Engineering Report
on the

REHABILITATION OF THE DEEP INJECTION AND MONITORING WELLS at the Stuart Wastewater Treatment Plant

for the
City of Stuart, Florida

Prepared By

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APRIL 1982
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Section 1
SCOPE

This report describes the modifications and testing of the City of Stuart's deep-well injection system. The City's deep injection well system was never granted an operating permit by the Department of Environmental Regulation (DER) after construction in 1974. Modifications have just been completed to conform to present regulations in order to obtain an operating permit and utilize the injection system. The location of the deep injection and monitoring wells is shown on Figures 1-1 and 1-2.

The injection and monitoring wells were modified in accordance with the "Contract Documents for the Rehabilitation of the Deep Injection and Monitoring Wells at the Stuart Wastewater Treatment Plant" dated July 1981. Construction permit No. UD-43-46099 was issued by the DER on September 4, 1981. The rehabilitation of the injection system was executed as part of a consent order between the City of Stuart and DER. The agreement defined a timetable for progress toward rehabilitation of the injection well and pump system and the subsequent elimination of effluent discharge into the St. Lucie River. Table 1-1 shows the timetable defined in the consent order.

The rehabilitation of the system included the deepening and the installing of a 10-inch steel liner in the injection well and plugging a portion of the open hole of the monitoring well. The pump bowls of the injection pumps are being modified to match the new flow characteristics of the injection well: 2,100 gallons per minute (gpm) or 3 million gallons per day (mgd) in lieu of 4,200 gpm or 6 mgd of the original system. The instrumentation system for pump control and monitoring data collection is also being modified. All data collected during the rehabilitation work, including testing, geophysical logs, summaries of underwater television surveys, weekly activities, daily field reports, and project meeting summaries are included in the Appendix of this report.

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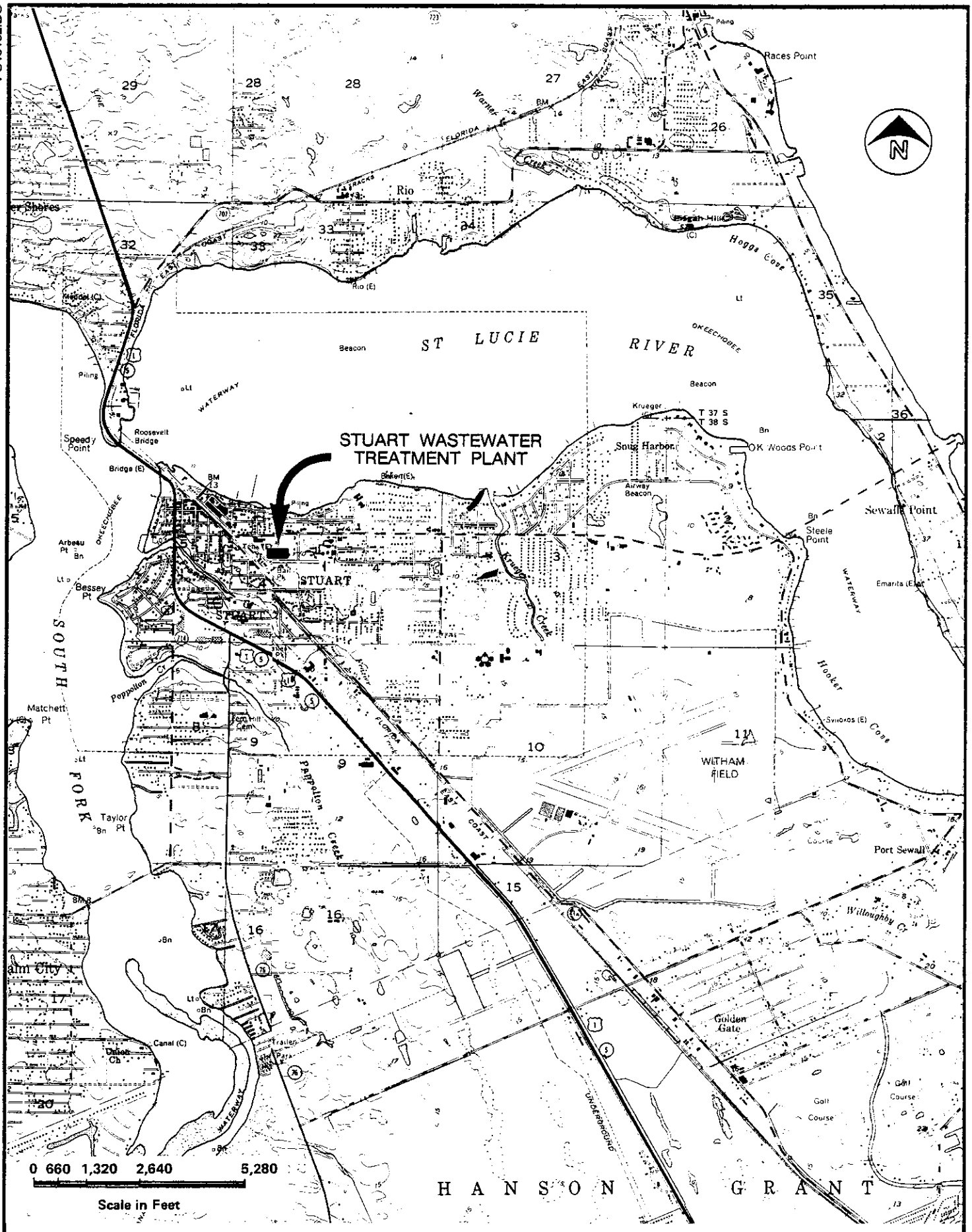

FIGURE 1-1.
Location of the deep injection and monitoring wells at the Stuart Wastewater Treatment Plant.

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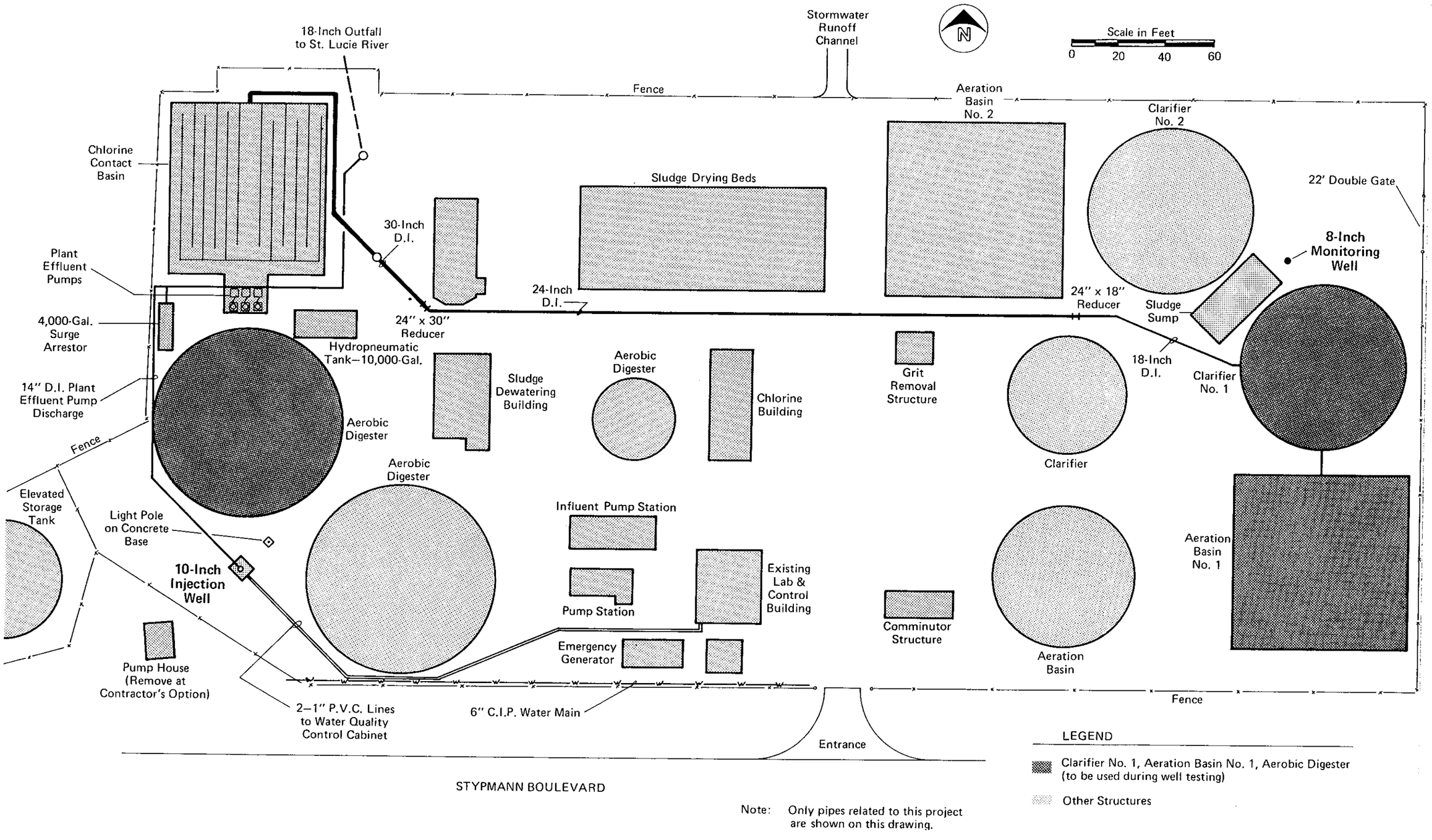

Note: Only pipes related to this project are shown on this drawing.

FIGURE 1-2.
Site plan and well locations —City of Stuart, rehabilitation of deep injection and monitoring wells.

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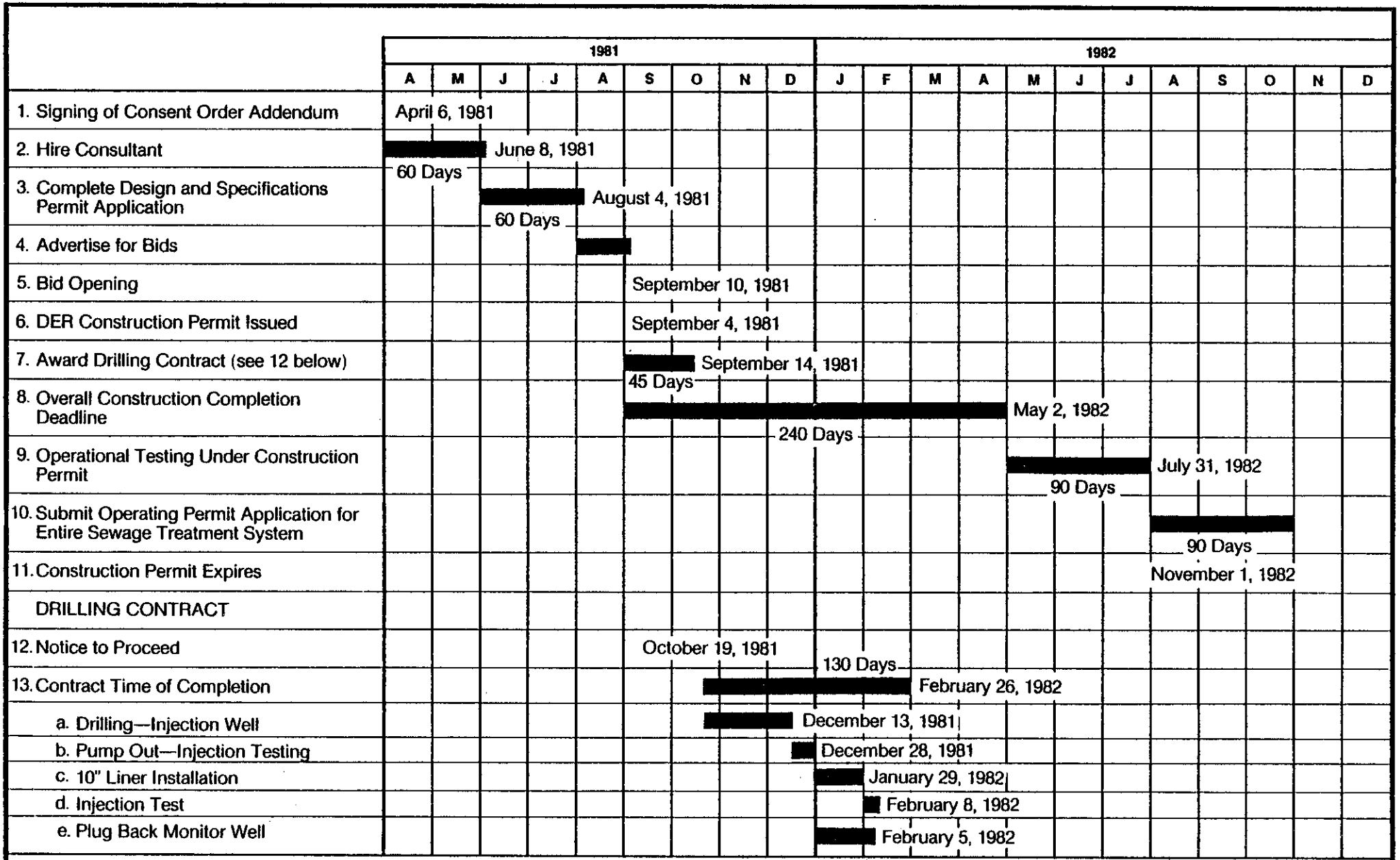

Table 1-1

Stuart Injection and Monitoring Well Rehabilitation—
DER Consent Order Schedule and Project Schedule

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Section 2
BACKGROUND

Prior to the latest wastewater treatment plant expansion and upgrading (1974), effluent from the City's plant was discharged to the St. Lucie River. In the permit for the plant expansion, the Florida Department of Pollution Control (DPC), predecessor of the Florida Department of Environmental Regulation (DER), limited discharge to the river to 1 million gallons per day (mgd). At such time as the flow from the plant reached 1 mgd, discharge to the river was to cease. The outfall to the river was to be upgraded to accept 4 mgd, and would thereafter be used only as a backup to the primary means of effluent disposal. The DPC staff approved deep-well injection as the primary means of effluent disposal.

Consequently, the City of Stuart applied for and was granted DPC Permit No. 43-0001-73 for the construction of one injection and one monitoring well. A construction contract for $485,969 was awarded on November 7, 1973 to Werner Drilling Company, Inc., and Cepco Drilling Ltd., for construction of the wells.

Construction on the monitoring well began on January 28, 1973 and was completed March 21. The drilling equipment was then moved to the injection well site, and the injection well was completed June 2, 1974.

Shortly after the notice to proceed was given to the contractor, the City received a letter from the U.S. Environmental Protection Agency (EPA) in which the question was first raised of increasing the length of the inner casing in the well. Much discussion on the subject took place among the City, EPA, and Black, Crow and Eidsness (BC&E), now part of CH2M HILL. In the meantime, this same issue came to the attention of the other interested agencies, including DPC, Florida Department of Natural Resources (DNR), Central and Southern Florida Flood Control District (CSFFCD), now the South Florida Water Management District (SFWMD), and the U.S. Geological Survey (USGS). An evaluation of each agency's position in regard to the casing length issue indicated a strong bias in favor of extending the casing.

Consequently, BC&E recommended that the casing be extended, at an estimated cost of $45,000, rather than risk later problems in obtaining an operating permit for the well. However, the City elected not to to extend the casing since it had been issued a construction permit, with 2,000 feet of casing specified, only 2 months before.

The deep-well injection system as originally constructed, included one injection well, one monitoring well, the injection pumps and appurtenances, and related monitoring equipment.

The injection well was originally drilled to a depth of 3,011 feet. Geophysical logs run in April 1978 showed that the well had filled back to a depth of 2,990 feet. The well was triple-cased, with 16-inch casing to 2,000 feet, 24-inch casing to 1,010 feet, and 36-inch casing to 318 feet. The annulus between the 16-inch and 24-inch casings was filled with cement grout up to 1,300 feet. The uncemented part of this annulus allows monitoring of water quality and pressure in the Floridan aquifer between 1,010 feet and 1,300 feet.

The monitoring well was of similar construction, with 24-inch casing to 310 feet, 16-inch casing to 1,200 feet, and 8-inch casing to 2,027 feet. The open hole extended to 2,993 feet before the rehabilitation work.

After completion, the well stood idle for 4 years, until January 1978, during which time extensive negotiations took place and much correspondence was exchanged among various regulatory agencies regarding an operation permit. An agreement was reached with the agencies in December 1976 to permit a short-term injection test of the well. The test was intended to demonstrate either that the well casing depth was adequate or that it should be extended. The test was started in February but ran for only 15 days, at which time it was decided to shut down the test due to an unexpected increase of the injection pressure.

Rhodamine WT dye was injected with the effluent during the 15-day test, and water samples from the injection well annulus were collected and analyzed for the dye. No dye was found in the annulus, and the piezometric head of the annulus remained at background trends after allowing for cooling of the water by the injected fluid. The water level in the monitoring well also remained at background trends.

BC&E's conclusion was that the injection well casing was set at an adequate depth for isolating injected fluid from the Floridan aquifer and that installation of a deeper casing was not necessary. However, because of the unexpected higher injection pressure and partial backfill of both injection and monitor wells, the regulatory agencies insisted that the casing in the injection well be extended. The higher than expected injection pressure was found during the rehabilitation work to be caused by settled formation material in the injection zone which partially plugged the cavities.

Further negotiations between the City and DER resulted in the City agreeing to enter into a consent order to modify the system. The rehabilitation work was intended to obtain an operating permit from DER. Three alternatives were presented by CH2M HILL to the interested agencies for approval.

The first alternative, which was recommended by CH2M HILL, was to deepen and clean the injection well to 3,300 feet in depth to restore injection capacity and cement the 16-inch final string of casing up to the surface. This would have brought the well into conformance with present regulations. The monitoring well would have been plugged back and perforated at 1,500 feet in the Floridan aquifer. The second alternative involved deepening and cleaning the well to 3,300 feet and installing a 10-inch steel liner to ±2,700 feet and cemented to ground surface. The monitoring well would be plugged to 2,100-feet to isolate the monitoring zone from the injection zone. The third alternative was similar to the second, but would have cut the 10-inch liner off at 1,800 feet to lower the hydraulic losses in the well and reduce pumping costs.

The regulatory agencies agreed that the 16-inch casing was set below aquifer water with greater than 10,000 mg/l of total dissolved solids (TDS), but they maintained that the thickness of the strata between the bottom of the casing and overlaying, less brackish water was minimal. In order to increase the thickness of strata between the injection horizon and the protected water (less than 10,000 TDS), a liner had to be installed to an approximate depth of 2,700 feet. Therefore, the first alternative was eliminated. Alternative No. 3 was eliminated because the 16-inch casing could not be left uncemented and, therefore, an additional monitoring well would have been required to monitor the Floridan aquifer. Thus, Alternative No. 2 was selected.

In accordance with the rehabilitation plan agreed upon by the regulatory agencies the injection well was first deepened and cleaned to 3,300 feet to reestablish the injection capacity of the well. After injection testing, a 10-inch steel liner was then installed to 2,670 feet and cemented to ground surface. The monitoring well was plugged back to 2,100 feet to discretely monitor the thin aquifer between 2,000 and 2,080 feet. The annulus outside of the 16-inch casing of the injection well was left open to the Floridan aquifer. The installation of the liner reduced the design capacity of the well from 6 mgd to 3 mgd but was required for the granting of an operation permit.

INJECTION WELL

Work began on October 19, 1981, with the running of a gyroscopic directional survey in the injection well from ground surface to a depth of 2,750 feet. The purpose of this survey was to evaluate the alignment of the 16-inch casing and open hole in which the 10-inch liner was to be installed. The well was found to be free of doglegs with a gradual inclination angle of less than 1 degree in a southeast direction. The borehole was approximately 8 feet from true vertical at a depth of 2,750 feet. The survey indicated that the 10-inch liner could be installed without difficulty. A copy of the gyroscopic directional survey is included in Appendix A. Table 4-1 is a summary of the geophysical logs and surveys run in the injection well during the rehabilitation work. Copies of the geophysical surveys run are in Appendix J.

Rehabilitation work for both the injection and monitoring wells was performed by the Layne-Atlantic Co. of Orlando, Florida with a Spencer-3500 rig. Layne-Atlantic's contract amounted to $439,348. Reverse air open circulation was used for the deepening of the well. Fluid produced from the well was circulated through mud tanks to settle the heavier solids and then was discharged to the St. Lucie River via the effluent outfall.

Formation samples were collected every 10 feet and at each change in formation starting at 2,996 feet. Lithologic data from these samples are in Appendix B. Loose fill material was first encountered at 2,996 feet and was composed of fine dolomite cuttings and lime sand. Grain size progressively increased, up to 30mm, as the bit dredged previously drilled cuttings to a depth of 3,032 feet. At that depth, the bit started drilling a new hole in light brown dolomite. Drilling progressed slowly to a depth of 3,152 feet, where the drill bit locked into the fractured dolomite and the drill pipe twisted in two. A TV survey was run to inspect the top of the lost pipe, and the pipe and bit were recovered with an overshot tool.

Drilling was resumed to the total depth of 3,305 feet. The well was developed by air lifting through the drill pipe throughout the open hole section. Following development, a pump-out test was run at 4,200 gpm for 8 hours to evaluate the aquifer performance and to clean the well of any remaining loose material. This pumping test is described in Section 5.

An injection test was then run to verify that the well would operate as planned. This injection test was run at rates of up to 6,000 gpm with a maximum wellhead pressure of 47.5 psi. The injection test is described in Section 6 of this report.

Table 4-1
SUMMARY OF GEOPHYSICAL LOGGING AND SURVEYS

Date	Casing Size, Depth, Well Depth	Type of Logs or Surveys	Purpose
10/19/81	16-inch to 2,000 feet, open hole to 2,990 feet	Gyroscopic Directional Survey	Evaluate the alignment of the 16-inch casing and open hole for installation of the 10-inch liner.
11/14/81	16-inch to 2,000 feet, open hole to 3,152 feet	TV Survey	Inspect the top of the twisted off drill pipe at 2,605 feet in preparation for fishing operation.
12/04/81	16-inch to 2,000 feet, open hole to 3,305 feet	LSN, Caliper, Temperature, Gamma Ray	Evaluate the geohydrological characteristics of the deepened open hole.
12/09/81	16-inch to 2,000 feet, open hole to 3,305 feet	TV Survey	Inspect the proposed casing setting depths and evaluate the cavities in the injection zone after the pumping test.
12/18/81	16-inch to 2,000 feet, open hole to 3,305 feet	Flow Meter, Temperature	Identify exit points of the injected fluid during the injection test on the 16-inch casing.
01/24/82	10-inch to 2,670 feet, first stage of cement	Temperature	Identify the top of the first stage of cement outside of the 10-inch liner.
01/29/82	10-inch to 2,670-foot, cemented to ground surface	Cement Bond Log	Evaluate the integrity of the cement outside of the 10-inch liner.
02/20/82	10-inch to 2,670 feet, open hole to 3,305 feet	TV Survey	Conduct final inspection of the condition of the 10-inch liner and open hole.

The injection test demonstrated that the well had been restored to better than anticipated capacity and, therefore, the installation of the 10-inch liner could proceed. The original plan for cementing the liner was to use cement baskets and cementing ports at the bottom of the liner. The liner would have been closed bottom and the first stage of cement would have been pumped out the ports into the cement baskets. However, while reviewing the caliper log run after drilling, it was evident that the drill pipe had apparently enlarged the borehole to greater than 23 inches in diameter where the cement baskets would have been set. The largest diameter to which the baskets can extend is 18 inches; therefore, they would not have sealed against the borehole wall in the enlarged hole.

Instead of using the cement baskets, the hole was filled with gravel up to 2,679 feet in depth with a cement cap to 2,675 feet. The liner was set 5 feet above the cap. In order to minimize the amount of gravel filling the cavities in the bottom of the hole, the first 50 cubic feet of gravel were bagged in burlap sacks and dropped into the well. These bags bridged the hole at the floor of the first cavity at approximately 2,990 feet. The remainder of the gravel, approximately 1,100 cubic feet, was free-dropped to fill the hole up to 2,679 feet. A 20-sack cement cap was then placed up to 2,675 feet.

The 10-inch steel liner (ASTM, A-53) was then installed with centralizers every 100 feet but without cement baskets or ports. The bottom of the liner was set at 2,670 feet with a pump-down plug shoe on the end.

The first stage of cement, 1,800 sacks of Class H with 2 percent bentonite, was pumped into the 10-inch liner and was followed by a Halliburton pump-down plug which seated into the shoe at the bottom of the liner. The top of the first stage of cement was shown to be at 2,210 feet by the temperature log and was tagged by work pipe at 2,214 feet. The annulus space around the 10-inch liner was grouted to ground surface with 1,470 sacks of Class H with 2 percent bentonite through two 1-inch-diameter grout pipes in five stages. Table 4-2 is a summary of the gravel and cement data.

A liner pressure test was run at 100 psi for 1 hour, in which time there was no loss of pressure. A cement bond log was then run showing bond throughout the liner. The results of the pressure test are in the Appendix C. A copy of the cement bond log is in Appendix J.

The cement plug in the 10-inch liner and the gravel fill were then drilled out. The borehole was cleaned to total depth (3,305 feet) and then was pumped out at 2,000 gpm for 8 hours to remove any remaining debris and turbidity from

Table 4-2
SUMMARY OF INJECTION WELL GRAVEL AND CEMENTING DATA

Date	Material	Quantity	Interval (ft) From	Interval (ft) To
01/05/82	Gravel in burlap bags 1/2 ft^3 each	12 bags	3,300	3,300
01/06/82	Gravel in burlap bags 1/2 ft^3 each	95 bags	3,000	2,965
01/14/82	Loose gravel	135 ft^3	2,965	2,965
01/15/82	Loose gravel	837 ft^3	2,965	2,718
01/18/82	Sand	54 ft^3	2,718	2,713
01/18/82	Class H neat cement	30 sacks	2,713	2,736
01/19/82	Gravel	162 ft^3	2,736	2,679
01/19/82	Class H neat cement	20 sacks	2,679	2,675
	10-Inch Liner @ 2,670 Feet			
01/23/82	Class H cement with 2% bentonite	1,800 sacks	2,670	2,214
01/24/82	Class H cement with 2% bentonite	180 sacks	2,214	2,170
01/25/82	Class H cement with 2% bentonite	300 sacks	2,170	1,997
01/26/82	Class H cement with 2% bentonite	350 sacks	1,997	1,200
01/26/82	Class H cement with 2% bentonite	350 sacks	1,200	506
01/27/82	Class H cement with 2% bentonite	290 sacks	506	0

the well bore. The final TV inspection indicates that the 10-inch liner is in good condition and that the borehole is clean and open to a total depth of 3,305 feet. A summary of observations from the TV Survey is in Appendix D. Figure 4-1 is a diagram of the injection well showing the new liner and deepened borehole.

Monitoring Well

Upon completion of cementing the liner in the injection well, work began on the monitoring well using a small cable tool rig. Approximately 270 cubic feet of gravel were dropped into the well to plug it up to 2,752 feet. Class H cement with 4 percent bentonite was then pumped in five stages up to 2,093 feet. This required 320 sacks of cement.

The monitoring well was then developed with a submersible pump at about 30 gpm. Upon completion of development, the static water level in the monitoring well stood at approximately 4 feet above ground level. Chloride concentration was approximately 16,000 mg/l from the new monitor zone from 2,016 feet to 2,093 feet. Background water quality data collection is summarized in Section 7 of this report. The modified monitor well is shown on Figure 4-2.

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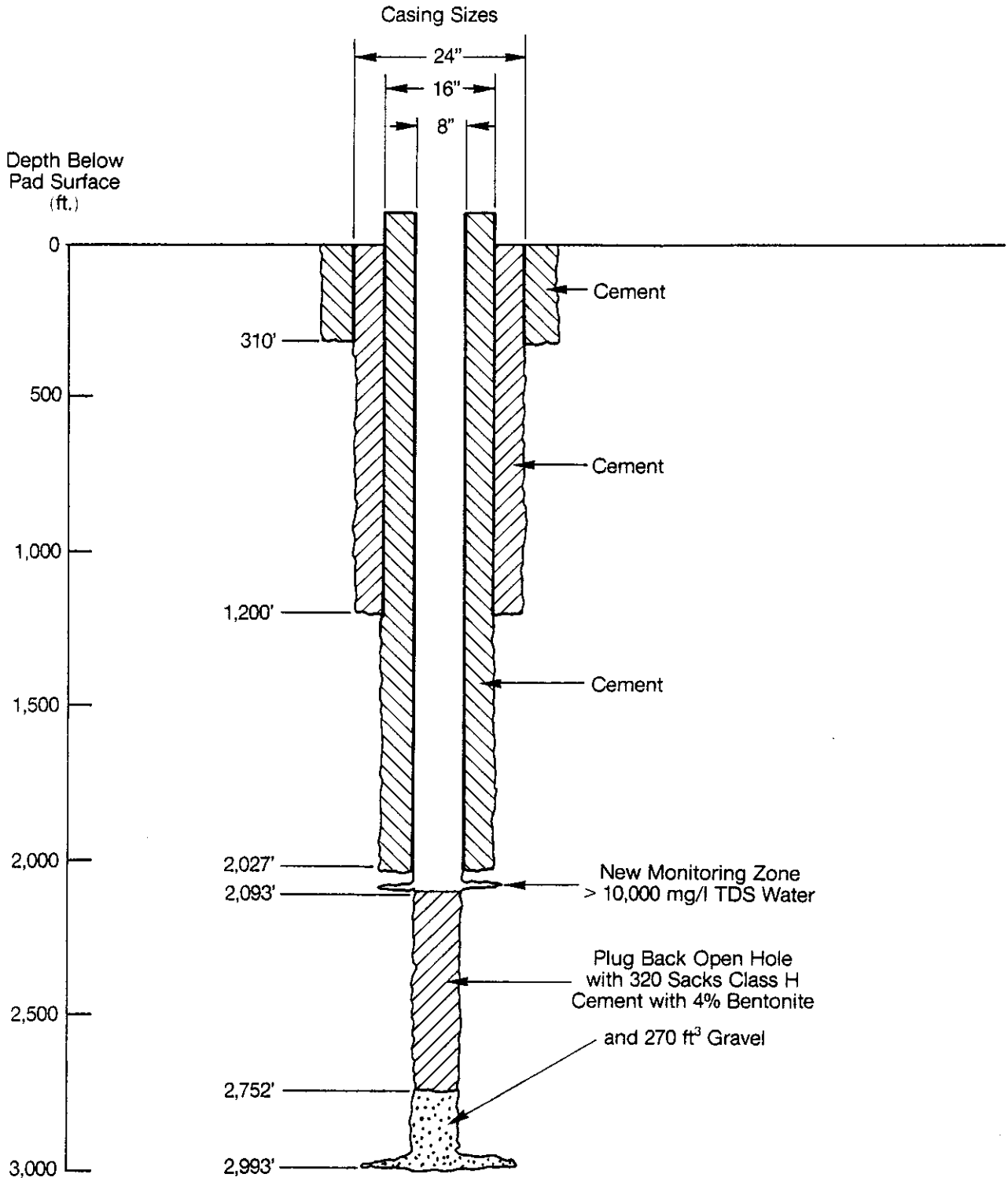

FIGURE 4-2
Monitoring well diagram—
Rehabilitation of the deep injection and monitoring wells—
City of Stuart, Florida.

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Section 5
PUMP-OUT TEST

A pump-out test was run after the injection well was deepened to 3,305 feet and developed with air lifting. The purpose of this test was to evaluate the performance of the deepened well and to clean out any debris remaining in the well.

A vertical turbine pump was set at 150 feet in the 16-inch casing with the discharge in the chlorine contact basin. Pumping rate was measured with a 13-1/4 x 16-inch orifice plate and piezometer at the discharge. Part of the discharged water flowed through the basin to the outfall into the St. Lucie River. Approximately 1,000 gpm was pumped from the basin into the empty, unused aerobic digester and another 1,000 gpm was pumped to a stormwater runoff channel through the park to the east of the treatment plant.

A drawdown airline was installed with the pump column and was used as a bubbler system to measure drawdown during the test. Nitrogen gas was used, and the pressure was measured with a Heise gauge with a 0- to 60-psi scale. The annulus between the 16- and 24-inch casings was measured with another Heise gauge with a 0- to 60-psi scale. The water level in the monitoring well was recorded with a Stevens, Type F water level recorder with 1:1 gear scale and 24-hour time chart.

The test was run at 4,200 gpm for 8 hours. Static water level before the test was 12.19 feet below the 16-inch casing flange. The maximum drawdown in the well was 22.89 feet or 35.08 feet below the 16-inch casing flange. The monitoring well, 480 feet away and open only to the first cavity at 2,990 feet, showed an approximately 0.04-foot drawdown in the first few minutes of pumping. When the pump was stopped, the monitoring well recovered approximately 0.05 feet instantaneously.

Table 5-1 is a summary of the results of the pumping test. Table 5-2 is a summary of the water quality of the pumped water from the injection zone. The data collected during the test are contained in Appendix E. The water level charts from the monitoring well are also in that appendix.

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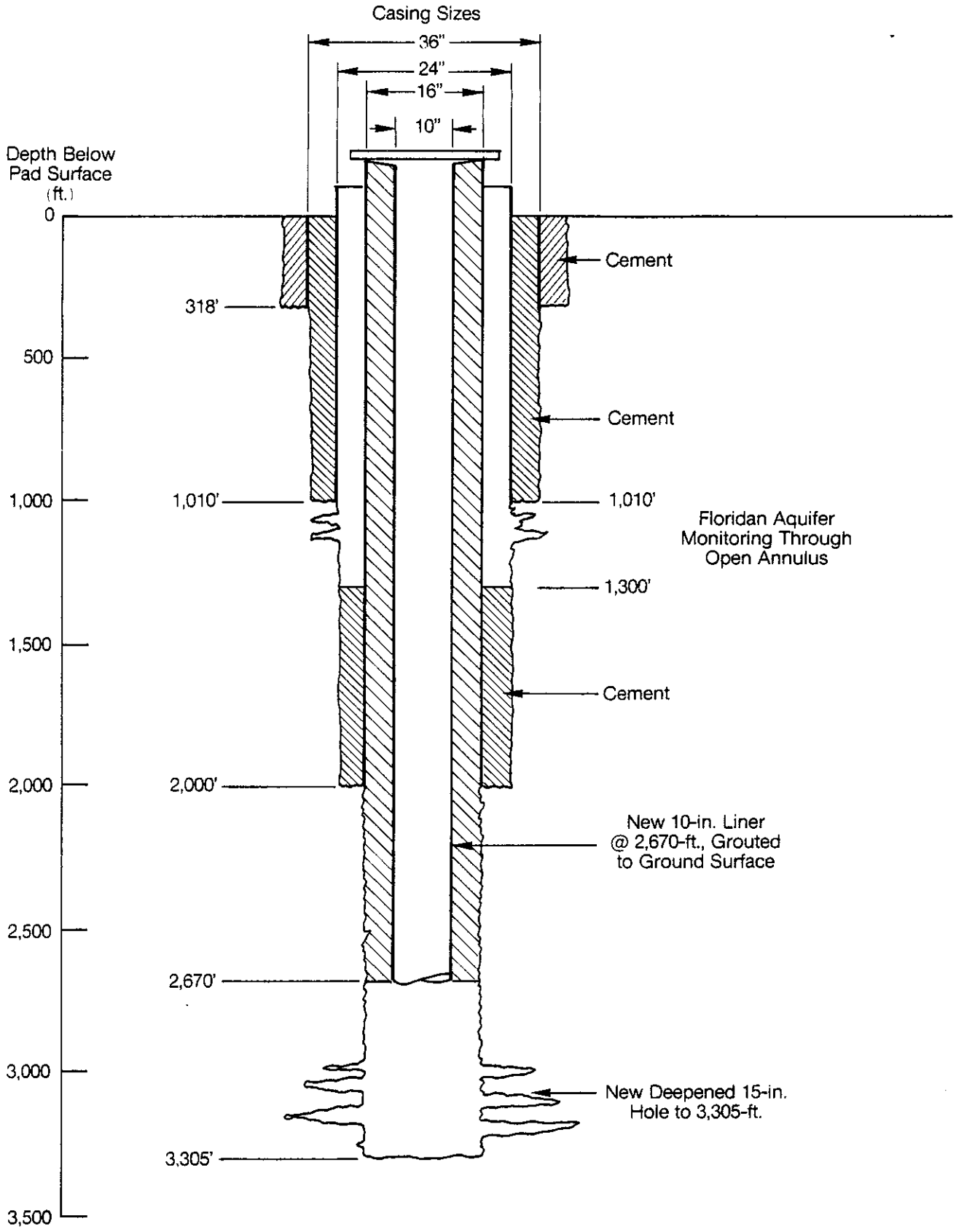

FIGURE 4-1

Injection well diagram—Rehabilitation of the deep injection and monitoring wells—City of Stuart, Florida.

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Table 5-1
PUMP-OUT TEST SUMMARY
December 8, 1981

Casing Size	16-inch
Test Rate	4,200 gpm
Test Duration	8 hours
Static Water Level	12.19 feet below 16-inch casing flange
Maximum Pumping Drawdown	22.89 feet
Monitoring Well Drawdown	0.05 foot

Table 5-2
WATER QUALITY OF INJECTION ZONE
(SAMPLE COLLECTED AT END OF PUMP-OUT TEST)

Date of Collection	12/08/81
Temperature	72.0°F
Chloride	19,130 mg/l
Fluoride	0.54 mg/l
Iron	0.27 mg/l
Sulfate	2,720 mg/l
Bicarbonates	148 mg/l
Total Hardness	6,280 mg/l, $CaCO_3$ equivalent
Calcium	1,280 mg/l $CaCO_3$ equivalent
Magnesium	5,000 mg/l $CaCO_3$ equivalent
Sodium	23,600 mg/l $CaCO_3$ equivalent
Carbon Dioxide	21 mg/l $CaCO_3$ equivalent
Total Dissolved Solids	34,500 mg/l
pH	7.40
Specific Conductance	47,300 µmhos/cm
Turbidity	2.0 NTU

16-INCH CASING

After the pump-out test was run on the 16-inch casing, an injection test was performed to confirm the injection capacity of the well before the 10-inch liner was installed. The electric injection pumps of the treatment plant were used to inject effluent at rates from 3,400 to 6,200 gpm. Prior to the start of the test, plant effluent was pumped into the unused aerobic digester, clarifier, and aeration basin for storage. During the test, centrifugal pumps supplied the treated effluent to the chlorine contact basin. The treatment plant flow, water from two fire hydrants, and the stored effluent were the combined source of the injected fluid for the test.

The injection flow rate was measured with the Venturi flow tube in the 14-inch pipe to the injection well using a u-tube to indicate the differential pressure through the tube. A Heise gauge with a 0- to 100-psi scale measured the wellhead pressure and a Heise gauge with a 0- to 60-psi scale measured the annulus pressure between the 16- and 24-inch casings. Figure 6-1 shows the wellhead instrumentation for the injection test.

A Stevens, Type F water level recorder on the monitoring well recorded the water level during the test. It was set up with 1:1 gear scale and a 24-hour time chart.

The test was started with two of the injection pumps at approximately 6,000 gpm. The third pump was started but did not increase the flow. During the test, various combinations of the three injection pumps were tried. The rate varied from 3,400 gpm when one pump was being backflowed to clean out the clogged bowls up to 6,000 gpm with all three pumps on.

Wellhead pressure varied according to the number of pumps operating from 34.0 psi with two pumps on and backflushing a third, to 47.5 psi with all three pumps on. The annulus between the 16- and 24-inch casings showed a slight pressure drop by the end of the test of 0.02 psi. This can be accounted for by the cooling of the injection casing by the injected fluid and thereby a slight cooling of the water in the annulus and subsequent density change.

The monitoring well showed a water level rise of approximately 0.11 feet at the start of the test and a drop of approximately 0.07 feet at the end of the test. The injection test data are contained in Appendix F. Copies of the water level charts from the monitoring well are also in that appendix.

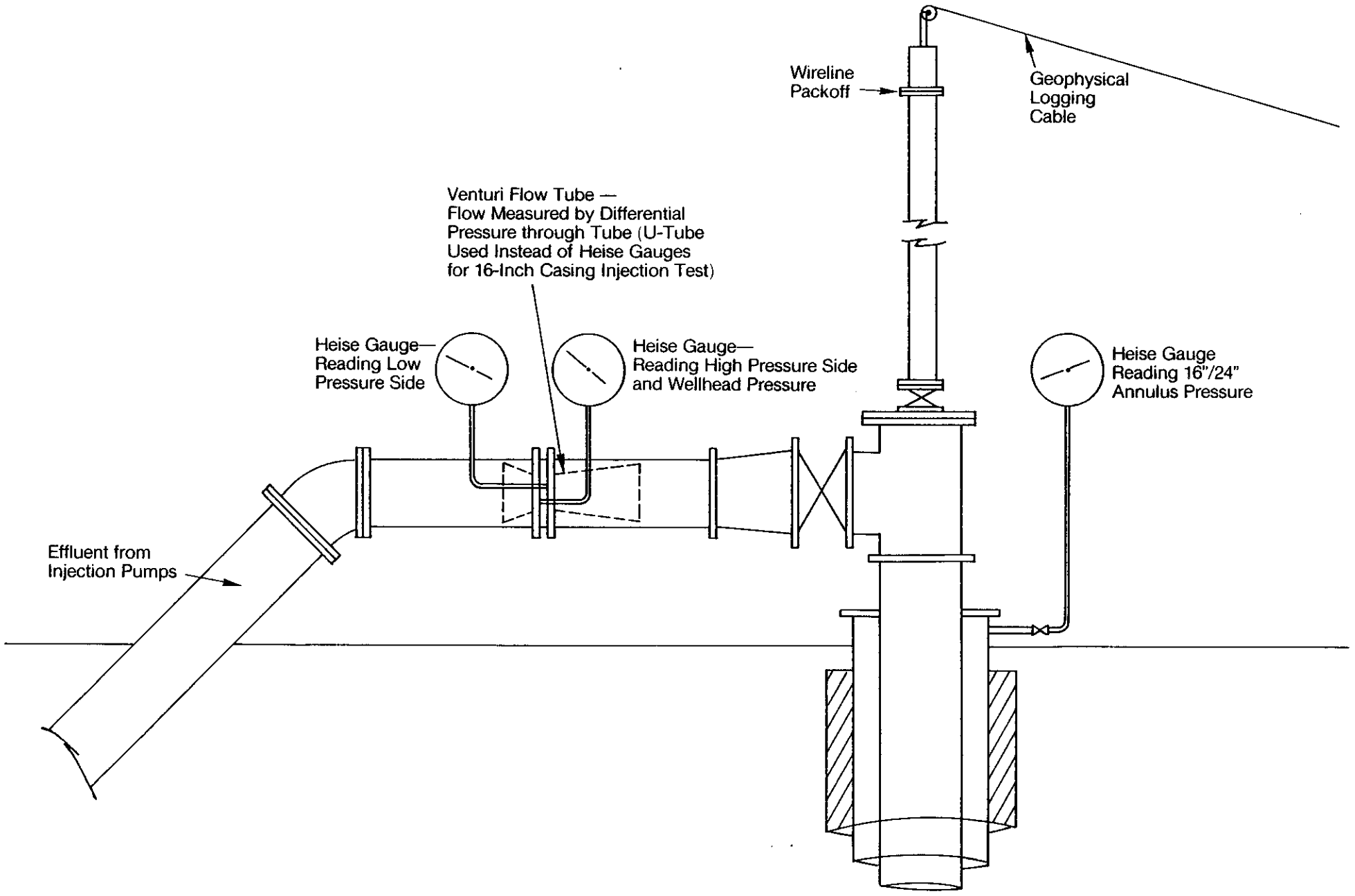


FIGURE 6-1

Injection test instrumentation—Rehabilitation of the deep injection and monitoring wells—City of Stuart, Florida.

10-INCH LINER

An injection test was run on the well after installing the new 10-inch liner to evaluate the existing pump performance characteristics after the capacity of the injection well was reduced to less than half its capacity with the 16-inch casing.

Freshwater from the nearby fire hydrant was used to fill the aerobic digester near the injection well prior to the test. The injection pumps were used again to inject effluent from the chlorine contact basin and the freshwater which was pumped to the chlorine contact basin with a centrifugal pump. The test was run for 8 hours at rates from 2,150 to 3,000 gpm with wellhead pressures from 55.2 to 67.7 psi.

The injection rate was measured with the Venturi flow tube connected to two Heise gauges reading the differential pressure through the tube. The accuracy of the existing flow meter with the 10-inch liner is poor because of the low differential head under the new flow conditions. However, it was sufficient to determine if the existing pumps could be used without modifications or what modifications would be required. The gauge on the high pressure side of the Venturi tube was used to measure the wellhead pressure and a Heise gauge with a 0- to 60-psi scale measured the pressure of the annulus between the 16- and 24-inch casings. A Stevens, Type F water level recorder recorded the monitoring well response during the test.

The test was started with No. 3 pump at 2,500 gpm and 57.2 psi wellhead pressure. Various combinations of the three pumps were used varying the injection rate and pressure. After the pumps were stopped, the wellhead pressure stabilized at 27.1 psi of buoyancy head from the fresh effluent floating on the saltwater of the Boulder Zone. The data collected during the injection test is contained in Appendix G. The data clearly show the inaccuracies of the flow measurements and also that the pumps need to be modified for better pumping system efficiency.

The pressure in the injection well annulus was 13.16 psi at the beginning of the test and 13.12 psi at the end of the test. This slight drop in pressure can be accounted for by the cooling of the annulus water by the injected fluid and a subsequent density change of the annulus water.

The water level in the monitoring well showed less background tidal fluctuation than before the well was plugged back to 2,093 feet. Previously, with the well open to 2,990 feet, the tidal fluctuation was 0.3 to 0.5 feet, whereas since the well has been plugged back, the tidal range has been 0.05 to 0.1 feet. There was no observable response in the monitoring well to the injection test run on the 10-inch liner of the

injection well, indicating effective isolation of the monitoring zone in the monitoring well from the injection zone below 2,670 feet. Copies of the water level charts from the monitoring well are contained in Appendix G. A comparison of the two injection tests is summarized in Table 6-1.

Table 6-1
SUMMARY OF INJECTION TESTS

Test No.	Date	Casing Size (in)	Test Duration (hr)	Flow Rate (gpm)	Wellhead Pressure (psi)	Static Pressure (psi)	16"/24" Annulus Pressure (psi) Before	16"/24" Annulus Pressure (psi) After
1	12/18/81	16	5.7	3,500 5,880 6,000	34.5[a] 46.5[b] 47.5[c]	26.9	12.82	12.80
2	02/24/82	10	8.0	2,400[d] 2,500[d]	54.4[a] 66.6[c]	27.1	13.16	13.12

[a]One pump on.
[b]Two pumps on.
[c]Three pumps on.
[d]Approximate flow rates.

Two aquifers will be monitored above the injection zone, which is located below 2,670 feet. The 8-inch monitoring well is open from 2,016 to 2,093 feet in a thin transmissive zone with water containing approximately 30,000 mg/l TDS. The upper Floridan aquifer is monitored at the injection well through the annulus between the 16-inch and 24-inch casings. The annulus is open from the bottom of the 24-inch casing at 1,010-feet to 1,300 feet where the cement around the 16-inch casing starts. Water in this zone contains approximately 5,000 mg/l TDS. Parameters to be monitored in these two aquifers are as follows:

- Pressure in the 1,010- to 1,300-foot zone of the injection well annulus continuously with a 7-day chart pressure recorder to be located at the wellhead with an 8-inch pressure gauge for backup.

- Water level in the 2,016- to 2,093-foot zone of the monitoring well with a direct reading piezometer read weekly.

- Water quality of the 2,016 to 2,093-foot zone of the monitoring well by collecting samples weekly and analyzing for specific conductance, chloride, and temperature.

A series of background water quality samples (six from the monitoring well and three from the injection well annulus) are being collected and analyzed for the following parameters:

Total Organic Carbon
Nitrogen:
  Ammonia
  Nitrate and Nitrite
  Total Kjeldahl
Total Soluble Phosphorus
Specific Conductance
Chloride
Sulfate
Temperature

The results of analysis of the first set of samples are shown in Table 7-1.

The annulus of the injection well and the monitoring well will be sampled prior to startup of the injection well. The first sample analysis is summarized in Table 7-1. The complete background sampling data will be submitted with the application for the operating permit from DER.

The injected fluid will be monitored on a daily basis for the following: specific conductance, turbidity, chloride, and temperature. This sampling will be done at the injection wellhead tap.

Table 7-1
BACKGROUND WATER QUALITY OF MONITORING ZONES
PRELIMINARY SAMPLES

Parameter	Injection Well Annulus (1,010' - 1,300')	Monitoring Well (2,027' - 2,093')
Date	4/05/82	4/05/82
Time	11:00 a.m.	11:15 a.m.
Temperature (°F)	77	80
Total Organic Carbon (TOC) (mg/l)	2.51	2.54
Nitrogen (as N) (mg/l)		
Ammonia	2.25	0.28
Nitrate	<0.02	<0.02
Nitrite	<0.02	<0.02
Total Kjeldahl	2.27	0.40
Total Soluble Phosphorus (mg/l as P)	0.048	0.032
Specific Conductance (μmhos/cm)	7,740	42,600
Total Dissolved Solids (mg/l) (by evaporation and weight)	4,860	29,700
Chloride (mg/l)	2,350	15,800
Sulfate (mg/l)	430	1,220
Potentiometric Head (feet above concrete pad)	--	4.16

In addition, the injection flow rate will be monitored continuously with a 7-day chart differential recorder connected to the Venturi flow tube. Total weekly flow will be calculated from the flow rate chart and compared to the influent totalizer. The recorder will be located at the injection wellhead.

Injection pressure will be monitored continuously with a 7-day chart recorder located at the wellhead. An 8-inch pressure gauge will also be provided for backup.

The monitoring system will detect any vertical migration of the injected fluid through the monitoring well first. The chloride concentration and specific conductance of the weekly water samples will change toward fresher water and the piezometric head will also start rising if effluent is migrating upward. The second zone, the annulus of the injection well, will show a rise in pressure if effluent reaches the 1,300-foot level. The quantity and quality of the injected fluid will be monitored regularly, as well as the wellhead pressure, providing a complete record of the system performance. The monitoring program is summarized in Table 7-2.

Table 7-2
MONITORING PROGRAM

	Parameter	Frequency
1.	Injection Flow Rate	Continuous
2.	Injection Pressure	Continuous
3.	Pressure, 1,000-foot zone at injection well annulus	Continuous
4.	Pressure, 2,000-foot zone at monitoring well	Weekly
5.	Specific Conductance, 2,000-foot zone at monitoring well	Weekly
6.	Chloride Concentration, 2,000-foot zone at monitoring well	Weekly
7.	Specific Conductance, injected fluid	Daily
8.	Chloride Concentration, injected fluid	Daily
9.	Turbidity, injected fluid	Daily
10.	Temperature, injected fluid	Daily

EQUIPMENT AND PROCEDURES--(Numbers below correspond to above requirements.)

1. Recorder, weekly charts, change and tabulate every Monday

2. Recorder, weekly charts, change and tabulate every Monday

3. Recorder, weekly charts, change and tabulate every Monday

4. Piezometer, direct reading (see below)

5&6. Collect samples from monitoring well.

A. Well is provided with a bleed pipe (1-inch-diameter) to river which will normally be open.

B. Every Monday at 9 a.m. a sample of water will be collected and temperature immediately read. Sample will be taken to laboratory for determining 5 and 6 above; then continue with C below.

C. Close bleed valve to river and open valve connecting to piezometer on monitoring well. Measure head on piezometer every 10 minutes until three consecutive readings are identical. Record value of the three identical consecutive readings.

D. Close the valve to the piezometer and open the bleed valve to the river.

E. Leave the bleed valve open until the following Monday when Steps B through E are repeated.

7-10. Collect sample from tap on the injection line, read the field temperature, and take it to laboratory for analysis.

CONCLUSIONS

The Stuart deep injection well system has been rehabilitated to comply with present regulatory guidelines. The well is now cased with the 10-inch liner to 2,670 feet and was tested with the plant's treated effluent at approximately 3.5 mgd. The monitoring well has been plugged back to monitor the thin zone of saltwater between 2,000 and 2,100 feet. Presently there are 600 feet of cased interval between the bottom of the injection liner, and the first saltwater monitoring zone in the monitoring well. More than 1,100 feet of confining beds now separate the bottom of the injection liner and the Floridan aquifer with chloride concentrations of about 2,000 mg/l at approximately 1,500 feet.

During the injection test on the 10-inch liner, there was no indication of a connection between the injection zone and the injection well annulus monitor or the monitoring well 2,000 to 2,100-foot zone.

The injection well's capacity has been restored to better than original design, as demonstrated by the two injection tests. The first test on the 16-inch casing injected 6,000 gpm (8.6 mgd) with a wellhead pressure of 47.5 psi (110 feet of water). Bouyancy of the fresh injected fluid on the native saltwater accounts for 27 psi or 62 feet of water, and the major part of the balance of the wellhead pressure is attributable to the hydraulic friction losses in the 16-inch casing.

Installation of the 10-inch liner reduced the design capacity of the well from 6 mgd to 3 mgd. This reduction reflects the hydraulic losses in the smaller liner and not in the injection formation.

The City plant is currently operating at an average 1.0 mgd with transient peak flows of 2.0 mgd. In accordance with DER regulations, the outfall to the St. Lucie River will be used only on an emergency basis, the injection well disposing of all of the effluent flow.

RECOMMENDATIONS

1. Two of the three injection pumps need to be modified to inject 3.0 mgd (2,100 gpm) of treated effluent with the new wellhead conditions created by the 10-inch liner. The modified pumps will operate much more efficiently with a considerable savings in electrical costs. The third injection pump does not have to be modified because the injection capacity of the well is limited to approximately 3 mgd. Each pump will be used alternately as a primary injection pump and as a standby.

2. A new simple monitoring system needs to be developed to comply with the new requirements shown in Table 7-2. Basically the system needs to include one continuous injection flow recorder using, if possible, the existing flow tube as the primary flow measuring device, and two continuous pressure recorders, one for the injection pressure and one for the injection well annulus pressure.

3. Following the completion of the background water quality sampling described in Section 7, the injection well system can be used for effluent disposal and operational testing. Operational testing may be done with one of the existing pumps, while the other two existing pumps are being modified. On July 31, 1982 a formal application needs to be presented to DER for an operating permit for the injection well and the entire sewage treatment system. This permit needs to become effective November 1, 1982 when the present consent order rehabilitation schedule and the construction and testing permit expire.

APPENDIXES

Appendix A
GYROSCOPIC DIRECTIONAL SURVEY

Eastman Whipstock
A PETROLANE COMPANY

REPORT of SUB-SURFACE DIRECTIONAL SURVEY

C. H. 2 M. HILL
COMPANY

CITY OF STUART-WATER DISPOSAL WELL #1
WELL NAME

STUART, FLORIDA
LOCATION

JOB NUMBER	TYPE OF SURVEY	DATE
B1081-G-0094	GYROSCOPIC SURVEY	10/19/81

SURVEY BY Brookhaven, MS OFFICE

Eastman Whipstock
A PETROLANE COMPANY

P. O. Box 43/Brookhaven, Mississippi 39601/(601) 833-7831

October 20, 1981

C. H. & M. Hill
P. O. Box 1647
Gainesville, FLA 32602

Atten: Mr. J. D. Garcia

Re: City of Stuart--Water Disposal Well #1
Stuwart, Florida

Dear Sir:

Enclosed please find the original and four (4) copies of the Gyroscopic Survey report on the above mentioned well.

We wish to take this opportunity to thank you for calling us for our services and trust that we may continue to serve you in the future.

Sincerely,

EASTMAN WHIPSTOCK, INC.

John D. Coleman

John D. Coleman
District Manager

JDC:ms

Enclosures

CITY OF STUART, FLORIDA
WATER DISPOSAL WELL NO. 1
ST. LUCIE COUNTY, FLA.
FILE NO. 1-107
10-20-81
GYROSCOPIC MULTIPLE SHOT SURVEY
R. LOFTON
EASTMAN WHIPSTOCK, INC.

VERTICAL SECTION CALCULATED IN PLANE OF BOTTOM HOLE CLOSURE

RECORD OF SURVEY

RADIUS OF CURVATURE METHOD

CITY OF ST RT, FLORIDA
WATER DISPOSAL WELL NO. 1
STUART, FLORIDA

COMPUTATION TIME 04:04:18 DATE 00--00 'AGE NO.

MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	RECTANGULAR COORDINATES FEET		CLOSURE DISTANCE FEET	CLOSURE DIRECTION D M	DOG LEG SEVERITY DG/100FT
0.	0 0	0	0.00	0.00	0.00	0.00	0.00	0 0	0.00
30.	0 15	N 19 E	30.00	-0.03	0.06 N	0.02 E	0.07	N 19 55 E	0.86
60.	0 7	N 77 E	60.00	-0.01	0.13 N	0.09 E	0.16	N 36 49 E	0.73
90.	0 7	N 62 E	90.00	0.02	0.15 N	0.16 E	0.22	N 46 28 E	0.11
120.	0 0	S 69 E	120.00	0.03	0.16 N	0.19 E	0.25	N 48 42 E	0.40
150.	0 0	S 20 W	150.00	0.03	0.16 N	0.18 E	0.24	N 49 30 E	0.02
180.	0 4	S 79 W	180.00	0.02	0.15 N	0.16 E	0.22	N 46 27 E	0.23
210.	0 13	S 51 W	210.00	-0.02	0.12 N	0.09 E	0.15	N 36 4 E	0.54
240.	0 6	S 80 W	240.00	-0.05	0.08 N	0.01 E	0.08	N 4 21 E	0.50
270.	0 21	S 74 W	270.00	-0.12	0.06 N	0.11 W	0.13	N 62 29 W	0.83
300.	0 16	N 57 W	300.00	-0.25	0.08 N	0.27 W	0.28	N 72 58 W	0.88
330.	0 18	N 64 W	330.00	-0.40	0.16 N	0.40 W	0.43	N 68 41 W	0.16
360.	0 19	N 61 W	360.00	-0.56	0.23 N	0.55 W	0.59	N 67 5 W	0.07
390.	0 27	N 61 W	390.00	-0.76	0.33 N	0.73 W	0.80	N 65 43 W	0.47
420.	0 28	N 57 W	420.00	-1.00	0.45 N	0.94 W	1.04	N 64 16 W	0.13
450.	0 24	N 59 W	450.00	-1.22	0.57 N	1.13 W	1.27	N 63 12 W	0.22
480.	0 19	N 50 W	479.99	-1.41	0.68 N	1.29 W	1.45	N 62 10 W	0.32
510.	0 12	N 36 W	509.99	-1.55	0.78 N	1.38 W	1.59	N 60 34 W	0.45
540.	0 2	S 63 E	539.99	-1.55	0.82 N	1.35 W	1.58	N 58 55 W	0.79
570.	0 5	S 19 E	569.99	-1.52	0.79 N	1.33 W	1.55	N 59 14 W	0.22
600.	0 8	S 7 E	599.99	-1.47	0.73 N	1.32 W	1.51	N 60 59 W	0.20
630.	0 6	S 29 E	629.99	-1.41	0.67 N	1.30 W	1.46	N 62 43 W	0.21
660.	0 6	S 32 E	659.99	-1.36	0.62 N	1.27 W	1.42	N 63 50 W	0.01
690.	0 2	S 7 W	689.99	-1.34	0.59 N	1.26 W	1.40	N 64 53 W	0.24
720.	0 6	S 22 W	719.99	-1.32	0.56 N	1.27 W	1.39	N 66 17 W	0.21
750.	0 19	S 56 W	749.99	-1.31	0.47 N	1.34 W	1.42	N 70 32 W	0.81
780.	0 19	S 49 W	779.99	-1.35	0.37 N	1.48 W	1.53	N 75 53 W	0.13
810.	0 20	S 53 W	809.99	-1.38	0.26 N	1.62 W	1.64	N 80 48 W	0.09
840.	0 17	S 62 W	839.99	-1.43	0.17 N	1.76 W	1.77	N 84 21 W	0.25
870.	0 16	S 45 W	869.99	-1.46	0.09 N	1.88 W	1.88	N 87 17 W	0.28

MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	RECTANGULAR COORDINATES FEET		CLOSURE DISTANCE FEET	CLOSURE DIRECTION D M	DOG LEG SEVERITY DG/100FT
900.	0 16	S 3 W	899.99	-1.41	0.04 S	1.94 W	1.94	S 88 48 W	0.66
930.	0 13	S 2 W	929.99	-1.33	0.17 S	1.95 W	1.95	S 84 56 W	0.20
960.	0 8	S 24 E	959.99	-1.26	0.26 S	1.93 W	1.95	S 82 15 W	0.37
990.	0 1	N 67 W	989.99	-1.26	0.29 S	1.95 W	1.97	S 81 36 W	0.56
1020.	0 7	N 8 W	1019.99	-1.30	0.26 S	1.98 W	1.99	S 82 31 W	0.35
1050.	0 14	N 18 W	1049.99	-1.37	0.17 S	2.00 W	2.00	S 85 13 W	0.44
1080.	0 7	N 8 E	1079.99	-1.44	0.07 S	2.00 W	2.01	S 87 55 W	0.49
1110.	0 3	N 57 W	1109.99	-1.48	0.03 S	2.02 W	2.02	S 89 7 W	0.38
1140.	0 10	N 39 W	1139.99	-1.54	0.01 N	2.07 W	2.07	N 89 47 W	0.42
1170.	0 11	N 10 W	1169.99	-1.63	0.09 N	2.11 W	2.11	N 87 27 W	0.29
1200.	0 13	N 4 E	1199.99	-1.70	0.19 N	2.11 W	2.12	N 84 44 W	0.21
1230.	0 8	N 45 E	1229.99	-1.73	0.28 N	2.08 W	2.09	N 82 26 W	0.49
1260.	0 5	N 52 E	1259.99	-1.72	0.32 N	2.03 W	2.05	N 81 8 W	0.16
1290.	0 2	S 48 E	1289.99	-1.69	0.32 N	1.99 W	2.02	N 81 0 W	0.32
1320.	0 5	S 30 E	1319.99	-1.65	0.28 N	1.97 W	1.99	N 81 47 W	0.17
1350.	0 4	S 13 E	1349.99	-1.61	0.24 N	1.95 W	1.96	N 83 0 W	0.11
1380.	0 13	S 0 W	1379.99	-1.55	0.16 N	1.94 W	1.95	N 85 10 W	0.49
1410.	0 13	S 5 W	1409.99	-1.48	0.04 N	1.95 W	1.95	N 88 42 W	0.07
1440.	0 16	S 22 W	1439.99	-1.42	0.08 S	1.98 W	1.98	S 87 40 W	0.29
1470.	0 20	S 6 W	1469.99	-1.34	0.24 S	2.02 W	2.03	S 83 13 W	0.39
1500.	0 20	S 27 W	1499.99	-1.26	0.41 S	2.07 W	2.11	S 78 45 W	0.42
1530.	0 19	S 20 W	1529.99	-1.21	0.57 S	2.14 W	2.22	S 75 4 W	0.14
1560.	0 22	S 20 W	1559.99	-1.15	0.74 S	2.20 W	2.32	S 71 31 W	0.16
1590.	0 24	S 30 W	1589.99	-1.09	0.93 S	2.29 W	2.47	S 68 1 W	0.25
1620.	0 20	S 13 W	1619.99	-1.02	1.11 S	2.37 W	2.61	S 64 56 W	0.43
1650.	0 18	S 0 E	1649.99	-0.92	1.27 S	2.39 W	2.70	S 61 56 W	0.28
1680.	0 14	S 25 E	1679.99	-0.81	1.41 S	2.35 W	2.74	S 59 7 W	0.44
1710.	0 17	S 30 E	1709.98	-0.68	1.53 S	2.29 W	2.75	S 56 13 W	0.22
1740.	0 18	S 9 E	1739.98	-0.54	1.68 S	2.23 W	2.80	S 53 2 W	0.38
1770.	0 26	S 3 E	1769.98	-0.39	1.88 S	2.21 W	2.90	S 49 41 W	0.48

CITY OF ST[illegible]RT, FLORIDA
WATER DISPOSAL WELL NO. 1
STUART, FLORIDA

COMPUTATION TIME 04:04:18 DATE 00--00 AGE NO.

MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	RECTANGULAR COORDINATES FEET		CLOSURE DISTANCE FEET	CLOSURE DIRECTION D M	DOG LEG SEVERITY DG/100FT
1800.	0 38	S 3 E	1799.98	-0.18	2.16 S	2.19 W	3.08	S 45 25 W	0.64
1830.	0 31	S 14 E	1829.98	0.05	2.46 S	2.14 W	3.27	S 41 3 W	0.55
1860.	0 31	S 1 E	1859.98	0.26	2.73 S	2.10 W	3.45	S 37 35 W	0.40
1890.	0 22	S 16 E	1889.98	0.45	2.97 S	2.07 W	3.61	S 34 52 W	0.64
1920.	0 18	S 34 E	1919.98	0.61	3.12 S	1.99 W	3.70	S 32 32 W	0.41
1950.	0 20	S 19 E	1949.98	0.76	3.27 S	1.92 W	3.79	S 30 26 W	0.29
1980.	0 12	S 2 E	1979.98	0.87	3.40 S	1.89 W	3.90	S 29 4 W	0.51
2010.	0 11	S 15 E	2009.98	0.95	3.51 S	1.87 W	3.98	S 28 7 W	0.15
2040.	0 5	N 80 E	2039.98	1.02	3.55 S	1.81 W	3.98	S 27 5 W	0.71
2070.	0 27	S 88 E	2069.98	1.13	3.54 S	1.67 W	3.91	S 25 15 W	1.23
2100.	0 42	S 65 E	2099.98	1.39	3.60 S	1.37 W	3.86	S 20 47 W	1.12
2130.	0 54	S 62 E	2129.97	1.80	3.79 S	0.99 W	3.91	S 14 38 W	0.64
2160.	0 44	S 56 E	2159.97	2.22	4.00 S	0.62 W	4.05	S 8 48 W	0.62
2190.	0 43	S 69 E	2189.97	2.58	4.17 S	0.28 W	4.18	S 3 49 W	0.56
2220.	0 58	S 75 E	2219.96	2.99	4.31 S	0.15 E	4.31	S 1 58 E	0.88
2250.	1 0	S 76 E	2249.96	3.45	4.44 S	0.65 E	4.48	S 8 24 E	0.08
2280.	0 44	S 63 E	2279.96	3.88	4.59 S	1.08 E	4.72	S 13 16 E	1.06
2310.	0 44	S 68 E	2309.95	4.25	4.75 S	1.44 E	4.97	S 16 52 E	0.20
2340.	0 44	S 66 E	2339.95	4.62	4.90 S	1.80 E	5.22	S 20 11 E	0.06
2370.	0 42	S 63 E	2369.95	4.98	5.06 S	2.15 E	5.50	S 23 0 E	0.22
2400.	0 43	S 63 E	2399.95	5.35	5.23 S	2.48 E	5.79	S 25 24 E	0.10
2430.	0 34	S 56 E	2429.94	5.68	5.40 S	2.78 E	6.07	S 27 14 E	0.60
2460.	0 36	S 57 E	2459.94	5.99	5.57 S	3.04 E	6.34	S 28 38 E	0.14
2490.	0 34	S 55 E	2489.94	6.30	5.74 S	3.31 E	6.63	S 29 56 E	0.13
2520.	0 35	S 57 E	2519.94	6.60	5.91 S	3.56 E	6.90	S 31 4 E	0.06
2550.	0 47	S 59 E	2549.94	6.96.	6.10 S	3.87 E	7.22	S 32 23 E	0.71
2580.	0 54	S 76 E	2579.93	7.37	6.27 S	4.28 E	7.59	S 34 21 E	0.91
2610.	0 38	S 88 E	2609.93	7.71	6.32 S	4.68 E	7.86	S 36 33 E	0.99
2640.	0 50	N 81 E	2639.93	7.98	6.29 S	5.07 E	8.08	S 38 51 E	0.76
2670.	0 38	N 77 E	2669.93	8.21	6.22 S	5.45 E	8.27	S 41 12 E	0.67

CITY OF ST RT, FLORIDA
WATER DISPOSAL WELL NO. 1
STUART, FLORIDA

COMPUTATION TIME 04:04:18 DATE 00--00 AGE NO.

MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	RECTANGULAR COORDINATES FEET		CLOSURE DISTANCE FEET	CLOSURE DIRECTION D M	DOG LEG SEVERITY DG/100FT
2700.	0 53	N 73 E	2699.92	8.43	6.12 S	5.84 E	8.46	S 43 39 E	0.87
2730.	0 53	N 69 E	2729.92	8.66	5.97 S	6.28 E	8.66	S 46 26 E	0.19
2750.	0 41	N 74 E	2749.92	8.80	5.89 S	6.54 E	8.80	S 48 1 E	1.01

FINAL CLOSURE - DIRECTION: S 48 DEGS 1 MINS 8 SECS E
DISTANCE: 8.80 FEET

CITY OF STUART, FLORIDA
WATER DISPOSAL WELL NO. 1
STUART, FLORIDA
FILE NO. 1
10-20-81
GYROSCOPIC MULTIPLE SHOT SURVEY

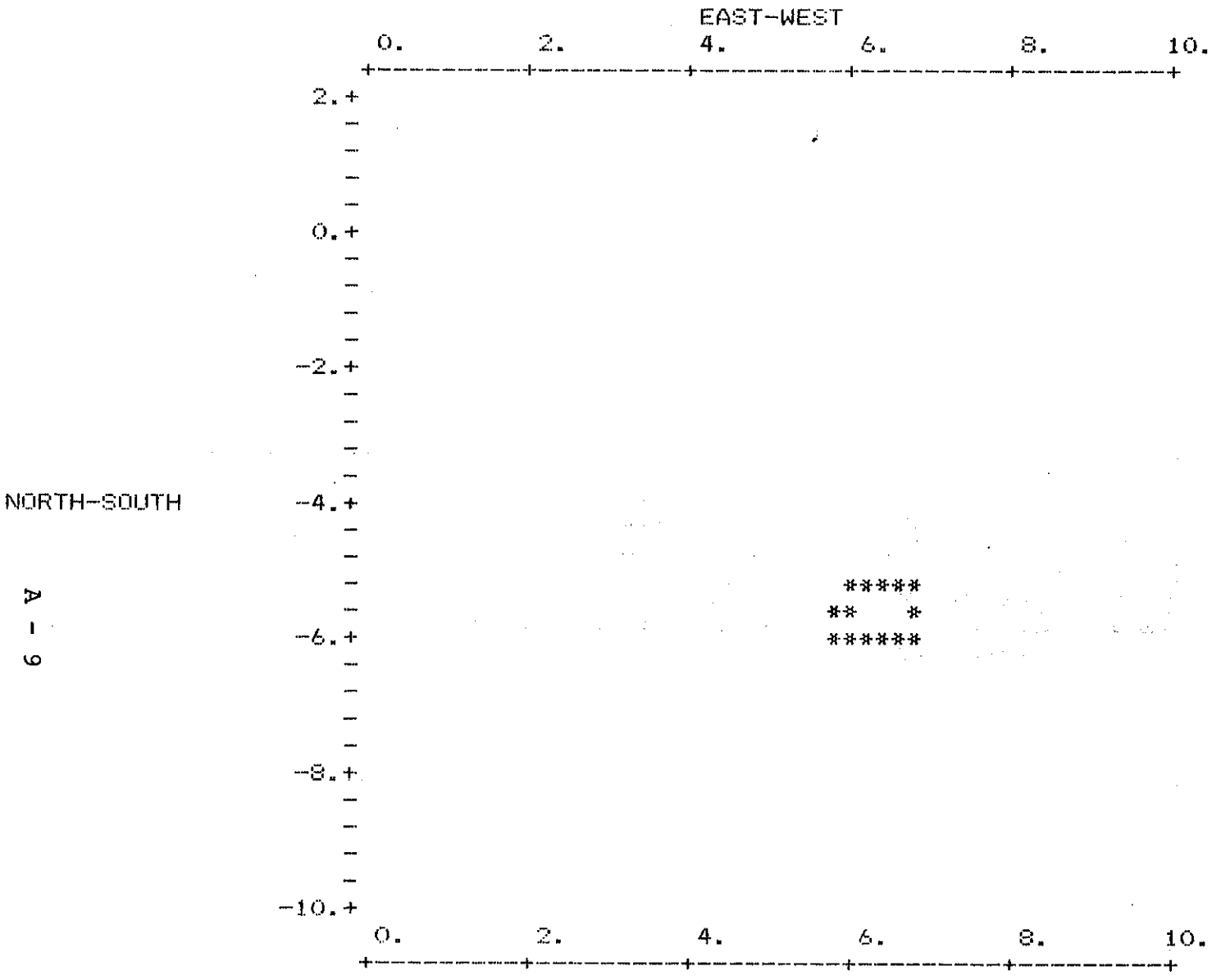
PROBABILITY CALCULATIONS

EXPECTED VALUE :		VARIANCE :		COVARIANCE :	
EAST-WEST COORDINATE :	6.4 FT.	EAST-WEST :	0.0	EW-NS :	-0.0
NORTH-SOUTH COORDINATE:	-5.7 FT.	NORTH-SOUTH :	0.0	EW-V :	-0.0
VERTICAL COORDINATE :	2749.9 FT.	VERTICAL :	0.0	NS-V :	0.0

RESULTS ARE BASED ON THE FOLLOWING TOOLS:

0.0 TO 2750.0 TOOL NUMBER 3 = 5 DEGREE UNIT GYRO WITH TAC

ELLIPSE OF ICERTAINTY V2.10
FOR FILE 0



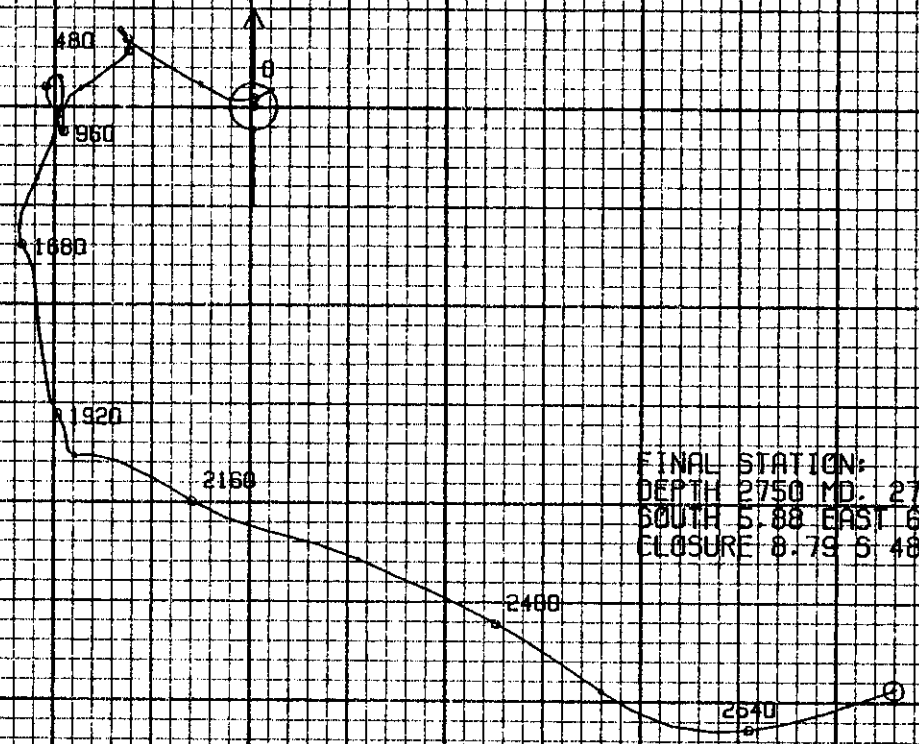
PROBABILITY IS 0.99 THAT BOTTOM-HOLE COORDINATES ARE WITHIN THIS ELLIPSE AND
THAT TRUE VERTICAL DEPTH IS BETWEEN 2749.9 FT. AND 2749.9 FT.
CENTER OF ELLIPSE IS 5.7 FT. SOUTH AND 6.4 FT. EAST AT A DEPTH OF 2749.9 FT.
MAJOR AXIS IS 1.0 FT. AND IS ROTATED 10. DEG COUNTER-CLOCKWISE FROM EAST
MINOR AXIS IS 1.0 FT. VERTICAL THICKNESS IS 0.0 FT.

CITY OF STUART, FLORIDA
WATER DISPOSAL WELL NO. 1
ST. LUCIE COUNTY, FLA.

EASTMAN WHIPSTOCK, INC.

HORIZONTAL PROJECTION

SCALE 1 IN. = 2 FEET
DEPTH INDICATOR: MD



FINAL STATION:
DEPTH 2750 MD, 2749.91 TVD
SOUTH 5.88 EAST 6.54
CLOSURE 8.79 S 48 1 8 E

Appendix B
LITHOLOGIC LOG

Appendix B
GEOLOGIC DATA

Depth Interval From	To	Description
2,995	3,000	Mixed aggregate, white fossiliferous limestone to tan saccaroidal, hackly dolomite, generally a medium-sized gravel
3,000	3,005	A white to tan dolomite-limestone, fine gravel sand
3,005	3,010	White cobbly limestone to a tan saccaroidal dolomite, generally a very coarse aggregate
3,010	3,030	A medium-grained, mixed limestone-dolomite sand, white limestone shell fragments, tan succrosic dolomite fragments
3,030	3,032	A coarse tan dolomite gravel with a white medium-grained limestone sand, some shell fragments
3,032	3,042	Dolomite, buff, vugular, new hole;
3,040	--	Same as above, also clay, calcareous, massive
3,042	3,052	Limestone, gray-white, friable, primary porosity, mixed with some crystalline dolomite
3,052	3,062	Dolomite, gray, very hard, microcrystalline, some white limestone
3,062	3,072	Dolomite, tan, very coarse gravel, secondary porosity, crystalline
3,072	3,082	Dolomite, tan, crystalline, fine to coarse gravel, massive, some limestone, white, fossiliferous
3,082	3,092	Dolomite, tan to dark brown, secondary porosity, crystalline, medium to coarse gravel, very little limestone, white
3,092	3,100	Dolomite, same as above, more limestone, white, fossiliferous
3,100	3,106	Same as above
3,106	3,112	Dolomite, tan, hard, crystalline, succrosic
3,112	3,122	Dolomite, massive, crystalline in part, tan to brown, some calcareous dolomite mottling
3,122	3,132	Dolomite, same as above; limestone, white, soft, easily broken, some very hard fine-grained, with crystalline surfaces of dolomite

Depth Interval From	To	Description
3,132	3,142	Dolomite, brown, good crystal development, saccaroidal, some friability; limestone, white, very little, some very hard with mottling
3,142	3,152	Same as above
3,152	3,162	Dolomite, hard, some crystalline surfaces, buff, some blue-gray chert
3,160	3,170	Same as above
3,170	3,180	Dolomite, massive, buff, microcrystalline to well developed crystalline surfaces, secondary porosity, some limestone, soft, white
3,180	3,190	Limestone, dense, hard, fossiliferous, crystalline surfaces of calcite, some dolomite, buff to brown, microcrystalline
3,190	3,200	Dolomite, brown, massive, well developed crystalline surfaces, secondary porosity, some claystone and limestone, white, soft
3,200	3,210	Dolomite, brown, massive, some mottling with claystone, crystalline surfaces of dolomite; limestone, primary porosity, vugular, white, soft
3,210	3,220	Same as above
3,220	3,230	Same as above
3,230	3,240	Dolomite, brown, crystalline surfaces
3,240	3,250	Same as above
3,250	3,260	Dolomite, fine-grained, massive, buff
3,260	3,270	Dolomite and limestone, as above
3,270	3,280	Dolomite, very fine-grained, buff, some soft white limestone
3,280	3,290	Same as above
3,290	3,300	Same as above
3,300	3,305	Dolomite, more crystalline development, generally as above

Appendix C
LINER PRESSURE TEST

Appendix C
LINER PRESSURE TEST DATA
REHABILITATION OF THE DEEP-INJECTION AND MONITORING WELLS
CITY OF STUART, FLORIDA

Test Started (minutes)	Pressure (psi)	Total Pressure Loss (psi)	Remarks
0	100.0	0	Start test
10	100.0	0	
20	100.0	0	
30	100.0	0	
40	100.0	0	
50	100.0	0	
60	100.0	0	End test

Appendix D
TV SURVEY SUMMARY

CH2M HILL RECORD OF UNDERWATER TV SURVEY

Project: City of Stuart, Florida

Well: Injection Well

Survey By: Deep Venture

Survey Date: December 9, 1981 Total Depth: 3,300 feet

Witnessed By:

Reviewed By: J. I. G. B. Date: 12/30/81

Remarks:

Depth in Feet		Reel Counter		Observations
From	To	From	To	
--	--	0	14	Titles
1,996	2,000	14	33	Bottom of casing
2,000	2,015	33	65	Hole to top rough zone
2,015	2,622	65	280	Smooth hole—first narrow spot
2,622	2,625	280	300	Narrow spot
2,625	2,680	300	347	Smooth hole—second narrow spot
2,680	2,682	347	368	Second narrow spot
2,682	2,744	368	415	Smooth hole—some roughness at 2,744
2,744	2,880	415	537	Smooth hole—fourth narrow spot
2,880	2,926	537	574	Smooth hole—big hole
2,926	2,979	574	612	Big hole—first cavity
2,979	2,985	612	624	Big rock in cavity
2,985	2,988	624	640	Centering hole @ 2,990 (642)
--	3,016	--	650	Calipered hole

Project: City of Stuart, Florida

Well: Injection Date: December 9, 1981 Total Depth: 3,300 feet

Depth in Feet		Reel Counter		Observations
From	To	From	To	
--	3,032	--	655	Old bottom of hole
--	3,048	--	665	Top of big cavity
3,050	3,121	660	715	Calipered hole—top of cavity
3,121	3,125	715	719	Cavity
3,125	3,150	719	729	Rough caliper log—top of cavity
3,150	3,154	729	734	Cavity
3,154	3,291	734	800	Calipered log (rough and smooth)
--	3,291	--	800	Top of cavity
3,291	3,299	800	805	Cavernous zone, bottom of
--	--	--	--	Hole at approximately +3,300 feet
3,299	3,298	805	815	Looking at bottom of hole
3,298	3,146	815	881	Coming out of hole; end of tape

Appendix E
PUMP-OUT TEST DATA

PUMP-OUT TEST OF INJECTION WELL
CITY OF STUART

CH2M HILL

Pumping Test Report
Project No.: FL15132.B0

Well No.: INJECTION WELL
Date: 12-8-81 Page 1 of 3

Time Since Start of Test	Water Level		Depth to Water * (ft)	Drawdown (ft)	Pumping Rate gpm	Remarks
	Gauge Reading					
minutes	psi	feet				
3:00 PM	57.91	133.74	12.19	-	-	STATIC
3:25 PM	57.91	133.74	12.19	-	-	"
3:32 PM	57.91	133.74	12.19	-	-	"
3:32 PM	-	-	-	-	0	START PUMP
1	51.0	117.78	28.15	15.96	3500	INCREASING RPM
2	48.0	110.85	35.08	22.89	3800	"
3	47.0	108.55	37.38	25.19	3900	"
3.5	48.5	112.01	33.92	21.73	4000	"
4.4	47.5	109.70	36.23	24.04	4000	"
5	47.7	110.16	35.77	23.58	4000	"
6	48.0	110.85	35.08	22.89	4200	"
7.5	47.7	110.16	35.77	23.58	4300	SET PUMP RATE
9	48.5	112.01	33.92	21.73	4300	
11	48.5	112.01	33.92	21.73	4300	
13	48.5	112.01	33.92	21.73	4300	
16	48.0	110.85	35.08	22.89	4200	ADJUST PUMP
18	48.0	110.85	35.08	22.89	4200	WATER TEMP. 72.5°
23	47.8	110.39	35.54	23.35	4200	
28	48.0	110.85	35.08	22.89	4200	
33	48.0	110.85	35.08	22.89	4200	WATER TEMP. 72.5°
38	48.0	110.85	35.08	22.89	4200	
43	48.1	111.09	34.84	22.65	4200	
48	48.1	111.09	34.84	22.65	4200	

* MEASURING POINT = TOP OF 16-INCH CASING FLANGE.

CH2M HILL

Pumping Test Report
Project No.: FC15132.B0

Well No.: INJECTION WELL
Date: 12-8-81 Page 2 of 3

Time Since Start of Test	Water Level				Pumping Rate gpm	Remarks
	Gauge Reading		Depth to Water (ft)	Drawdown (ft)		
minutes	psi	feet				
53	48.1	111.09	34.84	22.65	4200	
58	48.1	111.09	34.84	22.65	4200	
68	48.0	110.85	35.08	22.89	4200	
78	48.0	110.85	35.08	22.89	4200	
88	48.2	111.32	34.61	22.42	4200	
118	48.2	111.32	34.61	22.42	4200	WATER TEMP. 72.5°
148	48.2	111.32	34.61	22.42	4200	
178	48.2	111.32	34.61	22.42	4200	
208	48.2	111.32	34.61	22.42	4200	
238	48.1	111.09	34.84	22.65	4200	WATER TEMP. 72.5°
328	48.2	111.32	34.61	22.42	4200	
358	48.0	110.86	35.08	22.89	4200	
448	48.0	110.86	35.08	22.89	4200	
463	48.1	111.09	34.84	22.65	4200	
478	48.0	110.86	35.08	22.89	4200	WATER TEMP. 72.5°
480	51.5	118.94	26.99	14.80	3000	THROTTLE DOWN PUMP
481	54.1	124.94	20.99	8.80	1000	"
482	58.5	135.10	13.55	1.36	-0-	PUMP OFF
483	57.3	132.33	13.60	1.41	0	RECOVERY
484	58.0	133.95	11.98	-.21	0	
485	57.8	133.49	11.94	-.25	0	
486	57.5	132.79	11.24	-.95	0	
487	57.7	133.26	11.71	-.48	0	

CH2M HILL

Pumping Test Report
Project No.: FC15132.B0

Well No.: INJECTION WELL
Date: 12-8-81 Page 3 of 3

Time Since Start of Test	Water Level				Pumping Rate gpm	Remarks
	Gauge Reading		Depth to Water (ft)	Drawdown (ft)		
minutes	psi	feet				
489 (11:41 PM)	57.8	133.49	11.94	-.25	0	STATIC
490	57.8	133.49	11.94	-.25	0	
498	57.8	133.49	11.94	-.25	0	
508	57.8	133.49	11.94	-.25	0	

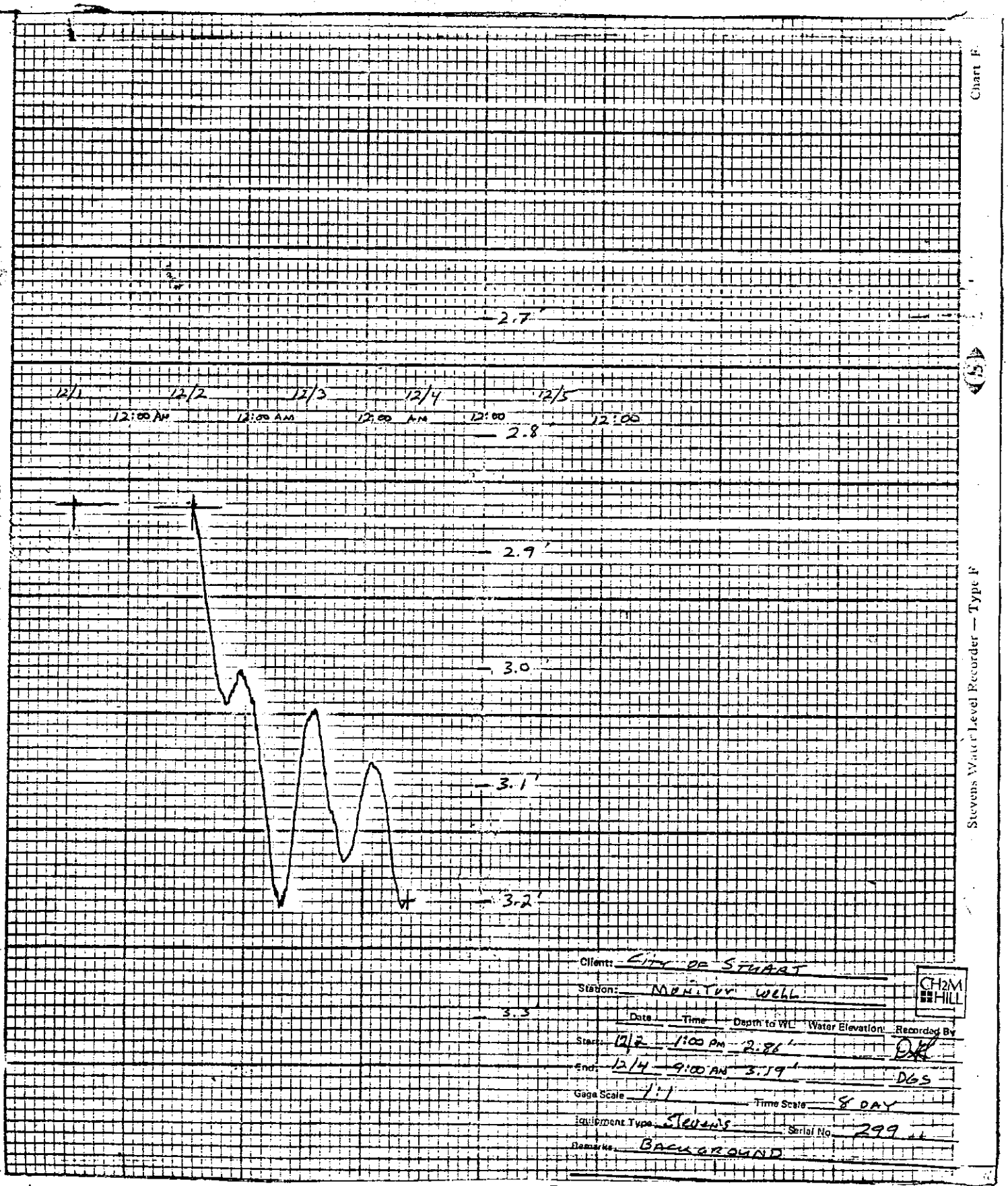
24"/16" ANNULUS PRESSURE

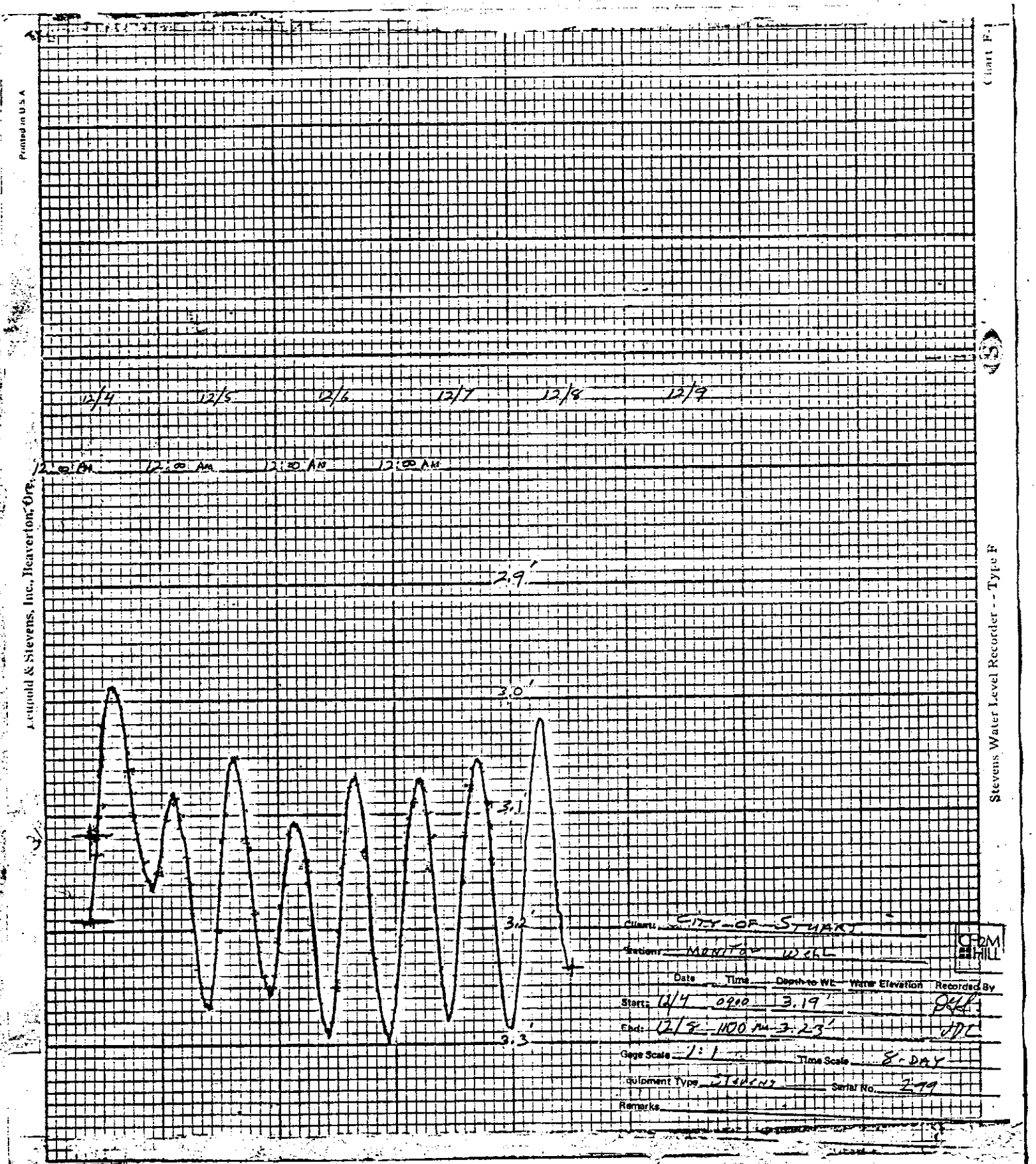
CH2M HILL

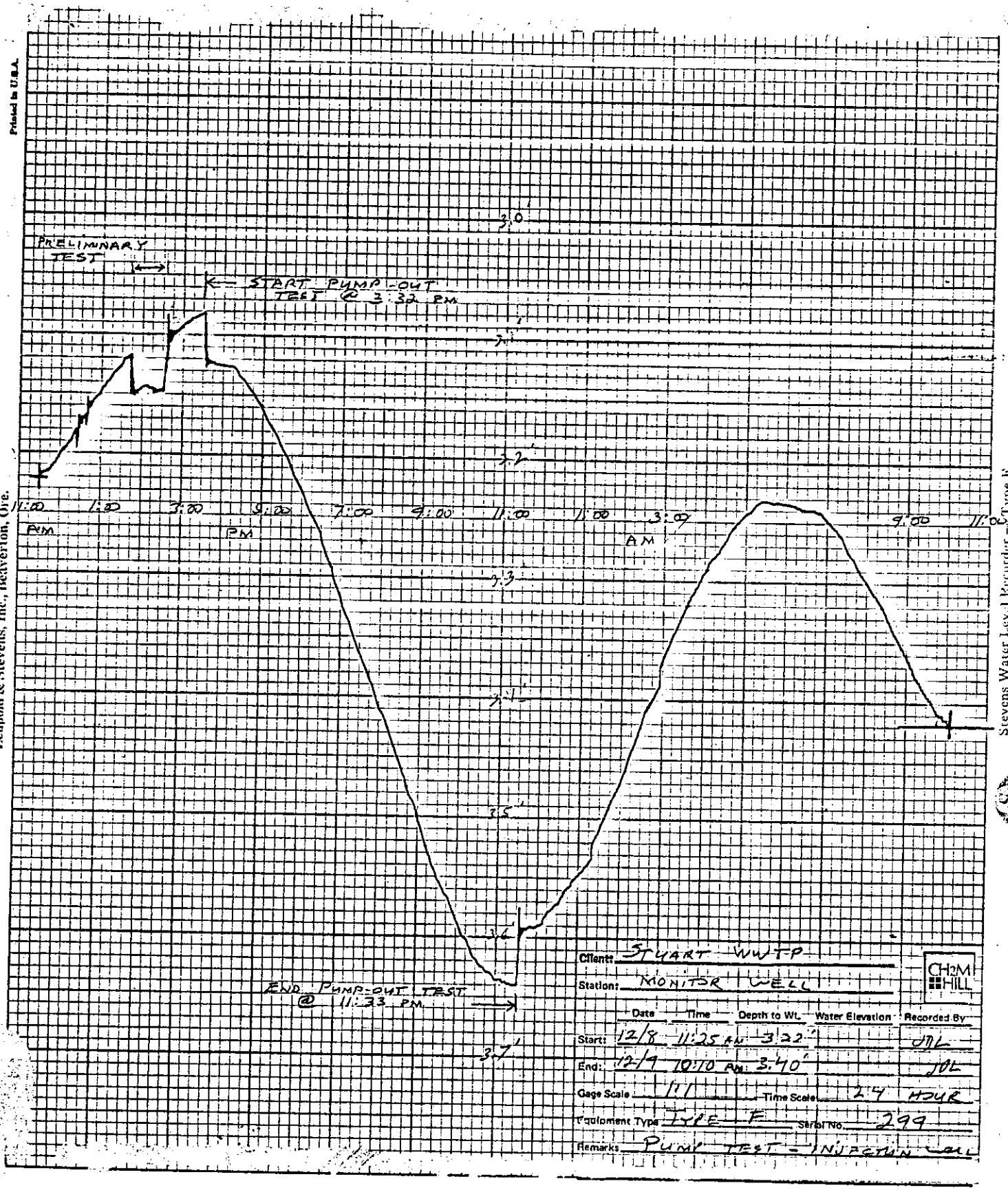
Pumping Test Report
Project No.: FC15132.B0

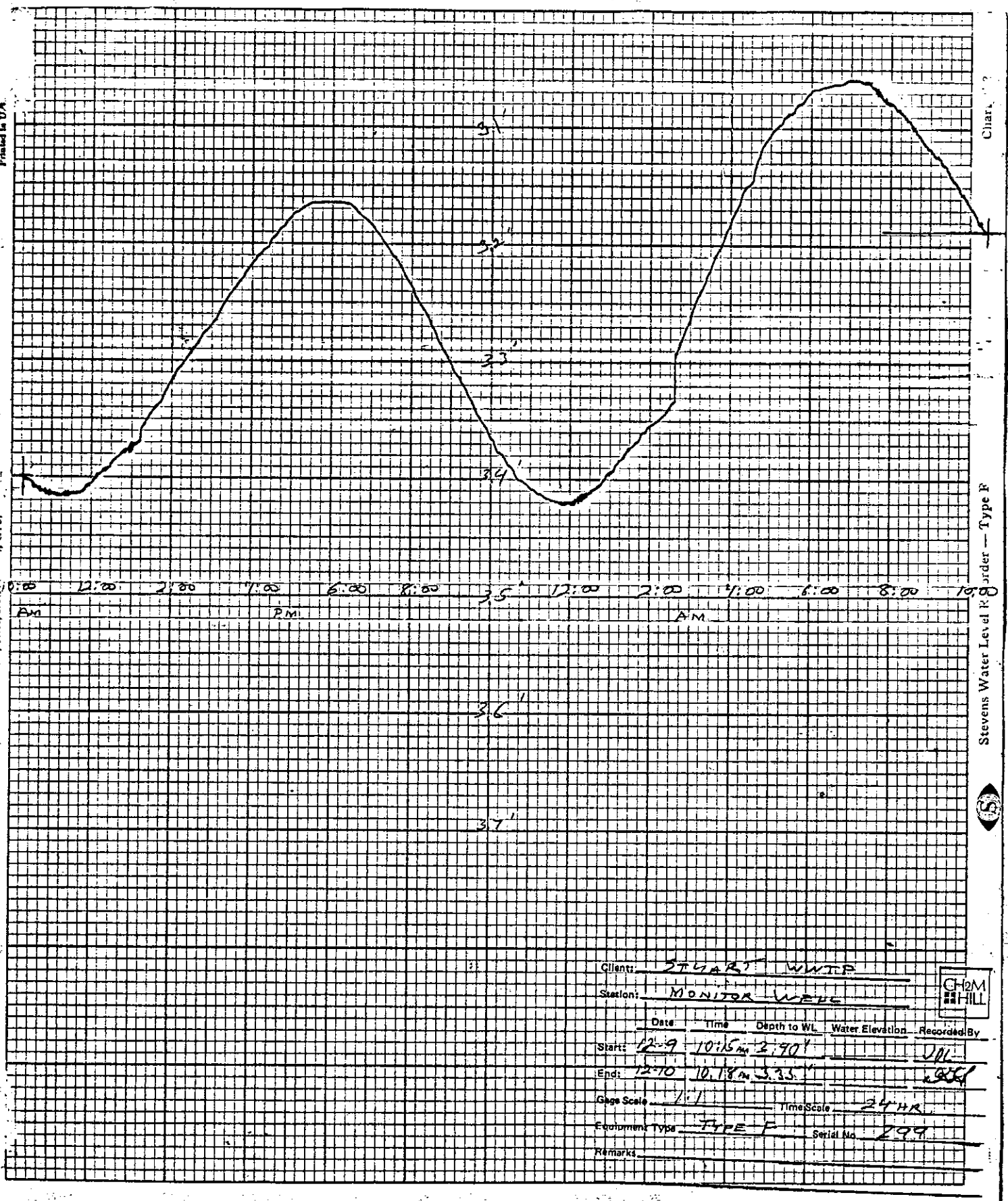
Well No.: INJECTION WELL
Date: 12-8-81 Page 1 of 1

Time Since Start of Test	Water Level				Pumping Rate gpm	Remarks
	Gauge Reading *		Depth to Water (ft)	Drawdown (ft)		
minutes	psi	feet				
12:00 PM	12.97	29.95			-	STATIC
3:00 PM	12.92	29.84			-	"
3:30 PM	12.91	29.82			-	"
3:32 PM	-	-			0	START PUMP
5	12.90	29.79			4000	
17	12.90	29.79			4200	
58	12.90	29.79			4200	
123	12.85	29.68			4200	
178	12.85	29.68			4200	
238	12.82	29.61			4200	
328	12.80	29.56			4200	
418	12.75	29.45			4200	
478	12.75	29.45			4200	END PUMP TEST
484	12.76	29.47			0	
486	12.76	29.47			0	
490	12.77	29.49			0	
498 (11:50 PM)	12.76	29.47			0	
* GAUGE HEIGHT =	2.75 FT. ABOVE		16-INCH	CASING	FLANGE	


Leupold & Stevens, Inc., Beaverton, Ore.
Printed in U.S.A.
Stevens Water Level Recorder — Type F
Chart F
12/1
12/2
12/3
12/4
12/5
12:00 AM
12:00 AM
12:00 AM
12:00
12:00
2.7'
2.8
2.9'
3.0
3.1'
3.2'
3.3
Client: CITY OF STUART
Station: MONITOR WELL
Date Time Depth to WL Water Elevation Recorded By
Start: 12/2 1:00 PM 2.86' DK
End: 12/4 9:00 AM 3.19' DGS
Gage Scale 1:1 Time Scale 8 DAY
Equipment Type STEVENS Serial No 299
Remarks BACKGROUND
CH2M HILL


12/4
12/5
12/6
12/7
12/8
12/9
12:00 AM
12:00 AM
12:00 AM
12:00 AM
2.9'
3.0'
3.1'
3.2'
3.3'
Client: CITY OF STUART
Station: MONITOR WELL
Date Time Depth to WE Water Elevation Recorded By
Start: 12/4 0900 3.19' BKK
End: 12/8 1100 AM 3.23' JDC
Gage Scale 1:1 Time Scale 8-DAY
Equipment Type Stevens Serial No. 279
Remarks
CH2M HILL
Stevens Water Level Recorder -- Type F
Chart F-1
Printed in U.S.A.
Leupold & Stevens, Inc., Beaverton, Ore.


PRELIMINARY TEST
← START PUMP-OUT TEST @ 3:32 PM
END PUMP-OUT TEST @ 11:33 PM
3.0
3.1
3.2
3.3
3.4
3.5
3.7
11:00 1:00 3:00 5:00 7:00 9:00 11:00 1:00 3:00 9:00 11:00
PM PM AM
Client: STUART WWTP
Station: MONITOR WELL
Date Time Depth to WL Water Elevation Recorded By
Start: 12/8 11:25 AM 3.22' JDL
End: 12/9 10:10 AM 3.40' JDL
Gage Scale 1:1 Time Scale 24 HOUR
Equipment Type TYPE F Serial No. 299
Remarks PUMP TEST - INJECTION WELL
CH2M HILL
Printed in U.S.A.
Leupold & Stevens, Inc., Beaverton, Ore.
Stevens Water Level Recorder — Type F
Chart


Printed in U.S.A.
Leupold & Stevens, Inc., Beav., Ore.
Stevens Water Level Recorder — Type F
Chart
3.1'
3.2'
3.3'
3.4'
3.5'
3.6'
3.7'
0:00
12:00
2:00
4:00
6:00
8:00
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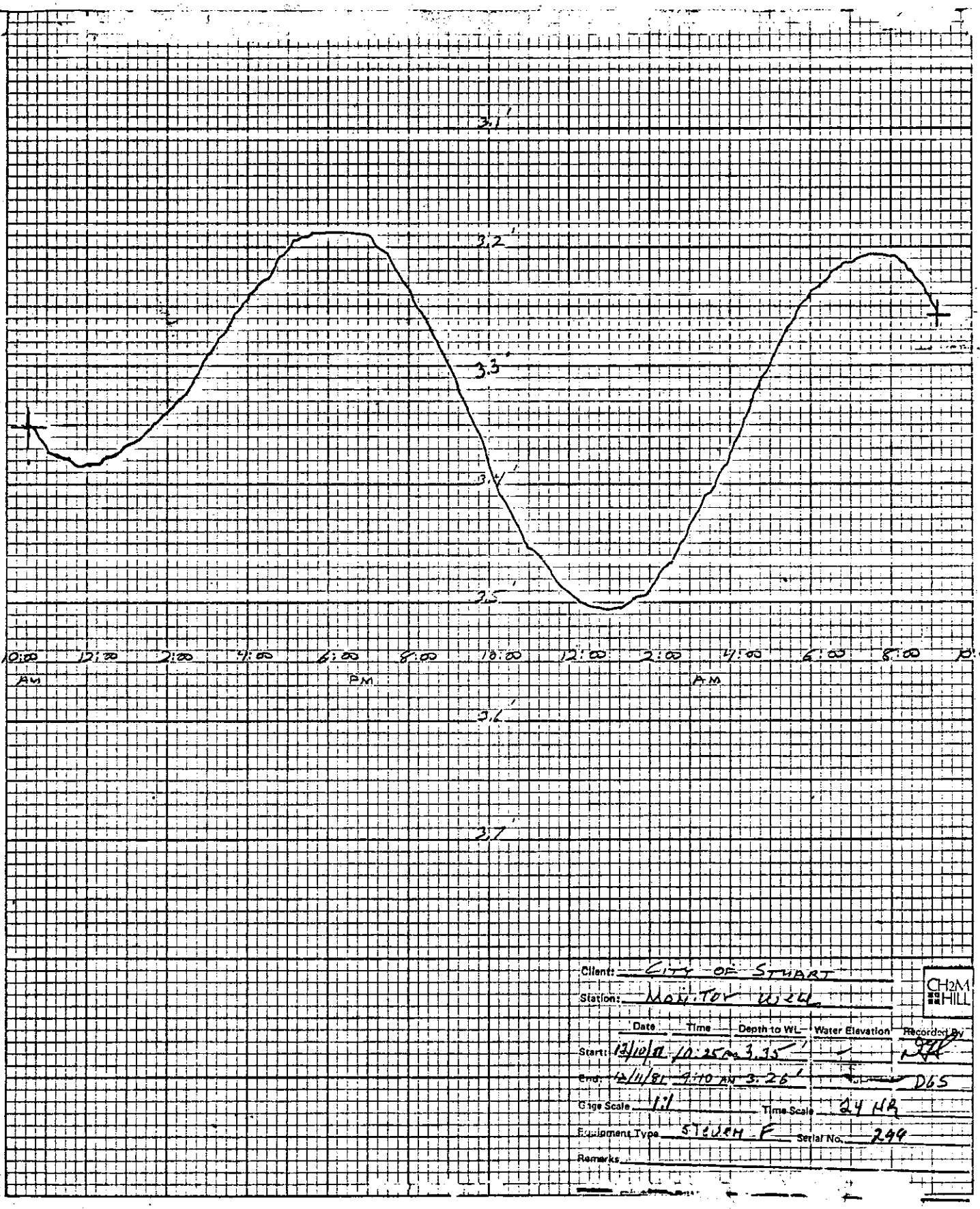
2:00
4:00
6:00
8:00
10:00
AM
PM
AM
Client: STUART WWTP
Station: MONITOR WELL
Date
Time
Depth to WL
Water Elevation
Recorded By
Start: 12-9 10:15 AM 2.70'
End: 12-10 10:18 AM 3.35'
Gage Scale 1:1
Time Scale 24 HR
Equipment Type TYPE F
Serial No. 299
Remarks
CH2M HILL


3.1'
3.2'
3.3'
3.4'
3.5'
3.6'
3.7'
0:00
12:00
2:00
4:00
6:00
8:00
10:00
12:00
2:00
4:00
6:00
8:00
10:
AM
PM
AM
Client: CITY OF STUART
Station: MONITOR WELL
Date Time Depth to WL Water Elevation Recorded By
Start: 12/10/81 10:25 AM 3.35' DGS
End: 12/11/81 9:10 AM 3.26'
Gage Scale 1:1 Time Scale 24 HR
Equipment Type STEVEN F Serial No. 249
Remarks
CH2M HILL
Leupold & Stevens, Inc., Beaverton, Ore.
Printed in U.S.A.
Stevens Water Level Recorder — Type F
Chart F-1

Appendix F
INJECTION TEST DATA--16-INCH CASING

INJECTION WELL - WELL-HEAD PRESSURE & FLOW

CH2M HILL
Engineers

Page No. 1
Date: 12-18-81

Client: CITY OF STUART
Project No.: FC15132.B0

Well No.: INJECTION

INJECTION TEST DATA

Actual Time	Time Since Pump Started (min)	Flow (gpm)	Well Head Pressure * (psi)	Totalizer (gpm)	Remarks
12:00 PM	—	—	19.85	—	STATIC AFTER PRELIMINARY TEST.
12:05	0	0	19.85	—	START PUMPS #2 & 3
12:07	2	6200	43.5		
12:10	5	6200	44.5		
12:11	6	6000	46.7		START PUMP #1
12:14	9	5880	46.0		WATER TEMP. = 74°
12:17	12	5880	45.8		
12:23	18	2980	33.0		PUMP #1 OFF, BACKFLOWING TO UNCLOG SCREEN.
12:25	20	2980	34.0		"
12:27	22	5200	46.0		"
12:28	23	5880	45.6		PUMP #1 ON
12:32	27	5880	45.5		
12:36	31	5880	45.5		WATER TEMP. = 74°
12:40	35	5880	45.3		
12:45	40	5880	45.4		
1:00	55	5720	45.5		WATER TEMP. = 74°, CONDUCTIVITY = 850 umhos/cm.
1:10	65	3400	34.0		PUMP #1 OFF BACKFLOWING TO UNCLOG SCREEN
* GAUGE HEIGHT = 3.0' ABOVE 16-INCH CASING FLANGE					

CH2M HILL
Engineers

Page No. 2
Date: 12-18-81

Client: CITY OF STUART
Project No.: FC15132.B0

Well No.: INJECTION

INJECTION TEST DATA

Actual Time	Time Since Pump Started (min)	Flow (gpm)	Well Head Pressure (psi)	Totalizer (gpm)	Remarks
1:13	68	3400	33.5		"
1:20	75	5880	46.5		PUMP #1 ON.
1:26	81	5880	46.5		
1:42	97	5880	46.5		
1:55	110	5880	46.2		
2:02	117	3400	38.0		PUMP #1 OFF, BACKFLOWING TO UNCLOG SCREEN
2:07	122	3400	34.0		PUMP #1 ON PUMP #2 OFF BACKFLOWING
2:12	127	3680	38.0		PUMP #2 ON PUMP #3 OFF BACKFLOWING.
2:15	130	5420	45.0		PUMPS #1 #2 ON, #3 OFF.
2:17	132	6200	48.8		PUMPS #1, 2, 3 ON
2:22	137	6200	48.8		
3:00	175	6200	48.0		WATER TEMP. = 74°, CONDUCTIVITY = 800 umhos/cm
3:35	210	6000	47.5		
3:45	220	6000	46.5		
3:52	227	5880	46.6		
3:53	228	3750	35.0		PUMPS #1 #2 OFF TO REDUCE RATE TO ALLOW A FLOWMETER LOG TO BE RUN.
4:23	258	3700	34.5		
			F - 2		

CH2M HILL
Engineers

Page No. 3
Date: 12-18-81

Client: City of Stuart
Project No.: FC15132.80

Well No.: Injection

INJECTION TEST DATA

Actual Time	Time Since Pump Started (min)	Flow (gpm)	Well Head Pressure (psi)	Totalizer (gpm)	Remarks
4:52	287	3500	34.5		"
5:25	320	6000	47.7		PUMPS #1, 2, 3 ON.
5:32	327	6000	47.5		
5:39	334	6000	47.5		
5:40	335	0	—		ALL PUMPS OFF.
5:41	336	0	27.6		STATIC READING
5:43	338	0	27.5		
5:44	339	0	27.2		
5:46	341	0	26.9		
5:49	344	0	26.9		
5:55	350	0	26.9		

INJECTION WELL - 16"/24"
ANNULUS PRESSURE

CH2M HILL
Engineers

Page No. 1
Date: 12-18-81

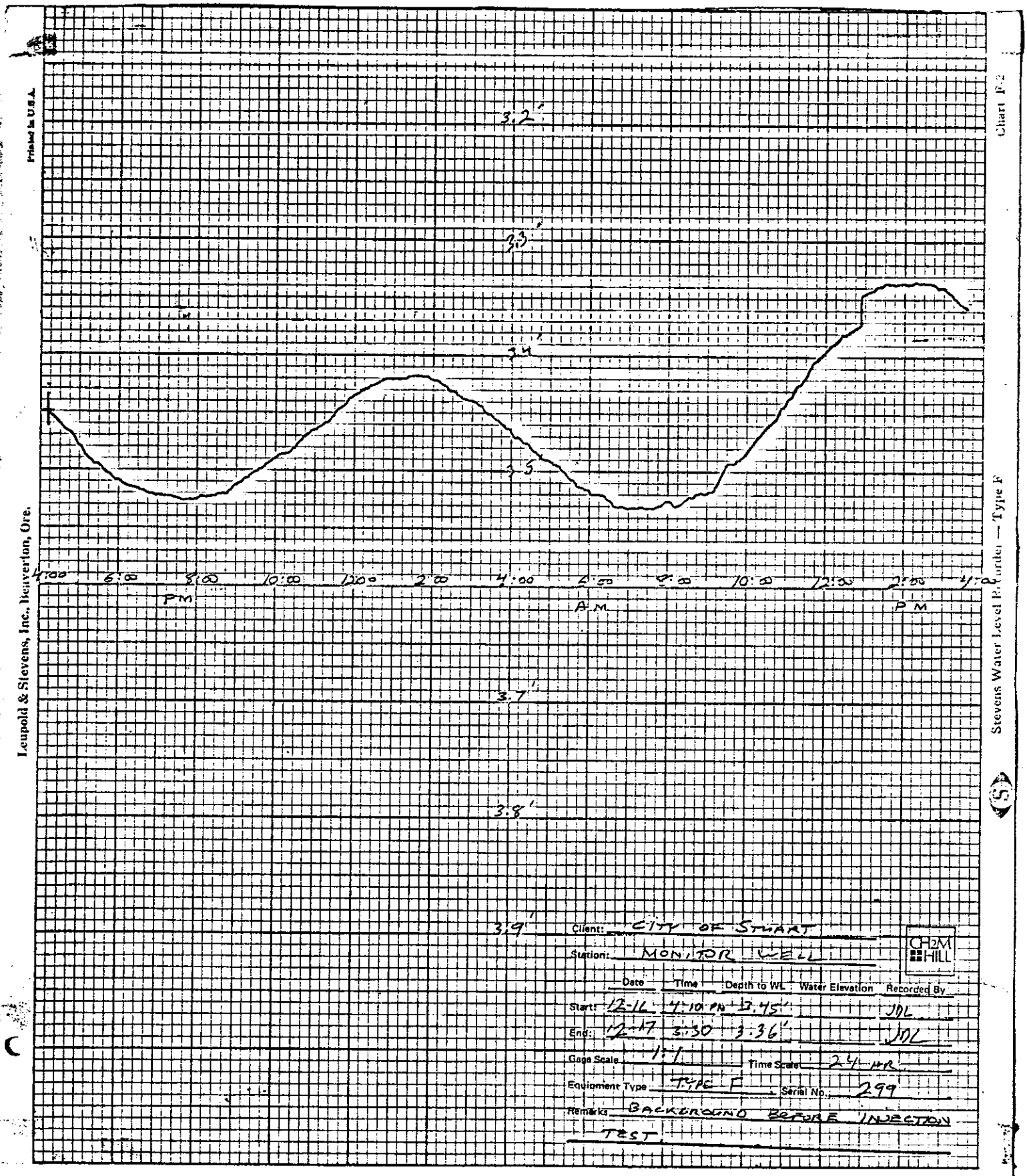
Client: CITY OF STUART
Project No.: FC15132.B0

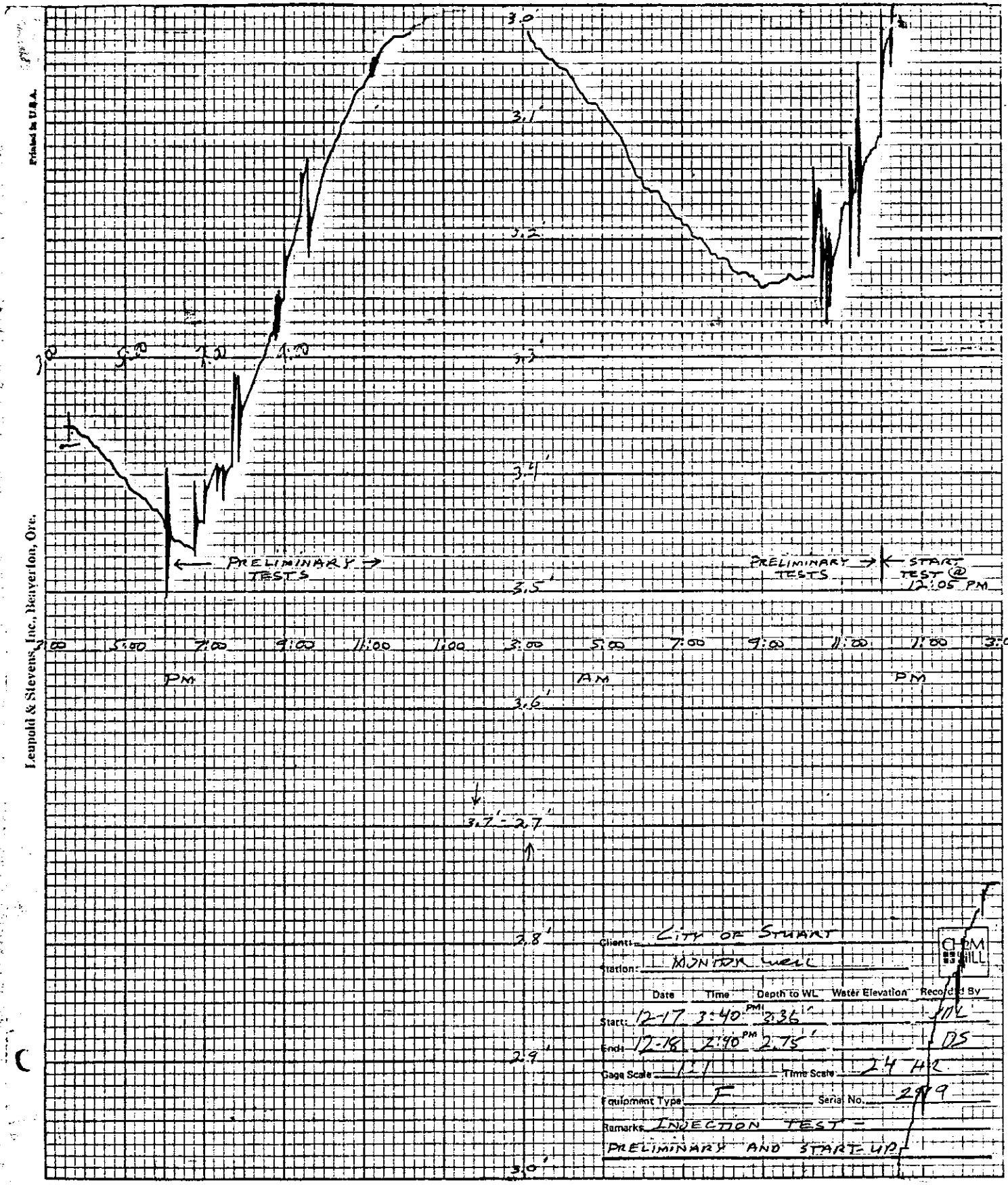
Well No.: INJECTION

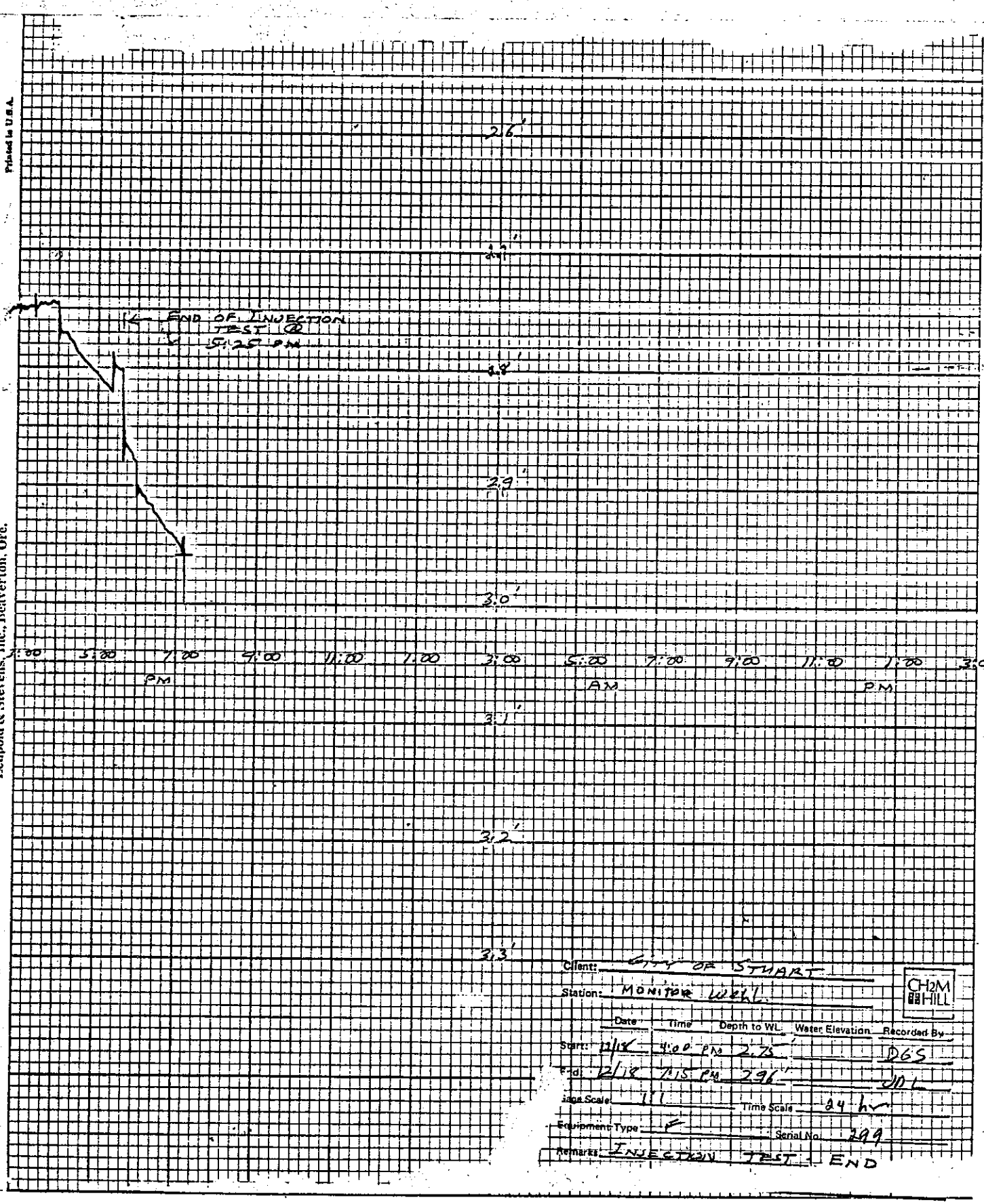
INJECTION TEST DATA

Actual Time	Time Since Pump Started (min)	Flow (gpm)	ANNULUS Pressure * (psi)	Totalizer (gpm)	Remarks
11:58 AM	—		12.82		STATIC
12:05 PM	0		—		START PUMPS
12:15	10		12.8		
12:32	27		12.8		
12:36	31		12.8		
12:41	36		12.8		
1:00	55		12.8		
1:45	100		12.8		
1:55	110		12.8		
3:00	175		12.8		
4:00	235		12.8		
4:55	290		12.8		
5:25	320		12.8		PUMPS OFF
5:47	342		12.80		STATIC AFTER TEST

* GAUGE HEIGHT = 2.75' ABOVE 16-INCH CASING FLANGE


Printed in U.S.A.
Leupold & Stevens, Inc., Beaverton, Ore.
Stevens Water Level Recorder — Type F
Chart F-2
3.2'
3.3'
3.4'
3.5'
3.7'
3.8'
3.9'
4:00
6:00
8:00
10:00
12:00
2:00
4:00
6:00
8:00
10:00
12:00
2:00
4:00
PM
AM
PM
Client: CITY OF STUART
Station: MONITOR WELL
CH2M HILL
Date Time Depth to WL Water Elevation Recorded By
Start: 12-16 4:10 PM 3.45' JDL
End: 12-17 3:30 3.36' JDL
Gage Scale 1:1 Time Scale 24 HR
Equipment Type TYPE F Serial No. 299
Remarks BACKGROUND BEFORE INJECTION TEST


Printed in U.S.A.
Leupold & Stevens, Inc., Beaverton, Ore.
Stevens Water Level Recorder — Type F
Chart 1-2
3.0'
3.1'
3.2'
3.3'
3.4'
3.5'
3.6'
3.7'
2.7'
2.8'
2.9'
3.0'
PRELIMINARY TESTS
PRELIMINARY TESTS
START TEST @ 12:05 PM
5:00
7:00
9:00
11:00
1:00
3:00
5:00
7:00
9:00
11:00
1:00
3:00
PM
AM
PM
Client: CITY OF STUART
Station: MONITOR WELL
Date Time Depth to WL Water Elevation Recorded By
Start: 12-17 3:40 PM 3.36' JHL
End: 12-18 2:40 PM 2.75' DS
Gage Scale 1/1 Time Scale 24 HR
Equipment Type F Serial No. 2979
Remarks INJECTION TEST - PRELIMINARY AND START-UP


2.6'
2.8'
2.9'
3.0'
3.1'
3.2'
3.3'
← END OF INJECTION TEST @ 5:25 PM
1:00
5:00
7:00
9:00
11:00
1:00
3:00
5:00
7:00
9:00
11:00
1:00
3:0
PM
AM
PM
Client: CITY OF STUART
Station: MONITOR WELL
CH2M HILL
Date Time Depth to WL Water Elevation Recorded By
Start: 12/18 4:00 PM 2.75 DGS
End: 12/18 7:15 PM 2.96 DL
Gage Scale 1" Time Scale 24 hr
Equipment Type F Serial No. 299
Remarks: INJECTION TEST END
Printed in U.S.A.
Leupold & Stevens, Inc., Beaverton, Ore.
Stevens Water Level Recorder — Type F
Chart

Appendix G
INJECTION TEST DATA--10-INCH LINER

INJECTION WELL - WELL HEAD PRESSURE & FLOW

CH2M HILL
Engineers

Page No. 1
Date: 2-24-82

Client: CITY OF STUART
Project No.: FC15132.B0

Well No.: INJECTION

INJECTION TEST DATA

* GAUGE HEIGHT = 3.0' ABOVE 16-INCH CASING FLANGE

Actual Time	Time Since Pump Started (min)	Flow (gpm)	* Well Head Pressure (psi)	Totalizer (gpm)	Remarks
11:34 AM	0	0	54.7	-NA-	START TEST (EFFLUENT IN WELL)
11:35	1	1850	57.0		PUMP #3 RUNNING
11:36	2	2150	57.2		
11:37	3	-	57.2		LOW PRESSURE GAUGE PLUGGED
11:39	5	-	57.3		"
11:49	15	2600	57.3		
11:52	18	2500	57.3		
11:53	19	-	-		PUMP #3 OFF - NO PUMPING
11:59	25	-	-		PUMP #3 ON
12:00	26	2600	57.2		
12:01	27	2400	57.2		
12:02	28	2400	57.2		
12:04	30	2600	57.35		
12:09	35	2500	57.3		
12:19	45	2500	57.2		
12:34	60	2500	57.2		
12:40	66	2630	64.3		PUMPS #2 AND #3 ON.
12:41	67	2500	56.15		PUMP #2 ON ONLY

G - 1

CH2M HILL
Engineers

Page No. 2
Date: 2-24-82

Client: City of Stuart
Project No.: FC15132.B0

Well No.: Injection

INJECTION TEST DATA

Actual Time	Time Since Pump Started (min)	Flow (gpm)	Well Head Pressure (psi)	Totalizer (gpm)	Remarks
12:50	76	3000	67.7		Pumps #1 and 2 on
12:51	77	2730	65.65		
12:54	80	2630	64.9		
12:59	85	2280	54.75		Pump #1 on only
1:00 PM	86	2500	54.65		
1:12	98	2500	54.6		
1:19	105	2400	54.4		
1:24	110	2400	54.4		
1:34	120	2400	54.1		
1:51	137	-	-		Pump #1 off, Pump #2 on Backflushing #1
1:52	138	2150	55.2		
1:54	140	2400	55.2		Pump #2 on only
2:34	180	2400	55.1		
3:04	210	2400	54.85		
3:27	233	-	-		Pump #3 on Backflushing #2
3:29	235	2280	53.55		Pump #3 on only
3:31	237	2280	53.6		
4:43	309	2150	54.3 G = 2		

CH2M HILL
Engineers

Page No. 3
Date: 2-24-82

Client: City of Stuart
Project No.: FC151 32.B0

Well No.: Injection

INJECTION TEST DATA

Actual Time	Time Since Pump Started (min)	Flow (gpm)	Well Head Pressure (psi)	Totalizer (gpm)	Remarks
4:44	310	2630	62.9		Pumps #1 and #3 on
4:47	313	2400	63.2		
4:49	315	2500	63.3		
4:51	317	2400	63.4		
4:53	319	2630	63.5		
4:54	320	2500	63.5		
4:59	325	2400	63.6		
5:04	330	2280	63.45		
5:09	335	-	-		Pumps #1 on, backflushing #3
5:16	342	2400	63.6		Pumps #1 and #3 on.
5:19	345	-	-		Pump #3 on, backflush #1
5:22	348	2150	56.6		"
5:23	349	2280	64.1		Pumps #1 and #3 on.
5:24	350	2500	64.2		
5:26	352	2500	64.25		
5:31	357	2500	64.25		
5:36	362	2400	64.2		
5:46	372	2400	64.3		

CH2M HILL
Engineers

Page No. 4
Date: 2-24-82

Client: CITY OF STUART
Project No.: FL15132.B0

Well No.: INJECTION

INJECTION TEST DATA

Actual Time	Time Since Pump Started (min)	Flow (gpm)	Well Head Pressure (psi)	Totalizer (gpm)	Remarks
5:55	381	2400	64.3		
5:56	382	-	-		PUMPS #1, #2, AND #3 ON.
5:57	383	2400	66.7		
5:59	385	2500	66.7		
6:03	389	2400	66.65		
6:09	395	2400	66.6		
6:34	420	2400	66.6		
6:59	445	2400	66.55		
7:19	465	2400	66.7		
7:30	476	2280	66.65		
7:34	480	-	-		ALL PUMPS OFF.
7:37	483	-	26.3		STATIC BUOYANCY HEAD.
7:40	486	-	26.8		"
7:44	490	-	27.0		"
7:46	492	-	27.1		"
7:49	495	-	27.1		"

16"/24" ANNULUS PRESSURE

CH2M HILL
Engineers

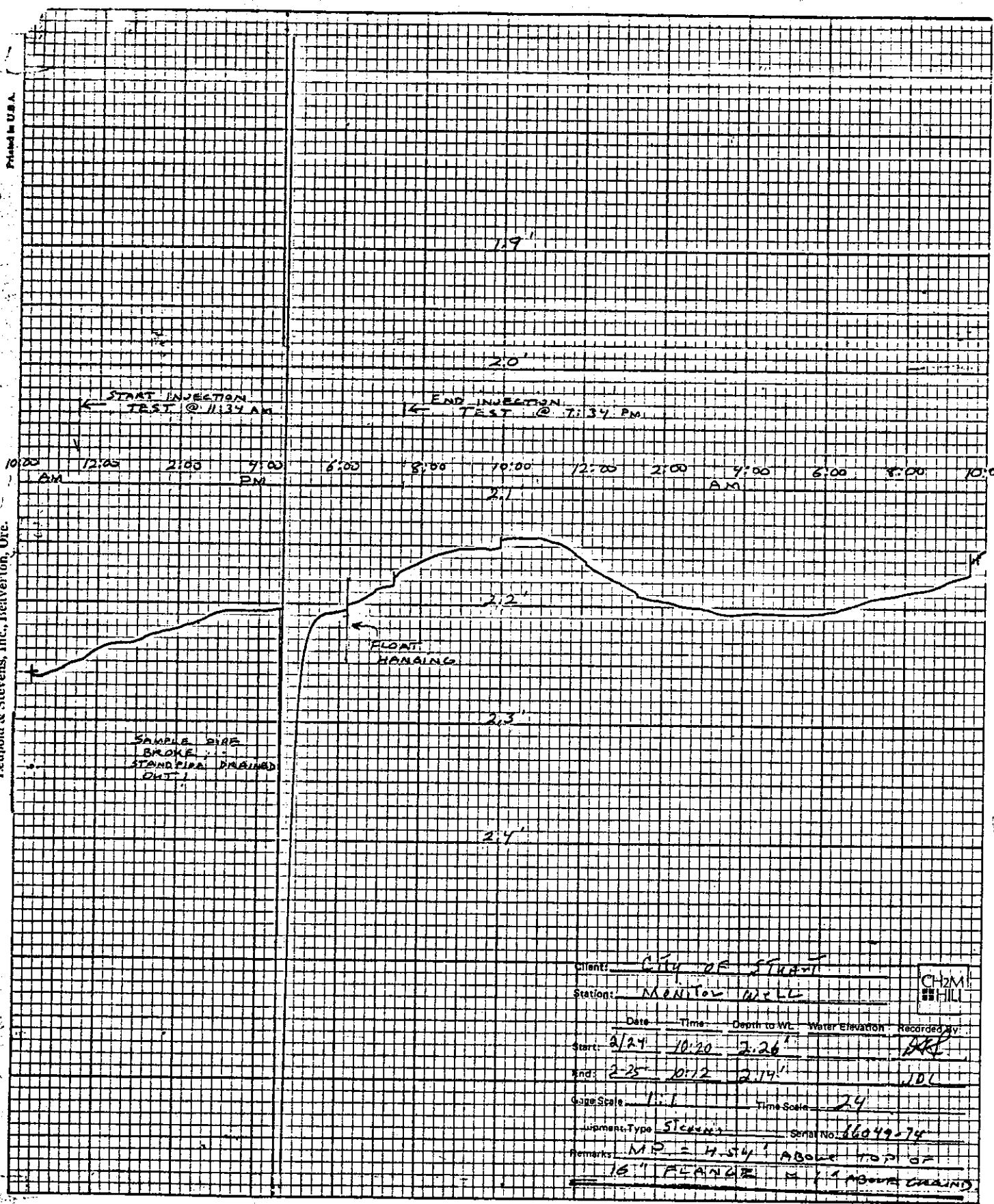
Page No. 1
Date: 2-24-82

Client: CITY OF STUART
Project No.: FC15132.B0

Well No.: INJECTION

INJECTION TEST DATA

Actual Time	Time Since Pump Started (min)	Flow (gpm)	ANNULUS Pressure * (psi)	Totalizer (gpm)	Remarks
10:36 AM	–	-	13.00		BACKGROUND
11:13	–	-	13.16		BACKGROUND RE-ZERO GAUGE
12:10 PM	36	-	13.16		INJECTON TEST
2:30	176	-	13.1		"
7:25	471	-	13.1		"
7:43	489	-	13.12		AFTER INJECTION TEST.
* GAUGE HEIGHT = 2.75' ABOVE 16-INCH CASING FLANGE					

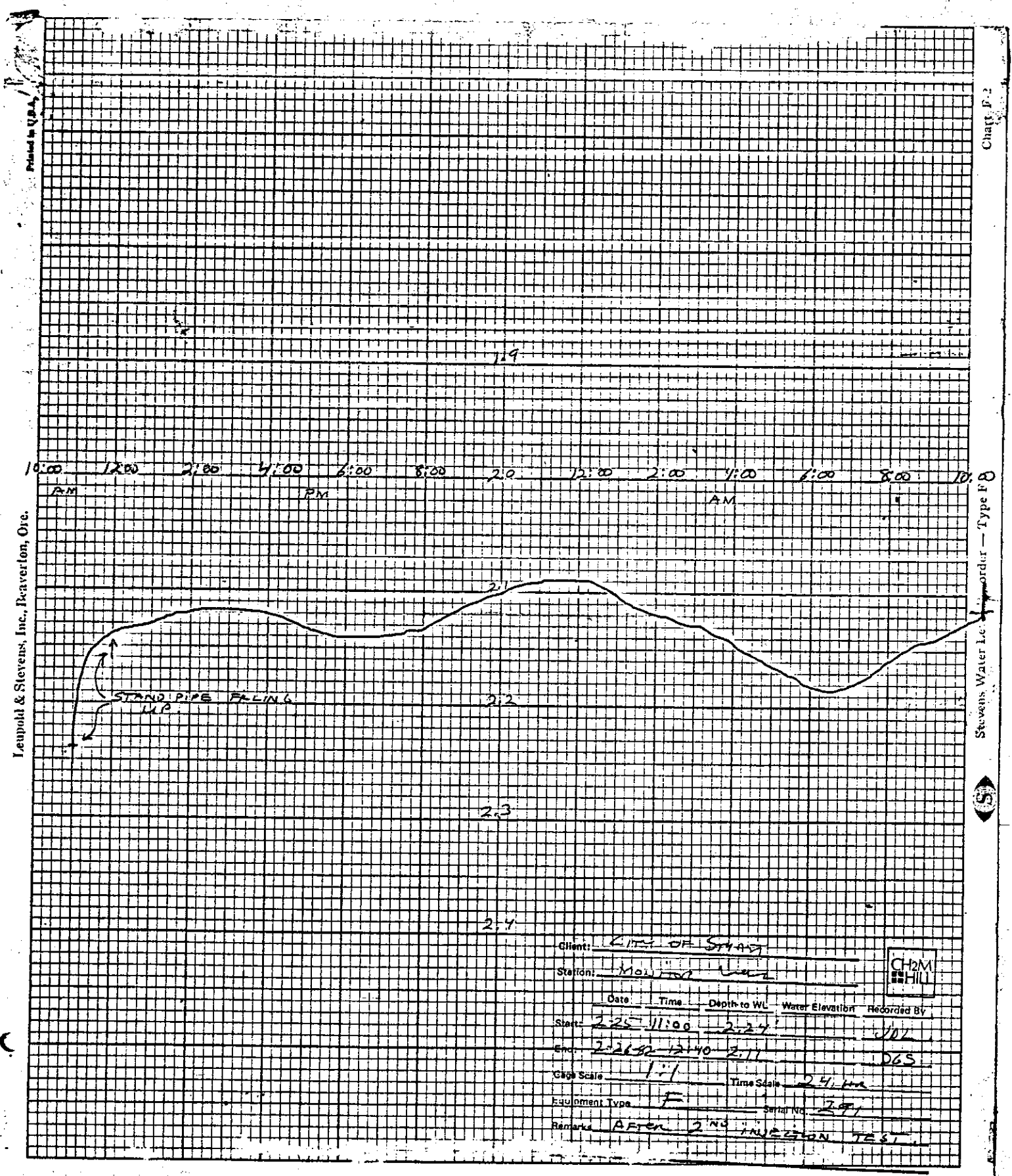


Printed in U.S.A.

Leupold & Stevens, Inc., Beaverton, Ore.

Stevens Water Level Recorder — Type F

Chart 1-2


Leupold & Stevens, Inc., Beaverton, Ore.
Printed in U.S.A.
Stevens Water Level Recorder — Type F
Chart F-2
10:00 AM
12:00
2:00
4:00 PM
6:00
8:00
2:00
12:00
2:00 AM
4:00
6:00
8:00
10:00
1.9
2.1
2.2
2.3
2.4
STAND PIPE FILLING UP.
Client: CITY OF STAYTON
Station: MOUNTAIN WELL
Date Time Depth to WL Water Elevation Recorded By
Start: 2-25 11:00 2.24 JDZ
End: 2-26-82 12:40 2.11 DGS
Gage Scale 1:1
Time Scale 24 HR
Equipment Type F
Serial No. 2491
Remarks AFTER 2ND INJECTION TEST
CH2M HILL

Appendix H
PROJECT MEETING SUMMARIES

CH2M HILL

SUMMARY OF MEETING

DATE: June 16, 1981

SUBJECT: Stuart Injection System Rehabilitation

PROJECT: FC15132.A0

LOCATION: City of Stuart Commission Room

ATTENDING:
Cathy Cash/DER-Tallahassee
Richard Knittel/DER--Tallahassee
Donnie R. McClaugherty/DER--Tallahassee
John Carter/DER--Port St. Lucie
John Guidry/DER--W. Palm Beach
Roy Duke/DER--W. Palm Beach
Abe Kreitman/SFWMD--W. Palm Beach
Leslie Wedderburn/SFWMD--W. Palm Beach
Peter Walson/Mayor--City of Stuart
Fred Meyer/USGS
Joan Jefferson/Commissioner--City of Stuart
Ed Glasscock/City of Stuart
Sandy Mitchell/City of Stuart
David Gale/City of Stuart
J. I. Garcia-Bengochea/CH2M HILL
Jeff Lehnen/CH2M HILL
Ross Sproul/CH2M HILL
Shurlo Tooker/CH2M HILL

1. The meeting opened with the introduction of all attendees. Roy Duke, DER, explained the function of the Technical Advisory Group (TAG). He also pointed out that TAG's suggestions are only suggestions and that the responsibility for the project success still rests with the City and its engineers. Directives may come in writing from DER's District Manager (Warren Strahm).

2. Pages 1 through 20 of the April 1978 Interim Report on the Injection Well Test by CH2M HILL were distributed and the history of the injection well system was reviewed. Discussion of the cause of the high injection pressure followed. It was the general opinion of the group that the well was partially plugged by cuttings that were never pumped out of the well at the time of construction.

3. A visit to the treatment plant followed and the injection and monitoring wells were viewed. The group also visited the outfall on the St. Lucie River. The effluent appeared clear and odorless.

4. The meeting reconvened with the showing of the TV survey made on the injection well on February 27, 1979.

5. Deepening and testing of the injection well was agreed on as the first step in rehabilitation. All agreed on 3,300 feet as the nominal depth to drill to. It was also agreed to run a gyroscopic survey to determine well alignment and dog-leg severity. This will determine the maximum size of liner that could be installed.

   The drill cuttings and saltwater produced during drilling will go through mud tanks provided by the contractor to the chlorine contact chamber for further settling. From there the fluid will be piped to the River via the present outfall. DER expressed concern over the turbidity of the resulting effluent and it was agreed that appropriate measures would be taken if the turbidity into the River exceeds the State requirements.

6. All agreed that the River could be discharged into for the pump out test at an estimated 4,500 gpm for 12 hours.

7. It was also agreed the River water or plant effluent could be used for the injection test. The following instrumentation for the injection test was agreed on: flow rate, well head pressure, water levels in the injection well annulus and monitor well. Water quality of the injected water including temperature, chloride, conductivity, density, and turbidity will be measured. No dye tracer will be required. City representatives informed that by utilizing extra tanks at the plant, it may be possible to store enough fresh water to run a 6 hour test at 4,200 gpm. This will be explored further.

8. Alternate 2 for injection and monitoring well modifications was presented and includes the following: installing and cementing to the ground surface in the injection well, a 10-inch liner to approximately 2,700 feet in depth, leaving the annulus outside the 16" casing open for lower Floridan monitoring, and plugging the monitoring well back to 2,100 feet to monitor the low transmissivity zone from 2,027 to 2,100 feet. After long discussions on this subject and others below it was agreed that the annulus outside the 16" casing would be left uncemented. This alternate would reduce the injection capacity of the system to approximately half and would also increase the pumping cost. It was also agreed that there was not enough annulus space for installing a 12-inch liner.

9. Alternate 3 was presented and rejected. It included setting a liner to approximately 2,700 feet in depth and cutting it off at 1,800 feet to allow for a greater hydraulic capacity. The annulus outside the 16" casing would have to be cemented, and a new lower Floridan monitoring well drilled. The existing monitor well would have to be filled back to monitor the 2,027 to 2,100 feet zone.

10. Alternate 1 was presented to the group as follows: no liner would be installed but the annulus outside the 16" casing cemented to the ground surface. The monitoring well would be plugged back to 1,500 feet and perforated to monitor the lower Floridan aquifer. Much discussion followed concerning the UIC regulations and the environmental protection philosophy of the agencies.

    Roy Duke stated that technically this design meets Federal UIC regulations, but added that there is no conservatism in the design. Dr. Garcia proposed using the well as described in Alternate 1 and if effluent was ever detected in the lower Floridan, only then install a liner. More discussion followed with no resolution.

11. It was proposed that CH2M HILL prepare the specifications in parts. Part I would be the drilling out, pump testing, and logging of the injection well. Part II, Alternate A, would be the setting and cementing of a liner and appropriate modifications to the monitor well and Part II, Alternate B, would be cementing the 16" annulus to the surface (no liner) and modifications to the monitoring well. Part I, drilling and testing would be done, and either Part IIA or Part IIB would then be executed depending on an agency decision.

    This plan would define the different costs involved for each alternative to help evaluate the most cost effective and environmentally sound modifications.

    Roy Duke, DER, stated that a provisional permit for Part I drilling and testing would be granted, but he would not comment on either Part IIA or IIB until next week when he discusses the subject with Warren Strahm.

12. Modifications to the outfall and injection pumps were briefly discussed and Cathy Cash, DER, stated that no matter what course was taken on the well system, the restrictions in the outfall had to be removed to provide emergency use capacity.

13. Possible modifications to pumping station resulting from liner installation if required were discussed. Roy Duke, DER, stated his preference for single speed pumps instead of variable speed, all agreed.

14. It was suggested that plugging the 2,000 to 2,100 feet zone with cement could be an alternative to installing a liner. This would prevent the horizontal migration of effluent into that zone. CH2M HILL will investigate this alternative further.

Prepared by CH2M HILL, June 19, 1981

83/d

SUMMARY OF MEETING

DATE: July 30, 1981

SUBJECT: Stuart Injection System Rehabilitation

PROJECT: FC15132.AO

LOCATION: CH2M HILL Office, Gainesville

ATTENDING: Abe Kreitman/SFWMD, West Palm Beach
Leslie Wedderburn/SFWMD, West Palm Beach
Sandy Mitchell/City of Stuart
Roy Duke/DER, West Palm Beach
Fred Meyer/USGS, Miami
Emmette Waite, Jr./CH2M HILL, Gainesville
Cathie Cash/DER, Tallahassee
Donnie McClaugherty/DER, Tallahassee
J. I. Garcia-Bengochea/CH2M HILL, Gainesville
Ross Sproul/CH2M HILL, Gainesville
Jeff Lehnen/CH2M HILL, Gainesville

1. The meeting opened with a review of last meeting (June 16, 1981) summary with no comments. Roy Duke's letter to Dr. Garcia dated July 6, 1981 and Warren Strahm's letter to Ed Glasscock dated July 14, 1981 were read to the attendees. No discussion.

2. The specifications for the well rehabilitation will accompany the well construction permit application to DER. The modification parts DER will allow will be indicated in the issued permit. It was agreed that the City could start advertising for bids before a construction permit is issued.

3. The Law Engineering Testing Company report dated April 10, 1975 of the permeability and porosity of the rock cores taken from the Stuart disposal well was distributed to the attendees. The values for permeability and porosity were compared to the values found in the MDWSA cores from monitoring well BZ-1. In general, the cores from Stuart were less permeable than the cores from Miami at the same approximate depths.

4. The electric log from 1,000 feet to 2,940 feet in the injection well was shown, and the top of the brackish/saltwater interface appeared to occur at about 1,930 feet. If the water at this depth were of quality less than 10,000 mg/l TDS, then there would be about 70 feet of confinement to the bottom of the 16-inch casing. The travel time of injected fluid to migrate through the 70 feet of rock was estimated to be over 7 years based on the porosity and permeability of cores from that strata.

Discussion followed concerning the philosophical question of the nature of the injected fluid after filtration and reaction through fine grained rock and over periods of years. All agreed the fluid would be essentially fresh water posing little, if any, threat to any future drinking water supply.

5. The question of injected freshwater causing a bubble of saltwater to migrate upward into freshwater was addressed. Water quality records from the monitoring wells at St. Petersburg Northeast and Southwest wastewater treatment plants were presented showing vertical migration of tertiary treated effluent. At both plants, the chloride values rose slightly, then fell abruptly where freshwater effluent was migrating upward into monitored zones. Fred Meyer presented water level records from the Sunset Park injection well annulus in Miami. He feels that this data shows that saltwater is moving upward.

6. The injection test on the Stuart injection well in 1978 was dicussed. The annulus water level records were presented by Fred Meyer. He believes that they show a leak from the injection zone into the open annulus at 1,300 feet. Some discussion of the effects of temperature on the annulus water level followed. All agreed that the data left the results inconclusive.

7. Sandy Mitchell asked that if a liner is installed in the injection well and effluent is detected in the 2,060-foot zone after injection begins, would DER require additional injection wells to be cased below 2,060 feet. Roy Duke's response was that if this occurred, a deeper casing setting would not be required provided the integrity of the existing wells was not in question.

8. DER acknowledged that the specifications for the rehabilitation of the injection and monitoring wells are all that is needed by the August 4, 1981 deadline set by the Consent Agreement. Modifications to the surface appurtanences may be delayed so long as progress is being made. All representatives of the agencies agreed that Part 2 Alternate B of these specifications (setting a liner) is the only alternate that will be permitted.

9. The Contract Documents for the rehabilitation of the deep injection and monitoring wells at the Stuart Wastewater Treatment Plant were reviewed by all attendees. No substantive changes were made. It was agreed that the following geophysical logs will be run after deepening the hole in the injection well; electric, gamma ray, caliper, and temperature. A flowmeter log during injection at low rate was also agreed on. No logging in the monitoring well will be required.

10. Field staffing during construction was discussed. DER recommended adequate staffing to ensure proper engineering, but they are not requiring anything specific. CH2M HILL plans to have at least one person on call at all times.

11. Progress meeting will be as follows:

    - o Preconstruction meeting with the selected contractor.
    - o Casing setting meeting after Part 1 is completed.
    - o Other meetings as needed.

12. The operational monitoring program was discussed. It was agreed that CH2M HILL will make a proposed schedule with frequency and parameters to be monitored. The City will provide well pad elevations for reference points.

Summary prepared by Jeff Lehnen and reviewed by J. I. Garcia-Bengochia of CH2M HILL, August 4, 1981.

pab/bjb4q

CH2M HILL

SUMMARY OF MEETING

DATE: October 6, 1981

SUBJECT: Pre-Construction Meeting

PROJECT: Injection Well Rehabilitation,
City of Stuart, Project No. FC15132.B0

LOCATION: Stuart City Hall

ATTENDING: Sandy Mitchell-City of Stuart
Hal Chittum, Jr.-Layne-Atlantic Co.
Ben Baummier-City of Stuart
Dave Gale-City of Stuart
John Coleman-Eastern Whipstock Inc.
Nick Blount-FPL
J. Ignacio Garcia-Bengochea-CH2M HILL
Ross Sproul-CH2M HILL
Dave Snyder-CH2M HILL
Jeffrey D. Lehnen-CH2M HILL

1) The meeting opened with discussion of the overhead service adjacent to the injection well site. Layne representative Mr. Chittum stated that the line may not have to be removed, but that it be dead when they move the drilling rig onto the well. Layne will contact FPL as soon as their needs are determined. FPL representative Nick Blount stated that they expect to be able to make the necessary modifications by the expected rig mobilization date of October 21, 1981. The Contractor also stated that he plans to hire a local fencing company to perform the fence work.

2) The Contractor's work schedule was presented. He requested that the Notice to Proceed be issued on October 21, 1981 to allow him time to complete another project. The City agreed with this request but stated that the Certificate of Insurance must be in conformance with the Contract Documents before the Notice will be issued. A new certificate is to be sent by Layne's Insurance Company directly to the City.

3) Eastman Whipstock representative John Coleman explained the equipment and methodology they plan to use for the gyroscopic survey. The survey will be run in the 16-inch casing and open hole to a depth of 2,750 feet. CH2M HILL will provide the wire line service.

4) The pump-out and injection tests were briefly discussed. Centrifigual pumps will be used as transfer pumps between the existing tanks during the tests. The Contractor plans to use the City's injection pumps for the injection tests. Arrangements for an electrician will be made later.

5) The liner will be installed using 40-foot joints of welded pipe with three band centralizers instead of four as stated in the specifications. Centralizers will be installed in line with each other to allow tremie pipe to pass freely. Lifting lugs will be of sufficient number to handle the casing string weight safely. The Contractor plans to use recognized casing alignment techniques but stated that he would investigate the use of a casing alignment jig for the 10-inch casing. He also plans to use J-55 intergral joint tremie pipe.

6) The monitor well plugging program was discussed. The Contractor plans to start work on the monitor well once the 10-inch liner is installed. He will use a cable tool rig to do the work.

7) Pay estimates will be submitted by Layne on the 25th of each month. After approval by CH2M HILL, they will be sent to the City of Stuart. Sandy Mitchell stated that the pay estimates must be submitted by 10:00 a.m. on the Monday prior to a scheduled City Commission Meeting to be included on the agenda. Meetings are held on the second and fourth Mondays of each month.

ae276/cc

SUMMARY OF MEETING

CH2M HILL

DATE: October 7, 1981

SUBJECT: Pre-Construction Meeting

PROJECT: Injection Well Rehabilitation
City of Stuart, Project No. FC15132.B0

LOCATION: DER Offices, West Palm Beach

ATTENDING: Sandy Mitchell-City of Stuart
Hal Chittum, Jr.-Layne Atlantic Company
Roy Duke-DER West Palm Beach
Ben Baummier-City of Stuart
Fred Meyer-USGS-Miami
Leslie Wedderburn-SFWMD-West Palm Beach
Abe Kreitman-SFWMD-West Palm Beach
John D. Coleman-Eastman-Whipstock, Inc.
Charles W. Pemble-DER-Port St. Lucie
John A. Guidry-DER-West Palm Beach
Donnie McClaugherty-DER-Tallahassee
J.I. Garcia-Bengochea-CH2M HILL-Gainesville
Ross Sproul-CH2M HILL-Gainesville
David G. Synder-CH2M HILL-Gainesville
Jeff Lehnen-CH2 HILL-Gainesville

1) Roy Duke opened the meeting by introducing the Technical Advisory Committee (TAC) members to the attendees. He then explained the function of the TAC as that of a non-directive advisory group formed to interface between Owner and Contractor and the regulatory bodies. The following persons will receive copies of all pertinent reports, logs, analyses, etc.: Roy Duke-DER; Fred Meyer-USGS; Abe Kreitman-SFWMD; Charles Pemble-DER; Donnie McClaugherty-DER. CH2M HILL will send copies of the daily reports from the construction site to the above individuals on each Friday.

2) The Contractor's work schedule was presented. Tentatively the Notice to Proceed will be issued on October 21, 1981. The gyroscopic directional survey will be run on October 15, 1981, if scheduling allows. The TAC will be notified as to the firm date of running the gyroscopic survey.

3) John Coleman of Eastman-Whipstock presented the planned gyroscopic directional Ssurvey methodology. The survey will be run in the 16-inch casing and open hole to 2,750 feet.

4) Installation of the 10-inch liner was discussed. The Contractor's use of three centralizers instead of four was agreed on. Use of gravel to build a bridge around the bottom of the casing was approved if efforts to cement in the cement baskets fail.

5) The City representative was informed that an Operation and Maintenance Manual will have to be prepared during the operational testing of the system.

6) The next TAC meeting will be held after the injection well has been deepened and tested. Only if problems of setting the 10-inch liner are indicated from the gyroscopic survey will an earlier meeting be arranged.

ae88/aa

SUMMARY OF MEETING

CH2M HILL

DATE: December 11, 1981

SUBJECT: 10-inch Casing Setting

PROJECT: Injection Well Rehabilitation
City of Stuart, Project No. FC15132.B0

LOCATION: CH2M HILL Office, Gainesville

ATTENDING: Sandy Mitchell--City of Stuart
Donnie McClaugherty--DER--Tallahassee
Bill Neeley--Layne Atlantic--Orlando
Hal Chittum--Layne Atlantic--Orlando
Ralph Palmer--Layne Atlantic--Orlando
J.I. Garcia-Bengochea--CH2M HILL--Gainesville
Ross Sproul--CH2M HILL--Gainesville
Emmette Waite, Jr.--CH2M HILL--Gainesville
Jeff Lehnen--CH2M HILL--Gainesville

1. The TV tape of the survey run on December 9, 1981 in the injection well was shown. The casing setting depths were reviewed at 2,630, 2,680, 2,750, and 2,890 feet. The hole diameter at these depths has been enlarged apparently by the drill rod while deepening the hole. The hole diameter is greater than 21-inches at these depths, and is much larger throughout the the rest of the borehole. The cement baskets will not contact the borehole wall if the hole diameter is over 18 inches.

2. The Contractor proposed to fill the hole with "chat" gravel, an angular 3/8-inch limestone gravel. The hole would be filled with gravel up to 2,700 feet with a sand cap and several feet of cement on top. This would allow the 10-inch casing to be installed without cement baskets. The first stage of cement would be pumped inside the casing, the cementing shoe plug installed, and the cement forced down and outside of the casing. When the plug reached the cementing shoe, the casing would pressurize and the cement would be allowed to set.

3. Sandy Mitchell suggested cutting the 10-inch casing off at about 1,800 feet after cementing up to that depth to increase hydraulic capacity and to save pumping costs. The 16-inch casing would have to be cemented outside from approximately 1,300 feet to

the surface. This is similar to Alternate 3 proposed at the first TAC meeting June 16, 1981. The significant difference is that the hole would be filled with gravel below the casing during installation and cementing. This alternative would possibly involve the drilling of an upper Floridan aquifer monitoring well.

4. A letter outlining the proposed changes and any cost adjustments necessary was requested from the Contractor. CH2M HILL will contact the members of TAC to present the proposed changes in cementing and investigate the feasabiblity of cutting the 10-inch casing and altering the modification plan.

aecasoo/h

CH2M HILL

SUMMARY OF MEETING

DATE: January 11, 1982, 10:00 a.m.

SUBJECT: Progress Meeting No. 2--City of Stuart
Injection Well Rehabilitation
Project No. FC15132.B0

LOCATION: DER Offices, West Palm Beach

ATTENDING: Sandy Mitchell--City of Stuart
John Guidry--DER-West Palm Beach
Roy Duke--DER-West Palm Beach
Tom Waldeck--GDU-Miami
Fred Meyer--USGS-Miami
John Carter--DER-Port St. Lucie
Abe Kreitman--SFWMD-West Palm Beach
Leslie Wedderburn--SFWMD-West Palm Beach
J.I. Garcia-Bengochea--CH2M HILL-Gainesville
Dick Bedard--CH2M HILL-Boca Raton
Dave Snyder--CH2M HILL-Gainesville
Jeff Lehnen--CH2M HILL-Gainesville

PREPARED BY: Jeff Lehnen JL

1. Progress to date of the project was presented. Data from the pump-out test run on December 8, 1981 was distributed. The test was run at 4,200 gpm for 8 hours with a maximum drawdown of 23 feet. The annulus pressure outside of the 16-inch casing of the injection well dropped 0.33 feet during the test. This drop could be accounted for by the cooling of the annulus water by the pumped water in the 16-inch casing. In the monitor well 460 feet away the background tidal effect was ±0.25 feet and the approximate drawdown during the pump-out test was ±0.29 feet.

2. After the completion of the pump-out test, a TV survey of the open hole of the injection well was performed. It showed very smooth borehole walls from the bottom of the 16-inch casing at 2,000 feet to approximately 2,980 feet. From 2,980 feet to TD of 3,300 feet, numerous fractures and solution cavities are present. The TV survey tape was shown to the meeting.

3. Data from the injection test on the injection well were also distributed. The test was run on December 18, 1981 for 5.3 hours at rates from 2,980 gpm to 6,200 gpm. Wellhead pressure at 6,200 gpm was approximately 47 psi and static pressure at the end of the test was approximately 27 psi. The water level in the monitor well rose ±0.3 feet during the injection test.

4. The current plan for graveling up to 2,700 feet and installing the 10-inch casing was summarized. The first gravel was installed in burlap bags to facilitiate bridging the hole at 2,990 feet. Gravel will then be placed up to 2,700 feet with a sand cap and cement plug. The 10-inch casing will then be installed and cemented without the use of cement baskets as previously planned.

5. It was then proposed by CH2M HILL that the 10-inch liner be cut off at 1,800 feet after being cemented up to that depth. This would lower the hydraulic head in the well and thereby reduce electrical costs of running the injection pumps. The annulus outside the 16-inch casing would be cemented to ground surface thereby eliminating the Floridan aquifer monitoring capability. Roy Duke indicated that a new monitoring well would have to be installed before the system could be operated.

   It is estimated that the energy savings would be approximately $6,000/MGD per year or about $10,000/year initially. This savings would grow with time as the plant flow increased and energy costs rose.

   This proposed change is similar to the Alternate 3 proposed during the design phase of the project. Before the casing would be cut, all cementing of the 10-inch liner would be completed, and a cement bond log (CBL) run. If any problems were indicated by the CBL, the liner would not be cut. Leslie Wedderburn requested that CH2M HILL address the possibility of the 16-inch casing being scoured at the entrance to the 10-inch liner.

   After discussion, the TAC stated that they would not approve of cutting the 10-inch liner off at 1,800 feet. TAC did however, approve of cutting the casing off at a depth 100 feet above the bottom of the 24-inch casing at about 900 feet. The TAC agreed that if this were done, the annulus outside of the 16-inch casing could be left open for monitoring purposes.

   The savings in energy costs will be significantly less if the 10-inch liner is cut at 900 feet instead of 1,800 feet. CH2M HILL and the City of Stuart will evaluate the approved plan of cutting off the 10-inch liner at 900 feet instead of extending the 10-inch liner to the surface.

ae27/m

SUMMARY OF MEETING

CH2M HILL

DATE: March 17, 1982

SUBJECT: Stuart Injection System Rehabilitation

PROJECT: FC15132.B0

LOCATION: SFWMD Offices, West Palm Beach

ATTENDING: Sandy Mitchell--City of Stuart
John Guidry--DER--West Palm Beach
Fred Meyer--USGS--Miami
Donnie McClaugherty--DER--Tallahassee
Leslie Bell--FDER--Tallahassee
Richard J. Deuerling, Jr.--FDER--Tallahassee
Thomas V. Waldeck--GDU--Miami
Dick Bedard--CH2M HILL--Boca Raton
Abe Kreitman--SFWMD--West Palm Beach
Jose R. Peralta--GDU--Miami
John Carter--DER--Port St. Lucie
Gary Freeman--GDU--Port St. Lucie
Curtis Morris--GDU--Port St. Lucie
Leslie A. Wedderburn--SFWMD--West Palm Beach
J.I. Garcia-Bengochea--CH2M HILL--Gainesville
Jeff Lehnen--CH2M HILL--Gainesville

1. Project construction has been satisfactorily completed. The Contractor has removed his equipment from the site and has restored the worked areas to their original condition. The outline for the final report for the project was distributed with no comments. (copy attached)

   A table summarizing the results of the two injection tests was also distributed. The first test run on the 16-inch casing resulted in a well head pressure of 47.5 psi at an injection rate of 6,000 gpm. The second test run on the new 10-inch liner resulted in a well-head pressure of 64.0 psi at an injection rate of 2,500 gpm. This is a reduction in flow of 58 percent at an increased pressure of 35 percent. This change is caused by the friction of the flow in the 10-inch liner.

   In both tests, the annulus between the 16 inch and 24 inch casings of the injection well showed a very slight drop in pressure (.02 to .04 psi) at the end of the tests.

2. The proposed monitoring requirements were distributed and discussed. (attached) Background samples will be collected from the monitoring well once a week for 6 weeks and from the annulus of the injection well 3 times in one week, allowing the annulus to flow between samples. The following parameters will be analysed in each sample:

total organic carbon
nitrogen: ammonia
nitrate and nitrite
total kjeldahl

total soluble phosphorous
specific conductance
chloride
sulfate
temperature

During operation the following parameters will be monitored as follows:

Annulus pressure; continuously, with a 7-day chart recorder and 0-50 foot scale. An 8-inch pressure gauge will be provided with 0-50 foot scale.

Injection pressure; continuously, with a 7-day chart recorder and 0-100 psi scale. An 8-inch pressure gauge will be provided with 0-100 psi scale.

Injection flow rate; continuously, with a 7-day chart Differential Recorder connected to the present venturi flow tube. Total weekly flow will be calculated from the flow rate chart and compared to the influent totalizer.

Water quality and pressure of monitoring well; weekly, by reading the water level in a piezometer at the well head and sampling for specific conductance, temperature and chloride.

Injected fluid water quality; daily, by sampling effluent for specific conductance, chloride, turbidity, and temperature.

3. The final report is planned to be complete by mid-April. The above referenced background water quality testing will be submitted with the operating permit application and will not be included in the final report.

   Copies of the cement bond logs and temperature survey run on the first cement stage in the 10-inch liner were distributed to: Abe Kreitman, Fred Meyer, John Guidry, John Carter, and Donnie McClaugherty.

88/m

CITY OF STUART, FLORIDA--1982

OUTLINE

1. Scope
2. Background
3. Rehabilitation Plan
4. Rehabilitation Work
5. Pump Out Test
6. Injection Test
7. Proposed Monitoring System
8. Conclusions
9. Recommendations

APPENDICES

A-1 Gyroscopic Survey

A-2 Geophysical Logging

A-3 Lithologic Log

A-4 Casing Pressure Test

A-5 TV Survey Summary

A-6 Pump Out Test Data

A-7 Injection Test Data

A-8 Monitoring Data

A-9 Summary of Meetings

A-10 Construction Weekly Summaries

SUMMARY OF INJECTION TESTS
STUART INJECTION WELL SYSTEM REHABILITATION

Test No.	Date	Casing Size (in)	Test Duration (hrs)	Flow Rates (gpm)	Wellhead Pressure (psi)	Static Pressure (psi)	16"/24" Annulus Pressure - Psi Before	16"/24" Annulus Pressure - Psi After
1	12-18-81	16"	5.7	3,500 5,880 6,000	34.5 46.5 47.5[a]	26.9	12.82	12.80
2	2-24-82	10"	8.0	2,400 2,500 2,500	54.4[b] 64.0 66.6[a]	27.1	13.16	13.12

Note: [a] 3 pumps on.
[b] 2 pumps on.

41/a

MONITORING REQUIREMENTS

		Frequency
1.	Injection Flow Rate	Continuous
2.	Injection Pressure	Continuous
3.	Pressure, 1,000-foot zone at injection well annulus	Continuous
4.	Pressure, 2,000-foot zone at monitoring well	Weekly
5.	Specific Conductance, 2,000-foot zone at monitoring well	Weekly
6.	Chloride Concentration	Weekly
7.	Specific Conductance, injected fluid	Daily
8.	Chloride Concentration, injected fluid	Daily
9.	Turbidity, injected fluid	Daily
10.	Temperature, injected fluid	Daily

EQUIPMENT AND PROCEDURES--(Numbers below correspond to above requirements.)

1. Recorder, weekly charts

2. Recorder, weekly charts

3. Recorder, weekly charts

4. Piezometer, direct reading (see below)

5&6. Collect samples from well. Run in laboratory (see below). Procedure to operate monitoring well is as follows:

A. Well will be provided with one bleed pipe (1-inch-diameter) to river which will normally be open.

B. Every Monday at 9 a.m. a sample of water will be collected and temperature immediately read. Sample will be taken to laboratory for determining 5 and 6 above.

C. Close bleed valve to river and open valve connecting to piezometer on monitoring well. Measure head on piezometer every 10 minutes until three consecutive readings are identical. Record value of the three identical consecutive readings.

D. Close valve connecting to piezometer and open bleed valve to river.

E. Leave bleed valve open until following Monday when Steps B through E are repeated.

7-10. Collect sample from tap on injection line, read field temperature, and take it to laboratory for analysis.

In order to obtain background information on items under 3, 4, and 5, comply with the following procedure.

Install pressure gauge at injection well annulus. Install valves, bleed pipe, and piezometer on monitoring well. For 5 days per week, for 2 consecutive weeks, record at 9:00 a.m. the annulus pressure at the injection well. Collect water sample from monitoring well bleed pipe and determine specific conductance and chloride concentration. Record result.

After the first 2 consecutive weeks, record every Monday at 9:00 a.m. the annulus pressure at the injection well. Collect water sample from monitoring well bleed pipe to determine specific conductance and chloride concentration following Items 5 and 6 above.

Appendix I
WEEKLY CONSTRUCTION SUMMARIES AND DAILY REPORTS

SUMMARY OF ACTIVITIES

CH2M HILL

TO: Sandy Mitchell/City of Stuart
Hal Chittum, Jr./Layne Atlantic
Roy Duke/DER, West Palm Beach
Fred Meyer/USGS, Miami
Abe Kreitman/SFWMD, West Palm Beach
Charles W. Pemble/DER, Port St. Lucie
Donnie McClaugherty/DER, Tallahassee
Cathy Cash/DER, Tallahassee
J. I. Garcia-Bengochea/CH2M HILL, Gainesville
Ross Sproul/CH2M HILL, Gainesville
David Snyder/CH2M HILL, Gainesville

FROM: Jeff Lehnen/CH2M HILL, Gainesville

DATE: October 23, 1981

SUBJECT: City of Stuart Injection Well Rehabilitation

PROJECT: FC15132.B0

During the week of October 12, the security fence near the injection well was relocated. The injection well-head was also removed.

On October 19, 1981 Eastman Whipstock ran the gyroscopic directional survey on the injection well to 2,750 feet in depth. No difficulties were encountered running the survey. Results of the directional survey indicate that the hole is free of significant dog legs and builds a slight angle of less than 1 degree in a southeast direction. The borehole is approximately 8.8 feet southeast of true plumb at a depth of 2,750 feet. The results of the survey indicate that the condition of the well should allow the installation of the 10-inch liner. A copy of the Eastman Whipstock survey report is enclosed.

The remainder of the week was spent moving in the drilling rig and equipment. It is anticipated that drilling will begin near the end of the week of October 26, 1981.

casoo/a
Enclosure

SUMMARY OF ACTIVITIES

TO: Sandy Mitchell/City of Stuart
Hal Chittum, Jr./Layne Atlantic
Roy Duke/DER, West Palm Beach
Fred Meyer/USGS, Miami
Abe Kreitman/SFWMD, West Palm Beach
Charles W. Pemble/DER, Port St. Lucie
Donnie McClaugherty/DER, Tallahassee
Cathy Cash/DER, Tallahassee
J. E. Garcia-Bengochea/CH2M HILL, Gainesville
Ross Sproul/CH2M HILL, Gainesville
David Snyder/CH2M HILL, Gainesville

FROM: Jeff Lehnen/CH2M HILL, Gainesville

DATE: November 6, 1981

SUBJECT: City of Stuart Injection Well Rehabilitation

PROJECT: FC15132.BO

During the week of November 2, 1981, the contractor started drilling in the injection well. Fill material was encountered from 2,996 feet to 3,032 feet below top of casing. It was composed of dolomite cuttings and lime sand.

As of Friday morning, November 6, 1981, drilling was progressing slowly at 3,045 feet in light brown dolomite. Daily reports through Thursday are enclosed.

smm

Enclosure

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 11-2-81
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION

Morning Shift 7:00 a.m. to 7:00 p.m.

Weather:
Fair ☒ Cloudy ☐ Rain ☐

Activity
Drilling ..... ☐
Reaming ..... ☐
Running Casing ..... ☐
Cementing ..... ☐
Testing ..... ☐
Waiting ..... ☐
RIGGING ☑
_____ ☐

Depth
Start — ft.
End — ft.
Bit Size — in.
Recorded By: JDL

Description of Operations: RIGGING FOR RAT HOLE
PIPE ON SITE. MUD PUMP & COMPRESSOR ON SITE.
WILLARD - "CURLY" - DAY DRILLER.

Evening Shift 7:00 p.m. to 7:00 a.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ..... ☑
Reaming ..... ☐
Running Casing ..... ☐
Cementing ..... ☐
Testing ..... ☐
Waiting ..... ☐
RAT HOLE ☑
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: JDL

Description of Operations: DRILLED RAT HOLE.
RIGGED SWIVEL, KELLY, ELEVATORS.

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 11-3-81
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION

Morning Shift 7:00 a.m. to 7:00 p.m.

Weather:
Fair ☐ Cloudy ☑ Rain ☑

Activity
Drilling ..... ☐
Reaming ..... ☐
Running Casing ..... ☐
Cementing ..... ☐
Testing ..... ☐
Waiting ..... ☐
TRIPPING ☑
_____ ☐

Depth
Start 0 ft.
End 60 ft.
Bit Size 15 in.
Recorded By: JDL

Description of Operations: TRIPPING IN THE HOLE. AT 5:00 PM. RUNNING 5 1/2" PIPE FIRST THEN 4 1/2" PIPE.

TOOL STRING: 15" BIT - TOOTHED
2: 8" COLLARS
74: JOINTS 5 1/2" PIPE
42: JOINTS 4 1/2" PIPE

Evening Shift 7:00 p.m. to 7:00 a.m.

Weather:
Fair ☑ Cloudy ☑ Rain ☐

Activity
Drilling ..... ☐
Reaming ..... ☐
Running Casing ..... ☐
Cementing ..... ☐
Testing ..... ☐
Waiting ..... ☐
TRIPPING ☑
_____ ☐

Depth
Start 60 ft.
End 1575 ft.
Bit Size 15 in.
Recorded By: JDL

Description of Operations: TRIPPING IN HOLE #50 IN DERRICK AT SHIFT CHANGE.

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 11-4-81
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION

Morning Shift 7:00 a.m. to 2:00 p.m.

Weather:
Fair ☐ Cloudy ☑ Rain ☑

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
TRIPPING ☑
☐

Depth
Start 1575 ft.
End 2969 ft.
Bit Size 15 in.
Recorded By: JDL

Description of Operations: TRIPPING INTO HOLE 2968' @ 1:00 PM. RIGGING KELLY AIR LINE SWIVEL. HOSES.

Evening Shift 2:00 p.m. to 7:00 a.m.

Weather:
Fair ☐ Cloudy ☑ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
CIRCULATING ☑
☐

Depth
Start 2969 ft.
End 2996 ft.
Bit Size 15 in.
Recorded By: JDL

Description of Operations: BOTTOM OF HOLE @ 2996' SOFT FILL MATERIAL. BIT PLUGGED OFF. ADDED MORE AIR-LINE - TO 300 FEET. CIRCULATED ON BOTTOM AIR ALIGHT. FINE MATERIAL TO CIRCULATE OUT WAS FINE DOLOMITE CUTTINGS - TAN-BROWN, FOLLOWED BY A LIME SAND - FINE - TAN. AT 7:00 AM SMALL DOLOMITE PEBBLES, TAN - BROWN - BLACK.

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 11-5-81
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION II

Morning Shift 7:00 a.m. to 7:00 p.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☑

Activity
Drilling ☑
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start 2996 ft.
End 3032 ft.
Bit Size 15 in.
Recorded By: JDL

Description of Operations: CIRCULATING ON BOTTOM. DOLOMITE: 4 MM TO 30 MM PEBBLES BROWN, TAN, GRAY-BLACK, SOME CRYSTALINE CALCITE FRAGMENTS. DREDGING ALL DAY. NO NEW HOLE DRILLED.

Evening Shift 7:00 p.m. to 7:00 a.m.

Weather:
Fair ☐ Cloudy ☑ Rain ☐

Activity
Drilling ☑
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start 3032 ft.
End 3044 ft.
Bit Size 15 in.
Recorded By: JDL

Description of Operations: HIT HARD FORMATION @ 3032' HARD DRILLING ALL NIGHT IN LIGHT BROWN DOLOMITE, SOME GRAY, HARD CRYSTALINE.

CH2M HILL
engineers
planners
economists
scientists

SUMMARY OF ACTIVITIES

TO: Sandy Mitchell/City of Stuart
Hal Chittum, Jr./Layne Atlantic
Roy Duke/DER, West Palm Beach
John Guidry/DER, West Palm Beach
Fred Meyer/USGS, Miami
Abe Kreitman/SFWMD, West Palm Beach
Charles W. Pemble/DER, Port St. Lucie
Donnie McClaugherty/DER, Tallahassee
Cathy Cash/DER, Tallahassee
J. I. Garcia-Bengochea/CH2M Hill, Gainesville
Ross Sproul/CH2M Hill, Gainesville
David Snyder/CH2M Hill, Gainesville

FROM: Jeff Lehnen/CH2M Hill, Gainesville

DATE: November 13, 1981

SUBJECT: City of Stuart Injection Well Rehabilitation

PROJECT: FC15132.BO

During the week of November 9, 1981, the drilling in the injection well progressed to a depth of 3,147 feet. Cavities were reported at 3,049 to 3,052 feet, 3,059 to 3,061 feet, and 3070 feet. The formation is highly fractured causing dredging of large volumes of cuttings.

Daily reports from November 6 through November 12 are enclosed.

smm

enclosures

Gainesville Office
7201 N.W. 11th Place, P.O. Box 1647, Gainesville, Florida 32602 904/377-2442

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 11-12-81
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION

Morning Shift 7:00 a.m. to 7:00 p.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☑
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start 3094 ft.
End 3112 ft.
Bit Size 15 in.
Recorded By: JDL

Description of Operations: KELLY DOWN AT SHIFT CHANGE MAKING CONNECTION, DRILLING TO 3106 FEET. LOST CIRCULATION. CHECKING AIR LINE & BIT. HOLE IN AIRLINE. REPAIRED RESUME DRILLING.

Evening Shift 7:00 p.m. to 7:00 a.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☑
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start 3112 ft.
End 3147 ft.
Bit Size 15 in.
Recorded By: JDL

Description of Operations: STEADY DRILLING IN TAN DOLOMITE. SOME STREAKS OF SOFT WHITE LIMESTONE. DREDGING A LARGE VOLUME OF CUTTINGS.

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 11-11-81
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION

Morning Shift 7:00 a.m. to 7:00 p.m.

Weather:
Fair ☐ Cloudy ☑ Rain ☐

Activity
Drilling ☑
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
PUMP TANKS ☑
☐

Depth
Start 3062 ft.
End 3067 ft.
Bit Size 15 in.
Recorded By: JNL

Description of Operations: CLEANING OUT MUD TANKS PT. "RAY COOKE'S 357-0657" LOADING RIG, POURED AND PLACED "DEAD MAN" AT FRONT OF RIG WITH CABLES TIED TO "DEAD MAN".

Evening Shift 7:00 p.m. to 2:00 a.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☑
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
☐
☐

Depth
Start 3067 ft.
End 3094 ft.
Bit Size 15 in.
Recorded By: JNL

Description of Operations: DRILLING ALL NIGHT. CAME ON 3070 FEET. HARD DRILLING WITH ROCKS FALLING ON TOP OF THE BIT. FORMATION IS FRACTURED AND CAVERNOUS.

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 11-10-81
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION

Morning Shift 7:00 a.m. to 2:00 p.m.

Weather:
Fair ☑ Cloudy ☑ Rain ☑

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
TRIPPING ☑
☐

Depth
Start 3052 ft.
End 3052 ft.
Bit Size 15 in.
Recorded By: JDL

Description of Operations: TRIPPED BACK INTO THE HOLE. REBUILD KELLY SWIVEL. PARTIALLY BLOCKED HOLE IN BIT TO KEEP LARGE ROCKS FROM GOING THROUGH AND DAMAGING THE AIR-LINE

Evening Shift 2:00 p.m. to 7:00 a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☑

Activity
Drilling ☑
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
☐
☐

Depth
Start 3052 ft.
End 3052 ft.
Bit Size 15 in.
Recorded By: JDL

Description of Operations: DRILLING AND DRAINING. HIT CAVITY @ 3059 TO 3061 FEET.

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 11-9-81
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: J-11 (TRAIN)

Morning Shift 7:00 a.m. to 2:00 p.m.

Weather:
Fair ☑ Cloudy ☑ Rain ☐

Activity
Drilling ☑
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☑
☐
☐

Depth
Start 3052 ft.
End 3052 ft.
Bit Size 15" in.
Recorded By: JDL

Description of Operations: DRILLING CREW DID NOT SHOW. SET GUY WIRES TO FINISH ROAD.

Evening Shift 2:00 p.m. to 7:00 a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☑

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
TRIPPING ☐
☐

Depth
Start 3052 ft.
End 3052 ft.
Bit Size 15 in.
Recorded By: JDL

Description of Operations: DRILLING CREW SHORT TRIPPED OUT OF HOLE TO RETRIEVE LOST AIR-LINE

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 11-6-81
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: [illegible]

Morning Shift 7:00 a.m. to 2:00 p.m.

Weather:
Fair ☐ Cloudy ☑ Rain ☐

Activity
Drilling ☑
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start 3044 ft.
End 3047 ft.
Bit Size 15 in.
Recorded By: JDL

Description of Operations: DRILLING, WORKING ON SWIVEL, WILL REBUILD ON MONDAY. [illegible] INSTALLED AND WORKING

Evening Shift 2:00 p.m. to 7:00 a.m.

Weather:
Fair ☐ Cloudy ☑ Rain ☐

Activity
Drilling ☑
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start 3047 ft.
End 3052 ft.
Bit Size 15 in.
Recorded By: JDL

Description of Operations: DRILLING AND CHANGING AIR LINE BROKE, COULD NOT CIRCULATE SHUT DOWN

CAVITY: 3049' TO 3052'

CH2M HILL
engineers
planners
economists
scientists

SUMMARY OF ACTIVITIES

TO: Sandy Mitchell/City of Stuart
Hal Chittum, Jr./Layne Atlantic
Roy Duke/DER, West Palm Beach
John Guidry/DER, West Palm Beach
Fred Meyer/USGS, Miami
Abe Kreitman/SFWMD, West Palm Beach
Charles W. Pemble, DER, Port St. Lucie
Donnie McClaugherty/DER, Tallahassee
Cathy Cash/DER, Tallahassee
J. I. Garcia-Bengochea/CH2M Hill, Gainesville
Ross Sproul/CH2M Hill, Gainesville
[redacted] CH2M Hill, Gainesville

FROM: David G. Snyder/CH2M Hill on Location, Stuart

DATE: November 19, 1981

SUBJECT: City of Stuart Injection Well Rehabilitation

PROJECT: FC15132.BO

During the week of November 13, 1981, drilled to a depth of 3,152 feet, twisted off on the 18 rod. This leaves 546.98 feet of iron on the bottom. This would be around 22,000 lbs.

Layne sent to the yard for overshot. This is a fishing tool. Also, Jim Hayden was called to run a T.V. survey to take a look at the iron in the well.

After the survey was run, Layne triping in with overshot, on the first pass they made, all the iron was picked up and removed from the well on 11/14/81 at 9:00 P.M.

11/16/81 removed old 15" bit, put on new 15" bit, Layne had to ream from 3032 feet to 3152 feet becuase of new bit.

11/17/81 reamed to 3152', started making mew hole at 1:25 PM Formation changed at 3158' to 3174', medium to hard, fractured and porus.

11/18/81 Layne worked on the air compresser a good part of the day. Drilling resumed at 6:00 PM

Gainesville Office
7201 N.W. 11th Place, P.O. Box 1647, Gainesville, Florida 32602 904/377-2442
In the Southeast, CH2M HILL was formerly known as Black, Crow and Eidsness.

From 3174' to 3197', formation was medium to hard, fractured.

From 3197' to 3202', hard dolomite.

11/19/81, 3204' to 3207. Broken, Fractured. 3207' to 3218', medium to hard dolomite. 3218' to 3232' hard dolomite. From 3232' to 3244' - very hard.

Daily reports from November 13 through November 19 are enclosed.

smm

enclosures

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 11-13-81
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INDIAN

Morning Shift 7:00 a.m. to 7:00 p.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☑
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start 3147 ft.
End 3152 ft.
Bit Size 15" in.
Recorded By: JDL

Description of Operations: DRILLING TILL 11:00 AM TWISTED OFF AT 3152 FEET. LOST ± 22,000 LBS. TRIPPING OUT.

22,000 LBS ± 25 JOINTS OF PIPE.

Evening Shift 7:00 p.m. to 7:00 a.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☑
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size 15 in.
Recorded By: JDL

Description of Operations: RUSSEL CEO MCCORY SENT TO ORLANDO FOR AN OVERSHOT. THIS IS A FISHING TOOL.

JIM HAYDEN WAS CALLED TO THE LOCATION W/ CAMERA TO RUN (T.V SURVEY)

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 11/14/81
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION

Morning Shift 7:00 a.m. to 3:00 p.m.

Weather: Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
☐
☐

Depth
Start ____ ft.
End ____ ft.
Bit Size Out in.
Recorded By: ____

Description of Operations: Jim Hayden completed T.V Survey AT 3:00 A.M, Crew started. Tripping in with overshot To Fish out iron
16" 6.T 2 Collars 16 Rods AMOUNT in hole 546.98 FT Overshot caught Rod and start Tripping out.

Evening Shift 3:00 p.m. to 7:00 a.m.

Weather: Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
☐
☐

Depth
Start ____ ft.
End ____ ft.
Bit Size Out in.
Recorded By: ____

Description of Operations: Completed Tripping out AT 9:00 P.M. Removed From well WAS. 546.98 FT OF IRON.
Layne shut down left location.

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 11/16/81
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION

Morning Shift 5:00 a.m. to 5:00 p.m.

Weather: Fair ☑ Cloudy ☐ Rain ☐

Activity
- Drilling ☐
- Reaming ☑
- Running Casing ☐
- Cementing ☐
- Testing ☐
- Waiting ☐
- _____ ☐
- _____ ☐

Depth
- Start 3032 ft.
- End 3049 ft.
- Bit Size 15" in.
- Recorded By: [illegible]

Description of Operations: 0730 Layne is not on location yet. Talked with Dr Garcia concerning twist off. Layne arrived on location at 0930. Replaced 15" b.t with a new one. Started tripping back in well with new b.t at 1430 hr.

Reached 3032 FT with new b.t at 6:45 P.M because of new b.t they will have to ream back to bottom, Changed crew's.

Driller day shift Rick Palmer.

Evening Shift 5:00 p.m. to 7:00 a.m.

Weather: Fair ☑ Cloudy ☐ Rain ☐

Activity
- Drilling ☐
- Reaming ☑
- Running Casing ☐
- Cementing ☐
- Testing ☐
- Waiting ☐
- _____ ☐
- _____ ☐

Depth
- Start 3049 ft.
- End 3132 ft.
- Bit Size 15" in.
- Recorded By: [illegible]

Description of Operations: Crew setting up to start reaming back to bottom from 3032 FT at shift change crew was 20 FT off bottom is 3152 FT when this point is reached they will start making new hole

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 11/17/81
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION

Morning Shift 7:00 a.m. to 7:00 p.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☑
Reaming ☑
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
☐
☐

Depth
Start 3132 ft.
End 3157 ft.
Bit Size 15" Ø in.
Recorded By: DAH.

Description of Operations: CREW WORKING ON R.C. STARTED REAMING AT 9:30 A.M REACH 3152 FT AT 12:45 A.M CHANGED OUT T.L.L 1:25 P.M. STARTED DRILLING NEW HOLE FORMATION VERY HARD DOLOMITE SHOW DRILLING DRILLING WT ABOUT 20,000 DEPTH AT SHIFT CHANGE 3157 FT

Evening Shift 7:00 p.m. to 7:00 a.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☑
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
☐
☐

Depth
Start 3157 ft.
End 3174 ft.
Bit Size 15" Ø in.
Recorded By: DAH.

Description of Operations: CREW ON LOCATION AT 7:00 P.M. MADE A CONNECTION AT 3158 FT. FORMATION HARD DOLOMITE W/DOLOMITE SAND, DEPTH AT SHIFT CHANGE 3174 FT

DRILLING WT 18,000 TO 20,000

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 11/18/91
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION

Morning Shift 7:00 a.m. to 7:00 p.m.

Weather: Fair ☑ Cloudy ☐ Rain ☐

Activity
- Drilling ☑
- Reaming ☐
- Running Casing ☐
- Cementing ☐
- Testing ☐
- Waiting ☐
- _____ ☐
- _____ ☐

Depth
- Start 3174 ft.
- End 3180 ft.
- Bit Size 15 in.
- Recorded By: [illegible]

Description of Operations: Crew on shift at 7:00 A.M. Stop drilling at 8:10 A.M Working on air line and air compressuren, This completed and back drilling at 3174 FT at 6:00 P.M shift change 3180'

Formation Med To hard Fractured

Evening Shift 7:00 p.m. to 7:00 a.m.

Weather: Fair ☑ Cloudy ☐ Rain ☐

Activity
- Drilling ☑
- Reaming ☐
- Running Casing ☐
- Cementing ☐
- Testing ☐
- Waiting ☐
- _____ ☐
- _____ ☐

Depth
- Start 3180 ft.
- End 3202 ft.
- Bit Size 15 in.
- Recorded By: [illegible]

Description of Operations: Crew on location 7:00 P.M Formation Med To Hard Fractured To 3197 FT Harder Formation To 3202 FT

Shift Change depth 3202 FT

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 11/14/81
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION

Morning Shift 7:00 a.m. to 3:00 p.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☑
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
☐
☐

Depth
Start 3202 ft.
End 3224 ft.
Bit Size 15" Open in.
Recorded By: [illegible]

Description of Operations: Crew on location at 7:00 AM. Started drilling at 3202 ft. 3204 Feet to 3207 Broken & Fractured From 3207 Feet To 3218 Med To Hard Dolomite, From 3218 Feet To 3224 Hard Dolomite

Shift change depth 3224.

Evening Shift 3:00 p.m. to 7:00 a.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☑
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
☐
☐

Depth
Start 3224 ft.
End 3244 ft.
Bit Size 15" Open in.
Recorded By: [illegible]

Description of Operations: Crew on location drilling From 3224 Feet To 3232 Hard dolomite 3232 Feet To 3244 Very Hard

Shift change depth 3244 ft

CH2M HILL
engineers
planners
economists
scientists

SUMMARY OF ACTIVITIES

TO: Sandy Mitchell/City of Stuart
Hal Chittum, Jr./Layne Atlantic
Roy Duke/DER, West Palm Beach
John Guidry/DER, West Palm Beach
Fred Meyer/USGS, Miami
Abe Kreitman/SFWMD, West Palm Beach
Charles W. Pemble, DER, Port St. Lucie
Donnie McClaugherty/DER, Tallahassee
Cathy Cash/DER, Tallahassee
J. I. Garcia-Bengochea/CH2M Hill, Gainesville
Ross Sproul/CH2M Hill, Gainesville
[redacted]Gainesville

FROM: David G. Snyder/CH2M Hill on Location, Stuart

DATE: November 25, 1981

SUBJECT: City of Stuart Injection Well Rehabilitation

PROJECT: FC15132.BO

During the short week of November 20, 1981, on 11/20/81 we drilled from 3,244 feet to 3,246 feet. Stopped at that point and cleaned cuttings out of tank; back drilling at 1:25 P.M. and drilled to a depth of 3,251 feet. Very hard drilling.

11/23/81, Layne triped out of well to check bit. Replaced the bit and continued drilling. Drilled from 3,251 feet to 3,268 feet. Hard drilling.

11/24/81, drilling very hard work on air line. Drilled from 3,268 feet to 3284 feet.

11/25/81, drilled from 3,284 feet to total depth 3,305 feet. Started developing well at 3:00 A.M. to 9:00 A.M. Pulled bit inside casing - shut down for weekend.

HAVE A HAPPY THANKSGIVING!

Gainesville Office
7201 N.W. 11th Place, P.O. Box 1647, Gainesville, Florida 32602 904/377-2442

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 11/20/81
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION

Morning Shift 7:00 a.m. to 3:00 p.m.

Weather: Fair ☐ Cloudy ☐ Rain ☐

Activity
- Drilling ☑
- Reaming ☐
- Running Casing ☐
- Cementing ☐
- Testing ☐
- Waiting ☐
- _____ ☐
- _____ ☐

Depth
Start 3244 ft.
End 3249 ft.
Bit Size 15 7/8 in.
Recorded By: DSA.

Description of Operations: Crew on location drilling from 3244 Feet To 3246 very Hard dolom. To stop drilling at 9:00 A.M. Cleaning out cutting, Plus cleaning out P.T.'s back drilling at 1:00 P.M. drilling very. Hard. Only made 3' at shift change.

(Note) drilling like b.t worn out.

Evening Shift 3:00 p.m. to 7:00 a.m.

Weather: Fair ☑ Cloudy ☐ Rain ☐

Activity
- Drilling ☑
- Reaming ☐
- Running Casing ☐
- Cementing ☐
- Testing ☐
- Waiting ☐
- _____ ☐
- _____ ☐

Depth
Start 3249 ft.
End 3251 ft.
Bit Size 15" in.
Recorded By: DSA.

Description of Operations: Changed Crew at 7:00 P.M only made 2' This shift. Tripping back inside casing shift down For week. End.

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 11/23/81
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION

Morning Shift 7:00 a.m. to 3:00 p.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☑
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start 3251 ft.
End 3251 ft.
Bit Size 15" Open in.
Recorded By: DKF.

Description of Operations: Layne Tripping out of well to check b.T. b.T was worn out Replaced with hard Tooth b.T, Tripping back in well.
No drilling this shift.

Evening Shift 3:00 p.m. to 11:00 a.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☑
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start 3251 ft.
End 3268 ft.
Bit Size 15 in.
Recorded By: DKF

Description of Operations: Crew change started making new hole. Formation: Hard dolomite, drilled 17 FT this shift

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 11/24/81
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION

Morning Shift 7:00 a.m. to 7:00 p.m.

Weather: Fair ☑ Cloudy ☐ Rain ☐

Activity
- Drilling ☑
- Reaming ☐
- Running Casing ☐
- Cementing ☐
- Testing ☐
- Waiting ☐
- _____ ☐
- _____ ☐

Depth
- Start 3268 ft.
- End 3284 ft.
- Bit Size 15" in.
- Recorded By: [illegible]

Description of Operations: Crew change drilling very hard, drilled 17 FT This Sh. FT

brake Air line 11:30 AM Replaced AT 1240 back drilling

Evening Shift 7:00 p.m. to 7:00 a.m.

Weather: Fair ☑ Cloudy ☐ Rain ☐

Activity
- Drilling ☑
- Reaming ☐
- Running Casing ☐
- Cementing ☐
- Testing ☐
- Waiting ☐
- _____ ☐
- developing ☑

Depth
- Start 3284 ft.
- End 3303 ft.
- Bit Size 15" in.
- Recorded By: [illegible]

Description of Operations: Crew change drilled From 3284 Feet To 3303' T.D Well AT 3303' FT AT 2:45. STARTED developing AT 3:00 P.M.

developing Time This Sh. FT
3-7 = 4 hr's.

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 11/26/21
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTOR

Morning Shift 7:00 a.m. to 7:00 p.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
developing ☐

Depth
Start 3305' ft.
End _____ ft.
Bit Size _____ in.
Recorded By: [illegible]

Description of Operations: Crew change AT 7:00 A.M developing well To 9:00 A.M, Parted b.T inside casing shut down 11/24/ 11/27 28 29.

developed From 7-9 A.M = 2 hrs.

Evening Shift _____ p.m. to _____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: _____

CH2M HILL
engineers
planners
economists
scientists

SUMMARY OF ACTIVITIES

TO: Sandy Mitchell/City of Stuart
Hal Chittum, Jr./Layne-Atlantic
Roy Duke/DER, West Palm Beach
John Guidry/DER, West Palm Beach
Fred Meyer/USGS, Miami
Abe Kreitman/SFWMD, West Palm Beach
Charles W. Pemble/DER, Port St. Lucie
Donnie McClaugherty/DER, Tallahassee
Cathy Cash/DER, Tallahassee
J. I. Garcia-Bengochea/CH2M Hill, Gainesville
Ross Sproul/CH2M Hill, Gainesville
[redacted] CH2M Hill, Gainesville

FROM: David G. Snyder/CH2M Hill on Location, Stuart

DATE: December 4, 1981

SUBJECT: City of Stuart Injection Well Rehabilitation

PROJECT: FC15132.BO

12/1/81 - Developed well from 2,000 feet back to bottom at 3,305 feet. This was started at 7:00 AM and completed at 10:00 AM. Started triping out of well to get ready for the pump out test.

Meeting on location for pump out test, with Dr. Garcia, Jeff Lehnen, CH2M Hill, Hall Chittum, George McCory, Layne-Atlantic, and Sandy Mitchell, City of Stuart.

12/2/81 - Finished triping out of well, crew work on location.

12/3/81 - This day spent on making arrangements to have the clarifier No. 1, aeration basin No. 1, and digester cleaned out for pump out test plus injection test.

12/4/81 - CH2M Hill logger Jean and Jeff Lehnen logging completed. Log's run, caliper, temp, gamma long and short. Layne spent the day working on pumps for injection test plus value's for well head. Also cleaning out digester.

smm

enclosures

Gainesville Office
7201 N.W. 11th Place, P.O. Box 1647, Gainesville, Florida 32602 904/377-2442
In the Southeast, CH2M HILL was formerly known as Black, Crow and Eidsness.

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 12/1/81
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION WELL

Morning Shift 7:00 a.m. to 7:00 p.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
DEVELOPING ☑
TRIPING OUT ☑

Depth 3305 FT T.D.
Start ____ ft.
End ____ ft.
Bit Size 15" in.
Recorded By: O'Neil

Description of Operations: CREW ON LOCATION AT 7:00 A.M developed WELL FROM 2,000 FT back TO BOTTOM AT 3305 FT, STARTED AT 7:00 COMPLE AT 10:00 STARTED TRIPING OUT, TO GET READY FOR PUMP OUT TEST AT 4200 G.P.M.

SHUT DOWN FOR THE DAY AT 7:00 P

ON LOCATION FOR MEETING FOR PUMP OUT TEST. DR GARCIA JEFF LEHMEN CH2M HILL HAL CHITTUM GEO MCCORY LAYNE SAND MITCHELL CITY OF STUART.

Evening Shift ____ p.m. to ____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
☐
☐

Depth
Start ____ ft.
End ____ ft.
Bit Size ____ in.
Recorded By: ____

Description of Operations: ____

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 12/2/81
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION WELL

Morning Shift 7:00 a.m. to 7:00 p.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
Triping out ☑

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: [illegible]

Description of Operations: Crew on location
Completed Triping out of well
AT 1130 P.M. Crew worked on location
NO other work being done.

Shut down AT 7:00 P.M.

Evening Shift _____ p.m. to _____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations:

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 12/3/81
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION WELL

Morning Shift 7:00 a.m. to 7:00 p.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ..... ☐
Reaming ..... ☐
Running Casing ..... ☐
Cementing ..... ☐
Testing ..... ☐
Waiting ..... ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: [illegible]

Description of Operations: CREW ON LOCATION AT 7:00
THIS DAY WAS SPENT ON MAKING
ARANGMENTS TO HAVE DIGESTER CHARGER
AND BASIN CLEANED OUT FOR PUMP OUT
TEST PLUS INJECTION TEST.

SHUT DOWN AT 7:00 P.M.

Evening Shift _____ p.m. to _____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ..... ☐
Reaming ..... ☐
Running Casing ..... ☐
Cementing ..... ☐
Testing ..... ☐
Waiting ..... ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: _____

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 12/4/21
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION WELL

Morning Shift 7:00 a.m. to 7:00 p.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
ENGINE ☑

Depth
Start _____ ft.
End _____ ft.
Bit Size 6 in.
Recorded By: [illegible]

Description of Operations: CREW ON LOCATION AT 7:00 CH2M HILL HOGGER SEAN AND JEFF LEHMEN ON LOCATION AND STARTED LOGGING AT 7:00 COMPLETED AT AT 7:00 P.M. LOG'S RUN CALIPER, TEMP GAMMA LONG & SHORT. LAYNE WORK ON LOCATION. CHECK OUT PUMP'S PLUS VALVE'S FOR WELL HEAD.

WORK ON CLEANING OUT AEROBIC DIGESTER WAS STARTED TO DAY FOR THE PUMP OUT TEST

SHUT DOWN AT 7:00 P.M.

Evening Shift _____ p.m. to _____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: _____

CH2M HILL
engineers
planners
economists
scientists

SUMMARY OF ACTIVITIES

TO: Sandy Mitchell/City of Stuart
Hal Chittum, Jr./Layne-Atlantic
Roy Duke/DER, West Palm Beach
John Guidry/DER, West Palm Beach
Fred Meyer/USGS, Miami
Abe Kreitman/SFWMD, West Palm Beach
Charles W. Pemble/DER, Port St. Lucie
Donnie McClaugherty/DER, Tallahassee
Cathy Cash/DER, Tallahassee
J. I. Garcia-Bengochea/CH2M Hill, Gainesville
Ross Sproul/CH2M Hill, Gainesville
[redacted]/CH2M Hill, Gainesville

FROM: David G. Snyder/CH2M Hill on Location, Stuart

DATE: December 11, 1981

SUBJECT: City of Stuart Injection Well Rehabilitation

PROJECT: FC15132.BO

12/4 - Layne setting up for pump-out test at 4200 GPM, also cleaning out digester.

12/7 - Layne worked the weekend, plus all day today setting up for pump-out test, waiting on engine for pump.

12/8 - Set up and ran a very short test to check out system shut down. Started pump-out test at 4200 GPM at 3:30 PM, shut test down at 11:30 PM, draw down 21ft.

12/9 - Layne pulling pump and column for camera survey. Started running survey at 3:00 PM, completed at 7:30 PM. Copies for City of Stuart and CH2M Hill.

12/10 Layne started moving pump-out equipment off location. Started setting up for injection test at 4200 GPM.

smm

enclosures

Gainesville Office
7201 N.W. 11th Place, P.O. Box 1647, Gainesville, Florida 32602 904/377-2442
In the Southeast, CH2M HILL was formerly known as Black, Crow and Eidsness.

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 12/4/81
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION WELL

Morning Shift 7:00 a.m. to 7:00 p.m.

Weather:
Fair ☒ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
SETTING UP FOR TEST ☒

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: [illegible]

Description of Operations: Layne working on setting up for pump out Test. working on cleaning out digester.

Evening Shift _____ p.m. to _____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: _____

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 12/7/81
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION WELL

Morning Shift 7:30 a.m. to 3:45 p.m.

Weather:
Fair ☒ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
SETTING UP FOR PUMP UNIT TEST ☒

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: [illegible]

Description of Operations: Layne Worked ALL day SETTING UP, Plus WAITING FOR ENGINE FOR pump.

Evening Shift _____ p.m. to _____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations:

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 12/8/81
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION WELL

Morning Shift 7:00 a.m. to 7:00 p.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
SETTING UP FOR TEST ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: DSK

Description of Operations: FINISH SETTING UP. RAN SHORT TEST TO CHECK OUT SYSTEM. SHUT DOWN STARTED PUMP OUT TEST AT 3:30 P.M COMPLETE AT 11:30 P.M. DRAWDOWN 21 FT RATE 4200 G.P.M.

Evening Shift _____ p.m. to _____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: _____

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 12/9/81
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION WELL.

Morning Shift 7:00 a.m. to 3:00 p.m.

Weather:
Fair ☒ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
☐
Completed Tests ☒

Depth
Start _____ ft.
End _____ ft.
Bit Size 18" in.
Recorded By: [illegible]

Description of Operations: Layne pumping pump and column. For Cement survey. Started Running survey at 3:00 P.M. Completed at 7:30 P.M. Copy's made for City of Stuart and CH2M Hill.

Evening Shift _____ p.m. to _____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: _____

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 12/10/81
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION WELL

Morning Shift 7:00 a.m. to 3:00 p.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ..... ☐
Reaming ..... ☐
Running Casing ..... ☐
Cementing ..... ☐
Testing ..... ☐
Waiting ..... ☐
_____ ☐
SETTING UP FOR INJECTION TEST ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: LAYNE STARTED MOVING PUMP OUT EQUIP OFF LOCATION, AND STARTED SETTING UP FOR INJECTION TEST.

Evening Shift ____ p.m. to ____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ..... ☐
Reaming ..... ☐
Running Casing ..... ☐
Cementing ..... ☐
Testing ..... ☐
Waiting ..... ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: _____

CH2M HILL
engineers
planners
economists
scientists

SUMMARY OF ACTIVITIES

TO: Sandy Mitchell/City of Stuart
Hal Chittum, Jr./Layne-Atlantic
Roy Duke/DER, West Palm Beach
John Guidry/DER, West Palm Beach
Fred Meyer/USGS, Miami
Abe Kreitman/SFWMD, West Palm Beach
Charles W. Pemble/DER, Port St. Lucie
Donnie McClaugherty/DER, Tallahassee
Cathy Cash/DER, Tallahassee
J. I. Garcia-Bengochea/CH2M HILL, Gainesville
Ross Sproul/CH2M HILL, Gainesville
[redacted]/CH2M HILL, Gainesville

FROM: David G. Snyder/CH2M HILL on Location, Stuart

DATE: December 21, 1981

SUBJECT: City of Stuart Injection Well Rehabilitation

PROJECT: FC15132.B0

12/11 - Layne setting up for injection test, plus cleaning out clarifier No. 1, aeration basin No. 1, and digester for test.

12/14 - Still setting up for injection test - cleaning out clarifier, aeration basin, and digester.

12/15 - Still setting up for injection test, started filling digester for test, cleaning out clarifier, and aeration basin.

12/16 - Setting up for injection test, filling digester, clarifier, and aeration basin.

12/17 - Completed setting up for injection test. Also completed filling digester, clarifier, and aeration basin at 3:30 p.m. Set up and ran a short preliminary to check for leak; was unable to get 4,200 GPM at 10:30 p.m. shutdown.

12/18 - Started injection test at 12:05 p.m. Average rate 4,000 GPM with 46.5 psi. Completed test at 5:40 p.m. There will be no summaries until January 8, 1982. Layne will be shut down.

At this time we wish you and your families a Merry Christmas and a Happy New Year.

cas

Gainesville Office
7201 N.W. 11th Place, P.O. Box 1647, Gainesville, Florida 32602 904/377-2442
In the Southeast, CH2M HILL was formerly known as Black, Crow and Eidsness.

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 12/11/81
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION WELL

Morning Shift 7:30 a.m. to 7:30 p.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☑
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: [illegible]

Description of Operations: LAYNE SETTING UP FOR INJECTION TEST, PLUS CLEANING OUT CLARIFIER #1 AERATION BASIN #1 AND DIGESTER FOR TEST.

Evening Shift _____ p.m. to _____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: _____

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 12/14/81
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION WELL

Morning Shift 7:00 a.m. to 7:00 p.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☑
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size 6" in.
Recorded By: [illegible]

Description of Operations: STILL SETTING UP FOR INJECTION TEST, CLEANING OUT CLARIFIER AERATION BASIN AND DIGESTER

Evening Shift _____ p.m. to _____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: _____

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 12/15/81
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION TEST

Morning Shift 7:00 a.m. to 7:00 p.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☑
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size 24 in.
Recorded By: DVA

Description of Operations: STILL SETTING UP FOR INJECTION TEST, STARTED FILLING DISPOSAL FOR INJECTION TEST, CLEANING OUT CLARIFIER AND AERATION BASIN

Evening Shift _____ p.m. to _____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: _____

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 12/16/81
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION WELL

Morning Shift 7:00 a.m. to 7:00 p.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☑
Waiting ☐
☐
☐

Depth
Start _____ ft.
End _____ ft.
Bit Size SKL in.
Recorded By: _____

Description of Operations: SETTING UP FOR INJECTION TEST; FILLING DISCHARGE CHANNEL AND RETENTION BASIN.

Evening Shift _____ p.m. to _____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
☐
☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: _____

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 12/17/81
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION WELL

Morning Shift 7:30 a.m. to 3:30 p.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: COMPLETED SETTING UP FOR INJECTION TEST, ALSO COMPLETED FILLING DISASTER AERATION BASIN AND CLAR-FIER AT 3:30 SET UP AND RUN PRELIMINARY TEST TO CHECK OUT FOR LEAKS SHUT DOWN AT 10:05 P.M, BECAUSE WE WERE NO ABLE TO REACH 4200 G.P.M

Evening Shift _____ p.m. to _____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: _____

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 12/18/81
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION WELL

Morning Shift 7:30 a.m. to 7:30 p.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☑
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: STARTED INJECTION TEST AT 12:00 AVERAGE RATE 4,200 G.P.M. WITH 46.5 PSI, COMPLETED TEST AT 5:40 P.M.

Evening Shift _____ p.m. to _____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: _____

CH2M HILL
engineers
planners
economists
scientists

SUMMARY OF ACTIVITIES

TO: Sandy Mitchell/City of Stuart
Hal Chittum, Jr./Layne Atlantic
Roy Duke/DER, West Palm Beach
John Guidry/DER, West Palm Beach
Fred Meyer/USGS, Miami
Abe Kreitman/SFWMD, West Palm Beach
Charles W. Pemble, DER, Port St. Lucie
Donnie McClaugherty/DER, Tallahassee
Cathy Cash/DER, Tallahassee
J. I. Garcia-Bengochea/CH2M Hill, Gainesville
Ross Sproul/CH2M Hill, Gainesville
Jeff Lehnen/CH2M Hill, Gainesville

FROM: David G. Snyder/CH2M Hill on Location, Stuart

DATE: January 7, 1982

SUBJECT: City of Stuart Injection Well Rehabilitation

PROJECT: FC15132.BO

1/4/82 - Layne started setting up to put in a gravel pick bridge at 2980 Ft. First they will run a 1" work pipe to 2100 Ft.

1/5/82 - Layne dropped 6 bags of gravel before running 1" work pipe. Set work pipe at 2062.73 Ft. Went in with wire line to tag the 6 bags. They went to the bottom at 3300 Ft. Layne dropped 6 bags of gravel. These bags were also tag at the bottom, 3300 Ft.

1/6/82 - Hal Chittum and George McCory was on location. George McCory had the crew put in the 95 bags of gravel that was left. Went in with wire line to tag. Tag was made at 1980 Ft. Worked the 1" pipe bridge drop to 2010 Ft. Was unable to move bridge at 2010 Ft. with work pipe. Layne started tripping out 1" work pipe.

1/7/82 - Layne finnished tripping out work pipe. Driller called his office. He was told to set up and go in well with drill rod and move bridge down the hole, out of the tight spot at 2018 Ft.

smm

Gainesville Office
7201 N.W. 11th Place, P Box 1647, Gainesville, Flo 32602 904/377-2442
In the Southeast, CH2M HILL ... merly known as Black, Crow and Eidsness

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 1/4/82
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION WELL

Morning Shift 7:00 a.m. to 7:00 p.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ..... ☐
Reaming ..... ☐
Running Casing ..... ☐
Cementing ..... ☐
Testing ..... ☐
Waiting ..... ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: [signature]

Description of Operations: ARRIVED ON LOCATION AT 0800 LAYNE DID NOT ARRIVE TILL 11:45 A.M. LAYNE STARTED SETTING UP TO TRY AND SET A GRAVEL BRIDGE AT 2980 FT LAYNE WILL RUN A 1" WORK PIPE TO 2100 FT, BE FOR GRAVELING.

Evening Shift _____ p.m. to _____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ..... ☐
Reaming ..... ☐
Running Casing ..... ☐
Cementing ..... ☐
Testing ..... ☐
Waiting ..... ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: _____

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 1/6/82
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION WELL

Morning Shift 7:00 a.m. to 7:00 p.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: [illegible]

Description of Operations: Layne drop 3 bags of gravel. And then started running 1" work pipe. Set work pipe at 2062.73 FT This is below a tight spot at 2018 FT. Layne set up wire line and started into well to the bottom to see if they had any luck with the 3 bags of gravel they drop. All 3 bags went to bottom at 3300 FT, Trip wire line out.

Layne drop 9 bags of gravel This made a total of 12 bags, all of this gravel went to the bottom at 3300 FT

Evening Shift _____ p.m. to _____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: _____

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 1/6/82
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION WELL

Morning Shift 7:00 a.m. to 7:00 p.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: DFF

Description of Operations: HAL CHITTUM WITH LAYNE WAS ON LOCATION WITH GEO MCCOY. THEY HAD 95 BAGS OF GRAVEL LEFT. THEY PUT ALL 95 BAGS IN THE WELL TO TRY AND BRIDGE AT 2980 FT. SOME OF THE GRAVEL BRIDGE AT 1980 FT THEY WORK THE 1" WORK PIPE GRAVEL DROP TO 2010 FT AND STOP AGAIN, THIS TIME THE WORK PIPE WAS UNABLE TO MAKE IT GO DOWN. LAYNE STARTED TRIPING OUT 1" WORK PIPE

Evening Shift _____ p.m. to _____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: _____

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 1/7/92
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION WELL

Morning Shift 7:00 a.m. to 7:00 p.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ..... ☐
Reaming ..... ☐
Running Casing ..... ☐
Cementing ..... ☐
Testing ..... ☐
Waiting ..... ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: [illegible]

Description of Operations: LAYNE FINNISH TRIPING OUT WORK PIPE. DRILLER CALLED HIS OFFICE AND WAS TOLD TO SET UP, AND GO IN WELL WITH DRILL ROD AND MOVE BRIDGE DOWN THE HOLE OUT OF THE TIGHT SPOT AT 2018.

LAYNE SETTING UP TO START RUNNING DRILL ROD.

Evening Shift _____ p.m. to _____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ..... ☐
Reaming ..... ☐
Running Casing ..... ☐
Cementing ..... ☐
Testing ..... ☐
Waiting ..... ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: _____

CH2M HILL
engineers
planners
economists
scientists

SUMMARY OF ACTIVITIES

TO: Sandy Mitchell/City of Stuart
Hal Chittum, Jr./Layne-Atlantic
Roy Duke/DER, West Palm Beach
John Guidry/DER, West Palm Beach
Fred Meyer/USGS, Miami
Abe Kreitman/SFWMD, West Palm Beach
Charles W. Pemble, DER, Port St. Lucie
Donnie McClaugherty/DER, Tallahassee
Cathy Cash/DER, Tallahassee
J.I. Garcia-Bengochea/CH2M Hill, Gainesville
Ross Sproul/CH2M Hill, Gainesville
Jeff Lehnen/CH2M Hill, Gainesville

FROM: David G. Snyder/CH2M Hill on Location, Stuart

DATE: January 14, 1982

SUBJECT: City of Stuart Injection Well Rehabilitation

PROJECT: FC15132.BO

1/11/82 - This day was spent running 15" bit collar's and drill rod in well to kick out bridge at 2000 ft. depth at shut down 1997 ft.

1/12/82 - Started tripping in, hit bridge plug at 1998 ft. Moved bridge plug to 2011 ft. Bridge fell free, ran bit and rods to 2714 ft. Stop at this point, started tripping.

1/13/82 - Crew set up and started tripping out of well, plus working on rig. Was unable to finish tripping out.

1/14/82 - Finished tripping out of well. Set up with wire line, ran in tag gravel at 2965 ft. Ordered 5 yards of gravel, put all 5 yards in well. Started tripping in with 1" work pipe to tag top of gravel. Depth with 1" work pipe at shut down was 2498 ft. Will finish tripping in tomorrow to tag top of gravel.

smm

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 1/11/82
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: Injection Well

Morning Shift 7:00 a.m. to 7:00 p.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: Crew on location Tripping in with 15" B.T Collars and drill Rod To kick out the bridge AT 2000 FT
depth AT shut down 1997 FT

Evening Shift _____ p.m. to _____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations:

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 1/12/82
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION WELL

Morning Shift 7:00 a.m. to 7:00 p.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size 24" in.
Recorded By: [signature]

Description of Operations: Crew on location at 0700 setting on bridge at 1998 FT moved bridge to 2011 FT bridge full free. Ran 15" B.T to 2714 FT stop at that point, started tripping out at 1500 hr.

Evening Shift ____ p.m. to ____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations:

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 1/13/82
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION WELL

Morning Shift 7:00 a.m. to 7:00 p.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: DKH

Description of Operations: CREW ON LOCATION TRIPPING OUT OF WELL, PLUG WORKING ON RIG WAS UNABLE TO FINISH TRIPPING OUT.

SHUT DOWN AT 7:00 P.M.

Evening Shift _____ p.m. to _____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: _____

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 1/14/82
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION WELL

Morning Shift 7:00 a.m. to 3:00 p.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☑

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: [signature]

Description of Operations: CREW FINISH TRIPPING OUT OF WELL. SET UP WIRE LINE WENT INTO WELL TAG GRAVEL AT 2965 FT, ordered 5 YARDS OF GRAVEL, PUT ALL 5 YARDS INTO WELL, STARTED TRIPPING IN WITH 1" WORK PIPE TO THE GRAVEL. DEPTH AT SHUT DOWN WITH 1" WORK PIPE IS 2498 FT.

Evening Shift _____ p.m. to _____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: _____

CH2M HILL
engineers
planners
economists
scientists

SUMMARY OF ACTIVITIES

TO: Sandy Mitchell/City of Stuart
Hal Chittum, Jr./Layne-Atlantic
Roy Duke/DER, West Palm Beach
John Guidry/DER, West Palm Beach
Fred Meyer/USGS, Miami
Abe Kreitman/SFWMD, West Palm Beach
Charles W. Pemble/DER, Port St. Lucie
Donnie McClaugherty/DER, Tallahassee
Cathy Cash/DER, Tallahassee
J.I. Garcia-Bengochea/CH2M Hill, Gainesville
Ross Sproul/CH2M Hill, Gainesville
Jeff Lehnen/CH2M Hill, Gainesville

FROM: David G. Snyder/CH2M Hill on Location, Stuart

DATE: January 21, 1982

SUBJECT: City of Stuart Injection Well Rehabilitation

PROJECT: FC15132.BO

Fri. 1/15/82 - Finished tripping in with 1" work pipe. Tag top of gravel at 2965 ft. Ordered 5 yards. Tag top of gravel at 2925.80 ft. Ordered 10 yds. Tag top of gravel at 2839 ft. Ordered 10 yds. Tag top of gravel at 2742 ft. Ordered 5 yds. Put this in well. This tag will be made Monday. Amount of gravel used up to this point: 107 sacks of gravel, 30 yds.

Mon. 1/18/82 - Tag top of gravel at 2728 ft. Picked up 1 yd. tag, this at 2718 ft. Ordered 2 yds. of sand. This was tagged at 2713 ft., cemented with 30 sacks of neat cement. This was completed at 8:00 PM. On location, 29 joints of 10" liner, 2 yds. of sand.

Tues. 1/19/82 - Tag top of cement with wire line at 2701 ft. Went in to check this tag with 1" work pipe. This tag showed top of cement at 2738 ft. Trip out 1" work pipe to check pipe tally. Went back in with 1" work pipe to check tag. This tag was 2735.80 ft. Ordered 6 yds. of gravel. Put this in well. Tag top at 2683 Ft. Set up and cemented with 20 sacks of cement for cap.

Weds. 1/20/82 - Tag cement cap at 2678.95 ft. with doubles after recount. Crew tripping out with 1" work pipe; also

Gainesville Office

laying down drill rod, getting ready to start running 10" liner. Layne welding lugs and centralizers on liner.

Thurs. 1/21/82 - Started running 10" liner at 10:30 AM, putting centralizer starting at bottom end of pipe 5', 20', 40', 60', 100' to surface. At shutdown there are 24 joints in the well; depth 964.35 ft.

smm

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 1/15/82
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION WELL

Morning Shift 7:00 a.m. to 7:00 p.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: [illegible]

Description of Operations: ARRIVED ON LOCATION RIGGING TRIPPING IN WITH 1" WORK PIPE, TAG TOP OF GRAVEL AT 2965 FT. PUT IN 5 YARDS TAG WAS MADE AT 2925.80 FT, PUT IN 10 YARDS TAG WAS MADE AT 2839 FT PUT IN 10 YARDS TAG WAS MADE AT 2792 FT PUT IN 5 YARDS. THIS TAG WILL BE MADE MONDAY.

AMOUNT OF GRAVEL USED TO THIS POINT
107 SKS OF GRAVEL.
30 YARDS = 36 TON.

Evening Shift ____ p.m. to ____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations:

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 1/18/82
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION WELL

Morning Shift 7:00 a.m. to 7:00 p.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: [signature]

Description of Operations: ARRIVED ON LOCATION TAG. TOP OF GRAVEL AT 2720 FT, PICKED UP 1 YARD OF GRAVEL TAG THIS AT 2718 FT PICK UP 2 YARDS OF SAND, THIS WAS TAG AT 2713 FT PUT ON A 30 SK'S OF NEAT CEMENT THIS WAS COMPLETED AT 8:00 P.M. SHUT DOWN

TOTAL GRAVEL 31 YARDS
107 SK'S GRAVEL.
2 YARDS OF SAND.
30 SK'S OF NEAT CEMENT,

Evening Shift _____ p.m. to _____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: _____

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 1/19/82
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION WELL

Morning Shift 7:00 a.m. to 2:00 p.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size 24" in.
Recorded By: [illegible]

Description of Operations: ON LOCATION AT 0700 TAG TOP OF CEMENT CHIP AT 2701 WITH WIRE LINE. CHECK THIS TAG WITH 1" WORK PIPE THIS TAG WAS 2738 FT TRIP OUT 1" WORK PIPE TO CHECK PIPE TALLY. WENT BACK IN WITH 1" WORK PIPE TO TAG PLUG, THIS TAG WAS 2735.80 FT TALK WITH DR GARCIA CONCERNING THIS TAG. ORDERED 6 YARDS OF GRAVEL. PUT ALL 6 YARDS IN WELL TAGED TOP OF GRAVEL AT 2678.95 FT CEMENTED WITH 20 SKS OF CEMENT

Evening Shift ____ p.m. to ____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: _____

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 1/20/82
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: Injection Well

Morning Shift 7:00 a.m. to 7:00 p.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size Drill in.
Recorded By: [illegible]

Description of Operations: The Top of Cement at 2678.95 FT Crew Tripping out 1" work pipe Also laying down drill Rod. Getting Ready To start Running 10" casing. Layne welding lugs and centralizers on liner

Evening Shift _____ p.m. to _____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: Ordered 1,800 sks of 2% (Class H) Bentonite Cement, This will bring Cement To 1800 FT or +

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 1/21/82
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION WELL

Morning Shift 7:00 a.m. to 7:00 p.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: [illegible]

Description of Operations: CREW SETTING UP TO START RUNNING 10" LINER, CENTRALIZERS ARE SET STARTING AT THE BOTTOM OF LINER UP, FIRST ONE 5' 20' 40' 60' 100' AND AVERY 100' TO SURFACE.

STARTED SETTING LINER AT 10:30 A.M.

AT SHUT DOWN 24 JOINTS IN THE WELL DEPTH 964.35 FT

ON LOCATION HALLIBURTON HAS 1,000 SKS. CLASS H 2% BENTONITE. WITH MORE TO COME.

Evening Shift ____ p.m. to ____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: _____

CH2M HILL
engineers
planners
economists
scientists

SUMMARY OF ACTIVITIES

TO: Sandy Mitchell/City of Stuart
Hal Chittum, Jr./Layne-Atlantic
John Guidry/DER, West Palm Beach
Fred Meyer/USGS, Miami
Abe Kreitman/SFWMD, West Palm Beach
Charles W. Pemble/DER, Port St. Lucie
Donnie McClaugherty/DER, Tallahassee
Cathy Cash/DER, Tallahassee
J.I. Garcia-Bengochea/CH2M Hill, Gainesville
Ross Sproul/CH2M Hill, Gainesville
Jeff Lehnen/CH2M Hill, Gainesville

FROM: David G. Snyder/CH2M Hill on Location, Stuart

DATE: January 27, 1982

SUBJECT: City of Stuart Injection Well Rehabilitation

PROJECT: FC15132.BO

Fri. 1/22/82 - Layne welding liner plus welding lugs and lining up guides. Depth at shut-down 1889.32 ft. Having trouble with elevators. Sent for new ones. Reason was because of weight.

Sat. 1/23/82 - Replaced elevators and finished running liner. T.D. liner at 2670 ft. at 3:30 PM. Halliburton arrived on location at 6:45 PM. Started cementing with 1800 sacks of Class H 2% Bentonite at 7:30 PM. Set plug and completed cementing at 10:45 PM.

Sun. 1/24/82 - CH2M Hill logger on location to run tempeture log. This was completed at 12:30 PM. Log showed cement at 2210 ft. Tag top of cement with 1" work pipe at 2214 ft. Using two work pipes pulled back 4'. Started cementing with Class H 2% at 7:00 PM. Pumped 180 sacks; had a big pressure drop. Stop cementing at that point. Pulled both work pipes to check lines before doing any more cementing.

Mon. 1/25/82 - With removing work pipe, one line plugged off. Replaced line. Trip back in with both work lines. Tag top of cement at 2172 ft. Pulled both lines back, set south line at 2168 ft., north at 2671 ft. Set up and cemented with 300 sacks at 5:30 PM. Pumped 150 sacks; pulled two stands on both

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sides. Cemented again with 150 sacks. Waiting for tag.

Tues. 1/26/82 - Tag cement at 1997 ft. on north side, 1996 ft. on south side. Set up, started cementing with 350 sacks = 88 barrels. This should give us 700 ft. of fill-up. This was done in 22 barrel stages, four times. Waiting to tag. Completed cementing at 11:05 AM.

Weds. 1/27/82 - Tag top of cement at 1201 ft. north side, 1198 ft. south side. Set up, cemented with 350 sacks Class H 2% Bentonite. This should fill-up 700 ft. Started cementing at 9:40 PM, completed at 12:10 AM.

smm

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date Fri 1/22/82
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: Injection Well

Morning Shift 7:00 a.m. to 7:00 p.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: Layne welding liner plug, welding lugs and lining up guides. Depth of liner at shut down 1889.32 FT. Reason for shut down at this depth, was because we feel the elevators, are not holding right on the 10" liner, because of the weight. Sent for elevator,

Evening Shift _____ p.m. to _____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: _____

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date SAT 1/23/82
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION WELL

Morning Shift 1:00 a.m. to 10:45 p.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size 26" in.
Recorded By: [illegible]

Description of Operations: Reached Elevation, and Finish Running liner. T.D liner AT 2670 FT AT 3:30 P.M SET up 10" Liner For Cementing Halliburton Arrived on location AT 6:45 P.M Set up and started Cementing with 1800 sacks of Class H 2% Bentonite AT 7:30 P.M Completed and set plug in 10" liner AT 10:46 P.M.

shut down

Called Sun To Have Logger on location sunday

Evening Shift _____ p.m. to _____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: _____

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 1/24/82 SUN
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION WELL

Morning Shift 7:00 a.m. to 3:30 p.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: SEAN AND HOGGER ON LOCATION AT 7:00 A.M. CREW ARRIVED ON LOCATION AND STARTED BLEEDING OFF LINER. SEAN STARTED RUNNING TEMP LOG AT 11:00 A.M. COMPLETED AT 12:30. TEMPERATURE LOG SHOW TOP OF CEMENT AT 2210 FT. TEMPERATURE IN 10" LINER SHOWED 160° TO 165°.

CREW STARTED RUNNING 2 1" WORK LINES FOR CEMENTING. TAG TOP OF CEMENT WITH WORK LINE AT 2614 FT. PULLED BACK 4' STARTED CEMENTING AT 7:00 P.M. PUMPED 180 SACKS. HAD A BIG CHANGE IN PUMPING PRESSURE. STOP PUMPING

Evening Shift _____ p.m. to _____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: AT THIS POINT STARTED TRIPPING OUT WITH WORK PIPE TO CHECK AND MAKE SURE WE DID NOT BLOW IT APART OR PLUG IT.

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date MON 1/25/82
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION WELL

Morning Shift 7:00 a.m. to ____ p.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ..... ☐
Reaming ..... ☐
Running Casing ..... ☐
Cementing ..... ☐
Testing ..... ☐
Waiting ..... ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: W.T4 Remoding 2 1" work pipe We Found one side plug OFF, Plus couple of bad Joint's AT The very bottom END called Lining in cylinder To boring MOVE 1" work pipe be For doing any More CEMENTING

Rack on bottom with 2 work lines For Cementing AT 4:45 P.M. The one on South side of liner SET AT 2168 FT North side SET AT 2171 FT STARTed cementing with both lines AT 5:30 pump 150 SK's Pulled 2 STAND's on both side, Pump ANOTHER 150 SK's. AMOUNT OF CEMENT used 300 SK's

Evening Shift ____ p.m. to ____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ..... ☐
Reaming ..... ☐
Running Casing ..... ☐
Cementing ..... ☐
Testing ..... ☐
Waiting ..... ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: Class H 2% Bentonite Completed Cementing AT 6:40 P.M. WAITING TO TAG

DAILY SHIFT REPORT

Tues

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 1/26/82
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION WELL

Morning Shift 8 a.m. to ____ p.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ..... ☐
Reaming ..... ☐
Running Casing ..... ☐
Cementing ..... ☐
Testing ..... ☐
Waiting ..... ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: [illegible]

Description of Operations: Check TAG HT 2:30 A.M. WAS NOT ABLE TO CEMENT YET. THE TOP OF CEMENT W.TH both lines North side 1997 FT South side HT 1996 FT. SET UP STARTED CEMENTING W.TH 950 SK's = 88 barrels This should give us 700 FT OF Fillup STARTED CEMENTING AT 9:15 A. COMPLETED HT 11:05 A.M.
This was done in 226 BARRELS STAGES Pulling 2 STANDS on both sides Four Times. LAST TIME Pulling Above CEMENT. WAITING TO TAG.

Evening Shift ____ p.m. to ____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ..... ☐
Reaming ..... ☐
Running Casing ..... ☐
Cementing ..... ☐
Testing ..... ☐
Waiting ..... ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: Ordered 950 SK's OF CLASS H. 2% BENTONITE.

DAILY SHIFT REPORT

wed

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 1/27/82
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: Injection Well

Morning Shift 7:00 a.m. to ____ p.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ..... ☐
Reaming ..... ☐
Running Casing ..... ☐
Cementing ..... ☐
Testing ..... ☐
Waiting ..... ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: [signature]

Description of Operations: TAG Top of Cement AT 1201 FT North side South side AT 1198 FT Set up Cemented with 350 SK's Class H 2% Benton. This should fill up 700 FT
Cementing done in four stages
22 barrels Pull 2 stands.
Cementing started AT 9:40 P.M completed.
AT 12:10 A.M.
Waiting To TAG

Evening Shift ____ p.m. to ____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ..... ☐
Reaming ..... ☐
Running Casing ..... ☐
Cementing ..... ☐
Testing ..... ☐
Waiting ..... ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: _____

CH2M HILL
engineers
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economists
scientists

SUMMARY OF ACTIVITIES

TO: Sandy Mitchell/City of Stuart
Hal Chittum Jr./Layne-Atlantic
John Guidry/DER, West Palm Beach
Fred Meyer/USGS, Miami
Abe Kreitman/SFWMD, West Palm Beach
Charles W. Pemble/DER, Port St. Lucie
Donnie McClaugherty/DER, Tallahassee
Cathy Cash/DER, Tallahassee
J. I. Garcia-Bengochea/CH2M Hill, Gainesville
Ross Sproul/CH2M Hill, Gainesville
[redacted] CH2M Hill, Gainesville

FROM: David G. Snyder/CH2M Hill on Location, Stuart

DATE: February 4, 1982

SUBJECT: City of Stuart Injection Well Rehabilitation

PROJECT: FC15132.BO

1/27/82 - Weds. - Tag top of cement at 511 ft. north side, 498 ft., south side. Cemented to surface. Total amount of cement used, 3,270 sacks, 2% bentonite. Completed cementing. Hallibuton ran a pressure test on 10" liner for one hour at 100 PSI. Shut well in for 72 hours.

1/28/82 - Thur. - Layne working on location, plus cleaning out mud tanks.

1/29/82 - Fri. - Layne working on location, plus cleaning out mud tanks and working on rig. A C.B.L. log ran by Schlumberaer at 4:30 PM, completed at 7:00 PM.

2/ 1 /82 - Mon. - Crew setting up to start tripping into well with 9 7/8 bit. Raining very hard. Only got to 1450 ft. at shut down.

2/ 2 /82 - Tue. - Finished tripping in at 5:00 PM. Replaced air line. Started drilling out plug at 2668 ft. at 6:00 PM. Shut down at 2676 ft. Starting tommorow, Layne will be working 24 hours a day.

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2/3/82 - Wed. - Running 2 shifts, removing gravel. Depth 2672 ft. Bit plug off, started tripping out.

2/4/82 - Thur. - Back on bottom and cleaning out gravel. Depth this day, 2702 ft.

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 1/27/82 wed
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: Injection Well

Morning Shift 10:00 a.m. to 7:00 p.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ..... ☐
Reaming ..... ☐
Running Casing ..... ☐
Cementing ..... ☐
Testing ..... ☐
Waiting ..... ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: [signature]

Description of Operations: Tag Top of Cement at 511 FT North side 498 South side Cement To Surface. Total amount of cement used 3,270 SK's 2% Bentonite Completed at 11:00 A.M. Set up and Ran 10" Liner Pressure Test at 100 P.S.I. For one hour Halliburton Ran pressure Test Chart Sent To Pr Circle.

(Shut Well in For 72 hrs.)

Evening Shift _____ p.m. to _____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ..... ☐
Reaming ..... ☐
Running Casing ..... ☐
Cementing ..... ☐
Testing ..... ☐
Waiting ..... ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: _____

DAILY SHIFT REPORT

Thurs

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 1/24/92
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: Injection Well

Morning Shift 7:30 a.m. to 7:30 p.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: [illegible]

Description of Operations: Layne working on location cleaning up, Plus cleaning out mud Tanks

Evening Shift _____ p.m. to _____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: _____

DAILY SHIFT REPORT

Fr.

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 1/29/82
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: Injection Well

Morning Shift 7:00 a.m. to 7:00 p.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ..... ☐
Reaming ..... ☐
Running Casing ..... ☐
Cementing ..... ☐
Testing ..... ☐
Waiting ..... ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: [signature]

Description of Operations: Layne working on location
Plug cleaning out Tank.
Also a CBL log Run by Schlumberger
AT 4:30 P.M completed AT 7:00 P.M.

Evening Shift _____ p.m. to _____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ..... ☐
Reaming ..... ☐
Running Casing ..... ☐
Cementing ..... ☐
Testing ..... ☐
Waiting ..... ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: _____

DAILY SHIFT REPORT

MON

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 2/1/82
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION Well

Morning Shift 7:00 a.m. to 7:00 p.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☑

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: Crew on location setting up to start tripping in well with a 9⅞ inch bit. Rotating very hard only. Got in about 1450 FT. Shut down.

Evening Shift _____ p.m. to _____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: _____

DAILY SHIFT REPORT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date Tues 2/2/82
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: Injection Well

Morning Shift 7:00 a.m. to 7:00 p.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: Crew on location. Finnish Tripping in at 5:00 P.M. Make up 17 new Air line start drilling out Plug at 2668 shut down at 2676 ft

Starting Tomorrow Layne will drill 24 hr's a day To clean out the hole.

Evening Shift _____ p.m. to _____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: _____

DAILY SHIFT REPORT

Wed.

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 2/3/82
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: Injection Well

Morning Shift 7:00 a.m. to 7:00 p.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: [illegible]

Description of Operations: Layne Removing Gravel From Well depth AT 9:00 A.M 216 72" b.t Plug, STARTed Tripping out.

Evening Shift 7:00 p.m. to 7:00 a.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: [illegible]

Description of Operations: Night Crew STARTed. Tripping back in Well.

DAILY SHIFT REPORT

Thurs

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 2/4/82
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: Injection

Morning Shift 7:00 a.m. to 7:00 p.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☑

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: [signature]

Description of Operations: Crew Finish Tripping in, back on bottom and started Cleaning out Gravel. Having Trouble Removing Gravel out of Well. depth at Sh. Fl Change 2698 Ft

Evening Shift 7:00 p.m. to 7:00 a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: [signature]

Description of Operations: ... Cleaning out Gravel ... at Sh. Fl Change 2702 Ft Lost Air Line

CH2M HILL
engineers
planners
economists
scientists

SUMMARY OF ACTIVITIES

TO: Sandy Mitchell/City of Stuart
Hal Chittum Jr./Layne-Atlantic
John Guidry/DER, West Palm Beach
Fred Meyer/USGS, Miami
Abe Kreitman/SFWMD, West Palm Beach
Charles W. Pemble/DER, Port St. Lucie
Donnie McClaugherty/DER, Tallahassee
Cathy Cash/DER, Tallahassee
J. I. Garcia-Bengochea/CH2M Hill, Gainesville
Ross Sproul/CH2M Hill, Gainesville
[redacted]/CH2M Hill, Gainesville

FROM: David G. Snyder/CH2M Hill on Location, Stuart

DATE: February 12, 1982

SUBJECT: City of Stuart Injection Well Rehabilitation

PROJECT: FC15132.BO

2/5/82 - Fri. - Working on air line plus back cleaning out gravel. Depth at shift change 2703 ft. Night shift at crew change, 2707 ft.

2/6/82 - Sat. - Cleaning out gravel, very slow going. At shift change, depth 2715 ft. Night shift shut down.

2/7/82 - Sun. - Cleaning out gravel. Moving out very little gravel. At 7:45 AM, depth 2715 ft. Layne at this point started tripping out to check bit. When drill rod was tripped out, they had lost a 9 7/8 bit in the well. Night shift trip back to 2715 ft. with new bit.

2/8/82 - Mon. - Crew back removing gravel. Depth at shift change, 2763 ft. Night shift reached a depth of 2796 ft.

2/9/82 - Tue. - Stopped drilling because Kelly swivel started leaking very bad. Swivel fixed, back removing gravel, depth 2847 ft. Layne setting up cable tool rig to work on monitoring well.

2/10/81 - Wed. - Crew removing gravel plus working on air line. Day and night shift, depth 2902 ft.

Gainesville Office
7201 N.W. 11th Place, P.O. Box 1647, Gainesville, Florida 32602, 904/377-2442

2/10/82 --- continued

Monitor Well: Crew tripping in with work pipe plus started graveling up to 2750 ft. in depth. At shut down, 2864 ft.

2/11/82 - Thur. - Crew's removing gravel night and day shift; depth, 3002 ft.

Monitor Well: Completed gravel in well; depth 2752 ft. Cemented with six (6) sacks for cement cap.

2/12/82 - Fri. - Crew removing gravel. Hit bottom of gravel plug at 3011 ft. Went to bottom at 3304 ft. The lost 9-7/8 bit is on bottom. Night crew trip back up inside liner; shut down for the weekend.

Monitor Well: Tag top of cement cap at 2741.62 ft. 1" work pipe plug started tripping out.

smm

DAILY SHIFT REPORT

Fri.

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 2/3/82
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: Injection Well

Morning Shift 7:30 a.m. to 7:15 p.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: Removed Kelly Recovered Air hose lost Check Valve. Recoved check Valve back Cleaning out Gravel AT 3:10 P.M depth shift change 2703 FT

Evening Shift 7:30 p.m. to 7:30 a.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: Crew on location AT 7:30 P.M. Cleaning out Gravel depth AT shift change 2707 FT

DAILY SHIFT REPORT

5 of 1

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 2/6/82
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION WELL

Morning Shift 7:00 a.m. to 7:00 p.m.

Weather:
Fair ☒ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size 9 7/8 in.
Recorded By: [illegible]

Description of Operations: Crew on location at 7:00 A.M. Cleaning out Gravel. Depth at shift change 2715 FT

Very slow Removing Gravel.

Evening Shift 7:00 p.m. to 7:00 a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size 9 7/8 in.
Recorded By: [illegible]

Description of Operations: Shut Crew down This shift

DAILY SHIFT REPORT

Sun

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 2/7/82
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION WELL

Morning Shift 7:00 a.m. to 7:00 p.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☑

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: [illegible]

Description of Operations: CREW ON LOCATION AT 7:00 AM CLEANING OUT GRAVEL DEPTH 2715 FT LAYNE TRIPPING OUT TO REMOVE 2 COLLARS, PLUS REMOVING GRAVEL IS GIVING LAYNE TROUBLE COMPLETED TRIPPING OUT AT 6:40 P.M TO FIND OUT THEY LOST 9⅞ B.T. IN THE WELL

LAYNE PUT ON NEW B.T STARTED TRIPPING BACK INTO WELL

Evening Shift 7:00 p.m. to 7:00 a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☑

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: [illegible]

Description of Operations: NEW CREW TRIPPING BACK IN WELL RUNNING VERY HARD. DEPTH IN HOLE AT 7:00 P.M. 2656 FT

DAILY SHIFT REPORT

MON

CH2M HILL
Engineers

Project No.: FC15132.80 Date 2/8/82
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION WELL

Morning Shift 7:30 a.m. to 7:30 p.m.

Weather:
Fair ☐ Cloudy ☑ Rain ☑

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size 24" in.
Recorded By: [illegible]

Description of Operations: Crew completed Tripping in well depth 2715 FT. Started Removing Gravel depth at shift change 2763 FT

Evening Shift 7:30 p.m. to 7:30 a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size 24" in.
Recorded By: [illegible]

Description of Operations: Shift change crew Removing Gravel From well depth. At shift change 2796 FT

DAILY SHIFT REPORT

Tues

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 2/9/82
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION WELL

Morning Shift 7:30 a.m. to 3:30 p.m.

Weather: Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: Crew Change Removing Gravel Till Kelly Swivel started leaking bad, stop Layne at this point To Fix Swivel depth 2806. started Fix Swivel at 3:20 P.M

MONITOR WELL.

Crew setting up 2400 Cable Tool. Rig

Evening Shift 3:30 p.m. to 12:00 a.m.

Weather: Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: Crew change working on Swivel To 1:25 A.M started Removing Gravel depth at shift Change 2847 FT

DAILY SHIFT REPORT

Wed

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 2/10/82
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: Injection Well

Morning Shift 7:00 a.m. to 7:00 p.m.

Weather:
Fair ☒ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: Shift change crew
Removing Gravel Stop To Replace Air
Line depth at shift change 2878 FT

Monitor Well.
Tripet with 1" work pipe To
bottom Pulled back To 2900' started
Graveling well depth at shut down.
2864 FT

Evening Shift 7:00 p.m. to 7:00 a.m.

Weather:
Fair ☒ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: Shift change crew
Removing Gravel depth at shift
change 2902 FT

DAILY SHIFT REPORT Thur

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 2/11/82
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION WELL

Morning Shift 7:30 a.m. to 7:00 p.m.

Weather: Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: DEH

Description of Operations: SHIFT CHANGE CREW DRILLING OUT GRAVEL PLUG DEPTH AT SHUT DOWN 2954 FT

MONITOR WELL
COMPLETED GRAVELING UP TO 2762 FT
CEMENTED WITH 6 SIX SK's OF CEMENT
FOR CAP ON GRAVEL

Evening Shift 7:00 a.m. to 7:30 p.m.

Weather: Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: DEH

Description of Operations: CREW ON SHIFT REMOVING GRAVEL PLUG DEPTH AT SHIFT CHANGE 3002 FT

CH2M HILL
engineers
planners
economists
scientists

SUMMARY OF ACTIVITIES

TO: Sandy Mitchell/City of Stuart
Hal Chittum Jr./Layne-Atlantic
John Guidry/DER, West Palm Beach
Fred Meyer/USGS, Miami
Abe Kreitman/SFWMD, West Palm Beach
Charles W. Pemble/DER, Port St. Lucie
Donnie McClaugherty/DER, Tallahassee
Cathy Cash/DER, Tallahassee
J. I. Garcia-Bengochea/CH2M Hill, Gainesville
Ross Sproul/CH2M Hill, Gainesville
[redacted], Gainesville

FROM: David G. Snyder/CH2M Hill on Location, Stuart

DATE: February 22, 1982

SUBJECT: City of Stuart Injection Well Rehabilitation

PROJECT: FC15132.BO

2/15/82 - Mon. - Crew set up, made wiper trip from bottom of liner to 3304 Ft. Cleaned out, started tripping out and laying down rod.

Monitor Well - Crew trip back in with 1" work pipe, tag cement plug at 2740.93 Ft. Waiting on Halliburton.

2/16/82 - Tue. - Crew tripping out laying down rod.

Monitor Well - Setting up getting ready to cement. Started cementing at 9:00 AM with 110 sacks Class H, 4% Bentonite = 32 barrels. Tag top of cement at 9:30 PM at 2506.78 Ft. Set up cemented with 110 sacks.

2/17/82 - Wed. - Crew finished tripping out of well. Waiting on pump for pump-out.

Monitor Well - Tag top of cement at 2290.95 Ft. Talked with Dr. Garcia. Ordered 64 sacks, Class H, 4% Bentonite. Cemented at 2190.63 Ft. Ordered 50 sacks Class H, 4%.

2/18/82 - Thur - Crew started setting up to set pump. Started tripping in with pump column for pump-out.

Monitor Well - Cement arrived on location. Cemented with 30 sacks

2/22/82 - continued-------

Class H, 4% Bentonite. Waiting to tag. Tag made at 9:45 PM. Top of cement is 2093.48 Ft.

2/19/81 - Fri. - Still setting up for pump out. Started pump-out at 5:30 PM till 1:30 AM. Rate 1970 GPM.

Monitor Well - Started tripping out 1" work pipe.

2/20/82 - Sat. - Removed pump from well at 12:10 PM. Larry Hayden arrived at 1:00 PM. Set up and run TV survey to a depth of 3305 Ft.

Monitor Well - Finished removing 1" work pipe.

smm

DAILY SHIFT REPORT

NOON

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 2/15/Fri
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INVESTIGATION Well.

Morning Shift 7:00 a.m. to 2:00 p.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
☐
☐

Depth
Start ____ ft.
End ____ ft.
Bit Size 8" in.
Recorded By: DEH.

Description of Operations: Crew on location set up and started making wiper Trip To bottom depth 3304 FT Pulled back cleaned out. Started Tripping out and laying down Rod.

MONITOR WELL.

Crew started going back in well with 1" work pipe The Top of Cement Plug AT 2740.93 FT

HALLIBURTON is set up for Tomorrow.

Evening Shift ____ p.m. to ____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
☐
☐

Depth
Start ____ ft.
End ____ ft.
Bit Size ____ in.
Recorded By: ____

Description of Operations: (NOT Crew)

DAILY SHIFT REPORT

Tues

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 2/16/82
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: Injection Well

Morning Shift 7:00 a.m. to 7:00 p.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
☐
☐

Depth
Start ____ ft.
End ____ ft.
Bit Size ____ in.
Recorded By: [illegible]

Description of Operations: Crew on location started tripping out of well. Monitor well. Crew set up and Halliburton started cementing with 110 sk's of Class H 4% Bentonite. This completed at 0900. Tag top at 9:00 PM to Nigel

Evening Shift ____ p.m. to ____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
☐
☐

Depth
Start ____ ft.
End ____ ft.
Bit Size ____ in.
Recorded By: ____

Description of Operations: Monitor well. Tag top of cement at 2506.78 FT at 9:20 P.M. Set up cemented with 110 sk's. Class H 4% Bentonite. Waiting to tag

DAILY SHIFT REPORT Wed.

CH2M HILL
Engineers

Project No.: FC15132.80 Date 2/11/82
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION WELL

Morning Shift 7:00 a.m. to 7:00 p.m.

Weather: Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
☐
☐

Depth
Start ft.
End ft.
Bit Size in.
Recorded By:

Description of Operations: Crew on location finish tripping out. Waiting on pump for pump out.

MONITOR WELL

Crew tag top of cement at 2290.95 FT talked w.t.b. Dr Chrica ordered 64 sk's Class H. 4% Bentonite. Cemented at 3:00 P.M. Waiting to tag.

Evening Shift ____ p.m. to ____ a.m.

Weather: Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
☐
☐

Depth
Start ft.
End ft.
Bit Size in.
Recorded By:

Description of Operations:

Tag top of cement at 3:00 P.M 2190.63 FT ordered 50 sk's Class H. 4% Bentonite.

DAILY SHIFT REPORT Thurs

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 2/18/82
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION Well

Morning Shift 7:00 a.m. to 1:00 p.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
☐
☐

Depth
Start ____ ft.
End ____ ft.
Bit Size ____ in.
Recorded By: ____

Description of Operations: Crew on location setting up and started tripping in with pump column to get pump for pump out

MONITOR WELL.

Cement arrived on location at 9:30 AM. Cemented with 30 sk's waiting to tag

Evening Shift ____ p.m. to ____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
☐
☐

Depth
Start ____ ft.
End ____ ft.
Bit Size ____ in.
Recorded By: ____

Description of Operations: MONITOR WELL.

TAG Top of Cement at 2093.48 FT

9:45 P.M.

DAILY SHIFT REPORT

FRI

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 2/19/82
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION WELL

Morning Shift 7:00 a.m. to 7:00 p.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: CREW STILL SETTING UP FOR PUMP OUT. STARTED PUMP OUT AT 5:30 P.M TILL 1:30 A.M RATE 1970 G.P.M.

PUMP OUT TIME
8 hrs TOTAL

MONITOR WELL.
CREW TRIPPING OUT 1" WORK P.P.
TOP OF CEMENT IS 2093.48 FT

Evening Shift _____ p.m. to _____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: _____

DAILY SHIFT REPORT SAT

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 9/20/82
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION WELL

Morning Shift 7:00 a.m. to 7:00 p.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
☐
☐

Depth
Start ____ ft.
End ____ ft.
Bit Size ____ in.
Recorded By: [illegible]

Description of Operations: Removed pump from well at 12:10 P.M, Harry Hayden arrived at 1:00 P.M set up and Run T.V. survey to a depth of 2305 FT

MONITOR WELL

Removed 1" work p.p.e

Evening Shift ____ p.m. to ____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
☐
☐

Depth
Start ____ ft.
End ____ ft.
Bit Size ____ in.
Recorded By: ____

Description of Operations:

CH2M HILL
engineers
planners
economists
scientists

SUMMARY OF ACTIVITIES

TO: Sandy Mitchell/City of Stuart
Hal Chittum Jr./Layne-Atlantic
John Guidry/DER, West Palm Beach
Fred Meyer/USGS, Miami
Abe Kreitman/SFWMD, West Palm Beach
Charles W. Pemble/DER, Port St. Lucie
Donnie McClaugherty/DER,Tallahassee
Cathy Cash/DER, Tallahassee
J. I. Garcia-Bengochea/CH2M Hill, Gainesville
Ross Sproul/CH2M Hill, Gainesville
Jeff Lehnen/CH2M Hill, Gainesville

FROM: David G. Snyder/CH2M Hill on Location, Stuart

DATE: February 26, 1982

SUBJECT: City of Stuart Injection Well Rehabilitation

PROJECT: FC15132.BO

2/21/82 - Sun. - Crew started cleaning up, plus setting up for injection test at 2500 gpm.

Monitor Well - Started setting up to develop monitor well.

2/22/82 - Mon. - Still setting up for injection test.

Monitor Well - Completed setting up pump check-out, pump rate, 30 gpm.

2/23/82 - Tue. - Completed setting up for injection test. Test will be run Wed.

Monitor Well - Started developing well at 8:00 AM at 30 gpm till 6:00 PM. Collecting samples every hour; conductivity, temp., clorides.

2/24/82 - Wed. - Started injection test at 11:35 AM. Shut down test at 7:35 PM. Pumping rate, 2200 gpm. 55 psi well head. Pressure 27 psi. Shut in well head pressure.

Monitor Well - Set up a Steven's Recorder on well.

This will be the last field report for this job. All that is left to do is clean up location.

smm

Gainesville Office
7201 N.W. 11th Place, P.O. Box 1647, Gainesville, Florida 32602 904/377-2442
In the Southeast, CH2M HILL (formerly known as Black, Crow and Eidsness)

DAILY SHIFT REPORT

SHN

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 2/21/82
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION WELL

Morning Shift 7:00 a.m. to 7:00 p.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: [illegible]

Description of Operations: CREW CLEANING UP TOOLS SETTING UP FOR INJECTION TEST 2500 GPM

MONITOR WELL.

STARTED SETTING PUMPS TO DEVELOP WELL.

Evening Shift _____ p.m. to _____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations:

DAILY SHIFT REPORT

MON

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 2/22/82
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION WELL

Morning Shift 7:00 a.m. to 7:00 p.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size OPEN in.
Recorded By: [illegible]

Description of Operations: STILL SETTING UP FOR INJECTION TEST

MONITOR WELL.

FINISH SETTING UP PUMP CHECKING PUMP RATE. 30 G.P.M.

Evening Shift _____ p.m. to _____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations:

DAILY SHIFT REPORT Thurs

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 2/23/84
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION WELL

Morning Shift 7:00 a.m. to 7:00 p.m.

Weather: Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: C.H.

Description of Operations: SETTING UP FOR INJECTION TEST WELL START TEST WED MORNING. MONITOR WELL. STARTED DEVELOPING WELL AT 8:00 A.M. 30 G.P.M. COLLECTING SAMPLES EVERY HOUR. RUN TEMP. CONDUCTIVITY & CHLORIDE.

Evening Shift _____ p.m. to _____ a.m.

Weather: Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
_____ ☐
_____ ☐

Depth
Start _____ ft.
End _____ ft.
Bit Size _____ in.
Recorded By: _____

Description of Operations: STARTED DEVELOPING AT 8:00 A.M. COMPLETED AT 6:00 P.M. TOTAL 10 HRS.

DAILY SHIFT REPORT Wed

CH2M HILL
Engineers

Project No.: FC15132.B0 Date 2/24/82
Client: City of Stuart, Florida
Contractor: Layne-Atlantic Company
Well No.: INJECTION WELL

Morning Shift 7:00 a.m. to 7:30 p.m.

Weather:
Fair ☑ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
☐
☐

Depth
Start ft.
End ft.
Bit Size in.
Recorded By:

Description of Operations: SET UP RIG & STARTED INJECTION TEST ON INJECTION WELL AT 11:35 A
SHUT TEST DOWN AT 7:35 P.M = 8 Hrs
PUMPING RATE 2200 G.P.M.
55 P.S.I. WELL HEAD PRESSURE
27 P.S.I SHUT IN HEAD.

MONITOR WELL
SET A STEVENS RECORDER ON WELL

Evening Shift ____ p.m. to ____ a.m.

Weather:
Fair ☐ Cloudy ☐ Rain ☐

Activity
Drilling ☐
Reaming ☐
Running Casing ☐
Cementing ☐
Testing ☐
Waiting ☐
☐
☐

Depth
Start ft.
End ft.
Bit Size in.
Recorded By:

Description of Operations: THIS WILL BE MY LAST FIELD REPORT ON THIS JOB. ALL I HAVE LEFT TO DO IS CLEAN UP LOCATION.

Appendix J
GEOPHYSICAL LOGS

IW-1 0006-0231

COMPANY	: FT. LAUDERDALE MIT SEF28551.	OTHER SERVICES:			
WELL	: IW-1 0006-0231	CALIPER			
LOCATION/FIELD	: FT. LAUDERDALE				
COUNTY	: BROWARD				
STATE	: FL				
SECTION	: 14	TOWNSHIP	: 50S	RANGE	: 42E
DATE	: 02/23/90	PERMANENT DATUM	: GL	ELEVATIONS	
DEPTH DRILLER	: 3520'	ELEV. PERM. DATUM:		KB	:
LOG BOTTOM	: 3522.00	LOG MEASURED FROM:	GL	DF	:
LOG TOP	: 1.00	DRL MEASURED FROM:	GL	GL	:
CASING DRILLER	: 2800	LOGGING UNIT	: 1		
CASING TYPE	: STEEL	FIELD OFFICE	: DFB		
CASING THICKNESS:	1.0	RECORDED BY	: C. DIGIACOMO		
BIT SIZE	: 23	BOREHOLE FLUID	: WATER	FILE	: ORIGINAL
MAGNETIC DECL.	: 7.5	RM	: 15	TYPE	: 9040A
MATRIX DENSITY	: 2.68	RM TEMPERATURE	: 80	LOG	: 2
FLUID DENSITY	: 1	MATRIX DELTA T	: 57	PLOT	: VELLUM 29
NEUTRON MATRIX	: LIMESTONE	FLUID DELTA T	: 210	THRESH:	30000
REMARKS	:				

FUID RESISTIVITY & TEMPERATURE ON INJECTION WELL
OBSERVER: SEAN SKEHAN

CH2M HILL

IW-1 0006-0231

COMPANY	: FT. LAUDERDALE MIT SEF28551.			OTHER SERVICES:			
WELL	: IW-1 0006-0231			TEMP			
LOCATION/FIELD	: FT. LAUDERDALE			FLRS RES			
COUNTY	: BROWARD						
STATE	: FL						
SECTION	: 14	TOWNSHIP	: 50S	RANGE	: 42E		
DATE	: 02/23/90	PERMANENT DATUM	: GL	ELEVATIONS			
DEPTH DRILLER	: 3520	ELEV. PERM. DATUM	:	KB	:		
LOG BOTTOM	: 3522.50	LOG MEASURED FROM	: GL	DF	:		
LOG TOP	: 0.50	DRL MEASURED FROM	: GL	GL	:		
CASING DRILLER	: 2800	LOGGING UNIT	: 1				
CASING TYPE	: STEEL	FIELD OFFICE	: DFB				
CASING THICKNESS	: 1.0	RECORDED BY	: C. DIGIACOMO				
BIT SIZE	: 23	BOREHOLE FLUID	: WATER	FILE	: ORIGINAL		
MAGNETIC DECL.	: 7.5	RM	: 15	TYPE	: CCAL3		
MATRIX DENSITY	: 2.68	RM TEMPERATURE	: 80	LOG	: 3		
FLUID DENSITY	: 1	MATRIX DELTA T	: 57	PLOT	: VELLUM 9		
NEUTRON MATRIX	: LIMESTONE	FLUID DELTA T	: 210	THRESH	: 30000		
REMARKS	:						

CALIPER ON INJECTION WELL
OBSERVER: SEAN SKEHAN

CH2M HILL

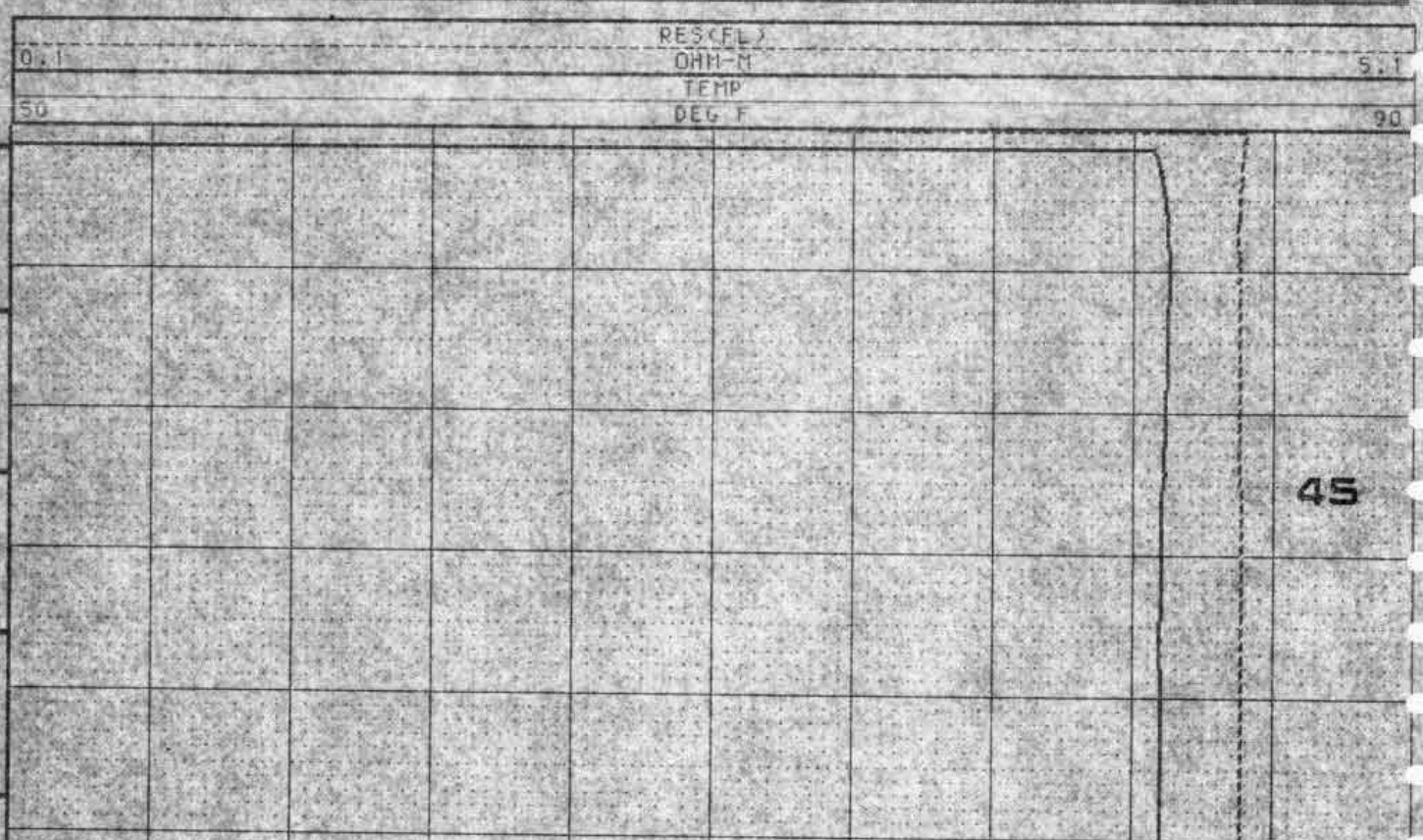
IW-2 0006-0230

COMPANY	: FT. LAUDERDALE MIT SEF28551.	OTHER SERVICES:	
WELL	: IW-2 0006-0230	CALIPER	
LOCATION/FIELD	: FT. LAUDERDALE		
COUNTY	: BROWARD		
STATE	: FL		
SECTION	: 14	TOWNSHIP : 50S	RANGE : 42E

DATE	: 02/22/90	PERMANENT DATUM	: GL	ELEVATIONS	
DEPTH DRILLER	: 3525	ELEV. PERM. DATUM:		KB	:
LOG BOTTOM	: 3522.00	LOG MEASURED FROM:	GL	DF	:
LOG TOP	: 2.00	DRL MEASURED FROM:	GL	GL	:
CASING DRILLER	: 2800	LOGGING UNIT	: 1		
CASING TYPE	: STEEL	FIELD OFFICE	: DFB		
CASING THICKNESS	: 1.0	RECORDED BY	: C. DIGIACOMO		

BIT SIZE	: 23	BOREHOLE FLUID	: WATER	FILE	: ORIGINAL
MAGNETIC DECL.	: 7.5	RM	: 15	TYPE	: 9040A
MATRIX DENSITY	: 2.68	RM TEMPERATURE	: 80	LOG	: 4
FLUID DENSITY	: 1	MATRIX DELTA T	: 57	PLOT	: VELLUM 29
NEUTRON MATRIX	: LIMESTONE	FLUID DELTA T	: 210	THRESH:	30000

REMARKS :
FLUID RESISTIVITY & TEMPERATURE ON INJECTION WELL
OBSERVER: SEAN SKEHAN



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MADE IN U.S.A.
CHART NO. WO
MADE IN U.S.A.

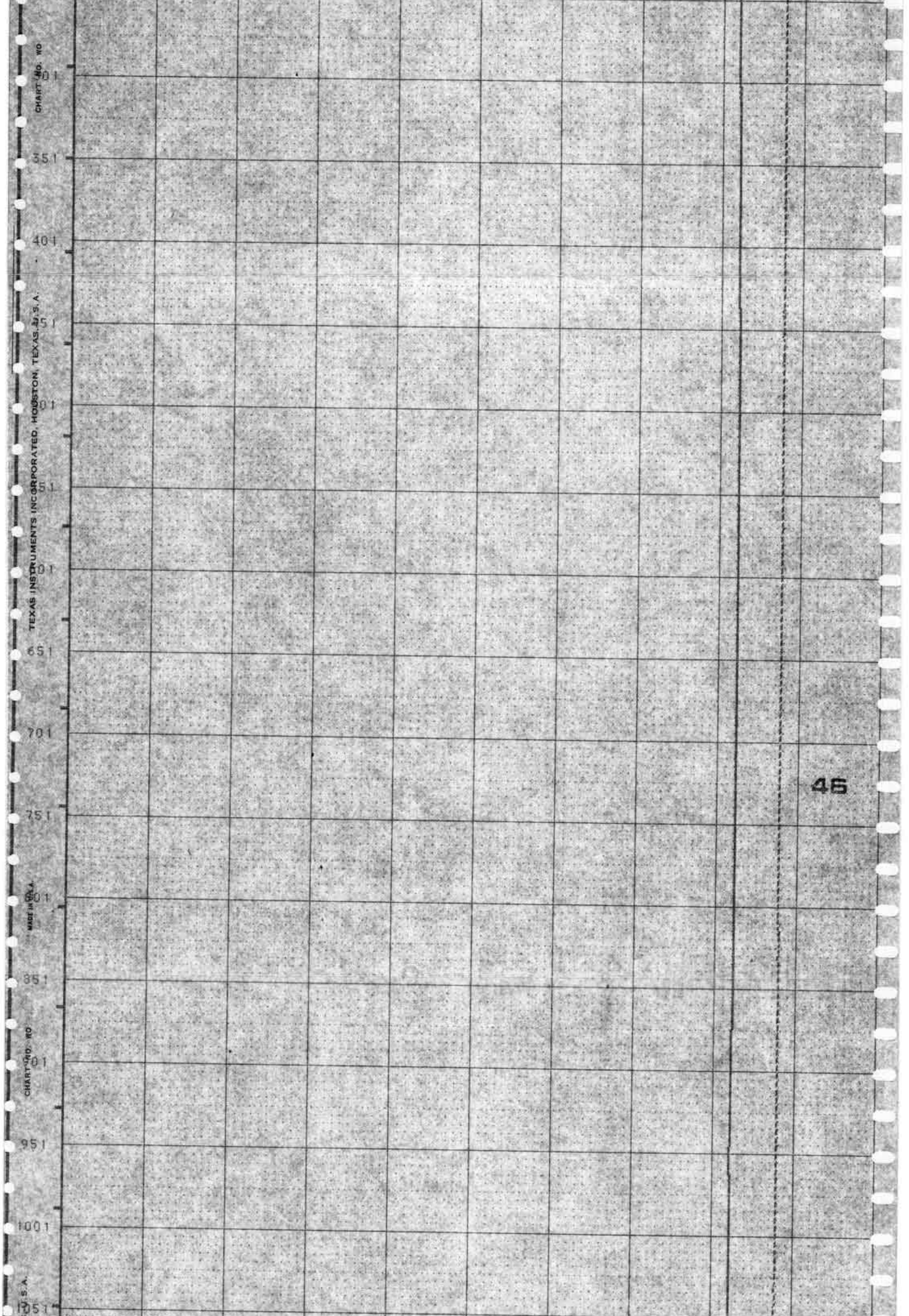
CHART NO. WO
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CHART NO. WO
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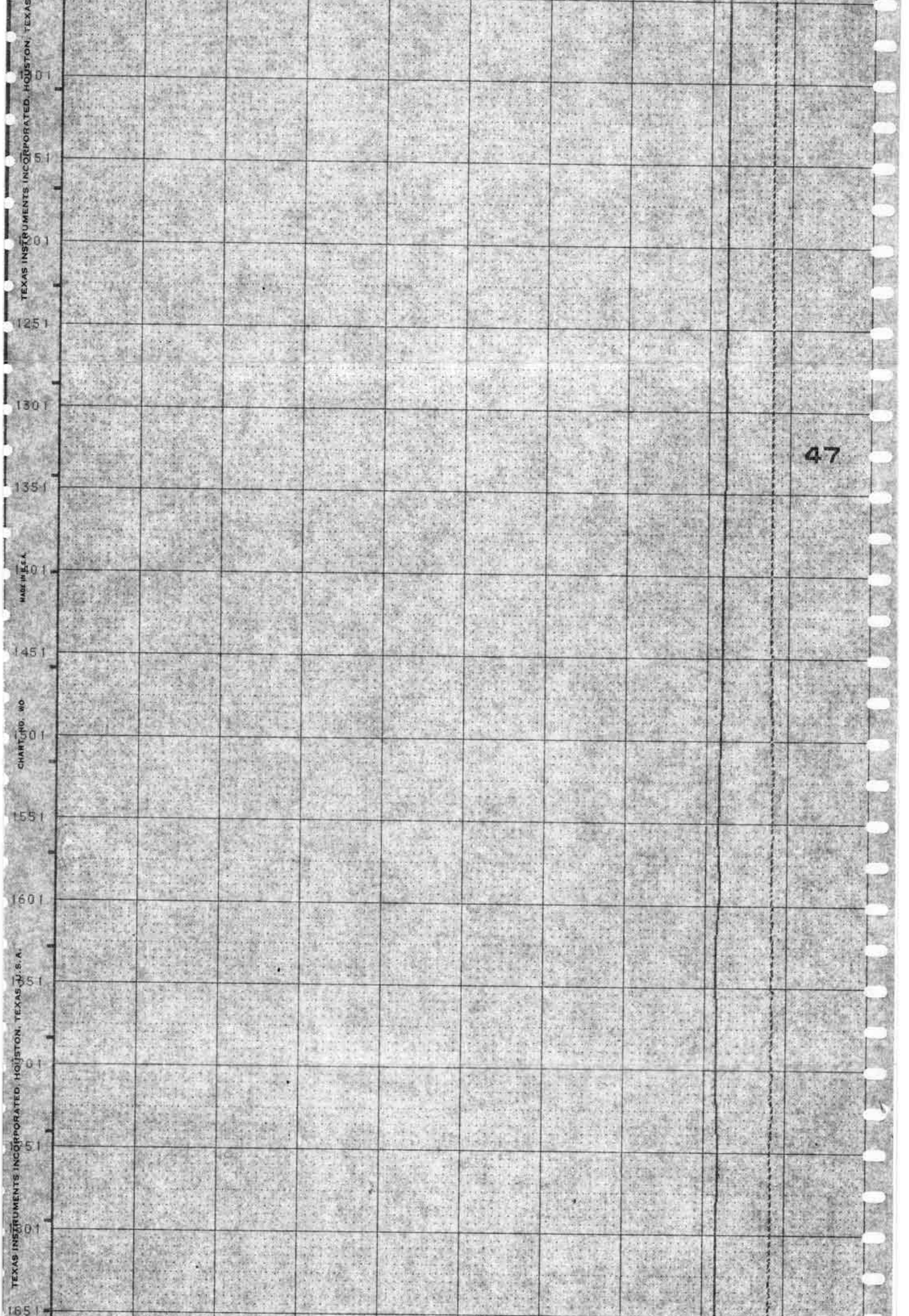
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CHART NO. 110
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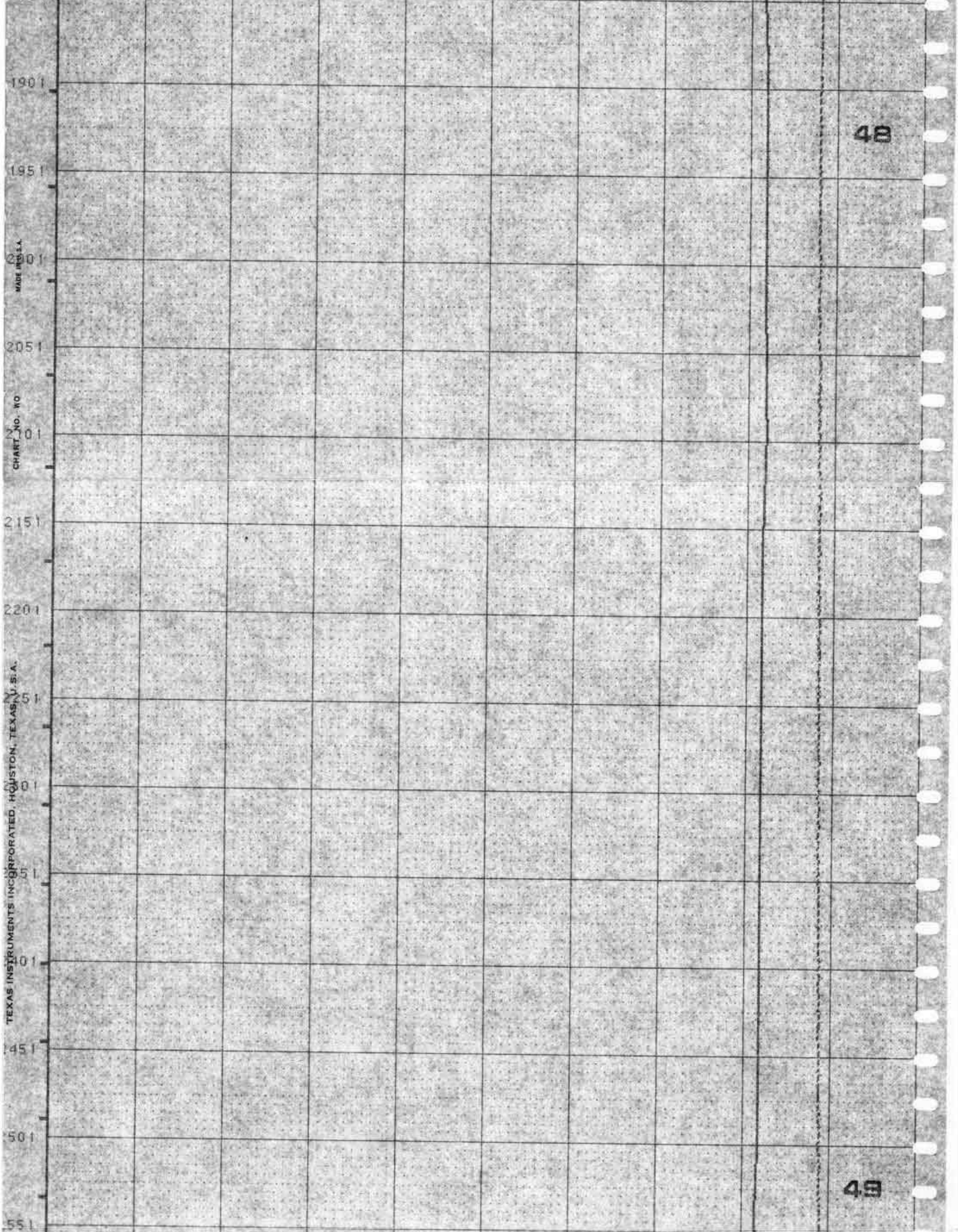
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CHART NO. 110
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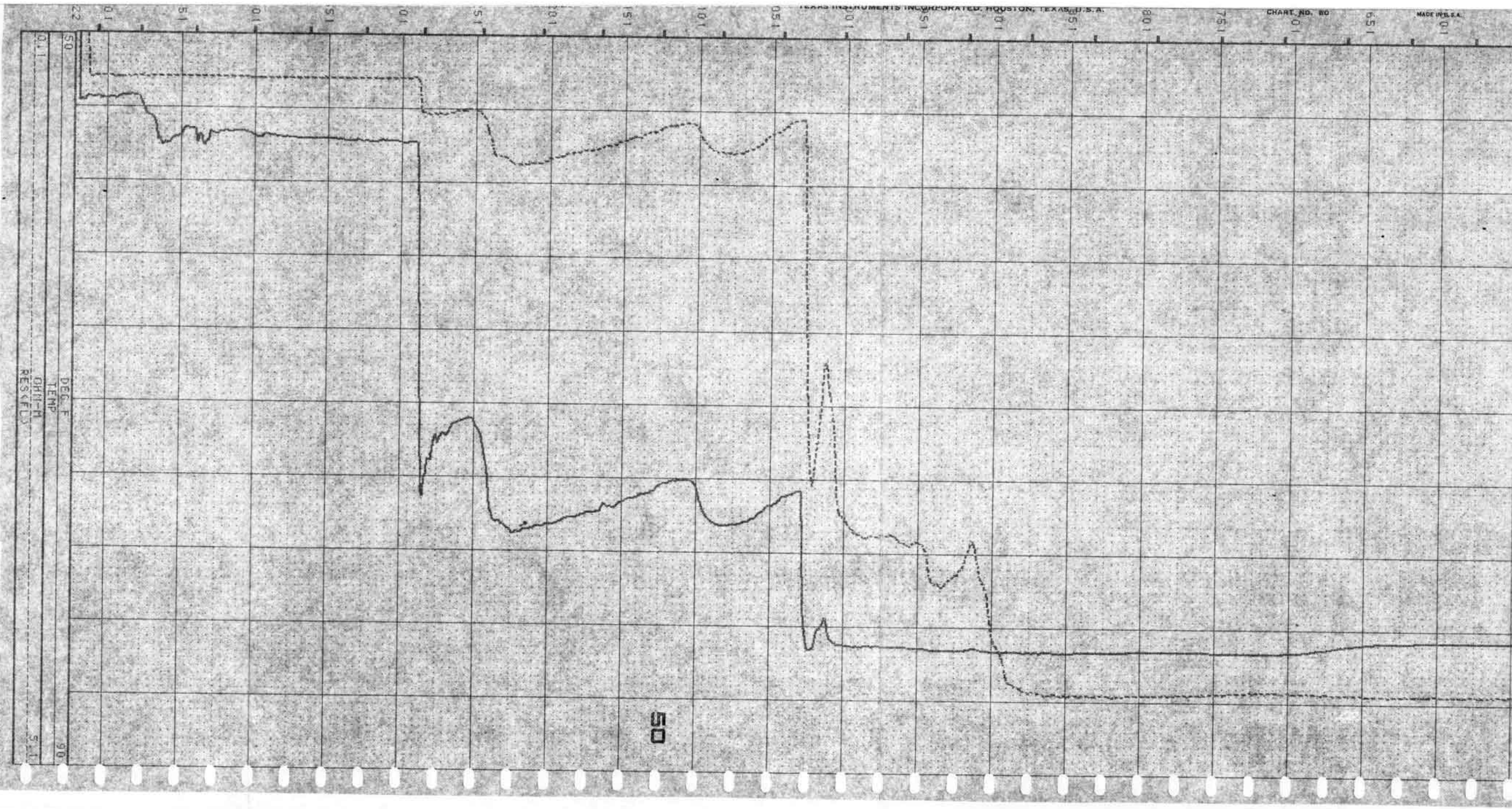
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CHART NO. 80
MADE IN U.S.A.
DEG. F
TEMP
OHM-M
RES(FL)
50

CH2M HILL

IW-2 0006-0230

COMPANY : FT. LAUDERDALE MIT SEF28551. OTHER SERVICES:
WELL : IW-2 0006-0230 TEMP
LOCATION/FIELD : FT. LAUDERDALE FLRS RES
COUNTY : BROWARD
STATE : FL
SECTION : 14 TOWNSHIP : 50S RANGE : 42E

DATE : 02/22/90 PERMANENT DATUM : GL ELEVATIONS
DEPTH DRILLER : 3525 ELEV. PERM. DATUM: KB :
LOG BOTTOM : 3522.50 LOG MEASURED FROM: GL DF :
LOG TOP : 0.50 DRL MEASURED FROM: GL GL :

CASING DRILLER : 2800 LOGGING UNIT : 1
CASING TYPE : STEEL FIELD OFFICE : DFB
CASING THICKNESS: 1.0 RECORDED BY : C. DIGIACOMO

BIT SIZE : 23 BOREHOLE FLUID : WATER FILE : ORIGINAL
MAGNETIC DECL. : 7.5 RM : 15 TYPE : CCAL3
MATRIX DENSITY : 2.68 RM TEMPERATURE : 80 LOG : 1
FLUID DENSITY : 1 MATRIX DELTA T : 57 PLOT : VELLUM 3
NEUTRON MATRIX : LIMESTONE FLUID DELTA T : 210 THRESH: 30000
REMARKS :
CALIPER ON INJECTION WELL
OBSERVER: SEAN SKEHAN

CH2M HILL

IW-3 0006-0229

COMPANY	: FT. LAUDERDALE MIT SEF28551.	OTHER SERVICES:			
WELL	: IW-3 0006-0229	TEMP			
LOCATION/FIELD	: FT. LAUDERDALE	FLRS RES			
COUNTY	: BROWARD				
STATE	: FL				
SECTION	: 14	TOWNSHIP	: 50S	RANGE	: 42E
DATE	: 02/21/90	PERMANENT DATUM	: GL	ELEVATIONS	
DEPTH DRILLER	: 4010	ELEV. PERM. DATUM:		KB	:
LOG BOTTOM	: 3926.50	LOG MEASURED FROM:	GL	DF	:
LOG TOP	: 1.00	DRL MEASURED FROM:	GL	GL	:
CASING DRILLER	: 2800	LOGGING UNIT	: 1		
CASING TYPE	: STEEL	FIELD OFFICE	: DFB		
CASING THICKNESS	: 1.0	RECORDED BY	: C. DIGIACOMO		
BIT SIZE	: 23	BOREHOLE FLUID	: WATER	FILE	: ORIGINAL
MAGNETIC DECL.	: 7.5	RM	: 15	TYPE	: CCAL3
MATRIX DENSITY	: 2.68	RM TEMPERATURE	: 80	LOG	: 7
FLUID DENSITY	: 1	MATRIX DELTA T	: 57	PLOT	: VELLUM 3
NEUTRON MATRIX	: LIMESTONE	FLUID DELTA T	: 210	THRESH:	30000

REMARKS :

CALIPER ON INJECTION WELL *RAN OUT OF CABLE? NOT TD!*

OBSERVER: SEAN SKEHAN

28

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35

CH2M HILL

IW-5 0006-0228

COMPANY	: FT. LAUDERDALE MIT SEF28551.		OTHER SERVICES:		
WELL	: IW-5 0006-0228		TEMP		
LOCATION/FIELD	: FT. LAUDERDALE		FLR RES		
COUNTY	: BROWARD				
STATE	: FL				
SECTION	: 14	TOWNSHIP	: 50S	RANGE	: 42E
DATE	: 02/20/90	PERMANENT DATUM	: GL	ELEVATIONS	
DEPTH DRILLER	: 3480	ELEV. PERM. DATUM	:	KB	:
LOG BOTTOM	: 3472.50	LOG MEASURED FROM	: GL	DF	:
LOG TOP	: 6.00	DRL MEASURED FROM	: GL	GL	:
CASING DRILLER	: 2820	LOGGING UNIT	: 1		
CASING TYPE	: STEEL	FIELD OFFICE	: DFB		
CASING THICKNESS	: 1.0	RECORDED BY	: C. DIGIACOMO		
BIT SIZE	: 23	BOREHOLE FLUID	: WATER	FILE	: ORIGINAL
MAGNETIC DECL.	: 7.5	RM	: 15	TYPE	: CCAL3
MATRIX DENSITY	: 2.68	RM TEMPERATURE	: 80	LOG	: 0
FLUID DENSITY	: 1	MATRIX DELTA T	: 57	PLOT	: VELLUM 3
NEUTRON MATRIX	: LIMESTONE	FLUID DELTA T	: 210	THRESH	: 30000

REMARKS :
CALIPER ON INJECTION WELL
OBSERVER: SEAN SKEHAN

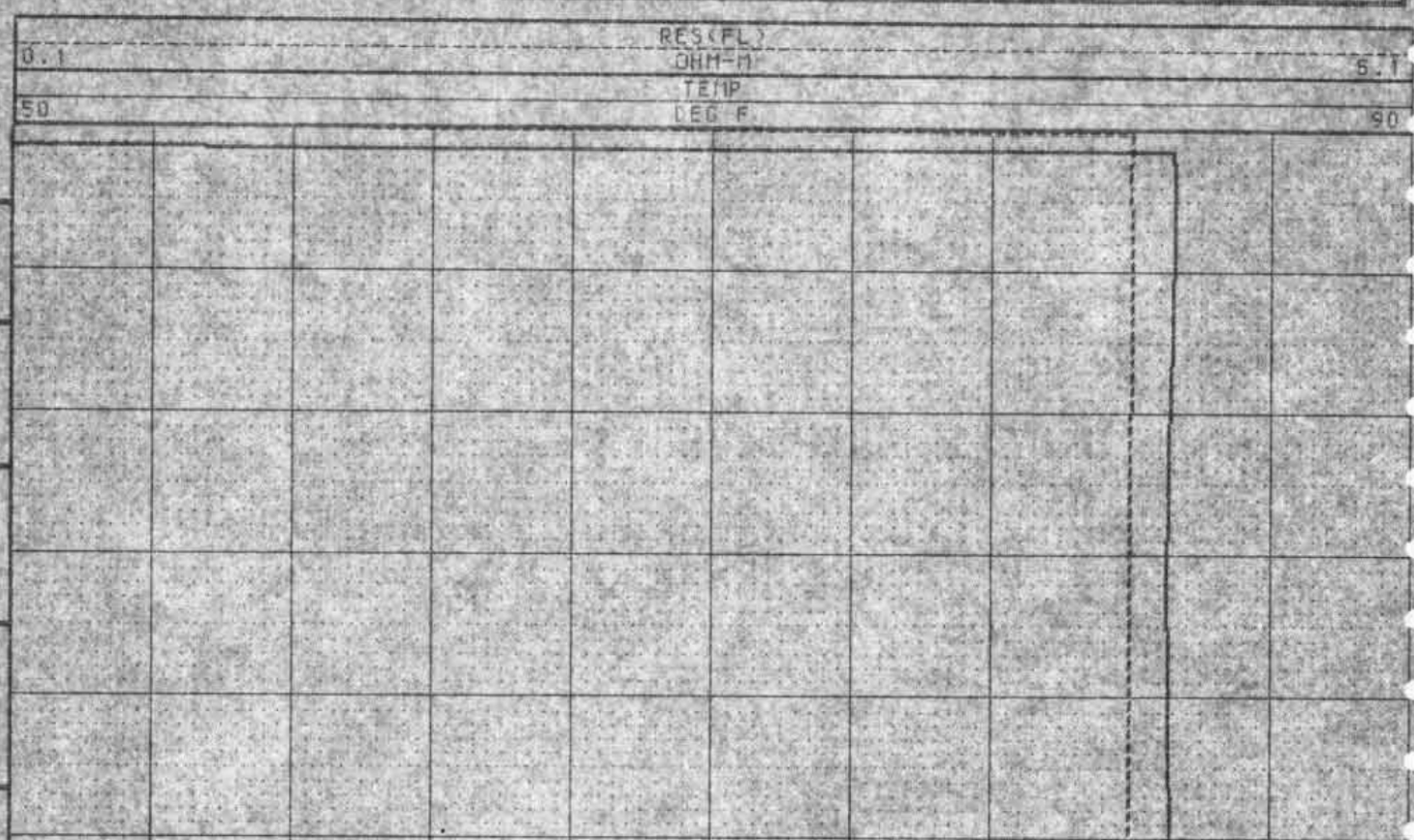
CH2M HILL

IW-5 0006-0228

COMPANY	: FT. LAUDERDALE MIT SEF28551.		OTHER SERVICES:		
WELL	: IW-5 0006-0228		CALIPER		
LOCATION/FIELD	: FT. LAUDERDALE				
COUNTY	: BROWARD				
STATE	: FL				
SECTION	: 14	TOWNSHIP	: 50S	RANGE	: 42E
DATE	: 02/20/90	PERMANENT DATUM	: GL	ELEVATIONS	
DEPTH DRILLER	: 3480	ELEV. PERM. DATUM:		KB	:
LOG BOTTOM	: 3470.00	LOG MEASURED FROM:	GL	DF	:
LOG TOP	: 1.00	DRL MEASURED FROM:	GL	GL	:
CASING DRILLER	: 2820	LOGGING UNIT	: 1		
CASING TYPE	: STEEL	FIELD OFFICE	: DFB		
CASING THICKNESS	: 1.0	RECORDED BY	: C. DIGIACOMO		
BIT SIZE	: 23	BOREHOLE FLUID	: WATER	FILE	: ORIGINAL
MAGNETIC DECL.	: 7.5	RM	: 15	TYPE	: 9040A
MATRIX DENSITY	: 2.68	RM TEMPERATURE	: 80	LOG	: 5
FLUID DENSITY	: 1	MATRIX DELTA T	: 57	PLOT	: VELLUM 29
NEUTRON MATRIX	: LIMESTONE	FLUID DELTA T	: 210	THRESH	: 30000

REMARKS :
FLUID RESISTIVITY & TEMPERATURE ON INJECTION WELL
OBSERVER: SEAN SKEHAN

3B



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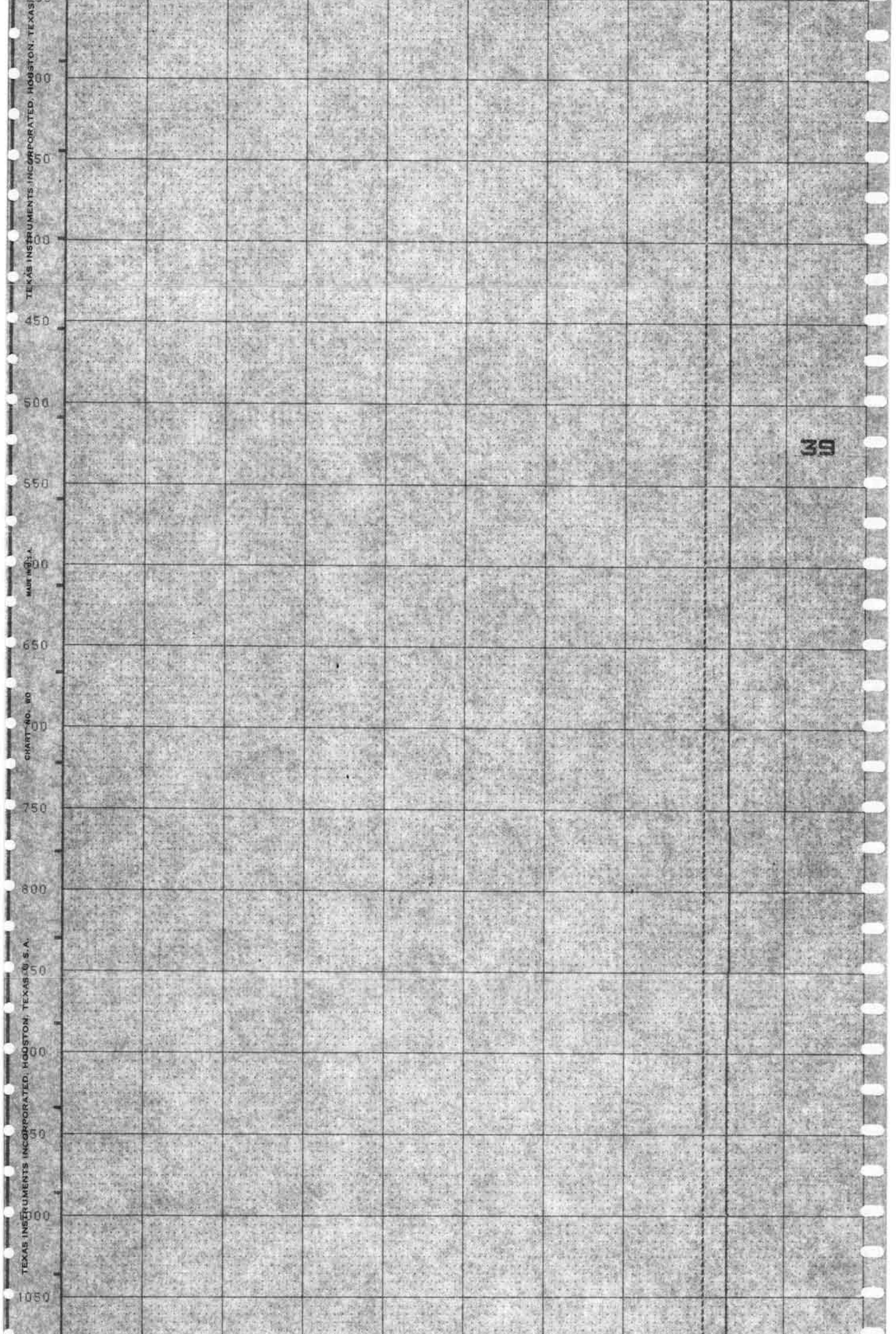
MADE IN U.S.A.
CHART NO. 80


TEXAS INSTRUMENTS INCORPORATED, HOUSTON, TEXAS
MADE IN U.S.A.
CHART NO. 90
TEXAS INSTRUMENTS INCORPORATED, HOUSTON, TEXAS
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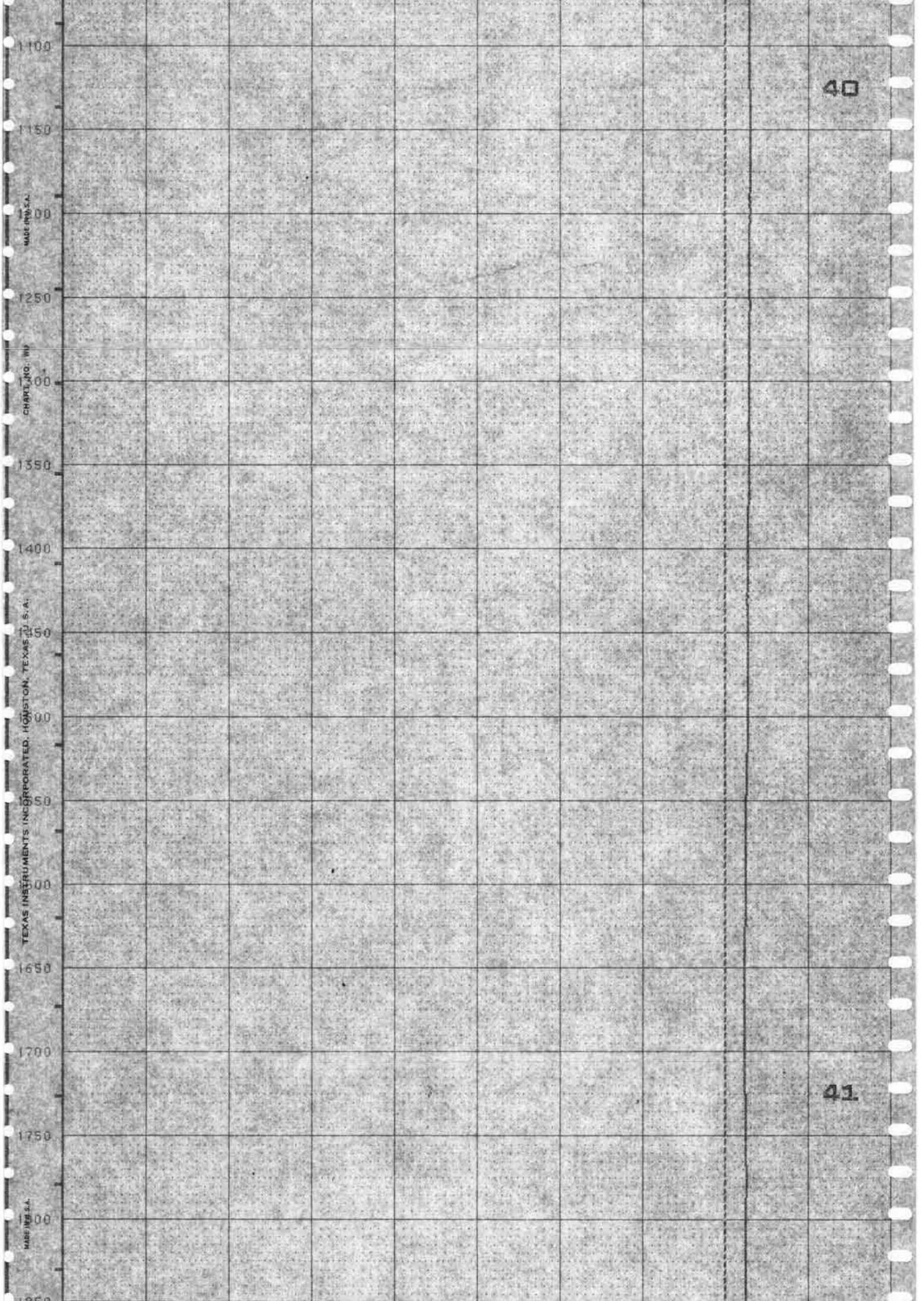
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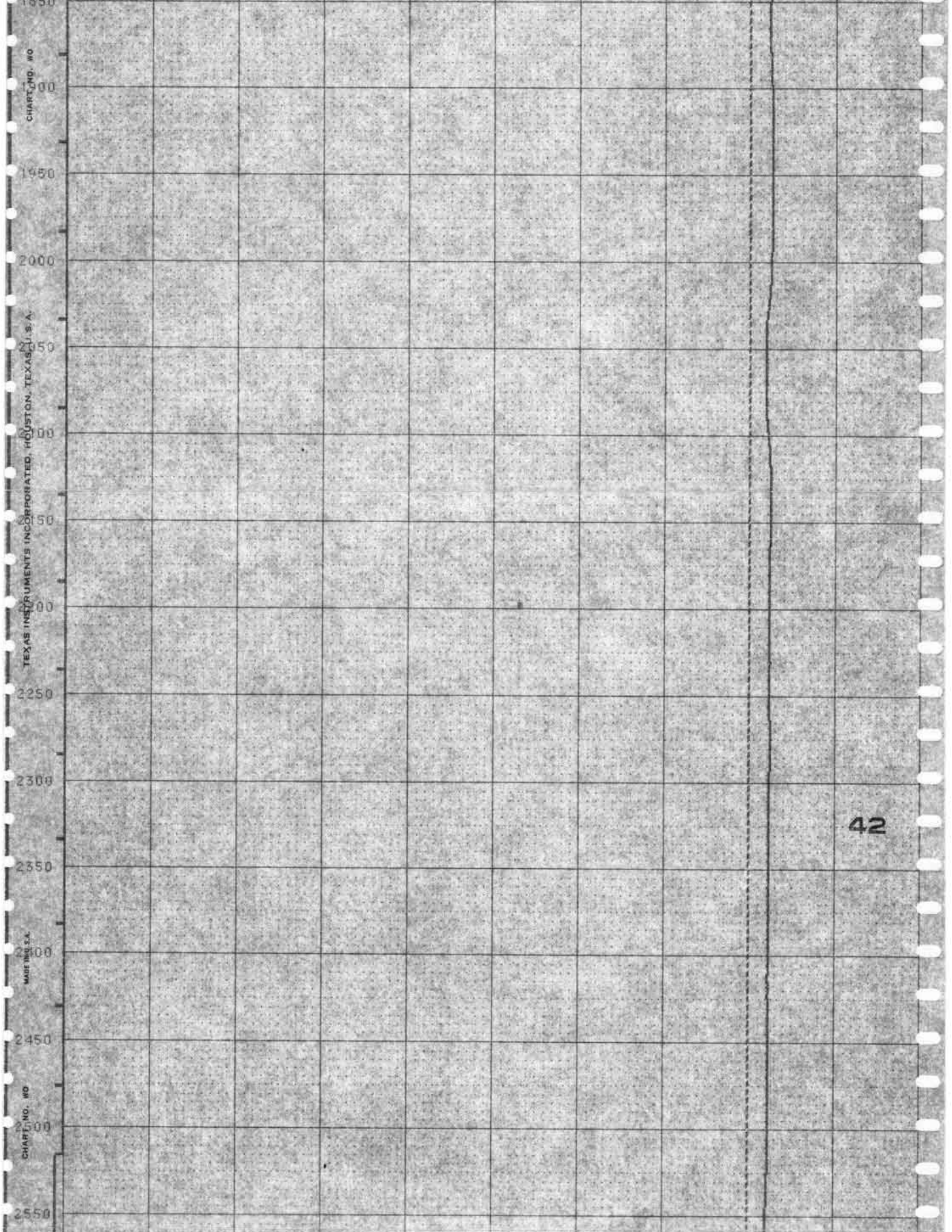
CHART NO. W
MADE IN U.S.A.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2450
2500
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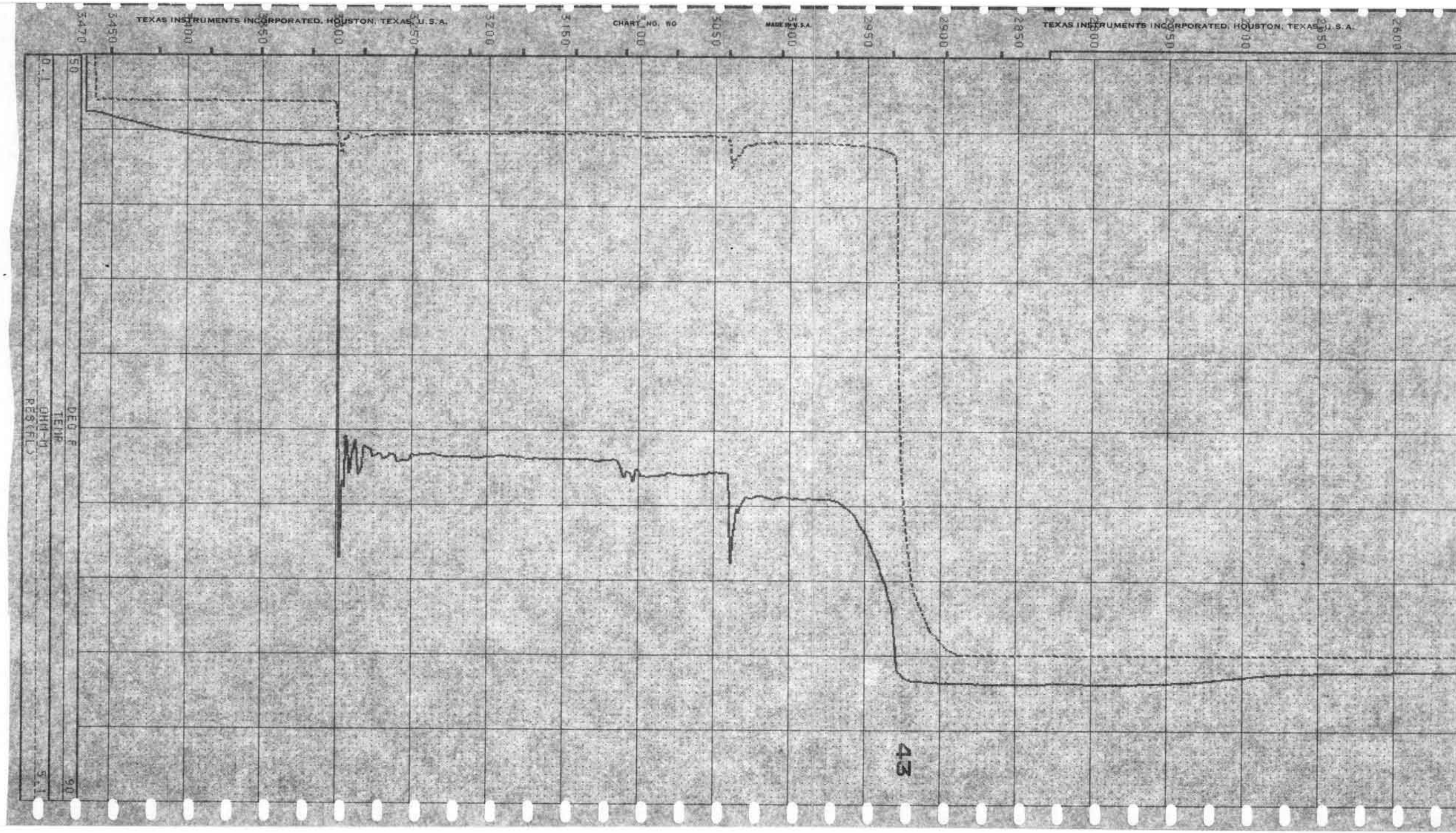
CHART NO. WO
TEXAS INSTRUMENTS INCORPORATED, HOUSTON, TEXAS, U.S.A.
MADE IN U.S.A.
CHART NO. WO
42


TEXAS INSTRUMENTS INCORPORATED, HOUSTON, TEXAS, U.S.A.
CHART NO. 80
MADE IN U.S.A.
TEXAS INSTRUMENTS INCORPORATED, HOUSTON, TEXAS, U.S.A.
3470
3450
3400
3350
3300
3250
3200
3150
3100
3050
3000
2950
2900
2850
2800
2750
2700
2650
2600
DEG F
TEMP
OHM-M
RES(FL)
50
90
0.1
5.1