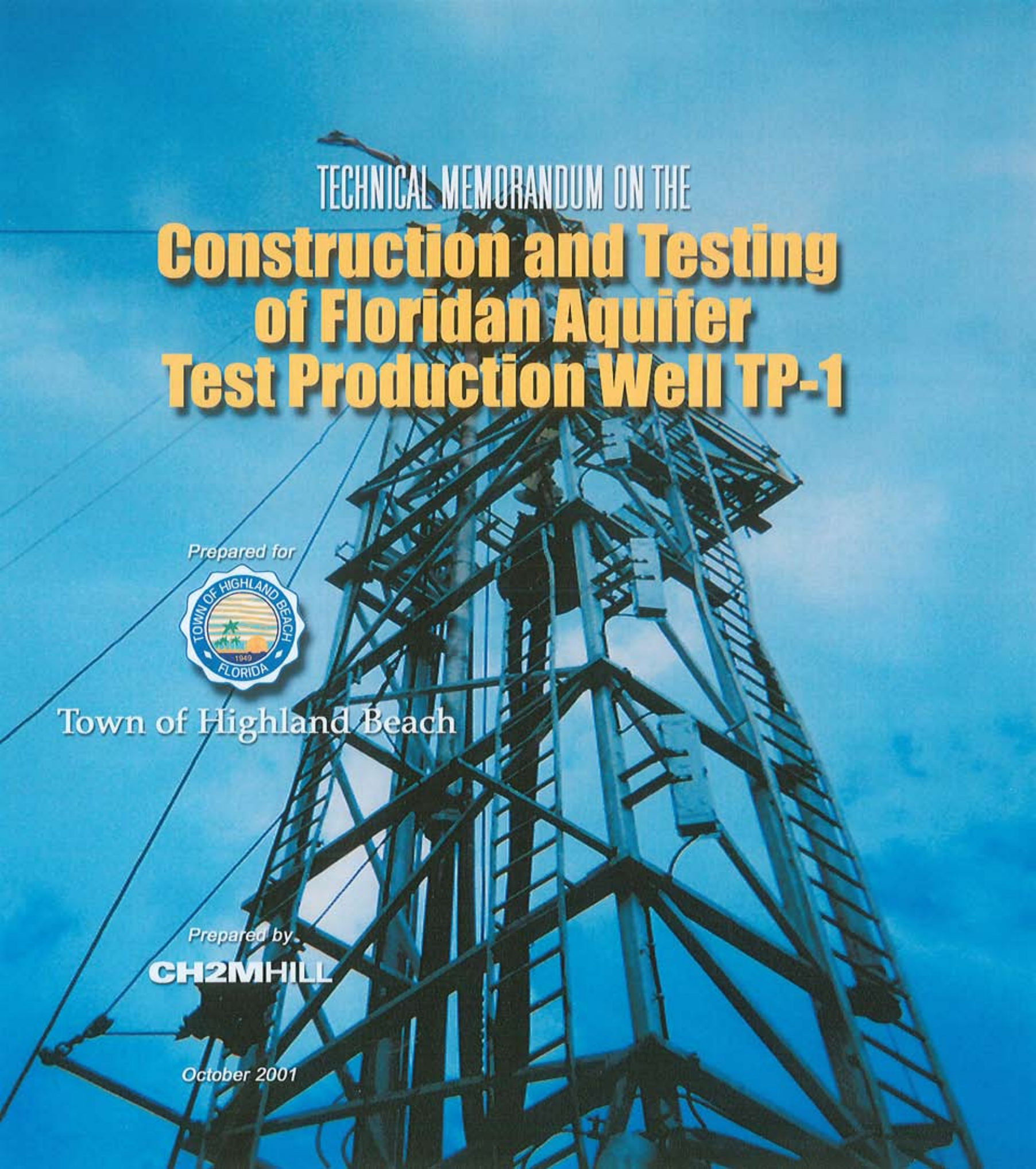


TECHNICAL MEMORANDUM ON THE
Construction and Testing of Floridan Aquifer Test Production Well TP-1

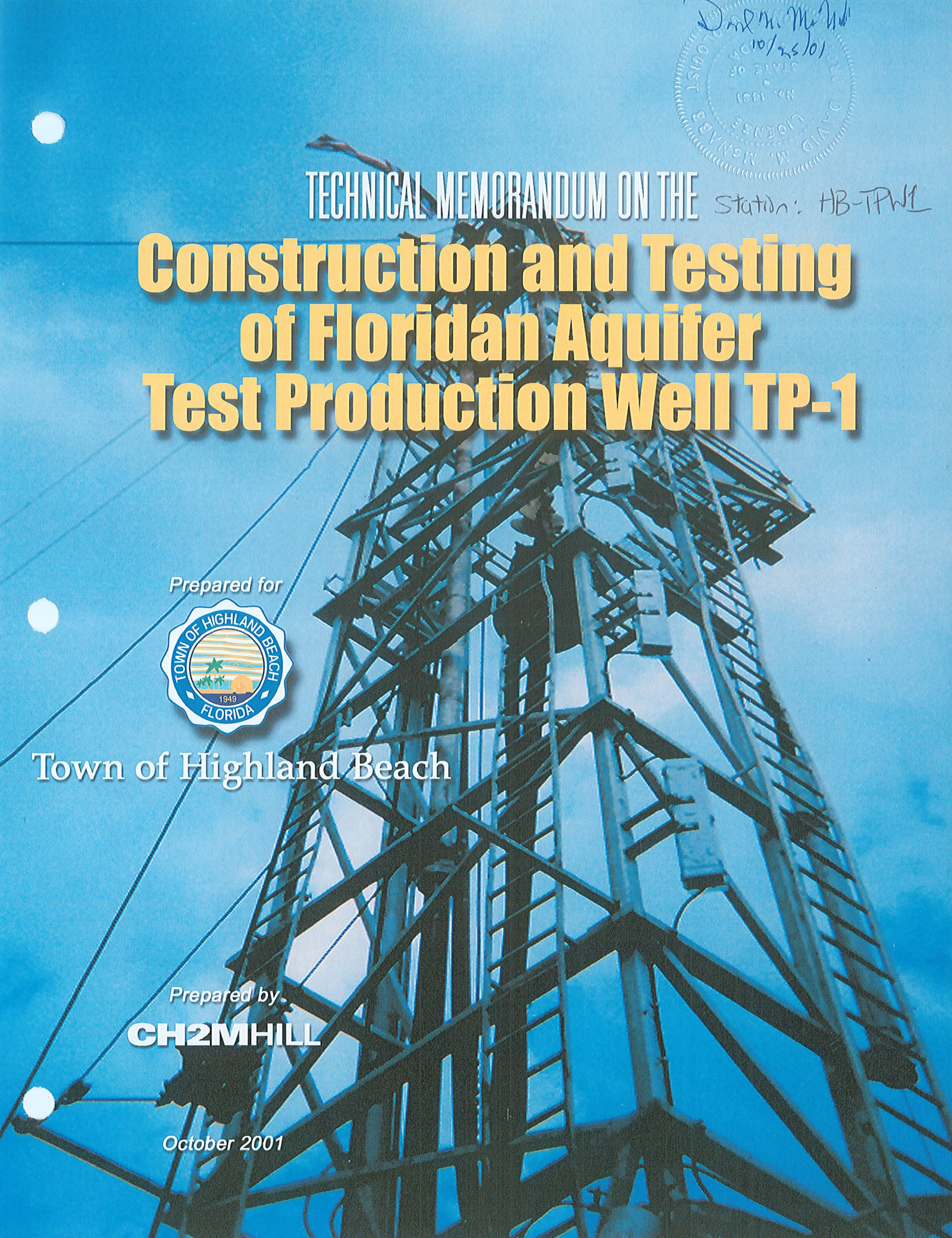
Prepared for

Town of Highland Beach

Prepared by

CH2MHILL

October 2001



TECHNICAL MEMORANDUM ON THE
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October 2001

Construction and Testing of the Town of Highland Beach Floridan Aquifer Test Production Well

PREPARED FOR: Ben Saag/Highland Beach

PREPARED BY: David McNabb

COPIES: David Schuman/CH2M HILL

DATE: October 5, 2001

Introduction

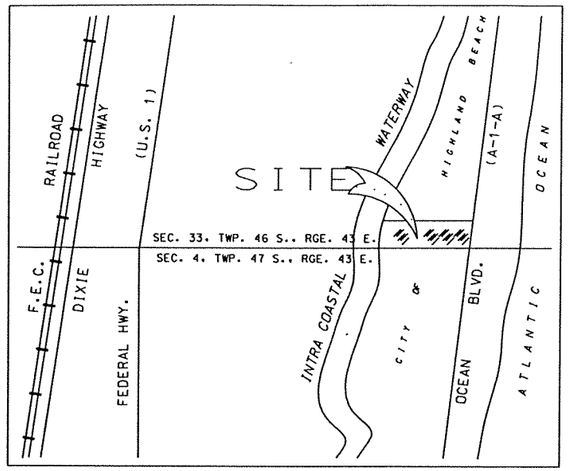
The Floridan aquifer is a sustainable, reliable source of drinking water with stable quality and a minimal risk of contamination. Though it is a brackish water supply that requires the Reverse Osmosis (RO) process to meet drinking water standards, it offers a more consistent supply than the Town's current source: water from the surficial aquifer. The Town of Highland Beach is planning to construct a RO water treatment plant (WTP) for production of drinking water taken from the Floridan aquifer. Two supply wells will be constructed into the upper Floridan aquifer to supply the raw water to the WTP. The WTP and these wells will eliminate or reduce the Town's demand on the surficial aquifer and ensure a more reliable water supply for the Town's future.

The proposed WTP will have a design capacity of 2.25 million gallons per day (mgd) with capability for ultimate build-out to 2.75 mgd. The WTP and associated supply wells will be constructed behind the Town Hall building at 3614 South Ocean Boulevard, Highland Beach, Florida. Figure 1 shows the project location map and site plan showing the proposed WTP, the location of TP-1, and the proposed location of the second production well (P-2).

The Town has constructed a Floridan aquifer Test Production well (TP-1). The purpose of constructing TP-1 was to obtain the following information:

- Depth of the top of the artesian aquifer
- Thickness and character of the overlying confining beds
- Water quality of the Floridan aquifer at different depths
- Potential yield of the artesian aquifer at different depths
- Potentiometric head of the artesian aquifer
- Preliminary aquifer characteristics (transmissivity and storativity)

This report details the construction and testing of test production well TP-1 including the results of testing during construction and a subsequent pumping test. TP-1 will be converted to one of the two Floridan aquifer supply wells (P-1) upon completion of the WTP. TP-1 was constructed in accordance with the conditions set forth in South Florida



LOCATION SKETCH
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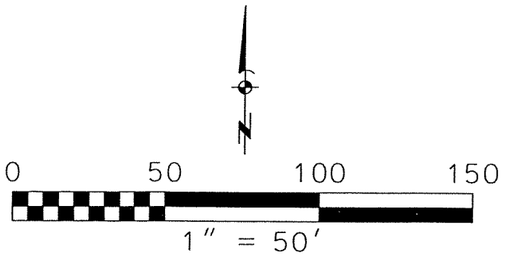

Figure 1
Project Location Map
and
Site Plan

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Water Management District (SFWMD) Water Well Construction Permit #SF030201C. Floridan aquifer water produced from the well during testing was discharged to the Intracoastal Waterway as allowed by the Florida Department of Environmental Protection (FDEP) Generic Permit for the Discharge of Produced Ground Water from any Non-Contaminated Site Activity. A copy of the SFWMD permit and the FDEP Generic Permit with associated correspondence is provided in Appendix A.

Construction of TP-1

The TP-1 drilling schedule and casing setting depth were designed to conform to the hydrogeological features observed at the site. Geologic formation samples were collected at 10-foot intervals during the drilling of the pilot hole. Sample collection used mud rotary and reverse-air drilling techniques. Formation samples were collected at 5-foot intervals using the dual-tube reverse-air drilling technique. Data from the pilot hole interval (formation samples [cuttings] and geophysical logs) were evaluated to provide the basis for describing the geologic formations encountered, to assist in selecting the casing setting depth, and to interpret the site lithology and hydrogeology. Following collection of pilot hole data, the pilot hole was reamed to the specified diameter for the selected casing setting depth.

Construction of TP-1 began on March 7, 2001, with the drilling of a 7-inch diameter test hole to a depth of 190 feet below land surface (bls). The test hole was drilled using the dual-tube reverse-air method to allow collection of continuous formation samples and discrete water quality samples. Data from the test hole were utilized to assist in developing a hydrogeologic profile for the upper 190 feet of the subsurface at the site. The hydrogeologic profile assisted in the site evaluation for the construction of a Class V injection well system that will be utilized for disposal of RO concentrate from the WTP.

Following completion of drilling the test hole to 190 feet bls and sample collection, the dual-tube reverse-air drill rig was removed from the site and the hole underwent geophysical logging. Logs performed include caliper, gamma ray, dual-induction, and spontaneous potential. Copies of the geophysical logs are provided in Appendix B.

Upon completion of the test hole, a 34-inch diameter steel surface casing was vibrated into place to a depth of 35 feet bls. The surface casing was installed to ensure that unconsolidated and unstable sands in the shallow subsurface did not collapse into the borehole during subsequent drilling operations.

A conventional drill rig was then mobilized to the site, and an interval from land surface to 273 feet bls was drilled with a nominal 11-inch diameter drill bit using the mud rotary technique. Formation samples were collected at 10-foot intervals during drilling. The borehole underwent caliper, gamma ray, dual-induction, and spontaneous potential geophysical logging after drilling had reached a depth of 273 feet bls.

The 11-inch pilot hole was then reamed to a nominal 32-inch diameter to a depth of 245 feet bls. The 26-inch diameter intermediate casing was then installed to a depth of 240 feet bls after conducting a caliper log on the reamed hole. The intermediate casing was then cemented into place in three stages. Table 1 provides a summary of the type and quantity of cement used to cement the intermediate casing in place.

TABLE 1
Intermediate Casing Cementing Summary

Date	Cement Stage	Type of Cement	Quantity of Cement
3/10/2001	#1	Neat	413 cubic feet
3/11/2001	#2	Neat with 6 percent bentonite	592 cubic feet
3/12/2001	#3	Neat with 4 percent bentonite	152 cubic feet

Construction of TP-1 resumed with the drilling of a nominal 11-inch diameter pilot hole to a depth of 1,100 feet bls using the mud rotary technique. The pilot hole then underwent geophysical logging to provide information regarding the geology and hydrogeology of the site. Geophysical logs performed include caliper, gamma ray, dual-induction, and spontaneous potential. Copies of the geophysical logs are provided in Appendix B.

Based on the information from the pilot hole, a final casing string setting depth of 1,027 feet bls was selected. The pilot hole was then reamed to a nominal 24-inch diameter to a depth of 1,032 feet bls prior to conducting a caliper log on the reamed hole. Table 2 provides a summary of the type and quantity of cement used to cement the final casing in place.

TABLE 2
Final Casing Cementing Summary

Date	Cement Stage	Type of Cement	Quantity of Cement
5/2/2001	#1	Neat	177 cubic feet
		Neat with 6 percent bentonite	318 cubic feet
5/4/2001	#2	Neat with 6 percent bentonite	557 cubic feet
5/7/2001	#3	Neat with 6 percent bentonite	239 cubic feet

Pilot hole drilling then took place over the interval from the base of the final casing string (1,027 feet bls) to a depth of 1,460 feet bls using the closed circulation, reverse-air drilling technique. The reverse-air drilling technique was utilized to avoid the potential of plugging productive intervals with drilling mud during the drilling process. Closed circulation prevented the production of large quantities of Florida aquifer water ultimately requiring discharge to the Intracoastal Waterway.

The pilot hole underwent geophysical logging after drilling to a depth of 1,465 feet bls. Geophysical logs performed include caliper, gamma ray, dual-induction, and spontaneous potential. Copies of the geophysical logs are provided in Appendix B. Based on the geophysical logging data, the following intervals were selected for packer testing:

- 1,290 to 1,460 feet bls

- 1,030 to 1,290 feet bls
- 1,030 to 1,200 feet bls
- 1,030 to 1,110 feet bls

Packer testing was conducted to obtain water quality and aquifer performance data for each of the selected test intervals. The packer testing results are discussed below.

Results of packer testing and geophysical logging data indicated that the interval from the base of pilot hole (1,460 feet bls) to approximately 1,200 feet bls was for the most part non-productive and contained relatively poor quality water when compared with the remainder of the pilot hole. Therefore, the pilot hole from 1,460 to 1,200 feet bls was back-plugged with neat cement. The open hole interval was then reamed to a nominal 17-inch diameter prior to fully developing the well. A 72-hour aquifer performance test was performed on TP-1 following completion of well development. Water produced during the aquifer performance test was discharged directly to the Intracoastal Waterway after ensuring that the water met the water quality requirements of the FDEP Generic Permit.

Geophysical logging of the open hole interval of the well took place following removal of the aquifer performance test pump from the well. Logs performed include caliper, gamma ray, daul-induction, and spontaneous potential.

The TP-1 wellhead was then installed and a concrete pad was constructed around the well. Figure 2 provides a completion diagram of TP-1. Figure 3 provides a wellhead diagram of TP-1.

Geologic and Hydrogeologic Framework

Groundwater in Palm Beach County's aquifer systems is developed within a thick carbonate platform with overlies the Early Jurassic (approximately 190 million years old). Sediments within the carbonate platform range in age from Early Jurassic to Holocene. The sediments consist primarily of carbonates and Miocene age siliciclastics. The aquifer systems in Palm Beach County exist in sediments ranging in age from late Paleocene (55 million years old) to Recent and include the Floridan aquifer system and the Surficial aquifer system. In general, groundwater within each of the aquifer systems becomes more saline with depth.

Due to its proximity to the Atlantic Ocean, groundwater in the Surficial aquifer at Highland Beach has a salinity level similar to that of seawater. Testing conducted during construction of TP-1 demonstrated the absence of potable water or an Underground Source of Drinking Water (USDW) within the Surficial aquifer at the site.

Figure 4 provides a stratigraphic profile of the site based on the correlation of formation samples with geophysical logs. Strata encountered during construction of TP-1 range in age from Recent to Eocene Age deposits. Each of the formations encountered are described below.

Undifferentiated Recent Sediments

The interval from land surface to 17 feet bls is made up of Recent unconsolidated quartz-rich sands and organic-rich soil. The base of the ecent sediments consists of a 7-foot thick

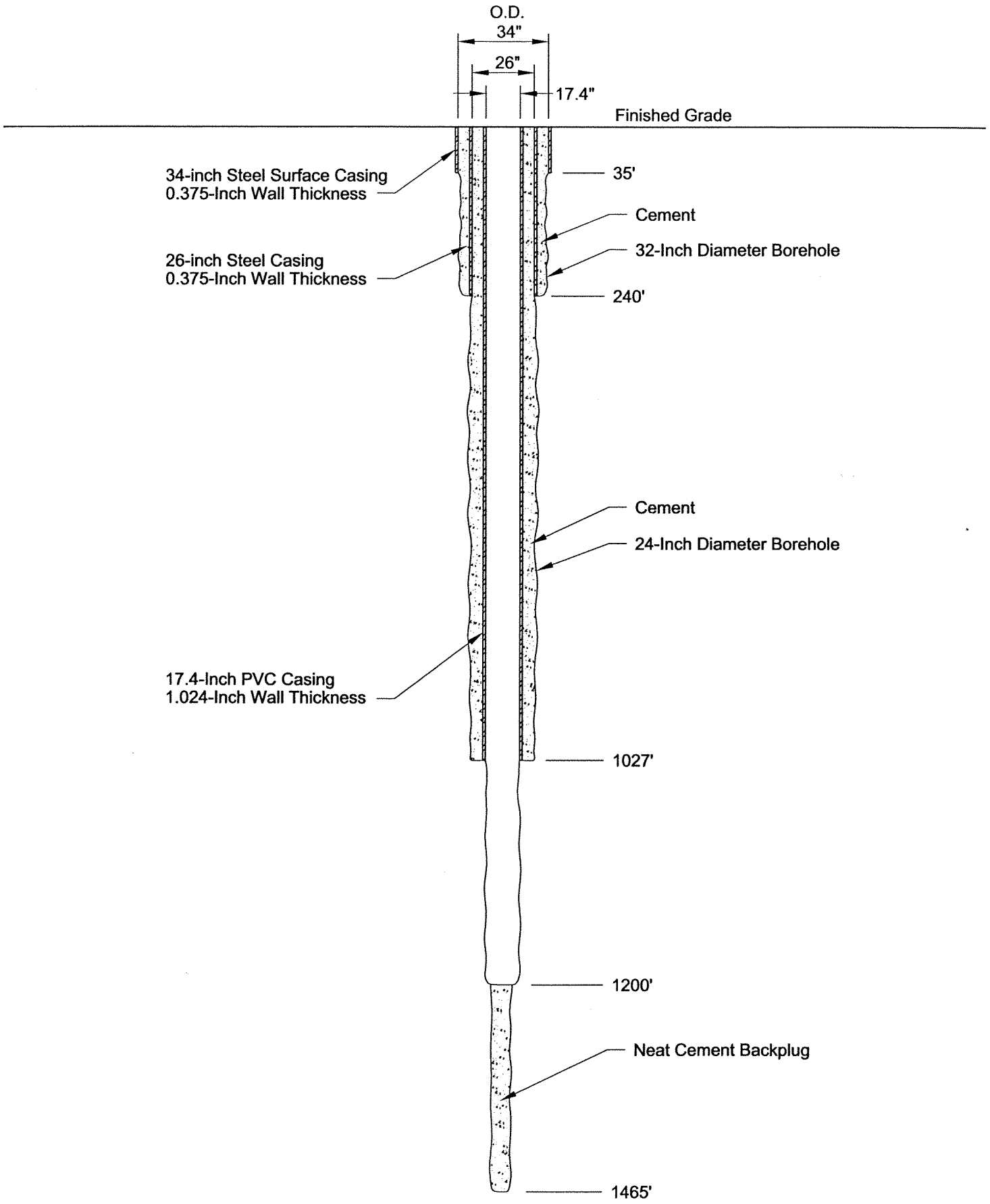

Figure 2
Highland Beach Test Production
Well TP-1 Completion Diagram

Not to Scale

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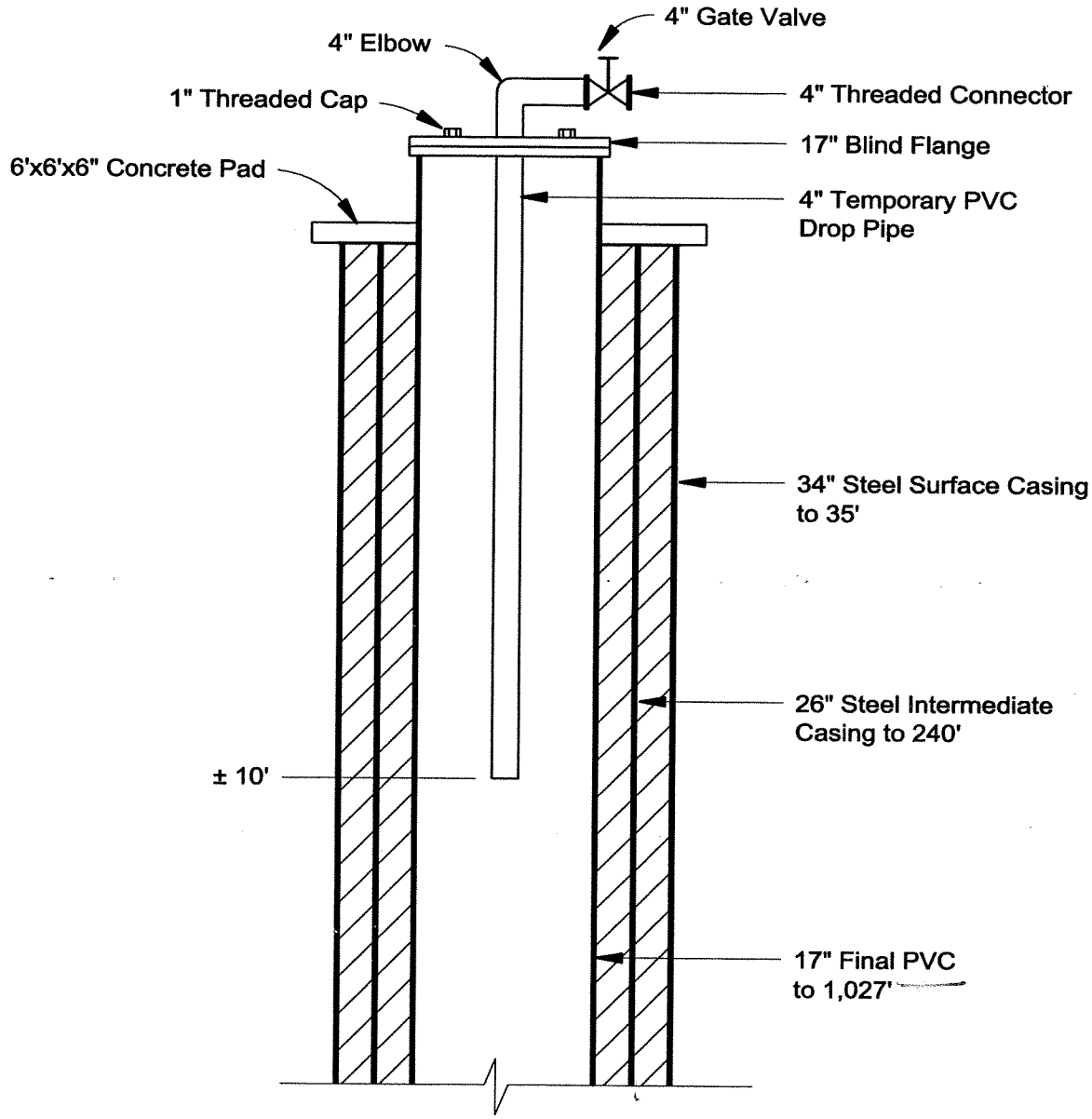

Figure 3
TP-1 Wellhead Diagram

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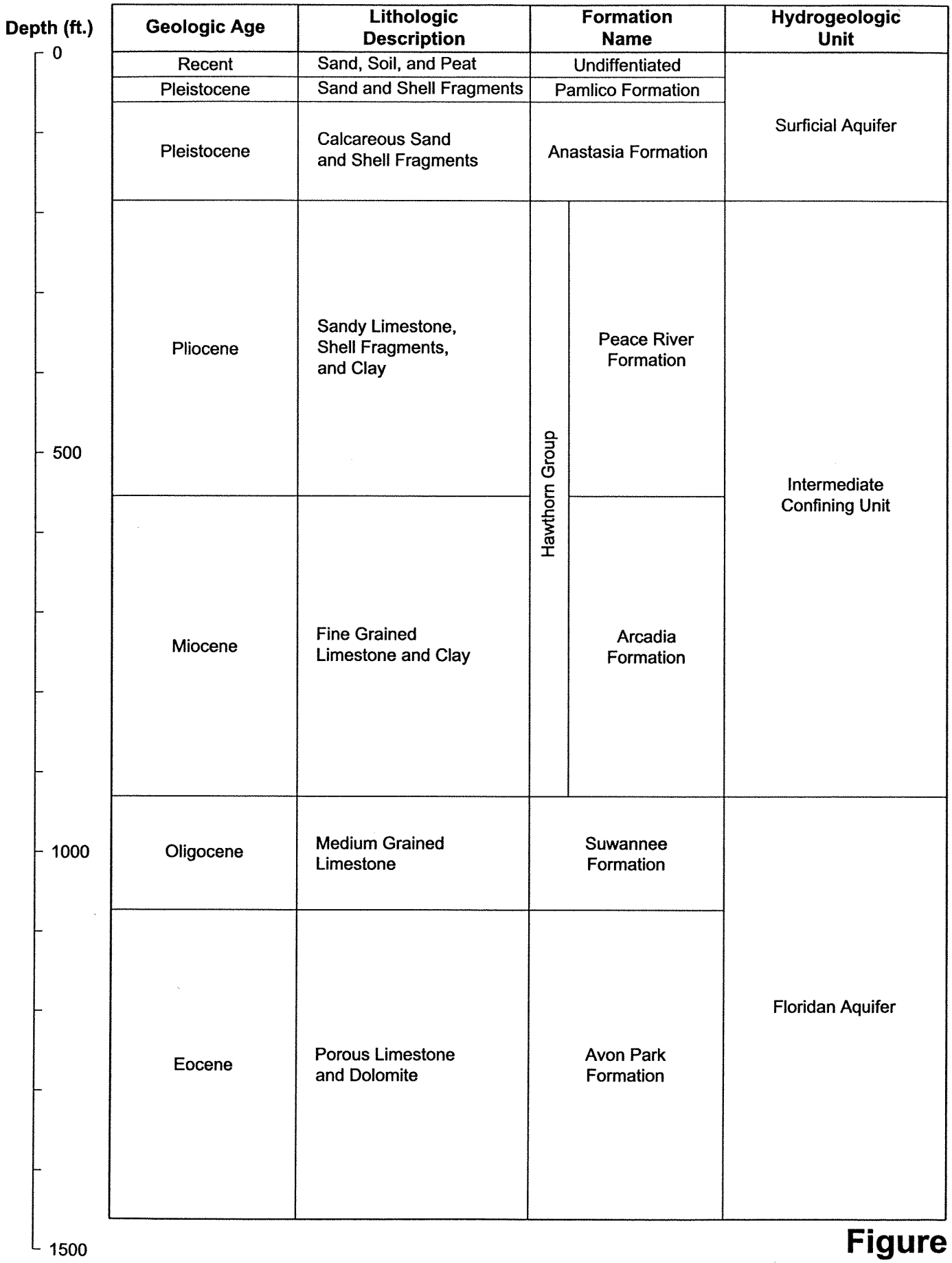

Figure 4
Geologic and Hydrogeologic Column of the TP-1 Site

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peat layer containing partially decomposed plant material. The undifferentiated Recent sediments form the upper-most portion of the Surficial aquifer; however, this portion of the aquifer is not productive at the site.

Pamlico Formation

The Pamlico Formation is of the Late Pleistocene Age and is present at the site from 17 feet bls to a depth of approximately 50 feet bls. It consists primarily of unconsolidated quartz sand and shell fragments. The contact between the base of the Pamlico Formation and the underlying Anastasia Formation is not clearly defined based on a review of the formation samples and geophysical logs; therefore, the depth of the contact of these formations is only approximate. The Pamlico Formation is part of the Surficial aquifer.

Anastasia Formation

The Anastasia Formation consists primarily of unconsolidated calcareous sand and shell fragments. Limestone and calcareous sandstone are present near the base of the Anastasia Formation. From approximately 50 to 190 feet bls. Deposited during the Pleistocene Age, the Anastasia Formation is part of the Surficial aquifer.

Hawthorn Group

Sediments making up the Hawthorn Group generally have a low permeability and are fine grained. These sediments act as a confining unit (often referred to as the Intermediate Confining Unit) separating the Surficial aquifer from the underlying Floridan aquifer. The Hawthorn Group is divided into the Peace River and Arcadia Formations, each of which are described below.

Peace River Formation

The Peace River Formation is of the lower-most Pliocene and upper Miocene Age and is present at the site from 190 to approximately 550 feet bls. It consist primarily of sandy limestone, shell fragments, and clay. The base of the Peace River Formation and top of the underlying Arcadia Formation is not clearly defined based on review of the formation samples and geophysical logs; therefore, the indicated base of the Peace River Formation is only approximate.

Arcadia Formation

The Arcadia Formation underlies the Peace River Formation and is present at the site between approximately 550 and 920 feet bls. The Arcadia Formation consists primarily of fine grained limestone and clay and is of the Miocene Age. Phosphate is common within the Arcadia Formation and responsible for the elevated gamma ray signature found in some intervals of the formation.

Suwannee Formation

The Suwannee Formation is present from 920 to 1,080 feet bls at the site. The formation is of the Oligocene Age and consists of medium grained limestone with occasional clay intervals.

Phosphate is common in the Suwannee Formation. The clay intervals within the Suwannee Formation greatly reduce the productivity of this Formation.

Avon Park Formation

Sediments making up the Avon Park Formation consists primarily of moderately consolidated, porous limestone with occasional dolomite intervals. The Avon Park Formation is present at the site from 1,080 to below 1,460 feet bls and is of the Eocene Age.

Testing During Construction

Testing during the construction of TP-1 included formation sampling, geophysical logging, packer testing, water quality sampling, and a 72-hour pumping test. Results of the hydrogeologic testing were used to determine the hydraulic characteristics of the strata intercepted by the borehole, which, in turn, were used to determine the optimal final subsurface design of the well.

The packer testing and 72-hour pumping portions of the testing program were designed to determine aquifer productivity and water quality. These parameters are useful in determining the viability of a Floridan aquifer water supply for the proposed WTP.

Formation samples (drill cuttings) from TP-1 were collected at 10-foot intervals (5-foot intervals during dual-tube reverse-air drilling) during pilot hole drilling. The samples were characterized for rock type, color, consolidation, porosity, and fossils. The data were used to determine hydrogeologic characteristics of the strata encountered and determine which geologic formations the borehole penetrated. A generalized summary of the geologic formations encountered during construction of TP-1 is presented in Table 3 and in Figure 4. A detailed lithologic description of samples from TP-1 is provided in Appendix C.

TABLE 3
Geologic Formations Encountered

Depth Interval (feet bpl)	Description	Formation	Geologic Age
0 – 17	Unconsolidated Quartz Sand, Organic Soil and Peat	Undifferentiated	Recent
17 – 50	Unconsolidated Quartz Sand and Shell Fragments	Pamlico	Pleistocene
50 – 190	Unconsolidated Calcareous Sand and Shell Fragments	Anastasia	Pleistocene
190 – 550	Sandy Limestone, Shell Fragments and Clay	Peace River	Pilocene – Miocene
550 – 920	Fine Grained Limestone and Clay	Arcadia	Miocene
920 – 1,080	Medium Grained Limestone	Suwannee	Oligocene
1,080 – 1,460	Porous Limestone with some Dolomite	Avon Park	Eocene

Dual-Tube Reverse-Air Drilling Results

The dual-tube reverse-air drilling took place on March 7 and 8, 2001. The interval from land surface to a depth of 190 feet bls was drilled. Continuous formation samples and water

samples from selected intervals were obtained during this phase of construction. The water quality sampling program was designed to ascertain the presence or absence of a USDW in the Surficial aquifer at the site. The continuous formation sampling program was designed to develop a clear understanding of the characteristics of the shallow geology and hydrogeology of the site. These data were necessary to assess the viability of constructing a Class V shallow injection well system for disposal of RO concentrate after the WTP has been constructed and placed into service.

The results of testing associated with the dual-tube reverse-air drilling demonstrate the absence of a USDW and confining intervals within the upper 190 feet of the subsurface at the site. Table 4 provides a detailed description of the lithologic samples collected during dual-tube reverse-air drilling. Table 5 provides a summary of the water quality data from the samples collected during this phase of construction.

TABLE 5
Dual-Tube Drilling Water Samples Data Summary

Sample Depth (feet bls)	Chloride (mg/L)	Total Dissolved Solids (mg/L)	Conductivity (umhos/cm)
20	6,500	12,000	18,000
30	14,000	23,000	33,000
35	16,000	23,000	38,000
40	17,000	24,000	39,000
50	17,000	30,000	41,000
55	17,000	30,000	41,000
60	17,000	31,000	42,000
70	17,000	28,000	41,000
90	19,000	35,000	46,000
100	19,000	34,000	47,000
120	19,000	35,000	49,000
140	18,000	35,000	47,000
160	19,000	36,000	48,000
180	20,000	35,000	48,000

Notes:
mg/L = milligrams per liter
umhos/cm = micromhos per centimeter

Geophysical Logging

Geophysical logs were performed in the pilot hole intervals of TP-1 to correlate formation samples taken during drilling, to identify formation boundaries, to aid in the selection of packer testing intervals, and to obtain specific geologic and hydrogeologic data pertaining to the underground formations. These data were then used to assist in the selection of the optimum casing setting depths for TP-1 and identify water-producing intervals. Reamed

hole caliper logs were also performed prior to casing installation to confirm appropriate casing setting depths. Table 4 provides a summary of geophysical logging conducted during the construction of TP-1. Copies of each of the logs performed on TP-1 are provided in Appendix B.

Review of the geophysical logs indicates the presence of porous, water-producing strata from approximately 20 feet bls to 350 feet bls, 1,030 to 1,140, and 1,300 to the total depth of the pilot hole at 1,460 feet bls. The remaining intervals are significantly less productive. The log data also suggests the interval from land surface to a depth of approximately 400 feet bls contains saline water and fresher, less saline water below this depth.

Gamma ray peaks at depths of approximately 260, 740, 820 to 910, and 980 to 1,015 feet bls. These intervals correlate to strata rich in phosphate. Flowmeter logging performed on the interval from 1,027 to 1,460 feet bls (the base of the final casing string to the bottom of the borehole) was conducted to confirm the presence of productive intervals. The geophysical logging data and formation sample data were utilized in the selection of intervals for packer testing.

Flowmeter and caliper logging conducted on the interval from 1,027 to 1,460 feet bls was used to generate the flow profile provided in Figure 5. The flow profile indicates that approximately 80 percent of the water produced from the logged interval is derived from the interval below a depth of 1,425 feet bls. The relatively featureless nature of the flow profile above 1,425 feet bls suggests the logged interval above this depth was not producing much water during the logging event. These data can be interpreted to indicate that the interval from 1,027 to 1,425 feet bls is non-productive and confining in nature or that the interval below 1,425 feet bls is under greater hydraulic pressure than the interval above, thus allowing flow from the higher pressure zone while preventing significant flow from the lower pressure productive zones above 1,425 feet bls. The packer testing program was designed in part to determine which of these two scenarios is correct.

Packer Tests

The intervals from 1,030 to 1,110, 1,030 to 1,200, 1,030 to 1,290, and 1,290 to 1,460 feet bls underwent packer testing to determine water quality and hydraulic characteristics of the test intervals. Each test consisted of pumping the test interval at a predetermined rate and recording time and water level drawdowns. Preliminary tests were conducted to determine the optimal pumping rate for each interval. Data from the pumping portion of each packer test were used to determine the specific capacity of the test interval. Water levels during the packer tests were measured using a submerged pressure transducer and were recorded by a Hermit 3000 data logger. Table 6 provides a summary of packer tests pumping rates, drawdown, and specific capacity of the test intervals.

Water samples were collected throughout the pumping portion of the tests and analyzed for conductivity and chlorides to demonstrate that water quality had stabilized prior to collecting a final water sample for laboratory analysis. The final water quality data are from the packer tests are provided in Table 7 below. Review of the water quality data indicates groundwater from below a depth of 1,290 feet bls is more saline than water above this depth and is therefore less desirable as a water supply source.

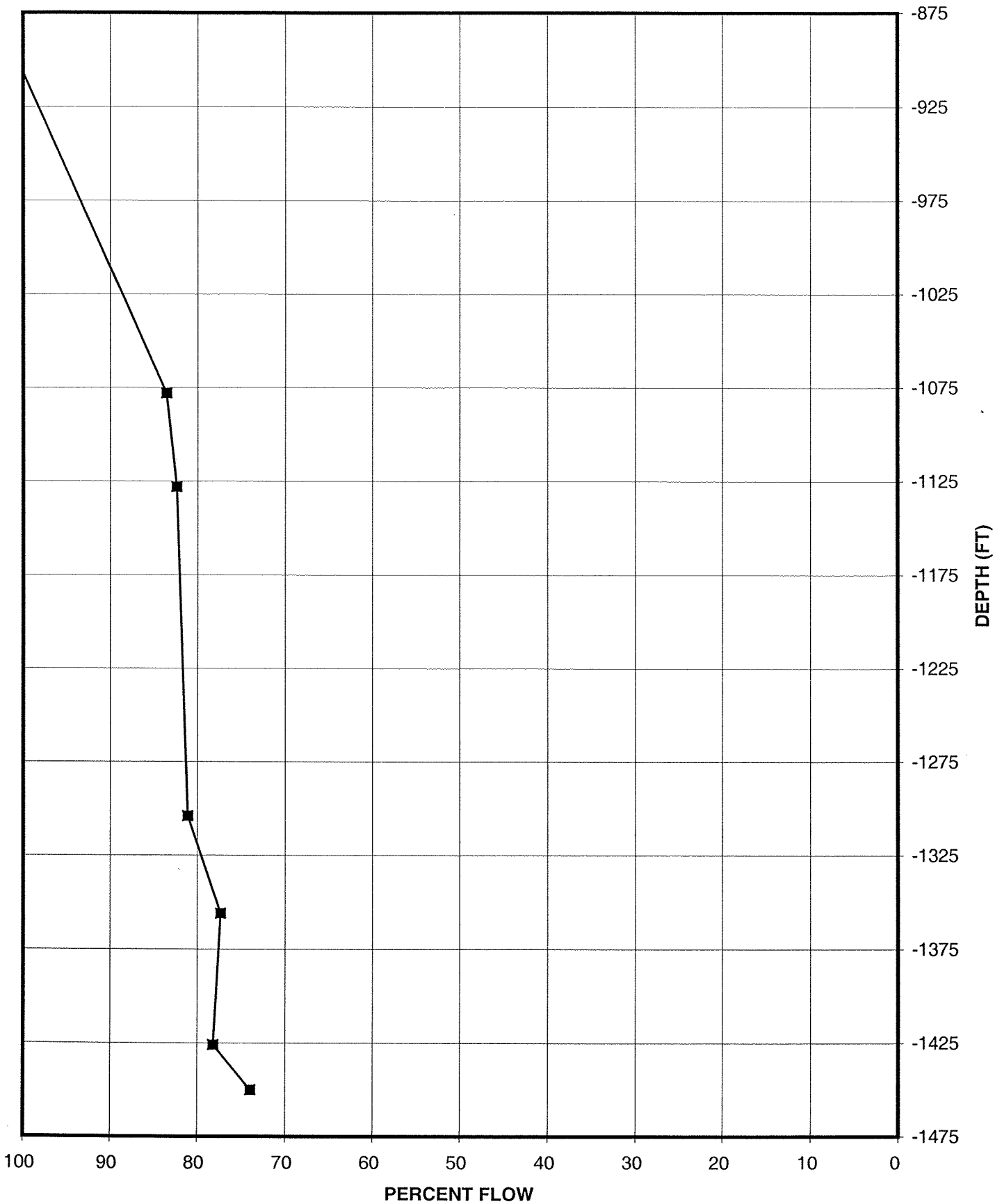


Figure 5. TP-1 Flow Profile

TABLE 6
Packer Tests Hydraulic Data

Test Interval (ft. bls)	Pumping Rate (gpm)	Drawdown (feet)	Specific Capacity (gpm/foot)
1,027 to 1,110	330	26.4	12.5
1,027 to 1,200	575	24.2	23.7
1,027 to 1,290	670	22.8	29.4
1,290 to 1,460	122	25.8	4.7

Note:
gpm = gallons per minute

TABLE 7
Packer Testing Water Quality Summary

Parameter	1,027 to 1,110 feet	1,027 to 1,200 feet	1,027 to 1,290 feet	1,290 to 1,460 feet
Chloride (mg/L)	3,700	3,700	3,700	6,700
TDS (mg/L)	6,730	6,700	7,030	11,900
Conductivity (umhos/cm)	10,500	10,500	11,000	17,000
Sodium (mg/L)	2,100	1,800	1,800	3,200
Iron (mg/L)	0.05	0.01	0.03	0.66
Sulfate (mg/L)	520	630	680	1,100
Total Hardness (mg/L)	1,540	1,520	1,560	2,540
Calcium Hardness (mg/L)	580	560	680	760
Alkalinity (mg/L)	208	205	214	225
Hydrogen Sulfide (mg/L)	6.7	6.6	6.2	6.1
Silica (mg/L)	6.0	6.0	6.1	5.2
pH (standard units)	7.7	7.6	7.7	7.7

Pumping Test

A 72-hour pumping test was conducted to evaluate the hydrogeologic characteristics and water quality of the open hole interval of TP-1. Fluid produced during the pumping test was discharged to the Intracoastal Waterway. All conditions of the FDEP Generic Permit for the Discharge of Produced Ground Water from any Non-Contaminated Site Activity were met while discharging to the Intracoast Waterway.

The pumping test included a 66-hour background data collection period, a 72-hour pumping period, and 21-hour recovery water level data collection. TP-1 was pumped at a rate of 3,000 gpm during the pumping portion of the test. Water levels were measured using a pressure transducer and recorded by a Hermit 3000 data logger.

The pumping test and associated water level data collection occurred between August 3, 2001, when the pressure transducer was installed in the well, and August 10, 2001, when the pressure transducer was removed from the well. Water level data for the entire testing period is presented in Figure 6. Figures 7 through 9 present the background, pumping, and recovery portions of the pumping test individually.

Figure 7 provides a summary of the background water level data collection phase of the pumping test. The increasing water level over time is due to recovery of the well following installation of the pump utilized for the pumping test. The well was allowed to flow during pump installation, resulting in a lowered water level that recovered during the background data collection period. The cyclic water level fluctuations are due to tidal influences that affect the Floridan aquifer.

Water level data during the pumping portion of the pumping test is presented in Figure 8. The water level at TP-1 was approximately 96 feet above the pressure transducer prior to beginning the pumping portion of the test. After approximately 21 hours of pumping, the water level had stabilized at approximately 28 feet above the pressure transducer, resulting in a specific capacity of 45.5 gpm/foot.

Figure 9 presents the water level data for the recovery portion of the pumping test. The data demonstrate that water level in the aquifer recovered to within 6 feet of the background water level approximately one hour after shutting off the pump and had fully recovered after approximately 12 hours.

Both pumping and recovery water level data were analyzed using the Cooper-Jacob method to calculate transmissivity and hydraulic conductivity of the open hole interval of TP-1. Figure 10 presents the analysis of the pumping water level data. Transmissivity and hydraulic conductivity values of 13,263 square feet per day (ft^2/day) and 2.71 x 10^{-2} centimeters per second (cm/sec), respectively, were calculated for the pumping portion of the test.

Figure 11 presents the analysis of the recovery data. Analysis of the pumping test recovery data indicated a transmissivity and hydraulic conductivity of 13,100 ft^2/day and 2.67 x 10^{-4} cm/sec, respectively, for the open hole interval of TP-1. Based on an average of the values calculated from the pumping and recovery portions of the test, the open hole interval of TP-1 has a transmissivity of 13,182 ft^2/day and a hydraulic conductivity of 2.69 x 10^{-2} cm/sec. These data are consistent with the calculated values for the pumping data and published values for the Floridan aquifer.

A water sample was collected at the end of the pumping portion or the pumping test and analyzed for primary and secondary drinking water standards. The water quality analyses indicate a total dissolved solids (TDS) concentration of 6,600 mg/L. Table 8 provides a summary of some of the key water quality parameters from the pumping test water sample. The analytical results for the entire list of drinking water standards are provided in Appendix D.

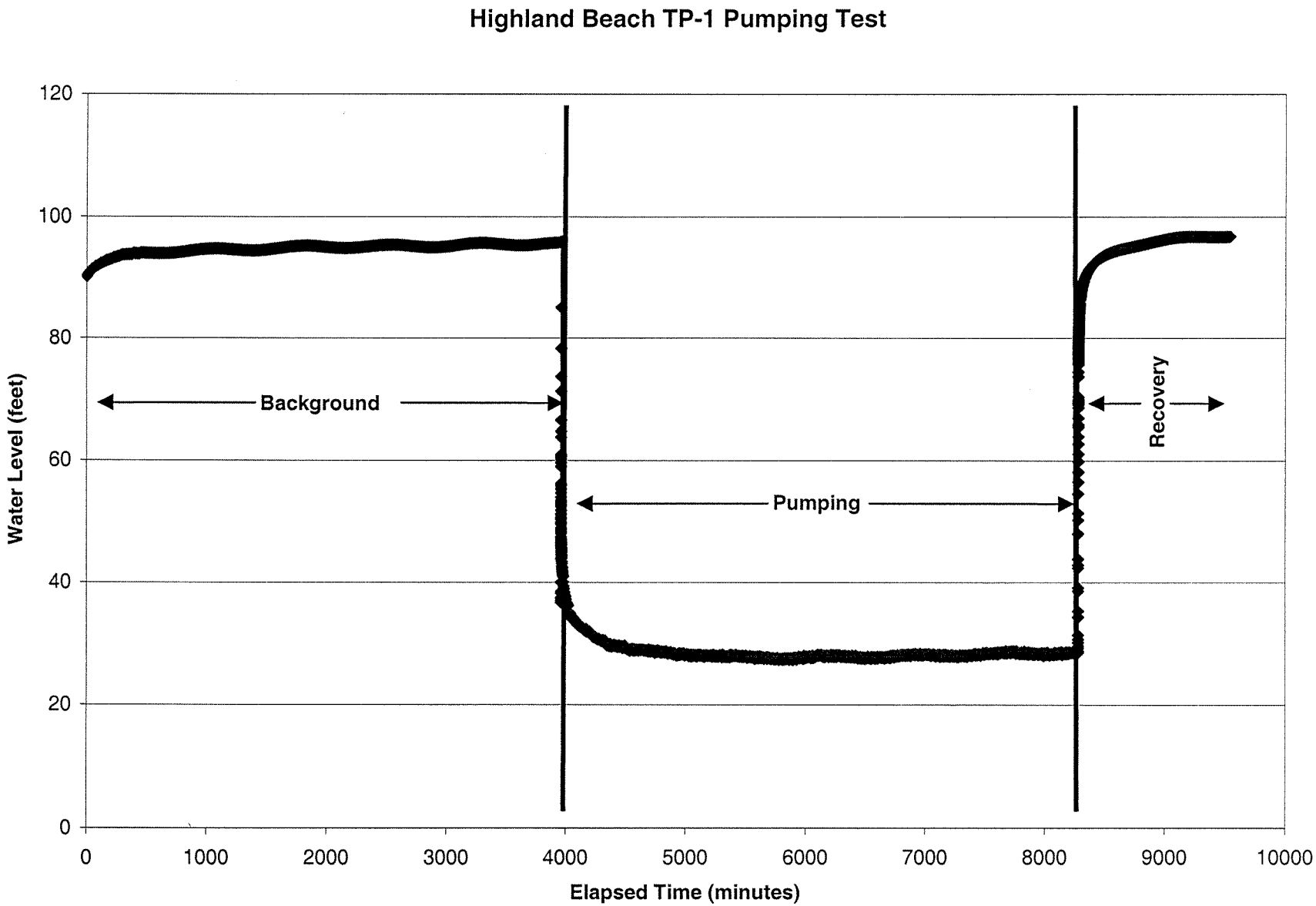


Figure 6. Entire Pumping Test Water Level Data

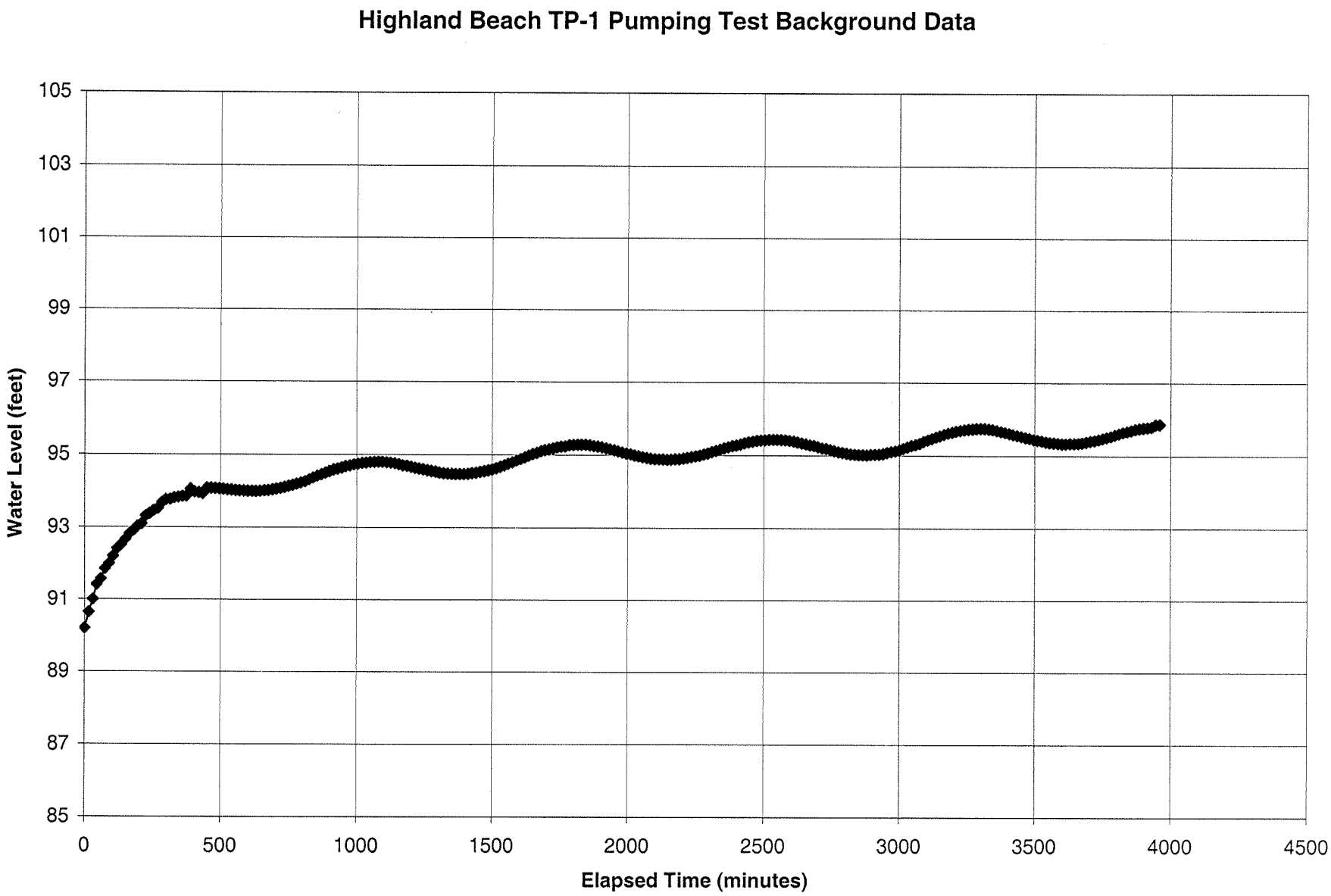


Figure 7. Pumping Test Background Water Level Data

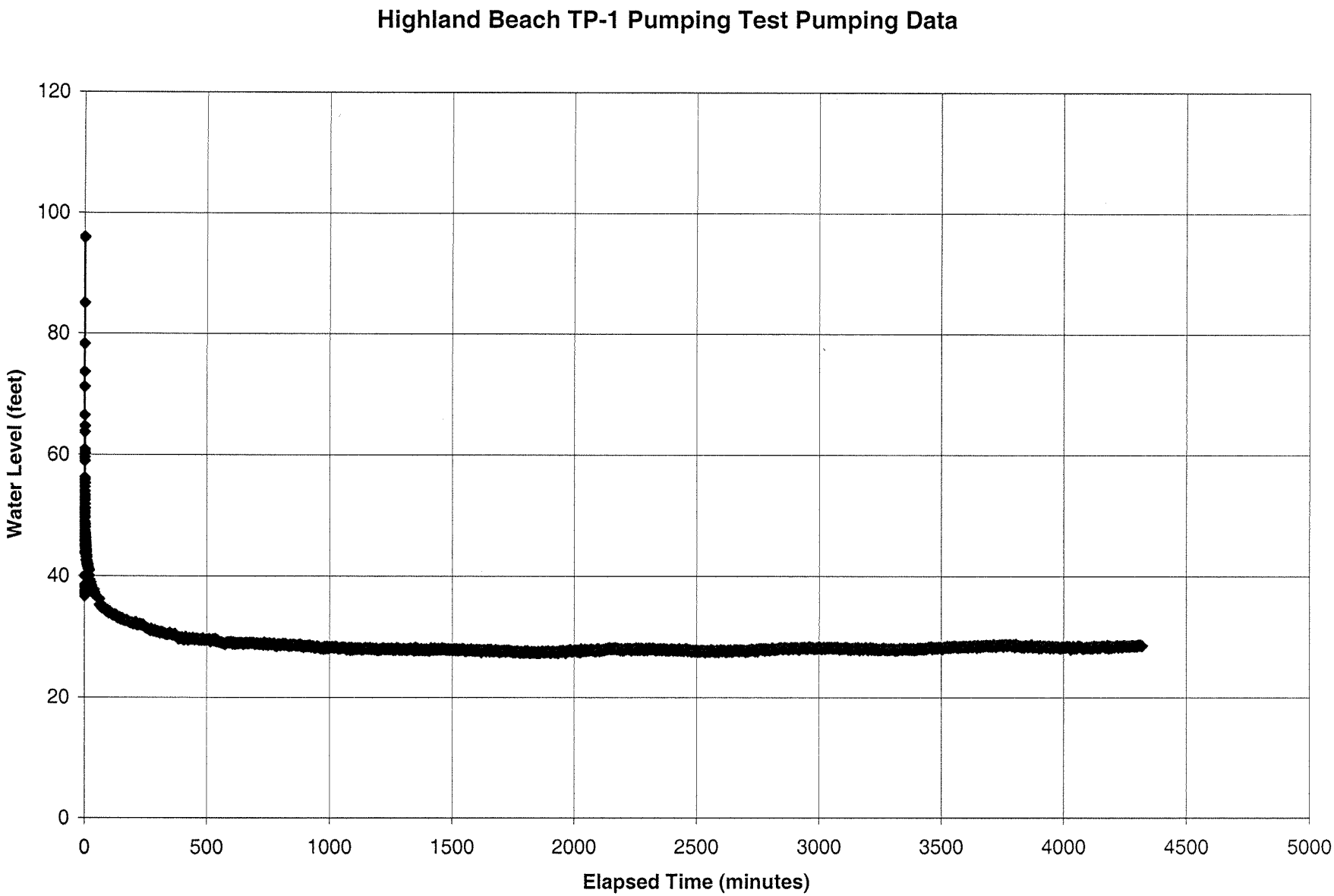


Figure 8. Pumping Test Pumping Water Level Data

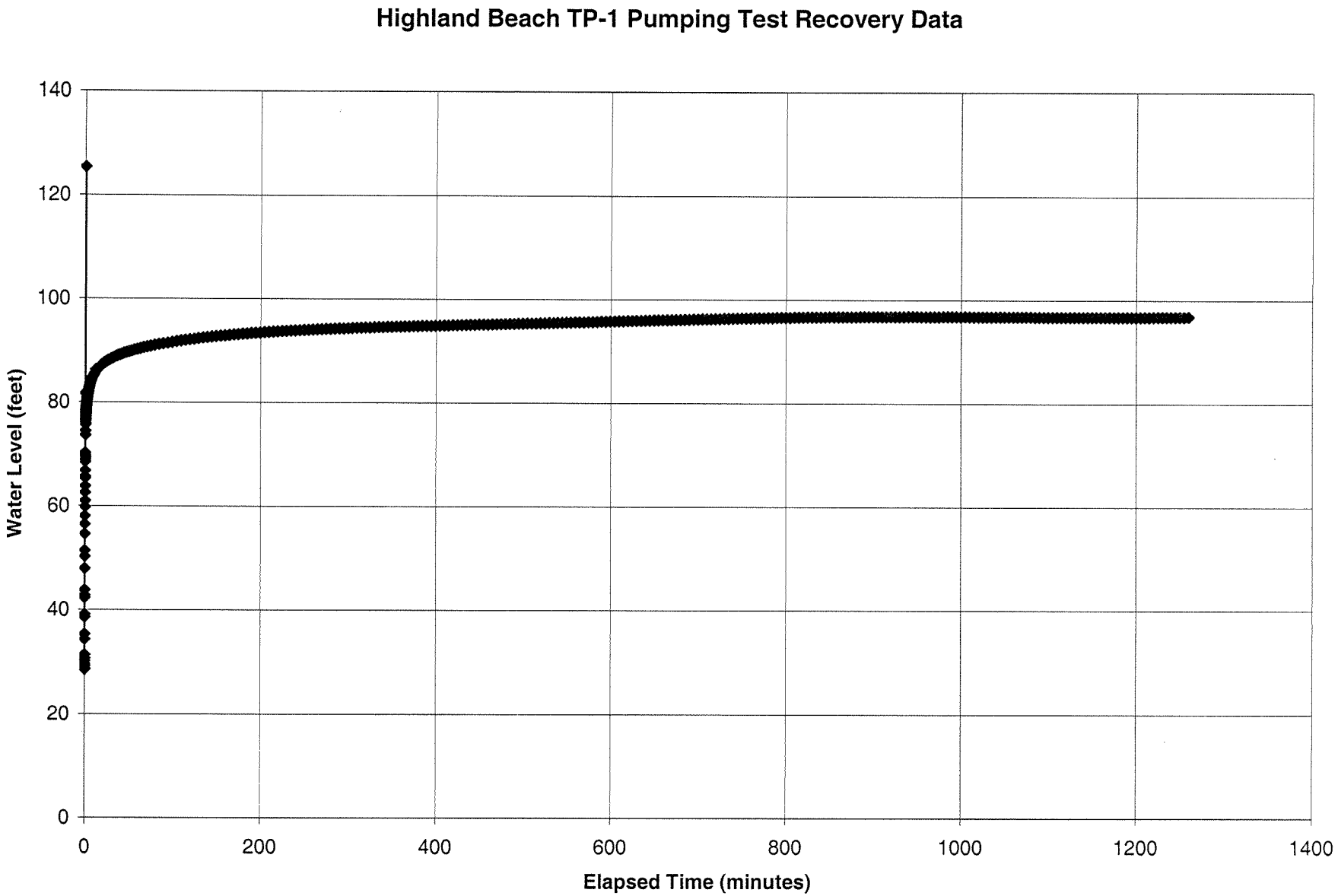


Figure 9. Pumping Test Recovery Water Level Data

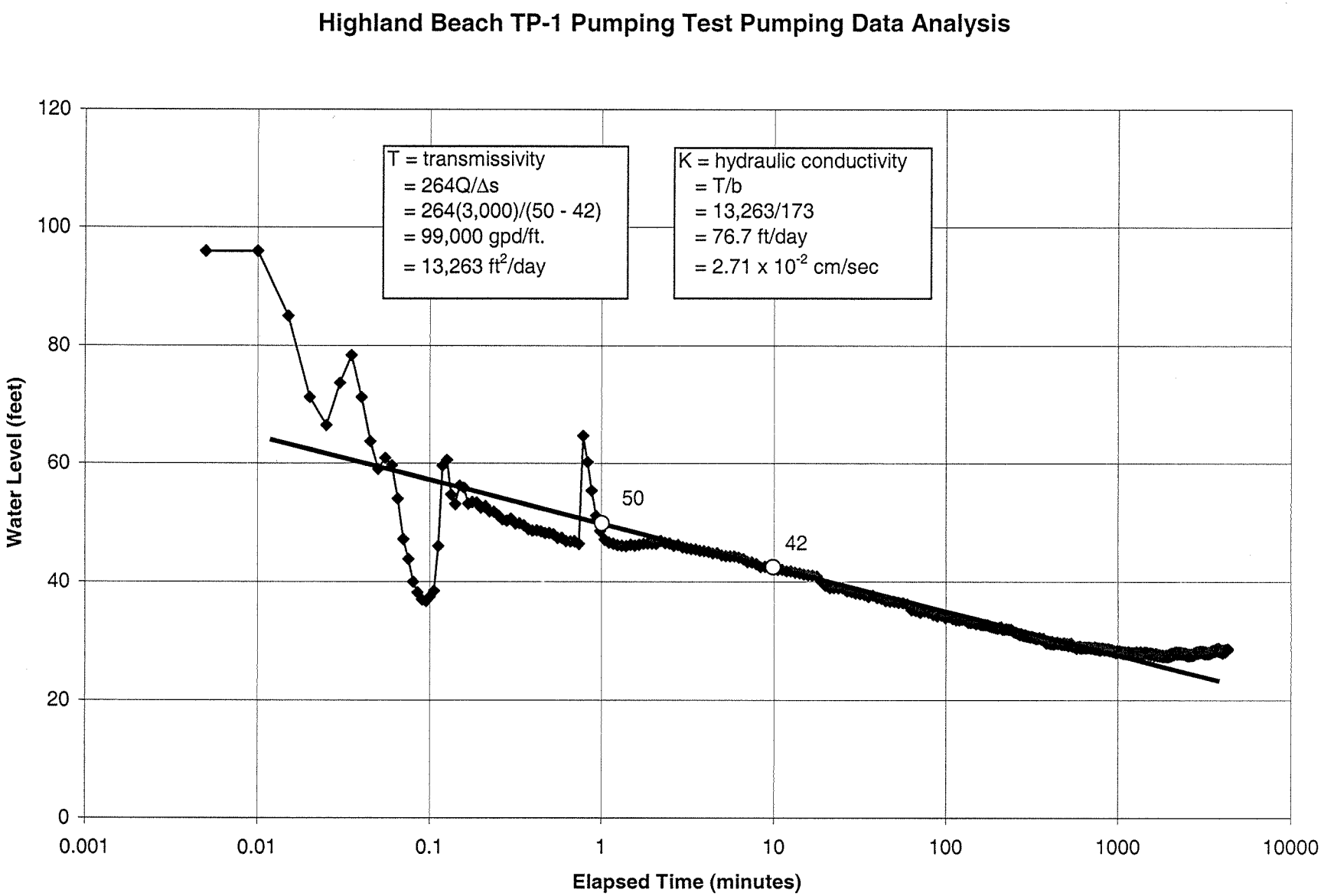


Figure 10. Pumping Test Pumping Water Level Data Analysis

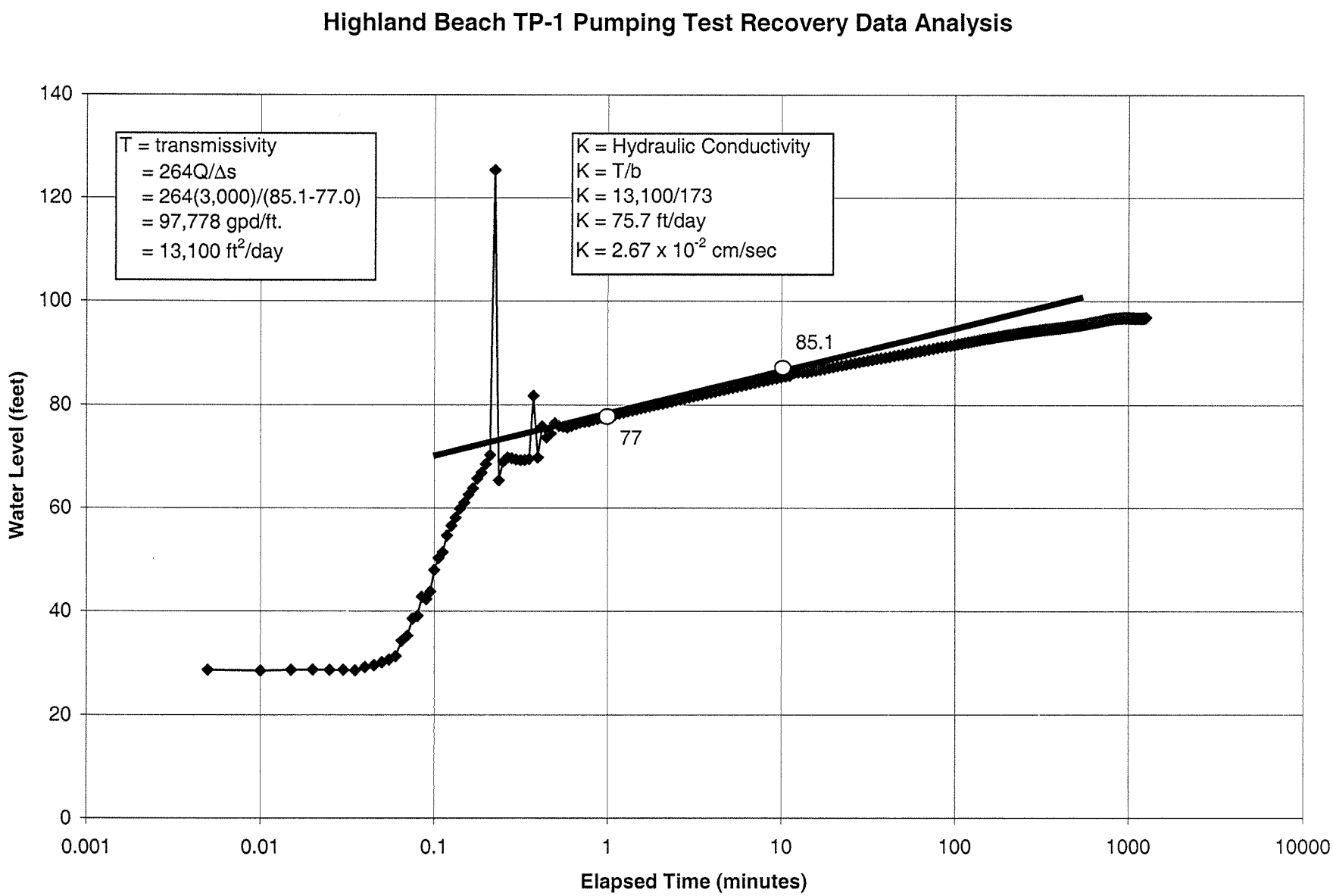


Figure 11. Pumping Test Recovery Data Analysis

TABLE 8
Packer Test Water Quality Summary

Parameter	Results
Total Dissolved Solids (mg/L)	6,600
Chloride (mg/L)	3,800
Sodium (mg/L)	810
Hydrogen Sulfide (mg/L)	3.2
Sulfate (mg/L)	510
Iron (mg/L)	BDL
Color (color units)	BDL
Odor (T.O.N.)	1.0

Summary

Test Production well TP-1 was constructed with a final 17-inch diameter PVC casing set to a depth of 1,027 feet and an open hole interval to 1,200 feet. The open hole interval was initially drilled to a depth of 1,460 feet; however, testing indicated the presence of low quality water below 1,200 feet. Therefore, the interval from 1,460 to 1,200 feet was backplugged with cement. Analysis of data collected during a 72-hour pumping test conducted on the completed well indicated the open hole interval of TP-1 has a transmissivity of 13,182 ft^2/day and a hydraulic conductivity of 2.69 x 10^{-2} cm/sec. A specific capacity of 45.5 gpm/foot was calculated for TP-1.

Water quality sampling indicates water produced from the well during the pumping test has a TDS concentration of 6,600 mg/L. These data indicate that TP-1 will successfully serve as a supply well for the planned RO plant.


TOWN OF HIGHLAND BEACH
1949
FLORIDA

APPENDIX A

SFWMD and FDEP Permits

SOUTH FLORIDA WATER MANAGEMENT DISTRICT
3301 Gun Club Road, West Palm Beach, Florida 33406 • (561) 686-8800 • FL WATS 1-800-432-2045 • TDD (561) 697-2574
Mailing Address: P.O. Box 24680, West Palm Beach, FL 33416-4680 • www.sfwmd.gov

CON 24-06

March 26, 2001

PERMITTEE
TOWN OF HIGHLAND BEACH
3614 SOUTH OCEAN BLVD.
HIGHLAND BEACH, FL 33487

CONTRACTOR
KOHLMEIER, ROBERT J.
17174 JEAN STREET
FT. MYERS, FL 33912
LICENSE NO:2352

WATER WELL CONSTRUCTION PERMIT # SF030201C
EXPIRATION DATE: September 26, 2001

PROJECT: HIGHLAND BEACH TEST/PWS PRODUCTION FLORIDAN WELL #1
TYPE OF USE: TEST/PUBLIC WATER SUPPLY
COUNTY: PALM BEACH SEC: 33 TWP: 46 RGE: 43

WELL CONSTRUCTION SPECIFICATIONS:	INNER	OUTER
CASING DIAMETER:	17"	26"
CASING DEPTH:	1000.00'	200.00'
SCREENED INTERVAL:	-	
OPEN HOLE INTERVAL:	1000'-1200'	
TOTAL DEPTH OF WELL:	1200.00'	

GROUT REQUIREMENT:
Inner casing shall be grouted bottom to top.

See additional conditions of permit on attached sheet.

We appreciate your assistance and cooperation in better managing the water resources of the District. If you have any questions on this matter, please call Ann-Marie Superchi at extension 6929.

Sincerely,

for Kurt Leckler, Supervising Hydrogeologist
Water Use Regulation Department, Water Supply Division

Attachment: Additional Conditions of Permit
c: MR. TOM LEFEVRE-HRS
DEP-POTABLE WATER SUPPLY
MR. DAVID MCNABB-CH2M HILL

HIGHLAND BEACH TEST/PWS PRODUCTION FLORIDAN WELL #1
March 26. 2001

VARIANCE

COMPLETION REPORT REQUIRED

A Water Well Completion Report (Form 0124) must be filed with the District within 30 days of completion of work.

ADDITIONAL CONDITIONS OF PERMIT

TEST RESULTS SHALL BE SUBMITTED TO THE DISTRICT WITHIN 30 DAYS OF COMPLETION OF TESTING.

THIS WELL IS PRESENTLY APPROVED FOR TESTING PURPOSES ONLY. WITHDRAWALS FOR PUBLIC WATER SUPPLY SHALL NOT COMMENCE UNTIL THE WATER USE PERMIT MODIFICATION HAS BEEN APPROVED.

The well must be cleaned, disinfected and bacteriologically cleared in accordance with Chapter 62-555, F.A.C. The bacteriological clearance data shall be submitted to the County Health Unit or appropriate office of the Department of Environmental Protection and release for use must be obtained prior to placing the well in service.

A grouting card (Form 0196) must be supplied to the District prior to beginning construction.

Department of Environmental Protection

Jeb Bush
Governor

Southeast District
P.O. Box 15425
West Palm Beach, Florida 33416

David B. Struhs
Secretary

FEB 26 2001

February 26, 2001

Mr. Ben Saag
Town Manager
Town of Highland Beach
Highland Beach, Florida 33487

Dear Mr. Saag:

RE: Well Construction Discharge

In response to your letter dated November 15, 2000, the Department has determined that the discharge of Floridan Aquifer water during the construction and testing of the new Test Production well can be authorized under the *Generic Permit for Discharge of Produced Ground Water from any Non-Contaminated Site Activity*, as given in Florida Administrative Code (FAC) Rule 62-621.302.

As indicated in your letter, additional monitoring is necessary over what the generic permit requires, for turbidity and dissolved oxygen (DO) at the point of discharge. Such monitoring shall be accomplished by taking a grab sample every two hours, and may be discontinued for any day in which four consecutive samples do not exceed standards. The standard for DO is 5 mg/L; the standard for turbidity is 29 NTU. The discharge shall be discontinued immediately should either standard be exceeded.

Please call me at (561)681-6684 should you have any questions.

Sincerely,

Tim Powell, P.E., Supervisor
Wastewater Permitting Section

cc: David McNabb, CH2M Hill

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL PROTECTION

GENERIC PERMIT

FOR THE

DISCHARGE OF PRODUCED GROUND WATER

FROM ANY NON-CONTAMINATED SITE ACTIVITY

June 19, 1995

Generic Permit for the Discharge of Produced Ground Water from any Non-Contaminated Site Activity

(1) The facility is authorized to discharge produced ground water from any non-contaminated site activity which discharges by a point source to surface waters of the State, as defined in Chapter 62-620, F.A.C., only if the reported values for the parameters listed in Table 1 do not exceed any of the listed screening values. Before discharge of produced ground water can occur from such sites, analytical tests on samples of the proposed untreated discharge water shall be performed to determine if contamination exists.

(2) Minimum reporting requirements for all produced ground water dischargers. The effluent shall be sampled before the commencement of discharge, again within thirty (30) days after commencement of discharge, and then once every six (6) months for the life of the project to maintain continued coverage under this generic permit. Samples taken in compliance with the provisions of this permit shall be taken prior to actual discharge or mixing with the receiving waters. The effluent shall be sampled for the parameters listed in Table 1.

Table 1

	Screening Values for Discharges into:	
Parameter	Fresh Waters	Coastal Waters
Total Organic Carbon (TOC)	10.0 mg/l	10.0 mg/l
pH, standard units	6.0-8.5	6.5-8.5
Total Recoverable Mercury	0.012 µg/l	0.025 µg/l
Total Recoverable Cadmium	9.3 µg/l	9.3 µg/l
Total Recoverable Copper	2.9 µg/l	2.9 µg/l
Total Recoverable Lead	0.03 µg/l	5.6 µg/l
Total Recoverable Zinc	86.0 µg/l	86.0 µg/l
Total Recoverable Chromium (Hex.)	11.0 µg/l	50.0 µg/l
Benzene	1.0 µg/l	1.0 µg/l
Naphthalene	100.0 µg/l	100.0 µg/l

(3) If any of the analytical test results exceed the screening values listed in Table 1, except TOC, the discharge is not authorized by this permit.

(a) For initial TOC values that exceed the screening values listed in Table 1, which may be caused by naturally-occurring, high molecular weight organic compounds, the

permittee may request to be exempted from the TOC requirement. To request this exemption, the permittee shall submit additional information with a Notice of Intent (NOI) which describes the method used to determine that these compounds are naturally occurring.

(b) The NOI shall be submitted to the appropriate Department district office thirty (30) days prior to discharge, and contain the following information:

1. the name and address of the person that the permit coverage will be issued to;

2. the name and address of the facility, including county location;

3. any applicable individual wastewater permit number(s);

4. a map showing the facility and discharge location (including latitude and longitude);

5. the name of the receiving water; and

6. the additional information required by paragraph (3)(a) of this permit.

(c) Discharge shall not commence until notification of coverage is received from the Department.

(4) For fresh waters and coastal waters, the pH of the effluent shall not be lowered to less than 6.0 units for fresh waters, or less than 6.5 units for coastal waters, or raised above 8.5 units, unless the permittee submits natural background data confirming a natural background pH outside of this range. If natural background of the receiving water is determined to be less than 6.0 units for fresh waters, or less than 6.5 units in coastal waters, the pH shall not vary below natural background or vary more than one (1) unit above natural background for fresh and coastal waters. If natural background of the receiving water is determined to be higher than 8.5 units, the pH shall not vary above natural background or vary more than one (1) unit below natural background of fresh and coastal waters. The permittee shall include the natural background pH of the receiving waters with the results of the analyses required under paragraph (2) of this permit. For purposes of this section only, fresh waters are those having a chloride concentration of less than 1500 mg/l, and coastal waters are those having a chloride concentration equal to or greater than 1500 mg/l.

(5) In accordance with Rule 62-302.500(1)(a-c), F.A.C., the discharge shall at all times be free from floating solids, visible foam, turbidity, or visible oil in such amounts as to form nuisances on surface waters.

(6) If contamination exists, as indicated by the results of the analytical tests required by paragraph (2), the discharge cannot be covered by this generic permit. The facility shall apply for an individual wastewater permit at least ninety (90) days prior to the date discharge to surface waters of the State is expected, or, if applicable, the facility may seek coverage under any other applicable Department generic permit. No discharge is permissible without an effective permit.

(7) If the analytical tests required by paragraph (2) reveal that no contamination exists from any source, the facility can begin discharge immediately and is covered by this permit without having to submit an NOI request for coverage to the Department. A short summary of the proposed activity and copy of the analytical tests shall be sent to the applicable Department district office within one (1) week after discharge begins. These analytical tests shall be kept on site during discharge and made available to the Department if requested. Additionally, no Discharge Monitoring Report forms are required to be submitted to the Department.

(8) All of the general conditions listed in Rule 62-621.250, F.A.C., are applicable to this generic permit.

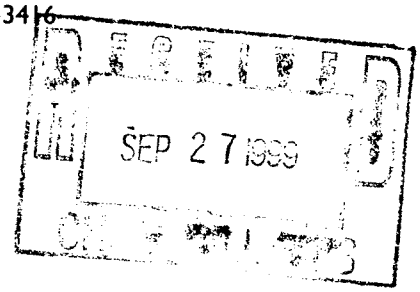
(9) There are no annual fees associated with the use of this generic permit.

Department of Environmental Protection

Jeb Bush
Governor

Southeast District
P.O. Box 15425
West Palm Beach, Florida 33416

David B. Struhs
Secretary



September 23, 1999

Mr. David McNabb
CH2M Hill
800 Fairway Drive
Suite 350
Deerfield Beach, Florida 33441

Dear David:

RE: Highland Beach Well Construction/Testing

In reference to our telephone conversation the other day, enclosed is the document *Generic Permit for Discharge of Produced Ground Water from any Non-Contaminated Site Activity*, as given in Florida Administrative Code (FAC) Rule 62-621.302. The Department will require additional monitoring, over what the generic permit requires, for turbidity and dissolved oxygen at the point of discharge.

Monitoring/effluent limits for Dissolved Oxygen and Turbidity shall be as follows:

Parameter	Discharge Limit	Frequency
Dissolved Oxygen	5.0 mg/L	Every two hours*
Turbidity	29 NTU	Every two hours*

*Sampling may be discontinued for that day, provided that 4 consecutive samples did not exceed either discharge limit.

Sampling for Turbidity and Dissolved Oxygen must be done daily for each day there is a discharge using field equipment. The sampling point(s) shall be at the end-of-pipe prior to discharge into the receiving ditch. Should either limit be exceeded the discharge shall be immediately discontinued until the problem is resolved.

Please call me at (561)681-6698 should you have any questions.

Sincerely,

Tim Powell, Supervisor
Industrial Waste Section

Enclosure:

APPENDIX B

Geophysical Logs

MV Geophysical

X-Y CALIPER LOG

Company: DIVERSIFIED DRILLING CORP.
Well: TPW-1
Field: Highland Beach
County: Palm Beach
State/Prv: Florida
Location: Town of Highland Beach Future R.O. WTP
Other Services: None

Permanent Datum: Land Surface Elevation: na
Log Measured From: Land Surface
Drilling Measured From: Land Surface
Elevation: K.B. na D.F. na G.L. na

Company: DIVERSIFIED DRILLING
Well: TPW-1
Field: Highland Beach
County: Palm Beach
State/Prv: Florida

Date	10-APR-2001
Run Number	TWO
Depth Driller	245'
Depth Logger	245'
Bottom Logged Interval	243'
Top Log Interval	SURFACE
Open Hole Size	32.5"
Type Fluid	MUD
Density / Viscosity	na/na
Max. Recorded Temp.	NA
Estimated Cement Top	NA
Time Well Ready	09:00 10-APR-01
Time Logger on Bottom	09:00 10-APR-01
Equipment Number	MVGS-1
Location	Ft. Myers
Recorded By	Miller/Vincent
Witnessed By	M.Schilling

Borehole Record				Tubing Record			
Run Number	Bit	From	To	Size	Weight	From	To
ONE	10.625"	35'	275'				
TWO	32.5"	35'	245'				

Casing Record	Size	Wgt/Ft	Top	Bottom
Surface String	34"	0.375" WT	SURFACE	35'
Prot. String				
Production String				
Liner				

Invoice No. 2001032 P.O. # 9335 * FINAL PRINT *

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Comments

Annular Hole Volume calculated using a Future Casing Size of 26".

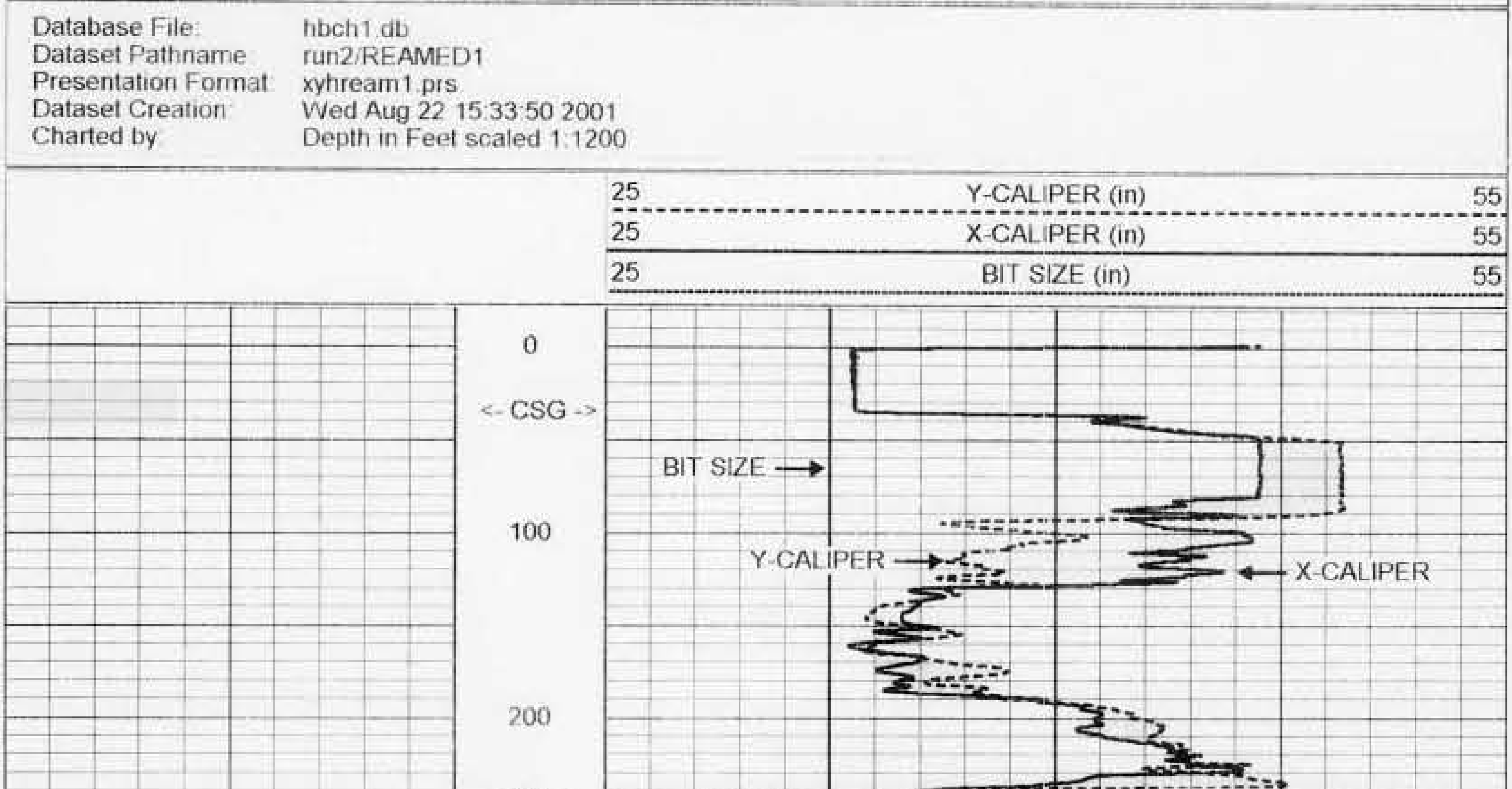
Maximum Arm Length: X=46.5"; Y=49"

REPEAT SECTION not run per customer.

MV Geophysical

REAMED HOLE

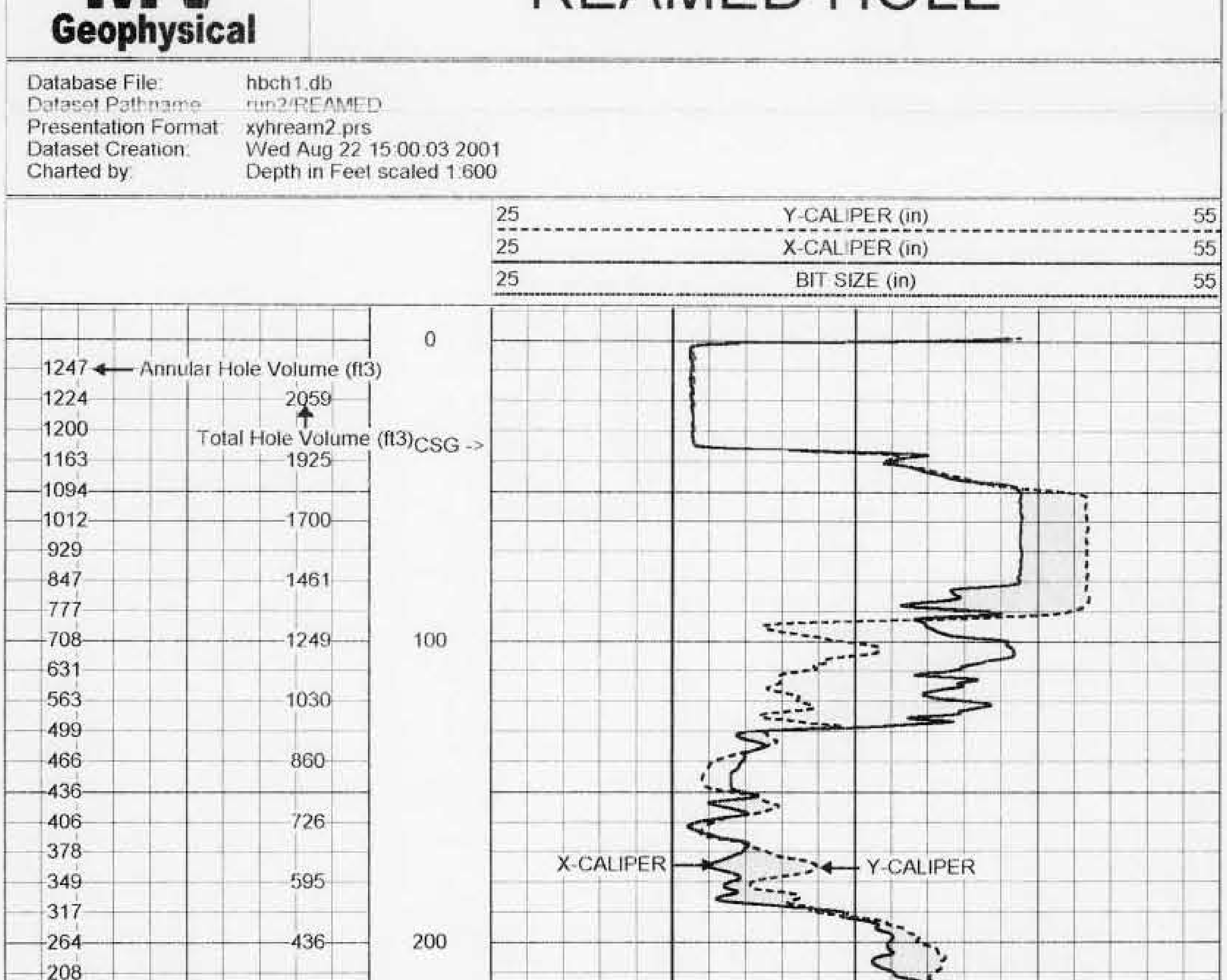
Database File: hbch1.db
Dataset Pathname: run2/REAMED1
Presentation Format: xyhream1.prs
Dataset Creation: Wed Aug 22 15:33:50 2001
Charted by: Depth in Feet scaled 1:1200



MV Geophysical

REAMED HOLE

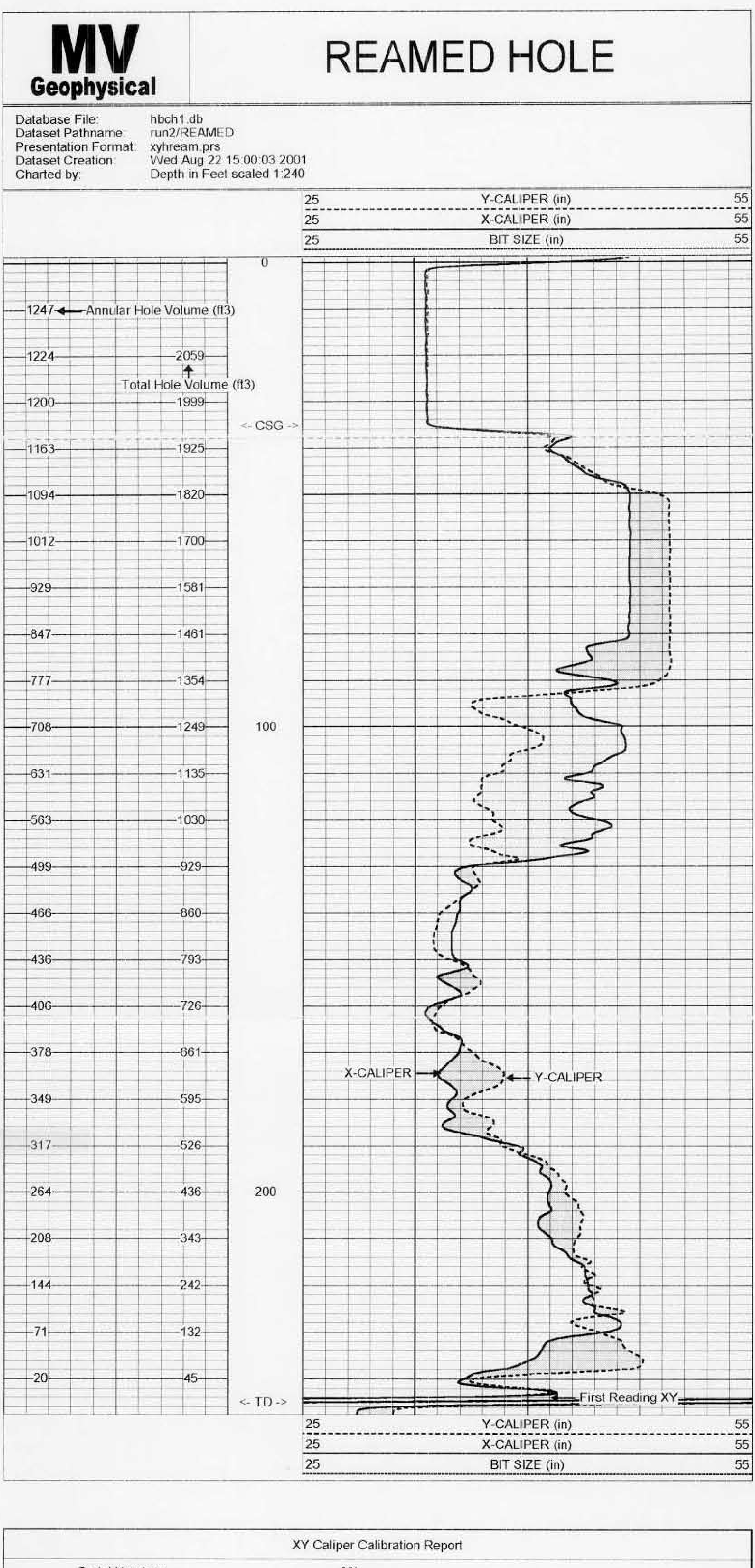
Database File: hbch1.db
Dataset Pathname: run2/REAMED
Presentation Format: xyhream2.prs
Dataset Creation: Wed Aug 22 15:00:03 2001
Charted by: Depth in Feet scaled 1:600



MV Geophysical

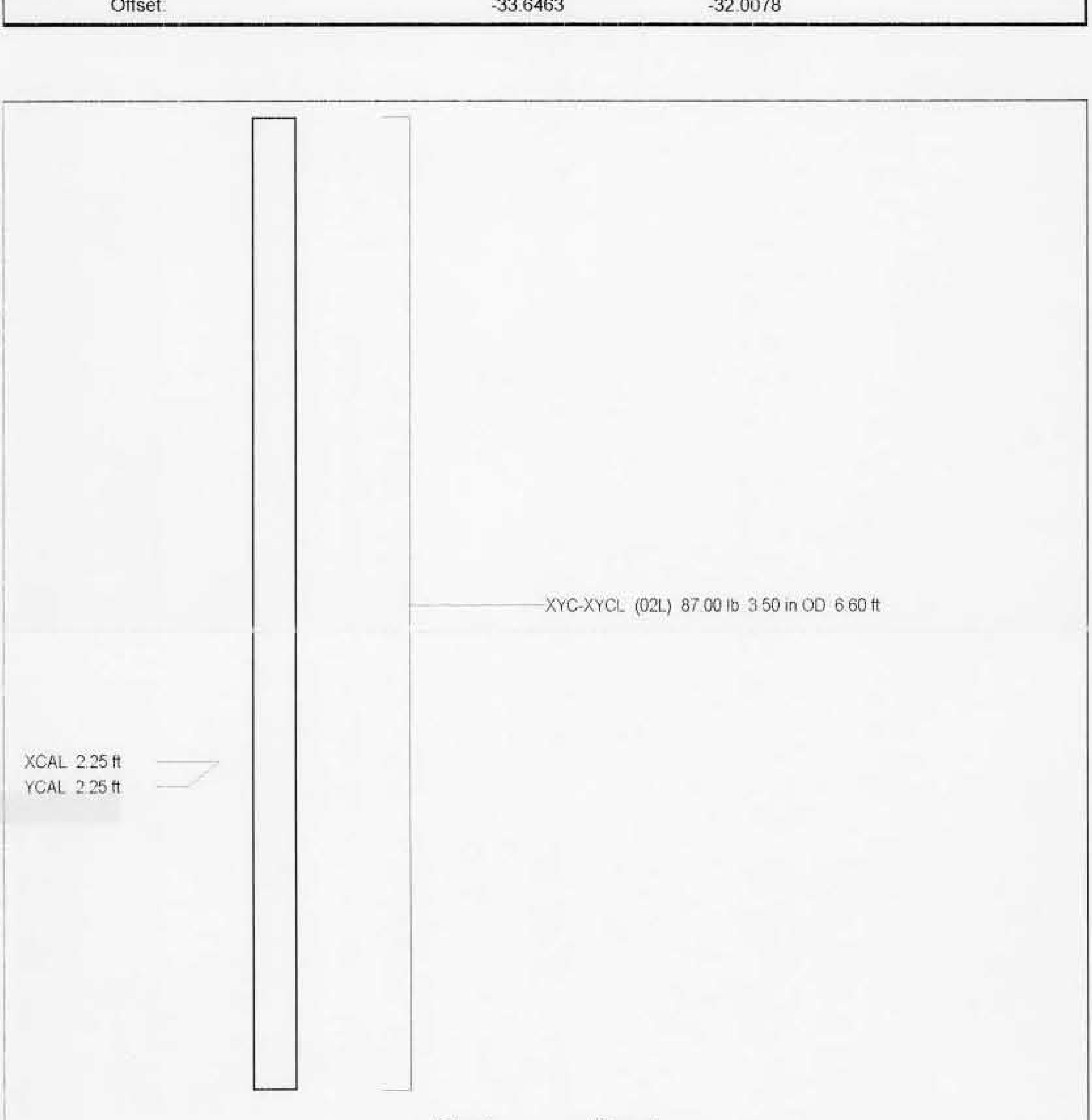
REAMED HOLE

Database File: hbch1.db
Dataset Pathname: run2/REAMED
Presentation Format: xyhream.prs
Dataset Creation: Wed Aug 22 15:00:03 2001
Charted by: Depth in Feet scaled 1:240



XY Caliper Calibration Report

Serial Number:	02L		
Tool Model:	XYCL		
Performed:	Tue Apr 10 08:22:19 2001		
Small Ring:	15.25	in	
Large Ring:	46	in	
	X Caliper	Y Caliper	
Reading with Small Ring:	669.751	645.473	cps
Reading with Large Ring:	1090.95	1065.47	cps
Gain:	0.0730067	0.0732143	
Offset:	-33.6463	-32.0078	



Dataset: run2/pass1
Total Length: 6.60 ft
Total Weight: 87.00 lb
O.D.: 3.50 in

Company DIVERSIFIED DRILLING
Well TPW-1
Field Highland Beach
County Palm Beach
State/Prv Florida

MV Geophysical

X-Y CALIPER GAMMA RAY LOG

Company	DIVERSIFIED DRILLING CORP.
Well	TPW-1
Field	Highland Beach
County	Palm Beach State/Prv Florida
Location	Town of Highland Beach Future R.O. WTP
Other Services	VIDEO

Permanent Datum	Land Surface	Elevation na	Elevation
Log Measured From	Land Surface		K.B na
Drilling Measured From	Land Surface		D.F na
			G.L na

Date	10-AUGUST-2001		
Run Number	SIX		
Depth Driller	1207'		
Depth Logger	1207'		
Bottom Logged Interval	1204'		
Top Log Interval	900'		
Open Hole Size	15"		
Type Fluid	WATER		
Density / Viscosity	na/na		
Max. Recorded Temp.	na		
Estimated Cement Top	NA		
Time Well Ready	9:45 10-AUGUST-01		
Time Logger on Bottom	10:15 10-AUGUST-01		
Equipment Number	MVGS-1		
Location	Ft. Myers		
Recorded By	J.Vincent		
Witnessed By	M.Schilling (Hill)	Travis (DDC)	

Borehole Record				Tubing Record			
Run Number	Bit	From	To	Size	Weight	From	To
ONE	10.625"	35'	275'	FIVE	7.875"	1027'	1462'
TWO	32.5"	35'	245'				
THREE	10.625"	240'	1100'				
FOUR	24	245	1035				

Casing Record	Size	Wgt/Ft	Top	Bottom
Surface String	34"	0.375" WT	SURFACE	35'
Prot. String	26"	0.375" WT	SURFACE	240'
Production String	17.4" PVC	15.25" ID	SURFACE	1027'
Liner				Logger: 1025'
Invoice No.:	2001113	P.O. # 11189		* FINAL PRINT *

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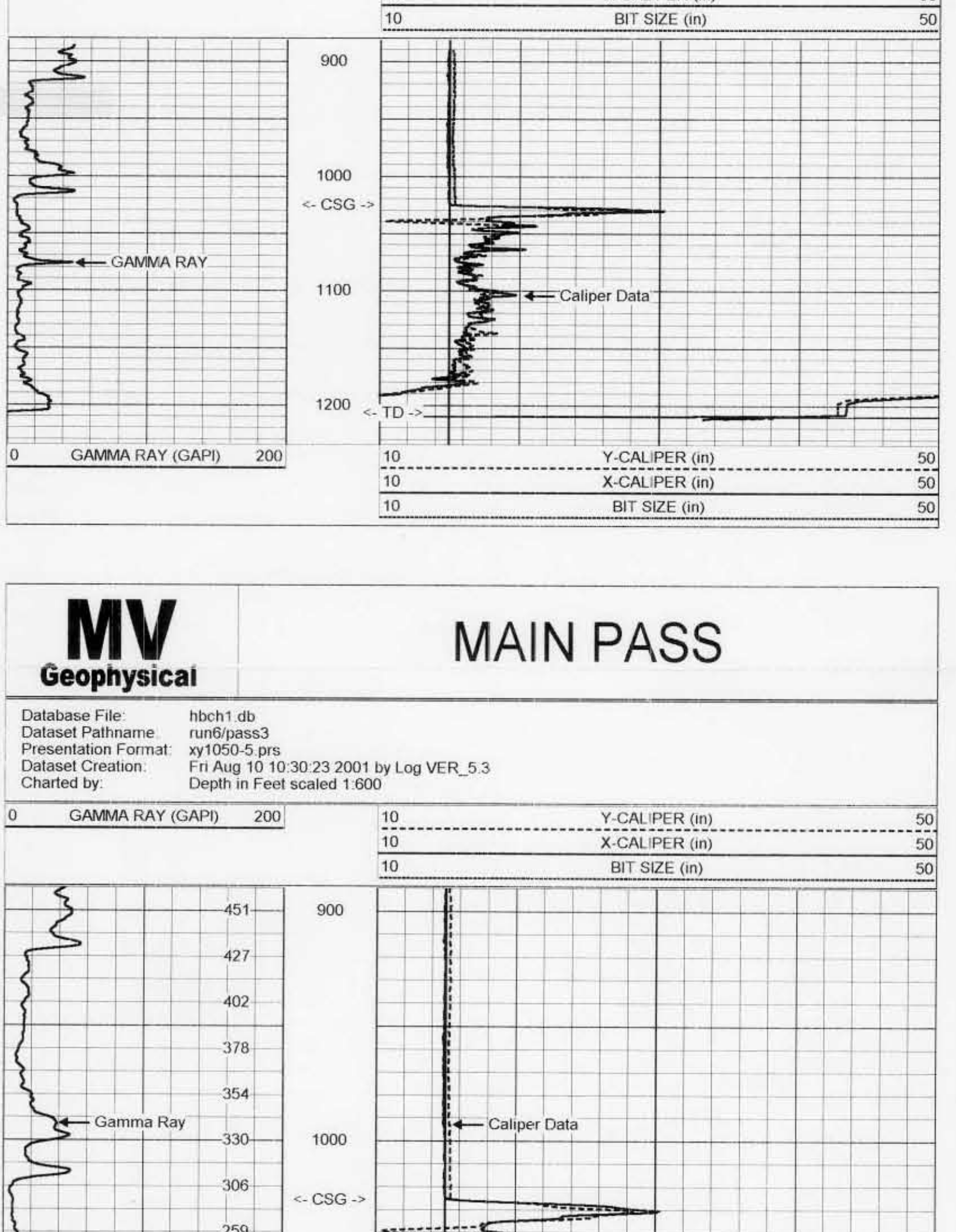
All interpretations are opinions based on inferences from electrical or other measurements and we cannot and do not guarantee the accuracy or correctness of any interpretation, and we shall not, except in the case of gross or wilful negligence on our part, be liable or responsible for any loss, costs, damages, or expenses incurred or sustained by anyone resulting from any interpretation made by any of our officers, agents or employees. These interpretations are also subject to our general terms and conditions set out in our current Price Schedule.

Comments

MV Geophysical

MAIN PASS

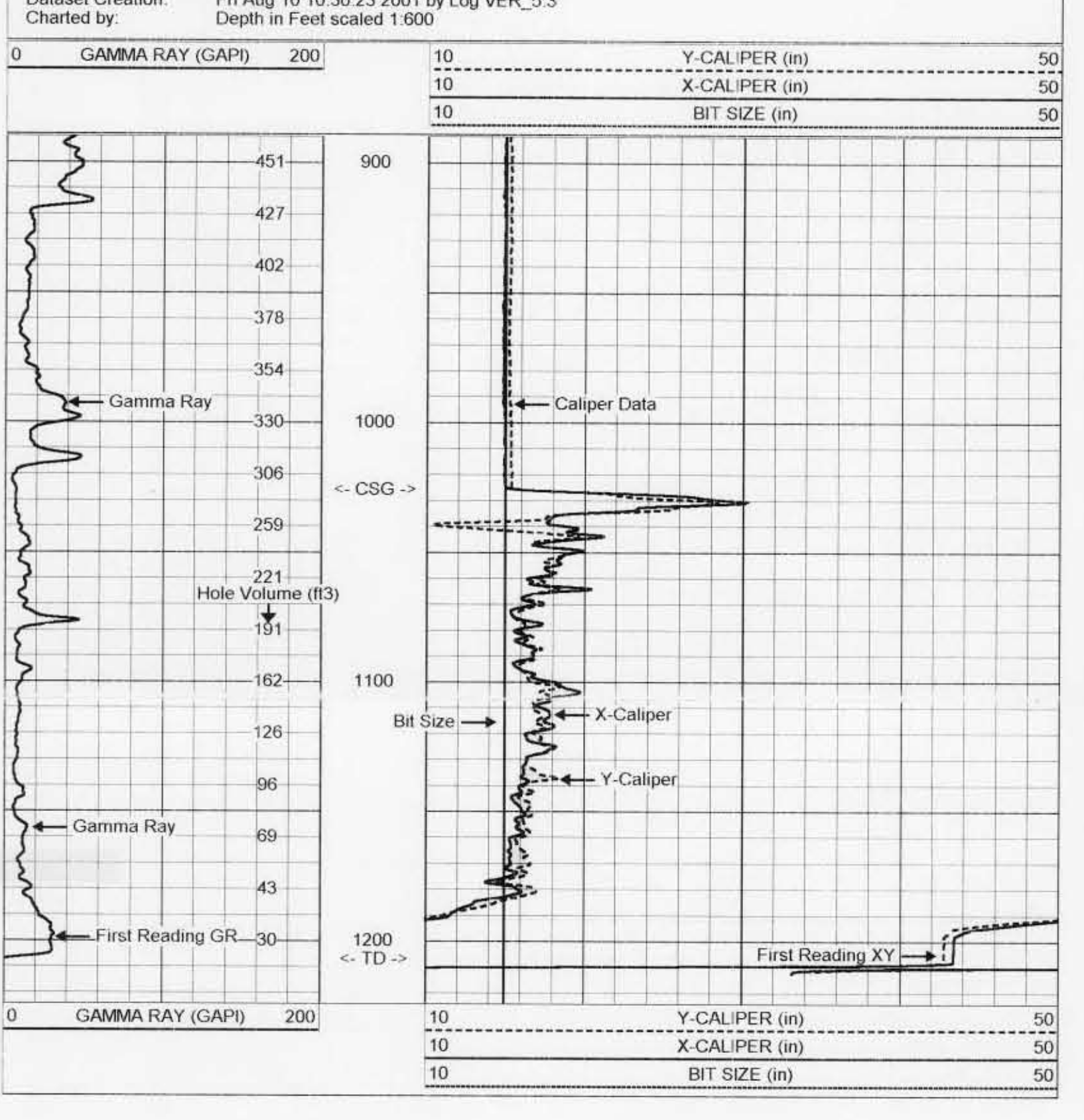
Database File: hbch1.db
Dataset Pathname: run6/pass3
Presentation Format: xy1050-1.prs
Dataset Creation: Fri Aug 10 10:30:23 2001 by Log VER_5.3
Charted by: Depth in Feet scaled 1:1200



MV Geophysical

MAIN PASS

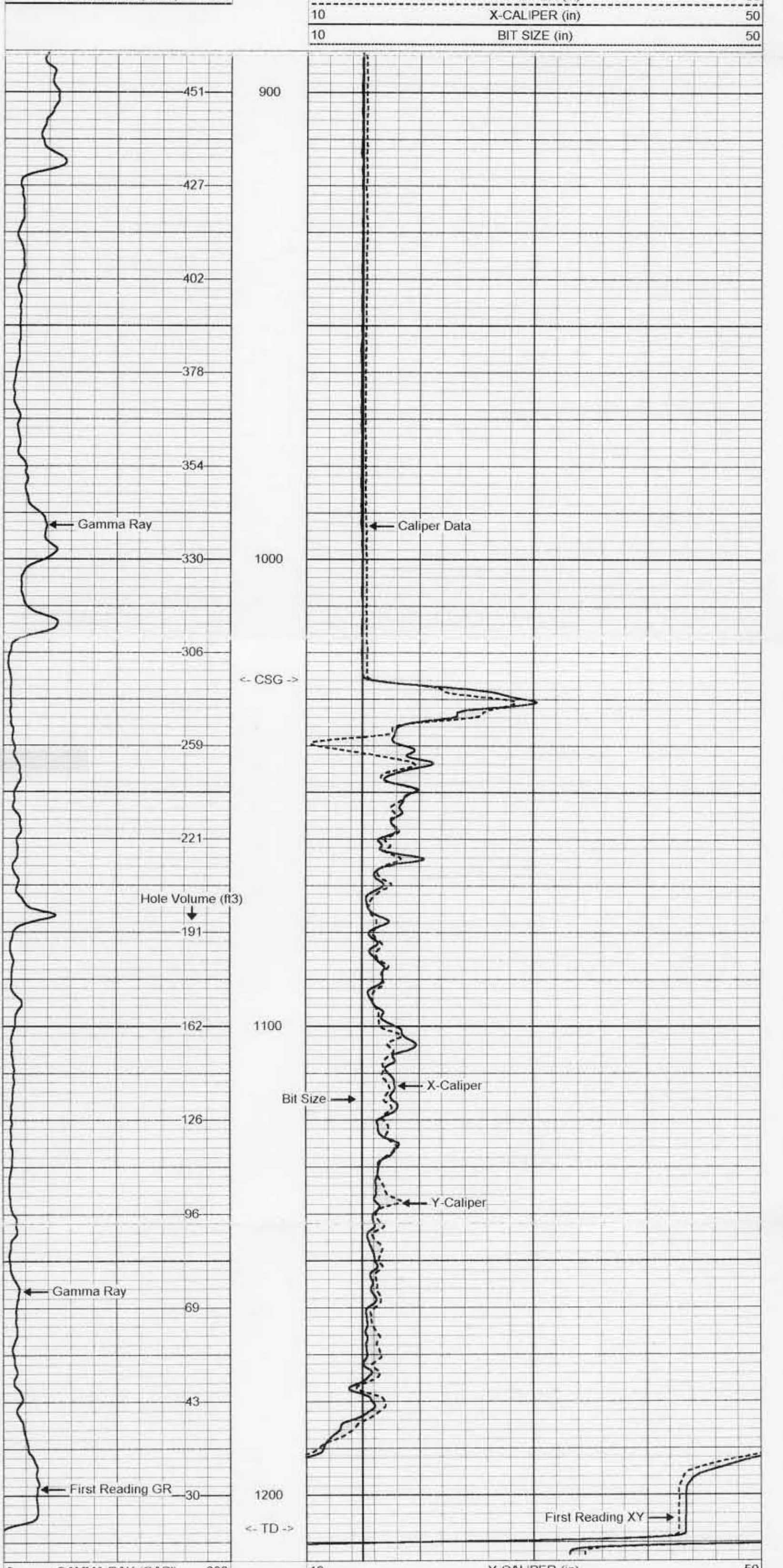
Database File: hbch1.db
Dataset Pathname: run6/pass3
Presentation Format: xy1050-5.prs
Dataset Creation: Fri Aug 10 10:30:23 2001 by Log VER_5.3
Charted by: Depth in Feet scaled 1:600



MV Geophysical

MAIN PASS

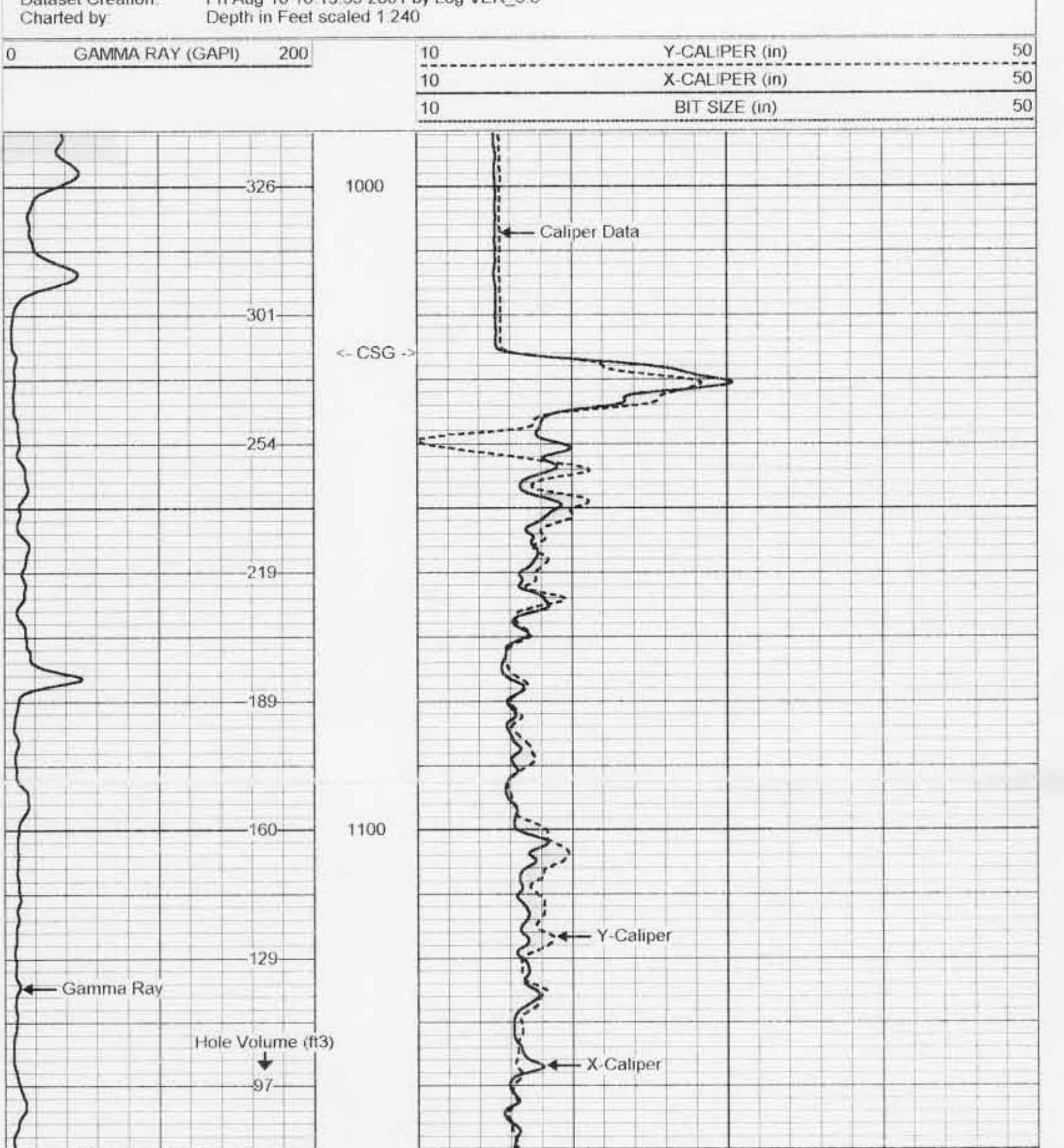
Database File: hbch1.db
Dataset Pathname: run6/pass3
Presentation Format: xy1050-5.prs
Dataset Creation: Fri Aug 10 10:30:23 2001 by Log VER_5.3
Charted by: Depth in Feet scaled 1:240



MV Geophysical

REPEAT SECTION

Database File: hbch1.db
Dataset Pathname: run6/pass1
Presentation Format: xy1050-5.prs
Dataset Creation: Fri Aug 10 10:13:59 2001 by Log VER_5.3
Charted by: Depth in Feet scaled 1:240

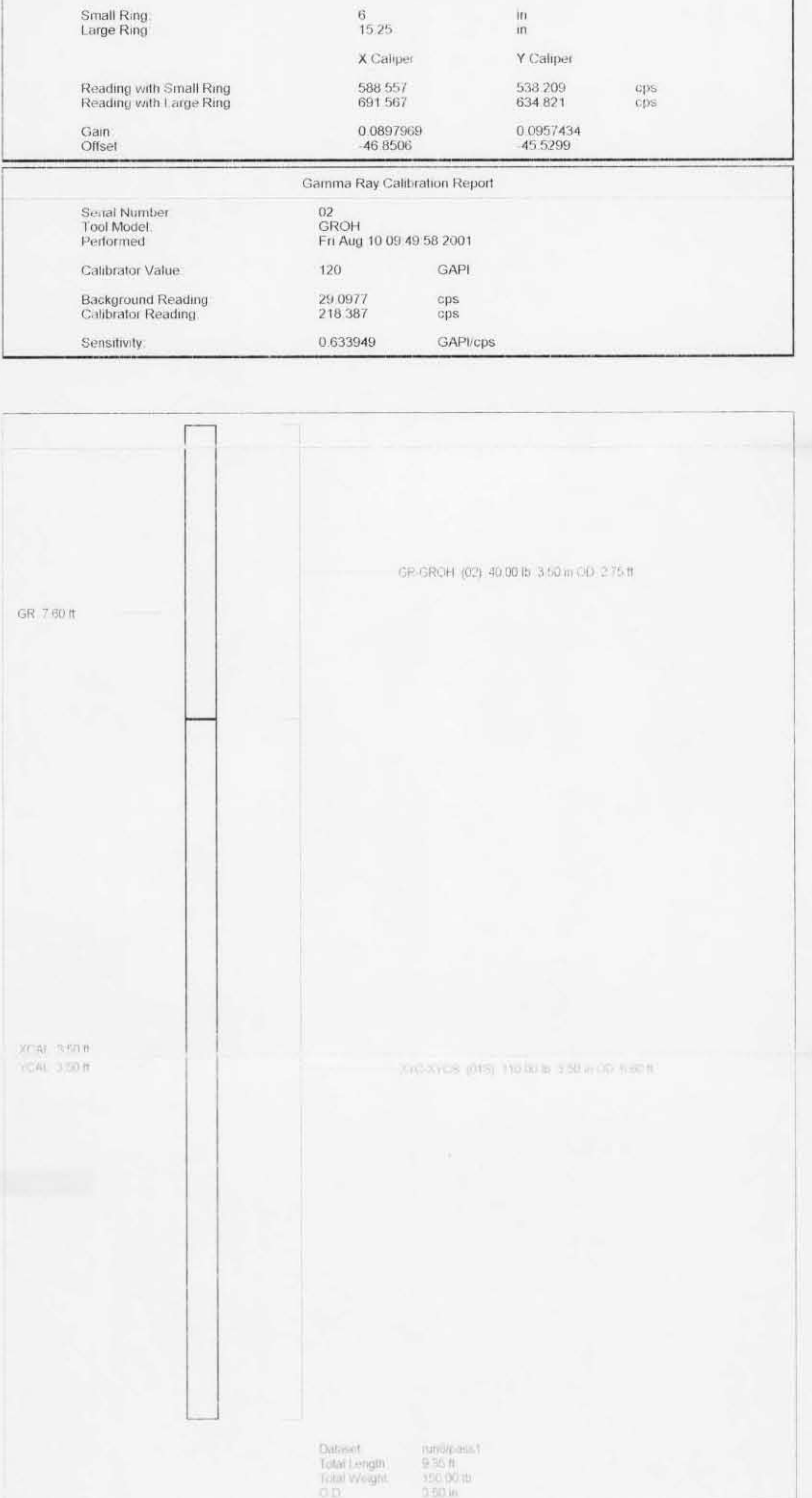


XY Caliper Calibration Report

Serial Number	01S		
Tool Model	XYCS		
Performed	Fri Aug 10 10:00:10 2001		
Small Ring	6	in	
Large Ring	15.25	in	
	X Caliper	Y Caliper	
Reading with Small Ring	588.557	538.209	cps
Reading with Large Ring	691.567	634.821	cps
Gain	0.0897969	0.0957434	
Offset	-46.8506	-45.5299	

Gamma Ray Calibration Report

Serial Number	02	
Tool Model	GROH	
Performed	Fri Aug 10 09:49:58 2001	
Calibrator Value	120	GAPI
Background Reading	29.0977	cps
Calibrator Reading	218.387	cps
Sensitivity	0.633949	GAPI/cps



Dataset: run6/pass1
Total Length: 9.35 ft
Total Weight: 150.00 lb
O.D.: 3.50 in

MV Geophysical

X-Y CALIPER LOG

Company	DIVERSIFIED DRILLING CORP.
Well	TPW-1
Field	Highland Beach
County	Palm Beach
State/Prv	Florida
Location	Town of Highland Beach Future R.O. WTP
Other Services	NONE

Company DIVERSIFIED DRILLING
Well TPW-1
Field Highland Beach
County Palm Beach
State/Prv Florida

All interpretations are opinions based on inferences from electrical or other measurements and we cannot and do not guarantee the accuracy or correctness of any interpretation, and we shall not, except in the case of gross or willful negligence on our part, be liable or responsible for any loss, costs, damages, or expenses incurred or sustained by anyone resulting from any interpretation made by any of our officers, agents or employees. These interpretations are also subject to our general terms and conditions set out in our current Price Schedule.

Comments

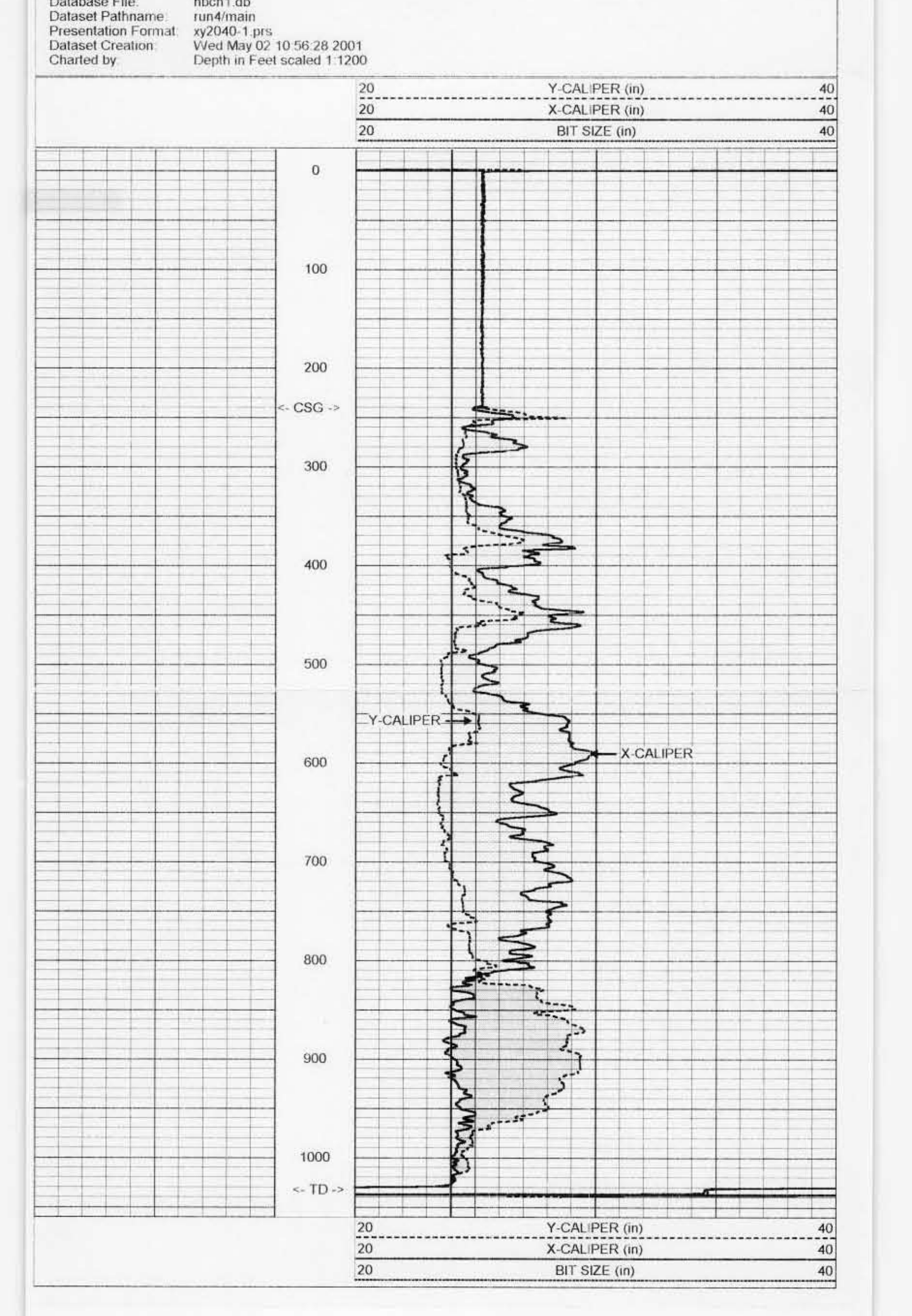
Annular Hole Volume calculated using a Future Casing Size of 17.4"

Maximum Arm Length: X=50"; Y=50"

<<< Fold Here >>>

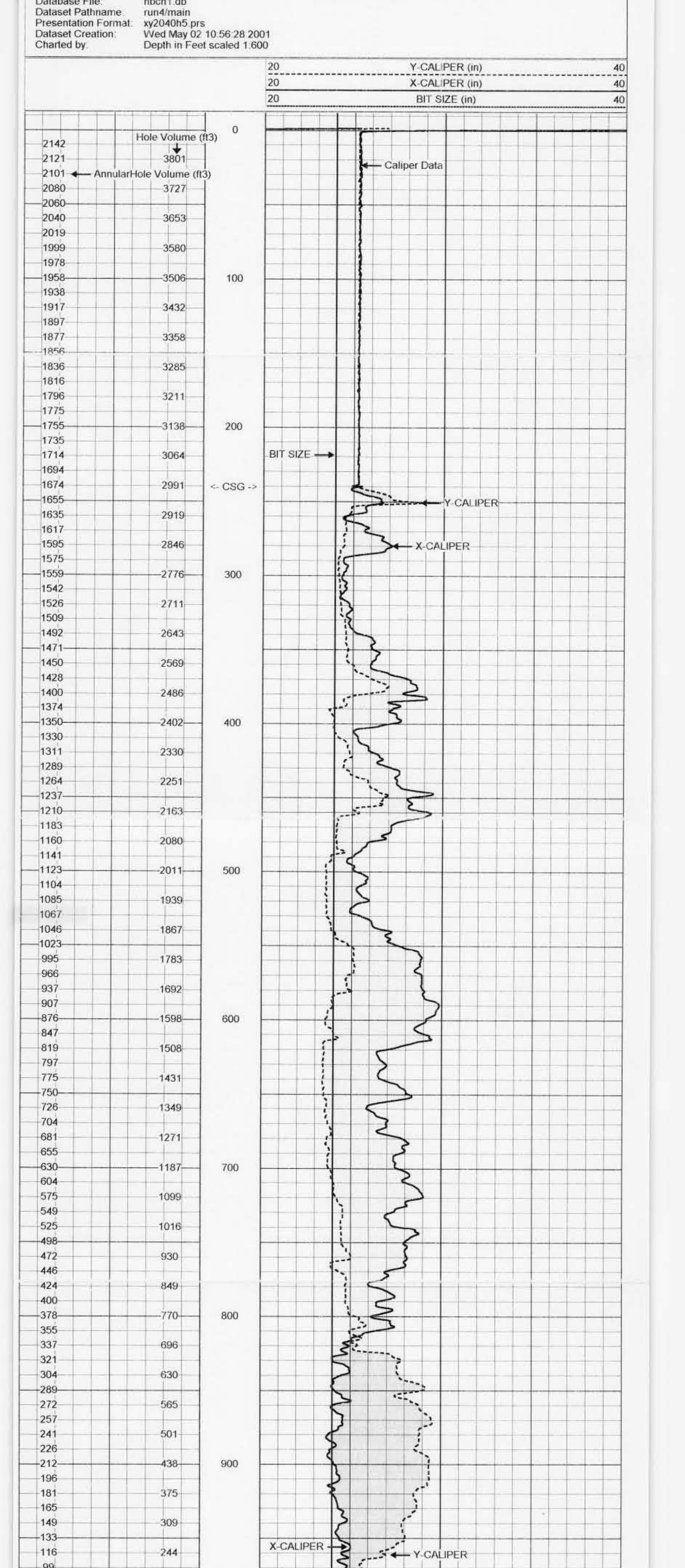
MV Geophysical — MAIN PASS

Database File: hbch1.db
Dataset Pathname: run4/main
Presentation Format: xy2040-1.prs
Dataset Creation: Wed May 02 10:56:28 2001
Charted by: Depth in Feet scaled 1:1200



MV Geophysical — MAIN PASS

Database File: hbch1.db
Dataset Pathname: run4/main
Presentation Format: xy2040h5.prs
Dataset Creation: Wed May 02 10:56:28 2001
Charted by: Depth in Feet scaled 1:600

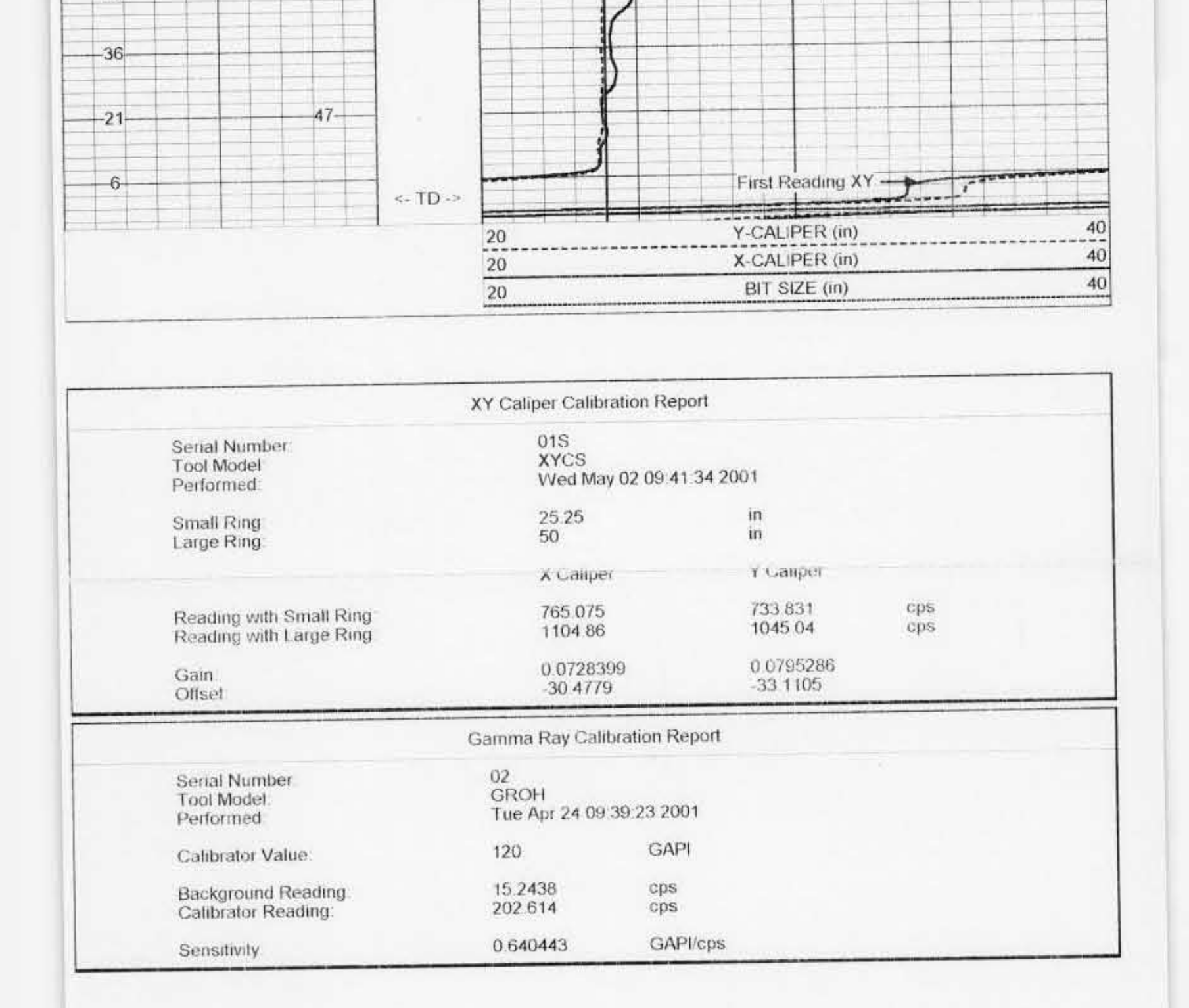


MV Geophysical — MAIN PASS

Database File: hbch1.db
Dataset Pathname: run4/main
Presentation Format: xy2040h5.prs
Dataset Creation: Wed May 02 10:56:28 2001
Charted by: Depth in Feet scaled 1:240

MV Geophysical — REPEAT SECTION

Database File: hbch1.db
Dataset Pathname: run4/REPEAT
Presentation Format: xy2040h5.prs
Dataset Creation: Wed May 02 10:01:11 2001
Charted by: Depth in Feet scaled 1:240



XY Caliper Calibration Report

Serial Number:	01S		
Tool Model:	XYCS		
Performed:	Wed May 02 09:41:34 2001		
Small Ring:	25 25	in	
Large Ring:	50	in	
	X Caliper	Y Caliper	
Reading with Small Ring:	765.075	733.831	cps
Reading with Large Ring:	1104.86	1045.04	cps
Gain:	0.0728399	0.0765286	
Offset:	-30.4779	-33.1105	

Gamma Ray Calibration Report

Serial Number:	02	
Tool Model:	GROH	
Performed:	Tue Apr 24 09:39:23 2001	
Calibrator Value:	120	GAPI
Background Reading:	15.2438	cps
Calibrator Reading:	202.614	cps
Sensitivity:	0.640443	GAPI/cps

APPENDIX C

Lithologic Log

Lithologic Description for Production Well FA-1

Depth Logged (ft-bls) From	To	Observer's Description
0	10	SAND and ORGAINC SOIL, sand very light gray (N8), fine to coarse, intermixed with black (N1) organic soil
10	20	ORGANIC soil, black (N1)
20	30	ORGANIC SOIL and SHELL FRAGMENTS, soil black (N1), shell fragments very light gray (N8) to medium light gray (N6), primarily bivalves, some consolidation of shell fragments
30	40	QUARTZ SAND and SHELL FRAGMENTS, sand: light gray (N7), medium to fine well-sorted sand; shell fragments very light gray (N8) to medium dark gray (N4), primarily bivalves, some consolidation
40	50	Same as above
50	60	SAND, light gray (N7) to light olive gray (5Y 6/1), fine-grained, some well-consolidated light gray (N7) fragments with low porosity
60	70	SAND and SHELL FRAGMENTS, sand medium light gray (N6), medium- to fine-grained; shell fragments light gray (N7) to medium dark gray (N4), some shell fragments well-consolidated
70	80	Same as above
80	90	Same as above
90	100	Same as above
100	110	SAND and SHELL FRAGMENTS, sand medium light gray (N6), medium- to fine-grained; shell fragments light gray (N7) to medium dark gray (N4)
110	120	Same as above
120	130	Same as above
130	140	SAND, SHELL FRAGMENTS, and LIMESTONE, sand and shell fragments same as above, limestone light gray (N7), well-consolidated fragments of consolidated oolitic limestone with solution channels
140	150	SAND and shell fragments as above, fewer shell fragments
150	160	Same as above, shell fragments white (N9), angular
160	170	SAND, light gray (N7), well-sorted, fine-grained, with fragments of consolidated nodular sandstone, medium light gray (N6) to light olive gray (5 Y 6/1)
170	180	Same as above
180	190	Same as above
190	200	LIMESTONE with SAND, very light gray (N8) to yellowish gray (5Y 8/1), friable clastic limestone with sand-sized calcite grains and shell fragments, poorly consolidated
200	210	LIMESTONE with SHELL FRAGMENTS, very light gray (N8) to medium light gray (N6), poorly consolidated
210	220	Same as above
220	230	SHELL FRAGMENTS with LIMESTONE, limestone pinkish gray (5YR8/1), poorly consolidated with calcite crystals, sample 90% shell fragments
230	240	Same as above
240	250	SHELL FRAGMENTS, light gray (N7), bivalves

250	260	SHELL FRAGMENTS with LIMESTONE, limestone light gray (N7) to yellowish gray (5Y8/1), moderately consolidated, >75% of sample shell fragments
260	270	Same as above
270	280	Same as above
280	290	Same as above
290	300	Same as above
300	310	Same as above, except 90% shell fragments
310	320	LIMESTONE, very light gray (N8) to medium light gray (N6), moderfate porosity, poorly consolidated
320	330	Same as above
330	340	Same as above
340	350	Same as above
350	360	Same as above
360	370	Same as above
370	380	Same as above
380	390	Same as above
390	400	Same as above
400	410	LIMESTONE, very light gray (N8) with white (N9) and light gray (N7) to medium dark gray (N4) specks, low porosity, moderately consolidated, some shell fragments
410	420	Same as above
420	430	Same as above
430	440	Same as above
440	450	CLAY (50%), greenish gray (5GY 6/1), low plasticity, very low porosity; LIMESTONE (50%), very light gray (N8) to medium gray (N6), abundant shell fragments, low porosity, moderately consolidated
450	460	Same as above, increase clay to 70%
460	470	Same as above
470	480	Same as above
480	490	Same as above
490	500	Same as above
500	510	Same as above
510	520	Same as above
520	530	Same as above
530	540	Same as above
540	550	Same as above
550	560	LIMESTONE, yellowish gray (5Y 8/1), fine grained, moderate porosity, moderately consolidated; trace of phosphate
560	570	Same as above
570	580	Same as above
580	590	Same as above
590	600	Same as above
600	610	Same as above
610	620	Same as above
620	630	Same as above
630	640	Same as above
640	650	LIMESTONE (80%), yellowish gray (5Y 8/1), fine grained, moderate porosity, moderately consolidated; trace of phosphate; clay, greenish gray (5GY 6/1), low plasticity, very low porosity

650	660	Same as above
660	670	Same as above, increase clay to 40%
670	680	Same as above
680	690	Same as above; decrease clay to 20%
690	700	LIMESTONE, yellowish gray (5Y 8/1), fine grained, moderate porosity, moderately consolidated; trace of phosphate
700	710	Same as above
710	720	Same as above
720	730	Same as above
730	740	Same as above
740	750	Same as above
750	760	CLAY, greenish gray (5GY6/1) to yellowish gray (5Y8/1), low plasticity, approximately 10% sand
760	770	Same as above
770	780	Same as above
780	790	SILTY CLAY, greenish gray (5GY6/1) to dark greenish gray (5GY4/1), low plasticity, trace of phosphate
790	800	Same as above
800	810	Same as above
810	820	PHOSPHATIC CLAY, greenish gray (5GY6/1), low plasticity
820	830	CLAY, greenish gray (5GY6/1), low plasticity
830	840	Same as above
840	850	Same as above
850	860	SILTY CLAY (70%), greenish gray (5GY6/1) to dark greenish gray (5GY4/1), low plasticity, trace of phosphate; LIMESTONE (30%), very light gray (N8), unconsolidated, some shell fragments (>5% of sample), trace of phosphate
860	870	Same as above, with coral fragments
870	880	Same as above
880	890	Same as above; increase limestone to 40%
890	900	CLAY (60%), greenish gray (5GY6/1) to dark greenish gray (5GY4/1), low plasticity, 5% phosphate; LIMESTONE (40%), very light gray (N8), unconsolidated, some shell fragments (>5% of sample), trace of phosphate
900	910	Same as above
910	920	Same as above
920	930	LIMESTONE, very light gray (N8), moderately consolidated, some shell fragments (>5% of sample), trace of phosphate
930	940	Same as above
940	950	Same as above
950	960	Same as above
960	970	Same as above
970	980	Same as above
980	990	Same as above
990	1000	Same as above
1000	1010	LIMESTONE (80%), very light gray (N8), moderately consolidated, some shell fragments (>5% of sample), trace of phosphate; clay (20%), greenish gray (5GY 6/1), low plasticity
1010	1020	Same as above, increase clay to 30%
1020	1030	Same as above, decrease clay to 20%
1030	1040	Same as above; increase clay to 40%

1040	1050	Same as above
1050	1060	LIMESTONE, very light gray (N8), moderately consolidated, trace of phosphate
1060	1070	Same as above
1070	1080	Same as above
1080	1090	Same as above, with coral fragments and *Leipdocyclinia sp.*
1090	1100	Same as above
1100	1110	Same as above
1110	1120	LIMESTONE, very light gray (N8), moderately consolidated, vuggy
1120	1130	Same as above
1130	1140	Same as above, with coral fragments
1140	1150	Same as above, poorly consolidated
1150	1160	Same as above, moderately consolidated
1160	1170	Same as above
1170	1180	Same as above
1180	1190	LIMESTONE, yellowish gray (5Y8/1), vuggy, moderately consolidated
1190	1200	Same as above
1200	1210	LIMESTONE, very light gray (N8), vuggy, poorly consolidated, with *Leipdocyclinia sp.*
1210	1220	Same as above
1220	1230	Same as above, moderately consolidated
1230	1240	Same as above
1240	1250	Same as above
1250	1260	MISSING
1260	1270	Same as above
1270	1280	MISSING
1280	1290	Same as above
1290	1300	Same as above
1300	1310	Same as above
1310	1320	LIMESTONE, very light gray (N8), vuggy, 10% chert fragments, light gray (N7), moderaterly consolidated
1320	1330	Same as above
1330	1340	LIMESTONE, yellowish gray (5Y8/1), poorly consolidated, with *Leipdocyclinia sp.* and coral fragments
1340	1350	Same as above
1350	1360	Same as above
1360	1370	LIMESTONE, yellowish gray (5Y8/1), fine calcilutite,moderately consolidated, with *Leipdocyclinia sp.*
1370	1380	Same as above
1380	1390	LIMESTONE, very light gray (N8), poorly consolidated
1390	1400	LIMESTONE, yellowish gray (5Y8/1), moderate consolidation
1400	1410	Same as above
1410	1420	Same as above
1420	1430	Same as above
1430	1440	Same as above
1440	1450	Same as above
1450	1460	LIMESTONE, light gray (N7), moderate consolidation
1460	1470	Same as above
1470	1480	Same as above, with *Leipdocyclinia sp.*

Lithologic Description for Production Well FA-1

Depth Logged (ft-bls) From	To	Observer's Description
0	10	SAND and ORGAINC SOIL, sand very light gray (N8), fine to coarse, intermixed with black (N1) organic soil
10	20	ORGANIC soil, black (N1)
20	30	ORGANIC SOIL and SHELL FRAGMENTS, soil black (N1), shell fragments very light gray (N8) to medium light gray (N6), primarily bivalves, some consolidation of shell fragments
30	40	QUARTZ SAND and SHELL FRAGMENTS, sand: light gray (N7), medium to fine well-sorted sand; shell fragments very light gray (N8) to medium dark gray (N4), primarily bivalves, some consolidation
40	50	Same as above
50	60	SAND, light gray (N7) to light olive gray (5Y 6/1), fine-grained, some well-consolidated light gray (N7) fragments with low porosity
60	70	SAND and SHELL FRAGMENTS, sand medium light gray (N6), medium- to fine-grained; shell fragments light gray (N7) to medium dark gray (N4), some shell fragments well-consolidated
70	80	Same as above
80	90	Same as above
90	100	Same as above
100	110	SAND and SHELL FRAGMENTS, sand medium light gray (N6), medium- to fine-grained; shell fragments light gray (N7) to medium dark gray (N4)
110	120	Same as above
120	130	Same as above
130	140	SAND, SHELL FRAGMENTS, and LIMESTONE, sand and shell fragments same as above, limestone light gray (N7), well-consolidated fragments of consolidated oolitic limestone with solution channels
140	150	SAND and shell fragments as above, fewer shell fragments
150	160	Same as above, shell fragments white (N9), angular
160	170	SAND, light gray (N7), well-sorted, fine-grained, with fragments of consolidated nodular sandstone, medium light gray (N6) to light olive gray (5 Y 6/1)
170	180	Same as above
180	190	Same as above
190	200	LIMESTONE with SAND, very light gray (N8) to yellowish gray (5Y 8/1), friable clastic limestone with sand-sized calcite grains and shell fragments, poorly consolidated
200	210	LIMESTONE with SHELL FRAGMENTS, very light gray (N8) to medium light gray (N6), poorly consolidated
210	220	Same as above
220	230	SHELL FRAGMENTS with LIMESTONE, limestone pinkish gray (5YR8/1), poorly consolidated with calcite crystals, sample 90% shell fragments
230	240	Same as above
240	250	SHELL FRAGMENTS, light gray (N7), bivalves

250	260	SHELL FRAGMENTS with LIMESTONE, limestone light gray (N7) to yellowish gray (5Y8/1), moderately consolidated, >75% of sample shell fragments
260	270	Same as above
270	280	Same as above
280	290	Same as above
290	300	Same as above
300	310	Same as above, except 90% shell fragments
310	320	LIMESTONE, very light gray (N8) to medium light gray (N6), moderfate porosity, poorly consolidated
320	330	Same as above
330	340	Same as above
340	350	Same as above
350	360	Same as above
360	370	Same as above
370	380	Same as above
380	390	Same as above
390	400	Same as above
400	410	LIMESTONE, very light gray (N8) with white (N9) and light gray (N7) to medium dark gray (N4) specks, low porosity, moderately consolidated, some shell fragments
410	420	Same as above
420	430	Same as above
430	440	Same as above
440	450	CLAY (50%), greenish gray (5GY 6/1), low plasticity, very low porosity; LIMESTONE (50%), very light gray (N8) to medium gray (N6), abundant shell fragments, low porosity, moderately consolidated
450	460	Same as above, increase clay to 70%
460	470	Same as above
470	480	Same as above
480	490	Same as above
490	500	Same as above
500	510	Same as above
510	520	Same as above
520	530	Same as above
530	540	Same as above
540	550	Same as above
550	560	LIMESTONE, yellowish gray (5Y 8/1), fine grained, moderate porosity, moderately consolidated; trace of phosphate
560	570	Same as above
570	580	Same as above
580	590	Same as above
590	600	Same as above
600	610	Same as above
610	620	Same as above
620	630	Same as above
630	640	Same as above
640	650	LIMESTONE (80%), yellowish gray (5Y 8/1), fine grained, moderate porosity, moderately consolidated; trace of phosphate; clay, greenish gray (5GY 6/1), low plasticity, very low porosity

650	660	Same as above
660	670	Same as above, increase clay to 40%
670	680	Same as above
680	690	Same as above; decrease clay to 20%
690	700	LIMESTONE, yellowish gray (5Y 8/1), fine grained, moderate porosity, moderately consolidated; trace of phosphate
700	710	Same as above
710	720	Same as above
720	730	Same as above
730	740	Same as above
740	750	Same as above
750	760	CLAY, greenish gray (5GY6/1) to yellowish gray (5Y8/1), low plasticity, approximately 10% sand
760	770	Same as above
770	780	Same as above
780	790	SILTY CLAY, greenish gray (5GY6/1) to dark greenish gray (5GY4/1), low plasticity, trace of phosphate
790	800	Same as above
800	810	Same as above
810	820	PHOSPHATIC CLAY, greenish gray (5GY6/1), low plasticity
820	830	CLAY, greenish gray (5GY6/1), low plasticity
830	840	Same as above
840	850	Same as above
850	860	SILTY CLAY (70%), greenish gray (5GY6/1) to dark greenish gray (5GY4/1), low plasticity, trace of phosphate; LIMESTONE (30%), very light gray (N8), unconsolidated, some shell fragments (>5% of sample), trace of phosphate
860	870	Same as above, with coral fragments
870	880	Same as above
880	890	Same as above; increase limestone to 40%
890	900	CLAY (60%), greenish gray (5GY6/1) to dark greenish gray (5GY4/1), low plasticity, 5% phosphate; LIMESTONE (40%), very light gray (N8), unconsolidated, some shell fragments (>5% of sample), trace of phosphate
900	910	Same as above
910	920	Same as above
920	930	LIMESTONE, very light gray (N8), moderately consolidated, some shell fragments (>5% of sample), trace of phosphate
930	940	Same as above
940	950	Same as above
950	960	Same as above
960	970	Same as above
970	980	Same as above
980	990	Same as above
990	1000	Same as above
1000	1010	LIMESTONE (80%), very light gray (N8), moderately consolidated, some shell fragments (>5% of sample), trace of phosphate; clay (20%), greenish gray (5GY 6/1), low plasticity
1010	1020	Same as above, increase clay to 30%
1020	1030	Same as above, decrease clay to 20%
1030	1040	Same as above; increase clay to 40%

1040	1050	Same as above
1050	1060	LIMESTONE, very light gray (N8), moderately consolidated, trace of phosphate
1060	1070	Same as above
1070	1080	Same as above
1080	1090	Same as above, with coral fragments and *Leipdocyclinia sp.*
1090	1100	Same as above
1100	1110	Same as above
1110	1120	LIMESTONE, very light gray (N8), moderately consolidated, vuggy
1120	1130	Same as above
1130	1140	Same as above, with coral fragments
1140	1150	Same as above, poorly consolidated
1150	1160	Same as above, moderately consolidated
1160	1170	Same as above
1170	1180	Same as above
1180	1190	LIMESTONE, yellowish gray (5Y8/1), vuggy, moderately consolidated
1190	1200	Same as above
1200	1210	LIMESTONE, very light gray (N8), vuggy, poorly consolidated, with *Leipdocyclinia sp.*
1210	1220	Same as above
1220	1230	Same as above, moderately consolidated
1230	1240	Same as above
1240	1250	Same as above
1250	1260	MISSING
1260	1270	Same as above
1270	1280	MISSING
1280	1290	Same as above
1290	1300	Same as above
1300	1310	Same as above
1310	1320	LIMESTONE, very light gray (N8), vuggy, 10% chert fragments, light gray (N7), moderaterly consolidated
1320	1330	Same as above
1330	1340	LIMESTONE, yellowish gray (5Y8/1), poorly consolidated, with *Leipdocyclinia sp.* and coral fragments
1340	1350	Same as above
1350	1360	Same as above
1360	1370	LIMESTONE, yellowish gray (5Y8/1), fine calcilutite,moderately consolidated, with *Leipdocyclinia sp.*
1370	1380	Same as above
1380	1390	LIMESTONE, very light gray (N8), poorly consolidated
1390	1400	LIMESTONE, yellowish gray (5Y8/1), moderate consolidation
1400	1410	Same as above
1410	1420	Same as above
1420	1430	Same as above
1430	1440	Same as above
1440	1450	Same as above
1450	1460	LIMESTONE, light gray (N7), moderate consolidation
1460	1470	Same as above
1470	1480	Same as above, with *Leipdocyclinia sp.*

APPENDIX D

Pumping Test Water and Quality Analyses

USBIOSYSTEMS

Client #: FTL-11-080102
Address: Diversified Drilling Corp.
17174 Jean Street
Fort Myers, FL 33912-6008
Mr. Dan Ringdahl

Date: 08/29/2001
Log #: L55281

Sample Description:

Highland Beach,FL
Town Hall

Analytical Report: Tap(PTW-1)
Date Sampled: 08/09/2001
Time Sampled: 08:30
Date Received: 08/09/2001
Collected By: P. Taylor

Radiochemical Analysis 62-550.310(5) (PWS033)

Parm ID	Name	MCL	Units	Samplenum	Result	Units	Method	Analysis Date	Error	Lab ID
4000	Gross Alpha			L55281-1	17.2	pCi/l	900.0	08/16/01	+/-10.3	E83033
4020	Radium 226			L55281-1	5.8	pCi/l	903.1	08/22/01	+/-0.3	E83033
4030	Radium 228			L55281-1	<1.0	pCi/l	Ra-05	08/22/01	+/-0.6	E83033

sticide/PCB Chemical Analysis 62-550.310(2)(c) (PWS029)

arm D	Name	MCL	Units	Samplenum	Result	Units	Method	MDL	Analysis Date	Lab ID
2005	Endrin	2.0	ug/l	L55281-1	BDL	ug/l	508	0.010	08/22/01	E84129
2010	Lindane	0.20	ug/l	L55281-1	BDL	ug/l	508	0.010	08/22/01	E84129
2015	Methoxychlor	40	ug/l	L55281-1	BDL	ug/l	508	0.020	08/22/01	E84129
2020	Toxaphene	3.0	ug/l	L55281-1	BDL	ug/l	508	0.20	08/22/01	E84129
2031	Dalapon	200	ug/l	L55281-1	BDL	ug/l	515.1	1.0	08/20/01	E84129
2032	Diquat	20	ug/l	L55281-1	BDL	ug/l	549.2	1.0	08/27/01	E84129
2033	Endothall	100	ug/l	L55281-1	BDL	ug/l	548.1	20	08/14/01	E84129
2034	Glyphosate	700	ug/l	L55281-1	BDL	ug/l	547	10	08/15/01	E84129
2035	Bis(2-Ethylhexyl)Adipate	400	ug/l	L55281-1	BDL	ug/l	506	1.0	08/17/01	E84129
2036	Oxamyl(Vydate)	200	ug/l	L55281-1	BDL	ug/l	531.1	0.50	08/13/01	E84129
2037	Simazine	4.0	ug/l	L55281-1	BDL	ug/l	507	0.10	08/22/01	E84129
2039	Bis(2-Ethylhexyl)Phthala	6.0	ug/l	L55281-1	BDL	ug/l	506	1.0	08/17/01	E84129
2040	Picloram	500	ug/l	L55281-1	BDL	ug/l	515.1	0.20	08/20/01	E84129
2041	Dinoseb	7.0	ug/l	L55281-1	BDL	ug/l	515.1	0.20	08/20/01	E84129
2042	Hexachlorocyclopentadien	50	ug/l	L55281-1	BDL	ug/l	508	0.10	08/22/01	E84129
2046	Carbofuran	40	ug/l	L55281-1	BDL	ug/l	531.1	0.50	08/13/01	E84129
2050	Atrazine	3.0	ug/l	L55281-1	BDL	ug/l	507	0.10	08/22/01	E84129
2051	Alachlor	2.0	ug/l	L55281-1	BDL	ug/l	507	0.30	08/22/01	E84129
2065	Heptachlor	0.40	ug/l	L55281-1	BDL	ug/l	508	0.010	08/22/01	E84129

Client #: FTL-11-080102
Address: Diversified Drilling Corp.
17174 Jean Street
Fort Myers, FL 33912-6008
Mr. Dan Ringdahl

Date: 08/29/2001
Log #: L55281

Sample Description:

Highland Beach,FL
Town Hall

Analytical Report: Tap(PTW-1)
Date Sampled: 08/09/2001
Time Sampled: 08:30
Date Received: 08/09/2001
Collected By: P. Taylor

Pesticide/PCB Chemical Analysis 62-550.310(2)(c) (PWS029) (continued)

2067	Heptachlor Epoxide	0.20	ug/l	L55281-1	BDL	ug/l	508	0.010	08/22/01	E84129

Parm ID	Name	MCL	Units	Samplenum	Result	Units	Method	MDL	Analysis Date	Lab ID
2105	2,4-D	70	ug/l	L55281-1	BDL	ug/l	515.1	0.50	08/20/01	E84129
2110	2,4,5-TP (Silvex)	50	ug/l	L55281-1	BDL	ug/l	515.1	0.050	08/20/01	E84129
2274	Hexachlorobenzene	1.0	ug/l	L55281-1	BDL	ug/l	508	0.010	08/22/01	E84129
2306	Benzo(a)pyrene	0.20	ug/l	L55281-1	BDL	ug/l	550	0.010	08/16/01	E84129
2326	Pentachlorophenol	1.0	ug/l	L55281-1	BDL	ug/l	515.1	0.050	08/20/01	E84129
2383	PCB	0.50	ug/l	L55281-1	BDL	ug/l	508	0.050	08/22/01	E84129
2959	Chlordane	2.0	ug/l	L55281-1	BDL	ug/l	508	0.050	08/22/01	E84129

Inorganics/Other

Parm ID	Name	MCL	Units	Samplenum	Result	Units	Method	MDL	Analysis Date	Lab ID
	Fecal Coliform			L55281-1	<1	cfu/100mL	SM9222D	1	08/10/01	E86240
	Fecal Strep			L55281-1	BDL	MPN/100mL	SM9230B	1	08/12/01	E86240
	Total Coliform			L55281-1	A,<1-Pass	cfu/100mL	SM9222B	1	08/10/01	E86240

Unregulated Group III Analysis 62-550.415 (PWS036/037)

Parm ID	Name	MCL	Units	Samplenum	Result	Units	Method	MDL	Analysis Date	Lab ID
2262	Isophorone		ug/l	L55281-1	BDL	ug/l	625	1.0	08/16/01	E86240
2270	2,4-Dinitrotoluene		ug/l	L55281-1	BDL	ug/l	625	1.0	08/16/01	E86240
2282	Dimethylphthalate		ug/l	L55281-1	BDL	ug/l	625	1.0	08/16/01	E86240
2284	Diethylphthalate		ug/l	L55281-1	BDL	ug/l	625	1.0	08/16/01	E86240
2290	Di-N-Butylphthalate		ug/l	L55281-1	BDL	ug/l	625	1.0	08/16/01	E86240
2294	Butylbenzylphthalate		ug/l	L55281-1	BDL	ug/l	625	1.0	08/16/01	E86240
9089	Di-N-Octylphthalate		ug/l	L55281-1	BDL	ug/l	625	1.0	08/16/01	E86240
9108	2-Chlorophenol		ug/l	L55281-1	BDL	ug/l	625	1.0	08/16/01	E86240
9112	2-Methyl-4,6-Dinitrophen		ug/l	L55281-1	BDL	ug/l	625	1.0	08/16/01	E86240
9115	Phenol		ug/l	L55281-1	BDL	ug/l	625	1.0	08/16/01	E86240
9116	2,4,6-Trichlorophenol		ug/l	L55281-1	BDL	ug/l	625	1.0	08/16/01	E86240

Subcontracted Services

Parm ID	Name	MCL	Units	Samplenum	Result	Units	Method	MDL	Analysis Date	Lab ID
	Subcontract Lab 1			L55281-1	E83033		RADIOLOGICAL			
	Subcontract Lab 2			L55281-1	E84129		PEST/PCB			

Inorganic Analysis 62-550.310(1) (PWS030)

Parm ID	Name	MCL	Units	Samplenum	Result	Units	Method	MDL	Analysis Date	Lab ID

Client #: FTL-11-080102
Address: Diversified Drilling Corp.
17174 Jean Street
Fort Myers, FL 33912-6008
Mr. Dan Ringdahl

Date: 08/29/2001
Log #: L55281

Sample Description:

Highland Beach,FL
Town Hall

Analytical Report: Tap(PTW-1)
Date Sampled: 08/09/2001
Time Sampled: 08:30
Date Received: 08/09/2001
Collected By: P. Taylor

Inorganic Analysis 62-550.310(1) (PWS030) (continued)

Parm ID	Name	MCL	Units	Samplenum	Result	Units	Method	MDL	Analysis Date	Lab ID
1005	Arsenic	0.0500	mg/l	L55281-1	BDL	mg/l	200.7	0.010	08/22/01	E86240
1010	Barium	2.00	mg/l	L55281-1	0.012	mg/l	200.7	0.010	08/22/01	E86240
1015	Cadmium	0.00500	mg/l	L55281-1	BDL	mg/l	200.7	0.0050	08/22/01	E86240
1020	Chromium	0.100	mg/l	L55281-1	BDL	mg/l	200.7	0.0050	08/22/01	E86240
1024	Cyanide	0.200	mg/l	L55281-1	BDL	mg/l	335.3	0.0050	08/15/01	E86240
1025	Fluoride	4.00	mg/l	L55281-1	BDL	mg/l	300.0	0.20	08/09/01	E86240
1030	Lead	0.0150	mg/l	L55281-1	BDL	mg/l	SM3113B	0.0050	08/17/01	E86240
1035	Mercury	0.00200	mg/l	L55281-1	BDL	mg/l	245.1	0.00050	08/16/01	E86240
1036	Nickel	0.100	mg/l	L55281-1	BDL	mg/l	200.7	0.0050	08/22/01	E86240
1040	Nitrate	10.0	mg/l	L55281-1	BDL	mg/l	300.0	0.050	08/09/01	E86240
1041	Nitrite	1.00	mg/l	L55281-1	BDL	mg/l	300.0	0.50	08/10/01	E86240
1045	Selenium	0.0500	mg/l	L55281-1	BDL	mg/l	SM3113B	0.0050	08/21/01	E86240
1052	Sodium	160	mg/l	L55281-1	810	mg/l	200.7	5.0	08/22/01	E86240
1074	Antimony	0.00600	mg/l	L55281-1	BDL	mg/l	SM3113B	0.0050	08/20/01	E86240
)75	Beryllium	0.00400	mg/l	L55281-1	BDL	mg/l	200.7	0.0040	08/22/01	E84129
085	Thallium	0.00200	mg/l	L55281-1	BDL	mg/l	3020/200.9	0.0020	08/21/01	E86240

General Chemistry

Parm ID	Name	MCL	Units	Samplenum	Result	Units	Method	MDL	Analysis Date	Lab ID
	Orthophosphate as P			L55281-1	BDL	mg/l	300.0	0.25	08/09/01	E86240
	Sulfide			L55281-1	3.2	mg/l	376.1	1.0	08/10/01	E86240
	Total Kjeldahl Nitrogen			L55281-1	BDL	mg/l	351.2	0.40	08/17/01	E86240
	Turbidity			L55281-1	BDL	NTU	180.1	0.10	08/09/01	E86240

General Chemistry

Parm ID	Name	MCL	Units	Samplenum	Result	Units	Method	MDL	Analysis Date	Lab ID
	Ammonia as N	2.8		L55281-1	0.50	mg/l	350.1	0.020	08/15/01	E86240
	Ammonium as N			L55281-1	0.50	mg/l	FL DEP SOP	0.020	08/20/01	E86240
	Organic Nitrogen as N			L55281-1	BDL	mg/l	Calc	0.50	08/20/01	E86240

Secondary Chemical Analysis 62-550.320 (PWS031)

Parm ID	Name	MCL	Units	Samplenum	Result	Units	Method	MDL	Analysis Date	Lab ID
1002	Aluminum	0.200	mg/l	L55281-1	BDL	mg/l	200.7	0.0500	08/22/01	E86240
1017	Chloride	250	mg/l	L55281-1	3800	mg/l	300.0	25.0	08/10/01	E86240
1022	Copper	1.00	mg/l	L55281-1	BDL	mg/l	200.7	0.0100	08/22/01	E86240
1028	Iron	0.300	mg/l	L55281-1	BDL	mg/l	200.7	0.0500	08/22/01	E86240
032	Manganese	0.0500	mg/l	L55281-1	BDL	mg/l	200.7	0.0100	08/22/01	E86240

Client #: FTL-11-080102
Address: Diversified Drilling Corp.
17174 Jean Street
Fort Myers, FL 33912-6008
Mr. Dan Ringdahl

Date: 08/29/2001
Log #: L55281

Sample Description:

Highland Beach,FL
Town Hall

Analytical Report: Tap(PTW-1)
Date Sampled: 08/09/2001
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Collected By: P. Taylor

Secondary Chemical Analysis 62-550.320 (PWS031) (continued)

1050 Silver	0.100	mg/l	L55281-1	BDL	mg/l	200.7	0.0100	08/22/01	E86240

Parm ID	Name	MCL	Units	Samplenum	Result	Units	Method	MDL	Analysis Date	Lab ID
1055	Sulfate	250	mg/l	L55281-1	510	mg/l	300.0	5.00	08/10/01	E86240
1095	Zinc	5.00	mg/l	L55281-1	BDL	mg/l	200.7	0.0200	08/22/01	E86240
1905	Color	15.0	pcu	L55281-1	BDL	pcu	110.2	5.00	08/09/01	E86240
1920	Odor	3.00	TON	L55281-1	1.0	TON	140.1	1.00	08/09/01	E86240
1925	pH	6.5-8.5		L55281-1	7.38	pH Units	150.1	0.100	08/14/01	E86240
1930	TDS	500	mg/l	L55281-1	6600	mg/l	160.1	500	08/10/01	E86240
2905	MBAS	0.500	mg/l	L55281-1	BDL	mg/l	425.1	0.100	08/09/01	E86240

All analyses were performed using EPA, ASTM, NIOSH, USGS, or Standard Methods and certified to meet NELAC requirements.
Flags: BDL or U-below reporting limit; DL-diluted out; IL-meets internal lab limits; MI-matrix interference; NA-not appl.
Flags: CFR-Pb/Cu rule; ND-non detect(RL estimated); NFL-no free liquids; dw-dry wt; ww-wet wt; C(#)-see attached USB code
FLDEP Flags: J(#)-estimated 1:surr. fail 2:no known QC req. 3:QC fail %R or %RPD; 4:matrix int. 5:improper fld. protocol
FLDEP Flags: L-exceeds calibration; Q-holding time exceeded; T-value < MDL; V-present in blank
FLDEP Flags: Y-improper preservation; B-colonies exceed range; I-result between MDL and PQL

QAP# 980126	DOH# E86240	NC CERT# 444
SUB HRS# 86122,86109,E86048	ADEM ID# 40850	RI CERT# 191
SC CERT# 96031001	TN CERT# 02985	CT CERT# PH-0122
ELPAT# 13801	GA CERT# 917	MA CERT# M-FL449
VA CERT# 00395	USDA Soil Permit# S-35240	

Respectfully submitted,

LouAnn Jones
Project Manager