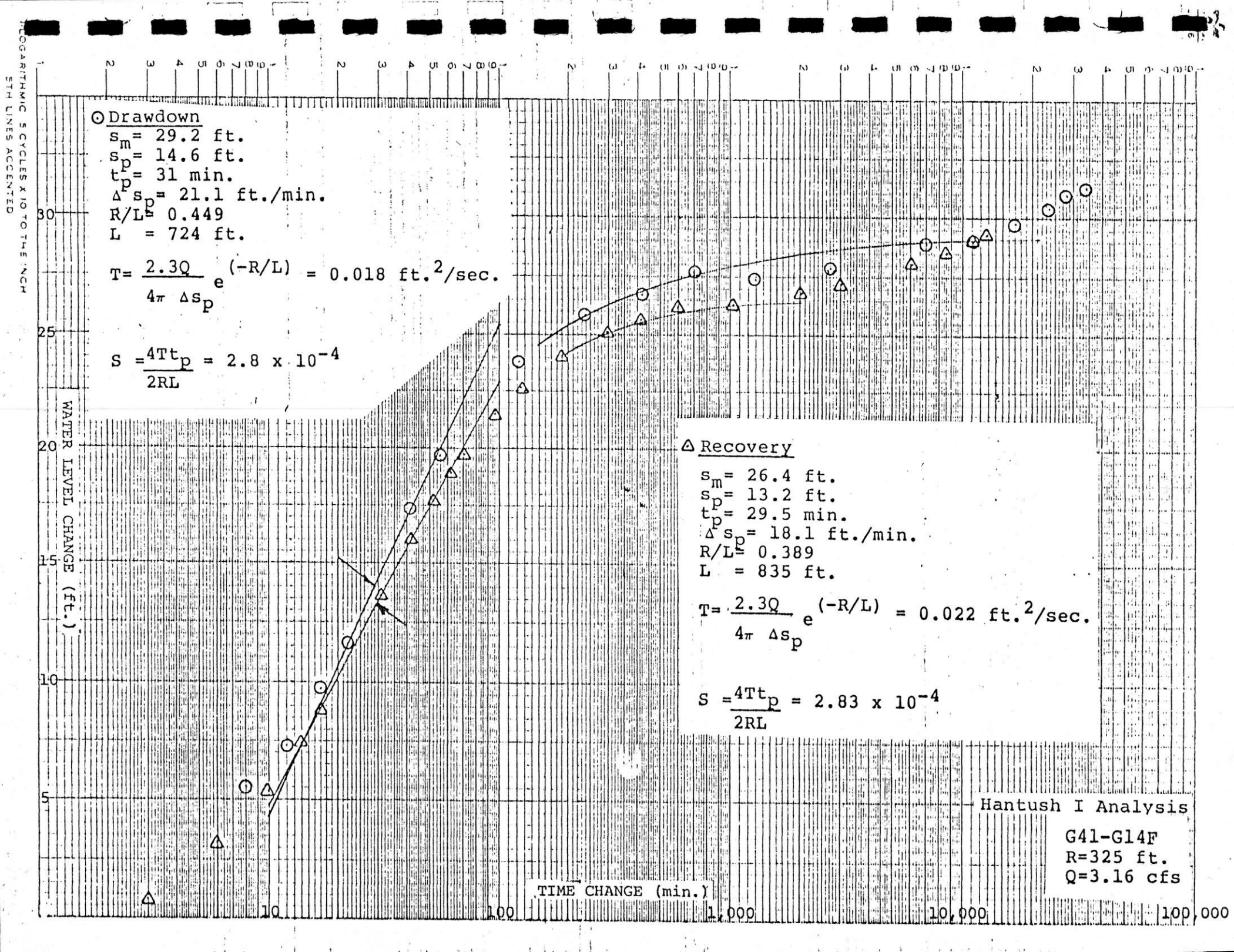
*Pump Test and Recovery Period Between these Dates. For Pump Test Data, Refer to PUMP TEST AND ANALYSIS, Project Report No. 4.

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked


Early
W = 1.0
u = 1.0
s = 9.7 ft.
t = 3.4 min.
Early
W = 1.0
u = 1.0
s = 11.5 ft.
t = 5.2 min.
R/B = 0.4
R/B = 0.3
Late
W = 1.0
u = 1.0
s = 9.7 ft.
t = 1500 min.
Late
W = 1.0
u = 1.0
s = 11.5 ft.
t = 1750 min.
Drawdown
$T = \frac{QW}{4\pi s} = 0.026$ ft.$^2$/sec.
$S_e = \frac{4Ttu}{R^2} = 2.0 \times 10^{-4}$
$S_L = \frac{4Ttu}{R^2} = 0.089$
Recovery
$T = \frac{QW}{4\pi s} = 0.022$ ft.$^2$/sec.
$S_e = \frac{4Ttu}{R^2} = 2.6 \times 10^{-4}$
$S_L = \frac{4Ttu}{R^2} = 0.087$
$k_v = \frac{Tm^1}{B^2} = \frac{(0.026)80}{(1080)^2}$
$= 1.8 \times 10^{-6}$ ft./sec.
$= 4.9 \times 10^{-4}$ cm./sec.
Boulton Analysis
G41-G14F
Q=3.16 cfs
R=325 ft.
WATER LEVEL CHANGE (ft.)
TIME CHANGE (min.)
100.0
10.0
1.0
0.1
1
10
100
1,000
10,000


LOGARITHMIC 5 CYCLES X 10 TO THE INCH
5TH LINES ACCENTED
⊙ Drawdown
$s_m$ = 29.2 ft.
$s_p$ = 14.6 ft.
$t_p$ = 31 min.
$\Delta s_p$ = 21.1 ft./min.
R/L = 0.449
L = 724 ft.
$T = \frac{2.3Q}{4\pi \Delta s_p} e^{(-R/L)} = 0.018$ ft.$^2$/sec.
$S = \frac{4Tt_p}{2RL} = 2.8 \times 10^{-4}$
△ Recovery
$s_m$ = 26.4 ft.
$s_p$ = 13.2 ft.
$t_p$ = 29.5 min.
$\Delta s_p$ = 18.1 ft./min.
R/L = 0.389
L = 835 ft.
$T = \frac{2.3Q}{4\pi \Delta s_p} e^{(-R/L)} = 0.022$ ft.$^2$/sec.
$S = \frac{4Tt_p}{2RL} = 2.83 \times 10^{-4}$
WATER LEVEL CHANGE (ft.)
TIME CHANGE (min.)
Hantush I Analysis
G41-G14F
R=325 ft.
Q=3.16 cfs

GOLDER ASSOCIATES -- PUMP TEST [illegible] A PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14F ***

| DATE | TIME | FIRST READING | SECOND READING | A L G | C O N | TIME SINCE TEST BEGAN | WATER LEVEL ELEVATION | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| DDMONYY | HHMM.SS | FEET | FEET | | | MINUTES | FEET | COLLAR ELEV 1706.92 FEET PIEZO ELEV 0.00 -NULL |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 11DEC79 | 1200.00 | 112.10 | 0.00 | 1 | 20 | -286445.00 | 1594.82 | CORRECT TO COLLAR TOP |
| 25APR80 | 1200.00 | 112.95 | .14 | 1 | 14 | -90605.00 | 1593.83 | 14 - TIME NOT RECORD |
| 20MAY80 | 600.00 | 110.88 | 0.00 | 1 | 66 | -54965.00 | 1595.90 | 4 14 |
| 21MAY80 | 1200.00 | 112.84 | 0.00 | 1 | 6 | -53165.00 | 1594.04 | 6 - NO TIME |
| 29MAY80 | 930.00 | 112.72 | 0.00 | 1 | 6 | -41795.00 | 1594.16 | 4 6 -REV. CIR. |
| 30MAY80 | 1730.00 | 112.69 | 0.00 | 1 | 6 | -39875.00 | 1594.19 | 4 6 -REV. CIR. |
| 31MAY80 | 20.00 | 111.75 | 0.00 | 1 | 6 | -39465.00 | 1595.13 | 4 6 -REV. CIR. |
| 31MAY80 | 945.00 | 112.56 | 0.00 | 1 | 6 | -38900.00 | 1594.32 | 4 6 SET CASE |
| 01JUN80 | 600.00 | 112.42 | 0.00 | 1 | 6 | -37685.00 | 1594.46 | 4 6 SET CASE |
| 01JUN80 | 1525.00 | 112.58 | 0.00 | 1 | 6 | -37120.00 | 1594.30 | 4 6 GRAVEL |
| 02JUN80 | 830.00 | 112.49 | 0.00 | 1 | 6 | -36095.00 | 1594.39 | 4 6 |
| 03JUN80 | 915.00 | 112.79 | 0.00 | 1 | 6 | -34610.00 | 1594.09 | 4 6 |
| 04JUN80 | 135.00 | 113.72 | 0.00 | 1 | 6 | -33630.00 | 1593.16 | 4 6 AIR DEV. |
| 06JUN80 | 933.00 | 114.45 | 0.00 | 1 | 6 | -30272.00 | 1592.43 | 4 6 |
| 06JUN80 | 1110.00 | 114.01 | 0.00 | 1 | 6 | -30175.00 | 1592.87 | 4 6 |
| 06JUN80 | 1307.00 | 113.07 | 0.00 | 1 | 6 | -30058.00 | 1593.81 | 4 6 |
| 06JUN80 | 1705.00 | 116.96 | 0.00 | 1 | 46 | -29820.00 | 1589.94 | 4 6 VEL TEST |
| 06JUN80 | 1848.00 | 116.83 | 0.00 | 1 | 46 | -29717.00 | 1590.07 | 4 6 VEL TEST |
| 07JUN80 | 930.00 | 112.91 | 0.00 | 1 | 6 | -28635.00 | 1593.97 | 4 6 |
| 08JUN80 | 830.00 | 113.12 | 0.00 | 1 | 6 | -27455.00 | 1593.76 | 4 6 |
| 09JUN80 | 800.00 | 112.82 | 0.00 | 1 | 6 | -26045.00 | 1594.06 | 4 6 |
| 10JUN80 | 835.00 | 112.98 | 0.00 | 1 | 6 | -24570.00 | 1593.90 | 4 6 |
| 11JUN80 | 845.00 | 113.12 | 0.00 | 1 | 6 | -23120.00 | 1593.76 | 4 6 |
| 12JUN80 | 840.00 | 112.97 | 0.00 | 1 | 6 | -21685.00 | 1593.91 | 4 6 |
| 13JUN80 | 815.00 | 112.78 | 0.00 | 1 | 6 | -20270.00 | 1594.10 | 4 6 |
| 13JUN80 | 2115.00 | 112.72 | 0.00 | 1 | 46 | -19490.00 | 1594.18 | 4 6 DIFF. RULE |
| 14JUN80 | 815.00 | 112.77 | 0.00 | 1 | 6 | -18830.00 | 1594.11 | 4 6 |
| 14JUN80 | 1745.00 | 112.78 | 0.00 | 1 | 6 | -18260.00 | 1594.10 | 4 6 |
| 15JUN80 | 820.00 | 112.91 | 0.00 | 1 | 6 | -17385.00 | 1593.97 | 4 6 |
| 16JUN80 | 805.00 | 113.09 | 0.00 | 1 | 6 | -15960.00 | 1593.79 | 4 6 |
| 24JUN80 | 820.00 | 112.98 | 0.00 | 1 | 6 | -4425.00 | 1593.90 | 4 6 |
| 25JUN80 | 815.00 | 112.95 | 0.00 | 1 | 6 | -2990.00 | 1593.93 | 4 6 |
| 26JUN80 | 840.00 | 112.91 | 0.00 | 1 | 6 | -1525.00 | 1593.97 | 4 6 |
| 27JUN80 | 800.00 | 113.09 | 0.00 | 1 | 6 | -125.00 | 1593.79 | 6 6 BEFORE TEST |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G19F ***

| DATE DDMONYY | TIME HHMM.SS | FIRST READING FEET | SECOND READING FEET | A L G | C O N | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | COLLAR ELEV 1706.92 FEET PIEZO ELEV 0.00 -NULL |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 27JUN80 | 1013.00 | 118.61 | 0.00 | 1 | 46 | 8.00 | 1588.29 | 6 6 START @ 10 |
| 27JUN80 | 1017.00 | 120.45 | 0.00 | 1 | 47 | 12.00 | 1586.44 | 6 6 |
| 27JUN80 | 1022.00 | 122.84 | 0.00 | 1 | 47 | 17.00 | 1584.05 | 6 6 START @ 10 |
| 27JUN80 | 1027.00 | 124.61 | 0.00 | 1 | 47 | 22.00 | 1582.28 | 6 6 |
| 27JUN80 | 1034.00 | 127.69 | 0.00 | 1 | 47 | 29.00 | 1579.25 | 6 6 |
| 27JUN80 | 1047.00 | 130.52 | 0.00 | 1 | 47 | 42.00 | 1576.37 | 6 6 |
| 27JUN80 | 1103.00 | 132.78 | 0.00 | 1 | 47 | 58.00 | 1574.11 | 6 6 |
| 27JUN80 | 1208.00 | 136.91 | 0.00 | 1 | 48 | 123.00 | 1569.97 | 6 6 |
| 27JUN80 | 1258.00 | 137.90 | 0.00 | 1 | 48 | 173.00 | 1568.98 | 6 6 |
| 27JUN80 | 1329.00 | 138.49 | 0.00 | 1 | 48 | 204.00 | 1568.39 | 6 6 |
| 27JUN80 | 1405.00 | 138.94 | 0.00 | 1 | 48 | 240.00 | 1567.94 | 6 6 |
| 27JUN80 | 1455.00 | 139.32 | 0.00 | 1 | 48 | 294.00 | 1567.56 | 6 6 |
| 27JUN80 | 1541.00 | 139.57 | 0.00 | 1 | 48 | 336.00 | 1567.31 | 6 6 TIME CORRECTED |
| 27JUN80 | 1708.00 | 139.79 | 0.00 | 1 | 48 | 423.00 | 1567.09 | 6 6 |
| 27JUN80 | 1754.00 | 139.93 | 0.00 | 1 | 48 | 469.00 | 1566.95 | 6 6 |
| 27JUN80 | 1850.00 | 140.00 | 0.00 | 1 | 49 | 525.00 | 1566.86 | 6 6 |
| 27JUN80 | 1933.00 | 140.05 | 0.00 | 1 | 49 | 568.00 | 1566.81 | 6 6 |
| 27JUN80 | 2049.00 | 140.11 | 0.00 | 1 | 49 | 644.00 | 1566.75 | 6 6 |
| 27JUN80 | 2144.00 | 140.18 | 0.00 | 1 | 49 | 699.00 | 1566.68 | 6 6 |
| 27JUN80 | 2308.00 | 140.31 | 0.00 | 1 | 49 | 783.00 | 1566.55 | 6 6 |
| 28JUN80 | 43.00 | 140.27 | 0.00 | 1 | 49 | 878.00 | 1566.59 | 6 6 |
| 28JUN80 | 229.00 | 140.33 | 0.00 | 1 | 49 | 984.00 | 1566.53 | 6 6 |
| 28JUN80 | 545.00 | 140.46 | 0.00 | 1 | 49 | 1178.00 | 1566.40 | 6 6 |
| 28JUN80 | 749.00 | 140.51 | 0.00 | 1 | 49 | 1304.00 | 1566.35 | 6 6 |
| 28JUN80 | 1013.00 | 140.60 | 0.00 | 1 | 49 | 1448.00 | 1566.26 | 6 6 |
| 28JUN80 | 1206.00 | 140.67 | 0.00 | 1 | 49 | 1561.00 | 1566.19 | 6 6 |
| 28JUN80 | 1513.00 | 140.71 | 0.00 | 1 | 49 | 1748.00 | 1566.15 | 6 6 |
| 28JUN80 | 1813.00 | 140.80 | 0.00 | 1 | 49 | 1928.00 | 1566.06 | 6 6 |
| 28JUN80 | 2340.00 | 140.84 | 0.00 | 1 | 49 | 2255.00 | 1566.02 | 6 6 |
| 29JUN80 | 825.00 | 140.95 | 0.00 | 1 | 49 | 2780.00 | 1565.91 | 6 6 |
| 29JUN80 | 1608.00 | 141.14 | 0.00 | 1 | 49 | 3243.00 | 1565.72 | 6 6 |
| 30JUN80 | 51.00 | 141.43 | 0.00 | 1 | 49 | 3766.00 | 1565.43 | 6 6 |
| 30JUN80 | 841.00 | 141.21 | 0.00 | 1 | 49 | 4236.00 | 1565.65 | 6 6 |
| 30JUN80 | 1600.00 | 141.52 | 0.00 | 1 | 49 | 4675.00 | 1565.34 | 6 6 |
| 01JUL80 | 806.00 | 141.55 | 0.00 | 1 | 49 | 5641.00 | 1565.31 | 6 6 |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14F ***

| DATE DDMONYY | TIME HHMM.SS | FIRST READING FEET | SECOND READING FEET | A L G | C O N | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | COLLAR ELEV 1706.92 FEET PIEZO ELEV 0.00 -NULL |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 01JUL80 | 1052.00 | 138.36 | 0.00 | 1 | 48 | 5807.00 | 1568.52 | 6 6 |
| 01JUL80 | 1117.00 | 140.11 | 0.00 | 1 | 49 | 5832.00 | 1566.75 | 6 6 |
| 01JUL80 | 1158.00 | 141.01 | 0.00 | 1 | 49 | 5873.00 | 1565.85 | 6 6 |
| 01JUL80 | 1309.00 | 141.39 | 0.00 | 1 | 49 | 5944.00 | 1565.47 | 6 6 |
| 01JUL80 | 1454.00 | 141.55 | 0.00 | 1 | 49 | 6049.00 | 1565.31 | 6 6 |
| 01JUL80 | 1652.00 | 141.64 | 0.00 | 1 | 49 | 6167.00 | 1565.22 | 6 6 |
| 02JUL80 | 211.00 | 141.68 | 0.00 | 1 | 49 | 6726.00 | 1564.98 | 6 6 |
| 02JUL80 | 845.00 | 141.94 | 0.00 | 1 | 49 | 7120.00 | 1564.92 | 6 6 |
| 02JUL80 | 1332.00 | 141.87 | .15 | 1 | 14 | 7408.00 | 1564.90 | 16 14 COMPARE PIEZ. |
| 02JUL80 | 1335.00 | 141.93 | 0.00 | 1 | 49 | 7410.00 | 1564.93 | 6 6 COMPARE PIEZ. |
| 02JUL80 | 2125.00 | 141.92 | 0.00 | 1 | 49 | 7880.00 | 1564.94 | 6 6 |
| 03JUL80 | 907.00 | 141.94 | 0.00 | 1 | 49 | 8582.00 | 1564.92 | 6 6 |
| 03JUL80 | 2044.00 | 141.47 | 0.00 | 1 | 49 | 9279.00 | 1565.39 | 6 6 |
| 04JUL80 | 857.00 | 142.05 | 0.00 | 1 | 49 | 10012.00 | 1564.81 | 6 6 |
| 04JUL80 | 2043.00 | 142.02 | 0.00 | 1 | 49 | 10718.00 | 1564.84 | 6 6 |
| 05JUL80 | 826.00 | 142.16 | 0.00 | 1 | 49 | 11421.00 | 1564.70 | 6 6 |
| 05JUL80 | 2048.00 | 142.46 | 0.00 | 1 | 49 | 12163.00 | 1564.40 | 6 6 |
| 06JUL80 | 918.00 | 142.58 | 0.00 | 1 | 49 | 12913.00 | 1564.28 | 6 6 |
| 06JUL80 | 1737.00 | 142.45 | 0.00 | 1 | 49 | 13412.00 | 1564.41 | 6 6 |
| 07JUL80 | 754.00 | 142.39 | 0.00 | 1 | 49 | 14269.00 | 1564.47 | 6 6 |
| 07JUL80 | 1641.00 | 142.34 | 0.00 | 1 | 49 | 14796.00 | 1564.52 | 6 6 |
| 08JUL80 | 842.00 | 142.73 | 0.00 | 1 | 49 | 15757.00 | 1564.13 | 6 6 |
| 08JUL80 | 2103.00 | 142.73 | 0.00 | 1 | 49 | 16498.00 | 1564.13 | 6 6 |
| 09JUL80 | 857.00 | 142.79 | 0.00 | 1 | 49 | 17212.00 | 1564.07 | 6 6 |
| 09JUL80 | 1611.00 | 142.78 | 0.00 | 1 | 49 | 17646.00 | 1564.08 | 6 6 |
| 10JUL80 | 850.00 | 142.94 | 0.00 | 1 | 49 | 18645.00 | 1563.92 | 6 6 |
| 10JUL80 | 1734.00 | 142.91 | 0.00 | 1 | 49 | 19169.00 | 1563.95 | 6 6 |
| 11JUL80 | 923.00 | 143.09 | 0.00 | 1 | 49 | 20118.00 | 1563.77 | 6 6 |
| 11JUL80 | 1928.00 | 143.10 | 0.00 | 1 | 49 | 20723.00 | 1563.76 | 6 6 |
| 12JUL80 | 902.00 | 143.20 | 0.00 | 1 | 49 | 21537.00 | 1563.66 | 6 6 |
| 13JUL80 | 828.00 | 143.36 | 0.00 | 1 | 49 | 22943.00 | 1563.50 | 6 6 |
| 14JUL80 | 805.00 | 143.47 | 0.00 | 1 | 49 | 24358.00 | 1563.39 | 6 6 |
| 14JUL80 | 1100.00 | 142.70 | 0.00 | 1 | 49 | 24535.00 | 1564.16 | 6 6 |
| 15JUL80 | 834.00 | 143.70 | 0.00 | 1 | 49 | 25829.00 | 1563.16 | 6 6 |
| 16JUL80 | 917.00 | 143.91 | 0.00 | 1 | 49 | 27312.00 | 1562.95 | 6 6 |
| 17JUL80 | 815.00 | 144.13 | 0.00 | 1 | 49 | 28690.00 | 1562.73 | 6 6 |
| 18JUL80 | 802.00 | 144.03 | 0.00 | 1 | 49 | 30117.00 | 1562.83 | 6 6 |
| 20JUL80 | 807.00 | 144.06 | 0.00 | 1 | 49 | 33002.00 | 1562.80 | 6 6 |
| 21JUL80 | 831.00 | 144.31 | 0.00 | 1 | 49 | 34466.00 | 1562.55 | 6 6 |
| 21JUL80 | 1008.00 | 143.52 | 0.00 | 1 | 49 | 34563.00 | 1563.34 | 6 6 RECOVERY @ 10 |
| 21JUL80 | 1011.00 | 141.17 | 0.00 | 1 | 49 | 34566.00 | 1565.69 | 6 6 |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 796085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14F ***

| DATE DDMONYY | TIME HHMM.SS | FIRST READING FEET | SECOND READING FEET | ALOG | COMN | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | COLLAR ELEV 1706.92 FEET PIEZO ELEV 0.00 -NULL |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 21JUL80 | 1015.00 | 139.04 | 0.00 | 1 | 48 | 34570.00 | 1567.88 | 6 6 |
| 21JUL80 | 1019.00 | 136.93 | 0.00 | 1 | 48 | 34574.00 | 1569.95 | 6 6 |
| 21JUL80 | 1022.00 | 135.49 | 0.00 | 1 | 48 | 34577.00 | 1571.39 | 6 6 |
| 21JUL80 | 1036.00 | 130.71 | 0.00 | 1 | 47 | 34591.00 | 1576.18 | 6 6 |
| 21JUL80 | 1047.00 | 128.27 | 0.00 | 1 | 47 | 34602.00 | 1578.62 | 6 6 |
| 21JUL80 | 1057.00 | 126.68 | 0.00 | 1 | 47 | 34612.00 | 1580.21 | 6 6 |
| 21JUL80 | 1107.00 | 125.52 | 0.00 | 1 | 47 | 34622.00 | 1581.37 | 6 6 |
| 21JUL80 | 1116.00 | 124.63 | 0.00 | 1 | 47 | 34631.00 | 1582.26 | 6 6 |
| 21JUL80 | 1125.00 | 123.87 | 0.00 | 1 | 47 | 34640.00 | 1583.02 | 6 6 |
| 21JUL80 | 1134.00 | 123.32 | 0.00 | 1 | 47 | 34649.00 | 1583.57 | 6 6 |
| 21JUL80 | 1142.00 | 122.85 | 0.00 | 1 | 47 | 34657.00 | 1584.04 | 6 6 |
| 21JUL80 | 1152.00 | 122.40 | 0.00 | 1 | 47 | 34667.00 | 1584.49 | 6 6 |
| 21JUL80 | 1159.00 | 122.05 | 0.00 | 1 | 47 | 34674.00 | 1584.84 | 6 6 |
| 21JUL80 | 1209.00 | 121.72 | 0.00 | 1 | 47 | 34684.00 | 1585.17 | 6 6 |
| 21JUL80 | 1219.00 | 121.39 | 0.00 | 1 | 47 | 34694.00 | 1585.50 | 6 6 |
| 21JUL80 | 1238.00 | 120.90 | 0.00 | 1 | 47 | 34713.00 | 1585.99 | 6 6 |
| 21JUL80 | 1258.00 | 120.48 | 0.00 | 1 | 47 | 34733.00 | 1586.41 | 6 6 |
| 21JUL80 | 1315.00 | 120.19 | 0.00 | 1 | 47 | 34750.00 | 1586.70 | 6 6 |
| 21JUL80 | 1341.00 | 119.88 | 0.00 | 1 | 46 | 34776.00 | 1587.02 | 6 6 |
| 21JUL80 | 1404.00 | 119.65 | 0.00 | 1 | 46 | 34799.00 | 1587.25 | 6 6 |
| 21JUL80 | 1435.00 | 119.37 | 0.00 | 1 | 46 | 34830.00 | 1587.53 | 6 6 |
| 21JUL80 | 1504.00 | 119.21 | 0.00 | 1 | 46 | 34859.00 | 1587.69 | 6 6 |
| 21JUL80 | 1539.00 | 119.00 | 0.00 | 1 | 46 | 34894.00 | 1587.90 | 6 6 |
| 21JUL80 | 1610.00 | 118.87 | 0.00 | 1 | 46 | 34925.00 | 1588.03 | 6 6 |
| 21JUL80 | 1706.00 | 118.67 | 0.00 | 1 | 46 | 34981.00 | 1588.23 | 6 6 |
| 21JUL80 | 1818.00 | 118.46 | 0.00 | 1 | 46 | 35053.00 | 1588.44 | 6 6 |
| 21JUL80 | 1915.00 | 118.40 | 0.00 | 1 | 46 | 35108.00 | 1588.50 | 6 6 |
| 21JUL80 | 2008.00 | 118.26 | 0.00 | 1 | 46 | 35163.00 | 1588.64 | 6 6 |
| 21JUL80 | 2127.00 | 118.16 | 0.00 | 1 | 46 | 35242.00 | 1588.74 | 6 6 |
| 21JUL80 | 2235.00 | 118.07 | 0.00 | 1 | 46 | 35310.00 | 1588.83 | 6 6 |
| 22JUL80 | 110.00 | 117.97 | 0.00 | 1 | 46 | 35465.00 | 1588.93 | 6 6 |
| 22JUL80 | 232.00 | 117.91 | 0.00 | 1 | 46 | 35547.00 | 1588.99 | 6 6 |
| 22JUL80 | 420.00 | 117.85 | 0.00 | 1 | 46 | 35655.00 | 1589.05 | 6 6 |
| 22JUL80 | 842.00 | 117.68 | 0.00 | 1 | 46 | 35917.00 | 1589.22 | 6 6 |
| 22JUL80 | 1133.00 | 117.58 | 0.00 | 1 | 46 | 36088.00 | 1589.32 | 6 6 |
| 22JUL80 | 1519.00 | 117.42 | 0.00 | 1 | 46 | 36314.00 | 1589.48 | 6 6 |
| 22JUL80 | 1902.00 | 117.38 | 0.00 | 1 | 46 | 36537.00 | 1589.52 | 6 6 |
| 23JUL80 | 23.00 | 117.30 | 0.00 | 1 | 46 | 36858.00 | 1589.60 | 6 6 |
| 23JUL80 | 338.00 | 117.23 | 0.00 | 1 | 46 | 37053.00 | 1589.67 | 6 6 |
| 23JUL80 | 1113.00 | 115.00 | 2.13 | 1 | 46 | 37508.00 | 1589.77 | 6 6 |
| 23JUL80 | 1927.00 | 115.00 | 1.97 | 1 | 46 | 38002.00 | 1589.93 | 6 6 |
| 24JUL80 | 840.00 | 115.00 | 1.79 | 1 | 46 | 38795.00 | 1590.11 | 6 6 |
| 24JUL80 | 1701.00 | 115.00 | 1.65 | 1 | 46 | 39296.00 | 1590.25 | 6 6 |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE= 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14F ***

| DATE | TIME | FIRST READING | SECOND READING | A L G | C O N | TIME SINCE TEST BEGAN | WATER LEVEL ELEVATION | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| DDMONYY | HHMM.SS | FEET | FEET | | | MINUTES | FEET | |
| | | | | | | | | COLLAR ELEV 1706.92 FEET PIEZO ELEV 0.00 -NULL- |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 25JUL80 | 1016.00 | 115.00 | 1.58 | 1 | 46 | 40331.00 | 1590.32 | 6 6 |
| 25JUL80 | 1530.00 | 115.00 | 1.53 | 1 | 46 | 40645.00 | 1590.37 | 6 6 |
| 26JUL80 | 806.00 | 115.00 | 1.32 | 1 | 67 | 41641.00 | 1590.45 | 14 14 |
| 27JUL80 | 945.00 | 115.00 | 3.26 | 1 | 94 | 43180.00 | 1590.54 | 15 BY D. K. TO 9/2/80 |
| 28JUL80 | 905.00 | 115.00 | 3.03 | 1 | 94 | 44580.00 | 1590.77 | 15 BY D. K. TO 9/2/80 |
| 29JUL80 | 900.00 | 115.00 | 2.99 | 1 | 94 | 46015.00 | 1590.81 | 15 BY D. K. TO 9/2/80 |
| 30JUL80 | 1125.00 | 115.00 | 2.88 | 1 | 94 | 47600.00 | 1590.92 | 15 BY D. K. TO 9/2/80 |
| 31JUL80 | 1446.00 | 115.00 | 2.77 | 1 | 94 | 49241.00 | 1591.03 | 15 BY D. K. TO 9/2/80 |
| 01AUG80 | 1235.00 | 115.00 | 2.70 | 1 | 94 | 50550.00 | 1591.10 | 15 BY D. K. TO 9/2/80 |
| 03AUG80 | 816.00 | 115.00 | 2.59 | 1 | 94 | 53171.00 | 1591.21 | 4 15 |
| 05AUG80 | 1421.00 | 115.00 | 2.48 | 1 | 94 | 56416.00 | 1591.32 | 4 15 |
| 07AUG80 | 1430.00 | 115.00 | 2.36 | 1 | 94 | 59305.00 | 1591.44 | 4 15 |
| 09AUG80 | 936.00 | 115.00 | 2.32 | 1 | 94 | 61891.00 | 1591.48 | 4 15 |
| 12AUG80 | 1324.00 | 115.00 | 2.25 | 1 | 94 | 66439.00 | 1591.55 | 4 15 |
| 14AUG80 | 1123.00 | 115.00 | 2.08 | 1 | 94 | 69198.00 | 1591.72 | 4 15 |
| 16AUG80 | 1110.00 | 115.00 | 2.10 | 1 | 94 | 72065.00 | 1591.70 | 4 15 |
| 20AUG80 | 1430.00 | 116.82 | 0.00 | 1 | 94 | 78025.00 | 1591.98 | 15 |
| 22AUG80 | 1308.00 | 117.07 | 0.00 | 1 | 93 | 80823.00 | 1592.06 | 15 |
| 02SEP80 | 941.00 | 116.71 | 0.00 | 1 | 94 | 96456.00 | 1592.09 | 15 |
| 10SEP80 | 930.00 | 114.89 | 0.00 | 1 | 15 | 107965.00 | 1592.03 | 15 FOR G.W. MAP |

COOR. N113805 ft. (N34688m)
E2284315 ft. (E696261m)

# BORING LOG G41-G14F

SHEET 1 OF 3

SURFACE ELEV. 1703.5 ft. (519.22m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 11/4/79 DATE COMPLETED 11/6/79

DRILL RIG Drilltech D40K DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS. | BLOWS / FOOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES HAMMER BLOWS PER 6 IN. | SAMPLES REC. / ATT. | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| 0.0 | | See borings G41-G14, G41-G14A and G41-G14B for soil stratigraphy | | | | | | | ▼12/11/79 33.07<br>108.5<br>Grout (to surface)<br>84.12<br>276.0<br>Bentonite Clay Seal<br>85.65<br>281.0<br>Pea Gravel<br>88.39<br>290.0<br>Pea Gravel<br>2" Solid PVC Pipe to Surface<br>2" Slotted PVC Pipe |
| 91.44 | | | | | | | | | |
| 300.0 | | CONTINUED | | | | | | | CONTINUED |

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked

COOR. N113805 ft. (N34688m)
E2284315 ft. (E696261m)

# BORING LOG G41-G14F



SURFACE ELEV. 1703.5 ft. (519.22m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 11/4/79 DATE COMPLETED 11/6/79

DRILL RIG Drilltech D40K DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS. | BLOWS / FOOT | SAMPLES: NUMBER | SAMPLES: TYPE | SAMPLES: HAMMER BLOWS PER 6 IN. | SAMPLES: REC./ATT. | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| 91.44 | | CONTINUED | | | | | | | CONTINUED |
| 300.0 | | See borings G41-G14, G41-G14A and G41-G14B for soil stratigraphy | | | | | | | 2" Slotted PVC Pipe; Caved Material (Note 1); 94.49; 310.0; Caved Material (Note 1) |
| 101.19 | | | | | | | | | |
| 332.0 | | END OF BORING | | | | | | | |

NOTES

1. Groundwater observation well was placed at 310.0 ft. on caved material. After placement of the PVC well pipe, the borehole caved to 3000 ft.

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked

COOR. N113805 ft. (N34688m)
E2284315 ft. (E696261m)

# BORING LOG G41-G14F



SURFACE ELEV. 1703.5 ft. (519.22) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 11/4/79 DATE COMPLETED 11/6/79

DRILL RIG Drilltech D40K DRILLING METHOD Mud Rotary

NOTES (continued)

2. Elevation of top of protector pipe, 1706.9 ft. (520.27).

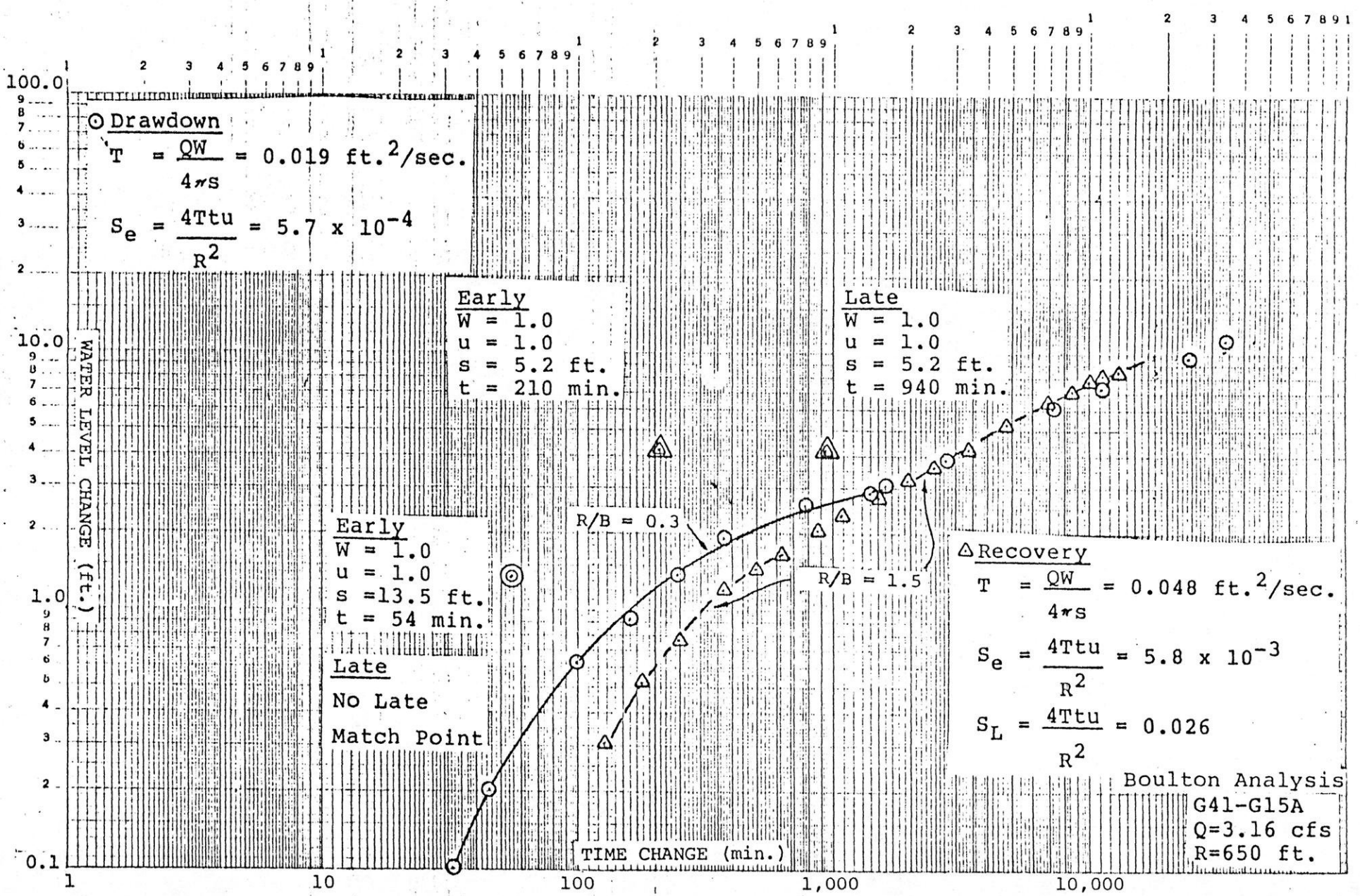
Table of Water Level Readings by Date. Readings Indicate Depth Below Ground Surface.

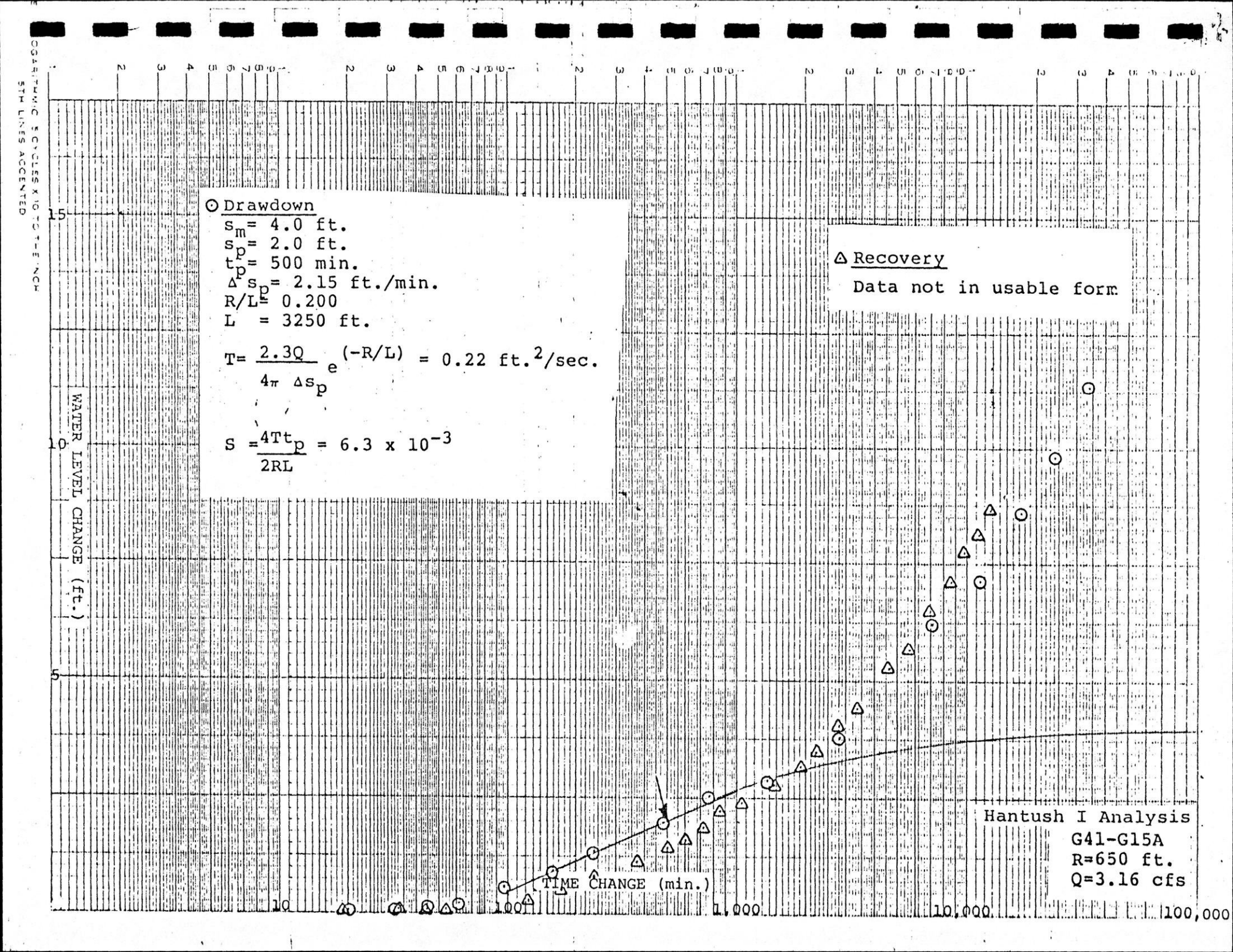
| DATE | 12/11/79 | 4/25/80 | 5/20/80 | 6/26/80* | 9/10/80* | | |
|---|---|---|---|---|---|---|---|
| DEPTH (m) | 33.07 | 33.38 | 32.74 | 33.38 | 33.95 | | |
| DEPTH (ft.) | 108.5 | 109.5 | 107.4 | 109.5 | 111.4 | | |

*Pump Test and Recovery Period Between these Dates. For Pump Test Data, Refer to PUMP TEST AND ANALYSIS, Project Report No. 4.

K&E 3 x 5 KEUFFEL & ESSER CO. MADE IN U.S.A.






⊙ Drawdown
$s_m$ = 4.0 ft.
$s_p$ = 2.0 ft.
$t_p$ = 500 min.
$\Delta s_p$ = 2.15 ft./min.
R/L = 0.200
L = 3250 ft.
$T = \frac{2.3Q}{4\pi \Delta s_p} e^{(-R/L)} = 0.22$ ft.$^2$/sec.
$S = \frac{4Tt_p}{2RL} = 6.3 \times 10^{-3}$
△ Recovery
Data not in usable form
WATER LEVEL CHANGE (ft.)
TIME CHANGE (min.)
10
100
1,000
10,000
100,000
5
10
15
Hantush I Analysis
G41-G15A
R=650 ft.
Q=3.16 cfs

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G15A ***

| DATE | TIME | FIRST READING | SECOND READING | A L G | C O N | TIME SINCE TEST BEGAN | WATER LEVEL ELEVATION | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| DDMONYY | HHMM.SS | FEET | FEET | | | MINUTES | FEET | |
| | | | | | | | | COLLAR ELEV 1695.71 FEET PIEZO ELEV 0.00 -NULL- |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 18APR79 | 1530.00 | 105.60 | 0.00 | 1 | 20 | -627515.00 | 1590.11 | |
| 18APR79 | 1530.00 | 105.60 | 0.00 | 1 | 20 | -627515.00 | 1590.11 | CORRECT TO COLLAR TOP |
| | | | | | | | | GROUND SURFACE-CORR. TO |
| 09NOV79 | 1200.00 | 100.80 | 0.00 | 1 | 20 | -332525.00 | 1594.91 | |
| 09NOV79 | 1200.00 | 100.80 | 0.00 | 1 | 20 | -332525.00 | 1594.91 | BY D&M |
| | | | | | | | | BY D&M |
| 12NOV79 | 1200.00 | 101.20 | 0.00 | 1 | 20 | -328205.00 | 1594.51 | GROUND SURFACE-CORR. TO |
| 03DEC79 | 1200.00 | 100.00 | 0.00 | 1 | 20 | -297965.00 | 1595.71 | CORRECT TO COLLAR TOP |
| 25APR80 | 1200.00 | 101.75 | .21 | 1 | 14 | -90605.00 | 1593.75 | 14 - TIME NOT RECORD |
| 20MAY80 | 600.00 | 100.85 | 0.00 | 1 | 70 | -54965.00 | 1594.65 | 14 - NO TIME |
| 21MAY80 | 1200.00 | 259.58 | 0.00 | 1 | 7 | -53165.00 | 1594.13 | 7 - NO TIME |
| 29MAY80 | 930.00 | 259.41 | 0.00 | 1 | 7 | -41795.00 | 1594.30 | 4 7 -REV. CIR. |
| 29MAY80 | 2250.00 | 259.37 | 0.00 | 1 | 7 | -40995.00 | 1594.34 | 4 7 -REV. CIR. |
| 30MAY80 | 1730.00 | 259.19 | 0.00 | 1 | 7 | -39875.00 | 1594.52 | 4 7 -REV. CIR. |
| 31MAY80 | 945.00 | 259.51 | 0.00 | 1 | 7 | -38900.00 | 1594.20 | 4 7 SET CASE |
| 01JUN80 | 600.00 | 259.52 | 0.00 | 1 | 7 | -37685.00 | 1594.19 | 4 7 SET CASE |
| 01JUN80 | 1525.00 | 259.30 | 0.00 | 1 | 7 | -37120.00 | 1594.41 | 4 7 GRAVEL |
| 02JUN80 | 830.00 | 259.33 | 0.00 | 1 | 7 | -36095.00 | 1594.38 | 4 7 |
| 03JUN80 | 1000.00 | 259.72 | 0.00 | 1 | 7 | -34565.00 | 1593.99 | 4 7 |
| 04JUN80 | 135.00 | 260.05 | 0.00 | 1 | 7 | -33630.00 | 1593.66 | 4 7 AIR DEV. |
| 06JUN80 | 936.00 | 259.65 | 0.00 | 1 | 7 | -30269.00 | 1594.06 | 4 7 |
| 06JUN80 | 1313.00 | 259.57 | 0.00 | 1 | 7 | -30052.00 | 1594.14 | 4 7 |
| 06JUN80 | 1708.00 | 259.83 | 0.00 | 1 | 7 | -29817.00 | 1593.88 | 4 7 VEL TEST |
| 06JUN80 | 1849.00 | 259.92 | 0.00 | 1 | 7 | -29716.00 | 1593.79 | 4 7 VEL TEST |
| 07JUN80 | 930.00 | 259.50 | 0.00 | 1 | 7 | -28835.00 | 1594.21 | 4 7 |
| 08JUN80 | 900.00 | 259.93 | 0.00 | 1 | 7 | -27425.00 | 1593.78 | 4 7 |
| 09JUN80 | 800.00 | 259.62 | 0.00 | 1 | 7 | -26045.00 | 1594.09 | 4 7 |
| 10JUN80 | 935.00 | 278.19 | 0.00 | 1 | 51 | -24510.00 | 1593.57 | 4 7 NEW CORRECTION |
| 11JUN80 | 910.00 | 278.42 | 0.00 | 1 | 51 | -23095.00 | 1593.34 | 4 7 |
| 12JUN80 | 900.00 | 278.25 | 0.00 | 1 | 51 | -21665.00 | 1593.51 | 4 7 |
| 13JUN80 | 815.00 | 277.99 | 0.00 | 1 | 51 | -20270.00 | 1593.77 | 4 7 |
| 13JUN80 | 2115.00 | 277.93 | 0.00 | 1 | 51 | -19490.00 | 1593.83 | 4 7 DIFF. RULE |
| 14JUN80 | 835.00 | 277.92 | 0.00 | 1 | 51 | -18810.00 | 1593.84 | 4 7 |
| 14JUN80 | 1745.00 | 277.96 | 0.00 | 1 | 51 | -18260.00 | 1593.80 | 4 7 |
| 15JUN80 | 820.00 | 278.16 | 0.00 | 1 | 51 | -17385.00 | 1593.60 | 4 7 |
| 16JUN80 | 805.00 | 278.37 | 0.00 | 1 | 51 | -15960.00 | 1593.39 | 4 7 |
| 24JUN80 | 820.00 | 278.21 | 0.00 | 1 | 51 | -4425.00 | 1593.55 | 4 7 |
| 25JUN80 | 815.00 | 278.14 | 0.00 | 1 | 51 | -2990.00 | 1593.62 | 4 7 |
| 26JUN80 | 840.00 | 278.11 | 0.00 | 1 | 51 | -1525.00 | 1593.65 | 4 7 |
| 27JUN80 | 800.00 | 278.38 | 0.00 | 1 | 51 | -125.00 | 1593.38 | 7 7 BEFORE TEST |
| 27JUN80 | 1020.00 | 278.25 | 0.00 | 1 | 51 | 15.00 | 1593.51 | 7 7 START @ 10 |
| 27JUN80 | 1025.00 | 278.42 | 0.00 | 1 | 51 | 20.00 | 1593.34 | 7 7 |
| 27JUN80 | 1037.00 | 278.48 | 0.00 | 1 | 51 | 32.00 | 1593.28 | 7 7 |
| 27JUN80 | 1050.00 | 278.58 | 0.00 | 1 | 51 | 45.00 | 1593.18 | 7 7 |
| 27JUN80 | 1106.00 | 278.62 | 0.00 | 1 | 51 | 61.00 | 1593.14 | 7 7 |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G15A ***

| DATE DDMONYY | TIME HHMM.SS | FIRST READING FEET | SECOND READING FEET | ALG | COM | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | COLLAR ELEV 1695.71 FEET PIEZO ELEV 0.00 -NULL |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 27JUN80 | 1142.00 | 279.00 | 0.00 | 1 | 51 | 97.00 | 1592.76 | 7 7 |
| 27JUN80 | 1212.00 | 279.19 | 0.00 | 1 | 51 | 127.00 | 1592.57 | 7 7 |
| 27JUN80 | 1245.00 | 279.30 | 0.00 | 1 | 51 | 160.00 | 1592.46 | 7 7 |
| 27JUN80 | 1407.00 | 279.76 | 0.00 | 1 | 51 | 242.00 | 1592.00 | 7 7 |
| 27JUN80 | 1500.00 | 279.90 | 0.00 | 1 | 51 | 295.00 | 1591.86 | 7 7 |
| 27JUN80 | 1544.00 | 280.04 | 0.00 | 1 | 52 | 339.00 | 1591.70 | 7 7 TIME CORRECTED |
| 27JUN80 | 1710.00 | 280.17 | 0.00 | 1 | 52 | 425.00 | 1591.57 | 7 7 |
| 27JUN80 | 1757.00 | 280.27 | 0.00 | 1 | 52 | 472.00 | 1591.47 | 7 7 |
| 27JUN80 | 1848.00 | 280.28 | 0.00 | 1 | 52 | 523.00 | 1591.46 | 7 7 |
| 27JUN80 | 1936.00 | 280.41 | 0.00 | 1 | 52 | 571.00 | 1591.33 | 7 7 |
| 27JUN80 | 2051.00 | 280.49 | 0.00 | 1 | 52 | 646.00 | 1591.25 | 7 7 |
| 27JUN80 | 2150.00 | 280.64 | 0.00 | 1 | 52 | 705.00 | 1591.10 | 7 7 |
| 28JUN80 | 45.00 | 280.64 | 0.00 | 1 | 52 | 880.00 | 1591.10 | 7 7 |
| 28JUN80 | 232.00 | 280.83 | 0.00 | 1 | 52 | 987.00 | 1590.91 | 7 7 |
| 28JUN80 | 857.00 | 281.21 | 0.00 | 1 | 52 | 1372.00 | 1590.53 | 9 7 |
| 28JUN80 | 1015.00 | 281.26 | 0.00 | 1 | 52 | 1450.00 | 1590.48 | 7 7 |
| 28JUN80 | 1204.00 | 281.38 | 0.00 | 1 | 52 | 1559.00 | 1590.36 | 7 7 |
| 28JUN80 | 1516.00 | 281.53 | 0.00 | 1 | 52 | 1751.00 | 1590.21 | 7 7 |
| 28JUN80 | 1815.00 | 281.68 | 0.00 | 1 | 52 | 1930.00 | 1590.06 | 7 7 |
| 28JUN80 | 2342.00 | 281.83 | 0.00 | 1 | 52 | 2257.00 | 1589.91 | 7 7 |
| 29JUN80 | 827.00 | 282.29 | 0.00 | 1 | 52 | 2782.00 | 1589.50 | 7 7 |
| 29JUN80 | 1610.00 | 282.61 | 0.00 | 1 | 52 | 3245.00 | 1589.13 | 7 7 |
| 30JUN80 | 55.00 | 283.07 | 0.00 | 1 | 52 | 3770.00 | 1588.67 | 7 7 |
| 30JUN80 | 849.00 | 283.35 | 0.00 | 1 | 52 | 4239.00 | 1588.39 | 7 7 |
| 30JUN80 | 1604.00 | 283.55 | 0.00 | 1 | 52 | 4679.00 | 1588.19 | 7 7 |
| 01JUL80 | 808.00 | 283.72 | 0.00 | 1 | 52 | 5643.00 | 1588.02 | 7 7 |
| 01JUL80 | 1055.00 | 283.80 | 0.00 | 1 | 52 | 5810.00 | 1587.94 | 7 7 |
| 01JUL80 | 1200.00 | 283.76 | 0.00 | 1 | 52 | 5875.00 | 1587.98 | 7 7 |
| 01JUL80 | 1313.00 | 283.83 | 0.00 | 1 | 52 | 5948.00 | 1587.91 | 7 7 |
| 01JUL80 | 1456.00 | 283.92 | 0.00 | 1 | 52 | 6051.00 | 1587.82 | 7 7 |
| 01JUL80 | 1646.00 | 284.02 | 0.00 | 1 | 52 | 6161.00 | 1587.72 | 7 7 |
| 02JUL80 | 214.00 | 284.37 | 0.00 | 1 | 52 | 6729.00 | 1587.37 | 7 7 |
| 02JUL80 | 847.00 | 284.63 | 0.00 | 1 | 52 | 7122.00 | 1587.11 | 7 7 |
| 02JUL80 | 1341.00 | 284.69 | 0.00 | 1 | 52 | 7416.00 | 1587.05 | 7 7 COMPARE PIEZ. |
| 02JUL80 | 2122.00 | 284.73 | 0.00 | 1 | 52 | 7877.00 | 1587.01 | 7 7 |
| 03JUL80 | 910.00 | 284.86 | 0.00 | 1 | 52 | 8585.00 | 1586.88 | 7 7 |
| 03JUL80 | 2042.00 | 284.96 | 0.00 | 1 | 52 | 9277.00 | 1586.78 | 7 7 |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G15A ***

| DATE DDMONYY | TIME HHMM.SS | FIRST READING FEET | SECOND READING FEET | A L G | C O N | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | COLLAR ELEV 1695.71 FEET PIEZO ELEV 0.00 -NULL- |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 04JUL80 | 858.00 | 285.18 | 0.00 | 1 | 53 | 10013.00 | 1586.54 | 7 7 |
| 04JUL80 | 2040.00 | 285.23 | 0.00 | 1 | 53 | 10715.00 | 1586.49 | 7 7 |
| 05JUL80 | 829.00 | 285.51 | 0.00 | 1 | 53 | 11424.00 | 1586.21 | 7 7 |
| 05JUL80 | 2051.00 | 285.99 | 0.00 | 1 | 53 | 12166.00 | 1585.73 | 7 7 |
| 06JUL80 | 920.00 | 286.31 | 0.00 | 1 | 53 | 12915.00 | 1585.41 | 7 7 |
| 06JUL80 | 1735.00 | 286.30 | 0.00 | 1 | 53 | 13410.00 | 1585.42 | 7 7 |
| 07JUL80 | 756.00 | 286.29 | 0.00 | 1 | 53 | 14271.00 | 1585.43 | 7 7 |
| 07JUL80 | 1643.00 | 286.29 | 0.00 | 1 | 53 | 14798.00 | 1585.43 | 7 7 |
| 08JUL80 | 845.00 | 286.67 | 0.00 | 1 | 53 | 15760.00 | 1585.05 | 7 7 |
| 08JUL80 | 2106.00 | 286.90 | 0.00 | 1 | 53 | 16501.00 | 1584.82 | 7 7 |
| 09JUL80 | 859.00 | 287.01 | 0.00 | 1 | 53 | 17214.00 | 1584.71 | 7 7 |
| 09JUL80 | 1613.00 | 287.08 | 0.00 | 1 | 53 | 17648.00 | 1584.64 | 7 7 |
| 10JUL80 | 853.00 | 287.27 | 0.00 | 1 | 53 | 18648.00 | 1584.45 | 7 7 |
| 10JUL80 | 1731.00 | 287.33 | 0.00 | 1 | 53 | 19166.00 | 1584.39 | 7 7 |
| 11JUL80 | 925.00 | 287.49 | 0.00 | 1 | 53 | 20120.00 | 1584.23 | 7 7 |
| 11JUL80 | 1930.00 | 287.68 | 0.00 | 1 | 53 | 20725.00 | 1584.04 | 7 7 |
| 12JUL80 | 907.00 | 287.79 | 0.00 | 1 | 53 | 21542.00 | 1583.93 | 7 7 |
| 13JUL80 | 831.00 | 288.14 | 0.00 | 1 | 53 | 22946.00 | 1583.58 | 7 7 |
| 14JUL80 | 805.00 | 288.16 | 0.00 | 1 | 53 | 24360.00 | 1583.56 | 7 7 |
| 14JUL80 | 1104.00 | 288.08 | 0.00 | 1 | 53 | 24539.00 | 1583.64 | 7 7 |
| 15JUL80 | 837.00 | 288.34 | 0.00 | 1 | 53 | 25832.00 | 1583.38 | 7 7 |
| 16JUL80 | 920.00 | 288.54 | 0.00 | 1 | 53 | 27315.00 | 1583.18 | 7 7 |
| 17JUL80 | 819.00 | 288.86 | 0.00 | 1 | 53 | 28694.00 | 1582.86 | 7 7 |
| 18JUL80 | 804.00 | 269.09 | 0.00 | 1 | 53 | 30119.00 | 1582.63 | 7 7 |
| 20JUL80 | 810.00 | 289.35 | 0.00 | 1 | 53 | 33005.00 | 1582.37 | 7 7 |
| 21JUL80 | 834.00 | 269.73 | 0.00 | 1 | 53 | 34469.00 | 1581.99 | 7 7 |
| 21JUL80 | 1024.00 | 289.72 | 0.00 | 1 | 53 | 34579.00 | 1582.00 | 7 7 RECOVERY @ 10 |
| 21JUL80 | 1038.00 | 289.66 | 0.00 | 1 | 53 | 34593.00 | 1582.06 | 7 7 |
| 21JUL80 | 1049.00 | 289.66 | 0.00 | 1 | 53 | 34604.00 | 1582.06 | 7 7 |
| 21JUL80 | 1059.00 | 289.64 | 0.00 | 1 | 53 | 34614.00 | 1582.08 | 7 7 |
| 21JUL80 | 1109.00 | 289.62 | 0.00 | 1 | 53 | 34624.00 | 1582.10 | 7 7 |
| 21JUL80 | 1118.00 | 289.59 | 0.00 | 1 | 53 | 34633.00 | 1582.13 | 7 7 |
| 21JUL80 | 1128.00 | 289.55 | 0.00 | 1 | 53 | 34643.00 | 1582.17 | 7 7 |
| 21JUL80 | 1136.00 | 289.51 | 0.00 | 1 | 53 | 34651.00 | 1582.21 | 7 7 |
| 21JUL80 | 1144.00 | 289.48 | 0.00 | 1 | 53 | 34659.00 | 1582.24 | 7 7 |
| 21JUL80 | 1153.00 | 289.45 | 0.00 | 1 | 53 | 34668.00 | 1582.27 | 7 7 |
| 21JUL80 | 1201.00 | 289.45 | 0.00 | 1 | 53 | 34676.00 | 1582.27 | 7 7 |
| 21JUL80 | 1211.00 | 289.42 | 0.00 | 1 | 53 | 34686.00 | 1582.30 | 7 7 |
| 21JUL80 | 1221.00 | 289.35 | 0.00 | 1 | 53 | 34696.00 | 1582.37 | 7 7 |
| 21JUL80 | 1240.00 | 289.29 | 0.00 | 1 | 53 | 34715.00 | 1582.43 | 7 7 |
| 21JUL80 | 1300.00 | 289.21 | 0.00 | 1 | 53 | 34735.00 | 1582.51 | 7 7 |
| 21JUL80 | 1316.00 | 289.12 | 0.00 | 1 | 53 | 34751.00 | 1582.60 | 7 7 |
| 21JUL80 | 1344.00 | 289.04 | 0.00 | 1 | 53 | 34779.00 | 1582.68 | 7 7 |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G15A ***

| DATE DDMONYY | TIME HHMM.SS | FIRST READING FEET | SECOND READING FEET | A L G | C O N | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | COLLAR ELEV 1695.71 FEET PIEZO ELEV 0.00 -NULL |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 21JUL80 | 1407.00 | 288.96 | 0.00 | 1 | 53 | 34802.00 | 1582.76 | 7 7 |
| 21JUL80 | 1439.00 | 288.84 | 0.00 | 1 | 53 | 34834.00 | 1582.88 | 7 7 |
| 21JUL80 | 1506.00 | 288.77 | 0.00 | 1 | 53 | 34861.00 | 1582.95 | 7 7 |
| 21JUL80 | 1541.00 | 288.62 | 0.00 | 1 | 53 | 34896.00 | 1583.10 | 7 7 |
| 21JUL80 | 1612.00 | 288.53 | 0.00 | 1 | 53 | 34927.00 | 1583.19 | 7 7 |
| 21JUL80 | 1708.00 | 288.42 | 0.00 | 1 | 53 | 34983.00 | 1583.30 | 7 7 |
| 21JUL80 | 1819.00 | 288.26 | 0.00 | 1 | 53 | 35054.00 | 1583.46 | 7 7 |
| 21JUL80 | 1915.00 | 288.20 | 0.00 | 1 | 53 | 35110.00 | 1583.52 | 7 7 |
| 21JUL80 | 2009.00 | 288.09 | 0.00 | 1 | 53 | 35164.00 | 1583.63 | 7 7 |
| 21JUL80 | 2129.00 | 287.98 | 0.00 | 1 | 53 | 35244.00 | 1583.74 | 7 7 |
| 21JUL80 | 2240.00 | 287.90 | 0.00 | 1 | 53 | 35315.00 | 1583.82 | 7 7 |
| 22JUL80 | 111.00 | 287.76 | 0.00 | 1 | 53 | 35466.00 | 1583.96 | 7 7 |
| 22JUL80 | 235.00 | 287.65 | 0.00 | 1 | 53 | 35550.00 | 1584.07 | 7 7 |
| 22JUL80 | 425.00 | 287.54 | 0.00 | 1 | 53 | 35660.00 | 1584.18 | 7 7 |
| 22JUL80 | 844.00 | 287.22 | 0.00 | 1 | 53 | 35919.00 | 1584.50 | 7 7 |
| 22JUL80 | 1135.00 | 287.13 | 0.00 | 1 | 53 | 36090.00 | 1584.59 | 7 7 |
| 22JUL80 | 1522.00 | 286.92 | 0.00 | 1 | 53 | 36317.00 | 1584.80 | 7 7 |
| 22JUL80 | 1903.00 | 286.75 | 0.00 | 1 | 53 | 36538.00 | 1584.97 | 7 7 |
| 23JUL80 | 25.00 | 286.49 | 0.00 | 1 | 53 | 36860.00 | 1585.23 | 7 7 |
| 23JUL80 | 340.00 | 286.42 | 0.00 | 1 | 53 | 37055.00 | 1585.30 | 7 7 |
| 23JUL80 | 1114.00 | 285.00 | 1.07 | 1 | 53 | 37509.00 | 1585.65 | 7 7 |
| 23JUL80 | 1928.00 | 285.00 | .83 | 1 | 53 | 38003.00 | 1585.89 | 7 7 |
| 24JUL80 | 842.00 | 285.00 | .96 | 1 | 53 | 38797.00 | 1586.26 | 7 7 |
| 24JUL80 | 1703.00 | 285.00 | .18 | 1 | 53 | 39298.00 | 1586.54 | 7 7 |
| 25JUL80 | 1018.00 | 280.00 | 4.93 | 1 | 52 | 40333.00 | 1586.81 | 7 7 |
| 25JUL80 | 1532.00 | 280.00 | 4.82 | 1 | 52 | 40647.00 | 1586.92 | 7 7 |
| 26JUL80 | 810.00 | 105.00 | 3.20 | 1 | 65 | 41645.00 | 1587.41 | 14 14 |
| 27JUL80 | 939.00 | 110.00 | .15 | 1 | 93 | 43174.00 | 1587.77 | 15 BY D. K. TO 9/2/80 |
| 28JUL80 | 853.00 | 105.00 | 4.72 | 1 | 92 | 44568.00 | 1588.19 | 15 BY D. K. TO 9/2/80 |
| 29JUL80 | 853.00 | 105.00 | 4.58 | 1 | 92 | 46008.00 | 1588.33 | 15 BY D. K. TO 9/2/80 |
| 30JUL80 | 1136.00 | 105.00 | 4.33 | 1 | 92 | 47611.00 | 1588.58 | 15 BY D. K. TO 9/2/80 |
| 31JUL80 | 1454.00 | 105.00 | 4.05 | 1 | 92 | 49249.00 | 1588.86 | 15 BY D. K. TO 9/2/80 |
| 01AUG80 | 1744.00 | 105.00 | 3.85 | 1 | 92 | 50559.00 | 1589.06 | 15 BY D. K. TO 9/2/80 |
| 03AUG80 | 804.00 | 105.00 | 3.53 | 1 | 92 | 53159.00 | 1589.38 | 4 15 |
| 05AUG80 | 1415.00 | 105.00 | 3.24 | 1 | 92 | 56410.00 | 1589.67 | 4 15 |
| 07AUG80 | 1423.00 | 105.00 | 3.08 | 1 | 92 | 59298.00 | 1589.83 | 4 15 |
| 09AUG80 | 925.00 | 105.00 | 3.00 | 1 | 92 | 61880.00 | 1589.91 | 4 15 |
| 12AUG80 | 1318.00 | 105.00 | 2.69 | 1 | 92 | 66433.00 | 1590.27 | 4 15 |
| 14AUG80 | 1118.00 | 105.00 | 2.52 | 1 | 92 | 69193.00 | 1590.59 | 4 15 |
| 16AUG80 | 1055.00 | 105.00 | 2.35 | 1 | 92 | 72050.00 | 1590.56 | 4 15 |
| 20AUG80 | 1427.00 | 106.78 | 0.00 | 1 | 92 | 78022.00 | 1591.13 | 15 |
| 22AUG80 | 1303.00 | 107.18 | 0.00 | 1 | 92 | 80818.00 | 1590.73 | 15 |
| 02SEP80 | 936.00 | 106.45 | 0.00 | 1 | 92 | 96451.00 | 1591.46 | 15 |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 61/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G15A ***

| DATE | TIME | FIRST READING | SECOND READING | A L G | C O N | TIME SINCE TEST BEGAN | WATER LEVEL ELEVATION |
|---|---|---|---|---|---|---|---|
| DDMONYY | HHMM.SS | FEET | FEET | | | MINUTES | FEET |
| 10SEP80 | 935.00 | 104.18 | 0.00 | 1 | 15 | 107970.00 | 1591.53 |

**COMMENTS**
COLLAR ELEV 1695.71 FEET PIEZO ELEV 0.00 -NULL-
TIME PUMP TEST BEGAN = 27JUN80-1005.00

15 FOR G.W. MAP

COOR. N113480 ft. (N34588m)
E2284390 ft. (E696283m)

# BORING LOG G41-G15A

SHEET 1 OF 5

SURFACE ELEV. 1692.8 ft. (515.95m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 3/6/79 DATE COMPLETED 3/9/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS | BLOWS/FOOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES HAMMER BLOWS PER 6 IN. (Note 1) | SAMPLES REC./ATT. (ins.) | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| 0.0 | | Brown, SAND and GRAVEL, some cobbles and boulders | SP to GP | | | | | | |
| 1.22 | | | | | | | | | |
| 4.0 | | Brown, fine to coarse SAND, some fine gravel, some silt, trace clay | SM | - | 1 | DO | Push | 18/18 | |
| | | | | - | 2 | DO | Push | 12/12 | |
| 4.57 | | | | | | | | | |
| 15.0 | | Brown, fine to coarse gravelly, silty, fine to coarse SAND | SM | - | 3 | DO | Push | 12/17 | |
| 6.10 | | | | | | | | | |
| 20.0 | | Brown, fine to coarse SAND, some fine gravel, some silt, trace clay | SM | - | 4 | DO | Push | 12/12 | |
| | | | | - | 5 | DO | Push | 5/6 | |
| 9.45 | | | | | | | | | |
| 31.0 | | CONTINUED | | | | | | | |

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked DCB

COOR. N113480 ft. (N34588m)
E2284390 ft. (E696283m)

# BORING LOG G41-G15A



SURFACE ELEV. 1692.8 ft. (515.95m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 3/6/79 DATE COMPLETED 3/9/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS. | BLOWS / FOOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES HAMMER BLOWS PER 6 IN. (Note 1) | SAMPLES REC./ATT. (ins.) | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| 9.45 | | CONTINUED | | | | | | | |
| 31.0 | | Brown, fine to coarse SAND, some fine gravel, some silt, trace clay | SM | - | 6 | DO | Push | 3/3 | |
| 11.58 | | | | - | 7 | DO | Push | 2/2 | |
| 38.0 | | Brown, fine to coarse sandy, fine to coarse GRAVEL, some silt, some clay | GM | | | | | | |
| 13.11 | | | | | | | | | |
| 43.0 | | Brown to red-brown, fine to coarse SAND, some silt, some to trace fine to coarse gravel, trace clay to brown, fine to coarse GRAVEL and fine to coarse SAND, some silt | SM to GM | | | | | | |
| 20.12 | | | | | | | | | |
| 66.0 | | CONTINUED | | | | | | | |

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked JCB

COOR. N113480 ft. (N34588m)
E2284390 ft. (E696283m)

# BORING LOG G41-G15A



SURFACE ELEV. 1692.8 ft. (515.95m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 3/6/79 DATE COMPLETED 3/9/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS. | BLOWS / FOOT | SAMPLES: NUMBER | SAMPLES: TYPE | SAMPLES: HAMMER BLOWS PER 6 IN. (Note 1) | SAMPLES: REC./ATT. (ins.) | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| 20.12 | | CONTINUED | | | | | | | |
| 66.0 | | Brown to red-brown, fine to coarse SAND, some silt, some to trace fine to coarse gravel, trace clay to brown, fine to coarse GRAVEL and fine to coarse SAND, some silt | SM to GM | | | | | | Grout (to surface) |
| 29.26 | | | | | | | | | 27.13 / 89.0 Bentonite Clay Seal 28.04 / 92.0 |
| 96.0 | | Red-brown, fine to coarse SAND, some fine to coarse gravel, some silt, trace clay | SM | | | | | | Pea Gravel |
| 30.79 | | | | | | | | | |
| 101.0 | | CONTINUED | | | | | | | CONTINUED |

2" Solid PVC Pipe to Surface

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked DCB

COOR. N113480 ft. (N34588m)
E2284390 ft. (E696283m)

# BORING LOG G41-G15A



SURFACE ELEV. 1692.8 ft. (515.95m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 3/6/79 DATE COMPLETED 3/9/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS. | BLOWS / FOOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES HAMMER BLOWS PER 6IN. (Note 1) | SAMPLES REC./ATT. (ins.) | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| 30.79 | | CONTINUED | | | | | | | CONTINUED |
| 101.0 | | Red-brown, fine to coarse SAND, some fine to coarse gravel, some silt, trace clay | SM | - | 8 | DO | Air Hammer | 18/18 | 30.94 101.5 ▼ 31.27 ≈ 102.6 4/18/79 |
| 33.22 | | | | - | 9 | DO | Air Hammer | 18/18 | 2" Slotted PVC Pipe; Pea Gravel |
| 109.0 | | Red-brown, silty fine to coarse SAND, trace fine to coarse gravel, trace clay | SM | | | | | | 33.99 111.5 |
| 34.44 | | | | - | 10 | DO | Air Hammer | 18/18 | Note 2 |
| 113.0 | | END OF BORING | | | | | | | |

NOTES

1. Penetration Test - 3" O.D. sampler pushed with drilling rig. (Samples 1 - 7)

   Penetration Test - 3" O.D. sampler driven with air hammer. (Samples 8 - 10)

2. PERMEABILITY TEST NUMBER 1
   Drove 6" casing from 96.0' to 111.5' leaving 2.0' above ground.
   Cleaned hole to 111.5' with water.
   Blew water out of hole to conduct rising head permeability test.
   After 40 minutes, water had risen 1.0' in the hole to 110.5'.
   Drove 3" O.D. split tube sampler from 111.5' to 113.0'.
   Filled 6" casing with water (2.0' above ground) to conduct falling head test.
   After 15 minutes, water level in casing dropped 0.02'. Test terminated.

3. Elevation of top of protector pipe, 1695.7 ft. (516.85m).

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked HB

COOR. N113480 ft. (N34588m)
E2284390 ft. (E696283m)

# BORING LOG G41-G15A



SURFACE ELEV. 1692.8 ft. (515.95m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 3/6/79 DATE COMPLETED 3/9/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

Table of Water Level Readings by Date. Readings Indicate Depth Below Ground Surface.

| DATE | 4/18/79 | 11/9/79 | 11/12/79 | 12/3/79 | 4/25/80 | 5/20/80 | 6/26/80* |
|---|---|---|---|---|---|---|---|
| DEPTH (m) | 31.27 | 29.81 | 29.93 | 29.57 | 30.11 | 30.08 | 30.21 |
| DEPTH (ft.) | 102.6 | 97.8 | 98.2 | 97.0 | 98.8 | 98.7 | 99.1 |

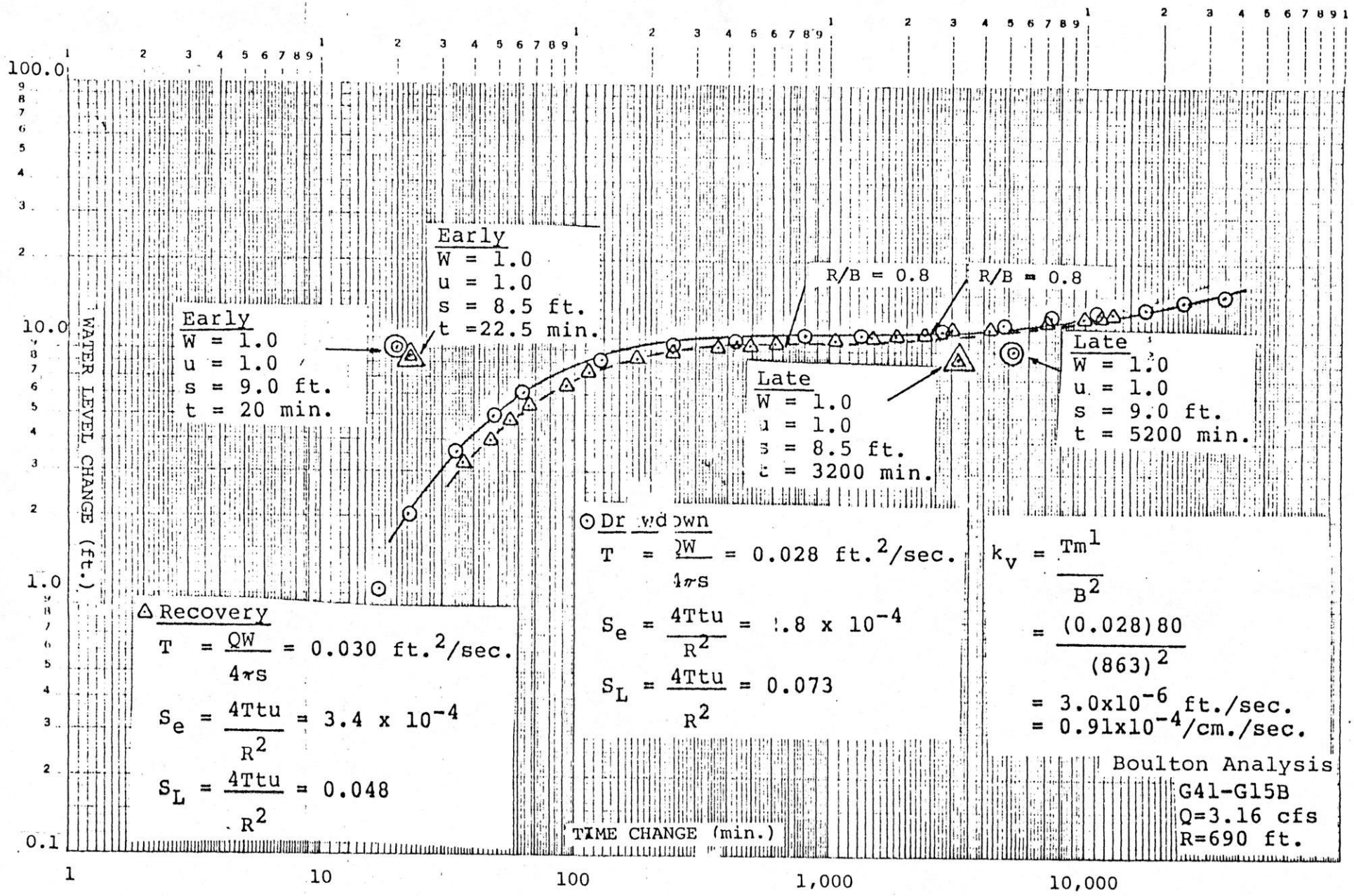
| DATE | 9/10/80* | | | | | | |
|---|---|---|---|---|---|---|---|
| DEPTH (m) | 30.85 | | | | | | |
| DEPTH (ft.) | 101.2 | | | | | | |

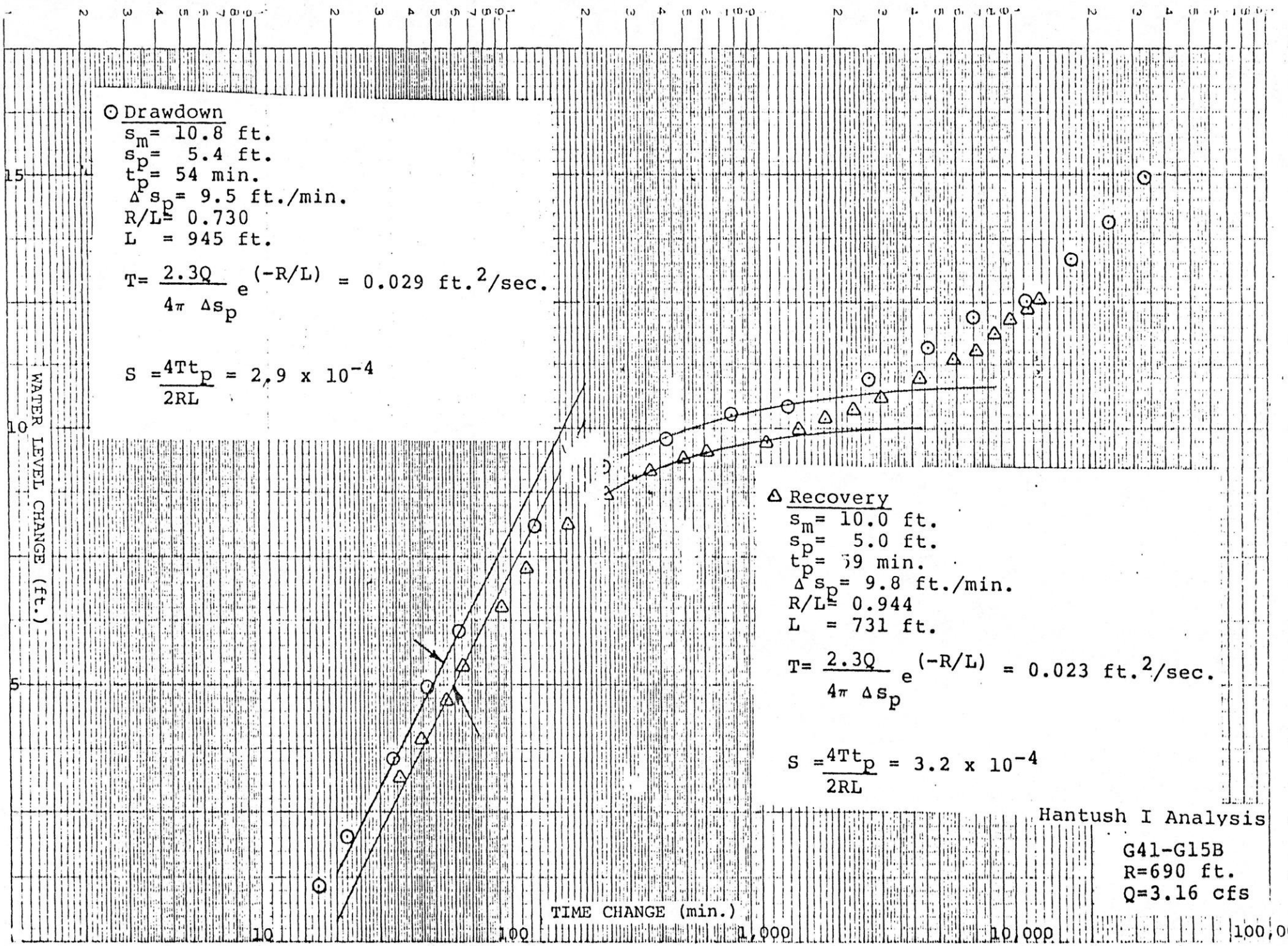
*Pump Test and Recovery Period Between these Dates. For Pump Test Data, Refer to PUMP TEST AND ANALYSIS, Project Report No. 4.

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn JEF
Checked DAB


WATER LEVEL CHANGE (ft.)
TIME CHANGE (min.)
100.0
10.0
1.0
0.1
1
10
100
1,000
10,000
Early
W = 1.0
u = 1.0
s = 9.0 ft.
t = 20 min.
Early
W = 1.0
u = 1.0
s = 8.5 ft.
t = 22.5 min.
R/B = 0.8
R/B = 0.8
Late
W = 1.0
u = 1.0
s = 8.5 ft.
t = 3200 min.
Late
W = 1.0
u = 1.0
s = 9.0 ft.
t = 5200 min.
Recovery
T = QW / 4πs = 0.030 ft.²/sec.
Se = 4Ttu / R² = 3.4 x 10⁻⁴
SL = 4Ttu / R² = 0.048
Drawdown
T = QW / 4πs = 0.028 ft.²/sec.
Se = 4Ttu / R² = 1.8 x 10⁻⁴
SL = 4Ttu / R² = 0.073
kv = Tm¹ / B²
= (0.028)80 / (863)²
= 3.0x10⁻⁶ ft./sec.
= 0.91x10⁻⁴/cm./sec.
Boulton Analysis
G41-G15B
Q=3.16 cfs
R=690 ft.


LOGARITHMIC 5 CYCLES X 10 TO THE INCH
STH LINES ACCENTED
WATER LEVEL CHANGE (ft.)
TIME CHANGE (min.)
10
100
1,000
10,000
100,000
5
10
15
⊙ Drawdown
$s_m$= 10.8 ft.
$s_p$= 5.4 ft.
$t_p$= 54 min.
$\Delta s_p$= 9.5 ft./min.
R/L= 0.730
L = 945 ft.
$T = \frac{2.3Q}{4\pi \Delta s_p} e^{(-R/L)}$ = 0.029 ft.$^2$/sec.
$S = \frac{4Tt_p}{2RL}$ = 2.9 x $10^{-4}$
△ Recovery
$s_m$= 10.0 ft.
$s_p$= 5.0 ft.
$t_p$= 59 min.
$\Delta s_p$= 9.8 ft./min.
R/L= 0.944
L = 731 ft.
$T = \frac{2.3Q}{4\pi \Delta s_p} e^{(-R/L)}$ = 0.023 ft.$^2$/sec.
$S = \frac{4Tt_p}{2RL}$ = 3.2 x $10^{-4}$
Hantush I Analysis
G41-G15B
R=690 ft.
Q=3.16 cfs

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G15B ***

| DATE | TIME | FIRST READING | SECOND READING | A L G | C O N | TIME SINCE TEST BEGAN | WATER LEVEL ELEVATION | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| DDMONYY | HHMM.SS | FEET | FEET | | | MINUTES | FEET | |
| | | | | | | | | COLLAR ELEV 1694.72 FEET PIEZO ELEV 0.00 -NULL |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 17APR79 | 1230.00 | 105.20 | 0.00 | 1 | 20 | -629135.00 | 1589.52 | |
| 17APR79 | 1230.00 | 105.20 | 0.00 | 1 | 20 | -629135.00 | 1589.52 | |
| | | | | | | | | CORRECT TO COLLAR TOP |
| 09NOV79 | 1030.00 | 100.00 | 0.00 | 1 | 20 | -332615.00 | 159[illegible].72 | GROUND SURFACE-CORR. TO |
| 09NOV79 | 1030.00 | 100.00 | 0.00 | 1 | 20 | -332615.00 | 159 .72 | |
| | | | | | | | | BY D&M |
| 12NOV79 | 1200.00 | 101.10 | 0.00 | 1 | 20 | -328205.00 | 159 .62 | BY D&M |
| 03DEC79 | 1200.00 | 99.70 | 0.00 | 1 | 20 | -297965.00 | 1590.02 | GROUND SURFACE-CORR. TO |
| 25APR80 | 1200.00 | 100.90 | .21 | 1 | 14 | -90[illegible] | 1593.61 | CORRECT TO COLLAR TOP |
| 20MAY80 | 600.00 | 101.64 | 0.00 | 1 | 70 | -54[illegible] | 1592.87 | 14 - TIME NOT RECORD |
| 21MAY80 | 1200.00 | 335.59 | 0.00 | 1 | 8 | -53[illegible] | 1593.87 | 14 - NO TIME |
| 29MAY80 | 930.00 | 335.44 | 0.00 | 1 | 8 | -41[illegible] | 1594.02 | 8 - NO TIME |
| 29MAY80 | 2250.00 | 335.50 | 0.00 | 1 | 8 | -40995. | 1593.96 | 4 8 -REV. CIR. |
| 30MAY80 | 1730.00 | 335.35 | 0.00 | 1 | 8 | -39875. | 1594.11 | 4 8 -REV. CIR. |
| 31MAY80 | 945.00 | 335.56 | 0.00 | 1 | 8 | -38900.[illegible] | 1593. 0 | 4 8 -REV. CIR. |
| 01JUN80 | 600.00 | 335.54 | 0.00 | 1 | 8 | -37685.00 | 1593. ? | 4 8 SET CASE |
| 01JUN80 | 1525.00 | 335.38 | 0.00 | 1 | 8 | -37120.00 | 1594. 1 | 4 8 SET CASE |
| 02JUN80 | 830.00 | 335.38 | 0.00 | 1 | 8 | -36095.00 | 1594. 1 | 4 8 |
| 03JUN80 | 915.00 | 335.61 | 0.00 | 1 | 8 | -34610.00 | 1593. 5 | 4 8 |
| 04JUN80 | 135.00 | 336.16 | 0.00 | 1 | 8 | -33630.00 | 1593.30 | 4 8 |
| 06JUN80 | 938.00 | 336.00 | 0.00 | 1 | 8 | -30267.00 | 1593.46 | 4 8 AIR DEV. |
| 06JUN80 | 1118.00 | 336.21 | 0.00 | 1 | 8 | -30167.00 | 1593.25 | 4 8 |
| 06JUN80 | 1315.00 | 335.72 | 0.00 | 1 | 8 | -30050.00 | 1593.74 | 4 8 |
| 06JUN80 | 1710.00 | 337.42 | 0.00 | 1 | 8 | -29815.00 | 1592.04 | 4 8 |
| 06JUN80 | 1851.00 | 337.58 | 0.00 | 1 | 8 | -29714.00 | 1591.88 | 4 8 VEL TEST |
| 07JUN80 | 930.00 | 335.52 | 0.00 | 1 | 8 | -28835.00 | 1593.94 | 4 8 VEL TEST |
| 08JUN80 | 900.00 | 335.87 | 0.00 | 1 | 8 | -27425.00 | 1593.59 | 4 8 |
| 09JUN80 | 800.00 | 335.54 | 0.00 | 1 | 8 | -26045.00 | 1593.92 | 4 8 |
| 10JUN80 | 935.00 | 335.73 | 0.00 | 1 | 8 | -24510.00 | 1593.73 | 4 8 |
| 11JUN80 | 910.00 | 335.90 | 0.00 | 1 | 8 | -23095.00 | 1593.56 | 4 8 |
| 12JUN80 | 900.00 | 335.78 | 0.00 | 1 | 8 | -21665.00 | 1593.68 | 4 8 |
| 13JUN80 | 815.00 | 335.57 | 0.00 | 1 | 8 | -20270.00 | 1593.89 | 4 8 |
| 13JUN80 | 2115.00 | 335.50 | 0.00 | 1 | 8 | -19498.00 | 1593.96 | 4 8 |
| 14JUN80 | 835.00 | 335.54 | 0.00 | 1 | 8 | -18810.00 | 1593.92 | 4 8 DIFF. RULE |
| 14JUN80 | 1745.00 | 335.61 | 0.00 | 1 | 8 | -18260.00 | 1593.85 | 4 8 |
| 15JUN80 | 820.00 | 335.71 | 0.00 | 1 | 8 | -17385.00 | 1593.75 | 4 8 |
| 16JUN80 | 805.00 | 335.87 | 0.00 | 1 | 8 | -15960.00 | 1593.59 | 4 8 |
| 24JUN80 | 820.00 | 335.78 | 0.00 | 1 | 8 | -4425.00 | 1593.68 | 4 8 |
| 25JUN80 | 815.00 | 335.72 | 0.00 | 1 | 8 | -2990.00 | 1593.74 | 4 8 |
| 26JUN80 | 840.00 | 335.61 | 0.00 | 1 | 8 | -1525.00 | 1593.85 | 4 8 |
| 27JUN80 | 815.00 | 335.87 | 0.00 | 1 | 8 | -110.00 | 1593.59 | 4 8 |
| 27JUN80 | 1022.00 | 337.21 | 0.00 | 1 | 8 | 17.00 | 1592.25 | 16 8 BEFORE TEST |
| 27JUN80 | 1027.00 | 337.90 | 0.00 | 1 | 8 | 22.00 | 1591.56 | 8 8 START @ 10 |
| 27JUN80 | 1039.00 | 339.43 | 0.00 | 1 | 8 | 34.00 | 1590.03 | 1 8 |
| 27JUN80 | 1052.00 | 340.80 | 0.00 | 1 | 8 | 47.00 | 1588.66 | 8 8 |
| | | | | | | | | 8 8 |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G150 ***

| DATE DDMONYY | TIME HHMM.SS | FIRST READING FEET | SECOND READING FEET | A L G | C O N | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | COLLAR ELEV 1694.72 FEET PIEZC ELEV 0.00 -NULL |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 27JUN80 | 1108.00 | 341.93 | 0.00 | 1 | 8 | 63.00 | 1587.53 | 8 8 |
| 27JUN80 | 1143.00 | 343.33 | 0.00 | 1 | 8 | 98.00 | 1586.13 | 8 8 |
| 27JUN80 | 1213.00 | 343.99 | 0.00 | 1 | 8 | 128.00 | 1585.47 | 8 8 |
| 27JUN80 | 1248.00 | 344.48 | 0.00 | 1 | 8 | 163.00 | 1584.9[illegible] | 8 8 |
| 27JUN80 | 1337.00 | 344.93 | 0.00 | 1 | 8 | 212.00 | 1584.[illegible] | 8 8 |
| 27JUN80 | 1409.00 | 345.19 | 0.00 | 1 | 56 | 244.00 | 1584.[illegible] | 8 8 |
| 27JUN80 | 1501.00 | 345.44 | 0.00 | 1 | 56 | 296.00 | 1584.05 | 8 8 |
| 27JUN80 | 1545.00 | 345.61 | 0.00 | 1 | 56 | 340.00 | 1583.88 | 8 8 TIME CORRECTED |
| 27JUN80 | 1711.00 | 345.77 | 0.00 | 1 | 56 | 426.[illegible] | 1583.72 | 8 8 |
| 27JUN80 | 1758.00 | 345.90 | 0.00 | 1 | 56 | 473.[illegible] | 1583.59 | 8 8 |
| 27JUN80 | 1847.00 | 345.90 | 0.00 | 1 | 56 | 522.00 | 1583.59 | 8 8 |
| 27JUN80 | 1939.00 | 345.94 | 0.00 | 1 | 56 | 574.00 | 1583.55 | 8 8 |
| 27JUN80 | 2052.00 | 346.00 | 0.00 | 1 | 56 | 647.00 | 1583.49 | 8 8 |
| 27JUN80 | 2152.00 | 346.13 | 0.00 | 1 | 56 | 707.00 | 1583.36 | 8 8 |
| 27JUN80 | 2311.00 | 346.15 | 0.00 | 1 | 56 | 786.00 | 1583.34 | 8 8 |
| 28JUN80 | 47.00 | 346.11 | 0.00 | 1 | 56 | 882.00 | 1583.38 | 8 8 |
| 28JUN80 | 234.00 | 346.17 | 0.00 | 1 | 56 | 989.00 | 1583.32 | 8 8 |
| 28JUN80 | 549.00 | 346.26 | 0.00 | 1 | 56 | 1184.00 | 1583.23 | 8 8 |
| 28JUN80 | 753.00 | 346.37 | 0.00 | 1 | 56 | 1308.00 | 1583.12 | 8 8 |
| 28JUN80 | 1016.00 | 346.37 | 0.00 | 1 | 56 | 1451.00 | 1583.12 | 8 8 |
| 28JUN80 | 1202.00 | 346.51 | 0.00 | 1 | 56 | 1557.00 | 1582.98 | 8 8 |
| 28JUN80 | 1517.00 | 346.58 | 0.00 | 1 | 56 | 1752.00 | 1582.91 | 8 8 |
| 28JUN80 | 1816.00 | 346.63 | 0.00 | 1 | 56 | 1931.00 | 1582.86 | 8 8 |
| 28JUN80 | 2344.00 | 346.73 | 0.00 | 1 | 56 | 2259.00 | 1582.76 | 8 8 |
| 29JUN80 | 828.00 | 346.89 | 0.00 | 1 | 56 | 2783.00 | 1582.60 | 8 8 |
| 29JUN80 | 1612.00 | 347.11 | 0.00 | 1 | 56 | 3247.00 | 1582.38 | 8 8 |
| 30JUN80 | 58.00 | 347.38 | 0.00 | 1 | 56 | 3773.00 | 1582.11 | 8 8 |
| 30JUN80 | 846.00 | 347.42 | 0.00 | 1 | 56 | 4241.00 | 1582.07 | 8 8 |
| 30JUN80 | 1606.00 | 347.53 | 0.00 | 1 | 56 | 4681.00 | 1581.96 | 8 8 |
| 01JUL80 | 810.00 | 347.55 | 0.00 | 1 | 56 | 5645.00 | 1581.94 | 8 8 |
| 01JUL80 | 1056.00 | 346.40 | 0.00 | 1 | 56 | 5811.00 | 1583.09 | 8 8 |
| 01JUL80 | 1202.00 | 347.35 | 0.00 | 1 | 56 | 5877.00 | 1582.14 | 8 8 |
| 01JUL80 | 1314.00 | 347.56 | 0.00 | 1 | 56 | 5949.00 | 1581.93 | 8 8 |
| 01JUL80 | 1457.00 | 347.67 | 0.00 | 1 | 56 | 6052.00 | 1581.82 | 8 8 |
| 01JUL80 | 1642.00 | 347.71 | 0.00 | 1 | 56 | 6157.00 | 1581.78 | 8 8 |
| 02JUL80 | 217.00 | 348.00 | 0.00 | 1 | 56 | 6732.00 | 1581.49 | 8 8 |
| 02JUL80 | 850.00 | 348.10 | 0.00 | 1 | 56 | 7125.00 | 1581.39 | 8 8 |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.25.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G158 ***

| DATE DDMONYY | TIME HHMM.SS | FIRST READING FEET | SECOND READING FEET | ALG | CON | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | COLLAR ELEV 1694.72 FEET PIEZO ELEV 0.00 -NULL |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 02JUL80 | 1345.00 | 113.19 | 0.00 | 1 | 66 | 7420.00 | 1581.39 | 16 16 COMPARE PIEZ. |
| 02JUL80 | 1346.00 | 348.04 | 0.00 | 1 | 56 | 7421.00 | 1581.45 | 8 8 COMPARE PIEZ. |
| 02JUL80 | 2118.00 | 348.06 | 0.00 | 1 | 56 | 7873.00 | 1581.4? | 8 8 |
| 03JUL80 | 912.00 | 348.13 | 0.00 | 1 | 56 | 8587.00 | 1581.3? | 8 8 |
| 03JUL80 | 2041.00 | 348.14 | 0.00 | 1 | 56 | 9276.00 | 1581.3? | 8 8 |
| 04JUL80 | 859.00 | 348.30 | 0.00 | 1 | 56 | 10014.00 | 1581.1? | 8 8 |
| 04JUL80 | 2039.00 | 348.27 | 0.00 | 1 | 56 | 10714.00 | 1581.22 | 8 8 |
| 05JUL80 | 830.00 | 348.44 | 0.00 | 1 | 56 | 11425.?? | 1581.05 | 8 8 |
| 05JUL80 | 2053.00 | 348.78 | 0.00 | 1 | 56 | 12168.? | 1580.71 | 8 8 |
| 06JUL80 | 922.00 | 348.91 | 0.00 | 1 | 56 | 12917. | 1580.58 | 8 8 |
| 06JUL80 | 1733.00 | 348.86 | 0.00 | 1 | 56 | 13408.?? | 1580.63 | 8 8 |
| 07JUL80 | 758.00 | 348.78 | 0.00 | 1 | 56 | 14273.00 | 1580.71 | 8 8 |
| 07JUL80 | 1645.00 | 348.78 | 0.00 | 1 | 56 | 14800.00 | 1580.71 | 8 8 |
| 08JUL80 | 846.00 | 349.14 | 0.00 | 1 | 56 | 15761.00 | 1580.35 | 8 8 |
| 08JUL80 | 2107.00 | 349.19 | 0.00 | 1 | 56 | 16502.00 | 1580.30 | 8 8 |
| 09JUL80 | 900.00 | 349.26 | 0.00 | 1 | 56 | 17215.00 | 1580.23 | 8 8 |
| 09JUL80 | 1615.00 | 349.22 | 0.00 | 1 | 56 | 17650.00 | 1580.27 | 8 8 |
| 10JUL80 | 855.00 | 349.38 | 0.00 | 1 | 56 | 18650.00 | 1580.11 | 8 8 |
| 10JUL80 | 1728.00 | 349.37 | 0.00 | 1 | 56 | 19163.00 | 1580.12 | 8 8 |
| 11JUL80 | 927.00 | 349.59 | 0.00 | 1 | 56 | 20122.00 | 1579.90 | 8 8 |
| 11JUL80 | 1932.00 | 349.61 | 0.00 | 1 | 56 | 20727.00 | 1579.88 | 8 8 |
| 12JUL80 | 910.00 | 349.70 | 0.00 | 1 | 56 | 21545.00 | 1579.79 | 8 8 |
| 13JUL80 | 833.00 | 349.94 | 0.00 | 1 | 56 | 22948.00 | 1579.55 | 8 8 |
| 14JUL80 | 806.00 | 350.00 | 0.00 | 1 | 56 | 24361.00 | 1579.49 | 8 8 |
| 14JUL80 | 1105.00 | 349.46 | 0.00 | 1 | 56 | 24540.00 | 1580.03 | 8 8 |
| 15JUL80 | 838.00 | 350.10 | 0.00 | 1 | 56 | 25833.00 | 1579.39 | 8 8 |
| 16JUL80 | 922.00 | 350.28 | 0.00 | 1 | 56 | 27317.00 | 1579.21 | 8 8 |
| 17JUL80 | 818.00 | 350.48 | 0.00 | 1 | 56 | 28693.00 | 1579.01 | 8 8 |
| 18JUL80 | 806.00 | 350.48 | 0.00 | 1 | 56 | 30121.00 | 1579.01 | 8 8 |
| 20JUL80 | 811.00 | 350.57 | 0.00 | 1 | 56 | 33006.00 | 1578.92 | 8 8 |
| 21JUL80 | 835.00 | 350.85 | 0.00 | 1 | 56 | 34470.00 | 1578.64 | 8 8 |
| 21JUL80 | 1041.00 | 114.71 | 0.00 | 1 | 81 | 34596.00 | 1581.83 | 16 16 RECOVERY @ 10 |
| | | | | | | | | REPLACED INSTRUMENT |
| 21JUL80 | 1051.00 | 113.94 | 0.00 | 1 | 81 | 34606.00 | 1582.60 | 16 16 |
| 21JUL80 | 1100.00 | 113.20 | 0.00 | 1 | 81 | 34615.00 | 1583.34 | 16 16 |
| 21JUL80 | 1110.00 | 112.53 | 0.00 | 1 | 81 | 34625.00 | 1584.01 | 16 16 |
| 21JUL80 | 1120.00 | 112.02 | 0.00 | 1 | 81 | 34635.00 | 1584.52 | 16 16 |
| 21JUL80 | 1129.00 | 111.68 | 0.00 | 1 | 81 | 34644.00 | 1584.86 | 16 16 |
| 21JUL80 | 1137.00 | 111.37 | 0.00 | 1 | 81 | 34652.00 | 1585.17 | 16 16 |
| 21JUL80 | 1145.00 | 111.06 | 0.00 | 1 | 81 | 34660.00 | 1585.48 | 16 16 |
| 21JUL80 | 1154.00 | 110.83 | 0.00 | 1 | 81 | 34669.00 | 1585.71 | 16 16 |
| 21JUL80 | 1202.00 | 110.62 | 0.00 | 1 | 81 | 34677.00 | 1585.92 | 16 16 |
| 21JUL80 | 1212.00 | 110.43 | 0.00 | 1 | 81 | 34687.00 | 1586.11 | 16 16 |
| 21JUL80 | 1222.00 | 110.29 | 0.00 | 1 | 81 | 34697.00 | 1586.25 | 16 16 |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G15B ***

| DATE DDMONYY | TIME HHMM.SS | FIRST READING FEET | SECOND READING FEET | A L G | C O N | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | COLLAR ELEV 1694.72 FEET PIEZO ELEV 0.00 -NULL- |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 21JUL80 | 1241.00 | 110.00 | 0.00 | 1 | 81 | 34716.00 | 1586.54 | 16 16 |
| 21JUL80 | 1301.00 | 109.75 | 0.00 | 1 | 81 | 34736.00 | 1586.79 | 16 16 |
| 21JUL80 | 1318.00 | 109.53 | 0.00 | 1 | 81 | 34753.00 | 1587.01 | 16 16 |
| 21JUL80 | 1345.00 | 109.39 | 0.00 | 1 | 81 | 34780.00 | 1587.15 | 16 16 |
| 21JUL80 | 1408.00 | 109.17 | 0.00 | 1 | 81 | 34803.00 | 1587.37 | 16 16 |
| 21JUL80 | 1438.00 | 109.07 | 0.00 | 1 | 81 | 34833.00 | 1587.47 | 16 16 |
| 21JUL80 | 1507.00 | 108.89 | 0.00 | 1 | 81 | 34862.00 | 1587.65 | 16 16 |
| 21JUL80 | 1543.00 | 108.79 | 0.00 | 1 | 81 | 34898.00 | 1587.75 | 16 16 |
| 21JUL80 | 1613.00 | 108.70 | 0.00 | 1 | 81 | 34928.00 | 1587.84 | 16 16 |
| 21JUL80 | 1709.00 | 108.60 | 0.00 | 1 | 81 | 34984.00 | 1587.94 | 16 16 |
| 21JUL80 | 1820.00 | 108.46 | 0.00 | 1 | 81 | 35055.00 | 1588.08 | 16 16 |
| 21JUL80 | 1916.00 | 108.42 | 0.00 | 1 | 81 | 35111.00 | 1588.12 | 16 16 |
| 21JUL80 | 2011.00 | 108.32 | 0.00 | 1 | 81 | 35166.00 | 1588.22 | 16 16 |
| 21JUL80 | 2131.00 | 108.26 | 0.00 | 1 | 81 | 35246.00 | 1588.28 | 16 16 |
| 21JUL80 | 2241.00 | 108.21 | 0.00 | 1 | 81 | 35316.00 | 1588.33 | 16 16 |
| 22JUL80 | 113.00 | 108.07 | 0.00 | 1 | 81 | 35468.00 | 1588.47 | 16 16 |
| 22JUL80 | 237.00 | 108.00 | 0.00 | 1 | 81 | 35552.00 | 1588.54 | 16 16 |
| 22JUL80 | 428.00 | 107.94 | 0.00 | 1 | 81 | 35663.00 | 1588.60 | 16 16 |
| 22JUL80 | 845.00 | 107.77 | 0.00 | 1 | 81 | 35920.00 | 1588.77 | 16 16 |
| 22JUL80 | 1137.00 | 107.76 | 0.00 | 1 | 81 | 36092.00 | 1588.78 | 16 16 |
| 22JUL80 | 1523.00 | 107.60 | 0.00 | 1 | 81 | 36318.00 | 1588.94 | 16 16 |
| 22JUL80 | 1905.00 | 107.53 | 0.00 | 1 | 81 | 36540.00 | 1589.01 | 16 16 |
| 23JUL80 | 26.00 | 107.46 | 0.00 | 1 | 81 | 36661.00 | 1589.08 | 16 16 |
| 23JUL80 | 341.00 | 107.41 | 0.00 | 1 | 81 | 37056.00 | 1589.13 | 16 16 |
| 23JUL80 | 1115.00 | 105.00 | 2.24 | 1 | 81 | 37510.00 | 1589.30 | 16 16 |
| 23JUL80 | 1928.00 | 105.00 | 2.08 | 1 | 81 | 38003.00 | 1589.46 | 16 16 |
| 24JUL80 | 843.00 | 105.00 | 1.91 | 1 | 81 | 38798.00 | 1589.63 | 16 16 |
| 24JUL80 | 1704.00 | 105.00 | 1.74 | 1 | 81 | 39299.00 | 1589.80 | 16 16 |
| 25JUL80 | 1019.00 | 105.00 | 1.71 | 1 | 81 | 40334.00 | 1589.83 | 16 16 |
| 25JUL80 | 1533.00 | 105.00 | 1.68 | 1 | 81 | 40648.00 | 1589.86 | 16 16 |
| 26JUL80 | 812.00 | 100.00 | 4.52 | 1 | 70 | 41647.00 | 1589.99 | 14 14 |
| 27JUL80 | 930.00 | 105.00 | 1.77 | 1 | 92 | 43165.00 | 1590.15 | 15 BY D. K. TO 9/2/80 |
| 28JUL80 | 856.00 | 105.00 | 1.58 | 1 | 92 | 44571.00 | 1590.34 | 15 BY D. K. TO 9/2/80 |
| 29JUL80 | 856.00 | 105.00 | 1.52 | 1 | 92 | 46011.00 | 1590.40 | 15 BY D. K. TO 9/2/80 |
| 30JUL80 | 1140.00 | 105.00 | 1.40 | 1 | 92 | 47615.00 | 1590.52 | 15 BY D. K. TO 9/2/80 |
| 31JUL80 | 1458.00 | 105.00 | 1.26 | 1 | 92 | 49253.00 | 1590.66 | 15 BY D. K. TO 9/2/80 |
| 01AUG80 | 1248.00 | 105.00 | 1.20 | 1 | 92 | 50563.00 | 1590.72 | 15 BY D. K. TO 9/2/80 |
| 03AUG80 | 809.00 | 105.00 | 1.05 | 1 | 92 | 53164.00 | 1590.87 | 4 15 |
| 05AUG80 | 1418.00 | 105.00 | .92 | 1 | 92 | 56413.00 | 1591.00 | 4 15 |
| 07AUG80 | 1426.00 | 105.00 | .81 | 1 | 92 | 59301.00 | 1591.11 | 4 15 |
| 09AUG80 | 930.00 | 105.00 | .78 | 1 | 92 | 61885.00 | 1691.14 | 4 15 |
| 12AUG80 | 1321.00 | 105.00 | .62 | 1 | 92 | 66436.00 | 1591.30 | 4 15 |
| 14AUG80 | 1115.00 | 105.00 | .48 | 1 | 92 | 69190.00 | 1591.44 | 4 15 |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CHANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G15B ***

| DATE | TIME | FIRST READING | SECOND READING | A L G | C O N | TIME SINCE TEST BEGAN | WATER LEVEL ELEVATION | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| DDMONYY | HHMM.SS | FEET | FEET | | | MINUTES | FEET | |
| | | | | | | | | COLLAR ELEV 1694.72 FEET PIEZO ELEV 0.00 -NULL |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 16AUG80 | 1058.00 | 105.00 | .50 | 1 | 92 | 72053.00 | 1591.42 | 9 15 |
| 20AUG80 | 1425.00 | 105.24 | 0.00 | 1 | 92 | 78020.00 | 1591.68 | 15 |
| 22AUG80 | 1306.00 | 105.43 | 0.00 | 1 | 92 | 80821.00 | 1591.49 | 15 |
| 02SEP80 | 935.00 | 105.14 | 0.00 | 1 | 92 | 96450.00 | 1591.78 | 15 |
| 10SEP80 | 940.00 | 102.81 | 0.00 | 1 | 15 | 107975.00 | 1591.91 | 15 FOR G.W. MAP |

COOR. N113440 ft. (N34577m)
E2284385 ft. (E696282m)

# BORING LOG G41-G15B

SHEET 1 OF 2

SURFACE ELEV. 1692.1 ft. (515.75m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 3/9/79 DATE COMPLETED 3/13/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Casing and Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS. | BLOWS / FOOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES HAMMER BLOWS PER 6IN. (Note 1) | SAMPLES REC./ATT. (ins.) | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | ▼4/17/79 31.27 |
| | | | | | | | | | 102.6 Grout (to surface) |
| | | | | | | | | | 43.59 Bentonite Clay Seal |
| | | | | | | | | | 143.0 44.50 |
| | | | | | | | | | 146.0 Pea Gravel |
| 48.77 | | See borings G41-G15 and G41-G15A for soil stratigraphy<br>Boulder encountered in this hole at 147' | | | | | | | 48.16 |
| 160.0 | | | | | | | | | 158.0 Pea Gravel |
| | | Brown, fine to coarse GRAVEL and fine to coarse SAND, trace silt | GP-GM | - | 1 | DO | Air Hammer | 18/18 | 2" Slotted PVC Pipe |
| | | | | - | 2 | DO | Air Hammer | 18/18 | 51.21 168.0 |
| 51.82 | | | | | | | | | 51.82 |
| 170.0 | | END OF BORING | | | | | | | 170.0 |

2" Solid PVC Pipe to Surface

NOTES

1. Penetration Test - 3" O.D. sampler driven with air hammer. (All samples)
2. Mud Rotary to 141.0'. Advanced 6" casing to 147.0' and encountered boulder. Drilled past boulder but could not advance casing.

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked DB

COOR. N113440 ft. (N34577m)
E2284385 ft. (E696282m)

# BORING LOG G41-G15B



SURFACE ELEV. 1692.1 ft. (515.75m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 3/9/79 DATE COMPLETED 3/13/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Casing and Mud Rotary

NOTES (continued)

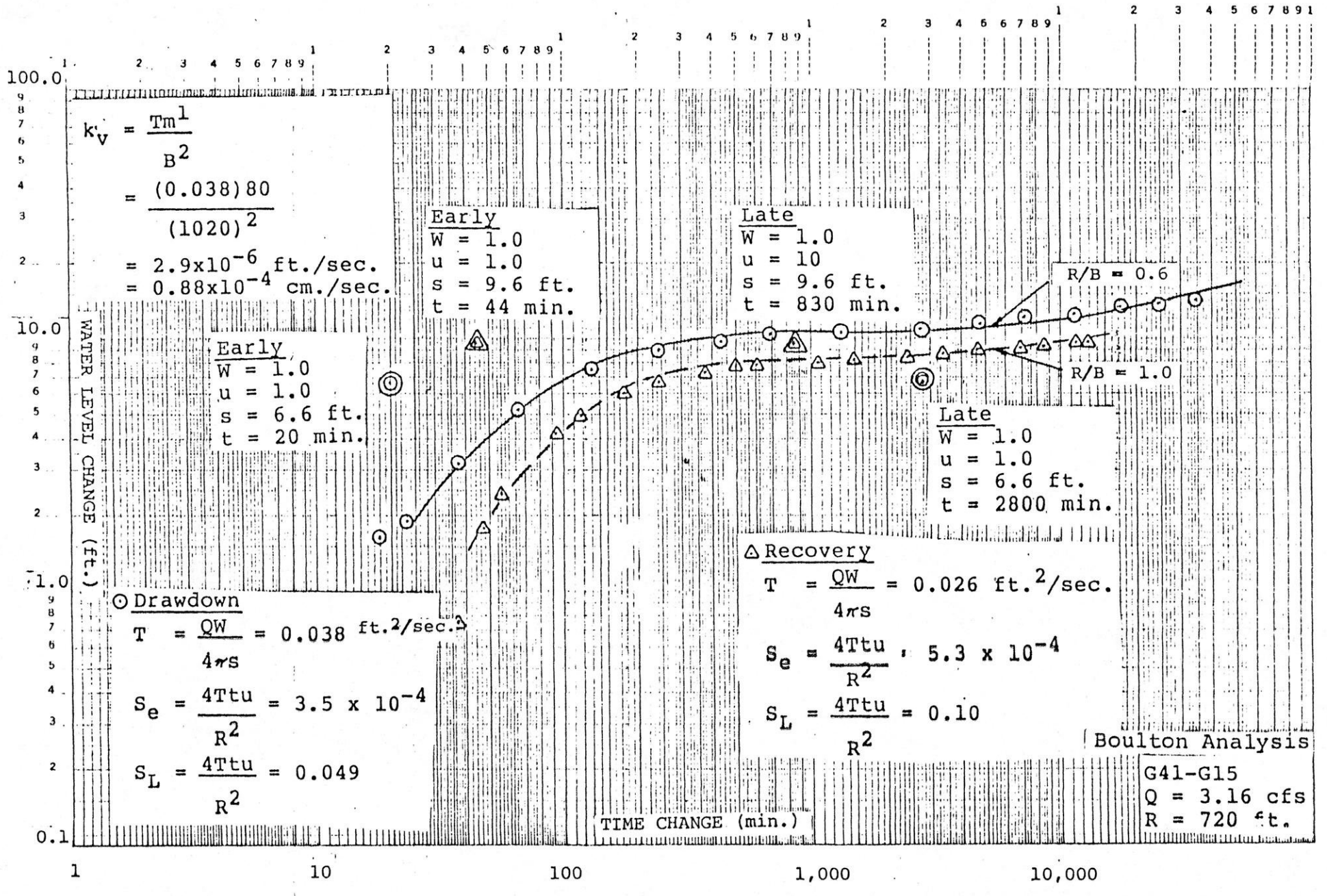
3. Elevation of top of protector pipe, 1694.7 ft. (516.55m).

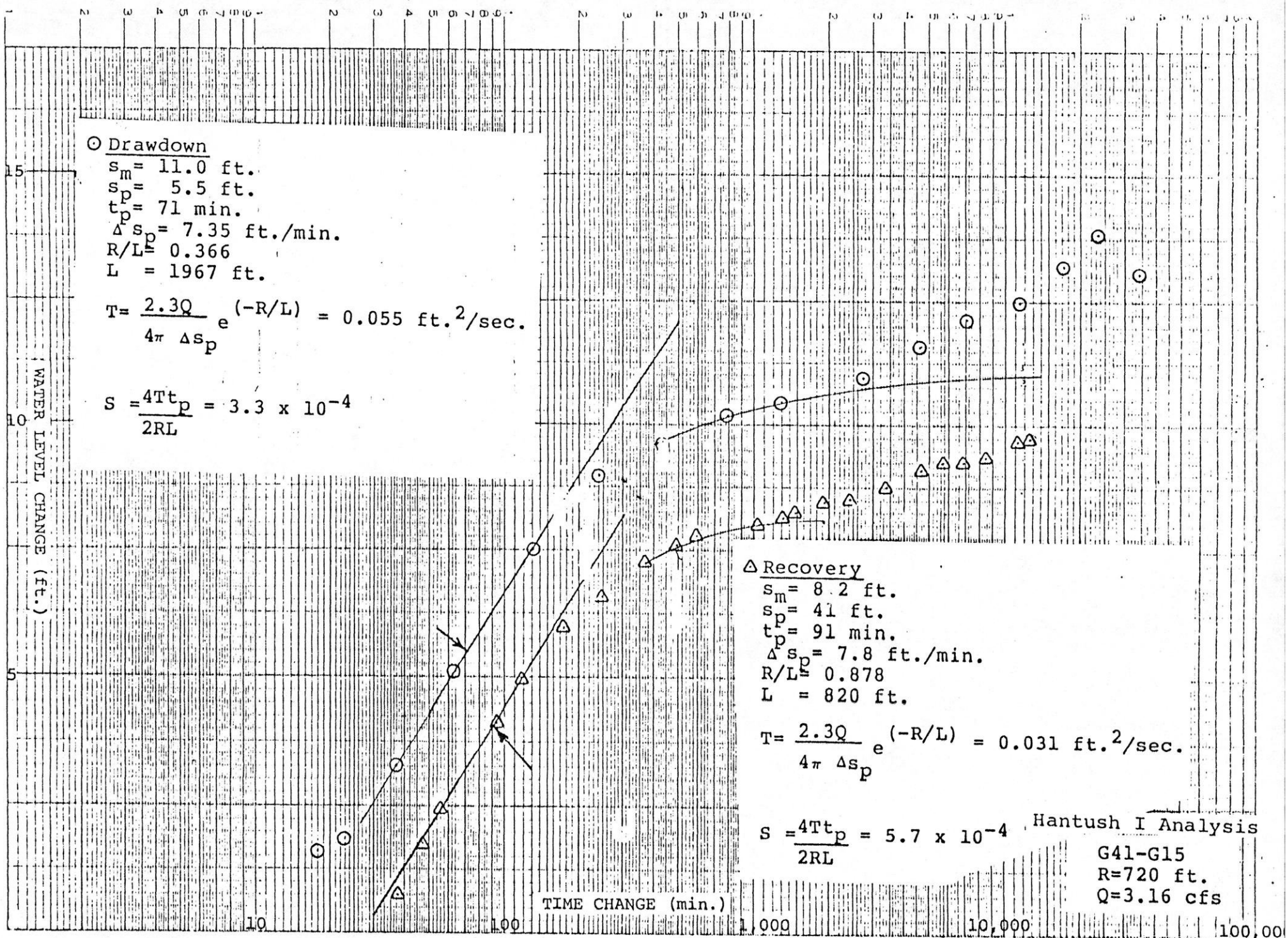
Table of Water Level Readings by Date. Readings Indicate Depth Below Ground Surface.

| DATE | 4/17/79 | 11/9/79 | 11/12/79 | 12/3/79 | 4/25/80 | 5/20/80 | 6/26/80* |
|---|---|---|---|---|---|---|---|
| DEPTH (m) | 31.27 | 29.69 | 30.02 | 29.60 | 29.96 | 29.93 | 29.93 |
| DEPTH (ft.) | 102.6 | 97.4 | 98.5 | 97 | 98.3 | 98.2 | 98.2 |

| DATE | 9/10/80* | | | | | | |
|---|---|---|---|---|---|---|---|
| DEPTH (m) | 30.54 | | | | | | |
| DEPTH (ft.) | 100.2 | | | | | | |

*Pump Test and Recovery Period Between these Dates. For Pump Test Data, Refer to PUMP TEST AND ANALYSIS, Project Report No. 4.


$k'_v = \frac{Tm^1}{B^2}$
$= \frac{(0.038)80}{(1020)^2}$
$= 2.9 \times 10^{-6}$ ft./sec.
$= 0.88 \times 10^{-4}$ cm./sec.
Early
W = 1.0
u = 1.0
s = 9.6 ft.
t = 44 min.
Late
W = 1.0
u = 10
s = 9.6 ft.
t = 830 min.
R/B = 0.6
R/B = 1.0
Early
W = 1.0
u = 1.0
s = 6.6 ft.
t = 20 min.
Late
W = 1.0
u = 1.0
s = 6.6 ft.
t = 2800 min.
WATER LEVEL CHANGE (ft.)
100.0
10.0
1.0
0.1
⊙ Drawdown
$T = \frac{QW}{4\pi s} = 0.038$ ft.²/sec.
$S_e = \frac{4Ttu}{R^2} = 3.5 \times 10^{-4}$
$S_L = \frac{4Ttu}{R^2} = 0.049$
△ Recovery
$T = \frac{QW}{4\pi s} = 0.026$ ft.²/sec.
$S_e = \frac{4Ttu}{R^2} = 5.3 \times 10^{-4}$
$S_L = \frac{4Ttu}{R^2} = 0.10$
Boulton Analysis
G41-G15
Q = 3.16 cfs
R = 720 ft.
TIME CHANGE (min.)
1
10
100
1,000
10,000


⊙ Drawdown
$s_m$= 11.0 ft.
$s_p$= 5.5 ft.
$t_p$= 71 min.
$\Delta s_p$= 7.35 ft./min.
R/L= 0.366
L = 1967 ft.
$T = \frac{2.3Q}{4\pi \Delta s_p} e^{(-R/L)}$ = 0.055 ft.²/sec.
$S = \frac{4Tt_p}{2RL}$ = 3.3 x $10^{-4}$
△ Recovery
$s_m$= 8.2 ft.
$s_p$= 41 ft.
$t_p$= 91 min.
$\Delta s_p$= 7.8 ft./min.
R/L= 0.878
L = 820 ft.
$T = \frac{2.3Q}{4\pi \Delta s_p} e^{(-R/L)}$ = 0.031 ft.²/sec.
$S = \frac{4Tt_p}{2RL}$ = 5.7 x $10^{-4}$
Hantush I Analysis
G41-G15
R=720 ft.
Q=3.16 cfs
WATER LEVEL CHANGE (ft.)
TIME CHANGE (min.)
15
10
5
10
100
1,000
10,000
100,000

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G15 ***

| DATE | TIME | FIRST READING | SECOND READING | ALG | CON | TIME SINCE TEST BEGAN | WATER LEVEL ELEVATION | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| DDMONYY | HHMM.SS | FEET | FEET | | | MINUTES | FEET | COLLAR ELEV 1694.24 FEET PIEZO ELEV 0.00 -NULL |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 18APR79 | 1530.00 | 102.50 | 0.00 | 1 | 20 | -627515.00 | 1591.74 | |
| 18APR79 | 1530.00 | 102.50 | 0.00 | 1 | 20 | -627515.00 | 1591.74 | CORRECT TO COLLAR TOP |
| | | | | | | | | GROUND SURFACE-CORR. TO |
| 12NOV79 | 1200.00 | 99.90 | 0.00 | 1 | 20 | -328205.00 | 1594.34 | GROUND SURFACE-CORR. TO |
| 03DEC79 | 1200.00 | 99.20 | 0.00 | 1 | 20 | -297965.00 | 1595.04 | CORRECT TO COLLAR TOP |
| 25APR80 | 1200.00 | 99.80 | .06 | 1 | 14 | -90605.00 | 1594.38 | 14 - TIME NOT RECORD |
| 20MAY80 | 600.00 | 99.82 | 0.00 | 1 | 9 | -54965.00 | 1594.50 | 4 9 |
| 21MAY80 | 1200.00 | 99.83 | 0.00 | 1 | 9 | -53165.00 | 1594.49 | 9 - NO TIME |
| 29MAY80 | 930.00 | 99.90 | 0.00 | 1 | 9 | -41795.00 | 1594.42 | 4 9 -REV. CIR. |
| 29MAY80 | 2250.00 | 99.93 | 0.00 | 1 | 9 | -40995.00 | 1594.39 | 4 9 -REV. CIR. |
| 30MAY80 | 1730.00 | 99.85 | 0.00 | 1 | 9 | -39875.00 | 1594.47 | 4 9 -REV. CIR. |
| 31MAY80 | 945.00 | 99.84 | 0.00 | 1 | 9 | -38900.00 | 1594.48 | 4 9 SET CASE |
| 01JUN80 | 600.00 | 99.82 | 0.00 | 1 | 9 | -37685.00 | 1594.50 | 4 9 SET CASE |
| 01JUN80 | 1525.00 | 99.81 | 0.00 | 1 | 9 | -37120.00 | 1594.51 | 4 9 GRAVEL |
| 02JUN80 | 830.00 | 99.80 | 0.00 | 1 | 9 | -36095.00 | 1594.52 | 4 9 |
| 03JUN80 | 915.00 | 99.77 | 0.00 | 1 | 9 | -34610.00 | 1594.55 | 4 9 |
| 04JUN80 | 135.00 | 99.90 | 0.00 | 1 | 9 | -33630.00 | 1594.42 | 4 9 AIR DEV. |
| 06JUN80 | 939.00 | 99.84 | 0.00 | 1 | 9 | -3026 .00 | 1594.48 | 4 9 |
| 06JUN80 | 1116.00 | 99.81 | 0.00 | 1 | 9 | -3016 .00 | 1594.51 | 4 9 |
| 06JUN80 | 1314.00 | 99.81 | 0.00 | 1 | 9 | -3001 .00 | 1594.51 | 4 9 |
| 06JUN80 | 1712.00 | 99.88 | 0.00 | 1 | 9 | -2981 .00 | 1594.44 | 4 9 VEL TEST |
| 06JUN80 | 1852.00 | 99.83 | 0.00 | 1 | 9 | -2971 .00 | 1594.49 | 4 9 VEL TEST |
| 07JUN80 | 930.00 | 99.79 | 0.00 | 1 | 9 | -28835.00 | 1594.53 | 4 9 |
| 08JUN80 | 900.00 | 99.78 | 0.00 | 1 | 9 | -27425.00 | 1594.54 | 4 9 |
| 09JUN80 | 800.00 | 99.79 | 0.00 | 1 | 9 | -26045.00 | 1594.53 | 4 9 |
| 10JUN80 | 935.00 | 99.80 | 0.00 | 1 | 9 | -24510.00 | 1594.52 | 4 9 |
| 11JUN80 | 910.00 | 99.79 | 0.00 | 1 | 9 | -23095.00 | 1594.53 | 4 9 |
| 12JUN80 | 900.00 | 99.79 | 0.00 | 1 | 9 | -21665.00 | 1594.53 | 4 9 |
| 13JUN80 | 815.00 | 99.79 | 0.00 | 1 | 9 | -20270.00 | 1594.53 | 4 9 |
| 13JUN80 | 2115.00 | 99.79 | 0.00 | 1 | 61 | -19490.00 | 1594.53 | 4 9 DIFF. RULE |
| 14JUN80 | 835.00 | 99.79 | 0.00 | 1 | 9 | -18810.00 | 1594.53 | 4 9 |
| 14JUN80 | 1745.00 | 99.79 | 0.00 | 1 | 9 | -18260.00 | 1594.53 | 4 9 |
| 15JUN80 | 820.00 | 99.80 | 0.00 | 1 | 9 | -17385.00 | 1594.52 | 4 9 |
| 16JUN80 | 805.00 | 99.78 | 0.00 | 1 | 9 | -15960.00 | 1594.54 | 4 9 |
| 24JUN80 | 820.00 | 100.71 | 0.00 | 1 | 9 | -4425.00 | 1593.61 | 4 9 |
| 25JUN80 | 815.00 | 100.67 | 0.00 | 1 | 9 | -2990.00 | 1593.65 | 4 9 |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G15 ***

| DATE | TIME | FIRST READING | SECOND READING | ALG | CON | TIME SINCE TEST BEGIN | WATER LEVEL ELEVATION | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| DDMONYY | HHMM.SS | FEET | FEET | | | MINUTE | FEET | |
| | | | | | | | | COLLAR ELEV 1694.24 FEET PIEZO ELEV 0.00 -NULL |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 26JUN80 | 840.00 | 100.65 | 0.00 | 1 | 61 | -1525.00 | 1593.67 | 9 9 |
| 27JUN80 | 815.00 | 100.79 | 0.00 | 1 | 61 | -110.00 | 1593.53 | 9 9 BEFORE TEST |
| 27JUN80 | 1023.00 | 102.41 | 0.00 | 1 | 61 | 18.00 | 1591.91 | 9 9 START @ 0 |
| 27JUN80 | 1028.00 | 102.66 | 0.00 | 1 | 61 | 23.00 | 1591.66 | 9 9 |
| 27JUN80 | 1042.00 | 104.08 | 0.00 | 1 | 61 | 37.00 | 1590.24 | 9 9 |
| 27JUN80 | 1054.00 | 105.11 | 0.00 | 1 | 61 | 49.00 | 1589.21 | 9 9 |
| 27JUN80 | 1110.00 | 105.98 | 0.00 | 1 | 61 | 65.00 | 1588.34 | 9 9 |
| 27JUN80 | 1145.00 | 107.51 | 0.00 | 1 | 61 | 100.00 | 1586.81 | 9 9 |
| 27JUN80 | 1215.00 | 108.31 | 0.00 | 1 | 61 | 130.00 | 1586.01 | 9 9 |
| 27JUN80 | 1249.00 | 108.87 | 0.00 | 1 | 61 | 164.00 | 1585.45 | 9 9 |
| 27JUN80 | 1340.00 | 109.52 | 0.00 | 1 | 61 | 215.00 | 1584.80 | 9 9 |
| 27JUN80 | 1410.00 | 109.77 | 0.00 | 1 | 61 | 245.00 | 1584.55 | 9 9 |
| 27JUN80 | 1502.00 | 110.07 | 0.00 | 1 | 62 | 297.00 | 1584.24 | 9 9 |
| 27JUN80 | 1548.00 | 110.27 | 0.00 | 1 | 62 | 343.00 | 1584.04 | 9 9 TIME CORRECTED |
| 27JUN80 | 1711.00 | 110.47 | 0.00 | 1 | 62 | 426.00 | 1583.84 | 9 9 |
| 27JUN80 | 1800.00 | 110.59 | 0.00 | 1 | 62 | 475.00 | 1583.72 | 9 9 |
| 27JUN80 | 1846.00 | 110.67 | 0.00 | 1 | 62 | 521.00 | 1583.64 | 9 9 |
| 27JUN80 | 1938.00 | 110.73 | 0.00 | 1 | 62 | 573.00 | 1583.58 | 9 9 |
| 27JUN80 | 2054.00 | 110.81 | 0.00 | 1 | 62 | 649.00 | 1583.50 | 9 9 |
| 27JUN80 | 2154.00 | 110.91 | 0.00 | 1 | 62 | 709.00 | 1583.40 | 9 9 |
| 27JUN80 | 2312.00 | 111.02 | 0.00 | 1 | 62 | 787.00 | 1583.29 | 9 9 |
| 28JUN80 | 49.00 | 110.96 | 0.00 | 1 | 62 | 884.00 | 1583.35 | 9 9 |
| 28JUN80 | 238.00 | 111.04 | 0.00 | 1 | 62 | 993.00 | 1583.27 | 9 9 |
| 28JUN80 | 552.00 | 111.17 | 0.00 | 1 | 62 | 1187.00 | 1583.14 | 9 9 |
| 28JUN80 | 755.00 | 111.25 | 0.00 | 1 | 62 | 1310.00 | 1583.06 | 9 |
| 28JUN80 | 1017.00 | 111.34 | 0.00 | 1 | 62 | 1452.00 | 1582.97 | 9 9 |
| 28JUN80 | 1200.00 | 111.42 | 0.00 | 1 | 62 | 1555.00 | 1582.89 | 9 9 |
| 28JUN80 | 1520.00 | 111.47 | 0.00 | 1 | 62 | 1755.00 | 1582.84 | 9 9 |
| 28JUN80 | 1818.00 | 111.53 | 0.00 | 1 | 62 | 1933.00 | 1582.78 | 9 9 |
| 28JUN80 | 2346.00 | 111.59 | 0.00 | 1 | 62 | 2261.00 | 1582.72 | 9 9 |
| 29JUN80 | 829.00 | 111.75 | 0.00 | 1 | 62 | 2784.00 | 1582.56 | 9 9 |
| 29JUN80 | 1613.00 | 112.00 | 0.00 | 1 | 61 | 3248.00 | 1582.32 | 9 9 |
| 30JUN80 | 101.00 | 112.26 | 0.00 | 1 | 61 | 3776.00 | 1582.06 | 9 9 |
| 30JUN80 | 847.00 | 112.29 | 0.00 | 1 | 61 | 4242.00 | 1582.03 | 9 9 |
| 30JUN80 | 1607.00 | 112.41 | 0.00 | 1 | 61 | 4682.00 | 1581.91 | 9 9 |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G15 ***

| DATE | TIME | FIRST READING | SECOND READING | A L G | C O N | TIME SINCE TEST BEGAN | WATER LEVEL ELEVATION | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| DDMONYY | HHMM.SS | FEET | FEET | | | MINUTES | FEET | |
| | | | | | | | | COLLAR ELEV 1694.24 FEET PIEZO ELEV 0.00 -NULL- |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 01JUL80 | 813.00 | 112.45 | 0.00 | 1 | 62 | 5648.00 | 1581.86 | 9 9 |
| 01JUL80 | 1057.00 | 111.50 | 0.00 | 1 | 62 | 5812.00 | 1582.81 | 9 9 |
| 01JUL80 | 1203.00 | 112.17 | 0.00 | 1 | 62 | 5878.00 | 1582.14 | 9 9 |
| 01JUL80 | 1316.00 | 112.40 | 0.00 | 1 | 62 | 5951.00 | 1581.91 | 9 9 |
| 01JUL80 | 1459.00 | 112.54 | 0.00 | 1 | 62 | 6054.00 | 1581.77 | 9 9 |
| 01JUL80 | 1640.00 | 112.61 | 0.00 | 1 | 62 | 6155.00 | 1581.70 | 9 9 |
| 02JUL80 | 220.00 | 112.85 | 0.00 | 1 | 62 | 6735.00 | 1581.46 | 9 9 |
| 02JUL80 | 852.00 | 112.94 | 0.00 | 1 | 62 | 7127.00 | 1581.37 | 9 9 |
| 02JUL80 | 1350.00 | 112.77 | 0.00 | 1 | 66 | 7425.00 | 1581.33 | 16 14 COMPARE PIEZ. |
| 02JUL80 | 1351.00 | 112.91 | 0.00 | 1 | 62 | 7426.00 | 1581.40 | 9 9 COMPARE PIEZ. |
| 02JUL80 | 2117.00 | 112.92 | 0.00 | 1 | 62 | 7872.00 | 1581.39 | 9 9 |
| 03JUL80 | 913.00 | 112.96 | 0.00 | 1 | 62 | 8588.00 | 1581.35 | 9 9 |
| 03JUL80 | 2040.00 | 113.00 | 0.00 | 1 | 62 | 9275.00 | 1581.31 | 9 9 |
| 04JUL80 | 901.00 | 113.13 | 0.00 | 1 | 62 | 10016.00 | 1581.18 | 9 9 |
| 05JUL80 | 836.00 | 113.26 | 0.00 | 1 | 62 | 11431.00 | 1581.05 | 9 9 |
| 05JUL80 | 2052.00 | 113.59 | 0.00 | 1 | 62 | 12167.00 | 1580.72 | 9 9 |
| 06JUL80 | 923.00 | 113.72 | 0.00 | 1 | 62 | 12918.00 | 1580.59 | 9 9 |
| 06JUL80 | 1728.00 | 113.65 | 0.00 | 1 | 62 | 13403.00 | 1580.66 | 9 9 |
| 07JUL80 | 759.00 | 113.58 | 0.00 | 1 | 62 | 14274.00 | 1580.73 | 9 9 |
| 07JUL80 | 1647.00 | 113.57 | 0.00 | 1 | 62 | 14802.00 | 1580.74 | 9 9 |
| 08JUL80 | 848.00 | 113.92 | 0.00 | 1 | 62 | 15763.00 | 1580.39 | 9 9 |
| 08JUL80 | 2108.00 | 113.96 | 0.00 | 1 | 62 | 16503.00 | 1580.35 | 9 9 |
| 09JUL80 | 901.00 | 114.01 | 0.00 | 1 | 62 | 17216.00 | 1580.30 | 9 9 |
| 09JUL80 | 1617.00 | 113.99 | 0.00 | 1 | 62 | 17652.00 | 1580.32 | 9 9 |
| 10JUL80 | 857.00 | 114.14 | 0.00 | 1 | 62 | 18652.00 | 1580.17 | 9 9 |
| 10JUL80 | 1727.00 | 114.14 | 0.00 | 1 | 62 | 19162.00 | 1580.17 | 9 9 |
| 11JUL80 | 929.00 | 114.30 | 0.00 | 1 | 62 | 20124.00 | 1580.01 | 9 9 |
| 11JUL80 | 1933.00 | 114.36 | 0.00 | 1 | 62 | 20728.00 | 1579.95 | 9 9 |
| 12JUL80 | 913.00 | 114.42 | 0.00 | 1 | 62 | 21548.00 | 1579.[illegible] | 9 9 |
| 13JUL80 | 835.00 | 114.64 | 0.00 | 1 | 62 | 22950.00 | 1579. [illegible] | 9 9 |
| 14JUL80 | 807.00 | 114.62 | 0.00 | 1 | 62 | 24362.00 | 1579. [illegible] | 9 9 |
| 14JUL80 | 1107.00 | 113.83 | 0.00 | 1 | 62 | 24542.00 | 1580.48 | 9 9 |
| 15JUL80 | 840.00 | 113.87 | 0.00 | 1 | 62 | 25837.00 | 1580.44 | 9 9 |
| 16JUL80 | 923.00 | 113.87 | 0.00 | 1 | 62 | 27311. | 1580.44 | 9 9 |
| 17JUL80 | 820.00 | 113.87 | 0.00 | 1 | 62 | 2869 | 1580.44 | 9 9 |
| 18JUL80 | 807.00 | 113.89 | 0.00 | 1 | 62 | 3012 | 1580.42 | 9 9 |
| 20JUL80 | 813.00 | 113.81 | 0.00 | 1 | 62 | 33006. | 1580.50 | 9 9 |
| 21JUL80 | 836.00 | 113.81 | 0.00 | 1 | 62 | 34471. | 1580.50 | 9 9 |
| 21JUL80 | 1027.00 | 113.82 | 0.00 | 1 | 62 | 34582.0 | 1580.49 | 9 9 RECOVERY @ 10 |
| 21JUL80 | 1042.00 | 113.06 | 0.00 | 1 | 62 | 34597.00 | 1581.2[illegible] | 9 9 |
| 21JUL80 | 1052.00 | 112.04 | 0.00 | 1 | 62 | 34607.00 | 1582.2 | 9 9 |
| 21JUL80 | 1101.00 | 111.40 | 0.00 | 1 | 62 | 34616.00 | 1582.9. | 9 9 |
| 21JUL80 | 1111.00 | 110.76 | 0.00 | 1 | 62 | 34626.00 | 1583.5[illegible] | 9 9 |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G15 ***

| DATE DDMONYY | TIME HHMM.SS | FIRST READING FEET | SECOND READING FEET | A L G | C O N | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET | |
|---|---|---|---|---|---|---|---|---|
| 21JUL80 | 1121.00 | 110.29 | 0.00 | 1 | 62 | 34636.00 | 1584.02 | 9 9 |
| 21JUL80 | 1129.00 | 109.92 | 0.00 | 1 | 61 | 34644.00 | 1584.40 | 9 9 |
| 21JUL80 | 1138.00 | 109.64 | 0.00 | 1 | 61 | 34653.00 | 1584.68 | 9 9 |
| 21JUL80 | 1147.00 | 109.26 | 0.00 | 1 | 61 | 34662.00 | 1585.06 | 9 9 |
| 21JUL80 | 1155.00 | 109.04 | 0.00 | 1 | 61 | 34670.00 | 1585.28 | 9 9 |
| 21JUL80 | 1203.00 | 108.83 | 0.00 | 1 | 61 | 34678.00 | 1585.49 | 9 9 |
| 21JUL80 | 1213.00 | 108.60 | 0.00 | 1 | 61 | 34688.00 | 1585.72 | 9 9 |
| 21JUL80 | 1223.00 | 108.42 | 0.00 | 1 | 61 | 34698.00 | 1585.90 | 9 9 |
| 21JUL80 | 1242.00 | 108.07 | 0.00 | 1 | 61 | 34717.00 | 1586.25 | 9 9 |
| 21JUL80 | 1302.00 | 107.84 | 0.00 | 1 | 61 | 34737.00 | 1586.48 | 9 9 |
| 21JUL80 | 1320.00 | 107.58 | 0.00 | 1 | 61 | 34755.00 | 1586.74 | 9 9 |
| 21JUL80 | 1346.00 | 107.36 | 0.00 | 1 | 61 | 34781.00 | 1586.96 | 9 9 |
| 21JUL80 | 1409.00 | 107.17 | 0.00 | 1 | 61 | 34804.00 | 1587.15 | 9 9 |
| 21JUL80 | 1441.00 | 106.98 | 0.00 | 1 | 61 | 34836.00 | 1587.34 | 9 9 |
| 21JUL80 | 1508.00 | 106.84 | 0.00 | 1 | 61 | 34863.00 | 1587.48 | 9 9 |
| 21JUL80 | 1544.00 | 106.62 | 0.00 | 1 | 61 | 34899.00 | 1587.70 | 9 9 |
| 21JUL80 | 1615.00 | 106.56 | 0.00 | 1 | 61 | 34930.00 | 1587.76 | 9 9 |
| 21JUL80 | 1710.00 | 106.38 | 0.00 | 1 | 61 | 34985.00 | 1587.94 | 9 9 |
| 21JUL80 | 1822.00 | 106.21 | 0.00 | 1 | 61 | 35057.00 | 1588.11 | 9 9 |
| 21JUL80 | 1917.00 | 106.15 | 0.00 | 1 | 61 | 35112.00 | 1588.17 | 9 9 |
| 21JUL80 | 2012.00 | 106.04 | 0.00 | 1 | 61 | 35167.00 | 1588.28 | 9 9 |
| 21JUL80 | 2133.00 | 105.98 | 0.00 | 1 | 61 | 35248.00 | 1588.3 | 9 9 |
| 21JUL80 | 2242.00 | 105.88 | 0.00 | 1 | 61 | 35317.00 | 1588.4 | 9 9 |
| 22JUL80 | 115.00 | 105.78 | 0.00 | 1 | 61 | 35470.00 | 1588.5 | 9 9 |
| 22JUL80 | 240.00 | 105.72 | 0.00 | 1 | 61 | 35555. | 1588.60 | 9 9 |
| 22JUL80 | 430.00 | 105.66 | 0.00 | 1 | 61 | 35665. | 1588.66 | 9 9 |
| 22JUL80 | 846.00 | 105.47 | 0.00 | 1 | 61 | 35921. | 1588.85 | 9 9 |
| 22JUL80 | 1138.00 | 105.42 | 0.00 | 1 | 61 | 36093. | 1588.90 | 9 9 |
| 22JUL80 | 1532.00 | 105.28 | 0.00 | 1 | 61 | 36327. | 1589.04 | 9 9 |
| 22JUL80 | 1906.00 | 105.20 | 0.00 | 1 | 61 | 36541.0 | 1589.12 | 9 9 |
| 23JUL80 | 28.00 | 105.13 | 0.00 | 1 | 61 | 36863.04 | 1589.19 | 9 9 |
| 23JUL80 | 342.00 | 105.07 | 0.00 | 1 | 61 | 37057.00 | 1589.25 | 9 9 |
| 23JUL80 | 1115.00 | 100.00 | 4.97 | 1 | 61 | 37510.00 | 1589.35 | 9 9 |
| 23JUL80 | 1929.00 | 100.00 | 4.80 | 1 | 61 | 38004.00 | 1589.52 | 9 9 |
| 24JUL80 | 844.00 | 100.00 | 4.58 | 1 | 61 | 38799.00 | 1589.74 | 9 9 |
| 24JUL80 | 1705.00 | 100.00 | 4.44 | 1 | 61 | 39300.00 | 1589.88 | 9 9 |
| 25JUL80 | 1020.00 | 100.00 | 4.34 | 1 | 61 | 40335.00 | 1589.98 | 9 9 |
| 25JUL80 | 1536.00 | 100.00 | 4.34 | 1 | 61 | 40651.00 | 1589.98 | 9 9 |

**COMMENTS**
COLLAR ELEV 1694.24 FEET PIEZO ELEV 0.00 -NULL
TIME PUMP TEST BEGAN = 27JUN80-1005.00

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G15 ***

| DATE DDMONYY | TIME HHMM.SS | FIRST READING FEET | SECOND READING FEET | A L G | C O N | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | COLLAR ELEV 1694.24 FEET PIEZO ELEV 0.00 -NULL |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 26JUL80 | 815.00 | 100.00 | 4.01 | 1 | 70 | 41650.00 | 1590.02 | 14 14 |
| 27JUL80 | 928.00 | 105.00 | 1.27 | 1 | 92 | 43163.00 | 1590.17 | 15 BY D. K. TO 9/2/80 |
| 28JUL80 | 850.00 | 105.00 | .05 | 1 | 92 | 44565.00 | 1591.39 | 15 BY D. K. TO 9/2/80 |
| 29JUL80 | 850.00 | 105.00 | .95 | 1 | 92 | 46005.00 | 1590.49 | 15 BY D. K. TO 9/2/80 |
| 30JUL80 | 1132.00 | 105.00 | .93 | 1 | 92 | 47607.00 | 1590.51 | 15 BY D. K. TO 9/2/80 |
| 31JUL80 | 1450.00 | 105.00 | .79 | 1 | 92 | 49245.00 | 1590.65 | 15 BY D. K. TO 9/2/80 |
| 01AUG80 | 1240.00 | 105.00 | .73 | 1 | 92 | 50555.00 | 1590.71 | 15 BY D. K. TO 9/2/80 |
| 03AUG80 | 800.00 | 105.00 | .52 | 1 | 92 | 53155.00 | 1590.92 | 4 15 |
| 05AUG80 | 1410.00 | 105.00 | .35 | 1 | 92 | 56405.00 | 1591.09 | 4 15 |
| 07AUG80 | 1420.00 | 105.00 | .33 | 1 | 92 | 59295.00 | 1591.11 | 4 15 |
| 09AUG80 | 920.00 | 105.00 | .22 | 1 | 92 | 61875.00 | 1591.22 | 4 15 |
| 12AUG80 | 1315.00 | 100.00 | 4.62 | 1 | 91 | 66430.00 | 1591.48 | 4 15 |
| 14AUG80 | 1120.00 | 100.00 | 4.72 | 1 | 91 | 69195.00 | 1591.58 | 4 15 |
| 16AUG80 | 1100.00 | 100.00 | 4.75 | 1 | 91 | 72055.00 | 1591.55 | 4 15 |
| 20AUG80 | 1428.00 | 104.54 | 0.00 | 1 | 91 | 7802 | 1591.76 | 15 |
| 22AUG80 | 1300.00 | 104.43 | 0.00 | 1 | 91 | 8081 | 1591.87 | 15 |
| 02SEP80 | 938.00 | 104.32 | 0.00 | 1 | 91 | 96455 | 1591.98 | 15 |
| 10SEP80 | 945.00 | 102.38 | 0.00 | 1 | 15 | 107980. | 1591.89 | 15 FOR G.W. MAP |

COOR. N113415 ft. (N34569m)
E2284420 ft. (E696292m)

# BORING LOG G41-G15

SHEET 1 OF 10

SURFACE ELEV. 1691.5 ft. (515.56m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 4/2/79 DATE COMPLETED 4/9/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS | BLOWS / FOOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES HAMMER BLOWS PER 6IN. (Note 1) | SAMPLES REC./ATT. (ins.) | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| 0.0 | | See Boring G41-G15A for detailed descriptions. | | - | 1 | DO | Air Hammer | 12/12 | |
| 13.72 | | | | | | | | | |
| 45.0 | | Very dense, brown, fine to coarse gravelly, fine to coarse SAND, some silt, trace clay to brown, fine to coarse GRAVEL and fine to coarse SAND, some silt | SM to GM | - | 2 | DO | Air Hammer | 6/6 | |
| | | | | - | 3 | DO | Air Hammer | 6/6 | |
| | | | | - | 4 | DO | Air Hammer | 3/3 | |
| 18.90 | | | | | | | | | |
| 62.0 | | Very dense, red-brown, silty, fine to coarse SAND, some fine gravel, trace clay to fine to coarse SAND, some fine gravel, some silt, trace clay | SM | - | 5 | DO | Air Hammer | 12/12 | |
| | | | | - | 6 | DO | Air Hammer | 10/12 | |
| | | | | - | 7 | DO | Air Hammer | 10/12 | |
| 23.47 | | | | | | | | | |
| 77.0 | | CONTINUED | | | | | | | |

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked DB

COOR. N113415 ft. (N34569m)
E2284420 ft. (E696292m)

# BORING LOG G41-G15



SURFACE ELEV. 1691.5 ft. (515.56m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 4/2/79 DATE COMPLETED 4/9/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS. | BLOWS/FOOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES HAMMER BLOWS PER 6IN. (Note 1) | SAMPLES REC./ATT. (ins.) | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| 23.47 | | CONTINUED | | | | | | | |
| 77.0 | | Very dense, red-brown, silty, fine to coarse SAND, some fine gravel, trace clay to fine to coarse SAND, some fine gravel, some silt, trace clay | SM | - | 8 | DO | Air Hammer | 8/12 | |
| | | | | - | 9 | DO | Air Hammer | 10/12 | |
| 27.43 | | | | | | | | | |
| 90.0 | | Very dense, red-brown, fine to coarse SAND, some silt, trace fine to coarse gravel, trace clay | SM | - | 10 | DO | Air Hammer | 12/12 | |
| | | | | - | 11 | DO | Air Hammer | 12/12 | |
| | | | | - | 12 | DO | Air Hammer | 6/6 | ▼ 4/18/79 30.39 ≈ 99.7 |
| 32.31 | | | | | | | | | |
| 106.0 | | CONTINUED | | | | | | | |

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked JCB

COOR. N113415 ft. (N34569m)
E2284420 ft. (E696292m)

# BORING LOG G41-G15



SURFACE ELEV. 1691.5 ft. (515.56m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 4/2/79 DATE COMPLETED 4/9/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS. | BLOWS / FOOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES HAMMER BLOWS PER 6 IN. (Note 1) | SAMPLES REC./ATT. (ins.) | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| 32.31 | | CONTINUED | | | | | | | |
| 106.0 | | Very dense, red-brown, fine to coarse SAND, some silt, trace fine to coarse gravel, trace clay | SM | - | 13 | DO | Air Hammer | 12/12 | |
| 35.97 | | | | | | | | | |
| 118.0 | | Very dense, red-brown, silty, fine to coarse SAND, some fine to coarse gravel, trace clay | SM | - | 14 | DO | Air Hammer | 12/12 | |
| | | | | - | 15 | DO | Air Hammer | 6/6 | |
| 41.76 | | | | | | | | | |
| 137.0 | | CONTINUED | | | | | | | |

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked

COOR. N113415 ft. (N34569m)
E2284420 ft. (E696292m)

# BORING LOG G41-G15



SURFACE ELEV. 1691.5 ft. (515.56m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSI DATE STARTED 4/2/79 DATE COMPLETED 4/9/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS. | BLOWS / FOOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES HAMMER BLOWS PER 6IN. (Note 1) | SAMPLES REC./ATT. (ins.) | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| 41.76 / 137.0 | | CONTINUED | | | | | | | |
| | | Very dense, red-brown, silty, fine to coarse SAND, some fine to coarse gravel, trace clay | SM | - | 16 | DO | Air Hammer | 2/2 | |
| | | | | - | 17 | DO | Air Hammer | 12/12 | |
| 48.77 / 160.0 | | Very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt to fine to coarse SAND, some fine to coarse gravel | SP to SP-SM | - | 18 | DO | Air Hammer | 5/12 | |
| 51.21 / 168.0 | | CONTINUED | | | | | | | |

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked

COOR. N113415 ft. (N34569m)
E2284420 ft. (E696292m)

# BORING LOG G41-G15

SHEET 5 OF 10

SURFACE ELEV. 1691.5 ft. (515.56m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 4/2/79 DATE COMPLETED 4/9/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS. | BLOWS/FOOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES HAMMER BLOWS PER 6 IN. (Note 1) | SAMPLES REC./ATT. (ins.) | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| 51.21 | | CONTINUED | | | | | | | |
| 168.0 | | | | - | 19 | DO | Air Hammer | 2/2 | |
| | | Very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt to fine to coarse SAND, some fine to coarse gravel | SP to SP-SM | - | 20 | DO | Air Ham[illegible] | [illegible]6 | |
| | | | | - | 21 | DO | Air Hammer | 6/6 | |
| 60.05 | | | | | | | | | |
| 197.0 | | CONTINUED | | | | | | | |

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked [illegible]

COOR. N113415 ft. (N34569m)
E2284420 ft. (E696292m)

# BORING LOG G41-G15



SURFACE ELEV. 1691.5 ft. (515.56m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 4/2/79 DATE COMPLETED 4/9/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS. | BLOWS / FOOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES HAMMER BLOWS PER 6IN. (Note 1) | SAMPLES REC./ATT. (ins.) | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| 60.05 | | CONTINUED | | | | | | | |
| 197.0 | | Very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt to fine to coarse SAND, some fine to coarse gravel | SP to SP-SM | - | 22 | DO | Air Hammer | 0/6 | |
| 64.01 | | | | | | | | | |
| 210.0 | | Very dense, brown, fine to coarse SAND, some silt | SP-SM | - | 23 | DO | Air Hammer | 8/12 | |
| 65.53 | | | | | | | | | |
| 215.0 | | | | - | 24 | DO | Air Hammer | 12/12 | |
| | | Very dense, brown, fine to coarse SAND, trace silt | SP | | | | | | |
| | | | | - | 25 | DO | Air Hammer | 6/6 | |
| 68.58 | | | | | | | | | |
| 225.0 | | CONTINUED | | | | | | | |

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked DB

COOR. N113415 ft. (N34569m)
E2284420 ft. (E696292m)

# BORING LOG G41-G15

SHEET 7 OF 10

SURFACE ELEV. 1691.5 ft. (515.56m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 4/2/79 DATE COMPLETED 4/9/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS. | BLOWS / FOOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES HAMMER BLOWS PER 6 IN. (Note 1) | SAMPLES REC./ATT. (ins.) | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| 68.58 | | CONTINUED | | | | | | | |
| 225.0 | | Very dense, brown, fine to coarse SAND, trace silt | SP | | | | | | |
| 70.10 | | | | | | | | | |
| 230.0 | | | | - | 26 | DO | Air Hammer | 6/6 | |
| | | Very dense, brown, fine to coarse SAND, some fine to coarse gravel, some silt, trace clay to silty, fine to coarse SAND, some fine to coarse gravel, trace clay | SM | | | | | | |
| | | | | - | 27 | DO | Air Hammer | 4/4 | |
| | | | | - | 28 | DO | Air Hammer | 0/4 | |
| 77.72 | | | | | | | | | |
| 255.0 | | Stiff to hard, brown, SILT, some clay | ML | | | | | | |
| 79.25 | | | | | | | | | |
| 260.0 | | CONTINUED | | | | | | | |

Grout (to surface) 70.10

Bentonite Clay Seal 230.0 – 71.32

2" Solid PVC Pipe to Surface

Pea Gravel 234.0 – 73.15

2" Slotted PVC Pipe

Pea Gravel 240.0 – 76.20

(to bottom of boring) 250.0

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked JCB

COOR. N113415 ft. (N34569m)
E2284420 ft. (E696292m)

# BORING LOG G41-G15



SURFACE ELEV. 1691.5 ft. (515.56m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 4/2/79 DATE COMPLETED 4/9/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS. | BLOWS / FOOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES HAMMER BLOWS PER 6 IN. (Note 1) | SAMPLES REC./ATT. (ins.) | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| 79.25 | | CONTINUED | | | | | | | |
| 260.0 | | Stiff to hard, brown, SILT, some clay | ML | - | 29 | DO | Air Hammer | 4/4 | |
| 82.30 | | | | | | | | | |
| 270.0 | | | | - | 30 | DO | Air Hammer | 3/3 | |
| | | Very dense, brown, silty, fine to coarse SAND to stiff to hard, brown, SILT with some fine to coarse sand, weathered green gravel throughout | SM to ML | - | 31 | DO | Air Hammer | 4/4 | |
| 88.39 | | | | | | | | | |
| 290.0 | | CONTINUED | | | | | | | |

Job No 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked JCB

COOR. N113415 ft. (N34569m)
E2284420 ft (E696292m)

# BORING LOG G41-G15

SHEET 9 OF 10

SURFACE ELEV. 1691.5 ft. (515.56m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 4/2/79 DATE COMPLETED 4/9/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS. | BLOWS / FOOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES HAMMER BLOWS PER 6IN. (Note 1) | SAMPLES REC./ATT. (ins.) | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| 88.39 | | CONTINUED | | | | | | | |
| 290.0 | | | | - | 32 | DO | Air Hammer | 0/3 | |
| | | Very dense, brown, silty, fine to coarse SAND to stiff to hard, brown, SILT with some fine to coarse sand, weathered green gravel throughout | SM to ML | - | 33 | DO | Air Hammer | 2/2 | |
| | | | | - | 34 | DO | Air Hammer | 2/2 | |
| 97.54 | | | | | | | | | |
| 320.0 | | CONTINUED | | | | | | | |

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked

COOR. N113415 ft. (N34569m)
E228442C ft (E696292m)

# BORING LOG G41-G15



SURFACE ELEV. 1691.5 ft. (515.56m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 4/2/79 DATE COMPLETED 4/9/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS. | BLOWS / FOOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES HAMMER BLOWS PER 6 IN. (Note 1) | SAMPLES REC./ATT. (ins.) | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| 97.54 | | CONTINUED | | | | | | | |
| 320.0 | | Very dense, brown, silty, fine to coarse SAND to stiff to hard, brown, SILT with some fine to coarse sand, weathered green gravel throughout | SM to ML | | | | | | |
| 99.06 | | | | | | | | | |
| 325.0 | | Green, residual CLAY and weathered metavolcanic TUFF | | - | | | Drill Cuttings | - | |
| 103.02 | | | | | | | | | |
| 338.0 | | END OF BORING | | | | | | | |

NOTES

1. Penetration Test - 3" O.D. sampler driven with air hammer. (All samples)
2. Elevation of top of protector pipe, 1694.2 ft. (516.40m).

Table of Water Level Readings by Date. Readings Indicate Depth Below Ground Surface.

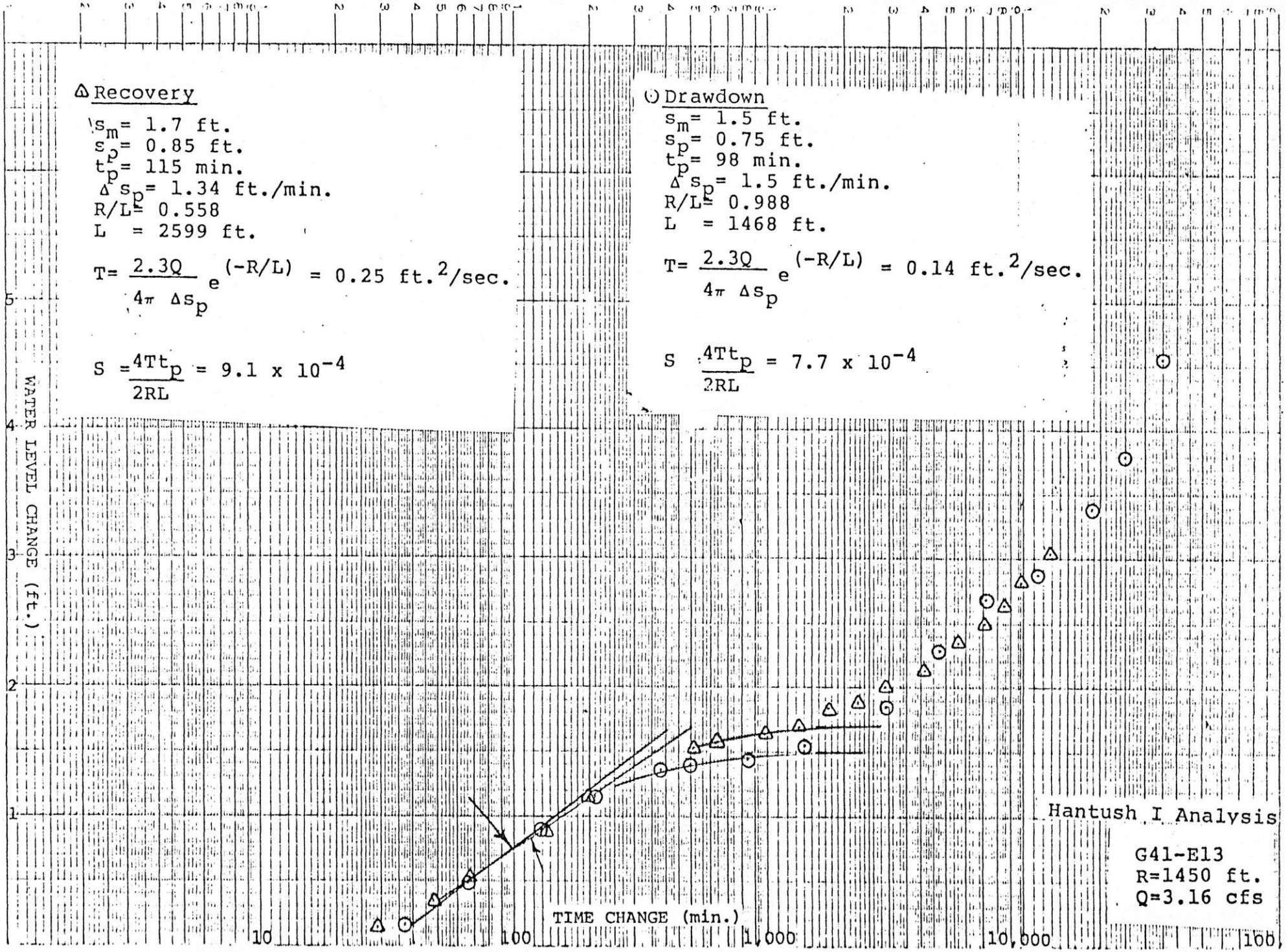
| DATE | 4/18/79 | 11/12/79 | 12/3/79 | 4/25/80 | 5/20/80 | 5/26/80* | 9/10/80* |
|---|---|---|---|---|---|---|---|
| DEPTH (m) | 30.39 | 29.60 | 29.38 | 29.44 | 29.44 | 29.66 | 30.21 |
| DEPTH (ft.) | 99.7 | 97.1 | 96.4 | 96.6 | 96.6 | 97.3 | 99.1 |

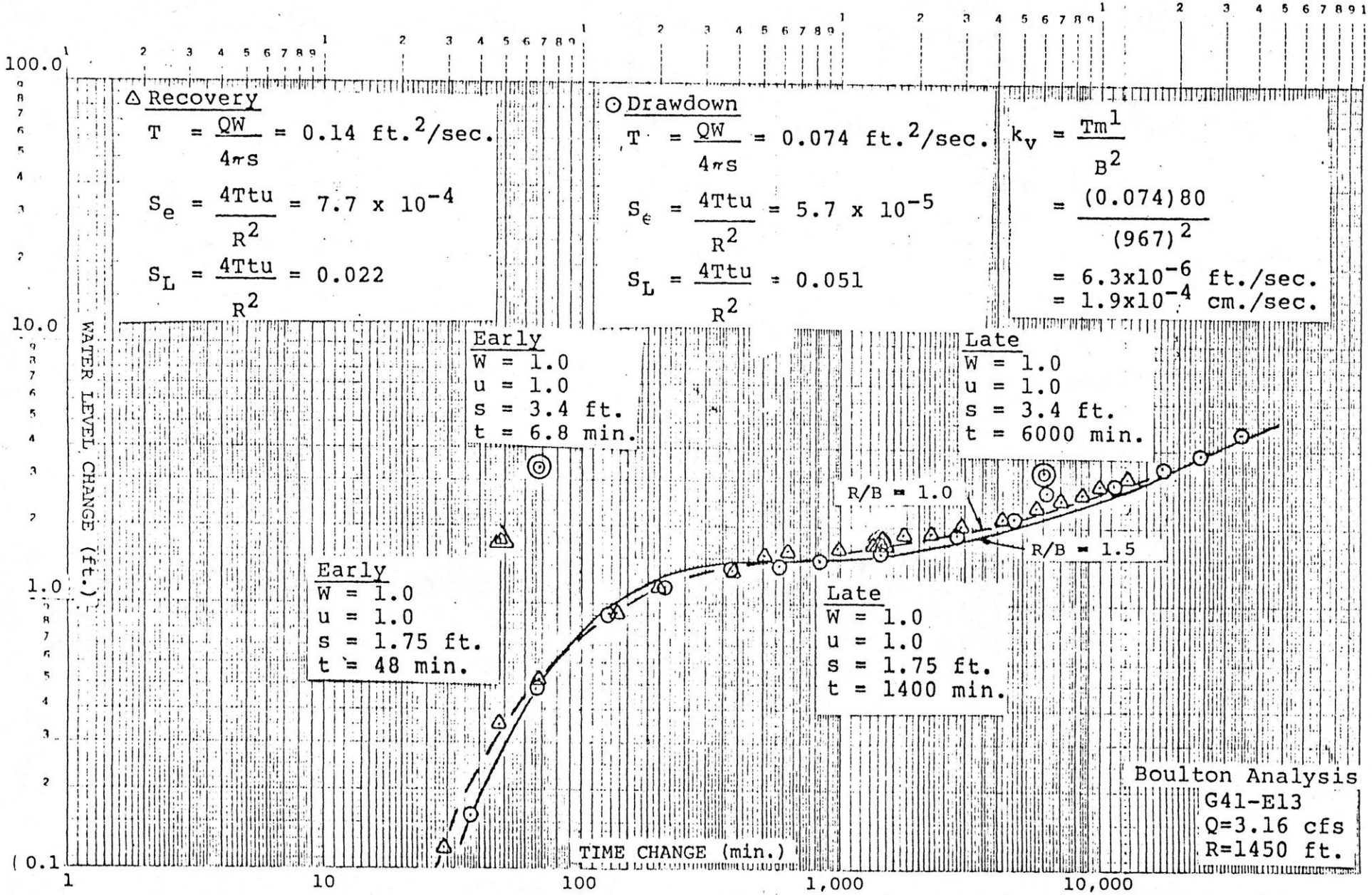
*Pump Test and Recovery Period Between these Dates. For Pump Test Data, Refer to PUMP TEST AND ANALYSIS, Project Report No. 4.

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked RCB


Recovery
$s_m$ = 1.7 ft.
$s_p$ = 0.85 ft.
$t_p$ = 115 min.
$\Delta s_p$ = 1.34 ft./min.
R/L = 0.558
L = 2599 ft.
$T = \frac{2.3Q}{4\pi \Delta s_p} e^{(-R/L)} = 0.25$ ft.$^2$/sec.
$S = \frac{4Tt_p}{2RL} = 9.1 \times 10^{-4}$
Drawdown
$s_m$ = 1.5 ft.
$s_p$ = 0.75 ft.
$t_p$ = 98 min.
$\Delta s_p$ = 1.5 ft./min.
R/L = 0.988
L = 1468 ft.
$T = \frac{2.3Q}{4\pi \Delta s_p} e^{(-R/L)} = 0.14$ ft.$^2$/sec.
$S = \frac{4Tt_p}{2RL} = 7.7 \times 10^{-4}$
WATER LEVEL CHANGE (ft.)
1
2
3
4
5
TIME CHANGE (min.)
10
100
1,000
10,000
100,000
Hantush I Analysis
G41-E13
R=1450 ft.
Q=3.16 cfs


△ Recovery
T = QW/4πs = 0.14 ft.²/sec.
S_e = 4Ttu/R² = 7.7 x 10⁻⁴
S_L = 4Ttu/R² = 0.022
⊙ Drawdown
T = QW/4πs = 0.074 ft.²/sec.
S_e = 4Ttu/R² = 5.7 x 10⁻⁵
S_L = 4Ttu/R² = 0.051
k_v = Tm'/B²
= (0.074)80/(967)²
= 6.3x10⁻⁶ ft./sec.
= 1.9x10⁻⁴ cm./sec.
Early
W = 1.0
u = 1.0
s = 3.4 ft.
t = 6.8 min.
Late
W = 1.0
u = 1.0
s = 3.4 ft.
t = 6000 min.
R/B = 1.0
R/B = 1.5
Early
W = 1.0
u = 1.0
s = 1.75 ft.
t = 48 min.
Late
W = 1.0
u = 1.0
s = 1.75 ft.
t = 1400 min.
Boulton Analysis
G41-E13
Q=3.16 cfs
R=1450 ft.
WATER LEVEL CHANGE (ft.)
TIME CHANGE (min.)
100.0
10.0
1.0
0.1
1
10
100
1,000
10,000

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***E13 ***

| DATE DDMONYY | TIME HHMM.SS | FIRST READING FEET | SECOND READING FEET | A L G | C O N | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | COLLAR ELEV 1629.45 FEET PIEZO ELEV 0.00 -NULL- |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 17APR79 | 1425.00 | 37.40 | 0.00 | 1 | 20 | -629020.00 | 1592.05 | |
| 17APR79 | 1425.00 | 37.40 | 0.00 | 1 | 20 | -629020.00 | 1592.05 | |
| | | | | | | | | CORRECT TO COLLAR TOP |
| 07NOV79 | 1210.00 | 33.55 | 0.00 | 1 | 20 | -335395.00 | 1595.90 | GROUND SURFACE-CORR. TO |
| 02JAN80 | 1200.00 | 34.00 | 0.00 | 1 | 20 | -254765.00 | 1595.45 | BY D&M |
| 25APR80 | 1200.00 | 34.95 | -.09 | 1 | 14 | -90605.00 | 1594.59 | CORRECT TO COLLAR TOP |
| 22MAY80 | 1200.00 | 34.95 | -.04 | 1 | 14 | -51725.00 | 1594.54 | 14 - TIME NOT RECORD |
| 08JUN80 | 915.00 | 35.29 | 0.00 | 1 | 64 | -27410.00 | 1594.25 | 14 - NO TIME |
| 09JUN80 | 945.00 | 34.93 | 0.00 | 1 | 64 | -25940.00 | 1594.61 | 4 14 |
| 10JUN80 | 1025.00 | 35.10 | 0.00 | 1 | 64 | -24460.00 | 1594.44 | 4 14 |
| 11JUN80 | 1000.00 | 35.25 | 0.00 | 1 | 64 | -23045.00 | 1594.29 | 4 14 |
| 12JUN80 | 950.00 | 35.10 | 0.00 | 1 | 64 | -21615.00 | 1594.44 | 14 14 |
| 13JUN80 | 850.00 | 34.94 | 0.00 | 1 | 64 | -20235.00 | 1594.60 | 14 14 |
| 14JUN80 | 1015.00 | 34.50 | 0.00 | 1 | 64 | -18710.0 | 1595.04 | 14 14 |
| 15JUN80 | 920.00 | 35.08 | 0.00 | 1 | 64 | -17325.0 | 1594.46 | 4 14 |
| 16JUN80 | 805.00 | 35.18 | 0.00 | 1 | 64 | -15960.( | 1594.36 | 4 14 |
| 24JUN80 | 820.00 | 35.11 | 0.00 | 1 | 64 | -4425.00 | 1594.43 | 4 14 |
| 25JUN80 | 915.00 | 35.07 | 0.00 | 1 | 64 | -2930.00 | 1594.47 | 4 14 |
| 26JUN80 | 930.00 | 35.07 | 0.00 | 1 | 64 | -1475.00 | 1594.47 | 4 14 |
| 27JUN80 | 850.00 | 34.92 | 0.00 | 1 | 10 | -75.00 | 1594.33 | 4 14 |
| 27JUN80 | 1042.00 | 35.08 | 0.00 | 1 | 10 | 37.00 | 1594.17 | 10 10 |
| 27JUN80 | 1111.00 | 35.40 | 0.00 | 1 | 10 | 66.00 | 1593.85 | 10 10 START,a 10 |
| 27JUN80 | 1213.00 | 35.83 | 0.00 | 1 | 10 | 128.00 | 1593.42 | 10 10 |
| 27JUN80 | 1335.00 | 36.08 | 0.00 | 1 | 10 | 210.00 | 1593.17 | 10 10 |
| 27JUN80 | 1513.00 | 36.25 | 0.00 | 1 | 10 | 308.00 | 1593.00 | 14 10 |
| 27JUN80 | 1623.00 | 36.29 | 0.00 | 1 | 10 | 378.00 | 1592.96 | 10 10 |
| 27JUN80 | 1813.00 | 36.32 | 0.00 | 1 | 10 | 488.00 | 1592.93 | 10 10 |
| 27JUN80 | 2004.00 | 36.35 | 0.00 | 1 | 10 | 599.00 | 1592.90 | 10 10 |
| 27JUN80 | 2207.00 | 36.37 | 0.00 | 1 | 10 | 722.00 | 1592.88 | 10 10 |
| 27JUN80 | 2349.00 | 36.38 | 0.00 | 1 | 10 | 824.00 | 1592.87 | 10 10 |
| 28JUN80 | 206.00 | 36.42 | 0.00 | 1 | 10 | 961.00 | 1592.83 | 4 10 |
| 28JUN80 | 611.00 | 36.50 | 0.00 | 1 | 10 | 1206.00 | 1592.75 | 10 10 |
| 28JUN80 | 932.00 | 36.49 | 0.00 | 1 | 10 | 1407.00 | 1592.76 | 10 10 |
| 28JUN80 | 1314.00 | 36.61 | 0.00 | 1 | 10 | 1629.00 | 1592.64 | 10 10 |
| 28JUN80 | 1608.00 | 36.65 | 0.00 | 1 | 10 | 1803.00 | 1592.60 | 10 10 |
| 28JUN80 | 1906.00 | 36.67 | 0.00 | 1 | 10 | 1981.00 | 1592.58 | 10 10 |
| 28JUN80 | 2341.00 | 36.74 | 0.00 | 1 | 10 | 2256.00 | 1592.51 | 10 10 |
| 29JUN80 | 657.00 | 36.78 | 0.00 | 1 | 10 | 2812.00 | 1592.47 | 10 10 |
| 29JUN80 | 1707.00 | 36.98 | 0.00 | 1 | 10 | 3502.00 | 1592.27 | 10 10 |
| 30JUN80 | 124.00 | 37.13 | 0.00 | 1 | 10 | 3799.00 | 1592.12 | 10 10 |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***E13 ***

| DATE | TIME | FIRST READING | SECOND READING | A L G | C O N | TIME SINCE TEST BEGAN | WATER LEVEL ELEVATION | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| DDMONYY | HHMM.SS | FEET | FEET | | | MINUTES | FEET | |
| 30JUN80 | 757.00 | 37.18 | 0.00 | 1 | 64 | 4192.00 | 1592.36 | 14 14 |
| 30JUN80 | 1623.00 | 37.51 | 0.00 | 1 | 64 | 4698.00 | 1592.03 | 14 14 |
| 01JUL80 | 724.00 | 37.21 | 0.00 | 1 | 10 | 5599.00 | 1592.04 | 10 10 |
| 01JUL80 | 1723.00 | 37.66 | 0.00 | 1 | 64 | 6198.00 | 1591.88 | 16 14 |
| 02JUL80 | 138.00 | 37.52 | 0.00 | 1 | 10 | 6693.00 | 1591.73 | 10 10 |
| 02JUL80 | 2059.00 | 37.89 | 0.00 | 1 | 64 | 7854.00 | 1591.65 | 16 14 |
| 03JUL80 | 945.00 | 37.89 | 0.00 | 1 | 64 | 8620.00 | 1591.65 | 16 14 |
| 03JUL80 | 2026.00 | 37.93 | 0.00 | 1 | 64 | 9261.00 | 1591.61 | 16 14 |
| 04JUL80 | 824.00 | 38.03 | 0.00 | 1 | 64 | 9979.00 | 1591.51 | 16 14 |
| 04JUL80 | 2017.00 | 38.84 | 0.00 | 1 | 11 | 10692.00 | 1591.57 | 11 11 |
| 05JUL80 | 755.00 | 38.95 | 0.00 | 1 | 11 | 11390.00 | 1591.46 | 11 11 |
| 05JUL80 | 2117.00 | 38.34 | 0.00 | 1 | 64 | 12192.00 | 1591.20 | 14 14 SINCO 1 |
| 06JUL80 | 1212.00 | 38.37 | 0.00 | 1 | 64 | 13087.00 | 1591.17 | 14 14 |
| 06JUL80 | 1812.00 | 38.30 | 0.00 | 1 | 64 | 13447.00 | 1591.24 | 14 14 |
| 07JUL80 | 857.00 | 38.29 | 0.00 | 1 | 64 | 14332.00 | 1591.25 | 14 14 |
| 07JUL80 | 1708.00 | 38.29 | 0.00 | 1 | 64 | 14823.00 | 1591.25 | 14 14 |
| 08JUL80 | 612.00 | 38.58 | 0.00 | 1 | 64 | 15727.00 | 1590.96 | 14 14 |
| 08JUL80 | 2022.00 | 38.58 | 0.00 | 1 | 64 | 16457.00 | 1590.96 | 14 14 |
| 09JUL80 | 1031.00 | 38.61 | 0.00 | 1 | 64 | 17306.00 | 1590.93 | 14 14 |
| 09JUL80 | 1641.00 | 38.57 | 0.00 | 1 | 64 | 17676.00 | 1590.97 | 14 14 |
| 10JUL80 | 1009.00 | 38.71 | 0.00 | 1 | 64 | 18724.00 | 1590.83 | 14 14 |
| 10JUL80 | 1804.00 | 38.71 | 0.00 | 1 | 64 | 19199.00 | 1590.83 | 14 14 |
| 11JUL80 | 1040.00 | 38.83 | 0.00 | 1 | 64 | 20195.00 | 1590.71 | 14 14 |
| 11JUL80 | 2001.00 | 38.88 | 0.00 | 1 | 64 | 20756.00 | 1590.66 | 14 14 |
| 12JUL80 | 1100.00 | 38.96 | 0.00 | 1 | 64 | 21655.00 | 1590.58 | 14 14 |
| 13JUL80 | 953.00 | 39.08 | 0.00 | 1 | 64 | 23028.00 | 1590.46 | 14 14 |
| 14JUL80 | 1230.00 | 39.01 | 0.00 | 1 | 64 | 24625.00 | 1590.53 | 14 14 |
| 15JUL80 | 1050.00 | 39.26 | 0.00 | 1 | 64 | 25965.00 | 1590.28 | 14 14 |
| 16JUL80 | 1051.00 | 39.27 | 0.00 | 1 | 64 | 27406.00 | 1590.27 | 14 14 |
| 17JUL80 | 944.00 | 39.49 | 0.00 | 1 | 64 | 28779.00 | 1590.05 | 14 14 |
| 18JUL80 | 903.00 | 39.50 | 0.00 | 1 | 64 | 30178.00 | 1590.04 | 14 14 |
| 20JUL80 | 911.00 | 39.60 | 0.00 | 1 | 64 | 33066.00 | 1589.94 | 14 14 |
| 21JUL80 | 801.00 | 39.78 | 0.00 | 1 | 64 | 34436.00 | 1589.76 | 14 14 |
| 21JUL80 | 802.00 | 41.72 | -1.91 | 1 | 15 | 34437.00 | 1669.69 | 15 15 |

**COMMENTS**
COLLAR ELEV 1629.45 FEET PIEZO ELEV 0.00 -NULL
TIME PUMP TEST BEGAN = 27JUN80-1005.00

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***E13 ***

| DATE DDMONYY | TIME HHMM.SS | FIRST READING FEET | SECOND READING FEET | ALOG | CON | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | COLLAR ELEV 1629.45 FEET PIEZO ELEV 0.00 -NULL |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 21JUL80 | 1010.00 | 39.79 | 0.00 | 1 | 64 | 34565.00 | 1589.75 | 14 14 START @ 10 |
| 21JUL80 | 1034.00 | 39.66 | 0.00 | 1 | 64 | 34589.00 | 1589.88 | 14 14 |
| 21JUL80 | 1053.00 | 39.43 | 0.00 | 1 | 64 | 3460[illegible] | 1590.11 | 14 14 |
| 21JUL80 | 1113.00 | 39.27 | 0.00 | 1 | 64 | 3462[illegible] | 1590.27 | 14 14 |
| 21JUL80 | 1133.00 | 39.19 | 0.00 | 1 | 64 | 34648. | 1590.35 | 14 14 |
| 21JUL80 | 1159.00 | 39.02 | 0.00 | 1 | 64 | 34674. | 1590.52 | 14 14 |
| 21JUL80 | 1220.00 | 38.87 | 0.00 | 1 | 64 | 34695.[illegible] | 1590.67 | 14 14 |
| 21JUL80 | 1243.00 | 38.74 | 0.00 | 1 | 64 | 34718.00 | 1590.80 | 14 14 |
| 21JUL80 | 1303.00 | 38.69 | 0.00 | 1 | 64 | 34738.00 | 1590.85 | 14 14 |
| 21JUL80 | 1325.00 | 38.63 | 0.00 | 1 | 64 | 34760.00 | 1590.9[illegible] | 14 14 |
| 21JUL80 | 1351.00 | 38.55 | 0.00 | 1 | 64 | 34786.00 | 1590.9[illegible] | 14 14 |
| 21JUL80 | 1412.00 | 38.49 | 0.00 | 1 | 64 | 34807.00 | 1591.05 | 14 14 |
| 21JUL80 | 1458.00 | 38.43 | 0.00 | 1 | 64 | 34853.00 | 1591.11 | 14 14 |
| 21JUL80 | 1627.00 | 38.43 | 0.00 | 1 | 64 | 34942.00 | 1591.11 | 14 14 |
| 21JUL80 | 1737.00 | 38.40 | 0.00 | 1 | 64 | 35012.00 | 1591.14 | 14 14 |
| 21JUL80 | 1837.00 | 38.26 | 0.00 | 1 | 64 | 35072.00 | 1591.28 | 14 14 |
| 21JUL80 | 1935.00 | 38.24 | 0.00 | 1 | 64 | 35130.00 | 1591.30 | 14 14 |
| 21JUL80 | 2027.00 | 38.20 | 0.00 | 1 | 64 | 35182.00 | 1591.34 | 14 14 |
| 21JUL80 | 2145.00 | 38.18 | 0.00 | 1 | 64 | 35260.00 | 1591.36 | 14 14 |
| 21JUL80 | 2302.00 | 38.17 | 0.00 | 1 | 64 | 35337.00 | 1591.37 | 14 14 |
| 22JUL80 | 50.00 | 38.11 | 0.00 | 1 | 64 | 35445.00 | 1591.43 | 14 14 |
| 22JUL80 | 254.00 | 38.09 | 0.00 | 1 | 64 | 35569.00 | 1591.45 | 14 14 |
| 22JUL80 | 442.00 | 38.07 | 0.00 | 1 | 64 | 35677.00 | 1591.47 | 14 14 |
| 22JUL80 | 818.00 | 38.05 | 0.00 | 1 | 64 | 35893.00 | 1591.49 | 14 14 |
| 22JUL80 | 1154.00 | 37.99 | 0.00 | 1 | 64 | 36109.00 | 1591.55 | 14 14 |
| 22JUL80 | 1612.00 | 37.93 | 0.00 | 1 | 64 | 36367.00 | 1591.61 | 14 14 |
| 22JUL80 | 1916.00 | 37.88 | 0.00 | 1 | 64 | 36551.00 | 1591.66 | 14 14 |
| 23JUL80 | 41.00 | 37.88 | 0.00 | 1 | 64 | 36876.00 | 1591.66 | 14 14 |
| 23JUL80 | 354.00 | 37.85 | 0.00 | 1 | 64 | 37069.00 | 1591.69 | 14 14 |
| 23JUL80 | 1143.00 | 35.00 | 2.81 | 1 | 64 | 37538.00 | 1591.73 | 14 14 |
| 23JUL80 | 1937.00 | 35.00 | 2.72 | 1 | 64 | 38012.00 | 1591.82 | 14 14 |
| 24JUL80 | 920.00 | 35.00 | 2.73 | 1 | 64 | 38835.00 | 1591.81 | 14 14 |
| 24JUL80 | 1732.00 | 35.00 | 2.58 | 1 | 64 | 39327.00 | 1591.96 | 14 14 |
| 25JUL80 | 1030.00 | 35.00 | 2.61 | 1 | 64 | 40345.00 | 1591.93 | 14 14 |
| 25JUL80 | 1716.00 | 35.00 | 2.60 | 1 | 64 | 40751.00 | 1591.94 | 14 14 |
| 26JUL80 | 1030.00 | 35.00 | 2.52 | 1 | 64 | 41785.00 | 1592.02 | 14 14 |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/29.- 21.24.33.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***E13 ***

| DATE | TIME | FIRST READING | SECOND READING | A L G | C O N | TIME SINCE TEST BEGAN | WATER LEVEL ELEVATION | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| DDMONYY | HHMM.SS | FEET | FEET | | | MINUTES | FEET | |
| | | | | | | | | COLLAR ELEV 1629.45 FEET PIEZO ELEV 0.00 -NULL- |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 27JUL80 | 1030.00 | 30.00 | 9.64 | 1 | 83 | 43225.00 | 1592.10 | 15 BY D. K. TO 9/2/80 |
| 28JUL80 | 950.00 | 30.00 | 9.55 | 1 | 83 | 44625.00 | 1592.19 | 15 BY D. K. TO 9/2/80 |
| 29JUL80 | 830.00 | 30.00 | 9.56 | 1 | 83 | 45985.00 | 1592.18 | 15 BY D. K. TO 9/2/80 |
| 30JUL80 | 1035.00 | 30.00 | 9.47 | 1 | 83 | 47550.00 | 1592.27 | 15 BY D. K. TO 9/2/80 |
| 31JUL80 | 1400.00 | 30.00 | 9.45 | 1 | 83 | 49195.00 | 1592.29 | 15 BY D. K. TO 9/2/80 |
| 01AUG80 | 1310.00 | 30.00 | 9.40 | 1 | 83 | 50585.00 | 1592.34 | 15 BY D. K. TO 9/2/80 |
| 03AUG80 | 725.00 | 30.00 | 9.37 | 1 | 83 | 53120.00 | 1592.37 | 4 15 |
| 05AUG80 | 1400.00 | 30.00 | 9.34 | 1 | 83 | 56395.00 | 1592.40 | 4 15 |
| 07AUG80 | 1400.00 | 30.00 | 9.26 | 1 | 83 | 59275.00 | 1592.48 | 4 15 |
| 09AUG80 | 905.00 | 30.00 | 9.23 | 1 | 83 | 61860.00 | 1592.51 | 4 15 |
| 12AUG80 | 1420.00 | 30.00 | 9.17 | 1 | 83 | 66495.00 | 1592.57 | 4 15 |
| 14AUG80 | 1055.00 | 30.00 | 9.15 | 1 | 83 | 69170.00 | 1592.59 | 4 15 |
| 16AUG80 | 1205.00 | 30.00 | 9.17 | 1 | 83 | 72120.00 | 1592.57 | 4 15 |
| 20AUG80 | 1400.00 | 39.02 | 0.00 | 1 | 83 | 77995.00 | 1592.72 | 15 |
| 22AUG80 | 1230.00 | 39.23 | 0.00 | 1 | 83 | 80785.00 | 1592.51 | 15 |
| 02SEP80 | 815.00 | 38.99 | 0.00 | 1 | 83 | 96370.00 | 1592.75 | 15 |
| 11SEP80 | 1700.00 | 36.58 | 0.00 | 1 | 15 | 109855.00 | 1592.87 | 15 FOR G.W. MAP |

COOR. N114395 ft. (N34868m)
E2282890 ft. (E695826m)

# BORING LOG G41-E13

SHEET 1 OF 8

SURFACE ELEV. 1627.3 ft. (496.00m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 2/25/79 DATE COMPLETED 3/6/79

DRILL RIG Joy 12B DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS. | BLOWS / FOOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES HAMMER BLOWS PER 6IN. (Note 1) | SAMPLES REC./ATT. (ins.) | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| 0.30 | | Topsoil and rootmat | | - | 1 | AS | - | - | |
| 1.0 | | Compact to very dense, brown to light brown, fine to coarse SAND, some silt, some fine gravel, occasional cobbles | SM | 27 | 2 | DO | 4-14-13 | 18/18 | |
| | | | | 35 | 3 | DO | 12-11-24 | 18/18 | |
| | | | | 148 | 4 | DO | 48-100 | 12/12 | |
| | | | | 169 | 5 | DO | 24-57-112 | 16/18 | |
| | | | | 156 | 6 | DO | 27-60-96 | 16/18 | |
| | | | | 165 | 7 | DO | 50-65-100 | 16/18 | |
| | | | | | | | | | ▼ 4/17/79 10.73 |
| | | | | 115 | 8 | DO | 30-55-60 | 13/18 | 35.2 |
| 11.28 | | | | | | | | | |
| 37.0 | | CONTINUED | | | | | | | |

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked JCB

COOR. N114395 ft. (N34868m)
E2282890 ft. (E695826m)

# BORING LOG G41-E13

SHEET 2 OF 8

SURFACE ELEV. 1627.3 ft (496.00m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 2/25/79 DATE COMPLETED 3/6/79

DRILL RIG Joy 12B DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS | BLOWS / FOOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES HAMMER BLOWS PER 6IN. (Note 1) | SAMPLES REC./ATT. (ins.) | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| | | CONTINUED | | | | | | | |
| 11.28 / 37.0 | | | | | | | | | |
| | | | | 145 | 9 | DO | 62-62-83 | 10/18 | |
| | | | | 87 | 10 | DO | 30-37-50 | 12/18 | |
| | | Very dense, red-brown, fine to coarse SAND and fine GRAVEL, trace silt, trace clay to fine to coarse gravelly, fine to coarse SAND, some silt, trace clay, occasional boulders | | 200/5" | 11 | DO | 200/5" | 5/6 | |
| | | | SP-SM to SM | 210/10" | 12 | DO | 110-100/4" | 9/10 | |
| | | | | 200/9" | 13 | DO | 100-100/3" | 8/9 | |
| | | | | 125/6" | 14 | DO | 125/6" | 6/6 | |
| | | | | 180/9" | 15 | DO | 80-100/3" | 9/9 | |
| 21.95 / 72.0 | | CONTINUED | | | | | | | |

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked DB

COOR. N114395 ft. (N34868m)
E2282890 ft. (E695826m)

# BORING LOG G41-E13



SURFACE ELEV. 1627.3 ft. (496.00m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 2/25/79 DATE COMPLETED 3/6/79

DRILL RIG Joy 12B DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS | BLOWS / FOOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES HAMMER BLOWS PER 6IN. (Note 1) | SAMPLES REC./ATT. (ins.) | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| 21.95 | | CONTINUED | | | | | | | |
| 72.0 | | Very dense, red-brown, fine to coarse SAND and fine GRAVEL, trace silt, trace clay to fine to coarse gravelly, fine to coarse SAND, some silt, trace clay, occasional boulders | SP-SM to SM | 190/8" | 16 | DO | 90-100/2" | 8/8 | |
| | | | | 180/11" | 17 | DO | 80-100/5" | 8/11 | |
| | | | | 200/10" | 18 | DO | 100-100/4" | 8/10 | |
| | | | | 165/6" | 19 | DO | 165/6" | 6/6 | |
| 28.19 | | | | | | | | | |
| 92.5 | | Very dense, red-brown to light brown, fine to coarse SAND, some silt, trace fine gravel, trace clay, occasional silty sand layers | SM | 167 | 20 | DO | 78-75-92 | 16/18 | |
| | | | | 170/8" | 21 | DO | 70-100/2" | 8/8 | |
| 31.70 | | | | | | | | | |
| 104.0 | | CONTINUED | | | | | | | |

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked ACB

COOR. N114395 ft. (N34868m)
E2282890 ft. (E695826m)

# BORING LOG G41-E13



SURFACE ELEV. 1627.3 ft. (496.00m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 2/25/79 DATE COMPLETED 3/6/79

DRILL RIG Joy 12B DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS | BLOWS / FOOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES HAMMER BLOWS PER 6IN. (Note 1) | SAMPLES REC./ATT. (ins.) | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| 31.70 | | CONTINUED | | | | | | | |
| 104.0 | | Very dense, red-brown to light brown, fine to coarse SAND, some silt, trace fine gravel, trace clay, occasional silty sand layers | SM | 175 | 22 | DO | 75-100 | 12/12 | |
| | | | | 185/8" | 23 | DO | 85-100/2" | 7/8 | |
| 38.10 | | | | | | | | | |
| 125.0 | | Very dense, red-brown to light brown, fine to coarse SAND, trace silt | SP to SP-SM | 105 | 24 | DO | 27-35-70 | 12/18 | |
| 41.15 | | | | | | | | | |
| 135.0 | | CONTINUED | | | | | | | |

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked JCB

COOR. N114395 ft. (N34868m)
E2282890 ft. (E695826m)

# BORING LOG G41-E13



SURFACE ELEV. 1627.3 ft. (496.00m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 2/25/79 DATE COMPLETED 3/6/79

DRILL RIG Joy 12B DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS | BLOWS/FOOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES HAMMER BLOWS PER 6 IN. (Note 1) | SAMPLES REC./ATT. (ins.) | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| 41.15 | | CONTINUED | | | | | | | |
| 135.0 | | | | 190 | 25 | DO | 40-150 | 10/12 | |
| | | Very dense, red-brown to light brown, fine to medium SAND, trace silt | SP to SP-SM | 270 | 26 | DO | 70-200 | 12/12 | |
| | | | | 190 | 27 | DO | 50-140 | 0/12 | |
| 51.21 | | | | | | | | | |
| 168.0 | | CONTINUED | | | | | | | |

COOR. N114395 ft. (N34868m)
E2282890 ft. (E695826m)

# BORING LOG G41-E13



SURFACE ELEV. 1627.3 ft. (496.00m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 2/25/79 DATE COMPLETED 3/6/79

DRILL RIG Joy 12B DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS. | BLOWS / FOOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES HAMMER BLOWS PER 6IN. (Note 1) | SAMPLES REC./ATT. (ins.) | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| 51.21 | | CONTINUED | | | | | | | |
| 168.0 | | | | 215 9' | 28 | DO | 115-100/3 | 9/9 | |
| | | Very dense, red-brown to light brown fine to medium SAND, trace silt | SP to SP-SM | 251 | 29 | DO | 85-166 | 12/12 | |
| | | | | 185 | 30 | DO | 45-140 | 12/12 | |
| 60.35 | | | | | | | | | |
| 198.0 | | CONTINUED | | | | | | | |

Job No. 786035
Scale 1"=5'

Golder Associates

Drawn jls
Checked JCB

COOR. N114395 ft. (N34868m)
E2282890 ft. (E695826m)

# BORING LOG G41-E13

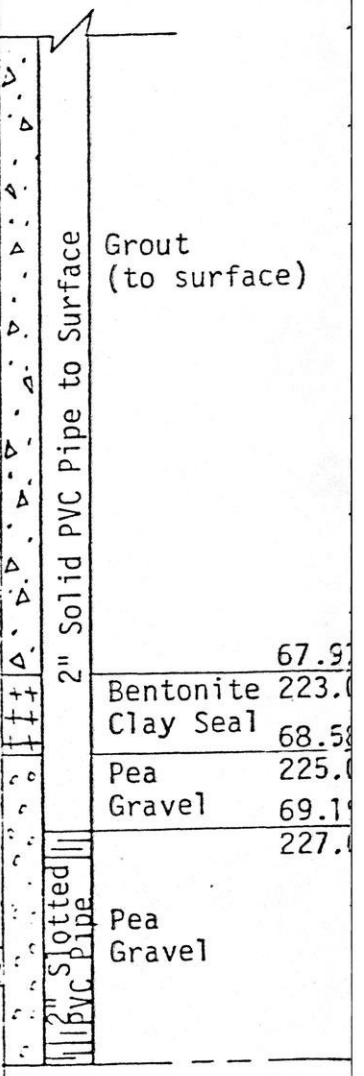


SURFACE ELEV. 1627.3 ft. (496.00m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 2/25/79 DATE COMPLETED 3/6/79

DRILL RIG Joy 12B DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS | BLOWS / FOOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES HAMMER BLOWS PER 6 IN. (Note 1) | SAMPLES REC./ATT. (ins.) | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| 60.35 | | CONTINUED | | | | | | | |
| 198.0 | | Very dense, red-brown to light brown, fine to medium SAND, trace silt | SP to SP-SM | 210 | 31 | DO | 80-130 | 12/12 | |
| | | | | 275 | 32 | DO | 75-200 | 12/12 | |
| 67.06 | | | | | | | | | |
| 220.0 | | Very dense, red-brown to light brown, fine to coarse SAND, some fine to coarse gravel, trace silt, occasional cobbles | SP-SM to SM | 180 | 33 | DO | 60-120 | 12/12 | |
| 68.88 | | | | | | | | | |
| 226.0 | | Very dense, red-brown to light brown, fine to coarse SAND, trace fine gravel, trace silt | SP-SM | 220 | 34 | DO | 50-170 | 12/12 | |
| 71.02 | | | | | | | | | |
| 233.0 | | CONTINUED | | | | | | | |




CONTINUED

Job No 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked

COOR. N114395 ft. (N34868m)
E2282890 ft. (E695826m)

# BORING LOG G41-E13

SHEET 8 OF 8

SURFACE ELEV. 1627.3 ft. (496.00m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 2/25/79 DATE COMPLETED 3/6/79

DRILL RIG Joy 12B DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS | BLOWS/FOOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES HAMMER BLOWS PER 6IN. (Note 1) | SAMPLES REC./ATT. (ins.) | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| 71.02 | | CONTINUED | | | | | | | CONTINUED |
| 233.0 | | Very dense, red-brown to light brown, fine to coarse SAND, trace fine gravel, trace silt | SP-SM | 170 / 6" | 35 | DO | 170/6" | 2/6 | 2" Slotted PVC Pipe; Pea Gravel to 72.24 |
| 73.30 | | | | | | | | | |
| 240.5 | | Green-gray, slight to highly weathered metavolcanic TUFF | | - | 36 | NX RC | - | 10/24 | Pea Gravel to 237.0 |
| | | | | - | 37 | NX RC | - | 34/36 | |
| | | | | - | 38 | RC | - | 4/6 | |
| | | | | - | 39 | NX RC | - | 54/54 | |
| 76.35 | | | | | | | | | |
| 250.5 | | END OF BORING | | | | | | | |

NOTES

1. Standard Penetration Test - Driving 2" O.D. sampler with 140 lb. hammer freely falling 30". (Samples 2 - 23)

   Penetration Test - Driving 2" O.D. sampler with 300 lb. hammer freely falling 20". (Sample 24)

   Penetration Test - Driving 3" O.D. sampler with 300 lb. hammer freely falling 20". (Samples 25 - 35)

2. Elevation of top of protector pipe, 1629.45 ft. (496.66m).

Table of Water Level Readings by Date. Readings Indicate Depth Below Ground Surface.

| DATE | 4/17/79 | 11/7/79 | 1/2/80 | 4/25/80 | 5/22/80 | 6/25/80* | 9/10/80* |
|---|---|---|---|---|---|---|---|
| DEPTH (m) | 10.73 | 9.57 | 9.69 | 10.00 | 10.00 | 10.00 | 10.49 |
| DEPTH (ft.) | 35.2 | 31.4 | 31.8 | 32.8 | 32.8 | 32.8 | 34.4 |

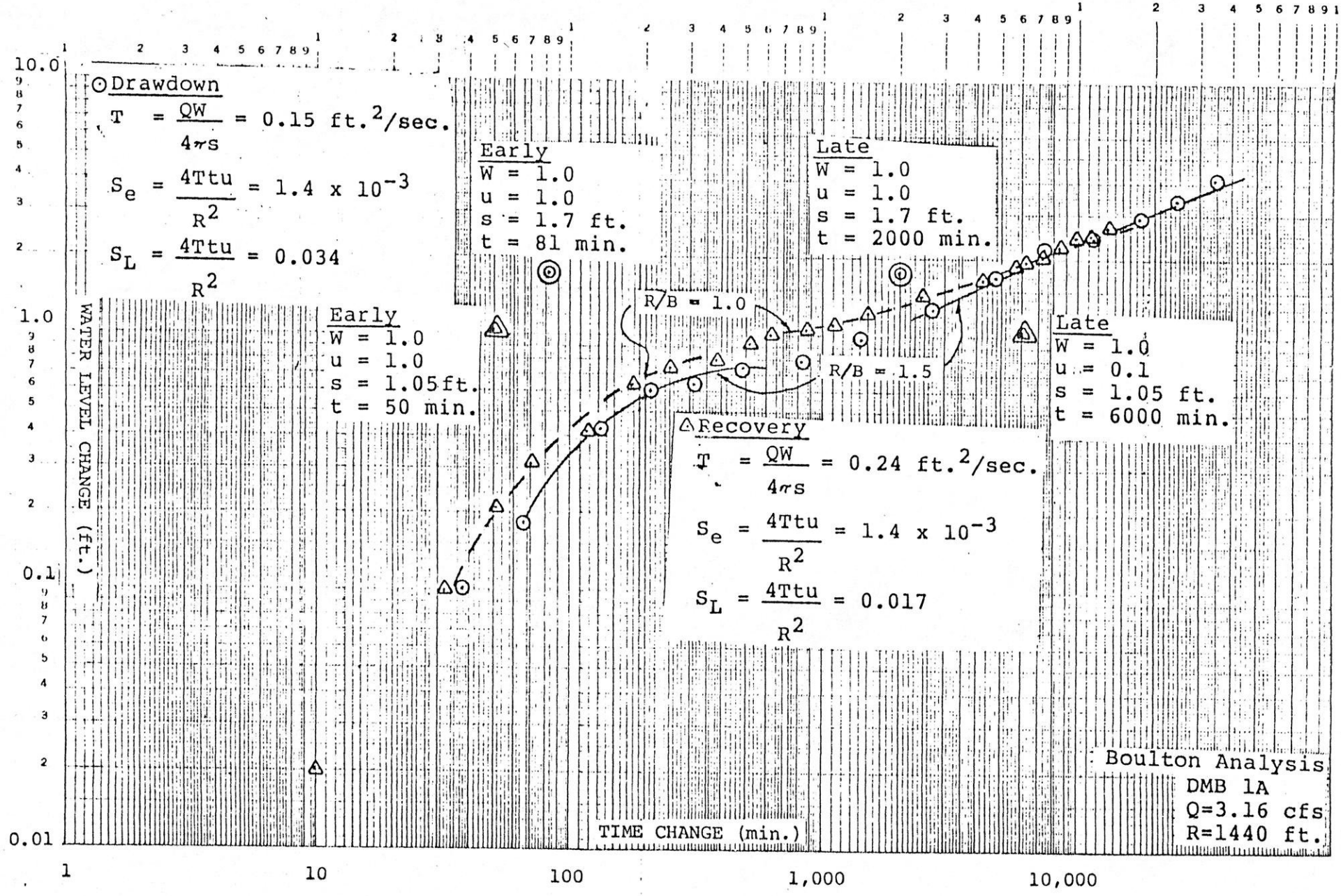
| DATE | 6/10/81 | | | | | | |
|---|---|---|---|---|---|---|---|
| DEPTH (m) | 10.64 | | | | | | |
| DEPTH (ft.) | 34.9 | | | | | | |

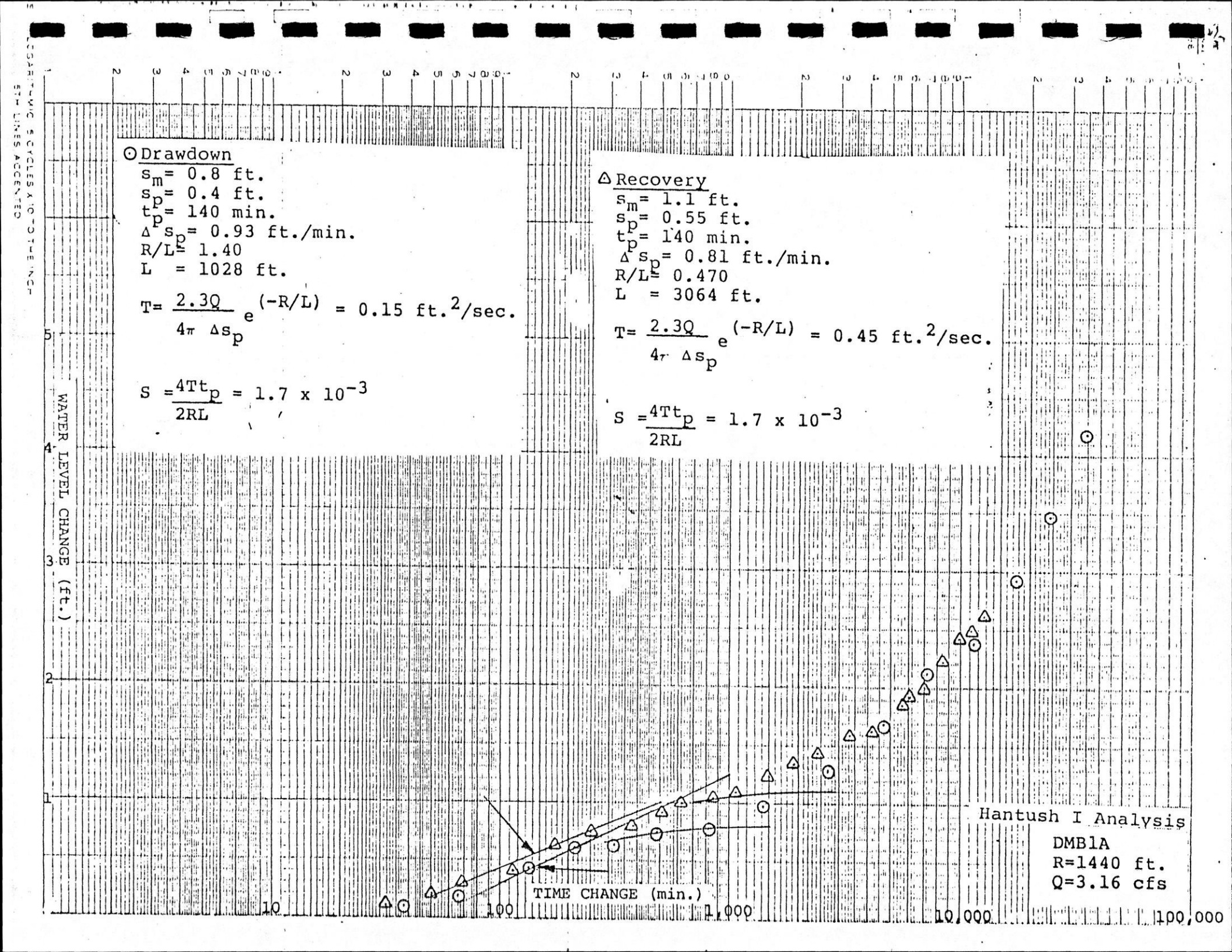
*Pump Test and Recovery Period Between these Dates. For Pump Test Data, Refer to PUMP TEST AND ANALYSIS, Project Report No. 4.

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked JCB


Drawdown
T = QW / 4πs = 0.15 ft.²/sec.
Se = 4Ttu / R² = 1.4 x 10⁻³
SL = 4Ttu / R² = 0.034
Early
W = 1.0
u = 1.0
s = 1.7 ft.
t = 81 min.
Late
W = 1.0
u = 1.0
s = 1.7 ft.
t = 2000 min.
Early
W = 1.0
u = 1.0
s = 1.05ft.
t = 50 min.
R/B = 1.0
R/B = 1.5
Late
W = 1.0
u = 0.1
s = 1.05 ft.
t = 6000 min.
Recovery
T = QW / 4πs = 0.24 ft.²/sec.
Se = 4Ttu / R² = 1.4 x 10⁻³
SL = 4Ttu / R² = 0.017
WATER LEVEL CHANGE (ft.)
TIME CHANGE (min.)
10.0
1.0
0.1
0.01
1
10
100
1,000
10,000
Boulton Analysis
DMB 1A
Q=3.16 cfs
R=1440 ft.


⊙Drawdown
$s_m$= 0.8 ft.
$s_p$= 0.4 ft.
$t_p$= 140 min.
$\Delta s_p$= 0.93 ft./min.
R/L= 1.40
L = 1028 ft.
$T = \frac{2.3Q}{4\pi \Delta s_p} e^{(-R/L)}$ = 0.15 ft.$^2$/sec.
$S = \frac{4Tt_p}{2RL}$ = 1.7 x $10^{-3}$
△Recovery
$s_m$= 1.1 ft.
$s_p$= 0.55 ft.
$t_p$= 140 min.
$\Delta s_p$= 0.81 ft./min.
R/L= 0.470
L = 3064 ft.
$T = \frac{2.3Q}{4\pi \Delta s_p} e^{(-R/L)}$ = 0.45 ft.$^2$/sec.
$S = \frac{4Tt_p}{2RL}$ = 1.7 x $10^{-3}$
WATER LEVEL CHANGE (ft.)
TIME CHANGE (min.)
10
100
1,000
10,000
100,000
Hantush I Analysis
DMB1A
R=1440 ft.
Q=3.16 cfs

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***DMB1A ***

| DATE | TIME | FIRST READING | SECOND READING | A L G | C O N | TIME SINCE TEST BEGAN | WATER LEVEL ELEVATION | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| DDMONYY | HHMM.SS | FEET | FEET | | | MINUTES | FEET | COLLAR ELEV 1629.70 FEET PIEZO ELEV 0.00 -NULL- |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 25APR80 | 1200.00 | 35.16 | -.09 | 1 | 14 | -90605.00 | 1594.63 | 14 - TIME NOT RECORD |
| 22MAY80 | 1200.00 | 35.21 | -.04 | 1 | 14 | -51725.00 | 1594.53 | 14 - NO TIME |
| 08JUN80 | 915.00 | 35.42 | 0.00 | 1 | 64 | -27410.00 | 1594.37 | 4 14 |
| 09JUN80 | 945.00 | 35.22 | 0.00 | 1 | 64 | -25940.00 | 1594.57 | 4 14 |
| 10JUN80 | 1025.00 | 35.33 | 0.00 | 1 | 64 | -24460.00 | 1594.46 | 4 14 |
| 11JUN80 | 1000.00 | 35.52 | 0.00 | 1 | 64 | -23045.00 | 1594.27 | 14 14 |
| 12JUN80 | 950.00 | 35.35 | 0.00 | 1 | 64 | -21615.00 | 1594.44 | 14 14 |
| 13JUN80 | 850.00 | 35.23 | 0.00 | 1 | 64 | -20235.00 | 1594.56 | 14 14 |
| 14JUN80 | 1015.00 | 35.23 | 0.00 | 1 | 64 | -18710.00 | 1594.56 | 4 14 |
| 15JUN80 | 920.00 | 35.35 | 0.00 | 1 | 64 | -17325.00 | 1594.44 | 4 14 |
| 16JUN80 | 805.00 | 35.47 | 0.00 | 1 | 64 | -15960.00 | 1594.32 | 4 14 |
| 24JUN80 | 820.00 | 35.39 | 0.00 | 1 | 64 | -4425.00 | 1594.40 | 4 14 |
| 25JUN80 | 915.00 | 35.34 | 0.00 | 1 | 64 | -2930.00 | 1594.45 | 4 14 |
| 26JUN80 | 930.00 | 35.36 | 0.00 | 1 | 64 | -1475.00 | 1594.43 | 4 14 |
| 27JUN80 | 845.00 | 32.40 | 0.00 | 1 | 11 | -80.00 | 1594.26 | 11 11 |
| 27JUN80 | 1043.00 | 32.50 | 0.00 | 1 | 11 | 38.00 | 1594.16 | 11 11 |
| 27JUN80 | 1113.00 | 32.58 | 0.00 | 1 | 11 | 68.00 | 1594.08 | 11 11 |
| 27JUN80 | 1217.00 | 32.83 | 0.00 | 1 | 11 | 132.00 | 1593.83 | 11 11 |
| 27JUN80 | 1337.00 | 33.00 | 0.00 | 1 | 11 | 212.00 | 1593.66 | 11 11 |
| 27JUN80 | 1515.00 | 33.03 | 0.00 | 1 | 11 | 310.00 | 1593.63 | 14 11 |
| 27JUN80 | 1624.00 | 33.13 | 0.00 | 1 | 11 | 379.00 | 1593.53 | 11 11 |
| 27JUN80 | 1617.00 | 33.13 | 0.00 | 1 | 11 | 492.00 | 1593.53 | 11 11 |
| 27JUN80 | 2005.00 | 33.12 | 0.00 | 1 | 11 | 600.00 | 1593.54 | 11 11 |
| 27JUN80 | 2210.00 | 33.17 | 0.00 | 1 | 11 | 725.00 | 1593.49 | 11 11 |
| 27JUN80 | 2351.00 | 33.18 | 0.00 | 1 | 11 | 826.00 | 1593.48 | 11 11 |
| 28JUN80 | 207.00 | 33.25 | 0.00 | 1 | 11 | 962.00 | 1593.41 | 11 11 |
| 28JUN80 | 613.00 | 33.33 | 0.00 | 1 | 11 | 1208.00 | 1593.33 | 11 11 |
| 28JUN80 | 934.00 | 33.36 | 0.00 | 1 | 11 | 1409.00 | 1593.30 | 11 11 |
| 28JUN80 | 1312.00 | 33.41 | 0.00 | 1 | 11 | 1627.00 | 1593.25 | 11 11 |
| 28JUN80 | 1606.00 | 33.52 | 0.00 | 1 | 11 | 1801.00 | 1593.14 | 11 11 |
| 28JUN80 | 1904.00 | 33.51 | 0.00 | 1 | 11 | 1979.00 | 1593.15 | 11 11 |
| 28JUN80 | 2344.00 | 33.57 | 0.00 | 1 | 11 | 2259.00 | 1593.09 | 11 11 |
| 29JUN80 | 859.00 | 33.68 | 0.00 | 1 | 11 | 2814.00 | 1592.98 | 11 11 |
| 29JUN80 | 1709.00 | 33.87 | 0.00 | 1 | 11 | 3304.00 | 1592.79 | 11 11 |
| 30JUN80 | 126.00 | 34.03 | 0.00 | 1 | 11 | 3801.00 | 1592.63 | 11 11 |
| 30JUN80 | 758.00 | 34.06 | 0.00 | 1 | 11 | 4193.00 | 1592.60 | 11 11 SINCO 1 |
| 30JUN80 | 1622.00 | 34.10 | 0.00 | 1 | 11 | 4697.00 | 1592.56 | 11 11 |
| 01JUL80 | 726.00 | 34.14 | 0.00 | 1 | 11 | 5601.00 | 1592.52 | 11 11 |
| 01JUL80 | 1721.00 | 34.31 | 0.00 | 1 | 11 | 6196.00 | 1592.35 | 11 11 |
| 02JUL80 | 140.00 | 34.43 | 0.00 | 1 | 11 | 6695.00 | 1592.23 | 11 11 |
| 02JUL80 | 1006.00 | 34.52 | 0.00 | 1 | 11 | 7201.00 | 1592.14 | 11 11 |
| 02JUL80 | 1408.00 | 34.48 | 0.00 | 1 | 11 | 7443.00 | 1592.18 | 11 11 COMPARE PIEZ. |
| 02JUL80 | 2103.00 | 34.51 | 0.00 | 1 | 11 | 7858.00 | 1592.15 | 11 11 |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***OMB1A ***

| DATE DDMONYY | TIME HHMM.SS | FIRST READING FEET | SECOND READING FEET | ALG | COM | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET | | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | **COMMENTS** |
| | | | | | | | | | COLLAR ELEV 1629.70 FEET PIEZO ELEV 0.00 -NULL- |
| | | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 03JUL80 | 947.00 | 34.54 | 0.00 | 1 | 11 | 8622.00 | 1592.12 | 11 11 | |
| 03JUL80 | 2028.00 | 34.57 | 0.00 | 1 | 11 | 9263.00 | 1592.09 | 11 11 | |
| 04JUL80 | 826.00 | 34.69 | 0.00 | 1 | 11 | 9981.00 | 1591.97 | 11 11 | |
| 04JUL80 | 2015.00 | 34.63 | 0.00 | 1 | 11 | 10690.00 | 1592.03 | 11 11 | |
| 05JUL80 | 757.00 | 34.78 | 0.00 | 1 | 11 | 11392.00 | 1591.88 | 11 11 | |
| 05JUL80 | 2118.00 | 35.00 | 0.00 | 1 | 11 | 12193.00 | 1591.66 | 11 11 | |
| 06JUL80 | 1216.00 | 38.17 | 0.00 | 1 | 64 | 13091.00 | 1591.62 | 14 14 | |
| 06JUL80 | 1815.00 | 38.09 | 0.00 | 1 | 64 | 13448.00 | 1591.70 | 14 14 | |
| 07JUL80 | 858.00 | 38.14 | 0.00 | 1 | 64 | 14333.00 | 1591.65 | 14 14 | |
| 07JUL80 | 1710.00 | 38.14 | 0.00 | 1 | 64 | 14825.00 | 1591.65 | 14 14 | |
| 08JUL80 | 814.00 | 38.40 | 0.00 | 1 | 64 | 15729.00 | 1591.39 | 14 14 | |
| 08JUL80 | 2024.00 | 38.42 | 0.00 | 1 | 64 | 16459.00 | 1591.37 | 14 14 | |
| 09JUL80 | 1033.00 | 38.46 | 0.00 | 1 | 64 | 17308.00 | 1591.33 | 14 14 | |
| 09JUL80 | 1642.00 | 38.44 | 0.00 | 1 | 64 | 17677.00 | 1591.35 | 14 14 | |
| 10JUL80 | 1011.00 | 38.55 | 0.00 | 1 | 64 | 18726.00 | 1591.24 | 14 14 | |
| 10JUL80 | 1805.00 | 38.54 | 0.00 | 1 | 64 | 19200.00 | 1591.25 | 14 14 | |
| 11JUL80 | 1040.00 | 38.68 | 0.00 | 1 | 64 | 20195.00 | 1591.11 | 14 14 | |
| 11JUL80 | 2003.00 | 38.73 | 0.00 | 1 | 64 | 20758.00 | 1591.06 | 14 14 | |
| 12JUL80 | 1102.00 | 38.82 | 0.00 | 1 | 64 | 21657.00 | 1590.97 | 14 14 | |
| 13JUL80 | 955.00 | 38.94 | 0.00 | 1 | 64 | 23030.00 | 1590.85 | 14 14 | |
| 14JUL80 | 1232.00 | 39.01 | 0.00 | 1 | 64 | 24627.00 | 1590.78 | 14 14 | |
| 15JUL80 | 1053.00 | 39.13 | 0.00 | 1 | 64 | 25968.00 | 1590.66 | 14 14 | |
| 16JUL80 | 1052.00 | 39.16 | 0.00 | 1 | 64 | 27407.00 | 1590.63 | 14 14 | |
| 17JUL80 | 946.00 | 39.34 | 0.00 | 1 | 64 | 28781.00 | 1590.45 | 14 14 | |
| 18JUL80 | 905.00 | 39.38 | 0.00 | 1 | 64 | 30180.00 | 1590.41 | 14 14 | |
| 20JUL80 | 912.00 | 39.49 | 0.00 | 1 | 64 | 33067.00 | 1590.30 | 14 14 | |
| 21JUL80 | 801.00 | 39.68 | 0.00 | 1 | 64 | 34436.00 | 1590.11 | 14 14 | |
| 21JUL80 | 803.00 | 41.54 | -1.91 | 1 | 15 | 34438.00 | 1590.07 | 15 15 | |
| 21JUL80 | 1015.00 | 39.70 | 0.00 | 1 | 64 | 34570.00 | 1590.09 | 14 14 | START @ 10 |
| 21JUL80 | 1037.00 | 39.62 | 0.00 | 1 | 64 | 34592.00 | 1590.17 | 14 14 | |
| 21JUL80 | 1056.00 | 39.51 | 0.00 | 1 | 64 | 34611.00 | 1590.28 | 14 14 | |
| 21JUL80 | 1115.00 | 39.41 | 0.00 | 1 | 64 | 34630.00 | 1590.38 | 14 14 | |
| 21JUL80 | 1136.00 | 39.40 | 0.00 | 1 | 64 | 34651.00 | 1590.39 | 14 14 | |
| 21JUL80 | 1201.00 | 39.30 | 0.00 | 1 | 64 | 34676.00 | 1590.49 | 14 14 | |
| 21JUL80 | 1223.00 | 39.20 | 0.00 | 1 | 64 | 34698.00 | 1590.59 | 14 14 | |
| 21JUL80 | 1244.00 | 39.14 | 0.00 | 1 | 64 | 34719.00 | 1590.65 | 14 14 | |
| 21JUL80 | 1304.00 | 39.08 | 0.00 | 1 | 64 | 34739.00 | 1590.71 | 14 14 | |
| 21JUL80 | 1327.00 | 39.04 | 0.00 | 1 | 64 | 34762.00 | 1590.75 | 14 14 | |
| 21JUL80 | 1353.00 | 39.00 | 0.00 | 1 | 64 | 34788.00 | 1590.79 | 14 14 | |
| 21JUL80 | 1417.00 | 38.97 | 0.00 | 1 | 64 | 34812.00 | 1590.82 | 14 14 | |
| 21JUL80 | 1500.00 | 38.92 | 0.00 | 1 | 64 | 34855.00 | 1590.87 | 14 14 | |
| 21JUL80 | 1629.00 | 38.92 | 0.00 | 1 | 64 | 34944.00 | 1590.87 | 14 14 | |
| 21JUL80 | 1738.00 | 38.84 | 0.00 | 1 | 64 | 35013.00 | 1590.95 | 14 14 | |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANCON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***DMW1A ***

| DATE | TIME | FIRST READING | SECOND READING | ALG | COM | TIME SINCE TEST BEGAN | WATER LEVEL ELEVATION | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| DDMONYY | HHMM.SS | FEET | FEET | | | MINUTES | FEET | |
| 21JUL80 | 1859.00 | 38.79 | 0.00 | 1 | 64 | 35074.00 | 1591.00 | 14 14 |
| 21JUL80 | 1937.00 | 38.77 | 0.00 | 1 | 64 | 35132.00 | 1591.02 | 14 14 |
| 21JUL80 | 2029.00 | 38.71 | 0.00 | 1 | 64 | 35184.00 | 1591.08 | 14 14 |
| 21JUL80 | 2148.00 | 38.70 | 0.00 | 1 | 64 | 35263.00 | 1591.09 | 14 14 |
| 21JUL80 | 2259.00 | 38.67 | 0.00 | 1 | 64 | 35334.00 | 1591.12 | 14 14 |
| 22JUL80 | 51.00 | 38.61 | 0.00 | 1 | 64 | 35446.00 | 1591.18 | 14 14 |
| 22JUL80 | 255.00 | 38.57 | 0.00 | 1 | 64 | 35570.00 | 1591.22 | 14 14 |
| 22JUL80 | 444.00 | 38.55 | 0.00 | 1 | 64 | 35679.00 | 1591.24 | 14 14 |
| 22JUL80 | 819.00 | 38.53 | 0.00 | 1 | 64 | 35894.00 | 1591.26 | 14 14 |
| 22JUL80 | 1155.00 | 38.46 | 0.00 | 1 | 64 | 36110.00 | 1591.33 | 14 14 |
| 22JUL80 | 1614.00 | 38.40 | 0.00 | 1 | 64 | 36369.00 | 1591.39 | 14 14 |
| 22JUL80 | 1917.00 | 38.34 | 0.00 | 1 | 64 | 36552.00 | 1591.45 | 14 14 |
| 23JUL80 | 43.00 | 38.32 | 0.00 | 1 | 64 | 36878.00 | 1591.47 | 14 14 |
| 23JUL80 | 356.00 | 38.29 | 0.00 | 1 | 64 | 37071.00 | 1591.50 | 14 14 |
| 23JUL80 | 1144.00 | 35.00 | 3.23 | 1 | 64 | 37539.00 | 1591.56 | 14 14 |
| 23JUL80 | 1938.00 | 35.00 | 3.15 | 1 | 64 | 38013.00 | 1591.64 | 14 14 |
| 24JUL80 | 922.00 | 35.00 | 3.14 | 1 | 64 | 38837.00 | 1591.65 | 14 14 |
| 24JUL80 | 1733.00 | 35.00 | 2.97 | 1 | 64 | 39328.00 | 1591.82 | 14 14 |
| 25JUL80 | 1032.00 | 35.00 | 3.00 | 1 | 64 | 40347.00 | 1591.79 | 14 14 |
| 25JUL80 | 1720.00 | 35.00 | 2.97 | 1 | 64 | 40755.00 | 1591.82 | 14 14 |
| 26JUL80 | 1031.00 | 35.00 | 2.91 | 1 | 64 | 41786.00 | 1591.88 | 14 14 |
| 27JUL80 | 1035.00 | 30.00 | 9.99 | 1 | 83 | 43230.00 | 1592.00 | 15 BY D. K. TO 9/2/80 |
| 28JUL80 | 953.00 | 30.00 | 9.85 | 1 | 83 | 44628.00 | 1592.14 | 15 BY D. K. TO 9/2/80 |
| 29JUL80 | 833.00 | 30.00 | 9.88 | 1 | 83 | 45988.00 | 1592.11 | 15 BY D. K. TO 9/2/80 |
| 30JUL80 | 1038.00 | 30.00 | 9.81 | 1 | 83 | 47553.00 | 1592.18 | 15 BY D. K. TO 9/2/80 |
| 31JUL80 | 1405.00 | 30.00 | 9.78 | 1 | 83 | 49200.00 | 1592.21 | 15 BY D. K. TO 9/2/80 |
| 01AUG80 | 1314.00 | 30.00 | 9.75 | 1 | 83 | 50589.00 | 1592.24 | 15 BY D. K. TO 9/2/80 |
| 03AUG80 | 728.00 | 30.00 | 9.70 | 1 | 83 | 53123.00 | 1592.29 | 4 15 |
| 05AUG80 | 1405.00 | 30.00 | 9.67 | 1 | 83 | 56400.00 | 1592.32 | 4 15 |
| 07AUG80 | 1403.00 | 30.00 | 9.59 | 1 | 83 | 59278.00 | 1592.40 | 4 15 |
| 09AUG80 | 900.00 | 30.00 | 9.54 | 1 | 83 | 61855.00 | 1592.45 | 4 15 |
| 12AUG80 | 1422.00 | 30.00 | 9.54 | 1 | 83 | 66497.00 | 1592.45 | 4 15 |
| 14AUG80 | 1058.00 | 30.00 | 9.44 | 1 | 83 | 69173.00 | 1592.55 | 4 15 |
| 16AUG80 | 1210.00 | 30.00 | 9.47 | 1 | 83 | 72125.00 | 1592.52 | 4 15 |
| 20AUG80 | 1405.00 | 39.31 | 0.00 | 1 | 83 | 78000.00 | 1592.68 | 15 |
| 22AUG80 | 1232.00 | 39.44 | 0.00 | 1 | 83 | 80787.00 | 1592.55 | 15 |
| 02SEP80 | 818.00 | 39.28 | 0.00 | 1 | 83 | 96373.00 | 1592.71 | 15 |

COLLAR ELEV 1629.70 FEET PIEZO ELEV 0.00 -NULL-
TIME PUMP TEST BEGAN = 27JUN80-1005.00

## BORING DMB-1A

SURFACE ELEVATION 1627.3

COORDINATES: N 114,405 E 2,282,900

| DEPTH (FEET) | OTHER TESTS | SHEAR STRENGTH PSF | ATTERBERG LIMITS: LIQUID LIMIT % | ATTERBERG LIMITS: PLASTIC LIMIT % | ATTERBERG LIMITS: PLASTICITY INDEX % | FIELD MOISTURE CONTENT % | DRY DENSITY PCF | PERCENT RECOVERED | RQD | BLOW COUNTS SAMPLES | SYMBOLS | DESCRIPTIONS | ELEVATION (FEET) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | | | NO SAMPLES TAKEN FROM 0.0 TO 63.5 FEET SEE LOG FOR DMB-1 | 1625 |
| 5 | | | | | | | | | | | | | 1620 |
| 10 | | | | | | | | | | | | | 1615 |
| 15 | | | | | | | | | | | | | 1610 |
| 20 | | | | | | | | | | | | | 1605 |
| 25 | | | | | | | | | | | | | 1600 |
| 30 | | | | | | | | | | | | | 1595 |
| 35 | | | | | | | | | | 6-10-78 ▼ 38.6' | | | 1590 |
| 40 | | | | | | | | | | | | | 1585 |
| 45 | | | | | | | | | | | | | 1580 |
| 50 | | | | | | | | | | | | | 1575 |
| 55 | | | | | | | | | | | | | 1570 |
| 60 | | | | | | | | | | | | | |

PRELIMINARY

Copy from Dames & Moore
Preliminary Report

EXXON MINERALS COMPANY, U.S.A.
CRANDON PROJECT

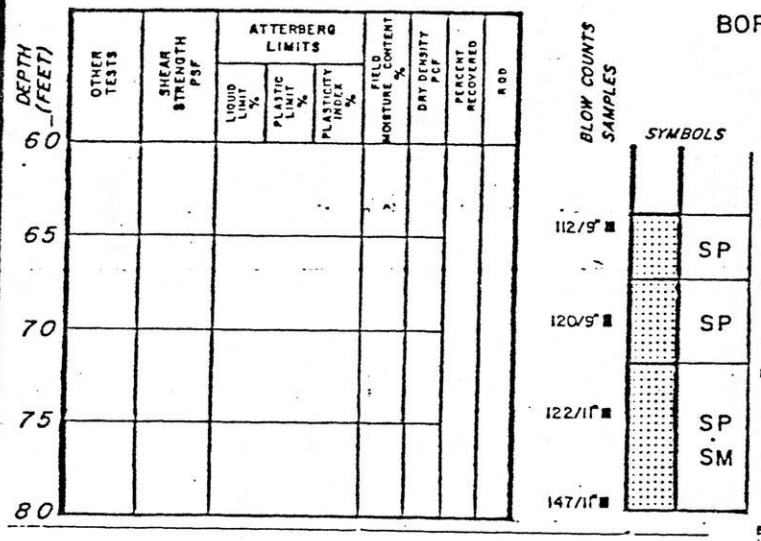
LOG OF BORING DMB-1A
SHEET 1 OF 2

1/79

DAMES & MOORE

FIGURE B-40.1

## BORING DMB-1A (CONT'D)




BORING COMPLETED AT 79.4 FEET ON 5-16-78.
4 INCH CASING USED TO A DEPTH OF 10 FEET.
PIEZOMETER INSTALLED ON 5-16-78.
2 INCH PVC SLOTTED FROM 69.0 TO 79.0 FEET.
GRAVEL PACK: 30.0 TO 79.0 FEET.
SAND: 24.0 TO 30.0 FEET.
GROUT: 0 TO 24.0 FEET.
GROUND WATER LEVEL RECORDED AT 36.6 FEET ON 6-10-78.

PRELIMINARY

Copy from Dames & Moore
Preliminary Report

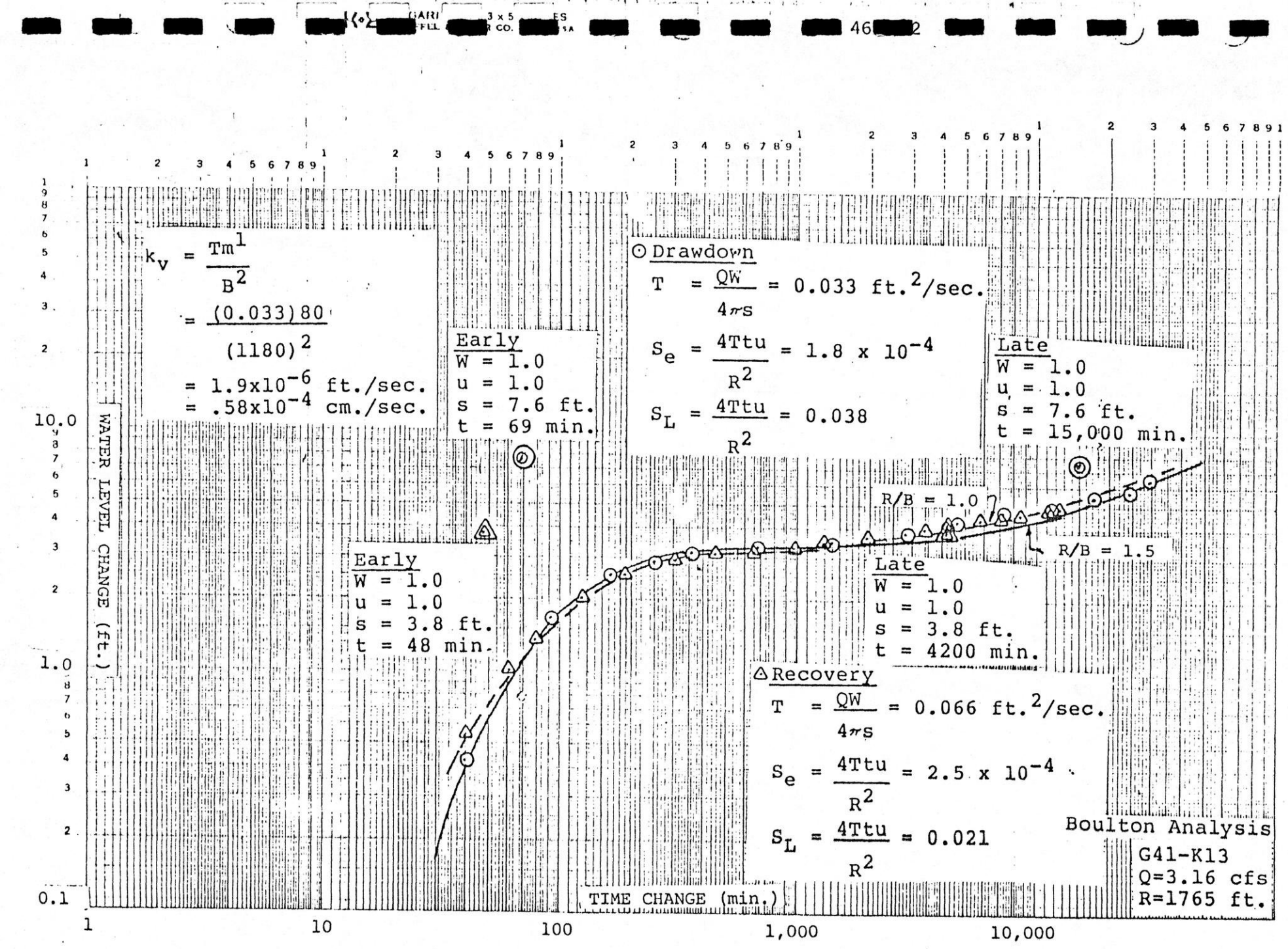
EXXON MINERALS COMPANY, U.S.A.
CRANDON PROJECT

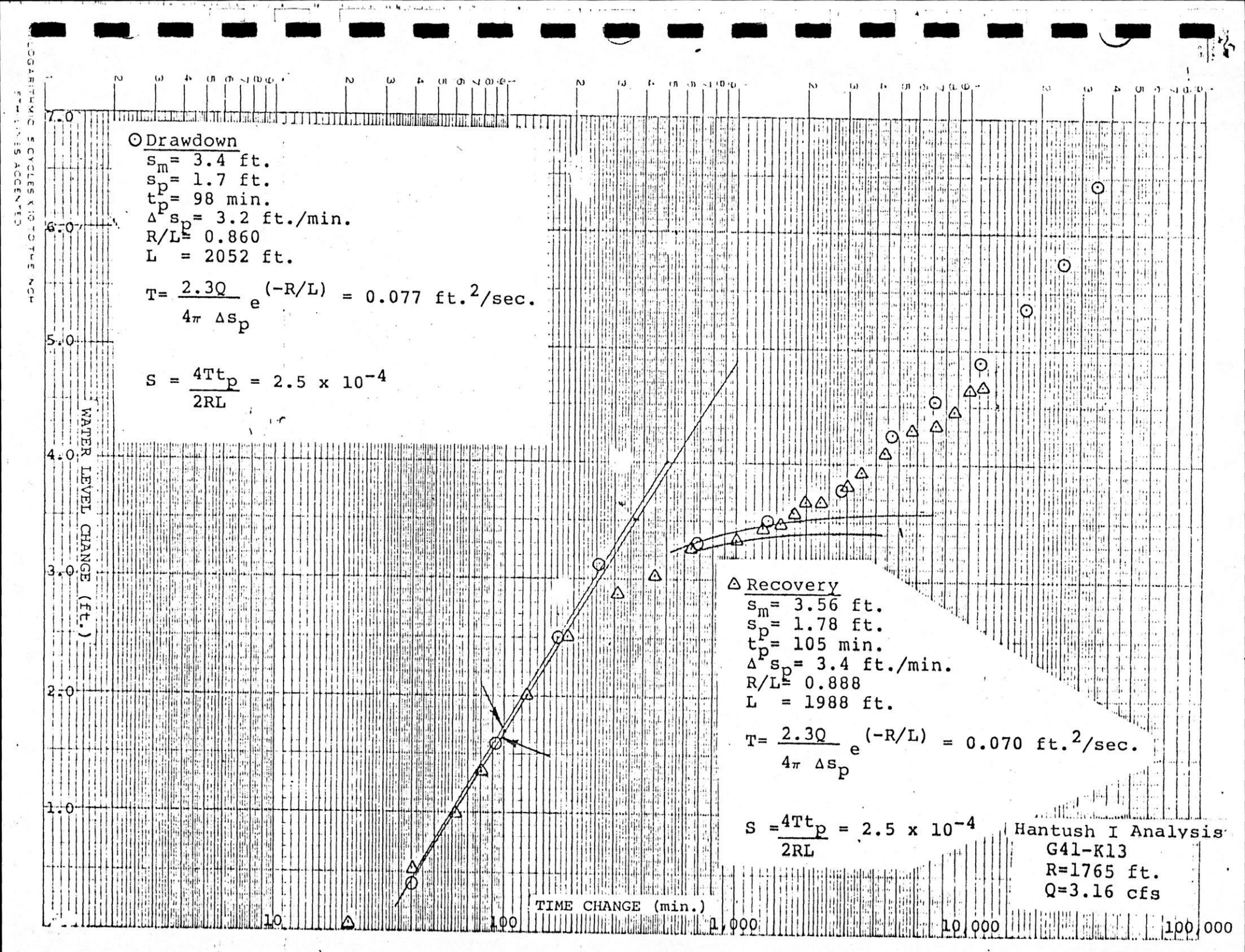
LOG OF BORING DMB-1A
SHEET 2 OF 2

1/79

DAMES & MOORE

FIGURE B-402


$k_v = \frac{Tm^1}{B^2}$
$= \frac{(0.033)80}{(1180)^2}$
$= 1.9 \times 10^{-6}$ ft./sec.
$= .58 \times 10^{-4}$ cm./sec.
⊙ Drawdown
$T = \frac{QW}{4\pi s} = 0.033$ ft.$^2$/sec.
$S_e = \frac{4Ttu}{R^2} = 1.8 \times 10^{-4}$
$S_L = \frac{4Ttu}{R^2} = 0.038$
Early
W = 1.0
u = 1.0
s = 7.6 ft.
t = 69 min.
Late
W = 1.0
u = 1.0
s = 7.6 ft.
t = 15,000 min.
R/B = 1.0
R/B = 1.5
Early
W = 1.0
u = 1.0
s = 3.8 ft.
t = 48 min.
Late
W = 1.0
u = 1.0
s = 3.8 ft.
t = 4200 min.
△ Recovery
$T = \frac{QW}{4\pi s} = 0.066$ ft.$^2$/sec.
$S_e = \frac{4Ttu}{R^2} = 2.5 \times 10^{-4}$
$S_L = \frac{4Ttu}{R^2} = 0.021$
Boulton Analysis
G41-K13
Q=3.16 cfs
R=1765 ft.
WATER LEVEL CHANGE (ft.)
TIME CHANGE (min.)
10.0
1.0
0.1
1
10
100
1,000
10,000


⊙ Drawdown
$s_m$ = 3.4 ft.
$s_p$ = 1.7 ft.
$t_p$ = 98 min.
$\Delta s_p$ = 3.2 ft./min.
R/L = 0.860
L = 2052 ft.
$T = \frac{2.3Q}{4\pi \Delta s_p} e^{(-R/L)} = 0.077$ ft.$^2$/sec.
$S = \frac{4Tt_p}{2RL} = 2.5 \times 10^{-4}$
△ Recovery
$s_m$ = 3.56 ft.
$s_p$ = 1.78 ft.
$t_p$ = 105 min.
$\Delta s_p$ = 3.4 ft./min.
R/L = 0.888
L = 1988 ft.
$T = \frac{2.3Q}{4\pi \Delta s_p} e^{(-R/L)} = 0.070$ ft.$^2$/sec.
$S = \frac{4Tt_p}{2RL} = 2.5 \times 10^{-4}$
Hantush I Analysis
G41-K13
R=1765 ft.
Q=3.16 cfs
WATER LEVEL CHANGE (ft.)
TIME CHANGE (min.)
7.0
6.0
5.0
4.0
3.0
2.0
1.0
10
100
1,000
10,000
100,000

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***K13 ***

| DATE DDMONYY | TIME HHMM.SS | FIRST READING FEET | SECOND READING FEET | A L G | C O N | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | COLLAR ELEV 1702.92 FEET PIEZO ELEV 0.00 -NULL |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 18APR79 | 1005.00 | 100.70 | 0.00 | 1 | 20 | -627840.00 | 1602.22 | |
| 18APR79 | 1005.00 | 100.70 | 0.00 | 1 | 20 | -627840.00 | 1602.22 | |
| | | | | | | | | CORRECT TO COLLAR TOP |
| 12NOV79 | 1200.00 | 108.50 | 0.00 | 1 | 20 | -328205.00 | 1594.42 | GROUND SURFACE-CORR. TO |
| 03DEC79 | 1200.00 | 108.30 | 0.00 | 1 | 20 | -297965.00 | 1594.62 | GROUND SURFACE-CORR. TO |
| 25APR80 | 1200.00 | 109.15 | .10 | 1 | 14 | -90605.00 | 1593.67 | CORRECT TO COLLAR TOP |
| 21MAY80 | 1200.00 | 111.16 | -1.88 | 1 | 15 | -53165.00 | 1593.64 | 14 - TIME NOT RECORD |
| 31MAY80 | 1240.00 | 109.25 | 0.00 | 1 | 65 | -38725.00 | 1593.57 | 15 - NO TIME |
| 02JUN80 | 930.00 | 109.07 | 0.00 | 1 | 65 | -36035.00 | 1593.75 | 4 14 SET CASE |
| 03JUN80 | 1030.00 | 111.53 | 0.00 | 1 | 93 | -34535.00 | 1593.60 | 4 14 |
| 08JUN80 | 915.00 | 109.43 | 0.00 | 1 | 65 | -27410.00 | 1593.39 | 4 15 |
| 09JUN80 | 930.00 | 109.08 | 0.00 | 1 | 65 | -25955.00 | 1593.74 | 4 14 |
| 10JUN80 | 1025.00 | 109.30 | 0.00 | 1 | 65 | -24460.00 | 1593.52 | 4 14 |
| 11JUN80 | 945.00 | 111.54 | 0.00 | 1 | 93 | -23060.00 | 1593.59 | 4 14 |
| 12JUN80 | 935.00 | 111.44 | 0.00 | 1 | 93 | -21630.00 | 1593.69 | 15 15 |
| 13JUN80 | 935.00 | 109.12 | 0.00 | 1 | 92 | -20190.00 | 1596.00 | 15 15 |
| 14JUN80 | 1035.00 | 109.11 | 0.00 | 1 | 65 | -18690.00 | 1593.71 | 15 15 |
| 15JUN80 | 935.00 | 109.03 | 0.00 | 1 | 65 | -17310.00 | 1593.79 | 4 14 |
| 16JUN80 | 805.00 | 109.19 | 0.00 | 1 | 65 | -15960.00 | 1593.63 | 4 14 |
| 24JUN80 | 820.00 | 109.08 | 0.00 | 1 | 65 | -9425.00 | 1593.74 | 4 14 |
| 25JUN80 | 930.00 | 109.03 | 0.00 | 1 | 65 | -2915.00 | 1593.79 | 4 14 |
| 26JUN80 | 945.00 | 109.05 | 0.00 | 1 | 65 | -1460.00 | 1593.77 | 4 14 |
| 27JUN80 | 853.00 | 109.29 | 0.00 | 1 | 65 | -72.00 | 1593.53 | 4 14 |
| 27JUN80 | 1045.00 | 109.71 | 0.00 | 1 | 65 | 40.00 | 1593.11 | 14 14 BEFORE TEST |
| 27JUN80 | 1137.00 | 110.88 | 0.00 | 1 | 66 | 92.00 | 1591.90 | 14 14 |
| 27JUN80 | 1258.00 | 111.75 | 0.00 | 1 | 66 | 173.00 | 1591.03 | 14 14 |
| 27JUN80 | 1415.00 | 112.12 | 0.00 | 1 | 66 | 250.00 | 1590.66 | 14 14 |
| 27JUN80 | 1602.00 | 112.37 | 0.00 | 1 | 66 | 357.00 | 1590.41 | 14 14 |
| 27JUN80 | 1747.00 | 112.50 | 0.00 | 1 | 66 | 462.00 | 1590.28 | 14 14 |
| 27JUN80 | 1944.00 | 112.52 | 0.00 | 1 | 66 | 579.00 | 1590.26 | 14 14 |
| 27JUN80 | 2138.00 | 112.56 | 0.00 | 1 | 66 | 693.00 | 1590.22 | 14 14 |
| 28JUN80 | 551.00 | 112.83 | 0.00 | 1 | 66 | 1186.00 | 1589.95 | 14 14 |
| 28JUN80 | 917.00 | 112.75 | 0.00 | 1 | 66 | 1392.00 | 1590.03 | 14 14 |
| 28JUN80 | 1231.00 | 113.20 | 0.00 | 1 | 4 | 1586.00 | 1589.94 | |
| 28JUN80 | 1231.00 | 113.20 | 0.00 | 1 | 4 | 1586.00 | 1589.94 | 4 |
| | | | | | | | | 4 |
| 28JUN80 | 1539.00 | 113.18 | 0.00 | 1 | 4 | 1774.00 | 1589.96 | |
| 28JUN80 | 1539.00 | 113.18 | 0.00 | 1 | 4 | 1774.00 | 1589.96 | 4 4 |
| | | | | | | | | 4 4 |
| 28JUN80 | 1842.00 | 113.24 | 0.00 | 1 | 4 | 1957.00 | 1589.90 | 4 4 |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***K13 ***

| DATE DDMONYY | TIME HHMM.SS | FIRST READING FEET | SECOND READING FEET | ALG | COM | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET | |
|---|---|---|---|---|---|---|---|---|
| 28JUN80 | 2329.00 | 112.96 | 0.00 | 1 | 66 | 2244.00 | 1589.82 | 12 14 |
| 29JUN80 | 908.00 | 113.03 | 0.00 | 1 | 66 | 2823.00 | 1589.75 | 14 14 |
| 29JUN80 | 1717.00 | 113.23 | 0.00 | 1 | 66 | 3312.00 | 1589.55 | 14 14 |
| 30JUN80 | 137.00 | 113.42 | 0.00 | 1 | 66 | 3812.00 | 1589.36 | 14 14 |
| 30JUN80 | 746.00 | 113.45 | 0.00 | 1 | 66 | 4181.00 | 1589.33 | 14 14 |
| 30JUN80 | 1633.00 | 113.50 | 0.00 | 1 | 66 | 4708.00 | 1589.28 | 14 14 |
| 01JUL80 | 710.00 | 113.48 | 0.00 | 1 | 66 | 5585.00 | 1589.30 | 14 14 |
| 01JUL80 | 1734.00 | 113.64 | 0.00 | 1 | 66 | 6209.00 | 1589.14 | 16 14 |
| 02JUL80 | 126.00 | 113.79 | 0.00 | 1 | 66 | 6681.00 | 1588.99 | 16 14 |
| 02JUL80 | 1017.00 | 113.88 | 0.00 | 1 | 66 | 7212.00 | 1588.90 | 16 14 |
| 02JUL80 | 2051.00 | 113.85 | 0.00 | 1 | 66 | 7846.00 | 1588.93 | 16 14 |
| 03JUL80 | 958.00 | 113.88 | 0.00 | 1 | 66 | 8633.00 | 1588.90 | 16 14 |
| 03JUL80 | 2017.00 | 113.89 | 0.00 | 1 | 66 | 9252.00 | 1588.89 | 16 14 |
| 04JUL80 | 811.00 | 113.98 | 0.00 | 1 | 66 | 9966.00 | 1588.80 | 16 14 |
| 05JUL80 | 2110.00 | 114.33 | 0.00 | 1 | 66 | 12185.00 | 1588.45 | 14 14 |
| 06JUL80 | 1205.00 | 114.40 | 0.00 | 1 | 66 | 13080.00 | 1588.38 | 14 14 |
| 06JUL80 | 1803.00 | 114.31 | 0.00 | 1 | 66 | 13438.00 | 1588.47 | 14 14 |
| 07JUL80 | 735.00 | 114.25 | 0.00 | 1 | 66 | 14250.00 | 1588.63 | 14 14 |
| 07JUL80 | 1700.00 | 114.20 | 0.00 | 1 | 66 | 14815.00 | 1588.58 | 14 14 |
| 08JUL80 | 1130.00 | 114.59 | 0.00 | 1 | 66 | 15925.00 | 1588.19 | 14 14 |
| 08JUL80 | 2042.00 | 114.56 | 0.00 | 1 | 66 | 16477.00 | 1588.22 | 14 14 |
| 09JUL80 | 1001.00 | 114.61 | 0.00 | 1 | 66 | 17276.00 | 1588.17 | 14 14 |
| 09JUL80 | 1632.00 | 114.56 | 0.00 | 1 | 66 | 17667.00 | 1588.22 | 14 14 |
| 10JUL80 | 948.00 | 114.68 | 0.00 | 1 | 66 | 18703.00 | 1588.10 | 14 14 |
| 10JUL80 | 1757.00 | 114.65 | 0.00 | 1 | 66 | 19192.00 | 1588.13 | 14 14 |
| 11JUL80 | 1028.00 | 114.79 | 0.00 | 1 | 66 | 20183.00 | 1587.99 | 14 14 |
| 11JUL80 | 1952.00 | 114.87 | 0.00 | 1 | 66 | 20747.00 | 1587.91 | 14 14 |
| 12JUL80 | 1049.00 | 114.94 | 0.00 | 1 | 66 | 21644.00 | 1587.84 | 14 14 |
| 13JUL80 | 947.00 | 115.11 | 0.00 | 1 | 66 | 23022.00 | 1587.67 | 14 14 |
| 14JUL80 | 1158.00 | 115.00 | 0.00 | 1 | 66 | 24593.00 | 1587.78 | 14 14 |
| 15JUL80 | 1039.00 | 115.25 | 0.00 | 1 | 66 | 25954.00 | 1587.53 | 14 14 |
| 16JUL80 | 1040.00 | 115.22 | 0.00 | 1 | 66 | 27395.00 | 1587.56 | 14 14 |
| 17JUL80 | 932.00 | 115.38 | 0.00 | 1 | 66 | 28767.00 | 1587.40 | 14 14 |
| 18JUL80 | 857.00 | 115.42 | 0.00 | 1 | 66 | 30172.00 | 1587.36 | 14 14 |
| 20JUL80 | 902.00 | 115.42 | 0.00 | 1 | 66 | 33057.00 | 1587.36 | 14 14 |
| 21JUL80 | 747.00 | 115.69 | 0.00 | 1 | 66 | 34422.00 | 1587.09 | 14 14 |

**COMMENTS**
COLLAR ELEV 1702.92 FEET PIEZO ELEV 0.00 -NULL-
TIME PUMP TEST BEGAN = 27JUN80-1005.00

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***K13 ***

| DATE DDMONYY | TIME HHMM.SS | FIRST READING FEET | SECOND READING FEET | ALG | CON | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET |
|---|---|---|---|---|---|---|---|
| 21JUL80 | 1026.00 | 115.62 | 0.00 | 1 | 67 | 34581.00 | 1587.15 |
| 21JUL80 | 1045.00 | 115.15 | 0.00 | 1 | 67 | 34600.00 | 1587.62 |
| 21JUL80 | 1106.00 | 114.69 | 0.00 | 1 | 66 | 34621.00 | 1588.09 |
| 21JUL80 | 1125.00 | 114.35 | 0.00 | 1 | 66 | 34640.00 | 1588.43 |
| 21JUL80 | 1150.00 | 113.91 | 0.00 | 1 | 66 | 34665.00 | 1588.87 |
| 21JUL80 | 1211.00 | 113.67 | 0.00 | 1 | 66 | 34686.00 | 1589.11 |
| 21JUL80 | 1233.00 | 113.46 | 0.00 | 1 | 66 | 34708.00 | 1589.32 |
| 21JUL80 | 1253.00 | 113.31 | 0.00 | 1 | 66 | 34728.00 | 1589.47 |
| 21JUL80 | 1314.00 | 113.17 | 0.00 | 1 | 66 | 34749.00 | 1589.61 |
| 21JUL80 | 1337.00 | 113.06 | 0.00 | 1 | 66 | 34772.00 | 1589.72 |
| 21JUL80 | 1404.00 | 112.96 | 0.00 | 1 | 66 | 34799.00 | 1589.82 |
| 21JUL80 | 1427.00 | 112.89 | 0.00 | 1 | 66 | 34822.00 | 1589.89 |
| 21JUL80 | 1510.00 | 112.80 | 0.00 | 1 | 66 | 34865.00 | 1589.98 |
| 21JUL80 | 1635.00 | 112.69 | 0.00 | 1 | 66 | 34954.00 | 1590.09 |
| 21JUL80 | 1731.00 | 112.65 | 0.00 | 1 | 66 | 35006.00 | 1590.13 |
| 21JUL80 | 1945.00 | 112.46 | 0.00 | 1 | 66 | 35140.00 | 1590.32 |
| 21JUL80 | 2037.00 | 112.41 | 0.00 | 1 | 66 | 35192.00 | 1590.37 |
| 21JUL80 | 2200.00 | 112.38 | 0.00 | 1 | 66 | 35275.00 | 1590.40 |
| 22JUL80 | 37.00 | 112.34 | 0.00 | 1 | 66 | 35432.00 | 1590.44 |
| 22JUL80 | 308.00 | 112.28 | 0.00 | 1 | 66 | 35583.00 | 1590.50 |
| 22JUL80 | 826.00 | 112.19 | 0.00 | 1 | 66 | 35901.00 | 1590.59 |
| 22JUL80 | 1213.00 | 112.15 | 0.00 | 1 | 66 | 36128.00 | 1590.63 |
| 22JUL80 | 1549.00 | 112.08 | 0.00 | 1 | 66 | 36344.00 | 1590.70 |
| 22JUL80 | 1929.00 | 112.00 | 0.00 | 1 | 66 | 36564.00 | 1590.78 |
| 23JUL80 | 55.00 | 112.00 | 0.00 | 1 | 66 | 36890.00 | 1590.78 |
| 23JUL80 | 408.00 | 111.99 | 0.00 | 1 | 66 | 37083.00 | 1590.79 |
| 23JUL80 | 1202.00 | 110.00 | 1.90 | 1 | 66 | 37557.00 | 1590.88 |
| 23JUL80 | 1947.00 | 110.00 | 1.81 | 1 | 66 | 38022.00 | 1590.97 |
| 24JUL80 | 945.00 | 110.00 | 1.69 | 1 | 66 | 38860.00 | 1591.09 |
| 24JUL80 | 1741.00 | 110.00 | 1.58 | 1 | 66 | 39336.00 | 1591.20 |
| 25JUL80 | 1041.00 | 110.00 | 1.57 | 1 | 66 | 40356.00 | 1591.21 |
| 25JUL80 | 1710.00 | 110.00 | 1.64 | 1 | 66 | 40745.00 | 1591.14 |
| 26JUL80 | 955.00 | 110.00 | 1.61 | 1 | 66 | 41750.00 | 1591.17 |
| 27JUL80 | 905.00 | 110.00 | 3.90 | 1 | 93 | 43140.00 | 1591.23 |
| 28JUL80 | 840.00 | 110.00 | 3.77 | 1 | 93 | 44555.00 | 1591.36 |
| 29JUL80 | 940.00 | 110.00 | 3.84 | 1 | 93 | 46055.00 | 1591.29 |
| 30JUL80 | 1151.00 | 110.00 | 3.75 | 1 | 93 | 47626.00 | 1591.38 |
| 31JUL80 | 1508.00 | 110.00 | 3.70 | 1 | 93 | 49263.00 | 1591.43 |
| 01AUG80 | 1155.00 | 110.00 | 3.64 | 1 | 93 | 50510.00 | 1591.49 |
| 03AUG80 | 911.00 | 110.00 | 3.59 | 1 | 93 | 53226.00 | 1591.54 |

**COMMENTS**

COLLAR ELEV 1702.92 FEET PIEZO ELEV 0.00 -NULL-
TIME PUMP TEST BEGAN = 27JUN80-1005.00

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GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE--9/10/80
PIEZOMETER/WELL IDENTIFIER ***K13 ***

| DATE DDMONYY | TIME HHMM.SS | FIRST READING FEET | SECOND READING FEET | ALG | COM | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | COLLAR ELEV 1702.92 FEET PIEZO ELEV 0.00 -NULL- |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 05AUG80 | 1705.00 | 100.00 | 3.51 | 1 | 91 | 56580.00 | 1601.47 | 4 15 |
| 07AUG80 | 1453.00 | 110.00 | 3.49 | 1 | 93 | 59328.00 | 1591.64 | 4 15 |
| 09AUG80 | 1020.00 | 110.00 | 3.48 | 1 | 93 | 61935.00 | 1591.65 | 4 15 |
| 12AUG80 | 1303.00 | 110.00 | 3.52 | 1 | 93 | 66418.00 | 1591.61 | 4 15 |
| 14AUG80 | 1156.00 | 110.00 | 3.41 | 1 | 93 | 69231.00 | 1591.72 | 4 15 |
| 16AUG80 | 1040.00 | 110.00 | 3.43 | 1 | 93 | 72035.00 | 1591.70 | 4 15 |
| 20AUG80 | 1502.00 | 113.23 | 0.00 | 1 | 93 | 78057.00 | 1591.90 | 15 |
| 22AUG80 | 1350.00 | 113.17 | 0.00 | 1 | 93 | 80865.00 | 1591.96 | 15 |
| 02SEP80 | 838.00 | 113.22 | 0.00 | 1 | 93 | 96393.00 | 1591.91 | 15 |
| 10SEP80 | 1010.00 | 114.14 | 0.00 | 1 | 15 | 108005.00 | 1588.78 | 15 FOR G.W. MAP |

COOR. N114755 ft. (N34977m)
E2285965 ft. (E696764m)

# BORING LOG G41-K13

SHEET 1 OF 6

SURFACE ELEV. 1699.7 ft. (518.06m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 4/3/79 DATE COMPLETED 4/9/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS | BLOWS / FOOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES HAMMER BLOWS PER 6IN. (Note 1) | SAMPLES REC./ATT. (ins.) | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| 0.0 | | For soil stratigraphy, see boring G41-K13A | | | | | | | ▼ 4/18/79 29.69 97.4 |
| 36.58 | | | | - | 1 | DO | Air Hammer | 9/9 | |
| 120.0 | | Very dense, yellow-brown, fine to coarse SAND, trace silt, trace fine gravel, trace clay<br>Boulder noted at 125.0'-129.5' | SM | | | | | | |
| 39.47 | | | | - | 2 | DO | Air Hammer | 6/6 | |
| 129.5 | | Very dense, red-brown, fine to coarse SAND, some silt, trace fine gravel, trace clay | SM | | | | | | |
| | | | | - | 3 | DO | Air Hammer | 12/12 | |
| 44.50 | | | | | | | | | |
| 146.0 | | CONTINUED | | | | | | | |

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked

COOR. N114755 ft. (N34977m)
E2285965 ft. (E696764m)

# BORING LOG G41-K13



SURFACE ELEV. 1699.7 ft. (518.06m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 4/3/79 DATE COMPLETED 4/9/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS. | BLOWS / FOOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES HAMMER BLOWS PER 6IN. (Note 1) | SAMPLES REC./ATT. (ins.) | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| 44.50 / 146.0 | | CONTINUED | | | | | | | |
| | | Very dense, red-brown, fine to coarse SAND, some silt, trace fine gravel, trace clay | SM | | 4 | DO | Air Hammer | 6/6 | |
| | | | | - | 5 | DO | Air Hammer | 12/12 | |
| 51.05 / 167.5 | | Very dense, brown, fine gravelly, fine to coarse SAND, some silt, occasional cobbles | GP GM | - | 6 | DO | Air Hammer | 10/12 | |
| | | | | - | 7 | DO | Air Hammer | 0/0 | |
| 55.17 / 181.0 | | CONTINUED | | | | | | | |

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked JCB

COOR. N114755 ft. (N34977m)
E2285965 ft. (E696764m)

# BORING LOG G41-K13



SURFACE ELEV. 1699.7 ft. (518.06m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 4/3/79 DATE COMPLETED 4/9/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS. | BLOWS / FOOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES HAMMER BLOWS PER 6 IN. (Note 1) | SAMPLES REC./ATT. (ins.) | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| 55.17 | | CONTINUED | | | | | | | |
| 181.0 | | Very dense, brown, fine gravelly, fine to coarse SAND, some silt, occasional cobbles | GP-GM | | | | | | |
| 57.91 | | | | | | | | | |
| 190.0 | | Very dense, yellow-brown, fine to coarse SAND, some silt | SM | - | 8 | DO | Air Hammer | 12/12 | |
| 59.44 | | | | | | | | | |
| 195.0 | | Very dense, brown, fine to coarse SAND, some fine gravel, trace silt | SW-SM | - | 9 | DO | Air Hammer | 18/18 | |
| 64.01 | | | | | | | | | |
| 210.0 | | Very dense, brown, fine to medium SAND and SILT | SM | - | 10 | DO | Air Hammer | 6/6 | |
| 65.53 | | | | | | | | | |
| 215.0 | | CONTINUED | | | | | | | |

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked JCB

COOR. N114755 ft. (N34977m)
E2285965 ft. (E696764m)

# BORING LOG G41-K13



SURFACE ELEV. 1699.7 ft. (518.06m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 4/3/79 DATE COMPLETED 4/9/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS. | BLOWS / FOOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES HAMMER BLOWS PER 6IN. (Note 1) | SAMPLES REC./ATT. (ins.) | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| 65.53 | | CONTINUED | | | | | | | |
| 215.0 | | Very dense, brown fine to medium SAND and SILT | SM | | | | | | |
| 66.45 | | | | | | | | | |
| 218.0 | | Very dense, brown, fine to medium SAND, trace silt | SP-SM | - | 11 | DO | Air Hammer | 6/12 | Grout (to surface) |
| 69.50 | | | | | | | | | |
| 228.0 | | Very dense, red-brown, silty fine to coarse SAND, trace to some fine gravel | SM | - | 12 | DO | Air Hammer | 6/6 | 2" Solid PVC Pipe to Surface |
| | | | | | | | | | 72.39 / 237.5 Bentonite Clay Seal |
| | | | | | | | | | 73.15 / 240.0 Pea Gravel |
| 74.07 | | | | | | | | | |
| 243.0 | | CONTINUED | | | | | | | CONTINUED |

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked

COOR. N114755 ft. (N34977m)
E2285965 ft. (E696764m)

# BORING LOG G41-K13

SHEET 5 OF 6

SURFACE ELEV. 1699.7 ft. (518.06m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 4/3/79 DATE COMPLETED 4/9/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS | BLOWS / FOOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES HAMMER BLOWS PER 6IN. (Note 1) | SAMPLES REC/ATT. (ins.) | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| 74.07 | | CONTINUED | | | | | | | CONTINUED |
| 243.0 | | Very dense, red-brown, silty fine to coarse SAND, trace to some fine gravel | SM | - | 13 | DO | Air Hammer | 12/12 | |
| 75.44 | | | | | | | | | |
| 247.5 | | Very dense, brown, fine to coarse SAND, some fine gravel, trace silt, trace clay | SM | - | 14 | DO | Air Hammer | 18/18 | |
| 78.86 | | | | | | | | | |
| 262.0 | | Very dense, brown, fine to coarse SAND, trace silt, trace clay | SM | - | 15 | DO | Air Hammer | 18/18 | |
| 82.91 | | | | | | | | | |
| 272.0 | | Greenish-gray, highly weathered metavolcanic TUFF | | - | 16 | DO | Air Hammer | 6/6 | |
| 84.43 | | | | | | | | | |
| 277.0 | | CONTINUED | | | | | | | |

Pea Gravel

2" Solid PVC Pipe

79.25
260.0

Pea Gravel

2" Slotted PVC Pipe

82.30
270.0

Pea Gravel (to bottom of boring)

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked ACB

COOR. N114755 ft. (N34977m)
E2285965 ft. (E696764m)

# BORING LOG G41-K13

SHEET 6 OF 6

SURFACE ELEV. 1699.7 ft. (518.06m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 4/3/79 DATE COMPLETED 4/9/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS. | BLOWS / FOOT | SAMPLES: NUMBER | SAMPLES: TYPE | SAMPLES: HAMMER BLOWS PER 6IN. (Note 1) | SAMPLES: REC./ATT. (ins.) | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| 84.43 | | CONTINUED | | | | | | | |
| 277.0 | | Greenish-gray, highly weathered metavolcanic TUFF | | - | - | - | Drill Cuttings | - | |
| 86.87 | | | | | | | | | |
| 285.0 | | END OF BORING | | | | | | | |

NOTES

1. Penetration Test - 3" O.D. sampler driven with air hammer. (All samples)
2. Elevation of top of protector pipe, 1702.9 ft. (519.05m).

Table of Water Level Readings by Date. Readings Indicate Depth Below Ground Surface.

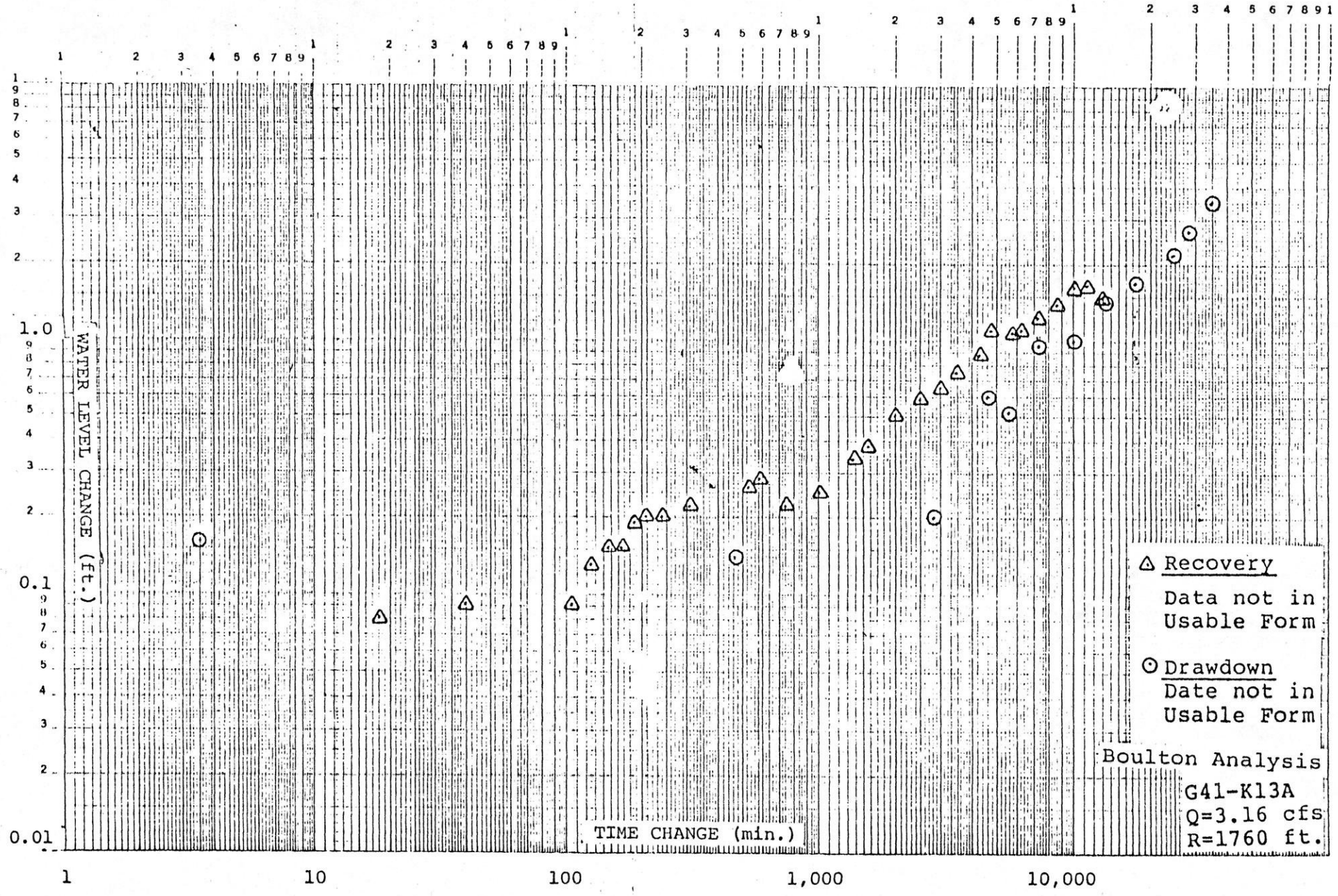
| DATE | 4/18/79 | 11/12/79 | 12/3/79 | 4/25/80 | 5/21/80 | 6/26/80* | 9/10/80* |
|---|---|---|---|---|---|---|---|
| DEPTH (m) | 29.69 | 32.06 | 32.00 | 32.28 | 32.89 | 32.28 | 32.89 |
| DEPTH (ft.) | 97.4 | 105.2 | 105.0 | 105.9 | 107.9 | 105.9 | 107.9 |

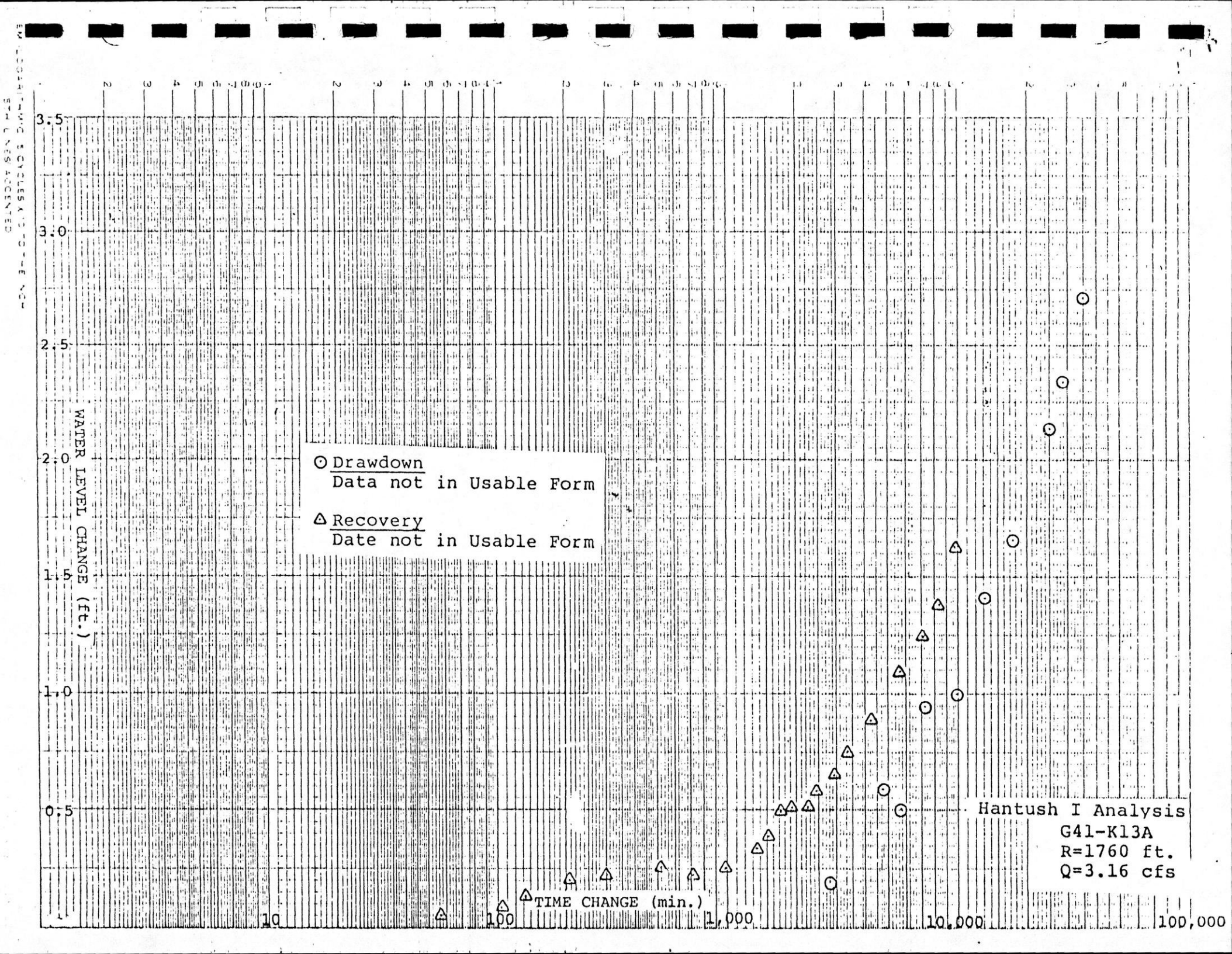
*Pump Test and Recovery Period Between these Dates. For Pump Test Data, Refer to PUMP TEST AND ANALYSIS, Project Report No. 4.

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked


WATER LEVEL CHANGE (ft.)
TIME CHANGE (min.)
1.0
0.1
0.01
1
10
100
1,000
10,000
Recovery
Data not in Usable Form
Drawdown
Date not in Usable Form
Boulton Analysis
G41-K13A
Q=3.16 cfs
R=1760 ft.


WATER LEVEL CHANGE (ft.)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
Drawdown
Data not in Usable Form
Recovery
Date not in Usable Form
TIME CHANGE (min.)
10
100
1,000
10,000
100,000
Hantush I Analysis
G41-K13A
R=1760 ft.
Q=3.16 cfs

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.25.37.

CRANSON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***K13A ***

| DATE | TIME | FIRST READING | SECOND READING | A L G | C O N | TIME SINCE TEST BEGAN | WATER LEVEL ELEVATION | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| DDMONYY | HHMM.SS | FEET | FEET | | | MINUTES | FEET | |
| | | | | | | | | COLLAR ELEV 1702.99 FEET PIEZO ELEV 0.00 -NULL- |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 18APR79 | 1005.00 | 111.70 | 0.00 | 1 | 20 | -627840.00 | 1591.29 | |
| 18APR79 | 1005.00 | 111.70 | 0.00 | 1 | 20 | -627840.00 | 1591.29 | CORRECT TO COLLAR TOP |
| | | | | | | | | GROUND SURFACE-CORR. TO |
| 12NOV79 | 1200.00 | 108.20 | 0.00 | 1 | 20 | -328205.00 | 1594.79 | GROUND SURFACE-CORR. TO |
| 03DEC79 | 1200.00 | 107.60 | 0.00 | 1 | 20 | -297965.00 | 1595.39 | CORRECT TO COLLAR TOP |
| 25APR80 | 1200.00 | 108.75 | .10 | 1 | 14 | -90605.00 | 1594.14 | 14 - TIME NOT RECORD |
| 21MAY80 | 1200.00 | 100.71 | -2.06 | 1 | 15 | -53165.00 | 1604.34 | 15 - NO TIME |
| 31MAY80 | 1240.00 | 108.87 | 0.00 | 1 | 65 | -38725.00 | 1594.02 | 4 14 SET CASE |
| 02JUN80 | 930.00 | 108.68 | 0.00 | 1 | 65 | -36035.00 | 1594.21 | 4 14 |
| 03JUN80 | 1030.00 | 111.05 | 0.00 | 1 | 93 | -34535.00 | 1594.15 | 4 15 |
| 06JUN80 | 915.00 | 108.90 | 0.00 | 1 | 65 | -27410.00 | 1593.99 | 4 14 |
| 09JUN80 | 930.00 | 108.60 | 0.00 | 1 | 65 | -25955.00 | 1594.29 | 4 14 |
| 10JUN80 | 1025.00 | 108.79 | 0.00 | 1 | 65 | -24460.00 | 1594.10 | 4 14 |
| 11JUN80 | 945.00 | 111.10 | 0.00 | 1 | 93 | -23060.00 | 1594.10 | 15 15 |
| 12JUN80 | 935.00 | 110.92 | 0.00 | 1 | 93 | -21630.00 | 1594.28 | 15 15 |
| 13JUN80 | 935.00 | 108.64 | 0.00 | 1 | 92 | -20190.00 | 1594.55 | 15 15 |
| 14JUN80 | 1035.00 | 108.63 | 0.00 | 1 | 65 | -18690.00 | 1594.26 | 4 14 |
| 15JUN80 | 935.00 | 108.79 | 0.00 | 1 | 65 | -17310.00 | 1594.10 | 4 14 |
| 16JUN80 | 805.00 | 108.70 | 0.00 | 1 | 65 | -15960.00 | 1594.19 | 4 14 |
| 24JUN80 | 820.00 | 108.64 | 0.00 | 1 | 65 | -4425.00 | 1594.25 | 4 14 |
| 25JUN80 | 930.00 | 108.52 | 0.00 | 1 | 65 | -2915.00 | 1594.37 | 4 14 |
| 26JUN80 | 945.00 | 108.52 | 0.00 | 1 | 65 | -1460.00 | 1594.37 | 4 14 |
| 27JUN80 | 850.00 | 108.79 | 0.00 | 1 | 65 | -75.00 | 1594.10 | 14 14 BEFORE TEST |
| 27JUN80 | 1040.00 | 108.68 | 0.00 | 1 | 65 | 35.00 | 1594.21 | 14 14 START @ 10 |
| 27JUN80 | 1140.00 | 108.77 | 0.00 | 1 | 65 | 95.00 | 1594.12 | 14 14 |
| 27JUN80 | 1255.00 | 108.68 | 0.00 | 1 | 65 | 170.00 | 1594.21 | 14 14 |
| 27JUN80 | 1419.00 | 108.75 | 0.00 | 1 | 65 | 254.00 | 1594.14 | 14 14 |
| 27JUN80 | 1600.00 | 108.70 | 0.00 | 1 | 65 | 355.00 | 1594.19 | 14 14 |
| 27JUN80 | 1749.00 | 108.66 | 0.00 | 1 | 65 | 464.00 | 1594.23 | 14 14 |
| 27JUN80 | 1942.00 | 108.60 | 0.00 | 1 | 65 | 577.00 | 1594.29 | 14 14 |
| 27JUN80 | 2141.00 | 108.58 | 0.00 | 1 | 65 | 696.00 | 1594.31 | 14 14 |
| 28JUN80 | 547.00 | 108.58 | 0.00 | 1 | 65 | 1182.00 | 1594.31 | 14 14 |
| 28JUN80 | 919.00 | 108.53 | 0.00 | 1 | 65 | 1394.00 | 1594.36 | 14 14 |
| 28JUN80 | 1247.00 | 108.91 | 0.00 | 1 | 4 | 1602.00 | 1594.30 | |
| 28JUN80 | 1247.00 | 108.91 | 0.00 | 1 | 4 | 1602.00 | 1594.30 | 14 |
| | | | | | | | | 14 |
| 28JUN80 | 1547.00 | 108.92 | 0.00 | 1 | 4 | 1782.00 | 1594.29 | 4 14 |
| 28JUN80 | 1838.00 | 108.92 | 0.00 | 1 | 4 | 1953.00 | 1594.29 | 4 14 |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***K13A ***

| DATE DDMONYY | TIME HHMM.SS | FIRST READING FEET | SECOND READING FEET | A L G | C O N | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | COLLAR ELEV 1702.99 FEET PIEZO ELEV 0.00 -NULL |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 28JUN80 | 2325.00 | 108.66 | 0.00 | 1 | 65 | 2240.00 | 1594.23 | 12 14 |
| 29JUN80 | 910.00 | 108.72 | 0.00 | 1 | 65 | 2825.00 | 1594.17 | 14 14 |
| 29JUN80 | 1714.00 | 108.94 | 0.00 | 1 | 65 | 3309.00 | 1593.95 | 14 14 |
| 30JUN80 | 133.00 | 109.11 | 0.00 | 1 | 65 | 3808.00 | 1593.78 | 14 14 |
| 30JUN80 | 743.00 | 109.10 | 0.00 | 1 | 65 | 4178.00 | 1593.79 | 14 14 |
| 30JUN80 | 1631.00 | 109.11 | 0.00 | 1 | 65 | 4706.00 | 1593.78 | 14 14 |
| 01JUL80 | 706.00 | 109.03 | 0.00 | 1 | 65 | 5581.00 | 1593.86 | 14 14 |
| 01JUL80 | 1731.00 | 109.22 | 0.00 | 1 | 65 | 6206.00 | 1593.67 | 16 14 |
| 02JUL80 | 122.00 | 109.37 | 0.00 | 1 | 65 | 6677.00 | 1593.52 | 16 14 |
| 02JUL80 | 1015.00 | 109.47 | 0.00 | 1 | 65 | 7210.00 | 1593.42 | 16 14 |
| 02JUL80 | 2048.00 | 109.41 | 0.00 | 1 | 65 | 7843.00 | 1593.48 | 16 14 |
| 03JUL80 | 955.00 | 109.40 | 0.00 | 1 | 65 | 8630.00 | 1593.49 | 16 14 |
| 03JUL80 | 2013.00 | 109.40 | 0.00 | 1 | 65 | 9248.00 | 1593.49 | 16 14 |
| 04JUL80 | 808.00 | 109.52 | 0.00 | 1 | 65 | 9963.00 | 1593.37 | 16 14 |
| 04JUL80 | 2003.00 | 109.51 | 0.00 | 1 | 62 | 10678.00 | 1593.55 | 15 15 SINCO 1 |
| 05JUL80 | 743.00 | 109.63 | 0.00 | 1 | 65 | 11378.00 | 1593.26 | 14 14 |
| 05JUL80 | 2108.00 | 109.92 | 0.00 | 1 | 65 | 12183.00 | 1592.97 | 14 14 |
| 06JUL80 | 1203.00 | 109.94 | 0.00 | 1 | 65 | 13078.00 | 1592.95 | 14 14 |
| 06JUL80 | 1801.00 | 109.79 | 0.00 | 1 | 65 | 13436.00 | 1593.10 | 14 14 |
| 07JUL80 | 730.00 | 109.75 | 0.00 | 1 | 65 | 14245.00 | 1593.14 | 14 14 |
| 07JUL80 | 1658.00 | 109.71 | 0.00 | 1 | 65 | 14813.00 | 1593.18 | 14 14 |
| 08JUL80 | 1126.00 | 110.14 | 0.00 | 1 | 66 | 15921.00 | 1592.71 | 14 14 |
| 08JUL80 | 2040.00 | 110.13 | 0.00 | 1 | 66 | 16475.00 | 1592.72 | 14 14 |
| 09JUL80 | 959.00 | 110.14 | 0.00 | 1 | 66 | 17274.00 | 1592.71 | 14 14 |
| 09JUL80 | 1629.00 | 110.09 | 0.00 | 1 | 66 | 17664.00 | 1592.76 | 14 14 |
| 10JUL80 | 946.00 | 110.24 | 0.00 | 1 | 66 | 18701.00 | 1592.61 | 14 14 |
| 10JUL80 | 1755.00 | 110.20 | 0.00 | 1 | 66 | 19190.00 | 1592.65 | 14 14 |
| 11JUL80 | 1028.00 | 110.37 | 0.00 | 1 | 66 | 20183.00 | 1592.48 | 14 14 |
| 11JUL80 | 1950.00 | 110.49 | 0.00 | 1 | 66 | 20745.00 | 1592.36 | 14 14 |
| 12JUL80 | 1045.00 | 110.51 | 0.00 | 1 | 66 | 21640.00 | 1592.34 | 14 14 |
| 13JUL80 | 945.00 | 110.80 | 0.00 | 1 | 66 | 23020.00 | 1592.05 | 14 14 |
| 14JUL80 | 1155.00 | 110.66 | 0.00 | 1 | 66 | 24590.00 | 1592.19 | 14 14 |
| 15JUL80 | 1037.00 | 110.87 | 0.00 | 1 | 66 | 25952.00 | 1591.98 | 14 14 |
| 16JUL80 | 1037.00 | 110.99 | 0.00 | 1 | 66 | 27392.00 | 1591.86 | 14 14 |
| 17JUL80 | 930.00 | 111.16 | 0.00 | 1 | 66 | 28765.00 | 1591.69 | 14 14 |
| 18JUL80 | 855.00 | 111.31 | 0.00 | 1 | 66 | 30170.00 | 1591.54 | 14 14 |
| 20JUL80 | 901.00 | 111.53 | 0.00 | 1 | 66 | 33056.00 | 1591.32 | 14 14 |
| 21JUL80 | 745.00 | 111.92 | 0.00 | 1 | 66 | 34420.00 | 1590.93 | 14 14 |
| 21JUL80 | 1023.00 | 111.84 | 0.00 | 1 | 66 | 34578.00 | 1591.01 | 14 14 START @ 10 |
| 21JUL80 | 1044.00 | 111.83 | 0.00 | 1 | 66 | 34599.00 | 1591.02 | 14 14 |
| 21JUL80 | 1102.00 | 111.87 | 0.00 | 1 | 66 | 34617.00 | 1590.98 | 14 14 |
| 21JUL80 | 1122.00 | 111.97 | 0.00 | 1 | 66 | 34637.00 | 1590.88 | 66 |
| 21JUL80 | 1148.00 | 111.83 | 0.00 | 1 | 66 | 34663.00 | 1591.02 | 14 14 |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***K13A ***

| DATE DDMONYY | TIME HHMM.SS | FIRST READING FEET | SECOND READING FEET | A L G | C O N | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | COLLAR ELEV 1702.99 FEET PIEZO ELEV 0.00 -NULL |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 21JUL80 | 1208.00 | 111.79 | 0.00 | 1 | 66 | 34683.00 | 1591.06 | 14 14 |
| 21JUL80 | 1231.00 | 111.77 | 0.00 | 1 | 66 | 34706.00 | 1591.08 | 14 14 |
| 21JUL80 | 1251.00 | 111.77 | 0.00 | 1 | 66 | 34726.00 | 1591.08 | 14 14 |
| 21JUL80 | 1312.00 | 111.73 | 0.00 | 1 | 66 | 34747.00 | 1591.12 | 14 14 |
| 21JUL80 | 1334.00 | 111.73 | 0.00 | 1 | 66 | 34769.00 | 1591.12 | 14 14 |
| 21JUL80 | 1402.00 | 111.73 | 0.00 | 1 | 66 | 34797.00 | 1591.12 | 14 14 |
| 21JUL80 | 1425.00 | 111.73 | 0.00 | 1 | 66 | 34820.00 | 1591.12 | 14 14 |
| 21JUL80 | 1508.00 | 111.70 | 0.00 | 1 | 66 | 34863.00 | 1591.15 | 14 14 |
| 21JUL80 | 1637.00 | 111.73 | 0.00 | 1 | 66 | 34952.00 | 1591.12 | 14 14 |
| 21JUL80 | 1729.00 | 111.71 | 0.00 | 1 | 66 | 35004.00 | 1591.14 | 14 14 |
| 21JUL80 | 1845.00 | 111.66 | 0.00 | 1 | 66 | 35080.00 | 1591.19 | 14 14 |
| 21JUL80 | 1943.00 | 111.64 | 0.00 | 1 | 66 | 35138.00 | 1591.21 | 14 14 |
| 21JUL80 | 2039.00 | 111.71 | 0.00 | 1 | 66 | 35194.00 | 1591.14 | 14 14 |
| 21JUL80 | 2203.00 | 111.70 | 0.00 | 1 | 66 | 35278.00 | 1591.15 | 14 14 |
| 21JUL80 | 2314.00 | 111.96 | 0.00 | 1 | 66 | 35349.00 | 1590.89 | 14 14 |
| 22JUL80 | 35.00 | 111.82 | 0.00 | 1 | 66 | 35430.00 | 1591.03 | 14 14 |
| 22JUL80 | 305.00 | 111.66 | 0.00 | 1 | 66 | 35580.00 | 1591.19 | 14 14 |
| 22JUL80 | 828.00 | 111.62 | 0.00 | 1 | 66 | 35903.00 | 1591.23 | 14 14 |
| 22JUL80 | 1215.00 | 111.62 | 0.00 | 1 | 66 | 36130.00 | 1591.23 | 14 14 |
| 22JUL80 | 1552.00 | 111.52 | 0.00 | 1 | 66 | 36347.00 | 1591.33 | 14 14 |
| 22JUL80 | 1927.00 | 111.51 | 0.00 | 1 | 66 | 36562.00 | 1591.34 | 14 14 |
| 23JUL80 | 53.00 | 111.52 | 0.00 | 1 | 66 | 36888.00 | 1591.33 | 14 14 |
| 23JUL80 | 406.00 | 111.50 | 0.00 | 1 | 66 | 37081.00 | 1591.35 | 14 14 |
| 23JUL80 | 1201.00 | 110.00 | 1.45 | 1 | 66 | 37556.00 | 1591.40 | 14 14 |
| 23JUL80 | 1946.00 | 110.00 | 1.38 | 1 | 66 | 38021.00 | 1591.47 | 14 14 |
| 24JUL80 | 943.00 | 110.00 | 1.32 | 1 | 66 | 38858.00 | 1591.53 | 14 14 |
| 24JUL80 | 1740.00 | 110.00 | 1.17 | 1 | 66 | 39335.00 | 1591.68 | 14 14 |
| 25JUL80 | 1039.00 | 110.00 | 1.26 | 1 | 66 | 40354.00 | 1591.59 | 14 14 |
| 25JUL80 | 1705.00 | 110.00 | 1.28 | 1 | 66 | 40740.00 | 1591.57 | 14 14 |
| 26JUL80 | 953.00 | 110.00 | 1.23 | 1 | 66 | 41748.00 | 1591.62 | 14 14 |
| 27JUL80 | 902.00 | 110.00 | 3.54 | 1 | 93 | 43137.00 | 1591.66 | 15 BY D. K. TO 9/2/80 |
| 28JUL80 | 838.00 | 110.00 | 3.41 | 1 | 93 | 44553.00 | 1591.79 | 15 BY D. K. TO 9/2/80 |
| 29JUL80 | 945.00 | 110.00 | 3.52 | 1 | 93 | 46060.00 | 1591.68 | 15 BY D. K. TO 9/2/80 |
| 30JUL80 | 1156.00 | 110.00 | 3.88 | 1 | 93 | 47631.00 | 1591.32 | 15 BY D. K. TO 9/2/80 |
| 31JUL80 | 1510.00 | 110.00 | 3.33 | 1 | 93 | 49265.00 | 1591.87 | 15 BY D. K. TO 9/2/80 |
| 01AUG80 | 1158.00 | 110.00 | 3.34 | 1 | 93 | 50513.00 | 1591.86 | 15 BY D. K. TO 9/2/80 |
| 03AUG80 | 916.00 | 110.00 | 3.31 | 1 | 93 | 53231.00 | 1591.89 | 4 15 |
| 05AUG80 | 1700.00 | 110.00 | 3.32 | 1 | 93 | 56575.00 | 1591.88 | 4 15 |
| 07AUG80 | 1450.00 | 110.00 | 3.18 | 1 | 93 | 59325.00 | 1592.02 | 4 15 |
| 09AUG80 | 1023.00 | 110.00 | 3.15 | 1 | 93 | 61938.00 | 1592.05 | 4 15 |
| 12AUG80 | 1306.00 | 110.00 | 3.12 | 1 | 93 | 66421.00 | 1592.08 | 4 15 |
| 14AUG80 | 1159.00 | 110.00 | 3.10 | 1 | 93 | 69234.00 | 1592.10 | 4 15 |
| 16AUG80 | 1043.00 | 110.00 | 3.11 | 1 | 93 | 72038.00 | 1592.09 | 4 15 |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***K13A ***

| DATE | TIME | FIRST READING | SECOND READING | A L G | C O N | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| DDMONYY | HHMM.SS | FEET | FEET | | | | | |
| | | | | | | | | COLLAR ELEV 1702.99 FEET PIEZO ELEV 0.00 -NULL |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 20AUG80 | 1505.00 | 112.87 | 0.00 | 1 | 93 | 78060.00 | 1592.33 | 15 |
| 22AUG80 | 1352.00 | 112.80 | 0.00 | 1 | 93 | 80867.00 | 1592.40 | 15 |
| 02SEP80 | 855.00 | 112.98 | 0.00 | 1 | 93 | 96390.00 | 1592.22 | 15 |
| 10SEP80 | 1005.00 | 110.81 | 0.00 | 1 | 15 | 108000.00 | 1592.18 | 15 FOR G.W. MAP |

COOR. N114770 ft. (N34982m)
E2285955 ft. (E696760m)

# BORING LOG G41-K13A

SHEET 1 OF 5

SURFACE ELEV. 1699.9 ft. (518.12m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 3/28/79 DATE COMPLETED 3/31/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS. | BLOWS/FOOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES HAMMER BLOWS PER 6IN. (Note 1) | SAMPLES REC./ATT. (ins.) | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| 0.15 | | Topsoil and rootmat | | | | | | | |
| 0.5 | | | | - | 1 | DO | Air Hammer | 18/18 | |
| | | | | - | 2 | DO | Air Hammer | 18/18 | |
| | | Dense to very dense, red-brown, fine to coarse SAND, some fine to coarse gravel, some silt, trace clay<br><br>Boulders noted at:<br>22.5'-25.0'<br>25.0'-26.0' | SM | - | 3 | DO | Air Hammer | 12/12 | |
| | | | | - | 4 | DO | Air Hammer | 6/18 | |
| | | | | - | 5 | DO | Air Hammer | 2/6 | |
| 7.92 | | | | | | | Air Hammer | | |
| 26.0 | | | | - | 6 | DO | | 6/9 | |
| | | Very dense, brown, fine to coarse SAND, some fine gravel, some silt, trace clay, occasional cobbles and boulders | SM | - | 7 | DO | Air Hammer | 3/3 | |
| | | | | - | 8 | DO | Air Hammer | 4/4 | |
| 11.13 | | | | | | | | | |
| 36.5 | | CONTINUED | | | | | | | |

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked RB

COOR. N114770 ft. (N34982m)
E2285955 ft. (E696760m)

# BORING LOG G41-K13A

SHEET 2 OF 5

SURFACE ELEV. 1699.9 ft. (518.12m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 3/28/79 DATE COMPLETED 3/31/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

| DEPTH METER / FFET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS. | BLOWS / FOOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES HAMMER BLOWS PER 6IN. (Note 1) | SAMPLES REC./ATT. (ins.) | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| 11.13 | | CONTINUED | | | | | | | |
| 36.5 | | | | - | 9 | DO | Air Hammer | 0/3 | |
| | | Very dense, brown, fine to coarse SAND, some fine gravel, some silt, trace clay, occasional cobbles and boulders | SM | - | 10 | DO | Air Hammer | 3/3 | |
| | | Boulder noted at 42.5'-44.5' | | - | 11 | DO | Air Hammer | 3/3 | |
| 16.76 | | | | - | 12 | DO | Air Hammer | 7/7 | |
| 55.0 | | Hard, red-brown SILT, trace clay and fine gravel | ML | | | | | | |
| 17.52 | | | | | | | | | |
| 57.5 | | Very dense, brown, fine to coarse SAND, some fine gravel,, some clay, trace silt | SM | - | 13 | DO | Air Hammer | 6/6 | |
| | | | | - | 14 | DO | Air Hammer | 2/2 | |
| 20.12 | | | | | | | | | |
| 66.0 | | CONTINUED | | | | | | | |

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked RCB

COOR. N114770 ft. (N34982m)
E2285955 ft. (E696760m)

# BORING LOG G41-K13A



SURFACE ELEV. 1699.9 ft. (518.12m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 3/28/79 DATE COMPLETED 3/31/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS. | BLOWS / FOOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES HAMMER BLOWS PER 6IN. (Note 1) | SAMPLES REC./ATT. (ins.) | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| 20.12 | | CONTINUED | | | | | | | |
| 66.0 | | Very dense, brown, fine to coarse SAND, some fine gravel, some clay, trace silt, occasional cobbles | SM | - | 15 | DO | Air Hammer | 4/4 | |
| 21.34 | | | | | | | | | |
| 70.0 | | Very dense, brown, fine GRAVEL and fine to coarse SAND, some silt | GM | - | 16 | DO | Air Hammer | 6/6 | |
| 22.86 | | | | | | | | | |
| 75.0 | | Very dense, green-gray, fine to coarse gravelly, fine to coarse SAND, trace silt, trace clay, occasional cobbles | SP SM | - | 17 | DO | Air Hammer | 0/2 | |
| | | | | - | 18 | DO | Air Hammer | 7/7 | |
| 26.67 | | | | | | | | | |
| 87.5 | | Very dense, red-brown to brown, fine to coarse SAND, some silt, some fine gravel, occasional cobbles | SM | - | 19 | DO | Air Hammer | 6/6 | |
| | | | | - | 20 | DO | Air Hammer | 12/12 | |
| 29.87 | | | | | | | | | |
| 98.0 | | CONTINUED | | | | | | | |

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked

COOR. N114770 ft. (N34982m)
E2285955 ft. (E696760m)

# BORING LOG G41-K13A

SHEET 4 OF 5

SURFACE ELEV. 1699.9 ft. (518.12m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 3/28/79 DATE COMPLETED 3/31/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

| DEPTH METER / FEET | STRAT. PLOT | DESCRIPTION | UNIFIED CLASS. | BLOWS / FOOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES HAMMER BLOWS PER 6IN. (Note 1) | SAMPLES REC./ATT. (ins.) | GROUNDWATER OBSERVATION WELL |
|---|---|---|---|---|---|---|---|---|---|
| 29.87 | | CONTINUED | | | | | | | |
| 98.0 | | Very dense, red-brown to brown, fine to coarse SAND, some silt, some fine gravel, occasional cobbles | SM | - | 21 | DO | Air Hammer | 18/18 | |
| 33.99 | | | | - | 22 | DO | Air Hammer | 6/6 | |
| 111.5 | | Very dense, brown, fine to coarse SAND, trace fine gravel, trace silt<br>Boulder noted at 120.0'-121.5' | SP-SM | - | 23 | DO | Air Hammer | 18/18 | |
| 37.24 | | | | | | | | | |
| 122.2 | | END OF BORING | | | | | | | |

Grout (to surface) 31.55

Bentonite Clay Seal 103.5 – 32.16

Pea Gravel 105.5

▼33.10 4/18/79

2" Solid PVC Pipe to Surface

≈108.6 33.32

109.3

2" Slotted PVC Pipe

Pea Gravel

36.36

119.3

Note 2

NOTES

1. Penetration Test - 3" O.D. sampler driven with air hammer. (All samples)
2. Permeability test was falling head test with water level at top of casing at beginning of test. See page 5 for permeability test number 1.

Job No. 786085
Scale 1"=5'

Golder Associates

Drawn jls
Checked

COOR. N114770 ft. (N34982m)
E2285955 ft. (E696760m)

BORING LOG G41-K13A



SURFACE ELEV. 1699.9 ft. (518.12m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 3/28/79 DATE COMPLETED 3/31/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

NOTES (continued)

PERMEABILITY TEST NUMBER 1

Drove 4" casing from 116.0' to 120.0', leaving top of casing 2.67' above ground.
Cleaned hole to 120.0' with water and encountered boulder.
Advanced hole from 120.0' to 121.5' with 4" bit through boulder.
Cleaned hole to 122.17' (0.67' past boulder) with water. Performed falling head permeability test.

| Time (min.) | Drop (ft.) | Time (min.) | Drop (ft.) |
|---|---|---|---|
| 0.5 | 0.04 | 20.0 | 1.46 |
| 1.0 | 0.13 | 25.0 | 1.67 |
| 2.0 | 0.21 | 30.0 | 1.83 |
| 5.0 | 0.46 | 35.0 | 1.96 |
| 10.0 | 0.79 | 40.0 | 2.08 |
| 15.0 | 1.17 | | |

3. Elevation of top of protector pipe, 1703.0 ft. (519.07m).

Table of Water Level Readings by Date. Readings Indicate Depth Below Ground Surface.

| DATE | 4/18/79 | 11/12/79 | 12/3/79 | 4/25/80 | 5/21/80 | 6/26/80* | 9/10/80* |
|---|---|---|---|---|---|---|---|
| DEPTH (m) | 33.10 | 32.06 | 31.85 | 32.19 | 32.80 | 32.16 | 32.83 |
| DEPTH (ft.) | 108.6 | 105.1 | 104.5 | 105.6 | 107.6 | 105.5 | 107.7 |

*Pump Test and Recovery Period Between these Dates. For Pump Test Data, Refer to PUMP TEST AND ANALYSIS, Project Report No. 4.

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CHANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***C15 ***

| DATE | TIME | FIRST READING | SECOND READING | A L G | C O N | TIME SINCE TEST BEGAN | WATER LEVEL ELEVATION | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| DDMONYY | HHMM.SS | FEET | FEET | | | MINUTES | FEET | COLLAR ELEV 1617.30 FEET PIEZO ELEV 0.00 -NULL |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 18APR79 | 1615.00 | 22.60 | 0.00 | 1 | 20 | -627470.00 | 1594.70 | |
| 18APR79 | 1615.00 | 22.60 | 0.00 | 1 | 20 | -627470.00 | 1594.70 | CORRECT TO COLLAR TOP |
| | | | | | | | | GROUND SURFACE-CORR. TO |
| 07NOV79 | 800.00 | 23.15 | 0.00 | 1 | 20 | -335645.00 | 1594.15 | |
| 07NOV79 | 800.00 | 23.15 | 0.00 | 1 | 20 | -335645.00 | 1594.15 | BY D&M |
| | | | | | | | | BY D&M |
| 12NOV79 | 1200.00 | 23.60 | 0.00 | 1 | 20 | -328205.00 | 1593.70 | GROUND SURFACE-CORR. TO |
| 14FEB80 | 1145.00 | 23.50 | 0.00 | 1 | 20 | -192860.00 | 1593.80 | BY D&M |
| 25APR80 | 1200.00 | 24.30 | -.08 | 1 | 14 | -90605.00 | 1593.08 | 14 - TIME NOT RECORD |
| 22MAY80 | 1200.00 | 24.26 | -.03 | 1 | 14 | -51725.00 | 1593.07 | 14 - NO TIME |
| 28JUN80 | 1855.00 | 27.76 | -.08 | 1 | 14 | 1970.00 | 1589.62 | 14 14 |
| 07JUL80 | 919.00 | 29.49 | -.08 | 1 | 14 | 14354.00 | 1587.89 | 14 14 |
| 09JUL80 | 1057.00 | 29.83 | -.08 | 1 | 14 | 17332.00 | 1587.55 | 14 14 |
| 17JUL80 | 2430.00 | 30.78 | 0.00 | 1 | 69 | 29665.00 | 1586.61 | 14 14 |
| 24JUL80 | 1032.00 | 25.00 | 2.41 | 1 | 69 | 38907.00 | 1589.98 | 14 14 |
| 02AUG80 | 850.00 | 25.00 | 1.50 | 1 | 82 | 51765.00 | 1590.83 | 15 BY O. K. TO 9/2/80 |
| 09AUG80 | 1650.00 | 25.00 | 1.35 | 1 | 82 | 61965.00 | 1590.98 | 4 15 |
| 16AUG80 | 1000.00 | 25.00 | 1.22 | 1 | 82 | 71995.00 | 1591.11 | 4 15 |
| 20AUG80 | 715.00 | 26.06 | 0.00 | 1 | 20 | 77590.00 | 1591.24 | 20 D&M |
| 22AUG80 | 1428.00 | 26.20 | 0.00 | 1 | 82 | 80903.00 | 1591.13 | 15 |
| 02SEP80 | 915.00 | 24.97 | 0.00 | 1 | 82 | 96430.00 | 1592.36 | 15 |
| 10SEP80 | 1115.00 | 25.92 | 0.00 | 1 | 15 | 108070.00 | 1591.38 | 15 FOR G.W. MAP |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***E17 ***

| DATE | TIME | FIRST READING | SECOND READING | A L G | C O N | TIME SINCE TEST BEGAN | WATER LEVEL ELEVATION |
|---|---|---|---|---|---|---|---|
| DDMONYY | HHMM.SS | FEET | FEET | | | MINUTES | FEET |
| 18APR79 | 1630.00 | 78.80 | 0.00 | 1 | 20 | -627455.00 | 1589.69 |
| 12NOV79 | 1200.00 | 79.80 | 0.00 | 1 | 20 | -328205.00 | 1593.69 |
| 25APR80 | 1200.00 | 75.75 | -.03 | 1 | 14 | -90605.00 | 1592.77 |
| 22MAY80 | 1200.00 | 75.72 | -.06 | 1 | 14 | -51725.00 | 1592.83 |
| 09JUL80 | 1112.00 | 78.11 | -.03 | 1 | 14 | 17347.00 | 1590.41 |
| 17JUL80 | 2417.00 | 81.61 | -.02 | 1 | 14 | 29652.00 | 1586.90 |
| 24JUL80 | 1017.00 | 75.00 | 3.62 | 1 | 68 | 38892.00 | 1589.90 |
| 02AUG80 | 840.00 | 75.00 | 2.82 | 1 | 89 | 51755.00 | 1590.65 |
| 09AUG80 | 1045.00 | 75.00 | 2.63 | 1 | 89 | 61960.00 | 1590.84 |
| 16AUG80 | 1017.00 | 75.00 | 2.48 | 1 | 89 | 72012.00 | 1590.99 |
| 22AUG80 | 1415.00 | 77.44 | 0.00 | 1 | 89 | 80690.00 | 1591.03 |
| 02SEP80 | 905.00 | 77.22 | 0.00 | 1 | 89 | 96420.00 | 1591.25 |
| 10SEP80 | 1050.00 | 77.23 | 0.00 | 1 | 15 | 108045.00 | 1591.26 |

**COMMENTS**

COLLAR ELEV 1668.49 FEET PIEZO ELEV 0.00 -NULL-
TIME PUMP TEST BEGAN = 27JUN80-1005.00

GROUND SURFACE-CORR. TO
CORRECT TO COLLAR TOP
14 - TIME NOT RECORD
14 - NO TIME
14 14
14 14
14 14
15 BY D. K. TO 9/2/80
4 15
4 15
15
15
15 FOR G.W. MAP

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G21 ***

| DATE DDMONYY | TIME HHMM.SS | FIRST READING FEET | SECOND READING FEET | ALG | CON | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET |
|---|---|---|---|---|---|---|---|
| 18DEC79 | 1200.00 | 75.30 | 0.00 | 1 | 20 | -276365.00 | 1591.61 |
| 25APR80 | 1200.00 | 74.00 | -.09 | 1 | 14 | -90605.00 | 1593.00 |
| 28JUN80 | 1240.00 | 75.75 | -.03 | 1 | 14 | 1595.00 | 1591.19 |
| 09JUL80 | 1335.00 | 76.06 | -.03 | 1 | 14 | 17490.00 | 1590.88 |
| 17JUL80 | 1523.00 | 76.34 | -.03 | 1 | 14 | 29118.00 | 1590.60 |
| 02AUG80 | 949.00 | 75.00 | 1.30 | 1 | 89 | 51824.00 | 1590.59 |
| 09AUG80 | 1430.00 | 75.00 | 1.43 | 1 | 89 | 62185.00 | 1590.46 |
| 16AUG80 | 941.00 | 75.00 | 1.52 | 1 | 89 | 71976.00 | 1590.37 |
| 23AUG80 | 730.00 | 76.60 | 0.00 | 1 | 89 | 81925.00 | 1590.29 |
| 02SEP80 | 1030.00 | 76.60 | 0.00 | 1 | 89 | 96505.00 | 1590.29 |
| 10SEP80 | 1310.00 | 76.62 | 0.00 | 1 | 15 | 108185.00 | 1590.29 |

**COMMENTS**

COLLAR ELEV 1666.91 FEET PIEZO ELEV 0.00 -NULL
TIME PUMP TEST BEGAN = 27JUN80-1005.00

CORRECT TO COLLAR TOP
14 - TIME NOT RECORD
14 14
14 14
14 14
15 BY D. K. TO 9/2/80
4 15
4 15
15
15
15 FOR G.W. MAP

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***F24 ***

| DATE DDMONYY | TIME HHMM.SS | FIRST READING FEET | SECOND READING FEET | ALG | COM | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET |
|---|---|---|---|---|---|---|---|
| 10JAN80 | 1200.00 | 68.50 | 0.00 | 1 | 20 | -243245.00 | 1588.11 |
| 25APR80 | 1200.00 | 69.20 | -.09 | 1 | 14 | -90605.00 | 1587.50 |
| 28JUN80 | 1545.00 | 68.95 | -.06 | 1 | 14 | 1780.00 | 1587.72 |
| 09JUL80 | 1226.00 | 69.06 | -.06 | 1 | 14 | 17421.00 | 1587.61 |
| 17JUL80 | 1443.00 | 69.13 | -.06 | 1 | 14 | 29078.00 | 1587.54 |
| 25JUL80 | 1323.00 | 65.00 | 4.06 | 1 | 14 | 40518.00 | 1587.55 |
| 02AUG80 | 1010.00 | 60.00 | 8.99 | 1 | 88 | 51845.00 | 1587.59 |
| 09AUG80 | 1515.00 | 60.00 | 8.94 | 1 | 88 | 62230.00 | 1587.64 |
| 16AUG80 | 905.00 | 60.00 | 8.90 | 1 | 88 | 71940.00 | 1587.68 |
| 23AUG80 | 745.00 | 68.92 | 0.00 | 1 | 88 | 81940.00 | 1587.66 |
| 02SEP80 | 1105.00 | 68.93 | 0.00 | 1 | 88 | 96540.00 | 1587.65 |
| 10SEP80 | 1400.00 | 69.36 | 0.00 | 1 | 15 | 108235.00 | 1587.25 |

**COMMENTS**

COLLAR ELEV 1656.61 FEET PIEZO ELEV 0.00 -NULL-
TIME PUMP TEST BEGAN = 27JUN80-1005.00

CORRECT TO COLLAR TOP
14 - TIME NOT RECORD
14 14
14 14
14 14
14 14
15 BY D. K. TO 9/2/80
4 15
4 15
15
15
15 FOR G.W. MAP

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***J17 ***

| DATE DDMONYY | TIME HHMM.SS | FIRST READING FEET | SECOND READING FEET | ALG | CON | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET |
|---|---|---|---|---|---|---|---|
| 27JUN80 | 900.00 | 98.50 | .06 | 1 | 14 | -65.00 | 1590.68 |
| 02JUL80 | 1208.00 | 100.09 | .21 | 1 | 14 | 7323.00 | 1588.94 |
| 07JUL80 | 847.00 | 100.63 | .21 | 1 | 14 | 14322.00 | 1588.40 |
| 17JUL80 | 1153.00 | 101.91 | .21 | 1 | 14 | 28908.00 | 1587.12 |
| 24JUL80 | 1012.00 | 100.00 | 1.10 | 1 | 70 | 38887.00 | 1587.93 |
| 02AUG80 | 830.00 | 100.00 | 2.50 | 1 | 91 | 51745.00 | 1588.80 |
| 09AUG80 | 1033.00 | 100.00 | 2.32 | 1 | 91 | 61948.00 | 1588.98 |
| 16AUG80 | 1030.00 | 100.00 | 2.13 | 1 | 91 | 72025.00 | 1589.17 |
| 22AUG80 | 1410.00 | 102.11 | 0.00 | 1 | 91 | 80885.00 | 1589.19 |
| 02SEP80 | 855.00 | 101.92 | 0.00 | 1 | 91 | 96410.00 | 1589.38 |

**COMMENTS**

COLLAR ELEV 1689.24 FEET PIEZO ELEV 0.00 -NULL-
TIME PUMP TEST BEGAN = 27JUN80-1005.00

14 14 BEFORE TEST
16 14
14 14
14 14
14 14
15 BY D. K. TO 9/2/80
4 15
4 15
15
15

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***N21 ***

| DATE | TIME | FIRST READING | SECOND READING | A L G | C O N | TIME SINCE TEST BEGAN | WATER LEVEL ELEVATION | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| DDMONYY | HHMM.SS | FEET | FEET | | | MINUTES | FEET | |
| 18APR79 | 1200.00 | 138.30 | 0.00 | 1 | 20 | -627725.00 | 1591.20 | COLLAR ELEV 1729.50 FEET PIEZO ELEV 0.00 -NULL |
| 25APR80 | 1200.00 | 139.90 | .15 | 1 | 14 | -90605.00 | 1589.45 | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 28JUN80 | 1650.00 | 138.71 | .16 | 1 | 14 | 1845.00 | 1590.63 | CORRECT TO COLLAR TOP |
| 09JUL80 | 1249.00 | 138.84 | .16 | 1 | 14 | 17444.00 | 1590.50 | 14 - TIME NOT RECORD |
| 17JUL80 | 1337.00 | 138.80 | .16 | 1 | 14 | 29012.00 | 1590.54 | 14 14 |
| 25JUL80 | 1414.00 | 135.00 | 3.97 | 1 | 14 | 40569.00 | 1590.53 | 14 14 |
| 02AUG80 | 1040.00 | 140.00 | 1.13 | 1 | 97 | 51875.00 | 1590.87 | 14 14 |
| 09AUG80 | 1555.00 | 140.00 | 1.18 | 1 | 97 | 62270.00 | 1590.82 | 15 BY D. K. TO 9/2/80 |
| 16AUG80 | 830.00 | 140.00 | 1.30 | 1 | 97 | 71905.00 | 1590.70 | 4 15 |
| 23AUG80 | 858.00 | 141.34 | 0.00 | 1 | 97 | 82013.00 | 1590.66 | 4 15 |
| 02SEP80 | 1130.00 | 141.33 | 0.00 | 1 | 97 | 96565.00 | 1590.67 | 15 |
| | | | | | | | | 15 |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***P18 ***

| DATE | TIME | FIRST READING | SECOND READING | A L G | C O N | TIME SINCE TEST BEGAN | WATER LEVEL ELEVATION | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| DDMONYY | HHMM.SS | FEET | FEET | | | MINUTES | FEET | COLLAR ELEV 1591.51 FEET PIEZO ELEV 0.00 -NULL |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 19APR79 | 930.00 | 4.40 | 0.00 | 1 | 20 | -626435.00 | 1587.11 | |
| 19APR79 | 930.00 | 4.40 | 0.00 | 1 | 20 | -626435.00 | 1587.11 | CORRECT TO COLLAR TOP |
| | | | | | | | | GROUND SURFACE-CORR. TO |
| 02JAN80 | 1200.00 | 4.00 | 0.00 | 1 | 20 | -254765.00 | 1587.51 | GROUND SURFACE-CORR. TO |
| 11FEB80 | 1030.00 | 4.25 | 0.00 | 1 | 20 | -197255.00 | 1587.26 | BY D&M |
| 25APR80 | 1200.00 | 4.20 | 0.00 | 1 | 14 | -90605.00 | 1587.31 | 14 - TIME NOT RECORD |
| 29JUN80 | 1030.00 | 4.11 | 0.00 | 1 | 14 | 2905.00 | 1587.40 | 4 14 |
| 07JUL80 | 1030.00 | 4.15 | 0.00 | 1 | 14 | 14425.00 | 1587.36 | 14 14 |
| 09JUL80 | 1345.00 | 4.17 | 0.00 | 1 | 14 | 17500.00 | 1587.34 | 14 14 |
| 17JUL80 | 1313.00 | 4.30 | 0.00 | 1 | 14 | 28988.00 | 1587.21 | 14 14 |
| 25JUL80 | 1425.00 | 0.00 | 4.35 | 1 | 14 | 40580.00 | 1587.16 | 14 14 |
| 02AUG80 | 923.00 | 0.00 | 4.40 | 1 | 15 | 51798.00 | 1587.11 | 15 BY D. K. TO 9/2/80 |
| 09AUG80 | 1105.00 | 0.00 | 4.44 | 1 | 15 | 61980.00 | 1587.07 | 4 15 |
| 16AUG80 | 950.00 | 0.00 | 4.49 | 1 | 15 | 71985.00 | 1587.02 | 4 15 |
| 22AUG80 | 1450.00 | 4.50 | 0.00 | 1 | 15 | 80925.00 | 1587.01 | 15 |
| 02SEP80 | 1015.00 | 4.50 | 0.00 | 1 | 15 | 96490.00 | 1587.01 | 15 |
| 10SEP80 | 1200.00 | 4.65 | 0.00 | 1 | 20 | 108115.00 | 1586.86 | 20 FOR G.W. MAP, D&M, N |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***P188 ***

| DATE ODMONYY | TIME HHMM.SS | FIRST READING FEET | SECOND READING FEET | ALG | CON | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | COLLAR ELEV 1591.27 FEET PIEZO ELEV 0.00 -NULL |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 19APR79 | 935.00 | 2.70 | 0.00 | 1 | 20 | -626430.00 | 1588.57 | CORRECT TO COLLAP TOP |
| 02JAN80 | 1200.00 | 0.00 | 0.00 | 1 | 20 | -254765.00 | 1591.27 | ICE IN COLLAR |
| 13FEB80 | 1200.00 | 0.00 | 0.00 | 1 | 20 | -194285.00 | 1591.27 | ICE IN COLLAR |
| 17MAY80 | 1240.00 | 1.67 | 0.00 | 1 | 20 | -58885.00 | 1589.60 | 20 D&M |
| 29JUN80 | 1034.00 | 1.83 | 0.00 | 1 | 14 | 2909.00 | 1589.44 | 4 14 |
| 09JUL80 | 1348.00 | 2.05 | 0.00 | 1 | 14 | 17503.00 | 1589.22 | 14 14 |
| 17JUL80 | 1315.00 | 2.20 | 0.00 | 1 | 14 | 28990.00 | 1589.07 | 14 14 |
| 25JUL80 | 1427.00 | 0.00 | 2.23 | 1 | 14 | 40582.00 | 1589.04 | 14 14 |
| 02AUG80 | 930.00 | 0.00 | 2.23 | 1 | 15 | 51805.00 | 1589.04 | 15 BY D. K. TO 9/2/80 |
| 09AUG80 | 1100.00 | 0.00 | 2.28 | 1 | 15 | 61975.00 | 1588.99 | 4 15 |
| 16AUG80 | 954.00 | 0.00 | 2.32 | 1 | 15 | 71989.00 | 1588.95 | 4 15 |
| 20AUG80 | 845.00 | 2.54 | 0.00 | 1 | 20 | 77680.00 | 1588.73 | 20 D&M |
| 22AUG80 | 1455.00 | 2.32 | 0.00 | 1 | 15 | 80930.00 | 1588.95 | 15 |
| 02SEP80 | 1018.00 | 2.32 | 0.00 | 1 | 15 | 96493.00 | 1588.95 | 15 |
| 10SEP80 | 1200.00 | 2.52 | 0.00 | 1 | 20 | 108115.00 | 1588.75 | 20 FOR G.W. MAP, D&M, N |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***P24 ***

| DATE DDMONYY | TIME HHMM.SS | FIRST READING, FEET | SECOND READING FEET | ALG | CON | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | COLLAR ELEV 1684.37 FEET PIEZO ELEV = 0.00 -NULL |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 10JAN80 | 1200.00 | 93.10 | 0.00 | 1 | 20 | -243245.00 | 1591.27 | GROUND SURFACE-CORR. TO |
| 14FEB80 | 1200.00 | 93.67 | 0.00 | 1 | 20 | -192845.00 | 1590.70 | BY D&M |
| 25APR80 | 1200.00 | 93.80 | -.07 | 1 | 14 | -90605.00 | 1590.64 | 14 - TIME NOT RECORD |
| 19MAY80 | 930.00 | 93.67 | 0.00 | 1 | 20 | -56195.00 | 1590.70 | 20 D&M |
| 28JUN80 | 1710.00 | 93.48 | .04 | 1 | 14 | 1865.00 | 1590.85 | 14 14 |
| 09JUL80 | 1305.00 | 93.59 | .04 | 1 | 14 | 17460.00 | 1590.74 | 14 14 |
| 17JUL80 | 1355.00 | 93.61 | .04 | 1 | 14 | 29030.00 | 1590.72 | 14 14 |
| 25JUL80 | 1400.00 | 90.00 | 3.74 | 1 | 14 | 40555.00 | 1590.63 | 14 14 |
| 02AUG80 | 1056.00 | 95.00 | .67 | 1 | 90 | 51891.00 | 1590.63 | 15 BY O. K. TO 9/2/80 |
| 05AUG80 | 1610.00 | 95.00 | .73 | 1 | 90 | 62285.00 | 1590.57 | 4 15 |
| 16AUG80 | 845.00 | 95.00 | .80 | 1 | 90 | 71920.00 | 1590.50 | 4 15 |
| 18AUG80 | 820.00 | 94.00 | 0.00 | 1 | 20 | 74775.00 | 1590.37 | 20 D&M |
| 23AUG80 | 920.00 | 95.86 | 0.00 | 1 | 90 | 82035.00 | 1590.44 | 15 |
| 02SEP80 | 1145.00 | 95.82 | 0.00 | 1 | 90 | 96580.00 | 1590.48 | 15 |
| 10SEP80 | 1200.00 | 94.15 | 0.00 | 1 | 20 | 108115.00 | 1590.22 | 20 FOR G.W. MAP, D&M, N |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***DM83 ***

| DATE | TIME | FIRST READING | SECOND READING | A L G | C O N |
|---|---|---|---|---|---|
| DDMONYY | HHMM.SS | FEET | FEET | | |
| 02JUL80 | 1438.00 | 9.51 | -.02 | 1 | 14 |
| 07JUL80 | 1020.00 | 9.53 | -.02 | 1 | 14 |
| 09JUL80 | 1407.00 | 9.56 | -.02 | 1 | 14 |

| TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET | |
|---|---|---|
| 7473.00 | 1579.99 | 16 14 |
| 14415.00 | 1579.97 | 14 14 |
| 17522.00 | 1579.94 | 14 14 |

**COMMENTS**
COLLAR ELEV 1589.48 FEET PIEZO ELEV 0.00 -NULL
TIME PUMP TEST BEGAN = 27JUN80-1005.00

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/03/02.- 07.55.16.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***DM05 ***

| DATE DDMMYY | TIME HHMM.SS | FIRST READING FEET | SECOND READING FEET | A L G | C O N | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | COLLAR ELEV 1690.37 FEET PIEZO ELEV 0.00 -NULL |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 27JUN80 | 900.00 | 98.50 | .06 | 1 | 14 | -65.00 | 1591.81 | 14 14 BEFORE TEST |
| 02JUL80 | 1208.00 | 100.09 | .21 | 1 | 14 | 7323.00 | 1590.07 | 16 14 |
| 07JUL80 | 847.00 | 100.63 | .21 | 1 | 14 | 14322.00 | 1589.53 | 14 14 |
| 17JUL80 | 1153.00 | 101.91 | .21 | 1 | 14 | 28408.00 | 1588.25 | 14 14 |
| 29JUL80 | 1012.00 | 100.00 | 1.10 | 1 | 70 | 38887.00 | 1589.06 | 14 14 |
| 02AUG80 | 830.00 | 100.00 | 2.50 | 1 | 91 | 51745.00 | 1589.93 | 15 BY D. K. TO 9/2/80 |
| 09AUG80 | 1033.00 | 100.00 | 2.52 | 1 | 91 | 61948.00 | 1590.11 | 4 15 |
| 16AUG80 | 1030.00 | 100.00 | 2.15 | 1 | 91 | 72025.00 | 1590.30 | 4 15 |
| 22AUG80 | 1410.00 | 102.11 | 0.00 | 1 | 91 | 80885.00 | 1590.32 | 15 |
| 02SEP80 | 855.00 | 101.92 | 0.00 | 1 | 91 | 96410.00 | 1590.51 | 15 |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***DM66 ***

| DATE | TIME | FIRST READING | SECOND READING | A L G | C O N | TIME SINCE TEST BEGAN | WATER LEVEL ELEVATION | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| DDMONYY | HHMM.SS | FEET | FEET | | | MINUTES | FEET | |
| | | | | | | | | COLLAR ELEV 1668.26 FEET PIEZO ELEV 0.00 -NULL |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 25APR80 | 1200.00 | 73.00 | -.09 | 1 | 14 | -90605.00 | 1595.35 | 14 - TIME NOT RECORD |
| 22MAY80 | 1200.00 | 74.60 | -.08 | 1 | 14 | -51725.00 | 1593.74 | 14 - NO TIME |
| 09JUL80 | 1108.00 | 80.75 | -.02 | 1 | 14 | 17343.00 | 1587.53 | 14 14 |
| 17JUL80 | 2419.00 | 79.24 | -.03 | 1 | 14 | 29654.00 | 1589.05 | 14 14 |
| 24JUL80 | 1019.00 | 75.00 | 3.10 | 1 | 68 | 38894.00 | 1590.19 | 14 14 |
| 02AUG80 | 843.00 | 75.00 | 2.23 | 1 | 89 | 51758.00 | 1591.01 | 15 BY D. K. TO 9/2/80 |
| 09AUG80 | 1043.00 | 75.00 | 2.04 | 1 | 89 | 61958.00 | 1591.20 | 4 15 |
| 16AUG80 | 1015.00 | 75.00 | 1.80 | 1 | 89 | 72010.00 | 1591.44 | 4 15 |
| 22AUG80 | 1417.00 | 76.73 | 0.00 | 1 | 89 | 80892.00 | 1591.51 | 15 |
| 02SEP80 | 907.00 | 77.05 | 0.00 | 1 | 89 | 96422.00 | 1591.19 | 15 |

GOLLER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST  JOB NO. 786085  DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER  ***DMB7  ***

| DATE DDMONYY | TIME HHMM.SS | FIRST READING FEET | SECOND READING FEET | A L G | C O N | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET |
|---|---|---|---|---|---|---|---|
| 25APR80 | 1200.00 | 63.40 | -.07 | 1 | 14 | -90605.00 | 1551.75 |
| 28JUN80 | 1615.00 | 64.53 | -.07 | 1 | 14 | 1810.00 | 1590.62 |
| 09JUL80 | 1235.00 | 64.70 | -.07 | 1 | 14 | 17430.00 | 1590.45 |

**COMMENTS**

COLLAR ELEV 1655.08 FEET  PIEZO ELEV  0.00 -NULL-
TIME PUMP TEST BEGAN = 27JUN80-1005.00

14 - TIME NOT RECORD
14 14
14 14

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANCON PUMP TEST  JOB NO. 786085  DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***DMBB ***

| DATE DDMONYY | TIME HHMM.SS | FIRST READING FEET | SECOND READING FEET | A L G | C O N | TIME SINCE TEST BEGAN MINUTES | WATER LEVEL ELEVATION FEET |
|---|---|---|---|---|---|---|---|
| 25APR80 | 1200.00 | 32.55 | -.09 | 1 | 14 | -90605.00 | 1592.11 |
| 02JUL80 | 1451.00 | 34.91 | 0.00 | 1 | 64 | 7486.00 | 1589.75 |
| 09JUL80 | 1358.00 | 35.13 | 0.00 | 1 | 64 | 17513.00 | 1589.53 |

**COMMENTS**
COLLAR ELEV 1624.57 FEET  PIEZO ELEV 0.00 -NULL-
TIME PUMP TEST BEGAN = 27JUN80-1005.00

14 - TIME NOT RECORD
16 14
14 14

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***DMB26 ***

| DATE | TIME | FIRST READING | SECOND READING | A L G | C O N | TIME SINCE TEST BEGAN | WATER LEVEL ELEVATION | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| DDMONYY | HHMM.SS | FEET | FEET | | | MINUTES | FEET | |
| | | | | | | | | COLLAR ELEV 1714.49 FEET PIEZO ELEV 0.00 -NULL |
| | | | | | | | | TIME PUMP TEST BEGAN = 27JUN80-1005.00 |
| 28JUN80 | 1910.00 | 126.05 | .16 | 1 | 14 | 1985.00 | 1588.28 | 14 14 |
| 09JUL80 | 1212.00 | 129.15 | .16 | 1 | 14 | 17407.00 | 1585.18 | 14 14 |
| 17JUL80 | 1458.00 | 129.19 | .16 | 1 | 14 | 29093.00 | 1585.14 | 14 14 |
| 25JUL80 | 1307.00 | 125.00 | 4.27 | 1 | 14 | 40502.00 | 1585.22 | 14 14 |
| 02AUG80 | 958.00 | 130.00 | 1.48 | 1 | 96 | 51833.00 | 1585.14 | 15 BY D. K. TO 9/2/80 |
| 09AUG80 | 1455.00 | 130.00 | 1.46 | 1 | 96 | 62210.00 | 1585.16 | 4 15 |
| 16AUG80 | 924.00 | 130.00 | 1.43 | 1 | 96 | 71959.00 | 1585.19 | 4 15 |
| 23AUG80 | 805.00 | 131.45 | 0.00 | 1 | 96 | 81960.00 | 1585.17 | 15 |
| 02SEP80 | 1050.00 | 131.45 | 0.00 | 1 | 96 | 96525.00 | 1585.17 | 15 |

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***DMB28 ***

| DATE | TIME | FIRST READING | SECOND READING | A L G | C O N | TIME SINCE TEST BEGAN | WATER LEVEL ELEVATION |
|---|---|---|---|---|---|---|---|
| DDMONYY | HHMM.SS | FEET | FEET | | | MINUTES | FEET |
| 25APR80 | 1200.00 | 53.25 | -.10 | 1 | 14 | -90605.00 | 1590.73 |
| 17JUL80 | 1437.00 | 55.16 | -.10 | 1 | 14 | 29072.00 | 1587.82 |
| 25JUL80 | 1328.00 | 55.00 | .06 | 1 | 14 | 40523.00 | 1587.82 |
| 02AUG80 | 1016.00 | 50.00 | 5.22 | 1 | 86 | 51851.00 | 1588.75 |
| 09AUG80 | 1525.00 | 50.00 | 5.31 | 1 | 86 | 62240.00 | 1588.66 |
| 16AUG80 | 858.00 | 50.00 | 5.38 | 1 | 86 | 71933.00 | 1588.59 |
| 23AUG80 | 825.00 | 55.40 | 0.00 | 1 | 87 | 81980.00 | 1590.52 |
| 02SEP80 | 1110.00 | 55.47 | 0.00 | 1 | 87 | 96545.00 | 1590.45 |

**COMMENTS**

COLLAR ELEV 1643.88 FEET PIEZO ELEV 0.00 -NULL
TIME PUMP TEST BEGAN = 27JUN80-1005.00

14 - TIME NOT RECORD
14 14
14 14
15 BY D. K. TO 9/2/80
4 15
4 15
15
15

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***DM029 ***

| DATE | TIME | FIRST READING | SECOND READING | A L G | C O N | TIME SINCE TEST BEGAN | WATER LEVEL ELEVATION |
|---|---|---|---|---|---|---|---|
| DDMONYY | HHMM.SS | FEET | FEET | | | MINUTES | FEET |
| 28JUN80 | 1725.00 | 41.95 | -.01 | 1 | 14 | 1680.00 | 1569.54 |
| 09JUL80 | 1321.00 | 42.04 | -.10 | 1 | 14 | 17476.00 | 1569.54 |
| 17JUL80 | 1429.00 | 42.14 | -.10 | 1 | 14 | 29064.00 | 1569.44 |
| 25JUL80 | 1346.00 | 40.00 | 2.09 | 1 | 14 | 40541.00 | 1569.39 |
| 02AUG80 | 1022.00 | 40.00 | 3.98 | 1 | 85 | 51857.00 | 1569.41 |
| 09AUG80 | 1538.00 | 40.00 | 3.97 | 1 | 85 | 62253.00 | 1569.42 |
| 16AUG80 | 850.00 | 40.00 | 4.10 | 1 | 85 | 71925.00 | 1569.29 |
| 23AUG80 | 833.00 | 44.13 | 0.00 | 1 | 85 | 81588.00 | 1569.26 |
| 02SEP80 | 1115.00 | 44.16 | 0.00 | 1 | 85 | 96550.00 | 1569.23 |

**COMMENTS**

COLLAR ELEV 1631.48 FEET PIEZO ELEV 0.00 -NULL-
TIME PUMP TEST BEGAN = 27JUN80-1005.00

14 14
14 14
14 14
14 14
15 BY D. K. TO 9/2/80
4 15
4 15
15
15

UW-STEVENS POINT
3 1775 620575 5