IW1 = MIR WWRF IW1
IW2 = MIR WWRF IW2
MW1 = MIR-MW1 (when merged)
MW2 = MIR-MW2

Response to Request for Information

Florida Department of Environmental Protection

City of Miramar Injection Wells at the Wastewater Treatment Facility

March 25, 1997

HAZEN AND SAWYER
Environmental Engineers & Scientists

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March 25, 1997

William W. Cocke
Groundwater Section - UIC
FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
Post Office Box 15425
West Palm Beach, Florida 33416-5425

City of Miramar WWTP
Permit Nos. UC-06-243432 & UC-06-243433

Dear Mr. Cocke:

Please find below additional information and clarifications requested in your correspondence dated March 5, 1997.

Item No.	Response
1.	Referenced temperature logs conducted on July 16 and July 18, 1996, are included as Attachment 1.
2.	The cement bond logs interpretation is included as Attachment 2.
3.	A revised plugging and abandonment (section 4.5 of the construction report) is included as Attachment 3.
4.	Revised signed and sealed Figures 5, and 6 are included as Attachment 4. The wells "As-Built" profiles are shown with respect to the geologic stratigraphic cross section. A note has been added to each drawing indicating that all casing sizes are given as outer diameters. Monitor well casing thicknesses have been added. Revised signed and sealed Figure 2 showing the latitude and longitude of each well head are included under Attachment 3. Signed and sealed Figure 3 submitted in the report on January 6, 1997, is also included under Attachment 4.
5.	We have prepared a certification letter for the project and have included it as Attachment 5.
6.	Water quality analyses for the injection zone were not submitted as a result of a misunderstanding of the Department's position. The wells are located within the area of influence of the adjacent Pembroke Pines injection wells as demonstrated by the presence of effluent detected during construction activities. We were under the understanding that

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because effluent is already present in the injection zone, analyses of the water within that formation were not meaningful and therefore not required.

We have scheduled sampling of the formation water in both injection wells for March 25, 1997. It is anticipated that we will forward the results to the Department under separate cover by the end of April 1997.

Considering that the wells will be injecting into a currently active injection formation and that the nature of the existing and new injected fluids is essentially the same, we suggest that granting of the operational testing approval not be contingent on receipt and acceptance of these analyses by the Department.

We will submit complete effluent analysis, as requested, after six months of operation. Monitoring during operational testing will be in compliance with the construction permit conditions.

7. The Department has identified fourteen constituents not shown in the monitoring zones background analysis. The analyses were conducted but were not reported in the laboratory reports. Revised laboratory reports are included as Attachment 6. For convenience, the following table identifies where each of these constituents can be found on the revised reports.

	Monitor Well 1		Monitor Well 2	
Constituent	**Report**	**Page #**	**Report**	**Page #**
Alachlor	D6-72346	1	D6-72346	1
Antimony	D6-71991	8	D6-71992	8
Berylium	D6-71991	8	D6-71992	8
Dibromochloropropane (DBCP) [1,2-Dibromo-3-chloropropane]	D6-71991	7	D6-71992	7
Methoxychlor	D6-71991	6	D6-71992	6
Nickel	D6-71991	9	D6-71992	9
Nitrite (as N)	D6-71991	11	D6-71992	11
Styrene (Vinyl benzene)	D6-71991	1	D6-71992	1
Trihalomethanes, total	D6-71991	2	D6-71992	2
Xylenes, total	D6-71991	2	D6-71992	2
Aluminum	D6-71991	7	D6-71992	7
Iron	D6-71991	9	D6-71992	9
Conductivity	D6-71991	12	D6-71992	12

We have scheduled the resampling of the formation water to obtain the water temperature for March 25, 1997. We will report the results to the Department under separate cover.

8. Additional information requested regarding demonstration of confinement is included as Attachment 7.

9. As indicated in the letter dated January 6, 1997 requesting operational testing approval, the Wastewater Reclamation Facility (WWRF) is currently under construction. The City needs to begin operation of these facilities on April 29, 1997. We request that the operational testing approval be issued contingent upon certification of substantial completion of the surface equipment which will be forwarded as soon as available.

10. Signed and sealed record drawings for the injection and monitor wells are included as Attachment 8. The drawings for the injection well pad show the pad with an impermeable curb and sump. Temporary piping will be provided to allow for the manual pumping of spillage of well fluids to the wet well (head of the treatment plant). This will be accomplished using portable sump pump that discharges into the onsite sanitary sewer system.

    The surface equipment (injection well pump station and piping between the station and the wells) is expected to be completed in the middle of April 1997. As agreed by telephone conversation between Ghislaine Carr and Heidi Vandor on March 19, 1997, we are submitting signed and sealed mechanical and instrumentation bid drawings for the surface equipment. These drawings have been updated to reflect known substantial deviations implemented through construction change orders. These drawings are submitted as Attachment 9.

    It is anticipated that all construction activities at the site will be completed in July 1997. Considering the time required for finalization of the record drawings by the contractor and the engineer, it is anticipated that record drawings for the entire project will be available by the end of September and will be forwarded to the Department at that time.

11. Emergency Disposal Contingency Plan

    1) a) Power failure

        i) The standby power system consists of three Caterpillar engine generator sets. The generator system single line power diagram is shown on Drawing E-22 included under Attachment 10.

        ii) Each of the three generator set is a Caterpillar Model 356 TA Prime Diesel Generator sets rated at 1,275KW at 1,800 rpm, 4160V, AC, 3 phase, 60 Hertz, 0.8 P.F. Equipment data on this units is provided under Attachment 11.

iii) The standby power generation system is designed to operate the two duty injection well pumps. It should be noted that the third installed pump is a standby unit. Injection well pump station and electrical distribution system single line power diagrams are shown on drawings E-21, and E-51 which are included under Attachment 10. As shown, the entire power distribution system is designed as a dual feed system to provide an additional level of redundancy in case of electrical component failure.

iv) Switch over time from normal to emergency power is 15 to 20 seconds.

v) The emergency power system has sufficient capacity to allow the injection well pump station to discharge the plant rated peak hour flowrate of 18.5 mgd to both or a single well.

vi) Not applicable. See response to item 11. 10 a) vi) above.

b) Pump station failure

i) The facility maintains an inventory of major spare parts allowing the maintenance staff to conduct certain emergency repairs within two to seven days, with or without the assistance of the manufacturer's representative as required. The inventory of majors spare parts maintained at the facility for the injection well pump station is included under Attachment 12. All equipment is supplied by major manufacturers, therefore, parts not kept at the facilities can generally be obtained from the equipment service facilities or from local machine shops within a week.

Repairs involving pump/motor removal require rental of a crane and generally service by an outside repair company. Under such conditions, repair time could take up to two weeks.

ii) The injection well pump station is designed with a standby pump (including associated strainer and valves). In event of failure of one pump, the station will continue operation without loss of performance. In the event of failure of two pumps, the single remaining pump is capable of handling the projected peak flow in the early years of operation of the plant. As plant flows increase, some of the effluent would have to be diverted toward the emergency disposal system described under 11. 3).

It should also be noted that the influent piping to the plant is interconnected to the Pembroke Pines and Hollywood Southern Regional WWTP allowing diversion of a portion of the influent to the two treatment plants under emergency conditions. At start-up, all of the influent could be diverted. As the plant flows increase, it is anticipated that only a portion of the influent could be diverted in that manner.

iii) Depending on the actual flows through the plant at the time of the failure, the nature of the failure (one or both duty pumps out of service), and the time frame for the repairs, the quantity of effluent to be discharged to the emergency disposal method could range from zero up to the full rated capacity of the plant of 8.9 mgd, until the repairs are completed.

c) Natural disasters which render the injection wells inoperative or inadequate

i) The City would rely on the emergency disposal described under 11. 3).

ii) Depending on the actual flows through the plant at the time of the failure, the nature of the failure (one or both duty pumps out of service), and the time frame for the repairs, the quantity of effluent to be discharged to the emergency disposal method could range from zero up to the full rated capacity of the plant of 8.9 mgd, until the repairs are completed.

d) One well out of service

i) In the event one well has to be taken out of service for MIT testing, the remaining well can be used in conjunction with the injection well pump station to dispose of the entire effluent flow. Duration of the well outage would depend on the nature of the failure. Should such a situation occur, the City would submit a remediation plan to the Department which would identify duration of the proposed activities.

ii) Based on plant current permitted rating of 8.9 mgd (maximum 3-month average), two pumps operating below maximum speed can discharge the corresponding peak hour flowrate of 12,840 gpm (18.5 mgd) to a single well. Under this condition, the velocity in the well is 10 fps. This condition is illustrated on the curves included under Attachment 13. Revised hydraulic calculations for the system are also included in Attachment 13. Refer to response to Item 15 for further information in support of the pending uprating request.

2) i) It is anticipated that each well will be out of service for approximately four days every five years for MIT work. Well maintenance, such as periodic casing cleaning if necessary, will be combined with MIT work and could add another four days to the planned outage.

ii) Refer to response to Item 11. 1) d).

iii) Storage is not required during planned outage as one single well provides for one hundred percent disposal.

3) Catastrophic Emergency

Under catastrophic emergency of the WWRF and of the injection well system, while the plant is still receiving raw influent from the regional pump station, wastewater could flow by gravity through the liquid treatment train and overflow at the clarifiers and/or at the injection well pump station. The plant effluent would initially be held into the on-site stormwater retention areas and wetlands. Once the stormwater areas have reached capacity, water will flood the WWRF site. Based on average elevations of the top of the stormwater retention areas and of the perimeter berm, maximum water depth in flooded areas will be approximately 6 inches. Approximately one and one-half days of effluent at the peak hour flow rate of 18.5 mgd could be held on site. Beyond that point, effluent would discharge off site either through the proposed South Broward Drainage District canal, if constructed, or flow off site in a general southwest direction.

The catastrophic emergency plan was originally submitted on April 12, 1994 in response to permit application RFI No. 2. Since that time, the site work had been modified to comply with wetlands permitting requirements. A revised site plan showing sheet flow path under catastrophic failure conditions is provided under Attachment 14.

12. The previously described EDM will be incorporated in the facility Operation and Maintenance Manual.

13. Emergency disposal method (defined under 62-528.200(21) as a method for short term discharges), is provided by the two injection well design, one well being a full back-up to the other well. Discharge to a surface water is only anticipated under catastrophic failure conditions. Should such conditions occur, they will be reported to the Department and dealt with in accordance with rules 62-620.610 (20) through 62-620.610 (23).

14. As previously noted, the facility is still under construction. A draft Operation and Maintenance Manual is currently being prepared. To allow operational testing approval in the interim period, we are submitting a preliminary draft of the section related to the injection well system provided under Attachment 15. This section contains all salient information necessary to begin operation of the system and specifically addresses all considerations listed under this RFI.

15. At the time of submittal of the permit application of the injection wells, the WWRF was under design and the projected plant capacity was 6 mgd AADF or 15 mgd peak hour flowrate. Subsequently, the Phase I required capacity was established as 7.4 mgd AADF (8.9 mgd maximum three month) with a corresponding peak hour flowrate of 18.5 mgd. As such, under planned outage of one well, the remaining well would have to handle the entire plant flow, operating at a fluid velocity of approximately 10 fps. This condition is illustrated on the curves included under Attachment 13.

Furthermore, in order to maximize utilization of the injection wells, in the future the City intends to use the wells to the maximum extent allowed as a result of the 62-628 rule change adopted after issuance of the well construction permits. As such, the City requested through the August 15, 1996 correspondence that the new wells be rated based on maximum injection fluid velocities of 10 fps under normal conditions and 12 fps in case of outage of one or more wells. Based on the well interior diameter of 23 inches, these velocities equate to ratings of 18.7 mgd and 22.4 mgd per well, respectively. In order to support the uprating of the wells, injection tests and MIT pressure tests were conducted at flowrates and corresponding pressures at least equivalent to the uprated conditions. The injectivity test demonstrated that the wells can be pumped at these flowrates while maintaining the integrity of the formation. The injection well pump station is designed to provide the necessary capacity and head under these conditions by adding a fourth pump (three duty pumps) as illustrated in the figure included under Attachment 13.

16. The anticipated maximum pressure and flowrate for the wells are shown below under different scenarios.

	Current WWRF Permitted Condition		**Future WWRF Condition**	
	Two Wells Operation	**Single Well Operation**	**Two Wells Operation**	**Single Well Operation**
Flowrate, mgd				
Total	18.5	18.5	34.5	22.4
Per Well	9.25		17.25 (1)	
Velocity in Well, fps	5.0	9.9	9.2	12
System Pressure, TDH				
in ft	100	165	175	200
in psig	43	71	76	87

(1) This value represents the maximum achievable capacity with three duty pumps.

Operation of the injection well system is automatically controlled by the local Programmable Logic Controller (PLC) at the pump station. The injection well system is operated automatically based on the station wetwell level. Upon rising level, the first pump is started and the control system modulates the pump speed to try to maintain a preset setpoint (approximate El. 10.50). If the first pump is unable to maintain the level setpoint, the control system automatically starts the second duty pump. Upon falling level, the system shuts down the pumps sequentially. The system is provided with multiple equipment safety features to automatically monitor and shut down the equipment, and to inform the operator of mechanical, electrical and control problems.

It should be noted that, initially, the pumps will be installed with only two of the three stages to allow better tracking of the reduced plant flows experienced in the early years of operation. Motors and electrical system are sized for the three stage operation. Refer to Attachment 15 for additional information.

Unless one well is out of service, the effluent is discharged simultaneously to both wells. The effluent flowrate and well head pressure at each injection well is continuously monitored and recorded via the plant control system.

The City intends to begin operation of the wastewater treatment plant in the second part of April of this year. It is therefore critical that all outstanding issues be resolved before that time. We are available to meet at your offices, if necessary, to ensure prompt issuance of operational testing approval of these wells.

Very truly yours,

HAZEN AND SAWYER, P.C.

Patrick A. Davis, P.E.
Vice President
Registration No. 37167

WATER TECHNOLOGY ASSOCIATES, INC.

James A. Wheatley, P.G.
President
Registration No. 530

Attachments

c. Distribution List
V. Hargray

HAZEN AND SAWYER

CITY OF MIRAMAR
WASTEWATER RECLAMATION FACILITY
INJECTION WELL CONSTRUCTION

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ATTACHMENT 1

TEMPERATURE LOGS

FLORIDA

DEPARTMENT OF ENVIRONMENTAL PROTECTION

DIVISION OF WATER RESOURCE MANAGEMENT

OFFICE OF WATER RESOURCE ALLOCATION

WATER USE MONITORING NETWORK

This data is provided as a service to the public. While every effort is made to ensure the accuracy of the information, the Department makes no warranty, expressed or implied, regarding the accuracy of the information and assumes no liability for any errors, omissions, or misuse of the information.

GENERAL

DISTRICT NAME SUWANNEE RIVER WATER MANAGEMENT DISTRICT

DISTRICT NUMBER 32

01 STATION NO. 1-17-1 (WELL NO.)

02 STATION NAME 1-17-1 (WELL NO.)

03 STATUS (ACTIVE, INACTIVE, DESTROYED, ETC.) ACTIVE

04 DATE DATA STORED (MONTH,DAY,YEAR)

05 COUNTY NAME 1-17-1 (WELL NO.) LEVY

06 AQUIFER NAME 1-17-1 (WELL NO.) FLORIDAN AQUIFER

07 WELL DEPTH 1-17-1 (WELL NO.) 0

08 CASING DIAM 1-17-1 (WELL NO.) 0

09 CASING DEPTH 1-17-1 (WELL NO.) 0

10 WELL DIAMETER 1-17-1 (WELL NO.) 0

11 WELL CONSTRUCTION DATE

WATER TABLE

DESCRIPTION

CODE (DRY, ABNL,ETC) STATICAL LEVEL (DTW, DTP, DTS, DTD, DTM, DTW, DTP, DTS, DTD, DTM)

DATE	DTW	DTP	DTS	DTD	DTM	DTW	DTP	DTS	DTD	DTM

FLORIDA DEPARTMENT OF TRANSPORTATION	
DISTRICT	
COUNTY	
ROUTE	
SECTION	
PROJECT	
DATE	
DRILLER	
DRILL METHOD	
HAMMER TYPE	
BORE DIA.	
SHEET	
OF	

THIS DOCUMENT IS PRELIMINARY AND SUBJECT TO REVISION. THE INFORMATION PRESENTED HAS NOT BEEN FULLY REVIEWED AND MAY BE INCOMPLETE.

NOTES

GEOTECHNICAL DATA PRESENTED FOR FDOT CONSTRUCTION.

ADDITIONAL DATA AVAILABLE FROM FDOT.

STATION 0+ - 21+77, 25MW-01

STATION 0+00 - 1+00 ON TRACK

1+00 - 21+77 ON TRACK

21+77 - 21+77 ON TRACK

STATION 21+77 - 25+00 ON TRACK

25MW-01 - 1+00 ON TRACK

1+00 - 21+77 ON TRACK

NOTES

FROM DATA SHEETS

SHEET 1 OF

BORE TIME

| | | |

ATTACHMENT 2

CEMENT BOND LOGS INTERPRETATION

CEMENT BOND LOG INTERPRETATION

In response to RFI question No. 2, we are providing the following interpretation of the cement bond logs:

The cement bond log, used to assess the quality of the bond between the inner casing and the cement grout around the casing, is a function of casing size and thickness, cement strength and thickness, degree of cement bonding, and tool centering.

The travel time curve (left log track) is run to determine if the tool is properly centralized. The critical travel time is the time recorded when the tool is absolutely centralized in high signal areas, areas with no cement (free pipe). The travel time curves are affected by cycle skipping that can be caused by fast formation arrivals, formations that are so dense, they actually have a faster transit time than the casing. The basic transit time of steel is slower than that of some dolomites and limestones.

In order to develop the amplitude curves (center log track), a time gate is set at the time corresponding to the expected arrival of the casing signal, and the amplitude of the signal in that gate is recorded. A high amplitude indicates an increase in casing signal, and therefore a decrease in cement bond; a low amplitude indicates a good bond.

The variable density display (right log track) displays the entire wave signal. If there is no bond, an arrival is seen at the time corresponding to the casing velocity. The thicker and stronger the cement, the weaker the casing signal.

Injection Well No. 1

From the travel time log it can be seen that good tool centralization was maintained for the entire log. Some cycle skipping is seen throughout the log this interpreted to be due to fast formation arrivals.

The amplitude curve from 2,650 feet to the bottom averages about 3 millivolts indicating an excellent bond. The variable density display shows no casing signal throughout this interval. The cement placed behind the casing in this section of the well was neat cement with no bentonite additives, thus this cement has the highest compressive strength and shows the lowest amplitude. Within this interval, the section from 2,850 to 2,870 feet displays travel times as low as 500 microseconds and amplitudes as high as 8 millivolts. These characteristics are the result of the adjacent fast formations. This is confirmed in that the same effect can be seen at the same depth on Injection Well No. 2 log.

Between 2,000 feet and 2,650 feet the amplitude averages about 5 millivolts. The cement used in this section of the well consisted of neat cement with 12% bentonite gel additives, thus reducing the compressive strength and increasing the associated amplitude. The variable density display in that interval indicates that the casing signal is weaker than in the free pipe section of the well, and that, therefore, cement is present and a good bond has occurred.

The interval between 450 feet and 2,000 feet is where the most cycle skipping occurs. The amplitude generally varies from 2 to 10 millivolts. The variable density display shows little or no casing signal, indicating excellent bond. The cement used throughout this interval had 12% bentonite additives, thus reducing the compressive strength and increasing the associated amplitude. Within this interval, there are two forty foot sections (1,860 - 1,900 and 1,630 - 1,670) where the amplitude is as high as 30 millivolts and which appear to be poorly bonded. These two sections do not pose a threat to the integrity of the well in that they are both above the 2,300 foot intermediate casing and thus not exposed to any formation and, as such, will not allow any fluid movement.

The interval from 200 feet to 450 feet shows amplitudes of about 4 millivolts. The variable density display shows little or no casing signal, indicating excellent bond. The cement used through this interval had 12% bentonite additives, thus reducing the compressive strength and increasing the associated amplitude.

The interval from surface to 200 feet has no cement. The log was conducted in that interval to provide a casing signal base line. A strong casing signal can be seen on the variable density display.

The cement bond log conducted on Injection Well No. 1 demonstrates that there is a good cement seal around the 24-inch diameter casing and that there are no channels or conduits that would allow fluid movement adjacent to the casing.

Injection Well No. 2

From the travel time log it can be seen that good tool centralization was maintained for the entire log. Some cycle skipping is seen throughout the log. This is interpreted to be due to fast formation arrivals.

The amplitude curve from 2,680 feet to the bottom averages about 5 millivolts indicating an excellent bond. The variable density display shows no casing signal throughout this interval. The cement placed behind the casing in this section of the well was neat cement with no bentonite additives, thus this cement has the highest compressive strength and shows the lowest amplitude. Within this interval the section from 2,850 feet to 2,870 feet exhibits travel times as low as 500 microseconds and amplitudes as high as 8 millivolts. These characteristics are the result of the adjacent fast formations. This is confirmed in that the same effect can be seen at the same depth on Injection Well No. 1 log.

Between 2,100 feet and 2,680 feet the amplitude varies between 5 and 30 millivolts. The cement used in this section of the well consisted of neat cement with 12% bentonite gel additives, thus reducing the compressive strength and thus reducing the compressive strength and increasing the associated amplitude. A comparison of these values to the variable density display indicates that the casing signal is weaker than in the free pipe section of the well, and that, therefore, cement is present and a good bond has occurred.

The interval between 200 feet and 1,600 feet is where the most cycle skipping occurs. The amplitude varies from 3 to 20 millivolts. The variable density display shows little or no casing signal, indicating excellent bond. The cement used through this interval had 12% bentonite additives, thus reducing the compressive strength and increasing the associated amplitude.

The interval from surface to 200 feet has no cement. The log was conducted in that interval to provide a casing signal base line. A strong casing signal can be seen on the variable density display.

The cement bond log conducted on Injection Well No. 2 demonstrates that there is a good cement seal around the 24-inch diameter casing and that there are no channels or conduits that would allow fluid movement adjacent to the casing.

Monitor Well No. 1

From the travel time log it can be seen that good tool centralization was maintained for the entire log.

The amplitude curve from 1,697 feet to 1,978 feet averages between 3 and 5 millivolts indicating an excellent bond. The variable density display shows no casing signal through this interval. The cement placed behind the casing in this section of the well was neat cement with no bentonite additives, thus this cement has the highest compressive strength and shows the lowest amplitude.

The interval from surface to 1,697 feet has no cement. The log was conducted in that interval to provide a casing signal base line. A strong casing signal can be seen on the variable density display.

The cement bond log conducted on Monitor Well No. 1 demonstrates that there is a good cement seal around the 6-5/8-inch diameter casing and that there are no channels or conduits that would allow fluid movement adjacent to the casing.

Monitor Well No. 2

From the travel time log it can be seen that good tool centralization was maintained for the entire log. This can be confirmed by the straight line nature of the travel time curve in the free pipe section above 1,700 feet.

The amplitude curve from 1,700 feet to 1,975 feet averages about 5 millivolts indicating an excellent bond. The variable density display shows no casing signal throughout this interval. The cement placed behind the casing in this section of the well was neat cement with no bentonite additives, thus this cement has the highest compressive strength and shows the lowest amplitude.

The interval from surface to 1,700 feet has no cement. The log was conducted in that interval to provide a casing signal base line. A strong casing signal can be seen on the variable density display.

The cement bond log conducted on Monitor Well No. 2 demonstrates that there is a good cement seal around the 6-5/8-inch diameter casing and that there are no channels or conduits that would allow fluid movement adjacent to the casing.

ATTACHMENT 3

PLUGGING AND ABANDONMENT PLAN

4.5 Plugging and Abandonment Plan

In the event that an injection well has to be abandoned, the well will be effectively sealed (or plugged) to prevent upward migration of the injection fluid, or the interchange of formation through the borehole or along the casing. It is anticipated that the following procedures would be used to accomplish well abandonment.

A cost estimate for the Plugging and Abandonment Plan, including estimated volumes of materials to fill the wells, is presented in Table 6. The quantities and costs do not exceed the current demonstrated financial responsibility.

4.5.1 Injection Wells

Mobilization - Included in mobilization is the moving in of the necessary equipment to perform the work, suppressing the flow of the well, removal of the well head, and site cleanup.

MIT - Included in the mechanical integrity testing of the well is a pressure test of the injection casing, a temperature log, television survey, and radioactive tracer survey.

Filling of the Open Hole - The open hole will be filled with crushed limestone from the bottom of the open hole to a point ten feet below the injection casing.

Filling 24-Inch Diameter Casing - The 24-inch diameter injection casing will be filled from the top of the crushed limestone to the surface with neat cement.

4.5.2 Monitor Wells

Mobilization - Included in mobilization is the moving in of the necessary equipment to perform the work, suppressing the flow of the well, removal of the well head, and site cleanup.

Cementing - The monitor wells open hole zones, 0.652-inch diameter inner casing and the annulus between the inner casing and the 16-inch diameter casing will be filled from the bottom of the hole to surface.

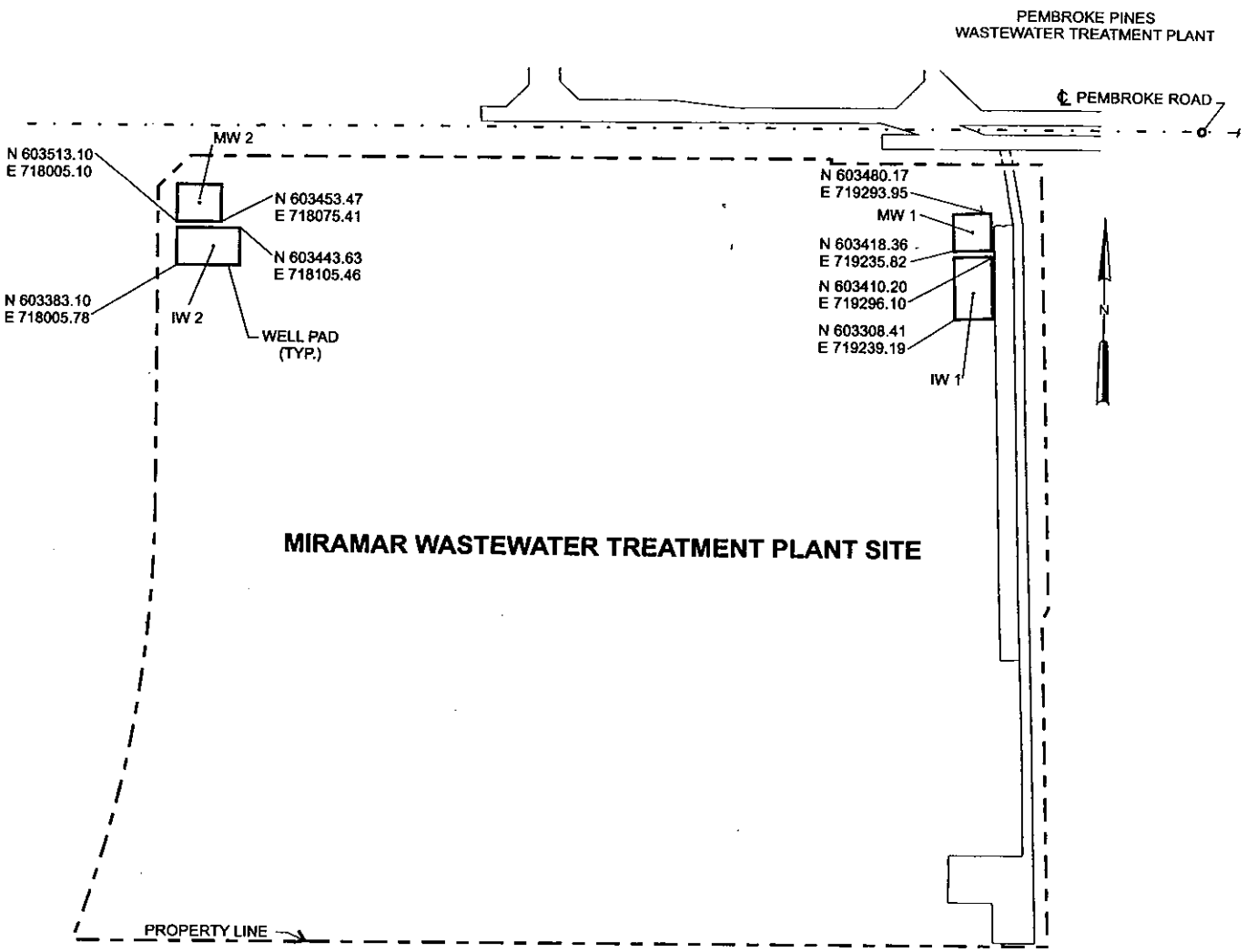
TABLE 6
PLUGGING AND ABANDONMENT COST ESTIMATE

	Unit Cost	Plan Estimate
Injection Well		
Mobilization	$20,000	$20,000
MIT	$20,000	$20,000
4,000 CF Crushed Limestone	$10/CF	$40,000
10,000 CF Neat Cement	$10/CF	$100,000
20% contingency		$36,000
	TOTAL	$216,000
Dual Zone Monitor Well		
Mobilization	$10,000	$10,000
3,000 CF Neat Cement	$10/CF	$30,000
20% contingency		$8,000
	TOTAL	$48,000

ATTACHMENT 4

FIGURES

K:\Z8136\8136x015.CDR



WELL LOCATIONS

WELL	LATITUDE	LONGITUDE
IW 1	25° 59' 32.87" N	80° 19' 56.12" W
MW 1	25° 59' 33.85" N	80° 19' 56.21" W
IW 2	25° 59' 33.55" N	80° 20' 09.07" W
MW 2	25° 59' 34.25" N	80° 20' 09.56" W

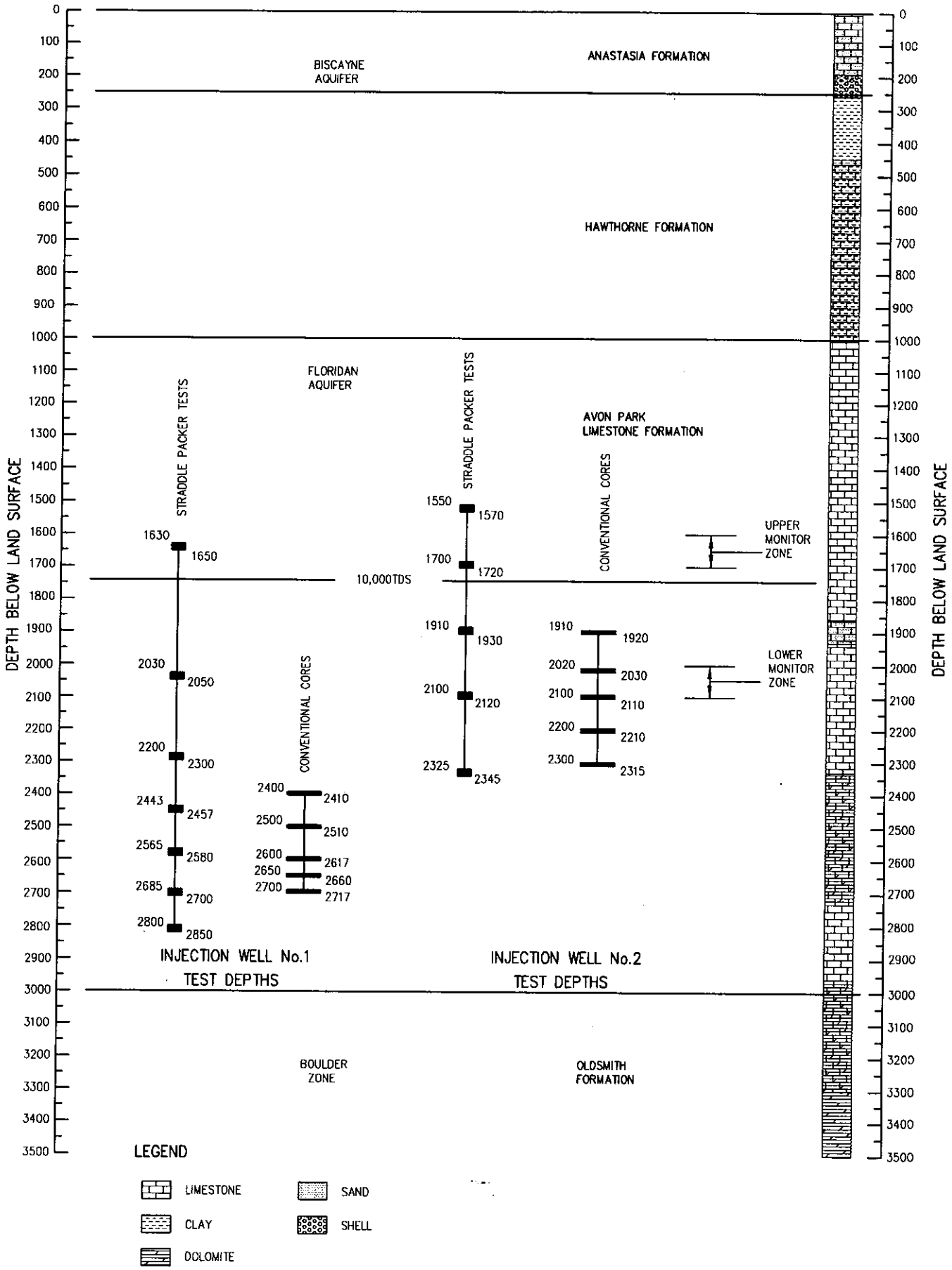
SCALE : 1" = 300'

HAZEN AND SAWYER
Environmental Engineers & Scientists

INJECTION WELL REPORT
MIRAMAR WASTEWATER RECLAMATION FACILITY

SITE PLAN

FIGURE
2



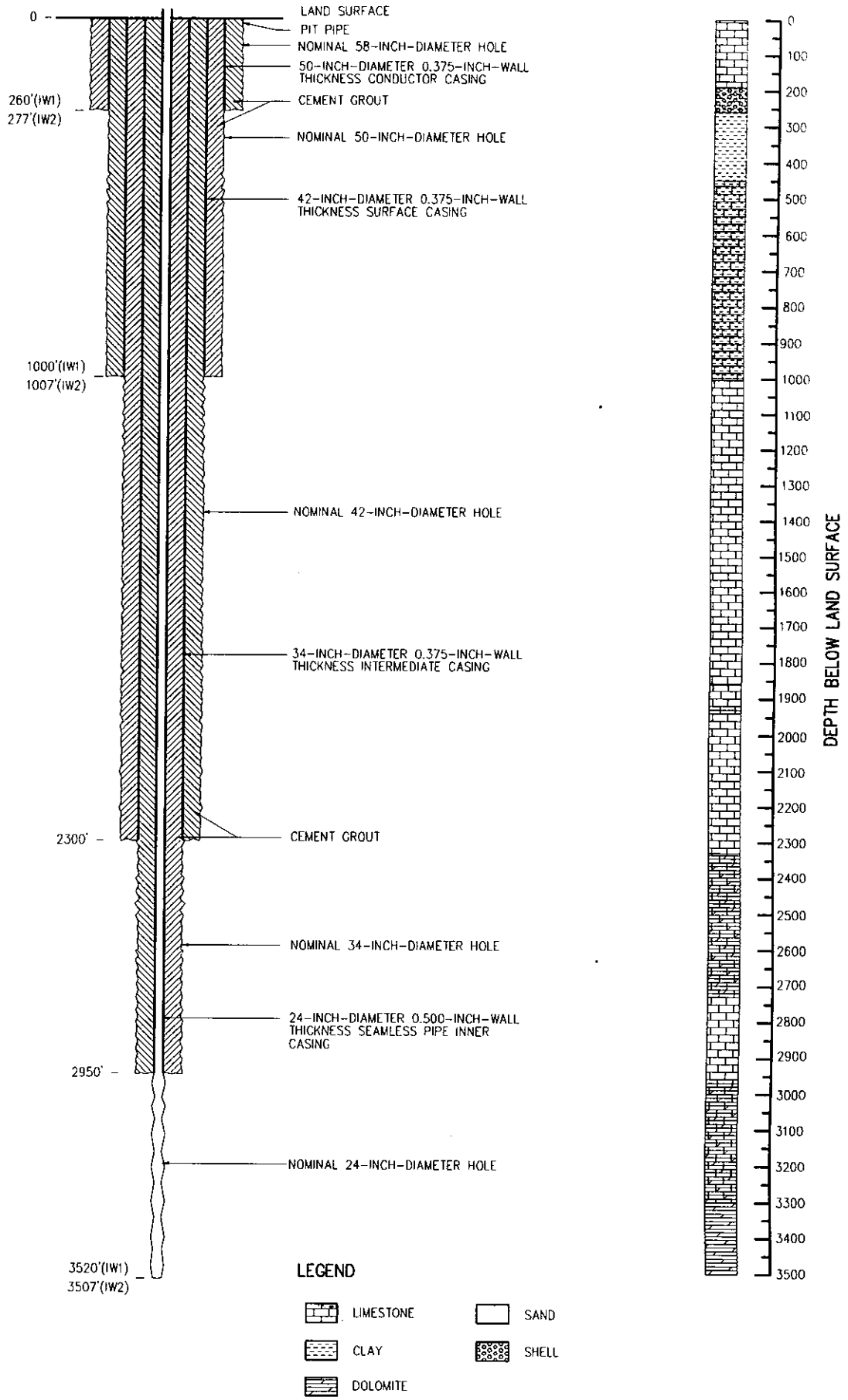
3/19/1997/4:23 P.M. - 22 HWD - H:\8136\OTHER\8136X014 () XREFS: () - Plot Scale 1=1

HAZEN AND SAWYER
Environmental Engineers & Scientists

INJECTION WELL REPORT
MIRAMAR WASTEWATER RECLAMATION FACILITY

CORING AND TESTING DEPTHS

FIGURE 3



NOTE: PIPE O.D. IS IDENTIFIED

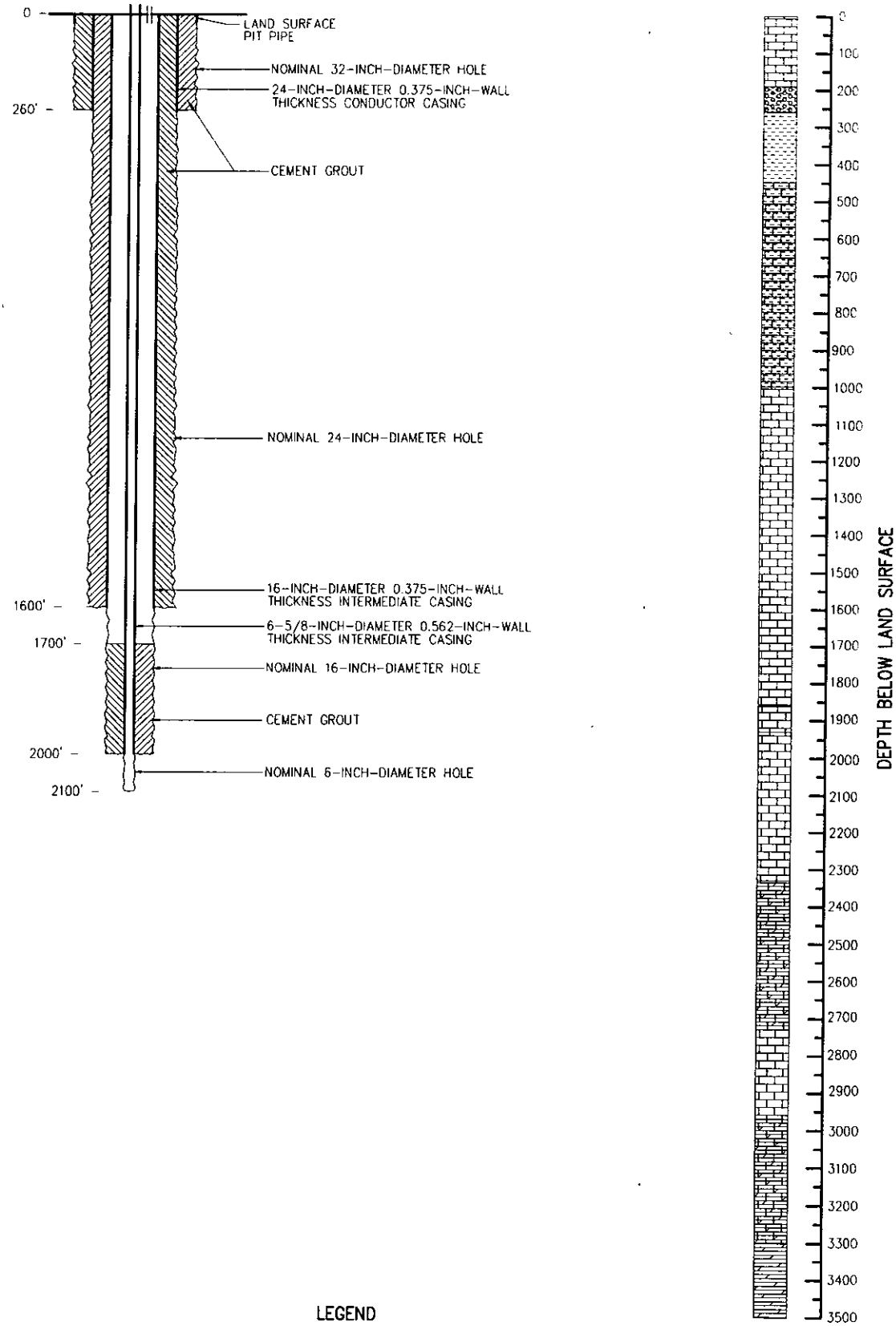
HAZEN AND SAWYER
Environmental Engineers & Scientists

INJECTION WELL REPORT
MIRAMAR WASTEWATER RECLAMATION FACILITY

CORING AND TESTING DEPTHS

FIGURE 5

3/21/1997/3:55 P.M. - 05 HWD - H:\8136\OTHER\8136X009 () XREFS: () - Plot Scale 1=1



LEGEND

- LIMESTONE
- CLAY
- DOLOMITE
- SAND
- SHELL

NOTE: PIPE O.D. IS IDENTIFIED

HAZEN AND SAWYER
Environmental Engineers & Scientists

INJECTION WELL REPORT
MIRAMAR WASTEWATER RECLAMATION FACILITY

CORING AND TESTING DEPTHS

FIGURE 6

3/21/1997/3:56 P.M. - 05 HWD - H:\8136\OTHER\8136X010 () XREFS: () - Plot Scale 1=1

ATTACHMENT 5

CERTIFICATION LETTER

HAZEN AND SAWYER
Environmental Engineers & Scientists

Hazen and Sawyer, P.C.
4000 Hollywood Boulevard
Seventh Floor, North Tower
Hollywood, Florida 33021
305 987-0066
Fax: 305 987-2949

March 21, 1997

William W. Cocke, P.G.
STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Groundwater Section - UIC
400 North Congress Avenue
West Palm Beach, Florida 33401

Notice of Completion
Injection Well Construction
Miramar Wastewater Reclamation Facility
FDEP Permit Nos. UC-06-243432.3

Dear Mr. Cocke:

In fulfillment of Federal regulation 40 CFR 144.51(m) and Florida Administrative Code Rule 62-528.450(3)(a)1., Hazen and Sawyer, P.C., and Water Technology Associates are hereby certifying that the subject project has been substantially completed in accordance with approved plans and specifications. A report documenting the completion of the wells was previously submitted to FDEP on January 6, 1997.

If there are any questions, please contact our office.

Very truly yours,

HAZEN AND SAWYER, P.C.

Patrick A. Davis, P.E.
Vice President
Registration No. 37167

WATER TECHNOLOGY ASSOCIATES, INC.

James A. Wheatley, P.G.
President
Registration No. 530

c: File No. 8136 / 2.5.0

Hwd:8136L214

ATTACHMENT 6

BACKGROUND WATER QUALITY ANALYSIS

Monitor Well No. 1 - August 23, 1996

Background Water Quality Analysis

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

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LOG NO: D6-71991
Received: 23 AUG 96
Reported: 11 SEP 96

Mr. Ed McCullers
Youngquist Brothers, Inc.
15465 Pine Ridge Road
Ft. Myers, FL 33908

Client PO. No.: #958037

Project: Miramar WWTP
Sampled By: Client
Code: 151170319

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE SAMPLED
71991-1	MW-1 Upper Zone	08-23-96
71991-2	MW-1 Lower Zone	08-23-96

PARAMETER	71991-1	71991-2
1,1,2,2-Tetrachloroethane, ug/l	<1.0	<1.0
Tetrachloroethene, ug/l	<1.0	<1.0
Toluene, ug/l	<1.0	<1.0
1,1,1-Trichloroethane, ug/l	<1.0	<1.0
1,1,2-Trichloroethane, ug/l	<1.0	<1.0
Trichloroethene, ug/l	<1.0	<1.0
Trichlorofluoromethane, ug/l	<1.0	<1.0
Vinyl chloride, ug/l	<1.0	<1.0
Xylenes, ug/l	23	<1.0
Total Trihalomethanes, ug/l	<1.0	<1.0
Date Analyzed	08.28.96	08.28.96
Method Number	EPA 624	EPA 624
Dilution factor	1	1

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Reported: 11 SEP 96

Mr. Ed McCullers
Youngquist Brothers, Inc.
15465 Pine Ridge Road
Ft. Myers, FL 33908

Client PO. No.: #958037

Project: Miramar WWTP
Sampled By: Client
Code: 170961121

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE SAMPLED
71991-1	MW-1 Upper Zone	08-23-96
71991-2	MW-1 Lower Zone	08-23-96

PARAMETER	71991-1	71991-2
1,1,2,2-Tetrachloroethane, ug/l	<1.0	<1.0
Tetrachloroethene, ug/l	<1.0	<1.0
Toluene, ug/l	<1.0	<1.0
1,1,1-Trichloroethane, ug/l	<1.0	<1.0
1,1,2-Trichloroethane, ug/l	<1.0	<1.0
Trichloroethene, ug/l	<1.0	<1.0
Trichlorofluoromethane, ug/l	<1.0	<1.0
Vinyl chloride, ug/l	<1.0	<1.0
Xylenes, ug/l	23	<1.0
Date Analyzed	08.28.96	08.28.96
Method Number	EPA 624	EPA 624
Dilution factor	1	1

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Mr. Ed McCullers
Youngquist Brothers, Inc.
15465 Pine Ridge Road
Ft. Myers, FL 33908

Client PO. No.: #958037

Project: Miramar WWTP
Sampled By: Client
Code: 170961121

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE SAMPLED
71991-1	MW-1 Upper Zone	08-23-96
71991-2	MW-1 Lower Zone	08-23-96

PARAMETER	71991-1	71991-2
BN-A Extractables (625)		
Acenaphthene, ug/l	<10	<10
Acenaphthylene, ug/l	<10	<10
Anthracene, ug/l	<10	<10
Aldrin, ug/l	<10	<10
Benzo(a)anthracene, ug/l	<4.0	<4.0
Benzo(b)fluoranthene, ug/l	<4.0	<4.0
Benzo(k)fluoranthene, ug/l	<5.0	<5.0
Benzo(a)pyrene, ug/l	<4.0	<4.0
Benzo(g,h,i)perylene, ug/l	<10	<10
Benzyl butyl phthalate, ug/l	<10	<10
Beta-BHC, ug/l	<10	<10
Delta-BHC, ug/l	<10	<10
Bis(2-Chloroethyl)ether, ug/l	<10	<10
Bis(2-Chloroethoxy)methane, ug/l	<10	<10
Bis(2-Ethylhexyl)phthalate, ug/l	<10	<10
Bis(2-chloroisopropyl)ether, ug/l	<10	<10
4-Bromophenyl-phenyl-ether, ug/l	<10	<10
Chlordane, ug/l	<50	<50
2-Chloronaphthalene, ug/l	<10	<10
4-Chlorophenyl-phenyl ether, ug/l	<10	<10
Chrysene, ug/l	<5.0	<5.0
4,4'-DDD, ug/l	<10	<10
4,4'-DDE, ug/l	<10	<10
4,4'-DDT, ug/l	<10	<10

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Client PO. No.: #958037

Project: Miramar WWTP
Sampled By: Client
Code: 170961121

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE SAMPLED
71991-1	MW-1 Upper Zone	08-23-96
71991-2	MW-1 Lower Zone	08-23-96

PARAMETER	71991-1	71991-2
Dibenz(a,h)anthracene, ug/l	<5.0	<5.0
Di-n-butylphthalate, ug/l	<10	400
1,3-Dichlorobenzene, ug/l	<10	<10
1,2-Dichlorobenzene, ug/l	<10	<10
1,4-Dichlorobenzene, ug/l	<10	<10
3,3'-Dichlorobenzidine, ug/l	<20	<20
Dieldrin, ug/l	<10	<10
Diethylphthalate, ug/l	<10	<10
Dimethyl phthalate, ug/l	<10	<10
2,4-Dinitrotoluene, ug/l	<10	<10
2,6-Dinitrotoluene, ug/l	<10	<10
Di-n-octylphthalate, ug/l	<10	<10
Endosulfan sulfate, ug/l	<20	<20
Endrin Aldehyde, ug/l	<50	<50
Fluoranthene, ug/l	<10	<10
Fluorene, ug/l	<10	<10
Heptachlor, ug/l	<20	<20
Heptachlor epoxide, ug/l	<20	<20
Hexachlorobenzene, ug/l	<10	<10
Hexachlorobutadiene, ug/l	<10	<10
Hexachloroethane, ug/l	<10	<10
Indeno (1,2,3-cd)pyrene, ug/l	<5.0	<5.0
Isophorone, ug/l	<10	<10
Naphthalene, ug/l	<5.0	<5.0
Nitrobenzene, ug/l	<10	<10

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Ft. Myers, FL 33908

Client PO. No.: #958037

Project: Miramar WWTP
Sampled By: Client
Code: 170961121

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE SAMPLED
71991-1	MW-1 Upper Zone	08-23-96
71991-2	MW-1 Lower Zone	08-23-96

PARAMETER	71991-1	71991-2
N-Nitrosodi-N-Propylamine, ug/l	<10	<10
Aroclor-1016, ug/l	<500	<500
Aroclor-1221, ug/l	<500	<500
Aroclor-1232, ug/l	<500	<500
Aroclor-1242, ug/l	<500	<500
Aroclor-1248, ug/l	<500	<500
Aroclor-1254, ug/l	<500	<500
Aroclor-1260, ug/l	<500	<500
Phenanthrene, ug/l	<10	<10
Pyrene, ug/l	<10	<10
Toxaphene, ug/l	<2000	<2000
1,2,4-Trichlorobenzene, ug/l	<10	<10
4-Chloro-3-methylphenol, ug/l	<10	<10
2-Chlorophenol, ug/l	<10	<10
2,4-Dichlorophenol, ug/l	<4.0	<4.0
2,4-Dimethylphenol, ug/l	<10	<10
2,4-Dinitrophenol, ug/l	<30	<30
2-Methyl-4,6-dinitrophenol, ug/l	<50	<50
2-Nitrophenol, ug/l	<10	<10
4-Nitrophenol, ug/l	<15	<15
Pentachlorophenol, ug/l	<10	<10
Phenol, ug/l	<10	<10
2,4,6-Trichlorophenol, ug/l	<10	<10
Date Extracted	08.26.96	08.26.96
Date Analyzed	08.28.96	08.28.96
Method Number	EPA 625	EPA 625
Dilution factor	1	1

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Youngquist Brothers, Inc.
15465 Pine Ridge Road
Ft. Myers, FL 33908

Client PO. No.: #958037

Project: Miramar WWTP
Sampled By: Client
Code: 170961121

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE SAMPLED
71991-1	MW-1 Upper Zone	08-23-96
71991-2	MW-1 Lower Zone	08-23-96

PARAMETER	71991-1	71991-2
Chlorinated Pesticides		
Aldrin, ug/l	<0.050	<0.050
alpha-BHC, ug/l	<0.050	<0.050
beta-BHC, ug/l	<0.050	<0.050
delta-BHC, ug/l	<0.050	<0.050
gamma-BHC, ug/l	<0.050	<0.050
Chlordane, ug/l	<0.50	<0.50
4,4'-DDD, ug/l	<0.10	<0.10
4,4'-DDE, ug/l	<0.10	<0.10
4,4'-DDT, ug/l	<0.10	<0.10
Dieldrin, ug/l	<0.10	<0.10
Endosulfan I, ug/l	<0.050	<0.050
Endosulfan II, ug/l	<0.10	<0.10
Endosulfan sulfate, ug/l	<0.10	<0.10
Endrin, ug/l	<0.10	<0.10
Endrin aldehyde, ug/l	<0.10	<0.10
Heptachlor, ug/l	<0.050	<0.050
Heptachlor epoxide, ug/l	<0.050	<0.050
Methoxychlor, ug/l	<0.50	<0.50
Toxaphene, ug/l	<5.0	<5.0
Aroclor-1016, ug/l	<1.0	<1.0
Aroclor-1221, ug/l	<2.0	<2.0
Aroclor-1232, ug/l	<1.0	<1.0
Aroclor-1242, ug/l	<1.0	<1.0
Aroclor-1248, ug/l	<1.0	<1.0

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Mr. Ed McCullers
Youngquist Brothers, Inc.
15465 Pine Ridge Road
Ft. Myers, FL 33908

Client PO. No.: #958037

Project: Miramar WWTP
Sampled By: Client
Code: 170961121

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE SAMPLED
71991-1	MW-1 Upper Zone	08-23-96
71991-2	MW-1 Lower Zone	08-23-96

PARAMETER	71991-1	71991-2
Aroclor-1254, ug/l	<1.0	<1.0
Aroclor-1260, ug/l	<1.0	<1.0
Date Extracted	08.26.96	08.26.96
Date Analyzed	08.29.96	08.29.96
Method Number	EPA 608	EPA 608
Dilution factor	1	1
Primary Organics - Herbicides (515.1)		
2,4-D, ug/l	<0.50	<0.50
Dalapon, ug/l	<10	<10
Dinoseb, ug/l	<0.50	<0.50
Pentachlorophenol, ug/l	<1.0	<1.0
Picloram, ug/l	<0.50	<0.50
2,4,5-TP Silvex, ug/l	<0.50	<0.50
Date Extracted	08.26.96	08.26.96
Date Analyzed	08.30.96	08.30.96
Method Number	EPA 515.1	EPA 515.1
Ethylene Dibromide (504)		
1,2-Dibromo-3-chloropropane, ug/l	<0.020	<0.020
1,2-Dibromoethane (EDB) , ug/l	<0.020	<0.020
Date Analyzed	08.28.96	08.28.96
Method Number	EPA 504	EPA 504
Aluminum		
Aluminum, mg/l	<0.20	<0.20
Date Analyzed	09.05.96	09.05.96
Method Number	EPA 6010	EPA 6010

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LOG NO: D6-71991
Received: 23 AUG 96
Reported: 11 SEP 96

Mr. Ed McCullers
Youngquist Brothers, Inc.
15465 Pine Ridge Road
Ft. Myers, FL 33908

Client PO. No.: #958037

Project: Miramar WWTP
Sampled By: Client
Code: 175661121

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE SAMPLED
71991-1	MW-1 Upper Zone	08-23-96
71991-2	MW-1 Lower Zone	08-23-96

PARAMETER	71991-1	71991-2
Antimony (6010)		
Antimony, mg/l	<0.050	<0.25*F65
Date Analyzed	09.05.96	09.05.96
Method Number	EPA 6010	EPA 6010
Arsenic (7060)		
Arsenic, mg/l	<0.010	<0.010
Date Analyzed	09.09.96	09.09.96
Method Number	EPA 7060	EPA 7060
Barium (6010)		
Barium, mg/l	0.043	0.073
Date Analyzed	09.05.96	09.05.96
Method Number	EPA 6010	EPA 6010
Beryllium (6010)		
Beryllium, mg/l	<0.0040	<0.0040
Date Analyzed	09.05.96	09.05.96
Method Number	EPA 6010	EPA 6010
Cadmium (6010)		
Cadmium, mg/l	<0.0050	<0.0050
Date Analyzed	09.05.96	09.05.96
Method Number	EPA 6010	EPA 6010
Chromium (6010)		
Chromium, mg/l	<0.010	<0.050*F65
Date Analyzed	09.05.96	09.05.96
Method Number	EPA 6010	EPA 6010

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Youngquist Brothers, Inc.
15465 Pine Ridge Road
Ft. Myers, FL 33908

Client PO. No.: #958037

Project: Miramar WWTP
Sampled By: Client
Code: 170961121

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE SAMPLED
71991-1	MW-1 Upper Zone	08-23-96
71991-2	MW-1 Lower Zone	08-23-96

PARAMETER	71991-1	71991-2
Copper (6010)		
Copper, mg/l	<0.025	<0.025
Date Analyzed	09.05.96	09.05.96
Method Number	EPA 6010	EPA 6010
Iron		
Iron, mg/l	2.6	7.0
Date Analyzed	09.05.96	09.05.96
Method Number	EPA 6010	EPA 6010
Lead (7421)		
Lead, mg/l	<0.0050	<0.0050
Date Analyzed	09.10.96	09.10.96
Method Number	EPA 7421	EPA 7421
Manganese		
Manganese, mg/l	0.23	1.8
Date Analyzed	09.05.96	09.05.96
Method Number	EPA 6010	EPA 6010
Mercury (7470/7471)		
Mercury, mg/l	<0.00020	<0.00020
Date Analyzed	08.29.96	08.29.96
Method Number	EPA 7470	EPA 7470
Nickel (6010)		
Nickel, mg/l	<0.040	<0.040
Date Analyzed	09.05.96	09.05.96
Method Number	EPA 6010	EPA 6010

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Client PO. No.: #958037

Project: Miramar WWTP
Sampled By: Client
Code: 170961121

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE SAMPLED
71991-1	MW-1 Upper Zone	08-23-96
71991-2	MW-1 Lower Zone	08-23-96

PARAMETER	71991-1	71991-2
Selenium (7740)		
Selenium, mg/l	<0.0050	<0.0050
Date Analyzed	09.10.96	09.10.96
Method Number	EPA 7740	EPA 7740
Silver (6010)		
Silver, mg/l	<0.010	<0.010
Date Analyzed	09.05.96	09.05.96
Method Number	EPA 6010	EPA 6010
Sodium		
Sodium, mg/l	1400	8800
Date Analyzed	09.05.96	09.05.96
Method Number	EPA 6010	EPA 6010
Zinc (6010)		
Zinc, mg/l	<0.020	0.16
Date Analyzed	09.05.96	09.05.96
Method Number	EPA 6010	EPA 6010
Biochemical Oxygen Demand (5-Day) (405.1)		
Biochemical Oxygen Demand (5 Day), mg/l	<2.0	4.8
Date Analyzed	08.24.96	08.24.96
Method Number	EPA 405.1	EPA 405.1
Chloride		
Chloride, mg/l	2300	17000
Date Analyzed	09.06.96	09.06.96
Method Number	EPA 325.2	EPA 325.2

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Ft. Myers, FL 33908

Client PO. No.: #958037

Project: Miramar WWTP
Sampled By: Client
Code: 170961121

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE SAMPLED
71991-1	MW-1 Upper Zone	08-23-96
71991-2	MW-1 Lower Zone	08-23-96

PARAMETER	71991-1	71991-2
Coliform, Fecal (SM 9222D)		
Coliform (MF), Fecal, col/100ml	<1	<1
Date Analyzed	08.23.96	08.23.96
Method Number	SM 9222D	SM 9222D
Coliform, Total (SM 9222B)		
Coliform (MF), Total, col/100ml	<1	<1
Date Analyzed	08.23.96	08.23.96
Method Number	SM 9222B	SM 9222B
Color		
Color, c.u.	10	15
Date Analyzed	08.24.96	08.24.96
Method Number	EPA 110.2	EPA 110.2
Corrosivity (Saturation Index)		
Corrosivity (Saturation Index), units	-0.53	0.022
Fluoride (340.2)		
Fluoride, mg/l	0.68	0.31
Date Analyzed	09.04.96	09.04.96
Method Number	EPA 340.2	EPA 340.2
Nitrogen, Nitrate		
Nitrate-N, mg/l	<0.050	<0.050
Date Analyzed	08.18.96	08.18.96
Method Number	EPA 353.2	EPA 353.2
Nitrogen, Nitrite		
Nitrite-N, mg/l	<0.050	<0.050
Date Analyzed	08.18.96	08.18.96
Method Number	EPA 353.3	EPA 353.3

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LOG NO: D6-71991
Received: 23 AUG 96
Reported: 11 SEP 96

Mr. Ed McCullers
Youngquist Brothers, Inc.
15465 Pine Ridge Road
Ft. Myers, FL 33908

Client PO. No.: #958037

Project: Miramar WWTP
Sampled By: Client
Code: 170961121

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE SAMPLED
71991-1	MW-1 Upper Zone	08-23-96
71991-2	MW-1 Lower Zone	08-23-96

PARAMETER	71991-1	71991-2
Nitrogen, Nitrate + Nitrite		
Nitrate + Nitrite-N, mg/l	<0.050	<0.050
Date Analyzed	08.18.96	08.18.96
Method Number	EPA 353.3	EPA 353.3
Odor		
Odor, t.o.n.	2	2
Date Analyzed	08.24.96	08.24.96
Method Number	EPA 140.1	EPA 140.1
pH		
pH , units	7.7	7.2
Date Analyzed	08.28.96	08.28.96
Method Number	EPA 150.1	EPA 150.1
Solids, Total Dissolved (160.1)		
Solids, Total Dissolved, mg/l	3700	35000
Date Analyzed	08.26.96	08.26.96
Method Number	EPA 160.1	EPA 160.1
Specific Conductance		
Specific Conductance, umhos/cm	5400	36000
Date Analyzed	08.26.96	08.26.96
Method Number	EPA 120.1	EPA 120.1
Specific Gravity		
Specific Gravity-Gravimetric, units	0.99	1.0
Date Analyzed	08.29.96	08.29.96
Method Number	D1429-86	D1429-86

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LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE SAMPLED
71991-1	MW-1 Upper Zone	08-23-96
71991-2	MW-1 Lower Zone	08-23-96

PARAMETER	71991-1	71991-2
Sulfate as SO4		
Sulfate as SO4, mg/l	380	1600
Date Analyzed	09.10.96	09.10.96
Method Number	EPA 375.4	EPA 375.4
Surfactants (MBAS)		
Surfactants (MBAS), mg/l	<0.10	0.31
Date Analyzed	08.23.96	08.23.96
Method Number	SM 5540C	SM 5540C
Turbidity		
Turbidity, NTU	4.2	29
Date Analyzed	08.23.96	08.23.96
Method Number	EPA 180.1	EPA 180.1
Gross Alpha (EPA 900.0)		
Gross Alpha, pCi/l	25+/-39	92+/-380
Date Analyzed	09.06.96	09.09.96
Method Number	EPA 900.0	EPA 900.0
Radium 226 (EPA 903.1)		
Radium 226, pCi/L	0.95+/-.08	1.8+/-0.09
Date Analyzed	09.04.96	09.05.96
Method Number	EPA 903.1	EPA 903.1
Radium 228 (EPA 904.0)		
Radium 228, pCi/l	<1.0	<1.0
Date Analyzed	09.06.96	09.06.96
Method Number	EPA 904.0	EPA 904.0
Photonradioactivity (Gamma Spectral Analysis), pCi/l	ND	ND

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REPORT OF RESULTS

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71991-3	Lab Blank
71991-4	Accuracy - % Recovery (Mean)
71991-5	Precision - Relative % Difference
71991-6	Detection Limit

PARAMETER	71991-3	71991-4	71991-5	71991-6
Purgeables (624)				
Benzene, ug/l	<1.0	85 %	2.4 %	1.0
Bromodichloromethane, ug/l	<1.0	---	---	1.0
Bromoform, ug/l	<1.0	---	---	1.0
Bromomethane, ug/l	<1.0	---	---	1.0
Carbon tetrachloride, ug/l	<1.0	---	---	1.0
Chlorobenzene, ug/l	<1.0	102 %	0 %	1.0
Chloroethane, ug/l	<1.0	---	---	1.0
2-Chloroethylvinyl Ether, ug/l	<10	---	---	10
Chloroform, ug/l	<1.0	---	---	1.0
Chloromethane, ug/l	<1.0	---	---	1.0
Dibromochloromethane, ug/l	<1.0	---	---	1.0
1,2-Dichlorobenzene, ug/l	<1.0	---	---	1.0
1,3-Dichlorobenzene, ug/l	<1.0	---	---	1.0
1,4-Dichlorobenzene, ug/l	<1.0	---	---	1.0
1,1-Dichloroethane, ug/l	<1.0	---	---	1.0
1,2-Dichloroethane, ug/l	<1.0	---	---	1.0
1,1-Dichloroethene, ug/l	<1.0	108 %	0.93 %	1.0
trans-1,2-Dichloroethylene, ug/l	<1.0	---	---	1.0
1,2-Dichloropropane, ug/l	<1.0	---	---	1.0
cis-1,3-Dichloropropene, ug/l	<1.0	---	---	1.0
trans-1,3-Dichloropropene, ug/l	<1.0	---	---	1.0
Ethylbenzene, ug/l	<1.0	---	---	1.0

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71991-3	Lab Blank
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71991-5	Precision - Relative % Difference
71991-6	Detection Limit

PARAMETER	71991-3	71991-4	71991-5	71991-6
Methylene chloride, ug/l	<1.0	---	---	1.0
1,1,2,2-Tetrachloroethane, ug/l	<1.0	---	---	1.0
Tetrachloroethene, ug/l	<1.0	---	---	1.0
Toluene, ug/l	<1.0	105 %	3.8 %	1.0
1,1,1-Trichloroethane, ug/l	<1.0	---	---	1.0
1,1,2-Trichloroethane, ug/l	<1.0	---	---	1.0
Trichloroethene, ug/l	<1.0	105 %	1.9 %	1.0
Trichlorofluoromethane, ug/l	<1.0	---	---	1.0
Vinyl chloride, ug/l	<1.0	---	---	1.0
Date Analyzed	08.28.96	---	---	---
Method Number	EPA 624	---	---	---

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES
71991-3	Lab Blank
71991-4	Accuracy - % Recovery (Mean)
71991-5	Precision - Relative % Difference
71991-6	Detection Limit

PARAMETER	71991-3	71991-4	71991-5	71991-6
BN-A Extractables (625)				
Acenaphthene, ug/l	<10	78 %	9.0 %	10
Acenaphthylene, ug/l	<10	---	---	10
Anthracene, ug/l	<10	---	---	10
Aldrin, ug/l	<10	---	---	10
Benzo(a)anthracene, ug/l	<4.0	---	---	4.0
Benzo(b)fluoranthene, ug/l	<4.0	---	---	4.0
Benzo(k)fluoranthene, ug/l	<5.0	---	---	5.0
Benzo(a)pyrene, ug/l	<4.0	---	---	4.0
Benzo(g,h,i)perylene, ug/l	<10	---	---	10
Benzyl butyl phthalate, ug/l	<10	---	---	10
Beta-BHC, ug/l	<10	---	---	10
Delta-BHC, ug/l	<10	---	---	10
Bis(2-Chloroethyl)ether, ug/l	<10	---	---	10
Bis(2-Chloroethoxy)methane, ug/l	<10	---	---	10
Bis(2-Ethylhexyl)phthalate, ug/l	<10	---	---	10
Bis(2-chloroisopropyl)ether, ug/l	<10	---	---	10
4-Bromophenyl-phenyl-ether, ug/l	<10	---	---	10
Chlordane, ug/l	<50	---	---	50
2-Chloronaphthalene, ug/l	<10	---	---	10
4-Chlorophenyl-phenyl ether, ug/l	<10	---	---	10
Chrysene, ug/l	<5.0	---	---	5.0
4,4'-DDD, ug/l	<10	---	---	10

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71991-5	Precision - Relative % Difference
71991-6	Detection Limit

PARAMETER	71991-3	71991-4	71991-5	71991-6
4,4'-DDE, ug/l	<10	---	---	10
4,4'-DDT, ug/l	<10	---	---	10
Dibenz(a,h)anthracene, ug/l	<5.0	---	---	5.0
Di-n-butylphthalate, ug/l	<10	---	---	10
1,3-Dichlorobenzene, ug/l	<10	---	---	10
1,2-Dichlorobenzene, ug/l	<10	---	---	10
1,4-Dichlorobenzene, ug/l	<10	82 %	11 %	10
3,3'-Dichlorobenzidine, ug/l	<20	---	---	20
Dieldrin, ug/l	<10	---	---	10
Diethylphthalate, ug/l	<10	---	---	10
Dimethyl phthalate, ug/l	<10	---	---	10
2,4-Dinitrotoluene, ug/l	<10	87 %	18 %	10
2,6-Dinitrotoluene, ug/l	<10	---	---	10
Di-n-octylphthalate, ug/l	<10	---	---	10
Endosulfan sulfate, ug/l	<20	---	---	20
Endrin Aldehyde, ug/l	<50	---	---	50
Fluoranthene, ug/l	<10	---	---	10
Fluorene, ug/l	<10	---	---	10
Heptachlor, ug/l	<20	---	---	20
Heptachlor epoxide, ug/l	<20	---	---	20
Hexachlorobenzene, ug/l	<10	---	---	10
Hexachlorobutadiene, ug/l	<10	---	---	10
Hexachloroethane, ug/l	<10	---	---	10

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71991-5	Precision - Relative % Difference
71991-6	Detection Limit

PARAMETER	71991-3	71991-4	71991-5	71991-6
Indeno (1,2,3-cd)pyrene, ug/l	<5.0	---	---	5.0
Isophorone, ug/l	<10	---	---	10
Naphthalene, ug/l	<5.0	---	---	5.0
Nitrobenzene, ug/l	<10	---	---	10
N-Nitrosodi-N-Propylamine, ug/l	<10	98 %	15 %	10
Aroclor-1016, ug/l	<500	---	---	500
Aroclor-1221, ug/l	<500	---	---	500
Aroclor-1232, ug/l	<500	---	---	500
Aroclor-1242, ug/l	<500	---	---	500
Aroclor-1248, ug/l	<500	---	---	500
Aroclor-1254, ug/l	<500	---	---	500
Aroclor-1260, ug/l	<500	---	---	500
Phenanthrene, ug/l	<10	---	---	10
Pyrene, ug/l	<10	68 %	4.4 %	10
Toxaphene, ug/l	<2000	---	---	2000
1,2,4-Trichlorobenzene, ug/l	<10	88 %	17 %	10
4-Chloro-3-methylphenol, ug/l	<10	103 %	14 %	10
2-Chlorophenol, ug/l	<10	78 %	10 %	10
2,4-Dichlorophenol, ug/l	<4.0	---	---	4.0
2,4-Dimethylphenol, ug/l	<10	---	---	10
2,4-Dinitrophenol, ug/l	<30	---	---	30
2-Methyl-4,6-dinitrophenol, ug/l	<50	---	---	50
2-Nitrophenol, ug/l	<10	---	---	10

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71991-5	Precision - Relative % Difference
71991-6	Detection Limit

PARAMETER	71991-3	71991-4	71991-5	71991-6
4-Nitrophenol, ug/l	<15	69 %	20 %	15
Pentachlorophenol, ug/l	<10	112 %	13 %	10
Phenol, ug/l	<10	86 %	20 %	10
2,4,6-Trichlorophenol, ug/l	<10	---	---	10
Date Extracted	08.26.96	---	---	---
Date Analyzed	08.28.96	---	---	---
Method Number	EPA 625	---	---	---

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71991-3	Lab Blank
71991-4	Accuracy - % Recovery (Mean)
71991-5	Precision - Relative % Difference
71991-6	Detection Limit

PARAMETER	71991-3	71991-4	71991-5	71991-6
Chlorinated Pesticides				
Aldrin, ug/l	<0.050	65 %	6.2 %	0.050
alpha-BHC, ug/l	<0.050	---	---	0.050
beta-BHC, ug/l	<0.050	---	---	0.050
delta-BHC, ug/l	<0.050	---	---	0.050
gamma-BHC, ug/l	<0.050	69 %	5.8 %	0.050
Chlordane, ug/l	<0.50	---	---	0.50
4,4'-DDD, ug/l	<0.10	---	---	0.10
4,4'-DDE, ug/l	<0.10	---	---	0.10
4,4'-DDT, ug/l	<0.10	94 %	6.4 %	0.10
Dieldrin, ug/l	<0.10	80 %	6.3 %	0.10
Endosulfan I, ug/l	<0.050	---	---	0.050
Endosulfan II, ug/l	<0.10	---	---	0.10
Endosulfan sulfate, ug/l	<0.10	---	---	0.10
Endrin, ug/l	<0.10	86 %	30 %	0.10
Endrin aldehyde, ug/l	<0.10	---	---	0.10
Heptachlor, ug/l	<0.050	64 %	7.8 %	0.050
Heptachlor epoxide, ug/l	<0.050	---	---	0.050
Toxaphene, ug/l	<5.0	---	---	5.0
Aroclor-1016, ug/l	<1.0	---	---	1.0
Aroclor-1221, ug/l	<2.0	---	---	2.0
Aroclor-1232, ug/l	<1.0	---	---	1.0
Aroclor-1242, ug/l	<1.0	---	---	1.0

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71991-6	Detection Limit

PARAMETER	71991-3	71991-4	71991-5	71991-6
Aroclor-1248, ug/l	<1.0	---	---	1.0
Aroclor-1254, ug/l	<1.0	---	---	1.0
Aroclor-1260, ug/l	<1.0	---	---	1.0
Date Extracted	08.26.96	---	---	---
Date Analyzed	08.28.96	---	---	---
Method Number	EPA 608	---	---	---
Primary Organics - Herbicides (515.1)				
2,4-D, ug/l	<0.50	86 %	11 %	0.50
Dalapon, ug/l	<10	54 %	6.0 %	10
Dinoseb, ug/l	<0.50	71 %	5.2 %	0.50
Pentachlorophenol, ug/l	<1.0	94 %	0.1 %	1.0
Picloram, ug/l	<0.50	54 %	31 %	0.50
2,4,5-TP Silvex, ug/l	<0.50	96 %	7.7 %	0.50
Date Extracted	08.26.96	---	---	---
Date Analyzed	08.30.96	---	---	---
Method Number	EPA 515.1	---	---	---
Ethylene Dibromide (504)				
1,2-Dibromoethane (EDB) , ug/l	<0.020	128 %	0 %	0.020
Date Analyzed	08.28.96	---	---	---
Method Number	EPA 504	---	---	---
Aluminum				
Aluminum, mg/l	<0.20	94 %	1.0 %	0.20
Date Analyzed	09.05.96	---	---	---
Method Number	EPA 6010	---	---	---

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71991-5	Precision - Relative % Difference
71991-6	Detection Limit

PARAMETER	71991-3	71991-4	71991-5	71991-6
Antimony (6010)				
Antimony, mg/l	<0.050	98 %	3.1 %	0.050
Date Analyzed	09.05.96	---	---	---
Method Number	EPA 6010	---	---	---
Arsenic (7060)				
Arsenic, mg/l	<0.010	93 %	2.2 %	0.010
Date Analyzed	09.09.96	---	---	---
Method Number	EPA 7060	---	---	---
Barium (6010)				
Barium, mg/l	<0.010	97 %	0 %	0.010
Date Analyzed	09.05.96	---	---	---
Method Number	EPA 6010	---	---	---
Beryllium (6010)				
Beryllium, mg/l	<0.0040	98 %	0 %	0.0040
Date Analyzed	09.05.96	---	---	---
Method Number	EPA 6010	---	---	---
Cadmium (6010)				
Cadmium, mg/l	<0.0050	92 %	1.1 %	0.0050
Date Analyzed	09.05.96	---	---	---
Method Number	EPA 6010	---	---	---
Chromium (6010)				
Chromium, mg/l	<0.010	96 %	1.0 %	0.010
Date Analyzed	09.05.96	---	---	---
Method Number	EPA 6010	---	---	---

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71991-6	Detection Limit

PARAMETER	71991-3	71991-4	71991-5	71991-6
Copper (6010)				
Copper, mg/l	<0.025	102 %	0 %	0.025
Date Analyzed	09.05.96	---	---	---
Method Number	EPA 6010	---	---	---
Iron				
Iron, mg/l	<0.050	100 %	1.0 %	0.050
Date Analyzed	09.05.96	---	---	---
Method Number	EPA 6010	---	---	---
Lead (7421)				
Lead, mg/l	<0.0050	96 %	11 %	0.0050
Date Analyzed	09.10.96	---	---	---
Method Number	EPA 7421	---	---	---
Manganese				
Manganese, mg/l	<0.010	96 %	1.0 %	0.010
Date Analyzed	09.05.96	---	---	---
Method Number	EPA 6010	---	---	---
Mercury (7470/7471)				
Mercury, mg/l	<0.00020	95 %	2.1 %	0.00020
Date Analyzed	08.29.96	---	---	---
Method Number	EPA 7470	---	---	---
Nickel (6010)				
Nickel, mg/l	<0.040	98 %	1.0 %	0.040
Date Analyzed	09.05.96	---	---	---
Method Number	EPA 6010	---	---	---

SL SAVANNAH LABORATORIES
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LOG NO: D6-71991
Received: 23 AUG 96
Reported: 11 SEP 96

Mr. Ed McCullers
Youngquist Brothers, Inc.
15465 Pine Ridge Road
Ft. Myers, FL 33908

Client PO. No.: #958037

Project: Miramar WWTP
Sampled By: Client
Code: 170961121

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES
71991-3	Lab Blank
71991-4	Accuracy - % Recovery (Mean)
71991-5	Precision - Relative % Difference
71991-6	Detection Limit

PARAMETER	71991-3	71991-4	71991-5	71991-6
Selenium (7740)				
Selenium, mg/l	<0.0050	108 %*F75	0.93 %	0.0050
Date Analyzed	09.10.96	---	---	---
Method Number	EPA 7740	---	---	---
Silver (6010)				
Silver, mg/l	<0.010	94 %	0 %	0.010
Date Analyzed	09.05.96	---	---	---
Method Number	EPA 6010	---	---	---
Sodium				
Sodium, mg/l	<0.50	92 %*F75	2.2 %	0.50
Date Analyzed	09.05.96	---	---	---
Method Number	EPA 6010	---	---	---
Zinc (6010)				
Zinc, mg/l	<0.020	94 %	1.1 %	0.020
Date Analyzed	09.05.96	---	---	---
Method Number	EPA 6010	---	---	---
Biochemical Oxygen Demand (5-Day) (405.1)				
Biochemical Oxygen Demand (5 Day), mg/l	<2.0	98 %	3.1 %	2.0
Date Analyzed	08.24.96	---	---	---
Method Number	EPA 405.1	---	---	---
Chloride				
Chloride, mg/l	<1.0	102 %	0 %	1.0
Date Analyzed	09.06.96	---	---	---
Method Number	EPA 325.2	---	---	---

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES
71991-3	Lab Blank
71991-4	Accuracy - % Recovery (Mean)
71991-5	Precision - Relative % Difference
71991-6	Detection Limit

PARAMETER	71991-3	71991-4	71991-5	71991-6
Fluoride (340.2)				
Fluoride, mg/l	<0.20	110 %	0.91 %	0.20
Date Analyzed	09.04.96	---	---	---
Method Number	EPA 340.2	---	---	---
Nitrogen, Nitrate				
Nitrate-N, mg/l	<0.050	102 %	0.98 %	0.050
Date Analyzed	08.18.96	---	---	---
Method Number	EPA 353.2	---	---	---
Nitrogen, Nitrite				
Nitrogen, Nitrate + Nitrite				
Nitrate + Nitrite-N, mg/l	<0.050	---	---	0.050
Date Analyzed	08.18.96	---	---	---
Method Number	EPA 353.3	---	---	---
Sulfate as SO4				
Sulfate as SO4, mg/l	<5.0	92 %	1.1 %	5.0
Date Analyzed	09.10.96	---	---	---
Method Number	EPA 375.4	---	---	---
Surfactants (MBAS)				
Surfactants (MBAS), mg/l	<0.10	96 %	3.1 %	0.10
Date Analyzed	08.23.96	---	---	---
Method Number	SM 5540C	---	---	---
Gross Alpha (EPA 900.0)				
Gross Alpha, pCi/l	<3.0	128 %	25 %	3.0
Date Analyzed	09.04.96	---	---	---
Method Number	EPA 900.0	---	---	---

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES
71991-3	Lab Blank
71991-4	Accuracy - % Recovery (Mean)
71991-5	Precision - Relative % Difference
71991-6	Detection Limit

PARAMETER	71991-3	71991-4	71991-5	71991-6
Radium 226 (EPA 903.1)				
Radium 226, pCi/L	<0.60	79 %	2.8 %	0.60
Date Analyzed	08.20.96	---	---	---
Method Number	EPA 903.1	---	---	---
Radium 228 (EPA 904.0)				
Radium 228, pCi/l	<1.0	92 %	6.4 %	1.0
Date Analyzed	08.22.96	---	---	---
Method Number	EPA 904.0	---	---	---

SL Environmental HRS Cert. #E86221 and SL Drinking Water HRS Cert. #86371.
Method Reference: EPA 40 CFR Part 136, EPA 600/4-84-039, EPA SW-846 and EPA 600/4-79-020.
*F65 = Elevated detection limits were reported due to sample matrix interference which required sample or extract dilution.
*F75 = Matrix spike recoveries were outside advisory limits due to matrix interference present in the sample; therefore, recovery of laboratory control standards analyzed concurrently with the sample batch have been reported.

Paul Canevaro, Project Manager

Final Page Of Report

Monitor Well No. 2 - August 23, 1996

Background Water Quality Analysis

SL SAVANNAH LABORATORIES
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Client PO. No.: #958037

Project: Miramar WWTP
Sampled By: Client
Code: 171061121

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE SAMPLED
71992-1	MW-2 Upper Zone	08-23-96
71992-2	MW-2 Lower Zone	08-23-96

PARAMETER	71992-1	71992-2
Purgeables (624)		
Benzene, ug/l	<1.0	<1.0
Bromodichloromethane, ug/l	<1.0	<1.0
Bromoform, ug/l	<1.0	<1.0
Bromomethane, ug/l	<1.0	<1.0
Carbon tetrachloride, ug/l	<1.0	<1.0
Chlorobenzene, ug/l	<1.0	<1.0
Chloroethane, ug/l	<1.0	<1.0
2-Chloroethylvinyl Ether, ug/l	<10	<10
Chloroform, ug/l	<1.0	<1.0
Chloromethane, ug/l	<1.0	<1.0
Dibromochloromethane, ug/l	<1.0	<1.0
1,2-Dichlorobenzene, ug/l	<1.0	<1.0
1,3-Dichlorobenzene, ug/l	<1.0	<1.0
1,4-Dichlorobenzene, ug/l	<1.0	<1.0
1,1-Dichloroethane, ug/l	<1.0	<1.0
1,2-Dichloroethane, ug/l	<1.0	<1.0
1,1-Dichloroethene, ug/l	<1.0	<1.0
trans-1,2-Dichloroethylene, ug/l	<1.0	<1.0
1,2-Dichloropropane, ug/l	<1.0	<1.0
cis-1,3-Dichloropropene, ug/l	<1.0	<1.0
trans-1,3-Dichloropropene, ug/l	<1.0	<1.0
Ethylbenzene, ug/l	9.5	<1.0
Methylene chloride, ug/l	<1.0	<1.0
Styrene, ug/l	<1.0	<1.0

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Mr. Ed McCullers
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Client PO. No.: #958037

Project: Miramar WWTP
Sampled By: Client
Code: 151170319
Page 2

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE SAMPLED
71992-1	MW-2 Upper Zone	08-23-96
71992-2	MW-2 Lower Zone	08-23-96

PARAMETER	71992-1	71992-2
1,1,2,2-Tetrachloroethane, ug/l	<1.0	<1.0
Tetrachloroethene, ug/l	<1.0	<1.0
Toluene, ug/l	24	<1.0
1,1,1-Trichloroethane, ug/l	<1.0	<1.0
1,1,2-Trichloroethane, ug/l	<1.0	<1.0
Trichloroethene, ug/l	<1.0	<1.0
Trichlorofluoromethane, ug/l	<1.0	<1.0
Vinyl chloride, ug/l	<1.0	<1.0
Xylenes, ug/l	<1.0	<1.0
Total Trihalomethanes, ug/l	<1.0	<1.0
Date Analyzed	08.28.96	08.28.96
Method Number	EPA 624	EPA 624
Dilution factor	1	1

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Client PO. No.: #958037

Project: Miramar WWTP
Sampled By: Client
Code: 171061121

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE SAMPLED
71992-1	MW-2 Upper Zone	08-23-96
71992-2	MW-2 Lower Zone	08-23-96

PARAMETER	71992-1	71992-2
BN-A Extractables (625)		
Acenaphthene, ug/l	<10	<10
Acenaphthylene, ug/l	<10	<10
Anthracene, ug/l	<10	<10
Aldrin, ug/l	<10	<10
Benzo(a)anthracene, ug/l	<4.0	<4.0
Benzo(b)fluoranthene, ug/l	<4.0	<4.0
Benzo(k)fluoranthene, ug/l	<5.0	<5.0
Benzo(a)pyrene, ug/l	<4.0	<4.0
Benzo(g,h,i)perylene, ug/l	<10	<10
Benzyl butyl phthalate, ug/l	<10	<10
Beta-BHC, ug/l	<10	<10
Delta-BHC, ug/l	<10	<10
Bis(2-Chloroethyl)ether, ug/l	<10	<10
Bis(2-Chloroethoxy)methane, ug/l	<10	<10
Bis(2-Ethylhexyl)phthalate, ug/l	<10	<10
Bis(2-chloroisopropyl)ether, ug/l	<10	<10
4-Bromophenyl-phenyl-ether, ug/l	<10	<10
Chlordane, ug/l	<50	<50
2-Chloronaphthalene, ug/l	<10	<10
4-Chlorophenyl-phenyl ether, ug/l	<10	<10
Chrysene, ug/l	<5.0	<5.0
4,4'-DDD, ug/l	<10	<10
4,4'-DDE, ug/l	<10	<10
4,4'-DDT, ug/l	<10	<10

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE SAMPLED
71992-1	MW-2 Upper Zone	08-23-96
71992-2	MW-2 Lower Zone	08-23-96

PARAMETER	71992-1	71992-2
Dibenz(a,h)anthracene, ug/l	<5.0	<5.0
Di-n-butylphthalate, ug/l	<10	<10
1,3-Dichlorobenzene, ug/l	<10	<10
1,2-Dichlorobenzene, ug/l	<10	<10
1,4-Dichlorobenzene, ug/l	<10	<10
3,3'-Dichlorobenzidine, ug/l	<20	<20
Dieldrin, ug/l	<10	<10
Diethylphthalate, ug/l	<10	<10
Dimethyl phthalate, ug/l	<10	<10
2,4-Dinitrotoluene, ug/l	<10	<10
2,6-Dinitrotoluene, ug/l	<10	<10
Di-n-octylphthalate, ug/l	<10	<10
Endosulfan sulfate, ug/l	<20	<20
Endrin Aldehyde, ug/l	<50	<50
Fluoranthene, ug/l	<10	<10
Fluorene, ug/l	<10	<10
Heptachlor, ug/l	<20	<20
Heptachlor epoxide, ug/l	<20	<20
Hexachlorobenzene, ug/l	<10	<10
Hexachlorobutadiene, ug/l	<10	<10
Hexachloroethane, ug/l	<10	<10
Indeno (1,2,3-cd)pyrene, ug/l	<5.0	<5.0
Isophorone, ug/l	<10	<10
Naphthalene, ug/l	<5.0	<5.0
Nitrobenzene, ug/l	<10	<10

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE SAMPLED
71992-1	MW-2 Upper Zone	08-23-96
71992-2	MW-2 Lower Zone	08-23-96

PARAMETER	71992-1	71992-2
N-Nitrosodi-N-Propylamine, ug/l	<10	<10
Aroclor-1016, ug/l	<500	<500
Aroclor-1221, ug/l	<500	<500
Aroclor-1232, ug/l	<500	<500
Aroclor-1242, ug/l	<500	<500
Aroclor-1248, ug/l	<500	<500
Aroclor-1254, ug/l	<500	<500
Aroclor-1260, ug/l	<500	<500
Phenanthrene, ug/l	<10	<10
Pyrene, ug/l	<10	<10
Toxaphene, ug/l	<2000	<2000
1,2,4-Trichlorobenzene, ug/l	<10	<10
4-Chloro-3-methylphenol, ug/l	<10	<10
2-Chlorophenol, ug/l	<10	<10
2,4-Dichlorophenol, ug/l	<4.0	<4.0
2,4-Dimethylphenol, ug/l	<10	<10
2,4-Dinitrophenol, ug/l	<30	<30
2-Methyl-4,6-dinitrophenol, ug/l	<50	<50
2-Nitrophenol, ug/l	<10	<10
4-Nitrophenol, ug/l	<15	<15
Pentachlorophenol, ug/l	<10	<10
Phenol, ug/l	<10	<10
2,4,6-Trichlorophenol, ug/l	<10	<10
Date Extracted	08.26.96	08.26.96
Date Analyzed	08.28.96	08.28.96
Method Number	EPA 625	EPA 625
Dilution factor	1	1

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE SAMPLED
71992-1	MW-2 Upper Zone	08-23-96
71992-2	MW-2 Lower Zone	08-23-96

PARAMETER	71992-1	71992-2
Chlorinated Pesticides		
Aldrin, ug/l	<0.050	<0.050
alpha-BHC, ug/l	<0.050	<0.050
beta-BHC, ug/l	<0.050	<0.050
delta-BHC, ug/l	<0.050	<0.050
gamma-BHC, ug/l	<0.050	<0.050
Chlordane, ug/l	<0.50	<0.50
4,4'-DDD, ug/l	<0.10	<0.10
4,4'-DDE, ug/l	<0.10	<0.10
4,4'-DDT, ug/l	<0.10	<0.10
Dieldrin, ug/l	<0.10	<0.10
Endosulfan I, ug/l	<0.050	<0.050
Endosulfan II, ug/l	<0.10	<0.10
Endosulfan sulfate, ug/l	<0.10	<0.10
Endrin, ug/l	<0.10	<0.10
Endrin aldehyde, ug/l	<0.10	<0.10
Heptachlor, ug/l	<0.050	<0.050
Heptachlor epoxide, ug/l	<0.050	<0.050
Methoxychlor, ug/l	<0.50	<0.50
Toxaphene, ug/l	<5.0	<5.0
Aroclor-1016, ug/l	<1.0	<1.0
Aroclor-1221, ug/l	<2.0	<2.0
Aroclor-1232, ug/l	<1.0	<1.0
Aroclor-1242, ug/l	<1.0	<1.0
Aroclor-1248, ug/l	<1.0	<1.0

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE SAMPLED
71992-1	MW-2 Upper Zone	08-23-96
71992-2	MW-2 Lower Zone	08-23-96

PARAMETER	71992-1	71992-2
Aroclor-1254, ug/l	<1.0	<1.0
Aroclor-1260, ug/l	<1.0	<1.0
Date Extracted	08.26.96	08.26.96
Date Analyzed	08.29.96	08.29.96
Method Number	EPA 608	EPA 608
Dilution factor	1	1
Primary Organics - Herbicides (515.1)		
2,4-D, ug/l	<0.50	<0.50
Dalapon, ug/l	<10	<10
Dinoseb, ug/l	<0.50	<0.50
Pentachlorophenol, ug/l	<1.0	<1.0
Picloram, ug/l	<0.50	<0.50
2,4,5-TP Silvex, ug/l	<0.50	<0.50
Date Extracted	08.26.96	08.26.96
Date Analyzed	08.31.96	08.30.96
Method Number	EPA 515.1	EPA 515.1
Ethylene Dibromide (504)		
1,2-Dibromoethane (EDB) , ug/l	<0.020	<0.020
1,2-Dibromo-3-chloropropane, ug/l	<0.020	<0.020
Date Analyzed	08.29.96	08.29.396
Method Number	EPA 504	EPA 504
Aluminum		
Aluminum, mg/l	<0.20	<0.20
Date Analyzed	09.05.96	09.05.96
Method Number	EPA 6010	EPA 6010

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE SAMPLED
71992-1	MW-2 Upper Zone	08-23-96
71992-2	MW-2 Lower Zone	08-23-96

PARAMETER	71992-1	71992-2
Antimony (6010)		
Antimony, mg/l	<0.050	<0.050
Date Analyzed	09.05.96	09.05.96
Method Number	EPA 6010	EPA 6010
Arsenic (7060)		
Arsenic, mg/l	<0.010	<0.010
Date Analyzed	09.09.96	09.09.96
Method Number	EPA 7060	EPA 7060
Barium (6010)		
Barium, mg/l	0.048	0.030
Date Analyzed	09.05.96	09.05.96
Method Number	EPA 6010	EPA 6010
Beryllium (6010)		
Beryllium, mg/l	<0.0040	<0.0040
Date Analyzed	09.05.96	09.05.96
Method Number	EPA 6010	EPA 6010
Cadmium (6010)		
Cadmium, mg/l	<0.0050	0.011
Date Analyzed	09.05.96	09.05.96
Method Number	EPA 6010	EPA 6010
Chromium (6010)		
Chromium, mg/l	<0.020*F65	<0.10*F65
Date Analyzed	09.05.96	09.05.96
Method Number	EPA 6010	EPA 6010

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE SAMPLED
71992-1	MW-2 Upper Zone	08-23-96
71992-2	MW-2 Lower Zone	08-23-96

PARAMETER	71992-1	71992-2
Copper (6010)		
Copper, mg/l	<0.025	<0.025
Date Analyzed	09.05.96	09.05.96
Method Number	EPA 6010	EPA 6010
Iron		
Iron, mg/l	1.7	8.0
Date Analyzed	09.05.96	09.05.96
Method Number	EPA 6010	EPA 6010
Lead (7421)		
Lead, mg/l	<0.0050	<0.0050
Date Analyzed	09.10.96	09.10.96
Method Number	EPA 7421	EPA 7421
Manganese		
Manganese, mg/l	0.12	0.81
Date Analyzed	09.05.96	09.05.96
Method Number	EPA 6010	EPA 6010
Mercury (7470/7471)		
Mercury, mg/l	<0.00020	<0.00020
Date Analyzed	08.29.96	08.29.96
Method Number	EPA 7470	EPA 7470
Nickel (6010)		
Nickel, mg/l	<0.040	<0.040
Date Analyzed	09.05.96	09.05.96
Method Number	EPA 6010	EPA 6010

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15465 Pine Ridge Road
Ft. Myers, FL 33908

Client PO. No.: #958037

Project: Miramar WWTP
Sampled By: Client
Code: 171061121

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE SAMPLED
71992-1	MW-2 Upper Zone	08-23-96
71992-2	MW-2 Lower Zone	08-23-96

PARAMETER	71992-1	71992-2
Selenium (7740)		
Selenium, mg/l	<0.0050	<0.0050
Date Analyzed	09.10.96	09.10.96
Method Number	EPA 7740	EPA 7740
Silver (6010)		
Silver, mg/l	<0.010	<0.010
Date Analyzed	09.05.96	09.05.96
Method Number	EPA 6010	EPA 6010
Sodium		
Sodium, mg/l	1300	9900
Date Analyzed	09.05.96	09.05.96
Method Number	EPA 6010	EPA 6010
Zinc (6010)		
Zinc, mg/l	<0.020	0.054
Date Analyzed	09.05.96	09.05.96
Method Number	EPA 6010	EPA 6010
Biochemical Oxygen Demand (5-Day) (405.1)		
Biochemical Oxygen Demand (5 Day), mg/l	2.6	<4.0*F11
Date Analyzed	08.24.96	08.24.96
Method Number	EPA 405.1	EPA 405.1
Chloride		
Chloride, mg/l	2600	21000
Date Analyzed	09.06.96	09.06.96
Method Number	EPA 325.2	EPA 325.2

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Received: 23 AUG 96
Reported: 11 SEP 96

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71992-1	MW-2 Upper Zone	08-23-96
71992-2	MW-2 Lower Zone	08-23-96

PARAMETER	71992-1	71992-2
Coliform, Fecal (SM 9222D)		
Coliform (MF), Fecal, col/100ml	<1	<1
Date Analyzed	08.23.96	08.23.96
Method Number	SM 9222D	SM 9222D
Coliform, Total (SM 9222B)		
Coliform (MF), Total, col/100ml	<1	<1
Date Analyzed	08.23.96	08.23.96
Method Number	SM 9222B	SM 9222B
Color		
Color, c.u.	10	15
Date Analyzed	08.24.96	08.24.96
Method Number	EPA 110.2	EPA 110.2
Corrosivity (Saturation Index)		
Corrosivity (Saturation Index), units	-0.48	-0.042
Fluoride (340.2)		
Fluoride, mg/l	0.68	0.51
Date Analyzed	09.04.96	09.04.96
Method Number	EPA 340.2	EPA 340.2
Nitrogen, Nitrate		
Nitrate-N, mg/l	<0.050	<0.050
Date Analyzed	08.18.96	08.18.96
Method Number	EPA 353.2	EPA 353.2
Nitrogen, Nitrite		
Nitrite-N, mg/l	<0.050	<0.050
Date Analyzed	08.18.96	08.18.96
Method Number	EPA 353.3	EPA 353.3

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71992-2	MW-2 Lower Zone	08-23-96

PARAMETER	71992-1	71992-2
Nitrogen, Nitrate + Nitrite		
Nitrate + Nitrite-N, mg/l	<0.050	<0.050
Date Analyzed	08.18.96	08.18.96
Method Number	EPA 353.3	EPA 353.3
Odor		
Odor, t.o.n.	4	8
Date Analyzed	08.24.96	08.24.96
Method Number	EPA 140.1	EPA 140.1
pH		
pH , units	7.5	7.2
Date Analyzed	08.28.96	08.28.96
Method Number	EPA 150.1	EPA 150.1
Solids, Total Dissolved (160.1)		
Solids, Total Dissolved, mg/l	3600	36000
Date Analyzed	08.26.96	08.26.96
Method Number	EPA 160.1	EPA 160.1
Specific Conductance		
Specific Conductance, umhos/cm	4800	42000
Date Analyzed	08.26.96	08.26.96
Method Number	EPA 120.1	EPA 120.1
Specific Gravity		
Specific Gravity-Gravimetric, units	1.0	1.0
Date Analyzed	08.29.96	08.29.96
Method Number	D1429-86	D1429*86

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71992-1	MW-2 Upper Zone	08-23-96
71992-2	MW-2 Lower Zone	08-23-96

PARAMETER	71992-1	71992-2
Sulfate as SO4		
Sulfate as SO4, mg/l	400	3000
Date Analyzed	09.10.96	09.10.96
Method Number	EPA 375.4	EPA 375.4
Surfactants (MBAS)		
Surfactants (MBAS), mg/l	<0.10	0.24
Date Analyzed	08.23.96	08.23.96
Method Number	SM 5540C	SM 5540C
Turbidity		
Turbidity, NTU	5.0	25
Date Analyzed	08.23.96	08.23.96
Method Number	EPA 180.1	EPA 180.1
Gross Alpha (EPA 900.0)		
Gross Alpha, pCi/l	<3.0	150+/-320
Date Analyzed	09.07.96	09.09.96
Method Number	EPA 900.0	EPA 900.0
Radium 226 (EPA 903.1)		
Radium 226, pCi/L	0.74+/-.07	0.74+/-.07
Date Analyzed	09.05.96	09.05.96
Method Number	EPA 903.1	EPA 903.1
Radium 228 (EPA 904.0)		
Radium 228, pCi/l	<1.0	<1.0
Date Analyzed	09.06.96	09.06.96
Method Number	EPA 904.0	EPA 904.0
Photonradioactivity (Gamma Spectral Analysis), pCi/l	ND	ND

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES
71992-3	Lab Blank
71992-4	Accuracy - % Recovery (Mean)
71992-5	Precision - Relative % Difference
71992-6	Detection Limit

PARAMETER	71992-3	71992-4	71992-5	71992-6
Purgeables (624)				
Benzene, ug/l	<1.0	85 %	2.4 %	1.0
Bromodichloromethane, ug/l	<1.0	---	---	1.0
Bromoform, ug/l	<1.0	---	---	1.0
Bromomethane, ug/l	<1.0	---	---	1.0
Carbon tetrachloride, ug/l	<1.0	---	---	1.0
Chlorobenzene, ug/l	<1.0	102 %	0 %	1.0
Chloroethane, ug/l	<1.0	---	---	1.0
2-Chloroethylvinyl Ether, ug/l	<10	---	---	10
Chloroform, ug/l	<1.0	---	---	1.0
Chloromethane, ug/l	<1.0	---	---	1.0
Dibromochloromethane, ug/l	<1.0	---	---	1.0
1,2-Dichlorobenzene, ug/l	<1.0	---	---	1.0
1,3-Dichlorobenzene, ug/l	<1.0	---	---	1.0
1,4-Dichlorobenzene, ug/l	<1.0	---	---	1.0
1,1-Dichloroethane, ug/l	<1.0	---	---	1.0
1,2-Dichloroethane, ug/l	<1.0	---	---	1.0
1,1-Dichloroethene, ug/l	<1.0	108 %	0.93 %	1.0
trans-1,2-Dichloroethylene, ug/l	<1.0	---	---	1.0
1,2-Dichloropropane, ug/l	<1.0	---	---	1.0
cis-1,3-Dichloropropene, ug/l	<1.0	---	---	1.0
trans-1,3-Dichloropropene, ug/l	<1.0	---	---	1.0
Ethylbenzene, ug/l	<1.0	---	---	1.0

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71992-5	Precision - Relative % Difference
71992-6	Detection Limit

PARAMETER	71992-3	71992-4	71992-5	71992-6
Methylene chloride, ug/l	<1.0	---	---	1.0
Styrene, ug/l	<1.0	---	---	---
1,1,2,2-Tetrachloroethane, ug/l	<1.0	---	---	1.0
Tetrachloroethene, ug/l	<1.0	---	---	1.0
Toluene, ug/l	<1.0	105 %	3.8 %	1.0
1,1,1-Trichloroethane, ug/l	<1.0	---	---	1.0
1,1,2-Trichloroethane, ug/l	<1.0	---	---	1.0
Trichloroethene, ug/l	<1.0	105 %	1.9 %	1.0
Trichlorofluoromethane, ug/l	<1.0	---	---	1.0
Vinyl chloride, ug/l	<1.0	---	---	1.0
Xylenes, ug/l	<1.0	---	---	---
Date Analyzed	08.28.96	---	---	---
Method Number	EPA 624	---	---	---

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71992-5	Precision - Relative % Difference
71992-6	Detection Limit

PARAMETER	71992-3	71992-4	71992-5	71992-6
BN-A Extractables (625)				
Acenaphthene, ug/l	<10	78 %	9.0 %	10
Acenaphthylene, ug/l	<10	---	---	10
Anthracene, ug/l	<10	---	---	10
Aldrin, ug/l	<10	---	---	10
Benzo(a)anthracene, ug/l	<4.0	---	---	4.0
Benzo(b)fluoranthene, ug/l	<4.0	---	---	4.0
Benzo(k)fluoranthene, ug/l	<5.0	---	---	5.0
Benzo(a)pyrene, ug/l	<4.0	---	---	4.0
Benzo(g,h,i)perylene, ug/l	<10	---	---	10
Benzyl butyl phthalate, ug/l	<10	---	---	10
Beta-BHC, ug/l	<10	---	---	10
Delta-BHC, ug/l	<10	---	---	10
Bis(2-Chloroethyl)ether, ug/l	<10	---	---	10
Bis(2-Chloroethoxy)methane, ug/l	<10	---	---	10
Bis(2-Ethylhexyl)phthalate, ug/l	<10	---	---	10
Bis(2-chloroisopropyl)ether, ug/l	<10	---	---	10
4-Bromophenyl-phenyl-ether, ug/l	<10	---	---	10
Chlordane, ug/l	<50	---	---	50
2-Chloronaphthalene, ug/l	<10	---	---	10
4-Chlorophenyl-phenyl ether, ug/l	<10	---	---	10
Chrysene, ug/l	<5.0	---	---	5.0
4,4'-DDD, ug/l	<10	---	---	10

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71992-6	Detection Limit

PARAMETER	71992-3	71992-4	71992-5	71992-6
4,4'-DDE, ug/l	<10	---	---	10
4,4'-DDT, ug/l	<10	---	---	10
Dibenz(a,h)anthracene, ug/l	<5.0	---	---	5.0
Di-n-butylphthalate, ug/l	<10	---	---	10
1,3-Dichlorobenzene, ug/l	<10	---	---	10
1,2-Dichlorobenzene, ug/l	<10	---	---	10
1,4-Dichlorobenzene, ug/l	<10	82 %	11 %	10
3,3'-Dichlorobenzidine, ug/l	<20	---	---	20
Dieldrin, ug/l	<10	---	---	10
Diethylphthalate, ug/l	<10	---	---	10
Dimethyl phthalate, ug/l	<10	---	---	10
2,4-Dinitrotoluene, ug/l	<10	87 %	18 %	10
2,6-Dinitrotoluene, ug/l	<10	---	---	10
Di-n-octylphthalate, ug/l	<10	---	---	10
Endosulfan sulfate, ug/l	<20	---	---	20
Endrin Aldehyde, ug/l	<50	---	---	50
Fluoranthene, ug/l	<10	---	---	10
Fluorene, ug/l	<10	---	---	10
Heptachlor, ug/l	<20	---	---	20
Heptachlor epoxide, ug/l	<20	---	---	20
Hexachlorobenzene, ug/l	<10	---	---	10
Hexachlorobutadiene, ug/l	<10	---	---	10
Hexachloroethane, ug/l	<10	---	---	10

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71992-6	Detection Limit

PARAMETER	71992-3	71992-4	71992-5	71992-6
Indeno (1,2,3-cd)pyrene, ug/l	<5.0	---	---	5.0
Isophorone, ug/l	<10	---	---	10
Naphthalene, ug/l	<5.0	---	---	5.0
Nitrobenzene, ug/l	<10	---	---	10
N-Nitrosodi-N-Propylamine, ug/l	<10	98 %	15 %	10
Aroclor-1016, ug/l	<500	---	---	500
Aroclor-1221, ug/l	<500	---	---	500
Aroclor-1232, ug/l	<500	---	---	500
Aroclor-1242, ug/l	<500	---	---	500
Aroclor-1248, ug/l	<500	---	---	500
Aroclor-1254, ug/l	<500	---	---	500
Aroclor-1260, ug/l	<500	---	---	500
Phenanthrene, ug/l	<10	---	---	10
Pyrene, ug/l	<10	68 %	4.4 %	10
Toxaphene, ug/l	<2000	---	---	2000
1,2,4-Trichlorobenzene, ug/l	<10	88 %	17 %	10
4-Chloro-3-methylphenol, ug/l	<10	103 %	14 %	10
2-Chlorophenol, ug/l	<10	78 %	10 %	10
2,4-Dichlorophenol, ug/l	<4.0	---	---	4.0
2,4-Dimethylphenol, ug/l	<10	---	---	10
2,4-Dinitrophenol, ug/l	<30	---	---	30
2-Methyl-4,6-dinitrophenol, ug/l	<50	---	---	50
2-Nitrophenol, ug/l	<10	---	---	10

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71992-6	Detection Limit

PARAMETER	71992-3	71992-4	71992-5	71992-6
4-Nitrophenol, ug/l	<15	69 %	20 %	15
Pentachlorophenol, ug/l	<10	112 %	13 %	10
Phenol, ug/l	<10	86 %	20 %	10
2,4,6-Trichlorophenol, ug/l	<10	---	---	10
Date Extracted	08.26.96	---	---	---
Date Analyzed	08.28.96	---	---	---
Method Number	EPA 625	---	---	---

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71992-5	Precision - Relative % Difference
71992-6	Detection Limit

PARAMETER	71992-3	71992-4	71992-5	71992-6
Chlorinated Pesticides				
Aldrin, ug/l	<0.050	65 %	6.2 %	0.050
alpha-BHC, ug/l	<0.050	---	---	0.050
beta-BHC, ug/l	<0.050	---	---	0.050
delta-BHC, ug/l	<0.050	---	---	0.050
gamma-BHC, ug/l	<0.050	69 %	5.8 %	0.050
Chlordane, ug/l	<0.50	---	---	0.50
4,4'-DDD, ug/l	<0.10	---	---	0.10
4,4'-DDE, ug/l	<0.10	---	---	0.10
4,4'-DDT, ug/l	<0.10	94 %	6.4 %	0.10
Dieldrin, ug/l	<0.10	80 %	6.3 %	0.10
Endosulfan I, ug/l	<0.050	---	---	0.050
Endosulfan II, ug/l	<0.10	---	---	0.10
Endosulfan sulfate, ug/l	<0.10	---	---	0.10
Endrin, ug/l	<0.10	86 %	30 %	0.10
Endrin aldehyde, ug/l	<0.10	---	---	0.10
Heptachlor, ug/l	<0.050	64 %	7.8 %	0.050
Heptachlor epoxide, ug/l	<0.050	---	---	0.050
Methoxychlor, ug/l	<0.50	---	---	---
Toxaphene, ug/l	<5.0	---	---	5.0
Aroclor-1016, ug/l	<1.0	---	---	1.0
Aroclor-1221, ug/l	<2.0	---	---	2.0
Aroclor-1232, ug/l	<1.0	---	---	1.0

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71992-6	Detection Limit

PARAMETER	71992-3	71992-4	71992-5	71992-6
Aroclor-1242, ug/l	<1.0	---	---	1.0
Aroclor-1248, ug/l	<1.0	---	---	1.0
Aroclor-1254, ug/l	<1.0	---	---	1.0
Aroclor-1260, ug/l	<1.0	---	---	1.0
Date Extracted	08.26.96	---	---	---
Date Analyzed	08.28.96	---	---	---
Method Number	EPA 608	---	---	---
Primary Organics - Herbicides (515.1)				
2,4-D, ug/l	<0.50	86 %	11 %	0.50
Dalapon, ug/l	<10	54 %	6.0 %	10
Dinoseb, ug/l	<0.50	71 %	5.2 %	0.50
Pentachlorophenol, ug/l	<1.0	94 %	0.10 %	1.0
Picloram, ug/l	<0.50	54 %	31 %	0.50
2,4,5-TP Silvex, ug/l	<0.50	96 %	7.7 %	0.50
Date Extracted	08.26.96	---	---	---
Date Analyzed	08.30.96	---	---	---
Method Number	EPA 515.1	---	---	---
Ethylene Dibromide (504)				
1,2-Dibromoethane (EDB) , ug/l	<0.020	128 %	0 %	0.020
1,2-Dibromo-3-chloropropane, ug/l	<0.020	---	---	---
Date Analyzed	08.28.96	---	---	---
Method Number	EPA 504	---	---	---

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LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES
71992-3	Lab Blank
71992-4	Accuracy - % Recovery (Mean)
71992-5	Precision - Relative % Difference
71992-6	Detection Limit

PARAMETER	71992-3	71992-4	71992-5	71992-6
Aluminum				
Aluminum, mg/l	<0.20	94 %	1.0 %	0.20
Date Analyzed	09.05.96	---	---	---
Method Number	EPA 6010	---	---	---
Antimony (6010)				
Antimony, mg/l	<0.050	98 %	3.1 %	0.050
Date Analyzed	09.05.96	---	---	---
Method Number	EPA 6010	---	---	---
Arsenic (7060)				
Arsenic, mg/l	<0.010	93 %	2.2 %	0.010
Date Analyzed	09.09.96	---	---	---
Method Number	EPA 7060	---	---	---
Barium (6010)				
Barium, mg/l	<0.010	97 %	0 %	0.010
Date Analyzed	09.05.96	---	---	---
Method Number	EPA 6010	---	---	---
Beryllium (6010)				
Beryllium, mg/l	<0.0040	98 %	0 %	0.0040
Date Analyzed	09.05.96	---	---	---
Method Number	EPA 6010	---	---	---
Cadmium (6010)				
Cadmium, mg/l	<0.0050	92 %	1.1 %	0.0050
Date Analyzed	09.05.96	---	---	---
Method Number	EPA 6010	---	---	---

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LOG NO: D6-71992
Received: 23 AUG 96
Reported: 11 SEP 96

Mr. Ed McCullers
Youngquist Brothers, Inc.
15465 Pine Ridge Road
Ft. Myers, FL 33908

Client PO. No.: #958037

Project: Miramar WWTP
Sampled By: Client
Code: 171061121

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES
71992-3	Lab Blank
71992-4	Accuracy - % Recovery (Mean)
71992-5	Precision - Relative % Difference
71992-6	Detection Limit

PARAMETER	71992-3	71992-4	71992-5	71992-6
Chromium (6010)				
Chromium, mg/l	<0.010	96 %	1.0 %	0.010
Date Analyzed	09.05.96	---	---	---
Method Number	EPA 6010	---	---	---
Copper (6010)				
Copper, mg/l	<0.025	102 %	0 %	0.025
Date Analyzed	09.05.96	---	---	---
Method Number	EPA 6010	---	---	---
Iron				
Iron, mg/l	<0.050	100 %	1.0 %	0.050
Date Analyzed	09.05.96	---	---	---
Method Number	EPA 6010	---	---	---
Lead (7421)				
Lead, mg/l	<0.0050	96 %	11 %	0.0050
Date Analyzed	09.14.96	---	---	---
Method Number	EPA 7421	---	---	---
Manganese				
Manganese, mg/l	<0.010	96 %	1.0 %	0.010
Date Analyzed	09.05.96	---	---	---
Method Number	EPA 6010	---	---	---
Mercury (7470/7471)				
Mercury, mg/l	<0.00020	95 %	2.1 %	0.00020
Date Analyzed	08.29.96	---	---	---
Method Number	EPA 7470	---	---	---

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Sampled By: Client
Code: 171061121

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES
71992-3	Lab Blank
71992-4	Accuracy - % Recovery (Mean)
71992-5	Precision - Relative % Difference
71992-6	Detection Limit

PARAMETER	71992-3	71992-4	71992-5	71992-6
Nickel (6010)				
Nickel, mg/l	<0.040	98 %	1.0 %	0.040
Date Analyzed	09.05.96	---	---	---
Method Number	EPA 6010	---	---	---
Selenium (7740)				
Selenium, mg/l	<0.0050	108 %*F75	0.93 %	0.0050
Date Analyzed	09.10.96	---	---	---
Method Number	EPA 7740	---	---	---
Silver (6010)				
Silver, mg/l	<0.010	94 %	0 %	0.010
Date Analyzed	09.05.96	---	---	---
Method Number	EPA 6010	---	---	---
Sodium				
Sodium, mg/l	<0.50	92 %*F75	2.2 %	0.50
Date Analyzed	09.05.96	---	---	---
Method Number	EPA 6010	---	---	---
Zinc (6010)				
Zinc, mg/l	<0.020	94 %	1.1 %	0.020
Date Analyzed	09.05.96	---	---	---
Method Number	EPA 6010	---	---	---
Biochemical Oxygen Demand (5-Day) (405.1)				
Biochemical Oxygen Demand (5 Day), mg/l	<2.0	98 %	3.1 %	2.0
Date Analyzed	08.24.96	---	---	---
Method Number	EPA 405.1	---	---	---

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES
71992-3	Lab Blank
71992-4	Accuracy - % Recovery (Mean)
71992-5	Precision - Relative % Difference
71992-6	Detection Limit

PARAMETER	71992-3	71992-4	71992-5	71992-6
Chloride				
Chloride, mg/l	<1.0	102 %	0 %	1.0
Date Analyzed	09.06.96	---	---	---
Method Number	EPA 325.2	---	---	---
Fluoride (340.2)				
Fluoride, mg/l	<0.20	110 %	0.91 %	0.20
Date Analyzed	09.04.96	---	---	---
Method Number	EPA 340.2	---	---	---
Nitrogen, Nitrate				
Nitrate-N, mg/l	<0.050	102 %	0.98 %	0.050
Date Analyzed	08.18.96	---	---	---
Method Number	EPA 353.2	---	---	---
Nitrogen, Nitrite				
Nitrogen, Nitrate + Nitrite				
Nitrate + Nitrite-N, mg/l	<0.050	---	---	0.050
Date Analyzed	08.18.96	---	---	---
Method Number	EPA 353.3	---	---	---
Sulfate as SO4				
Sulfate as SO4, mg/l	<5.0	92 %	1.1 %	5.0
Date Analyzed	09.10.96	---	---	---
Method Number	EPA 375.4	---	---	---
Surfactants (MBAS)				
Surfactants (MBAS), mg/l	<0.10	96 %	3.1 %	0.10
Date Analyzed	08.23.96	---	---	---
Method Number	SM 5540C	---	---	---

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES
71992-3	Lab Blank
71992-4	Accuracy - % Recovery (Mean)
71992-5	Precision - Relative % Difference
71992-6	Detection Limit

PARAMETER	71992-3	71992-4	71992-5	71992-6
Gross Alpha (EPA 900.0)				
Gross Alpha, pCi/l	<3.0	128 %	25 %	3.0
Date Analyzed	09.04.96	---	---	---
Method Number	EPA 900.0	---	---	---
Radium 226 (EPA 903.1)				
Radium 226, pCi/L	<0.60	79 %	2.8 %	0.60
Date Analyzed	08.20.96	---	---	---
Method Number	EPA 903.1	---	---	---
Radium 228 (EPA 904.0)				
Radium 228, pCi/l	<1.0	92 %	6.4 %	1.0
Date Analyzed	08.22.96	---	---	---
Method Number	EPA 904.0	---	---	---

SL Environmental HRS Cert. #E86221 and SL Drinking Water HRS Cert. #86371.
Method Reference: EPA 40 CFR Part 136, EPA 600/4-84-039, EPA SW-846 and EPA 600/4-79-020.
*F11 = The reported BOD5 result is estimated because sample oxygen depletion was outside method-recommended limits.
*F65 = Elevated detection limits were reported due to sample matrix interference which required sample or extract dilution.
*F75 = Matrix spike recoveries were outside advisory limits due to matrix interference present in the sample; therefore, recovery of laboratory control standards analyzed concurrently with the sample batch have been reported.
*F86 = Because spikes are not appropriate for this method, reported precision was calculated from duplicate analysis of a sample in the batch.

Paul Canevaro

Paul Canevaro, Project Manager

Final Page Of Report

Monitor Wells Nos. 1 and 2 - October 7, 1996

Background Water Quality Analysis

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D6-72346
Received: 08 OCT 96
Reported: 28 OCT 96

Mr. Ed McCullers
Youngquist Brothers, Inc.
15465 Pine Ridge Road
Ft. Myers, FL 33908

Client PO. No.: #958037

Project: Miramar WWTP
Sampled By: Dave
Code: 181270318
Page 1

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE SAMPLED
72346-1	MW-1 Upper Zone	10-07-96
72346-2	MW-1 Lower Zone	10-07-96
72346-3	MW-2 Upper Zone	10-07-96
72346-4	Mw-2 Lower Zone	10-07-96

PARAMETER	72346-1	72346-2	72346-3	72346-4
Primary Organics - BN (525.2)				
Benzo(a)pyrene, ug/l	<0.20	<0.20	<0.20	<0.20
Bis(2-ethyl hexyl)adipate, ug/l	<2.0	<2.0	<2.0	<2.0
bis(2-Ethylhexyl) phthalate, ug/l	<2.0	<2.0	<2.0	<2.0
Hexachlorobenzene, ug/l	<1.0	<1.0	<1.0	<1.0
Hexachlorocyclopentadiene, ug/l	<1.0	<1.0	<1.0	<1.0
Date Extracted	10.14.96	10.14.96	10.14.96	10.14.96
Date Analyzed	10.16.96	10.16.96	10.16.96	10.16.96
Method Number	EPA 525.2	EPA 525.2	EPA 525.2	EPA 525.2
Dioxin-2,3,7,8-TCDD, ug/l	<10*F49	<10*F49	<10*F49	<10*F49
Primary Organics - Pesticides (507)				
Alachlor, ug/l	<1.0	<1.0	<1.0	<1.0
Atrazine, ug/l	<1.0	<1.0	<1.0	<1.0
Simazine, ug/l	<1.0	<1.0	<1.0	<1.0
Date Extracted	10.14.96	10.14.96	10.14.96	10.14.96
Date Analyzed	10.22.96	10.23.96	10.22.96	10.22.96
Method Number	EPA 507	EPA 507	EPA 507	EPA 507
Primary Organics - Carbamates (531.1)				
Carbofuran, ug/l	<1.0	<1.0	<1.0	<1.0
Oxamyl, ug/l	<1.0	<1.0	<1.0	<1.0
Date Analyzed	10.17.96	10.17.96	10.17.96	10.17.96
Method Number	EPA 531.1	EPA 531.1	EPA 531.1	EPA 531.1

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE SAMPLED
72346-1	MW-1 Upper Zone	10-07-96
72346-2	MW-1 Lower Zone	10-07-96
72346-3	MW-2 Upper Zone	10-07-96
72346-4	Mw-2 Lower Zone	10-07-96

PARAMETER	72346-1	72346-2	72346-3	72346-4
Group I Unregulated Carbamates (531.1)				
Aldicarb, ug/l	<0.50	<0.50	<0.50	<0.50
Aldicarb Sulfone, ug/l	<0.50	<0.50	<0.50	<0.50
Aldicarb Sulfoxide, ug/l	<0.50	<0.50	<0.50	<0.50
Date Analyzed	10.17.96	10.17.96	10.17.96	10.17.96
Method Number	EPA 531.1	EPA 531.1	EPA 531.1	EPA 531.1
Primary Organics - Glyphosate (547)				
Glyphosate, ug/l	<150	<150	<150	<150
Date Analyzed	10.16.96	10.16.96	10.16.96	10.16.96
Method Number	EPA 547	EPA 547	EPA 547	EPA 547
Primary Organics - Endothall (548.1)				
Endothall, ug/l	<10	<10	<10	<10
Date Extracted	10.09.96	10.09.96	10.09.96	10.09.96
Date Analyzed	10.14.96	10.14.96	10.14.96	10.14.96
Method Number	EPA 548.1	EPA 548.1	EPA 548.1	EPA 548.1
Primary Organics - Diquat (549.1)				
Diquat, ug/l	<1.0	<1.0	<1.0	<1.0
Date Extracted	10.14.96	10.14.96	10.14.96	10.14.96
Date Analyzed	10.16.96	10.16.96	10.16.96	10.16.96
Method Number	EPA 549	EPA 549	EPA 549	EPA 549
Thallium (278.2)				
Thallium (278.2), mg/l	<0.0020	<.0040*F65	<0.0020	<0.0020
Date Analyzed	10.16.96	10.16.96	10.16.96	10.16.96
Method Number	EPA 278.2	EPA 278.2	EPA 278.2	EPA 278.2

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE SAMPLED
72346-1	MW-1 Upper Zone	10-07-96
72346-2	MW-1 Lower Zone	10-07-96
72346-3	MW-2 Upper Zone	10-07-96
72346-4	Mw-2 Lower Zone	10-07-96

PARAMETER	72346-1	72346-2	72346-3	72346-4
Cyanide, Total				
Cyanide, Total , mg/l	<0.010	<0.010	<0.010	<0.010
Date Analyzed	10.18.96	10.18.96	10.18.96	10.18.96
Method Number	EPA 335.2	EPA 335.2	EPA 335.2	EPA 335.2
Nitrogen, Ammonia				
Nitrogen, Ammonia, mg/l	<0.050	<0.050	<0.050	<0.050
Date Analyzed	10.15.96	10.15.96	10.15.96	10.15.96
Method Number	EPA 350.3	EPA 350.3	EPA 350.3	EPA 350.3
Kjeldahl Nitrogen as N, Total (EPA 351.2)				
Kjeldahl Nitrogen-N, mg/l	0.41	0.36	0.44	0.29
Date Analyzed	10.23.96	10.23.96	10.23.96	10.23.96
Method Number	EPA 351.2	EPA 351.2	EPA 351.2	EPA 351.2
Nitrogen, Total Organic				
Nitrogen, Total Organic, mg/l	0.41	0.36	0.44	0.29
Date Calculated	10.28.96	10.28.96	10.28.96	10.28.96
Method Number	EPA CE	EPA CE	EPA CE	EPA CE
Phosphate, Ortho				
Phosphate, Ortho, mg/l	<0.050	<0.050	<0.050	<0.050
Date Analyzed	10.09.96	10.09.96	10.09.96	10.09.96
Method Number	EPA 365.2	EPA 365.2	EPA 365.2	EPA 365.2
Phosphorous, Total				
Phosphorus, Total, mg/l	<0.010	0.018	<0.010	<0.010
Date Analyzed	10.18.96	10.18.96	10.18.96	10.18.96
Method Number	EPA 365.2	EPA 365.2	EPA 365.2	EPA 365.2
Asbestos in Water (TEM), mg/l	*F71	*F71	*F71	*F71

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES
72346-5	Lab Blank
72346-6	Accuracy - % Recovery (Mean)
72346-7	Precision - Relative % Difference
72346-8	Detection Limit

PARAMETER	72346-5	72346-6	72346-7	72346-8
Primary Organics - BN (525.2)				
Benzo(a)pyrene, ug/l	<0.20	78 %	2.6 %	0.20
Bis(2-ethyl hexyl)adipate, ug/l	<2.0	92 %	2.2 %	2.0
bis(2-Ethylhexyl) phthalate, ug/l	<2.0	96 %	4.2 %	2.0
Hexachlorobenzene, ug/l	<1.0	76 %	6.6 %	1.0
Hexachlorocyclopentadiene, ug/l	<1.0	90 %	4.4 %	1.0
Date Extracted	10.14.96	---	---	---
Date Analyzed	10.16.96	---	---	---
Method Number	EPA 525.2	---	---	---
Primary Organics - Pesticides (507)				
Alachlor, ug/l	<1.0	---	---	1.0
Atrazine, ug/l	<1.0	112 %	17 %	1.0
Simazine, ug/l	<1.0	70 %	29 %	1.0
Date Extracted	10.14.96	---	---	---
Date Analyzed	10.22.96	---	---	---
Method Number	EPA 507	---	---	---
Primary Organics - Carbamates (531.1)				
Carbofuran, ug/l	<1.0	100 %	3.0 %	1.0
Oxamyl, ug/l	<1.0	104 %	2.9 %	1.0
Date Analyzed	10.17.96	---	---	---
Method Number	EPA 531.1	---	---	---

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES
72346-5	Lab Blank
72346-6	Accuracy - % Recovery (Mean)
72346-7	Precision - Relative % Difference
72346-8	Detection Limit

PARAMETER	72346-5	72346-6	72346-7	72346-8
Group I Unregulated Carbamates (531.1)				
Aldicarb, ug/l	<0.50	94 %	7.4 %	0.50
Aldicarb Sulfone, ug/l	<0.50	---	---	0.50
Aldicarb Sulfoxide, ug/l	<0.50	---	---	0.50
Date Analyzed	10.17.96	---	---	---
Method Number	EPA 531.1	---	---	---
Primary Organics - Glyphosate (547)				
Glyphosate, ug/l	<150	112 %	6.2 %	150
Date Analyzed	10.16.96	---	---	---
Method Number	EPA 547	---	---	---
Primary Organics - Endothall (548.1)				
Endothall, ug/l	<10	64 %	26 %	10
Date Extracted	10.09.96	---	---	---
Date Analyzed	10.14.96	---	---	---
Method Number	EPA 548.1	---	---	---
Primary Organics - Diquat (549.1)				
Diquat, ug/l	<1.0	58 %	16 %	1.0
Date Extracted	10.14.96	---	---	---
Date Analyzed	10.16.96	---	---	---
Method Number	EPA 549.1	---	---	---
Thallium (278.2)				
Thallium (278.2), mg/l	<0.0020	96 %	1.0 %	0.0020
Date Analyzed	10.16.96	---	---	---
Method Number	EPA 278.2	---	---	---

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES
72346-5	Lab Blank
72346-6	Accuracy - % Recovery (Mean)
72346-7	Precision - Relative % Difference
72346-8	Detection Limit

PARAMETER	72346-5	72346-6	72346-7	72346-8
Cyanide, Total				
Cyanide, Total , mg/l	<0.010	98 %	4.1 %	0.010
Date Analyzed	10.18.96	---	---	---
Method Number	EPA 335.2	---	---	---
Nitrogen, Ammonia				
Nitrogen, Ammonia, mg/l	<0.050	102 %	0.98 %	0.050
Date Analyzed	10.15.96	---	---	---
Method Number	EPA 350.3	---	---	---
Kjeldahl Nitrogen as N, Total (EPA 351.2)				
Kjeldahl Nitrogen-N, mg/l	<0.20	90 %	2.2 %	0.20
Date Analyzed	10.23.96	---	---	---
Method Number	EPA 351.2	---	---	---
Phosphate, Ortho				
Phosphate, Ortho, mg/l	<0.050	98 %	5.1 %	0.050
Date Analyzed	10.09.96	---	---	---
Method Number	EPA 365.2	---	---	---
Phosphorous, Total				
Phosphorus, Total, mg/l	<0.010	100 %	10 %	0.010
Date Analyzed	10.18.96	---	---	---
Method Number	EPA 365.2	---	---	---

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES
72346-5	Lab Blank
72346-6	Accuracy - % Recovery (Mean)
72346-7	Precision - Relative % Difference
72346-8	Detection Limit

PARAMETER	72346-5	72346-6	72346-7	72346-8

SL Environmental HRS Cert. #E86221 and SL Drinking Water HRS Cert. #86371.
Method References: EPA 600/4-88-039, EPA 40 CFR Part 136, EPA 600/4-79-020 and EPA/CE.
*F49 = The compound 2,3,7,8-TCDD was not detected by qualitative GC/MS screening analysis; reported results are estimated.
*F65 = Elevated detection limits were reported due to sample matrix interference which required sample or extract dilution.
*F71 - Subcontracted results are attached to this report.

Paul Canevaro, Project Manager

Final Page Of Report

ATTACHMENT 7

DEMONSTRATION OF CONFINEMENT

ADDITIONAL INFORMATION

DEMONSTRATION OF CONFINEMENT

In response to RFI question No. 8, we offer the following clarifications, additional data, and interpretations:

8.1) Aquifer and Laboratory Test Data

Testing

Straddle packers were used to isolate zones for drawdown and recovery tests. Stress was imposed on the aquifer over the packer intervals by a 4-inch submersible pump. Water level changes were measured and recorded by means of a pressure transducer system (Hermit 1000-C data logger). Prior to starting the tests, each zone was developed free of any drilling fluids by means of pumping until the specific conductance stabilized. The isolated zone was then allowed to recover from development before beginning the pumping test.

Analyses

The method of analysis used on the data collected and recorded during the straddle packer tests was the Modified Non-Equilibrium Formula derived by Cooper and Jacob (1946). The equation of the Cooper - Jacob method is as follows:

$$T = \frac{264Q}{\Delta s}$$

where:

T = coefficient of transmissivity
Q = pumping rate
Δs = change in drawdown over one log cycle

The results of all analyses, initially presented on Table 2 of the report, have been expanded and are shown as Table A in this attachment. Raw data and graphical plots of each test are also included in this attachment.

8. 2) through 8.4)

The general confining interval in question (between 1,800 feet and 2,300 feet) consists of horizontally interbedded limestones (dip angles of less than 10 degrees). Because of the horizontal nature of bedding planes, it is not believed that they pose a potential vertical pathway for effluent to move from the injection zone. From the geologic logs and geophysical logs which were conducted, it can be seen that these limestones are all very similar in nature. This is demonstrated by the dual induction, gamma ray, and sp logs that

show very little variance over this interval. The slight variances that can be seen represent the bedding nature of the formation. Because of this similarity, the data derived from the core analyses and straddle packer tests are representative of the entire section.

Although straddle packer tests were not conducted and cores were not collected across every possible bedding plane, the data collected that did include such features can be correlated to other similar features throughout the confining interval.

Some of the features found on the BHTV do reflect the interbedded formation bedding planes. These bedding planes are sealed and this can be demonstrated by the following data and observations. The feature questioned at 1,918 feet can be seen in the core collected over that interval as a bedding plane that is sealed. Additional sealed bedding planes can be seen at 1,910.5, 1,913 and 1,915 feet in the core pictures. Other data that demonstrate that these features are sealed are the straddle packer tests. Five of the features in question are within sections throughout which staddle packer tests were conducted. The first, at 1,918 feet, fell within the staddle packer test conducted between 1,910 and 1,930 feet with a hydraulic conductivity ranging from 3.5×10^{-5} cm/sec to 3.5×10^{-4} cm/sec. The second, between 2,101 and 2,107 feet, fell within the staddle packer test conducted between 2,100 and 2,120 feet with a hydraulic conductivity ranging from 4.4×10^{-4} cm/sec to 3.7×10^{-4} cm/sec. A staddle packer test on the Pembroke Pines Well between 1,982 and 2,022 feet contained three of the questioned features at 1,984 feet, 1,990 feet, and 1,996 feet and yielded a hydraulic conductivity ranging from 6.5×10^{-5} cm/sec to 8.1×10^{-5} cm/sec.

Comparison of the questioned splits, eyes, jagged spikes and discontinuities on the VDL display with the BHTV indicates that they are also bedding planes similar to the one seen in the core picture at 1,915.5 feet.

Demonstration of the criterion of 40% sonic porosity as indicative of confinement can be seen from the straddle packer test conducted in IW2 between 1,700 and 1,720 feet. The sonic porosity ranged between 40% and 50% over this interval and yielded a hydraulic conductivity ranging from 3.5×10^{-4} cm/sec to 1.6×10^{-4} cm/sec. The peaks seen over 40% are characterized as localized vuggs and voids as they cannot be correlated between the wells in this area.

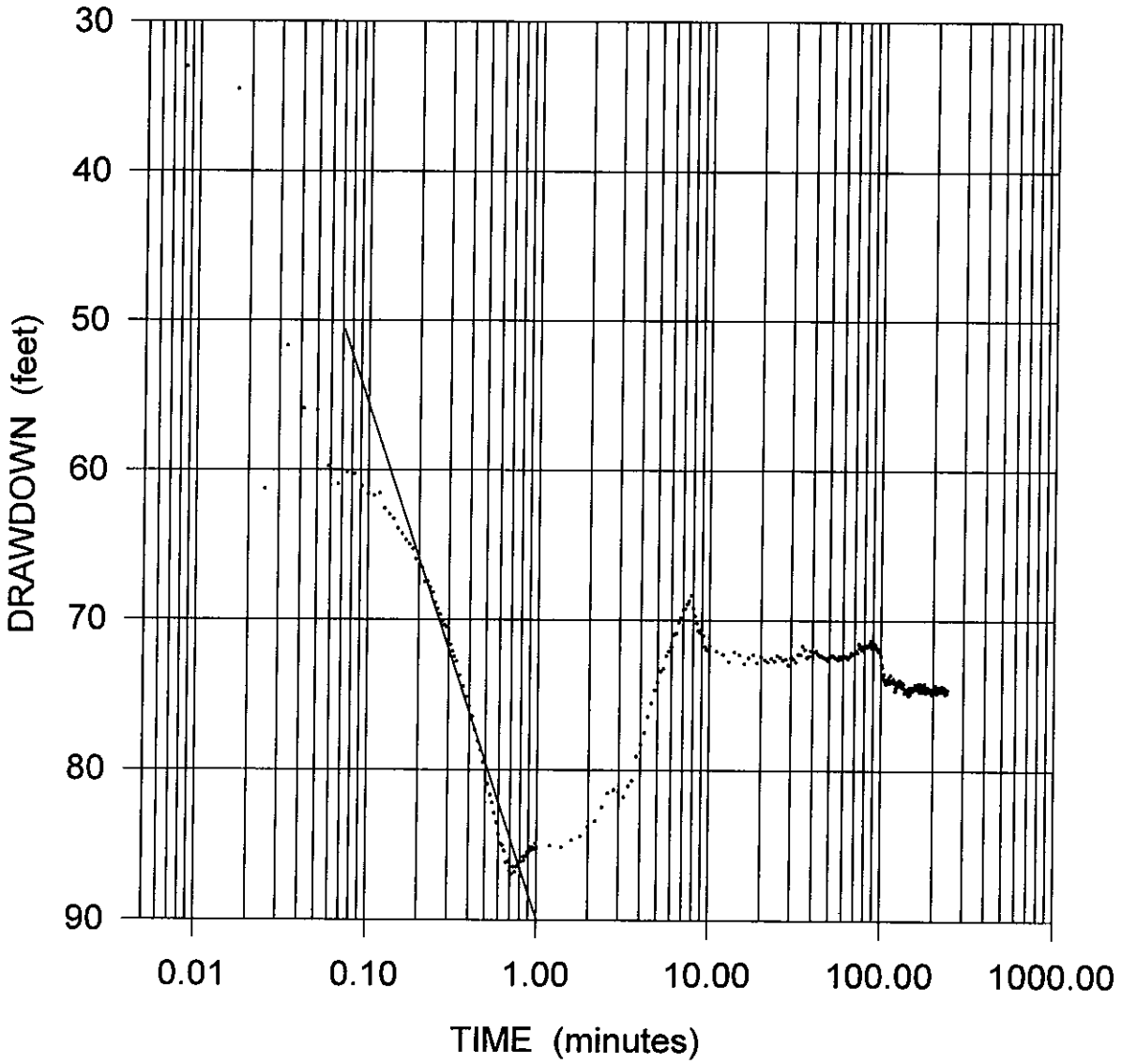
TABLE A
HYDRAULIC CONDUCTIVITY DERIVED FROM STRADDLE PACKER TESTS

	Depth Interval (feet)	Pumping Rate (gpm)	Maximum Drawdown (feet)	Drawdown Hydraulic Conductivity (cm/sec)	Recovery Hydraulic Conductivity (cm/sec)	Transmissivity (gpd/ft)
	1630-1650	20	30.99	3.4×10^{-4}	5.1×10^{-4}	211
IW-1	2030-2050	5	142.38	3.6×10^{-5}	3.5×10^{-5}	14.6
	2280-3300	7	27.18	No data	2.4×10^{-4}	115
	1550-1570	72	62.54	1.3×10^{-3}	9.9×10^{-4}	633
	1700-1720	35	94.10	3.5×10^{-4}	1.6×10^{-4}	149
IW-2	1910-1930	4.5	108.03	3.3×10^{-5}	3.7×10^{-4}	14.1
	2100-2120	52	117.70	4.0×10^{-4}	3.7×10^{-4}	173
	2325-2345	7	196.11	2.7×10^{-5}	3.3×10^{-5}	11.6

IW1 1630 - 1650 DRAWDOWN DATA

Time	Water Level	Time	Water Level	Time	Water Level	Time	Water Level	Time	Water Level
0	35.949	0.95	85.146	39	71.992	116	73.971	193	74.674
0.0083	33.008	0.9666	85.274	40	72.343	117	73.939	194	74.642
0.0166	34.511	0.9833	84.891	41	72.087	118	73.876	195	74.578
0.025	61.26	1	85.178	42	72.023	119	74.163	196	74.897
0.0333	51.675	1.2	85.05	43	72.247	120	74.067	197	74.802
0.0416	55.892	1.4	85.146	44	72.375	121	74.674	198	74.578
0.05	55.988	1.6	84.667	45	72.343	122	74.482	199	74.546
0.0583	59.758	1.8	84.412	46	72.439	123	74.418	200	74.546
0.0666	60.94	2	83.805	47	72.502	124	74.291	201	74.802
0.075	60.142	2.2	83.39	48	72.534	125	74.387	202	74.482
0.0833	60.269	2.4	82.464	49	72.662	126	74.067	203	74.706
0.0916	61.1	2.6	81.539	50	72.439	127	74.291	204	74.61
0.1	61.611	2.8	81.315	51	72.311	128	73.971	205	74.77
0.1083	61.707	3	81.443	52	72.375	129	74.227	206	74.61
0.1166	61.547	3.2	81.794	53	72.343	130	74.163	207	74.323
0.125	62.569	3.4	81.06	54	72.471	131	74.099	208	74.834
0.1333	62.953	3.6	80.709	55	72.502	132	74.387	209	74.514
0.1416	63.272	3.8	79.08	56	72.598	133	74.482	210	74.866
0.15	63.911	4	78.282	57	72.375	134	74.131	211	74.61
0.1583	64.262	4.2	77.516	58	72.566	135	74.227	212	74.482
0.1666	64.678	4.4	76.462	59	72.375	136	74.482	213	74.578
0.175	64.965	4.6	75.568	60	72.502	137	74.802	214	74.61
0.1833	65.285	4.8	74.674	61	72.343	138	74.578	215	74.642
0.1916	65.955	5	74.163	62	72.343	139	74.61	216	74.45
0.2	66.371	5.2	73.429	63	72.407	140	74.578	217	74.45
0.2083	66.498	5.4	73.237	64	72.534	141	74.674	218	74.706
0.2166	67.488	5.6	72.407	65	72.439	142	74.706	219	74.706
0.225	67.456	5.8	72.087	66	72.343	143	74.834	220	74.642
0.2333	67.84	6	71.768	67	72.151	144	74.738	221	74.77
0.2416	68.191	6.2	70.97	68	72.247	145	74.993	222	74.546
0.25	68.862	6.4	70.874	69	72.215	146	74.482	223	74.578
0.2583	69.277	6.6	70.171	70	72.183	147	74.929	224	74.77
0.2666	69.66	6.8	69.852	71	72.087	148	74.834	225	74.387
0.275	70.107	7	69.309	72	72.023	149	74.706	226	74.642
0.2833	70.363	7.2	69.245	73	72.151	150	74.546	227	74.61
0.2916	70.491	7.4	68.926	74	71.544	151	74.482	228	74.738
0.3	71.321	7.6	68.702	75	71.8	152	74.546	229	74.61
0.3083	71.672	7.8	68.351	76	71.672	153	74.674	230	74.578
0.3166	72.119	8	69.213	77	71.928	154	74.546	231	74.706
0.325	72.471	8.2	69.724	78	71.96	155	74.45	232	74.482
0.3333	72.79	8.4	70.203	79	71.736	156	74.514	233	74.482
0.35	73.716	8.6	70.714	80	71.768	157	74.482	234	74.642
0.3666	74.45	8.8	70.842	81	71.704	158	74.259	235	74.866
0.3833	75.153	9	70.618	82	71.64	159	74.323	236	74.897
0.4	75.76	9.2	71.033	83	71.736	160	74.546	237	74.802
0.4166	76.462	9.4	71.736	84	71.704	161	74.45	238	74.61
0.4333	77.388	9.6	71.96	85	71.672	162	74.514	239	74.674
0.45	78.122	9.8	72.023	86	71.544	163	74.387	240	74.834
0.4666	78.697	10	71.704	87	71.353	164	74.578	241	74.738
0.4833	79.495	11	72.087	88	71.8	165	74.227	242	74.61
0.5	80.07	12	72.279	89	71.576	166	74.323		
0.5166	80.932	13	72.758	90	71.512	167	74.642		
0.5333	81.666	14	72.119	91	71.512	168	74.738		
0.55	82.177	15	72.311	92	71.672	169	74.514		
0.5666	82.879	16	72.886	93	71.608	170	74.227		
0.5833	83.518	17	72.502	94	71.832	171	74.642		
0.6	84.284	18	72.279	95	71.832	172	74.418		
0.6166	84.923	19	72.822	96	71.992	173	74.738		
0.6333	85.018	20	72.439	97	72.055	174	74.418		
0.65	85.401	21	72.63	98	71.896	175	74.514		
0.6666	86.167	22	72.79	99	72.087	176	74.45		
0.6833	86.104	23	72.534	100	72.343	177	74.387		
0.7	86.71	24	72.726	101	72.918	178	74.578		
0.7166	86.934	25	72.343	102	73.109	179	74.195		
0.7333	86.455	26	72.471	103	73.748	180	74.706		
0.75	86.806	27	72.662	104	73.556	181	74.802		
0.7666	86.455	28	72.566	105	73.939	182	74.45		
0.7833	86.359	29	72.981	106	74.067	183	74.738		
0.8	86.136	30	72.471	107	74.227	184	74.546		
0.8166	86.104	31	72.566	108	74.099	185	74.514		
0.8333	85.784	32	72.79	109	74.099	186	74.706		
0.85	86.04	33	72.247	110	73.876	187	74.482		
0.8666	85.753	34	72.279	111	73.78	188	74.61		
0.8833	85.497	35	71.704	112	74.195	189	74.738		
0.9	85.497	36	71.928	113	74.035	190	74.738		
0.9166	85.146	37	72.471	114	73.62	191	74.674		
0.9333	85.338	38	72.375	115	74.067	192	74.642		

IW1 1630-1650 DRAWDOWN

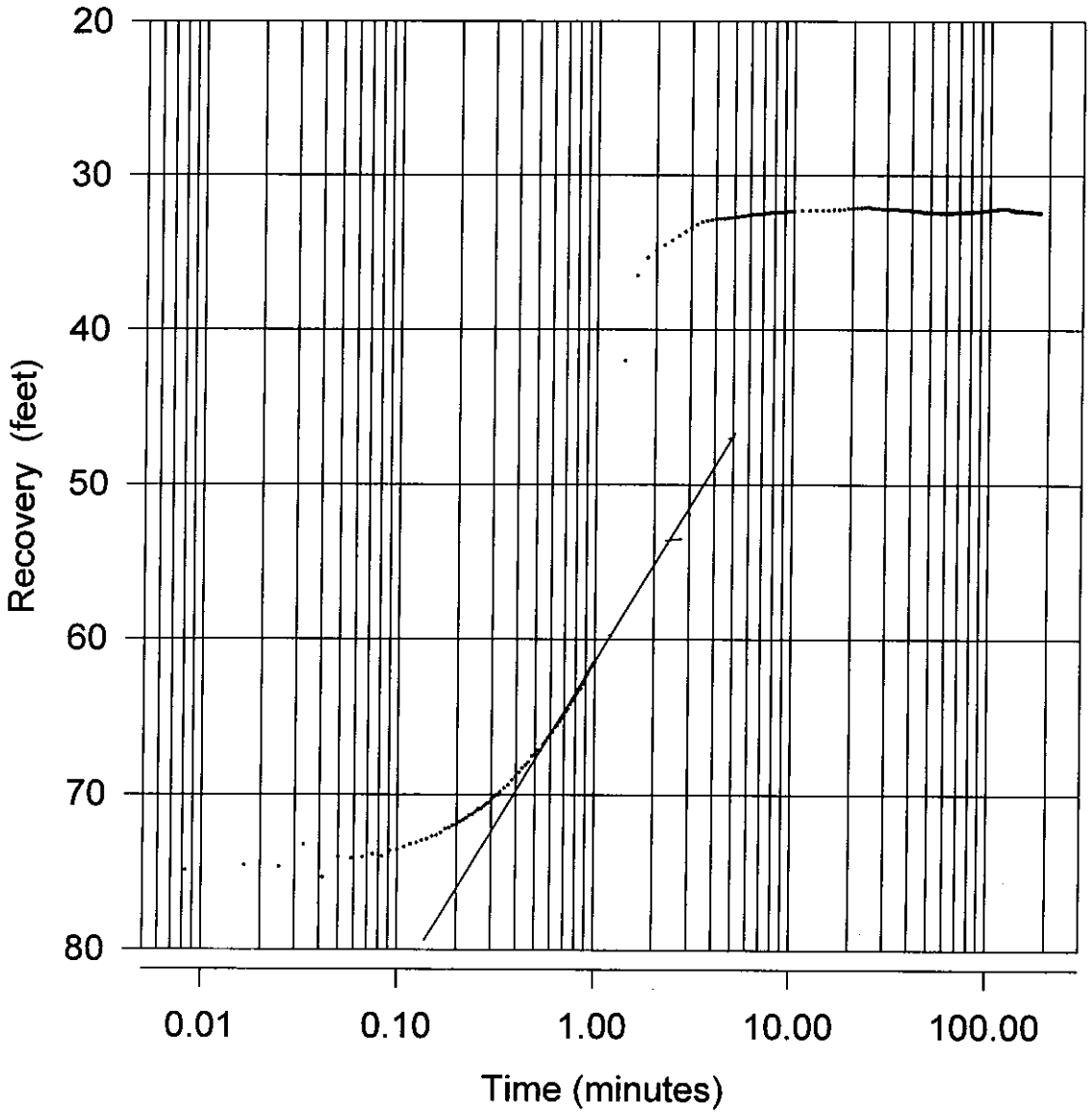


Cooper - Jocob Non-Equilibrium Drawndown Analysas

IW1 1630 - 1650 RECOVERY DATA

Time	Water Level	Time	Water Level	Time	Water Level	Time	Water Level
0	74.77	0.95	61.867	39	32.273	116	32.177
0.0083	74.866	0.9666	61.771	40	32.305	117	32.177
0.0166	74.546	0.9833	61.611	41	32.336	118	32.177
0.025	74.642	1	61.483	42	32.336	119	32.145
0.0333	73.205	1.2	59.758	43	32.336	120	32.177
0.0416	75.313	1.4	41.991	44	32.336	121	32.177
0.05	74.003	1.6	36.493	45	32.368	122	32.177
0.0583	74.099	1.8	35.342	46	32.432	123	32.177
0.0666	74.003	2	34.862	47	32.4	124	32.177
0.075	73.812	2.2	34.543	48	32.4	125	32.209
0.0833	73.971	2.4	34.223	49	32.4	126	32.209
0.0916	73.588	2.6	33.935	50	32.432	127	32.209
0.1	73.524	2.8	33.647	51	32.432	128	32.273
0.1083	73.365	3	33.424	52	32.432	129	32.241
0.1166	73.173	3.2	33.2	53	32.432	130	32.241
0.125	73.077	3.4	33.04	54	32.432	131	32.241
0.1333	72.95	3.6	32.944	55	32.432	132	32.241
0.1416	72.854	3.8	32.912	56	32.464	133	32.336
0.15	72.662	4	32.848	57	32.464	134	32.273
0.1583	72.598	4.2	32.816	58	32.432	135	32.273
0.1666	72.439	4.4	32.816	59	32.464	136	32.305
0.175	72.183	4.6	32.784	60	32.464	137	32.305
0.1833	72.119	4.8	32.752	61	32.464	138	32.305
0.1916	71.96	5	32.72	62	32.464	139	32.305
0.2	71.928	5.2	32.688	63	32.464	140	32.336
0.2083	71.736	5.4	32.656	64	32.496	141	32.336
0.2166	71.608	5.6	32.656	65	32.432	142	32.336
0.225	71.481	5.8	32.624	66	32.432	143	32.336
0.2333	71.289	6	32.592	67	32.432	144	32.336
0.2416	71.257	6.2	32.56	68	32.4	145	32.305
0.25	71.097	6.4	32.56	69	32.432	146	32.305
0.2583	70.938	6.6	32.528	70	32.4	147	32.336
0.2666	70.906	6.8	32.528	71	32.4	148	32.336
0.275	70.746	7	32.528	72	32.4	149	32.336
0.2833	70.586	7.2	32.464	73	32.432	150	32.336
0.2916	70.522	7.4	32.464	74	32.4	151	32.336
0.3	70.331	7.6	32.432	75	32.4	152	32.368
0.3083	70.139	7.8	32.432	76	32.4	153	32.336
0.3166	70.043	8	32.432	77	32.4	154	32.336
0.325	70.011	8.2	32.4	78	32.4	155	32.368
0.3333	69.82	8.4	32.432	79	32.4	156	32.368
0.35	69.564	8.6	32.4	80	32.4	157	32.368
0.3666	69.373	8.8	32.4	81	32.368	158	32.368
0.3833	69.053	9	32.4	82	32.4	159	32.368
0.4	68.83	9.2	32.368	83	32.368	160	32.368
0.4166	68.574	9.4	32.368	84	32.368	161	32.368
0.4333	68.287	9.6	32.368	85	32.368	162	32.368
0.45	68.095	9.8	32.368	86	32.368	163	32.4
0.4666	67.904	10	32.336	87	32.368	164	32.4
0.4833	67.52	11	32.305	88	32.336	165	32.4
0.5	67.393	12	32.305	89	32.336	166	32.4
0.5166	67.169	13	32.273	90	32.336	167	32.4
0.5333	67.169	14	32.273	91	32.336	168	32.4
0.55	66.754	15	32.273	92	32.336	169	32.4
0.5666	66.562	16	32.241	93	32.305	170	32.4
0.5833	66.307	17	32.241	94	32.305	171	32.4
0.6	66.115	18	32.209	95	32.305	172	32.4
0.6166	65.955	19	32.145	96	32.305	173	32.4
0.6333	65.668	20	32.145	97	32.273	174	32.4
0.65	65.572	21	32.113	98	32.273	175	32.432
0.6666	65.316	22	32.113	99	32.273	176	32.432
0.6833	65.093	23	32.081	100	32.305	177	32.432
0.7	64.933	24	32.049	101	32.241	178	32.432
0.7166	64.678	25	32.113	102	32.241	179	32.464
0.7333	64.486	26	32.145	103	32.241	180	32.432
0.75	64.198	27	32.145	104	32.241	181	32.432
0.7666	64.007	28	32.177	105	32.209		
0.7833	63.943	29	32.177	106	32.209		
0.8	63.624	30	32.209	107	32.209		
0.8166	63.464	31	32.209	108	32.209		
0.8333	63.272	32	32.209	109	32.209		
0.85	63.176	33	32.209	110	32.177		
0.8666	62.889	34	32.209	111	32.177		
0.8833	62.729	35	32.241	112	32.177		
0.9	62.442	36	32.241	113	32.177		
0.9166	62.282	37	32.241	114	32.145		
0.9333	62.09	38	32.273	115	32.177		

IW1 1630-1650 RECOVERY



Cooper - Jocob Non-Equilibrium Recovery Analysas

IW1 2030 - 2050 DRAWDOWN DATA

Time	Water Level
0	-8.382
0.0083	-7.264
0.0166	-0.426
0.025	0.756
0.0333	-0.777
0.0416	-0.426
0.05	0.564
0.0583	1.235
0.0666	-0.522
0.075	0.021
0.0833	0.564
0.0916	0.66
0.1	0.308
0.1083	0.787
0.1166	0.883
0.125	0.883
0.1333	0.787
0.1416	0.5
0.15	0.564
0.1583	0.692
0.1666	0.628
0.175	0.756
0.1833	0.787
0.1916	0.883
0.2	0.979
0.2083	0.787
0.2166	0.819
0.225	0.851
0.2333	0.883
0.2416	0.724
0.25	0.724
0.2583	0.66
0.2666	0.883
0.275	1.171
0.2833	0.851
0.2916	1.171
0.3	1.171
0.3083	1.011
0.3166	1.458
0.325	1.171
0.3333	1.554
0.35	1.458
0.3666	1.267
0.3833	1.299
0.4	1.65
0.4166	1.586
0.4333	1.938
0.45	1.906
0.4666	1.97
0.4833	2.033
0.5	1.874
0.5166	2.225
0.5333	2.257
0.55	2.033
0.5666	2.161
0.5833	2.225
0.6	2.033
0.6166	2.289
0.6333	2.449
0.65	2.513
0.6666	2.736
0.6833	2.8
0.7	2.832
0.7166	2.609
0.7333	3.024
0.75	3.311
0.7666	3.12
0.7833	3.12
0.8	3.407
0.8166	3.152
0.8333	3.216
0.85	3.407
0.8666	3.407
0.8833	3.759
0.9	3.759
0.9166	3.695
0.9333	3.886

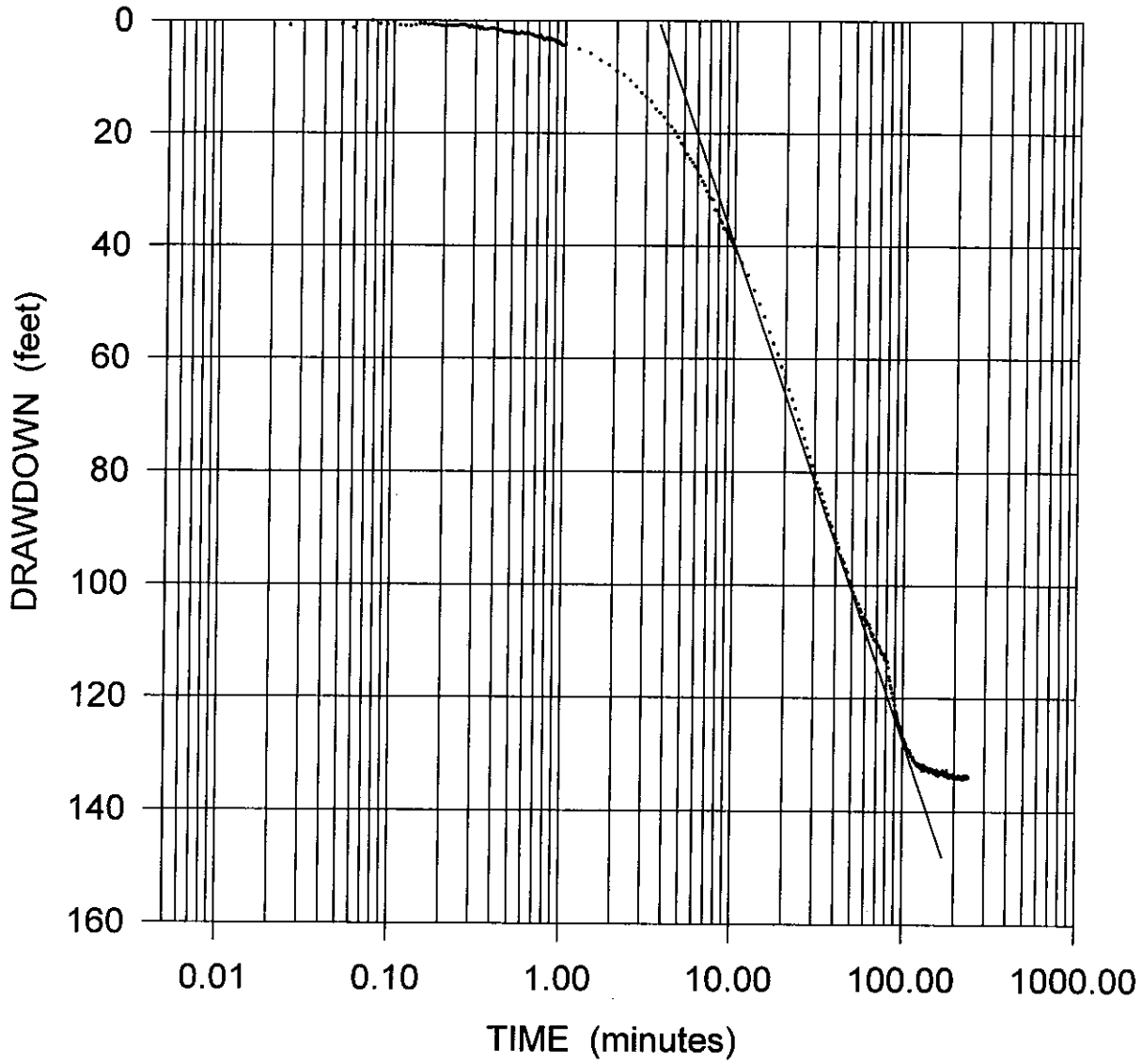
Time	Water Level
0.95	4.238
0.9666	4.27
0.9833	4.302
1	4.238
1.2	5.004
1.4	5.771
1.6	6.953
1.8	7.816
2	8.902
2.2	9.54
2.4	10.594
2.6	11.68
2.8	12.83
3	13.501
3.2	14.363
3.4	15.672
3.6	16.343
3.8	17.046
4	18.291
4.2	18.77
4.4	19.504
4.6	20.654
4.8	21.676
5	22.282
5.2	23.591
5.4	24.39
5.6	25.028
5.8	25.794
6	26.241
6.2	27.582
6.4	28.476
6.6	29.146
6.8	30.232
7	31.125
7.2	31.572
7.4	31.7
7.6	33.519
7.8	33.583
8	34.541
8.2	35.338
8.4	35.849
8.6	36.806
8.8	36.934
9	37.477
9.2	38.051
9.4	38.594
9.6	39.136
9.8	39.519
10	40.285
11	42.965
12	45.103
13	47.815
14	50.272
15	52.536
16	55.216
17	57.225
18	59.107
19	61.371
20	63.125
21	65.421
22	67.143
23	68.769
24	70.777
25	72.276
26	74.029
27	75.623
28	77.185
29	78.747
30	80.404
31	81.775
32	82.858
33	83.751
34	85.089
35	86.268
36	87.415
37	88.881
38	89.518

Time	Water Level
39	90.888
40	91.685
41	92.418
42	93.342
43	94.68
44	95.38
45	95.954
46	97.101
47	97.642
48	99.107
49	99.49
50	100.159
51	101.178
52	102.006
53	102.484
54	103.248
55	103.216
56	104.108
57	104.618
58	105.605
59	105.732
60	106.051
61	106.274
62	106.974
63	106.911
64	107.579
65	108.344
66	108.949
67	108.726
68	109.617
69	109.808
70	109.904
71	110.732
72	110.636
73	110.987
74	111.592
75	112.037
76	112.165
77	112.165
78	112.802
79	113.152
80	113.279
81	113.566
82	114.585
83	116.176
84	116.845
85	117.705
86	118.246
87	119.073
88	119.869
89	120.251
90	121.206
91	122.193
92	122.543
93	123.243
94	123.848
95	124.453
96	124.93
97	125.344
98	125.599
99	125.917
100	126.649
101	127.158
102	127.317
103	127.763
104	127.858
105	128.24
106	128.845
107	129.131
108	129.195
109	129.259
110	129.195
111	129.609
112	130.15
113	130.182
114	130.309
115	130.818

Time	Water Level
116	130.5
117	130.945
118	131.295
119	131.391
120	131.264
121	131.518
122	131.741
123	131.9
124	131.773
125	131.55
126	131.741
127	132.155
128	131.932
129	131.995
130	131.805
131	132.505
132	132.25
133	132.791
134	131.836
135	132.059
136	132.568
137	132.314
138	132.218
139	132.632
140	132.409
141	132.377
142	132.473
143	132.95
144	132.918
145	132.982
146	132.536
147	132.505
148	132.473
149	132.759
150	132.632
151	132.664
152	133.141
153	133.014
154	132.982
155	133.141
156	133.3
157	133.205
158	133.459
159	132.6
160	132.759
161	132.918
162	133.586
163	133.236
164	133.3
165	133.396
166	133.141
167	133.236
168	133.396
169	133.014
170	133.141
171	133.332
172	132.791
173	133.268
174	133.364
175	133.332
176	133.523
177	133.65
178	133.523
179	133.491
180	133.173
181	133.65
182	132.727
183	133.3
184	133.746
185	133.937
186	133.714
187	133.65
188	133.427
189	133.777
190	133.459
191	133.937
192	133.618

Time	Water Level
193	133.618
193	133.682
193	133.682
196	133.618
197	133.523
198	133.427
199	134
200	133.937
201	134.159
202	133.873
203	134
204	133.937
205	134.127
206	133.809
207	133.777
208	133.809
209	133.937
210	134.096
211	134
212	133.65
213	133.809
214	134.064
215	133.777
216	134.032
217	134.096
218	133.873
219	133.777
220	134.127
221	134.191
222	134.064
223	134.159
224	134.127
225	134.318
226	134.032
227	133.841
228	133.65
229	134.032
230	134.096
231	133.873
232	133.968
233	134.127
234	133.841
235	134.159
236	133.968
237	133.682
238	133.682
239	133.714
240	134
241	133.777
242	134

IW1 2030-2050 DRAWDOWN



Cooper - Jocob Non-Equilibrium Drawdown Analysas

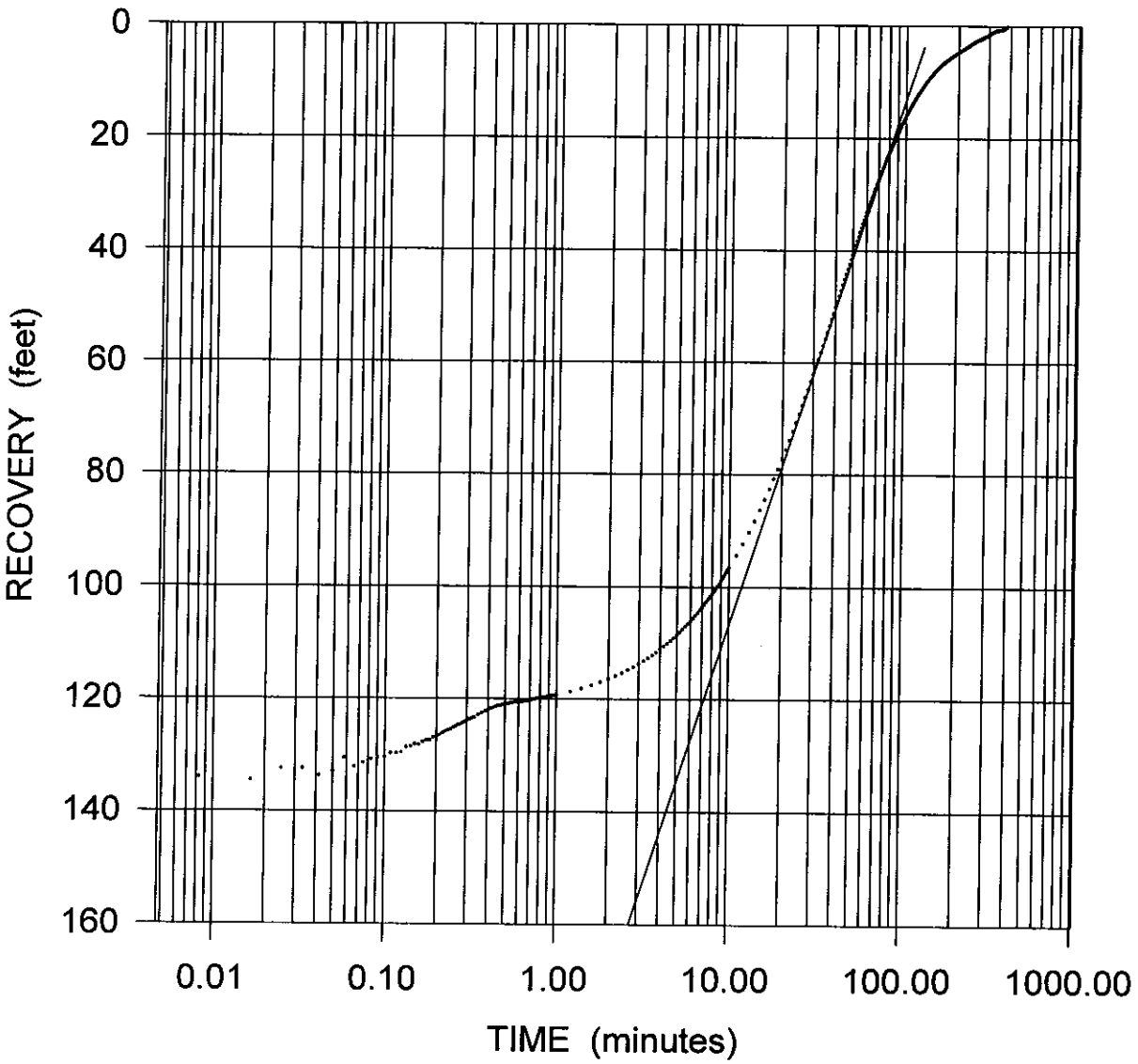
IW1 2030 - 2050 RECOVERY DATA

Time	Water Level	Time	Water Level	Time	Water Level	Time	Water Level	Time	Water Level
0	133.873	0.95	119.424	39	51.165	116	12.383	193	5.004
0.0083	134.032	0.9666	119.36	40	50.08	117	12.191	194	4.973
0.0166	134.573	0.9833	119.296	41	49.027	118	12.032	195	4.909
0.025	132.505	1	119.264	42	48.006	119	11.84	196	4.877
0.0333	132.473	1.2	118.66	43	47.017	120	11.648	197	4.813
0.0416	133.746	1.4	118.118	44	46.028	121	11.489	198	4.749
0.05	132.982	1.6	117.545	45	45.071	122	11.329	199	4.717
0.0583	130.627	1.8	117.004	46	44.146	123	11.169	200	4.685
0.0666	132.155	2	116.431	47	43.253	124	11.01	201	4.653
0.075	131.455	2.2	115.89	48	42.359	125	10.85	202	4.589
0.0833	130.786	2.4	115.349	49	41.498	126	10.69	203	4.557
0.0916	130.532	2.6	114.807	50	40.636	127	10.531	204	4.557
0.1	130.404	2.8	114.266	51	39.806	128	10.371	205	4.493
0.1083	129.736	3	113.725	52	38.977	129	10.243	206	4.429
0.1166	129.768	3.2	113.215	53	38.179	130	10.083	207	4.398
0.125	129.609	3.4	112.674	54	37.413	131	9.956	208	4.366
0.1333	128.686	3.6	112.165	55	36.647	132	9.828	209	4.366
0.1416	128.559	3.8	111.655	56	35.881	133	9.668	210	4.302
0.15	128.145	4	111.114	57	35.179	134	9.54	211	4.238
0.1583	128.177	4.2	110.605	58	34.477	135	9.413	212	4.206
0.1666	127.763	4.4	110.095	59	33.806	136	9.285	213	4.206
0.175	127.445	4.6	109.586	60	33.104	137	9.157	214	4.142
0.1833	127.413	4.8	109.044	61	32.466	138	9.029	215	4.11
0.1916	126.935	5	108.567	62	31.827	139	8.902	216	4.046
0.2	126.681	5.2	108.057	63	31.189	140	8.806	217	4.014
0.2083	126.522	5.4	107.548	64	30.583	141	8.678	218	3.982
0.2166	126.203	5.6	107.038	65	30.008	142	8.582	219	3.95
0.225	125.885	5.8	106.56	66	29.433	143	8.454	220	3.918
0.2333	125.662	6	106.051	67	28.891	144	8.359	221	3.854
0.2416	125.535	6.2	105.573	68	28.348	145	8.231	222	3.823
0.25	125.185	6.4	105.064	69	27.805	146	8.135	223	3.759
0.2583	124.962	6.6	104.586	70	27.295	147	8.039	224	3.759
0.2666	124.708	6.8	104.076	71	26.784	148	7.943	225	3.695
0.275	124.58	7	103.63	72	26.273	149	7.847	226	3.695
0.2833	124.326	7.2	103.121	73	25.794	150	7.752	227	3.663
0.2916	124.135	7.4	102.643	74	25.315	151	7.656	228	3.599
0.3	124.007	7.6	102.165	75	24.868	152	7.56	229	3.567
0.3083	123.689	7.8	101.688	76	24.39	153	7.496	230	3.535
0.3166	123.625	8	101.242	77	23.943	154	7.4	231	3.503
0.325	123.403	8.2	100.764	78	23.527	155	7.304	232	3.471
0.3333	123.371	8.4	100.318	79	23.081	156	7.241	233	3.407
0.35	122.893	8.6	99.84	80	22.665	157	7.145	234	3.343
0.3666	122.575	8.8	99.394	81	22.282	158	7.049	235	3.343
0.3833	122.289	9	98.916	82	21.899	159	6.985	236	3.279
0.4	122.034	9.2	98.47	83	21.484	160	6.889	237	3.247
0.4166	121.747	9.4	97.929	84	21.101	161	6.825	238	3.216
0.4333	121.525	9.6	97.387	85	20.75	162	6.761	239	3.184
0.45	121.334	9.8	96.941	86	20.367	163	6.698	240	3.152
0.4666	121.27	10	96.495	87	20.015	164	6.602	241	3.088
0.4833	121.111	11	94.361	88	19.664	165	6.538	242	3.056
0.5	120.952	12	92.322	89	19.313	166	6.474	243	3.024
0.5166	120.888	13	90.283	90	18.994	167	6.41	244	2.992
0.5333	120.824	14	88.307	91	18.642	168	6.346	245	2.96
0.55	120.792	15	86.332	92	18.323	169	6.282	246	2.896
0.5666	120.665	16	84.42	93	18.004	170	6.218	247	2.864
0.5833	120.57	17	82.571	94	17.716	171	6.154	248	2.832
0.6	120.697	18	80.755	95	17.397	172	6.091	249	2.8
0.6166	120.57	19	79.002	96	17.109	173	6.027	250	2.768
0.6333	120.474	20	77.249	97	16.822	174	5.995	251	2.736
0.65	120.442	21	75.559	98	16.535	175	5.931	252	2.704
0.6666	120.442	22	73.902	99	16.247	176	5.867	253	2.704
0.6833	120.315	23	72.276	100	15.992	177	5.803	254	2.672
0.7	120.251	24	70.714	101	15.736	178	5.739	255	2.64
0.7166	120.188	25	69.152	102	15.481	179	5.675	256	2.609
0.7333	120.124	26	67.621	103	15.225	180	5.643	257	2.577
0.75	120.028	27	66.154	104	14.97	181	5.58	258	2.545
0.7666	119.965	28	64.72	105	14.714	182	5.516	259	2.513
0.7833	119.933	29	63.285	106	14.491	183	5.484	260	2.513
0.8	119.837	30	62.009	107	14.267	184	5.42	261	2.481
0.8166	119.806	31	60.702	108	14.044	185	5.388	262	2.449
0.8333	119.774	32	59.394	109	13.788	186	5.324	263	2.417
0.85	119.678	33	58.15	110	13.597	187	5.292	264	2.417
0.8666	119.678	34	56.906	111	13.373	188	5.228	265	2.385
0.8833	119.615	35	55.726	112	13.181	189	5.196	266	2.353
0.9	119.551	36	54.546	113	12.958	190	5.132	267	2.321
0.9166	119.519	37	53.398	114	12.766	191	5.1	268	2.321
0.9333	119.455	38	52.281	115	12.575	192	5.036	269	2.289

IW1 2030 - 2050 RECOVERY DATA

Time	Water Level	Time	Water Level	Time	Water Level	Time	Water Level	Time	Water Level
270	2.257	347	0.724	424	-2.502	501	-3.301	578	-3.621
271	2.257	348	0.724	424	-2.534	502	-3.301	579	-3.653
272	2.257	349	0.724	426	-2.566	503	-3.301	580	-3.653
273	2.193	350	0.692	427	-2.598	504	-3.333	581	-3.621
274	2.193	351	0.692	428	-2.598	505	-3.333	582	-3.653
275	2.161	352	0.692	429	-2.63	506	-3.333	583	-3.653
276	2.129	353	0.692	430	-2.662	507	-3.333	584	-3.653
277	2.097	354	0.692	431	-2.662	508	-3.333	585	-3.589
278	2.065	355	0.66	432	-2.662	509	-3.365	586	-3.589
279	2.033	356	0.66	433	-2.694	510	-3.365		
280	2.033	357	0.66	434	-2.694	511	-3.365		
281	2.002	358	0.628	435	-2.726	512	-3.365		
282	1.97	359	0.628	436	-2.726	513	-3.397		
283	1.938	360	0.628	437	-2.726	514	-3.397		
284	1.906	361	0.564	438	-2.758	515	-3.397		
285	1.906	362	0.564	439	-2.758	516	-3.397		
286	1.874	363	0.532	440	-2.758	517	-3.397		
287	1.842	364	0.532	441	-2.79	518	-3.397		
288	1.81	365	0.5	442	-2.79	519	-3.429		
289	1.81	366	0.468	443	-2.822	520	-3.429		
290	1.778	367	0.468	444	-2.822	521	-3.429		
291	1.746	368	0.436	445	-2.854	522	-3.429		
292	1.746	369	0.404	446	-2.854	523	-3.429		
293	1.714	370	0.372	447	-2.854	524	-3.429		
294	1.682	371	0.34	448	-2.886	525	-3.461		
295	1.65	372	0.34	449	-2.886	526	-3.429		
296	1.618	373	0.308	450	-2.918	527	-3.461		
297	1.586	374	0.276	451	-2.918	528	-3.461		
298	1.586	375	0.276	452	-2.95	529	-3.461		
299	1.554	376	0.244	453	-2.95	530	-3.461		
300	1.522	377	0.212	454	-2.95	531	-3.461		
301	1.49	378	0.212	455	-2.982	532	-3.461		
302	1.458	379	0.18	456	-2.982	533	-3.493		
303	1.426	380	0.117	457	-2.982	534	-3.493		
304	1.394	381	-0.074	458	-3.014	535	-3.493		
305	1.363	382	-0.298	459	-3.014	536	-3.493		
306	1.331	383	-0.458	460	-3.014	537	-3.493		
307	1.331	384	-0.649	461	-3.046	538	-3.493		
308	1.299	385	-0.777	462	-3.046	539	-3.493		
309	1.267	386	-0.905	463	-3.046	540	-3.493		
310	1.267	387	-1.033	464	-3.078	541	-3.493		
311	1.235	388	-1.129	465	-3.078	542	-3.525		
312	1.203	389	-1.224	466	-3.078	543	-3.525		
313	1.203	390	-1.288	467	-3.078	544	-3.525		
314	1.171	391	-1.352	468	-3.11	545	-3.525		
315	1.139	392	-1.416	469	-3.11	546	-3.525		
316	1.107	393	-1.48	470	-3.11	547	-3.525		
317	1.075	394	-1.544	471	-3.11	548	-3.525		
318	1.043	395	-1.576	472	-3.142	549	-3.525		
319	1.011	396	-1.64	473	-3.11	550	-3.557		
320	1.011	397	-1.704	474	-3.142	551	-3.557		
321	0.979	398	-1.736	475	-3.142	552	-3.557		
322	0.979	399	-1.8	476	-3.142	553	-3.557		
323	0.947	400	-1.832	477	-3.142	554	-3.557		
324	0.915	401	-1.863	478	-3.142	555	-3.557		
325	0.883	402	-1.895	479	-3.174	556	-3.557		
326	0.883	403	-1.959	480	-3.174	557	-3.557		
327	0.851	404	-1.991	481	-3.174	558	-3.589		
328	0.851	405	-2.023	482	-3.174	559	-3.589		
329	0.851	406	-2.055	483	-3.174	560	-3.589		
330	0.851	407	-2.087	484	-3.174	561	-3.589		
331	0.819	408	-2.087	485	-3.205	562	-3.589		
332	0.819	409	-2.151	486	-3.205	563	-3.589		
333	0.819	410	-2.151	487	-3.205	564	-3.589		
334	0.819	411	-2.183	488	-3.205	565	-3.621		
335	0.819	412	-2.215	489	-3.205	566	-3.589		
336	0.787	413	-2.215	490	-3.237	567	-3.589		
337	0.787	414	-2.247	491	-3.237	568	-3.621		
338	0.787	415	-2.279	492	-3.269	569	-3.589		
339	0.787	416	-2.311	493	-3.237	570	-3.621		
340	0.787	417	-2.311	494	-3.269	571	-3.621		
341	0.756	418	-2.343	495	-3.269	572	-3.621		
342	0.756	419	-2.375	496	-3.269	573	-3.653		
343	0.756	420	-2.407	497	-3.269	574	-3.621		
344	0.756	421	-2.439	498	-3.269	575	-3.621		
345	0.756	422	-2.471	499	-3.301	576	-3.621		
346	0.724	423	-2.502	500	-3.301	577	-3.621		

IW1 2030-2050 RECOVERY

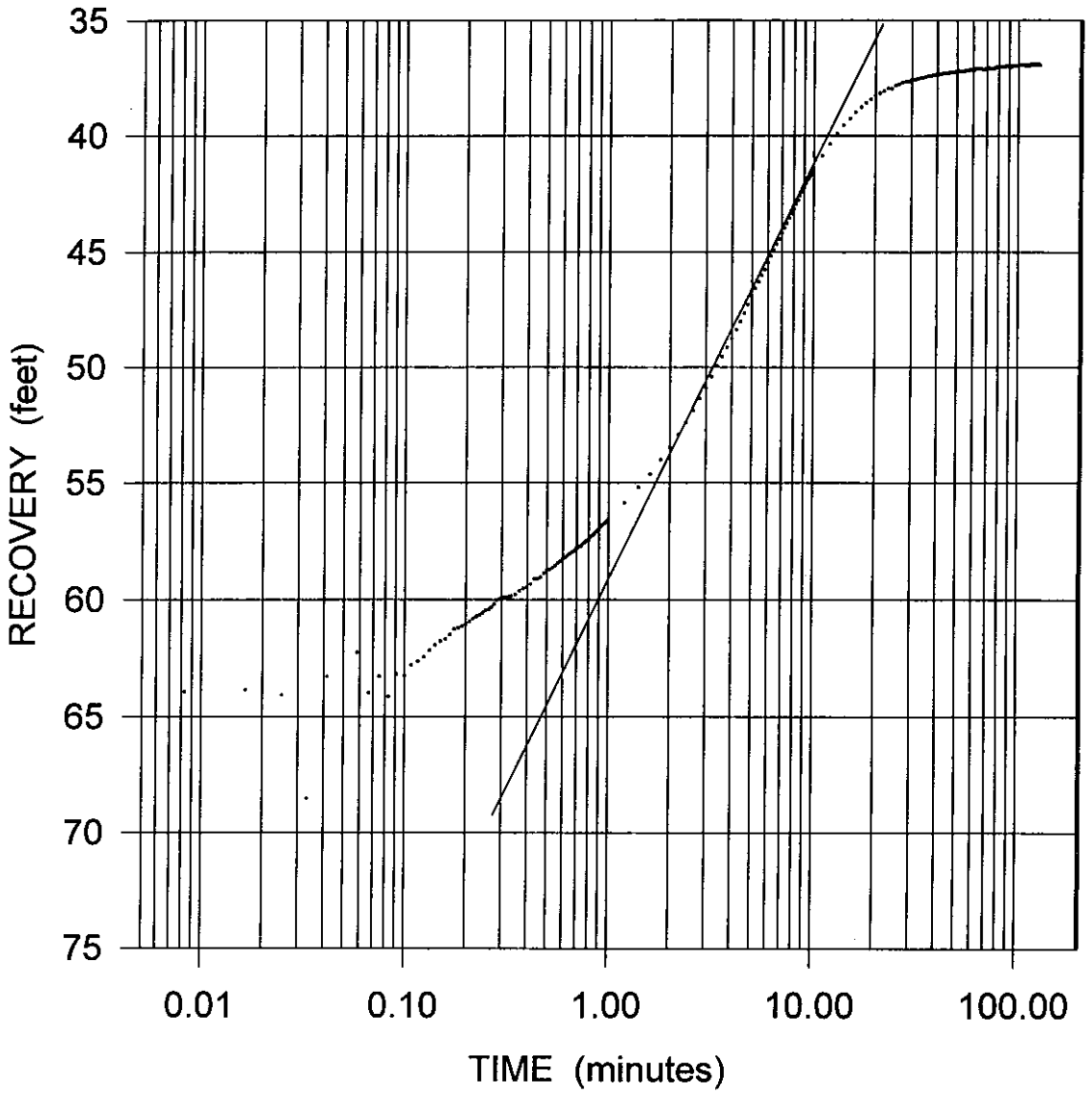


Cooper - Jocob Non-Equilibrium Recovery Analysas

IW 1 2280 - 2300 RECOVERY DATA

Time	Water Level						
0	64.132	0.95	56.757	39	37.369	116	36.922
0.0083	63.94	0.9666	56.725	40	37.369	117	36.922
0.0166	63.845	0.9833	56.629	41	37.337	118	36.922
0.025	64.068	1	56.565	42	37.337	119	36.922
0.0333	68.505	1.2	55.863	43	37.305	120	36.922
0.0416	63.27	1.4	55.192	44	37.305	121	36.922
0.05	65.951	1.6	54.617	45	37.305	122	36.922
0.0583	62.248	1.8	54.011	46	37.273	123	36.922
0.0666	63.972	2	53.468	47	37.273	124	36.89
0.075	63.27	2.2	52.925	48	37.273	125	36.954
0.0833	64.132	2.4	52.382	49	37.241	126	36.954
0.0916	63.174	2.6	51.871	50	37.241	127	36.954
0.1	63.238	2.8	51.36	51	37.21		
0.1083	62.791	3	50.881	52	37.21		
0.1166	62.631	3.2	50.402	53	37.21		
0.125	62.44	3.4	49.955	54	37.241		
0.1333	62.153	3.6	49.54	55	37.178		
0.1416	61.929	3.8	49.124	56	37.178		
0.15	61.769	4	48.741	57	37.178		
0.1583	61.674	4.2	48.358	58	37.146		
0.1666	61.482	4.4	48.007	59	37.146		
0.175	61.259	4.6	47.655	60	37.178		
0.1833	61.195	4.8	47.272	61	37.146		
0.1916	61.131	5	46.921	62	37.114		
0.2	61.035	5.2	46.569	63	37.114		
0.2083	60.939	5.4	46.282	64	37.114		
0.2166	60.812	5.6	45.994	65	37.114		
0.225	60.716	5.8	45.739	66	37.114		
0.2333	60.652	6	45.451	67	37.146		
0.2416	60.556	6.2	45.164	68	37.146		
0.25	60.46	6.4	44.908	69	37.114		
0.2583	60.429	6.6	44.653	70	37.082		
0.2666	60.333	6.8	44.429	71	37.082		
0.275	60.205	7	44.174	72	37.082		
0.2833	60.045	7.2	43.95	73	37.114		
0.2916	59.982	7.4	43.758	74	37.114		
0.3	59.918	7.6	43.535	75	37.114		
0.3083	59.918	7.8	43.343	76	37.114		
0.3166	59.918	8	43.152	77	37.05		
0.325	59.886	8.2	42.928	78	37.05		
0.3333	59.854	8.4	42.768	79	37.05		
0.35	59.79	8.6	42.545	80	37.05		
0.3666	59.63	8.8	42.385	81	37.05		
0.3833	59.535	9	42.193	82	37.018		
0.4	59.471	9.2	42.034	83	37.018		
0.4166	59.343	9.4	41.874	84	37.018		
0.4333	59.12	9.6	41.746	85	37.018		
0.45	59.12	9.8	41.618	86	37.018		
0.4666	59.056	10	41.49	87	36.986		
0.4833	58.864	11	40.852	88	36.986		
0.5	58.736	12	40.34	89	36.986		
0.5166	58.704	13	39.893	90	36.986		
0.5333	58.641	14	39.542	91	37.05		
0.55	58.545	15	39.254	92	37.05		
0.5666	58.449	16	38.999	93	36.986		
0.5833	58.353	17	38.775	94	36.986		
0.6	58.257	18	38.583	95	36.986		
0.6166	58.194	19	38.424	96	36.986		
0.6333	58.098	20	38.296	97	36.986		
0.65	58.034	21	38.168	98	36.986		
0.6666	57.97	22	38.072	99	36.986		
0.6833	57.906	23	37.976	100	36.954		
0.7	57.81	24	37.976	101	36.954		
0.7166	57.747	25	37.848	102	36.954		
0.7333	57.715	26	37.785	103	36.954		
0.75	57.619	27	37.721	104	36.954		
0.7666	57.555	28	37.689	105	36.954		
0.7833	57.491	29	37.657	106	36.954		
0.8	57.427	30	37.593	107	36.954		
0.8166	57.331	31	37.593	108	36.986		
0.8333	57.268	32	37.561	109	36.986		
0.85	57.204	33	37.529	110	36.986		
0.8666	57.108	34	37.497	111	36.954		
0.8833	57.044	35	37.465	112	36.986		
0.9	56.98	36	37.433	113	36.954		
0.9166	56.884	37	37.433	114	36.922		
0.9333	56.821	38	37.401	115	36.922		

IW1 2280-2300 RECOVERY

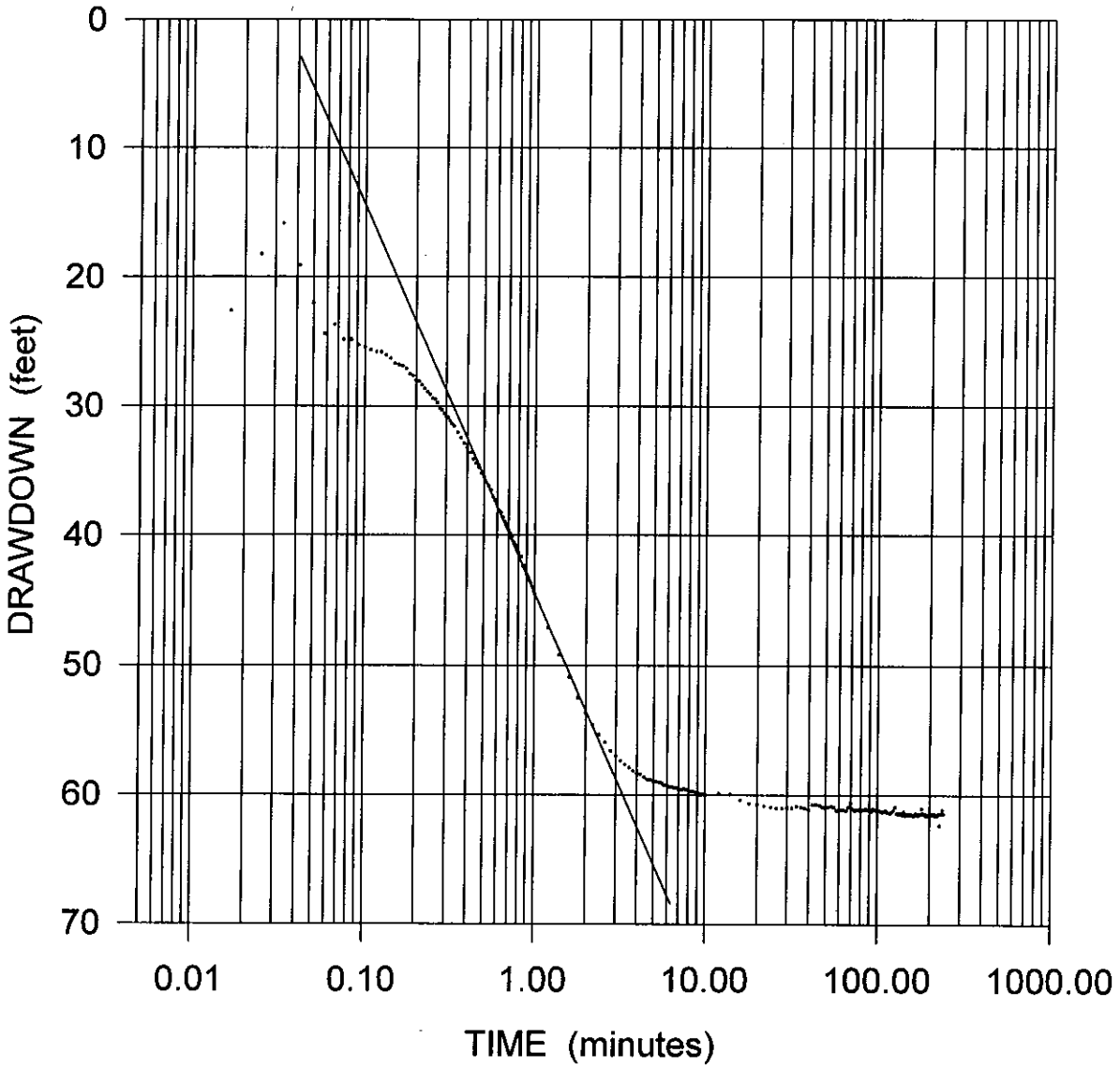


Cooper - Jocob Non-Equilibrium Recovery Analysas

IW2 1550 - 1570 DRAWDOWN DATA

Time	WaterLevel	Time	WaterLevel	Time	WaterLevel
0	-0.217	0.95	43.679	68	60.897
0.0083	-0.217	0.9666	43.958	70	60.586
0.0166	22.627	0.9833	44.299	72	61.021
0.025	18.246	1	44.517	74	61.207
0.0333	15.884	1.2	47.092	76	61.083
0.0416	19.116	1.4	49.202	78	61.083
0.05	22.005	1.6	50.878	80	61.207
0.0583	24.366	1.8	52.491	82	61.083
0.0666	23.683	2	53.639	84	61.145
0.075	24.832	2.2	54.6	86	61.021
0.0833	24.832	2.4	55.314	88	61.145
0.0916	25.236	2.6	55.903	90	61.083
0.1	25.422	2.8	56.586	92	61.238
0.1083	25.64	3	56.958	94	61.052
0.1166	25.795	3.2	57.33	96	61.083
0.125	25.795	3.4	57.64	98	61.145
0.1333	26.044	3.6	57.888	100	61.052
0.1416	26.292	3.8	58.136	103	61.207
0.15	26.696	4	58.353	106	61.269
0.1583	26.789	4.2	58.385	109	61.269
0.1666	26.882	4.4	58.602	112	61.176
0.175	27.1	4.6	58.788	115	61.331
0.1833	27.503	4.8	58.819	118	61.362
0.1916	27.628	5	58.943	121	61.3
0.2	28	5.2	58.974	124	61.145
0.2083	28.093	5.4	59.005	127	60.897
0.2166	28.373	5.6	59.067	130	61.393
0.225	28.652	5.8	59.222	133	61.455
0.2333	28.901	6	59.222	136	61.362
0.2416	29.087	6.2	59.377	139	61.486
0.25	29.398	6.4	59.346	142	61.269
0.2583	29.46	6.6	59.439	145	61.548
0.2666	29.739	6.8	59.408	148	61.424
0.275	30.143	7	59.563	151	61.517
0.2833	30.298	7.2	59.594	154	61.455
0.2916	30.578	7.4	59.563	157	61.455
0.3	30.795	7.6	59.501	160	61.548
0.3083	30.888	7.8	59.594	163	61.579
0.3166	31.137	8	59.625	166	61.393
0.325	31.385	8.2	59.718	169	61.455
0.3333	31.541	8.4	59.687	172	61.548
0.35	32.037	8.6	59.718	175	61.455
0.3666	32.441	8.8	59.78	178	61.455
0.3833	32.876	9	59.811	181	61.021
0.4	33.217	9.2	59.873	184	61.362
0.4166	33.621	9.4	59.966	187	61.455
0.4333	34.118	9.6	59.935	190	61.424
0.45	34.428	9.8	59.935	193	61.579
0.4666	34.739	10	59.966	196	61.548
0.4833	35.235	12	59.873	199	61.61
0.5	35.484	14	59.935	202	61.393
0.5166	35.918	16	60.369	205	61.393
0.5333	36.167	18	60.648	208	61.548
0.55	36.539	20	60.71	211	61.455
0.5666	37.067	22	60.835	214	61.424
0.5833	37.284	24	60.928	217	61.579
0.6	37.595	26	61.021	220	61.61
0.6166	38.123	28	61.021	223	61.517
0.6333	38.278	30	60.959	226	61.393
0.65	38.619	32	60.99	229	62.323
0.6666	38.961	34	60.866	232	61.455
0.6833	39.178	36	60.928	235	61.393
0.7	39.613	38	60.99	238	61.114
0.7166	39.861	40	61.114	241	61.455
0.7333	40.14	42	60.741		
0.75	40.513	44	60.71		
0.7666	40.761	46	60.772		
0.7833	40.916	48	60.897		
0.8	41.351	50	60.99		
0.8166	41.661	52	60.897		
0.8333	41.661	54	60.866		
0.85	42.375	56	60.928		
0.8666	42.344	58	61.176		
0.8833	42.623	60	61.114		
0.9	43.027	62	61.114		
0.9166	43.213	64	61.145		
0.9333	43.461	66	61.176		

IW2 1550-1570 DRAWDOWN

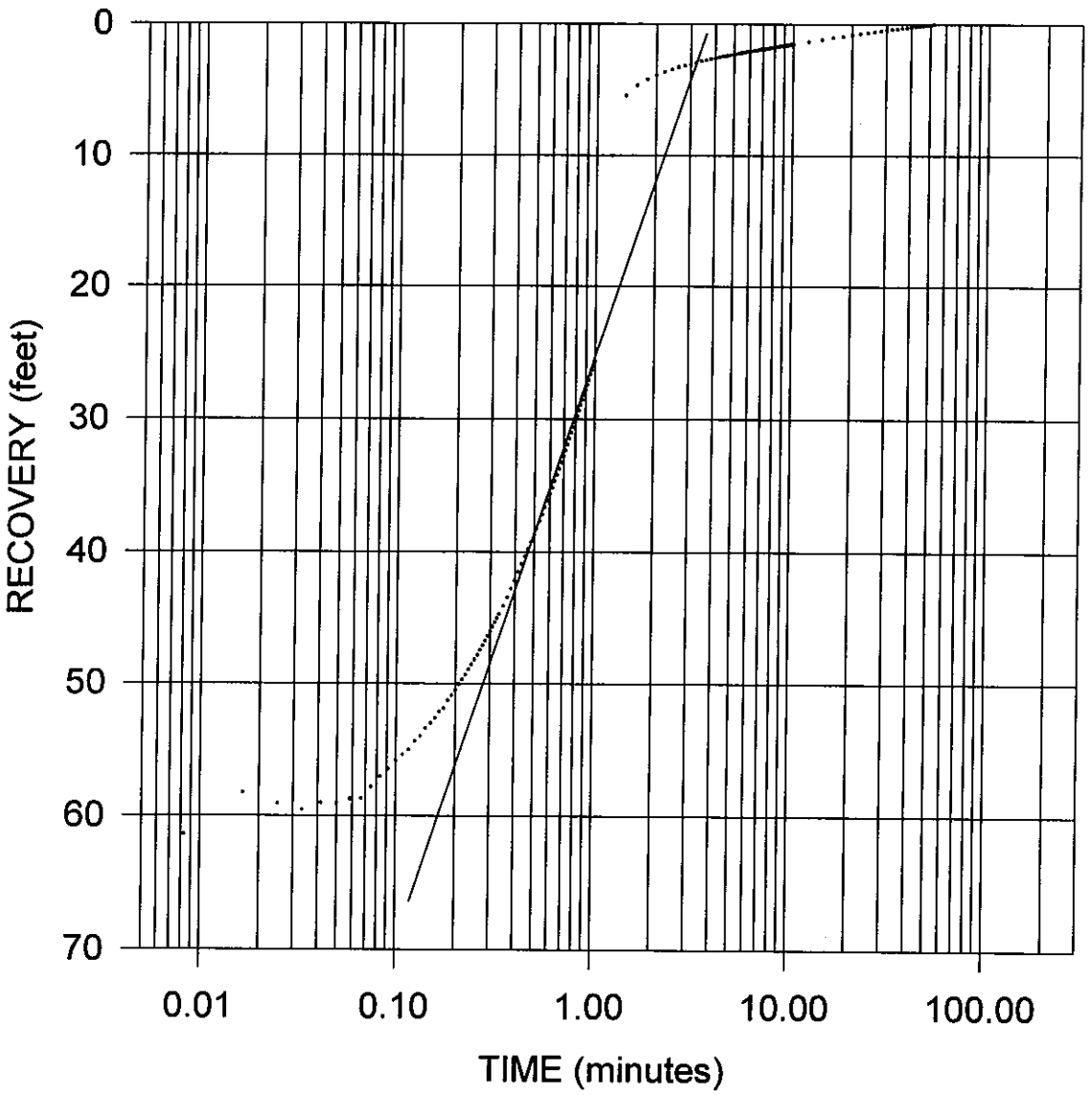


Cooper - Jocob Non-Equilibrium Drawdown Analysas

IW2 1550 - 1570 RECOVERY DATA

Time	Water Level	Time	Water Level	Time	Water Level
0	61.486	0.95	26.665	68	-0.186
0.0083	61.393	0.9666	26.323	70	-0.217
0.0166	58.26	0.9833	26.012	72	-0.217
0.025	59.098	1	25.671	74	-0.248
0.0333	59.532	1.2	10.011	76	-0.248
0.0416	59.036	1.4	5.441	78	-0.279
0.05	59.036	1.6	4.664	80	-0.279
0.0583	58.726	1.8	4.197	82	-0.279
0.0666	58.695	2	3.886	84	-0.31
0.075	57.826	2.2	3.638	86	-0.342
0.0833	57.051	2.4	3.451	88	-0.342
0.0916	56.462	2.6	3.264	90	-0.342
0.1	55.841	2.8	3.14	92	-0.373
0.1083	55.407	3	3.047	94	-0.373
0.1166	55.035	3.2	2.922	96	-0.404
0.125	54.383	3.4	2.798	98	-0.404
0.1333	54.011	3.6	2.736	100	-0.404
0.1416	53.422	3.8	2.643	103	-0.435
0.15	53.018	4	2.58	106	-0.435
0.1583	52.615	4.2	2.518	109	-0.466
0.1666	52.15	4.4	2.425	112	-0.466
0.175	51.902	4.6	2.394	115	-0.497
0.1833	51.281	4.8	2.332	118	-0.497
0.1916	50.909	5	2.269	121	-0.528
0.2	50.505	5.2	2.238	124	-0.528
0.2083	50.071	5.4	2.176	127	-0.528
0.2166	49.699	5.6	2.145	130	-0.559
0.225	49.326	5.8	2.083	133	-0.559
0.2333	48.923	6	2.083	136	-0.59
0.2416	48.551	6.2	2.021	139	-0.59
0.25	48.178	6.4	1.99	142	-0.59
0.2583	47.837	6.6	1.959	145	-0.59
0.2666	47.434	6.8	1.896	148	-0.59
0.275	47.092	7	1.865	151	-0.621
0.2833	46.72	7.2	1.865	154	-0.653
0.2916	46.379	7.4	1.834	157	-0.653
0.3	46.006	7.6	1.803	160	-0.653
0.3083	45.665	7.8	1.772	163	-0.653
0.3166	45.324	8	1.741	166	-0.653
0.325	45.013	8.2	1.71	169	-0.684
0.3333	44.703	8.4	1.679	172	-0.684
0.35	44.082	8.6	1.648	175	-0.715
0.3666	43.43	8.8	1.648	178	-0.715
0.3833	42.779	9	1.585	181	-0.715
0.4	42.158	9.2	1.585		
0.4166	41.506	9.4	1.585		
0.4333	40.885	9.6	1.523		
0.45	40.327	9.8	1.523		
0.4666	39.768	10	1.523		
0.4833	39.24	12	1.306		
0.5	38.712	14	1.15		
0.5166	38.216	16	0.995		
0.5333	37.657	18	0.901		
0.55	37.16	20	0.808		
0.5666	36.633	22	0.715		
0.5833	36.105	24	0.621		
0.6	35.639	26	0.559		
0.6166	35.142	28	0.497		
0.6333	34.646	30	0.435		
0.65	34.18	32	0.373		
0.6666	33.714	34	0.342		
0.6833	33.248	36	0.279		
0.7	32.783	38	0.248		
0.7166	32.317	40	0.186		
0.7333	31.882	42	0.155		
0.75	31.447	44	0.124		
0.7666	31.013	46	0.093		
0.7833	30.609	48	0.062		
0.8	30.174	50	0.031		
0.8166	29.739	52	0		
0.8333	29.336	54	-0.031		
0.85	28.932	56	-0.062		
0.8666	28.559	58	-0.062		
0.8833	28.187	60	-0.093		
0.9	27.814	62	-0.124		
0.9166	27.441	64	-0.155		
0.9333	27.068	66	-0.155		

IW2 1550-1570 RECOVERY

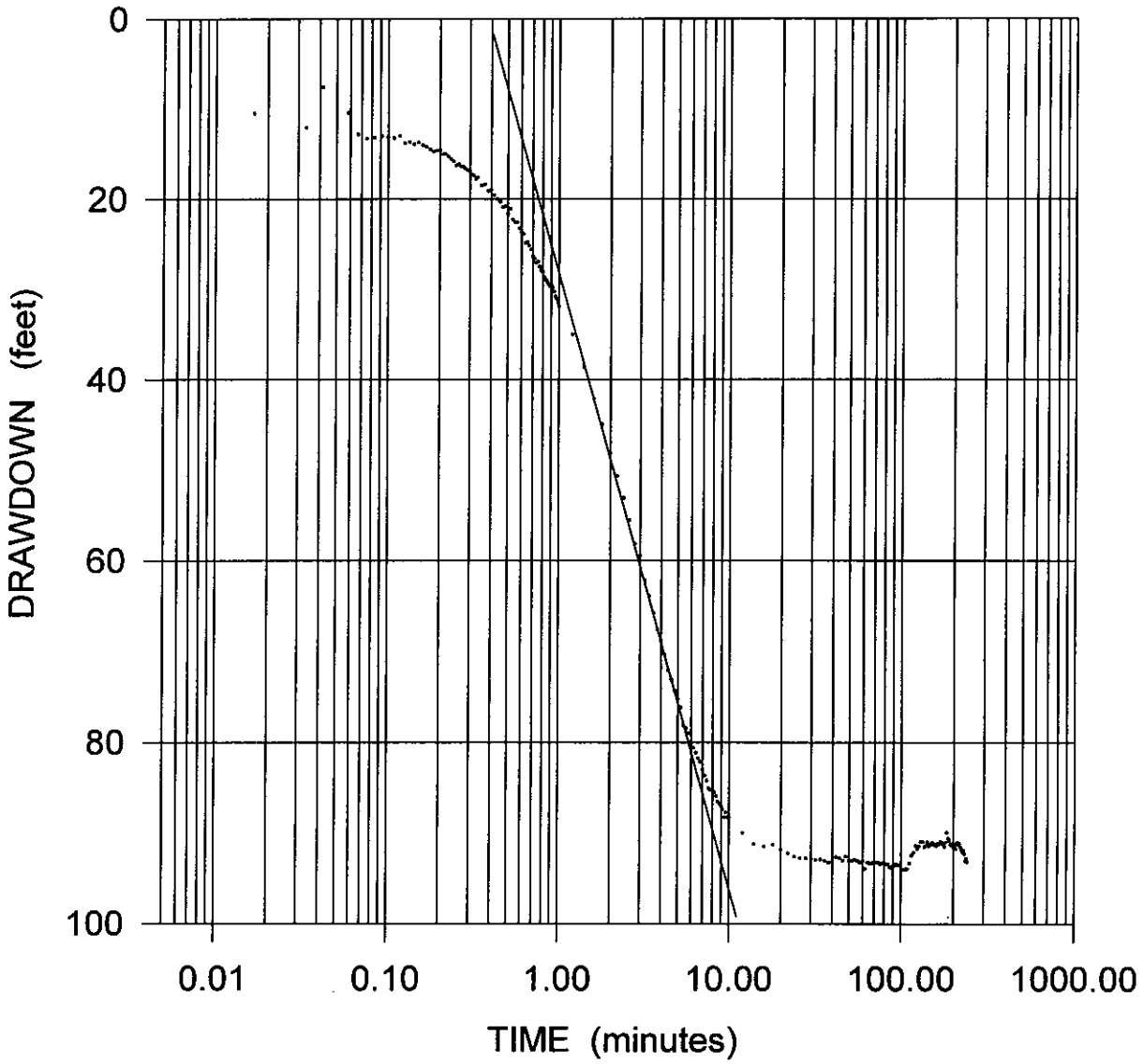


Cooper - Jocob Non-Equilibrium Recovery Analysas

IW2 1700 - 1720 DRAWDOWN DATA

Time	Water Level	Time	Water Level	Time	Water Level
0	-0.124	0.95	30.812	68	93.298
0.0083	-0.124	0.9666	31.092	70	93.206
0.0166	10.503	0.9833	31.526	72	93.206
0.025	-3.699	1	31.93	74	93.206
0.0333	12.056	1.2	35.033	76	93.391
0.0416	7.551	1.4	38.602	78	93.268
0.05	-0.279	1.6	42.077	80	93.298
0.0583	10.41	1.8	44.931	82	93.36
0.0666	12.802	2	48.063	84	93.36
0.075	13.299	2.2	50.638	86	93.701
0.0833	13.175	2.4	53.087	88	93.794
0.0916	12.988	2.6	55.506	90	93.608
0.1	13.113	2.8	58.141	92	93.422
0.1083	13.206	3	59.474	94	93.391
0.1166	12.988	3.2	62.202	96	93.546
0.125	13.796	3.4	63.937	98	93.515
0.1333	13.641	3.6	65.766	100	93.577
0.1416	13.92	3.8	67.656	103	93.979
0.15	13.703	4	68.865	106	93.948
0.1583	14.014	4.2	70.352	109	93.948
0.1666	14.169	4.4	72.087	112	93.298
0.175	14.448	4.6	73.109	115	92.432
0.1833	14.728	4.8	74.317	118	92.091
0.1916	14.635	5	75.278	121	91.348
0.2	14.573	5.2	76.176	124	91.72
0.2083	15.039	5.4	78.127	127	91.41
0.2166	15.008	5.6	78.437	130	90.946
0.225	15.287	5.8	78.995	133	90.946
0.2333	15.567	6	79.924	136	91.472
0.2416	15.815	6.2	80.574	139	91.348
0.25	16.25	6.4	81.131	142	90.946
0.2583	16.126	6.6	81.751	145	91.41
0.2666	16.343	6.8	82.122	148	91.225
0.275	16.436	7	83.02	151	91.008
0.2833	16.623	7.2	83.64	154	91.163
0.2916	16.809	7.4	84.197	157	91.256
0.3	16.933	7.6	85.033	160	91.379
0.3083	17.306	7.8	85.25	163	91.132
0.3166	17.368	8	85.188	166	91.163
0.325	17.772	8.2	85.497	169	90.946
0.3333	17.586	8.4	85.931	172	91.008
0.35	18.517	8.6	86.488	175	91.163
0.3666	18.362	8.8	86.736	178	91.441
0.3833	19.107	9	86.984	181	90.977
0.4	18.983	9.2	87.355	184	89.894
0.4166	19.542	9.4	88.222	187	90.544
0.4333	19.977	9.6	87.665	190	90.76
0.45	20.318	9.8	88.222	193	91.225
0.4666	20.877	10	88.222	196	91.318
0.4833	20.784	12	89.925	199	91.101
0.5	21.623	14	91.163	202	91.596
0.5166	21.064	16	91.441	205	91.225
0.5333	22.275	18	91.225	208	91.689
0.55	22.585	20	91.751	211	91.008
0.5666	22.616	22	92.184	214	91.256
0.5833	23.268	24	92.556	217	91.132
0.6	23.734	26	92.741	220	91.472
0.6166	23.889	28	92.741	223	91.751
0.6333	24.914	30	92.803	226	91.999
0.65	24.79	32	92.927	229	91.844
0.6666	25.193	34	92.896	232	92.246
0.6833	25.628	36	93.02	235	93.02
0.7	26.435	38	93.237	238	92.772
0.7166	26.622	40	93.113	241	93.144
0.7333	27.087	42	92.587		
0.75	26.963	44	92.71		
0.7666	27.522	46	92.989		
0.7833	27.894	48	92.525		
0.8	28.081	50	92.989		
0.8166	28.67	52	93.051		
0.8333	28.95	54	92.927		
0.85	29.198	56	92.989		
0.8666	29.447	58	93.206		
0.8833	29.726	60	93.051		
0.9	29.54	62	93.887		
0.9166	29.819	64	93.175		
0.9333	30.254	66	93.298		

IW2 1700-1720 DRAWDOWN

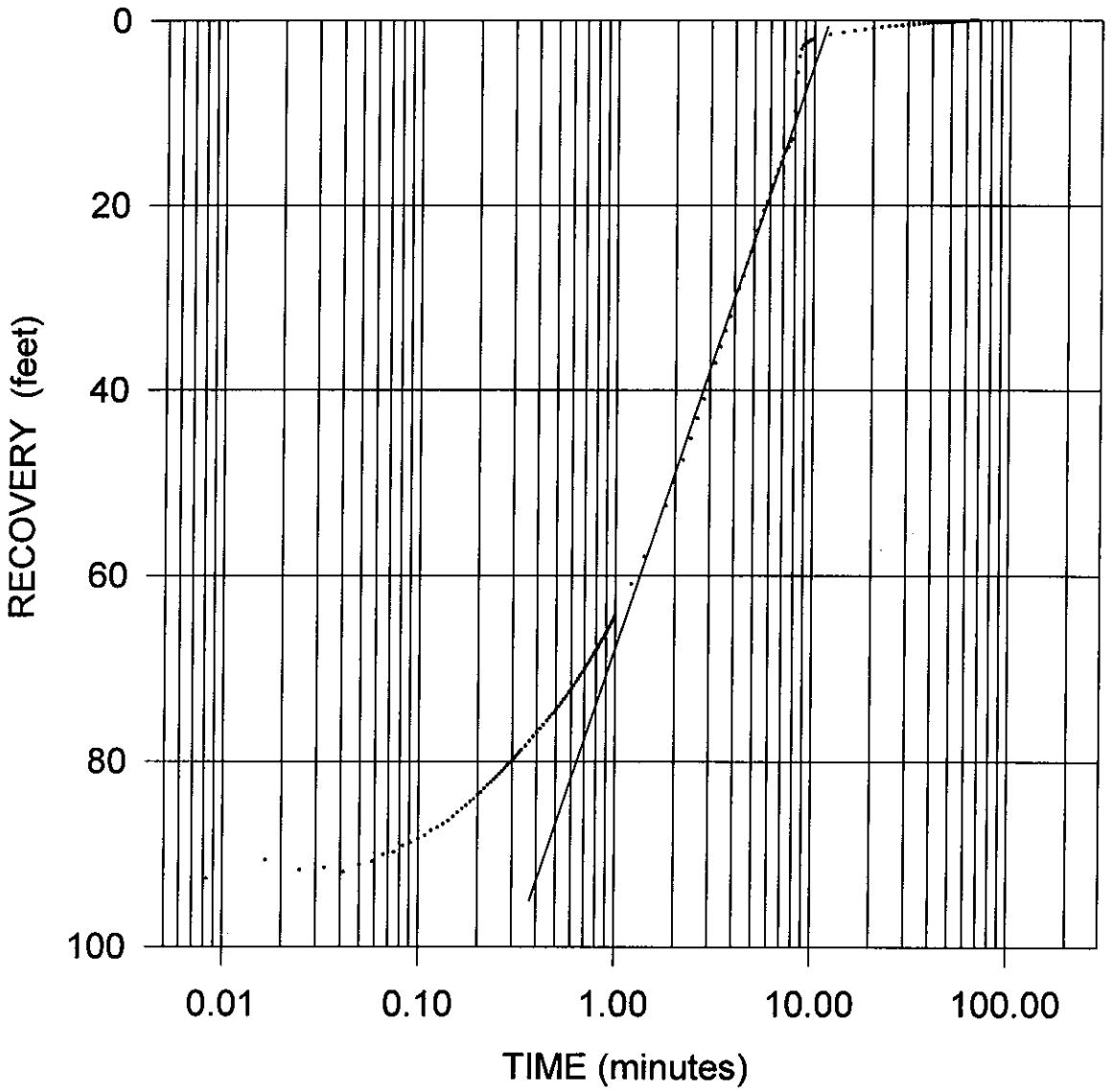


Cooper - Jocob Non-Equilibrium Drawdown Analysas

IW2 1700 - 1720 RECOVERY DATA

Time	Water Level	Time	Water Level	Time	Water Level
0	92.587	0.95	65.146	68	0
0.0083	92.648	0.9666	64.867	70	-0.031
0.0166	90.637	0.9833	64.557	72	-0.031
0.025	91.72	1	64.278	74	-0.031
0.0333	91.441	1.2	60.9	76	-0.031
0.0416	91.937	1.4	57.955	78	-0.031
0.05	91.101	1.6	55.103	80	-0.031
0.0583	90.791	1.8	52.467	82	-0.062
0.0666	90.048	2	49.955	84	-0.062
0.075	89.77	2.2	47.536	86	-0.062
0.0833	89.089	2.4	45.21	88	-0.093
0.0916	88.748	2.6	43.038	90	-0.093
0.1	88.315	2.8	40.929	92	-0.093
0.1083	87.974	3	38.974	94	-0.093
0.1166	87.448	3.2	37.081	96	-0.093
0.125	87.107	3.4	35.313	98	-0.124
0.1333	86.736	3.6	33.637	100	-0.093
0.1416	86.364	3.8	32.023	103	-0.124
0.15	85.931	4	30.533	106	-0.124
0.1583	85.497	4.2	28.981	109	-0.124
0.1666	85.064	4.4	27.584	112	-0.155
0.175	84.754	4.6	26.249	115	-0.155
0.1833	84.321	4.8	25.007	118	-0.155
0.1916	84.042	5	23.796	121	-0.155
0.2	83.64	5.2	22.678	124	-0.155
0.2083	83.33	5.4	21.592	127	-0.186
0.2166	82.897	5.6	20.536	130	-0.186
0.225	82.556	5.8	19.573	133	-0.186
0.2333	82.246	6	18.641	136	-0.186
0.2416	81.937	6.2	17.741	139	-0.186
0.25	81.627	6.4	16.933	142	-0.217
0.2583	81.317	6.6	16.126	145	-0.217
0.2666	81.008	6.8	15.38	148	-0.186
0.275	80.698	7	14.697	151	-0.217
0.2833	80.388	7.2	14.014	154	-0.217
0.2916	80.109	7.4	13.703	157	-0.217
0.3	79.862	7.6	13.051	160	-0.217
0.3083	79.583	7.8	12.833	163	-0.217
0.3166	79.304	8	9.851	166	-0.217
0.325	79.025	8.2	5.656	169	-0.248
0.3333	78.747	8.4	3.885	172	-0.217
0.35	78.282	8.6	3.108	175	-0.217
0.3666	77.787	8.8	2.704	178	-0.248
0.3833	77.291	9	2.486		
0.4	76.857	9.2	2.362		
0.4166	76.455	9.4	2.237		
0.4333	76.021	9.6	2.113		
0.45	75.587	9.8	2.051		
0.4666	75.216	10	1.989		
0.4833	74.844	12	1.523		
0.5	74.472	14	1.305		
0.5166	74.101	16	1.087		
0.5333	73.698	18	0.963		
0.55	73.295	20	0.839		
0.5666	72.954	22	0.714		
0.5833	72.552	24	0.621		
0.6	72.211	26	0.59		
0.6166	71.808	28	0.528		
0.6333	71.436	30	0.435		
0.65	71.095	32	0.404		
0.6666	70.724	34	0.372		
0.6833	70.383	36	0.31		
0.7	70.011	38	0.279		
0.7166	69.67	40	0.248		
0.7333	69.36	42	0.217		
0.75	69.02	44	0.217		
0.7666	68.679	46	0.186		
0.7833	68.338	48	0.155		
0.8	68.028	50	0.124		
0.8166	67.718	52	0.124		
0.8333	67.346	54	0.062		
0.85	67.036	56	0.093		
0.8666	66.727	58	0.062		
0.8833	66.386	60	0.031		
0.9	66.107	62	0.031		
0.9166	65.766	64	0		
0.9333	65.487	66	0		

IW2 1700-1720 RECOVERY

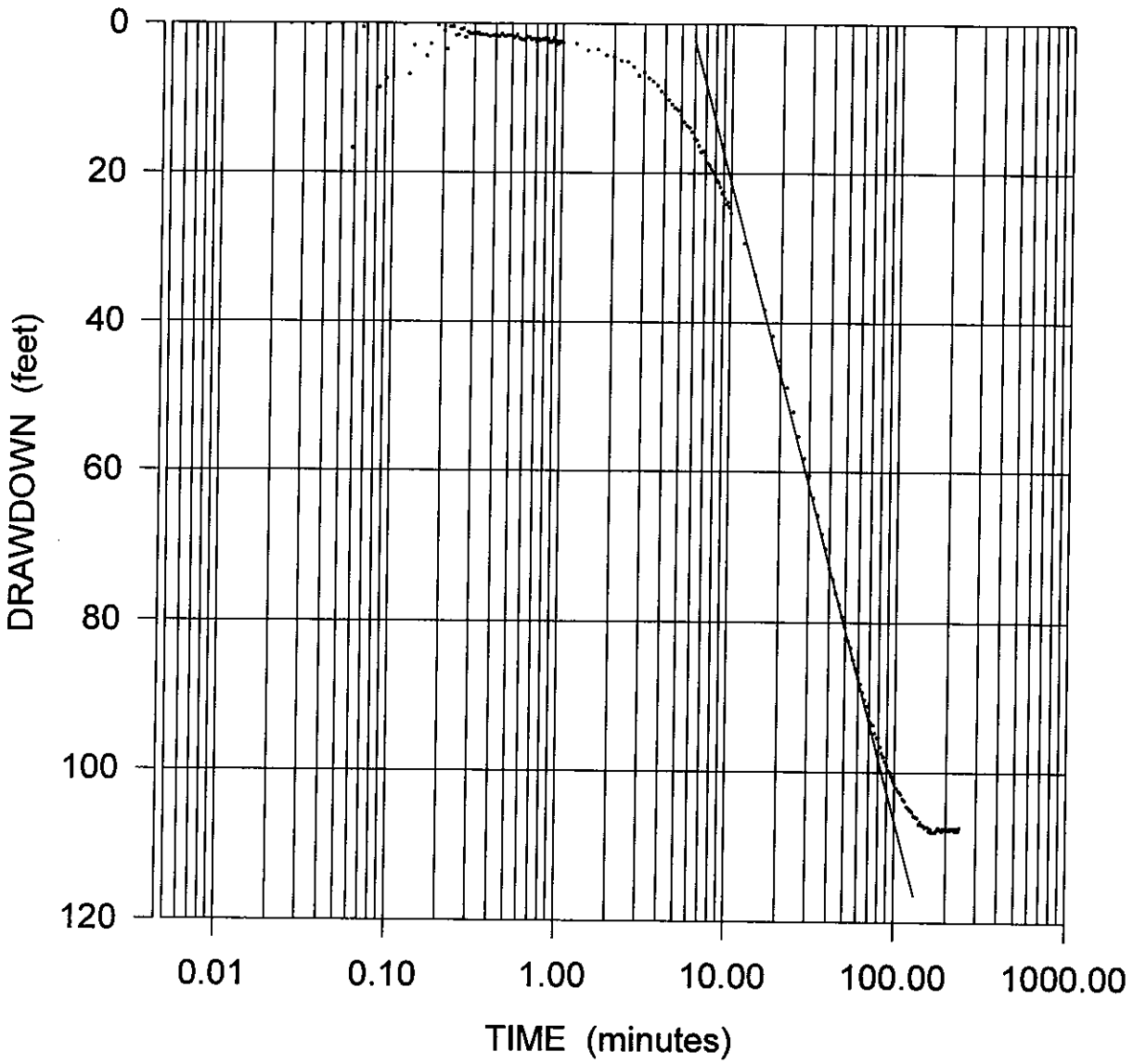


Cooper - Jocob Non-Equilibrium Recovery Analysas

IW2 1910 - 1930 DRAWDOWN DATA

Time	Water Level	Time	Water Level	Time	Water Level
0	-0.031	0.95	2.399	68	91.108
0.0083	-0.062	0.9666	2.493	70	92.194
0.0166	-0.031	0.9833	2.493	72	93.312
0.025	0.062	1	2.493	74	93.653
0.0333	0.093	1.2	2.711	76	94.771
0.0416	0.155	1.4	3.646	78	95.36
0.05	0.218	1.6	3.459	80	95.329
0.0583	16.763	1.8	4.238	82	96.571
0.0666	0.529	2	4.394	84	97.439
0.075	-2.836	2.2	4.955	86	97.967
0.0833	8.663	2.4	5.111	88	98.526
0.0916	7.417	2.6	5.796	90	98.991
0.1	-1.683	2.8	6.981	92	99.736
0.1083	-3.709	3	6.513	94	100.015
0.1166	0.187	3.2	7.292	96	100.48
0.125	6.825	3.4	7.728	98	101.039
0.1333	2.992	3.6	8.258	100	101.38
0.1416	-2.369	3.8	9.068	103	102.125
0.15	-1.215	4	9.473	106	102.559
0.1583	4.394	4.2	10.19	109	102.869
0.1666	2.773	4.4	10.813	112	103.521
0.175	-0.935	4.6	11.311	115	103.8
0.1833	0.249	4.8	11.592	118	104.576
0.1916	-0.966	5	12.277	121	104.824
0.2	1.028	5.2	13.149	124	105.072
0.2083	3.459	5.4	13.617	127	105.289
0.2166	0.498	5.6	13.928	130	105.817
0.225	0.436	5.8	14.52	133	105.941
0.2333	1.62	6	15.361	136	106.065
0.2416	1.558	6.2	15.579	139	106.902
0.25	0.81	6.4	16.327	142	106.623
0.2583	0.716	6.6	17.168	145	106.995
0.2666	1.87	6.8	17.043	148	107.057
0.275	1.184	7	17.635	151	107.368
0.2833	1.433	7.2	18.6	154	107.243
0.2916	1.433	7.4	18.943	157	107.337
0.3	1.215	7.6	19.441	160	107.833
0.3083	1.371	7.8	19.846	163	107.554
0.3166	1.246	8	20.157	166	108.05
0.325	1.496	8.2	20.811	169	107.957
0.3333	1.496	8.4	21.216	172	108.05
0.35	1.527	8.6	21.808	175	107.864
0.3666	1.714	8.8	22.617	178	107.647
0.3833	1.651	9	22.431	181	107.399
0.4	1.589	9.2	23.334	184	107.616
0.4166	1.714	9.4	24.112	187	107.647
0.4333	1.402	9.6	23.801	190	107.864
0.45	1.714	9.8	24.517	193	107.492
0.4666	1.651	10	25.295	196	107.616
0.4833	1.589	12	29.342	199	107.554
0.5	1.651	14	33.544	202	107.709
0.5166	1.901	16	38.212	205	107.709
0.5333	1.527	18	41.79	208	107.585
0.55	1.994	20	45.025	211	107.74
0.5666	2.119	22	48.727	214	107.461
0.5833	2.212	24	51.961	217	107.492
0.6	1.994	26	55.257	220	107.616
0.6166	1.807	28	58.211	223	107.678
0.6333	1.838	30	60.48	226	107.492
0.65	2.15	32	63.464	229	107.833
0.6666	2.057	34	65.795	232	107.523
0.6833	2.088	36	68.281	235	107.833
0.7	2.462	38	70.238	238	107.74
0.7166	2.088	40	72.786	241	107.368
0.7333	2.244	42	74.277		
0.75	2.119	44	76.11		
0.7666	2.181	46	77.601		
0.7833	1.994	48	79.216		
0.8	2.119	50	80.614		
0.8166	2.057	52	82.353		
0.8333	2.524	54	83.346		
0.85	2.555	56	84.93		
0.8666	2.244	58	86.079		
0.8833	1.932	60	87.321		
0.9	2.493	62	88.128		
0.9166	2.337	64	89.308		
0.9333	2.773	66	90.301		

IW2 1910-1930 DRAWDOWN



Cooper - Jocob Non-Equilibrium Drawdown Analysas

IW2 1910 - 1930 RECOVERY DATA

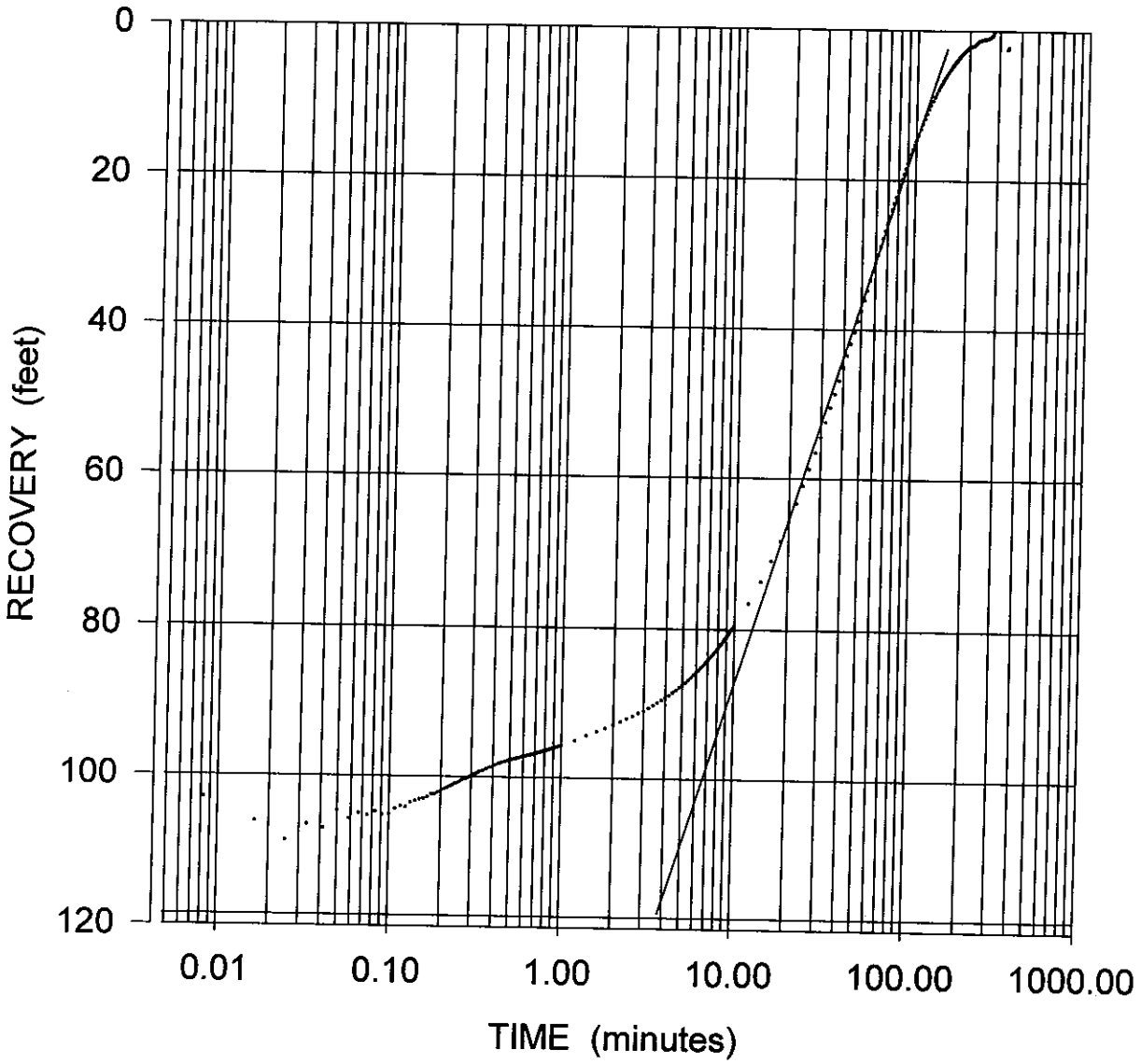
Time	Water Level
0	107.957
0.0083	102.994
0.0166	106.158
0.025	108.701
0.0333	106.592
0.0416	107.057
0.05	104.7
0.0583	105.786
0.0666	105.041
0.075	105.32
0.0833	104.824
0.0916	105.227
0.1	105.103
0.1083	104.39
0.1166	104.048
0.125	104.172
0.1333	103.552
0.1416	103.335
0.15	103.118
0.1583	102.994
0.1666	102.776
0.175	102.373
0.1833	102.404
0.1916	102.156
0.2	101.97
0.2083	101.69
0.2166	101.504
0.225	101.349
0.2333	101.194
0.2416	100.915
0.25	100.853
0.2583	100.636
0.2666	100.387
0.275	100.325
0.2833	100.201
0.2916	100.046
0.3	99.891
0.3083	99.736
0.3166	99.643
0.325	99.487
0.3333	99.332
0.35	99.146
0.3666	98.898
0.3833	98.712
0.4	98.557
0.4166	98.37
0.4333	98.215
0.45	98.06
0.4666	97.967
0.4833	97.843
0.5	97.75
0.5166	97.626
0.5333	97.564
0.55	97.47
0.5666	97.408
0.5833	97.315
0.6	97.253
0.6166	97.191
0.6333	97.098
0.65	97.036
0.6666	96.974
0.6833	96.912
0.7	96.819
0.7166	96.757
0.7333	96.695
0.75	96.633
0.7666	96.54
0.7833	96.477
0.8	96.415
0.8166	96.384
0.8333	96.291
0.85	96.229
0.8666	96.167
0.8833	96.105
0.9	96.043
0.9166	95.981
0.9333	95.919

Time	Water Level
0.95	95.857
0.9666	95.826
0.9833	95.733
1	95.702
1.2	95.019
1.4	94.336
1.6	93.777
1.8	93.312
2	92.877
2.2	92.412
2.4	92.008
2.6	91.667
2.8	91.263
3	90.922
3.2	90.549
3.4	90.177
3.6	89.835
3.8	89.494
4	89.152
4.2	88.811
4.4	88.438
4.6	88.128
4.8	87.786
5	87.445
5.2	87.103
5.4	86.762
5.6	86.451
5.8	86.11
6	85.768
6.2	85.458
6.4	85.116
6.6	84.806
6.8	84.464
7	84.154
7.2	83.843
7.4	83.502
7.6	83.191
7.8	82.881
8	82.57
8.2	82.228
8.4	81.949
8.6	81.638
8.8	81.297
9	81.017
9.2	80.676
9.4	80.396
9.6	80.086
9.8	79.775
10	79.495
12	76.545
14	73.687
16	70.953
18	68.343
20	65.764
22	63.277
24	60.946
26	58.708
28	56.501
30	54.418
32	52.428
34	50.468
36	48.634
38	46.83
40	45.119
42	43.439
44	41.852
46	40.328
48	38.834
50	37.403
52	36.034
54	34.727
56	33.357
58	32.175
60	30.992
62	29.84
64	28.782
66	27.723

Time	Water Level
68	26.696
70	25.731
72	24.797
74	23.894
76	23.022
78	22.181
80	21.372
82	20.593
84	19.846
86	19.13
88	18.413
90	17.759
92	17.105
94	16.482
96	15.891
98	15.299
100	14.738
103	13.928
106	13.181
109	12.464
112	11.779
115	11.124
118	10.533
121	9.972
124	9.411
127	8.912
130	8.414
133	7.946
136	7.51
139	7.105
142	6.731
145	6.357
148	6.015
151	5.672
154	5.36
157	5.048
160	4.768
163	4.519
166	4.269
169	4.051
172	3.802
175	3.615
178	3.366
181	3.179
184	2.992
187	2.836
190	2.68
193	2.555
196	2.368
199	2.244
202	2.15
205	2.119
208	2.057
211	1.994
214	1.901
217	1.776
220	1.651
223	1.527
226	1.433
229	1.34
232	1.277
235	1.215
238	1.184
241	1.153
244	1.122
247	1.09
250	1.09
253	1.059
256	1.028
259	0.966
262	0.903
265	0.841
268	0.748
271	0.654
274	0.498
277	0.093
280	-0.062

Time	Water Level
283	-0.124
286	-0.187
289	-0.218
292	-0.249
295	-0.249
298	-0.28
301	-0.28
304	-0.28
307	-0.28
310	-0.311
313	-0.311
316	-0.311
319	-0.311
322	-0.342
325	-0.342
328	-0.342
331	-0.342
334	2.462
337	2.244

IW2 1910-1930 RECOVERY

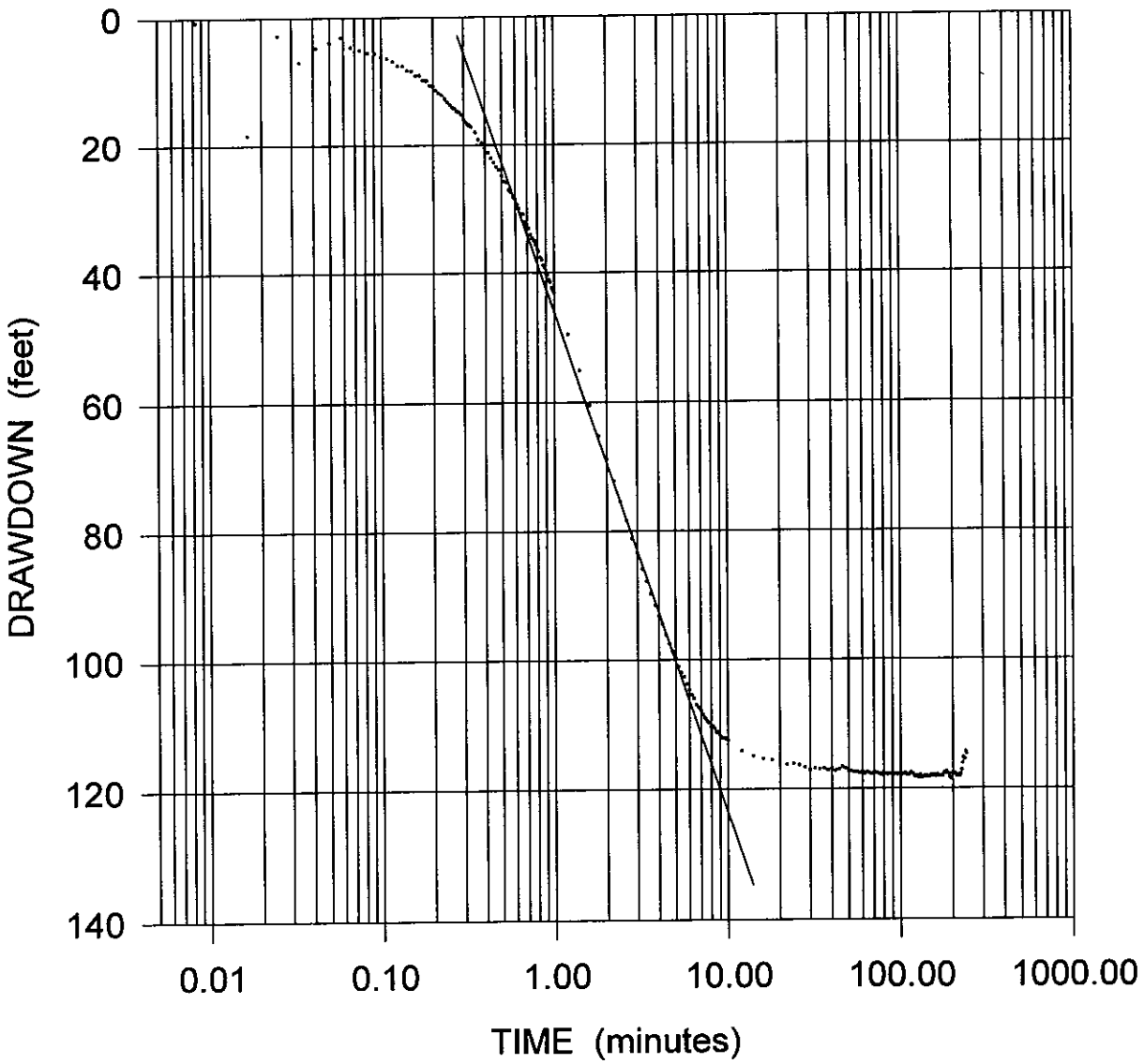


Cooper - Jocob Non-Equilibrium Recover Analysas

IW2 2100 - 2110 DRAWDOWN DATA

Time	Water Level	Time	Water Level	Time	Water Level
0	0.628	0.95	41.426	68	117.736
0.0083	0.596	0.9666	42.274	70	117.673
0.0166	18.374	0.9833	42.651	72	117.516
0.025	2.732	1	43.059	74	117.673
0.0333	6.941	1.2	49.498	76	117.799
0.0416	4.711	1.4	55.056	78	117.924
0.05	3.894	1.6	60.426	80	117.705
0.0583	3.046	1.8	65.263	82	117.705
0.0666	4.585	2	68.843	84	117.83
0.075	5.088	2.2	72.266	86	117.736
0.0833	5.465	2.4	75.469	88	117.799
0.0916	5.59	2.6	78.39	90	117.83
0.1	6.187	2.8	81.153	92	117.83
0.1083	6.407	3	83.383	94	117.736
0.1166	6.878	3.2	85.926	96	117.83
0.125	7.6	3.4	87.842	98	117.799
0.1333	7.6	3.6	89.82	100	117.799
0.1416	8.291	3.8	91.579	103	117.83
0.15	8.386	4	93.212	106	117.673
0.1583	9.108	4.2	94.499	109	117.924
0.1666	9.045	4.4	96.163	112	117.893
0.175	9.799	4.6	97.514	115	117.548
0.1833	9.893	4.8	98.644	118	117.767
0.1916	10.647	5	99.68	121	118.144
0.2	10.804	5.2	101.062	124	118.05
0.2083	11.401	5.4	102.004	127	118.333
0.2166	11.872	5.6	102.632	130	117.956
0.225	12.155	5.8	103.794	133	118.395
0.2333	12.751	6	104.61	136	118.207
0.2416	13.191	6.2	105.49	139	118.081
0.25	13.662	6.4	106.023	142	118.144
0.2583	14.071	6.6	106.965	145	118.238
0.2666	14.259	6.8	107.374	148	118.238
0.275	14.699	7	107.813	151	117.956
0.2833	14.824	7.2	108.473	154	118.081
0.2916	15.201	7.4	109.007	157	118.019
0.3	15.955	7.6	109.446	160	118.144
0.3083	16.332	7.8	109.76	163	117.893
0.3166	16.772	8	110.388	166	118.144
0.325	16.897	8.2	110.263	169	118.081
0.3333	17.149	8.4	110.671	172	118.144
0.35	18.028	8.6	111.205	175	118.081
0.3666	19.159	8.8	111.173	178	117.642
0.3833	19.693	9	111.644	181	117.673
0.4	20.446	9.2	111.99	184	117.422
0.4166	21.2	9.4	112.084	187	117.736
0.4333	22.08	9.6	112.147	190	117.767
0.45	22.771	9.8	112.178	193	118.301
0.4666	23.462	10	112.429	196	118.49
0.4833	23.964	12	114.093	199	117.705
0.5	24.843	14	114.878	202	117.579
0.5166	25.754	16	115.318	205	117.705
0.5333	25.911	18	115.506	208	117.83
0.55	27.105	20	115.789	211	118.144
0.5666	27.45	22	116.26	214	118.144
0.5833	28.204	24	116.072	217	117.924
0.6	28.55	26	116.323	220	118.176
0.6166	29.398	28	116.668	223	117.862
0.6333	30.026	30	117.108	226	117.234
0.65	30.842	32	116.857	229	116.134
0.6666	30.936	34	116.982	232	115.287
0.6833	32.13	36	116.825	235	115.506
0.7	32.664	38	117.139	238	114.313
0.7166	33.166	40	116.92	241	114.721
0.7333	34.109	42	117.234		
0.75	34.674	44	117.014		
0.7666	35.019	46	116.605		
0.7833	35.585	48	116.825		
0.8	36.307	50	117.171		
0.8166	36.715	52	117.328		
0.8333	37.595	54	117.485		
0.85	37.972	56	117.485		
0.8666	38.851	58	117.579		
0.8833	39.196	60	117.453		
0.9	39.982	62	117.673		
0.9166	40.358	64	117.453		
0.9333	41.081	66	117.579		

IW2 2100-2120 DRAWDOWN

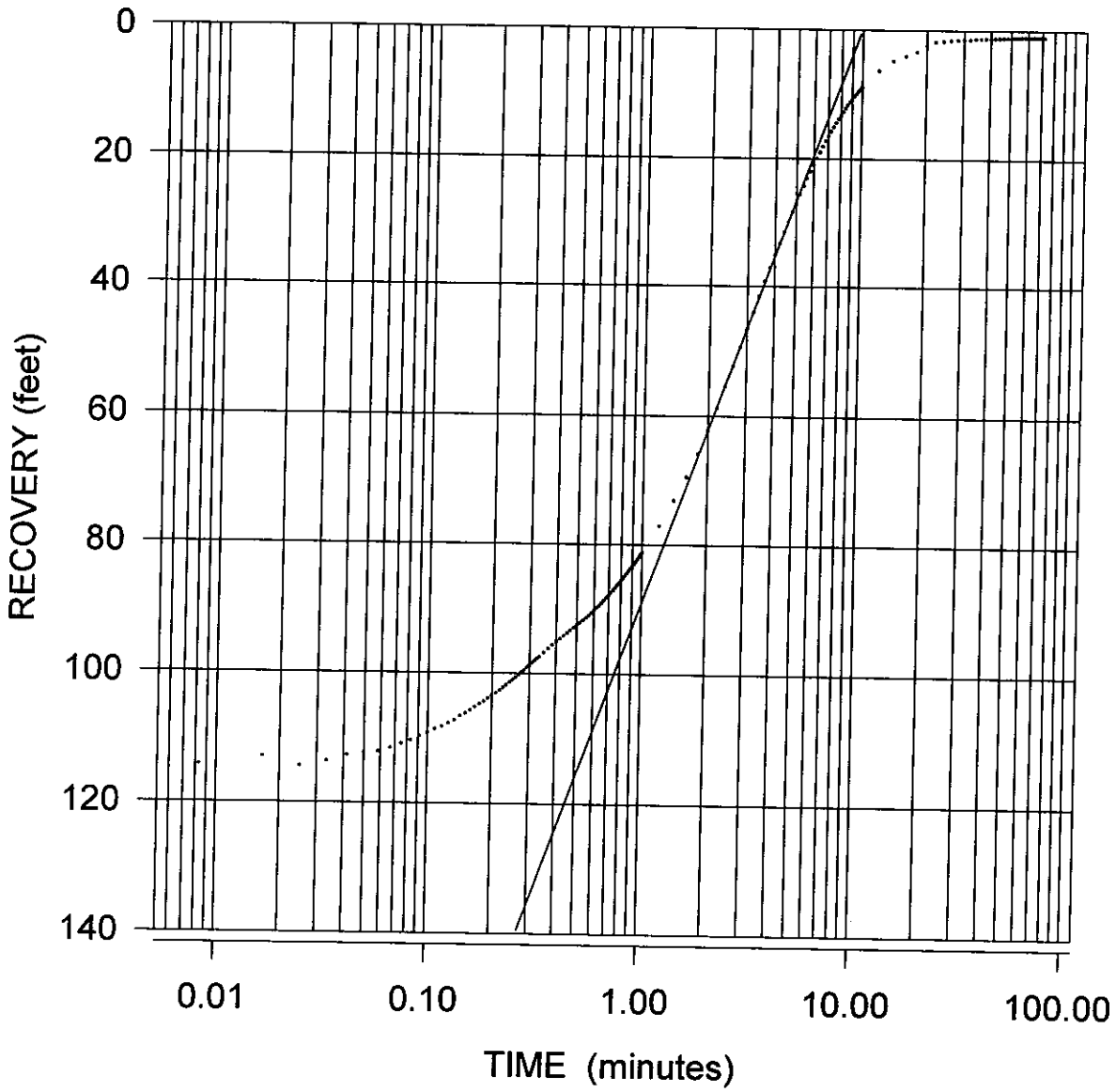


Cooper - Jocob Non-Equilibrium Drawdown Analysas

IW2 2100 -2110 RECOVERY DATA

Time	Water Level	Time	Water Level	Time	Water Level
0	114.973	0.95	82.315	68	1.005
0.0083	114.25	0.9666	81.938	70	1.005
0.0166	112.994	0.9833	81.561	72	1.036
0.025	114.439	1	81.216		
0.0333	113.654	1.2	77.071		
0.0416	112.68	1.4	73.114		
0.05	112.366	1.6	69.408		
0.0583	112.147	1.8	65.828		
0.0666	111.581	2	62.185		
0.075	110.891	2.2	58.699		
0.0833	110.325	2.4	55.37		
0.0916	109.697	2.6	52.261		
0.1	109.226	2.8	49.309		
0.1083	108.63	3	46.545		
0.1166	108.19	3.2	43.939		
0.125	107.688	3.4	41.489		
0.1333	107.185	3.6	39.196		
0.1416	106.62	3.8	37.061		
0.15	106.18	4	35.114		
0.1583	105.678	4.2	33.292		
0.1666	105.207	4.4	31.533		
0.175	104.767	4.6	29.9		
0.1833	104.359	4.8	28.392		
0.1916	103.825	5	26.948		
0.2	103.511	5.2	25.566		
0.2083	103.04	5.4	24.278		
0.2166	102.632	5.6	23.085		
0.225	102.255	5.8	21.985		
0.2333	101.816	6	20.918		
0.2416	101.376	6.2	19.944		
0.25	100.999	6.4	19.002		
0.2583	100.685	6.6	18.091		
0.2666	100.214	6.8	17.274		
0.275	99.837	7	16.489		
0.2833	99.492	7.2	15.767		
0.2916	99.084	7.4	15.044		
0.3	98.77	7.6	14.416		
0.3083	98.362	7.8	13.788		
0.3166	98.079	8	13.223		
0.325	97.733	8.2	12.657		
0.3333	97.451	8.4	12.123		
0.35	96.823	8.6	11.621		
0.3666	96.195	8.8	11.181		
0.3833	95.598	9	10.741		
0.4	95.096	9.2	10.302		
0.4166	94.656	9.4	9.925		
0.4333	94.185	9.6	9.548		
0.45	93.745	9.8	9.202		
0.4666	93.337	10	8.857		
0.4833	92.929	12	6.281		
0.5	92.552	14	4.742		
0.5166	92.144	16	3.988		
0.5333	91.767	18	3.329		
0.55	91.39	20	2.355		
0.5666	91.013	22	1.79		
0.5833	90.637	24	1.633		
0.6	90.228	26	1.539		
0.6166	89.82	28	1.444		
0.6333	89.443	30	1.382		
0.65	89.066	32	1.35		
0.6666	88.658	34	1.287		
0.6833	88.281	36	1.256		
0.7	87.873	38	1.224		
0.7166	87.496	40	1.193		
0.7333	87.088	42	1.162		
0.75	86.743	44	1.13		
0.7666	86.334	46	1.13		
0.7833	85.989	48	1.099		
0.8	85.612	50	1.099		
0.8166	85.235	52	1.036		
0.8333	84.859	54	1.036		
0.85	84.482	56	1.005		
0.8666	84.105	58	1.005		
0.8833	83.728	60	1.005		
0.9	83.383	62	1.005		
0.9166	83.006	64	0.973		
0.9333	82.66	66	0.973		

IW2 2100-2120 RECOVERY

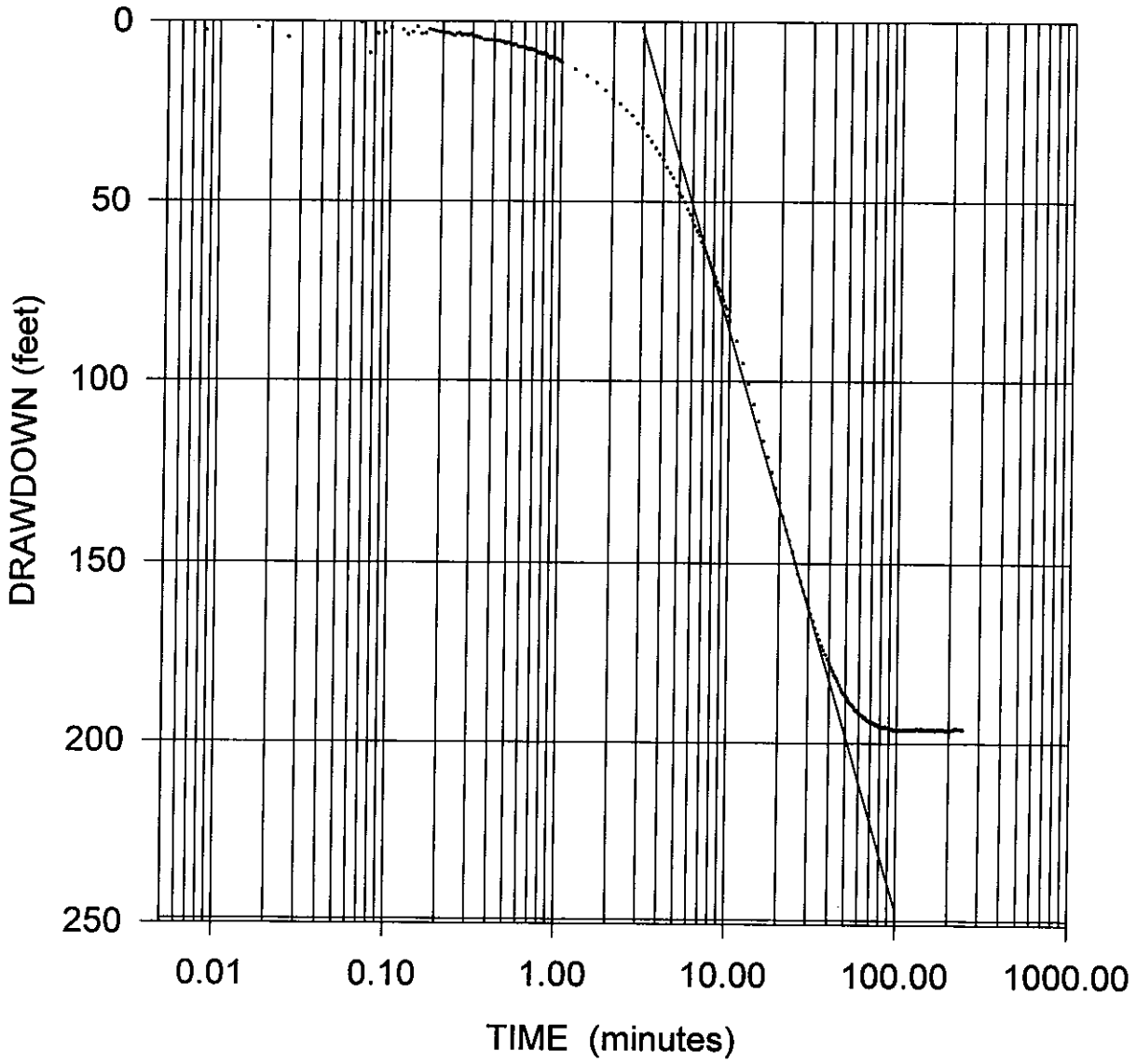


Cooper - Jocob Non-Equilibrium Recovery Analysas

IW2 2325 - 2345 DRAWDOWN DATA

Time	Water Level	Time	Water Level	Time	Water Level	Time	Water Level	Time	Water Level
0	20.576	0.95	10.493	39	176.62	116	196.105	193	196.383
0.0083	2.553	0.9666	10.835	40	177.794	117	196.414	194	196.476
0.0166	1.744	0.9833	10.928	41	178.999	118	196.352	195	196.476
0.025	4.422	1	11.24	42	179.987	119	196.352	196	196.414
0.0333	-8.254	1.2	13.201	43	181.007	120	196.167	197	196.229
0.0416	-2.273	1.4	15.099	44	181.81	121	196.29	198	196.383
0.05	4.857	1.6	16.904	45	182.798	122	196.321	199	196.383
0.0583	-10.996	1.8	19.145	46	183.786	123	196.321	200	196.476
0.0666	0.311	2	21.385	47	184.898	124	196.26	201	196.599
0.075	8.78	2.2	22.754	48	185.701	125	196.167	202	196.537
0.0833	3.363	2.4	24.558	49	186.38	126	196.445	203	196.414
0.0916	3.051	2.6	25.989	50	186.751	127	196.29	204	196.445
0.1	1.775	2.8	28.229	51	187.183	128	196.013	205	196.198
0.1083	-2.086	3	29.411	52	188.233	129	196.167	206	196.383
0.1166	2.335	3.2	31.619	53	188.789	130	196.044	207	196.352
0.125	3.612	3.4	33.267	54	189.128	131	195.889	208	196.26
0.1333	2.865	3.6	35.071	55	189.375	132	196.136	209	196.229
0.1416	1.494	3.8	36.843	56	189.931	133	196.105	210	196.229
0.15	3.456	4	38.273	57	190.857	134	196.105	211	196.167
0.1583	3.269	4.2	40.356	58	190.734	135	196.29	212	196.29
0.1666	2.148	4.4	41.911	59	191.259	136	196.044	213	196.013
0.175	2.335	4.6	43.34	60	191.722	137	196.229	214	196.198
0.1833	2.709	4.8	45.454	61	191.876	138	195.858	215	196.136
0.1916	2.802	5	47.598	62	192.123	139	196.229	216	195.92
0.2	3.051	5.2	48.5	63	192.308	140	196.229	217	195.889
0.2083	3.176	5.4	50.147	64	192.864	141	196.074	218	195.797
0.2166	3.238	5.6	52.011	65	192.741	142	196.229	219	195.982
0.225	3.581	5.8	53.533	66	193.173	143	196.26	220	195.951
0.2333	3.986	6	55.024	67	193.512	144	196.321	221	195.766
0.2416	3.332	6.2	56.733	68	193.728	145	196.352	222	196.044
0.25	3.176	6.4	58.286	69	193.883	146	196.229	223	195.889
0.2583	3.799	6.6	59.404	70	194.037	147	196.321	224	195.951
0.2666	3.612	6.8	61.175	71	193.945	148	196.29	225	195.858
0.275	3.674	7	62.603	72	194.315	149	196.26	226	195.889
0.2833	3.768	7.2	64.032	73	194.222	150	196.229	227	196.044
0.2916	3.456	7.4	65.522	74	194.469	151	196.26	228	196.013
0.3	4.017	7.6	66.982	75	194.809	152	196.136	229	195.92
0.3083	4.141	7.8	68.348	76	194.593	153	196.198	230	195.951
0.3166	4.266	8	69.9	77	194.871	154	196.198	231	196.013
0.325	4.359	8.2	71.018	78	194.963	155	196.229	232	195.951
0.3333	4.671	8.4	72.508	79	195.395	156	196.352	233	196.074
0.35	5.138	8.6	73.967	80	195.241	157	196.26	234	196.044
0.3666	5.107	8.8	74.805	81	195.364	158	196.136	235	195.982
0.3833	5.2	9	76.512	82	195.395	159	196.321	236	196.136
0.4	5.262	9.2	77.536	83	195.704	160	196.074	237	196.167
0.4166	5.262	9.4	79.119	84	195.395	161	196.321	238	196.044
0.4333	5.418	9.6	79.863	85	195.426	162	196.26	239	196.105
0.45	5.605	9.8	81.911	86	195.334	163	196.229	240	196.105
0.4666	6.009	10	83.183	87	195.673	164	196.29	241	196.105
0.4833	5.792	11	88.86	88	195.611	165	196.229		
0.5	6.445	12	95.001	89	195.642	166	196.229		
0.5166	6.414	13	100.675	90	195.827	167	196.445		
0.5333	6.227	14	106.286	91	195.704	168	196.352		
0.55	6.975	15	110.965	92	195.92	169	196.229		
0.5666	7.099	16	116.325	93	196.167	170	196.26		
0.5833	7.068	17	120.631	94	195.951	171	196.29		
0.6	7.099	18	125.091	95	196.198	172	196.26		
0.6166	7.442	19	129.271	96	196.321	173	196.074		
0.6333	7.691	20	133.202	97	196.044	174	196.044		
0.65	7.691	21	137.103	98	196.229	175	196.136		
0.6666	7.66	22	140.785	99	196.198	176	196.044		
0.6833	7.878	23	143.663	100	196.105	177	196.198		
0.7	8.033	24	146.726	101	196.167	178	195.982		
0.7166	8.656	25	149.912	102	196.167	179	195.951		
0.7333	8.749	26	152.85	103	196.537	180	196.167		
0.75	8.625	27	155.015	104	196.29	181	196.074		
0.7666	9.061	28	157.551	105	196.167	182	196.26		
0.7833	8.687	29	159.777	106	196.445	183	196.105		
0.8	8.998	30	162.188	107	196.352	184	196.198		
0.8166	9.216	31	163.981	108	196.414	185	196.29		
0.8333	9.839	32	165.99	109	196.229	186	196.229		
0.85	10.244	33	167.907	110	196.352	187	196.198		
0.8666	9.839	34	169.668	111	196.445	188	196.26		
0.8833	9.808	35	171.182	112	196.29	189	196.167		
0.9	9.932	36	172.913	113	196.321	190	196.414		
0.9166	10.244	37	174.087	114	196.321	191	196.198		
0.9333	10.306	38	175.292	115	196.136	192	196.29		

IW2 2325-2345 DRAWDOWN



Cooper - Jocob Non-Equilibrium Drawdown Analysas

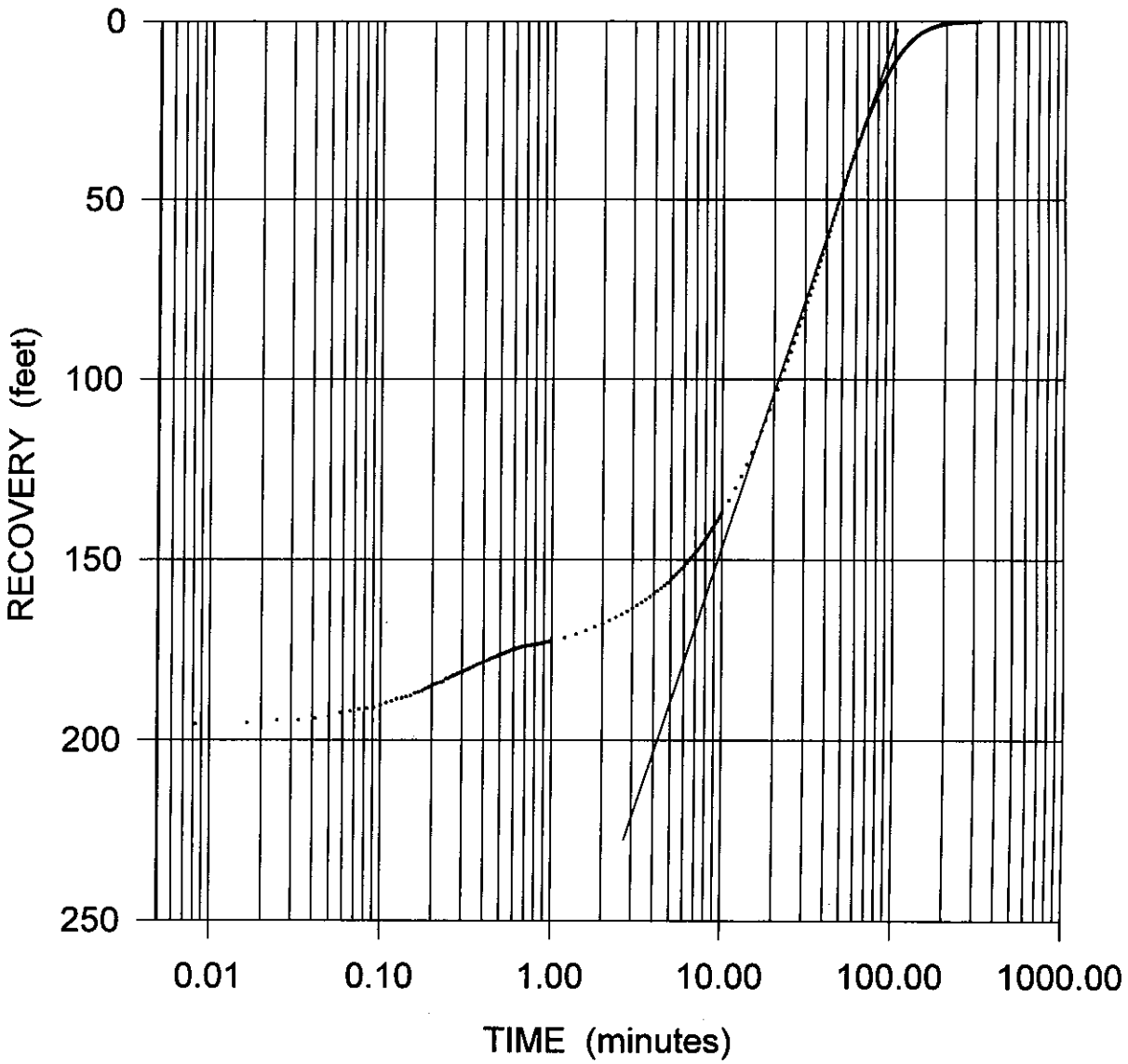
IW2 2325 - 2345 RECOVERY DATA

Time	Water Level	Time	Water Level	Time	Water Level	Time	Water Level	Time	Water Level
0	195.148	0.95	172.913	39	63.69	116	7.099	193	0.872
0.0083	195.55	0.9666	172.758	40	62.013	117	6.881	194	0.872
0.0166	195.303	0.9833	172.727	41	60.367	118	6.663	195	0.84
0.025	194.531	1	172.604	42	58.752	119	6.508	196	0.84
0.0333	194.469	1.2	171.708	43	57.199	120	6.29	197	0.809
0.0416	194.068	1.4	170.688	44	55.615	121	6.103	198	0.778
0.05	193.451	1.6	169.699	45	54.155	122	5.947	199	0.778
0.0583	192.494	1.8	168.679	46	52.694	123	5.76	200	0.747
0.0666	192.031	2	167.783	47	51.234	124	5.605	201	0.747
0.075	191.475	2.2	166.887	48	49.836	125	5.449	202	0.716
0.0833	191.382	2.4	166.021	49	48.469	126	5.293	203	0.716
0.0916	191.104	2.6	165.187	50	47.132	127	5.138	204	0.685
0.1	190.394	2.8	164.352	51	45.827	128	4.982	205	0.685
0.1083	189.684	3	163.548	52	44.553	129	4.826	206	0.654
0.1166	189.283	3.2	162.714	53	43.309	130	4.702	207	0.654
0.125	188.696	3.4	161.941	54	42.128	131	4.577	208	0.654
0.1333	188.48	3.6	161.137	55	40.947	132	4.453	209	0.622
0.1416	188.11	3.8	160.333	56	39.828	133	4.328	210	0.622
0.15	187.801	4	159.529	57	38.709	134	4.204	211	0.591
0.1583	187.029	4.2	158.756	58	37.652	135	4.079	212	0.591
0.1666	186.782	4.4	157.953	59	36.594	136	3.954	213	0.56
0.175	186.442	4.6	157.18	60	35.568	137	3.861	214	0.56
0.1833	185.948	4.8	156.407	61	34.604	138	3.736	215	0.56
0.1916	185.485	5	155.633	62	33.641	139	3.643	216	0.529
0.2	185.053	5.2	154.829	63	32.708	140	3.518	217	0.529
0.2083	184.589	5.4	154.056	64	31.775	141	3.425	218	0.529
0.2166	184.25	5.6	153.283	65	30.873	142	3.332	219	0.498
0.225	184.126	5.8	152.541	66	30.002	143	3.238	220	0.498
0.2333	183.91	6	151.768	67	29.162	144	3.145	221	0.498
0.2416	183.076	6.2	151.025	68	28.353	145	3.083	222	0.498
0.25	183.045	6.4	150.252	69	27.514	146	2.989	223	0.467
0.2583	182.644	6.6	149.51	70	26.767	147	2.896	224	0.467
0.2666	182.242	6.8	148.798	71	26.021	148	2.833	225	0.467
0.275	182.026	7	148.056	72	25.243	149	2.74	226	0.436
0.2833	181.748	7.2	147.314	73	24.527	150	2.709	227	0.436
0.2916	181.439	7.4	146.571	74	23.874	151	2.615	228	0.436
0.3	181.161	7.6	145.829	75	23.19	152	2.584	229	0.436
0.3083	181.007	7.8	145.055	76	22.567	153	2.46	230	0.404
0.3166	180.667	8	144.313	77	21.945	154	2.397	231	0.404
0.325	180.451	8.2	143.57	78	21.323	155	2.335	232	0.404
0.3333	180.234	8.4	142.827	79	20.701	156	2.273	233	0.404
0.35	179.709	8.6	142.085	80	20.14	157	2.211	234	0.404
0.3666	179.277	8.8	141.342	81	19.58	158	2.179	235	0.373
0.3833	178.937	9	140.63	82	19.02	159	2.086	236	0.373
0.4	178.536	9.2	139.888	83	18.491	160	2.024	237	0.373
0.4166	178.196	9.4	139.176	84	17.962	161	1.961	238	0.373
0.4333	177.794	9.6	138.433	85	17.464	162	1.93	239	0.342
0.45	177.423	9.8	137.721	86	16.966	163	1.868	240	0.373
0.4666	177.115	10	137.041	87	16.469	164	1.806	241	0.342
0.4833	176.837	11	133.481	88	16.002	165	1.775	242	0.404
0.5	176.528	12	130.045	89	15.566	166	1.744	243	0.342
0.5166	176.25	13	126.701	90	15.099	167	1.681	244	0.342
0.5333	175.971	14	123.418	91	14.663	168	1.65	245	0.342
0.55	175.693	15	120.197	92	14.259	169	1.588	246	0.311
0.5666	175.477	16	117.131	93	13.854	170	1.557	247	0.311
0.5833	175.199	17	114.126	94	13.45	171	1.494	248	0.311
0.6	175.014	18	111.151	95	13.076	172	1.494	249	0.311
0.6166	174.828	19	108.269	96	12.703	173	1.432	250	0.311
0.6333	174.612	20	105.511	97	12.329	174	1.401	251	0.311
0.65	174.489	21	102.69	98	11.987	175	1.37	252	0.28
0.6666	174.303	22	100.024	99	11.613	176	1.339	253	0.28
0.6833	174.18	23	97.42	100	11.302	177	1.308	254	0.28
0.7	174.087	24	94.846	101	10.959	178	1.245	255	0.28
0.7166	173.994	25	92.365	102	10.648	179	1.245	256	0.28
0.7333	173.901	26	89.915	103	10.337	180	1.214	257	0.28
0.75	173.871	27	87.558	104	10.057	181	1.183	258	0.28
0.7666	173.747	28	85.293	105	9.745	182	1.152	259	0.28
0.7833	173.685	29	83.09	106	9.465	183	1.121	260	0.28
0.8	173.623	30	80.918	107	9.216	184	1.09	261	0.249
0.8166	173.531	31	78.839	108	8.936	185	1.058	262	0.249
0.8333	173.5	32	76.791	109	8.687	186	1.027	263	0.249
0.85	173.376	33	74.774	110	8.438	187	1.027	264	0.249
0.8666	173.314	34	72.818	111	8.189	188	0.996	265	0.249
0.8833	173.222	35	70.894	112	7.971	189	0.965	266	0.249
0.9	173.098	36	69.031	113	7.722	190	0.934	267	0.249
0.9166	173.036	37	67.199	114	7.504	191	0.934	268	0.249
0.9333	172.975	38	65.429	115	7.286	192	0.903	269	0.249

IW2 2325 - 2345 RECOVERY DATA

Time	Water Level
270	0.218
271	0.218
272	0.218
273	0.218
274	0.218
275	0.218
276	0.218
277	0.186
278	0.218
279	0.218
280	0.218
281	0.218
282	0.186
283	0.249
284	0.218
285	0.186
286	0.186
287	0.186
288	0.186
289	0.186
290	0.186
291	0.186
292	0.186
293	0.155
294	0.155
295	0.155
296	0.155
297	0.155
298	0.155
299	0.155
300	0.155
301	0.155
302	0.155
303	0.155
304	0.155
305	0.155
306	0.155
307	0.124
308	0.124
309	0.124
310	0.124
311	0.124
312	0.124
313	0.124
314	0.124
315	0.124
316	0.155

IW2 2325-2345 RECOVERY



Cooper - Jocob Non-Equilibrium Recovery Analysas

ATTACHMENT 8

RECORD DRAWINGS

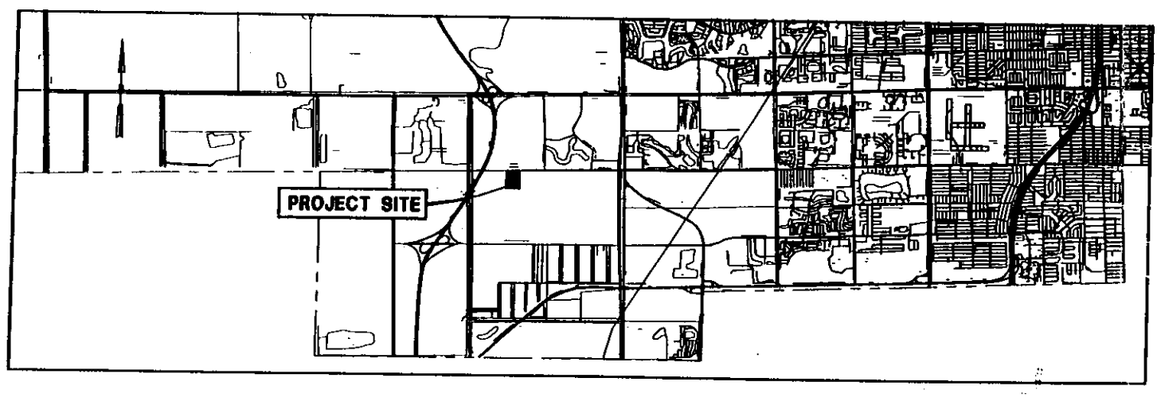
INJECTION WELLS AND MONITOR WELLS

CITY OF MIRAMAR

DEPARTMENT OF PUBLIC WORKS/UTILITIES

WASTEWATER RECLAMATION FACILITY

BID PACKAGE 2: INJECTION WELLS



LOCATION MAP
N.T.S.

CITY COMMISSION

Vicki Coceano,	Mayor
Sandra R. Lucas,	Vice-Mayor
Marjorie J. Conlan,	Commissioner
Daniel Lewis,	Commissioner
Nicolas A. Sacco Sr.,	Commissioner
Eric M. Soroka	City Manager
Lawrence J. Keating P.E.	Public Works/ Utilities Director
Stan Hochman	Director of Finance

HAZEN AND SAWYER
Environmental Engineers & Scientists

LIST OF DRAWINGS

SHT. NO.	DWG. NO.	TITLE
1	G-1	TITLE SHEET, LOCATION MAP AND LIST OF DRAWINGS
2	C-2	STAGING PLAN
3	C-1	LOCATION PLAN
4	M-1	INJECTION WELL AND FLORIDAN AQUIFER MONITOR WELL PROFILES
5	M-2	WELL HEAD DETAILS
6	S-1	INJECTION WELL 1 AND MONITOR WELL 1 PAD DETAILS
7	S-2	INJECTION WELL 2 AND MONITOR WELL 2 PAD DETAILS

VOLUME 2 - DRAWINGS

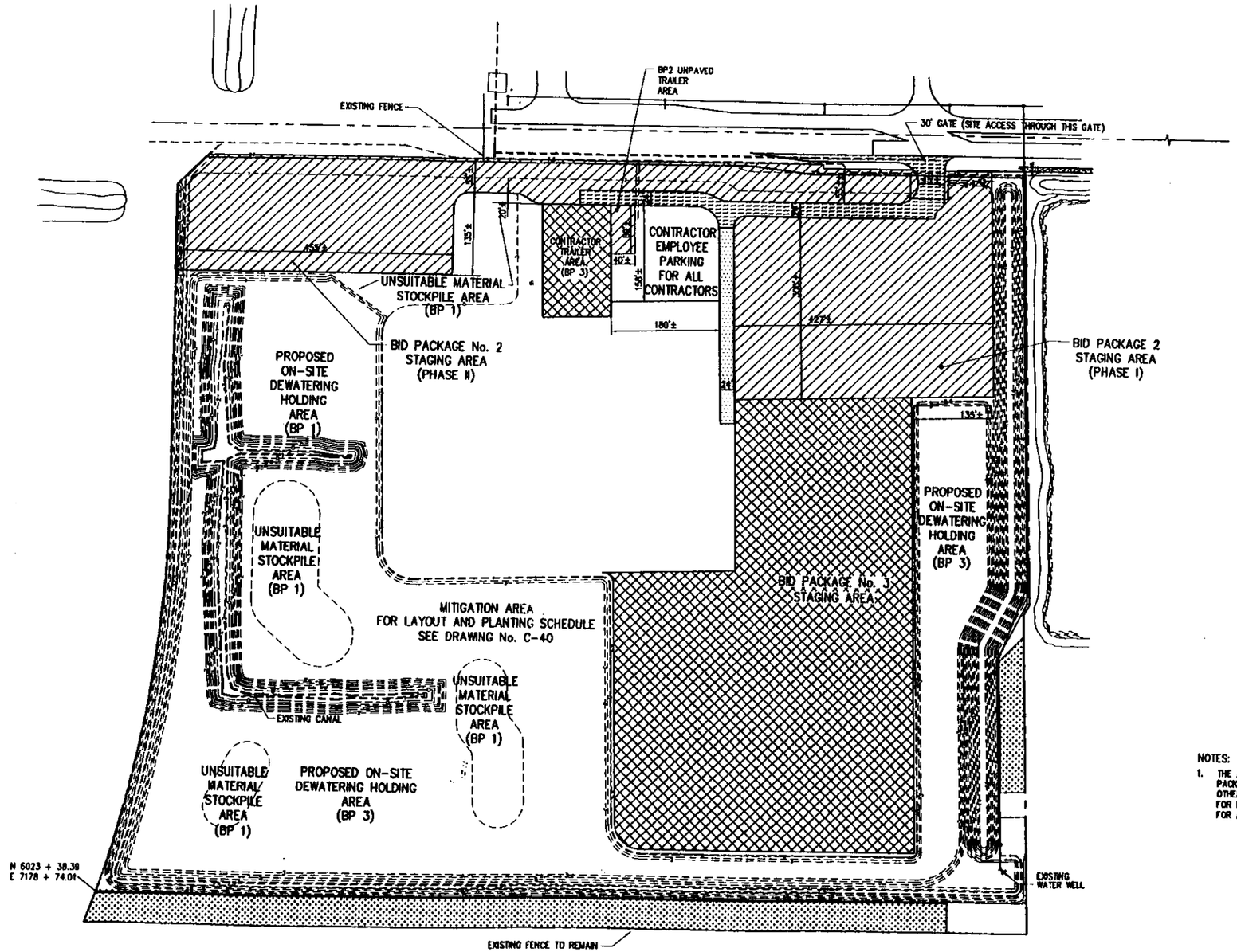
PATRICK A. DAVIS No. 37167
(CIVIL/MECHANICAL/GENERAL)

MICHAEL W. WENGRENOVICH No. 34939
(STRUCTURAL)

TITLE SHEET, LOCATION MAP
AND LIST OF DRAWINGS
SHEET 1 OF 7
DRAWING No. G-1

RECORD DRAWINGS

HAS PROJECT No. 8104 MIRAMAR WASTEWATER RECLAMATION FACILITY BID PACKAGE 2: INJECTION WELLS



LEGEND

- ACCESS ROAD (CONSTRUCTED UNDER BP 1)
- ACCESS ROAD (IMPROVED) (CONSTRUCTED UNDER BP 1)
- BID PACKAGE 2 STAGING AREA
- BID PACKAGE 3 STAGING AREA
- AREA OF NO IMPACT, (NO EARTHMOVING/FILLING OPERATIONS PERMITTED)
- EXISTING CONTOURS

NOTES:

1. THE ACCESS ROAD IS A COMMON ROAD FOR ALL BID PACKAGE CONTRACTORS AND SHALL BE MAINTAINED BY OTHERS UNTILL FEBRUARY, 1996 WHEN THE CONTRACTOR FOR BID PACKAGE No. 3 SHALL ASSUME RESPONSIBILITY FOR ALL ACCESS ROAD MAINTENANCE.

RECORD DRAWING 1"=200' 200 100 0 200'

NO.	DATE	ISSUED FOR	BY
3	3/17/97	RECORD DRAWING	PAD
2	4/12/95	CONTRACT	PAD
1	1/19/95	NEGOCIATIONS	PAD

DESIGNED M.W.W.
DRAWN S.L.M.
CHECKED M.W.W.
PROJ. ENGR. M.W.W.

PATRICK A. DAVIS P.E.
No. 37167

HAZEN AND SAWYER
Environmental Engineers & Scientists

SCALE 1"=200'

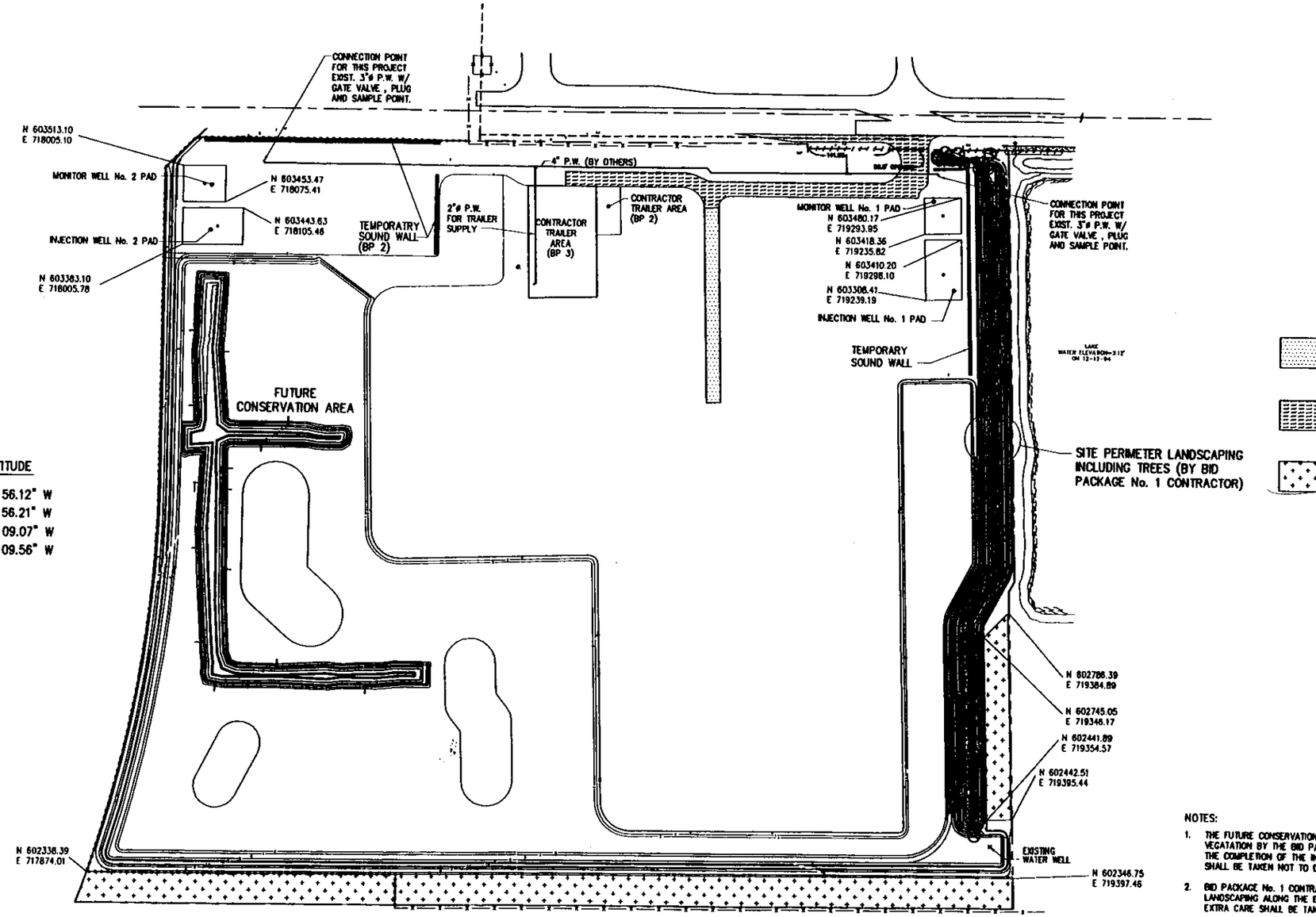
CONTRACT: 8118
CLIENTS PROJECT:
ENGINEERS PROJECT: 8118
CAD REFERENCE: 003/81D4G2

CITY OF MIRAMAR
DEPARTMENT OF PUBLIC WORKS/UTILITIES

MIRAMAR WASTEWATER RECLAMATION FACILITY
BID PACKAGE 2: INJECTION WELLS

STAGING PLAN

DATE JANUARY 1995
SHEET 2 OF 7
DRAWING G-2



WELL LOCATIONS

WELL	LATTITUDE	LONGTITUDE
IW 1	25° 59' 32.87" N	80° 19' 56.12" W
MW 1	25° 59' 33.85" N	80° 19' 56.21" W
IW 2	25° 59' 33.55" N	80° 20' 09.07" W
MW 2	25° 59' 34.25" N	80° 20' 09.56" W

LEGEND

- ACCESS ROAD
- ACCESS ROAD
- AREA OF NO IMPACT (AREA TO BE CLEARED BY BP1; NO OTHER EARTHMOVING/ FILLING OPERATIONS PERMITTED)

NOTES:

1. THE FUTURE CONSERVATION AREA WILL BE PLANTED WITH NATIVE VEGATATION BY THE BID PACKAGE No. 3 CONTRACTOR AFTER THE COMPLETION OF THE INJECTION WELLS. EXTRA CARE SHALL BE TAKEN NOT TO DISTURB THIS AREA.
2. BID PACKAGE No. 1 CONTRACTOR WILL BE PLANTING PERIMETER LANDSCAPING ALONG THE EAST PROPERTY LINE. EXTRA CARE SHALL BE TAKEN NOT TO DISTURB THE LANDSCAPING.

RECORD DRAWING 1"=200' 200 100 0 200'

NO	DATE		BY
3	3/17/97	RECORD DRAWING	P.A.D.
2	4/12/95	CONTRACT	P.A.D.
1	1/10/95	RECORDATIONS	P.A.D.

ISSUED FOR

DESIGNED M.W.W.
DRAWN S.L.M.
CHECKED M.W.W.
PROJ. ENGR M.W.W.

PATRICK A. DAVIS P.E.
No. 37187

HAZEN AND SAWYER
Environmental Engineers & Scientists

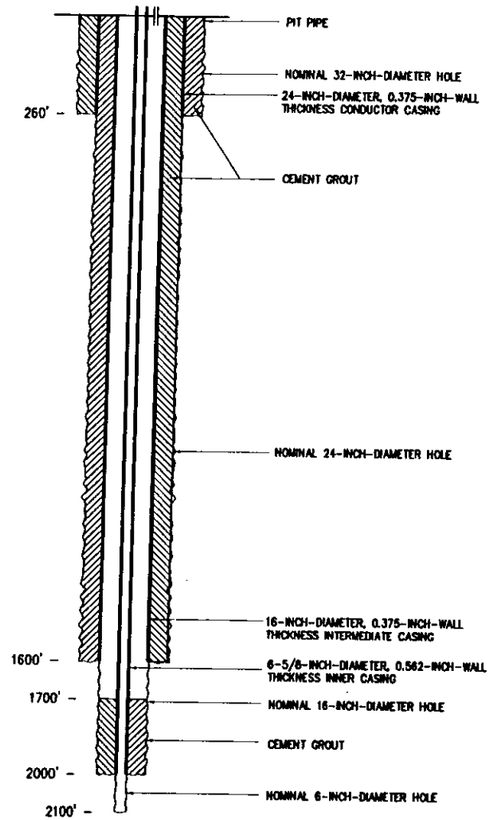
SCALE 1" = 200'

CONTRACT: 8118
CLIENTS PROJECT:
ENGINEERS PROJECT: 8118
CAD REFERENCE: 003/8104C1

CITY OF MIRAMAR
DEPARTMENT OF PUBLIC WORKS/UTILITIES

MIRAMAR WASTEWATER RECLAMATION FACILITY
BID PACKAGE 2: INJECTION WELLS
LOCATION PLAN

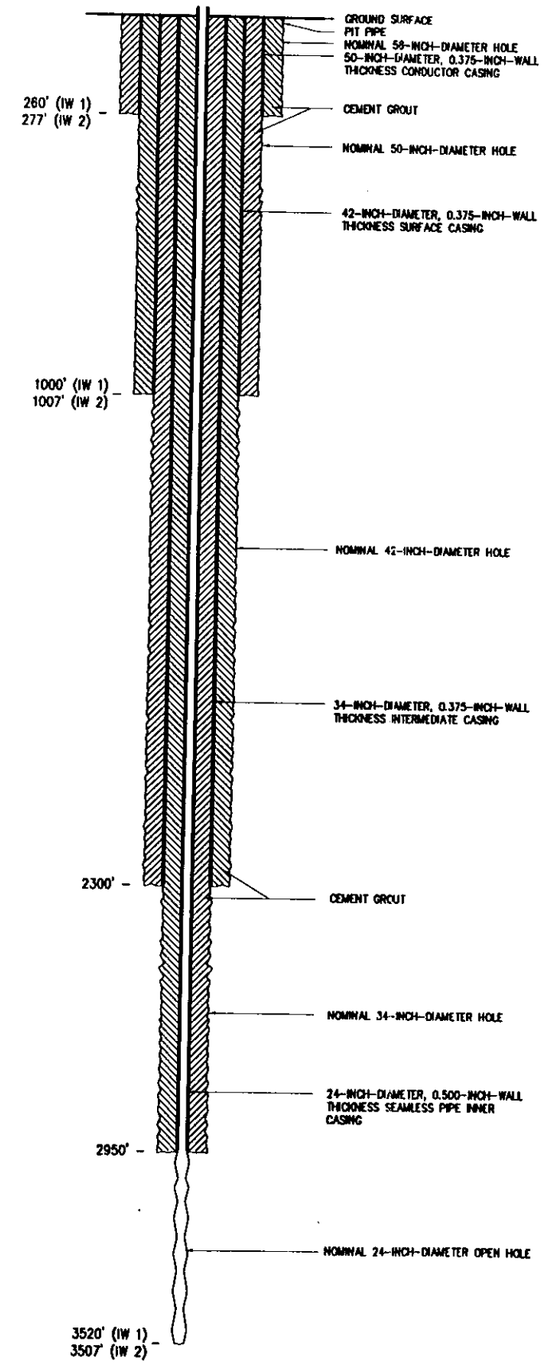
DATE JANUARY 1995
SHEET 3 OF 7
DRAWING C-1



FLORIDAN AQUIFER MONITOR WELLS

NOTE

6-5/8-INCH CASING SHALL BE EXTERNALLY COATED WITH MATCOTE EPOXY-PHENOLIC SYSTEM I-850 (INTEGARD THA 855/THA 724) OR EQUIVALENT



INJECTION WELLS

RECORD DRAWING

NO.	DATE		BY
3	3/17/97	RECORD DRAWING	PAD
2	4/12/95	CONTRACT	PAD
1	1/19/95	NEGOTIATIONS	PAD
		ISSUED FOR	

DESIGNED J.A.W.
DRAWN S.L.M.
CHECKED P.A.D.
PROJ. ENGR. M.W.W.

PATRICK A. DAVIS P.E.
No. 37187

HAZEN AND SAWYER
Environmental Engineers & Scientists

SCALE N.T.S.

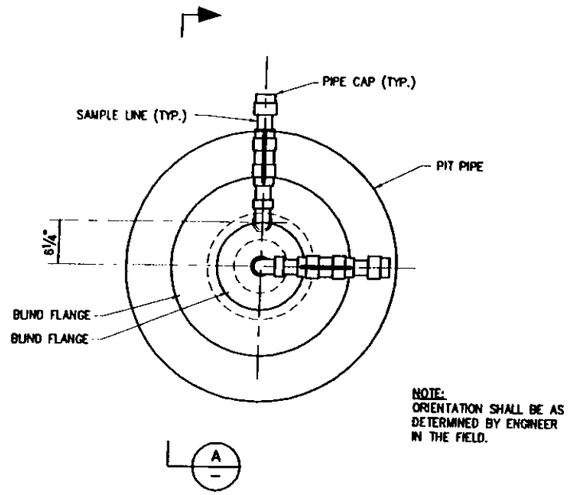
CONTRACT: 8118
CLIENTS PROJECT:
ENGINEERS PROJECT: 8118
CAD REFERENCE: 003\8104M1

CITY OF MIRAMAR
DEPARTMENT OF PUBLIC WORKS/UTILITIES

MIRAMAR WASTEWATER RECLAMATION FACILITY
BID PACKAGE 2: INJECTION WELLS
INJECTION WELL AND FLORIDAN AQUIFER MONITOR WELL PROFILES

DATE JANUARY, 1995
SHEET 4 OF 7
DRAWING M-1

3/20/1997/11:46 A.M. - 72.1MB - H:\8104\RECORD\8104M1 () 3RD'S. () - Plot Scale 1=100

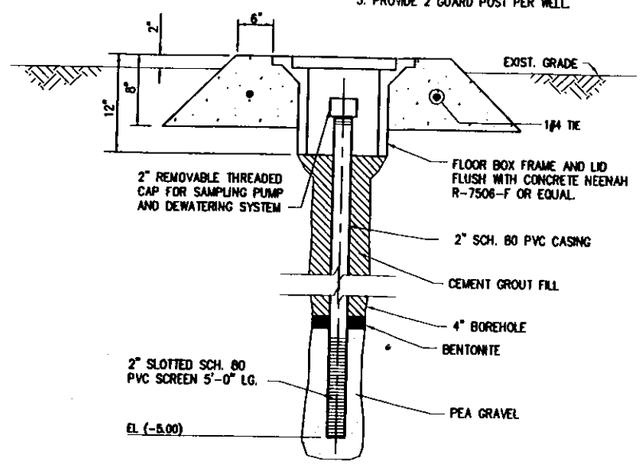


NOTE:
ORIENTATION SHALL BE AS DETERMINED BY ENGINEER IN THE FIELD.

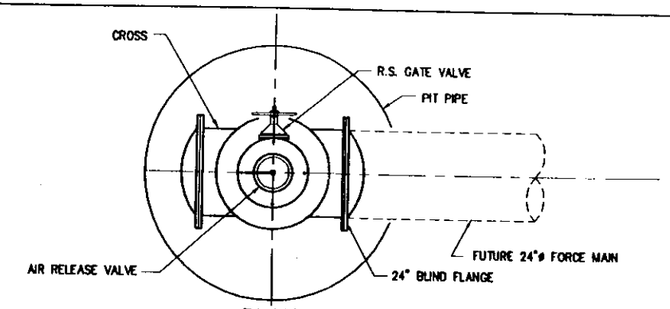
PLAN
N.T.S.

NOTE:

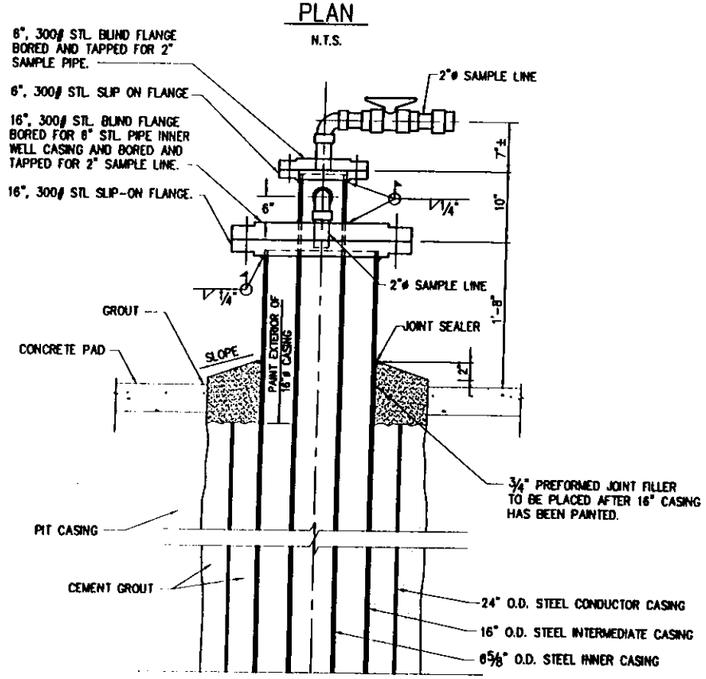
1. WELL DEPTH TO BE A MINIMUM OF 5' BELOW WATER TABLE.
2. LOCATE AS SHOWN ON DWG. S-1
3. PROVIDE 2 GUARD POST PER WELL.



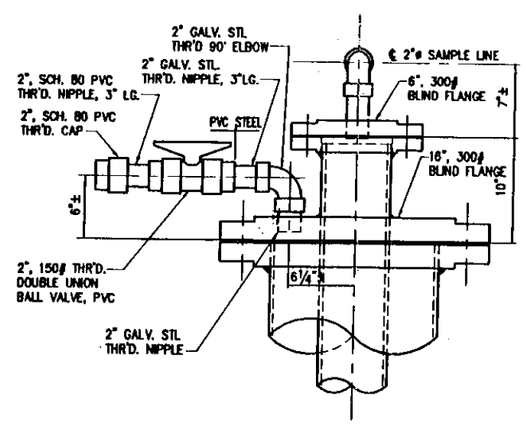
WATER TABLE
MONITORING WELL DETAIL
N.T.S.



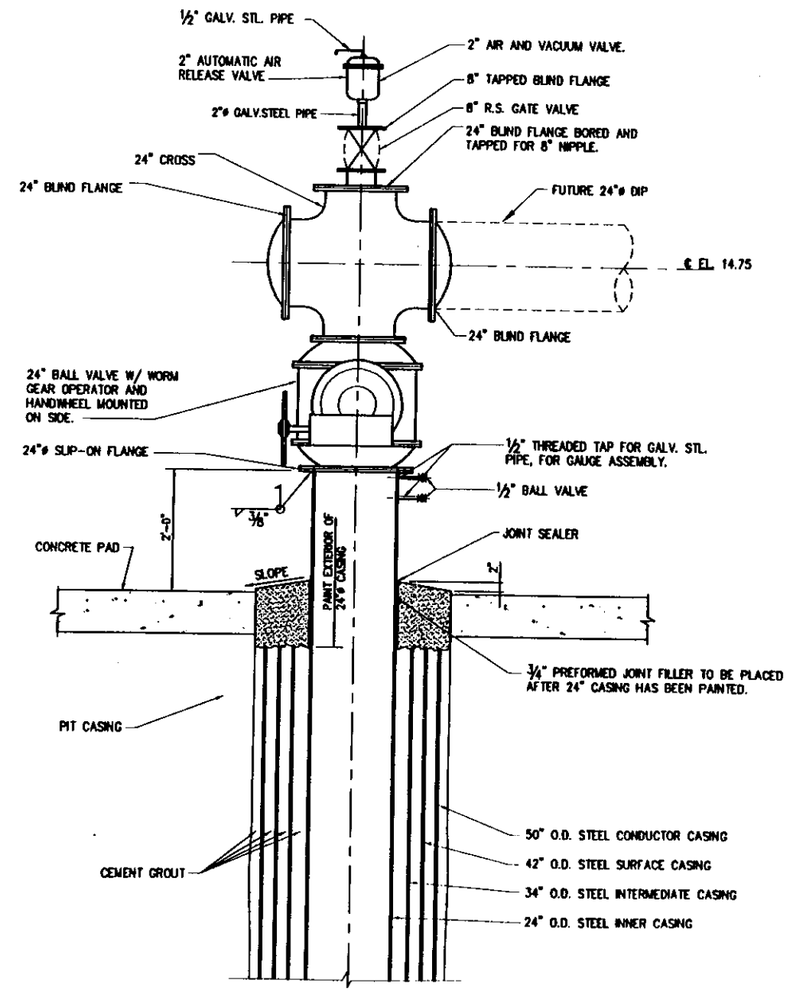
PLAN
N.T.S.



FLORIDAN AQUIFER
MONITOR WELL HEAD
N.T.S.



SECTION A
N.T.S.



INJECTION WELL HEAD
N.T.S.

RECORD DRAWING

NO.	DATE	ISSUED FOR	BY
3	3/17/97	RECORD DRAWING	PAD
2	4/12/95	CONTRACT	PAD
1	1/16/95	NEGOTIATIONS	PAD

DESIGNED M.W.W.
DRAWN S.L.M.
CHECKED P.A.D.
PROJ. ENGR. M.W.W.

PATRICK A. DAVIS P.E.
No. 37167

HAZEN AND SAWYER
Environmental Engineers & Scientists

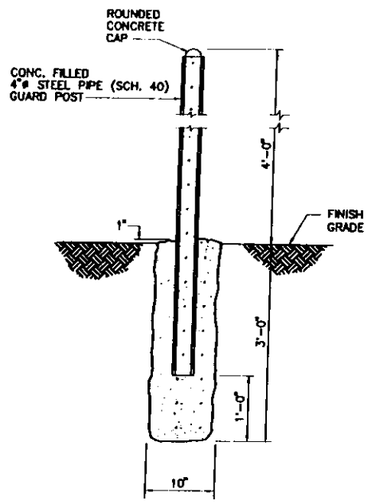
SCALE: AS NOTED

CONTRACT: 8118
CLIENTS PROJECT:
ENGINEERS PROJECT: 8118
CAD REFERENCE: 003\8104M2

CITY OF MIRAMAR
DEPARTMENT OF PUBLIC WORKS/UTILITIES

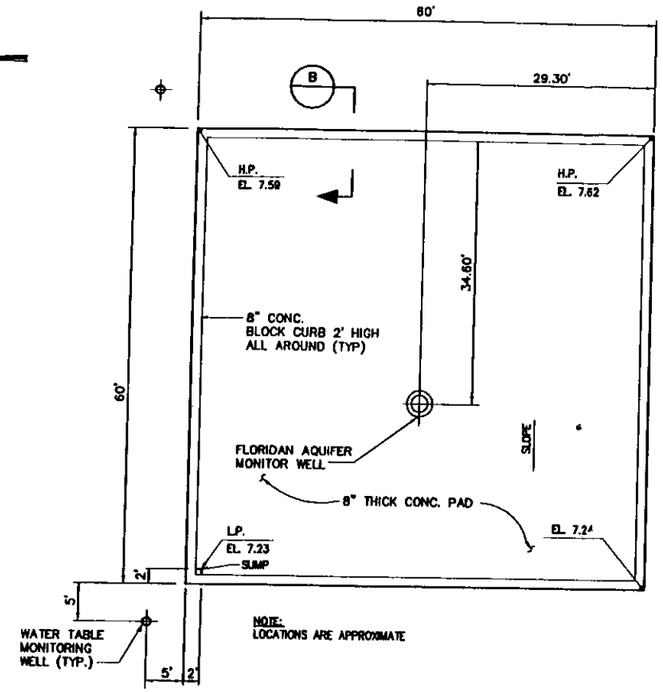
MIRAMAR WASTEWATER RECLAMATION FACILITY
BID PACKAGE 2: INJECTION WELLS
WELL HEAD DETAILS

DATE JANUARY 1995
SHEET 5 OF 7
DRAWING M-2



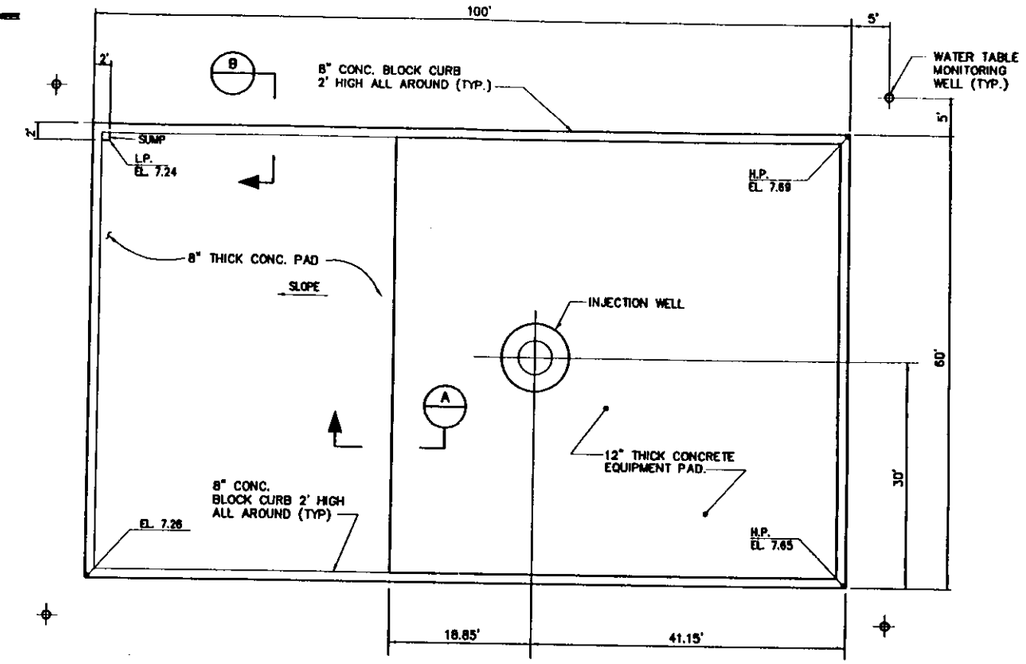
NOTE:
THE CONTRACTOR SHALL PAINT ALL BUMPER GUARDS.

GUARD POST DETAIL



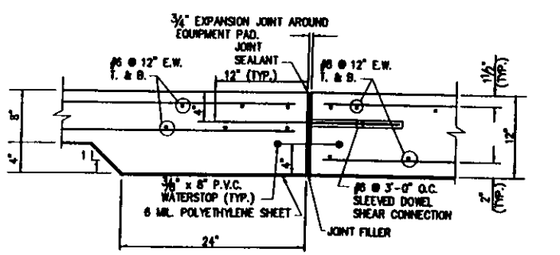
NOTE:
LOCATIONS ARE APPROXIMATE

MONITOR WELL 1 PAD
PLAN
1"=20'



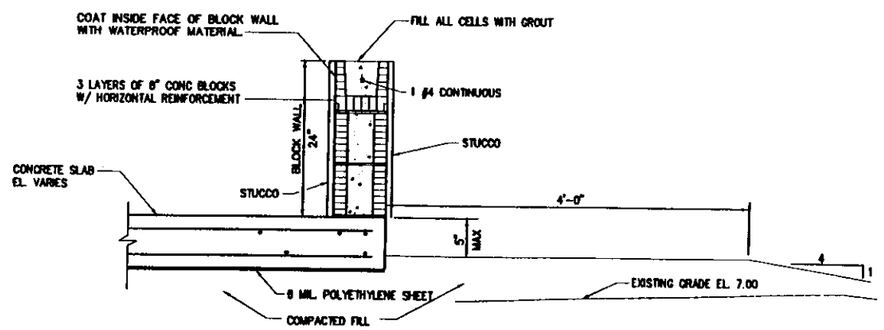
NOTES:
1. SEE DRAWING C-1 FOR WELL PAD LOCATIONS

INJECTION WELL 1 PAD
PLAN
1"=20'



NOTE:
CONTINUE JOINT THROUGH BLOCK WALL

SECTION A
N.T.S.



SECTION B
N.T.S.

RECORD DRAWING 1"=20' 20 10 0 20'

NO	DATE	ISSUED FOR	BY
4	3/17/97	RECORD DRAWING	PAD
3	7/18/95	PERMIT	PAD
2	4/12/95	CONTRACT	PAD
1	1/10/95	NEGOTIATIONS	PAD

DESIGNED A.M.W.
DRAWN S.L.M.
CHECKED M.W.W.
PROJ. ENGR. M.W.W.

MICHEL W. WENGRENOVICH P.E.
No. 34939

HAZEN AND SAWYER
Environmental Engineers & Scientists

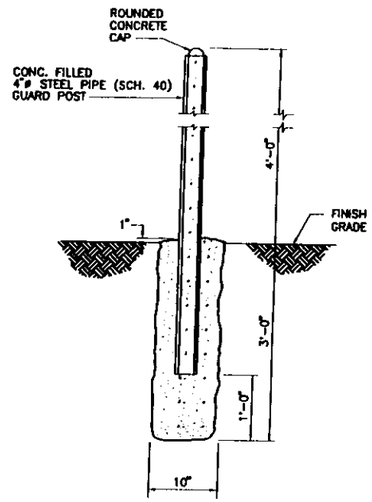
SCALE: AS NOTED

CONTRACT: 8118
CLIENTS PROJECT:
ENGINEERS PROJECT: 8118
CAD REFERENCE: 003\8104S1

CITY OF MIRAMAR
DEPARTMENT OF PUBLIC WORKS/UTILITIES

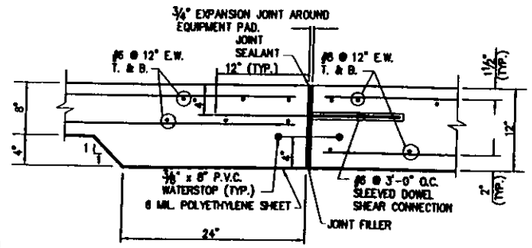
MIRAMAR WASTEWATER RECLAMATION FACILITY
BID PACKAGE 2: INJECTION WELLS
INJECTION WELL 1 AND MONITOR WELL 1 PAD DETAILS

DATE: JANUARY, 1995
SHEET 6 OF 7
DRAWING S-1



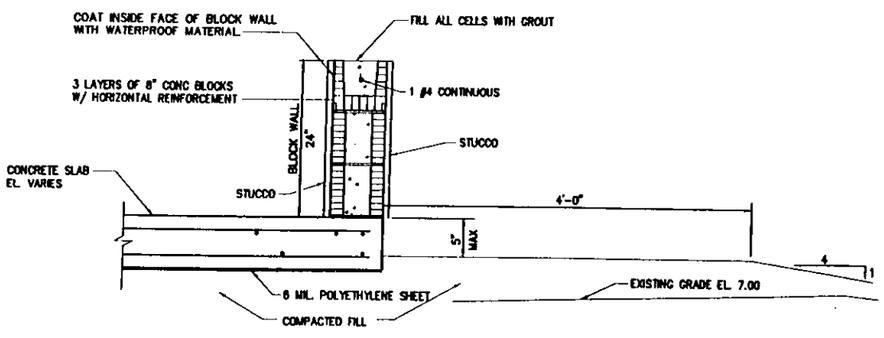
NOTE:
THE CONTRACTOR SHALL PAINT ALL BUMPER GUARDS.

GUARD POST DETAIL

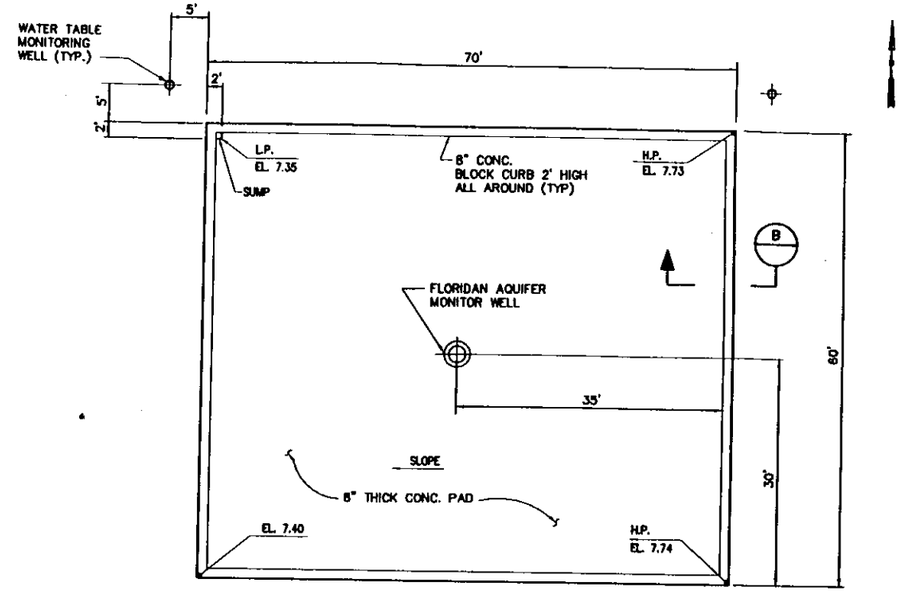


NOTE:
CONTINUE JOINT THROUGH BLOCK WALL

SECTION A
N.T.S.

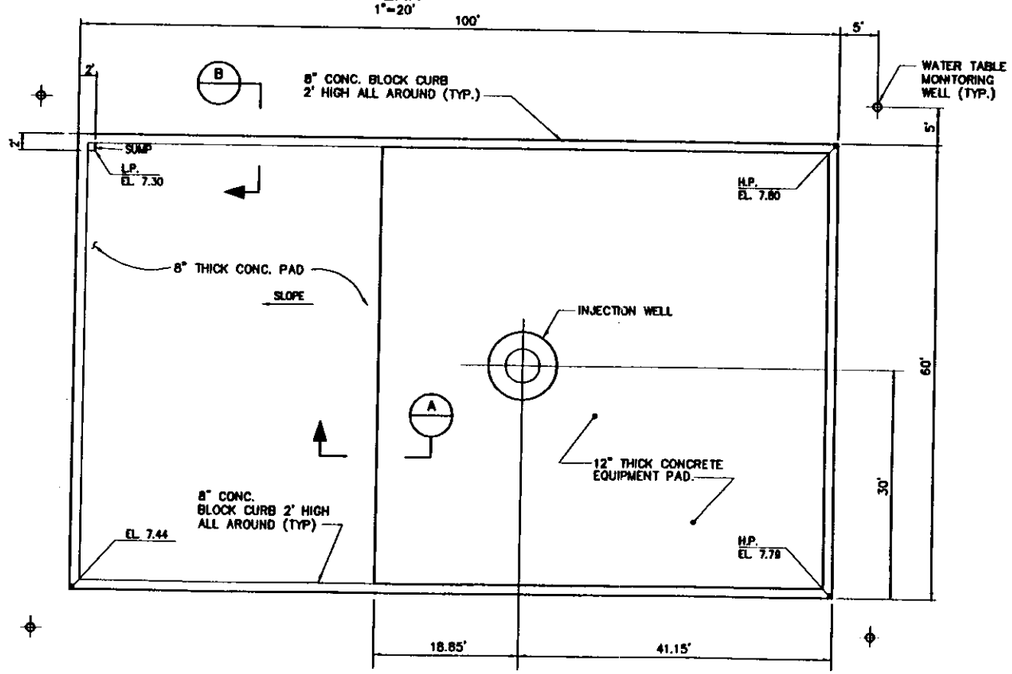


SECTION B
N.T.S.



NOTE:
LOCATIONS ARE APPROXIMATE

MONITOR WELL 2 PAD
PLAN
1"=20'



INJECTION WELL 2 PAD
PLAN
1"=20'

NOTES:
1. SEE DRAWING C-1 FOR WELL PAD LOCATIONS

RECORD DRAWING

1"=20' 20 10 0 20'

NO	DATE	ISSUED FOR	BY
4	3/17/97	RECORD DRAWING	PAD
3	7/18/95	PERMIT	PAD
2	4/12/95	CONTRACT	PAD
1	1/18/95	NEGOTIATIONS	PAD

DESIGNED A.M.W.
DRAWN S.L.M.
CHECKED M.W.W.
PROJ. ENGR M.W.W.

MICHEL W. WENGRENOVICH P.E.
No. 34939

HAZEN AND SAWYER
Environmental Engineers & Scientists

SCALE: AS NOTED

CONTRACT: 8118
CLIENTS PROJECT:
ENGINEERS PROJECT: 8118
CAD REFERENCE: 003\810452

CITY OF MIRAMAR
DEPARTMENT OF PUBLIC WORKS/UTILITIES

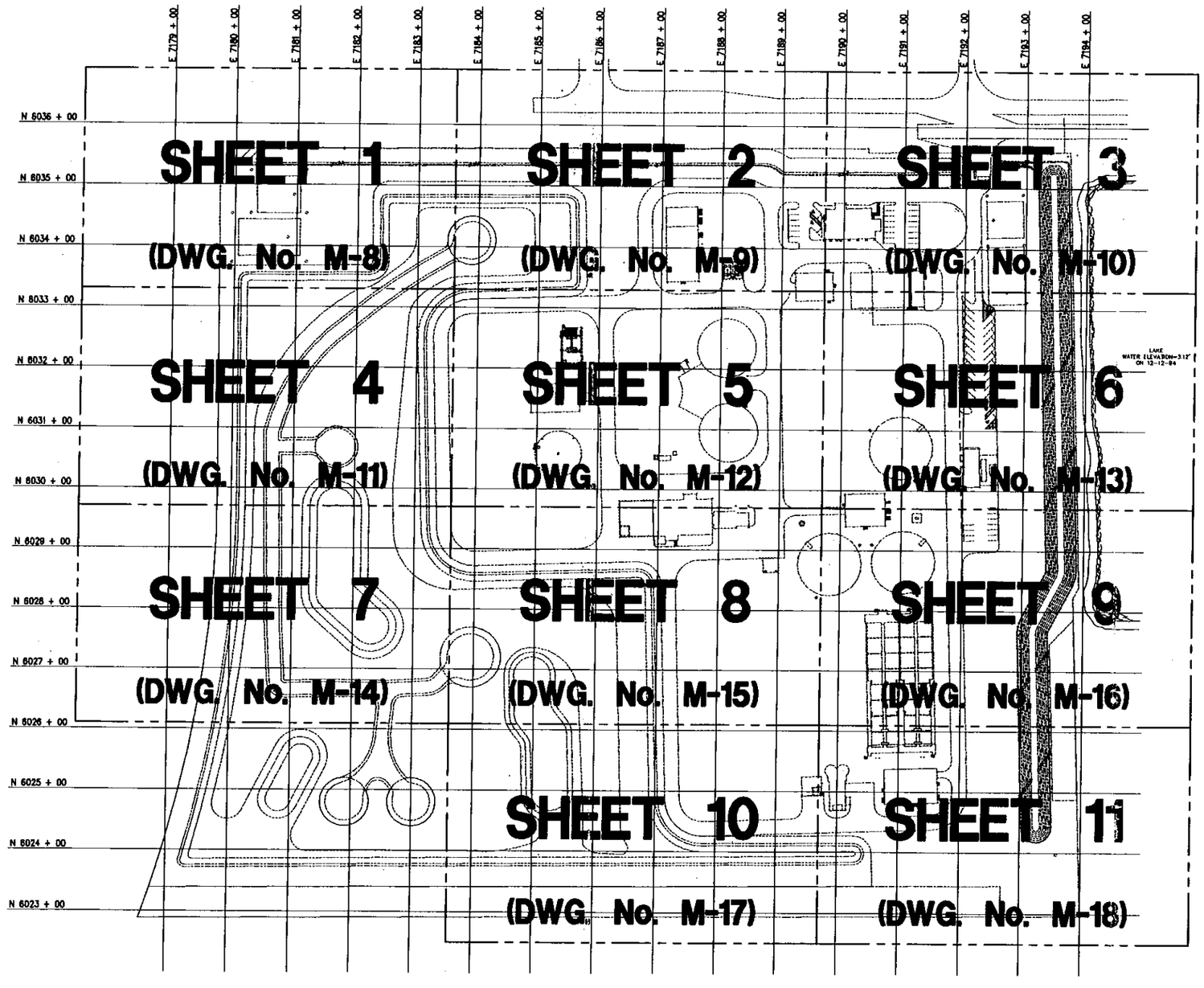
MIRAMAR WASTEWATER RECLAMATION FACILITY
BID PACKAGE 2: INJECTION WELLS
INJECTION WELL 2 AND MONITOR WELL 2 PAD DETAILS

DATE: JANUARY, 1995
SHEET 7 OF 7
DRAWING S-2

ATTACHMENT 9

SURFACE EQUIPMENT

DRAWINGS



BID DRAWINGS REVISED BASED ON AVAILABLE RECORDS OF FACILITIES CONSTRUCTED TO DATE. RECORD DRAWINGS TO BE FORWARDED UPON FINAL COMPLETION OF THE FACILITIES.

UPDATED BID DRAWINGS

1"=200' 100 50 0 100'

NO.	DATE	ISSUED FOR	BY
2	3/19/97	INJECTION WELL OPERATIONAL TESTING	H.J.V.
1	5/3/95	BIDDING	H.J.V.

DESIGNED H.J.V.
DRAWN S.L.M./H.M.
CHECKED
PROJ. ENGR. H.J.V.

H.J. VIDAL P.E.
No. 37882

HAZEN AND SAWYER
Environmental Engineers & Scientists

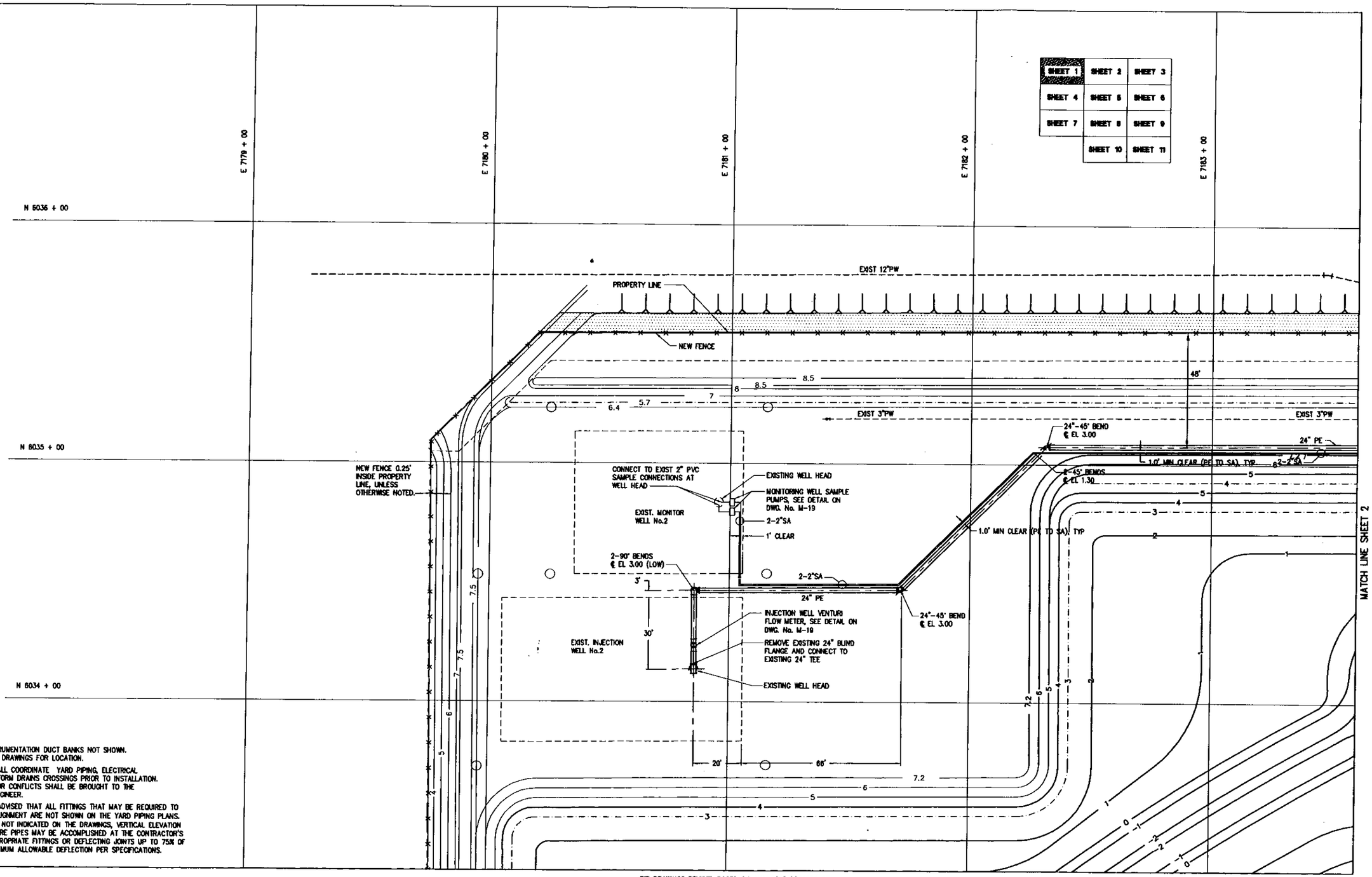
SCALE 1" = 200'

CONTRACT: 8118
CLIENTS PROJECT:
ENGINEERS PROJECT: 8118
CAD REFERENCE: 8136W7

CITY OF MIRAMAR
DEPARTMENT OF PUBLIC WORKS/UTILITIES

MIRAMAR WASTEWATER RECLAMATION FACILITY
BID PACKAGE 3: TREATMENT WORKS
YARD PIPING
KEY MAP

DATE: MAY 1995
SHEET: 57 OF 565
DRAWING: M-7



NOTES:

1. ELECTRICAL AND INSTRUMENTATION DUCT BANKS NOT SHOWN. REFER TO ELECTRICAL DRAWINGS FOR LOCATION.
2. THE CONTRACTOR SHALL COORDINATE YARD PIPING, ELECTRICAL DUCTS BANKS AND STORM DRAINS CROSSINGS PRIOR TO INSTALLATION. ANY INTERFERENCES OR CONFLICTS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER.
3. THE CONTRACTOR IS ADVISED THAT ALL FITTINGS THAT MAY BE REQUIRED TO MAKE UP VERTICAL ALIGNMENT ARE NOT SHOWN ON THE YARD PIPING PLANS. WHERE REQUIRED AND NOT INDICATED ON THE DRAWINGS, VERTICAL ELEVATION CHANGES FOR PRESSURE PIPES MAY BE ACCOMPLISHED AT THE CONTRACTOR'S OPTION BY USING APPROPRIATE FITTINGS OR DEFLECTING JOINTS UP TO 75% OF MANUFACTURER'S MAXIMUM ALLOWABLE DEFLECTION PER SPECIFICATIONS.

BID DRAWINGS REVISED BASED ON AVAILABLE RECORDS OF FACILITIES CONSTRUCTED TO DATE. RECORD DRAWINGS TO BE FORWARDED UPON FINAL COMPLETION OF THE FACILITIES.

UPDATED BID DRAWINGS

1"=40'

20 10 0 20'

NO.	DATE	ISSUED FOR	BY
3	3/19/97	INJECTION WELL OPERATIONAL TESTING	H.J.V.
2	5/31/95	ADDENDUM No. 2	H.J.V.
1	5/3/95	BIDDING	H.J.V.

DESIGNED R.H.C.
DRAWN S.L.M./H.M.
CHECKED
PROJ. ENGR. H.J.V.

H.J. VIDAL P.E.
No. 37882

HAZEN AND SAWYER
Environmental Engineers & Scientists

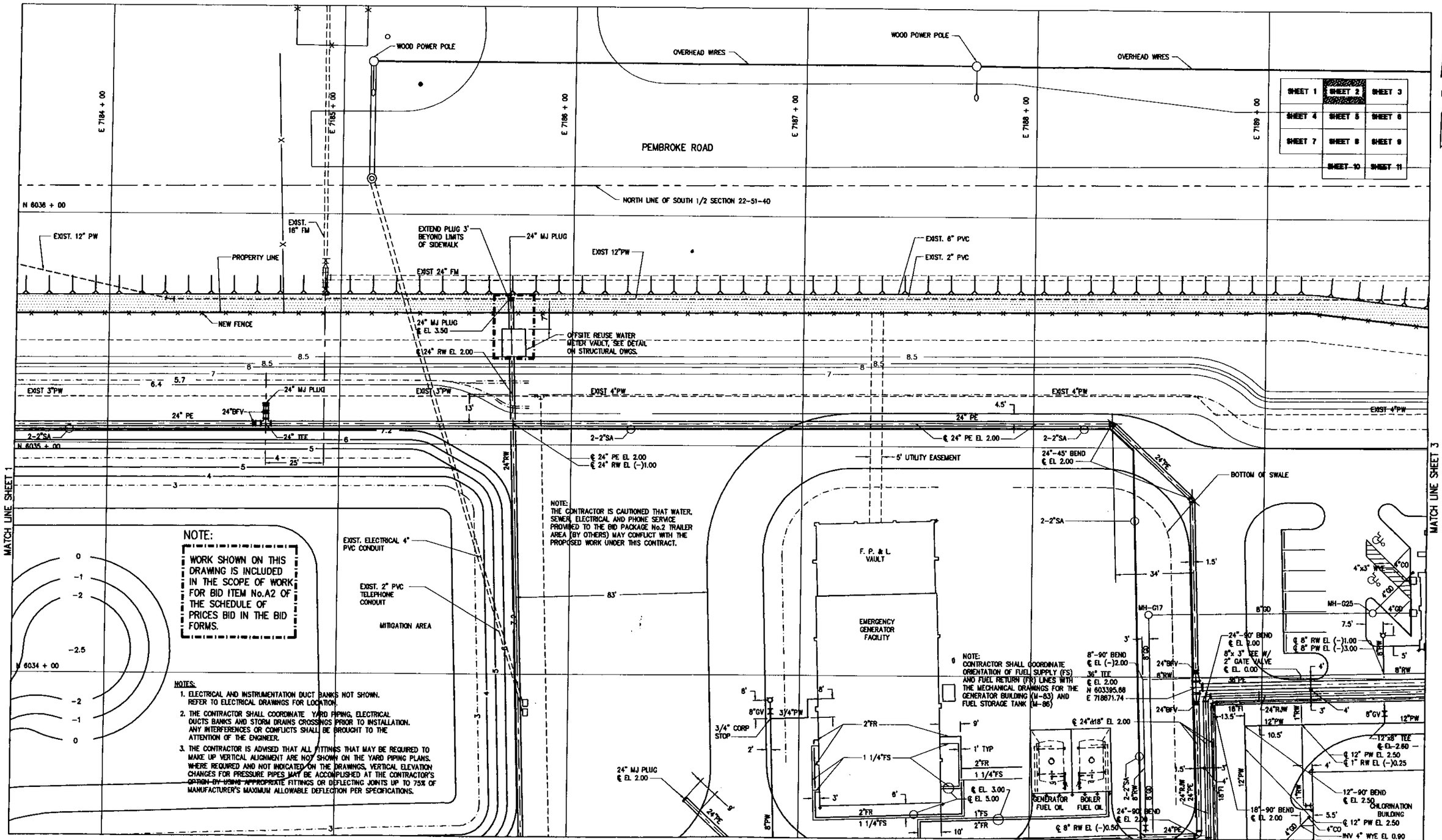
SCALE 1" = 40'

CONTRACT: 8118
CLIENTS PROJECT:
ENGINEERS PROJECT: 8118
CAD REFERENCE: 8136MB

CITY OF MIRAMAR
DEPARTMENT OF PUBLIC WORKS/UTILITIES

MIRAMAR WASTEWATER RECLAMATION FACILITY
BID PACKAGE 3: TREATMENT WORKS
YARD PIPING
SHEET 1

DATE: MAY 1995
SHEET: 58 OF 565
DRAWING: M-8



BID DRAWINGS REVISED BASED ON AVAILABLE RECORDS OF FACILITIES CONSTRUCTED TO DATE. RECORD DRAWINGS TO BE FORWARDED UPON FINAL COMPLETION OF THE FACILITIES.

UPDATED BID DRAWINGS

1"=40'

20 10 0 20'

NO.	DATE	ISSUED FOR	BY
3	3/19/97	INJECTION WELL OPERATIONAL TESTING	H.J.V.
2	5/31/95	ADDENDUM No. 2	H.J.V.
1	5/3/95	BIDDING	H.J.V.

DESIGNED R.H.C.
DRAWN S.L.M.
CHECKED
PROJ. ENGR. H.J.V.

H.J. VIDAL P.E.
No. 37882

HAZEN AND SAWYER
Environmental Engineers & Scientists

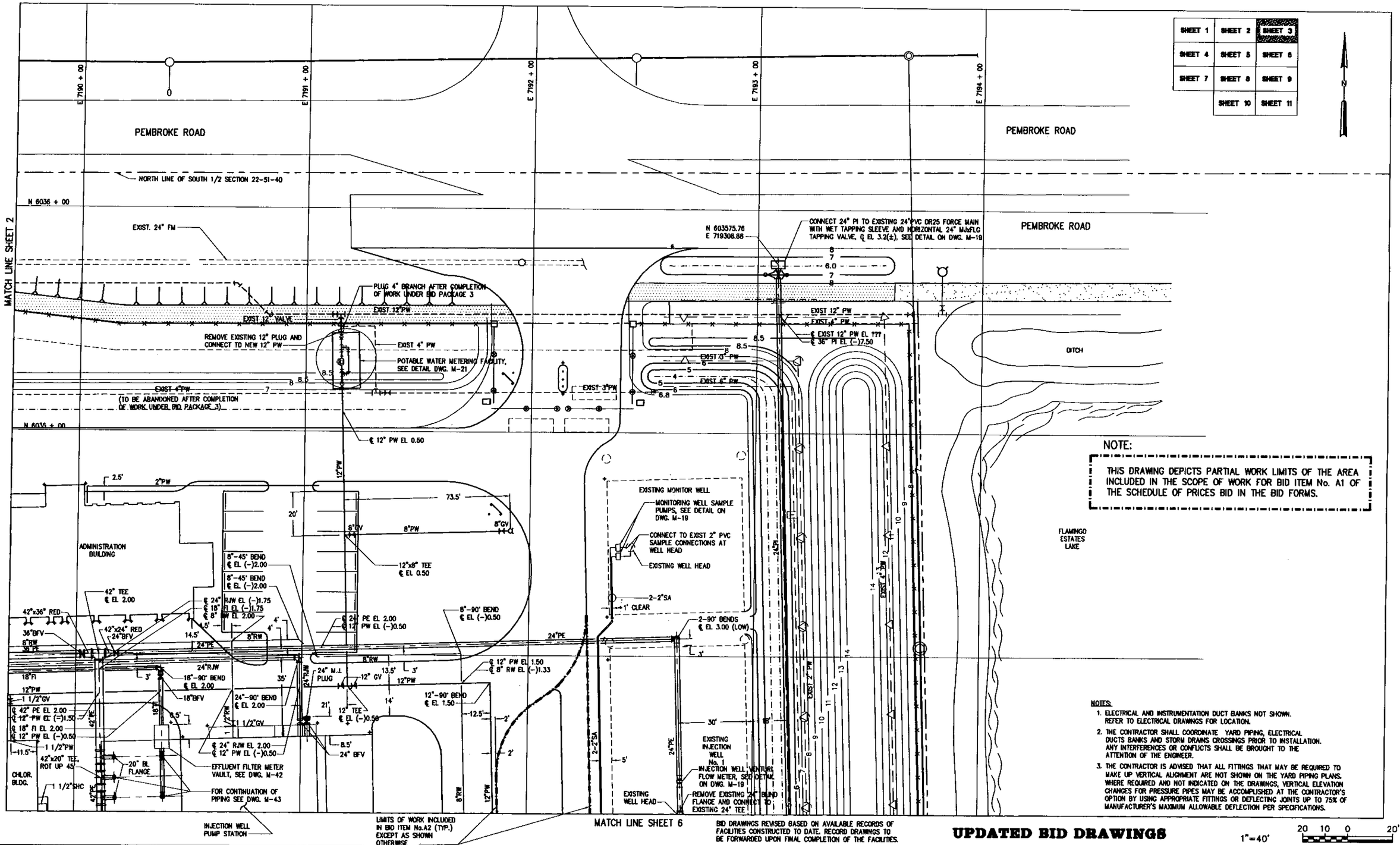
SCALE 1" = 40'

CONTRACT: 8118
CLIENTS PROJECT:
ENGINEERS PROJECT: 8118
CAD REFERENCE: 8136M9

CITY OF MIRAMAR
DEPARTMENT OF PUBLIC WORKS/UTILITIES

MIRAMAR WASTEWATER RECLAMATION FACILITY
BID PACKAGE 3: TREATMENT WORKS
YARD PIPING
SHEET 2

DATE: MAY 1995
SHEET: 59 OF 565
DRAWING: M-9



NOTES:

1. ELECTRICAL AND INSTRUMENTATION DUCT BANKS NOT SHOWN. REFER TO ELECTRICAL DRAWINGS FOR LOCATION.
2. THE CONTRACTOR SHALL COORDINATE YARD PIPING, ELECTRICAL DUCTS BANKS AND STORM DRAINS CROSSINGS PRIOR TO INSTALLATION. ANY INTERFERENCES OR CONFLICTS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER.
3. THE CONTRACTOR IS ADVISED THAT ALL FITTINGS THAT MAY BE REQUIRED TO MAKE UP VERTICAL ALIGNMENT ARE NOT SHOWN ON THE YARD PIPING PLANS. WHERE REQUIRED AND NOT INDICATED ON THE DRAWINGS, VERTICAL ELEVATION CHANGES FOR PRESSURE PIPES MAY BE ACCOMPLISHED AT THE CONTRACTOR'S OPTION BY USING APPROPRIATE FITTINGS OR DEFLECTING JOINTS UP TO 75% OF MANUFACTURER'S MAXIMUM ALLOWABLE DEFLECTION PER SPECIFICATIONS.

NO.	DATE	ISSUED FOR	BY
4	3/19/97	INJECTION WELL OPERATIONAL TESTING	H.J.V.
3	10/19/95	CONTRACT DOCUMENT CLARIFICATION	H.J.V.
2	5/31/95	ADDENDUM No. 2	H.J.V.
1	5/3/95	BIDDING	H.J.V.

DESIGNED R.H.C
DRAWN S.L.M./H.M.
CHECKED
PROJ. ENGR. H.J.V.

H.J. VIDAL P.E.
No. 37882

HAZEN AND SAWYER
Environmental Engineers & Scientists

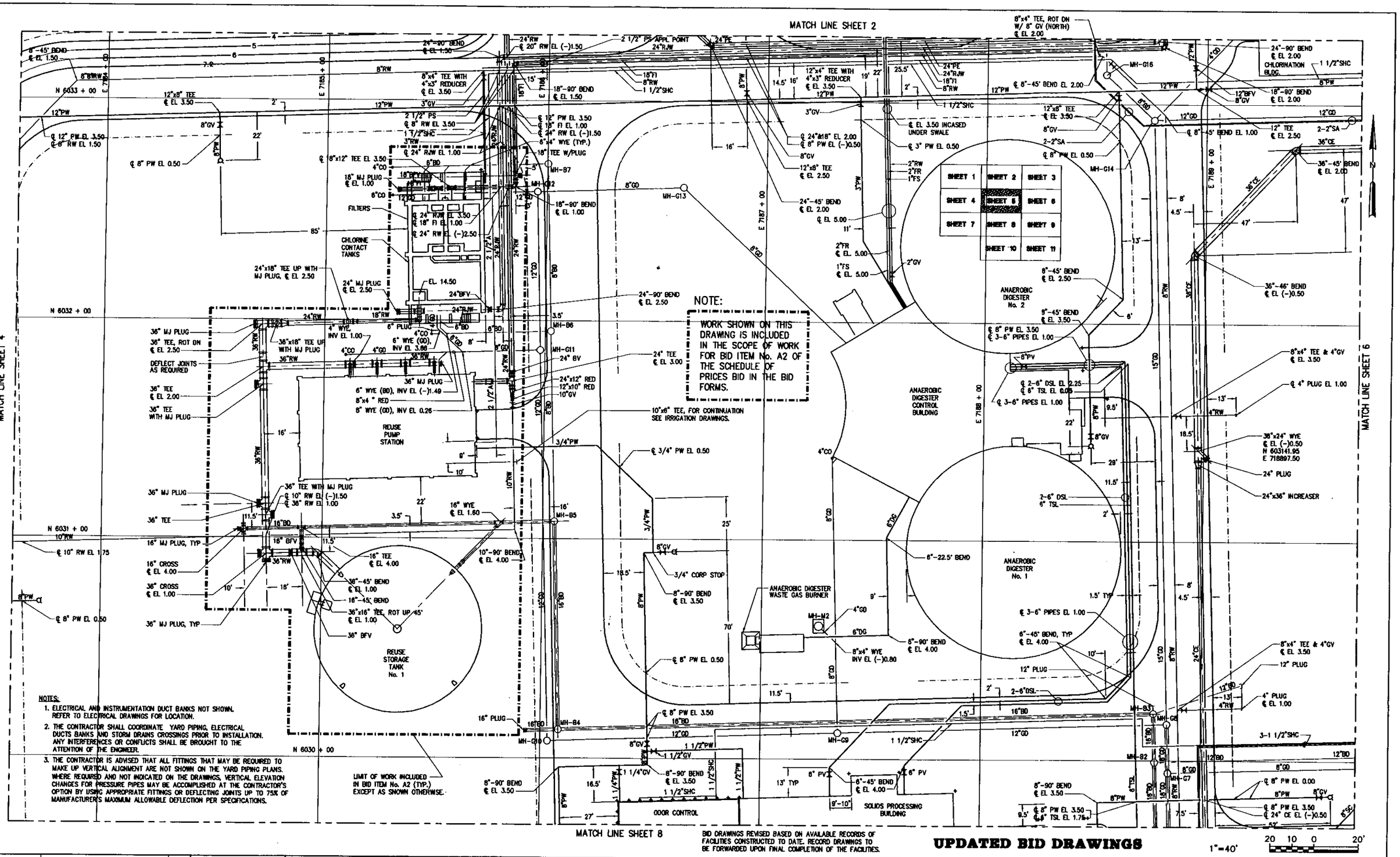
SCALE 1" = 40'

CONTRACT: 8118
CLIENTS PROJECT:
ENGINEERS PROJECT: 8118
CAD REFERENCE: 8136M10

CITY OF MIRAMAR
DEPARTMENT OF PUBLIC WORKS/UTILITIES

MIRAMAR WASTEWATER RECLAMATION FACILITY
BID PACKAGE 3: TREATMENT WORKS
YARD PIPING
SHEET 3

DATE: MAY 1995
SHEET: 60 OF 565
DRAWING: M-10



NOTES:

1. ELECTRICAL AND INSTRUMENTATION DUCT BANKS NOT SHOWN. REFER TO ELECTRICAL DRAWINGS FOR LOCATION.
2. THE CONTRACTOR SHALL COORDINATE YARD PIPING, ELECTRICAL DUCTS BANKS AND STORM DRAINS CROSSINGS PRIOR TO INSTALLATION. ANY INTERFERENCES OR CONFLICTS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER.
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BID DRAWINGS REVISED BASED ON AVAILABLE RECORDS OF FACILITIES CONSTRUCTED TO DATE. RECORD DRAWINGS TO BE FORWARDED UPON FINAL COMPLETION OF THE FACILITIES.

UPDATED BID DRAWINGS

NO.	DATE	ISSUED FOR	BY
5	3/19/97	INJECTION WELL OPERATIONAL TESTING	H.J.V.
4	2/20/97	CONTRACT CLARIFICATION	H.J.V.
3	6/11/96	CONTRACT CLARIFICATION	H.J.V.
2	5/31/95	ADDENDUM No. 2	H.J.V.
1	5/3/95	BIDDING	H.J.V.

DESIGNED R.H.C.
DRAWN S.L.M./H.M.
CHECKED
PROJ. ENGR. H.J.V.

H.J. VIDAL P.E.
No. 37882

HAZEN AND SAWYER
Environmental Engineers & Scientists

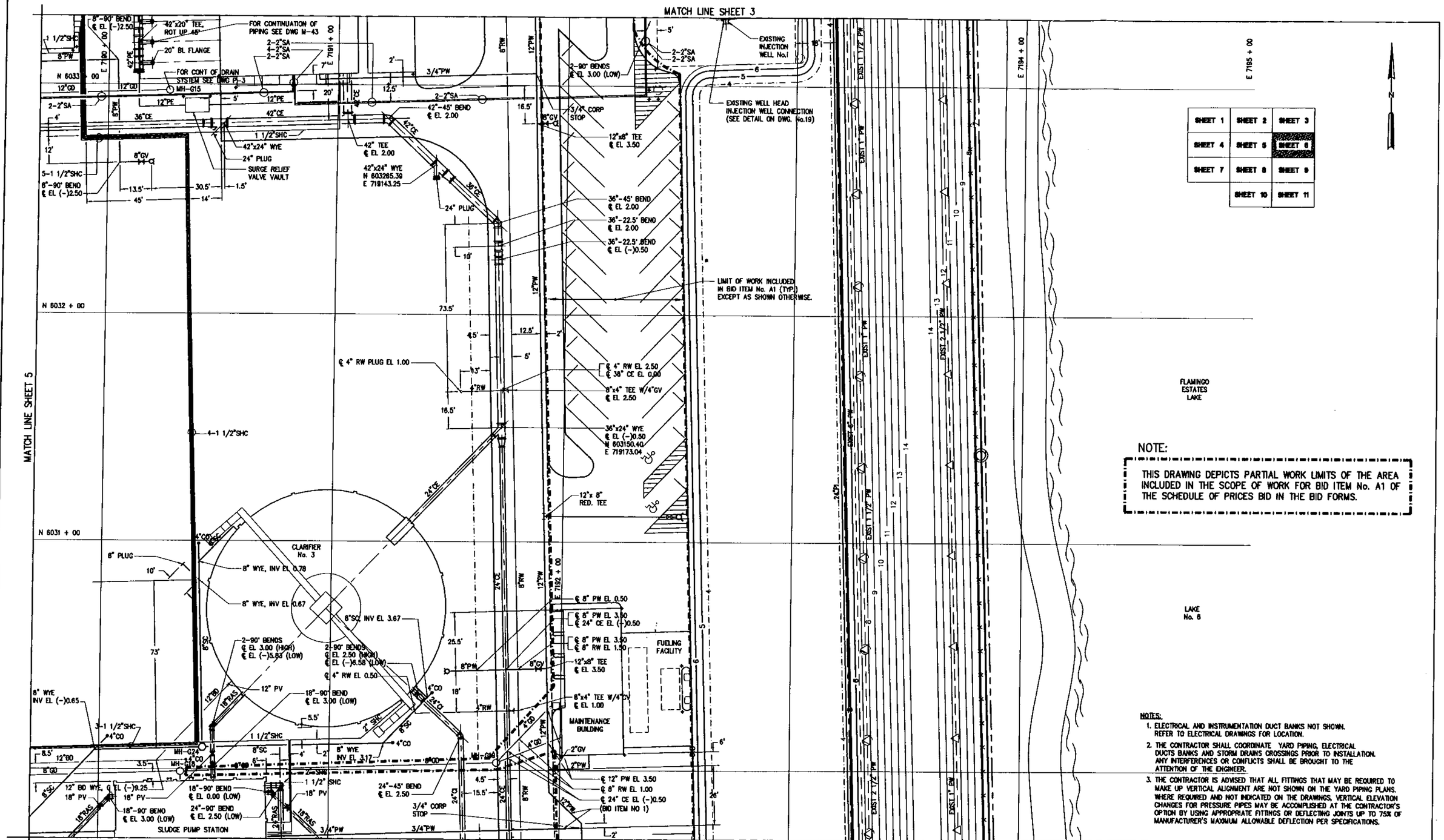
SCALE 1" = 40'

CONTRACT: 8118
CLIENTS PROJECT:
ENGINEERS PROJECT: 8118
CAD REFERENCE: B136M12

CITY OF MIRAMAR
DEPARTMENT OF PUBLIC WORKS/UTILITIES

MIRAMAR WASTEWATER RECLAMATION FACILITY
BID PACKAGE 3: TREATMENT WORKS
YARD PIPING
SHEET 5

DATE: MAY 1995
SHEET 62 OF 565
DRAWING: M-12



NOTE:

THIS DRAWING DEPICTS PARTIAL WORK LIMITS OF THE AREA INCLUDED IN THE SCOPE OF WORK FOR BID ITEM No. A1 OF THE SCHEDULE OF PRICES BID IN THE BID FORMS.

NOTES:

1. ELECTRICAL AND INSTRUMENTATION DUCT BANKS NOT SHOWN. REFER TO ELECTRICAL DRAWINGS FOR LOCATION.
2. THE CONTRACTOR SHALL COORDINATE YARD PIPING, ELECTRICAL DUCTS BANKS AND STORM DRAINS CROSSINGS PRIOR TO INSTALLATION. ANY INTERFERENCES OR CONFLICTS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER.
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BID DRAWINGS REVISED BASED ON AVAILABLE RECORDS OF FACILITIES CONSTRUCTED TO DATE. RECORD DRAWINGS TO BE FORWARDED UPON FINAL COMPLETION OF THE FACILITIES.

UPDATED BID DRAWINGS

1"=40'

20 10 0 20'

NO.	DATE	ISSUED FOR	BY
3	3/10/97	INJECTION WELL OPERATIONAL TESTING	H.J.V.
2	6/08/95	ADDENDUM No. 3	H.J.V.
1	5/3/95	BIDDING	H.J.V.

DESIGNED R.H.C.
DRAWN S.L.M./H.M.
CHECKED
PROJ. ENGR. H.J.V.

H.J. VIDAL P.E.
No. 37882

HAZEN AND SAWYER
Environmental Engineers & Scientists

SCALE 1" = 40'

CONTRACT: 8118
CLIENTS PROJECT:
ENGINEERS PROJECT: 8118
CAD REFERENCE: 8136MI3

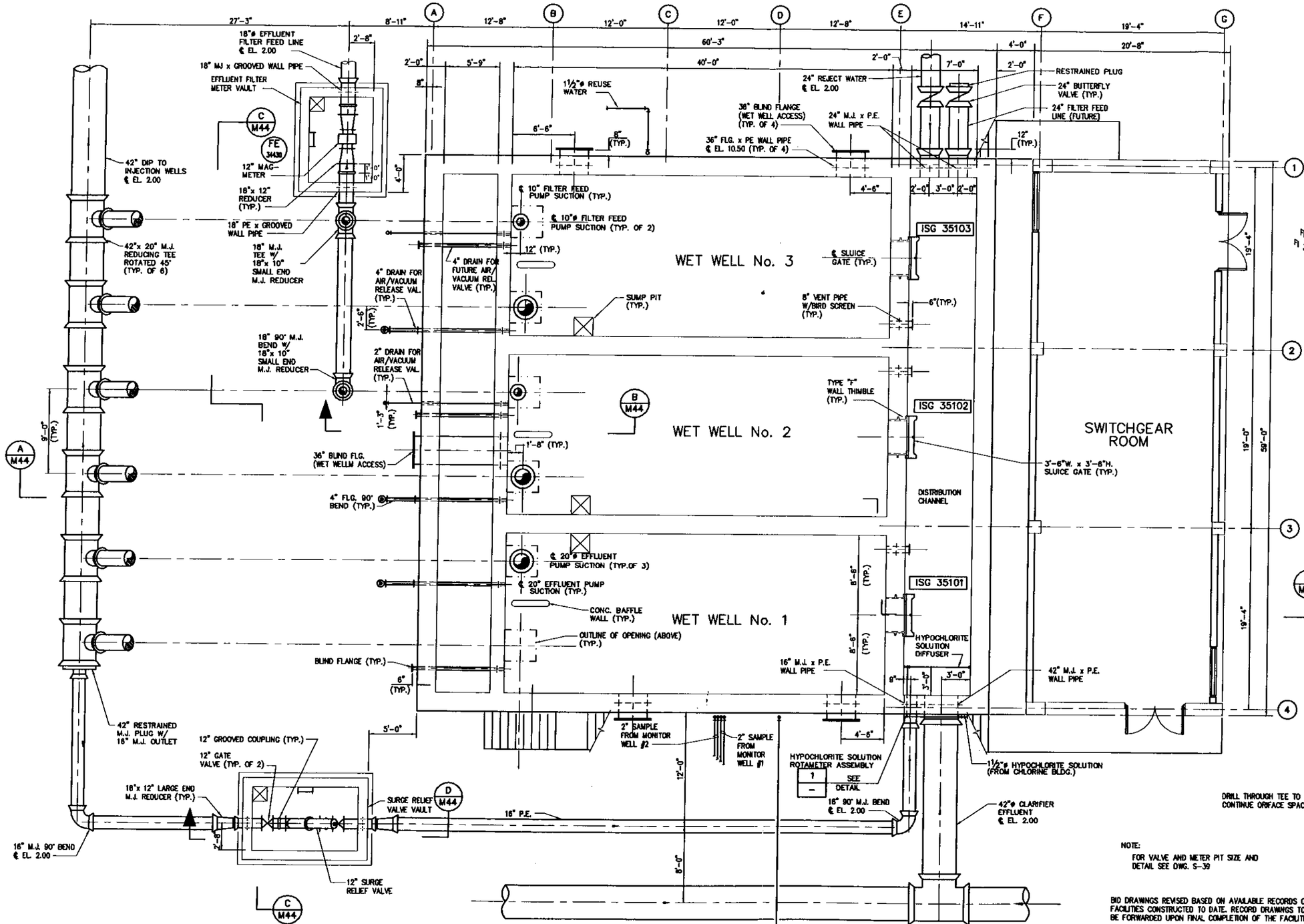
CITY OF MIRAMAR
DEPARTMENT OF PUBLIC WORKS/UTILITIES

MIRAMAR WASTEWATER RECLAMATION FACILITY
BID PACKAGE 3: TREATMENT WORKS
YARD PIPING
SHEET 6

DATE: MAY 1995
SHEET: 63 OF 565
DRAWING: M-13

ATTACHMENT 10

GENERATOR SINGLE LINE DIAGRAM



	DISTRIBUTION CHANNEL
CHANNEL WIDTH	7'-0"
DROP PIPE SIZE	1" DIA.
DIFFUSER SIZE	1" DIA.
ORIFICES SIZE & SPACING	¼"ø @ 3" O.C.
PLANE OF ORIFACES	HORIZONTAL
NUMBER REQUIRED	1

NOTE:
FOR VALVE AND METER PIT SIZE AND DETAIL SEE DWG. S-39

BID DRAWINGS REVISED BASED ON AVAILABLE RECORDS OF FACILITIES CONSTRUCTED TO DATE. RECORD DRAWINGS TO BE FORWARDED UPON FINAL COMPLETION OF THE FACILITIES.

UPDATED BID DRAWINGS

NO	DATE	ISSUED FOR	BY
2	3/19/97	INJECTION WELL OPERATIONAL TESTING	H.J.V.
1	5/3/95	BIDDING	H.J.V.

DESIGNED H.J.V.
DRAWN S.L.M.
CHECKED
PROJ. ENGR. H.J.V.

H.J. VIDAL P.E.
No. 37882

HAZEN AND SAWYER
Environmental Engineers & Scientists

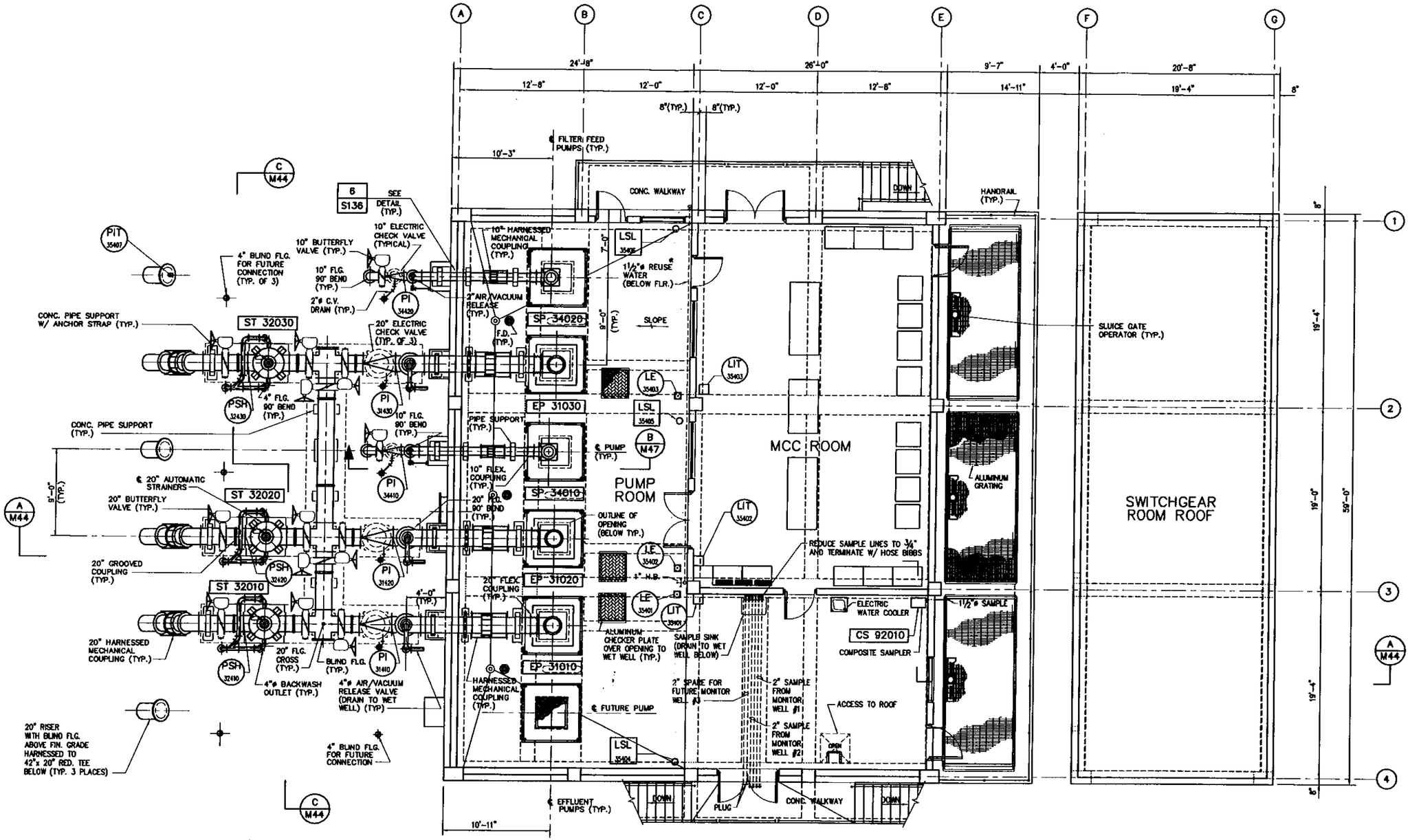
SCALE 3/32"=1'-0"

CONTRACT: 8118
CLIENTS PROJECT:
ENGINEERS PROJECT: 8118
CAD REFERENCE: 8136M42

CITY OF MIRAMAR
DEPARTMENT OF PUBLIC WORKS/UTILITIES

MIRAMAR WASTEWATER RECLAMATION FACILITY
BID PACKAGE 3: TREATMENT WORKS
INJECTION WELL PUMP STATION
LOWER LEVEL – PLAN

DATE: MAY 1995
SHEET: 92 OF 565
DRAWING: M-42



FIRST FLOOR – PLAN

3/32"=1'-0"

BID DRAWINGS REVISED BASED ON AVAILABLE RECORDS OF FACILITIES CONSTRUCTED TO DATE. RECORD DRAWINGS TO BE FORWARDED UPON FINAL COMPLETION OF THE FACILITIES.

UPDATED BID DRAWINGS

3/32"=1'-0" 6 4 2 0 6'

NO.	DATE	ISSUED FOR	BY
2	3/19/97	INJECTION WELL OPERATIONAL TESTING	H.J.V.
1	5/3/95	BIDDING	H.J.V.

DESIGNED H.J.V.
DRAWN S.L.M.
CHECKED
PROJ. ENGR. H.J.V.

H.J. VIDAL P.E.
No. 37882

HAZEN AND SAWYER
Environmental Engineers & Scientists

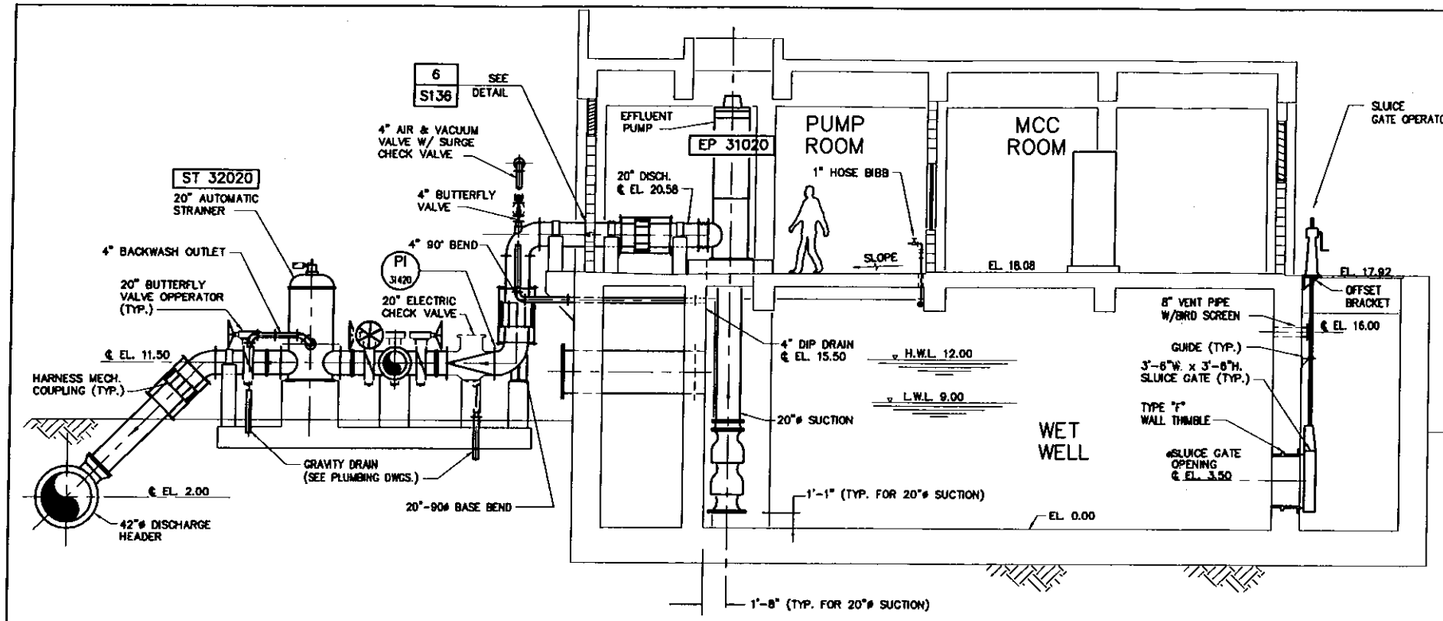
SCALE 3/32"=1'-0"

CONTRACT: 8118
CLIENTS PROJECT:
ENGINEERS PROJECT: 8118
CAD REFERENCE: 8135M43

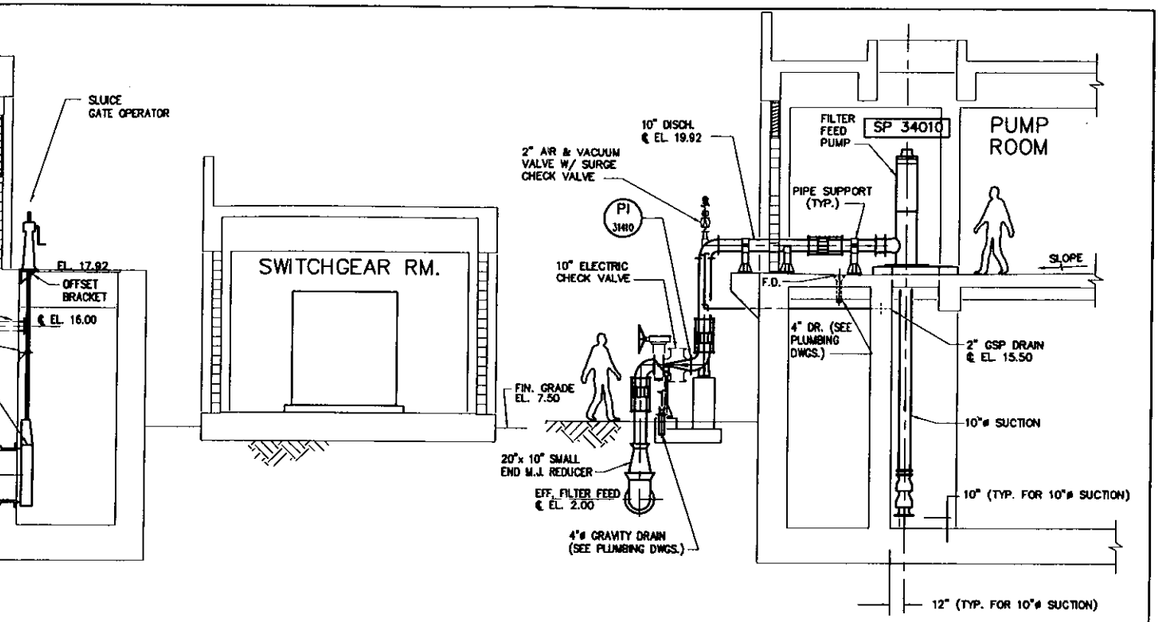
CITY OF MIRAMAR
DEPARTMENT OF PUBLIC WORKS/UTILITIES

MIRAMAR WASTEWATER RECLAMATION FACILITY
BID PACKAGE 3: TREATMENT WORKS
INJECTION WELL PUMP STATION
UPPER LEVEL – PLAN

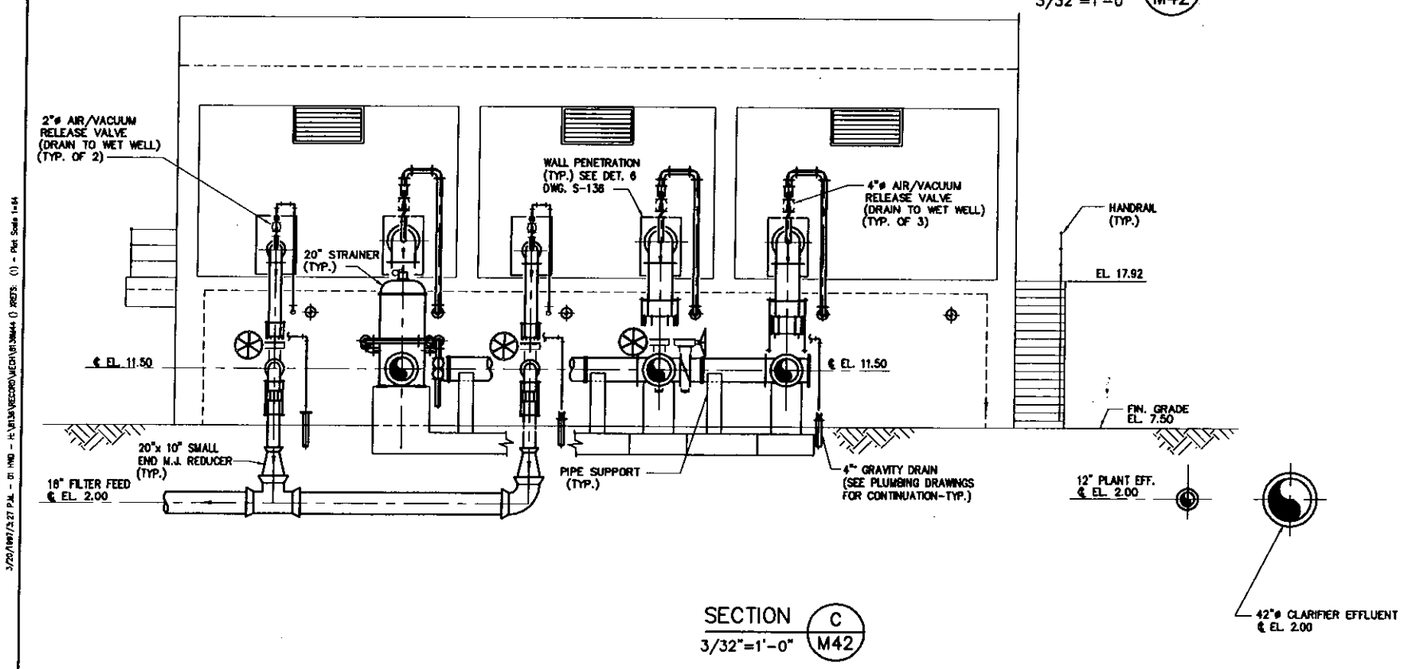
DATE: MAY 1995
SHEET: 93 OF 565
DRAWING: M-43



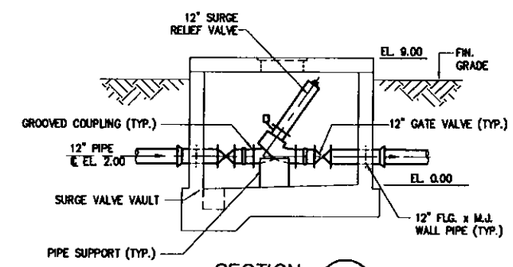
SECTION A / M42
3/32"=1'-0"



SECTION B / M42
3/32"=1'-0"



SECTION C / M42
3/32"=1'-0"



SECTION D / M42
3/32"=1'-0"

BID DRAWINGS REVISED BASED ON AVAILABLE RECORDS OF FACILITIES CONSTRUCTED TO DATE. RECORD DRAWINGS TO BE FORWARDED UPON FINAL COMPLETION OF THE FACILITIES.

* SUBJECT TO EQUIPMENT SUPPLIER REQUIRMENTS

UPDATED BID DRAWINGS

3/32"=1'-0" 6 4 2 0 6'

NO.	DATE	ISSUED FOR	BY
2	3/19/97	INJECTION WELL OPERATIONAL TESTING	H.J.V.
1	5/3/95	BIDDING	H.J.V.

DESIGNED H.J.V.
DRAWN S.L.M.
CHECKED
PROJ. ENGR. H.J.V.

H.J. VIDAL P.E.
No. 37882

HAZEN AND SAWYER
Environmental Engineers & Scientists

SCALE 3/32"=1'-0"

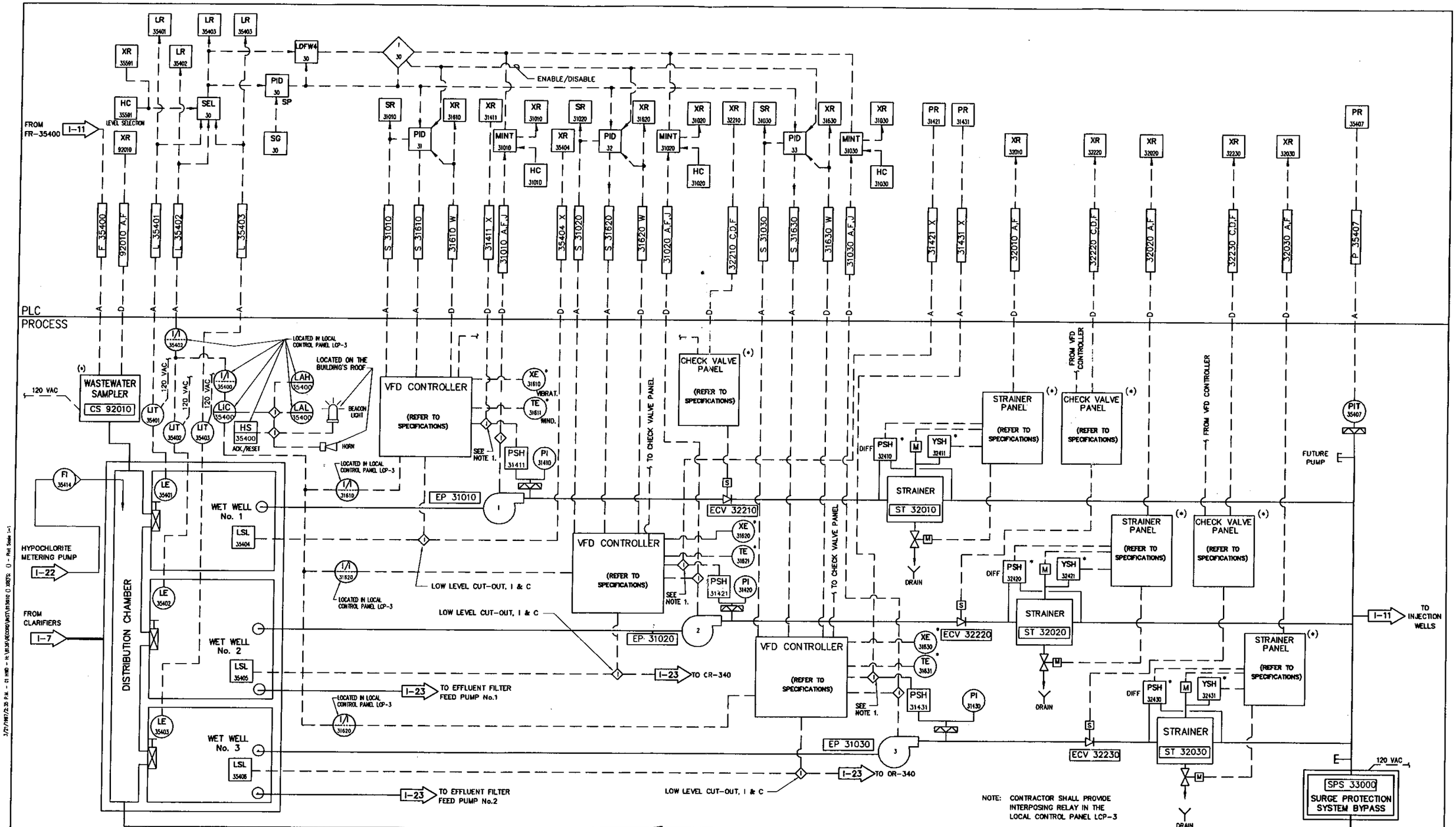
CONTRACT: 8118
CLIENTS PROJECT:
ENGINEERS PROJECT: 8118
CAD REFERENCE: 8136M44

CITY OF MIRAMAR
DEPARTMENT OF PUBLIC WORKS/UTILITIES

MIRAMAR WASTEWATER RECLAMATION FACILITY
BID PACKAGE 3: TREATMENT WORKS
INJECTION WELL PUMP STATION
SECTIONS

DATE: MAY 1995
SHEET: 94 OF 565
DRAWING: M-44

3/20/1997 5:27 P.M. - D: \WD - H:\JOB\WECSPRV\WECR\8136M44 (1 PRINT) (1) - Plot Scale 1=64



BID DRAWINGS REVISED BASED ON AVAILABLE RECORDS OF FACILITIES CONSTRUCTED TO DATE. RECORD DRAWINGS TO BE FORWARDED UPON FINAL COMPLETION OF THE FACILITIES.

UPDATED BID DRAWINGS

NO.	DATE	ISSUED FOR	BY
2	3/19/97	INJECTION WELL OPERATIONAL TESTING	H.J.V.
1	5/3/95	BIDDING	H.J.V.

DESIGNED A.C.
DRAWN T.L.J.
CHECKED
PROJ. ENGR. H.J.V.

GARY W. BORS P.E.
No. 19959

HAZEN AND SAWYER
Environmental Engineers & Scientists

SCALE: NONE

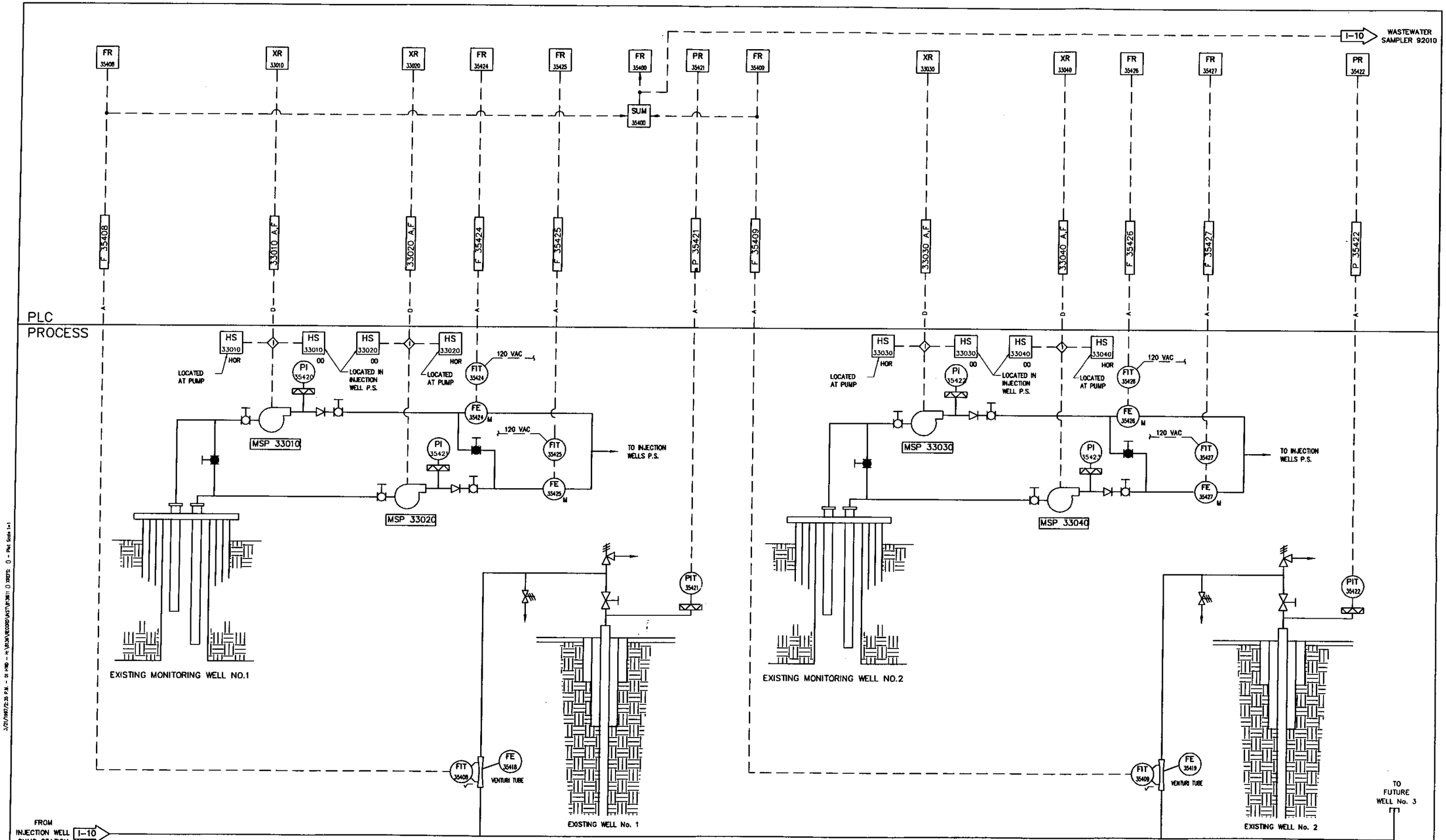
CONTRACT: 8118
CLIENTS PROJECT:
ENGINEERS PROJECT: 8118
CAD REFERENCE: 8136110

CITY OF MIRAMAR
DEPARTMENT OF PUBLIC WORKS/UTILITIES

MIRAMAR WASTEWATER RECLAMATION FACILITY
BID PACKAGE 3: TREATMENT WORKS

INSTRUMENTATION AND CONTROL
INJECTION WELL PUMP STATION

DATE: MAY 1995
SHEET: 150 OF 565
DRAWING: I-10



BID DRAWINGS REVISED BASED ON AVAILABLE RECORDS OF FACILITIES CONSTRUCTED TO DATE. RECORD DRAWINGS TO BE FORWARDED UPON FINAL COMPLETION OF THE FACILITIES.

UPDATED BID DRAWINGS

NO.	DATE	ISSUED FOR	BY
2	3/19/97	INJECTION WELL OPERATIONAL TESTING	H.J.V.
1	5/3/95	BIDDING	H.J.V.

DESIGNED A.C.
DRAWN T.L.J.
CHECKED
PROJ. ENGR. H.J.V.

GARY W. BORS P.E.
No. 19959

HAZEN AND SAWYER
Environmental Engineers & Scientists

SCALE: NONE

CONTRACT: 8118
CLIENTS PROJECT:
ENGINEERS PROJECT: 8118
CAD REFERENCE: 8136111

CITY OF MIRAMAR
DEPARTMENT OF PUBLIC WORKS/UTILITIES

MIRAMAR WASTEWATER RECLAMATION FACILITY
BID PACKAGE 3: TREATMENT WORKS

INSTRUMENTATION AND CONTROL
INJECTION WELLFIELD

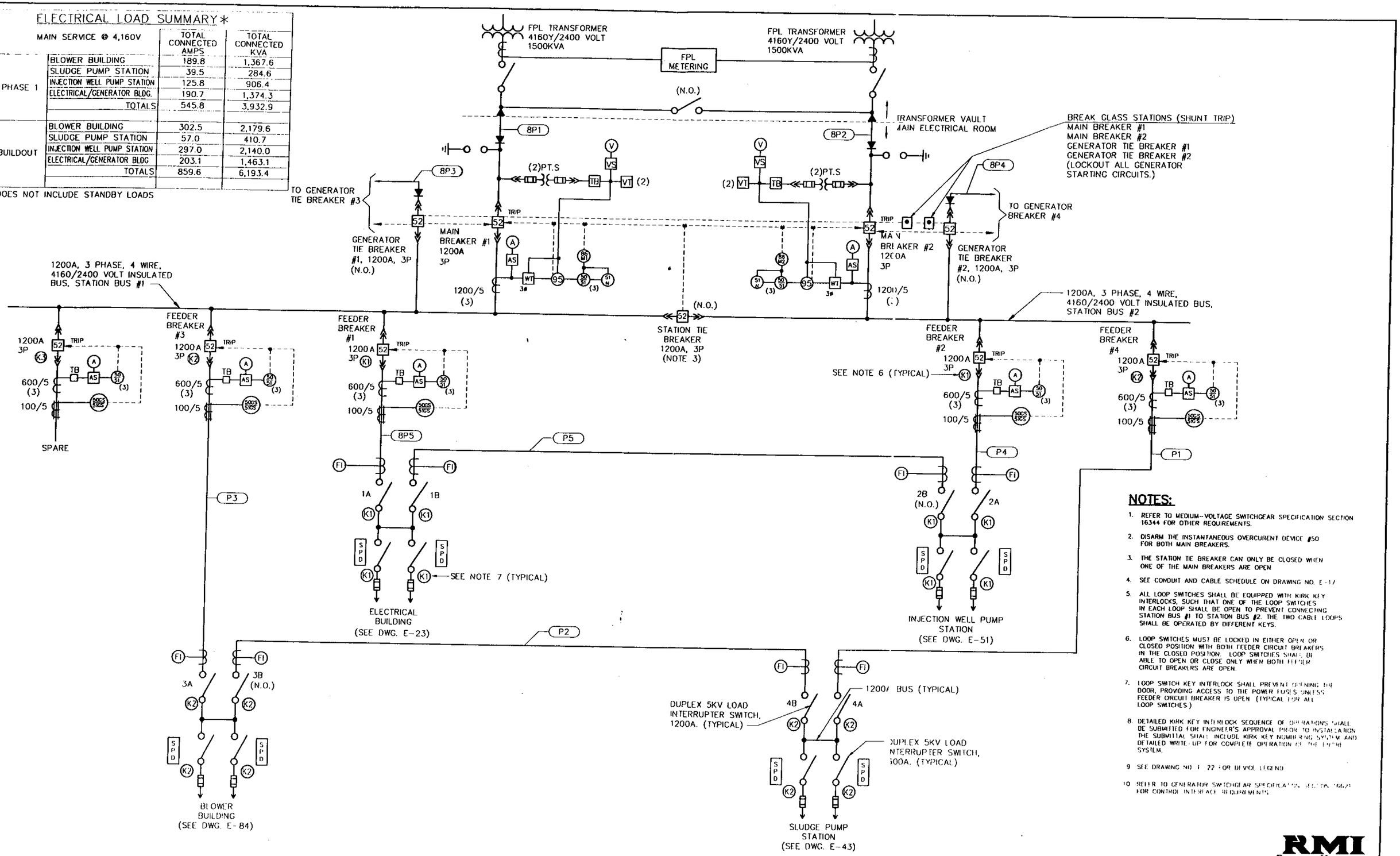
DATE: MAY 1995
SHEET: 151 OF 565
DRAWING: I-11

3/21/1997 2:35 P.M. - M:\MIRAMAR\RECORD\WSTP\UF3811.D 3/20/97 D - Plot Scale 1=1

ELECTRICAL LOAD SUMMARY*

MAIN SERVICE @ 4,160V		TOTAL CONNECTED AMPS	TOTAL CONNECTED KVA
PHASE 1	BLOWER BUILDING	189.8	1,367.6
	SLUDGE PUMP STATION	39.5	284.6
	INJECTION WELL PUMP STATION	125.8	906.4
	ELECTRICAL/GENERATOR BLDG.	190.7	1,374.3
	TOTALS	545.8	3,932.9
BUILDOUT	BLOWER BUILDING	302.5	2,179.6
	SLUDGE PUMP STATION	57.0	410.7
	INJECTION WELL PUMP STATION	297.0	2,140.0
	ELECTRICAL/GENERATOR BLDG	203.1	1,463.1
	TOTALS	859.6	6,193.4

*DOES NOT INCLUDE STANDBY LOADS



NOTES:

1. REFER TO MEDIUM-VOLTAGE SWITCHGEAR SPECIFICATION SECTION 16344 FOR OTHER REQUIREMENTS.
2. DISARM THE INSTANTANEOUS OVERCURENT DEVICE #50 FOR BOTH MAIN BREAKERS.
3. THE STATION TIE BREAKER CAN ONLY BE CLOSED WHEN ONE OF THE MAIN BREAKERS ARE OPEN.
4. SEE CONDUIT AND CABLE SCHEDULE ON DRAWING NO. E-17
5. ALL LOOP SWITCHES SHALL BE EQUIPPED WITH KIRK KEY INTERLOCKS, SUCH THAT ONE OF THE LOOP SWITCHES IN EACH LOOP SHALL BE OPEN TO PREVENT CONNECTING STATION BUS #1 TO STATION BUS #2. THE TWO CABLE LOOPS SHALL BE OPERATED BY DIFFERENT KEYS.
6. LOOP SWITCHES MUST BE LOCKED IN EITHER OPEN OR CLOSED POSITION WITH BOTH FEEDER CIRCUIT BREAKERS IN THE CLOSED POSITION. LOOP SWITCHES SHALL BE ABLE TO OPEN OR CLOSE ONLY WHEN BOTH FEEDER CIRCUIT BREAKERS ARE OPEN.
7. LOOP SWITCH KEY INTERLOCK SHALL PREVENT OPENING THE DOOR, PROVIDING ACCESS TO THE POWER FUSES UNLESS FEEDER CIRCUIT BREAKER IS OPEN (TYPICAL FOR ALL LOOP SWITCHES.)
8. DETAILED KIRK KEY INTERLOCK SEQUENCE OF OPERATIONS SHALL BE SUBMITTED FOR ENGINEER'S APPROVAL PRIOR TO INSTALLATION. THE SUBMITTAL SHALL INCLUDE KIRK KEY NUMBERING SYSTEM AND DETAILED WRITE-UP FOR COMPLETE OPERATION OF THE ENTIRE SYSTEM.
9. SEE DRAWING NO. E-22 FOR DEVICE LEGEND.
10. REFER TO GENERATOR SWITCHGEAR SPECIFICATION SECTION 16621 FOR CONTROL INTERFACE REQUIREMENTS.

RMI RESOURCE MANAGEMENT INTERNATIONAL, INC.

NO	DATE		BY
1	5/3/95	BIDDING	H.J.V

DESIGNED L.M.S.
DRAWN W.L.S.
CHECKED
PROJ. ENGR. H.J.V.

JOHN C. BURKE No. 17301 P.E.

HAZEN AND SAWYER
Environmental Engineers & Scientists

SCALE: NONE

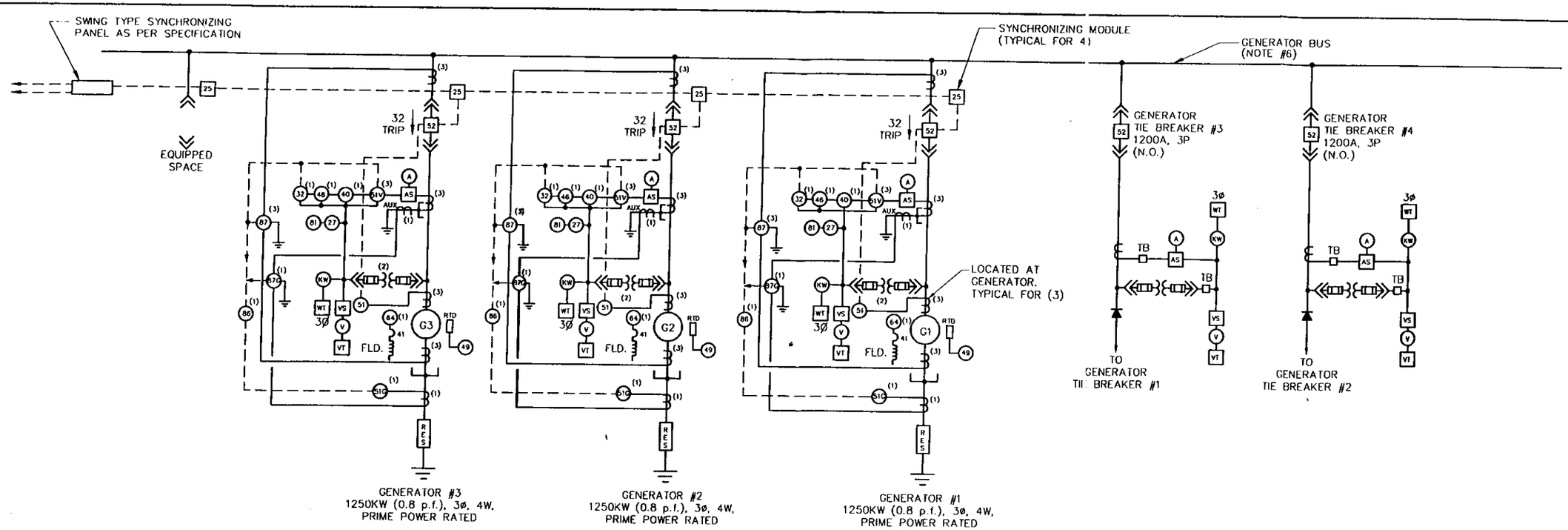
CONTRACT 8118
CLIENTS PROJECT:
ENGINEERS PROJECT: 8118
CAD REFERENCE: 4656E21

CITY OF MIRAMAR
DEPARTMENT OF PUBLIC WORKS/UTILITIES

MIRAMAR WASTEWATER RECLAMATION FACILITY
BID PACKAGE 3: TREATMENT WORKS

DISTRIBUTION SYSTEM
SINGLE LINE POWER DIAGRAM

DATE: MAY, 1995
SHEET 414 OF 565
DRAWING E-21



SINGLE LINE LEGEND

DEVICE NUMBER	DEFINITION	FUNCTION
32	DIRECTIONAL POWER RELAY	ANTI-MOTORING
50/51	INSTANTANEOUS AND TIME OVERCURRENT RELAY	PHASE FAULT
51G	TIME OVERCURRENT RELAY	GROUNDFAULT
51N	TIME OVERCURRENT RELAY	GROUNDFAULT RESIDUAL
51V	TIME OVERCURRENT RELAY VOLTAGE CONTROLLED	OVERCURRENT BACK-UP
27/47	UNDERVOLTAGE	UNDERVOLTAGE, PHASE SEQUENCE AND UNBALANCED VOLTAGE
27	UNDERVOLTAGE RELAY	
40	LOSS OF FIELD RELAY	LOW VALUE OR FAILURE OF FIELD CURRENT
46	NEGATIVE SEQUENCE RELAY	REVERSE PHASE, PHASE BALANCE OR NEGATIVE SEQUENCE
49	THERMAL RELAY	OVER TEMPERATURE (RTD)
52	DRAW OUT TYPE VACUUM BREAKER	
	MOLDED CASE CIRCUIT BREAKER	
64	FIELD GROUND RELAY	
86	LOCKING-OUT RELAY (MANUAL RESET)	LOCKOUT
81	FREQUENCY RELAY, TIME DELAY	UNDER FREQUENCY
87G	DIFFERENTIAL PROTECTIVE RELAY	
41	FIELD CIRCUIT BREAKER	
RTD	RESISTANCE TEMPERATURE DETECTOR	

DEVICE NUMBER	DEFINITION	FUNCTION
95	W-IQ DATA PLUS COMMON METERING AND PROTECTION UNIT	DIRECT READING METERING VALUES: A.C. AMPS, A.C. VOLTS, MW, MVAR, P.F., FREQ., MW DEMAND. FIELD SETTABLE PROTECTION FUNCTIONS WITH TRIP AND ALARM OUTPUT: PHASE LOSS (VOLTAGE AND CURRENTS), PHASE UNBALANCE, PHASE REVERSAL, OVER VOLTAGE, UNDER VOLTAGE
AS	AMPERE METER SWITCH	
VS	VOLT METER SWITCH	
	TRANSFORMER	
	LIGHTNING ARRESTOR	
	SURGE CAPACITOR	
PFR	PHASE FAILURE RELAY	MOTOR PROTECTION
VAR	REACTIVE VOLT-AMPERE METER	
KW	KILOWATT METER	
SPD	SINGLE PHASE DETECTOR	PROTECTS AGAINST SINGLE PHASING
FI	FAULT INDICATOR	
KWh D	KWhr / DEMAND METER SURFACE MOUNTED	
F	FREQUENCY METER	
A	AMPERE METER	
V	VOLT METER	
K	KIRK KEY INTERLOCK	

DEVICE NUMBER	DEFINITION
TB	TEST BLOCK AND PLUGS GE 642212064, SEMIFLUSH
W	WATT TRANSDUCER
V	VOLT TRANSDUCER

NOTES:

1. THIS SCHEMATIC IS FOR ILLUSTRATION ONLY. ACTUAL RELAYING AND APPARATUS, SUCH AS VOLTAGE REGULATOR, GOVERNOR CONTROL, AUTOMATIC PARALLELING TO BE FURNISHED BY MANUFACTURER. THIS SCHEMATIC INDICATES PROTECTIVE RELAYS AND MISCELLANEOUS METERING ONLY.
2. REFER TO SPECIFICATION SECTIONS 16620 AND 16621 FOR OTHER REQUIREMENTS.
3. PHASE CT'S SHALL BE RATED 150% OF FULL CAPACITY OF GENERATOR.
4. NEUTRAL CT'S SHALL BE RATED ONE HALF OF THE MAXIMUM GROUND FAULT CURRENT.
5. GENERATOR SWITCHGEAR SHALL BE MANUFACTURED FOR TOTAL OF 4 GENERATORS.
6. GENERATOR SWITCHGEAR BUS SHALL BE 3 PHASE, 4 WIRE. PHASE CONDUCTORS SHALL BE COPPER, RATED FOR 1200A. THE NEUTRAL CONDUCTOR SHALL BE COPPER RATED, FOR 600A. THE EQUIPMENT GROUND BUS SHALL BE COPPER, RATED FOR 600A.

RMI Resource Management International, Inc.

NO	DATE	ISSUED FOR	BY
1	5/3/95	BIDDING	HJV

DESIGNED L.M.S.
DRAWN W.L.S.
CHECKED
PROJ. ENGR. H.J.V.

JOHN C. BURKE PE No 17301

HAZEN AND SAWYER
Environmental Engineers & Scientists

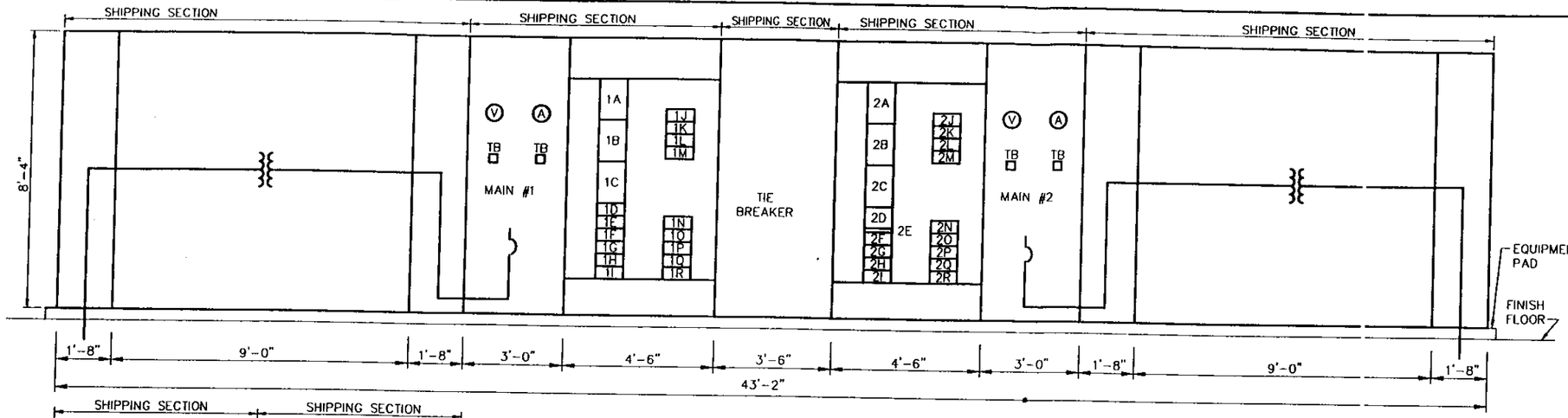
SCALE: NONE

CONTRACT 8118
CLIENTS PROJECT:
ENGINEER'S PROJECT 8118
CAD REFERENCE 4656E22

CITY OF MIRAMAR
DEPARTMENT OF PUBLIC WORKS/UTILITIES

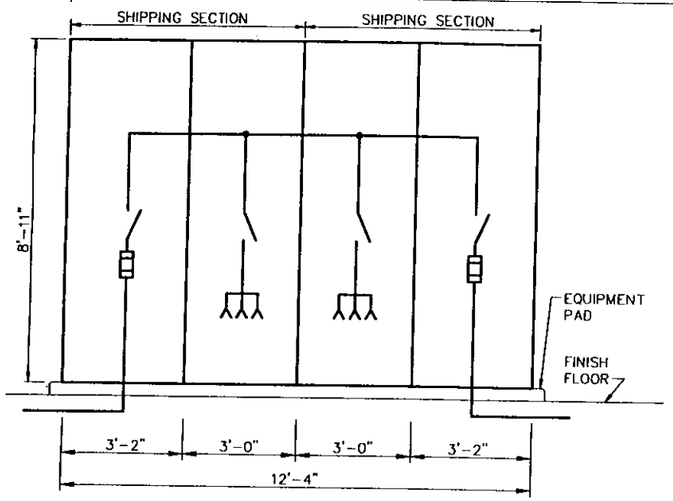
MIRAMAR WASTEWATER RECLAMATION FACILITY
BID PACKAGE 3: TREATMENT WORKS
GENERATION SYSTEM
SINGLE LINE POWER DIAGRAM

DATE MAY, 1995
SHEET 415 OF 565
DRAWING E-22



SECONDARY UNIT SUBSTATION NO. 3 (SUS-3) ELEVATION

SCALE: 1/2"=1'-0"
NOTE: SUBSTATION DEPTH 4'-6"



5KV LOAD INTERRUPTER SWITCH ELEVATION

SCALE: 1/2"=1'-0"
NOTE: DEPTH 3'-0"

ELECTRICAL NOTES:

1. LOAD BREAK AIR INTERRUPTER SWITCH, 3P-600A-5KV, WITH 3-500A TYPE "E" FUSES, INDOOR NEMA 1A GASKETED ENCLOSURE
2. VENTILATED, DRY-TYPE CAST EPOXY SECONDARY SUBSTATION TRANSFORMER, 4160V-480/277V, 2000/2667KVA, Z=5.75%, INDOOR ENCLOSURE WITH FAN COOLING FOR 33% ADDITIONAL CAPACITY ABOVE THE SELF-COOLED RATING.
3. 3000A/3000A, 3P, 100% RATED WITH GROUND FAULT TRIP
4. 3000A/3000A, 3P, 100%
5. (3) GROUND RODS, 5/8" DIA. x 20'-0", COPPER CLAD, 10'0" APART IN THE FORM OF AN EQUILATERAL TRIANGLE.
6. 3TR2: 15KVA, 480V:120/208V, 3ø, 4W
7. 800A, 3P, NON-AUTO, 65,000A WITHSTAND RATING

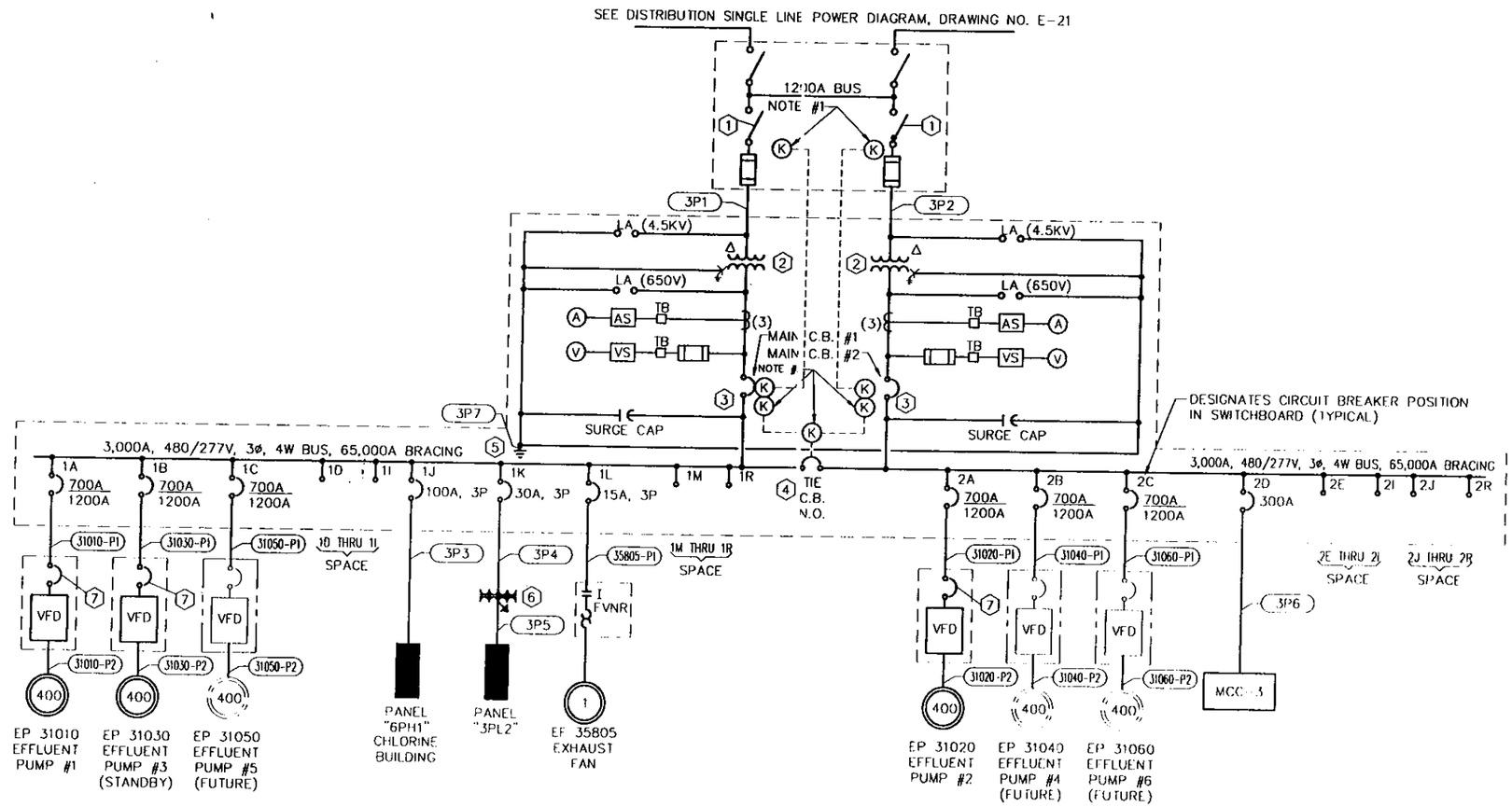
NOTES:

1. SEE NOTES NO. 5, 6, 7 & 8 ON DRAWING E-21 FOR INTERLOCK REQUIREMENTS.
2. INTERLOCK MAIN AND TIE CIRCUIT BREAKERS. WHEN TIE CIRCUIT BREAKER IS CLOSED ONLY MAIN CIRCUIT BREAKER NO. 1 OR MAIN CIRCUIT BREAKER NO. 2 SHALL BE CLOSED.

ELECTRICAL LOAD SUMMARY *

SECONDARY UNIT SUBSTATION (INCLUDES MCC-3 LOADS)		TOTAL CONNECTED AMPS @ 480V	TOTAL CONNECTED KVA
PHASE 1	MISC. MOTORS	569.8	473.7
	LARGEST MOTOR (@ 125%)	600.0	498.8
	MISC. LOADS	40.2	33.4
	TOTALS	1,210.0	1,005.9
BUILDOUT	MISC. MOTORS	2,053.6	1,707.4
	LARGEST MOTOR (@ 125%)	600.0	498.8
	MISC. LOADS	40.2	33.4
	TOTALS	2,693.8	2,239.6

* DOES NOT INCLUDE STANDBY LOADS



SUS-3 SINGLE LINE POWER DIAGRAM

RMI RESOURCE MANAGEMENT INTERNATIONAL, INC.

NO	DATE	REVISED FOR	BY
1	5/3/95	BIDDING	H.J.V

DESIGNED L.M.S.
DRAWN W.L.S.
CHECKED
PROJ ENGR H.J.V.

JOHN C. BURKE No. 17301 PE

HAZEN AND SAWYER
Environmental Engineers & Scientists

SCALE: AS NOTED

CONTRACT: 8118
CLIENTS PROJECT:
ENGINEERS PROJECT: 8118
CAD REFERENCE: 4656E51

CITY OF MIRAMAR
DEPARTMENT OF PUBLIC WORKS/UTILITIES

MIRAMAR WASTEWATER RECLAMATION FACILITY
BID PACKAGE 3: TREATMENT WORKS

INJECTION WELL PUMP STATION
SINGLE LINE POWER DIAGRAM
AND ELEVATIONS

DATE: MAY, 1995
SHEET 444 OF 565
DRAWING: E-51

ATTACHMENT 11

GENERATOR DATA

BILL OF MATERIALS

Three (3) -Caterpillar model 3516 TA Prime Diesel Generator Set, rated at 1275 KW, @ 1800 RPM, 4160 Volts, AC, 3 Phase, 60 HZ, 0.8.P.F. each complete as follows:

AIR INLET SYSTEM
- Air cleaner, regular duty, with service indicator
- Turbocharger - Quad
- Aftercooler

CONTROL SYSTEM
- Governor, Woodward 2301A Speed Control, - Load Sharing (Installed inside generator switchgear)
- EG6Pc Actuator

COOLING SYSTEM
- Radiator, model 46/CV with duct flange (122 F ambient capacity)
- Blower fan, fan drive, and fan guard
- Thermostats and housing
- Jacket water pump, gear driven, centrifugal
- Water level switchgage (shutdown)
- 50% mixture ethylene glycol (Antifreeze)

CHARGING SYSTEM
- Charging Alternator, 24 VDC, 60 AMP
- Belt driven, with integral regulator

EXHAUST SYSTEM
- Exhaust manifolds, Dry
- Exhaust "Y" flex connector (Stainless Steel) -*
- Exhaust Hospital grade Silencer - Side inlet (with companion flanges) -*
- Exhaust ~~wall~~ thimble - (Stainless steel) -*4

Provide a total of four (4) thimbles See dwg. M-83 H&S

Exhaust shall be to roof

FLYWHEELS & FLYWHEEL HOUSINGS
- Flywheel, SAE No. 00 183 teeth
- Flywheel housing, SAE No. 00
- SAE Standard rotation

FUEL SYSTEM
- Fuel Filters
- Fuel transfer pump
- Mechanical unit injectors

SUBMITTAL ITEM
NO. 01
PANTROPIC POWER PRODUCTS, INC.

BILL OF MATERIALS continued on page two.

Fuel lines, flexible
Primary fuel filter
Fuel priming pump
Fuel oil cooler (Radiator mounted)
150 Gallon Day Tank - UL listed (Electrical Service Is Furnished by Others) -*
(with options as shown in submittal)
One (1) 7 GPM, 1/2 HP, 120 VAC, 1 PH Supply Pump/Motor
One (1) 7 GPM, 1/2 HP, 120 VAC, 1 PH Return Pump/Motor

GENERATOR

Brushless, permanent magnet excited, model SR4B generator, 6 lead 822 frame, Form Wound,
Vacum Pressure Impregnation, and terminal bar AC connections
with embedded temperature detectors (Platinum RTD)
Digital Automatic Voltage Regulator
Generator space heater - 1200 Watt, 120 VAC, 1 PH, (Electrical Service is Furnished By Others)
AC Junction box w/lightening arrestors, CTS, Surge capacitor - (shipped loose) (*)

INSTRUMENT PANEL - ENGINE MOUNTED

Water Temperature Gage
Oil Pressure Gage
Fuel Pressure Gage
Tachometer

DC CONTROLS

DC Junction Box
Terminal board interconnections
Service Hour meter
Emergency shutdown switch

PROTECTION SYSTEM

Crank termination switch
<u>Shutdown switches</u>
Overspeed
High water temperature
Low oil pressure
Low water level
Low oil level
Air inlet shutdown/switch

BILL OF MATERIALS continued on page three

Pre Alarm switches:
Low oil pressure
High water temperature
Low water temperature
Low oil level

LUBE SYSTEM
Crankcase breather, top mounted
Oil cooler
Oil filter, RH
Oil filter and dipstick, RH
Oil pump, gear type
Shallow oil pan
Fumes disposal hose
Lubricating oil

MOUNTING SYSTEM
Engine, Generator, Radiator Mounting Rails
Spring Vibration Isolators -*

STARTING SYSTEM
Dual 24 volt DC electric starting motor
Dual Jacket water heater: 240-480 VAC, 1PH, 6 kw each (Total: 12KW)
(Electric Service Is Provided By Others)
Automatic battery charger: 24 VDC, 16 A output, 120 VAC, 1 PH input for use with Nickel - Cadmium batteries with alarms (Electric Service Provided By Others) -*
Batteries : Nickel Cadmium - 24 VDC (90 Seconds of Engine Cranking)
Battery Rack
Battery Cable kit

GENERAL
Scheduled Oil Sample Kit
Paint, Caterpillar Yellow
Parts, Operation and Maintenance Manuals
5 year warranty
Factory Testing Certification
Equipment Job Site Start-up
Equipment Job-Site Load Bank Testing (Resistive)
Instruction Class

End of Bill of Materials
PANTROPIC POWER PRODUCTS, INC.
8205 NW 58TH STREET
MIAMI, FL 33166

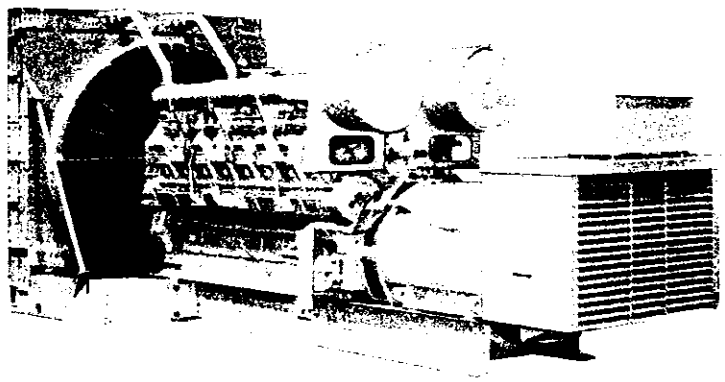
-* Shipped loose, installed and/or wired by others

CATERPILLAR®

Generator Set

3516
Prime Power

1275-1825 kW 60 Hz



Four Turbo Version – Shown with Optional Equipment

SPECIFICATIONS

V-16, 4-Stroke-Cycle Watercooled Diesel

Bore—mm (in)	170 (6.7)
Stroke—mm (in)	190 (7.5)
Displacement—L (cu in)	69 (4,210)
Compression ratio	13.5:1

SUBMITTAL FORM

NO. 2

PANTROPIC POWER PRODUCTS, INC.

FEATURES

- **CAT® DIESEL GENERATOR SETS**
  Factory designed, certified prototype tested with torsional analysis. Production tested and delivered to you in a package that is ready to be connected to your fuel and power lines. EPG Designer computer sizing available. Supported 100% by your Caterpillar dealer with warranty on parts and labor. Extended warranty available in some areas. The generator set was designed and manufactured in an ISO 9001 compliant facility. Generator set and components meet or exceed the following specifications: AS1359, AS2789, ABGSM TM3, BS4999, DIN6271, DIN6280, EGSA101P, JEM1359, IEC 34/1, ISO3046/1, ISO DIS8528, NEMA MG1-22.
- **RELIABLE, FUEL EFFICIENT DIESEL**
  The compact, four-stroke-cycle diesel engine combines durability with minimum weight while providing dependability and economy. The fuel system operates on a variety of fuels.
- **CATERPILLAR® SR4 GENERATOR**
  Single bearing, wye connected, static regulated, brushless permanent magnet excited generator designed to match the performance and output characteristics of the Caterpillar diesel engine that drives it.
- **EXCLUSIVE CATERPILLAR VOLTAGE REGULATOR**
  Three-phase sensing and Volts per Hertz regulation give precise control, excellent block loading, and constant voltage in the normal operating range.

CATERPILLAR® SR4 GENERATOR

Type	Brushless, revolving field, solid-state exciter
Construction	Single bearing, close coupled
Three phase	Wye connected
Insulation	Class H with tropicalization and antiabrasion
Enclosure	Drip proof IP 22
Alignment	Pilot shaft
Overspeed capability	150%
Wave form	Less than 5% deviation
Paralleling capability	standard with adjustable voltage droop
Voltage regulator	3-phase sensing with Volts-per-Hertz
Voltage regulation	Less than ± 1/2%
Voltage gain	Adjustable to compensate for engine speed droop and line loss
TIF	Less than 50
THF	Less than 3%

CATERPILLAR CONTROL PANEL

24 Volt DC Control
Terminal box mounted
Vibration isolated
NEMA 1, IP 22 enclosure
Electrically dead front
Lockable hinged door
Generator instruments meet ANSI C-39-1

Voltages Available
60 Hz
277/480, 380,
4160, 346/600 (807 frame only)

(Adjustable a minimum of ±10%)
Other voltages available—consult your Caterpillar dealer.
Some voltages require derating.

STANDARD EQUIPMENT

Engine
Aftercooler
Air cleaner
regular duty
Breather, crankcase
Cooler, lubricating oil
Exhaust fitting and flange
Filters, right hand
fuel and
lubricating oil
Flywheel housing
SAE No.00
standard rotation
Governor
2301A, speed control
with EG10P actuator
Manifold, exhaust, dry
Oil pan, shallow
Pumps,
fuel transfer,
lubricating oil –
gear driven
jacket water –
gear driven
Radiator
Rails, mounting
Shutoff, manual
Starting, electric,
24 Volt DC
Turbochargers
Vibration damper

Generator
SR4 brushless permanent
magnetic excited with
VR3 voltage regulator

ELECTRONIC MODULAR CONTROL PANEL (EMCP)

Standard Generator Controls and Monitoring:
Ammeter/voltmeter phase
selector switch
Digital ammeter, voltmeter,
and frequency meter
Voltage adjust rheostat

Standard Engine Controls and Monitoring:
Automatic/manual
start-stop control
Engine control switch for:
off/reset, auto start,
manual start, stop,
cooldown timer,
cycle cranking,
emergency stop
pushbutton

Safety shutoff protection and LED indicators for:
High coolant temperature
Low oil pressure
Overcrank
Overspeed
Emergency stop
pushbutton

OPTIONAL EQUIPMENT

Engine
Air cleaners
Charging systems
Cooling systems
fan drives, radiators,
fans, expansion tanks
Control systems
governor, Woodward
3161, 2301A
load share
Exhaust system
fittings, elbows,
flanges, muffler
Fuel system
Lube system
Mounting systems
Protection devices
Starting system
Torsional vibration
damper

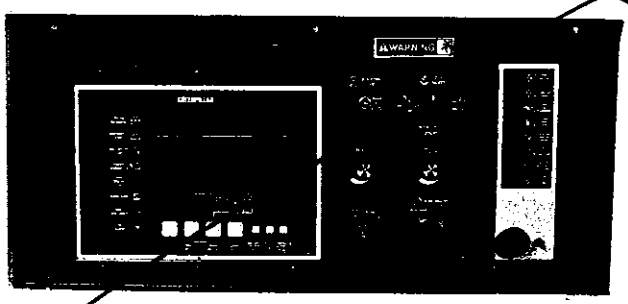
Generator
Installation
Arrangements
Manual voltage control
RFI Filters –
N level (VDE 875),
BS800
MIL Std 461B
Space heater kits

Control Panel Attachments for EMCP:
Auxiliary relay
Enclosure,
NEMA 12/IP 44
Governor speed switch
Illuminating lights
Installed speed sensing
governor (Woodward)
Low coolant level
Provision for:
alarm module
alarm module –
NFPA 99
alarm module –
NFPA 110
Reverse power relay
Starting aid switch
Synchronizing lights

Caterpillar® EMCP II

Electronic Modular Control Panel

The Electronic Modular Control Panel (EMCP) is a generator-mounted control panel, available on all Caterpillar packaged generator sets. It utilizes environmentally sealed, solid-state, micrprocessor-based modules for engine control and AC metering. This new application of mature, high-tech electronics to generator monitoring provides more features, accuracy and reliability than present electro-mechanical and many competitive panel systems.



The EMCP provides these standard control and monitoring features, many of which are options on other panels:

- Automatic/manual start-stop engine control with programmable safety shutdowns and associated flashing LED indicators for low oil pressure, high coolant temperature, overspeed, overcrank and emergency stop
- Cycle cranking–adjustable 1-60 second crank/rest periods
- Cooldown timer–adjustable 0-30 minutes
- Energized to run or shutdown fuel control systems
- LCD digital readout for: Engine oil pressure; coolant temperature; engine rpm; system DC volts; engine running hours; system diagnostic codes; generator AC volts; generator AC amps; and generator frequency
- Engine control switch
- Ammeter-voltmeter phase selector switch
- Emergency stop pushbutton
- Indicator/display test switch
- Voltage adjust potentiometer
- Rugged NEMA 1/IP 22 cabinet.

TECHNICAL DATA

3516 Prime Power Generator Sets			60 Hz–1800 RPM			
			4T	4T	4T	2T
Rating Information	Power Rating @ 0.8 PF with Fan	kW	1275	1360	1600	1825
		kV•A	1750	1875	2188	2281
	Engine Bhp wthout fan		1840	1967	2304	2598
Physical Factors	Length	mm	5720	5737	5813	6180
		in	**225**	**226**	**229**	**243**
	Width	mm	2319	2319	2319	2319
		in	**91.3**	**91.3**	**91.3**	**91.3**
	Height	mm	2545	2545	2545	2545
		in	**100.2**	**100.2**	**100.2**	**100.2**
	Weight	kg	12,620	12,850	13.235	14.700
		lb	**27,830**	**28,330**	**29,120**	**32,420**
	Generator Frame Size		805	806	807	808
Lubrication & Cooling Systems	Engine Lubricating Oil Capacity	L	416	416	416	416
		qts	**440**	**440**	**440**	**440**
	Engine Coolant Capacity with Radiator	L	460	460	460	460
		gal	**121**	**121**	**121**	**121**
	Standard Radiator Arrangement Data: Air Flow (Max @ Rated Speed)	m³/min	2295	2295	2295	2295
		cfm	**81,000**	**81,000**	**81,000**	**81,000**
	Air Flow Restriction (after radiator)	kPa	0.12	0.12	0.12	0.12
		in water	0.25 ~~0.5~~	**0.5**	**0.5**	**0.5**
	Ambient Air Capability (TMI)	Deg. C	54	50	44	42
		Deg. F	**130**	**122**	**110**	**106**
	Radiator Size		46/CV	46/CV	46/CV	46/CV
Exhaust System	System Backpressure (Max Allowable)	kPa	6.7	6.7	6.7	6.7
		in water	**27**	**27**	**27**	**27**
	Exhaust Flange Size (Internal Diameter)	mm	292	292	292	292
		in	**11.5**	**11.5**	**11.5**	**11.5**
Performance Data @ Rated Conditions	Fuel Consumption (100% load) with Fan per ISO3046/1: +5%, -0% tolerance	L/Hr	333.8	352.9	410.2	464.9
		gph	**88.1**	**93.2**	**108.3**	**122.8**
	Fuel Consumption (75% load) with Fan	L/Hr	259.1	274.2	318.5	353.3
		gph	**68.5**	**72.5**	**84.1**	**93.3**
	Fuel Consumption (50% load) with Fan	L/Hr	184.1	194.0	224.6	236.7
		gph	**48.6**	**51.2**	**59.4**	**62.6**
	Combustion Air Inlet Flow Rate	m³/min	133	138	156	176
		cfm	**4689**	**4887**	**5494**	**6204**
	Exhaust Gas Flow Rate	m³/min	330	346	395	449
		cfm	**11,659**	**12,210**	**13,933**	**15,847**
	Heat Rejection to Coolant (total)	kW	739	785	926	1045
		BTU/min	**42,027**	**44,643**	**52,662**	**59,429**
	Heat Rejection to Exhaust (total)	kW	1422	1507	1768	1979
		BTU/min	**80,869**	**85,703**	**100,546**	**112,545**
	Heat Rejection to Atmosphere from Engine	kW	135	137	140	142
		BTU/min	**7677**	**7791**	**7962**	**8076**
	Heat Rejection to Atmosphere from Generator	kW	58.7	58.1	68.4	66.2
		BTU/min	**3340**	**3305**	**3890**	**3765**
	Exhaust Gas Stack Temperature	Deg. C	469	474	485	488
		Deg. F	**877**	**885**	**904**	**910**
	Deration for Engine Altitude–3% per 305m (1000 ft) above	m	4000	3375	1850	775
		ft	**13,123**	**11,073**	**6,070**	**2,543**

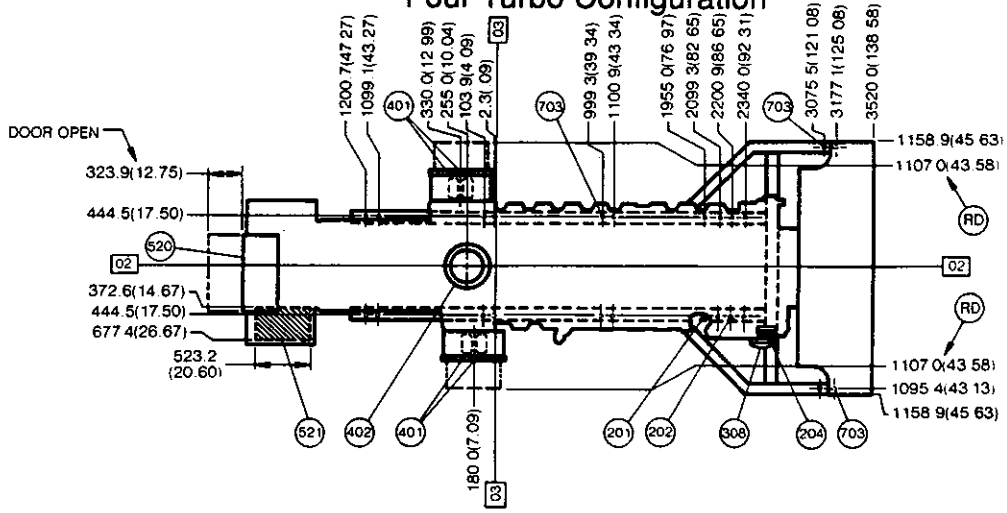
PRIME POWER GEN SET PACKAGE — TOP VIEWS

- 02 Centerline of Engine
- 03 Rear Face of Cylinder Block
- 308 Oil Filter
- 401 Air Inlet
- 402 Exhaust
- 520 Control and Power Panel
- 521 Conduit Entrance
- 703 Customer Mounting Holes

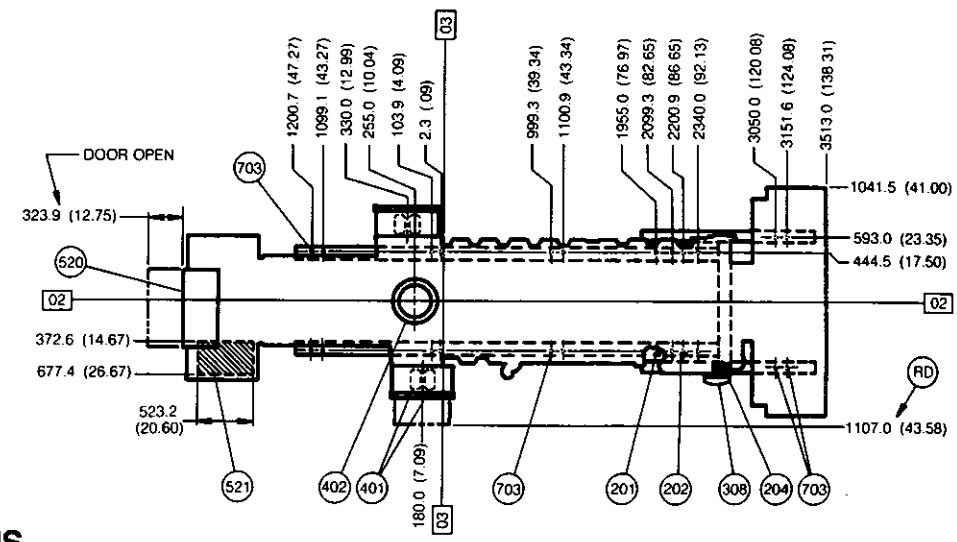
For overall length see technical data section (page 3).

Note: General configuration not to be used for installation. See general dimension drawings for detail.

Four Turbo Configuration



Two Turbo Configuration



CONDITIONS AND DEFINITIONS

Prime — Output available with varying load for an unlimited time. Prime power in accordance with ISO8528. 10% overload power in accordance with ISO3046/1, AS2789, DIN6271, and BS5514 available on request.

Standby — Output available with varying load for the duration of the interruption of the normal source power. Fuel stop power in accordance with ISO3046/1, AS2789, DIN6271, and BS5514.

Continuous — Output available without varying load for an unlimited time. Continuous power in accordance with ISO8528, ISO3046/1, AS2789, DIN6271 and BS5514.

Ratings are based on SAE J1349 standard conditions. These ratings also apply at ISO3046/1, DIN6271 and BS5514 standard conditions.

Fuel rates are based on fuel oil of 35° API (16° C or 60° F) gravity having an LHV of 42 780 kJ/kg (18,390 Btu/lb) when used at 29° C (85° F) and weighing 838.9 g/L (7.001 lbs/U.S. gal.).

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ELECTRIC POWER GENERATION
- DESIGNER -

SIZE REPORT
Job Number 96SLT004

Project
MIRAMAR

by
Pantropic Power Products

SUBMITTAL ITEM
NO. 03A
PANTROPIC POWER
PRODUCTS, INC.

May 10, 1996 Data Release 05/01/95

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Size	
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SITE CONDITIONS

Application	Prime
Altitude	10 ft
Engine Room Temperature, Max	110°F
Outside Temperature, Min	40°F
Installation	Outside or Large Engine Room
Engine, Fuel	Diesel
Speed	1800 RPM
Cooling	Radiator w/ Blower Fan, 50% Antifreeze

SYSTEM DATA

Total Power Capability	1,282 kW
Total Load	1,250 kW
Frequency	60 Hz
Voltage, Line-to-Line	4,160 V
Connection	Wye
Voltage Dip Starting Largest Motor Sequence	0.0%
Power Factor	0.80
Sound Level, Mechanical	95 dBA @ 21 ft

EQUIPMENT SELECTED

Factory Rating	Engine Model	Gen. Frame	Radiator Model	Drive Ratio	Site EkW	Temp. Rise °C	Radiator Ambient
1275	3516 TA	00822	72-46CV16P	0.428	1282	<70.0	127.7°F

SITE LOADS

SINGLE PHASE	Line-to-Line	Line-to-Neutral
Phase 1	0 kW	0 kW
2	0 kW	0 kW
3	0 kW	0 kW

THREE PHASE
Lighting - 0 kW Other Non-Motor - 1250 kW @ 0.80 P.F.

Non-Linear	Rated Output	Eff	P.F.	Pulse	Battery Recharge
UPS, Rectifier -	0	0.92	0.94	6	0 kW
Var Freq Motor -	0	0.87	0.80	6	

SYSTEM SUMMARY

Connected Load - 1,250 kW
Power Factor - 0.80
Motor Load
Worst Sequence - 0
Required - 0 SkVA

ENGINE 1

Type - Watercooled Diesel
Jacket Water, Aftercooled
Cycle - Four Stroke
No. of Cylinders - V16
Flywheel Housing - 00
Speed - 1800 RPM

Bore - 6.7 in
Stroke - 7.5 in
Displacement - 4210 cu.in
Compression Ratio - 13.0:1
Weight, Dry - 16808 lb
Wet - 18186 lb
Liquids, Lube Oil - 425 qt
Jacket Water - 61.6 gal

PERFORMANCE DATA
@ SITE CONDITIONS

Power Capability - 1,282 EkW
Heat Rejection to Coolant - 42026 Btu/min
@ Connected/Shared Load of - 1,250 EkW
Heat Rejection to Coolant - 41006 Btu/min

@ RATED CONDITIONS

Rating with Fan - 1,275 kW

Fuel Consumption w/ Fan (18,390 Btu/lb)		Standard	Site	
	100%	90.9	90.9	gal/Hr
	75%	70.6	70.6	gal/Hr
	50%	50.1	50.1	gal/Hr
	25%	30.5	30.5	gal/Hr

Combustion Air Inlet Flow Rate - 4,689.8 cfm
Exhaust Gas, Flow Rate - 11661 cfm
Stack Temperature - 876°F
Heat Rejection to Coolant - 42026 Btu/min
Exhaust - 80868 Btu/min
Fuel - 1,877 Btu/min
Atmosphere from Engine - 7,677 Btu/min
Atmosphere from Generator - 2,885 Btu/min
Sound @ 23 ft, Mechanical - 94 dBA
Exhaust - 99 dBA

CONDITIONS AND DEFINITIONS

Ratings are based on ISO 3046/1 standard conditions of 100 kPa, 27°C (29.61 in Hg, 77°F). Conditions described in SAE J1349, BS 5514, API 7B-11C, and DIN 6271 also apply.

10% overload power for one hour in twelve in accordance with ISO 3046/1, AS 2789, DIN 6271, and BS 5514.

Fuel rates are based on 35° API (16°C, 60°F) gravity having a low heat value (LHV) of 42780 kJ/kg (18390 Btu/lb) when used at 29°C (85°F) and weighing 838.9 g/L (7.001 lbs/US gal).

GENERATOR 1

CONSTRUCTION

Model - Caterpillar SR4
Frame - 00822
Type - Brushless
Frequency - 60 hertz
Voltage - 4,160 volts
Three Phase - Wye
Overspeed Capability - 150%
Wave Form - < 5% Deviation
Construction - Single Bearing
Close Coupled

Poles - 4
Insulation - Class H
Leads - 6
Terminal Box - drip proof, IP 22
Weight - 3,671 lb

VOLTAGE REGULATOR

Model - [redacted] DVR
Type - Volts per Hz
Sensing - 3 Phase
Regulation - less than +/- 1%
Gain - Adjustable
Droop - Adjustable, option
Mounting - Remote
TIF - less than 50
THF - less than 3%

PERFORMANCE DATA
@ SITE CONDITIONS, 0.80 PF

Power Capability - 1,282 EkW, 1,602 kVA, 222 amperes
Heat Rise - <70.0°C
@ Connected/Shared Load of - 1,250 EkW, 1,562 kVA, 217 amperes
Heat Rise - <70.0°C
Ventilating Air - 7,607 cfm
Heat Rejection - 2,885 Btu/min
Motor Starting - 0 SkVA at 0% voltage dip

@ RATED CONDITIONS, 0.80 PF

Rating - 1,275 EkW, 1,594 kVA, 221 amperes
Heat Rise - 69°F
Efficiency, Load 100 % - 96.10
75 % - 96.20
50 % - 95.80

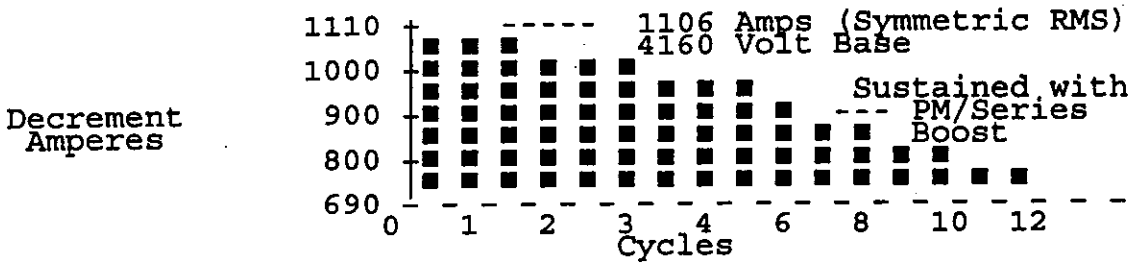
GENERATOR 1

ELECTRICAL CHARACTERISTICS

Time Constants, Short Circuit Transient T'D - 0.50227 seconds
Armature Short Circuit TA - 0.04747 seconds

Reactances	Per Unit	Ohms
Subtransient, Direct Axis X"D	- 0.20000	2.17169
Transcient, Saturated X'D	- 0.27191	2.95260
Synchronous, Direct Axis XD	- 3.37123	36.60626
Negative Sequence X2	- 0.19274	2.09291
Zero Sequence X0	- 0.00416	0.04523

Short Circuit Current, Three Phase



COOLING SYSTEM 1

TYPE
Radiator, Engine Mounted

CONSTRUCTION

Model - 72-46CV16P
Fan, Type - Blower
Diameter - 72 in
Drive Ratio - 0.428
Coolant Capacity, Radiator - 62.2 gal
Radiator and Engine - 123.8 gal
Weight, Dry - 2,254 lb
Wet - 2,690 lb

PERFORMANCE
@ SITE CONDITIONS

Ambient Capability, 50.0% Glycol - 128°F
Fan Power - 51.0 HP
Air Flow - 81,054 cfm
Sound @ 23 ft - 85 dBA

@ Connected/Shared Load of - 1,250 EkW
Ambient Capability, 50% Glycol - 129°F

@ RATED CONDITIONS

Ambient Capability, 50.0% Glycol - 128°F
Air Flow - 81,054 cfm
Restriction, Max. External - 0.25 in water

PUMP PERFORMANCE

	Main	Auxiliary
Flow at Maximum Restriction -	317.0 gal/min	154.3 gal/min
Restriction, Maximum -	43.0 ft water	40.4 ft water
Static Head, Maximum -	57.1 ft water	57.1 ft water

TRANSIENT RESPONSE, SYSTEM

SYSTEM CONDITIONS

Governor Speed Droop - 0%
Voltage Regulator Type - Volts/Hz
Site Power Capability at Site Power Factor - 1,282 kW @ 0.80 pf
Selected Power Factor - 0.80 pf

EQUIPMENT SELECTED

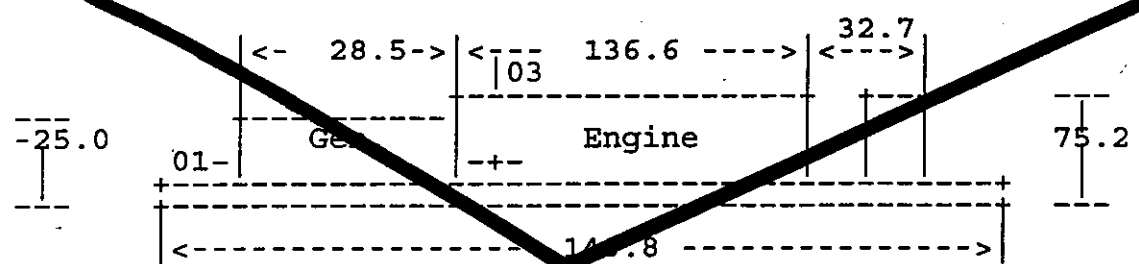
Set	Engine	Governor	Generator	Site Power EkW
1	3516 TA	2301A Elect/Hydra	00822	1,250

PERFORMANCE

Condition 1 — Gensets on Line 1 — Load On-Line 1,250

Change % :	0-25	0-50	0-75	0-100	100-0	75-0	50-0	25-0	-
Load EkW:	313	625	938	1250	1250	938	625	313	0
Freq % :	-1.4	-2.9	-7.5	-19.4	5.5	4.2	2.8	1.4	0.0
Volt % :	-4.3	-8.5	-12.8	-19.8	21.7	16.3	10.9	5.4	0.0
Recovery Seconds:	1.1	1.6	3.4	7.0	1.6	1.3	1.0	0.7	0.0

DIMENSIONS - (inches)



Overall, Width - 91 in
Height - 75 in
Length - 141 in

Weight, Dry - 25,156 lb
Wet - 28,970 lb

Dim coordinates
01 - Centerline of Crankshaft (height) +above, -below
02 - Centerline of Engine (width from rear) +right,-left
03 - Rear Face of Engine Block (length) +front, -rear

ATTACHMENT 12

PUMP STATION SPARE PARTS

FAIRBANKS MORSE PUMP CORPORATION

SUPPLIED SPARE PARTS

REF. NO	DESCRIPTION	QUANTITY
11	SEAL BOX GASKET	3
16	COLUMN FLANGE GASKET	3
17A	SEAL BOX BUSHING	2
26	BEARING	2
35	INTER BOWL BEARING	2
36W	BOWL WEAR RING, SET	2
38W	IMPELLER WEAR RING	2
41	SUCTION BEARING	2
50	CONNECTOR BEARING	2
	MECHANICAL SEAL	3
	MOTOR BEARINGS, SET	2

U.S. Electrical Motors Installation and Maintenance

NOTES

FAIRBANKS MORSE PUMP CORP
P.O. P384894
Job #062284

USEM # Z0670754

SPARE PARTS LIST

1. SHAFT/LOWER BEARING 6226 - J/C3
2. OPPOSITE/UPPER BEARING 7228 BCB
3. MOTOR SHAFT KEY
4. TERMINAL BOX GASKET
5. FILL & DRAIN PLUG

S.P. KINNEY ENGINEERS, INC.
143 FIRST AVENUE - CARNEGIE, PENNSYLVANIA

THIS DRAWING IS CERTIFIED FOR :

PURCHASER THE POOL & KENT COMPAMY MIAMI, FL. FOR MIRAMAR W.W.T.P.

LOCATION MIRAMAR, FL.

PURCHASE ORDER NO. 95621-1-105

S.P. KINNEY ORDER NO. 1-31282-01,02

JOB DESCRIPTION THREE(3)20" MODEL "A" AUTOMATIC SELF-CLEANING STRAINERS W/ AUTOMATIC BACKWASH CONTROLS (ST32010, ST32020, ST32030)

DATE 10-25-96 BY R.E.YEAGER, V.P. ENGRG.

STRAINER SERIAL NO. 7917V, 7918V, 7919V
MOTOR: U.S.ELECTRIC 1 1/2 H.P. HORIZONTAL FLANGE MOUNTED FRAME 56-C, 230/460 VOLTS, 3 PHASE, 60 HERTZ, 1800 RPM, 1.15 SF, TEFC-TROPICALIZED, CLASS F INSULATION, MOUNTED TO A WORM GEAR DRIVE UNIT.
MEDIA: 1/32" PERFORATED DELRIN DISCS
SERVICE: SECONDARY W.W.T.PLANT EFFLUENT
WORKING PRESSURE: 20-150 PSIG, DESIGN PRESSURE: 150 PSIG,
HYDROSTATIC TEST PRESSURE: 225 PSIG
CONSTRUCTION: BODY-CAST IRON
DRUM-CAST IRON
SHAFT-STEEL (CERAMIC COATED @ PACKING AREA)
INSPECTION COVER-TRANS. LEXAN
PACKING-J.M. SEA RING
RETAINER RINGS-DELRIN

AUTOMATIC BACKWASH CONTROLS

BACKWASH VALVE: 3" JAMESBURY FIG. 7150-31-2236-TTT-1 FLANGED BALL VALVE, CARBON STEEL BODY W/ 316S/S BALL AND STEM W/ TEFLON SEATS.
VALVE ACTUATOR: JAMESBURY FIG. EJ50 ELECTRIC OPERATOR FOR 120V, 1 PH, 60 HZ. OPERATION.
PRESSURE GAUGES: ASHCROFT 35-1009SW-02L 316S/S 3 1/2" DIAL 0-160 PSI COMPLETE WITH ASHCROFT 1/4" 316 S/S DIAPHRAGM SEAL GLYCERIN FILLED
PRESSURE SWITCH: BARKSDALE DPD2TA80SS
CONTROLLER:CONTROL PANEL FREE STANDING IN A NEMA 4X S/SENCLOSURE FOR 120 V, 1 PH, 60 HZ OPERATION & CONTAINING:
1-2 POSITION SELECTOR SWITCH "OPEN-CLOSE"
1-3 POSITION SELECTOR SWITCH "HAND-OFF-AUTO"
2-PUSH BUTTON "START-STOP-CLEANING CYCLE"
4-INDICATING LIGHTS
1-TERMINAL STRIP
1-SIZE 1 MOTOR STARTER W/ MANUAL RESET
3-CONTROL RELAYS
1-SURGE ARRESTOR
1-SINGLE SHOT TIMER
1-TRANSFORMER 460/120V 500VA
1-CIRCUIT BREAKER
1-SQ.D TIMER 9050JCK57V20 (30 MIN)

SPARE PARTS: 100 - 1/32" PERFORATED DELRIN DISCS
100 - 3/8" DELRIN RETAINER RINGS

VARIABLE FREQUENCY DRIVES

Spare Parts

CATALOG NO	DESCRIPTION	QTY
1336-MCB-SP1A	PCB, Main Control	3
1336-BDB-SP2A	PCB, Gate, Drive, 10HP	1
1336-BDB-SP3A	PCB, Gate, Drive, 15HP	1
1336-BDB-SP18A	PCB, Gate, Drive, 50HP	1
1336-BDB-SP31A	PCB, Gate, Drive, 125HP	1
1336-BDB-SP45A	PCB, Gate, Drive, 400HP	1
1336-PB-SP2A	Precharge PCB, 50HP	1
1336-PB-SP8A	Precharge PCB, 125HP	1
1336-PB-SP19A	Precharge PCB, 400HP	1
1336-SN-SP1A	PCB, Snubber, 50HP	1
1336-SN-SP4A	PCB, Snubber, 125HP	1
1336-BR-SP1A	Bridge Rectifier, 10 & 15HP	2
1336-BR-SP5A	Bridge Rectifier, 50HP	1
1336-QOUT-SP1A	Transistors Asmbly, Out., 10HP	3
1336-QOUT-SP3A	Transistors Asmbly, Out., 15HP	3
1336-QOUT-SP8A	Transistors Asmbly, Out., 50HP	3
1336-QOUT-SP14A	Transistors Asmbly, Out., 125H	3
1336-QOUT-SP20A	Transistors Asmbly, Out., 400H	3
1336-RLOAD-SP2A	Load Resistors, 10 & 15HP	2
1336-RLOAD-SP3A	Load Resistors, 50HP	1
1336-RLOAD-SP4A	Load Resistors, 125HP	2
1336-RLOAD-SP6A	Load Resistors, 400HP	9
1336-F1-SP3A	Fuse, Bus, 125HP	1

Provide one complete set of parts as listed on page 6-3 of the Troubleshooting Guide And Renewal Parts book for each size of drive supplied.

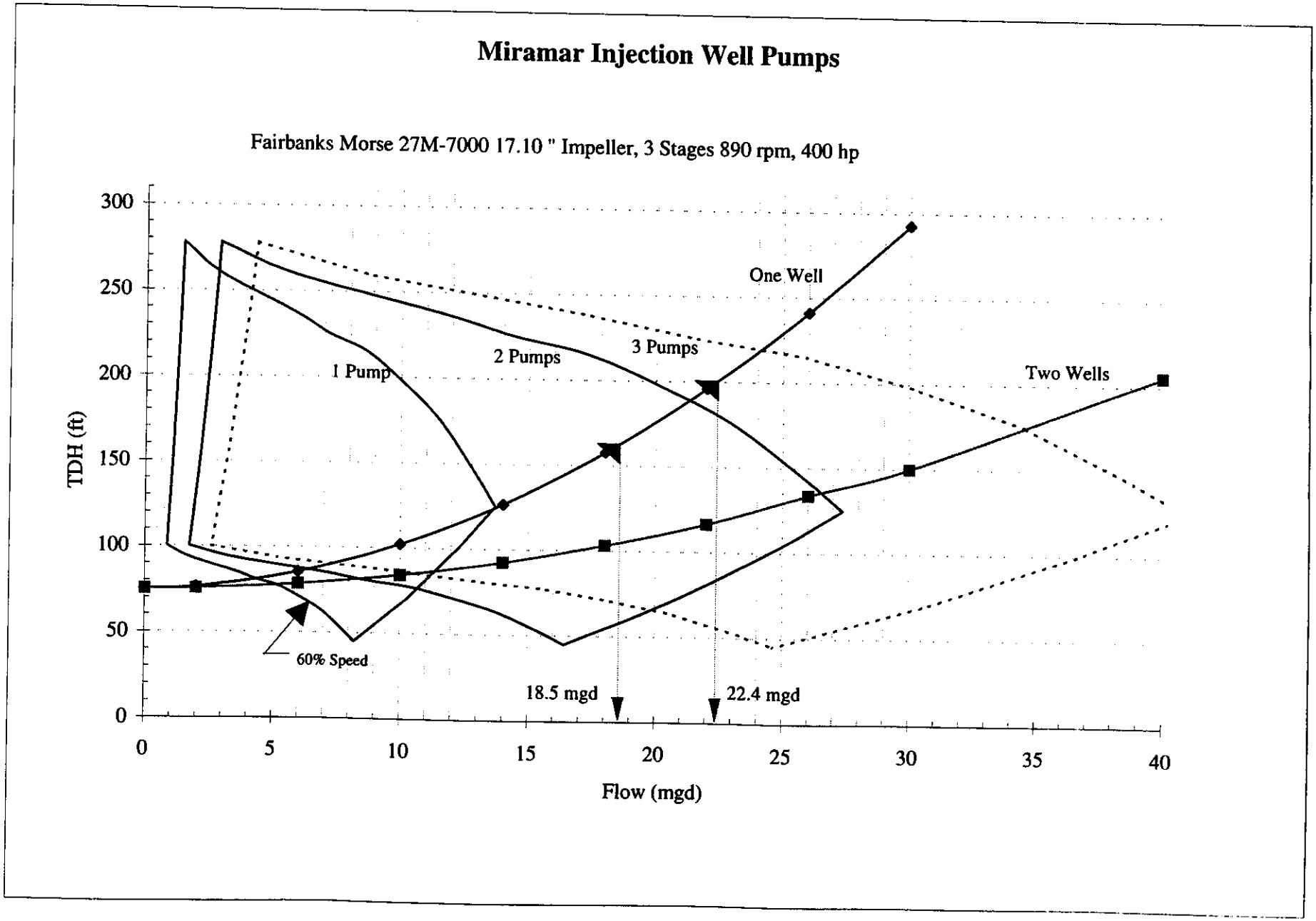
Include special tools, wrenches, and test equipment if required. Provide spare fuses and indicator lamps

Use or disclosure of data contained on this page is subject to the restrictions on the title page of this proposa

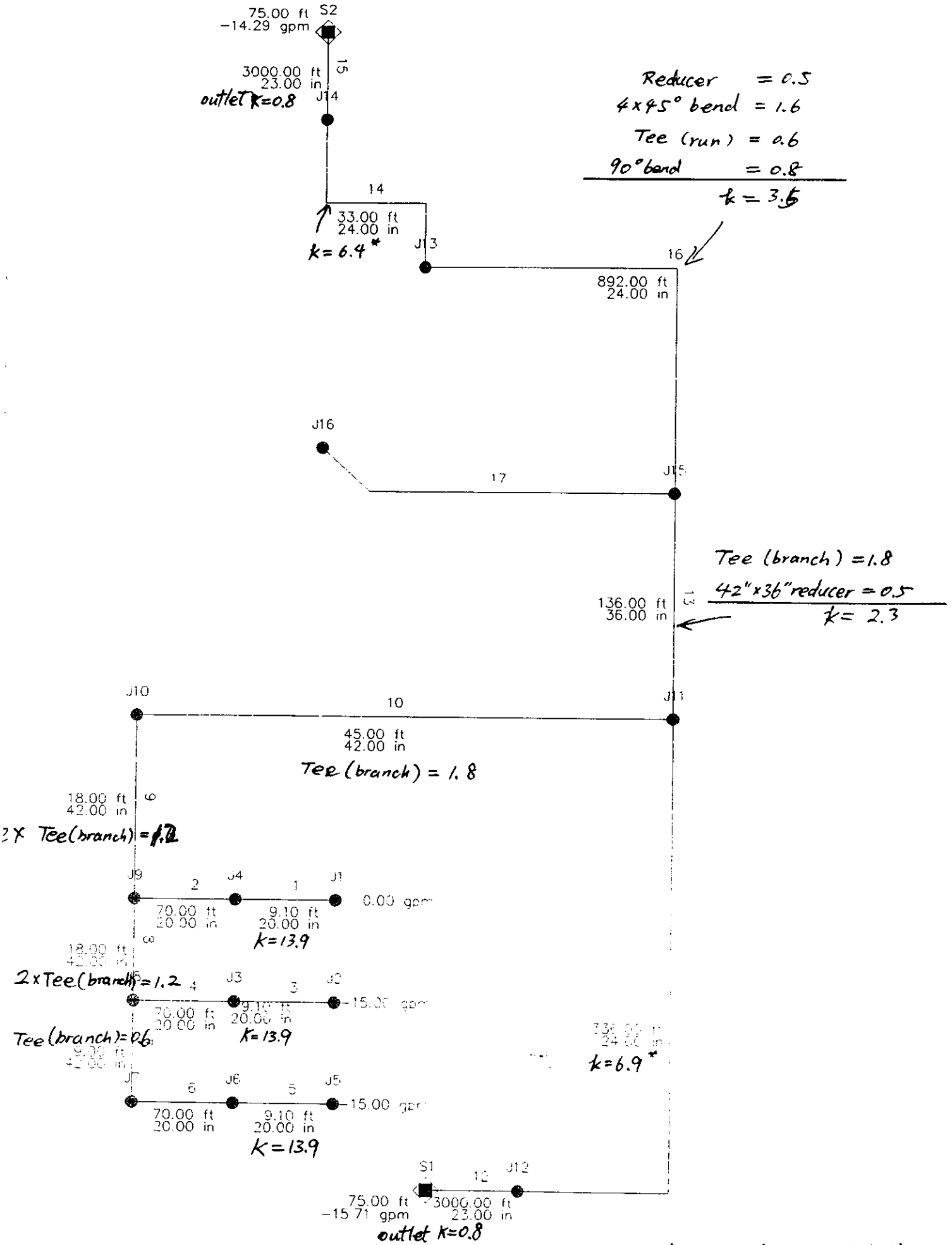
ATTACHMENT 13

PUMP AND SYSTEM CURVES

HYDRAULIC CALCULATIONS


Miramar Injection Well Pumps
Fairbanks Morse 27M-7000 17.10 " Impeller, 3 Stages 890 rpm, 400 hp
TDH (ft)
300
250
200
150
100
50
0
0
5
10
15
20
25
30
35
40
Flow (mgd)
One Well
Two Wells
1 Pump
2 Pumps
3 Pumps
60% Speed
18.5 mgd
22.4 mgd

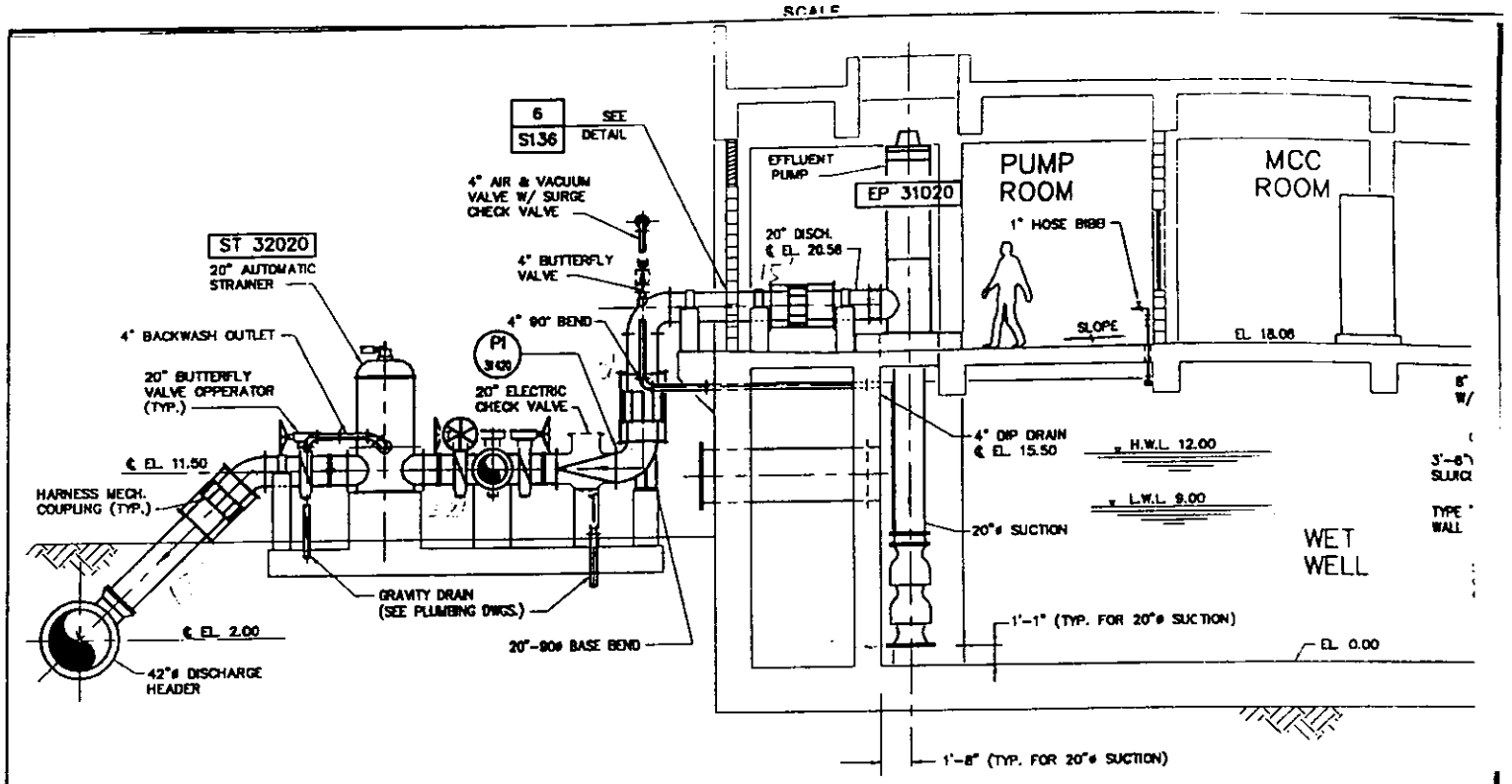
INJ_WELL.XLS



* See attached calculation sheets for details.

HAZEN AND SAWYER
Environmental Engineers & Scientists

JOB Miramar Injection Well Pump Station
SHEET NO. _____ OF _____
CALCULATED BY TJW DATE 3/20/97
CHECKED BY _____ DATE _____
SCALE



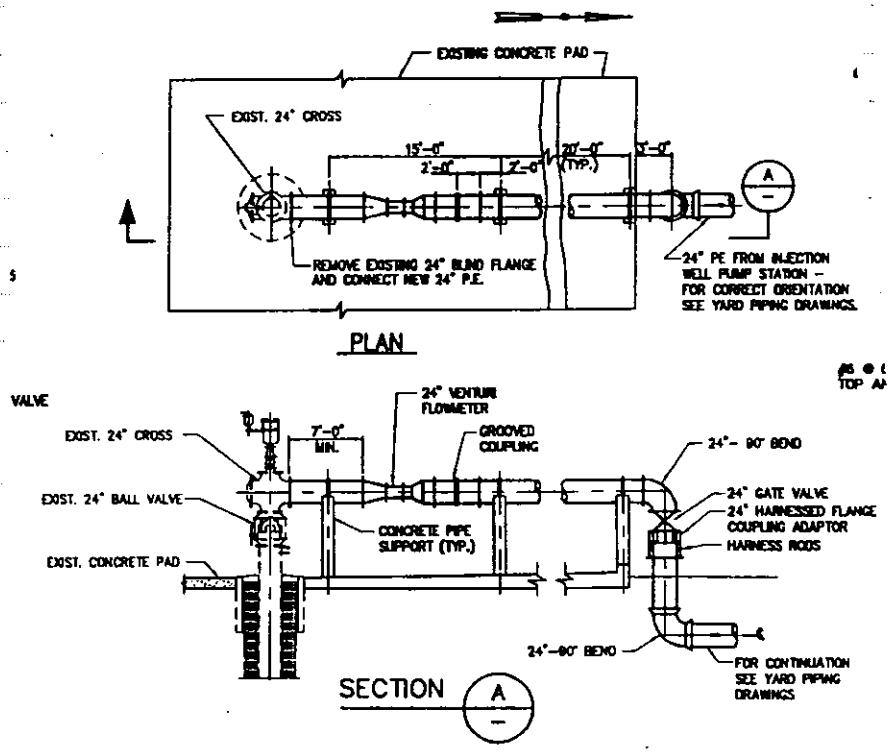
Pump Station Minor Losses

Suction inlet	:	k = 1.0
2 x 90° bend	:	1.6
check valve	:	3.7
Cross	:	2.2
Strainer	:	2.0
butterfly valve	:	1.2
45° bend	:	0.4
Tee (branch)	:	1.8
		13.9

FORM No. EN-01

HAZEN AND SAWYER
Environmental Engineers & Scientists

JOB Miramar Injection Wells
SHEET NO. _____ OF _____
CALCULATED BY TJW DATE 3/20/97
CHECKED BY _____ DATE _____
SCALE _____



INJECTION WELL CONNECTION DETAIL
N.T.S.

The last force main before injection wells:

	Well 1	Well 2
42"×24" Reducer :	k = 0.5	
2×90° bend	1.6	1.6
Butterfly valve :	1.2	1.2
Flow meter :	0.2	0.2
Cross (branch) :	2.2	2.2
Ball valve :	1.2	1.2
	6.9	6.4

```
+-----------------------------------------------+
|              MAXIMUM DIMENSIONS               |
|                                               |
|  Number of pipes ....................... 2000 |
|  Number of pumps ....................... 500  |
|  Number junction nodes................. 2000 |
|  Flow meters ........................... 500  |
|  Boundary nodes ........................ 200  |
|  Variable storage tanks ............... 500  |
|  Pressure switches ..................... 500  |
|  Regulating Valves...................... 500  |
|  Items for limited output ............. 2000 |
|  limit for non-consecutive numbering ..20510  |
+-----------------------------------------------+
```

Cybernet version 2.18. SN: 1132130586-2000

Extended Description:

U N I T S S P E C I F I E D

```
FLOWRATE ............ = million gallons/day
HEAD (HGL) .......... = feet
PRESSURE ............ = psig
```

O U T P U T O P T I O N D A T A

OUTPUT SELECTION: ALL RESULTS ARE INCLUDED IN THE TABULATED OUTPUT

S Y S T E M C O N F I G U R A T I O N

```
NUMBER OF PIPES ....................(p) =   17
NUMBER OF JUNCTION NODES ...........(j) =   16
NUMBER OF PRIMARY LOOPS ............(l) =    0
NUMBER OF BOUNDARY NODES ...........(f) =    2
NUMBER OF SUPPLY ZONES .............(z) =    1
```

```
*************************************
 S I M U L A T I O N   R E S U L T S
*************************************
```

*** WARNING ***
A PORTION OF THE SYSTEM IS DISCONNECTED FROM A BND BY CLOSED LINES

**** A FIX WILL BE ATTEMPTED

THE FOLLOWING JUNCTION NODES ARE DISCONNECTED FROM THE SYSTEM

DEMANDS AT THESE JUNCTION NODES ARE SET TO ZERO:
1 16

PIPE NO. 1 HAS BEEN OPENED TO REMOVE DISCONNECTION

*** WARNING ***
A PORTION OF THE SYSTEM IS DISCONNECTED FROM A BND BY CLOSED LINES

**** A FIX WILL BE ATTEMPTED

THE FOLLOWING JUNCTION NODES ARE DISCONNECTED FROM THE SYSTEM
DEMANDS AT THESE JUNCTION NODES ARE SET TO ZERO:
16

PIPE NO. 17 HAS BEEN OPENED TO REMOVE DISCONNECTION

The results are obtained after 3 trials with an accuracy = 0.00012

S I M U L A T I O N D E S C R I P T I O N

CyberNet Version 2.18. Copyright 1991,92 Haestad Methods Inc.
Run Description: 30 mgd
Drawing: INJEWELL

P I P E L I N E R E S U L T S

STATUS CODE: XX -CLOSED PIPE BN -BOUNDARY NODE PU -PUMP LINE
CV -CHECK VALVE RV -REGULATING VALVE TK -STORAGE TANK

PIPE NUMBER	NODE NOS. #1	#2	FLOWRATE (mgd)	HEAD LOSS (ft)	PUMP HEAD (ft)	MINOR LOSS (ft)	LINE VELO. (ft/s)	HL/ 1000 (ft/ft)
1	1	4	0.00	0.00	0.00	0.00	0.00	0.00
2	4	9	0.00	0.00	0.00	0.00	0.00	0.00
3	2	3	15.00	0.20	0.00	24.42	10.64	22.03
4	3	8	15.00	1.54	0.00	0.00	10.64	22.03
5	5	6	15.00	0.20	0.00	24.42	10.64	22.03
6	6	7	15.00	1.54	0.00	0.00	10.64	22.03
7	7	8	15.00	0.01	0.00	0.05	2.41	0.59
8	8	9	30.00	0.04	0.00	0.43	4.82	2.14
9	9	10	30.00	0.04	0.00	0.43	4.82	2.14
10	10	11	30.00	0.10	0.00	0.65	4.82	2.14
11	11	12	15.71	3.32	0.00	6.41	7.74	9.88
12-BN	12	0	15.71	36.46	0.00	0.88	8.43	12.15
13	11	15	14.29	0.16	0.00	0.35	3.13	1.15
14	13	14	14.29	0.27	0.00	4.92	7.04	8.28
15-BN	14	0	14.29	30.57	0.00	0.73	7.66	10.19
16	13	15	-14.29	7.39	0.00	2.69	7.04	8.28
17	15	16	0.00	0.00	0.00	0.00	0.00	0.00

J U N C T I O N N O D E R E S U L T S

JUNCTION NUMBER	JUNCTION TITLE	EXTERNAL DEMAND (mgd)	HYDRAULIC GRADE (ft)	JUNCTION ELEVATION (ft)	PRESSURE HEAD (ft)	JUNCTION PRESSURE (psi)
1-1	Wet Well 3	0.00	123.29	0.00	123.29	53.43
2-1	Wet Well 2	-15.00	149.93	0.00	149.93	64.97
3-1		0.00	125.31	2.00	123.31	53.43
4-1		0.00	123.29	2.00	121.29	52.56
5-1	Wet Well 1	-15.00	149.99	0.00	149.99	64.99
6-1		0.00	125.37	2.00	123.37	53.46
7-1		0.00	123.82	2.00	121.82	52.79
8-1		0.00	123.76	2.00	121.76	52.76
9-1		0.00	123.29	2.00	121.29	52.56
10-1		0.00	122.82	2.00	120.82	52.36
11-1		0.00	122.07	2.00	120.07	52.03
12-1		0.00	112.34	2.00	110.34	47.81
13-1		0.00	111.49	2.00	109.49	47.45
14-1		0.00	106.30	2.00	104.30	45.20
15-1		0.00	121.57	2.00	119.57	51.81
16-1		0.00	121.57			

S U M M A R Y O F I N F L O W S A N D O U T F L O W S

(+) INFLOWS INTO THE SYSTEM FROM BOUNDARY NODES
(-) OUTFLOWS FROM THE SYSTEM INTO BOUNDARY NODES

PIPE NUMBER	FLOWRATE (mgd)
12	-15.71
15	-14.29

NET SYSTEM INFLOW = 0.00
NET SYSTEM OUTFLOW = -30.00
NET SYSTEM DEMAND = -30.00

**** CYBERNET SIMULATION COMPLETED ****

DATE: 3/20/1997
TIME: 16:38:26

****
S U M M A R Y O F O R I G I N A L D A T A
****

CyberNet Version 2.18. Copyright 1991,92 Haestad Methods Inc.
Run Description: 30 mgd
Drawing: INJEWELL

P I P E L I N E D A T A

STATUS CODE: XX -CLOSED PIPE BN -BOUNDARY NODE PU -PUMP LINE
CV -CHECK VALVE RV -REGULATING VALVE

PIPE NUMBER	NODE NOS. #1	#2	LENGTH (ft)	DIAMETER (in)	ROUGHNESS COEFF.	MINOR LOSS COEFF.	BND-HGL (ft)
1-XX	1	4	9.1	20.0	110.00	13.90	
2	4	9	70.0	20.0	110.00	0.00	
3	2	3	9.1	20.0	110.00	13.90	
4	3	8	70.0	20.0	110.00	0.00	
5	5	6	9.1	20.0	110.00	13.90	
6	6	7	70.0	20.0	110.00	0.00	
7	7	8	9.0	42.0	110.00	0.60	
8	8	9	18.0	42.0	110.00	1.20	
9	9	10	18.0	42.0	110.00	1.20	
10	10	11	45.0	42.0	110.00	1.80	
11	11	12	336.0	24.0	110.00	6.90	
12-BN	12	0	3000.0	23.0	110.00	0.80	75.00
13	11	15	136.0	36.0	110.00	2.30	
14	13	14	33.0	24.0	110.00	6.40	
15-BN	14	0	3000.0	23.0	110.00	0.80	75.00
16	13	15	892.0	24.0	110.00	3.50	
17-XX	15	16	289.0	24.0	110.00	1.20	

J U N C T I O N N O D E D A T A

JUNCTION NUMBER	JUNCTION TITLE	EXTERNAL DEMAND (mgd)	JUNCTION ELEVATION (ft)	CONNECTING PIPES		
1-1	Wet Well 3	-550.00	0.00	1		
2-1	Wet Well 2	-15.00	0.00	3		
3-1		0.00	2.00	3	4	
4-1		0.00	2.00	1	2	
5-1	Wet Well 1	-15.00	0.00	5		
6-1		0.00	2.00	5	6	
7-1		0.00	2.00	6	7	
8-1		0.00	2.00	4	7	8
9-1		0.00	2.00	2	8	9
10-1		0.00	2.00	9	10	
11-1		0.00	2.00	10	11	13
12-1		0.00	2.00	11	12	
13-1		0.00	2.00	14	16	
14-1		0.00	2.00	14	15	

15-1	0.00	2.00	13	16	17
16-1	0.00	0.00	17		

```
+-----------------------------------------------+
|              MAXIMUM DIMENSIONS               |
|                                               |
|  Number of pipes ....................... 2000 |
|  Number of pumps ....................... 500  |
|  Number junction nodes................. 2000 |
|  Flow meters ........................... 500  |
|  Boundary nodes ........................ 200  |
|  Variable storage tanks ............... 500  |
|  Pressure switches ..................... 500  |
|  Regulating Valves...................... 500  |
|  Items for limited output ............ 2000   |
|  limit for non-consecutive numbering ..20510  |
+-----------------------------------------------+
```

Cybernet version 2.18. SN: 1132130586-2000

Extended Description:

U N I T S S P E C I F I E D

```
FLOWRATE ............ = million gallons/day
HEAD (HGL) .......... = feet
PRESSURE ............ = psig
```

O U T P U T O P T I O N D A T A

OUTPUT SELECTION: ALL RESULTS ARE INCLUDED IN THE TABULATED OUTPUT

S Y S T E M C O N F I G U R A T I O N

```
NUMBER OF PIPES ....................(p) =   17
NUMBER OF JUNCTION NODES ..........(j) =   16
NUMBER OF PRIMARY LOOPS ...........(l) =    0
NUMBER OF BOUNDARY NODES ..........(f) =    2
NUMBER OF SUPPLY ZONES ............(z) =    1
```

```
*************************************
 S I M U L A T I O N   R E S U L T S
*************************************
```

** WARNING ***
A PORTION OF THE SYSTEM IS DISCONNECTED FROM A BND BY CLOSED LINES

**** A FIX WILL BE ATTEMPTED

'HE FOLLOWING JUNCTION NODES ARE DISCONNECTED FROM THE SYSTEM
DEMANDS AT THESE JUNCTION NODES ARE SET TO ZERO:
1 16

IPE NO. 1 HAS BEEN OPENED TO REMOVE DISCONNECTION

*** WARNING ***
A PORTION OF THE SYSTEM IS DISCONNECTED FROM A BND BY CLOSED LINES

**** A FIX WILL BE ATTEMPTED

THE FOLLOWING JUNCTION NODES ARE DISCONNECTED FROM THE SYSTEM
DEMANDS AT THESE JUNCTION NODES ARE SET TO ZERO:
16

PIPE NO. 17 HAS BEEN OPENED TO REMOVE DISCONNECTION

he results are obtained after 3 trials with an accuracy = 0.00011

S I M U L A T I O N D E S C R I P T I O N

yberNet Version 2.18. Copyright 1991,92 Haestad Methods Inc.
un Description: 26 mgd
Drawing: INJEWELL

P I P E L I N E R E S U L T S

STATUS CODE: XX -CLOSED PIPE BN -BOUNDARY NODE PU -PUMP LINE
CV -CHECK VALVE RV -REGULATING VALVE TK -STORAGE TANK

PIPE NUMBER	NODE NOS. #1	#2	FLOWRATE (mgd)	HEAD LOSS (ft)	PUMP HEAD (ft)	MINOR LOSS (ft)	LINE VELO. (ft/s)	HL/ 1000 (ft/ft)
1	1	4	0.00	0.00	0.00	0.00	0.00	0.00
2	4	9	0.00	0.00	0.00	0.00	0.00	0.00
3	2	3	13.00	0.15	0.00	18.34	9.22	16.90
4	3	8	13.00	1.18	0.00	0.00	9.22	16.90
5	5	6	13.00	0.15	0.00	18.34	9.22	16.90
6	6	7	13.00	1.18	0.00	0.00	9.22	16.90
7	7	8	13.00	0.00	0.00	0.04	2.09	0.46
8	8	9	26.00	0.03	0.00	0.33	4.18	1.64
9	9	10	26.00	0.03	0.00	0.33	4.18	1.64
10	10	11	26.00	0.07	0.00	0.49	4.18	1.64
11	11	12	13.56	2.53	0.00	7.00	6.68	7.52
12-BN	12	0	13.56	27.77	0.00	0.66	7.27	9.26
13	11	15	12.44	0.12	0.00	0.26	2.72	0.89
14	13	14	12.44	0.21	0.00	5.41	6.12	6.40
15-BN	14	0	12.44	23.64	0.00	0.55	6.67	7.88
16	13	15	-12.44	5.71	0.00	2.04	6.12	6.40
17	15	16	0.00	0.00	0.00	0.00	0.00	0.00

J U N C T I O N N O D E R E S U L T S

JUNCTION NUMBER	JUNCTION TITLE	EXTERNAL DEMAND (mgd)	HYDRAULIC GRADE (ft)	JUNCTION ELEVATION (ft)	PRESSURE HEAD (ft)	JUNCTION PRESSURE (psi)
1-1	Wet Well 3	0.00	113.87	0.00	113.87	49.34
2-1	Wet Well 2	-13.00	133.90	0.00	133.90	58.02
3-1		0.00	115.41	2.00	113.41	49.14
4-1		0.00	113.87	2.00	111.87	48.48
5-1	Wet Well 1	-13.00	133.95	0.00	133.95	58.04
6-1		0.00	115.45	2.00	113.45	49.16
7-1		0.00	114.27	2.00	112.27	48.65
8-1		0.00	114.23	2.00	112.23	48.63
9-1		0.00	113.87	2.00	111.87	48.48
10-1		0.00	113.52	2.00	111.52	48.32
11-1		0.00	112.95	2.00	110.95	48.08
12-1		0.00	103.43	2.00	101.43	43.95
13-1		0.00	104.82	2.00	102.82	44.55
14-1		0.00	99.19	2.00	97.19	42.12
15-1		0.00	112.57	2.00	110.57	47.91
16-1		0.00	112.57			

S U M M A R Y O F I N F L O W S A N D O U T F L O W S

(+) INFLOWS INTO THE SYSTEM FROM BOUNDARY NODES
(-) OUTFLOWS FROM THE SYSTEM INTO BOUNDARY NODES

PIPE NUMBER	FLOWRATE (mgd)
12	-13.56
15	-12.44

ET SYSTEM INFLOW = 0.00
ET SYSTEM OUTFLOW = -26.00
ET SYSTEM DEMAND = -26.00

*** CYBERNET SIMULATION COMPLETED ****

ATE: 3/20/1997
IME: 15:32:46

```
+-----------------------------------------------+
|              MAXIMUM DIMENSIONS                |
|                                                |
|  Number of pipes ....................... 2000 |
|  Number of pumps ....................... 500  |
|  Number junction nodes................. 2000 |
|  Flow meters ........................... 500  |
|  Boundary nodes ........................ 200  |
|  Variable storage tanks ............... 500  |
|  Pressure switches ..................... 500  |
|  Regulating Valves...................... 500  |
|  Items for limited output ............ 2000  |
|  limit for non-consecutive numbering ..20510  |
+-----------------------------------------------+
```

Cybernet version 2.18. SN: 1132130586-2000

Extended Description:

```
I N I T S   S P E C I F I E D

  FLOWRATE ............ = million gallons/day
  HEAD (HGL) .......... = feet
  PRESSURE ............ = psig


O U T P U T   O P T I O N   D A T A

OUTPUT SELECTION:  ALL RESULTS ARE INCLUDED IN THE TABULATED OUTPUT


S Y S T E M   C O N F I G U R A T I O N

   NUMBER OF PIPES ....................(p) =   17
   NUMBER OF JUNCTION NODES ...........(j) =   16
   NUMBER OF PRIMARY LOOPS ............(l) =    0
   NUMBER OF BOUNDARY NODES ...........(f) =    2
   NUMBER OF SUPPLY ZONES .............(z) =    1


                  ************************************
                   S I M U L A T I O N   R E S U L T S
                  ************************************


*** WARNING ***
    A PORTION OF THE SYSTEM IS DISCONNECTED FROM A BND BY CLOSED LINES

                  **** A FIX WILL BE ATTEMPTED
```

THE FOLLOWING JUNCTION NODES ARE DISCONNECTED FROM THE SYSTEM
DEMANDS AT THESE JUNCTION NODES ARE SET TO ZERO:
1 16

PIPE NO. 1 HAS BEEN OPENED TO REMOVE DISCONNECTION

*** WARNING ***
A PORTION OF THE SYSTEM IS DISCONNECTED FROM A BND BY CLOSED LINES

**** A FIX WILL BE ATTEMPTED

THE FOLLOWING JUNCTION NODES ARE DISCONNECTED FROM THE SYSTEM
DEMANDS AT THESE JUNCTION NODES ARE SET TO ZERO:
16

PIPE NO. 17 HAS BEEN OPENED TO REMOVE DISCONNECTION

The results are obtained after 3 trials with an accuracy = 0.00016

S I M U L A T I O N D E S C R I P T I O N

CyberNet Version 2.18. Copyright 1991,92 Haestad Methods Inc.
Run Description: 22 mgd
Drawing: INJEWELL

P I P E L I N E R E S U L T S

STATUS CODE: XX -CLOSED PIPE BN -BOUNDARY NODE PU -PUMP LINE
CV -CHECK VALVE RV -REGULATING VALVE TK -STORAGE TANK

PIPE NUMBER	NODE NOS. #1	#2	FLOWRATE (mgd)	HEAD LOSS (ft)	PUMP HEAD (ft)	MINOR LOSS (ft)	LINE VELO. (ft/s)	HL/ 1000 (ft/ft)
1	1	4	0.00	0.00	0.00	0.00	0.00	0.00
2	4	9	0.00	0.00	0.00	0.00	0.00	0.00
3	2	3	11.00	0.11	0.00	13.13	7.80	12.40
4	3	8	11.00	0.87	0.00	0.00	7.80	12.40
5	5	6	11.00	0.11	0.00	13.13	7.80	12.40
6	6	7	11.00	0.87	0.00	0.00	7.80	12.40
7	7	8	11.00	0.00	0.00	0.03	1.77	0.33
8	8	9	22.00	0.02	0.00	0.23	3.54	1.21
9	9	10	22.00	0.02	0.00	0.23	3.54	1.21
10	10	11	22.00	0.05	0.00	0.35	3.54	1.21
11	11	12	11.52	1.87	0.00	3.45	5.67	5.56
12-BN	12	0	11.52	20.51	0.00	0.47	6.18	6.84
13	11	15	10.48	0.09	0.00	0.19	2.29	0.65
14	13	14	10.48	0.15	0.00	2.65	5.16	4.67
15-BN	14	0	10.48	17.22	0.00	0.39	5.62	5.74
16	13	15	-10.48	4.16	0.00	1.45	5.16	4.67
17	15	16	0.00	0.00	0.00	0.00	0.00	0.00

J U N C T I O N N O D E R E S U L T S

JUNCTION NUMBER	JUNCTION TITLE	EXTERNAL DEMAND (mgd)	HYDRAULIC GRADE (ft)	JUNCTION ELEVATION (ft)	PRESSURE HEAD (ft)	JUNCTION PRESSURE (psi)
1-1	Wet Well 3	0.00	101.96	0.00	101.96	44.18
2-1	Wet Well 2	-11.00	116.33	0.00	116.33	50.41
3-1		0.00	103.09	2.00	101.09	43.80
4-1		0.00	101.96	2.00	99.96	43.32
5-1	Wet Well 1	-11.00	116.36	0.00	116.36	50.42
6-1		0.00	103.12	2.00	101.12	43.82
7-1		0.00	102.25	2.00	100.25	43.44
8-1		0.00	102.22	2.00	100.22	43.43
9-1		0.00	101.96	2.00	99.96	43.32
10-1		0.00	101.71	2.00	99.71	43.21
11-1		0.00	101.30	2.00	99.30	43.03
12-1		0.00	95.99	2.00	93.99	40.73
13-1		0.00	95.42	2.00	93.42	40.48
14-1		0.00	92.62	2.00	90.62	39.27
15-1		0.00	101.03	2.00	99.03	42.91
16-1		0.00	101.03			

S U M M A R Y O F I N F L O W S A N D O U T F L O W S

(+) INFLOWS INTO THE SYSTEM FROM BOUNDARY NODES
(-) OUTFLOWS FROM THE SYSTEM INTO BOUNDARY NODES

PIPE NUMBER	FLOWRATE (mgd)
12	-11.52
15	-10.48

NET SYSTEM INFLOW = 0.00
NET SYSTEM OUTFLOW = -22.00
NET SYSTEM DEMAND = -22.00

**** CYBERNET SIMULATION COMPLETED ****

DATE: 3/20/1997
TIME: 15:32:46

```
+-----------------------------------------------+
|                MAXIMUM DIMENSIONS             |
|                                               |
|  Number of pipes ....................... 2000 |
|  Number of pumps ....................... 500  |
|  Number junction nodes................. 2000 |
|  Flow meters ........................... 500  |
|  Boundary nodes ........................ 200  |
|  Variable storage tanks ............... 500  |
|  Pressure switches ..................... 500  |
|  Regulating Valves...................... 500  |
|  Items for limited output ............ 2000  |
|  limit for non-consecutive numbering ..20510  |
+-----------------------------------------------+
```

Cybernet version 2.18. SN: 1132130586-2000

Extended Description:

U N I T S S P E C I F I E D

```
FLOWRATE ............ = million gallons/day
HEAD (HGL) .......... = feet
PRESSURE ............ = psig
```

O U T P U T O P T I O N D A T A

OUTPUT SELECTION: ALL RESULTS ARE INCLUDED IN THE TABULATED OUTPUT

S Y S T E M C O N F I G U R A T I O N

```
NUMBER OF PIPES ....................(p) =   17
NUMBER OF JUNCTION NODES ...........(j) =   16
NUMBER OF PRIMARY LOOPS ............(l) =    0
NUMBER OF BOUNDARY NODES ...........(f) =    2
NUMBER OF SUPPLY ZONES .............(z) =    1
```

```
*************************************
 S I M U L A T I O N   R E S U L T S
*************************************
```

*** WARNING ***
A PORTION OF THE SYSTEM IS DISCONNECTED FROM A BND BY CLOSED LINES

**** A FIX WILL BE ATTEMPTED

'HE FOLLOWING JUNCTION NODES ARE DISCONNECTED FROM THE SYSTEM
DEMANDS AT THESE JUNCTION NODES ARE SET TO ZERO:
1 16

'IPE NO. 1 HAS BEEN OPENED TO REMOVE DISCONNECTION

*** WARNING ***
A PORTION OF THE SYSTEM IS DISCONNECTED FROM A BND BY CLOSED LINES

**** A FIX WILL BE ATTEMPTED

THE FOLLOWING JUNCTION NODES ARE DISCONNECTED FROM THE SYSTEM
DEMANDS AT THESE JUNCTION NODES ARE SET TO ZERO:
16

PIPE NO. 17 HAS BEEN OPENED TO REMOVE DISCONNECTION

The results are obtained after 3 trials with an accuracy = 0.00019

S I M U L A T I O N D E S C R I P T I O N

CyberNet Version 2.18. Copyright 1991,92 Haestad Methods Inc.
Run Description: 18 mgd
Drawing: INJEWELL

P I P E L I N E R E S U L T S

STATUS CODE: XX -CLOSED PIPE BN -BOUNDARY NODE PU -PUMP LINE
CV -CHECK VALVE RV -REGULATING VALVE TK -STORAGE TANK

PIPE NUMBER	NODE NOS. #1	#2	FLOWRATE (mgd)	HEAD LOSS (ft)	PUMP HEAD (ft)	MINOR LOSS (ft)	LINE VELO. (ft/s)	HL/ 1000 (ft/ft)
1	1	4	0.00	0.00	0.00	0.00	0.00	0.00
2	4	9	0.00	0.00	0.00	0.00	0.00	0.00
3	2	3	9.00	0.08	0.00	8.79	6.38	8.55
4	3	8	9.00	0.60	0.00	0.00	6.38	8.55
5	5	6	9.00	0.08	0.00	8.79	6.38	8.55
6	6	7	9.00	0.60	0.00	0.00	6.38	8.55
7	7	8	9.00	0.00	0.00	0.02	1.45	0.23
8	8	9	18.00	0.01	0.00	0.16	2.89	0.83
9	9	10	18.00	0.01	0.00	0.16	2.89	0.83
10	10	11	18.00	0.04	0.00	0.23	2.89	0.83
11	11	12	9.42	1.29	0.00	2.31	4.64	3.83
12-BN	12	0	9.42	14.14	0.00	0.32	5.05	4.71
13	11	15	8.58	0.06	0.00	0.13	1.88	0.45
14	13	14	8.58	0.11	0.00	1.77	4.22	3.22
15-BN	14	0	8.58	11.88	0.00	0.26	4.60	3.96
16	13	15	-8.58	2.87	0.00	0.97	4.22	3.22
17	15	16	0.00	0.00	0.00	0.00	0.00	0.00

J U N C T I O N N O D E R E S U L T S

JUNCTION NUMBER	JUNCTION TITLE	EXTERNAL DEMAND (mgd)	HYDRAULIC GRADE (ft)	JUNCTION ELEVATION (ft)	PRESSURE HEAD (ft)	JUNCTION PRESSURE (psi)
1-1	Wet Well 3	0.00	93.50	0.00	93.49	40.51
2-1	Wet Well 2	-9.00	103.13	0.00	103.13	44.69
3-1		0.00	94.26	2.00	92.26	39.98
4-1		0.00	93.50	2.00	91.50	39.65
5-1	Wet Well 1	-9.00	103.16	0.00	103.15	44.70
6-1		0.00	94.29	2.00	92.29	39.99
7-1		0.00	93.69	2.00	91.69	39.73
8-1		0.00	93.67	2.00	91.67	39.72
9-1		0.00	93.50	2.00	91.50	39.65
10-1		0.00	93.32	2.00	91.32	39.57
11-1		0.00	93.05	2.00	91.05	39.46
12-1		0.00	89.46	2.00	87.46	37.90
13-1		0.00	89.02	2.00	87.02	37.71
14-1		0.00	87.15	2.00	85.15	36.90
15-1		0.00	92.87	2.00	90.87	39.38
16-1		0.00	92.87			

S U M M A R Y O F I N F L O W S A N D O U T F L O W S

(+) INFLOWS INTO THE SYSTEM FROM BOUNDARY NODES
(-) OUTFLOWS FROM THE SYSTEM INTO BOUNDARY NODES

PIPE NUMBER	FLOWRATE (mgd)
12	-9.42
15	-8.58

NET SYSTEM INFLOW = 0.00
NET SYSTEM OUTFLOW = -18.00
NET SYSTEM DEMAND = -18.00

**** CYBERNET SIMULATION COMPLETED ****

DATE: 3/20/1997
TIME: 15:32:47

```
+-----------------------------------------------+
|                MAXIMUM DIMENSIONS                |
|                                                  |
|  Number of pipes ....................... 2000   |
|  Number of pumps ....................... 500    |
|  Number junction nodes................... 2000   |
|  Flow meters ........................... 500    |
|  Boundary nodes ........................ 200    |
|  Variable storage tanks ............... 500    |
|  Pressure switches ..................... 500    |
|  Regulating Valves...................... 500    |
|  Items for limited output ............. 2000   |
|  limit for non-consecutive numbering ..20510    |
+-----------------------------------------------+
```

Cybernet version 2.18. SN: 1132130586-2000

Extended Description:

```
N I T S   S P E C I F I E D

  FLOWRATE ............ = million gallons/day
  HEAD (HGL) .......... = feet
  PRESSURE ............ = psig


O U T P U T   O P T I O N   D A T A

UTPUT SELECTION:  ALL RESULTS ARE INCLUDED IN THE TABULATED OUTPUT


Y S T E M   C O N F I G U R A T I O N

  NUMBER OF PIPES ....................(p) =   17
  NUMBER OF JUNCTION NODES ...........(j) =   16
  NUMBER OF PRIMARY LOOPS ............(l) =    0
  NUMBER OF BOUNDARY NODES ...........(f) =    2
  NUMBER OF SUPPLY ZONES .............(z) =    1


                 ************************************
                  S I M U L A T I O N   R E S U L T S
                 ************************************


*** WARNING ***
    A PORTION OF THE SYSTEM IS DISCONNECTED FROM A BND BY CLOSED LINES

                 **** A FIX WILL BE ATTEMPTED
```

THE FOLLOWING JUNCTION NODES ARE DISCONNECTED FROM THE SYSTEM
DEMANDS AT THESE JUNCTION NODES ARE SET TO ZERO:
1 16

PIPE NO. 1 HAS BEEN OPENED TO REMOVE DISCONNECTION

*** WARNING ***
A PORTION OF THE SYSTEM IS DISCONNECTED FROM A BND BY CLOSED LINES

**** A FIX WILL BE ATTEMPTED

THE FOLLOWING JUNCTION NODES ARE DISCONNECTED FROM THE SYSTEM
DEMANDS AT THESE JUNCTION NODES ARE SET TO ZERO:
16

PIPE NO. 17 HAS BEEN OPENED TO REMOVE DISCONNECTION

The results are obtained after 3 trials with an accuracy = 0.00025

S I M U L A T I O N D E S C R I P T I O N

CyberNet Version 2.18. Copyright 1991,92 Haestad Methods Inc.
Run Description: 14 mgd
Drawing: INJEWELL

P I P E L I N E R E S U L T S

STATUS CODE: XX -CLOSED PIPE BN -BOUNDARY NODE PU -PUMP LINE
CV -CHECK VALVE RV -REGULATING VALVE TK -STORAGE TANK

PIPE NUMBER	NODE NOS. #1	#2	FLOWRATE (mgd)	HEAD LOSS (ft)	PUMP HEAD (ft)	MINOR LOSS (ft)	LINE VELO. (ft/s)	HL/ 1000 (ft/ft)
1	1	4	0.00	0.00	0.00	0.00	0.00	0.00
2	4	9	0.00	0.00	0.00	0.00	0.00	0.00
3	2	3	7.00	0.05	0.00	5.32	4.96	5.37
4	3	8	7.00	0.38	0.00	0.00	4.96	5.37
5	5	6	7.00	0.05	0.00	5.32	4.96	5.37
6	6	7	7.00	0.38	0.00	0.00	4.96	5.37
7	7	8	7.00	0.00	0.00	0.01	1.13	0.14
8	8	9	14.00	0.01	0.00	0.09	2.25	0.52
9	9	10	14.00	0.01	0.00	0.09	2.25	0.52
10	10	11	14.00	0.02	0.00	0.14	2.25	0.52
11	11	12	7.33	0.81	0.00	1.39	3.61	2.40
12-BN	12	0	7.33	8.87	0.00	0.19	3.93	2.96
13	11	15	6.67	0.04	0.00	0.08	1.46	0.28
14	13	14	6.67	0.07	0.00	1.07	3.29	2.02
15-BN	14	0	6.67	7.46	0.00	0.16	3.58	2.49
16	13	15	-6.67	1.80	0.00	0.59	3.29	2.02
17	15	16	0.00	0.00	0.00	0.00	0.00	0.00

J U N C T I O N N O D E R E S U L T S

JUNCTION NUMBER	JUNCTION TITLE	EXTERNAL DEMAND (mgd)	HYDRAULIC GRADE (ft)	JUNCTION ELEVATION (ft)	PRESSURE HEAD (ft)	JUNCTION PRESSURE (psi)
1-1	Wet Well 3	0.00	86.54	0.00	86.54	37.50
2-1	Wet Well 2	-7.00	92.38	0.00	92.38	40.03
3-1		0.00	87.02	2.00	85.02	36.84
4-1		0.00	86.54	2.00	84.54	36.63
5-1	Wet Well 1	-7.00	92.40	0.00	92.40	40.04
6-1		0.00	87.03	2.00	85.03	36.85
7-1		0.00	86.65	2.00	84.65	36.68
8-1		0.00	86.64	2.00	84.64	36.68
9-1		0.00	86.54	2.00	84.54	36.63
10-1		0.00	86.43	2.00	84.43	36.59
11-1		0.00	86.27	2.00	84.27	36.52
12-1		0.00	84.07	2.00	82.07	35.56
13-1		0.00	83.76	2.00	81.76	35.43
14-1		0.00	82.62	2.00	80.62	34.94
15-1		0.00	86.15	2.00	84.15	36.47
16-1		0.00	86.15			

S U M M A R Y O F I N F L O W S A N D O U T F L O W S

(+) INFLOWS INTO THE SYSTEM FROM BOUNDARY NODES
(-) OUTFLOWS FROM THE SYSTEM INTO BOUNDARY NODES

PIPE NUMBER	FLOWRATE (mgd)
12	-7.33
15	-6.67

NET SYSTEM INFLOW = 0.00
NET SYSTEM OUTFLOW = -14.00
NET SYSTEM DEMAND = -14.00

**** CYBERNET SIMULATION COMPLETED ****

DATE: 3/20/1997
TIME: 15:32:47

```
+-----------------------------------------------+
|              MAXIMUM DIMENSIONS               |
|                                               |
|  Number of pipes ....................... 2000 |
|  Number of pumps ....................... 500  |
|  Number junction nodes................. 2000 |
|  Flow meters ........................... 500  |
|  Boundary nodes ........................ 200  |
|  Variable storage tanks ............... 500  |
|  Pressure switches ..................... 500  |
|  Regulating Valves...................... 500  |
|  Items for limited output ............. 2000 |
|  limit for non-consecutive numbering ..20510  |
+-----------------------------------------------+
```

Cybernet version 2.18. SN: 1132130586-2000

Extended Description:

U N I T S S P E C I F I E D

```
FLOWRATE ............ = million gallons/day
HEAD (HGL) .......... = feet
PRESSURE ............ = psig
```

O U T P U T O P T I O N D A T A

OUTPUT SELECTION: ALL RESULTS ARE INCLUDED IN THE TABULATED OUTPUT

S Y S T E M C O N F I G U R A T I O N

```
NUMBER OF PIPES ...................(p) =   17
NUMBER OF JUNCTION NODES ..........(j) =   16
NUMBER OF PRIMARY LOOPS ...........(l) =    0
NUMBER OF BOUNDARY NODES ..........(f) =    2
NUMBER OF SUPPLY ZONES ............(z) =    1
```

```
*************************************
 S I M U L A T I O N  R E S U L T S
*************************************
```

*** WARNING ***
A PORTION OF THE SYSTEM IS DISCONNECTED FROM A BND BY CLOSED LINES

**** A FIX WILL BE ATTEMPTED

HE FOLLOWING JUNCTION NODES ARE DISCONNECTED FROM THE SYSTEM
DEMANDS AT THESE JUNCTION NODES ARE SET TO ZERO:
1 16

IPE NO. 1 HAS BEEN OPENED TO REMOVE DISCONNECTION

*** WARNING ***
A PORTION OF THE SYSTEM IS DISCONNECTED FROM A BND BY CLOSED LINES

**** A FIX WILL BE ATTEMPTED

THE FOLLOWING JUNCTION NODES ARE DISCONNECTED FROM THE SYSTEM
EMANDS AT THESE JUNCTION NODES ARE SET TO ZERO:
16

PIPE NO. 17 HAS BEEN OPENED TO REMOVE DISCONNECTION

he results are obtained after 3 trials with an accuracy = 0.00038

S I M U L A T I O N D E S C R I P T I O N

yberNet Version 2.18. Copyright 1991,92 Haestad Methods Inc.
un Description: 10 mgd
Drawing: INJEWELL

I P E L I N E R E S U L T S

STATUS CODE: XX -CLOSED PIPE BN -BOUNDARY NODE PU -PUMP LINE
CV -CHECK VALVE RV -REGULATING VALVE TK -STORAGE TANK

PIPE NUMBER	NODE NOS. #1	#2	FLOWRATE (mgd)	HEAD LOSS (ft)	PUMP HEAD (ft)	MINOR LOSS (ft)	LINE VELO. (ft/s)	HL/ 1000 (ft/ft)
1	1	4	0.00	0.00	0.00	0.00	0.00	0.00
2	4	9	0.00	0.00	0.00	0.00	0.00	0.00
3	2	3	5.00	0.03	0.00	2.71	3.55	2.88
4	3	8	5.00	0.20	0.00	0.00	3.55	2.88
5	5	6	5.00	0.03	0.00	2.71	3.55	2.88
6	6	7	5.00	0.20	0.00	0.00	3.55	2.88
7	7	8	5.00	0.00	0.00	0.01	0.80	0.08
8	8	9	10.00	0.01	0.00	0.05	1.61	0.28
9	9	10	10.00	0.01	0.00	0.05	1.61	0.28
10	10	11	10.00	0.01	0.00	0.07	1.61	0.28
11	11	12	5.23	0.43	0.00	0.71	2.58	1.29
12-BN	12	0	5.23	4.76	0.00	0.10	2.81	1.59
13	11	15	4.77	0.02	0.00	0.04	1.04	0.15
14	13	14	4.77	0.04	0.00	0.55	2.35	1.09
15-BN	14	0	4.77	4.01	0.00	0.08	2.56	1.34
16	13	15	-4.77	0.97	0.00	0.30	2.35	1.09
17	15	16	0.00	0.00	0.00	0.00	0.00	0.00

J U N C T I O N N O D E R E S U L T S

JUNCTION NUMBER	JUNCTION TITLE	EXTERNAL DEMAND (mgd)	HYDRAULIC GRADE (ft)	JUNCTION ELEVATION (ft)	PRESSURE HEAD (ft)	JUNCTION PRESSURE (psi)
1-1	Wet Well 3	0.00	81.14	0.00	81.13	35.16
2-1	Wet Well 2	-5.00	84.13	0.00	84.13	36.46
3-1		0.00	81.39	2.00	79.39	34.40
4-1		0.00	81.14	2.00	79.14	34.29
5-1	Wet Well 1	-5.00	84.14	0.00	84.14	36.46
6-1		0.00	81.40	2.00	79.40	34.41
7-1		0.00	81.20	2.00	79.20	34.32
8-1		0.00	81.19	2.00	79.19	34.32
9-1		0.00	81.14	2.00	79.14	34.29
10-1		0.00	81.08	2.00	79.08	34.27
11-1		0.00	81.00	2.00	79.00	34.23
12-1		0.00	79.85	2.00	77.85	33.74
13-1		0.00	79.67	2.00	77.67	33.66
14-1		0.00	79.09	2.00	77.09	33.40
15-1		0.00	80.94	2.00	78.94	34.21
16-1		0.00	80.94			

S U M M A R Y O F I N F L O W S A N D O U T F L O W S

(+) INFLOWS INTO THE SYSTEM FROM BOUNDARY NODES
(-) OUTFLOWS FROM THE SYSTEM INTO BOUNDARY NODES

PIPE NUMBER	FLOWRATE (mgd)
12	-5.23
15	-4.77

NET SYSTEM INFLOW = 0.00
NET SYSTEM OUTFLOW = -10.00
NET SYSTEM DEMAND = -10.00

**** CYBERNET SIMULATION COMPLETED ****

DATE: 3/20/1997
TIME: 15:32:47

J U N C T I O N N O D E R E S U L T S

JUNCTION NUMBER	JUNCTION TITLE	EXTERNAL DEMAND (mgd)	HYDRAULIC GRADE (ft)	JUNCTION ELEVATION (ft)	PRESSURE HEAD (ft)	JUNCTION PRESSURE (psi)
1-1	Wet Well 3	0.00	77.35	0.00	77.35	33.52
2-1	Wet Well 2	-3.00	78.44	0.00	78.44	33.99
3-1		0.00	77.45	2.00	75.45	32.70
4-1		0.00	77.35	2.00	75.35	32.65
5-1	Wet Well 1	-3.00	78.44	0.00	78.44	33.99
6-1		0.00	77.45	2.00	75.45	32.70
7-1		0.00	77.38	2.00	75.38	32.66
8-1		0.00	77.37	2.00	75.37	32.66
9-1		0.00	77.35	2.00	75.35	32.65
10-1		0.00	77.33	2.00	75.33	32.65
11-1		0.00	77.30	2.00	75.30	32.63
12-1		0.00	76.88	2.00	74.88	32.45
13-1		0.00	76.80	2.00	74.80	32.41
14-1		0.00	76.59	2.00	74.59	32.32
15-1		0.00	77.28	2.00	75.28	32.62
16-1		0.00	77.28			

S U M M A R Y O F I N F L O W S A N D O U T F L O W S

(+) INFLOWS INTO THE SYSTEM FROM BOUNDARY NODES
(-) OUTFLOWS FROM THE SYSTEM INTO BOUNDARY NODES

PIPE NUMBER	FLOWRATE (mgd)
12	-3.14
15	-2.86

NET SYSTEM INFLOW = 0.00
NET SYSTEM OUTFLOW = -6.00
NET SYSTEM DEMAND = -6.00

**** CYBERNET SIMULATION COMPLETED ****

DATE: 3/20/1997
TIME: 15:32:48

```
+-----------------------------------------------+
|              MAXIMUM DIMENSIONS               |
|                                               |
|  Number of pipes ....................... 2000 |
|  Number of pumps ....................... 500 |
|  Number junction nodes................. 2000 |
|  Flow meters ........................... 500 |
|  Boundary nodes ........................ 200 |
|  Variable storage tanks ............... 500 |
|  Pressure switches .................... 500 |
|  Regulating Valves..................... 500 |
|  Items for limited output ............ 2000 |
|  limit for non-consecutive numbering ..20510 |
+-----------------------------------------------+
```

Cybernet version 2.18. SN: 1132130586-2000

Extended Description:

```
J N I T S   S P E C I F I E D

   FLOWRATE ............ = million gallons/day
   HEAD (HGL) .......... = feet
   PRESSURE ............ = psig


O U T P U T   O P T I O N   D A T A

)UTPUT SELECTION:  ALL RESULTS ARE INCLUDED IN THE TABULATED OUTPUT


; Y S T E M   C O N F I G U R A T I O N

    NUMBER OF PIPES ....................(p) =   17
    NUMBER OF JUNCTION NODES ...........(j) =   16
    NUMBER OF PRIMARY LOOPS ............(l) =    0
    NUMBER OF BOUNDARY NODES ...........(f) =    2
    NUMBER OF SUPPLY ZONES .............(z) =    1


                  ************************************
                   S I M U L A T I O N   R E S U L T S
                  ************************************


*** WARNING ***
     A PORTION OF THE SYSTEM IS DISCONNECTED FROM A BND BY CLOSED LINES

                  **** A FIX WILL BE ATTEMPTED
```

```
+-----------------------------------------------+
|              MAXIMUM DIMENSIONS               |
|                                               |
|  Number of pipes ....................... 2000 |
|  Number of pumps ....................... 500  |
|  Number junction nodes................. 2000 |
|  Flow meters ........................... 500  |
|  Boundary nodes ........................ 200  |
|  Variable storage tanks ............... 500  |
|  Pressure switches .................... 500  |
|  Regulating Valves..................... 500  |
|  Items for limited output ............ 2000  |
|  limit for non-consecutive numbering ..20510  |
+-----------------------------------------------+
```

Cybernet version 2.18. SN: 1132130586-2000

Extended Description:

U N I T S S P E C I F I E D

```
FLOWRATE ............ = million gallons/day
HEAD (HGL) .......... = feet
PRESSURE ............ = psig
```

O U T P U T O P T I O N D A T A

OUTPUT SELECTION: ALL RESULTS ARE INCLUDED IN THE TABULATED OUTPUT

S Y S T E M C O N F I G U R A T I O N

```
NUMBER OF PIPES ...................(p) =   17
NUMBER OF JUNCTION NODES ..........(j) =   16
NUMBER OF PRIMARY LOOPS ...........(l) =    0
NUMBER OF BOUNDARY NODES ..........(f) =    2
NUMBER OF SUPPLY ZONES ............(z) =    1
```

****
S I M U L A T I O N R E S U L T S
****

*** WARNING ***
A PORTION OF THE SYSTEM IS DISCONNECTED FROM A BND BY CLOSED LINES

**** A FIX WILL BE ATTEMPTED

THE FOLLOWING JUNCTION NODES ARE DISCONNECTED FROM THE SYSTEM
DEMANDS AT THESE JUNCTION NODES ARE SET TO ZERO:
1 16

PIPE NO. 1 HAS BEEN OPENED TO REMOVE DISCONNECTION

*** WARNING ***
A PORTION OF THE SYSTEM IS DISCONNECTED FROM A BND BY CLOSED LINES

**** A FIX WILL BE ATTEMPTED

THE FOLLOWING JUNCTION NODES ARE DISCONNECTED FROM THE SYSTEM
DEMANDS AT THESE JUNCTION NODES ARE SET TO ZERO:
16

PIPE NO. 17 HAS BEEN OPENED TO REMOVE DISCONNECTION

The results are obtained after 3 trials with an accuracy = 0.00082

S I M U L A T I O N D E S C R I P T I O N

CyberNet Version 2.18. Copyright 1991,92 Haestad Methods Inc.
Run Description: 6 mgd
Drawing: INJEWELL

P I P E L I N E R E S U L T S

STATUS CODE: XX -CLOSED PIPE BN -BOUNDARY NODE PU -PUMP LINE
CV -CHECK VALVE RV -REGULATING VALVE TK -STORAGE TANK

PIPE NUMBER	NODE NOS. #1	#2	FLOWRATE (mgd)	HEAD LOSS (ft)	PUMP HEAD (ft)	MINOR LOSS (ft)	LINE VELO. (ft/s)	HL/ 1000 (ft/ft)
1	1	4	0.00	0.00	0.00	0.00	0.00	0.00
2	4	9	0.00	0.00	0.00	0.00	0.00	0.00
3	2	3	3.00	0.01	0.00	0.98	2.13	1.12
4	3	8	3.00	0.08	0.00	0.00	2.13	1.12
5	5	6	3.00	0.01	0.00	0.98	2.13	1.12
6	6	7	3.00	0.08	0.00	0.00	2.13	1.12
7	7	8	3.00	0.00	0.00	0.00	0.48	0.03
8	8	9	6.00	0.00	0.00	0.02	0.96	0.11
9	9	10	6.00	0.00	0.00	0.02	0.96	0.11
10	10	11	6.00	0.00	0.00	0.03	0.96	0.11
11	11	12	3.14	0.17	0.00	0.26	1.55	0.50
12-BN	12	0	3.14	1.84	0.00	0.04	1.68	0.61
13	11	15	2.86	0.01	0.00	0.01	0.63	0.06
14	13	14	2.86	0.01	0.00	0.20	1.41	0.42
15-BN	14	0	2.86	1.56	0.00	0.03	1.53	0.52
16	13	15	-2.86	0.38	0.00	0.11	1.41	0.42
17	15	16	0.00	0.00	0.00	0.00	0.00	0.00

'HE FOLLOWING JUNCTION NODES ARE DISCONNECTED FROM THE SYSTEM
DEMANDS AT THESE JUNCTION NODES ARE SET TO ZERO:
1 16

'IPE NO. 1 HAS BEEN OPENED TO REMOVE DISCONNECTION

*** WARNING ***
A PORTION OF THE SYSTEM IS DISCONNECTED FROM A BND BY CLOSED LINES

**** A FIX WILL BE ATTEMPTED

THE FOLLOWING JUNCTION NODES ARE DISCONNECTED FROM THE SYSTEM
'EMANDS AT THESE JUNCTION NODES ARE SET TO ZERO:
16

PIPE NO. 17 HAS BEEN OPENED TO REMOVE DISCONNECTION

.he results are obtained after 4 trials with an accuracy = 0.00001

S I M U L A T I O N D E S C R I P T I O N

yberNet Version 2.18. Copyright 1991,92 Haestad Methods Inc.
.un Description: 2 mgd
Drawing: INJEWELL

' I P E L I N E R E S U L T S

STATUS CODE: XX -CLOSED PIPE BN -BOUNDARY NODE PU -PUMP LINE
CV -CHECK VALVE RV -REGULATING VALVE TK -STORAGE TANK

PIPE NUMBER	NODE NOS. #1	#2	FLOWRATE (mgd)	HEAD LOSS (ft)	PUMP HEAD (ft)	MINOR LOSS (ft)	LINE VELO. (ft/s)	HL/ 1000 (ft/ft)
1	1	4	0.00	0.00	0.00	0.00	0.00	0.00
2	4	9	0.00	0.00	0.00	0.00	0.00	0.00
3	2	3	1.00	0.00	0.00	0.11	0.71	0.15
4	3	8	1.00	0.01	0.00	0.00	0.71	0.15
5	5	6	1.00	0.00	0.00	0.11	0.71	0.15
6	6	7	1.00	0.01	0.00	0.00	0.71	0.15
7	7	8	1.00	0.00	0.00	0.00	0.16	0.00
8	8	9	2.00	0.00	0.00	0.00	0.32	0.01
9	9	10	2.00	0.00	0.00	0.00	0.32	0.01
10	10	11	2.00	0.00	0.00	0.00	0.32	0.01
11	11	12	1.04	0.02	0.00	0.03	0.51	0.07
12-BN	12	0	1.04	0.24	0.00	0.00	0.56	0.08
13	11	15	0.96	0.00	0.00	0.00	0.21	0.01
14	13	14	0.96	0.00	0.00	0.02	0.47	0.06
15-BN	14	0	0.96	0.20	0.00	0.00	0.51	0.07
16	13	15	-0.96	0.05	0.00	0.01	0.47	0.06
17	15	16	0.00	0.00	0.00	0.00	0.00	0.00

J U N C T I O N N O D E R E S U L T S

JUNCTION NUMBER	JUNCTION TITLE	EXTERNAL DEMAND (mgd)	HYDRAULIC GRADE (ft)	JUNCTION ELEVATION (ft)	PRESSURE HEAD (ft)	JUNCTION PRESSURE (psi)
1-1	Wet Well 3	0.00	75.30	0.00	75.30	32.63
2-1	Wet Well 2	-1.00	75.42	0.00	75.42	32.68
3-1		0.00	75.31	2.00	73.31	31.77
4-1		0.00	75.30	2.00	73.30	31.76
5-1	Wet Well 1	-1.00	75.42	0.00	75.42	32.68
6-1		0.00	75.31	2.00	73.31	31.77
7-1		0.00	75.30	2.00	73.30	31.76
8-1		0.00	75.30	2.00	73.30	31.76
9-1		0.00	75.30	2.00	73.30	31.76
10-1		0.00	75.30	2.00	73.30	31.76
11-1		0.00	75.29	2.00	73.29	31.76
12-1		0.00	75.24	2.00	73.24	31.74
13-1		0.00	75.23	2.00	73.23	31.73
14-1		0.00	75.21	2.00	73.21	31.72
15-1		0.00	75.29	2.00	73.29	31.76
16-1		0.00	75.29			

S U M M A R Y O F I N F L O W S A N D O U T F L O W S

(+) INFLOWS INTO THE SYSTEM FROM BOUNDARY NODES
(-) OUTFLOWS FROM THE SYSTEM INTO BOUNDARY NODES

PIPE NUMBER	FLOWRATE (mgd)
12	-1.04
15	-0.96

NET SYSTEM INFLOW = 0.00
NET SYSTEM OUTFLOW = -2.00
NET SYSTEM DEMAND = -2.00

**** CYBERNET SIMULATION COMPLETED ****

DATE: 3/20/1997
TIME: 15:32:48

```
+-----------------------------------------------+
|              MAXIMUM DIMENSIONS                |
|                                                |
|  Number of pipes ....................... 2000 |
|  Number of pumps ....................... 500  |
|  Number junction nodes................. 2000 |
|  Flow meters ........................... 500  |
|  Boundary nodes ........................ 200  |
|  Variable storage tanks ............... 500  |
|  Pressure switches .................... 500  |
|  Regulating Valves..................... 500  |
|  Items for limited output ............ 2000 |
|  limit for non-consecutive numbering ..20510 |
+-----------------------------------------------+
```

Cybernet version 2.18. SN: 1132130586-2000

Extended Description:

```
U N I T S   S P E C I F I E D

  FLOWRATE ............ = million gallons/day
  HEAD (HGL) .......... = feet
  PRESSURE ............ = psig


O U T P U T   O P T I O N   D A T A

OUTPUT SELECTION:  ALL RESULTS ARE INCLUDED IN THE TABULATED OUTPUT


S Y S T E M   C O N F I G U R A T I O N

   NUMBER OF PIPES ....................(p) =   17
   NUMBER OF JUNCTION NODES ...........(j) =   16
   NUMBER OF PRIMARY LOOPS ............(l) =    0
   NUMBER OF BOUNDARY NODES ...........(f) =    2
   NUMBER OF SUPPLY ZONES .............(z) =    1


                  ************************************
                   S I M U L A T I O N   R E S U L T S
                  ************************************


*** WARNING ***
    A PORTION OF THE SYSTEM IS DISCONNECTED FROM A BND BY CLOSED LINES

                  **** A FIX WILL BE ATTEMPTED
```

THE FOLLOWING JUNCTION NODES ARE DISCONNECTED FROM THE SYSTEM
DEMANDS AT THESE JUNCTION NODES ARE SET TO ZERO:
1 16

PIPE NO. 1 HAS BEEN OPENED TO REMOVE DISCONNECTION

*** WARNING ***
A PORTION OF THE SYSTEM IS DISCONNECTED FROM A BND BY CLOSED LINES

**** A FIX WILL BE ATTEMPTED

THE FOLLOWING JUNCTION NODES ARE DISCONNECTED FROM THE SYSTEM
DEMANDS AT THESE JUNCTION NODES ARE SET TO ZERO:
16

PIPE NO. 17 HAS BEEN OPENED TO REMOVE DISCONNECTION

The results are obtained after 2 trials with an accuracy = 0.00000

S I M U L A T I O N D E S C R I P T I O N

CyberNet Version 2.18. Copyright 1991,92 Haestad Methods Inc.
Run Description: One well, 30 mgd
Drawing: INJEWELL

P I P E L I N E R E S U L T S

STATUS CODE: XX -CLOSED PIPE BN -BOUNDARY NODE PU -PUMP LINE
CV -CHECK VALVE RV -REGULATING VALVE TK -STORAGE TANK

PIPE NUMBER	NODE NOS. #1	#2	FLOWRATE (mgd)	HEAD LOSS (ft)	PUMP HEAD (ft)	MINOR LOSS (ft)	LINE VELO. (ft/s)	HL/ 1000 (ft/ft)
1	1	4	0.00	0.00	0.00	0.00	0.00	0.00
2	4	9	0.00	0.00	0.00	0.00	0.00	0.00
3	2	3	15.00	0.20	0.00	24.42	10.64	22.03
4	3	8	15.00	1.54	0.00	0.00	10.64	22.03
5	5	6	15.00	0.20	0.00	24.42	10.64	22.03
6	6	7	15.00	1.54	0.00	0.00	10.64	22.03
7	7	8	15.00	0.01	0.00	0.05	2.41	0.59
8	8	9	30.00	0.04	0.00	0.43	4.82	2.14
9	9	10	30.00	0.04	0.00	0.43	4.82	2.14
10	10	11	30.00	0.10	0.00	0.65	4.82	2.14
11	11	12	0.00	0.00	0.00	0.00	0.00	0.00
12-XXBN	12	0						
13	11	15	30.00	0.62	0.00	1.54	6.57	4.54
14	13	14	30.00	1.08	0.00	21.69	14.77	32.72
15-BN	14	0	30.00	120.77	0.00	3.21	16.09	40.26
16	13	15	-30.00	29.19	0.00	11.86	14.77	32.72
17	15	16	0.00	0.00	0.00	0.00	0.00	0.00

J U N C T I O N N O D E R E S U L T S

JUNCTION NUMBER	JUNCTION TITLE	EXTERNAL DEMAND (mgd)	HYDRAULIC GRADE (ft)	JUNCTION ELEVATION (ft)	PRESSURE HEAD (ft)	JUNCTION PRESSURE (psi)
1-1	Wet Well 3	0.00	266.18	0.00	266.17	115.34
2-1	Wet Well 2	-15.00	292.81	0.00	292.81	126.88
3-1		0.00	268.19	2.00	266.19	115.35
4-1		0.00	266.18	2.00	264.18	114.48
5-1	Wet Well 1	-15.00	292.87	0.00	292.87	126.91
6-1		0.00	268.25	2.00	266.25	115.37
7-1		0.00	266.71	2.00	264.71	114.71
8-1		0.00	266.65	2.00	264.65	114.68
9-1		0.00	266.18	2.00	264.18	114.48
10-1		0.00	265.70	2.00	263.70	114.27
11-1		0.00	264.96	2.00	262.96	113.95
12-1		0.00	264.96	2.00	262.96	113.95
13-1		0.00	221.75	2.00	219.75	95.23
14-1		0.00	198.98	2.00	196.98	85.36
15-1		0.00	262.80	2.00	260.80	113.01
16-1		0.00	262.80			

S U M M A R Y O F I N F L O W S A N D O U T F L O W S

(+) INFLOWS INTO THE SYSTEM FROM BOUNDARY NODES
(-) OUTFLOWS FROM THE SYSTEM INTO BOUNDARY NODES

PIPE NUMBER	FLOWRATE (mgd)
15	-30.00

NET SYSTEM INFLOW = 0.00
NET SYSTEM OUTFLOW = -30.00
NET SYSTEM DEMAND = -30.00

**** CYBERNET SIMULATION COMPLETED ****

DATE: 3/20/1997
TIME: 15:32:48

```
+-----------------------------------------------+
|              MAXIMUM DIMENSIONS               |
|                                               |
|  Number of pipes ....................... 2000 |
|  Number of pumps ....................... 500  |
|  Number junction nodes................. 2000 |
|  Flow meters ........................... 500  |
|  Boundary nodes ........................ 200  |
|  Variable storage tanks ............... 500  |
|  Pressure switches .................... 500  |
|  Regulating Valves..................... 500  |
|  Items for limited output ............ 2000  |
|  limit for non-consecutive numbering ..20510  |
+-----------------------------------------------+
```

Cybernet version 2.18. SN: 1132130586-2000

Extended Description:

U N I T S S P E C I F I E D

```
FLOWRATE ............ = million gallons/day
HEAD (HGL) .......... = feet
PRESSURE ............ = psig
```

O U T P U T O P T I O N D A T A

OUTPUT SELECTION: ALL RESULTS ARE INCLUDED IN THE TABULATED OUTPUT

S Y S T E M C O N F I G U R A T I O N

```
NUMBER OF PIPES ...................(p) =   17
NUMBER OF JUNCTION NODES ..........(j) =   16
NUMBER OF PRIMARY LOOPS ...........(l) =    0
NUMBER OF BOUNDARY NODES ..........(f) =    2
NUMBER OF SUPPLY ZONES ............(z) =    1
```

```
*************************************
 S I M U L A T I O N  R E S U L T S
*************************************
```

*** WARNING ***
A PORTION OF THE SYSTEM IS DISCONNECTED FROM A BND BY CLOSED LINES

**** A FIX WILL BE ATTEMPTED

'HE FOLLOWING JUNCTION NODES ARE DISCONNECTED FROM THE SYSTEM
DEMANDS AT THESE JUNCTION NODES ARE SET TO ZERO:
1 16

'IPE NO. 1 HAS BEEN OPENED TO REMOVE DISCONNECTION

*** WARNING ***
A PORTION OF THE SYSTEM IS DISCONNECTED FROM A BND BY CLOSED LINES

**** A FIX WILL BE ATTEMPTED

THE FOLLOWING JUNCTION NODES ARE DISCONNECTED FROM THE SYSTEM
DEMANDS AT THESE JUNCTION NODES ARE SET TO ZERO:
16

PIPE NO. 17 HAS BEEN OPENED TO REMOVE DISCONNECTION

.he results are obtained after 2 trials with an accuracy = 0.00000

S I M U L A T I O N D E S C R I P T I O N

'yberNet Version 2.18. Copyright 1991,92 Haestad Methods Inc.
Run Description: One well, 26 mgd
Drawing: INJEWELL

P I P E L I N E R E S U L T S

STATUS CODE: XX -CLOSED PIPE BN -BOUNDARY NODE PU -PUMP LINE
CV -CHECK VALVE RV -REGULATING VALVE TK -STORAGE TANK

PIPE NUMBER	NODE NOS. #1	#2	FLOWRATE (mgd)	HEAD LOSS (ft)	PUMP HEAD (ft)	MINOR LOSS (ft)	LINE VELO. (ft/s)	HL/ 1000 (ft/ft)
1	1	4	0.00	0.00	0.00	0.00	0.00	0.00
2	4	9	0.00	0.00	0.00	0.00	0.00	0.00
3	2	3	13.00	0.15	0.00	18.34	9.22	16.90
4	3	8	13.00	1.18	0.00	0.00	9.22	16.90
5	5	6	13.00	0.15	0.00	18.34	9.22	16.90
6	6	7	13.00	1.18	0.00	0.00	9.22	16.90
7	7	8	13.00	0.00	0.00	0.04	2.09	0.46
8	8	9	26.00	0.03	0.00	0.33	4.18	1.64
9	9	10	26.00	0.03	0.00	0.33	4.18	1.64
10	10	11	26.00	0.07	0.00	0.49	4.18	1.64
11	11	12	0.00	0.00	0.00	0.00	0.00	0.00
12-XXBN	12	0						
13	11	15	26.00	0.47	0.00	1.16	5.69	3.48
14	13	14	26.00	0.83	0.00	16.29	12.80	25.10
15-BN	14	0	26.00	92.65	0.00	2.41	13.94	30.88
16	13	15	-26.00	22.39	0.00	8.91	12.80	25.10
17	15	16	0.00	0.00	0.00	0.00	0.00	0.00

J U N C T I O N N O D E R E S U L T S

JUNCTION NUMBER	JUNCTION TITLE	EXTERNAL DEMAND (mgd)	HYDRAULIC GRADE (ft)	JUNCTION ELEVATION (ft)	PRESSURE HEAD (ft)	JUNCTION PRESSURE (psi)
1-1	Wet Well 3	0.00	221.03	0.00	221.03	95.78
2-1	Wet Well 2	-13.00	241.07	0.00	241.07	104.46
3-1		0.00	222.57	2.00	220.57	95.58
4-1		0.00	221.03	2.00	219.03	94.91
5-1	Wet Well 1	-13.00	241.11	0.00	241.11	104.48
6-1		0.00	222.62	2.00	220.62	95.60
7-1		0.00	221.43	2.00	219.43	95.09
8-1		0.00	221.39	2.00	219.39	95.07
9-1		0.00	221.03	2.00	219.03	94.91
10-1		0.00	220.68	2.00	218.68	94.76
11-1		0.00	220.12	2.00	218.12	94.52
12-1		0.00	220.12	2.00	218.12	94.52
13-1		0.00	187.19	2.00	185.19	80.25
14-1		0.00	170.07	2.00	168.07	72.83
15-1		0.00	218.49	2.00	216.49	93.81
16-1		0.00	218.49			

S U M M A R Y O F I N F L O W S A N D O U T F L O W S

(+) INFLOWS INTO THE SYSTEM FROM BOUNDARY NODES
(-) OUTFLOWS FROM THE SYSTEM INTO BOUNDARY NODES

PIPE NUMBER	FLOWRATE (mgd)
15	-26.00

NET SYSTEM INFLOW = 0.00
NET SYSTEM OUTFLOW = -26.00
NET SYSTEM DEMAND = -26.00

**** CYBERNET SIMULATION COMPLETED ****

DATE: 3/20/1997
TIME: 15:32:49

```
+-----------------------------------------------+
|              MAXIMUM DIMENSIONS               |
|                                               |
|  Number of pipes ....................... 2000 |
|  Number of pumps ....................... 500  |
|  Number junction nodes................. 2000 |
|  Flow meters ........................... 500  |
|  Boundary nodes ........................ 200  |
|  Variable storage tanks ............... 500  |
|  Pressure switches ..................... 500  |
|  Regulating Valves...................... 500  |
|  Items for limited output ............. 2000 |
|  limit for non-consecutive numbering ..20510  |
+-----------------------------------------------+
```

Cybernet version 2.18. SN: 1132130586-2000

Extended Description:

```
'I N I T S   S P E C I F I E D

   FLOWRATE ............ = million gallons/day
   HEAD (HGL) .......... = feet
   PRESSURE ............ = psig


O U T P U T   O P T I O N   D A T A

)UTPUT SELECTION:  ALL RESULTS ARE INCLUDED IN THE TABULATED OUTPUT


 Y S T E M   C O N F I G U R A T I O N

   NUMBER OF PIPES ....................(p) =   17
   NUMBER OF JUNCTION NODES ...........(j) =   16
   NUMBER OF PRIMARY LOOPS ............(l) =    0
   NUMBER OF BOUNDARY NODES ...........(f) =    2
   NUMBER OF SUPPLY ZONES .............(z) =    1


                  ************************************
                   S I M U L A T I O N   R E S U L T S
                  ************************************


*** WARNING ***
    A PORTION OF THE SYSTEM IS DISCONNECTED FROM A BND BY CLOSED LINES

                  **** A FIX WILL BE ATTEMPTED
```

THE FOLLOWING JUNCTION NODES ARE DISCONNECTED FROM THE SYSTEM
DEMANDS AT THESE JUNCTION NODES ARE SET TO ZERO:
1 16

PIPE NO. 1 HAS BEEN OPENED TO REMOVE DISCONNECTION

*** WARNING ***
A PORTION OF THE SYSTEM IS DISCONNECTED FROM A BND BY CLOSED LINES

**** A FIX WILL BE ATTEMPTED

THE FOLLOWING JUNCTION NODES ARE DISCONNECTED FROM THE SYSTEM
DEMANDS AT THESE JUNCTION NODES ARE SET TO ZERO:
16

PIPE NO. 17 HAS BEEN OPENED TO REMOVE DISCONNECTION

The results are obtained after 2 trials with an accuracy = 0.00000

S I M U L A T I O N D E S C R I P T I O N

CyberNet Version 2.18. Copyright 1991,92 Haestad Methods Inc.
Run Description: One well, 22 mgd
Drawing: INJEWELL

P I P E L I N E R E S U L T S

STATUS CODE: XX -CLOSED PIPE BN -BOUNDARY NODE PU -PUMP LINE
CV -CHECK VALVE RV -REGULATING VALVE TK -STORAGE TANK

PIPE NUMBER	NODE NOS. #1	#2	FLOWRATE (mgd)	HEAD LOSS (ft)	PUMP HEAD (ft)	MINOR LOSS (ft)	LINE VELO. (ft/s)	HL/ 1000 (ft/ft)
1	1	4	0.00	0.00	0.00	0.00	0.00	0.00
2	4	9	0.00	0.00	0.00	0.00	0.00	0.00
3	2	3	11.00	0.11	0.00	13.13	7.80	12.40
4	3	8	11.00	0.87	0.00	0.00	7.80	12.40
5	5	6	11.00	0.11	0.00	13.13	7.80	12.40
6	6	7	11.00	0.87	0.00	0.00	7.80	12.40
7	7	8	11.00	0.00	0.00	0.03	1.77	0.33
8	8	9	22.00	0.02	0.00	0.23	3.54	1.21
9	9	10	22.00	0.02	0.00	0.23	3.54	1.21
10	10	11	22.00	0.05	0.00	0.35	3.54	1.21
11	11	12	0.00	0.00	0.00	0.00	0.00	0.00
12-XXBN	12	0						
13	11	15	22.00	0.35	0.00	0.83	4.82	2.56
14	13	14	22.00	0.61	0.00	11.66	10.83	18.42
15-BN	14	0	22.00	68.00	0.00	1.73	11.80	22.67
16	13	15	-22.00	16.43	0.00	6.38	10.83	18.42
17	15	16	0.00	0.00	0.00	0.00	0.00	0.00

J U N C T I O N N O D E R E S U L T S

JUNCTION NUMBER	JUNCTION TITLE	EXTERNAL DEMAND (mgd)	HYDRAULIC GRADE (ft)	JUNCTION ELEVATION (ft)	PRESSURE HEAD (ft)	JUNCTION PRESSURE (psi)
1-1	Wet Well 3	0.00	181.64	0.00	181.64	78.71
2-1	Wet Well 2	-11.00	196.01	0.00	196.01	84.94
3-1		0.00	182.77	2.00	180.77	78.33
4-1		0.00	181.64	2.00	179.64	77.85
5-1	Wet Well 1	-11.00	196.04	0.00	196.04	84.95
6-1		0.00	182.80	2.00	180.80	78.35
7-1		0.00	181.93	2.00	179.93	77.97
8-1		0.00	181.90	2.00	179.90	77.96
9-1		0.00	181.64	2.00	179.64	77.85
10-1		0.00	181.39	2.00	179.39	77.74
11-1		0.00	180.99	2.00	178.99	77.56
12-1		0.00	180.99	2.00	178.99	77.56
13-1		0.00	157.00	2.00	155.00	67.17
14-1		0.00	144.73	2.00	142.73	61.85
15-1		0.00	179.81	2.00	177.81	77.05
16-1		0.00	179.81			

S U M M A R Y O F I N F L O W S A N D O U T F L O W S

(+) INFLOWS INTO THE SYSTEM FROM BOUNDARY NODES
(-) OUTFLOWS FROM THE SYSTEM INTO BOUNDARY NODES

PIPE NUMBER	FLOWRATE (mgd)
15	-22.00

NET SYSTEM INFLOW = 0.00
NET SYSTEM OUTFLOW = -22.00
NET SYSTEM DEMAND = -22.00

**** CYBERNET SIMULATION COMPLETED ****

DATE: 3/20/1997
TIME: 15:32:49

```
+-----------------------------------------------+
|                MAXIMUM DIMENSIONS             |
|                                               |
|  Number of pipes ....................... 2000 |
|  Number of pumps ....................... 500  |
|  Number junction nodes................. 2000 |
|  Flow meters ........................... 500  |
|  Boundary nodes ........................ 200  |
|  Variable storage tanks ................ 500  |
|  Pressure switches ..................... 500  |
|  Regulating Valves...................... 500  |
|  Items for limited output ............. 2000 |
|  limit for non-consecutive numbering ..20510  |
+-----------------------------------------------+
```

Cybernet version 2.18. SN: 1132130586-2000

Extended Description:

U N I T S S P E C I F I E D

```
FLOWRATE ............ = million gallons/day
HEAD (HGL) .......... = feet
PRESSURE ............ = psig
```

O U T P U T O P T I O N D A T A

OUTPUT SELECTION: ALL RESULTS ARE INCLUDED IN THE TABULATED OUTPUT

S Y S T E M C O N F I G U R A T I O N

```
NUMBER OF PIPES ....................(p) =   17
NUMBER OF JUNCTION NODES ...........(j) =   16
NUMBER OF PRIMARY LOOPS ............(l) =    0
NUMBER OF BOUNDARY NODES ...........(f) =    2
NUMBER OF SUPPLY ZONES .............(z) =    1
```

```
*************************************
 S I M U L A T I O N  R E S U L T S
*************************************
```

*** WARNING ***
A PORTION OF THE SYSTEM IS DISCONNECTED FROM A BND BY CLOSED LINES

**** A FIX WILL BE ATTEMPTED

THE FOLLOWING JUNCTION NODES ARE DISCONNECTED FROM THE SYSTEM
DEMANDS AT THESE JUNCTION NODES ARE SET TO ZERO:
1 16

PIPE NO. 1 HAS BEEN OPENED TO REMOVE DISCONNECTION

*** WARNING ***
A PORTION OF THE SYSTEM IS DISCONNECTED FROM A BND BY CLOSED LINES

**** A FIX WILL BE ATTEMPTED

THE FOLLOWING JUNCTION NODES ARE DISCONNECTED FROM THE SYSTEM
DEMANDS AT THESE JUNCTION NODES ARE SET TO ZERO:
16

PIPE NO. 17 HAS BEEN OPENED TO REMOVE DISCONNECTION

The results are obtained after 2 trials with an accuracy = 0.00000

S I M U L A T I O N D E S C R I P T I O N

CyberNet Version 2.18. Copyright 1991,92 Haestad Methods Inc.
Run Description: One well, 18 mgd
Drawing: INJEWELL

P I P E L I N E R E S U L T S

STATUS CODE: XX -CLOSED PIPE BN -BOUNDARY NODE PU -PUMP LINE
CV -CHECK VALVE RV -REGULATING VALVE TK -STORAGE TANK

PIPE NUMBER	NODE NOS. #1	#2	FLOWRATE (mgd)	HEAD LOSS (ft)	PUMP HEAD (ft)	MINOR LOSS (ft)	LINE VELO. (ft/s)	HL/ 1000 (ft/ft)
1	1	4	0.00	0.00	0.00	0.00	0.00	0.00
2	4	9	0.00	0.00	0.00	0.00	0.00	0.00
3	2	3	9.00	0.08	0.00	8.79	6.38	8.55
4	3	8	9.00	0.60	0.00	0.00	6.38	8.55
5	5	6	9.00	0.08	0.00	8.79	6.38	8.55
6	6	7	9.00	0.60	0.00	0.00	6.38	8.55
7	7	8	9.00	0.00	0.00	0.02	1.45	0.23
8	8	9	18.00	0.01	0.00	0.16	2.89	0.83
9	9	10	18.00	0.01	0.00	0.16	2.89	0.83
10	10	11	18.00	0.04	0.00	0.23	2.89	0.83
11	11	12	0.00	0.00	0.00	0.00	0.00	0.00
12-XXBN	12	0						
13	11	15	18.00	0.24	0.00	0.55	3.94	1.76
14	13	14	18.00	0.42	0.00	7.81	8.86	12.70
15-BN	14	0	18.00	46.89	0.00	1.16	9.65	15.63
16	13	15	-18.00	11.33	0.00	4.27	8.86	12.70
17	15	16	0.00	0.00	0.00	0.00	0.00	0.00

J U N C T I O N N O D E R E S U L T S

JUNCTION NUMBER	JUNCTION TITLE	EXTERNAL DEMAND (mgd)	HYDRAULIC GRADE (ft)	JUNCTION ELEVATION (ft)	PRESSURE HEAD (ft)	JUNCTION PRESSURE (psi)
1-1	Wet Well 3	0.00	148.11	0.00	148.11	64.18
2-1	Wet Well 2	-9.00	157.75	0.00	157.75	68.36
3-1		0.00	148.88	2.00	146.88	63.65
4-1		0.00	148.11	2.00	146.11	63.32
5-1	Wet Well 1	-9.00	157.77	0.00	157.77	68.37
6-1		0.00	148.91	2.00	146.91	63.66
7-1		0.00	148.31	2.00	146.31	63.40
8-1		0.00	148.29	2.00	146.29	63.39
9-1		0.00	148.11	2.00	146.11	63.32
10-1		0.00	147.94	2.00	145.94	63.24
11-1		0.00	147.67	2.00	145.67	63.12
12-1		0.00	147.67	2.00	145.67	63.12
13-1		0.00	131.28	2.00	129.28	56.02
14-1		0.00	123.05	2.00	121.05	52.45
15-1		0.00	146.88	2.00	144.88	62.78
16-1		0.00	146.88			

S U M M A R Y O F I N F L O W S A N D O U T F L O W S

(+) INFLOWS INTO THE SYSTEM FROM BOUNDARY NODES
(-) OUTFLOWS FROM THE SYSTEM INTO BOUNDARY NODES

PIPE NUMBER	FLOWRATE (mgd)
15	-18.00

NET SYSTEM INFLOW = 0.00
NET SYSTEM OUTFLOW = -18.00
NET SYSTEM DEMAND = -18.00

**** CYBERNET SIMULATION COMPLETED ****

DATE: 3/20/1997
TIME: 15:32:49

```
+-----------------------------------------------+
|              MAXIMUM DIMENSIONS               |
|                                               |
|  Number of pipes ....................... 2000 |
|  Number of pumps ....................... 500  |
|  Number junction nodes................. 2000 |
|  Flow meters ........................... 500  |
|  Boundary nodes ........................ 200  |
|  Variable storage tanks ............... 500  |
|  Pressure switches .................... 500  |
|  Regulating Valves..................... 500  |
|  Items for limited output ............ 2000  |
|  limit for non-consecutive numbering ..20510  |
+-----------------------------------------------+
```

Cybernet version 2.18. SN: 1132130586-2000

Extended Description:

```
UNITS  SPECIFIED

   FLOWRATE ............ = million gallons/day
   HEAD (HGL) .......... = feet
   PRESSURE ............ = psig


OUTPUT  OPTION  DATA

OUTPUT SELECTION:  ALL RESULTS ARE INCLUDED IN THE TABULATED OUTPUT


SYSTEM  CONFIGURATION

    NUMBER OF PIPES ....................(p) =   17
    NUMBER OF JUNCTION NODES ...........(j) =   16
    NUMBER OF PRIMARY LOOPS ............(l) =    0
    NUMBER OF BOUNDARY NODES ...........(f) =    2
    NUMBER OF SUPPLY ZONES .............(z) =    1


                    ************************************
                     S I M U L A T I O N   R E S U L T S
                    ************************************


*** WARNING ***
     A PORTION OF THE SYSTEM IS DISCONNECTED FROM A BND BY CLOSED LINES

                    **** A FIX WILL BE ATTEMPTED
```

THE FOLLOWING JUNCTION NODES ARE DISCONNECTED FROM THE SYSTEM
DEMANDS AT THESE JUNCTION NODES ARE SET TO ZERO:
1 16

PIPE NO. 1 HAS BEEN OPENED TO REMOVE DISCONNECTION

*** WARNING ***
A PORTION OF THE SYSTEM IS DISCONNECTED FROM A BND BY CLOSED LINES

**** A FIX WILL BE ATTEMPTED

THE FOLLOWING JUNCTION NODES ARE DISCONNECTED FROM THE SYSTEM
DEMANDS AT THESE JUNCTION NODES ARE SET TO ZERO:
16

PIPE NO. 17 HAS BEEN OPENED TO REMOVE DISCONNECTION

The results are obtained after 2 trials with an accuracy = 0.00000

S I M U L A T I O N D E S C R I P T I O N

CyberNet Version 2.18. Copyright 1991,92 Haestad Methods Inc.
Run Description: One well, 14 mgd
Drawing: INJEWELL

P I P E L I N E R E S U L T S

STATUS CODE: XX -CLOSED PIPE BN -BOUNDARY NODE PU -PUMP LINE
CV -CHECK VALVE RV -REGULATING VALVE TK -STORAGE TANK

PIPE NUMBER	NODE NOS. #1	#2	FLOWRATE (mgd)	HEAD LOSS (ft)	PUMP HEAD (ft)	MINOR LOSS (ft)	LINE VELO. (ft/s)	HL/ 1000 (ft/ft)
1	1	4	0.00	0.00	0.00	0.00	0.00	0.00
2	4	9	0.00	0.00	0.00	0.00	0.00	0.00
3	2	3	7.00	0.05	0.00	5.32	4.96	5.37
4	3	8	7.00	0.38	0.00	0.00	4.96	5.37
5	5	6	7.00	0.05	0.00	5.32	4.96	5.37
6	6	7	7.00	0.38	0.00	0.00	4.96	5.37
7	7	8	7.00	0.00	0.00	0.01	1.13	0.14
8	8	9	14.00	0.01	0.00	0.09	2.25	0.52
9	9	10	14.00	0.01	0.00	0.09	2.25	0.52
10	10	11	14.00	0.02	0.00	0.14	2.25	0.52
11	11	12	0.00	0.00	0.00	0.00	0.00	0.00
12-XXBN	12	0						
13	11	15	14.00	0.15	0.00	0.34	3.06	1.11
14	13	14	14.00	0.26	0.00	4.72	6.89	7.98
15-BN	14	0	14.00	29.44	0.00	0.70	7.51	9.81
16	13	15	-14.00	7.12	0.00	2.58	6.89	7.98
17	15	16	0.00	0.00	0.00	0.00	0.00	0.00

J U N C T I O N N O D E R E S U L T S

JUNCTION NUMBER	JUNCTION TITLE	EXTERNAL DEMAND (mgd)	HYDRAULIC GRADE (ft)	JUNCTION ELEVATION (ft)	PRESSURE HEAD (ft)	JUNCTION PRESSURE (psi)
1-1	Wet Well 3	0.00	120.58	0.00	120.58	52.25
2-1	Wet Well 2	-7.00	126.43	0.00	126.43	54.78
3-1		0.00	121.06	2.00	119.06	51.59
4-1		0.00	120.58	2.00	118.58	51.39
5-1	Wet Well 1	-7.00	126.44	0.00	126.44	54.79
6-1		0.00	121.07	2.00	119.07	51.60
7-1		0.00	120.70	2.00	118.70	51.44
8-1		0.00	120.68	2.00	118.68	51.43
9-1		0.00	120.58	2.00	118.58	51.39
10-1		0.00	120.48	2.00	118.48	51.34
11-1		0.00	120.31	2.00	118.31	51.27
12-1		0.00	120.31	2.00	118.31	51.27
13-1		0.00	110.13	2.00	108.13	46.86
14-1		0.00	105.14	2.00	103.14	44.69
15-1		0.00	119.83	2.00	117.83	51.06
16-1		0.00	119.83			

S U M M A R Y O F I N F L O W S A N D O U T F L O W S

(+) INFLOWS INTO THE SYSTEM FROM BOUNDARY NODES
(-) OUTFLOWS FROM THE SYSTEM INTO BOUNDARY NODES

PIPE NUMBER	FLOWRATE (mgd)
15	-14.00

NET SYSTEM INFLOW = 0.00
NET SYSTEM OUTFLOW = -14.00
NET SYSTEM DEMAND = -14.00

**** CYBERNET SIMULATION COMPLETED ****

DATE: 3/20/1997
TIME: 15:32:50

```
+-----------------------------------------------+
|              MAXIMUM DIMENSIONS               |
|                                               |
|  Number of pipes ....................... 2000 |
|  Number of pumps ....................... 500 |
|  Number junction nodes................. 2000 |
|  Flow meters ........................... 500 |
|  Boundary nodes ........................ 200 |
|  Variable storage tanks ................ 500 |
|  Pressure switches ..................... 500 |
|  Regulating Valves...................... 500 |
|  Items for limited output ............. 2000 |
|  limit for non-consecutive numbering ..20510  |
+-----------------------------------------------+
```

Cybernet version 2.18. SN: 1132130586-2000

Extended Description:

U N I T S S P E C I F I E D

```
FLOWRATE ............ = million gallons/day
HEAD (HGL) .......... = feet
PRESSURE ............ = psig
```

O U T P U T O P T I O N D A T A

OUTPUT SELECTION: ALL RESULTS ARE INCLUDED IN THE TABULATED OUTPUT

S Y S T E M C O N F I G U R A T I O N

```
NUMBER OF PIPES ....................(p) =   17
NUMBER OF JUNCTION NODES ..........(j) =   16
NUMBER OF PRIMARY LOOPS ...........(l) =    0
NUMBER OF BOUNDARY NODES ..........(f) =    2
NUMBER OF SUPPLY ZONES ............(z) =    1
```

```
*************************************
 S I M U L A T I O N   R E S U L T S
*************************************
```

** WARNING ***
A PORTION OF THE SYSTEM IS DISCONNECTED FROM A BND BY CLOSED LINES

**** A FIX WILL BE ATTEMPTED

THE FOLLOWING JUNCTION NODES ARE DISCONNECTED FROM THE SYSTEM
DEMANDS AT THESE JUNCTION NODES ARE SET TO ZERO:
1 16

PIPE NO. 1 HAS BEEN OPENED TO REMOVE DISCONNECTION

*** WARNING ***
A PORTION OF THE SYSTEM IS DISCONNECTED FROM A BND BY CLOSED LINES

**** A FIX WILL BE ATTEMPTED

THE FOLLOWING JUNCTION NODES ARE DISCONNECTED FROM THE SYSTEM
DEMANDS AT THESE JUNCTION NODES ARE SET TO ZERO:
16

PIPE NO. 17 HAS BEEN OPENED TO REMOVE DISCONNECTION

The results are obtained after 2 trials with an accuracy = 0.00000

S I M U L A T I O N D E S C R I P T I O N

CyberNet Version 2.18. Copyright 1991,92 Haestad Methods Inc.
Run Description: One well, 10 mgd
Drawing: INJEWELL

P I P E L I N E R E S U L T S

STATUS CODE: XX -CLOSED PIPE BN -BOUNDARY NODE PU -PUMP LINE
CV -CHECK VALVE RV -REGULATING VALVE TK -STORAGE TANK

PIPE NUMBER	NODE NOS. #1	#2	FLOWRATE (mgd)	HEAD LOSS (ft)	PUMP HEAD (ft)	MINOR LOSS (ft)	LINE VELO. (ft/s)	HL/ 1000 (ft/ft)
1	1	4	0.00	0.00	0.00	0.00	0.00	0.00
2	4	9	0.00	0.00	0.00	0.00	0.00	0.00
3	2	3	5.00	0.03	0.00	2.71	3.55	2.88
4	3	8	5.00	0.20	0.00	0.00	3.55	2.88
5	5	6	5.00	0.03	0.00	2.71	3.55	2.88
6	6	7	5.00	0.20	0.00	0.00	3.55	2.88
7	7	8	5.00	0.00	0.00	0.01	0.80	0.08
8	8	9	10.00	0.01	0.00	0.05	1.61	0.28
9	9	10	10.00	0.01	0.00	0.05	1.61	0.28
10	10	11	10.00	0.01	0.00	0.07	1.61	0.28
11	11	12	0.00	0.00	0.00	0.00	0.00	0.00
12-XXBN	12	0						
13	11	15	10.00	0.08	0.00	0.17	2.19	0.59
14	13	14	10.00	0.14	0.00	2.41	4.92	4.28
15-BN	14	0	10.00	15.79	0.00	0.36	5.36	5.26
16	13	15	-10.00	3.82	0.00	1.32	4.92	4.28
17	15	16	0.00	0.00	0.00	0.00	0.00	0.00

J U N C T I O N N O D E R E S U L T S

JUNCTION NUMBER	JUNCTION TITLE	EXTERNAL DEMAND (mgd)	HYDRAULIC GRADE (ft)	JUNCTION ELEVATION (ft)	PRESSURE HEAD (ft)	JUNCTION PRESSURE (psi)
1-1	Wet Well 3	0.00	99.22	0.00	99.22	42.99
2-1	Wet Well 2	-5.00	102.21	0.00	102.21	44.29
3-1		0.00	99.47	2.00	97.47	42.24
4-1		0.00	99.22	2.00	97.22	42.13
5-1	Wet Well 1	-5.00	102.22	0.00	102.22	44.30
6-1		0.00	99.48	2.00	97.48	42.24
7-1		0.00	99.28	2.00	97.28	42.15
8-1		0.00	99.27	2.00	97.27	42.15
9-1		0.00	99.22	2.00	97.22	42.13
10-1		0.00	99.17	2.00	97.17	42.11
11-1		0.00	99.08	2.00	97.08	42.07
12-1		0.00	99.08	2.00	97.08	42.07
13-1		0.00	93.70	2.00	91.70	39.73
14-1		0.00	91.15	2.00	89.15	38.63
15-1		0.00	98.83	2.00	96.83	41.96
16-1		0.00	98.83			

S U M M A R Y O F I N F L O W S A N D O U T F L O W S

(+) INFLOWS INTO THE SYSTEM FROM BOUNDARY NODES
(-) OUTFLOWS FROM THE SYSTEM INTO BOUNDARY NODES

PIPE NUMBER	FLOWRATE (mgd)
15	-10.00

NET SYSTEM INFLOW = 0.00
NET SYSTEM OUTFLOW = -10.00
NET SYSTEM DEMAND = -10.00

**** CYBERNET SIMULATION COMPLETED ****

DATE: 3/20/1997
TIME: 15:32:50

```
+-----------------------------------------------+
|                MAXIMUM DIMENSIONS                |
|                                                  |
|  Number of pipes ....................... 2000   |
|  Number of pumps ....................... 500    |
|  Number junction nodes................... 2000   |
|  Flow meters ........................... 500    |
|  Boundary nodes ........................ 200    |
|  Variable storage tanks ................ 500    |
|  Pressure switches ..................... 500    |
|  Regulating Valves...................... 500    |
|  Items for limited output .............. 2000   |
|  limit for non-consecutive numbering ..20510     |
+-----------------------------------------------+
```

Cybernet version 2.18. SN: 1132130586-2000

Extended Description:

```
" N I T S   S P E C I F I E D

   FLOWRATE ............ = million gallons/day
   HEAD (HGL) .......... = feet
   PRESSURE ............ = psig


O U T P U T   O P T I O N   D A T A

 UTPUT SELECTION:  ALL RESULTS ARE INCLUDED IN THE TABULATED OUTPUT


 Y S T E M   C O N F I G U R A T I O N

   NUMBER OF PIPES ....................(p) =   17
   NUMBER OF JUNCTION NODES ...........(j) =   16
   NUMBER OF PRIMARY LOOPS ............(l) =    0
   NUMBER OF BOUNDARY NODES ...........(f) =    2
   NUMBER OF SUPPLY ZONES .............(z) =    1


                  ************************************
                   S I M U L A T I O N   R E S U L T S
                  ************************************

*** WARNING ***
    A PORTION OF THE SYSTEM IS DISCONNECTED FROM A BND BY CLOSED LINES

                  **** A FIX WILL BE ATTEMPTED
```

THE FOLLOWING JUNCTION NODES ARE DISCONNECTED FROM THE SYSTEM
DEMANDS AT THESE JUNCTION NODES ARE SET TO ZERO:
1 16

PIPE NO. 1 HAS BEEN OPENED TO REMOVE DISCONNECTION

*** WARNING ***
A PORTION OF THE SYSTEM IS DISCONNECTED FROM A BND BY CLOSED LINES

**** A FIX WILL BE ATTEMPTED

THE FOLLOWING JUNCTION NODES ARE DISCONNECTED FROM THE SYSTEM
DEMANDS AT THESE JUNCTION NODES ARE SET TO ZERO:
16

PIPE NO. 17 HAS BEEN OPENED TO REMOVE DISCONNECTION

The results are obtained after 2 trials with an accuracy = 0.00000

S I M U L A T I O N D E S C R I P T I O N

CyberNet Version 2.18. Copyright 1991,92 Haestad Methods Inc.
Run Description: One well, 6 mgd
Drawing: INJEWELL

P I P E L I N E R E S U L T S

STATUS CODE: XX -CLOSED PIPE BN -BOUNDARY NODE PU -PUMP LINE
CV -CHECK VALVE RV -REGULATING VALVE TK -STORAGE TANK

PIPE NUMBER	NODE NOS. #1	#2	FLOWRATE (mgd)	HEAD LOSS (ft)	PUMP HEAD (ft)	MINOR LOSS (ft)	LINE VELO. (ft/s)	HL/ 1000 (ft/ft)
1	1	4	0.00	0.00	0.00	0.00	0.00	0.00
2	4	9	0.00	0.00	0.00	0.00	0.00	0.00
3	2	3	3.00	0.01	0.00	0.98	2.13	1.12
4	3	8	3.00	0.08	0.00	0.00	2.13	1.12
5	5	6	3.00	0.01	0.00	0.98	2.13	1.12
6	6	7	3.00	0.08	0.00	0.00	2.13	1.12
7	7	8	3.00	0.00	0.00	0.00	0.48	0.03
8	8	9	6.00	0.00	0.00	0.02	0.96	0.11
9	9	10	6.00	0.00	0.00	0.02	0.96	0.11
10	10	11	6.00	0.00	0.00	0.03	0.96	0.11
11	11	12	0.00	0.00	0.00	0.00	0.00	0.00
12-XXBN	12	0						
13	11	15	6.00	0.03	0.00	0.06	1.31	0.23
14	13	14	6.00	0.05	0.00	0.87	2.95	1.66
15-BN	14	0	6.00	6.13	0.00	0.13	3.22	2.04
16	13	15	-6.00	1.48	0.00	0.47	2.95	1.66
17	15	16	0.00	0.00	0.00	0.00	0.00	0.00

J U N C T I O N N O D E R E S U L T S

JUNCTION NUMBER	JUNCTION TITLE	EXTERNAL DEMAND (mgd)	HYDRAULIC GRADE (ft)	JUNCTION ELEVATION (ft)	PRESSURE HEAD (ft)	JUNCTION PRESSURE (psi)
1-1	Wet Well 3	0.00	84.28	0.00	84.28	36.52
2-1	Wet Well 2	-3.00	85.36	0.00	85.36	36.99
3-1		0.00	84.38	2.00	82.38	35.70
4-1		0.00	84.28	2.00	82.28	35.65
5-1	Wet Well 1	-3.00	85.37	0.00	85.37	36.99
6-1		0.00	84.38	2.00	82.38	35.70
7-1		0.00	84.30	2.00	82.30	35.66
8-1		0.00	84.30	2.00	82.30	35.66
9-1		0.00	84.28	2.00	82.28	35.65
10-1		0.00	84.26	2.00	82.26	35.65
11-1		0.00	84.23	2.00	82.23	35.63
12-1		0.00	84.23	2.00	82.23	35.63
13-1		0.00	82.18	2.00	80.18	34.75
14-1		0.00	81.26	2.00	79.26	34.35
15-1		0.00	84.14	2.00	82.14	35.59
16-1		0.00	84.14			

S U M M A R Y O F I N F L O W S A N D O U T F L O W S

(+) INFLOWS INTO THE SYSTEM FROM BOUNDARY NODES
(-) OUTFLOWS FROM THE SYSTEM INTO BOUNDARY NODES

PIPE NUMBER	FLOWRATE (mgd)
15	-6.00

NET SYSTEM INFLOW = 0.00
NET SYSTEM OUTFLOW = -6.00
NET SYSTEM DEMAND = -6.00

**** CYBERNET SIMULATION COMPLETED ****

DATE: 3/20/1997
TIME: 15:32:50

```
+-----------------------------------------------+
|                MAXIMUM DIMENSIONS             |
|                                               |
|  Number of pipes ....................... 2000 |
|  Number of pumps ....................... 500  |
|  Number junction nodes................... 2000 |
|  Flow meters ........................... 500  |
|  Boundary nodes ........................ 200  |
|  Variable storage tanks ................ 500  |
|  Pressure switches ..................... 500  |
|  Regulating Valves...................... 500  |
|  Items for limited output ............. 2000 |
|  limit for non-consecutive numbering ..20510  |
+-----------------------------------------------+
```

Cybernet version 2.18. SN: 1132130586-2000

Extended Description:

U N I T S S P E C I F I E D

```
FLOWRATE ............ = million gallons/day
HEAD (HGL) .......... = feet
PRESSURE ............ = psig
```

O U T P U T O P T I O N D A T A

OUTPUT SELECTION: ALL RESULTS ARE INCLUDED IN THE TABULATED OUTPUT

S Y S T E M C O N F I G U R A T I O N

```
NUMBER OF PIPES ....................(p) =   17
NUMBER OF JUNCTION NODES ...........(j) =   16
NUMBER OF PRIMARY LOOPS ............(l) =    0
NUMBER OF BOUNDARY NODES ...........(f) =    2
NUMBER OF SUPPLY ZONES .............(z) =    1
```

```
*************************************
 S I M U L A T I O N   R E S U L T S
*************************************
```

*** WARNING ***
A PORTION OF THE SYSTEM IS DISCONNECTED FROM A BND BY CLOSED LINES

**** A FIX WILL BE ATTEMPTED

THE FOLLOWING JUNCTION NODES ARE DISCONNECTED FROM THE SYSTEM
DEMANDS AT THESE JUNCTION NODES ARE SET TO ZERO:
1 16

PIPE NO. 1 HAS BEEN OPENED TO REMOVE DISCONNECTION

*** WARNING ***
A PORTION OF THE SYSTEM IS DISCONNECTED FROM A BND BY CLOSED LINES

**** A FIX WILL BE ATTEMPTED

THE FOLLOWING JUNCTION NODES ARE DISCONNECTED FROM THE SYSTEM
DEMANDS AT THESE JUNCTION NODES ARE SET TO ZERO:
16

PIPE NO. 17 HAS BEEN OPENED TO REMOVE DISCONNECTION

The results are obtained after 2 trials with an accuracy = 0.00000

S I M U L A T I O N D E S C R I P T I O N

CyberNet Version 2.18. Copyright 1991,92 Haestad Methods Inc.
Run Description: One well, 2 mgd
Drawing: INJEWELL

P I P E L I N E R E S U L T S

STATUS CODE: XX -CLOSED PIPE BN -BOUNDARY NODE PU -PUMP LINE
CV -CHECK VALVE RV -REGULATING VALVE TK -STORAGE TANK

PIPE NUMBER	NODE NOS. #1	#2	FLOWRATE (mgd)	HEAD LOSS (ft)	PUMP HEAD (ft)	MINOR LOSS (ft)	LINE VELO. (ft/s)	HL/ 1000 (ft/ft)
1	1	4	0.00	0.00	0.00	0.00	0.00	0.00
2	4	9	0.00	0.00	0.00	0.00	0.00	0.00
3	2	3	1.00	0.00	0.00	0.11	0.71	0.15
4	3	8	1.00	0.01	0.00	0.00	0.71	0.15
5	5	6	1.00	0.00	0.00	0.11	0.71	0.15
6	6	7	1.00	0.01	0.00	0.00	0.71	0.15
7	7	8	1.00	0.00	0.00	0.00	0.16	0.00
8	8	9	2.00	0.00	0.00	0.00	0.32	0.01
9	9	10	2.00	0.00	0.00	0.00	0.32	0.01
10	10	11	2.00	0.00	0.00	0.00	0.32	0.01
11	11	12	0.00	0.00	0.00	0.00	0.00	0.00
12-XXBN	12	0						
13	11	15	2.00	0.00	0.00	0.01	0.44	0.03
14	13	14	2.00	0.01	0.00	0.10	0.98	0.22
15-BN	14	0	2.00	0.80	0.00	0.01	1.07	0.27
16	13	15	-2.00	0.19	0.00	0.05	0.98	0.22
17	15	16	0.00	0.00	0.00	0.00	0.00	0.00

J U N C T I O N N O D E R E S U L T S

JUNCTION NUMBER	JUNCTION TITLE	EXTERNAL DEMAND (mgd)	HYDRAULIC GRADE (ft)	JUNCTION ELEVATION (ft)	PRESSURE HEAD (ft)	JUNCTION PRESSURE (psi)
1-1	Wet Well 3	0.00	76.18	0.00	76.18	33.01
2-1	Wet Well 2	-1.00	76.30	0.00	76.30	33.06
3-1		0.00	76.19	2.00	74.19	32.15
4-1		0.00	76.18	2.00	74.18	32.15
5-1	Wet Well 1	-1.00	76.30	0.00	76.30	33.06
6-1		0.00	76.19	2.00	74.19	32.15
7-1		0.00	76.18	2.00	74.18	32.15
8-1		0.00	76.18	2.00	74.18	32.15
9-1		0.00	76.18	2.00	74.18	32.15
10-1		0.00	76.18	2.00	74.18	32.14
11-1		0.00	76.18	2.00	74.18	32.14
12-1		0.00	76.18	2.00	74.18	32.14
13-1		0.00	75.92	2.00	73.92	32.03
14-1		0.00	75.82	2.00	73.82	31.99
15-1		0.00	76.17	2.00	74.17	32.14
16-1		0.00	76.17			

S U M M A R Y O F I N F L O W S A N D O U T F L O W S

(+) INFLOWS INTO THE SYSTEM FROM BOUNDARY NODES
(-) OUTFLOWS FROM THE SYSTEM INTO BOUNDARY NODES

PIPE NUMBER	FLOWRATE (mgd)
15	-2.00

NET SYSTEM INFLOW = 0.00
NET SYSTEM OUTFLOW = -2.00
NET SYSTEM DEMAND = -2.00

**** CYBERNET SIMULATION COMPLETED ****

DATE: 3/20/1997
TIME: 15:32:50

```
+-----------------------------------------------+
|              MAXIMUM DIMENSIONS                |
|                                                |
|  Number of pipes ....................... 2000 |
|  Number of pumps ....................... 500  |
|  Number junction nodes................. 2000 |
|  Flow meters ........................... 500  |
|  Boundary nodes ........................ 200  |
|  Variable storage tanks ............... 500  |
|  Pressure switches ..................... 500  |
|  Regulating Valves...................... 500  |
|  Items for limited output ............ 2000  |
|  limit for non-consecutive numbering ..20510  |
+-----------------------------------------------+
```

Cybernet version 2.18. SN: 1132130586-2000

Extended Description:

```
UNITS  SPECIFIED

  FLOWRATE ............ = million gallons/day
  HEAD (HGL) .......... = feet
  PRESSURE ............ = psig


OUTPUT  OPTION  DATA

OUTPUT SELECTION:  ALL RESULTS ARE INCLUDED IN THE TABULATED OUTPUT


SYSTEM  CONFIGURATION

  NUMBER OF PIPES ....................(p) =   17
  NUMBER OF JUNCTION NODES ...........(j) =   16
  NUMBER OF PRIMARY LOOPS ............(l) =    0
  NUMBER OF BOUNDARY NODES ...........(f) =    2
  NUMBER OF SUPPLY ZONES .............(z) =    1


                  ************************************
                   S I M U L A T I O N   R E S U L T S
                  ************************************


*** WARNING ***
    A PORTION OF THE SYSTEM IS DISCONNECTED FROM A BND BY CLOSED LINES

                  **** A FIX WILL BE ATTEMPTED
```

THE FOLLOWING JUNCTION NODES ARE DISCONNECTED FROM THE SYSTEM
DEMANDS AT THESE JUNCTION NODES ARE SET TO ZERO:
1 16

PIPE NO. 1 HAS BEEN OPENED TO REMOVE DISCONNECTION

*** WARNING ***
A PORTION OF THE SYSTEM IS DISCONNECTED FROM A BND BY CLOSED LINES

**** A FIX WILL BE ATTEMPTED

THE FOLLOWING JUNCTION NODES ARE DISCONNECTED FROM THE SYSTEM
DEMANDS AT THESE JUNCTION NODES ARE SET TO ZERO:
16

PIPE NO. 17 HAS BEEN OPENED TO REMOVE DISCONNECTION

The results are obtained after 3 trials with an accuracy = 0.00010

S I M U L A T I O N D E S C R I P T I O N

CyberNet Version 2.18. Copyright 1991,92 Haestad Methods Inc.
Run Description: 40 mgd
Drawing: INJEWELL

P I P E L I N E R E S U L T S

STATUS CODE: XX -CLOSED PIPE BN -BOUNDARY NODE PU -PUMP LINE
CV -CHECK VALVE RV -REGULATING VALVE TK -STORAGE TANK

PIPE NUMBER	NODE NOS. #1	#2	FLOWRATE (mgd)	HEAD LOSS (ft)	PUMP HEAD (ft)	MINOR LOSS (ft)	LINE VELO. (ft/s)	HL/ 1000 (ft/ft)
1	1	4	0.00	0.00	0.00	0.00	0.00	0.00
2	4	9	0.00	0.00	0.00	0.00	0.00	0.00
3	2	3	20.00	0.34	0.00	43.41	14.18	37.52
4	3	8	20.00	2.63	0.00	0.00	14.18	37.52
5	5	6	20.00	0.34	0.00	43.41	14.18	37.52
6	6	7	20.00	2.63	0.00	0.00	14.18	37.52
7	7	8	20.00	0.01	0.00	0.10	3.22	1.01
8	8	9	40.00	0.07	0.00	0.77	6.43	3.65
9	9	10	40.00	0.07	0.00	0.77	6.43	3.65
10	10	11	40.00	0.16	0.00	1.16	6.43	3.65
11	11	12	20.96	5.66	0.00	11.41	10.32	16.84
12-BN	12	0	20.96	62.15	0.00	1.57	11.24	20.72
13	11	15	19.04	0.27	0.00	0.62	4.17	1.96
14	13	14	19.04	0.47	0.00	8.74	9.38	14.10
15-BN	14	0	19.04	52.05	0.00	1.30	10.21	17.35
16	13	15	-19.04	12.58	0.00	4.78	9.38	14.10
17	15	16	0.00	0.00	0.00	0.00	0.00	0.00

J U N C T I O N N O D E R E S U L T S

JUNCTION NUMBER	JUNCTION TITLE	EXTERNAL DEMAND (mgd)	HYDRAULIC GRADE (ft)	JUNCTION ELEVATION (ft)	PRESSURE HEAD (ft)	JUNCTION PRESSURE (psi)
1-1	Wet Well 3	0.00	157.94	0.00	157.94	68.44
2-1	Wet Well 2	-20.00	205.16	0.00	205.16	88.90
3-1		0.00	161.41	2.00	159.41	69.08
4-1		0.00	157.94	2.00	155.94	67.58
5-1	Wet Well 1	-20.00	205.27	0.00	205.27	88.95
6-1		0.00	161.51	2.00	159.51	69.12
7-1		0.00	158.89	2.00	156.89	67.98
8-1		0.00	158.78	2.00	156.78	67.94
9-1		0.00	157.94	2.00	155.94	67.58
10-1		0.00	157.11	2.00	155.11	67.21
11-1		0.00	155.79	2.00	153.79	66.64
12-1		0.00	138.72	2.00	136.72	59.24
13-1		0.00	137.54	2.00	135.54	58.74
14-1		0.00	128.34	2.00	126.34	54.75
15-1		0.00	154.90	2.00	152.90	66.26
16-1		0.00	154.90			

S U M M A R Y O F I N F L O W S A N D O U T F L O W S

(+) INFLOWS INTO THE SYSTEM FROM BOUNDARY NODES
(-) OUTFLOWS FROM THE SYSTEM INTO BOUNDARY NODES

PIPE NUMBER	FLOWRATE (mgd)
12	-20.96
15	-19.04

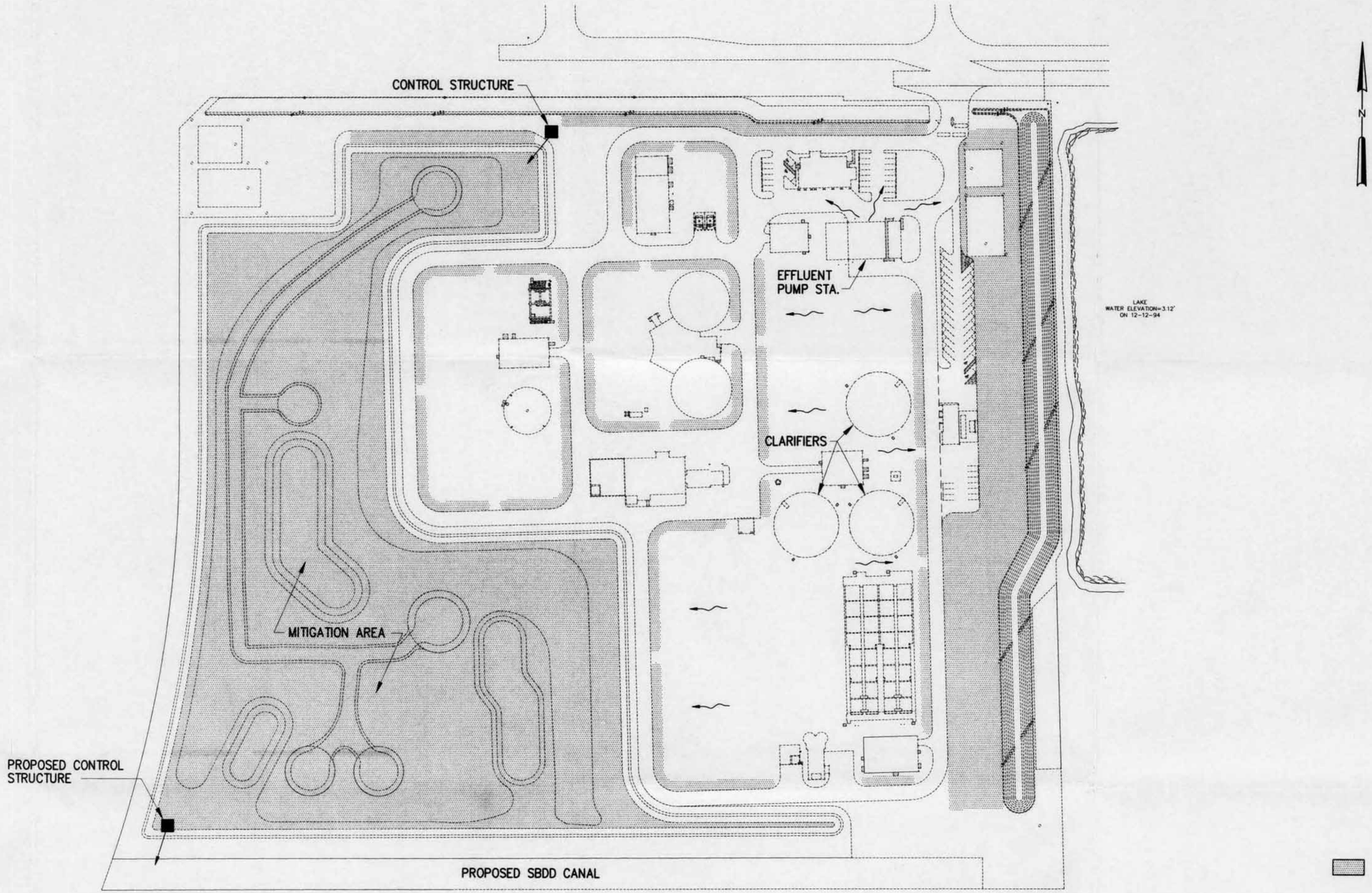
NET SYSTEM INFLOW = 0.00
NET SYSTEM OUTFLOW = -40.00
NET SYSTEM DEMAND = -40.00

**** CYBERNET SIMULATION COMPLETED ****

DATE: 3/20/1997
TIME: 15:49:16

ATTACHMENT 14

EMERGENCY DISPOSAL METHOD



LEGEND

WATER RETENTION AREAS (WATER DEPTH GREATER THAN SIX INCHES)

GENERAL DIRECTION OF SHEET FLOW (WATER DEPTH TYPICALLY TWO TO THREE INCHES)

NOTE:
CULVERTS CONNECTING SWALES ARE NOT SHOWN.

1"=100' 200 100 0 200'

NO.	DATE	ISSUED FOR	BY

DESIGNED H.J.V.
DRAWN S.L.M./H.M.
CHECKED
PROJ. ENGR. H.J.V.

H.J. VIDAL P.E.
No. 37882

HAZEN AND SAWYER
Environmental Engineers & Scientists

SCALE 1" = 100'

CONTRACT: 8118
CLIENTS PROJECT:
ENGINEERS PROJECT: 8118
CAD REFERENCE: 8136X54

CITY OF MIRAMAR
DEPARTMENT OF PUBLIC WORKS/UTILITIES

MIRAMAR WASTEWATER RECLAMATION FACILITY
BID PACKAGE 3: TREATMENT WORKS

SITE PLAN

DATE: MARCH 1997
SHEET: 1 OF 1
DRAWING:

3/26/1997/1:00 P.M. - D:\HWD - H:\8136\OTHER\8136X54 () XREFS: 8118AREA, 8118BNDR, 8118CAD, 8118GRID, 8118SLAT, 8118SLDC (1) - Plot Scale 1=100

ATTACHMENT 15

PRELIMINARY DRAFT O&M MANUAL

City of Miramar
Wastewater Reclamation Facility

Operation and Maintenance Manual for the Injection Well System

Preliminary Draft

Issued for Operational Testing

March 1997

PREAMBLE

This preliminary draft Operation and Maintenance (O&M) manual has been prepared to provide essential information to allow operation of the injection well system during operational testing. The information in this document is supplemented by reference material included in the manufacturers' O&M manuals kept at the site. A facility O&M is under preparation and will replace this preliminary draft within a few months.

INTRODUCTION

The Miramar Wastewater Reclamation Facility (WWRF) is a secondary treatment facility receiving domestic wastewater generated in the western areas of the City of Miramar. The wastewater is essentially of residential and commercial origin. The WWRF permitted capacity is 8.9 mgd on a maximum three months basis. The capacity on an annual average daily flow basis (AADF) is 7.4 mgd with a corresponding peak hour factor of 2.5. The facility does not include flow equalization. Therefore, the entire plant, including the injection well system, is designed to handle a hydraulic peak flowrate of 18.5 mgd.

The liquid treatment process consists of pretreatment, conventional activated sludge, and effluent disposal via deep injection well. A portion of the effluent is also diverted to the reclaimed water system. The secondary treated effluent is filtered and chlorinated and before it is used for on-site process water and for spray irrigation at the site as well as in residential areas near the plant.

The pretreatment consists of removal of large materials through a continuously cleaning screen, and grit removal in two forced vortex type grit chambers. The wastewater is then treated through up to four aeration basins provided with a fine bubble diffuser system. The biologically treated wastewater then flows to three circular clarifiers. The clarified effluent is either discharged to the deep injection wells or pumped to the reclaimed water system for additional treatment.

The biosolids removed from the clarifiers are thickened, anaerobically digested, and dewatered on belt filter presses prior to being hauled off site for land application.

A graphic representation of the plant treatment processes is shown on Figure 1. The hydraulic profile through the plant is shown on Figure 2. Major process piping is shown on Figure 3.

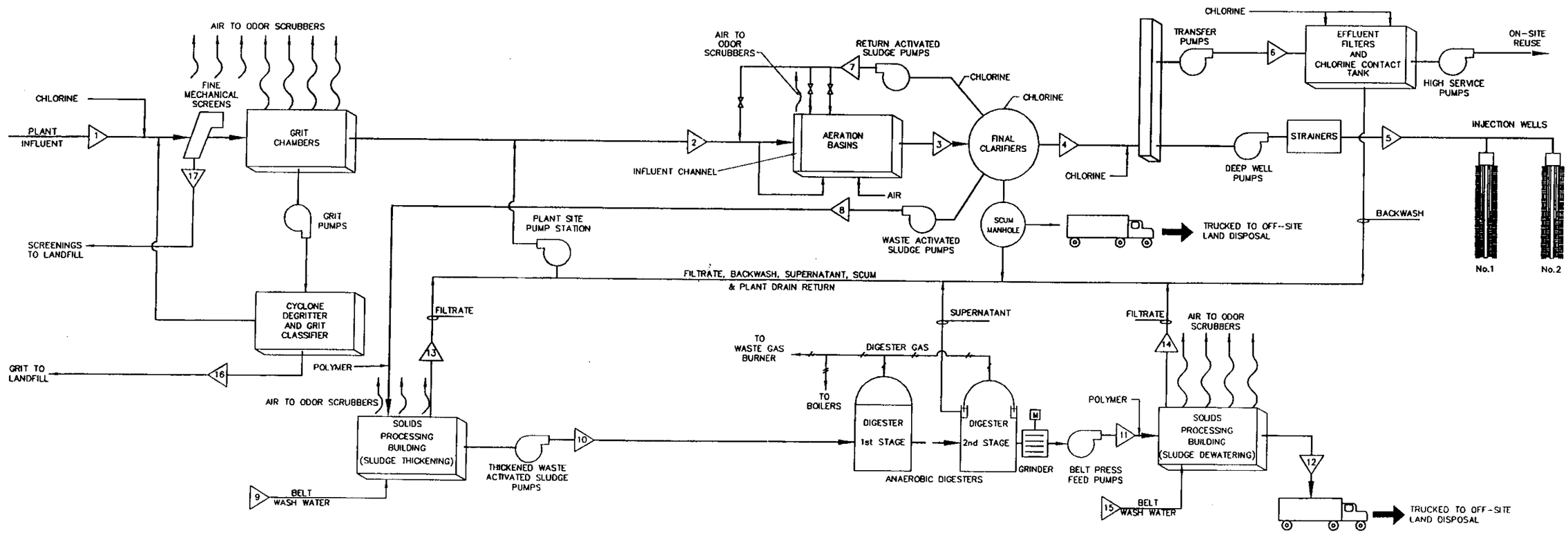
SYSTEM DESIGN AND OPERATION

The injection well system consists of a pump station and auxiliary systems, two deep injection wells, and associated Floridan Aquifer monitor wells. The injection well pump station is designed to accommodate the installation of a total of four injection well pumps and two filter feed pumps. In addition, provisions have been incorporated in the design of the facilities to allow construction of a separate filter feed pump station. Two additional injection well pumps could then be installed in lieu of the filter feed pumps, if necessary to provide additional capacity in the future.

The effluent is pumped by 20-inch vertical turbine pumps through automatic backwash strainers to the two injection wells. Each injection well is constructed out of 24-inch outer diameter welded mild steel pipe. The casing is half of an inch thick. Each injection well is drilled to a depth of 3,500 ft and discharges effluent in a highly fractured formation known as the Boulder Zone, which contains saline water. Confining sequences above the injection zone prevent upwards migration

		1 PLANT INFLUENT	2 AERATION BASIN INFLUENT	3 AERATION BASIN EFFLUENT	4 CLARIFIER EFFLUENT (NOMINAL)	5 EFFLUENT TO DEEP WELLS	6 EFFLUENT TO REUSE *	7 RETURN ACTIVATED SLUDGE	8 WASTE ACTIVATED SLUDGE	9 GBT WASHWATER	10 THICKENED WASTE ACTIVATED SLUDGE	11 DIGESTED SLUDGE	12 DEWATERED SLUDGE CAKE	13 FILTRATE FROM THICKENING	14 FILTRATE FROM DEWATERING	15 BFP WASHWATER	16 GRIT TO LANDFILL	17 SCREENINGS TO LANDFILL	18	19	20
BUILDOUT PHASE I	FLOW – MGD	7.30	12.21	12.21	7.36	7.324	0.036	4.46	0.39	0.029	0.044	0.044	33 C.Y.	0.347	0.038	0.007	1 C.Y.	2 C.Y.	–	–	–
	BOD – MG/L	250	160	20	20	20	20	20	20	–	–	–	–	112	293	–	–	–	–	–	–
	BOD – Lbs./DAY	15,220	16,384	2,037	1,227	1,221	6	745	65	–	–	–	–	326	93	–	–	–	–	–	–
	TSS – MG/L	250	1,998	2,000	20	20	20	5,000	5,000	–	40,000	25,000	16%	563	1,465	–	–	–	–	–	–
	TSS – Lbs./DAY	15,220	203,550	203,765	1,227	1,221	6	186,237	16,301	–	14,670	9,169	8,798	1,630	463	–	–	–	–	–	–
BUILDOUT PHASE II	FLOW – MGD	12.00	20.08	20.08	12.06	12.00	0.057	7.35	0.635	0.046	0.071	0.071	53 C.Y.	0.563	0.061	0.010	1.5 C.Y.	3 C.Y.	–	–	–
	BOD – MG/L	250	160	20	20	20	20	20	20	–	–	–	–	112	294	–	–	–	–	–	–
	BOD – Lbs./DAY	25,020	26,925	3,349	2,017	2,002	9	1,225	105	–	–	–	–	529	150	–	–	–	–	–	–
	TSS – MG/L	250	1,999	2,000	20	20	20	5,000	5,000	–	40,000	25,000	16%	563	1,473	–	–	–	–	–	–
	TSS – Lbs./DAY	25,020	334,847	334,915	2,017	2,002	9	306,428	26,469	–	23,823	14,889	14,286	2,646	751	–	–	–	–	–	–

* ON-SITE USES ONLY



NO.	DATE	ISSUED FOR	BY
1	5/3/95	BIDDING	H.J.V.

DESIGNED H.J.V.
DRAWN E.J.J.
CHECKED
PROJ. ENGR. H.J.V.

H.J. VIDAL
No. 37882
P.E.

HAZEN AND SAWYER
Environmental Engineers & Scientists

SCALE: NONE

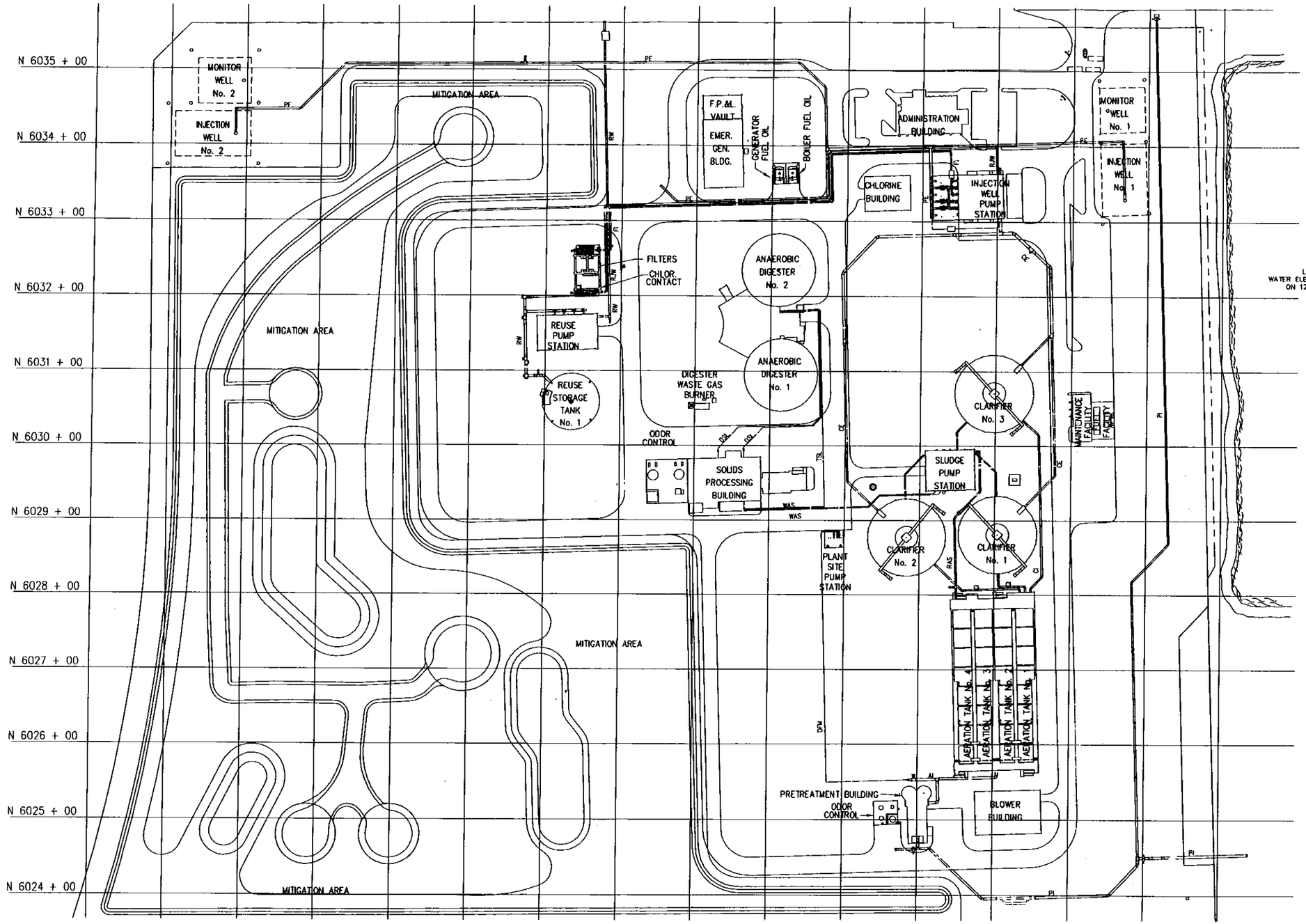
CONTRACT: 8118
CLIENTS PROJECT:
ENGINEERS PROJECT: 8118
CAD REFERENCE: 8118M1

CITY OF MIRAMAR
DEPARTMENT OF PUBLIC WORKS/UTILITIES

MIRAMAR WASTEWATER RECLAMATION FACILITY
BID PACKAGE 3: TREATMENT WORKS

PROCESS FLOW DIAGRAM AND MATERIAL BALANCE

DATE: MAY 1995
SHEET: 51 OF 565
DRAWING FIGURE 1



LEGEND

AERATION INFLUENT	AI
AIR	A
BASIN DRAIN	BD
CLARIFIER EFFLUENT	CE
CLARIFIER INFLUENT	CI
DIGESTED SLUDGE	DSL
DIGESTER GAS	DG
FILTER INFLUENT	FI
FUEL RETURN	FR
FUEL SUPPLY	FS
GRAVITY DRAIN	GD
HYPOCHLORITE SOLUTION	SHC
IRRIGATION QUALITY	IQ
MANHOLE	MH
PLANT DRAIN FORCE MAIN	DFM
PLANT EFFLUENT	PE
PLANT INFLUENT	PI
POLYMER SOLUTION	PS
POTABLE WATER	PW
REJECT WATER	RJW
RETURN ACTIVATED SLUDGE	RAS
REUSE WATER	RW
SAMPLE	SA
SCRUBBER DUCT	SCD
SCUM	SC
THICKENED SLUDGE	TSL
WASTE ACTIVATED SLUDGE	WAS
— — — — BOTTOM OF SWALE	

NO.	DATE	ISSUED FOR	BY
1	5/3/95	BIDDING	H.J.V.

DESIGNED H.J.V.
DRAWN S.L.M./H.M.
CHECKED
PROJ. ENGR. H.J.V.

H.J. VIDAL P.E.
No. 37882

HAZEN AND SAWYER
Environmental Engineers & Scientists

SCALE N.T.S.

CONTRACT: 8118
CLIENTS PROJECT:
ENGINEERS PROJECT: 8118
CAD REFERENCE: 8118M4

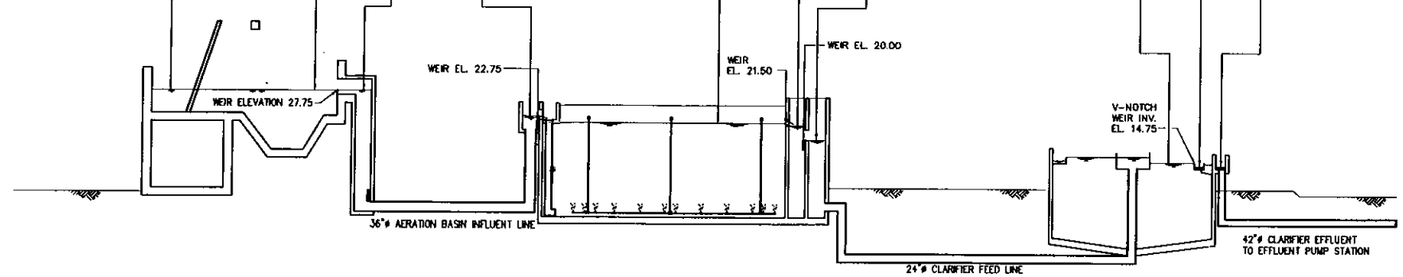
CITY OF MIRAMAR
DEPARTMENT OF PUBLIC WORKS/UTILITIES

MIRAMAR WASTEWATER RECLAMATION FACILITY
BID PACKAGE 3: TREATMENT WORKS
MAJOR PROCESS PIPING SCHEMATIC

DATE: MAY 1995
SHEET: 54 OF 565
DRAWING: FIGURE 2

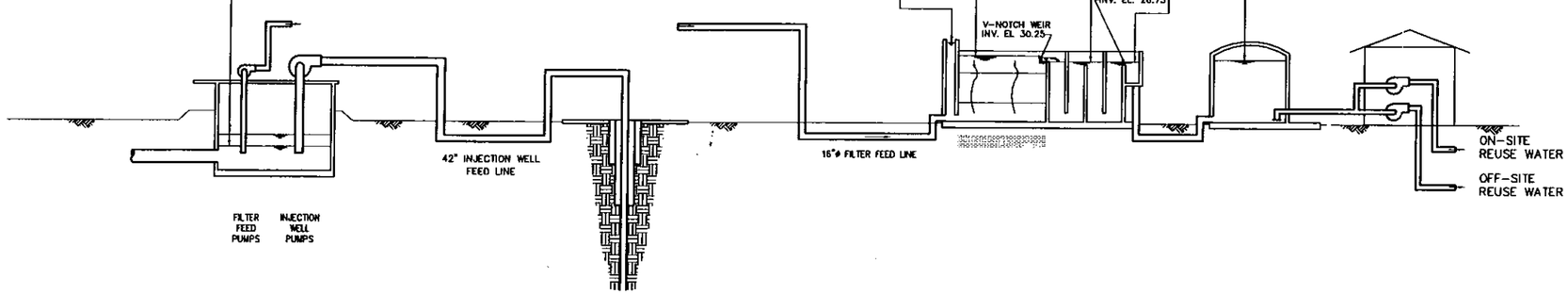
FIGURE 2

CONDITION		FLOW	WATER ELEVATION – FT.									
			PRETREATMENT FACILITY				AERATION TANKS			FINAL CLARIFIERS		
PHASE I	AVERAGE	7.3 MGD	29.15	28.48	23.12	22.84	21.73	20.63	15.52	14.82	13.88	12.22
	PEAK	18.25 MGD	31.75	29.09	25.18	23.45	21.84	20.71	17.18	14.86	14.16	13.27
BUILDOUT	AVERAGE	12 MGD	28.86	28.38	23.26	23.08	21.70	20.55	15.29	14.82	13.84	12.41
	PEAK	30 MGD	30.78	28.89	24.46	23.34	21.80	20.61	16.33	14.85	14.31	14.23



CONDITION		FLOW	WATER ELEVATION – FT.						
			EFFLUENT PUMP STATION	EFFLUENT FILTERS		CHLORINE CONTACT TANK		REUSE STORAGE TANK
PHASE I	AVERAGE	7.3 MGD	12.0 – 9.0	33.37	30.37	27.03	24.82	24.67 (MAX.)
	PEAK	18.25 MGD	12.0 – 9.0	33.43	30.43	27.27	25.57	24.67 (MAX.)
BUILDOUT	AVERAGE	12 MGD	12.0 – 9.0	*	*	*	*	*
	PEAK	30 MGD	12.0 – 9.0	*	*	*	*	*

* DEPENDS ON EXTENT OF REUSE PROGRAM IMPLEMENTATION



HAZEN AND SAWYER
Environmental Engineers & Scientists

CITY OF MIRAMAR
DEPARTMENT OF PUBLIC WORKS/UTILITIES

MIRAMAR WASTEWATER RECLAMATION FACILITY
BID PACKAGE 3: TREATMENT WORKS
HYDRAULIC PROFILE
NORMAL CONDITION

DATE: MARCH 1997
REF:
DRAWING: FIGURE 3

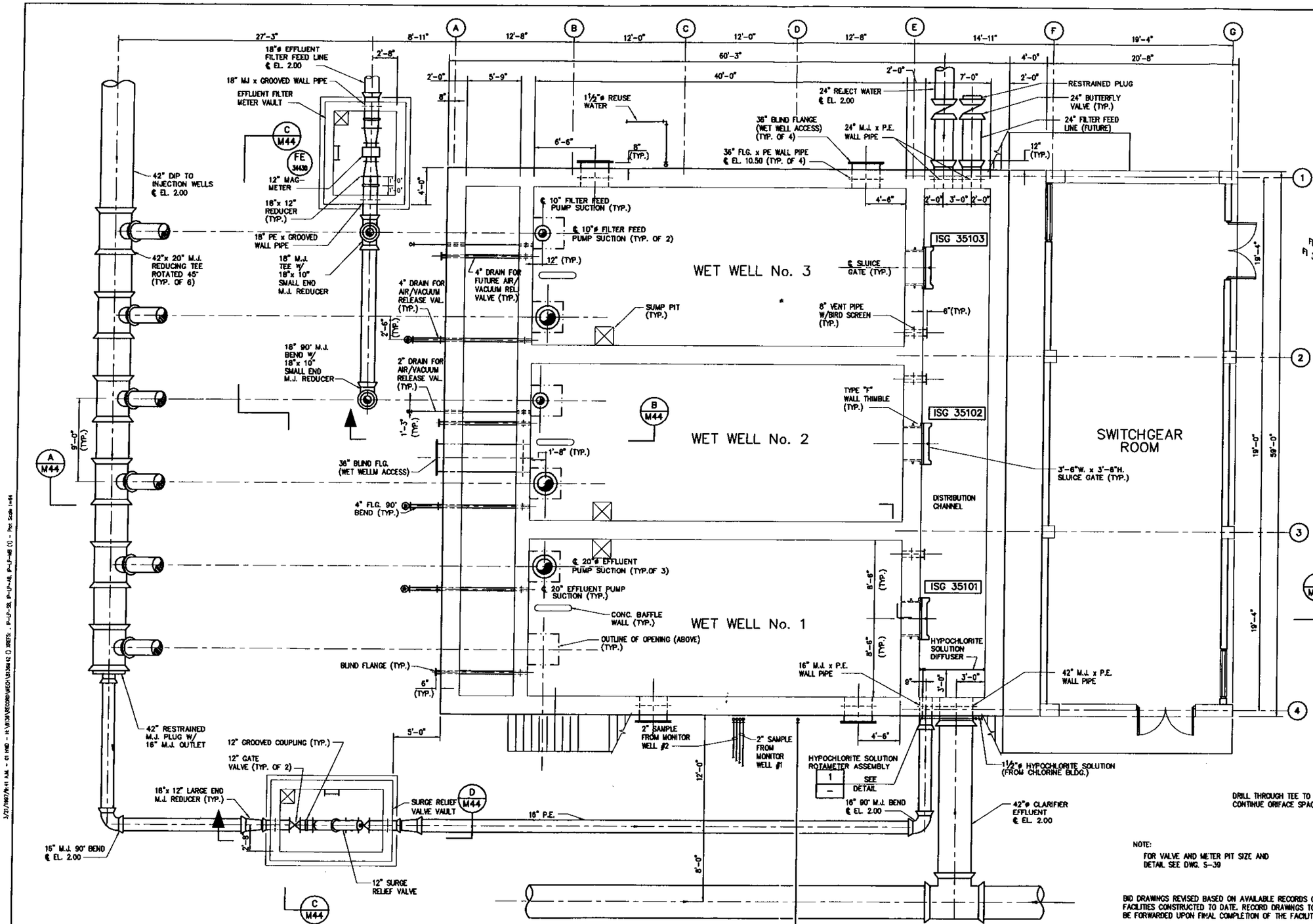
of the injected fluids. The fresh water effluent is lighter than the saline formation water and would therefore rise vertically in the absence of adequate confinement. The Floridan Aquifer monitor wells monitor two distinct zones above the injection horizon and provide a mean to confirm that the injected effluent does not migrate upwards.

The system is provided with a surge relief system consisting of 20-inch electric check valves on the discharge of each pump and a 16-inch surge relief line with a 12-inch surge relief valve designed to discharge back into the wetwell upon activation. The surge relief system is design to avoid damage from water hammer in case of power failure and/or abrupt valve closure. The station layout is shown on Figures 4, 5, and 6. The piping between the pump station and the wells is shown on Figure 3 (Drawings M-4). Each well is provided with a flow meter and pressure transducer which monitor the operation of the wells on a continuous basis.

To support the current rating of the plant, three injection well pumps are provided, two duty and one standby unit. Pumps information is listed below:

Number of pumps	3 (2 Duty + 1 Standby)
Type	Vertical Turbine
Manufacturer	Fairbanks Morse
Model	27M-7000
Suction &Discharge Flange Size, inch	20-inch
Impeller	
Diameter, inch	16.9
Number of Stages	3
Rated Conditions	
Capacity, each	8,000 gpm at -168 ft TDH
Efficiency at Rated Conditions	85%
Maximum Speed, rpm	895
Mechanical Seals	John Crane Type 1100
Controls	
Manual	From VFD cabinets and from PLC
Automatic	Based on wetwell level through PLC
Remote Operation	Via Plant Control system
Motor	
Manufacturer	U.S. Motors
Type	JVCI
Frame Size	5811P
Horsepower	400 hp
Maximum Speed, rpm	895
Speed Control	Allen Bradley Variable Frequency Drive

Initially, the pumps will be installed with two of the three stages to better track the reduced flows treated through the plant during the first years of operation. As the flows increase, the third stage



	DISTRIBUTION CHANNEL
CHANNEL WIDTH	7'-0"
DROP PIPE SIZE	1" DIA.
DIFFUSER SIZE	1" DIA.
ORIFICES SIZE & SPACING	¼"ø @ 3" O.C.
PLANE OF ORIFACES	HORIZONTAL
NUMBER REQUIRED	1

NOTE:
FOR VALVE AND METER PIT SIZE AND DETAIL SEE DWG. S-39

BID DRAWINGS REVISED BASED ON AVAILABLE RECORDS OF FACILITIES CONSTRUCTED TO DATE. RECORD DRAWINGS TO BE FORWARDED UPON FINAL COMPLETION OF THE FACILITIES.

UPDATED BID DRAWINGS

3/16"=1'-0" 6 4 2 0 6'

NO	DATE	ISSUED FOR	BY
2	3/19/97	INJECTION WELL OPERATIONAL TESTING	H.J.V.
1	5/3/95	BIDDING	H.J.V.

DESIGNED H.J.V.
DRAWN S.L.M.
CHECKED
PROJ. ENGR. H.J.V.

H.J. VIDAL P.E.
No. 37882

HAZEN AND SAWYER
Environmental Engineers & Scientists

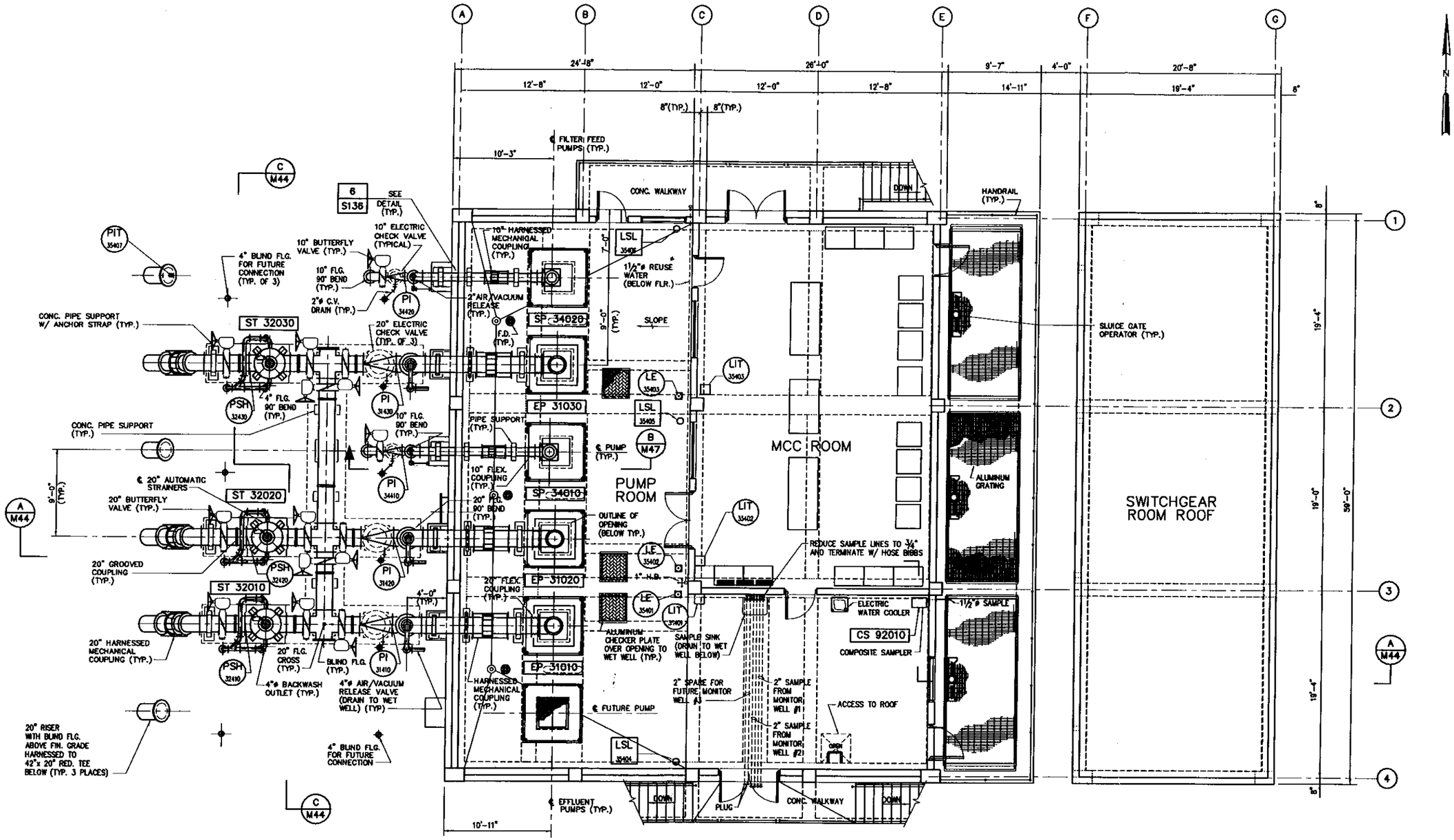
SCALE 3/16"=1'-0"

CONTRACT: 8118
CLIENTS PROJECT:
ENGINEERS PROJECT: 8118
CAD REFERENCE: 8136M42

CITY OF MIRAMAR
DEPARTMENT OF PUBLIC WORKS/UTILITIES

MIRAMAR WASTEWATER RECLAMATION FACILITY
BID PACKAGE 3: TREATMENT WORKS
INJECTION WELL PUMP STATION
LOWER LEVEL – PLAN

DATE: MAY 1995
SHEET: 92 OF 565
DRAWING: FIGURE 4



FIRST FLOOR – PLAN

3/16"=1'-0"

BID DRAWINGS REVISED BASED ON AVAILABLE RECORDS OF FACILITIES CONSTRUCTED TO DATE. RECORD DRAWINGS TO BE FORWARDED UPON FINAL COMPLETION OF THE FACILITIES.

UPDATED BID DRAWINGS

3/16"=1'-0" 6 4 2 0 6'

NO.	DATE	ISSUED FOR	BY
2	3/19/97	INJECTION WELL OPERATIONAL TESTING	H.J.V.
1	5/3/95	BIDDING	H.J.V.

DESIGNED H.J.V.
DRAWN S.L.M.
CHECKED
PROJ. ENGR. H.J.V.

H.J. VIDAL P.E.
No. 37882

HAZEN AND SAWYER
Environmental Engineers & Scientists

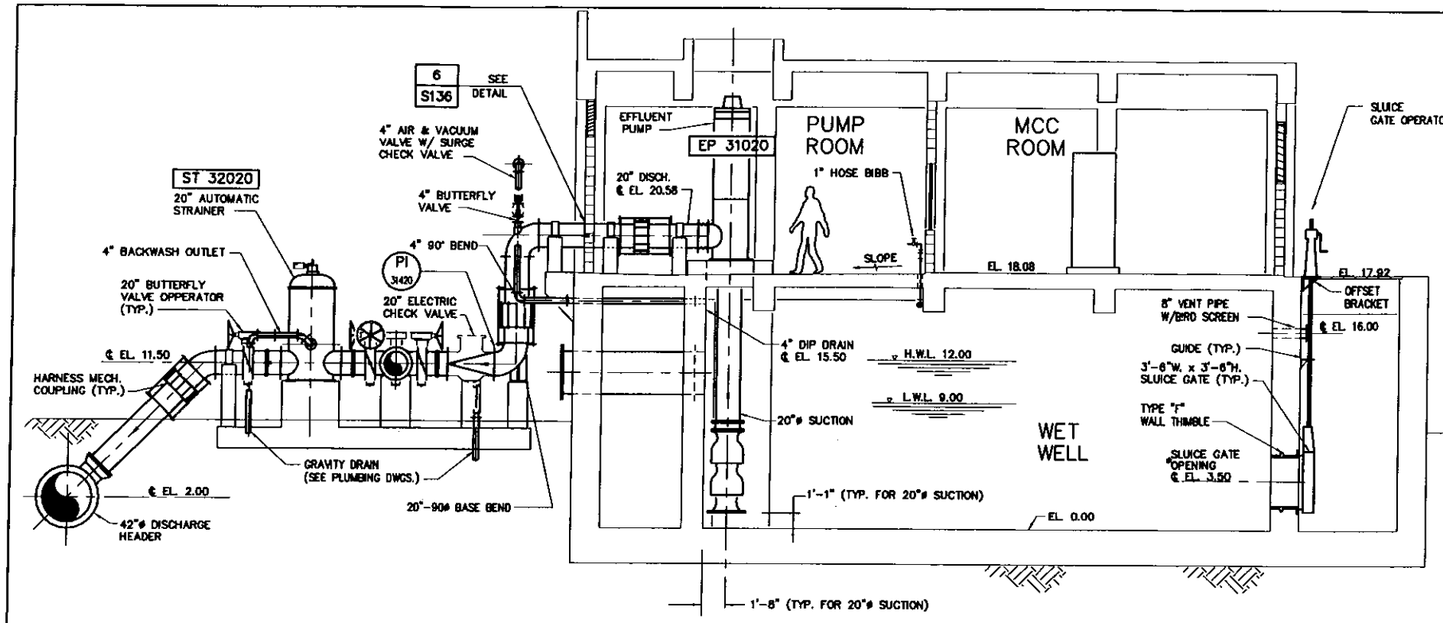
SCALE 3/16"=1'-0"

CONTRACT: 8118
CLIENTS PROJECT:
ENGINEERS PROJECT: 8118
CAD REFERENCE: 8136M43

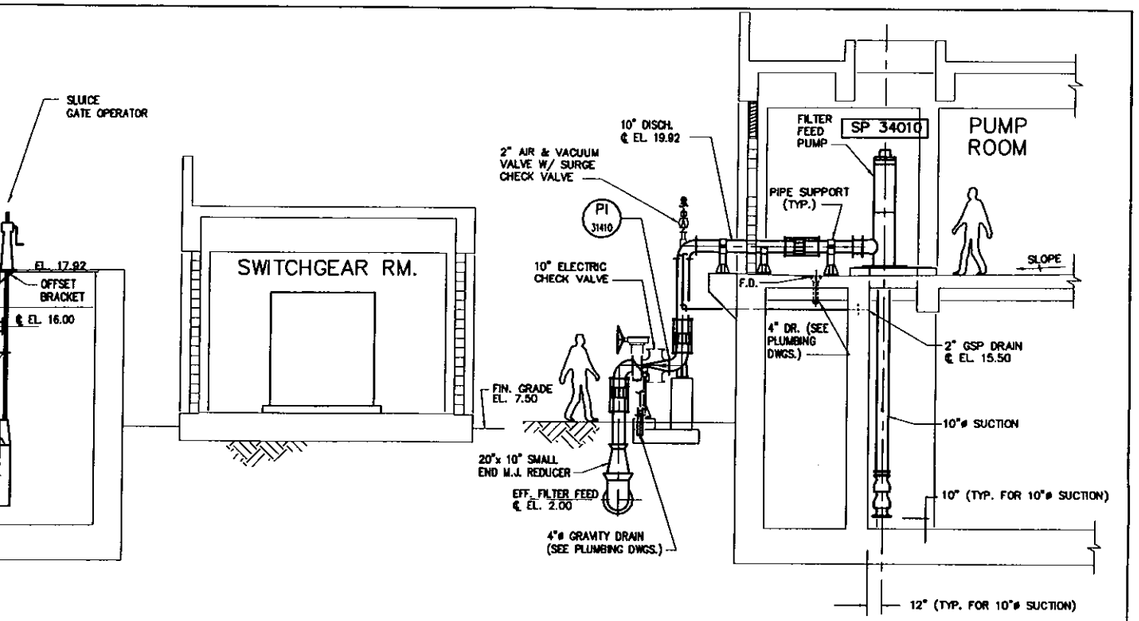
CITY OF MIRAMAR
DEPARTMENT OF PUBLIC WORKS/UTILITIES

MIRAMAR WASTEWATER RECLAMATION FACILITY
BID PACKAGE 3: TREATMENT WORKS
INJECTION WELL PUMP STATION
UPPER LEVEL – PLAN

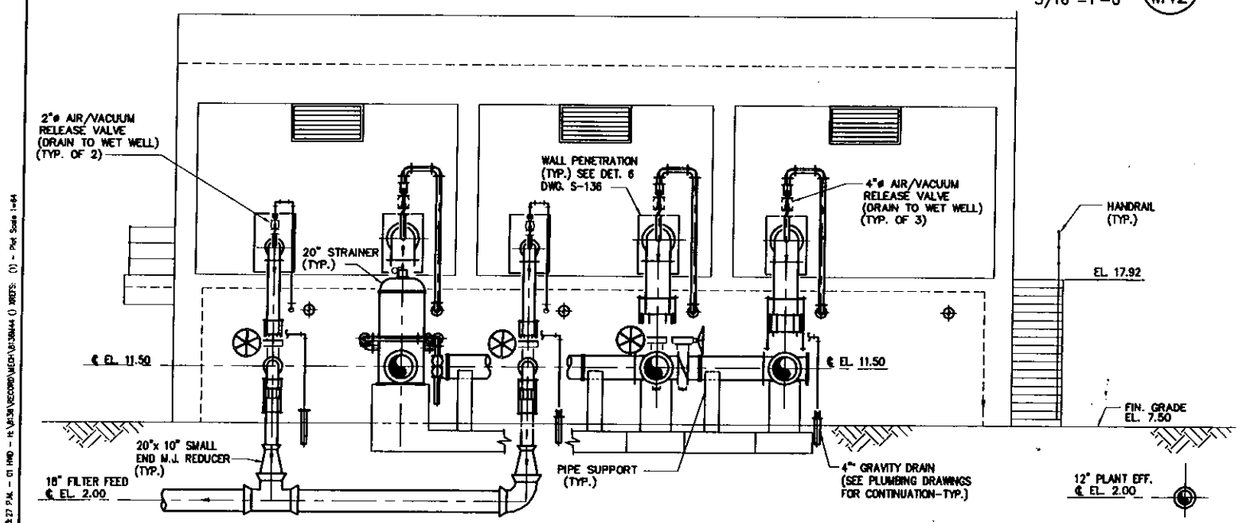
DATE: MAY 1995
SHEET: 93 OF 565
DRAWING: FIGURE 5



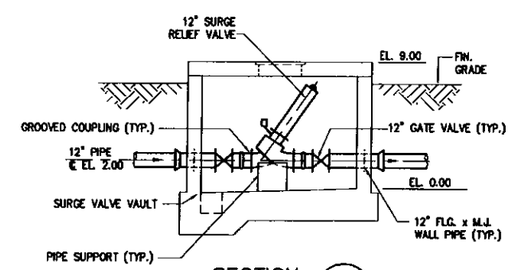
SECTION A / M42
3/16"=1'-0"



SECTION B / M42
3/16"=1'-0"



SECTION C / M42
3/16"=1'-0"



SECTION D / M42
3/16"=1'-0"

BID DRAWINGS REVISED BASED ON AVAILABLE RECORDS OF FACILITIES CONSTRUCTED TO DATE. RECORD DRAWINGS TO BE FORWARDED UPON FINAL COMPLETION OF THE FACILITIES.

* SUBJECT TO EQUIPMENT SUPPLIER REQUIRMENTS

UPDATED BID DRAWINGS

3/16"=1'-0" 6 4 2 0 6'

NO.	DATE	ISSUED FOR	BY
2	3/19/97	INJECTION WELL OPERATIONAL TESTING	H.J.V.
1	5/3/95	BIDDING	H.J.V.

DESIGNED H.J.V.
DRAWN S.L.M.
CHECKED
PROJ. ENGR H.J.V.

H.J. VIDAL P.E.
No. 37882

HAZEN AND SAWYER
Environmental Engineers & Scientists

SCALE 3/16"=1'-0"

CONTRACT: 8118
CLIENTS PROJECT:
ENGINEERS PROJECT: 8118
CAD REFERENCE: 8136M44

CITY OF MIRAMAR
DEPARTMENT OF PUBLIC WORKS/UTILITIES

MIRAMAR WASTEWATER RECLAMATION FACILITY
BID PACKAGE 3: TREATMENT WORKS
INJECTION WELL PUMP STATION
SECTIONS

DATE: MAY 1995
SHEET: 94 OF 565
DRAWING: FIGURE 6

3/20/1997 2:27 PM - (1) HWD - H:\JRJN\RECORD\MEDY\8136M44 (1) WRDS: (1) - Plot Scale 1=44

will be added in each pump. Under either scenario, the pump station capacity is established based on two pumps running. The third pump is a standby unit. The pump station operation during initial years with two stages installed is illustrated on Figure 7. Figure 8 shows operation with the three stages installed. These two figures represent firm capacity of the station (with the single larger unit out of service).

Individual pump performance curves for the two and three stage configurations are shown on Figures 9 and 10, respectively.

Operation of the injection well system is automatically controlled by the local Programmable Logic Controller (PLC) at the pump station. The injection well system is operated automatically based on the station wetwell level. Upon rising level, the first pump is started and the control system modulates the pump speed to maintain a preset setpoint (approximate El. 10.50). If the first pump is unable to maintain the level setpoint, the control system automatically starts the second duty pump. Both pumps are then operated at the same speed, as determined by the control system, to maintain the level setpoint. Upon falling level, the system shuts down the pumps sequentially. The system is provided with multiple equipment safety features to automatic monitor and shut down the equipment, and to inform the operator of mechanical, electrical and control problems. Instrumentation and control of the injection well system are shown on Figures 11 and 12.

Unless one well is out of service, the effluent is discharged simultaneously to both wells. The effluent flowrate and well head pressure at each injection well is continuously monitored and recorded via the plant control system.

EMERGENCY DISPOSAL METHOD

Power Failure

The standby power system consists of three Caterpillar engine generator sets. The generator system single line power diagram is shown on Figure 13.

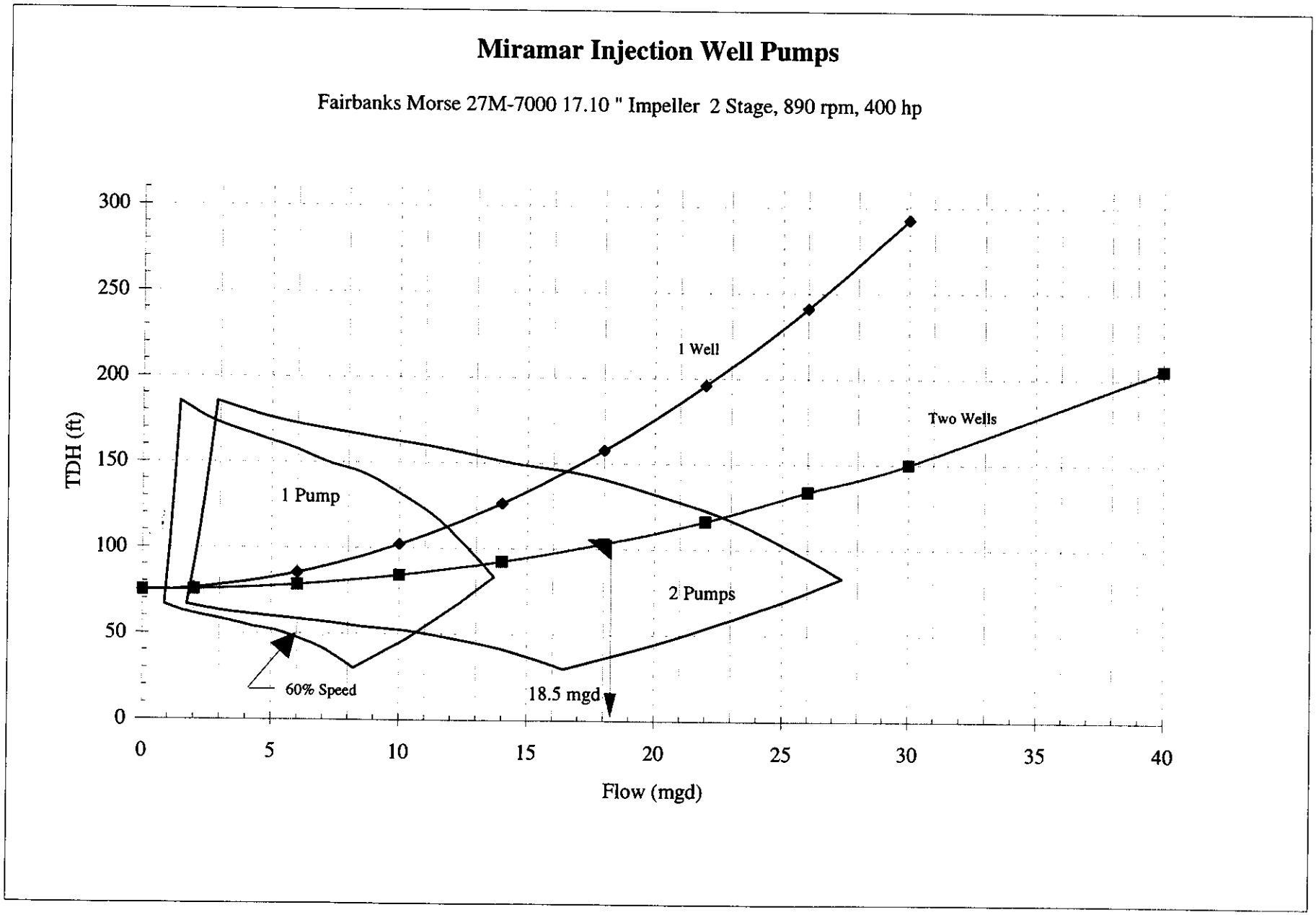
Each of the three generator set is a Caterpillar Model 356 TA Prime Diesel Generator sets rated at 1,275 KW at 1,800 rpm, 4160V, AC, 3 phase, 60 Hertz, 0.8 P.F.

The standby power generation system is designed to maintain the two duty injection well pumps in operation at all times. The injection well pump station and the electrical distribution system single line power diagrams are shown on Figures 14 and 15. As shown, the entire power distribution system is designed as a dual feed system to provide an additional level of reliability in case of electrical component failure.

In case of FP&L power failure, switch over time from normal to emergency power is about 15 to 20 seconds and will take place automatically.

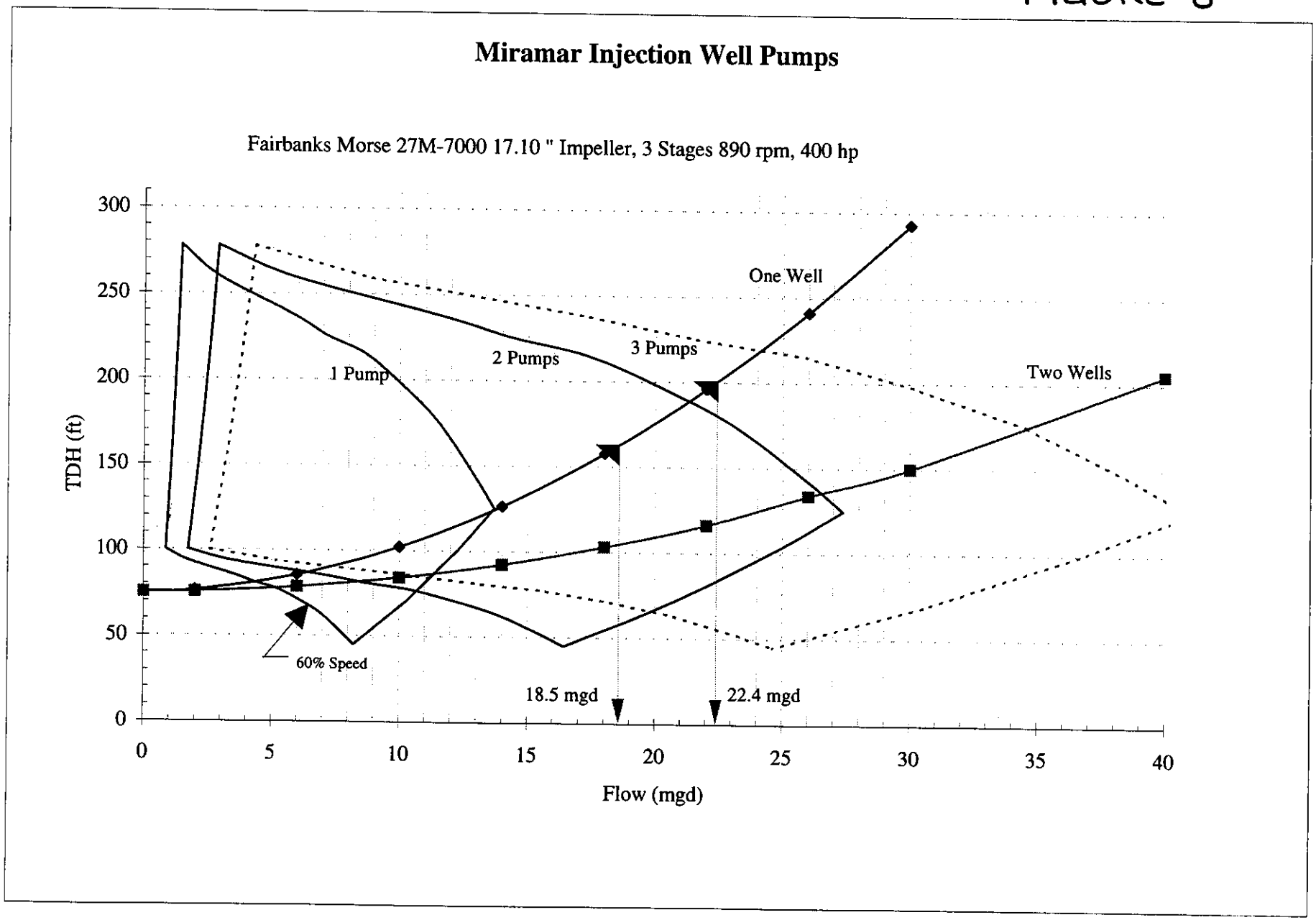
The emergency power system has sufficient capacity to allow the injection well pump station to discharge the plant rated peak hour flowrate of 18.5 mgd either to one or to both of the wells. The single line power diagram for the emergency generation system is shown on Figure 13.

FIGURE 7



INJ_WEL2.XLS

FIGURE 8



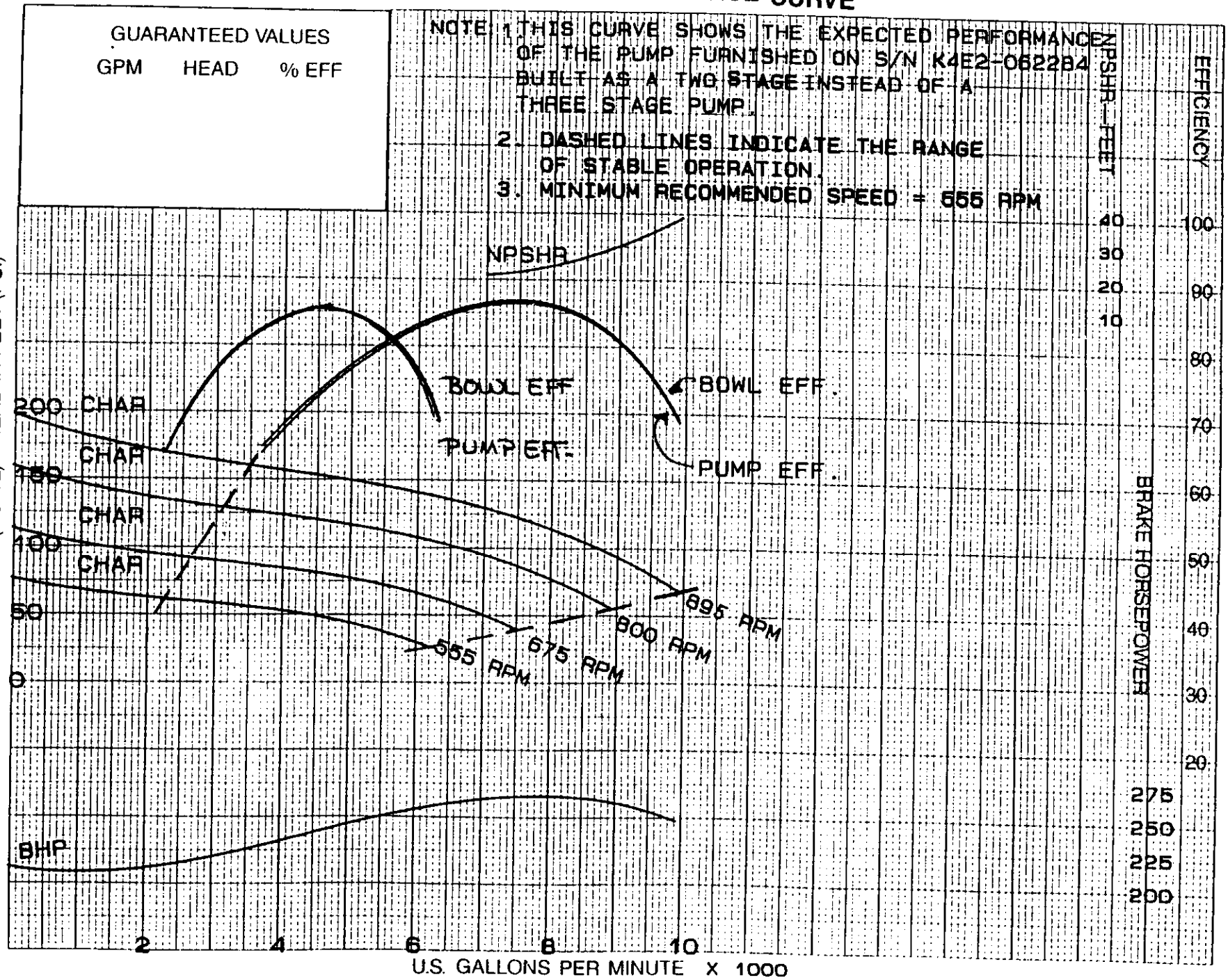
INJ_WELL.XLS

CURVE NO. CKPS-50450 (6)

PUMP PERFORMANCE CURVE

GUARANTEED VALUES		
GPM	HEAD	% EFF

NOTE 1. THIS CURVE SHOWS THE EXPECTED PERFORMANCE OF THE PUMP FURNISHED ON S/N K4E2-062284 BUILT AS A TWO STAGE INSTEAD OF A THREE STAGE PUMP.
2. DASHED LINES INDICATE THE RANGE OF STABLE OPERATION.
3. MINIMUM RECOMMENDED SPEED = 555 RPM



THIS CURVE IS BASED ON ACTUAL TEST PERFORMANCE OF A SIMILAR PUMP. ONLY THE INDICATED POINT(S) IS GUARANTEED.

NO. STAGES TWO
REFERENCE BC/61996
PLOTTED BY PTR
DATE 7/13/96

SIZE-MODEL 27M-7000
IMPELLER DES. T7MKB92A
IMPELLER DIA. 16.9"
RPM(S) 895 (AS NOTED)

Fairbanks Morse Pump Corporation

FIGURE 9

SUBMITTAL CURVE

CURVE NO. CK4E2-062284 (C)

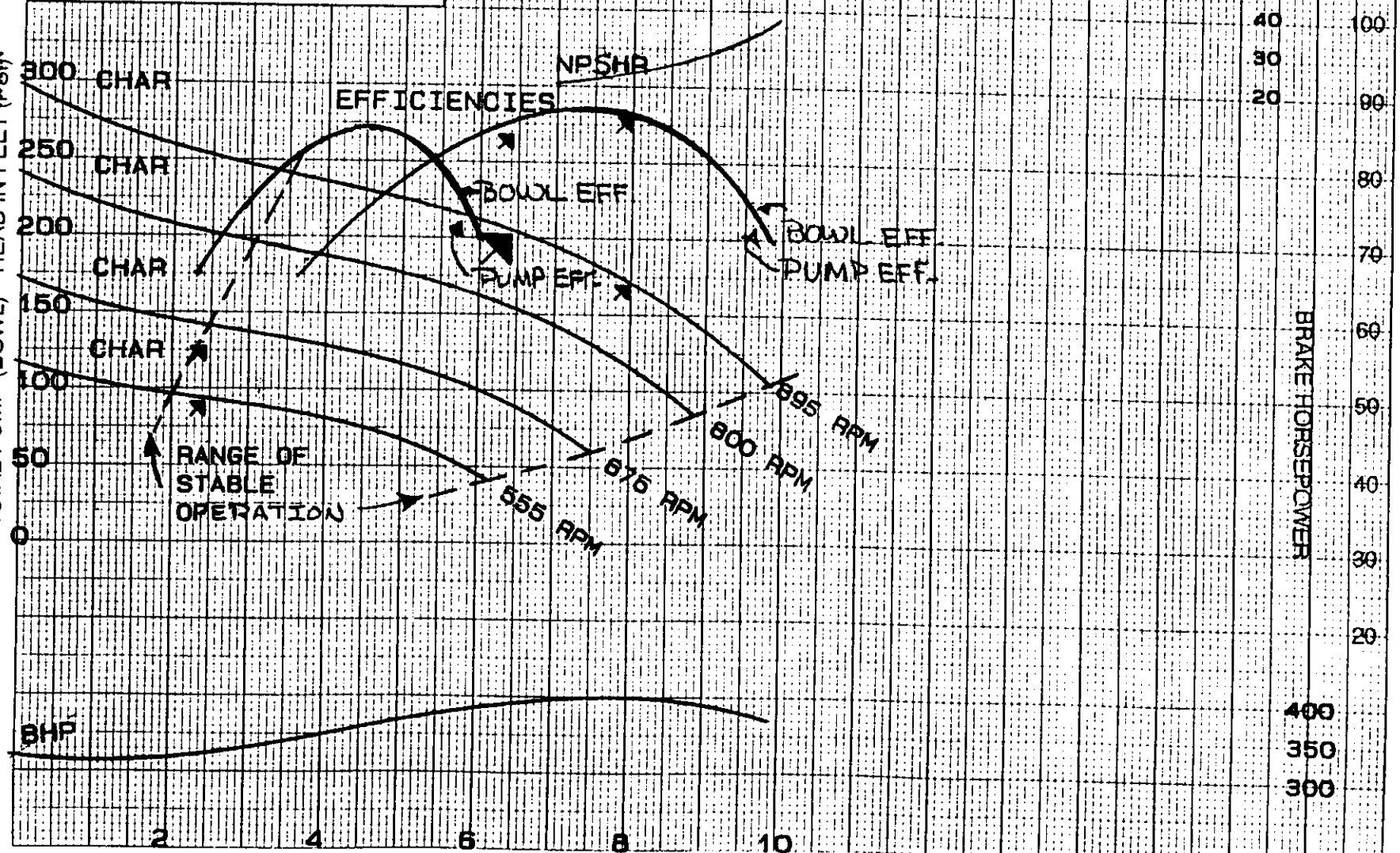
PUMP PERFORMANCE CURVE

GUARANTEED VALUES		
GPM	HEAD	% EFF
6450	200.0	83.0
8000	168.0	85.0
2500	89.0	55.0

MAX. BHP @ ANY GPM = 400 HP

REVISION A CHANGED COND PT TO HOLD 400 HP
REVISION B: ADDED RANGE OF STABLE OPERATION.
REVISION C: UPDATED MOTOR SPEED

NOTE: MINIMUM RECOMMENDED SPEED = 555 RPM



THIS CURVE IS BASED ON ACTUAL TEST PERFORMANCE OF A SIMILAR PUMP. ONLY THE INDICATED POINT(S) IS GUARANTEED.

NO. STAGES THREE
REFERENCE BC/61996
PLOTTED BY PTR
DATE 6/6/96

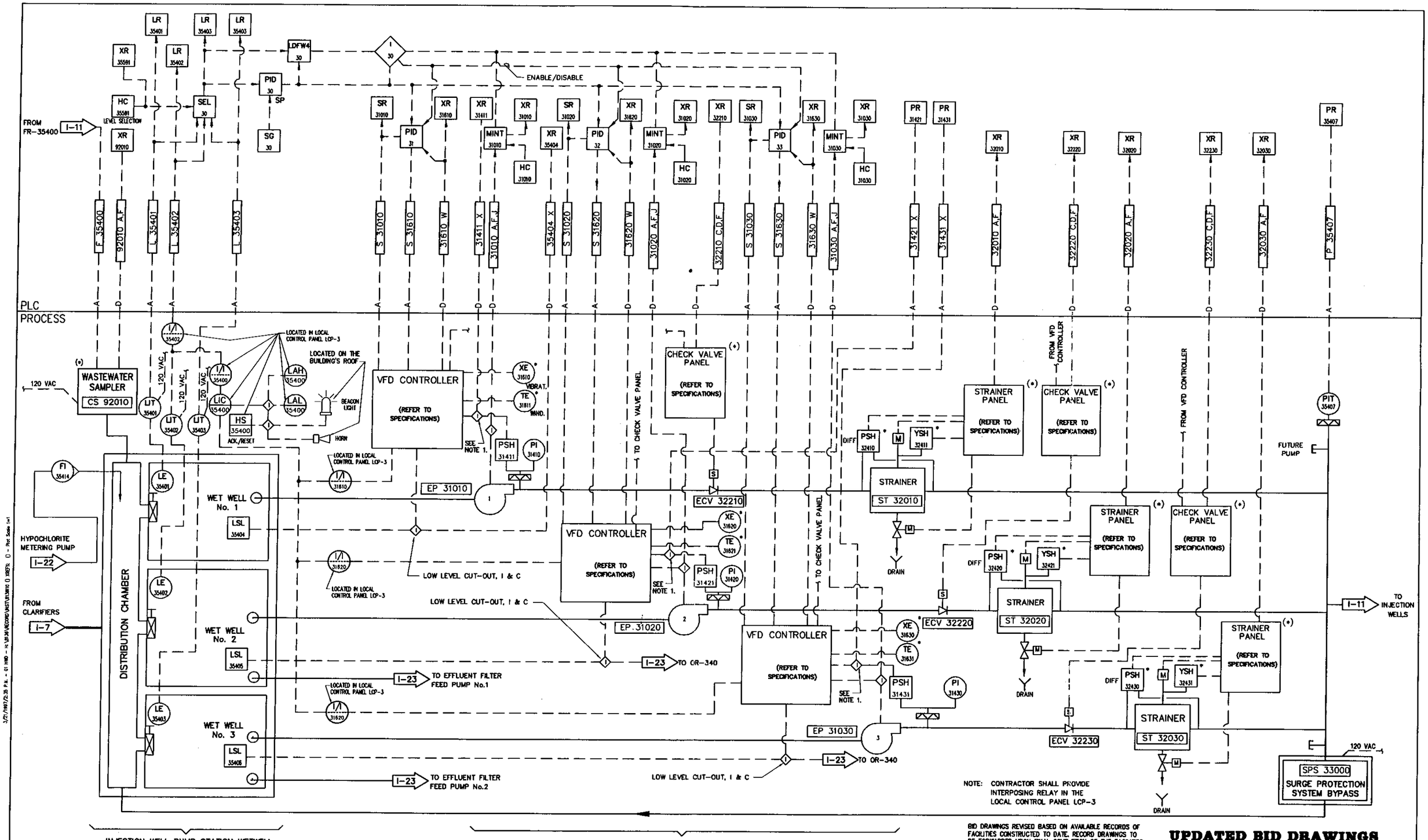
SIZE-MODEL 27M-7000
IMPELLER DES. T7MKB92A
IMPELLER DIA. 16.9 "
RPM(S) 895 (AS NOTED)

Fairbanks Morse
Pump Corporation

FIGURE 10

SUBMITTAL CURVE

FM143B/0292



BID DRAWINGS REVISED BASED ON AVAILABLE RECORDS OF FACILITIES CONSTRUCTED TO DATE. RECORD DRAWINGS TO BE FORWARDED UPON FINAL COMPLETION OF THE FACILITIES.

UPDATED BID DRAWINGS

NO.	DATE	ISSUED FOR	BY
2	3/19/97	INJECTION WELL OPERATIONAL TESTING	H.J.V.
1	5/3/95	BIDDING	H.J.V.

DESIGNED A.C.
DRAWN T.L.J.
CHECKED
PROJ. ENGR. H.J.V.

GARY W. BORS P.E.
No. 19950

HAZEN AND SAWYER
Environmental Engineers & Scientists

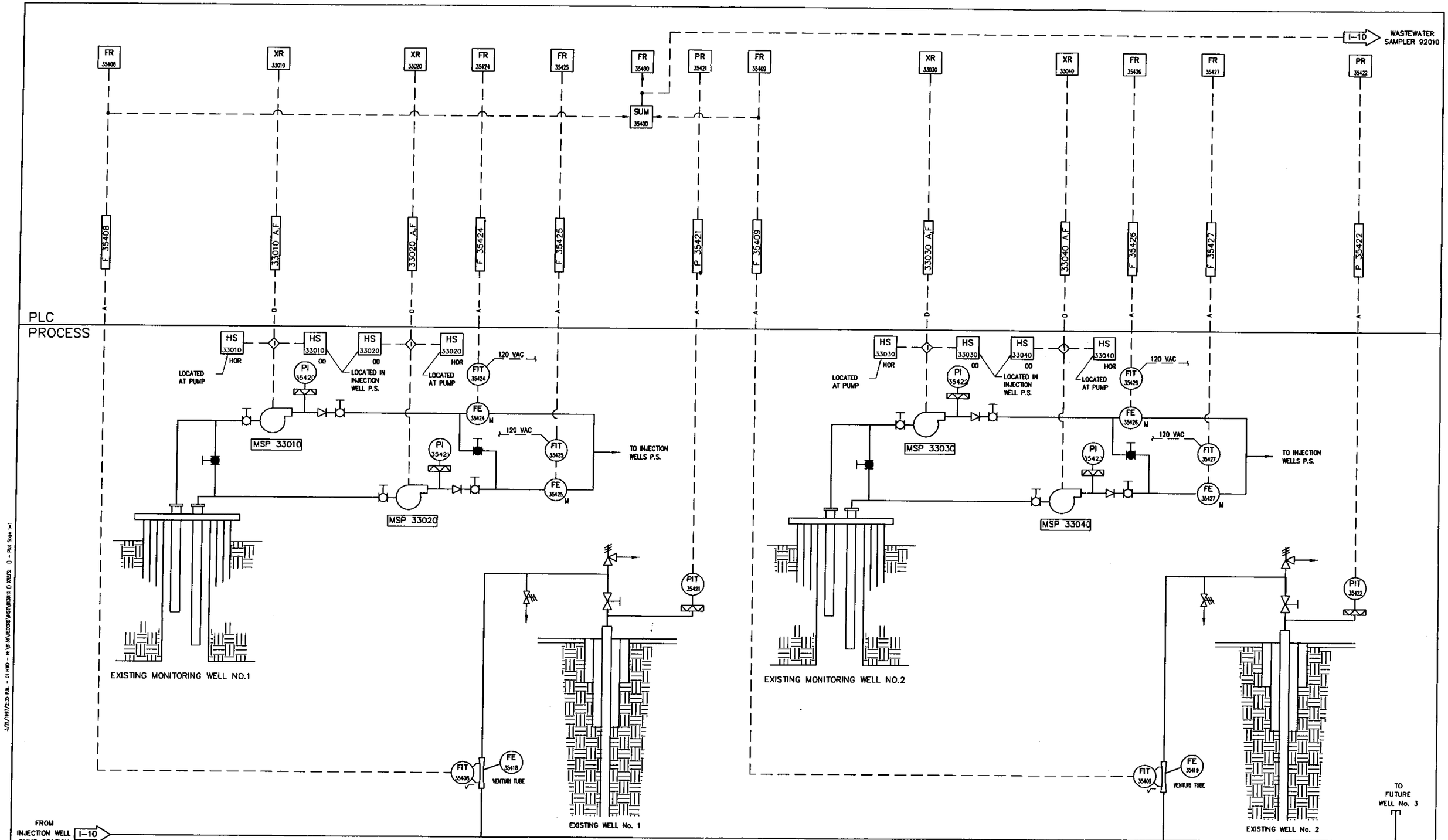
SCALE: NONE

CONTRACT:	8118
CLIENTS PROJECT:	
ENGINEERS PROJECT:	8118
CAD REFERENCE:	8136110

CITY OF MIRAMAR
DEPARTMENT OF PUBLIC WORKS/UTILITIES

MIRAMAR WASTEWATER RECLAMATION FACILITY
BID PACKAGE 3: TREATMENT WORKS
INSTRUMENTATION AND CONTROL
INJECTION WELL PUMP STATION

DATE: MAY 1995
SHEET: 150 OF 565
DRAWING: FIGURE 11



BID DRAWINGS REVISED BASED ON AVAILABLE RECORDS OF FACILITIES CONSTRUCTED TO DATE. RECORD DRAWINGS TO BE FORWARDED UPON FINAL COMPLETION OF THE FACILITIES.

UPDATED BID DRAWINGS

NO.	DATE	ISSUED FOR	BY
2	3/19/97	INJECTION WELL OPERATIONAL TESTING	H.J.V.
1	5/3/95	BIDDING	H.J.V.

DESIGNED A.C.
DRAWN T.L.J.
CHECKED
PROJ. ENGR. H.J.V.

GARY W. BORS P.E.
No. 19959

HAZEN AND SAWYER
Environmental Engineers & Scientists

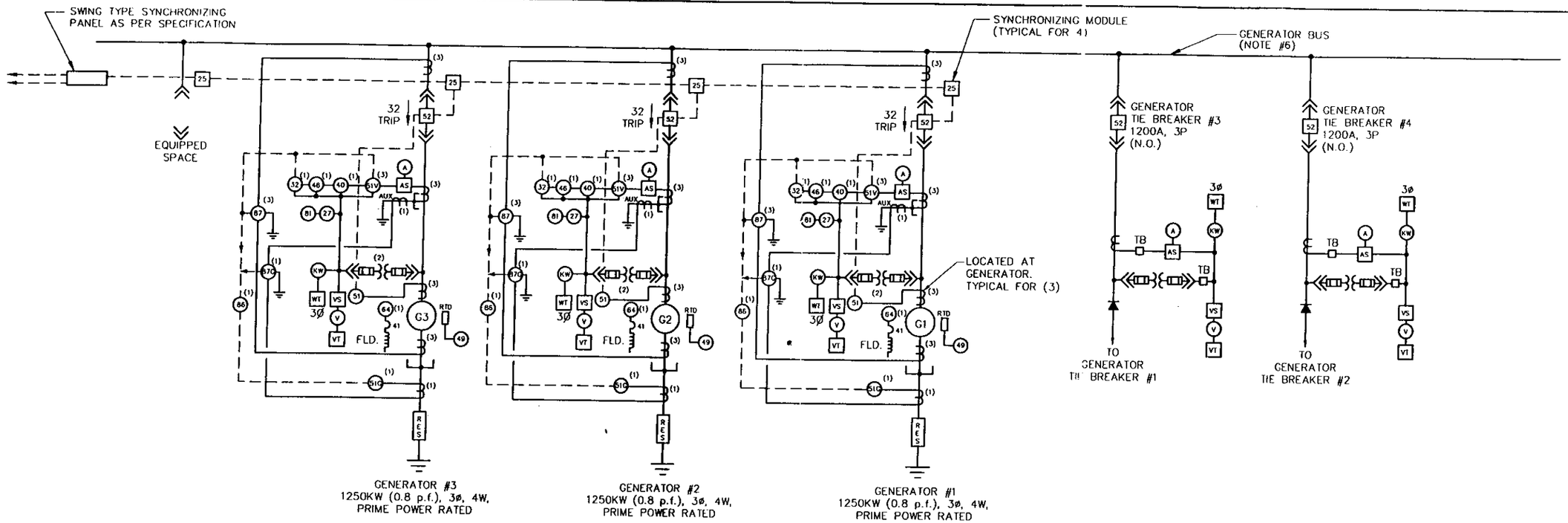
SCALE: NONE

CONTRACT: 8118
CLIENTS PROJECT:
ENGINEERS PROJECT: 8118
CAD REFERENCE: 8136111

CITY OF MIRAMAR
DEPARTMENT OF PUBLIC WORKS/UTILITIES

MIRAMAR WASTEWATER RECLAMATION FACILITY
BID PACKAGE 3: TREATMENT WORKS
INSTRUMENTATION AND CONTROL
INJECTION WELLFIELD

DATE: MAY 1995
SHEET: 151 OF 565
DRAWING: FIGURE 12



SINGLE LINE LEGEND

DEVICE NUMBER	DEFINITION	FUNCTION
32	DIRECTIONAL POWER RELAY	ANTI-MOTORING
50/51	INSTANTANEOUS AND TIME OVERCURRENT RELAY	PHASE FAULT
51G	TIME OVERCURRENT RELAY	GROUNDFAULT
51N	TIME OVERCURRENT RELAY	GROUNDFAULT RESIDUAL
51V	TIME OVERCURRENT RELAY VOLTAGE CONTROLLED	OVERCURRENT BACK-UP
27/47	UNDERVOLTAGE	UNDERVOLTAGE, PHASE SEQUENCE AND UNBALANCED VOLTAGE
27	UNDERVOLTAGE RELAY	
40	LOSS OF FIELD RELAY	LOW VALUE OR FAILURE OF FIELD CURRENT
46	NEGATIVE SEQUENCE RELAY	REVERSE PHASE, PHASE BALANCE OR NEGATIVE SEQUENCE
49	THERMAL RELAY	OVER TEMPERATURE (RTD)
52	DRAW OUT TYPE VACUUM BREAKER	
	MOLDED CASE CIRCUIT BREAKER	
64	FIELD GROUND RELAY	
86	LOCKING-OUT RELAY (MANUAL RESET)	LOCKOUT
81	FREQUENCY RELAY, TIME DELAY	UNDER FREQUENCY
87G	DIFFERENTIAL PROTECTIVE RELAY	
41	FIELD CIRCUIT BREAKER	
RTD	RESISTANCE TEMPERATURE DETECTOR	

DEVICE NUMBER	DEFINITION	FUNCTION
95	W-IQ DATA PLUS COMMON METERING AND PROTECTION UNIT	DIRECT READING METERING VALUES: A.C. AMPS, A.C. VOLTS, MW, MVAR, P.F., FREQ., MW DEMAND. FIELD SETTABLE PROTECTION FUNCTIONS WITH TRIP AND ALARM OUTPUT: PHASE LOSS (VOLTAGE AND CURRENTS), PHASE UNBALANCE, PHASE REVERSAL, OVER VOLTAGE, UNDER VOLTAGE
AS	AMPERE METER SWITCH	
VS	VOLT METER SWITCH	
	TRANSFORMER	
	LIGHTNING ARRESTOR	
	SURGE CAPACITOR	
PFR	PHASE FAILURE RELAY	MOTOR PROTECTION
VAR	REACTIVE VOLT-AMPERE METER	
KW	KILOWATT METER	
SPD	SINGLE PHASE DETECTOR	PROTECTS AGAINST SINGLE PHASING
FI	FAULT INDICATOR	
KWD	KWhr / DEMAND METER SURFACE MOUNTED	
f	FREQUENCY METER	
A	AMPERE METER	
V	VOLT METER	
K	KIRK KEY INTERLOCK	

DEVICE NUMBER	DEFINITION
TB	TEST BLOCK AND PLUGS GE 642212064, SEMIFLUSH
W	WATT TRANSDUCER
V	VOLT TRANSDUCER

NOTES:

1. THIS SCHEMATIC IS FOR ILLUSTRATION ONLY. ACTUAL RELAYING AND APPARATUS, SUCH AS VOLTAGE REGULATOR, GOVERNOR CONTROL, AUTOMATIC PARALLELING TO BE FURNISHED BY MANUFACTURER. THIS SCHEMATIC INDICATES PROTECTIVE RELAYS AND MISCELLANEOUS METERING ONLY.
2. REFER TO SPECIFICATION SECTIONS 16620 AND 16621 FOR OTHER REQUIREMENTS.
3. PHASE CT'S SHALL BE RATED 150% OF FULL CAPACITY OF GENERATOR.
4. NEUTRAL CT'S SHALL BE RATED ONE HALF OF THE MAXIMUM GROUND FAULT CURRENT.
5. GENERATOR SWITCHGEAR SHALL BE MANUFACTURED FOR TOTAL OF 4 GENERATORS
6. GENERATOR SWITCHGEAR BUS SHALL BE 3 PHASE, 4 WIRE. PHASE CONDUCTORS SHALL BE COPPER, RATED FOR 1200A. THE NEUTRAL CONDUCTOR SHALL BE COPPER RATED, FOR 600A. THE EQUIPMENT GROUND BUS SHALL BE COPPER, RATED FOR 500A.

RMI RESOURCE MANAGEMENT INTERNATIONAL, INC.

NO	DATE	ISSUED FOR	BY
1	5/3/95	BIDDING	H.J.V

DESIGNED L.M.S.
DRAWN W.L.S.
CHECKED
PROJ. ENGR. H.J.V.

JOHN C. BURKE PE No 17301

HAZEN AND SAWYER
Environmental Engineers & Scientists

SCALE: NONE

CONTRACT: 8118
CLIENT'S PROJECT:
ENGINEER'S PROJECT: 8118
CAD REFERENCE: 4856E22

CITY OF MIRAMAR
DEPARTMENT OF PUBLIC WORKS/UTILITIES

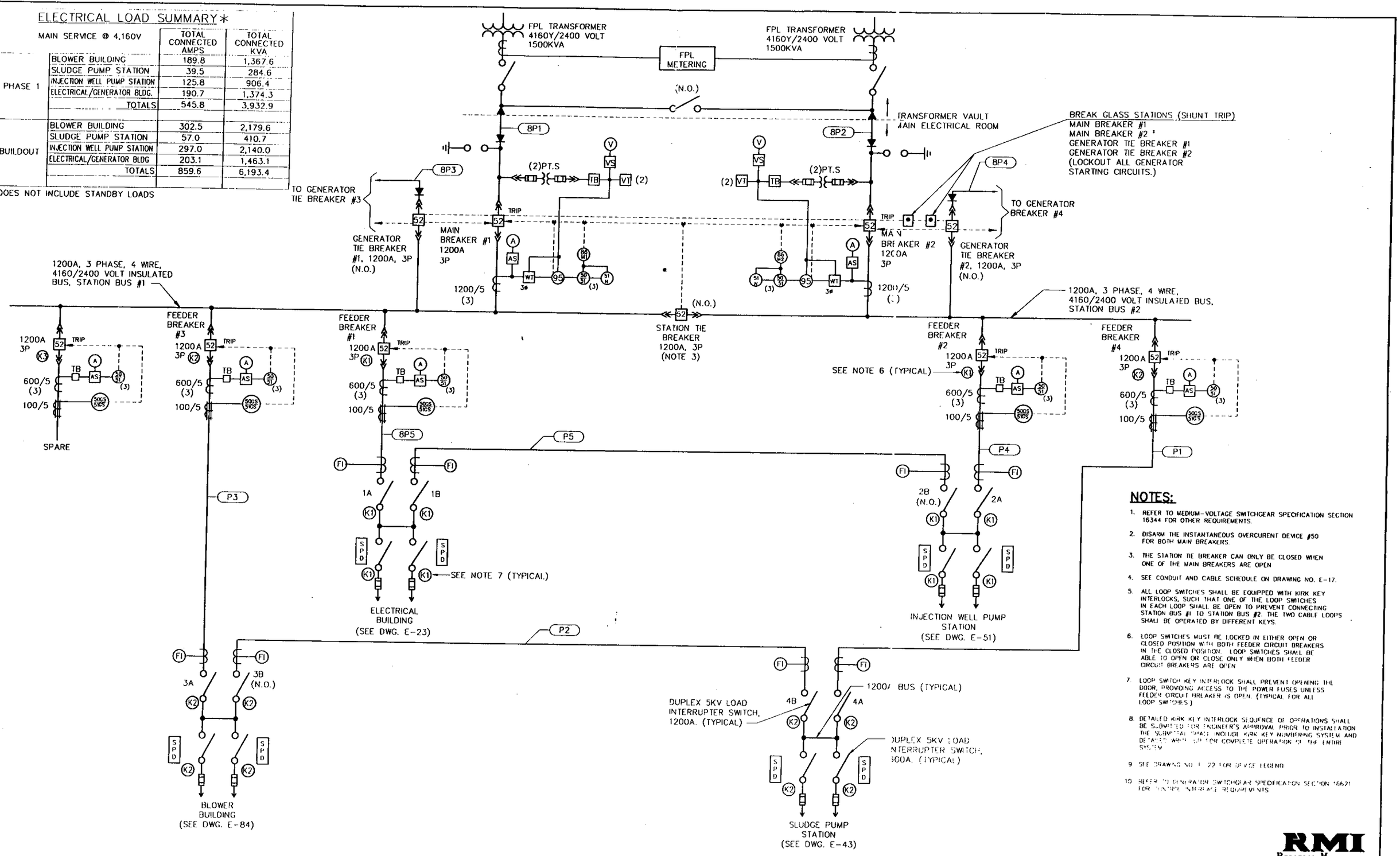
MIRAMAR WASTEWATER RECLAMATION FACILITY
BID PACKAGE 3: TREATMENT WORKS
GENERATION SYSTEM
SINGLE LINE POWER DIAGRAM

DATE: MAY, 1995
SHEET 415 of 565
DRAWING FIGURE 13

ELECTRICAL LOAD SUMMARY*

	MAIN SERVICE @ 4,160V	TOTAL CONNECTED AMPS	TOTAL CONNECTED KVA
PHASE 1	BLOWER BUILDING	189.8	1,367.6
	SLUDGE PUMP STATION	39.5	284.6
	INJECTION WELL PUMP STATION	125.8	906.4
	ELECTRICAL/GENERATOR BLDG.	190.7	1,374.3
	TOTALS	545.8	3,932.9
BUILDOUT	BLOWER BUILDING	302.5	2,179.6
	SLUDGE PUMP STATION	57.0	410.7
	INJECTION WELL PUMP STATION	297.0	2,140.0
	ELECTRICAL/GENERATOR BLDG	203.1	1,463.1
	TOTALS	859.6	6,193.4

*DOES NOT INCLUDE STANDBY LOADS



NOTES:

1. REFER TO MEDIUM-VOLTAGE SWITCHGEAR SPECIFICATION SECTION 16344 FOR OTHER REQUIREMENTS.
2. DISARM THE INSTANTANEOUS OVERCURENT DEVICE #50 FOR BOTH MAIN BREAKERS.
3. THE STATION TIE BREAKER CAN ONLY BE CLOSED WHEN ONE OF THE MAIN BREAKERS ARE OPEN
4. SEE CONDUIT AND CABLE SCHEDULE ON DRAWING NO. E-17.
5. ALL LOOP SWITCHES SHALL BE EQUIPPED WITH KIRK KEY INTERLOCKS, SUCH THAT ONE OF THE LOOP SWITCHES IN EACH LOOP SHALL BE OPEN TO PREVENT CONNECTING STATION BUS #1 TO STATION BUS #2. THE TWO CABLE LOOPS SHALL BE OPERATED BY DIFFERENT KEYS.
6. LOOP SWITCHES MUST BE LOCKED IN EITHER OPEN OR CLOSED POSITION WITH BOTH FEEDER CIRCUIT BREAKERS IN THE CLOSED POSITION. LOOP SWITCHES SHALL BE ABLE TO OPEN OR CLOSE ONLY WHEN BOTH FEEDER CIRCUIT BREAKERS ARE OPEN
7. LOOP SWITCH KEY INTERLOCK SHALL PREVENT OPENING THE DOOR, PROVIDING ACCESS TO THE POWER FUSES UNLESS FEEDER CIRCUIT BREAKER IS OPEN. (TYPICAL FOR ALL LOOP SWITCHES)
8. DETAILED KIRK KEY INTERLOCK SEQUENCE OF OPERATIONS SHALL BE SUBMITTED FOR ENGINEER'S APPROVAL PRIOR TO INSTALLATION. THE SUBMITTAL SHALL INCLUDE KIRK KEY NUMBERING SYSTEM AND DETAILED WIRING FOR COMPLETE OPERATION OF THE ENTIRE SYSTEM.
9. SEE DRAWING NO. E-22 FOR DEVICE LEGEND
10. REFER TO GENERATOR SWITCHGEAR SPECIFICATION SECTION 16621 FOR CONTROL INTERFACE REQUIREMENTS.

RMI RESOURCE MANAGEMENT INTERNATIONAL, INC.

NO.	DATE	REVISION	BY
1	5/3/95	BIDDING	H.J.V.

DESIGNED L.M.S.
DRAWN W.L.S.
CHECKED
PROJECT ENGINEER H.J.V.

JOHN C. BURKE No. 17301 PE

HAZEN AND SAWYER
Environmental Engineers & Scientists

SCALE NONE

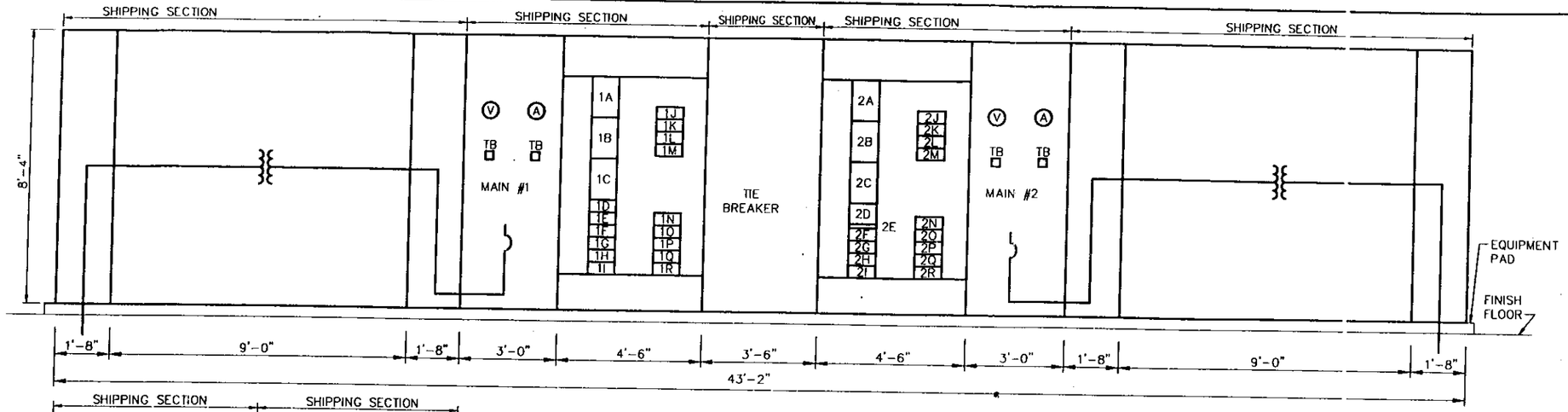
CONTRACT	8118
CLIENTS PROJECT	
ENGINEERS PROJECT	8118
CAD REFERENCE	4656E21

CITY OF MIRAMAR
DEPARTMENT OF PUBLIC WORKS/UTILITIES

MIRAMAR WASTEWATER RECLAMATION FACILITY
BID PACKAGE 3: TREATMENT WORKS

DISTRIBUTION SYSTEM SINGLE LINE POWER DIAGRAM

DATE MAY, 1995
SHEET 414 . 565
FIGURE 14



ELECTRICAL NOTES:

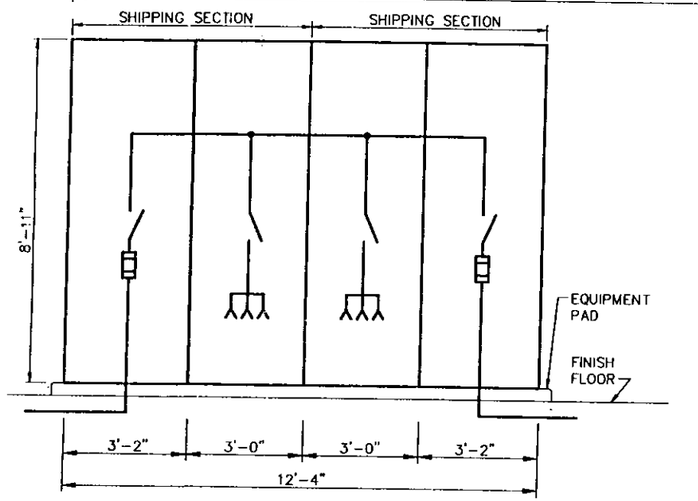
1. LOAD BREAK AIR INTERRUPTER SWITCH, 3P-600A-5KV, WITH 3-500A TYPE "E" FUSES, INDOOR NEMA 1A GASKETED ENCLOSURE
2. VENTILATED, DRY-TYPE CAST EPOXY SECONDARY SUBSTATION TRANSFORMER, 4160V-480/277V, 2000/2667KVA, Z=5.75%, INDOOR ENCLOSURE WITH FAN COOLING FOR 33% ADDITIONAL CAPACITY ABOVE THE SELF-COOLED RATING.
3. 3000A/3000A, 3P, 100% RATED WITH GROUND FAULT TRIP
4. 3000A/3000A, 3P, 100%
5. (3) GROUND RODS, 5/8" DIA. x 20'-0", COPPER CLAD, 10'0" APART IN THE FORM OF AN EQUILATERAL TRIANGLE.
6. 3TR2: 15KVA, 480V:120/208V, 3ø, 4W
7. 800A, 3P, NON-AUTO, 65,000A WITHSTAND RATING

NOTES:

1. SEE NOTES NO. 5, 6, 7 & 8 ON DRAWING E-21 FOR INTERLOCK REQUIREMENTS.
2. INTERLOCK MAIN AND TIE CIRCUIT BREAKERS. WHEN TIE CIRCUIT BREAKER IS CLOSED ONLY MAIN CIRCUIT BREAKER NO. 1 OR MAIN CIRCUIT BREAKER NO. 2 SHALL BE CLOSED.

SECONDARY UNIT SUBSTATION NO. 3 (SUS-3) ELEVATION

SCALE: 1/2"=1'-0"
NOTE: SUBSTATION DEPTH 4'-6"



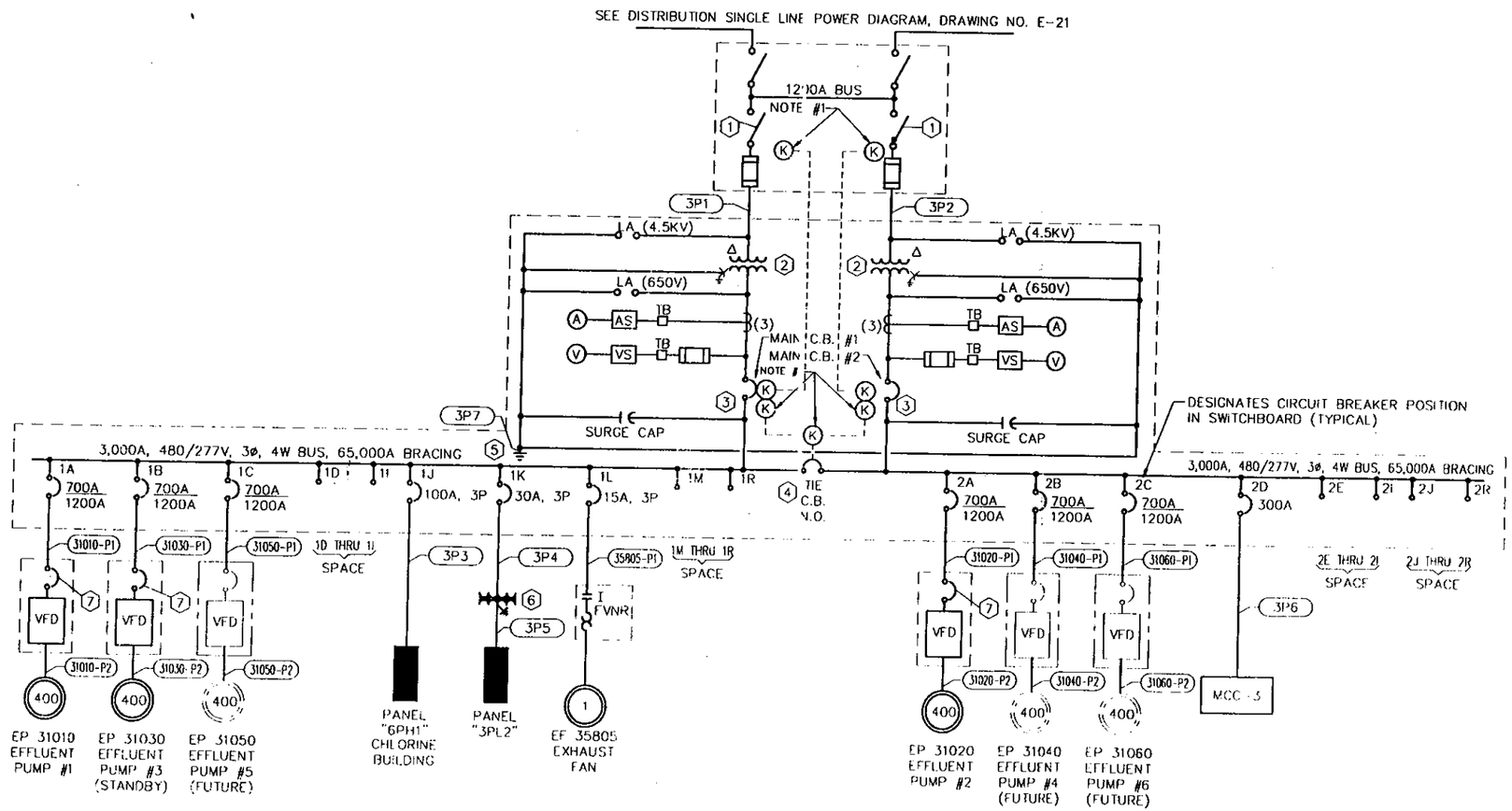
5KV LOAD INTERRUPTER SWITCH ELEVATION

SCALE: 1/2"=1'-0"
NOTE: DEPTH 3'-0"

ELECTRICAL LOAD SUMMARY *

SECONDARY UNIT SUBSTATION (INCLUDES MCC-3 LOADS)		TOTAL CONNECTED AMPS @ 480V	TOTAL CONNECTED KVA
PHASE 1	MISC. MOTORS	569.8	473.7
	LARGEST MOTOR (@ 125%)	600.0	498.8
	MISC. LOADS	40.2	33.4
	TOTALS	1,210.0	1,005.9
BUILDOUT	MISC. MOTORS	2,053.6	1,707.4
	LARGEST MOTOR (@ 125%)	600.0	498.8
	MISC. LOADS	40.2	33.4
	TOTALS	2,693.8	2,239.6

* DOES NOT INCLUDE STANDBY LOADS



SUS-3 SINGLE LINE POWER DIAGRAM

NO.	DATE	REVISED FOR	BY
1	5/3/95	BIDDING	H.J.V.

DESIGNED L.M.S.
DRAWN W.L.S.
CHECKED
CHIEF ENGINEER H.J.V.

JOHN C. BURKE No 17301

HAZEN AND SAWYER
Environmental Engineers & Scientists

SCALE: AS NOTED

CONTRACT 8118
CLIENTS PROJECT
ENGINEERS PROJECT 8118
CAD REFERENCE 4656E51

CITY OF MIRAMAR
DEPARTMENT OF PUBLIC WORKS/UTILITIES

MIRAMAR WASTEWATER RECLAMATION FACILITY
BID PACKAGE 3: TREATMENT WORKS
INJECTION WELL PUMP STATION SINGLE LINE POWER DIAGRAM AND ELEVATIONS

DATE MAY, 1995
444 565
FIGURE 15

RMI Resource Management International, Inc.

Pump Station Failure

The facility maintains an inventory of major spare parts allowing the maintenance staff to conduct certain emergency repairs within two to seven days, with or without the assistance of the manufacturer's representative as required. All equipment is supplied by major manufacturers, therefore, parts not kept at the facilities can generally be obtained from the equipment service facilities or from local machine shops within a week.

Repairs involving pump/motor removal require rental of a crane and generally service by an outside company. Under such conditions, repair time could take up to two weeks.

The injection well pump station is designed with a standby pump (including associated strainer and valves). In the event of failure of one pump, the station will continue operation without loss of performance. In the event of failure of two pumps, the single remaining pump would be capable of handling the projected peak flow in the early years of operation of the plant. As plant flows increase, some of the effluent would have to be diverted toward the emergency disposal system described under *Catastrophic Emergency Plan.*

It should also be noted that, the influent piping to the plant is interconnected to the Pembroke Pines WWTP and the Hollywood Southern Regional WWTP allowing diversion of a portion of the influent to these other two treatment plants. At start-up, all of the influent could be diverted. As the plant flows increase, it is anticipated that only a portion of the influent could be diverted in that manner.

Natural Disasters Which Render the Injection Wells Inoperative or Inadequate

Under these circumstances, the City would rely on the emergency disposal plan described under *Catastrophic Emergency Plan.*

One Well Out of Service

It is anticipated that each well will be out of service for approximately four days every five years for mechanical integrity testing (MIT). Well maintenance, such as periodic casing cleaning, if necessary, should be combined with MIT work to minimize down time.

During the MIT and in the event one well has to be taken out of service subsequent to a MIT failure, the remaining well can be used in conjunction with the injection well pump station to dispose of the entire effluent flow. This condition is illustrated on Figure 8. In case of MIT failure, the operator must submit a remediation plan to the Department identifying duration of the proposed remedial activities.

Based on plant current permitted rating of 8.9 mgd, one well can handle the entire associated peak hour flowrate of 12,840 gpm (18.5 mgd) at a velocity of approximately 10 feet per second (fps).

Catastrophic Emergency Plan

Under catastrophic emergency of the WWRF and of the injection well system, assuming that the plant is still receiving raw influent from the regional pump stations, wastewater will flow by gravity through the WWRF and overflow at the clarifiers and/or at the injection well pump station. The plant effluent would initially be held in the on-the site stormwater retention areas and in the on-site

wetlands areas. Once the stormwater areas have reached capacity, water will flood the WWRF site. Based on average elevations of the top of the stormwater retention areas and of the perimeter berm, maximum water depth in flooded areas will be approximately 6 inches. Approximately one and one-half days of effluent at the peak hour flow rate of 18.5 mgd could be held on site. Beyond that point, effluent would discharge offsite either through the proposed South Broward Drainage District Canal, if constructed, or flow offsite in a general southwest direction. A site plan showing sheet flow path towards the stormwater areas under catastrophic failure conditions is provided as Figure 16.

The catastrophic emergency plan would result in a discharge to a surface water and must be reported to the Department and dealt with in accordance with Florida Administrative Code (F.A.C.) rules 62-620.610 (20) through 62-620.610 (23).

MONITORING

The following injection well performance and monitoring data must be recorded and reported:

1. Injection well performance:

   a. Physical characteristics of the wastestream:

   - total daily flow to injection well (mg)
   - daily maximum sustained flow to injection well (mgd)
   - daily maximum sustained injection pressure at injection well (psig)
   - daily average injection pressure at injection well (psig)
   - average daily flow per month (mgd)
   - maximum daily flow per month (mgd) with peak hour flow (mgd) indicated as well
   - monthly wellhead pressure with no flow (shut-in pressure in psig)

   b. Chemical characteristics of the wastestream sampled from the wet well (weekly):

   - total dissolved solids (mg/l)
   - ammonia-N (mg/l)
   - TKN (mg/l)
   - pH (units)
   - conductivity (umho/cm)
   - temperature (°F)
   - total phosphorous as P (mg/l)

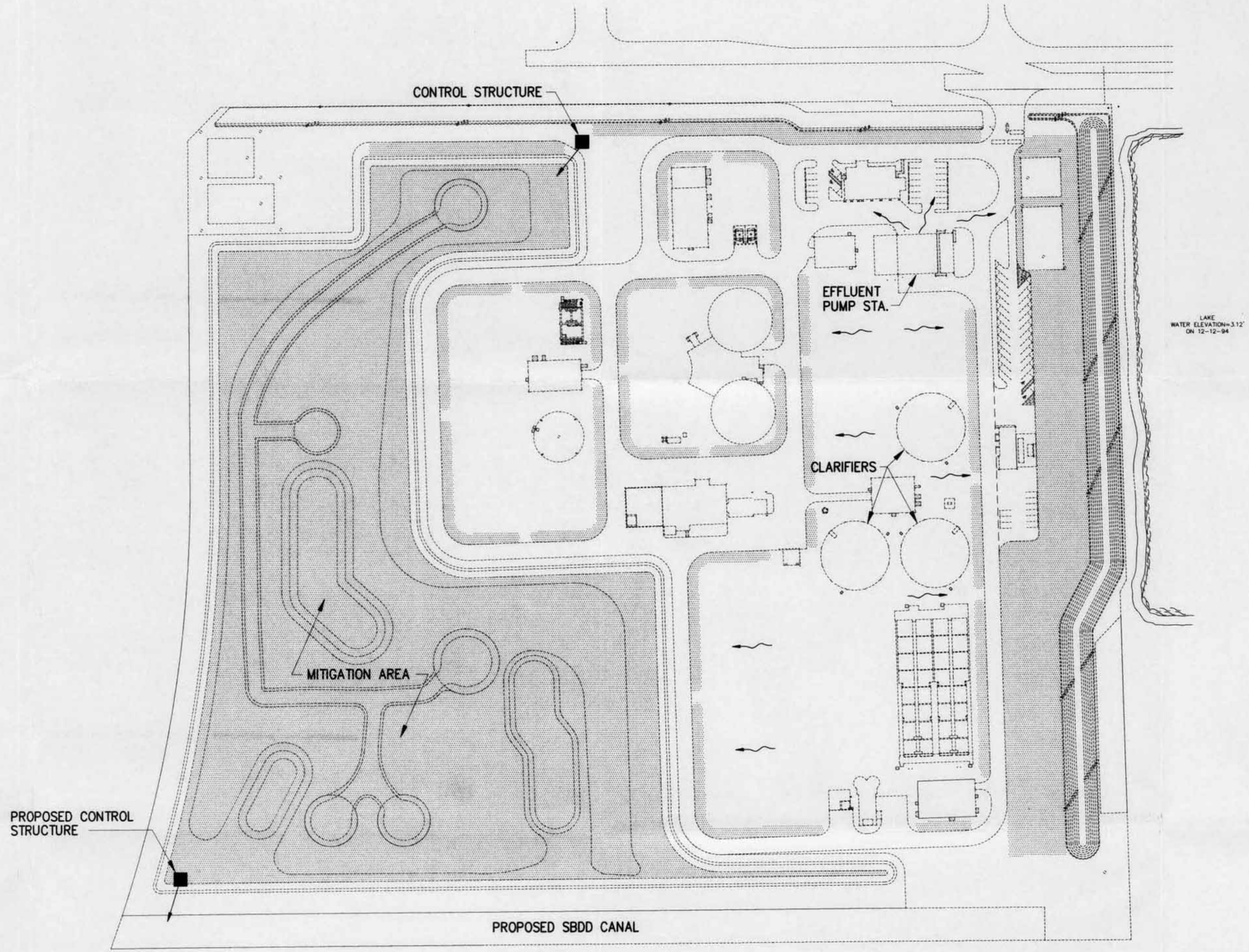
   b) Monitor well performance:

2. Physical characteristics of the monitor zones:

   Upper monitor zone potentiometric surface height relative to NGVD (feet head) or pressure (psig) referenced to NGVD:

   - daily maximum pressure
   - daily minimum pressure
   - daily average pressure

FIGURE 16



LEGEND

WATER RETENTION AREAS (WATER DEPTH GREATER THAN SIX INCHES)

GENERAL DIRECTION OF SHEET FLOW (WATER DEPTH TYPICALLY TWO TO THREE INCHES)

NOTE:
CULVERTS CONNECTING SWALES ARE NOT SHOWN.

1"=100' 200 100 0 200'

NO.	DATE	ISSUED FOR	BY

DESIGNED H.J.V.
DRAWN S.L.M./H.M.
CHECKED
PROJ. ENGR. H.J.V.

H.J. VIDAL P.E.
No. 37882

HAZEN AND SAWYER
Environmental Engineers & Scientists

SCALE 1" = 100'

CONTRACT: 8118
CLIENTS PROJECT:
ENGINEERS PROJECT: 8118
CAD REFERENCE: 8136X54

CITY OF MIRAMAR
DEPARTMENT OF PUBLIC WORKS/UTILITIES

MIRAMAR WASTEWATER RECLAMATION FACILITY
BID PACKAGE 3: TREATMENT WORKS
SITE PLAN

DATE: MARCH 1997
SHEET: 1 OF 1
DRAWING: FIGURE 16

3/26/1997 1:00 P.M. - 01 WMD - H:\8136\OTHER\8136X54 () AREFS: 8118ROAD, 8118AREA, 8118BNDR, 0118EAST, 8118GRID, 8118BL.DC (1) - Plot Scale 1=100

- monthly maximum pressure
- monthly minimum pressure

Lower monitor zone potentiometric surface height relative to NGVD (feet head) or pressure (psig) referenced to NGVD:

- daily maximum pressure
- daily minimum pressure
- daily average pressure
- monthly maximum pressure
- monthly minimum pressure

3. Chemical characteristics of the upper and lower monitoring zones (weekly):

- total dissolved solids (mg/l)
- chlorides (mg/l)
- ammonia-N (mg/l)
- TKN (mg/l)
- pH (units)
- conductivity (umho/cm)
- fecal coliform (# of colonies/100 ml)
- temperature (°F)
- total phosphorous as P (mg/l)
- sulfate (mg/l)

A minimum of three (3) well volumes of fluid shall be evacuated from the monitor systems prior to sampling for the chemical parameters listed above.

4. A controlled specific injectivity test (rate/pressure) of the well, conducted in accordance with Chapter 62-28, F.A.C., with at least three specified injection flow rates shall be conducted quarterly. The high rate should approach maximum design flow. Actual rates for the injectivity tests will have to be discussed with the FDEP as there will not be sufficient sustained flow to conduct the tests at the maximum design flowrates when the plant is first placed in operation.

The following data shall be recorded and reported at each injection rate:

- injection flow rate (mgd)
- injection pressure (psig)
- wellhead pressure with no flow (shut-in pressure in psig)
- monitor well pressure (psig)

All readings shall be taken after a minimum five-minute period of stabilized flow. Following the conclusion of injection, pressure recovery shall be monitored for a period of 30 minutes.