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September 3, 2013

Mr. Joseph R. May, P.G.
Florida Department of Environmental Protection
400 North Congress Avenue, 3rd Floor
West Palm Beach, Florida 33401

Certified Mail
7001 0360 0001 6783 8611

Reference: Miami-Dade Water and Sewer Department -- Mechanical Integrity Testing (MIT) Report for Deep Injection Well No. IW-1 at the SDWWTP Site.

Dear Mr. May:

Enclosed please find the Certificate of Mechanical Integrity and the MIT Report on the re-testing of Deep Injection Well No. IW-1 at the South District Wastewater Treatment Plant site in Miami-Dade County.

All the tests were conducted in strict adherence to the specifications submitted to and approved by your office. The testing results for the well were good. Both external and internal mechanical integrity were demonstrated. The well casing and the wellhead components are in good condition. All the well head valves and all the well head components are scheduled to be rust-proofed and repainted when all the MITs are completed. Based on the results of the well testing we conclude that the well retains full mechanical integrity and recommend that MDWASD be allowed to continue operating the well in its normal mode.

If you have any questions or require additional explanation of any item in the report, please do not hesitate to contact me at [redacted] or Sonia Villamil at [redacted].

Sincerely,

[redacted]

Rafael Terrero, P.E.
Assistant Director- Wastewater

Enclosures: Certificate of Mechanical Integrity
MIT Report Well IW-2 (2 copies)

cc: Joseph Haberfeld, FDEP - Tallahassee

MIAMI-DADE COUNTY
Delivering Excellence Every Day

Mechanical Integrity Test Report
Deep Injection Well No. IW-1
South District Wastewater Treatment Plant

Prepared by:
Miami-Dade Water and Sewer Department
3071 SW 38th Avenue
Miami, Florida 33146

CERTIFICATE OF MECHANICAL INTEGRITY

The **South District WWTP** deep injection well **IW-1** operated by **Miami-Dade Water and Sewer Department** has been tested for mechanical integrity. The tests followed standard engineering practices and used methods presented in the United States Environmental Protection Agency regulations for the purposes of these tests. The external and internal mechanical integrity tests followed Florida Department of Environmental Protection (FDEP) pre-approved testing specifications and all the critical test events were witnessed by representatives of the FDEP, the MDWASD and the contractor.

Having supervised the engineer and geologists that were present during the testing, conducted the examining of the results and the preparation this mechanical integrity report as part of this certification, the undersigned certifies that deep injection well **IW-1** operated by **Miami-Dade Water and Sewer Department** at the **South District Wastewater Treatment Plant Site in Miami-Dade County, Florida** has successfully passed all the test requirements for mechanical integrity under rules of Chapter 62-528 of the Florida Administrative Code and is therefore determined to have mechanical integrity.

Certified on August 29, 2013

[redacted]

8/29/13

Howard J. Fallon Jr., P.E.
Professional Engineer
License Number 24153

MECHANICAL INTEGRITY TEST REPORT
FOR
DEEP INJECTION WELL No. IW-1
AT THE
SOUTH DISTRICT WASTEWATER TREATMENT PLANT

Prepared by:

MIAMI-DADE WATER AND SEWER DEPARTMENT
3071 SW 38th Avenue
Miami, Florida 33146

For Submittal To:

UNDERGROUND INJECTION CONTROL
FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

August 2013

ABSTRACT

The internal mechanical integrity was investigated through a pressure test performed on the injection casing. The pressure test was conducted at 152.5 pounds per square inch (psi) which is approximately 1.5 times the maximum (100 psi) potential injection pressure and more than 1.7 times the maximum operational pressure that the well will be under when operating at its full permitted injection velocity of 10 feet per second (ft/sec). FDEP permits a 5% loss in pressure during the hour long test in order for the internal mechanical integrity to pass the pressure test.
IW-1 successfully passed the pressure test because the casing only lost 4 psi. The successful results of the pressure test for internal mechanical integrity were reinforced by the results of the second internal mechanical integrity test, the TV survey of the casing. The TV survey confirmed that the casing and the casing joints are in good condition and that the well has internal mechanical integrity down to 2,630 ft bls.

The external mechanical integrity was investigated using two test procedures, a Radioactive Tracer Survey (RTS) and a Temperature Log. Results of the RTS confirmed the integrity of the cement around the casing and the continued competence of its seal with the geologic strata. The temperature test showed that there are no anomalies that would indicate points where injected fluids could escape through the casing and cement into the formation. Similarly there were no temperature anomalies that would indicate injection fluids entering the formations at other than the approved injection depth.

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Section 1

1. INTRODUCTION

1.1 BACKGROUND

On October 12, 2012, (see Appendix A) the Miami-Dade Water and Sewer Department (MDWASD) submitted the County's proposed plan and testing specifications for conducting the mechanical integrity tests (MITs) and repairs on some of the injection wells at the South District Wastewater Treatment Plant (SDWWTP) site (see Figure 1) to the Florida Department of Environmental Protection (FDEP). The plan, represented by the specifications, described the step-by-step procedure to be followed and included the testing schedule required to meet the 5-year MIT re-testing conditions of the FDEP permit for each of the injection wells. After receipt of these documents, the FDEP Staff reviewed the proposed plan and sent an approval on June 5, 2013 (see Appendix B).

The contract documents for conducting the MITs were let out for bids, and the winning bid was submitted on February 28, 2013 by Youngquist Brothers, Inc., a well drilling contractor from Ft. Meyers, Florida. After the contract was approved by the Board of Country Commissioners and signed by the County Manager, the MDWASD issued the notice to proceed on May 17, 2013 and the contractor began mobilizing to the site.

1.2 PURPOSE AND SCOPE

The purpose of this report is to provide FDEP with a document that describes the re-testing procedures for mechanical integrity applied to each of the SDWWTP deep injection wells (see Figure 2). The report also presents the field reports (see Appendix C), and the results of the tests in a single volume for ease of reference. The mechanical integrity re-testing operations involved conducting a pressure test on the well casing to show that there are no leaks in the casing, and conducting a TV survey on the well to reinforce the data from the pressure test. The re-testing includes tracking a radioactive liquid-tracer (iodine isotope I-131) injected down the well to show that there is no fluid movement upward behind the casing, into underground sources of drinking water (USDW). The radioactive test information is reinforced with temperature logs run on the well. Gamma ray logs are used to detect the movement of the radioactive tracer.

Figure 1. South District Wastewater Treatment Plant Site

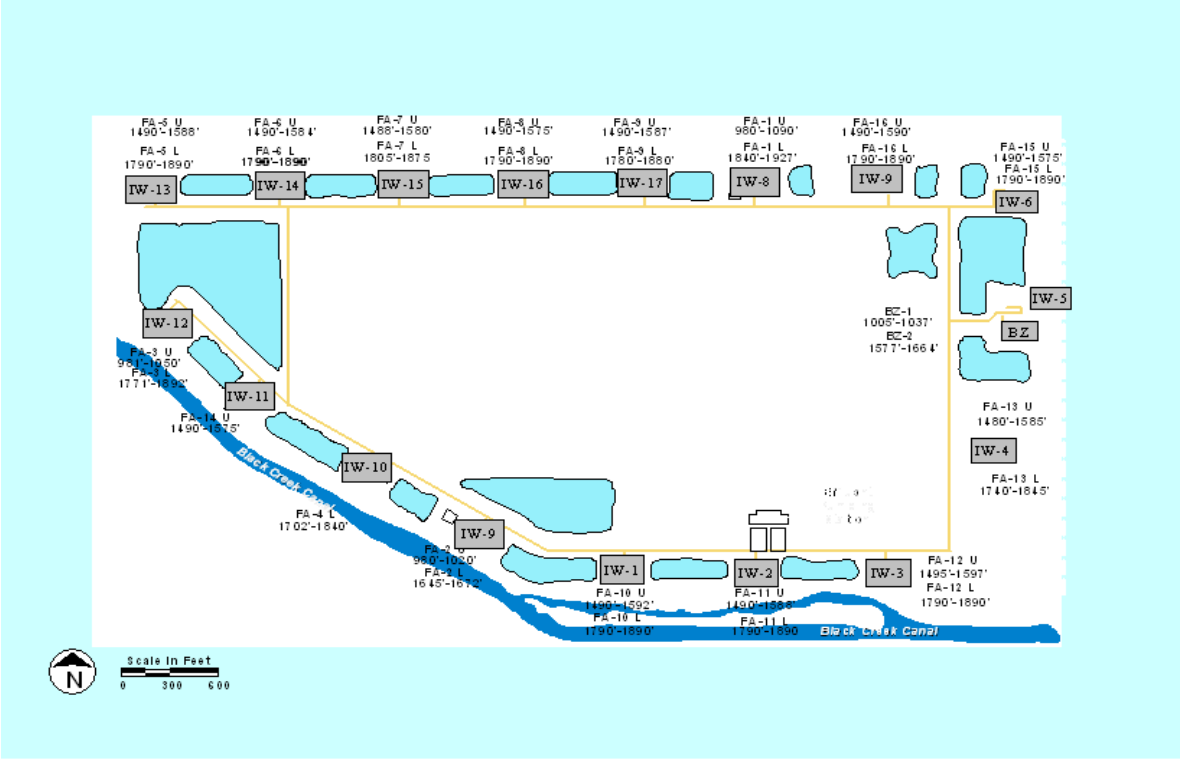

Figure 2. Well Locations Layout

Section 2

2. MECHANICAL INTEGRITY TESTING (MIT)

2.1 METHODS USED

The MIT program is designed to test two elements of the injection well system: 1. Internal integrity and 2. External integrity. The first test element, the internal mechanical integrity test of the well, tests the condition of the injection casing. The second test element, the external mechanical integrity test of the well, tests for leaks outside the casing. This is achieved through a series of field tests including a pressure test and a TV survey for the internal testing, and the temperature log, gamma ray log and RTS survey for the external testing. The first test element, the internal mechanical integrity test, tests for leaks in the injection pipe (casing). The second test element tests for leaks in the annular space outside the casing (cement-filled space between the periphery of the drilled hole and the casing) and in the near-to-the-well geologic strata.

2.2 CASING SCRUBBING

Because the mechanical integrity of injection wells has to be tested every five years, and because a TV inspection of the well is part of the test requirements, MITs provide a timely opportunity to clean the well of deposits that may have formed on the inside of the casing during the intervening years and at the same time provide a cleaner casing for the TV inspection. Cleaning the inside of the well casing is achieved by running a scrubbing brush up and down the casing. However, before the cleaning can be performed, flow out of the well must be controlled. The column of water inside the casing is fresh water and results in a positive hydraulic head inside the well. That head must first be controlled to prevent water from flowing out of the well during the cleaning operation.

2.2.1 Flow Suppression

Suppression of the fresh water head was achieved by first pre-mixing water with salt (NaCl) to form a heavy brine, and then pumping the brine down the well casing, through a 6-inch gate valve on the wellhead. This procedure results in the displacement down the well of the fresh water at the top of the column and replacement of the displaced fresh water with the brine solution. An equal volume of fresh water is displaced out of the well at the bottom of the casing. The procedure is repeated until the pressure head inside the well is suppressed. This method of displacement is used because it achieves flow suppression without first having to open the well to insert a tremie pipe to the bottom of the casing for introduction of the brine. This displacement method also provides a safe way of “killing” the well that at the same time reduces the volume of injected salt solution that would enter the formation at the bottom of the well. One additional advantage is that using this method the brine can be recovered and reused in flow suppression at other wells.

The brine was prepared in 1,000-gallon (gal.) batches by mixing the salt from a 2,000-pound (lbs.) sack in a 1,000 gal. tank of fresh water. The 1,000 gal. solution was then pumped down the well before other similarly mixed batches of salt solution were mixed and pumped down the

well (see Figure 3). In the end, the operation was repeated 12 times, and a total of 12 sacks (approximately 24,000 lbs. of salt) were used to suppress the head in the well. This salt concentration represents a theoretical specific gravity of 1.239 for the brine, calculated from the salt solution used in the field of 10.3 lbs per gallon. The 24,000 lbs of salt suppressed the pressure head from approximately 26 feet above the top of the casing to approximately 10 feet below.

Figure 3. Flow Suppression Equipment

2.2.2 Scrubbing Operation

The brush used to clean the casing is made with an old drill rod that has an outside diameter of 7 inches with thick steel wire inserted and secured sticking out of the drill rod. The total diameter of the brush with the steel wire bristles is 24 inches. The brush is attached to the bottom of the packer and inserted into the well (see Figure 4). A 24-inch flange was bolted to the top of the well and pressure fittings installed to be used for packer inflation later on in the process. Then Youngquist lowers the brush and packer by attaching drill rods to the top of the packer and then raising and lowering the brush several times using a 50 ton crane. This process was repeated until the casing was scrubbed and the packer was at the depth required to perform the packer test on the well.

Figure 4. Scrubbing Brush and Hydraulic Packer

2.3 INTERNAL MECHANICAL INTEGRITY (CASING TESTS)

2.3.1 Pressure Test

After the pressure head was suppressed and the casing scrubbed, and the inflatable packer was placed at a depth of 2,595 ft bls. This well is cased to a depth of 2,628 ft bls so the packer is in the bottom 50 feet of the casing. Additional pressure fittings were installed on the flange to pressurize the casing with water. A bleeder valve atop the 24-inch flange allows passage of the drill pipes that support the packer without loss of pressure in the casing (see Figure 5). A pretest was conducted on the casing to determine that the pressure was holding and that all the installed testing equipment was operating properly, then FDEP was informed that the well was ready for their inspection. The next day, June 7, 2013, the pressure test was repeated in the presence of FDEP Staff. The packer had been previously sealed against the casing, at an inflation pressure of 365 pounds per square inch (psi) and at 1:00 PM the casing was pressurized with water to a pressure of 152.5 psi.

Figure 5. Well-Head and Recorder Set Up for Pressure Test

At 1:54 P.M. the one-hour pressure test was started in the presence of Joseph May, P.G. representing FDEP and witnessed by Sonia Villamil, Maria Macfarlane, , and Michael Ashe representing MDWASD, and by Chris Harp and others representing the drilling contractor. The pressure test ran for the required one-hour period. The pressure deviation (loss) in that time was 4 psi, well below the 7.5 psi deviation allowable under the 5 % criteria in the rules (see Table 2-1). The packer inflation pressure and the pressure in the casing were measured using certified gages (see Appendix C) graduated from 0 to 200 psi in increments of 1 psi. The pressure was read in person and recorded by hand at five minute intervals during the test. The pressure was also recorded on an In-Situ pressure transducer attached to the stand with the pressure gauges (see Figure 5).

Table 2-1 Casing Pressure Readings

Time	Casing Pressure (psi)	Pressure Change (psi)	Packer Pressure (psi)
1:54	152.5	0.0	340
2:00	152.0	0.5	340
2:05	151.5	0.5	340
2:10	151.5	0.0	340
2:15	151.0	0.5	340
2:20	151.0	0.0	340
2:25	150.5	0.5	335
2:30	150.0	0.5	335
2:35	149.5	0.5	335
2:40	149.5	0.0	335
2:45	149.0	0.5	335
2:50	149.0	0.0	330
2:55	148.5	0.5	330

2.3.2 Bleed-Off

At the completion of the pressure test the casing pressure was bled-off and the discharged volume from the bleeding was measured (see Table 2-2). Bleeding until the pressure resulted in zero flow produced approximately 32 gallons (4.3 cubic feet). This exercise provides a reasonable assurance that the packer is placed at a depth in the well that is within the last 50 feet of the casing.

Table 2-2. Bleeding Volumes versus Pressure

Bled Volume (gallons)	0	5	10	15	20	25	30	32
Casing Pressure (psi)	148.5	124	100	77	59	30	6	0

2.3.3 Television Survey

A closed circuit color television camera, encased in a pressure vessel capable of withstanding the pressures exerted at the depths to be televised, and equipped with a fish-eye lens, was introduced into the well through a pack-off stripper device on a standpipe above the injection well (see Figure 6). The camera is centralized in the casing, and is preceded down the well with a light source attached below the camera. The camera televises a view of the full circumference of the inside of the casing and the image is recorded on video tape. Prior to the video survey, the well was scrubbed and flushed with potable water to provide the best picture possible. The video

survey began at land surface and continued down to 2,934 feet, where the camera runs into an obstruction. At selected intervals of interest, the camera was used to pan the intervals in a horizontal format prior to continuing the normal vertical recording.

A review of the video (see Appendix F) indicates that the casing is in good condition down to 2,630 feet. The video also shows that the scrubbing operation was successful. The scrubber has scrubbed the casing free of all growth down to 2,621 feet and this is confirmed by visible vertical scratches throughout that length of the casing; indicating that the scrubber had brushed the steel casing effectively. All the scratches are superficial, and do not detract from the physical and mechanical integrity of the casing. There are no gouges, grooves, nicks, or other physical damage visible in the casing for its whole length. Below 2,621 feet the casing was not scrubbed to avoid hanging the scrubber with the edge of the bottom of the casing at 2,630 feet. There are some growths and/or deposits visible inside the casing below 2,621 feet.

In summary, the video picture meets the quality standards that are needed for a visual evaluation of the well. This video survey presents a clear view of the casing and of the welded joints of the casing. All the joints are clean and appear to be tight. From the TV survey it is concluded that this casing is in good condition throughout its whole depth from land surface to 2,630 feet.

Figure 6. Television Survey (Standpipe and Logging Truck)

2.4 EXTERNAL MECHANICAL INTEGRITY (CEMENT AND FORMATIONS)

The external mechanical integrity test consisted of two low flow dynamic tests The RTS and temperature survey, conducted on June 14, 2013, for the external mechanical integrity portion of the test was witnessed by the representative of FDEP (Joseph May, P.G.), by representatives of MDWASD (Sonia Villamil and Maria Macfarlane) and by representatives of the contractor (Miguel Martinez).

2.4.1 Radioactive Tracer Survey (RTS)

The radioactive tracer survey uses an isotope of iodine (I-131) as a tracer of water movement inside and outside the casing. Iodine –131 is used because it is a radioactive isotope commonly used in medical practice and therefore it is more easily available and lower in cost than other potential tracers. I-131 also has the advantage of having a half-life of 8 days. That half-life is quite suitable because it is long enough to allow time for transportation to the well site with little decay but also short enough so that it would quickly be reduced if there were any unexpected spills or if there were mechanical failures through which the isotope could travel with the water. The radiation levels of I-131 at the concentration used for RTS testing is in millicurie-range, which if it were considered a waste, would be characterized as a low level waste by the US Atomic Energy Commission.

The I-131 is first loaded into a container located in the logging tool. This container is electronically activated from the logging truck to eject the desired quantity of tracer at the desired depth through an ejection port. In addition to the tracer container, the logging tool is also assembled with three gamma ray detectors. One detector, the top gamma ray detector (GRT), is located 10 feet above the ejector. The other two detectors, the middle one (GRM) and the bottom one (GRB) are located immediately below the ejector at about 3 feet and 12.4 feet below the ejector respectively. The bottom of the logging tool also includes a temperature tool at the very bottom, and a casing collar locator (CCL) 1 foot below the GRM. Figure 7 shows the configuration of the RTS logging tool. The RTS log in the appendix (Appendix D) shows the distances between each of the logging tool components described above.

Figure 7. RTS Tool and Temperature Probe

2.4.1.1 First Low Flow Dynamic Test

Prior to starting the low flow dynamic test, a background gamma ray log was conducted to establish the natural conditions. It was conducted right after the temperature log. Since the temperature log was run downward starting at land surface, the temperature log had ended with the logging tool at the bottom. The background gamma ray log was conducted from the bottom (2,930 feet) up to the surface.

From the surface, the logging tool was again lowered down the well and the casing collar locator (CCL) used to locate the bottom of the casing. The magnetic coils on the CCL give out a magnetic field and detect a change in the mass. If there is growth on the casing it is harder for the CCL to have a clean line. If the growth has some iron on it, it can cause a sort of interference with the CCL making it harder for the CCL to find the end of the casing. The CCL shows that the bottom of the casing is at 2,628 feet bls. After the bottom of the casing was located, the well was ready for the low-flow dynamic RTS test.

The ejector port of the I-131container was set at 2,623 feet and 1 millicurie (mCi) of I-131 was released while the flow down the well was kept at a constant rate of 92 gallons per minute (gpm). The logging tool was kept immobile after the ejection of the I-131 and the three gamma ray detectors continued to record in place. One (1) mCi of I-131 was ejected into the well. The middle detector, located 3 feet below the ejector port, picked up the radioactive tracer 20 seconds after the ejection. The bottom detector, which is located over 12 feet below the ejector, picked up the tracer 2 minutes and 16 seconds after the ejection. The middle detector seems to pick up some interference from the ejection motor on the tool when the ejection occurs and this shows up on the log at the same time of ejection.

However, this interference is at a much lower level and is dismissed as nothing more than interference from the ejection motor. The test ran for 60 minutes and the top detector did not pick up any tracer.

After the first low flow test ended, the tool was then raised up more than 200 feet, to a depth of 2,400 feet, to log out of position to make sure that the tracer did not migrate up the casing or the formation outside of the casing. No migration was detected.

Once the log out of position was conducted and the tool was placed back to depth, no staining on the casing was found which means no interference for the second RTS. Therefore, with the approval of Joseph May, P.G. from FDEP, the well was not flushed prior to the second RTS test.

2.4.1.2 Second Low Flow Dynamic Test

The tool was placed back to a depth were the ejector was located at 2,623 feet with a flow of 93 gallons per minute set down the well. For this test, 2 milicuries of I-131 were ejected into the casing. The middle detector started picking up the tracer about 16 seconds after it was ejected. The bottom detector, which is located over 12 feet below the ejector, picked up the tracer 1 minute and 40 seconds after the ejection. Again the middle detector picked up some interference from the ejector motor at the time the I-131 was released. The upper detector did not pick up any tracer for the duration of the test, which lasted 30 minutes.

After the second low flow test ended, the tool was then raised up more than 200 feet, to a depth of 2,400 feet, to log out of position to make sure that the tracer did not migrate up the casing or the formation outside of the casing. No migration was detected.

With the last low flow dynamic test, the mechanical integrity test was concluded, but before bringing the geophysical tools out of the well, the leftover I-131in the container was ejected and the container flushed-clean to insure that any remaining radioactive iodine was well dispersed. The tool was placed at a depth of 2,713.5 ft bls. The ejector was located at 2,700 ft bls, and the remaining Iodine 131 was ejected and the well was flushed with effluent at a rate of over 4,600 gallons per minute to ensure no staining of the tool. The logging tool was then brought up from the bottom and on the way up a final gamma ray log was made. Then the final gamma ray log was compared to the background gamma ray log, and the comparison showed that there are no noticeable differences in the two except for a residual stain at the bottom of the casing where the I-131 had been repeatedly released during the testing, and just below there, where the tracer exited the casing. Injection of water down the well at a rate of 4,600 gpm continued for the next hour to completely flush out the well.

2.4.2 Temperature Log

Youngquist Brothers Inc. conducted the temperature log on June 14, 2013 starting at about 8:00 A.M. and logging down to 2,939 feet. The temperature probe (Figure 7) was run from the surface downward to minimize the disturbing effect of the movement of the logging tool on the temperature of the water in the well. The temperature log was started more than 24 hours after the well had last been disturbed by outside influences. The TV survey was the last disturbance in the well.

The temperature log (see Appendix H) shows the warmest interval is in the section from 2,600 to 2,720 feet. This is consistent with the higher temperature of the injected water in that interval. The temperature log did not detect any anomalies that would indicate that injection fluids are present outside the casing, and there is no indication of any upward movement of warm injection water either. The similarity of the temperature oscillations in this temperature log (in the interval from land surface down to the bottom of the casing) to those in the temperature logs from previous MITs and to those in the temperature log when the well was constructed, indicates that there has been no apparent change in the cased interval, and no upward movement of the injected water in the last 5 years.

2.5 WELL HEAD REPAIRS AND RE-INSTALLATION

The work associated with the MIT ended when the wellhead was replaced. The air and vacuum release surge check valves were replaced prior to reinstallation of the wellhead. The 6 inch gate valve and air release were replaced. The wellheads are scheduled to be sandblasted, rust proofed and repainted after the MITs on all the other wells are completed. Injection well IW-1 has been placed back on line and flow from the plant's pump station is again discharging to this injection well.

Section 3

3. CONCLUSIONS AND RECOMMENDATIONS

3.1 CONCLUSIONS

The pressure test was conducted successfully and it was concluded from the results that there is internal mechanical integrity. This conclusion is reinforced by the analysis of the TV survey down to the injection level at 2,630 feet. The TV survey indicated that the casing is in good condition and that all the casing joints appear to be tight and in good working order.

The two successful RTS conducted at low flow rates indicate that there is no upward movement of water outside the casing. Therefore, it was concluded that the RTS results show that there is external mechanical integrity. The temperature survey reinforced the results of the RTS by showing that there has been no movement of injected water anywhere except the injection zone.

3.2 RECOMMENDATIONS

The successful completion of all the tests for mechanical integrity confirms that IW-3 retains full mechanical integrity and as such it is appropriate to continue using this injection well. MDWASD also recommends that FDEP review the results of the tests presented in this report and based on those results determine that the well has mechanical integrity and may continue to be used for its intended purpose.

Finally, MDWASD recommends that although the well head will not be painted until all the MIT tests are completed on the other wells, IW-3 should receive mechanical integrity certification.

Appendix A

Mechanical Integrity Testing Procedures Submitted by MDWASD to FDEP
October 12, 2012

Miami-Dade Water and Sewer Department
Mechanical Integrity Testing Procedures

Miami-Dade Water and Sewer Department
Mechanical Integrity Testing and Repair Procedures
October 12, 2012

MECHANICAL INTEGRITY TESTING and REPAIR PLAN (SDWWTP and NDWWTP Injection Wells)

General Information

The Contractor shall carefully coordinate his activities with the Department to minimize interference with any existing operations or the operations of the Department. Department forces will isolate the well and turn over to the Contractor. Existing valves shall only be operated by Department personnel. The Contractor's personnel, under no circumstances, shall operate any such valve.

The Contractor shall provide all barricades and/or flashing warning lights necessary to warn workers and employee of the testing throughout the Project. This shall be done at the Contractor's expense and to the satisfaction of the Engineer. Every effort must be made to reduce inconvenience and nuisances to a minimum.

The Contractor shall at all times, use the assigned entrance to the Plants to bring in materials, equipment etc. required for the Project. Materials and equipment shall be stored in areas designated by the Engineer, and shall not interfere with the daily operations at the site or with other Projects. Suitable platforms shall be used for material storage to prevent damage to the landscaping. The Contractor shall exercise extreme caution when transporting equipment or materials within the Plant area.

The conveying vehicles shall be properly selected, and equipped, to prevent damage to paved areas, landscaping and other existing facilities including wells, well pads, fencing, underground pipelines, pipe chases, etc. If necessary, suitable wooden skids shall be used to distribute loads, and to prevent damage.

If any of the above existing structures, including the wells, or any other parts of the project area, are damaged, the contractor shall make suitable repairs or replacement at his expense, in a manner described by the Engineer, and to his satisfaction.

The Contractor shall also exercise extreme caution to prevent any spillage of sewage effluent. The County may charge t he Contractor for any cost incurred or penalties imposed on the County as a result of such spillage.

The wells to be tested are Injection Wells IW-l through IW-17 at the South District Wastewater Treatment Plant and IW-1N through IW-4N at the North District Wastewater Treatment! Plant

The Injection Wells have a 24-inch outside diameter (OD), 0.500-inch wall thickness injection casing set to total depths of 2,450 to 2,850 feet below land surface (bls), and were constructed with a nominal 22-inch diameter open borehole extending from the bottom of the casing to approximately 3,000 feet bls.
Except IW-5 at the SDWWTP, has a 20-inch outside diameter (OD), and 0.500 inch wall thickness.

The CONTRACTOR will perform internal and external mechanical integrity tests on the casings of twenty one deep injection wells and perform all appurtenant work in accordance with the above

Contract Documents.

The work shall be performed by a competent crew with equipment that is adequate to complete all phases of the testing and instruments of sufficient accuracy and resolution to identify anomalous responses to the tests. If the CONTRACTOR'S equipment is not capable of satisfactorily performing the work provided for in these specifications, the CONTRACTOR at his own expense shall substitute equipment.

The CONTRACTOR shall have not less than 5 years experience in constructing and testing wells and shall have tested not less than 5 wells of similar type and capacity. The CONTRACTOR shall be licensed by the State of Florida and the license number shall be affixed to all correspondence and reports.

All work shall comply with and be in full conformance with this Mechanical Integrity Test Plan submitted to FDEP together with subsequent response letters for the injection wells at the South and North District Wastewater Treatment Plants and with the appropriate sections of Chapter 62-528 FAC.

If remedial work or re-testing is required prior to final acceptance of the work to meet regulatory requirements and the specifications of the Contract Documents due to defective materials, accident, loss of equipment or equipment malfunction, or for any other cause directly attributable to the CONTRACTOR's actions, the CONTRACTOR shall bear the entire cost of the remediation or re-testing, including all additional materials, labor, and equipment required and any necessary additional Engineering costs. In the event of a problem, the ENGINEER shall be notified immediately, and the following shall apply:

1. The CONTRACTOR shall propose a method of correcting the problem, in writing, to The ENGINEER, who shall review the method of corrective action, and accept the plan in writing before work can proceed.

2. All work on the well must be in accordance with all applicable local, state and federal regulations.

The CONTRACTOR shall notify the ENGINEER a minimum of 72 hours prior to conducting the pressure test, geophysical logging and the radioactive tracer survey so that the ENGINEER and regulatory agency staff can be properly notified.

The CONTRACTOR shall provide all facilities, equipment and materials required for the removal of waste fluids from the well site.

The CONTRACTOR shall kill the well using a dense food- grade salt solution. No barite or mud-based additives shall be used in the well.

The CONTRACTOR shall comply with the OSHA regulations contained in 29CFR Section 1910 for General Industry Regulations and 29CFR Section 1926 for Construction Regulations.

Equipment and Procedures

1. Wellhead Assembly: The stripper head assembly used during the video survey, Geophysical logging, and the radioactive survey shall be bolted to the wellhead above the 6-inch gate valve. The stripper head assembly used must be of sufficient length to house the longest of the wire line tools used for the testing between the gate valve and the pack-off mounted at the top of the assembly. The pack-off must be adjusted so that the tools can be moved freely up and down the well with minimal leakage from the well. The assembly shall include a 4-inch valve and tee, which will be used to inject potable water during the surveys. The assembly shall be fitted with a

pressure gauge for use during the tests.

2. Wellhead Hardware: Should the nuts and/or bolts at the wellhead assembly become stripped during the CONTRACTOR's efforts, the CONTRACTOR shall replace them with equivalent hardware.

3. Water Line: The CONTRACTOR shall provide a potable water supply line for use during the video surveys. This line shall be connected to the existing 4-inch valve on the CONTRACTOR's stripper head. It shall be equipped with a check value to prevent the backflow of effluent into the water supply source. It shall also be equipped with a continuous recording digital flow meter and totalizer capable of measuring flows accurately in the range of 0 to 250 gpm.

Mechanical Integrity Testing (MIT)

The mechanical integrity testing under this Contract shall be accomplished using the following methods and general sequence, however the Contractor shall submit a more detailed sequence to the Engineer for approval before he begins work. The Contractor shall use extreme caution to prevent any loss of equipment, tools or other items into the wells and shall be fully responsible for retrieving any such items immediately, at no expense to the Department. All pressure tests must be conducted in the presence of the Engineer or his authorized representative.

MIT Clean and Pressure Test the Casing

1. The Contractor shall set up all equipment required to prepare for suppressing the density differential pressure, cleaning, performing the pressure test and the radioisotope and closed circuit television surveys.

2. The Contractor shall inject sufficient salt solution into the well to balance the differential pressure and disassemble the wellhead. The brine solution shall remain in the well during the cleaning and pressure testing steps, after which time it shall be transferred to another well if clean enough for reuse, or shall otherwise be disposed of by the Contractor. Under no circumstances shall brine solution be spilled or disposed of on the ground surface, however it may be disposed of into the injection well.

3. The Contractor shall clean the casing before proceeding with the pressure test. The entire length of casing shall be cleaned. If the later television survey indicates insufficient cleaning, the well shall be re-cleaned by the Contractor, at his expense, to the satisfaction of the Engineer. If the television survey must be repeated because of insufficient cleaning, in the opinion of the Engineer, it shall also be at the Contractor's expense.

4. The Contractor shall, when requested by the Engineer, place the packer through a stand-pipe with a packoff device to a point near the top of the well (but within the concrete encasement area) and test its integrity. This shall be accomplished as described in Steps 6, 7, and 8 below. If the packer fails the integrity test it shall be replaced with one that will meet the test. The Engineer is aware that packers have limited inflation cycles and will attempt to minimize the verification of packer operation. However, any integrity failure for which the packer operation can not be eliminated must be repeated at the Contractor's cost. It is anticipated that each new packer will be tested at the wellhead to verify its capacity to seat and deflate.

5. The Contractor shall lower and place the packer to a point within the lower 40 feet of the casing, but not the last 10 feet. The CONTRACTOR will be responsible to assure the proper seating of the packer. A preliminary test shall be performed to ensure proper operation of the test set-up. The CONTRACTOR shall notify the ENGINEER at least 24 hours before running the preliminary test. The test will be run following the same test program as the actual pressure test, as described below. IW-2 at SDWWTP will have the packer placed within 40 feet of the tear in the casing.

6. The Contractor shall inflate the packer to a pressure not exceeding 350 psig over the static condition as measured at the wellhead on a calibrated gauge to create a positive seal.

7. The Contractor shall pressurize the casing to 150 psig with no air in the casing or wellhead. The pressure shall be recorded on a chart and signed by the Engineer, the Contractor and any witnesses present. The pressure test gauge shall be calibrated within 6 months of performing the pressure test. The CONTRACTOR must present proof of calibration of the pressure gauge to the ENGINEER and FDEP staff at the time of testing each well. The pressure gauge must be mounted at or near eye level in order to ensure maximum visibility.

8. The test will be considered successful if the pressure does not change more than 5% psi in one hour.

9. If the test fails, the Contractor shall move the packer upwards for approximately 10 feet, and repeat Steps 6, 7 and 8.

10. If the test still fails, additional repositioning of the packer and repeating of Steps 6, 7 and 8 shall be as ordered by the Engineer. If the test still fails, and subsequent radioisotope surveys indicate no casing failure, it will be presumed that the Contractor's packer did not create a positive seal, and the Contractor shall be required to repeat Steps 4 through 8 at his expense. No payments will be made to the Contractor if it is subsequently determined that the test failure was caused by the seating of the packer. If the packer fails during packer operation verification, it will be concluded that the packer was faulty during any previous test that did not demonstrate casing integrity. The Contractor shall repeat this test at his expense.

11. After pressure testing, measure the depressurization bleed down with a 5 gallon bucket upon release of the pressure in the casing. The bleed down fluid will be properly disposed of by the Contractor.

12. The Contractor shall deflate the packer and withdraw it from the casing.

13. The Contractor shall reassemble the wellhead and connecting piping using new gaskets.

14. Prior to geophysical logging, the fluid used to "kill" the well, or for pressure testing the casing shall be flushed from the well and the well will be shut-in for a minimum of 12 hours.

MIT Video Surveys

A Video Survey inside the injection well casing be performed using the following procedures.

.A 6-inch diameter stripper head assembly will be bolted to the wellhead assembly above the existing 6-inch diameter gate valve. The stripper head will be of dimensions that allow the video operator to put his camera between the gate valve and the pack off and close both the valve and the pack off. The lower part of the assembly shall consist of a 4-inch tee and valve through which potable water may be introduced into the well.
.
Prior to performance of the survey and for a period of 24 hours, fresh water from an adjacent fire hydrant will be introduced into the well through a 4-inch diameter valve located on the stripper head assembly. Fresh water shall be pumped into the well to provide clarity for the survey.

3. If, after 24 hours of pumping potable water into the well, the water quality does not permit a clear picture of the inside of the well, the CONTRACTOR may be required to perform additional pumping services to assure a good survey as specified above.

4. The pumping of the potable water will continue at a rate of approximately 0 to 250 gpm during video surveying. If the open hole portion of the well is not clean, or visibility in any part of the well is poor, the CONTRACTOR shall perform additional pumping services to ensure a good video survey before running another or continuing with the survey.

5. During the video survey, the CONTRACTOR shall stop the camera's progress as instructed by the ENGINEER at depths where there may be potential flaws in the casing or other features to allow for thorough examination at those locations.

Upon reaching the total depth of the well with the video camera and obtaining a video survey satisfactory to the ENGINEER, the camera shall be removed from the well, and the well placed back in service.

MIT Radioisotope Tracer Survey and Temperature Survey

A radioisotope tracer survey shall be used to detect any fluid movement outside of the injection casing from the injection zone into the overlaying aquifers. The tool configuration shown below, or approved equal is required. The tool must be capable of ejecting the radioactive tracer and simultaneously monitoring the gamma ray sensors. No time lag between ejection and monitoring is permitted. A casing collar locator (CCL) shall be positioned below the tool as shown below, to precisely locate the bottom of the casing. Two low flow dynamic test runs, shall be performed. Additional low flow dynamic test runs can be done if results warrant additional testing, as determined by the ENGINEER in consultation with FDEP staff.

A temperature survey log shall also be performed from land surface to the total depth of the well. The temperature log shall be performed logging down at a rate of not more than 60 feet per minute. The temperature survey shall be performed after the well has been "shut in" and stabilized for at least 12 hours prior to the dynamic and static tests.

The Contractor shall perform an initial background gamma ray survey extending from the base of the land surface to the total depth of the well. The background gamma ray log shall be taken at a rate of not more than 60 feet per minute.

After the dynamic tests are completed, another background gamma ray survey shall be taken from the base of the casing to the base of the intermediate casing.

If additional radioisotope tracer survey work is ordered by the Engineer, it will be paid for at the hourly price proposed for additional radioisotope tracer surveys.

Radioactive Tracer Survey (RTS)

A RTS will be performed in the injection well. The tool used for testing will be configured according to information to be supplied by the service company performing the logs and as approved by the ENGINEER. Below is an example of a typical RTS tool that will be used for these surveys. The CONTRACTOR will provide a specific tool configuration with the logs.

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)
			CHD-SDSCHD (SDS) Cable Head	1.00	1.50	5.00
GR#3	23.83					
			GR #3 -GR#3 (GR#3_T) GR#3_TOP	9.33	1.69	50.00
			TREJCT-A (RTS) EJECTOR 14.5' FROM TOOL BOTTOM	3.00	1.69	10.00
			GR #2 -GR#2 (GR#2_M) GR#2_MIDDLE	3.58	1.69	25.00
GR#2	11.17					
CCL	9.63		CCL-000 (000001) RTS_CCL	0.75	1.69	5.00
			TRDET-GR#1 (GR#1_B) GR#1_BOTTOM	8.67	1.69	50.00
GR#1	0.58		TEMP-11116Temp (11116HT)	0.58	1.69	5.00
TEMP	0.17		RTS_TEMP			

Dataset: sdiw1.db: field/well/run1/FINBK
Total Length: 26.92 ft
Total Weight: 150.00 lb
O.D. 1.69 in

RTS tool Typical Configuration

The sequence of the tests shall be as follows:

First Low Flow Dynamic: The low flow run of the radioactive tracer survey shall be performed with a pumping-in velocity of 3 to 5 feet per minute. This would require a volume of between 65 gpm and 108 gpm to be injected during the survey. This is for the 24 inch wells, for Well I-5, which has a 20 inch casing this volume is 44 gpm and 73 gpm. Potable water from the same source as used for the video survey would be used as the most appropriate water supply for this portion of the test.

1) After beginning the flow of water into the well, the tool will be placed at a depth of approximately 5 feet above the base of the final casing, and a slug of 2 millicuries radioactive Iodine 131 is ejected. The tool will remain in place for a period of approximately one hour and the three gamma ray detectors in the "time drive" mode will record the movement of the slug. If tracer is detected at the uppermost detector, indicating potential staining of the tool, the tool may be moved upward to an alternate location.

2) After the one hour waiting period, a log out-of-position will be performed between the ejection point and a minimum of 200 feet above the highest point of tracer detection.

3) Upon completion of logging, the casing will be flushed with 3 to 5 casing volumes of effluent.

4) After flushing, the tool will immediately be run to the base of the casing, then the interval between the ejection point and 200 feet above the highest point of tracer detection will be logged.

Second Low Flow Dynamic: The process described above for the low flow dynamic log will be repeated to include a log out-of-position, a casing flush, and an after flush pass. A slug of tracer greater than or equal to 3 millicuries shall be used as determined by the ENGINEER.

If, during testing, no apparent anomalies appear that may indicate a lack of mechanical integrity in the injection well, the RTS will be concluded. If anomalies do occur, the RTS will be altered to track the radioactive tracer material. After RTS is complete, the RTS tool will be discharged in the injection zone and the well shall be flushed with 3 to 5 volumes of effluent. A second background log will be run from the bottom to the top of the well.

MIT Deadlines (sorted by date MIT pressure test due)

SDWWTP MIT Schedule of Completion

Well	Pressure Test	RTS/Video
IW-2	7/13/2013	7/25/2013
IW-1[1]	7/20/2013	7/31/2013
IW-3	7/24/2013	8/7/2013
IW-9[1]	7/30/2013	8/12/2013
IW-10[1]	8/6/2013	8/21/2013
IW-11	8/20/2013	9/3/2013
IW-12	8/25/2013	9/19/2013
IW-14	9/9/2013	9/26/2013
IW-13	9/16/2013	10/6/2013
IW-4	9/25/2013	10/14/2013
IW-6	9/30/2013	10/20/2013
IW-5	10/19/2013	10/27/2013
IW-7[2]	10/26/2013	1/7/2014
IW-8	11/2/2013	11/12/2013
IW-17	11/11/2013	11/19/2013
IW-16	11/18/2013	12/9/2013
IW-15	12/3/2013	12/16/2013

NOTES:
1.The original video was not clear enough and therefore a new video was done at the end of the MITs at SDWWTP.
2.The Computer failed during the RTS, because the Iodine 131 had already been injected, FDEP and DOH required 46 days b/f the RTS could be redone.

NDWWTP MIT Schedule of Completion

Well	Pressure Test	RTS/Video
IW-1N	3/14/2014	3/26/2014
IW-2N	3/25/2014	4/9/2014
IW-3N	4/2/2014	4/17/2014
IW-4N	4/9/2014	4/24/2014

REPAIR PLAN:

The following repair plans apply to wells at SDWWTP and NDWWTP.

1. Kill well and remove 24 inch gate valve and 4 inch bypass valves. Remove 1 inch pressure transmitter line and weld hold closed. Please see drawings included in below.

2. Sand existing casing in concrete pits and coat with Bitumastic. Please see drawings included in below.

3. Chip concrete around outer casing 1 inch deep, in order to embed PVC sleeve. Please see drawings included in below.

4. Install C905 PVC sleeve around casing pipe, embed 1 inch deep and fill annular space with grout, using Type II Neat cement. Slope top edge to create 30 degree watershed and seal at edges with sealant. Please see drawings included in below.

5. Relocate 1 inch pressure transmitter as indicated in drawings. Weld the hole. Please see drawings included in below.

6. At the NDWWTP IW-1N, IW-3N and IW-4N install new magmeters with any necessary spool pieces to be field determined. Please see drawings included in below.

7. Reassemble wellheads including installation of new 24 inch butterfly valve on horizontal part of well. Mega flanges will be used to ensure the layout of the pipe and the vales match. Please see drawings included in below.

8. On IW-4N at NDWWTP, install electric actuator for butterfly valve at base of injection well. Please see drawings included in below.

Appendix B

FDEP Approval of MIT Plan for SDWWTP and NDWWTP

November 26, 2012

Villamil, Sonia (WASD)

From: May, Joseph [redacted]
Sent: Monday, November 26, 2012 2:40 PM
To: Villamil, Sonia (WASD)
Cc: Vandor, Heidi; Silverman, Mark; Walsh, Virginia (WASD); Goldenberg, Bertha M. (WASD); Fallon Jr., Howard J. (WASD); Arrebola, Vicente (WASD); Macfarlane, Maria (WASD); Oakley, Clint (WASD)
Subject: RE: MDWASD MIT and Repair Plan Submittal

Importance: High

Hello all,

The Department approves the plan with the following understandings:

1) Medicinal grade I-131 should be specified since this solution is filtered to reduce precipitate material, as opposed to regular grade I-131, in the vial causing a tool malfunction. It has been our experience that an activity of ~1mCi/ml has been the easiest to work with in the field.
2) Please contact me a minimum of three days prior to mobilization to each site. Due to the travel time from West Palm Beach to the sites close coordination would be appreciated between myself and a designated contact person from the utility so that each pressure and RTS can be witnessed.

Thank you,

Joe

Please take a few minutes to share your comments on the service you received from the department by clicking on this link. DEP Customer Survey.

From: Villamil, Sonia (WASD) [mailto:[redacted]
Sent: Wednesday, October 17, 2012 9:42 AM
To: May, Joseph
Cc: Vandor, Heidi; Silverman, Mark; Walsh, Virginia (WASD); Goldenberg, Bertha M. (WASD); Fallon Jr., Howard J. (WASD); Arrebola, Vicente (WASD); Macfarlane, Maria (WASD); Oakley, Clint (WASD)
Subject: MDWASD MIT and Repair Plan Submittal

Hello Mr. May,

The MDWASD respectfully submits the attached MIT testing and repair plan for your approval. The paper copy is being sent via regular mail as well.

Thank you,

Sonia Villamil
Engineer II
Miami Dade Water and Sewer Department
3071 SW 38th Ave Room 554-8
Miami, FL 33146
[redacted]
fax: 786-552-8640
miamidade.gov

Appendix C

Field Notes from tests including gauge certification and pressure charts.

IW 1 Pressure test

6-7-13

Time	Casing PSI	packer psi
1:54	152.5	340
2:00	152	340
2:05	151.5 +	340
2:10	151.5 +	340
2:15	151	340
2:20	151 -	340 -
2:25	150.5	335 +
2:30	150	335 +
2:35	149.5 +	335 +
2:40	149.5	335
2:45	149 +	335
2:50	149	330
2:55	149	330 -
3:00	148.5 +	330 -
~~3:05~~		

Bleed off	casing	packer
3:05	148.5 psi	330 psi
5g	124 psi	320
10g	100 psi	310
15g	74 psi	300
20g	59 psi	290
25g	30 psi	280
30g	6 psi	285 psi
32g	0	265 psi

FW-1 Pressure Test
6-7-13
1:54 pm
Witness List

Sonia Villamil	WASD
Maria Macfarlane	WASD
Joe May	LEP
Michael Ashe	WASD
CHRIS HARP	YBI

Miami Dade South District

Date: 6-5-13 WED

IW# 1

Packer Tally 2606.16' ℄ of PACKER

Joint #	Length (ft.)	Total Length (ft)	Joint #	Length (ft.)	Total Length (ft)	Joint #	Length (ft.)	Total Length (ft)
1	31.25	31.25	35	30.78	1071.98	68	30.68	2082.55
2	30.62	61.87	36	30.57	1102.55	69	30.57	2113.12
3	30.55	92.42	37	30.56	1133.11	70	30.6	2143.72
4	30.65	123.07	38	30.8	1163.91	71	30.55	2174.27
5	30.54	153.61	39	30.34	1194.25	72	30.53	2204.8
6	30.55	184.16	40	30.63	1224.88	73	30.8	2235.6
7	30.68	214.84	41	30.53	1255.41	74	30.63	2266.23
8	30.55	245.39	42	30.58	1285.99	75	30.53	2296.76
9	30.57	275.96	43	30.78	1316.77	76	30.6	2327.36
10	30.57	306.53	44	30.64	1347.41	77	30.63	2357.99
11	30.56	337.09	45	30.55	1377.96	78	30.56	2388.55
12	30.6	367.69	46	30.8	1408.76	79	30.56	2419.11
13	30.59	398.28	47	30.71	1439.47	80	30.67	2449.78
14	30.85	429.13	48	30.55	1470.02	81	30.6	2480.38
15	30.57	459.7	49	30.53	1500.55	82	30.71	2511.09
16	30.65	490.35	50	30.64	1531.19	83	30.65	2541.74
17	30.58	520.93	51	30.59	1561.78	84	30.55	2572.29
18	30.6	551.53	52	30.6	1592.38	85	30.55	2602.84
19	30.64	582.17	53	30.6	1622.98	86	30.63	2633.47
20	30.6	612.77	54	30.58	1653.56	87	30.74	2664.21
21	30.53	643.3	55	30.53	1684.09	88	30.82	2695.03
22	30.53	673.83	56	30.7	1714.79	89	30.69	2725.72
23	30.82	704.65	57	30.55	1745.34	90	30.6	2756.32
24	30.65	735.3	58	30.68	1776.02	91	30.6	2786.92
25	30.72	766.02	59	30.55	1806.57	92	30.72	2817.64
26	30.6	796.62	60	30.6	1837.17	93	30.53	2848.17
27	30.72	827.34	61	30.75	1867.92	94	30.74	2878.91
28	30.58	857.92	62	30.6	1898.52	95	30.67	2909.58
29	30.58	888.5	63	30.57	1929.09	96	30.63	2940.21
30	30.63	919.13	64	30.63	1959.72	97	30.57	2970.78
31	30.58	949.71	65	30.8	1990.52	98	30.6	3001.38
32	30.67	980.38	66	30.57	2021.09	99	30.53	3031.91
33	30.25	1010.63	67	30.78	2051.87	100	30.65	3062.56
34	30.57	1041.2						

IWI SOUTH DISTRICT 6-5-13 WED.
MIAMI - DADE. 24" CSG 2428'

PACKER	10.32 ℄	TOP OF BOTTOM FLANGE
85 JT'S 2 3/8"	2602.84	IS 2.15' ABOVE PAD.
	2613.16	
ESS FLANGE	-2.15	
	2611.01	
ESS STICKUP	-4.85	
	2606.16 ℄ OF PACKER.	

BOTTOM OF BRUSH @ 2621.39
FARTHEST EXTENT OF BRUSHING IS 2626.24.

In-Situ Inc. Hermit 3000

Report generated: 6/11/2013 15:15:18
Report from file: C:\WIN-SITU\Data\SN45716 2013-06-07 135536 Test #1.bin
DataMgr Version 3.69

Serial number: 45716
Firmware Version 7.1
Unit name: Hermit 3000

Test name: Test #1

Test defined on: 6/3/2013 18:37:17
Test started on: 6/7/2013 13:55:36
Test stopped on: 6/7/2013 15:22:08
Test extracted on: 6/11/2013 15:15:13

Data gathered using Logarithmic testing
Maximum time between data points: 1.0000 Minutes.
Number of data samples: 168

TOTAL DATA SAMPLES 168

Channel number [3]
Measurement type: Pressure
Channel name: 250psi 6488
Linearity: 1.764
Scale: 244.2348
Offset: -0.4381
Warmup: 50
Specific gravity: 1

Channel number [0]
Measurement type: Barometric Pressure
Channel name: Barometric
Linearity: 0
Scale: 0
Offset: 0
Warmup: 50

Date Time	ET (min)	Chan[3] Feet H2O	Chan[0] Inches Hg	PSI
6/7/2013 13:55	0	352.223	29.96	152.4354
6/7/2013 13:55	0.011	352.223	29.96	152.4354
6/7/2013 13:55	0.022	352.258	29.96	152.4506

6/7/2013 13:55	0.033	352.258	29.96	152.4506
6/7/2013 13:55	0.044	352.258	29.962	152.4506
6/7/2013 13:55	0.055	352.258	29.962	152.4506
6/7/2013 13:55	0.066	352.258	29.96	152.4506
6/7/2013 13:55	0.077	352.223	29.96	152.4354
6/7/2013 13:55	0.088	352.223	29.96	152.4354
6/7/2013 13:55	0.099	352.258	29.96	152.4506
6/7/2013 13:55	0.11	352.258	29.96	152.4506
6/7/2013 13:55	0.121	352.223	29.96	152.4354
6/7/2013 13:55	0.132	352.223	29.96	152.4354
6/7/2013 13:55	0.143	352.223	29.96	152.4354
6/7/2013 13:55	0.154	352.258	29.96	152.4506
6/7/2013 13:55	0.165	352.223	29.96	152.4354
6/7/2013 13:55	0.176	352.258	29.96	152.4506
6/7/2013 13:55	0.187	352.223	29.96	152.4354
6/7/2013 13:55	0.198	352.223	29.962	152.4354
6/7/2013 13:55	0.209	352.223	29.96	152.4354
6/7/2013 13:55	0.22	352.223	29.96	152.4354
6/7/2013 13:55	0.231	352.223	29.96	152.4354
6/7/2013 13:55	0.2427	352.187	29.96	152.4198
6/7/2013 13:55	0.2552	352.223	29.96	152.4354
6/7/2013 13:55	0.2683	352.223	29.96	152.4354
6/7/2013 13:55	0.2823	352.223	29.96	152.4354
6/7/2013 13:55	0.2972	352.223	29.958	152.4354
6/7/2013 13:55	0.3128	352.187	29.96	152.4198
6/7/2013 13:55	0.3295	352.187	29.96	152.4198
6/7/2013 13:55	0.3472	352.187	29.958	152.4198
6/7/2013 13:55	0.3658	352.187	29.96	152.4198
6/7/2013 13:55	0.3857	352.187	29.96	152.4198
6/7/2013 13:56	0.4067	352.187	29.958	152.4198
6/7/2013 13:56	0.4288	352.223	29.958	152.4354
6/7/2013 13:56	0.4523	352.187	29.958	152.4198
6/7/2013 13:56	0.4772	352.152	29.96	152.4047
6/7/2013 13:56	0.5035	352.152	29.958	152.4047
6/7/2013 13:56	0.5315	352.507	29.958	152.5583
6/7/2013 13:56	0.5612	352.187	29.958	152.4198
6/7/2013 13:56	0.5925	352.258	29.958	152.4506
6/7/2013 13:56	0.6257	352.294	29.958	152.4661
6/7/2013 13:56	0.6608	352.4	29.96	152.512
6/7/2013 13:56	0.6982	352.436	29.96	152.5276
6/7/2013 13:56	0.7377	352.436	29.962	152.5276
6/7/2013 13:56	0.7795	352.4	29.962	152.512
6/7/2013 13:56	0.8238	352.4	29.956	152.512
6/7/2013 13:56	0.8708	352.436	29.958	152.5276
6/7/2013 13:56	0.9207	352.4	29.958	152.512
6/7/2013 13:56	0.9733	352.365	29.956	152.4969
6/7/2013 13:56	1.0292	352.365	29.956	152.4969
6/7/2013 13:56	1.0883	352.4	29.954	152.512
6/7/2013 13:56	1.151	352.329	29.956	152.4813
6/7/2013 13:56	1.2173	352.329	29.956	152.4813
6/7/2013 13:56	1.2877	352.329	29.954	152.4813

6/7/2013 13:56	1.3622	352.329	29.954	152.4813
6/7/2013 13:57	1.4412	352.294	29.954	152.4661
6/7/2013 13:57	1.5248	352.294	29.954	152.4661
6/7/2013 13:57	1.6133	352.294	29.954	152.4661
6/7/2013 13:57	1.7072	352.258	29.952	152.4506
6/7/2013 13:57	1.8065	352.258	29.952	152.4506
6/7/2013 13:57	1.9118	352.223	29.952	152.4354
6/7/2013 13:57	2.0233	352.187	29.952	152.4198
6/7/2013 13:57	2.1415	352.152	29.95	152.4047
6/7/2013 13:57	2.2667	352.152	29.952	152.4047
6/7/2013 13:57	2.3992	352.152	29.95	152.4047
6/7/2013 13:58	2.5397	352.116	29.95	152.3891
6/7/2013 13:58	2.6885	352.045	29.952	152.3584
6/7/2013 13:58	2.846	351.761	29.935	152.2355
6/7/2013 13:58	3.0128	351.796	29.929	152.2506
6/7/2013 13:58	3.1897	351.725	29.931	152.2199
6/7/2013 13:58	3.377	351.69	29.931	152.2047
6/7/2013 13:59	3.5753	351.69	29.931	152.2047
6/7/2013 13:59	3.7855	351.654	29.931	152.1892
6/7/2013 13:59	4.0082	351.619	29.933	152.174
6/7/2013 13:59	4.244	351.619	29.933	152.174
6/7/2013 14:00	4.4938	351.548	29.931	152.1433
6/7/2013 14:00	4.7585	351.512	29.931	152.1277
6/7/2013 14:00	5.0388	351.477	29.933	152.1126
6/7/2013 14:00	5.3357	351.441	29.935	152.097
6/7/2013 14:01	5.6502	351.37	29.933	152.0663
6/7/2013 14:01	5.9833	351.335	29.933	152.0511
6/7/2013 14:01	6.3362	351.299	29.933	152.0355
6/7/2013 14:02	6.71	351.228	29.935	152.0048
6/7/2013 14:02	7.106	351.157	29.935	151.9741
6/7/2013 14:03	7.5253	351.05	29.935	151.9278
6/7/2013 14:03	7.9697	351.015	29.933	151.9126
6/7/2013 14:04	8.4403	350.944	29.935	151.8819
6/7/2013 14:04	8.9388	350.873	29.933	151.8512
6/7/2013 14:05	9.4668	350.802	29.933	151.8204
6/7/2013 14:05	10.0262	350.695	29.933	151.7741
6/7/2013 14:06	10.6187	350.624	29.939	151.7434
6/7/2013 14:06	11.2462	350.553	29.935	151.7127
6/7/2013 14:07	11.911	350.446	29.935	151.6664
6/7/2013 14:08	12.6152	350.304	29.935	151.6049
6/7/2013 14:08	13.361	350.198	29.935	151.559
6/7/2013 14:09	14.151	350.091	29.935	151.5127
6/7/2013 14:10	14.9878	349.984	29.933	151.4664
6/7/2013 14:11	15.8743	349.807	29.935	151.3898
6/7/2013 14:12	16.8133	349.665	29.933	151.3284
6/7/2013 14:13	17.808	349.487	29.933	151.2513
6/7/2013 14:14	18.808	349.416	29.931	151.2206
6/7/2013 14:15	19.808	349.238	29.931	151.1436
6/7/2013 14:16	20.808	349.274	29.933	151.1592
6/7/2013 14:17	21.808	349.025	29.931	151.0514
6/7/2013 14:18	22.808	348.848	29.933	150.9748

6/7/2013 14:19	23.808	348.635	29.933	150.8826
6/7/2013 14:20	24.808	348.528	29.933	150.8363
6/7/2013 14:21	25.808	348.386	29.937	150.7748
6/7/2013 14:22	26.808	348.244	29.935	150.7134
6/7/2013 14:23	27.808	348.102	29.935	150.6519
6/7/2013 14:24	28.808	347.924	29.933	150.5749
6/7/2013 14:25	29.808	347.817	29.931	150.5286
6/7/2013 14:26	30.808	347.675	29.931	150.4671
6/7/2013 14:27	31.808	347.427	29.931	150.3598
6/7/2013 14:28	32.808	347.356	29.931	150.3291
6/7/2013 14:29	33.808	347.178	29.933	150.252
6/7/2013 14:30	34.808	346.965	29.933	150.1599
6/7/2013 14:31	35.808	346.929	29.933	150.1443
6/7/2013 14:32	36.808	346.787	29.933	150.0828
6/7/2013 14:33	37.808	346.645	29.933	150.0214
6/7/2013 14:34	38.808	346.503	29.935	149.9599
6/7/2013 14:35	39.808	346.361	29.937	149.8985
6/7/2013 14:36	40.808	346.219	29.933	149.837
6/7/2013 14:37	41.808	344.656	29.937	149.1606
6/7/2013 14:38	42.808	345.899	29.939	149.6985
6/7/2013 14:39	43.808	345.722	29.937	149.6219
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6/7/2013 14:41	45.808	345.437	29.939	149.4986
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6/7/2013 14:43	47.808	345.189	29.937	149.3912
6/7/2013 14:44	48.808	345.118	29.937	149.3605
6/7/2013 14:45	49.808	344.976	29.939	149.2991
6/7/2013 14:46	50.808	344.798	29.939	149.222
6/7/2013 14:47	51.808	344.691	29.939	149.1757
6/7/2013 14:48	52.808	344.549	29.939	149.1143
6/7/2013 14:49	53.808	344.372	29.939	149.0377
6/7/2013 14:50	54.808	344.834	29.939	149.2376
6/7/2013 14:51	55.808	344.088	29.943	148.9147
6/7/2013 14:52	56.808	343.981	29.939	148.8684
6/7/2013 14:53	57.808	343.839	29.939	148.807
6/7/2013 14:54	58.808	343.697	29.939	148.7455
6/7/2013 14:55	59.808	343.555	29.941	148.6841
6/7/2013 14:56	60.808	343.377	29.941	148.607
6/7/2013 14:57	61.808	343.271	29.941	148.5612
6/7/2013 14:58	62.808	343.093	29.939	148.4841
6/7/2013 14:59	63.808	343.022	29.943	148.4534
6/7/2013 15:00	64.808	342.88	29.941	148.3919
6/7/2013 15:01	65.808	342.702	29.941	148.3149
6/7/2013 15:02	66.808	342.844	29.96	148.3764
6/7/2013 15:03	67.808	342.702	29.954	148.3149
6/7/2013 15:04	68.808	250.494	29.948	108.409
6/7/2013 15:05	69.808	258.327	29.935	111.799
6/7/2013 15:06	70.808	163.487	29.939	70.75407
6/7/2013 15:07	71.808	183.858	29.939	79.57025
6/7/2013 15:08	72.808	145.069	29.939	62.78311
6/7/2013 15:09	73.808	138.673	29.943	60.01504

6/7/2013 15:10	74.808	90.927	29.941	39.35148
6/7/2013 15:11	75.808	87.715	29.941	37.96139
6/7/2013 15:12	76.808	46.165	29.941	19.97933
6/7/2013 15:13	77.808	51.876	29.943	22.45095
6/7/2013 15:14	78.808	24.772	29.945	10.72085
6/7/2013 15:15	79.808	13.358	29.943	5.781089
6/7/2013 15:16	80.808	15.225	29.943	6.589091
6/7/2013 15:17	81.808	1.701	29.943	0.73616
6/7/2013 15:18	82.808	-1.433	29.943	0
6/7/2013 15:19	83.808	-2.278	29.943	0
6/7/2013 15:20	84.808	-2.208	29.943	0
6/7/2013 15:21	85.808	-7.102	29.943	0

Appendix D

RTS and RTS Tool Configuration

RADIOACTIVE TRACER SURVEY LOG

Company	SOUTH DISTRICT W.W.T.P
Well	IW-1
Field	S.D.W.W.T.P
County	MIAMI-DADE
State	FLORIDA

Company SOUTH DISTRICT W.W.T.P
Well IW-1
Field S.D.W.W.T.P
County MIAMI-DADE
State FLORIDA

Location: API # :

Other Services
SEE COMMENTS

	SEC	TWP	RGE	Elevation
Permanent Datum		GL		
Log Measured From		GL		K.B.
Drilling Measured From		GL		D.F.
				G.L.

Date	14-JUN-2013		
Run Number	MIT		
Depth Driller	2933'		
Depth Logger	2939'		
Bottom Logged Interval	2939'		
Top Log Interval	SURFACE		
Open Hole Size	24"		
Type Fluid	WATER		
Density / Viscosity	NA		
Max. Recorded Temp.	81.2 degF		
Estimated Cement Top	NA		
Time Well Ready	ON ARRIVAL		
Time Logger on Bottom	0800		
Equipment Number	103		
Location	FT. MYERS		
Recorded By	MARTINEZ	MOREY	RIVES
Witnessed By	S. VILLAMIL	J. MAY	

Borehole Record				Borehole Record			
Run Number	Bit	From	To	Run No	Bit	From	To
ONE	24"	CASING	2628'				

Casing Record	Size	Wgt/Ft	Top	Bottom
Surface String				
Prot. String				
Production String				
Liner	24"	.500 W.T	SURFACE	2928'

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

Comments

HIGH RESOLUTION TEMPERATURE

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)

GR#3	24.00				
		GR #3 -RTST (952T)	11.50	1.69	30.00
		TREJCT-A (952)	1.00	1.69	10.00
		GR #2 -RTSM (952M)	3.00	1.69	10.00
GR#2	10.50				
CCL	9.60	CCL-1.68GRRTS (952)	0.75	1.69	10.00
		GR-RTSB (952B)	9.25	1.69	10.00
GR	1.20				

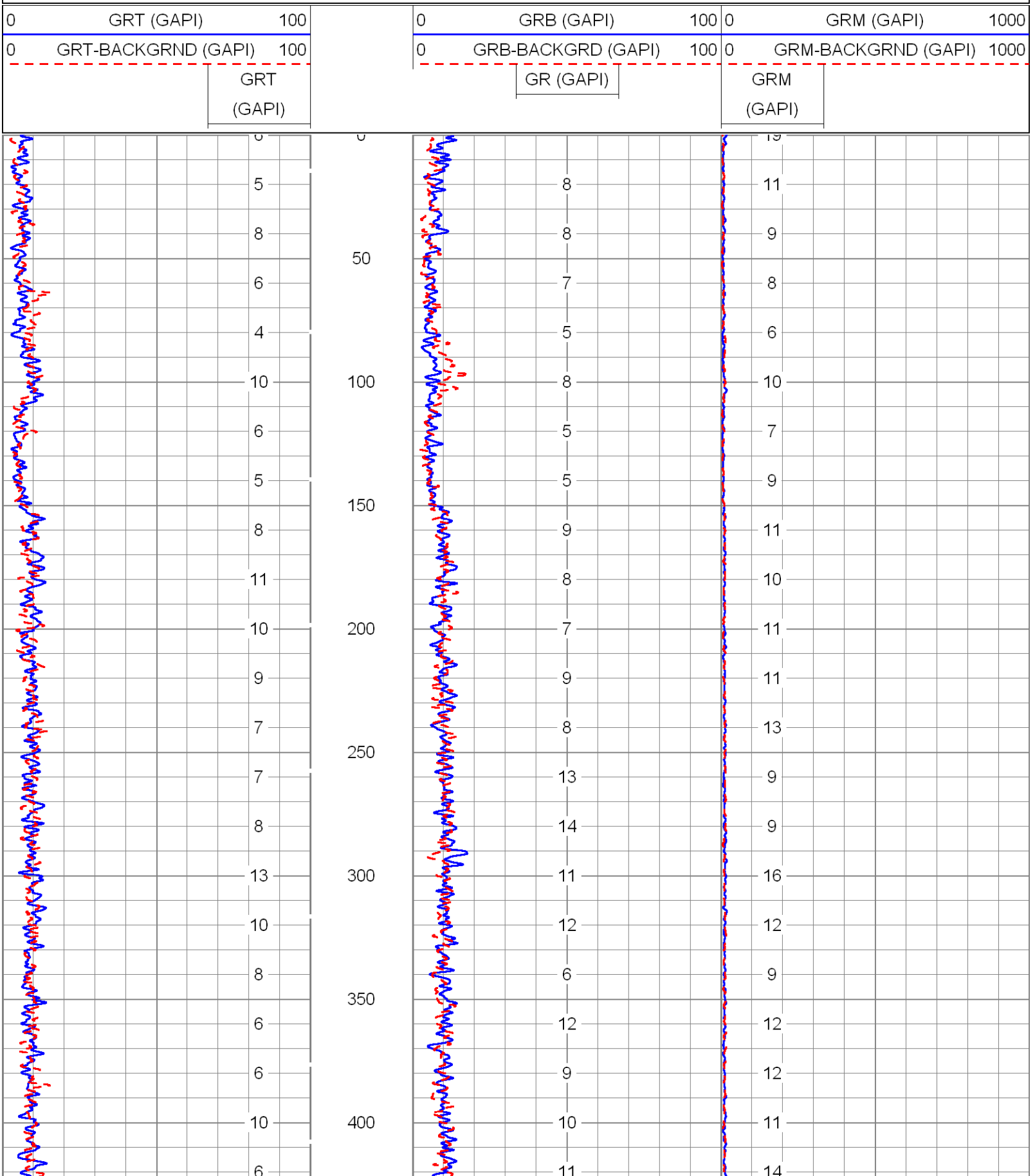
Dataset: sdwwtp-iw1.db: field/well/run1/pass2
Total Length: 25.50 ft
Total Weight: 70.00 lb
O.D. 1.69 in

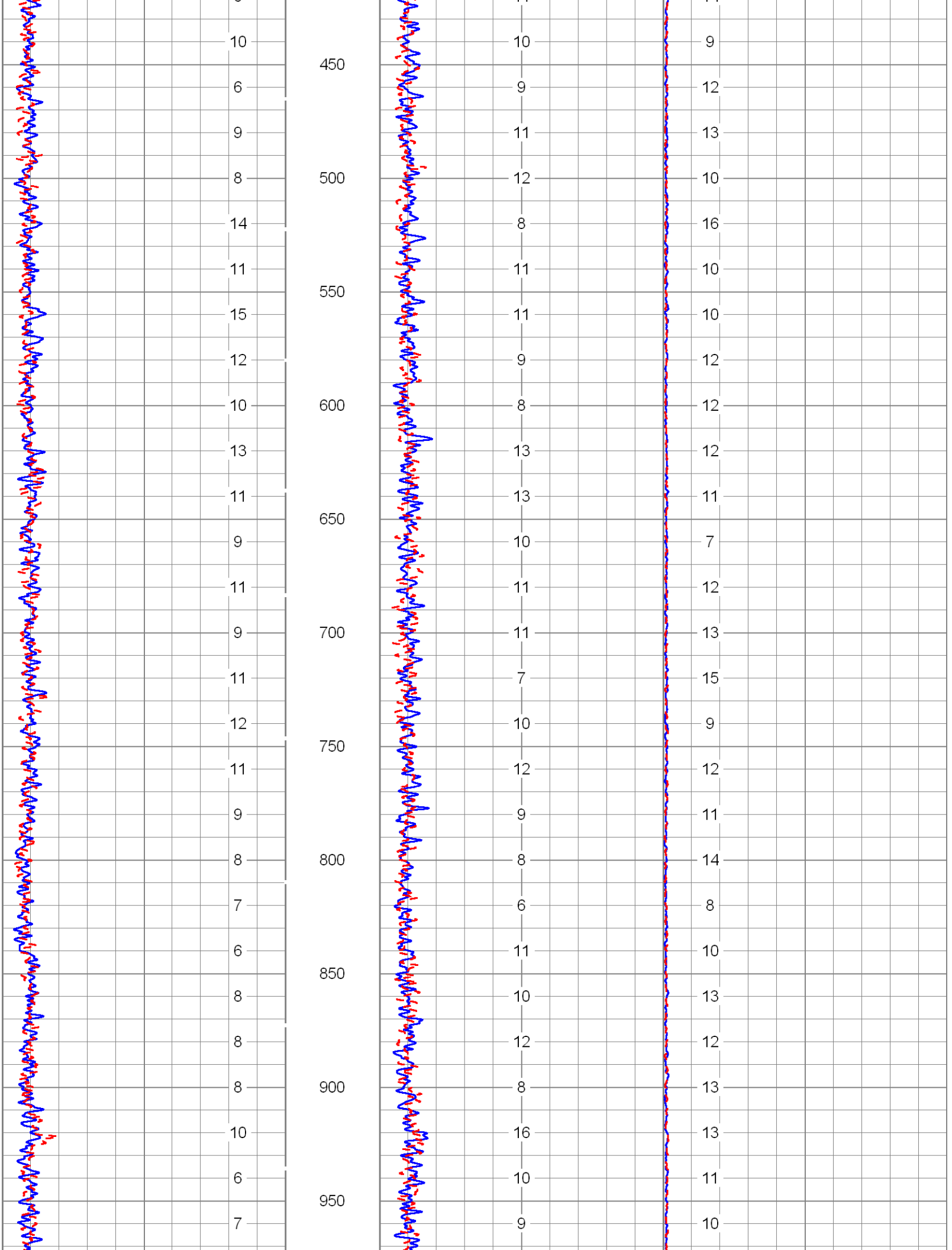
YOUNGQUIST

FINAL GAMMA RAY

FINAL GAMMA RAY

Database File:	sdwwtp-iw1.db
Dataset Pathname:	pass9
Presentation Format:	rts
Dataset Creation:	Fri Jun 14 14:08:38 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:600

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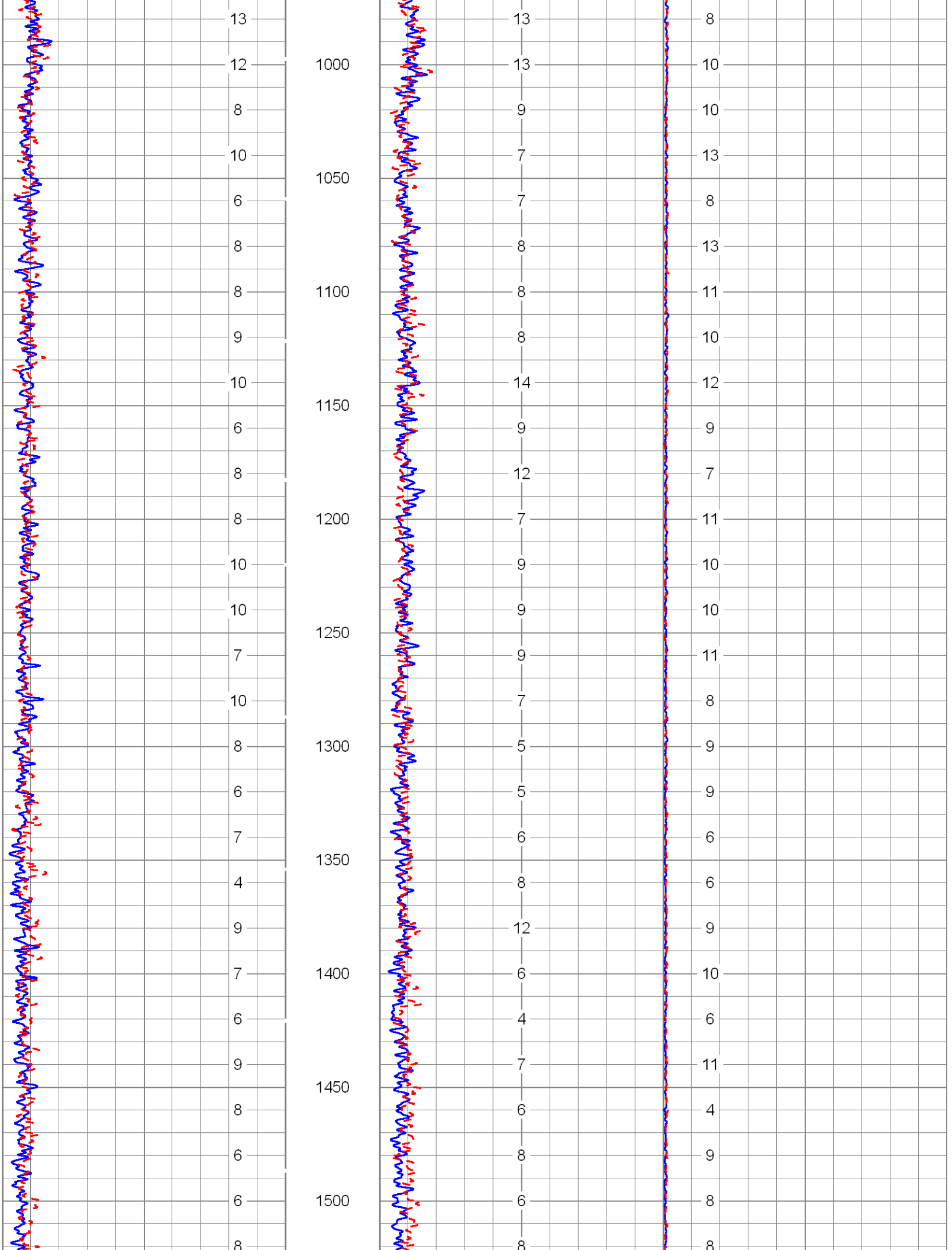
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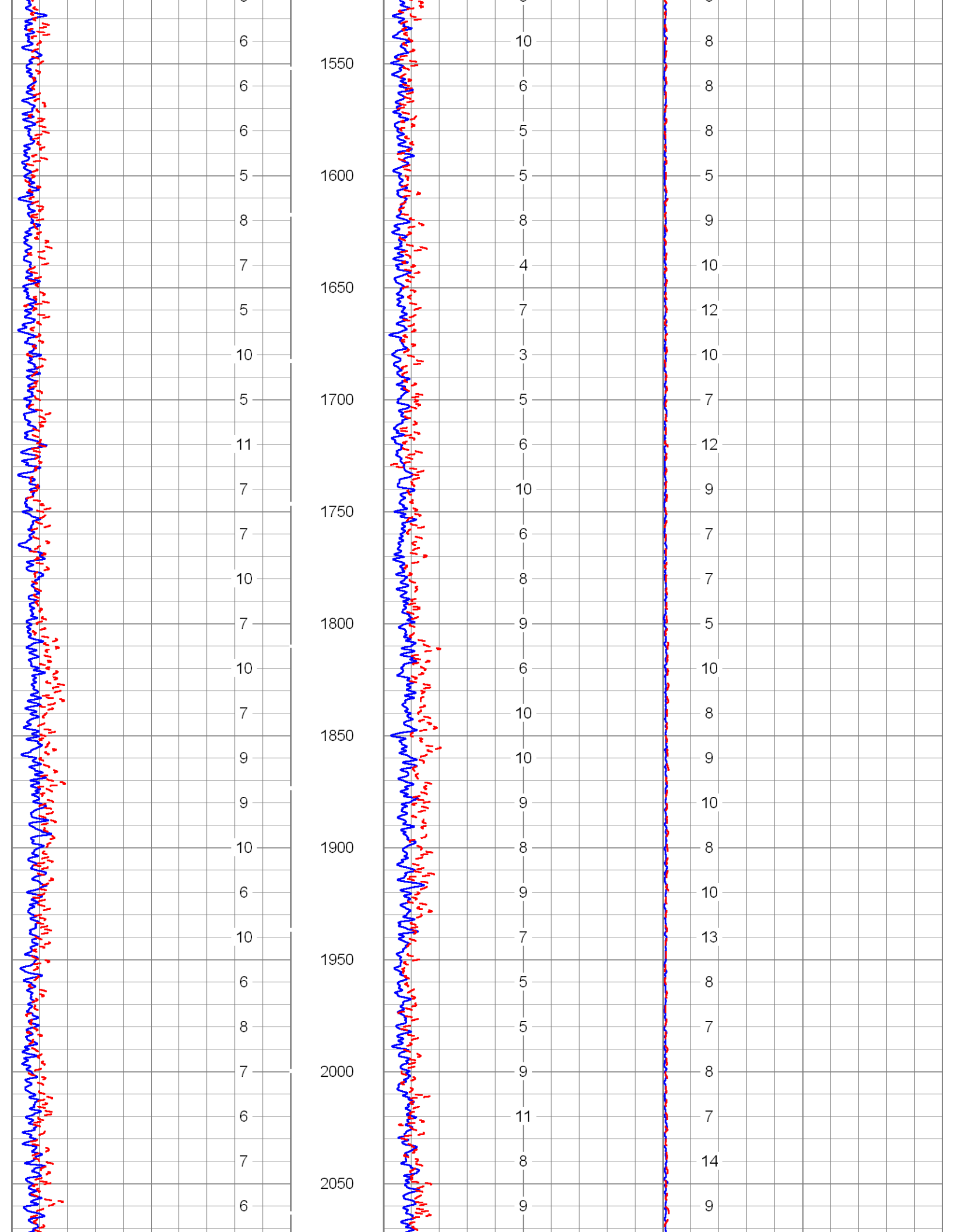
6 1550 10 8
6 6 8
6 5 8
5 1600 5 5
8 8 9
7 4 10
1650
5 7 12
10 3 10
5 1700 5 7
11 6 12
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1750
7 6 7
10 8 7
7 1800 9 5
10 6 10
7 10 8
1850
9 10 9
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10 7 13
1950
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8 5 7
7 2000 9 8
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7 8 14
2050
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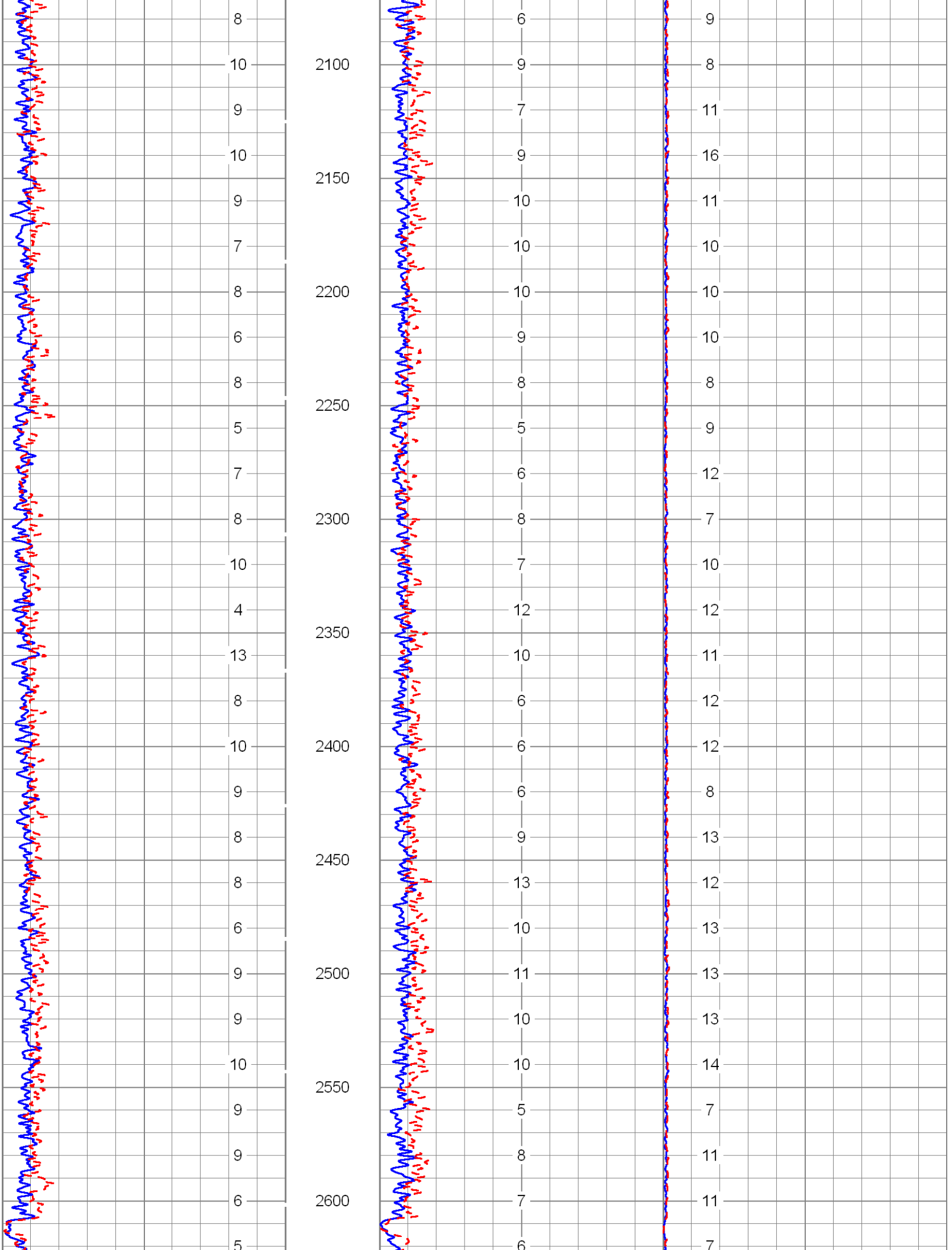
8 6 9
10 2100 9 8
9 7 11
10 9 16
2150
9 10 11
7 10 10
8 2200 10 10
6 9 10
8 8 8
2250
5 5 9
7 6 12
8 2300 8 7
10 7 10
4 12 12
2350
13 10 11
8 6 12
10 2400 6 12
9 6 8
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2450
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6 10 13
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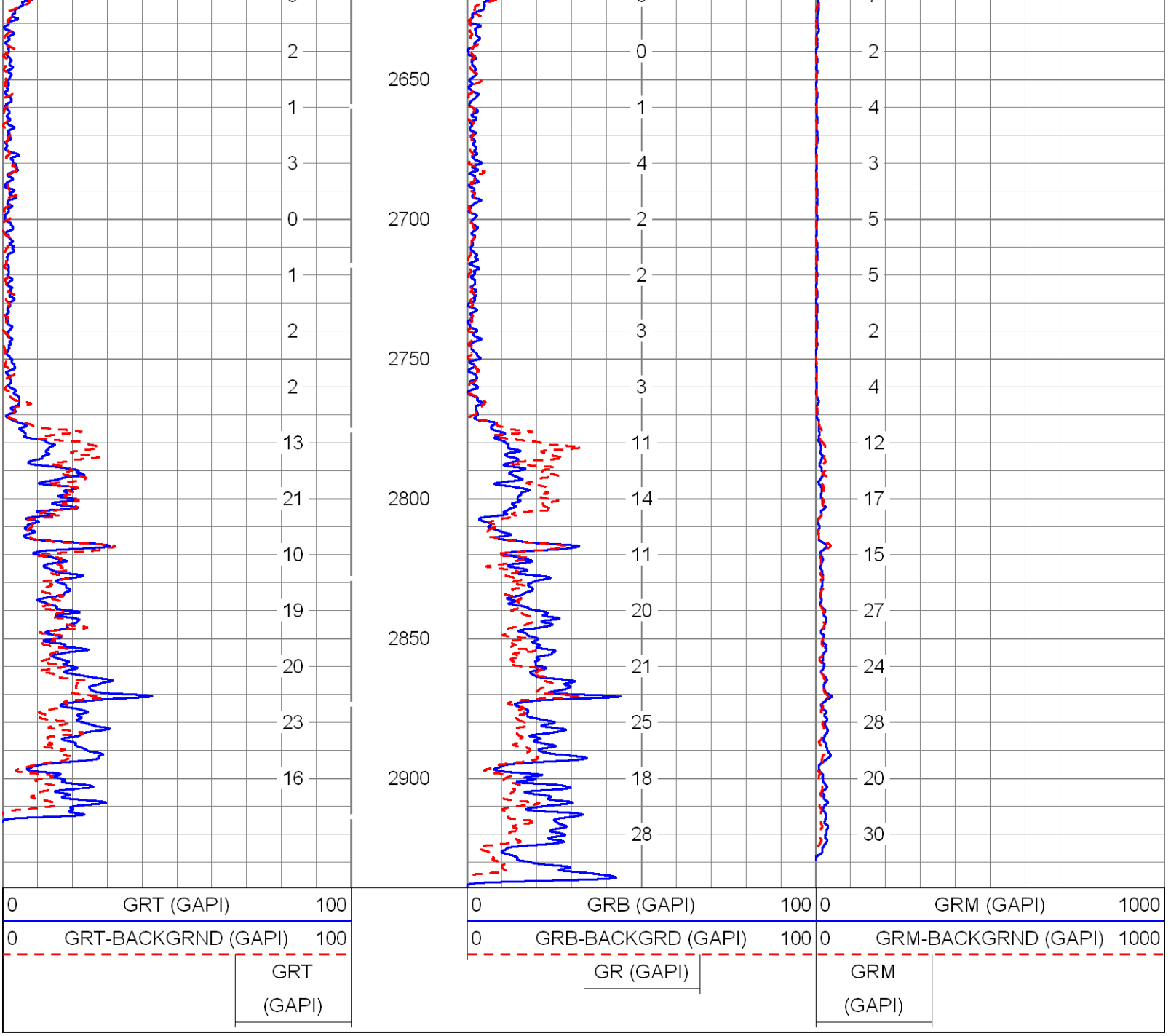
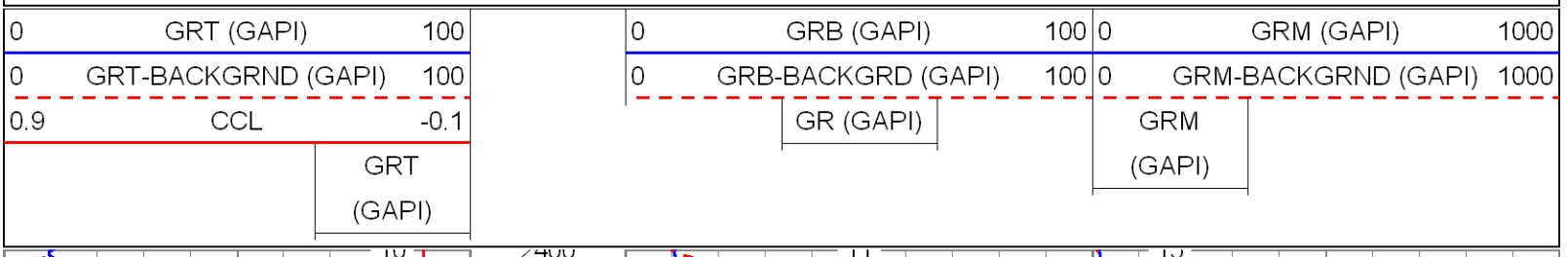
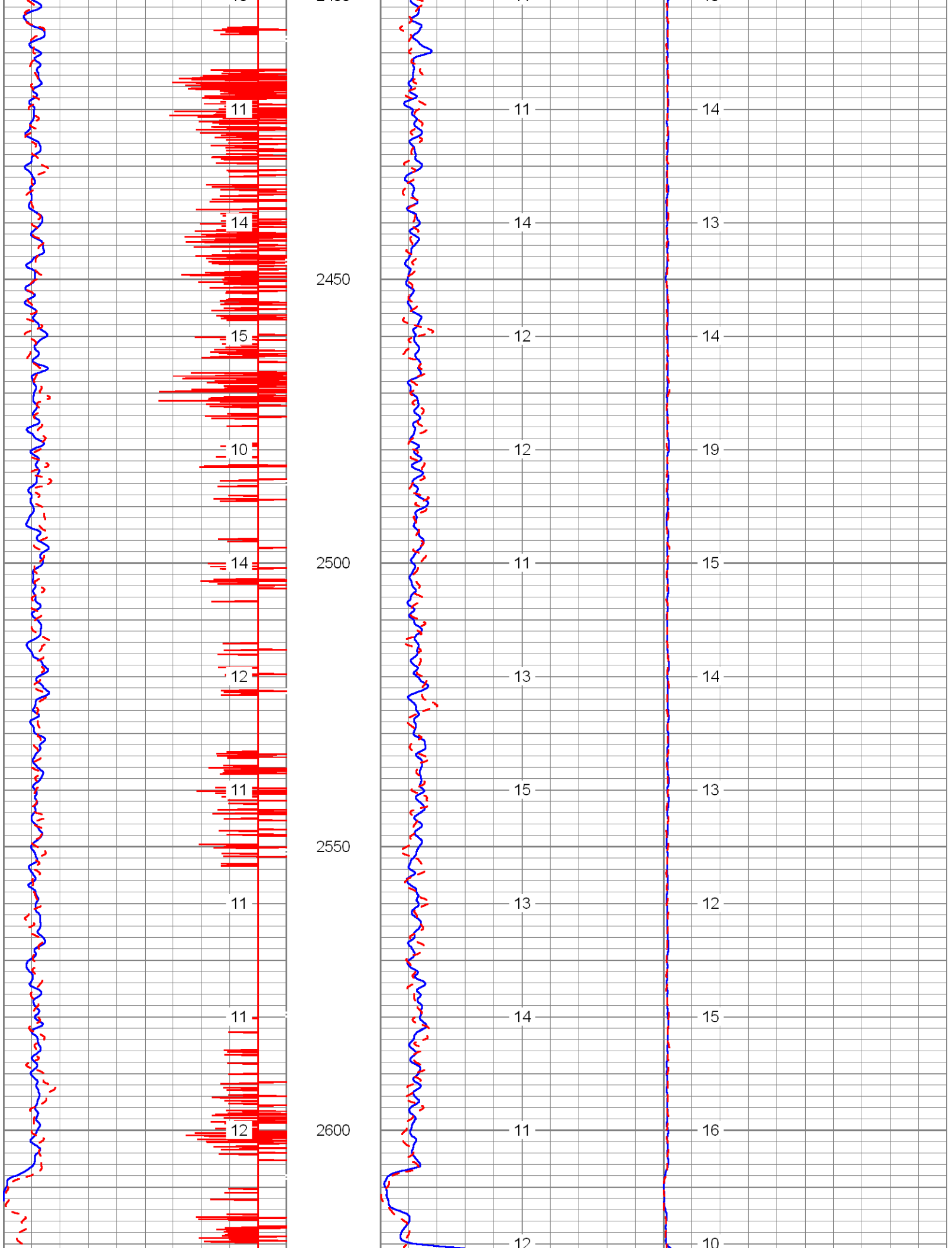
9 10 13
10 10 14
2550
9 5 7
9 8 11
6 2600 7 11
5 6 7



LOP #2

Database File:	sdwwtp-iw1.db
Dataset Pathname:	pass8
Presentation Format:	rts
Dataset Creation:	Fri Jun 14 13:06:57 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:240





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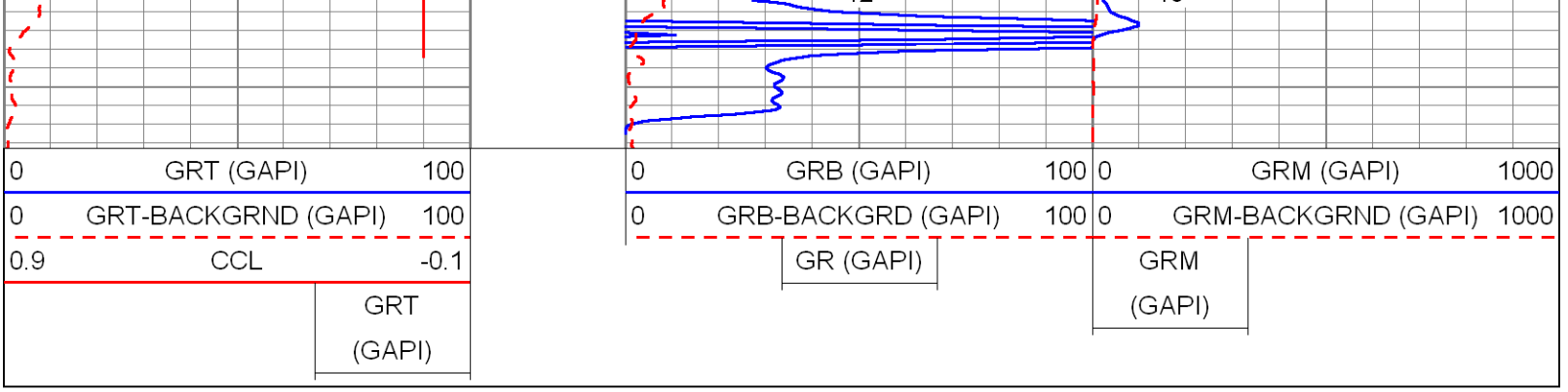
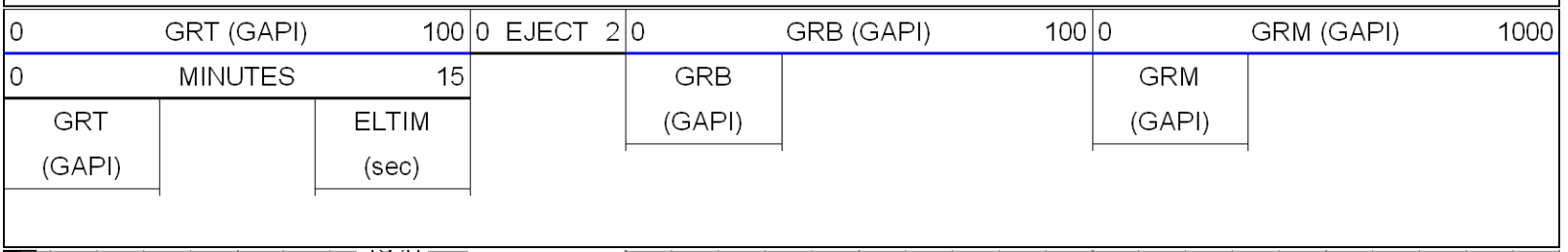
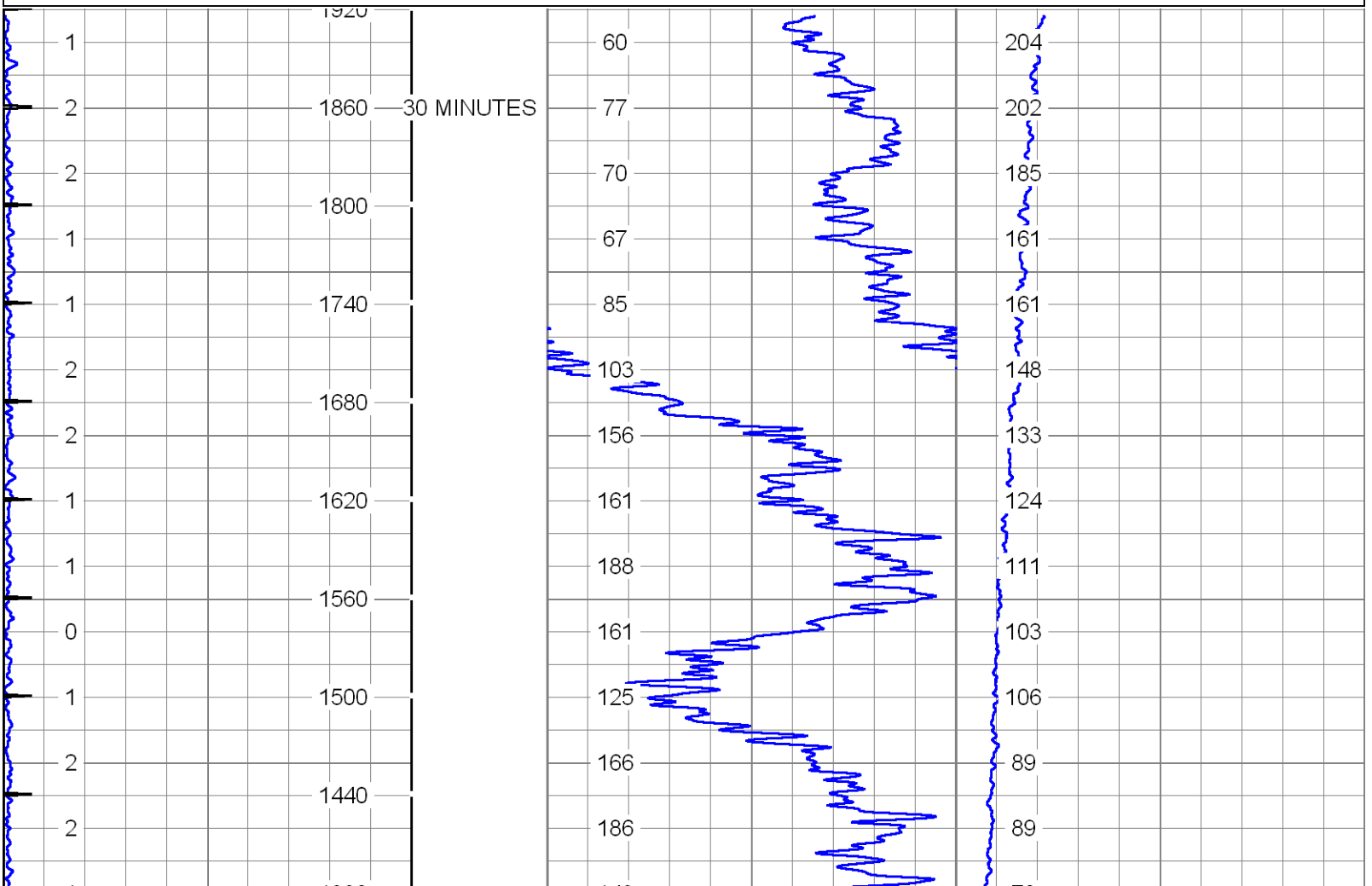
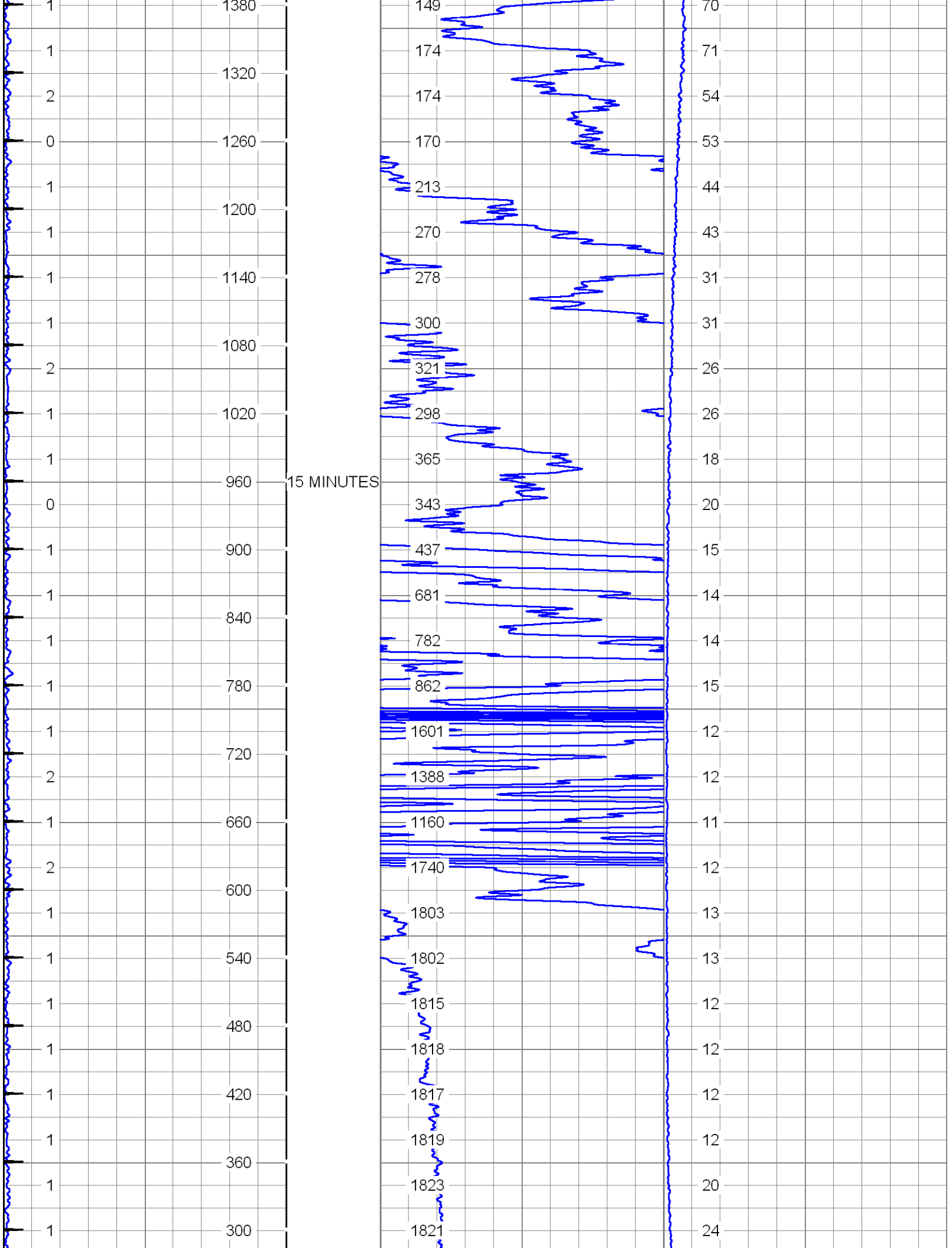


DYNAMIC TEST #2 (93GPM)

Database File:	sdwwtp-iw1.db
Dataset Pathname:	pass7
Presentation Format:	rtstime
Dataset Creation:	Fri Jun 14 12:33:31 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:600



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681
782
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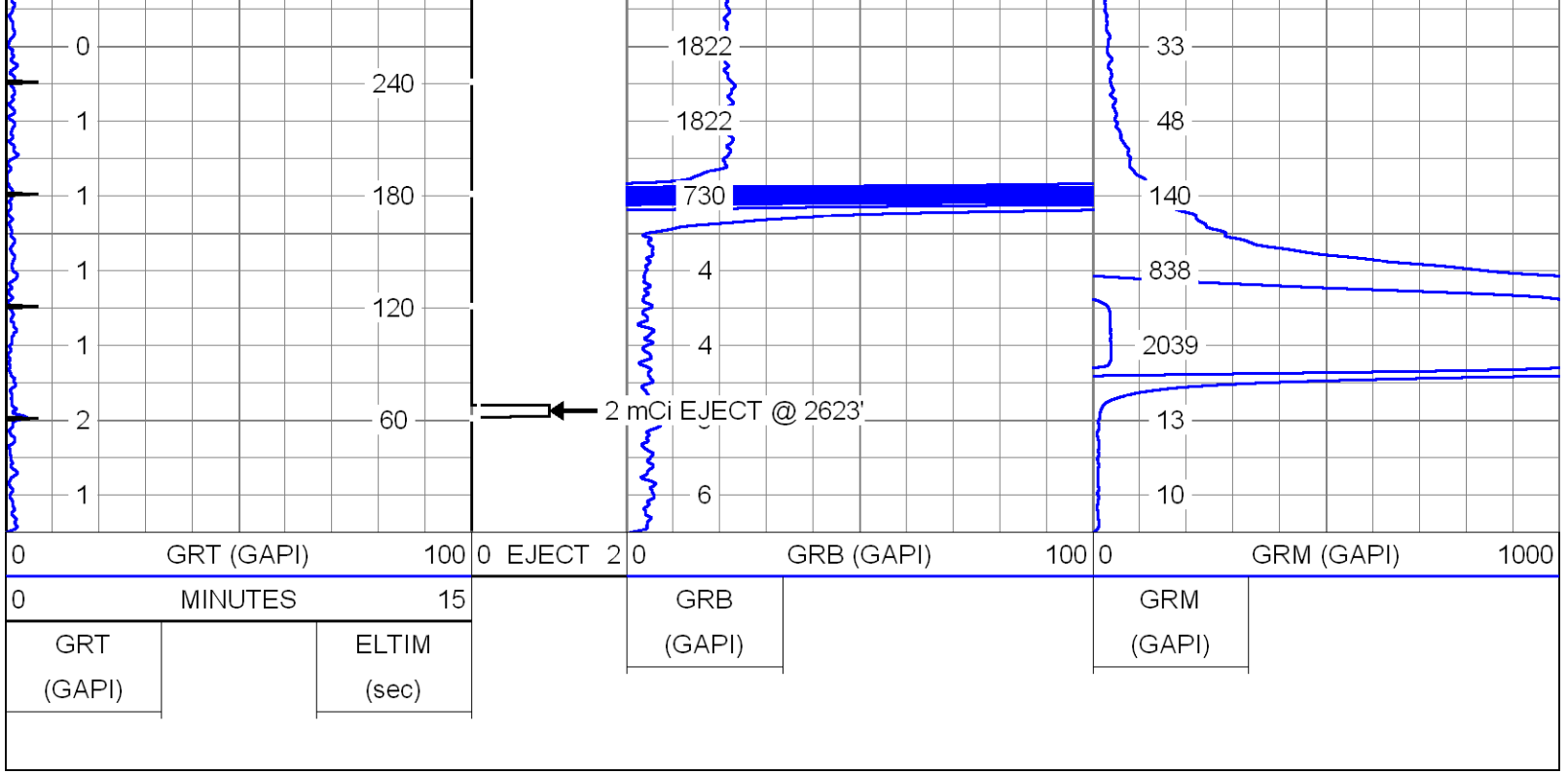
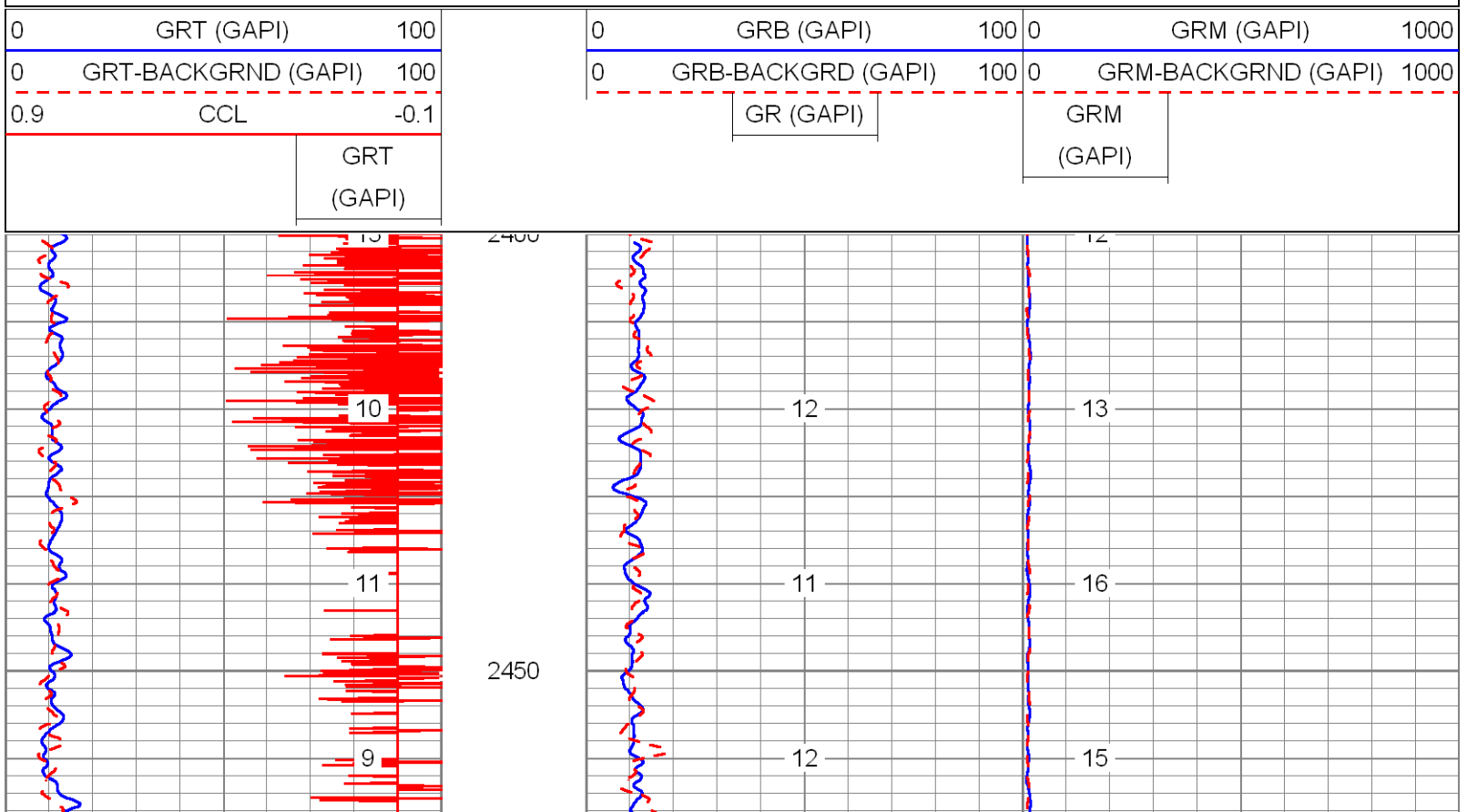
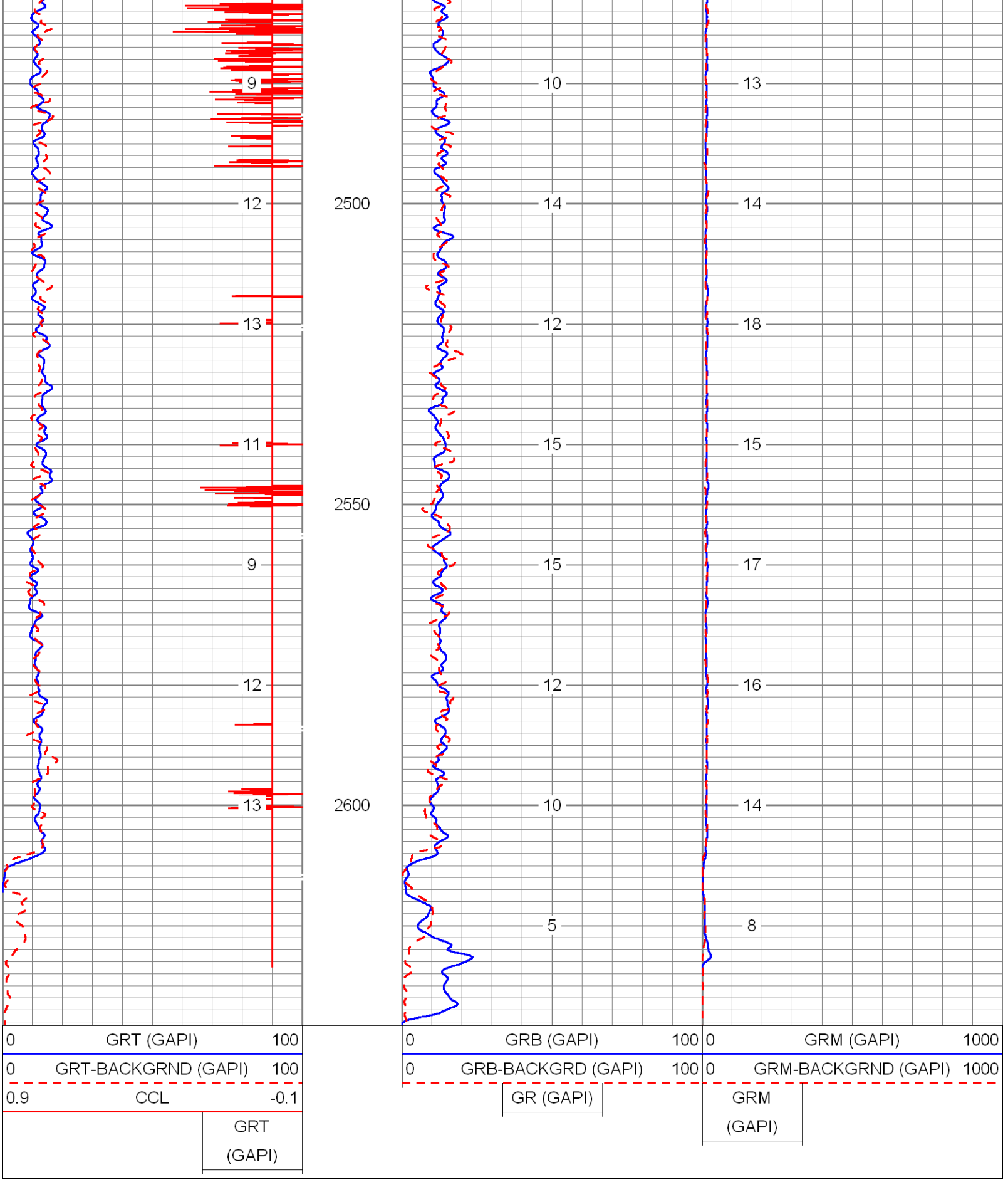


LOP #1

Database File:	sdwwtp-iw1.db
Dataset Pathname:	pass6
Presentation Format:	rts
Dataset Creation:	Fri Jun 14 12:16:41 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:240

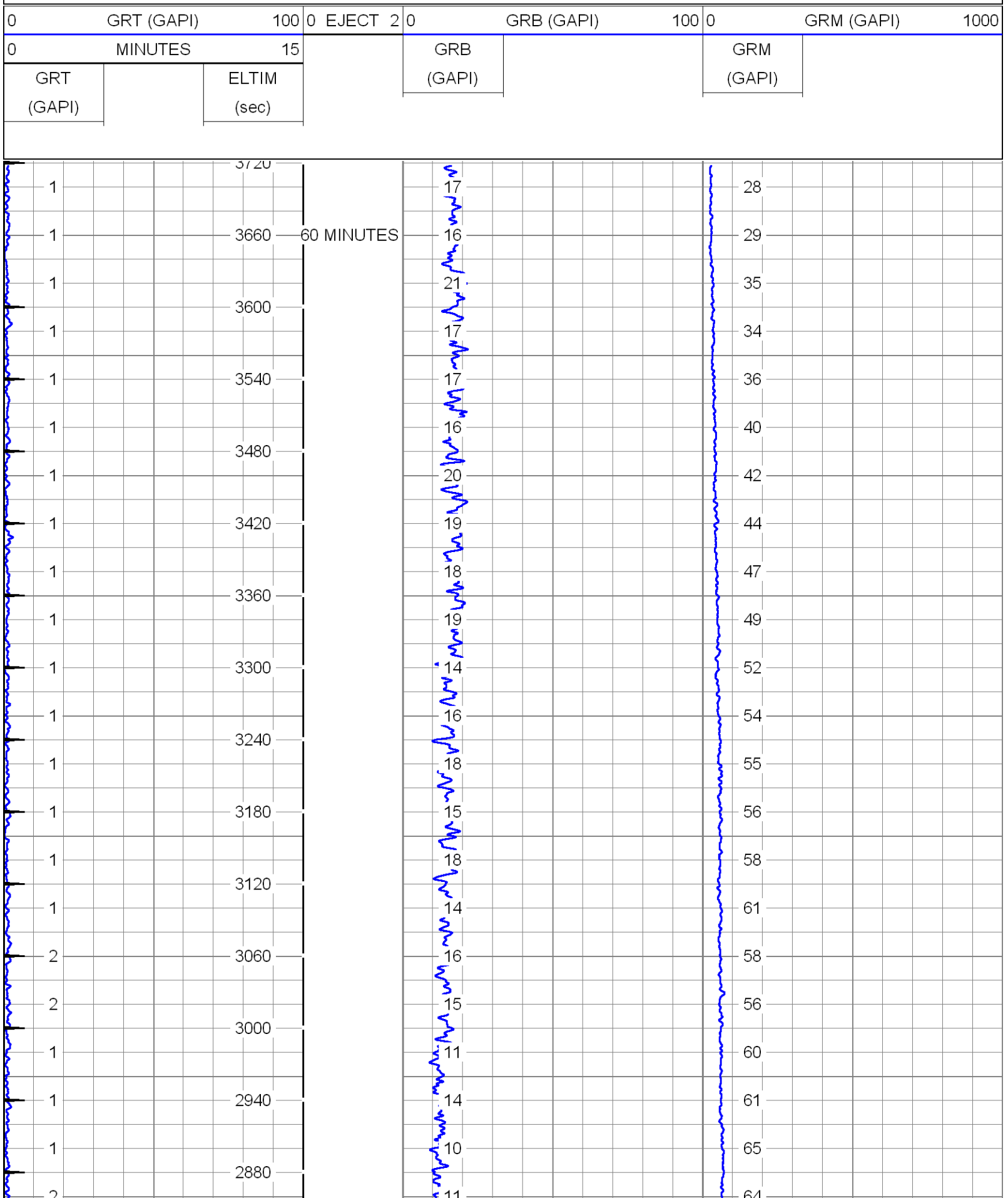


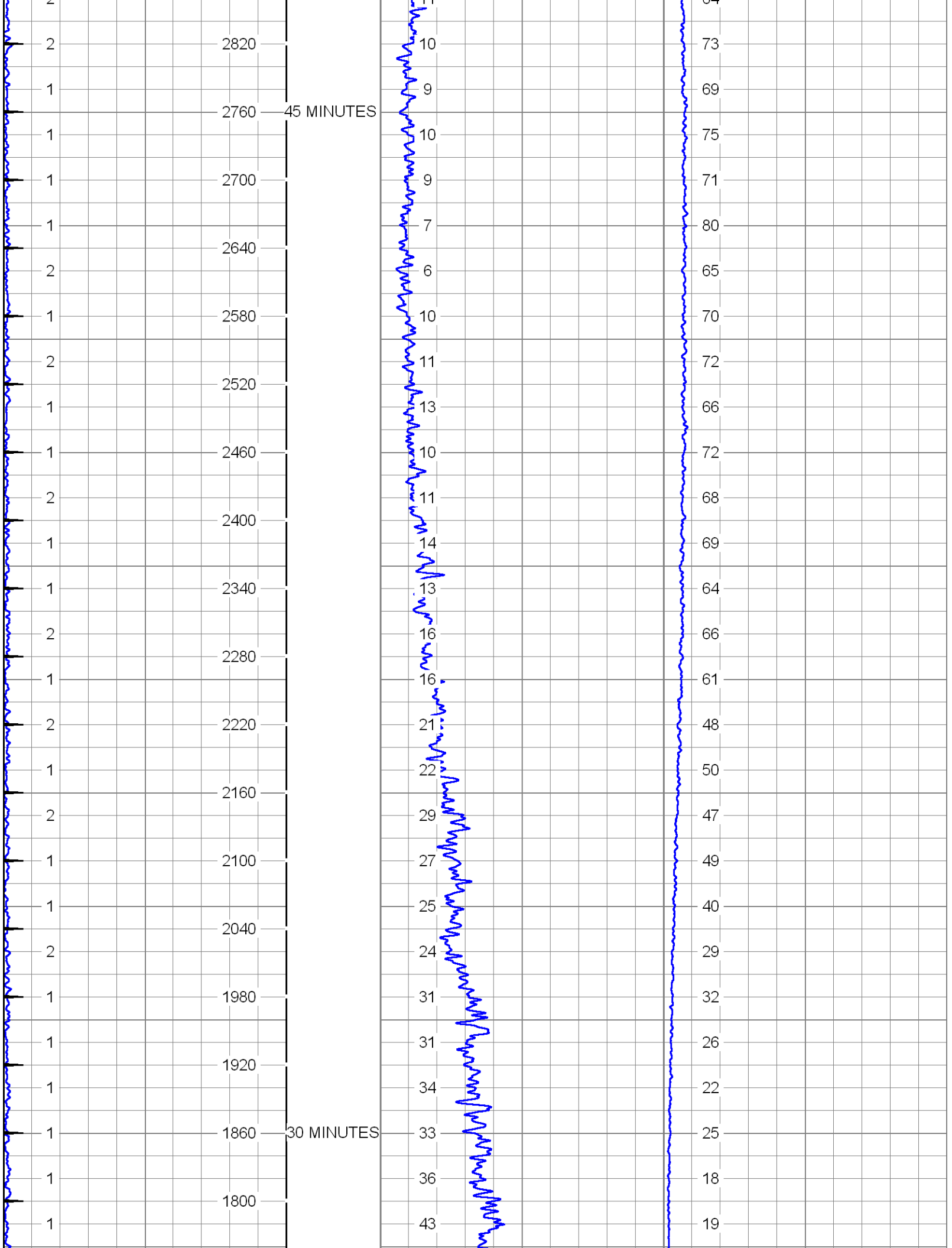


YOUNGQUIST BROTHERS

DYNAMIC TEST #1 (92GPM)

Database File: sdwwtp-iw1.db
Dataset Pathname: pass5
Presentation Format: rtstime
Dataset Creation: Fri Jun 14 11:14:15 2013 by Log SOC 110722
Charted by: Depth in Feet scaled 1:600




2820
2760
45 MINUTES
2700
2640
2580
2520
2460
2400
2340
2280
2220
2160
2100
2040
1980
1920
1860
30 MINUTES
1800
10
9
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6
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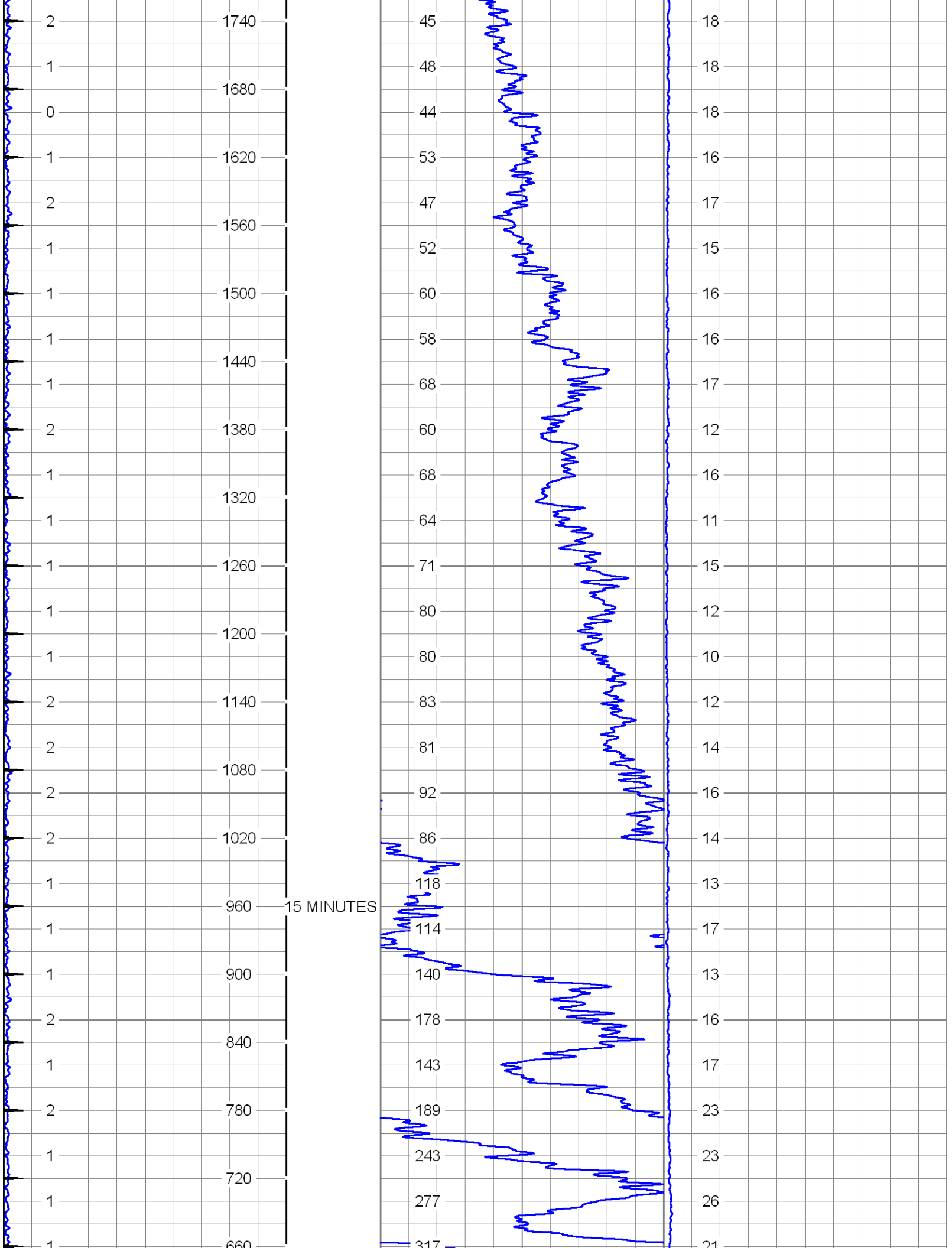
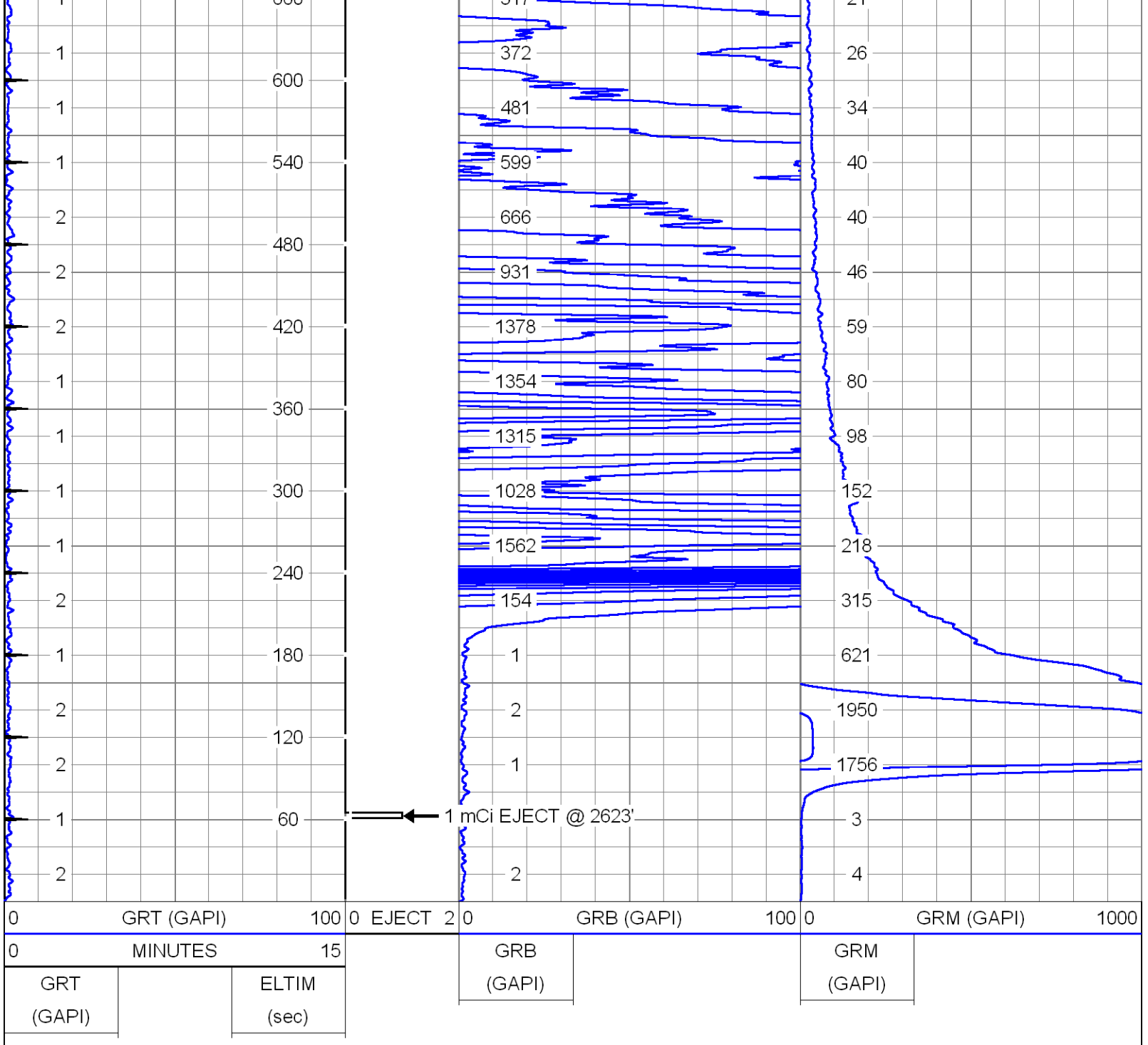
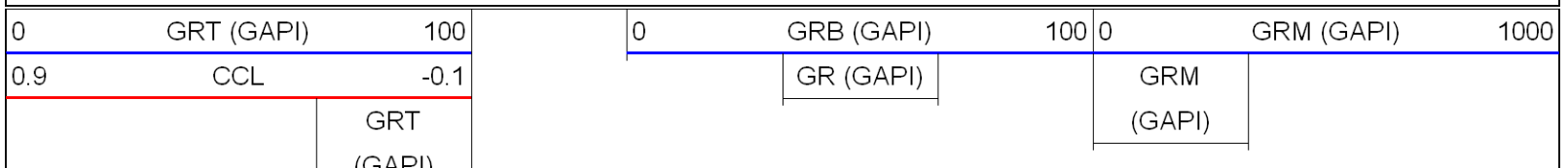
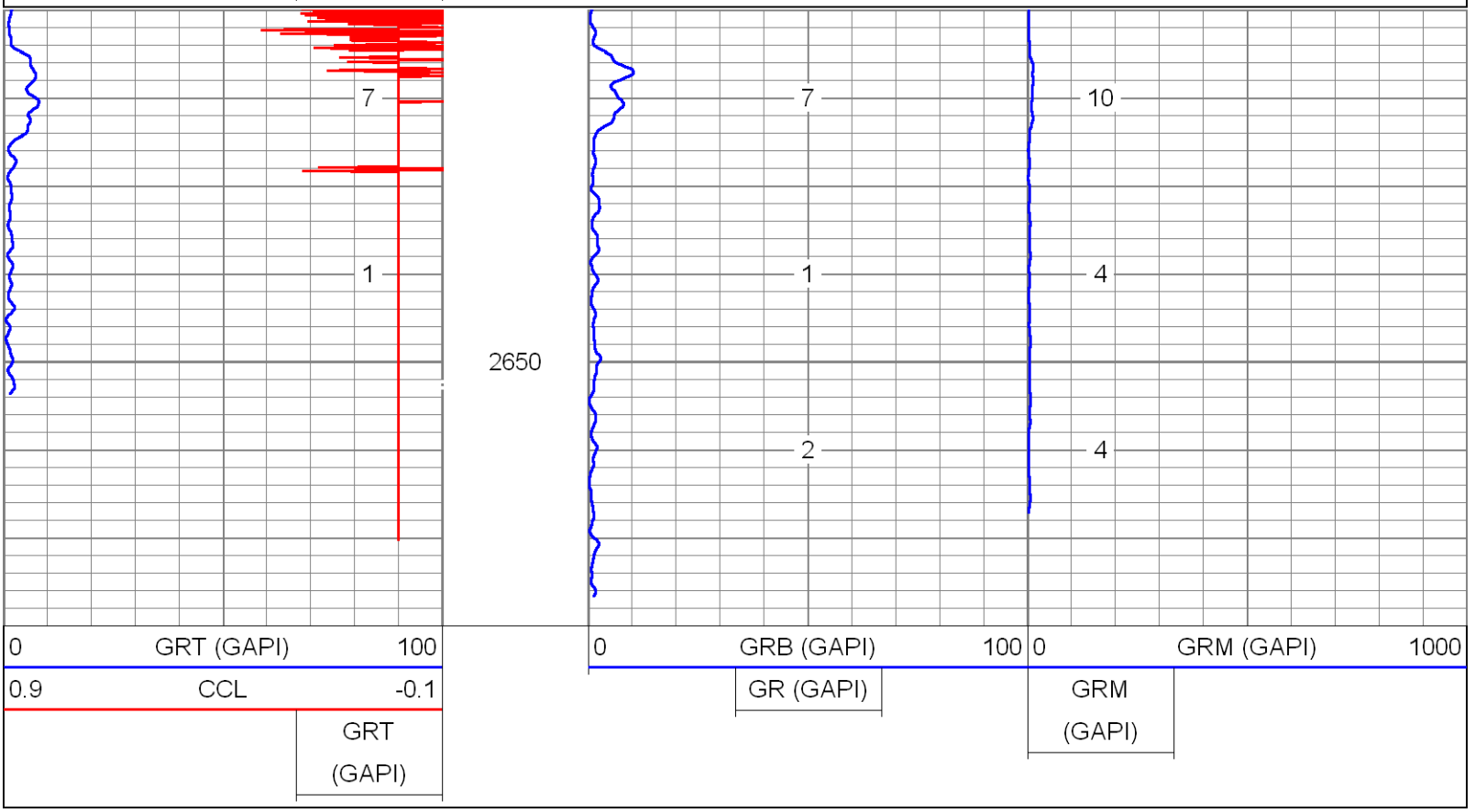

15 MINUTES



CASING TIE-IN

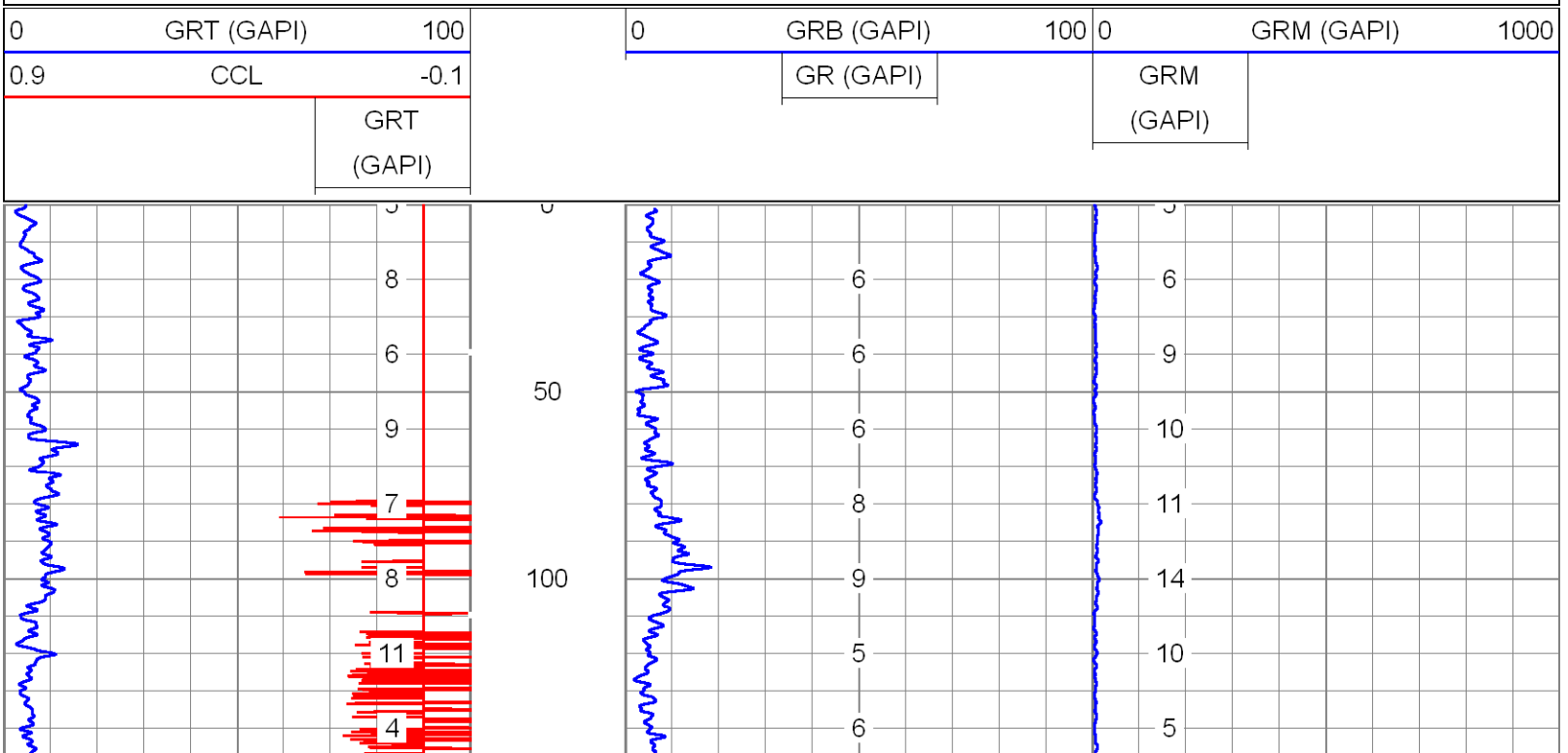
Database File:	sdwwtp-iw1.db
Dataset Pathname:	pass4
Presentation Format:	rts
Dataset Creation:	Fri Jun 14 10:40:40 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:240

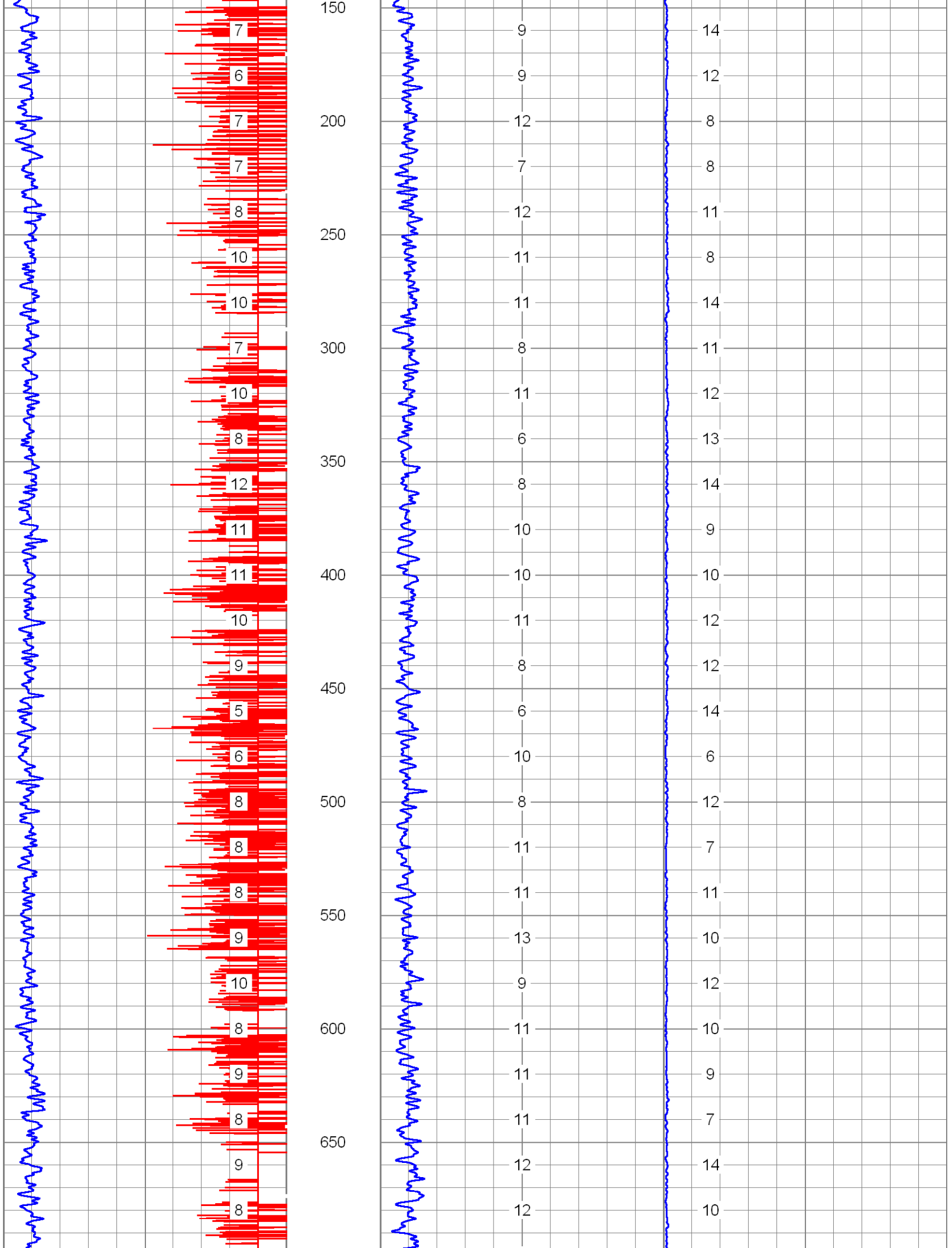




BACKGROUND GAMMA RAY

Database File:	sdwwtp-iw1.db
Dataset Pathname:	pass2
Presentation Format:	rts
Dataset Creation:	Fri Jun 14 09:02:05 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:600

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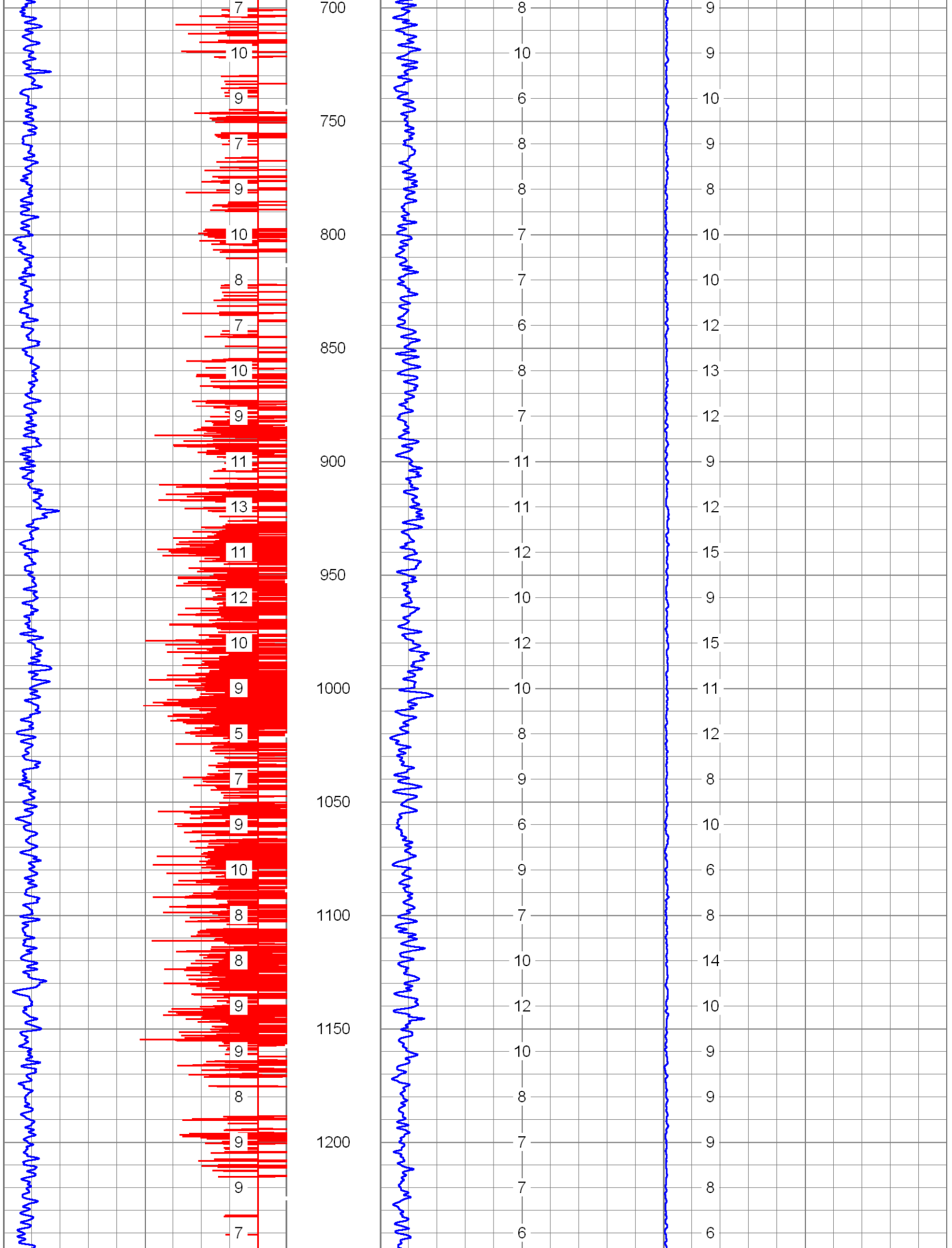
10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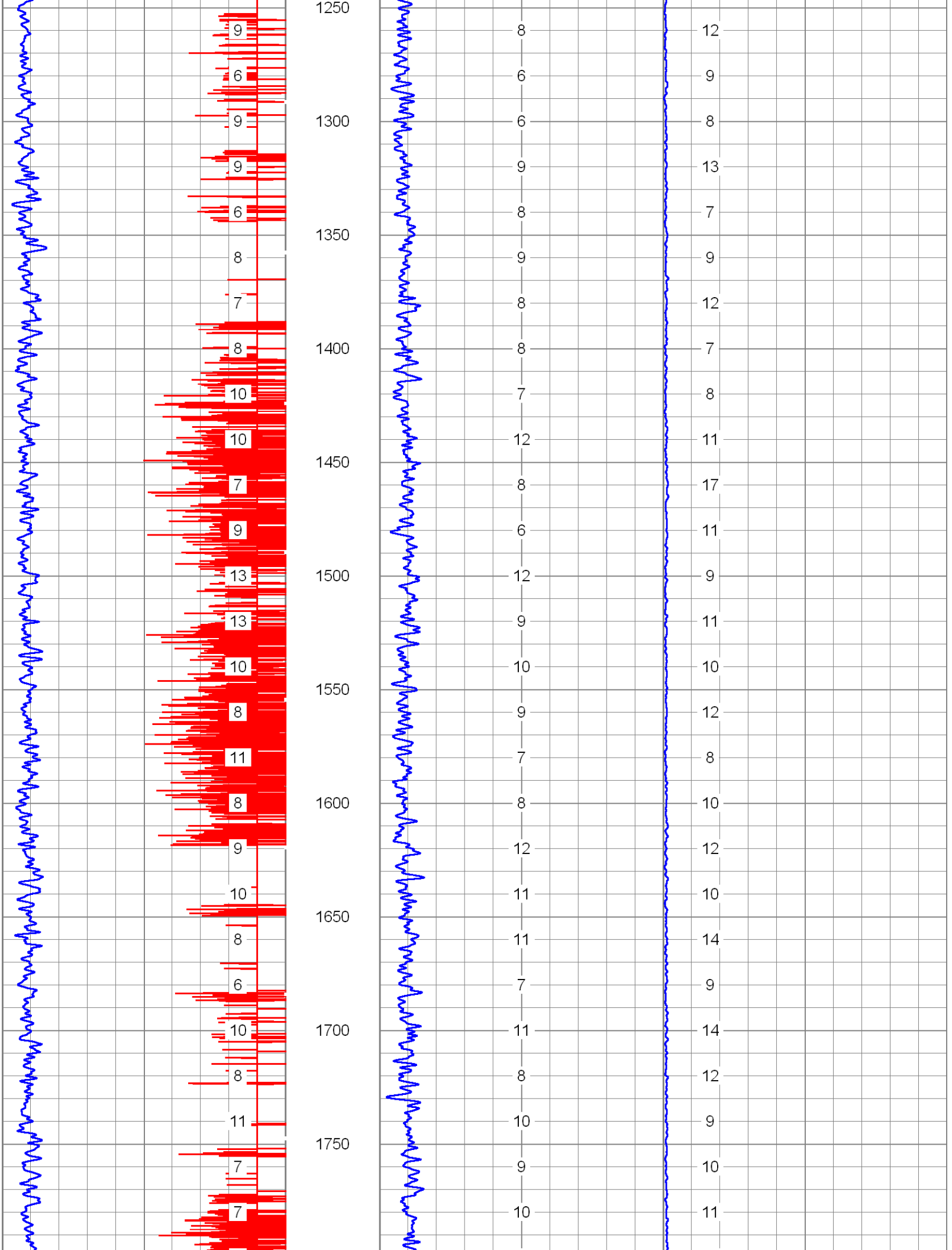
750
800
850
900
950
1000
1050
1100
1150
1200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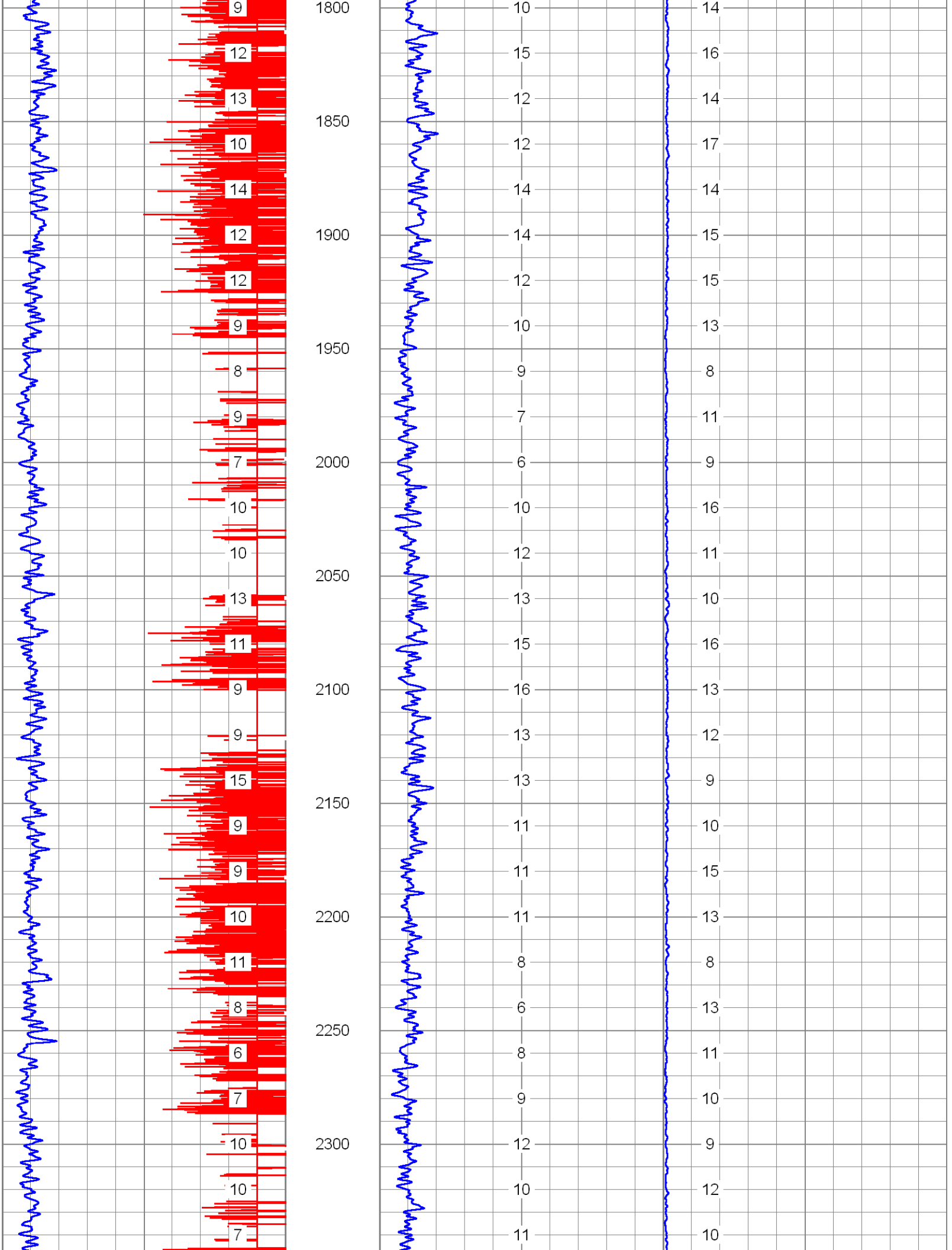
1300
1350
1400
1450
1500
1550
1600
1650
1700
1750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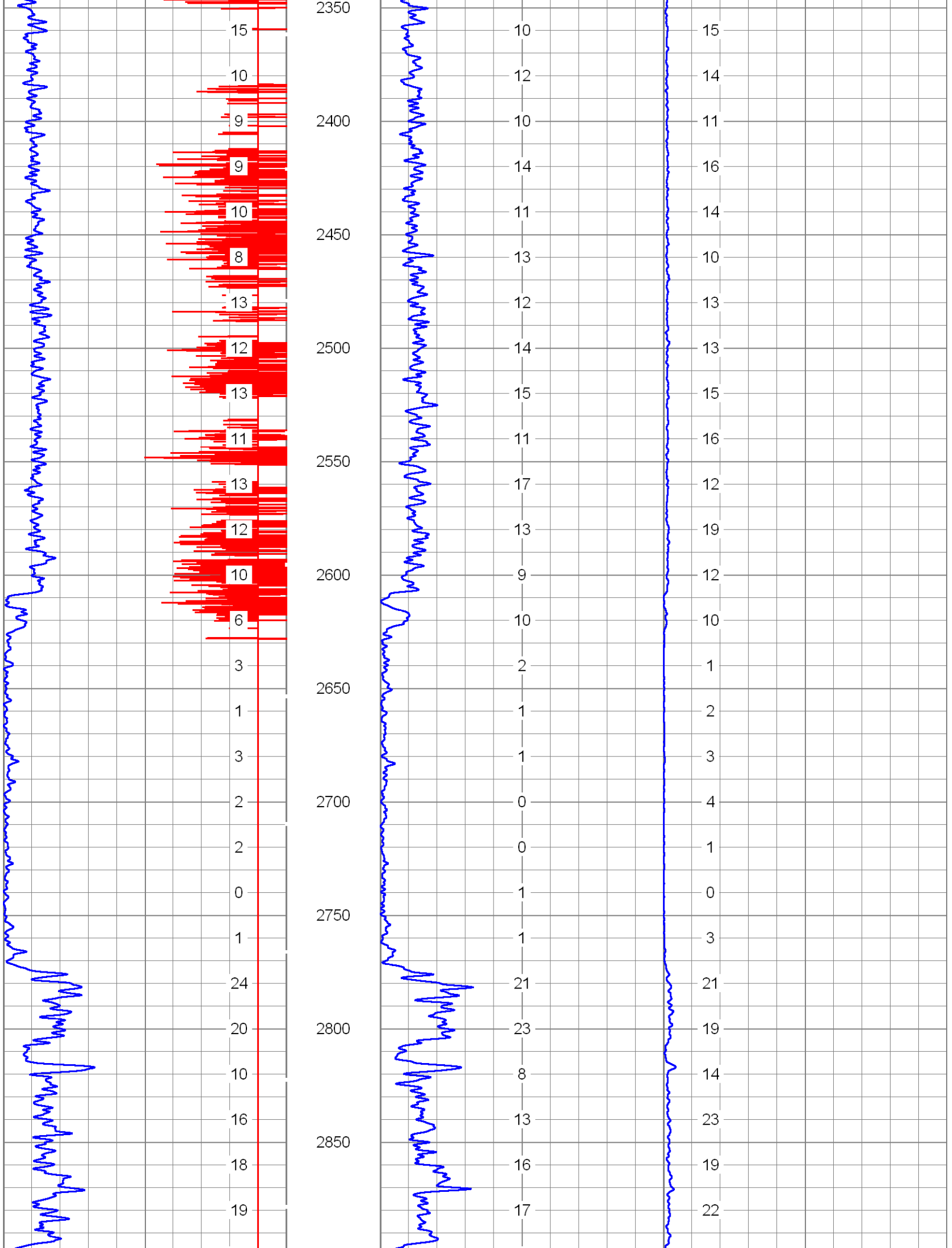
1850
1900
1950
2000
2050
2100
2150
2200
2250
2300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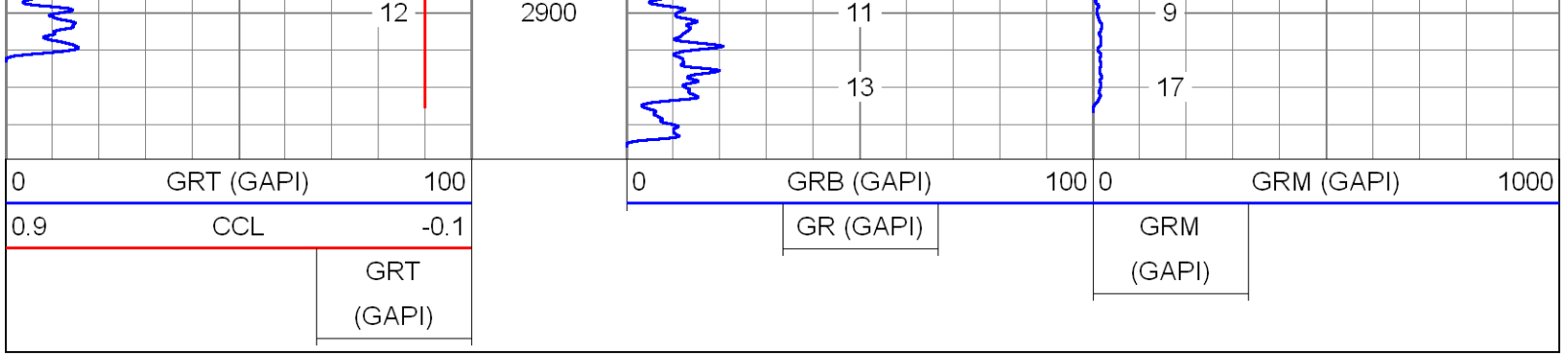
2550
2600
2650
2700
2750
2800
2850



Calibration Report

Database File: sdwwtp-iw1.db
Dataset Pathname: pass2
Dataset Creation: Fri Jun 14 09:02:05 2013 by Log SOC 110722

Gamma Ray Calibration Report

Serial Number:	952B	
Tool Model:	RTSB	
Performed:	Fri Jun 14 07:41:09 2013	
Calibrator Value:	90.0	GAPI
Background Reading:	30.7	cps
Calibrator Reading:	189.6	cps
Sensitivity:	0.5664	GAPI/cps

Gamma Ray Calibration Report

Serial Number:	952M	
Tool Model:	RTSM	
Performed:	Fri Jun 14 07:42:39 2013	
Calibrator Value:	90.0	GAPI
Background Reading:	32.0	cps
Calibrator Reading:	174.2	cps
Sensitivity:	0.6329	GAPI/cps

Gamma Ray Calibration Report

Serial Number:	952T	
Tool Model:	RTST	
Performed:	Fri Jun 14 07:44:18 2013	
Calibrator Value:	90.0	GAPI
Background Reading:	28.8	cps
Calibrator Reading:	195.8	cps
Sensitivity:	0.5388	GAPI/cps

Appendix E

Temperature Log

HIGH RESOLUTION TEMPERATURE LOG

Company	SOUTH DISTRICT W.W.T.P
Well	IW-1
Field	S.D.W.W.T.P
County	MIAMI-DADE
State	FLORIDA

Company SOUTH DISTRICT W.W.T.P
Well IW-1
Field S.D.W.W.T.P
County MIAMI-DADE
State FLORIDA

Location: API # :

SEC TWP RGE

Other Services
SEE COMMENTS

Permanent Datum	GL	Elevation
Log Measured From	GL	
Drilling Measured From	GL	

Elevation
K.B.
D.F.
G.L.

Date	14-JUN-2013		
Run Number	MIT		
Depth Driller	2933'		
Depth Logger	2939'		
Bottom Logged Interval	2939'		
Top Log Interval	SURFACE		
Open Hole Size	24"		
Type Fluid	WATER		
Density / Viscosity	NA		
Max. Recorded Temp.	81.2 degF		
Estimated Cement Top	NA		
Time Well Ready	ON ARRIVAL		
Time Logger on Bottom	0800		
Equipment Number	103		
Location	FT. MYERS		
Recorded By	MARTINEZ	MOREY	RIVES
Witnessed By	S. VILLAMIL	J. MAY	M. MACFARLANE

Borehole Record				Borehole Record			
Run Number	Bit	From	To	Run No	Bit	From	To
ONE	24"	CASING	2939'				

Casing Record	Size	Wgt/Ft	Top	Bottom
Surface String				
Prot. String				
Production String				
Liner	24"	.500 W.T	SURFACE	2628'

<< Fold Here >>>

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

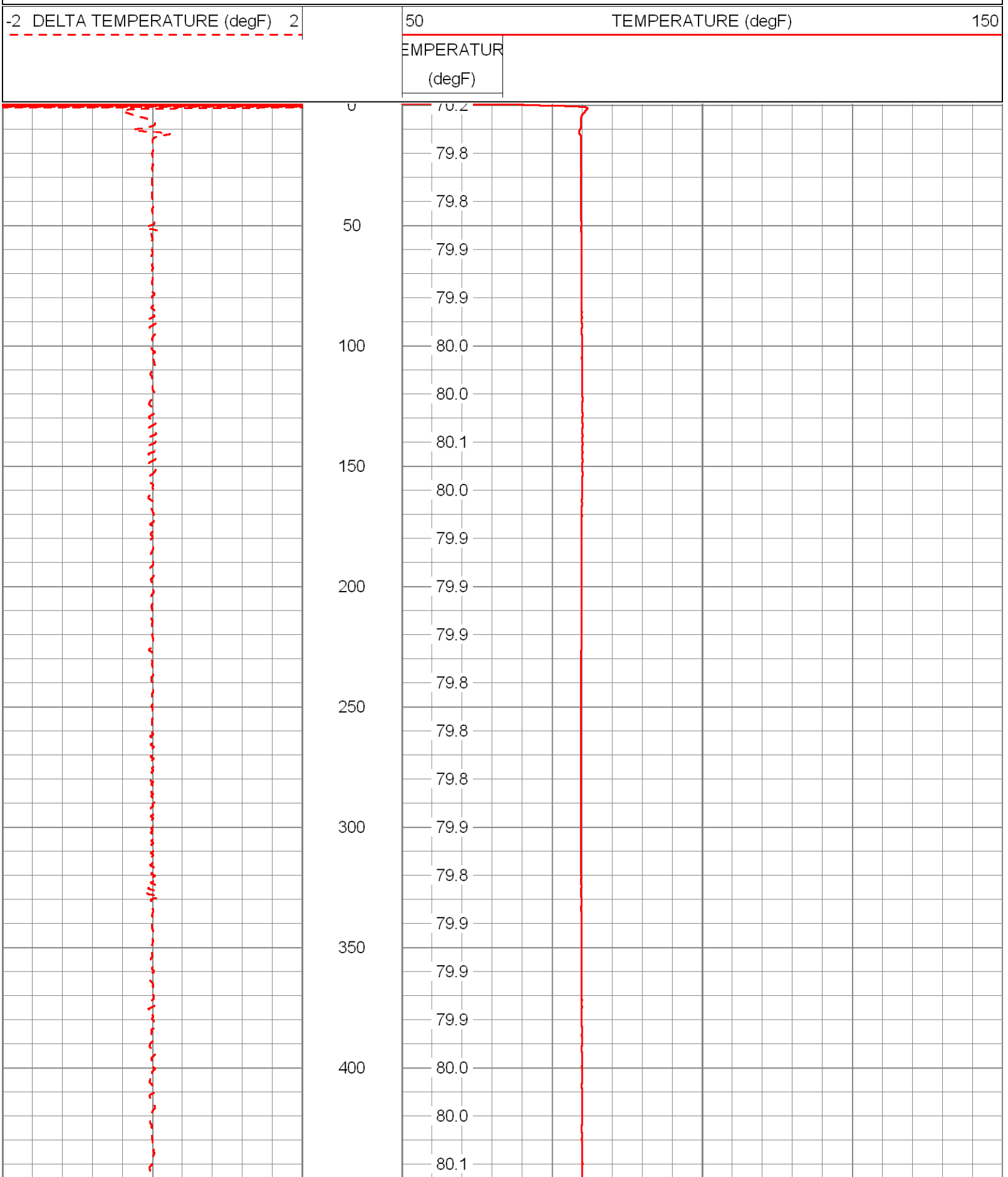
Comments

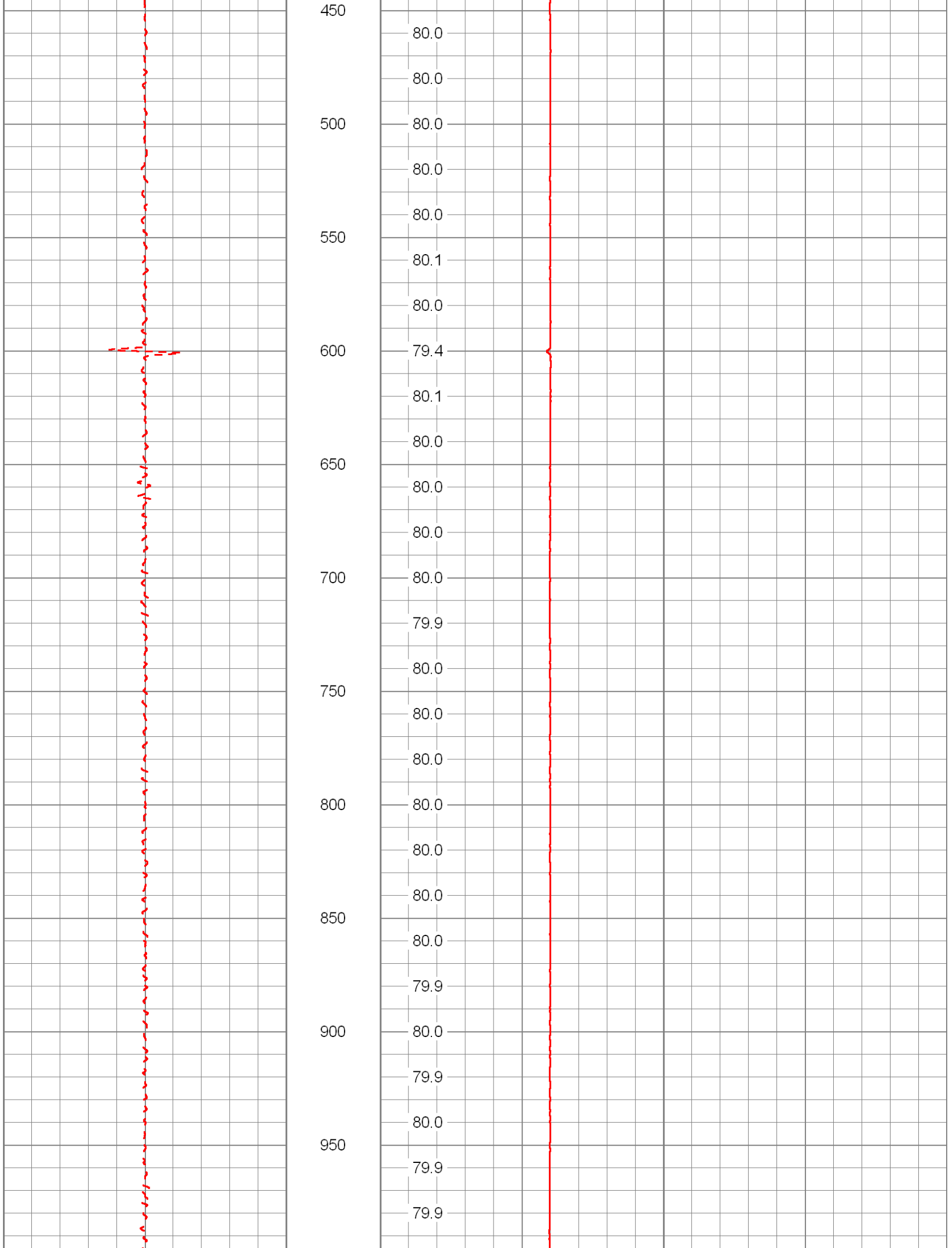
RADIOACTIVETRACER SURVEY

TEMPERATURE

BROTHERS

Database File:	sdwwtp-iw1.db
Dataset Pathname:	pass1
Presentation Format:	temp
Dataset Creation:	Fri Jun 14 08:05:40 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:600

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600
650
700
750
800
850
900
950
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80.0
80.0
80.0
80.0
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80.0
79.4
80.1
80.0
80.0
80.0
80.0
79.9
80.0
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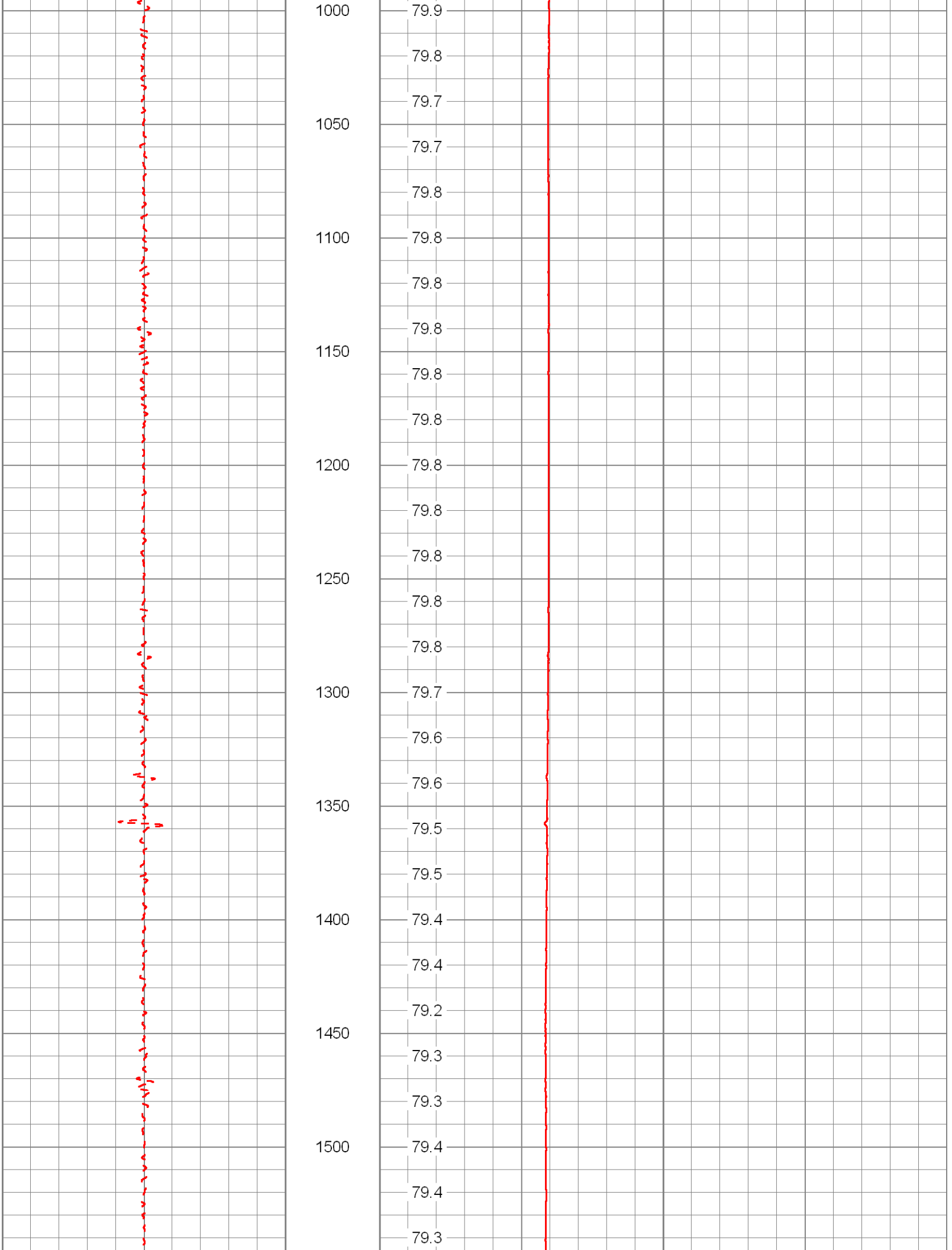
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1100
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1200
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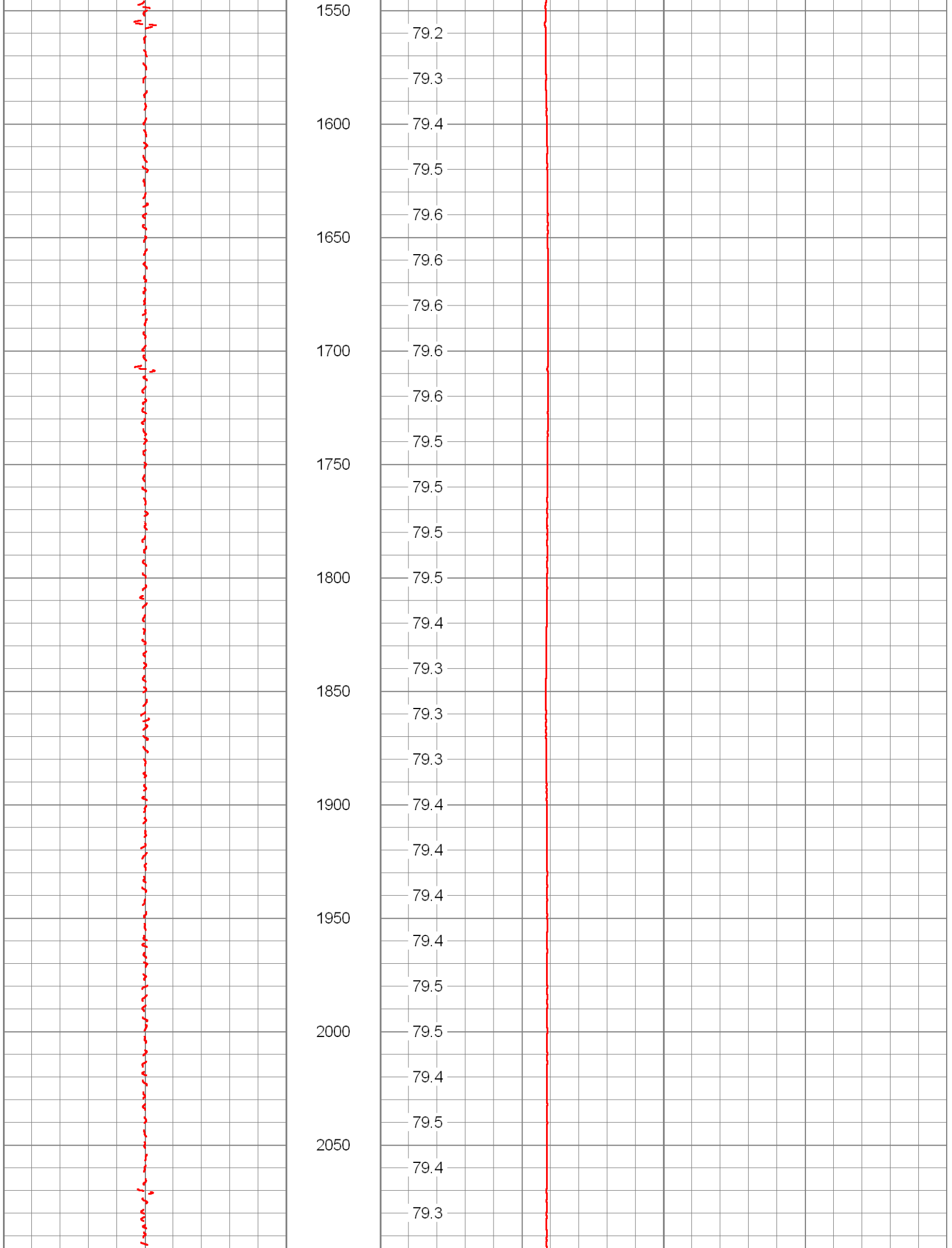
79.4
79.4
79.3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1950
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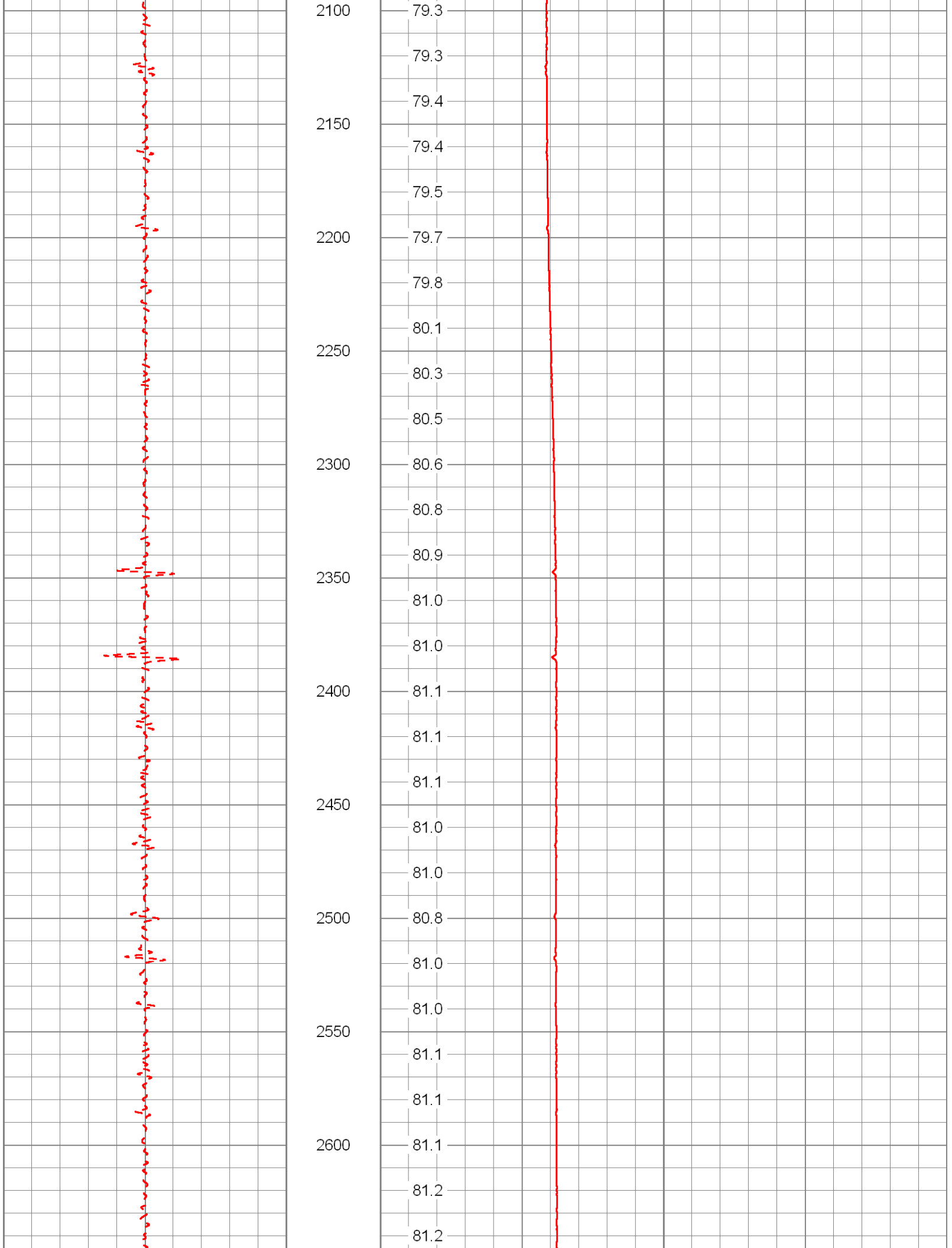
2100
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80.9
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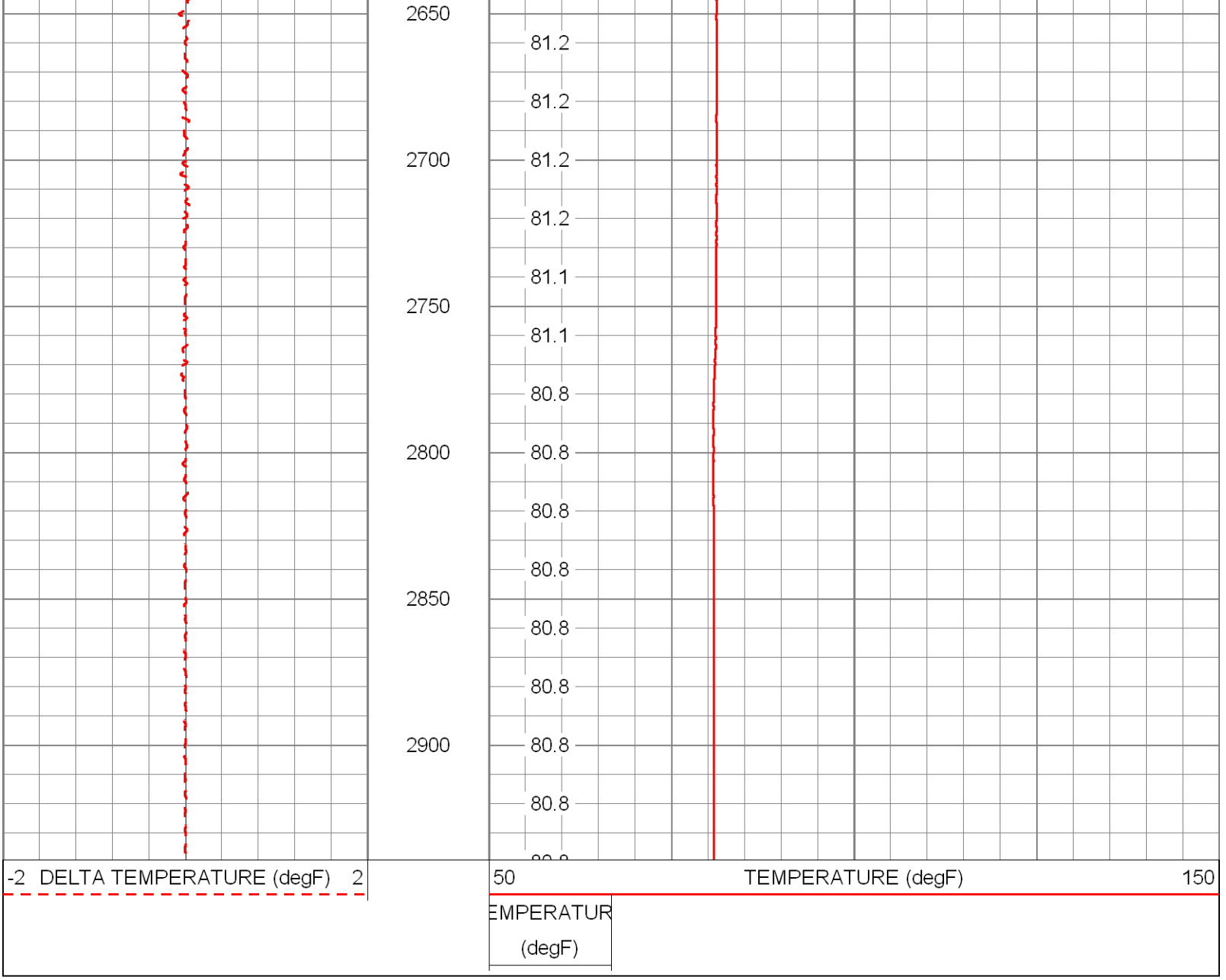
81.2



Calibration Report

Database File: sdwwtp-iw1.db
Dataset Pathname: pass1
Dataset Creation: Fri Jun 14 08:05:40 2013 by Log SOC 110722

Temperature Calibration Report

Serial Number: 952
Tool Model: RTS
Performed: Fri Mar 15 06:48:52 2013

Point #	Reading		Reference	
1	349.14	cps	33.00	degF
2	426.67	cps	46.00	degF
3	886.19	cps	84.00	degF
4	2227.87	cps	212.00	degF
5		cps		degF
6		cps		degF
7		cps		degF
8		cps		degF
9		cps		degF
10		cps		degF

Appendix F

Television Survey

Appendix G

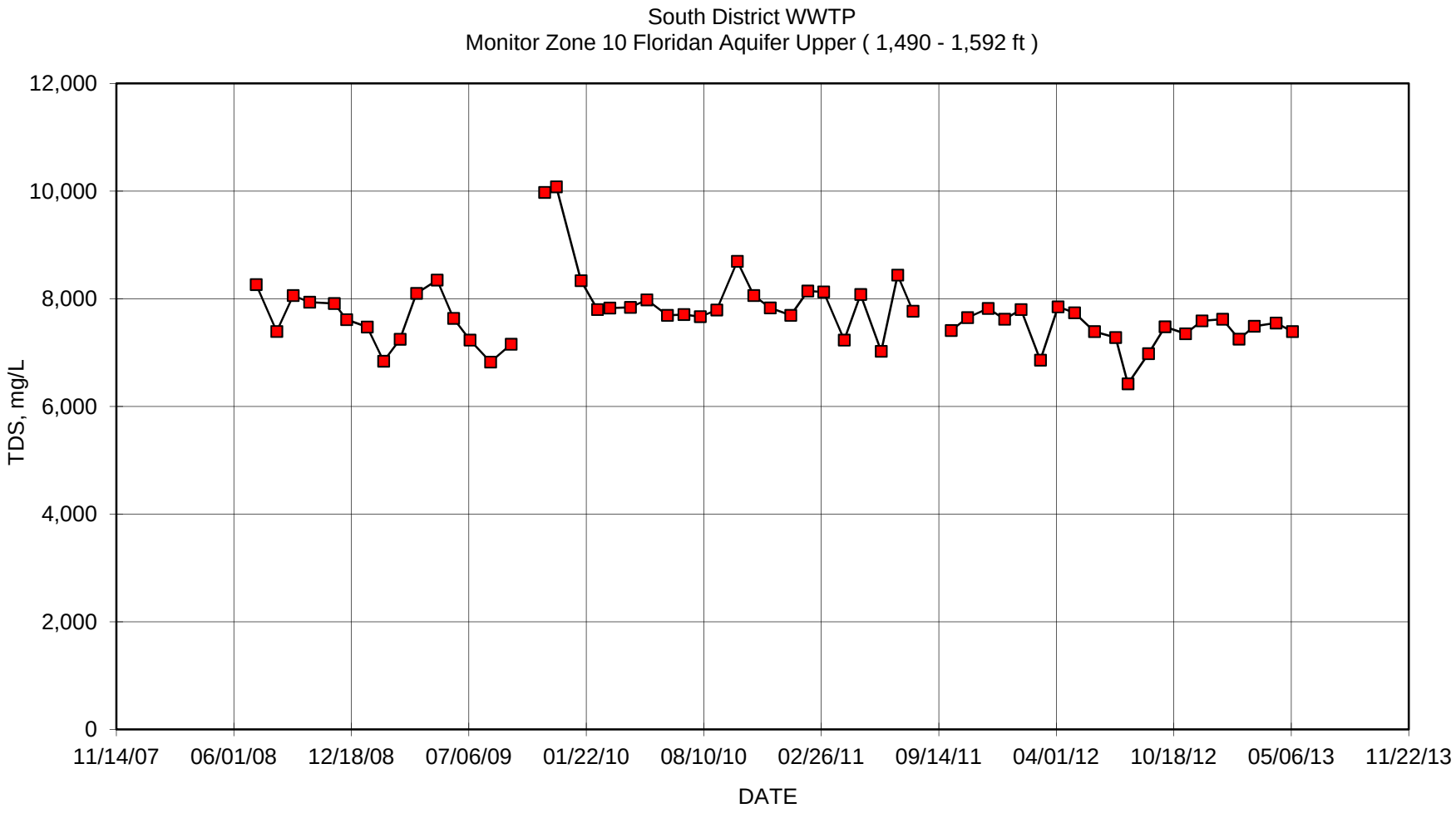
5 year Monitoring Data

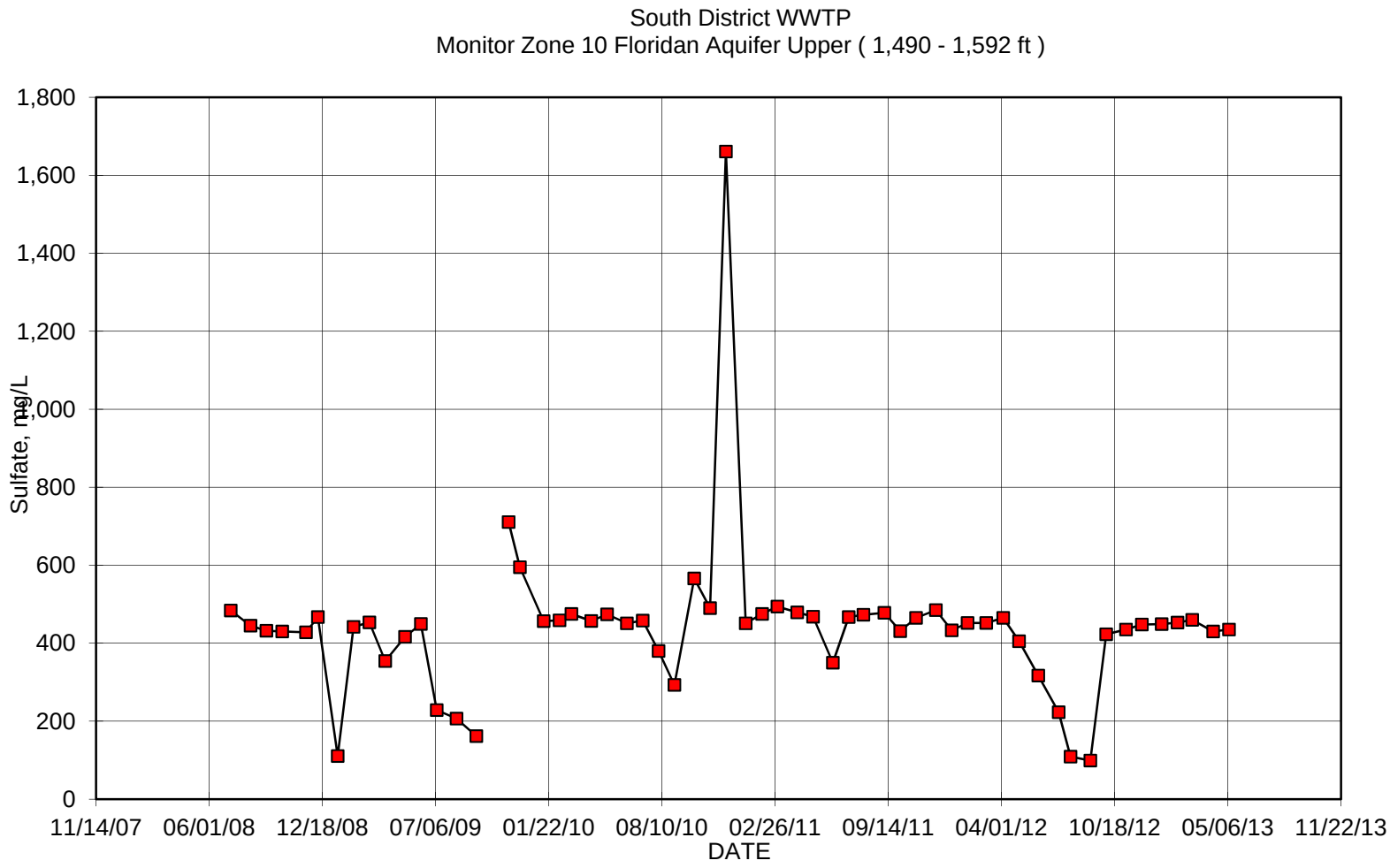
FA-10 Upper

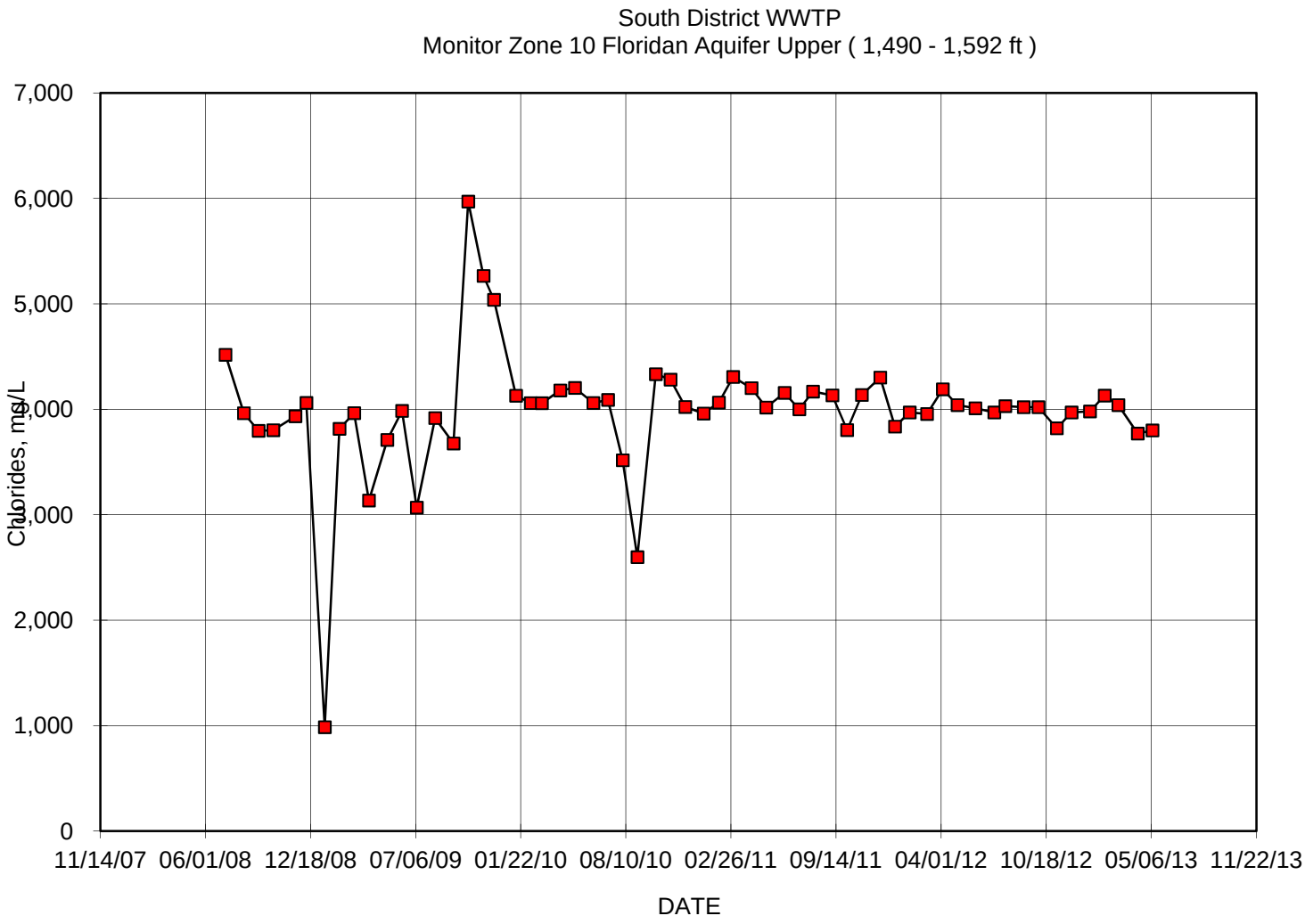
Date	TDS, mg/L	Sulfate, mg/L	Chlorides, mg/L	TKN, mg/L	NH3, mg/L	Conductivity, Micromho/cm	Temp., C	Temp., F	pH	DO, mg/L	TP, mg/L	TSS, mg/L	NO_3, mg/L	NO_2, mg/L	Sodium mg/L	Gross Aplha pCi/L	Radium 226 pCi/L	Radium 228 pCi/L
07/09/08	8,264	484	4,517	1.39	0.70	12,050	27	80	7.8		0.01	18.20	0.03	0.00				
08/13/08	7,392	445	3,963	1.85	1.33	12,020	26	79	7.8		0.01	16.80	0.12	0.01				
09/10/08	8,060	432	3,796	1.58	1.32	12,090	24	76	7.8		0.02	1.76	0.08	0.05				
10/08/08	7,936	430	3,802	1.62	1.10	12,460	24	75	7.7		0.02	1.76	0.03	0.00				
11/19/08	7,912	428	3,934	9.10	6.76	12,210	24	74	7.8		0.00	6.40	0.03	0.00				
12/10/08	7,612	467	4,061	1.62	1.24	12,130	23	74	7.6		0.02	5.20	0.03	0.00				
01/14/09	7,476	111	986	1.70	1.24	11,930	20	69	7.4		0.03	5.00	0.03	0.01				
02/11/09	6,840	442	3,815	1.58	1.30	12,040	24	75	7.4		0.03	17.50	0.01	0.00				
03/11/09	7,248	453	3,964	1.91	1.34	12,020	23	73	7.4		0.02	6.00	0.00	0.00				
04/08/09	8,100	354	3,135	1.81	1.48	12,320	22	72	7.6		0.02	7.20	0.00	0.00				
05/13/09	8,348	416	3,710	1.46	1.53	11,920	24	75	7.7		0.01	6.60	0.00	0.02				
06/10/09	7,636	449	3,985	1.47	1.47	11,910	24	74	7.7		0.17	5.40	0.00	0.00				
07/08/09	7,232	229	3,068	1.40	1.04	11,840	29	83	7.8		0.00	6.40	0.00	0.00				
08/12/09	6,824	207	3,917	0.83	1.54	12,240			7.8		0.01	4.20	0.00	0.00				
09/16/09	7,156	162	3,676	1.74	1.20	11,760			8.1		0.00		0.05	0.01	1920	9.5	4.9	1.0
10/14/09			5,970	2.39	1.97	19,100			7.5		0.01		0.00	0.00	3400	11.4	8.5	0.9
11/12/09	9,976	711	5,265	2.07	1.76	16,630			7.5		0.02		0.00		2610	12.5	7.9	0.8
12/02/09	10,080	595	5,038	2.19	1.89	15,810	25	76	7.6		0.02	11.20	0.00	0.00	2450	11.3	8.3	0.9
01/13/10	8,336	457	4,129	2.13	1.62	12,910	22	72	7.6		0.02	12.00	0.00	0.03	1710	10.6	8.0	0.9

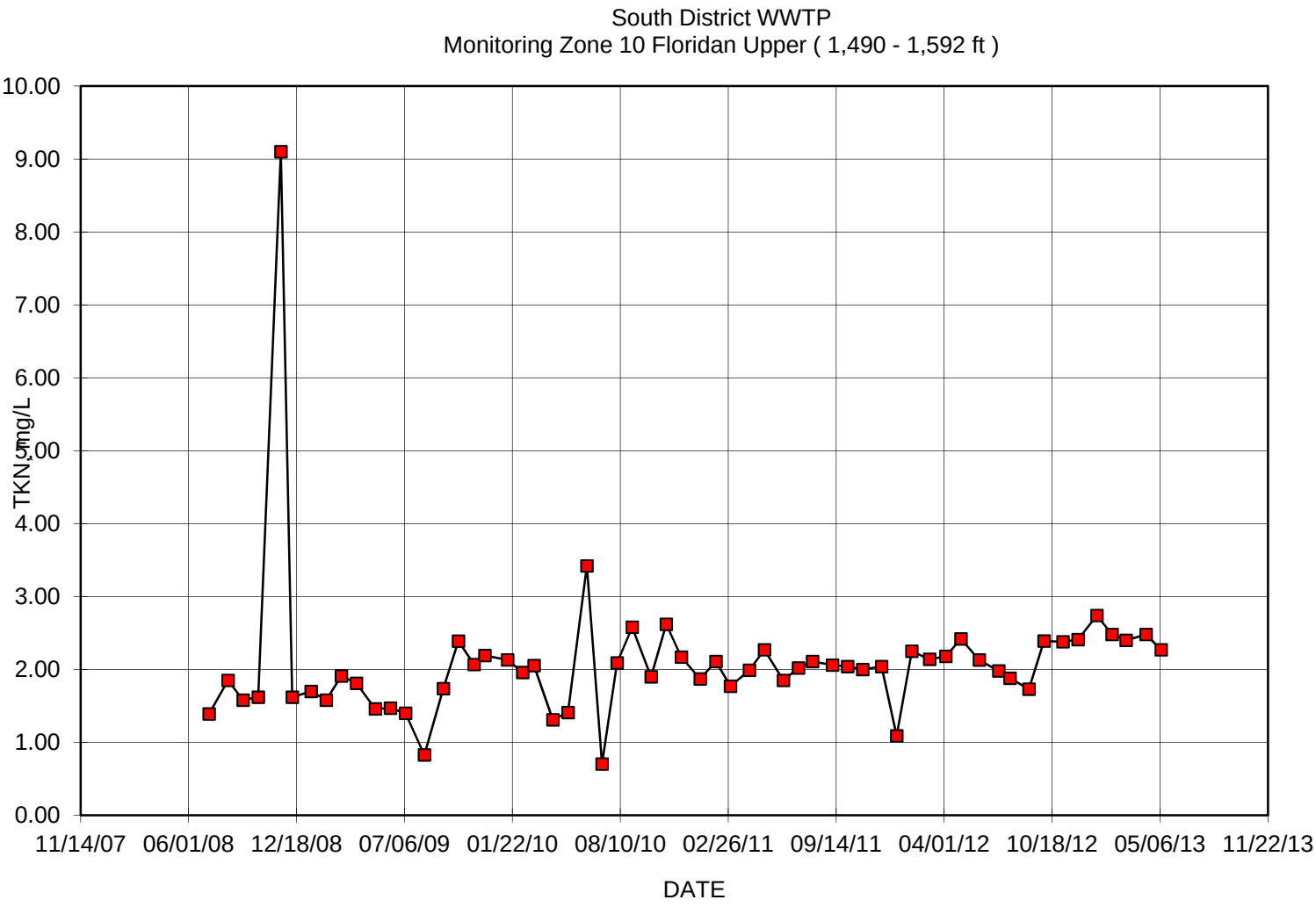
02/10/10	7,800	459	4,059	1.96	1.63	12,480	22	71	7.7		0.02	8.40	0.00	0.00	2100	10.0	7.5	0.7
03/03/10	7,828	475	4,058	2.05	1.70	12,850	22	72	7.5		0.02	7.40	0.00	0.00	2100	15.3	8.7	0.9
04/07/10	7,840	457	4,179	1.31	1.45	12,890	25	78	7.5		0.01	6.60	0.00	0.00	2120	20.0	7.0	0.7
05/05/10	7,980	474	4,203	1.41	1.52	12,560	25	77	7.7		0.01	5.60	0.00	0.00	2090	6.6	6.3	0.8
06/09/10	7,692	451	4,060	3.42	3.40	12,610	25	78	7.6		0.04	7.60	0.01	0.00	1990	28.5	6.7	0.7
07/07/10	7,708	458	4,089	0.70	1.61	12,540	24	76	7.7		0.03	4.60	0.01	0.00	2010	22.1	7.6	0.6
08/04/10	7,668	380	3,517	2.09	1.92	11,820	24	76	7.7		0.19	4.40	0.01	0.00	2000	21.5	6.4	0.8
09/01/10	7,792	293	2,598	2.58	2.03	12,670	25	77	7.6		0.02	13.60	0.01	0.00	2060	21.3	9.6	0.9
10/06/10	8,696	566	4,333	1.90	1.99	13,820	25	76	7.4		0.02	9.40	0.00	0.00	2340	8.3	7.3	0.9
11/03/10	8,060	490	4,281	2.62	1.88	12,870	23	74	7.5		0.02	8.20	0.00	0.00	2180	16.2	7.3	0.8
12/01/10	7,830	1,661	4,022	2.17	1.95	12,790	24	75	7.7		0.02	7.60	0.00	0.00	2090	29.9	1.1	0.8
01/05/11	7,692	451	3,960	1.87	1.82	12,130	24	75	7.4		0.02	4.20	0.00	0.01	2140	23.3	7.8	0.8
02/03/11	8,144	475	4,064	2.11	1.88	12,230	24	75	7.3		0.17	2.80	0.01	0.00	2090	20.9	9.0	0.8
03/02/11	8,128	494	4,307	1.77	1.77	13,200	23	74	7.6		0.01	12.70	0.00	0.00	2030	19.0	6.1	0.9
04/06/11	7,232	479	4,201	1.99	2.09	12,070	24	75	7.7		0.02	4.40	0.00	0.00	2160	23.9	7.0	0.8
05/04/11	8,080	468	4,017	2.27	1.93	12,190	24	75	7.6		0.02	3.60	0.00	0.00	1840	12.6	7.5	1.0
06/08/11	7,024	350	4,156	1.85	1.85	12,090	28	83	7.7		0.05	3.10	0.00	0.00	2100	29.5	4.8	0.8
07/06/11	8,440	467	4,000	2.02	2.31	12,830	24	75	7.4		0.02	9.20	0.00	0.01	2280	16.3	7.3	0.7
08/01/11	7,770	473	4,168	2.11	2.12	12,110	26	78	7.4		0.01	8.00	0.00	0.00	2150	18.3	9.0	0.7
09/07/11		478	4,132	2.06	2.06	12,290	25	76	7.6		0.03	10.70	0.00	0.00	2100	31.2	8.2	0.9
10/05/11	7,410	431	3,803	2.04	2.13	11,990	24	75	7.6		0.04	9.20	0.00	0.00	2060	12.2	6.9	0.9
11/02/11	7,650	465	4,136	2.00	1.87	12,170	24	76	7.5		0.03	7.20	0.00	0.01	2190	11.5	5.7	0.9

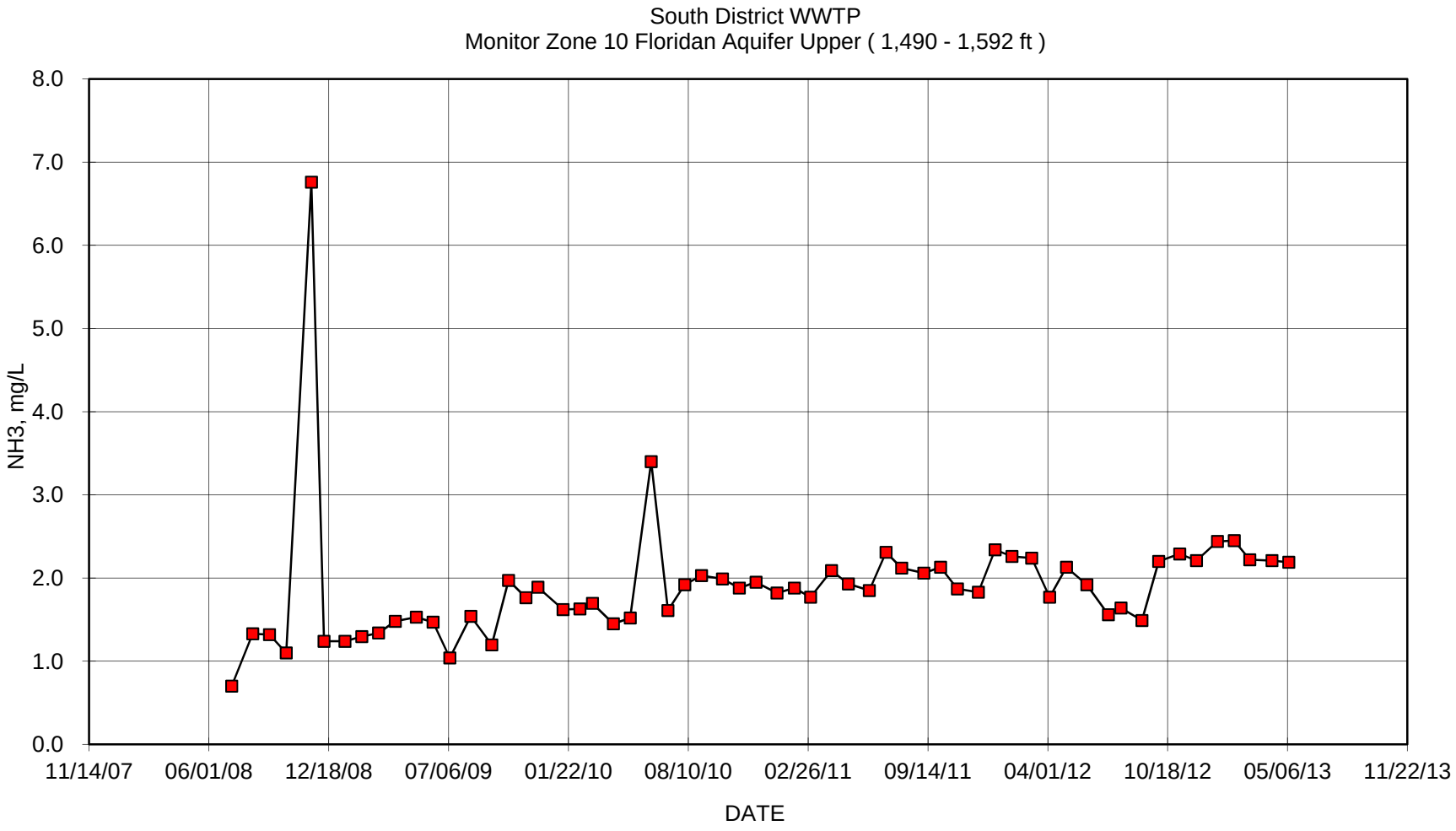
12/07/11	7,820	485	4,301	2.04	1.83	12,248	24	76	7.9		0.02	6.10	0.00	0.00	2120	19.4	5.7	0.8
01/04/12	7,620	433	3,836	1.09	2.34	11,390	23	73	7.5		0.02	6.90	0.00	0.00	2090	16.2	5.2	1.0
02/01/12	7,800	452	3,970	2.25	2.26	9,938	24	75	7.6		0.02	11.20	0.00	0.00	2220	18.5	8.3	0.8
03/05/12	6,860	452	3,956	2.14	2.24	11,850	24	76	7.4		0.01	4.80	0.01	0.00	2140	17.0	7.4	0.8
04/04/12	7,850	465	4,190	2.18	1.77	10,750	24	76	7.5		0.03	6.80	0.50	0.50	2030	23.0	0.1	0.8
05/02/12	7,740	405	4,040	2.42	2.13	11,545	24	75	7.7		0.05	4.70	0.00	0.00	2180	15.7	5.6	0.9
06/05/12	7,390	317	4,010	2.13	1.92	11,080	28	82	7.5		0.01	8.00	0.00	0.00	2050	12.6	5.0	0.9
07/11/12	7,280	223	3,970	1.98	1.56	11,840	27	81	7.9		0.00	4.10	0.03	0.00	2040	11.4	4.3	0.9
08/01/12	6,420	109	4,030	1.88	1.64	11,494	26	79	8.3		0.02	3.30	0.00	0.00	2190	19.0	6.1	0.8
09/05/12	6,980	99	4,020	1.73	1.49	11,382	26	79	8.2		0.04	1.90	0.00	0.00	1880	9.9	4.7	0.9
10/03/12	7,480	423	4,020	2.39	2.20	11,750	24	74	7.7		0.03	8.40	0.00	0.00	2050	17.3	8.3	0.7
11/07/12	7,350	435	3,820	2.38	2.29	11,390	24	74	7.7		0.02	4.80	0.02	0.00	2120	15.6	4.8	0.9
12/05/12	7,590	448	3,970	2.41	2.21	12,194	23	74	7.6		0.04	3.50	0.01	0.00	2190	21.8	8.0	0.9
01/09/13	7,620	449	3,980	2.74	2.44	12,256	23	74	7.7		0.08	2.80	0.01	0.00	2140	22.3	6.4	6.4
02/06/13	7,250	453	4,130	2.48	2.45	12,192	24	74	7.6		0.02	2.10	0.02	0.00	1860	16.5	5.6	0.8
03/04/13	7,490	460	4,040	2.40	2.22	12,406	23	73	7.7		0.03	10.90	0.00	0.01	2320	21.0	7.8	0.7
04/10/13	7,550	430	3,770	2.48	2.21	12,224	23	74	7.4		0.01	0.01	0.02	0.00	2070	20.6	10.6	0.9
05/08/13	7,390	435	3,800	2.27	2.19	12,475	24	76	7.6		0.02	0.02	0.01	0.00	2230	10.1	8.6	0.7

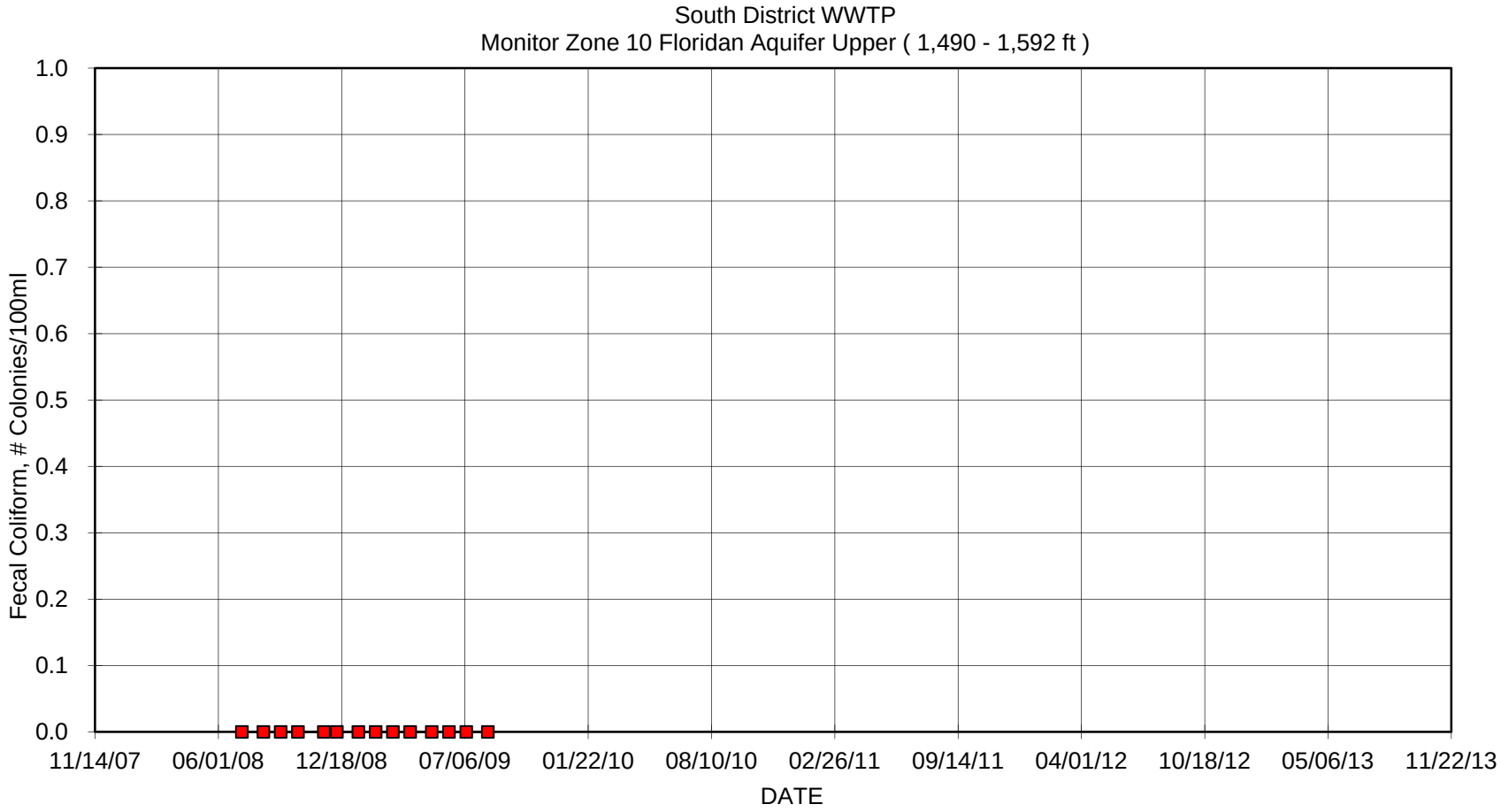

South District WWTP
Monitor Zone 10 Floridan Aquifer Upper (1,490 - 1,592 ft)
TDS, mg/L
12,000
10,000
8,000
6,000
4,000
2,000
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

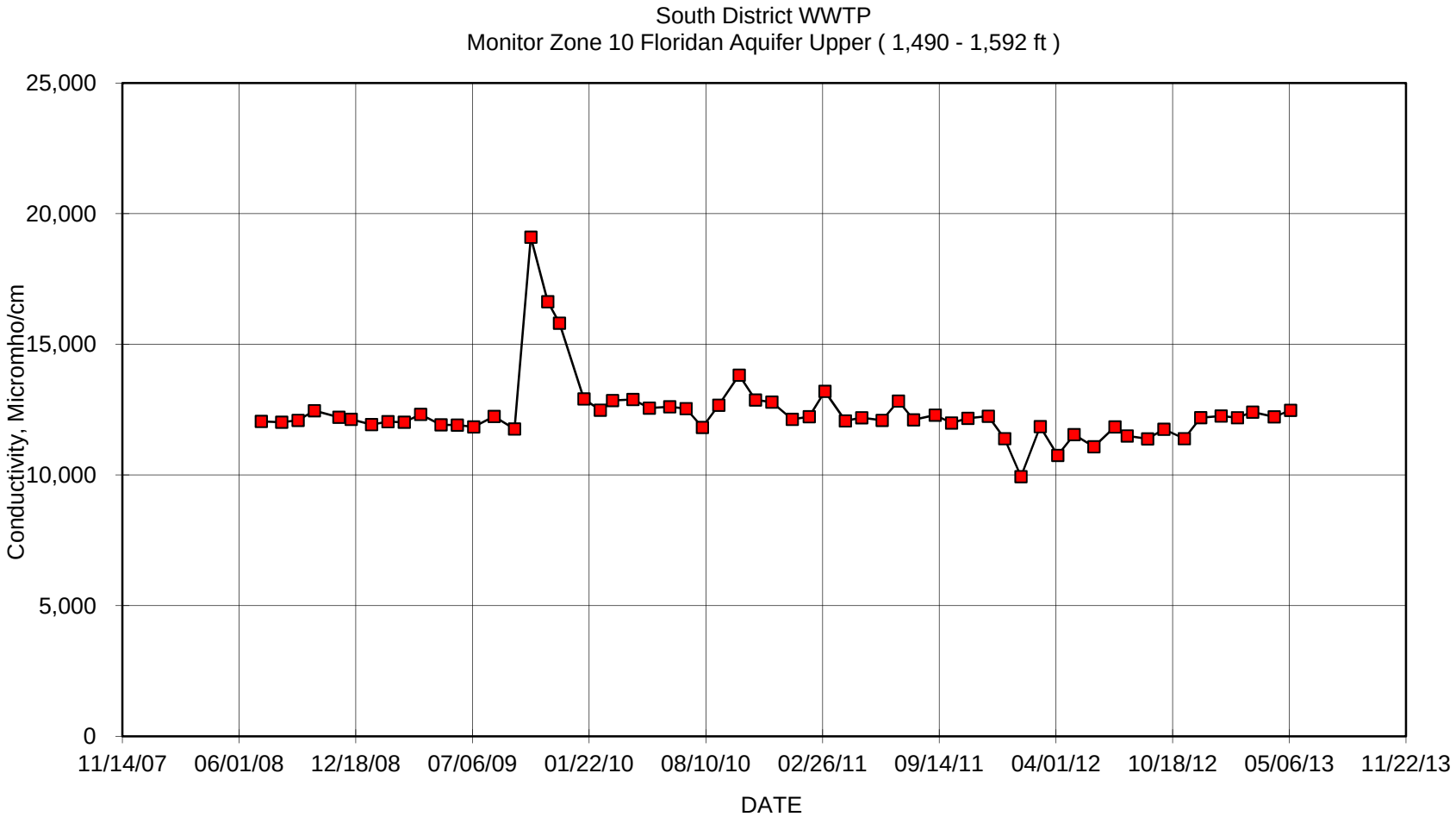

South District WWTP
Monitor Zone 10 Floridan Aquifer Upper (1,490 - 1,592 ft)
Sulfate, mg/L
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

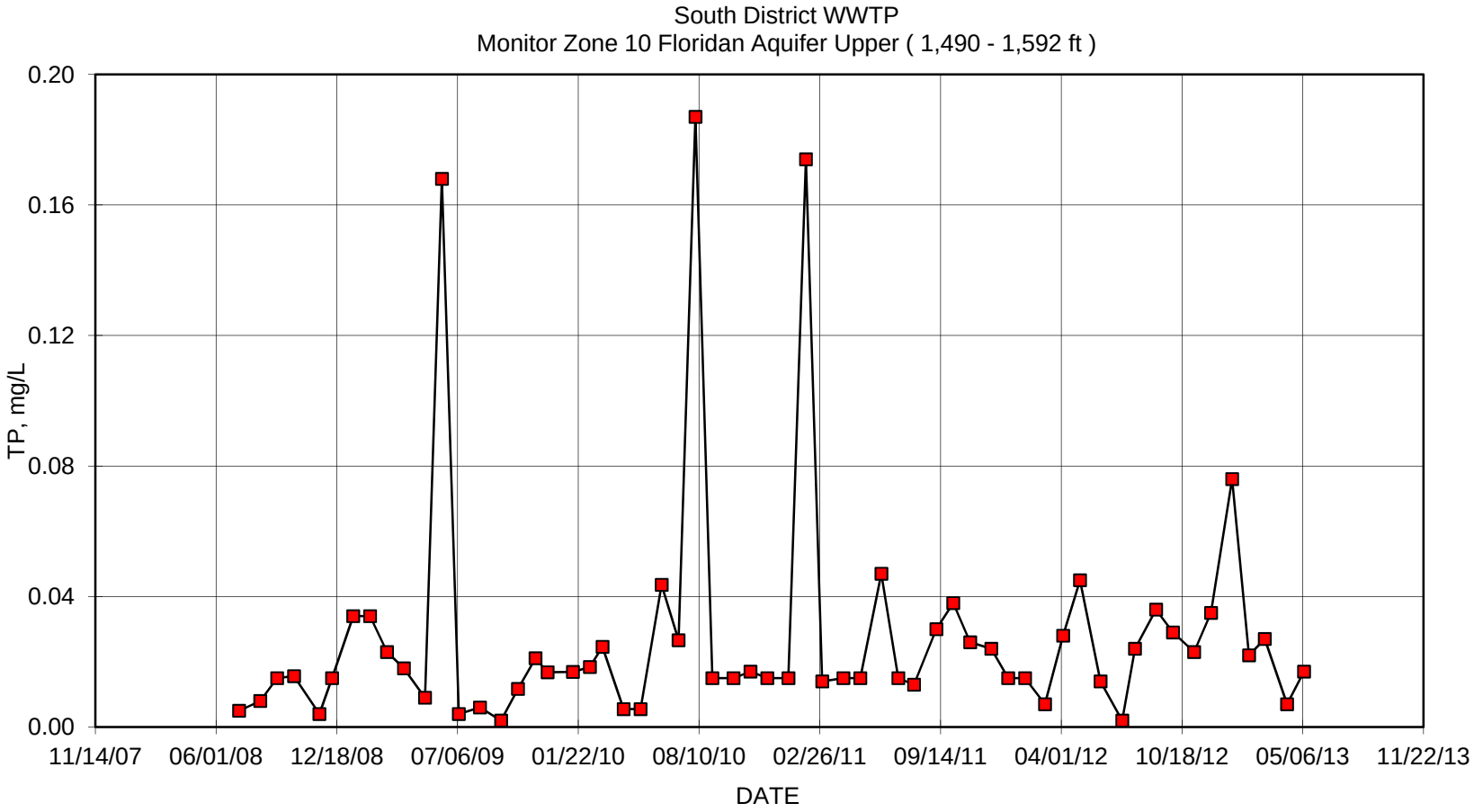

South District WWTP
Monitor Zone 10 Floridan Aquifer Upper (1,490 - 1,592 ft)
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
Chlorides, mg/L
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

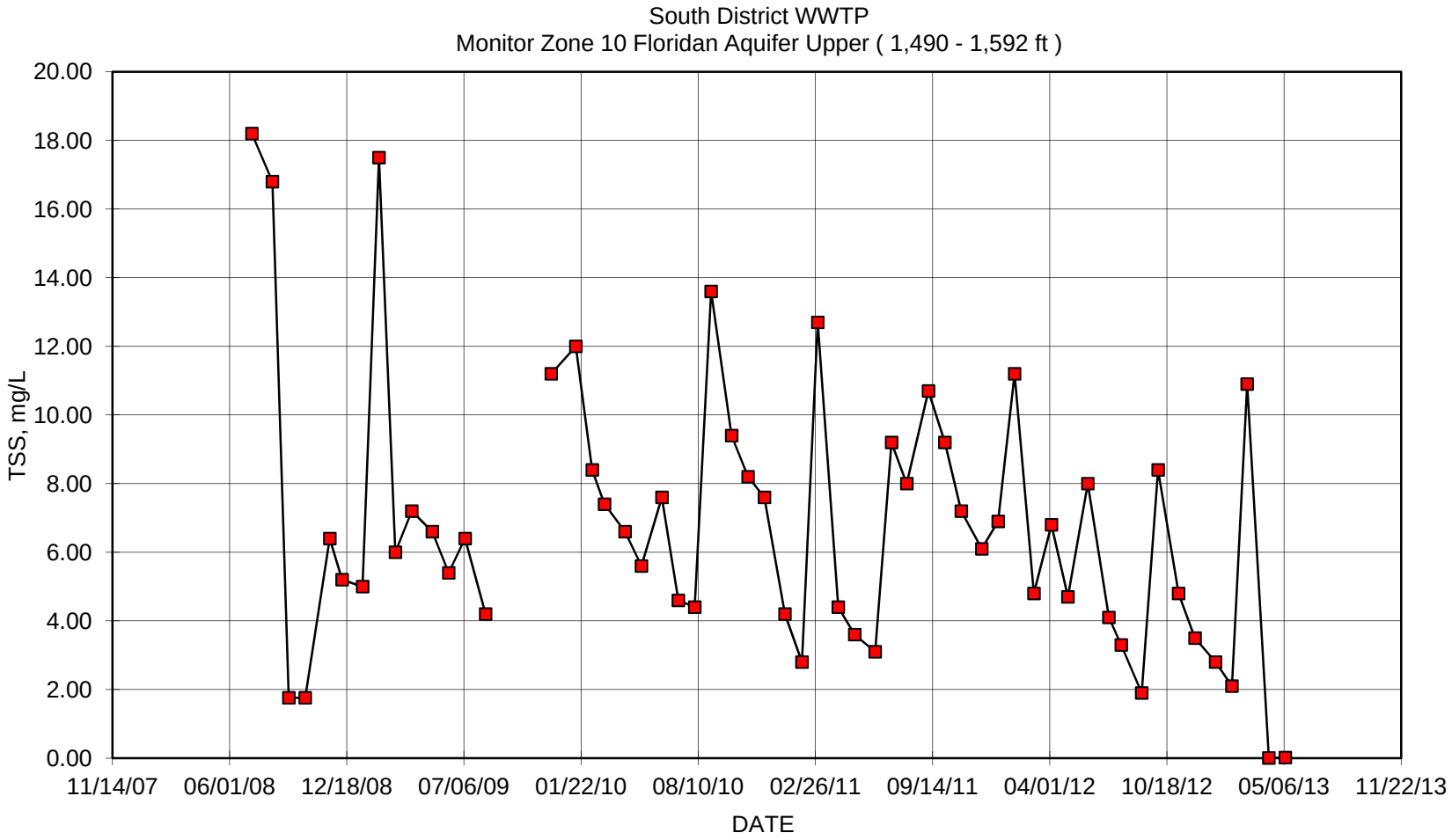

South District WWTP
Monitoring Zone 10 Floridan Upper (1,490 - 1,592 ft)
TKN, mg/L
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 10 Floridan Aquifer Upper (1,490 - 1,592 ft)
NH3, mg/L
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 10 Floridan Aquifer Upper (1,490 - 1,592 ft)
Fecal Coliform, # Colonies/100ml
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 10 Floridan Aquifer Upper (1,490 - 1,592 ft)
Conductivity, Micromho/cm
25,000
20,000
15,000
10,000
5,000
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

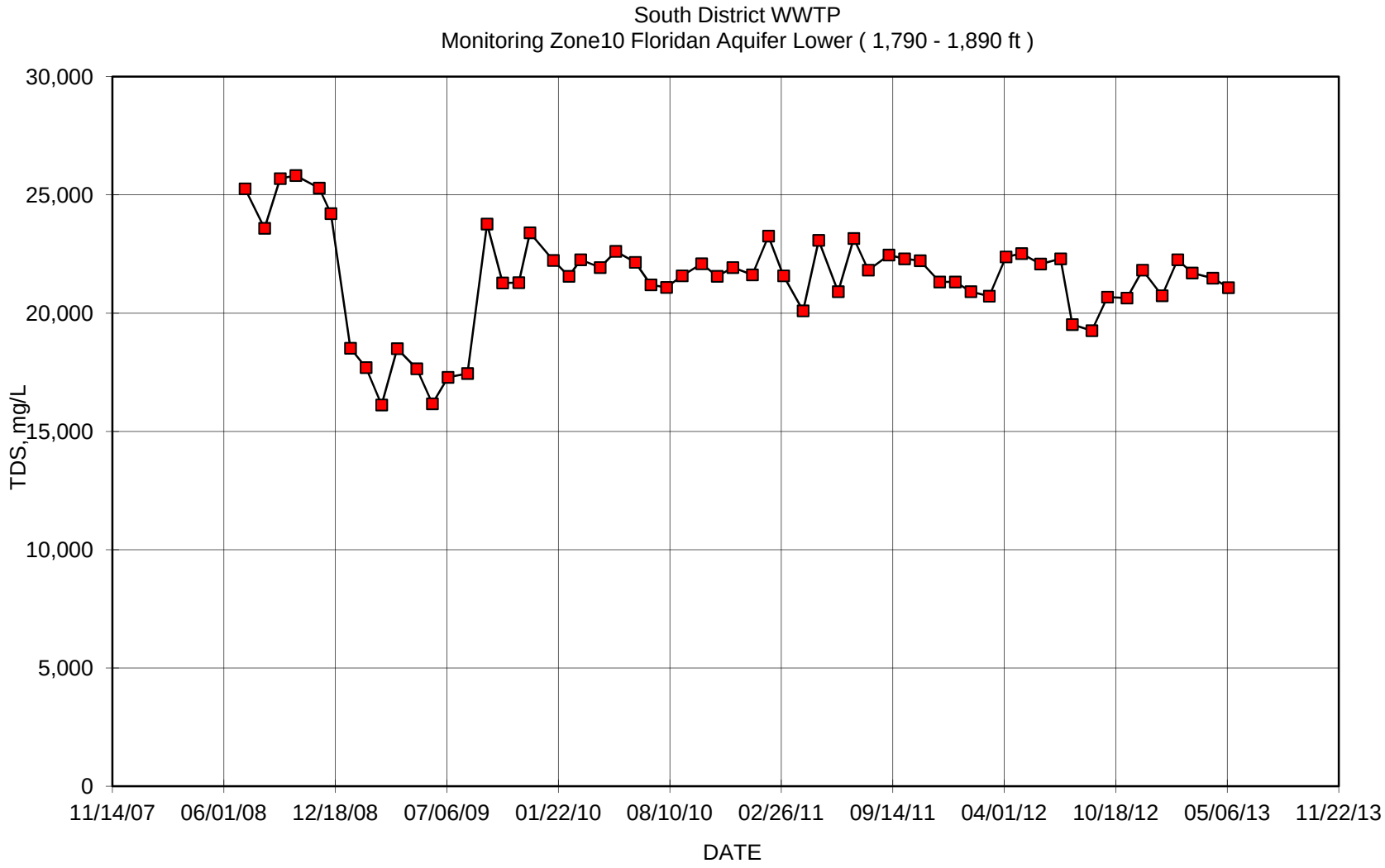

South District WWTP
Monitor Zone 10 Floridan Aquifer Upper (1,490 - 1,592 ft)
TP, mg/L
0.20
0.16
0.12
0.08
0.04
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

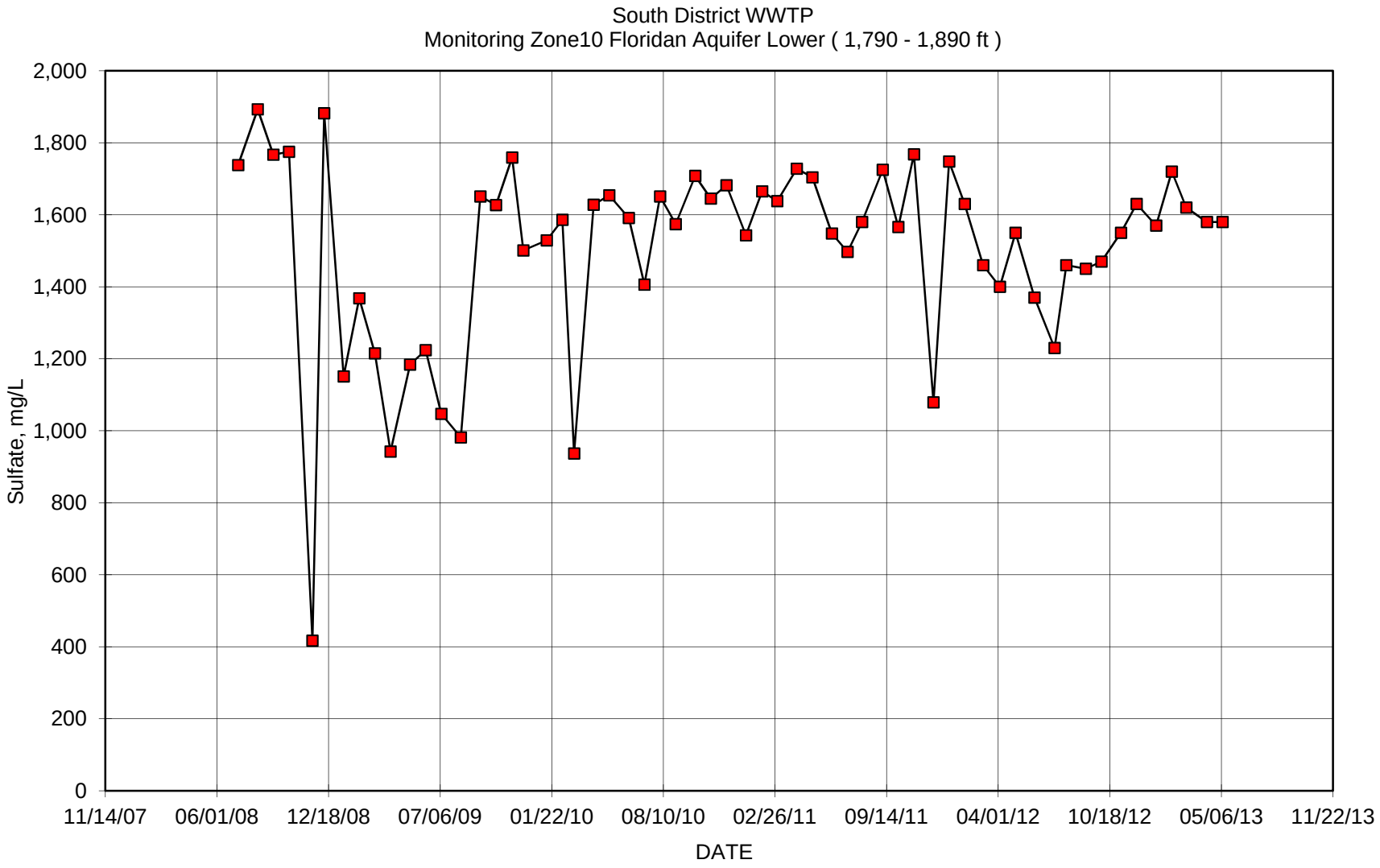

South District WWTP
Monitor Zone 10 Floridan Aquifer Upper (1,490 - 1,592 ft)
TSS, mg/L
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

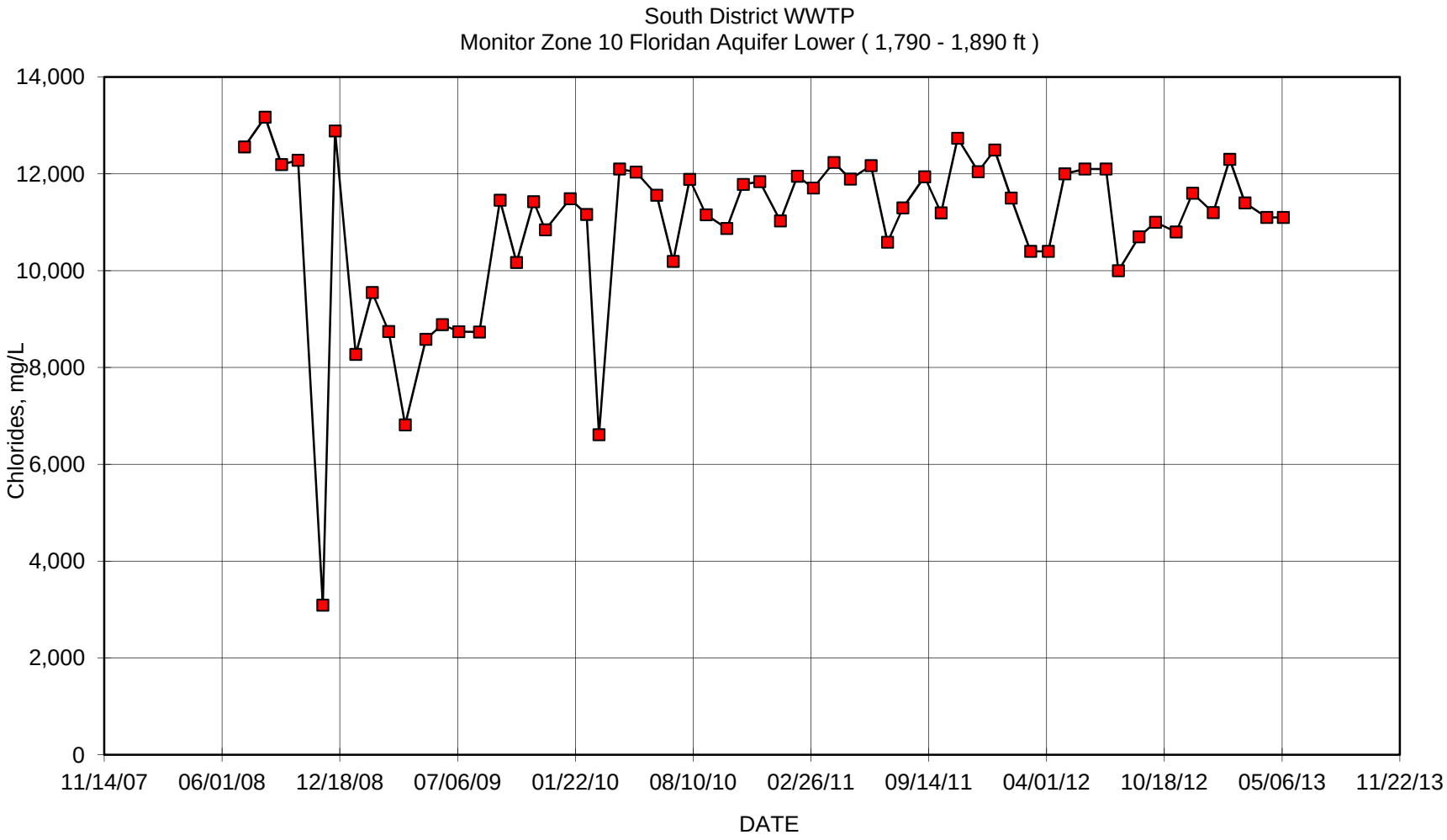
FA-10 Lower Data

Date	TDS, mg/L	Sulfate, mg/L	Chlorides, mg/L	TKN, mg/L	NH3, mg/L	Conductivity, Micromho/cm	Temp., C	Temp., F	pH	TP, mg/L	TSS, mg/L	NO_3, mg/L	NO_2, mg/L	Sodium mg/L	Gross Aplha pCi/L	Radium 226 pCi/L	Radium 228 pCi/L
07/09/08	25,260	1,738	12,557	3.56	2.10	35,980	24	76	7.6	0.01	0.01	0.03	0.00				
08/13/08	23,590	1,893	13,171	3.87	3.58	35,290	26	78	7.6	0.01	15.20	0.12	0.01				
09/10/08	25,690	1,767	12,192	3.54	3.56	33,470	24	75	7.5	0.02	20.60	0.08	0.05				
10/08/08	25,820	1,775	12,281	3.66	2.94	33,790	24	74	7.7	0.08	17.00	0.03	0.00				
11/19/08	25,290	417	3,091	1.50	0.88	35,520	36	96	7.6	0.00	13.40	0.03	0.00				
12/10/08	24,210	1,882	12,886	3.74	3.25	35,620	23	73	7.4	0.02	10.60	0.03	0.00				
01/14/09	18,520	1,151	8,271	2.99	2.79	26,270	21	70	7.5	0.03	9.20	0.03	0.00				
02/11/09	17,700	1,368	9,549	2.59	2.80	28,990	25	76	7.7	0.07	14.80	0.00	0.00				
03/11/09	16,120	1,215	8,744	2.50	2.81	26,540	22	72	7.3	0.82	9.60	0.00	0.00				
04/08/09	18,500	942	6,815	3.63	3.05	28,150	22	71	7.3	0.03	13.00	0.00	0.00				
05/13/09	17,650	1,184	8,582	2.97	3.04	26,200	24	76	7.5	0.01	8.20	0.00	0.00				
06/10/09	16,170	1,224	8,887	3.10	2.98	27,600	23	74	7.4	0.31	6.60	0.00	0.00				
07/08/09	17,290	1,047	8,740	2.71	2.30	25,390	26	78	7.6	0.00	28.40	0.00	0.00				
08/12/09	17,450	982	8,734	1.90	3.10	25,670			8.6	0.01	16.00	0.00	0.00				
09/16/09	23,770	1,651	11,456	4.03	3.58	34,340			7.8	0.01		0.05	0.01	6390	8.5	7.8	1.0
10/14/09	21,280	1,627	10,170	3.80	3.21	32,150			7.4	0.02		0.00	0.00	5900	12.8	9.6	1.0
11/12/09	21,290	1,759	11,425	3.92	3.43	31,980			6.9	0.03		0.00	0.00	5780	6.7	5.8	0.8
12/02/09	23,400	1,501	10,844	3.92	3.82	34,530	24	75	7.6	0.03	13.40	0.00	0.00	5390	9.9	6.7	0.8
01/13/10	22,230	1,529	11,486	3.92	3.55	31,830	23	73	7.3	0.02	13.40	0.00	0.00	4460	7.9	7.3	0.9
02/10/10	21,560	1,586	11,162	4.27	3.70	31,790	22	72	7.5	0.02	9.80	0.00	0.00	6170	10.6	9.7	0.9
03/03/10	22,260	937	6,612	4.07	3.67	33,130	22	72	7.4	0.03	7.60	0.00	0.00	6060	9.1	10.4	0.8
04/07/10	21,930	1,628	12,101	3.62	3.57	33,280	24	76	7.4	0.01	11.20	0.00	0.00	6190	7.8	9.5	0.6
05/05/10	22,616	1,654	12,036	4.25	3.30	32,750	25	78	7.6	0.01	3.40	0.00	0.00	6270	9.2	7.9	0.8
06/09/10	22,150	1,591	11,560	1.78	1.43	32,660	24	75	7.4	0.05	6.00	0.00	0.00	5860	14.5	12.9	0.8
07/07/10	21,200	1,406	10,193	1.59	3.62	32,460	24	76	7.6	0.01	2.80	0.06	0.00	5570	10.1	8.8	0.8
08/04/10	21,090	1,651	11,887	4.51	4.29	31,500	24	76	7.5	0.15	8.40	0.00	0.00	4010	11.5	8.4	0.7
09/01/10	21,580	1,574	11,155	4.54	3.99	32,700	25	76	7.5	0.02	25.60	0.00	0.00	6010	9.6	10.0	0.8
10/06/10	22,090	1,708	10,872	3.76	4.12	33,010	25	77	7.6	0.00	5.20	0.00	0.00	6330	10.3	8.9	0.8
11/03/10	21,560	1,645	11,783	4.51	4.17	32,720	23	74	7.5	0.06	6.80	0.00	0.00	6460	10.1	9.4	0.8
12/01/10	21,930	1,682	11,839	3.94	4.08	32,650	24	75	7.5	0.02	12.20	0.01	0.00	6350	8.9	7.2	0.9
01/05/11	21,620	1,543	11,028	4.21	4.17	31,410	24	75	7.5	0.02	7.80	0.04	0.00	6350	9.7	8.5	0.7
02/03/11	23,260	1,665	11,952	4.32	3.56	31,800	24	75	7.5	0.15	6.20	0.02	0.00	6140	9.5	9.2	0.8

03/02/11	21,580	1,638	11,708	4.12	4.22	33,040	23	74	7.4	0.02	18.40	0.01	0.00	5980	11.0	10.3	0.9
04/06/11	20,100	1,728	12,236	4.79	4.59	31,990	24	75	7.2	0.02	9.80	0.01	0.00	6540	9.4	8.9	0.7
05/04/11	23,080	1,704	11,892	4.54	4.33	34,160	24	74	7.6	0.02	11.60	0.00	0.00	4770	8.8	8.1	1.0
06/08/11	20,910	1,548	12,170	3.89	3.83	32,750	28	82	8.0	0.06	7.00	0.01	0.00	6780	4.2	2.7	0.9
07/06/11	23,160	1,497	10,588	1.95	4.99	33,310	24	75	7.7	0.02	15.60	0.01	0.00	6670	8.1	9.5	0.7
08/01/11	21,820	1,580	11,297	3.98	4.38	32,300	26	78	7.7	0.01	16.80	0.01	0.00	6680	13.3	11.1	0.8
09/07/11	22,460	1,725	11,941	4.17	4.50	33,780	25	76	7.5	0.04	5.70	0.01	0.00	6300	9.1	8.2	1.0
10/05/11	22,300	1,566	11,195	3.93	4.84	31,680	24	76	7.7	0.04	10.30	0.00	0.00	1970	10.2	9.4	0.9
11/02/11	22,220	1,768	12,736	4.21	4.07	32,670	24	75	7.7	0.03	8.80	0.00	0.00	6800	7.6	7.1	0.8
12/07/11	21,320	1,079	12,045	4.32	4.17	31,720	23	74	7.9	0.04	6.30	0.00	0.00	6210	10.4	9.4	0.8
01/04/12	21,320	1,748	12,494	4.28	5.53	31,090	23	73	7.5	0.02	6.90	0.01	0.00	6140	5.7	3.4	1.0
02/01/12	20,910	1,630	11,500	4.90	5.47	32,044	24	75	7.5	0.02	6.30	0.01	0.00	6670	10.2	9.9	0.8
03/05/12	20,720	1,460	10,400	4.46	4.97	30,750	24	76	7.5	0.02	5.70	0.01	0.00	6960	9.3	8.9	0.6
04/04/12	22,380	1,400	10,400	4.45	4.43	33,724	23	74	7.5	0.03	7.70	2.50	2.50	6220	7.1	6.5	0.7
05/02/12	22,520	1,550	12,000	4.66	4.86	33,980	24	75	7.6	0.05	8.00	0.01	0.00	7500	9.5	9.0	0.9
06/05/12	22,080	1,370	12,100	4.72	7.47	31,810	26	79	7.8	0.01	10.70	0.01	0.00	5500	5.0	6.1	1.0
07/11/12	22,300	1,230	12,100	4.27	3.63	33,100	26	78	8.5	0.01	4.40	0.01	0.00	6180	7.7	7.4	0.8
08/01/12	19,520	1,460	10,000	5.53	5.69	28,680	25	78	8.2	0.02	22.10	0.01	0.00	6450	7.2	7.5	0.8
09/05/12	19,260	1,450	10,700	5.95	5.63	29,800	27	80	8.4	0.04	4.50	0.01	0.00	5190	5.4	4.8	0.9
10/03/12	20,680	1,470	11,000	5.77	5.61	31,781	24	75	7.7	0.03	14.10	0.01	0.00	5970	6.3	6.0	0.7
11/07/12	20,640	1,550	10,800	5.50	5.54	31,142	24	75	7.1	0.03	13.60	0.01	0.00	6490	6.1	7.4	0.8
12/05/12	21,820	1,630	11,600	5.35	5.57	32,560	23	73	7.6	0.04	3.20	0.02	0.01	6340	9.2	8.2	0.9
01/09/13	20,740	1,570	11,200	5.97	5.51	32,520	24	75	7.6	0.11	4.80	0.01	0.01	6480	9.4	8.1	0.9
02/06/13	22,260	1,720	12,300	5.20	5.60	31,177	23	74	7.6	0.01	4.90	0.02	0.01	6590	9.8	8.0	0.9
03/04/13	21,700	1,620	11,400	4.93	5.15	32,725	23	73	7.6	0.05	3.30	0.02	0.01	7090	8.1	8.5	0.8
04/10/13	21,480	1,580	11,100	5.06	4.82	32,807	23	73	7.5	0.03	0.03	0.02	0.01	6750	6.9	6.7	0.7
05/08/13	21,080	1,580	11,100	4.81	4.82	33,825	24	75	7.6	0.04	0.04	0.01	0.01	6610	19.3	6.1	0.7


South District WWTP
Monitoring Zone10 Floridan Aquifer Lower (1,790 - 1,890 ft)
30,000
25,000
20,000
15,000
10,000
5,000
0
TDS, mg/L
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitoring Zone10 Floridan Aquifer Lower (1,790 - 1,890 ft)
Sulfate, mg/L
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE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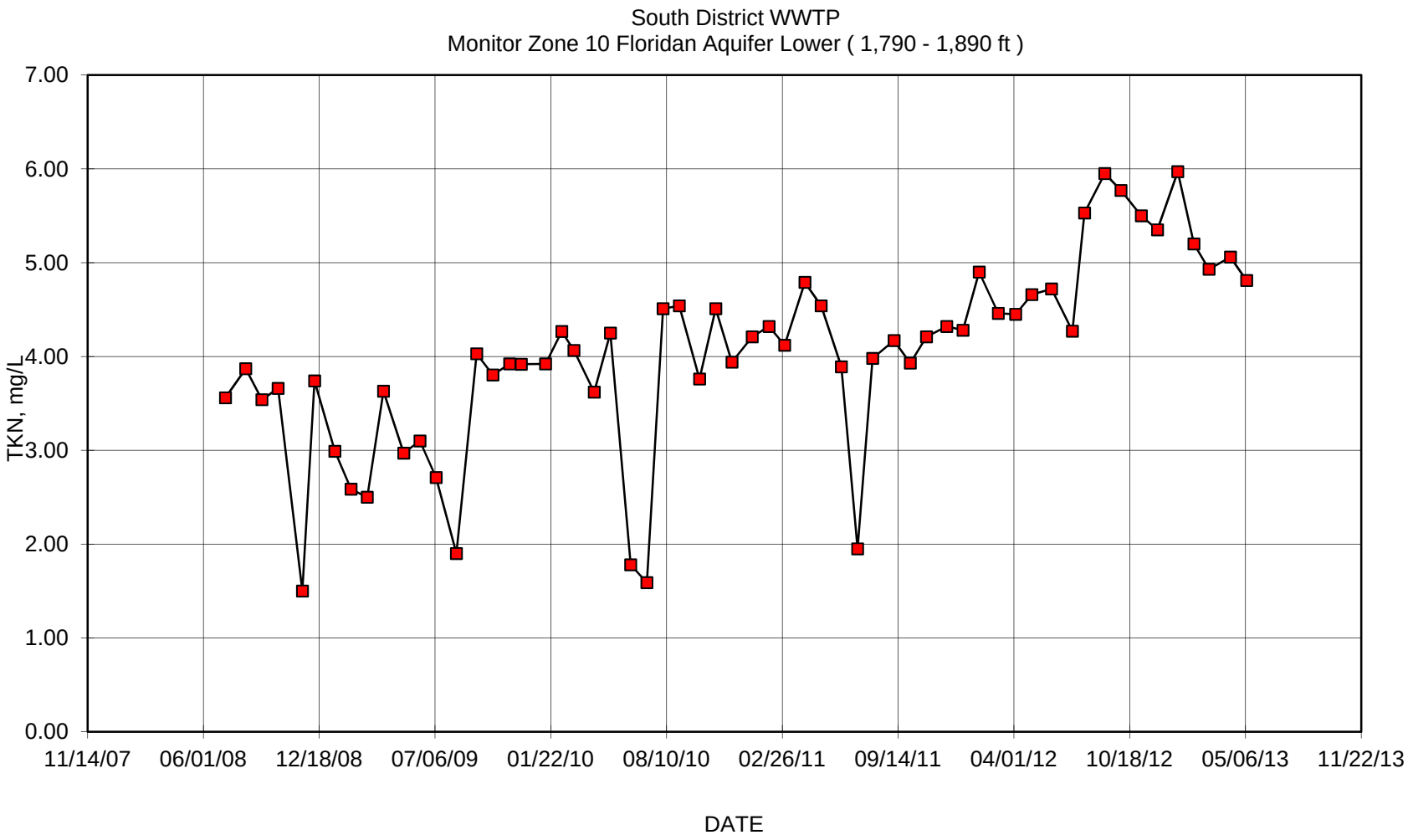
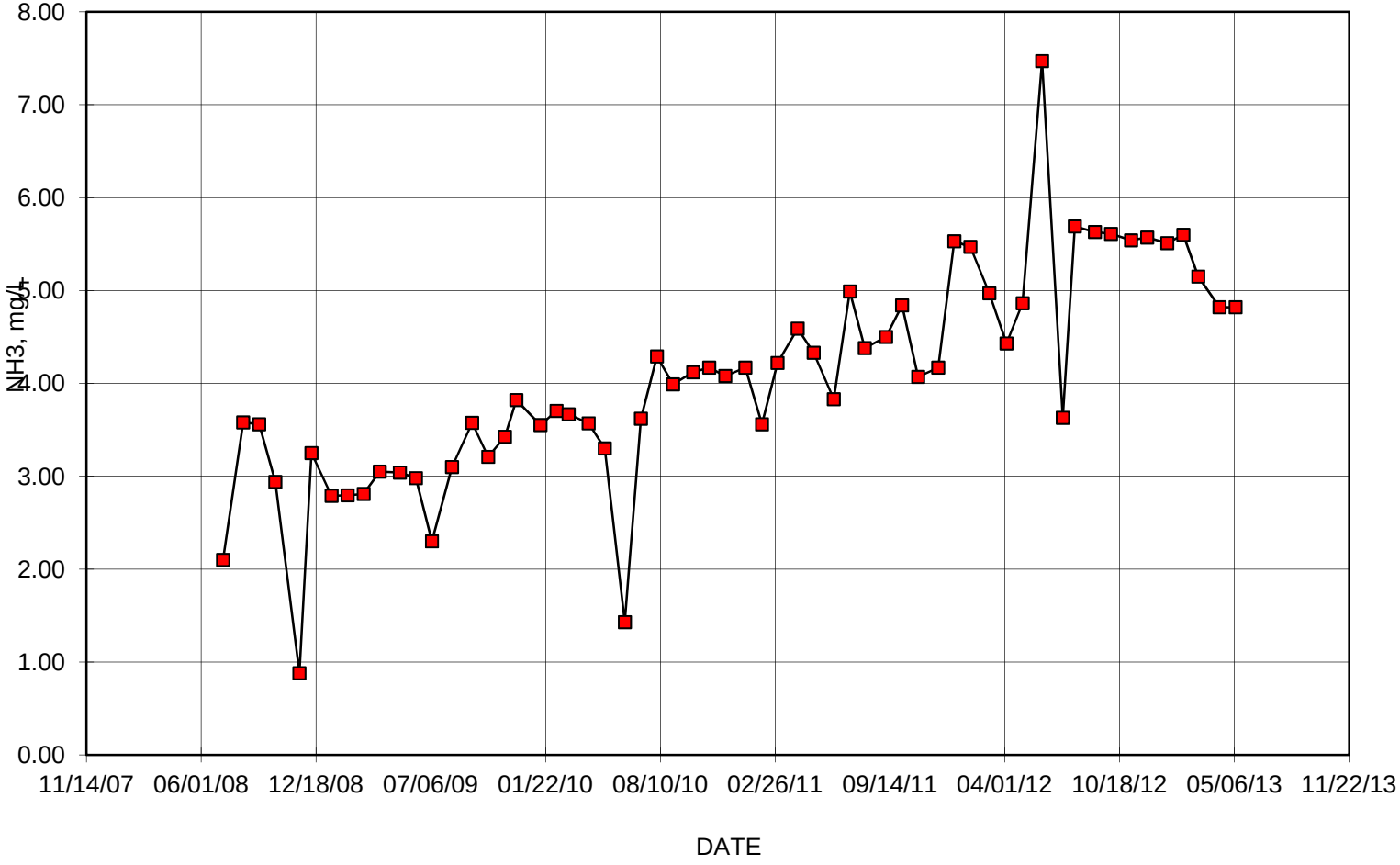
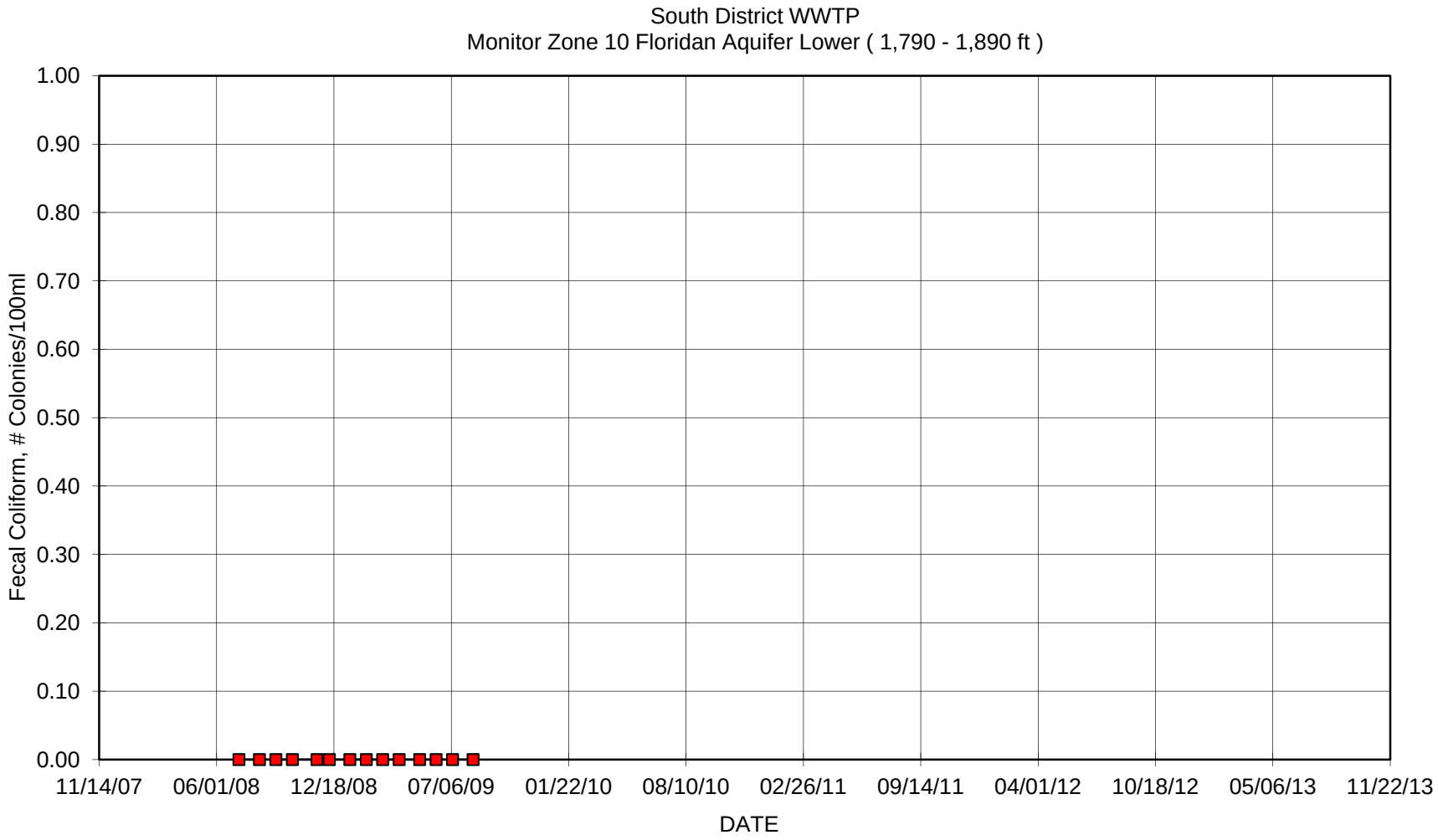
Monitor Zone 10 Floridan Aquifer Lower (1,790 - 1,890 ft)
Chlorides, mg/L
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 10 Floridan Aquifer Lower (1,790 - 1,890 ft)
TKN, mg/L
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

South District WWTP
Monitor Zone 10 Floridan Aquifer Lower (1,790 - 1,890 ft)




South District WWTP
Monitor Zone 10 Floridan Aquifer Lower (1,790 - 1,890 ft)
Fecal Coliform, # Colonies/100ml
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
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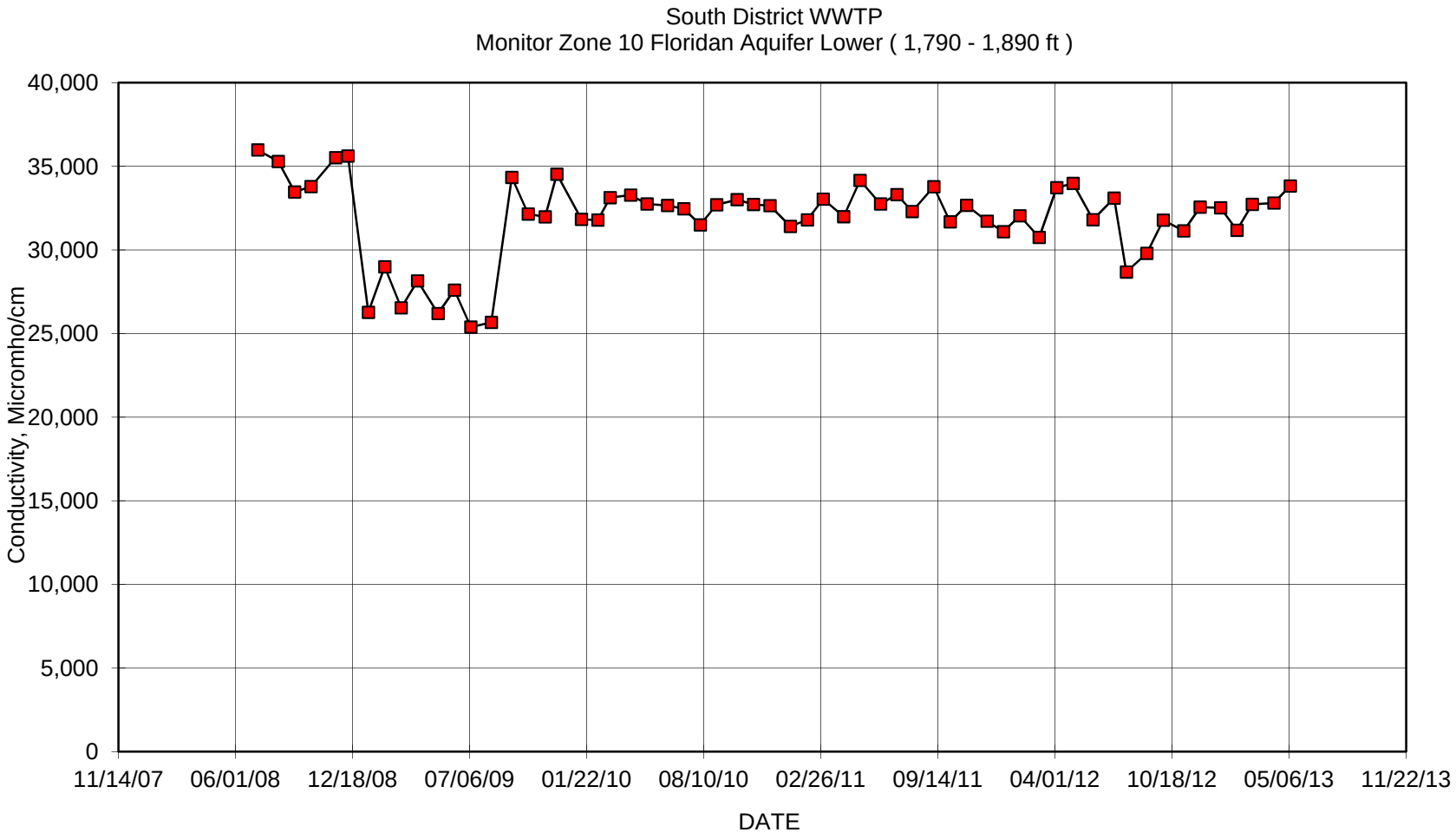
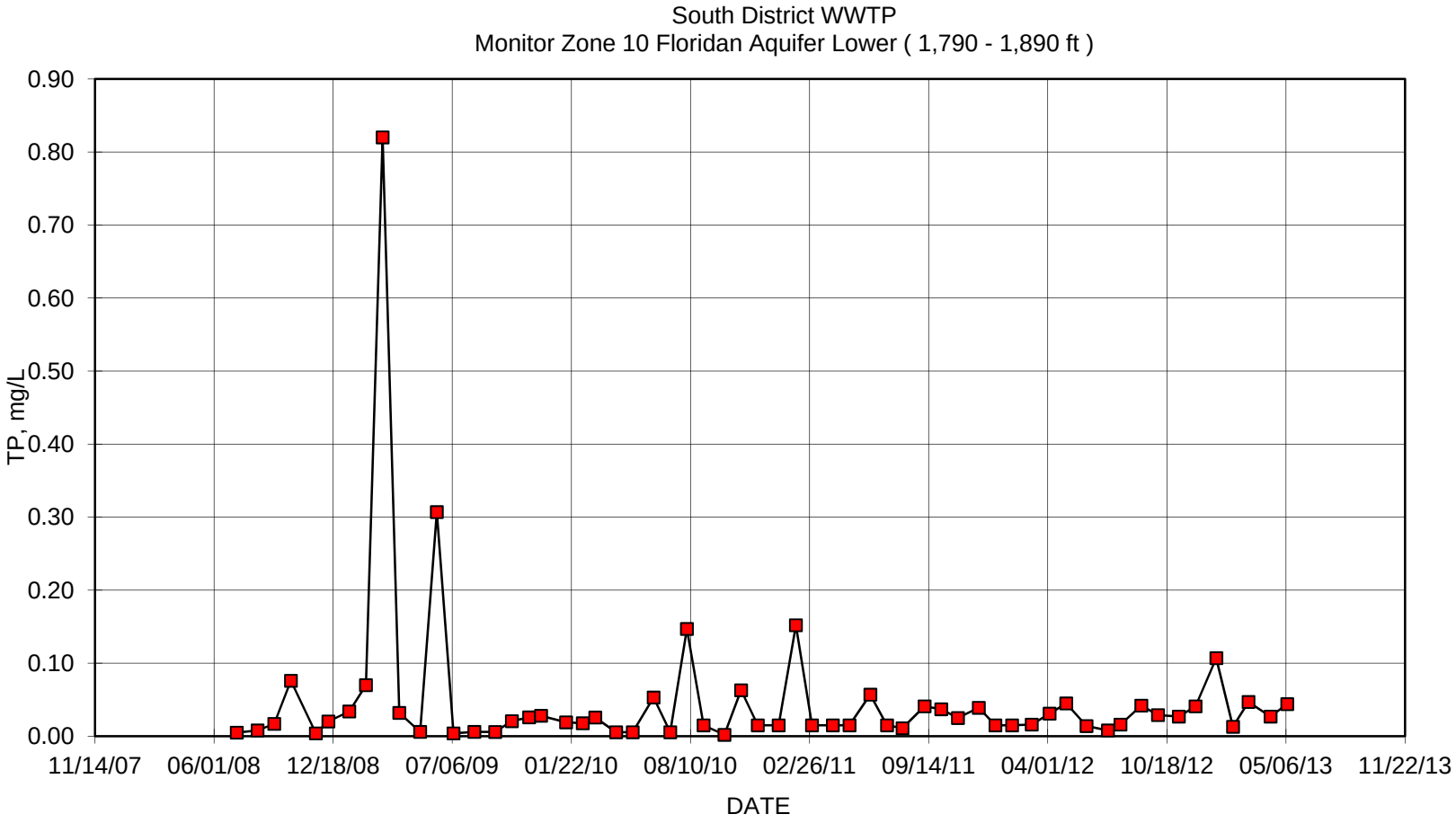
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 10 Floridan Aquifer Lower (1,790 - 1,890 ft)
Conductivity, Micromho/cm
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 10 Floridan Aquifer Lower (1,790 - 1,890 ft)
TP, mg/L
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
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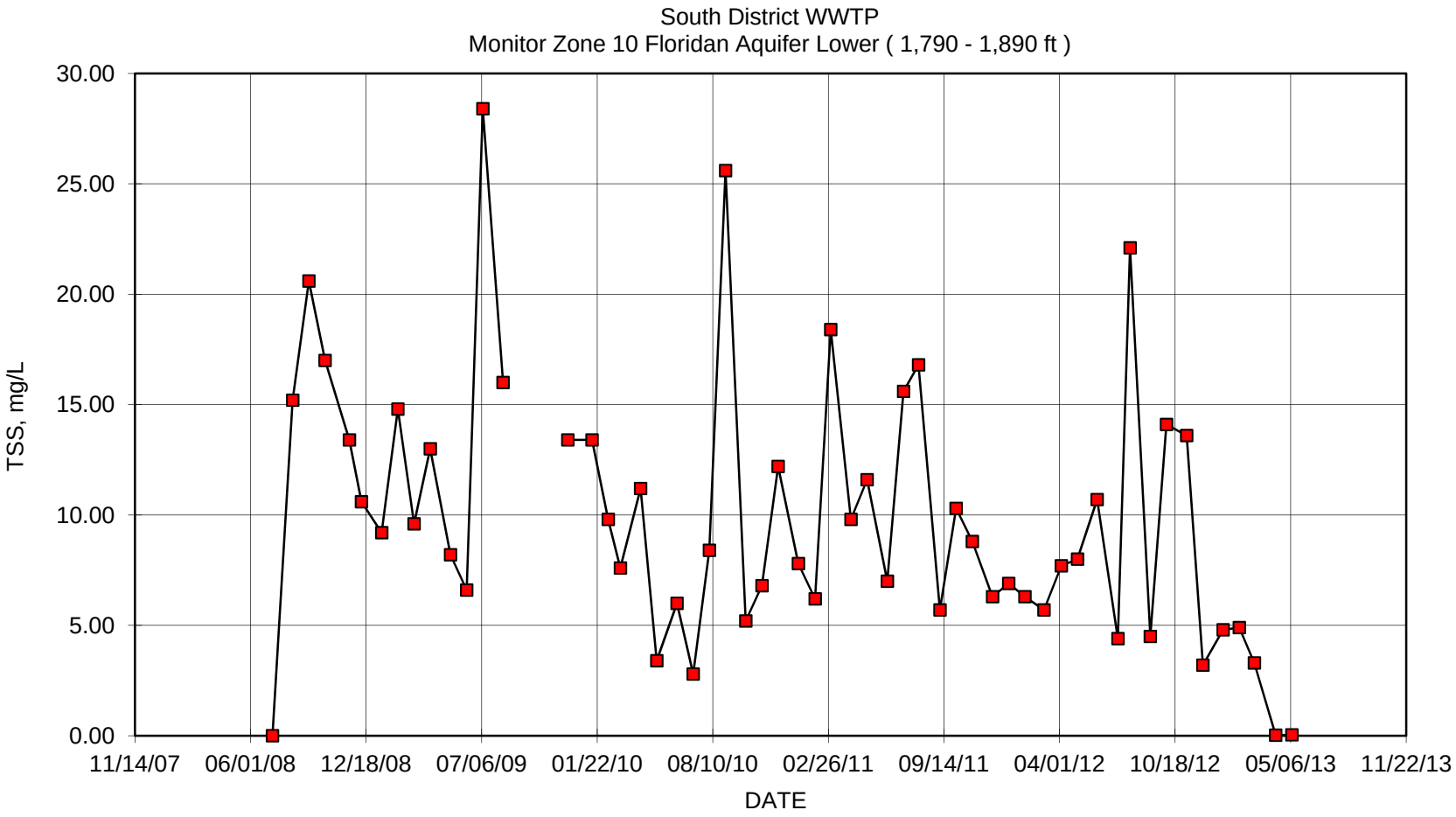
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 10 Floridan Aquifer Lower (1,790 - 1,890 ft)
TSS, mg/L
30.00
25.00
20.00
15.00
10.00
5.00
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

MIAMI-DADE COUNTY
miamidade.gov

Water and Sewer
PO Box 330316 • 3071 SW 38 Avenue
Miami, Florida 33233-3016
T 305-665-7471

September 3, 2013

Mr. Joseph R. May, P.G.
Florida Department of Environmental Protection
400 North Congress Avenue, 3rd Floor
West Palm Beach, Florida 33401

Certified Mail
7001 0360 0001 6783 8604

Reference: Miami-Dade Water and Sewer Department -- Mechanical Integrity Testing (MIT) Report for Deep Injection Well No. IW-2 at the SDWWTP Site.

Dear Mr. May:

Enclosed please find the Certificate of Mechanical Integrity and the MIT Report on the re-testing of Deep Injection Well No. IW-2 at the South District Wastewater Treatment Plant site in Miami-Dade County.

All the tests were conducted in strict adherence to the specifications submitted to and approved by your office. The testing results for the well were good. Both external and internal mechanical integrity were demonstrated. The well casing and the wellhead components are in good condition. All the well head valves and all the well head components are scheduled to be rust-proofed and repainted when all the MITs are completed. Based on the results of the well testing we conclude that the well retains full mechanical integrity and recommend that MDWASD be allowed to continue operating the well in its normal mode.

If you have any questions or require additional explanation of any item in the report, please do not hesitate to contact me at [redacted] or Sonia Villamil at ([redacted]

Sincerely,

[redacted]

Rafael Terrero, P.E.
Assistant Director- Wastewater

Enclosures: Certificate of Mechanical Integrity
MIT Report Well IW-2 (2 copies)

cc: Joseph Haberfeld, FDEP - Tallahassee

MIAMI-DADE COUNTY
Delivering Excellence Every Day

Mechanical Integrity Test Report
Deep Injection Well No. IW-2
South District Wastewater Treatment Plant

Prepared by:
Miami-Dade Water and Sewer Department
3071 SW 38th Avenue
Miami, Florida 33146

CERTIFICATE OF MECHANICAL INTEGRITY

The **South District WWTP** deep injection well **IW-2** operated by **Miami-Dade Water and Sewer Department** has been tested for mechanical integrity. The tests followed standard engineering practices and used methods presented in the United States Environmental Protection Agency regulations for the purposes of these tests. The external and internal mechanical integrity tests followed Florida Department of Environmental Protection (FDEP) pre-approved testing specifications and all the critical test events were witnessed by representatives of the FDEP, the MDWASD and the contractor.

Having supervised the engineer and geologists that were present during the testing, conducted the examining of the results and the preparation this mechanical integrity report as part of this certification, the undersigned certifies that deep injection well **IW-2** operated by **Miami-Dade Water and Sewer Department** at the **South District Wastewater Treatment Plant Site in Miami-Dade County, Florida** has successfully passed all the test requirements for mechanical integrity under rules of Chapter 62-528 of the Florida Administrative Code and is therefore determined to have mechanical integrity.

Certified on August 29, 2013

[redacted]

8/29/13

Howard J. Fallon Jr., P.E.
Professional Engineer
License Number 24153

MECHANICAL INTEGRITY TEST REPORT
FOR
DEEP INJECTION WELL No. IW-2
AT THE
SOUTH DISTRICT WASTEWATER TREATMENT PLANT

Prepared by:

MIAMI-DADE WATER AND SEWER DEPARTMENT
3071 SW 38th Avenue
Miami, Florida 33146

For Submittal To:

UNDERGROUND INJECTION CONTROL
FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

August 2013

ABSTRACT

The internal mechanical integrity was investigated through a pressure test performed on the injection casing. The pressure test was conducted at 150.5 pounds per square inch (psi) which is approximately 1.5 times the maximum (100 psi) potential injection pressure and more than 1.7 times the maximum operational pressure that the well will be under when operating at its full permitted injection velocity of 10 feet per second (ft/sec). FDEP permits a 5% loss in pressure during the hour long test in order for the internal mechanical integrity to pass the pressure test.
IW-2 successfully passed the pressure test because the casing only lost 2 psi. The successful results of the pressure test for internal mechanical integrity were reinforced by the results of the second internal mechanical integrity test, the TV survey of the casing. The TV survey confirmed that the casing and the casing joints are in good condition and that the well has internal mechanical integrity.

This well was originally cased down to 2628', but several years ago during an M.I.T. video survey, it was found that there was a gap in the casing. The gap in the casing is located at 2517'. Therefore, this well is now treated as if it were cased to 2517'.

The external mechanical integrity was investigated using two test procedures, a Radioactive Tracer Survey (RTS) and a Temperature Log. Results of the RTS confirmed the integrity of the cement around the casing and the continued competence of its seal with the geologic strata. The temperature test showed that there are no anomalies that would indicate points where injected fluids could escape through the casing and cement into the formation. Similarly there were no temperature anomalies that would indicate injection fluids entering the formations at other than the approved injection depth.

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Section 1

1. INTRODUCTION

1.1 BACKGROUND

On October 12, 2012, (see Appendix A) the Miami-Dade Water and Sewer Department (MDWASD) submitted the County's proposed plan and testing specifications for conducting the mechanical integrity tests (MITs) and repairs on some of the injection wells at the South District Wastewater Treatment Plant (SDWWTP) site (see Figure 1) to the Florida Department of Environmental Protection (FDEP). The plan, represented by the specifications, described the step-by-step procedure to be followed and included the testing schedule required to meet the 5-year MIT re-testing conditions of the FDEP permit for each of the injection wells. After receipt of these documents, the FDEP Staff reviewed the proposed plan and sent an approval on June 5, 2013 (see Appendix B).

The contract documents for conducting the MITs were let out for bids, and the winning bid was submitted on February 28, 2013 by Youngquist Brothers, Inc., a well drilling contractor from Ft. Meyers, Florida. After the contract was approved by the Board of Country Commissioners and signed by the County Manager, the MDWASD issued the notice to proceed on May 17, 2013 and the contractor began mobilizing to the site.

1.2 PURPOSE AND SCOPE

The purpose of this report is to provide FDEP with a document that describes the re-testing procedures for mechanical integrity applied to each of the SDWWTP deep injection wells (see Figure 2). The report also presents the field reports (see Appendix C), and the results of the tests in a single volume for ease of reference. The mechanical integrity re-testing operations involved conducting a pressure test on the well casing to show that there are no leaks in the casing, and conducting a TV survey on the well to reinforce the data from the pressure test. The re-testing includes tracking a radioactive liquid-tracer (iodine isotope I-131) injected down the well to show that there is no fluid movement upward behind the casing, into underground sources of drinking water (USDW). The radioactive test information is reinforced with temperature logs run on the well. Gamma ray logs are used to detect the movement of the radioactive tracer.

Figure 1. South District Wastewater Treatment Plant Site

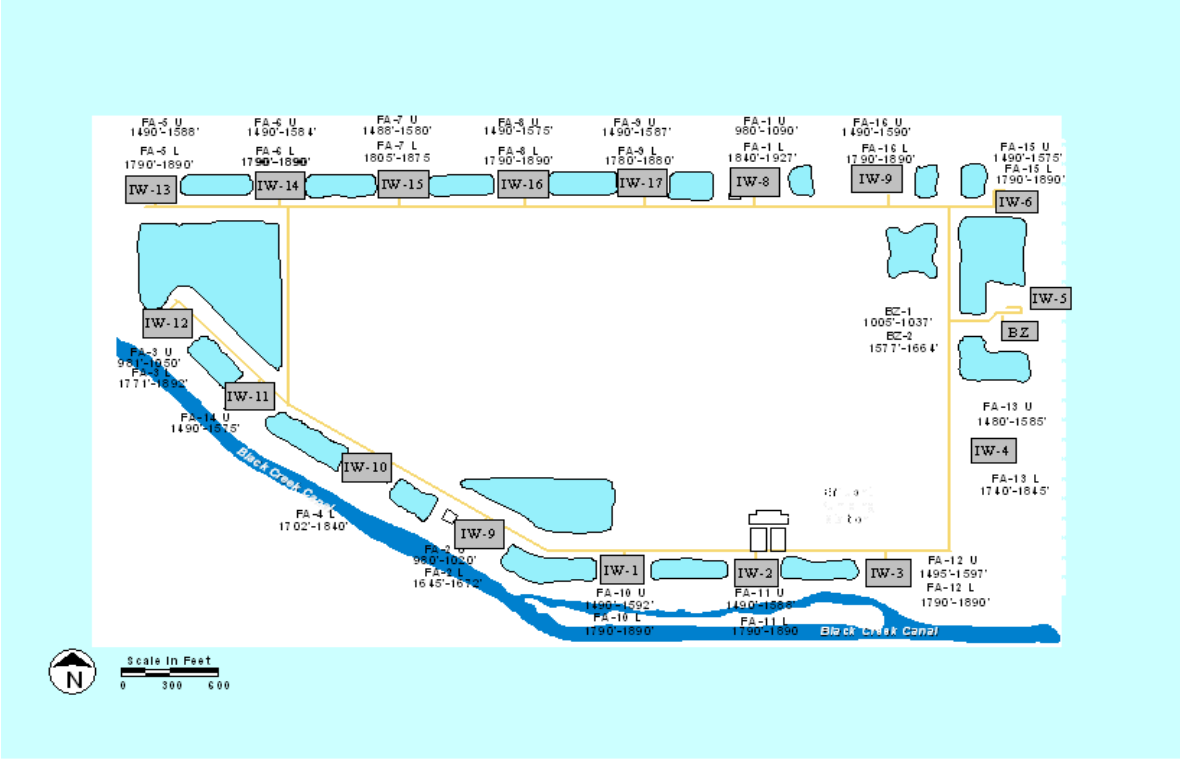


Figure 2. Well Locations Layout

Section 2

2. MECHANICAL INTEGRITY TESTING (MIT)

2.1 METHODS USED

The MIT program is designed to test two elements of the injection well system: 1. Internal integrity and 2. External integrity. The first test element, the internal mechanical integrity test of the well, tests the condition of the injection casing. The second test element, the external mechanical integrity test of the well, tests for leaks outside the casing. This is achieved through a series of field tests including a pressure test and a TV survey for the internal testing, and the temperature log, gamma ray log and RTS survey for the external testing. The first test element, the internal mechanical integrity test, tests for leaks in the injection pipe (casing). The second test element tests for leaks in the annular space outside the casing (cement-filled space between the periphery of the drilled hole and the casing) and in the near-to-the-well geologic strata.

2.2 CASING SCRUBBING

Because the mechanical integrity of injection wells has to be tested every five years, and because a TV inspection of the well is part of the test requirements, MITs provide a timely opportunity to clean the well of deposits that may have formed on the inside of the casing during the intervening years and at the same time provide a cleaner casing for the TV inspection. Cleaning the inside of the well casing is achieved by running a scrubbing brush up and down the casing. However, before the cleaning can be performed, flow out of the well must be controlled. The column of water inside the casing is fresh water and results in a positive hydraulic head inside the well. That head must first be controlled to prevent water from flowing out of the well during the cleaning operation.

2.2.1 Flow Suppression

Suppression of the fresh water head was achieved by first pre-mixing water with salt (NaCl) to form a heavy brine, and then pumping the brine down the well casing, through a 6-inch gate valve on the wellhead. This procedure results in the displacement down the well of the fresh water at the top of the column and replacement of the displaced fresh water with the brine solution. An equal volume of fresh water is displaced out of the well at the bottom of the casing. The procedure is repeated until the pressure head inside the well is suppressed. This method of displacement is used because it achieves flow suppression without first having to open the well to insert a tremie pipe to the bottom of the casing for introduction of the brine. This displacement method also provides a safe way of “killing” the well that at the same time reduces the volume of injected salt solution that would enter the formation at the bottom of the well. One additional advantage is that using this method the brine can be recovered and reused in flow suppression at other wells.

The brine was prepared in 1,000-gallon (gal.) batches by mixing the salt from a 2,000-pound (lbs.) sack in a 1,000 gal. tank of fresh water. The 1,000 gal. solution was then pumped down the well before other similarly mixed batches of salt solution were mixed and pumped down the

well (see Figure 3). In the end, the operation was repeated 12 times, and a total of 12 sacks (approximately 24,000 lbs. of salt) were used to suppress the head in the well. This salt concentration represents a theoretical specific gravity of 1.239 for the brine, calculated from the salt solution used in the field of 10.3 lbs per gallon. The 24,000 lbs of salt suppressed the pressure head from approximately 26 feet above the top of the casing to approximately 10 feet below.

Figure 3. Flow Suppression Equipment

2.2.2 Scrubbing Operation

The brush used to clean the casing is made with an old drill rod that has an outside diameter of 7 inches with thick steel wire inserted and secured sticking out of the drill rod. The total diameter of the brush with the steel wire bristles is 24 inches. The brush is attached to the bottom of the packer and inserted into the well (see Figure 4). A 24-inch flange was bolted to the top of the well and pressure fittings installed to be used for packer inflation later on in the process. Then Youngquist lowers the brush and packer by attaching drill rods to the top of the packer and then raising and lowering the brush several times using a 50 ton crane. This process was repeated until the casing was scrubbed and the packer was at the depth required to perform the packer test on the well.

Figure 4. Scrubbing Brush and Hydraulic Packer

2.3 INTERNAL MECHANICAL INTEGRITY (CASING TESTS)

2.3.1 Pressure Test

After the pressure head was suppressed and the casing scrubbed, and the inflatable packer was placed at a depth of 2,474 ft bls. This well is cased to a depth of 2,523 ft bls so the packer is in the bottom 50 feet of the casing. Additional pressure fittings were installed on the flange to pressurize the casing with water. A bleeder valve atop the 24-inch flange allows passage of the drill pipes that support the packer without loss of pressure in the casing (see Figure 5). A pretest was conducted on the casing to determine that the pressure was holding and that all the installed testing equipment was operating properly, then FDEP was informed that the well was ready for their inspection. The next day, June 4, 2013, the pressure test was repeated in the presence of FDEP Staff. The packer had been previously sealed against the casing, at an inflation pressure of 365 pounds per square inch (psi) and at 7:30 AM the casing was pressurized with water to a pressure of 150.5 psi.

Figure 5. Well-Head and Recorder Set Up for Pressure Test

At 8:07 AM the one-hour pressure test was started in the presence of Joseph May, P.G. representing FDEP and witnessed by Sonia Villamil, Maria Macfarlane, Michael Ashe, and Jules Durand representing MDWASD, and by Chris Harp and others representing the drilling contractor. The pressure test ran for the required one-hour period. The pressure deviation (loss) in that time was 2 psi, well below the 7.5 psi deviation allowable under the 5 % criteria in the rules (see Table 2-1). The packer inflation pressure and the pressure in the casing were measured using certified gages (see Appendix C) graduated from 0 to 200 psi in increments of 1 psi. The pressure was read in person and recorded by hand at five minute intervals during the test. The pressure was also recorded on an In-Situ pressure transducer attached to the stand with the pressure gauges (see Figure 5).

Table 2-1 Casing Pressure Readings

Time	Casing Pressure (psi)	Pressure Change (psi)	Packer Pressure (psi)
8:07	150.5	0.0	365
8:12	150.5	0.0	365
8:17	150.0	0.5	365
8:22	150.0	0.0	365
8:27	150.0	0.0	365
8:32	150.0	0.0	365
8:37	150.0	0.0	365
8:42	149.5	0.5	365
8:47	149.0	0.5	365
8:52	149.0	0.0	365
8:57	149.0	0.0	365
9:02	149.0	0.0	365
9:07	148.5	0.5	365

2.3.2 Bleed-Off

At the completion of the pressure test the casing pressure was bled-off and the discharged volume from the bleeding was measured (see Table 2-2). Bleeding until the pressure resulted in zero flow produced 31.5 gallons (4.2 cubic feet). This exercise provides a reasonable assurance that the packer is placed at the depth in the well that is within the last 50 feet of the casing.

Table 2-2. Bleeding Volumes versus Pressure

Bled Volume (gallons)	0	5	10	15	20	25	30	31.5
Casing Pressure (psi)	148.5	124	100	76	52.6	28	4	0

2.3.3 Television Survey

As originally constructed, IW-2 was cased to 2,628 feet, but the bottom portion of the casing from 2,517 to 2,628 feet became separated and dropped approximately 7 feet, leaving an uncased gap between the present bottom of the casing at 2,517 feet and the top of the fallen part of the casing at approximately 2,530 feet +/- 2 feet.. The television survey clearly shows that gap, and the panning motion of the camera clearly identifies the edges of the casing separation. However, the well is considered as being cased just to 2,517 feet and the mechanical integrity test is applicable only to that depth. The well has an obstruction at 2,530 feet that did not permit the camera to travel any further down into the well.

A closed circuit color television camera, encased in a pressure vessel capable of withstanding the pressures exerted at the depths to be televised, and equipped with a fish-eye lens, was introduced into the well through a pack-off stripper device on a standpipe above the injection well (see Figure 6). The camera is centralized in the casing, and is preceded down the well with a light source attached below the camera. The camera televises a view of the full circumference of the inside of the casing and the image is recorded on video tape. Prior to the video survey, the well was scrubbed and flushed with potable water to provide the best picture possible. The video survey began at land surface and continued down to 2,530 feet, where the camera runs into an obstruction. At selected intervals of interest, the camera was used to pan the intervals in a horizontal format prior to continuing the normal vertical recording.

A review of the video (see Appendix F) indicates that the casing is in good condition down to 2,517 feet. The video also shows that the scrubbing operation was successful. The scrubber has scrubbed the casing free of all growth down to 2,499 feet and this is confirmed by visible vertical scratches throughout that length of the casing; indicating that the scrubber had brushed the steel casing effectively. All the scratches are superficial, and do not detract from the physical and mechanical integrity of the casing. There are no gouges, grooves, nicks, or other physical damage visible in the casing for its whole length. Below 2,499 feet the casing was not scrubbed to avoid hanging the scrubber with the edge of the bottom of the casing at 2,517 feet. There are some growths and/or deposits visible inside the casing below 2,499 feet.

In summary, the video picture meets the quality standards that are needed for a visual evaluation of the well. This video survey presents a clear view of the casing and of the welded joints of the casing. All the joints are clean and appear to be tight. From the TV survey it is concluded that this casing is in good condition throughout its whole depth from land surface to 2,517 feet.

Figure 6. Television Survey (Standpipe and Logging Truck)

2.4 EXTERNAL MECHANICAL INTEGRITY (CEMENT AND FORMATIONS)

The external mechanical integrity test consisted of two low flow dynamic tests The RTS and temperature survey, conducted on June 10, 2013, for the external mechanical integrity portion of the test was witnessed by the representative of FDEP (Joseph May, P.G.), by representatives of MDWASD (Sonia Villamil and Maria Macfarlane) and by representatives of the contractor (Miguel Martinez).

2.4.1 Radioactive Tracer Survey (RTS)

The radioactive tracer survey uses an isotope of iodine (I-131) as a tracer of water movement inside and outside the casing. Iodine –131 is used because it is a radioactive isotope commonly used in medical practice and therefore it is more easily available and lower in cost than other potential tracers. I-131 also has the advantage of having a half-life of 8 days. That half-life is quite suitable because it is long enough to allow time for transportation to the well site with little decay but also short enough so that it would quickly be reduced if there were any unexpected spills or if there were mechanical failures through which the isotope could travel with the water.

The radiation levels of I-131 at the concentration used for RTS testing is in millicurie-range, which if it were considered a waste, would be characterized as a low level waste by the US Atomic Energy Commission.

The I-131 is first loaded into a container located in the logging tool. This container is electronically activated from the logging truck to eject the desired quantity of tracer at the desired depth through an ejection port. In addition to the tracer container, the logging tool is also assembled with three gamma ray detectors. One detector, the top gamma ray detector (GRT), is located 10 feet above the ejector. The other two detectors, the middle one (GRM) and the bottom one (GRB) are located immediately below the ejector at about 3 feet and 12.4 feet below the ejector respectively. The bottom of the logging tool also includes a temperature tool at the very bottom, and a casing collar locator (CCL) 1 foot below the GRM. Figure 7 shows the configuration of the RTS logging tool. The RTS log in the appendix (Appendix D) shows the distances between each of the logging tool components described above.

Figure 7. RTS Tool and Temperature Probe

2.4.1.1 First Low Flow Dynamic Test

Prior to starting the low flow dynamic test, a background gamma ray log was conducted to establish the natural conditions. It was conducted right after the temperature log. Since the temperature log was run downward starting at land surface, the temperature log had ended with the logging tool at the bottom. The background gamma ray log was conducted from the bottom (2,530 feet) up to the surface.

From the surface, the logging tool was again lowered down the well and the casing collar locator (CCL) used to locate the bottom of the casing. The magnetic coils on the CCL give out a magnetic field and detect a change in the mass. If there is growth on the casing it is harder for the CCL to have a clean line. If the growth has some iron on it, it can cause a sort of interference with the CCL making it harder for the CCL to find the end of the casing. This well has a tear in the casing at approximately 2,517 ft bls, so this well does not get scrubbed below 2,500 ft bls to not risk causing any additional damage to the casing. The additional growth on the casing may have been the cause of the CCL not finding the bottom of casing. The video that was conducted on June 5, 2013 shows the bottom to casing to be at 2,517 feet bls and an obstruction that blocks the camera at 2,530 ft bls. The logging tool also hit an obstruction at 2,530 ft bls and could not continue down the hole any deeper. Because we cannot use the CCL to determine the bottom of casing, the video depth of the obstruction and the logging tool depth of the obstruction are the same at 2,530 ft bls. Therefore, the video location of the bottom of casing at 2,517 ft bls can be used as the depth because it is reinforced by the depth of the obstruction of the logging tool. After the bottom of the casing was located, the well was ready for the low-flow dynamic RTS test.

The ejector port of the I-131container was set at 2,512 feet and 1 millicurie (mCi) of I-131 was released while the flow down the well was kept at a constant rate of 88 gallons per minute (gpm). The logging tool was kept immobile after the ejection of the I-131 and the three gamma ray detectors continued to record in place. One (1) mCi of I-131 was ejected into the well. The middle detector, located 3 feet below the ejector port, picked up the radioactive tracer 24 seconds after the ejection. The bottom detector, which is located over 12 feet below the ejector, picked up the tracer 1 minute and 56 seconds after the ejection. The middle detector seems to pick up some interference from the ejection motor on the tool when the ejection occurs and this shows up on the log at the same time of ejection. However, this interference is at a much lower level and is dismissed as nothing more than interference from the ejection motor. The bottom detector picked up a small blip or increase in the iodine levels approximately 45 minutes into the test, but the levels of detection were low, from 10 to 20 mCi and only lasted for 3 minutes of the test. The flow was checked and found to be steady at 77 gallons per minute. This small increase may be caused by the type of flow in the well below the obstruction at only 5 feet below the GRB detector. The obstruction may be causing some type of turbulent flow that may have cause the small increase. The test ran for 60 minutes and the top detector did not pick up any tracer.

After the first low flow test ended, the tool was then raised up more than 200 feet, to a depth of 2,300 feet, to log out of position to make sure that the tracer did not migrate up the casing or the formation outside of the casing. No migration was detected.

Once the log out of position was conducted and the tool placed back to depth, no staining on the casing was found which means no interference for the second RTS. Therefore, with the approval of Joseph May, P.G. from FDEP, the well was not flushed prior to the second RTS test.

2.4.1.2 Second Low Flow Dynamic Test

The tool was placed back to a depth were the ejector was located at 2,512 feet with a flow of 95 gallons per minute set down the well. For this test, 2 milicuries of I-131 were ejected into the casing. The middle detector started picking up the tracer about 24 seconds after it was ejected. The bottom detector, which is located over 12 feet below the ejector, picked up the tracer 1 minute and 52 seconds after the ejection. Again the middle detector picked up some interference from the ejector motor at the time the I-131 was released. The upper detector did not pick up any tracer for the duration of the test, which lasted 30 minutes.

After the second low flow test ended, the tool was then raised up more than 200 feet, to a depth of 2,300 feet, to log out of position to make sure that the tracer did not migrate up the casing or the formation outside of the casing. No migration was detected.

With the last low flow dynamic test, the mechanical integrity test was concluded, but before bringing the geophysical tools out of the well, the leftover I-131in the container was ejected and the container flushed-clean to insure that any remaining radioactive iodine was well dispersed. Because of the obstruction in the well at 2,530 ft bls, the tool was placed at a depth of 2,529 ft bls. The ejector was located at 2,526 ft bls, which is less than 10 feet from the bottom of the casing. The remaining Iodine 131 was ejected and the well was flushed with effluent at a rate of over 4,000 gallons per minute to ensure no staining of the tool. The logging tool was then brought up from the bottom and on the way up a final gamma ray log was made. Then the final gamma ray log was compared to the background gamma ray log, and the comparison showed that there are no noticeable differences in the two except for a residual stain at the bottom of the casing where the I-131 had been repeatedly released during the testing, and just below there, where the tracer exited the casing. Injection of water down the well at a rate of 4,600 gpm continued for the next hour to completely flush out the well.

2.4.2 Temperature Log

Youngquist Brothers Inc. conducted the temperature log on June 10, 2013 starting at about 10:30 A.M. and logging down to 2,530 feet. The temperature probe (Figure 7) was run from the surface downward to minimize the disturbing effect of the movement of the logging tool on the temperature of the water in the well. The temperature log was started more than 24 hours after the well had last been disturbed by outside influences. The TV survey was the last disturbance in the well.

The temperature log (see Appendix H) shows the warmest interval is in the section from 2,450 to 2,500 feet and then the temperature reaches the highest level just above the bottom of the casing at 2,510 feet. This is consistent with the higher temperature of the injected water in that interval. The temperature log did not detect any anomalies that would indicate that injection fluids are present outside the casing, and there is no indication of any upward movement of warm injection water either. The similarity of the temperature oscillations in this temperature log (in the interval from land surface down to the bottom of the casing) to those in the temperature logs from

previous MITs and to those in the temperature log when the well was constructed, indicates that there has been no apparent change in the cased interval, and no upward movement of the injected water in the last 5 years.

2.5 WELL HEAD REPAIRS AND RE-INSTALLATION

The work associated with the MIT ended when the wellhead was replaced. The air and vacuum release surge check valves were replaced prior to reinstallation of the wellhead. The 6 inch gate valve and air release were replaced. The wellheads are scheduled to be sandblasted, rust proofed and repainted after the MITs on all the other wells are completed. Injection well IW-2 has been placed back on line and flow from the plant's pump station is again discharging to this injection well.

Section 3

3. CONCLUSIONS AND RECOMMENDATIONS

3.1 CONCLUSIONS

The pressure test was conducted successfully and it was concluded from the results that there is internal mechanical integrity. This conclusion is reinforced by the analysis of the TV survey down to the injection level at 2,517 feet. The TV survey indicated that the casing is in good condition and that all the casing joints appear to be tight and in good working order.

The two successful RTS conducted at low flow rates indicate that there is no upward movement of water outside the casing. Therefore, it was concluded that the RTS results show that there is external mechanical integrity. The temperature survey reinforced the results of the RTS by showing that there has been no movement of injected water anywhere except the injection zone.

3.2 RECOMMENDATIONS

The successful completion of all the tests for mechanical integrity confirms that IW-2 retains full mechanical integrity and as such it is appropriate to continue using this injection well. MDWASD also recommends that FDEP review the results of the tests presented in this report and based on those results determine that the well has mechanical integrity and may continue to be used for its intended purpose.

Finally, MDWASD recommends that although the well head will not be painted until all the MIT tests are completed on the other wells, IW-2 should receive mechanical integrity certification.

Appendix A

Mechanical Integrity Testing Procedures Submitted by MDWASD to FDEP
October 12, 2012

Miami-Dade Water and Sewer Department
Mechanical Integrity Testing Procedures

Miami-Dade Water and Sewer Department
Mechanical Integrity Testing and Repair Procedures
October 12, 2012

MECHANICAL INTEGRITY TESTING and REPAIR PLAN (SDWWTP and NDWWTP Injection Wells)

General Information

The Contractor shall carefully coordinate his activities with the Department to minimize interference with any existing operations or the operations of the Department. Department forces will isolate the well and turn over to the Contractor. Existing valves shall only be operated by Department personnel. The Contractor's personnel, under no circumstances, shall operate any such valve.

The Contractor shall provide all barricades and/or flashing warning lights necessary to warn workers and employee of the testing throughout the Project. This shall be done at the Contractor's expense and to the satisfaction of the Engineer. Every effort must be made to reduce inconvenience and nuisances to a minimum.

The Contractor shall at all times, use the assigned entrance to the Plants to bring in materials, equipment etc. required for the Project. Materials and equipment shall be stored in areas designated by the Engineer, and shall not interfere with the daily operations at the site or with other Projects. Suitable platforms shall be used for material storage to prevent damage to the landscaping. The Contractor shall exercise extreme caution when transporting equipment or materials within the Plant area.

The conveying vehicles shall be properly selected, and equipped, to prevent damage to paved areas, landscaping and other existing facilities including wells, well pads, fencing, underground pipelines, pipe chases, etc. If necessary, suitable wooden skids shall be used to distribute loads, and to prevent damage.

If any of the above existing structures, including the wells, or any other parts of the project area, are damaged, the contractor shall make suitable repairs or replacement at his expense, in a manner described by the Engineer, and to his satisfaction.

The Contractor shall also exercise extreme caution to prevent any spillage of sewage effluent. The County may charge t he Contractor for any cost incurred or penalties imposed on the County as a result of such spillage.

The wells to be tested are Injection Wells IW-l through IW-17 at the South District Wastewater Treatment Plant and IW-1N through IW-4N at the North District Wastewater Treatment! Plant

The Injection Wells have a 24-inch outside diameter (OD), 0.500-inch wall thickness injection casing set to total depths of 2,450 to 2,850 feet below land surface (bls), and were constructed with a nominal 22-inch diameter open borehole extending from the bottom of the casing to approximately 3,000 feet bls.
Except IW-5 at the SDWWTP, has a 20-inch outside diameter (OD), and 0.500 inch wall thickness.

The CONTRACTOR will perform internal and external mechanical integrity tests on the casings of twenty one deep injection wells and perform all appurtenant work in accordance with the above

Contract Documents.

The work shall be performed by a competent crew with equipment that is adequate to complete all phases of the testing and instruments of sufficient accuracy and resolution to identify anomalous responses to the tests. If the CONTRACTOR'S equipment is not capable of satisfactorily performing the work provided for in these specifications, the CONTRACTOR at his own expense shall substitute equipment.

The CONTRACTOR shall have not less than 5 years experience in constructing and testing wells and shall have tested not less than 5 wells of similar type and capacity. The CONTRACTOR shall be licensed by the State of Florida and the license number shall be affixed to all correspondence and reports.

All work shall comply with and be in full conformance with this Mechanical Integrity Test Plan submitted to FDEP together with subsequent response letters for the injection wells at the South and North District Wastewater Treatment Plants and with the appropriate sections of Chapter 62-528 FAC.

If remedial work or re-testing is required prior to final acceptance of the work to meet regulatory requirements and the specifications of the Contract Documents due to defective materials, accident, loss of equipment or equipment malfunction, or for any other cause directly attributable to the CONTRACTOR's actions, the CONTRACTOR shall bear the entire cost of the remediation or re-testing, including all additional materials, labor, and equipment required and any necessary additional Engineering costs. In the event of a problem, the ENGINEER shall be notified immediately, and the following shall apply:

1. The CONTRACTOR shall propose a method of correcting the problem, in writing, to The ENGINEER, who shall review the method of corrective action, and accept the plan in writing before work can proceed.

2. All work on the well must be in accordance with all applicable local, state and federal regulations.

The CONTRACTOR shall notify the ENGINEER a minimum of 72 hours prior to conducting the pressure test, geophysical logging and the radioactive tracer survey so that the ENGINEER and regulatory agency staff can be properly notified.

The CONTRACTOR shall provide all facilities, equipment and materials required for the removal of waste fluids from the well site.

The CONTRACTOR shall kill the well using a dense food- grade salt solution. No barite or mud-based additives shall be used in the well.

The CONTRACTOR shall comply with the OSHA regulations contained in 29CFR Section 1910 for General Industry Regulations and 29CFR Section 1926 for Construction Regulations.

Equipment and Procedures

1. Wellhead Assembly: The stripper head assembly used during the video survey, Geophysical logging, and the radioactive survey shall be bolted to the wellhead above the 6-inch gate valve. The stripper head assembly used must be of sufficient length to house the longest of the wire line tools used for the testing between the gate valve and the pack-off mounted at the top of the assembly. The pack-off must be adjusted so that the tools can be moved freely up and down the well with minimal leakage from the well. The assembly shall include a 4-inch valve and tee, which will be used to inject potable water during the surveys. The assembly shall be fitted with a

pressure gauge for use during the tests.

2. Wellhead Hardware: Should the nuts and/or bolts at the wellhead assembly become stripped during the CONTRACTOR's efforts, the CONTRACTOR shall replace them with equivalent hardware.

3. Water Line: The CONTRACTOR shall provide a potable water supply line for use during the video surveys. This line shall be connected to the existing 4-inch valve on the CONTRACTOR's stripper head. It shall be equipped with a check value to prevent the backflow of effluent into the water supply source. It shall also be equipped with a continuous recording digital flow meter and totalizer capable of measuring flows accurately in the range of 0 to 250 gpm.

Mechanical Integrity Testing (MIT)

The mechanical integrity testing under this Contract shall be accomplished using the following methods and general sequence, however the Contractor shall submit a more detailed sequence to the Engineer for approval before he begins work. The Contractor shall use extreme caution to prevent any loss of equipment, tools or other items into the wells and shall be fully responsible for retrieving any such items immediately, at no expense to the Department. All pressure tests must be conducted in the presence of the Engineer or his authorized representative.

MIT Clean and Pressure Test the Casing

1. The Contractor shall set up all equipment required to prepare for suppressing the density differential pressure, cleaning, performing the pressure test and the radioisotope and closed circuit television surveys.

2. The Contractor shall inject sufficient salt solution into the well to balance the differential pressure and disassemble the wellhead. The brine solution shall remain in the well during the cleaning and pressure testing steps, after which time it shall be transferred to another well if clean enough for reuse, or shall otherwise be disposed of by the Contractor. Under no circumstances shall brine solution be spilled or disposed of on the ground surface, however it may be disposed of into the injection well.

3. The Contractor shall clean the casing before proceeding with the pressure test. The entire length of casing shall be cleaned. If the later television survey indicates insufficient cleaning, the well shall be re-cleaned by the Contractor, at his expense, to the satisfaction of the Engineer. If the television survey must be repeated because of insufficient cleaning, in the opinion of the Engineer, it shall also be at the Contractor's expense.

4. The Contractor shall, when requested by the Engineer, place the packer through a stand-pipe with a packoff device to a point near the top of the well (but within the concrete encasement area) and test its integrity. This shall be accomplished as described in Steps 6, 7, and 8 below. If the packer fails the integrity test it shall be replaced with one that will meet the test. The Engineer is aware that packers have limited inflation cycles and will attempt to minimize the verification of packer operation. However, any integrity failure for which the packer operation can not be eliminated must be repeated at the Contractor's cost. It is anticipated that each new packer will be tested at the wellhead to verify its capacity to seat and deflate.

5. The Contractor shall lower and place the packer to a point within the lower 40 feet of the casing, but not the last 10 feet. The CONTRACTOR will be responsible to assure the proper seating of the packer. A preliminary test shall be performed to ensure proper operation of the test set-up. The CONTRACTOR shall notify the ENGINEER at least 24 hours before running the preliminary test. The test will be run following the same test program as the actual pressure test, as described below. IW-2 at SDWWTP will have the packer placed within 40 feet of the tear in the casing.

6. The Contractor shall inflate the packer to a pressure not exceeding 350 psig over the static condition as measured at the wellhead on a calibrated gauge to create a positive seal.

7. The Contractor shall pressurize the casing to 150 psig with no air in the casing or wellhead. The pressure shall be recorded on a chart and signed by the Engineer, the Contractor and any witnesses present. The pressure test gauge shall be calibrated within 6 months of performing the pressure test. The CONTRACTOR must present proof of calibration of the pressure gauge to the ENGINEER and FDEP staff at the time of testing each well. The pressure gauge must be mounted at or near eye level in order to ensure maximum visibility.

8. The test will be considered successful if the pressure does not change more than 5% psi in one hour.

9. If the test fails, the Contractor shall move the packer upwards for approximately 10 feet, and repeat Steps 6, 7 and 8.

10. If the test still fails, additional repositioning of the packer and repeating of Steps 6, 7 and 8 shall be as ordered by the Engineer. If the test still fails, and subsequent radioisotope surveys indicate no casing failure, it will be presumed that the Contractor's packer did not create a positive seal, and the Contractor shall be required to repeat Steps 4 through 8 at his expense. No payments will be made to the Contractor if it is subsequently determined that the test failure was caused by the seating of the packer. If the packer fails during packer operation verification, it will be concluded that the packer was faulty during any previous test that did not demonstrate casing integrity. The Contractor shall repeat this test at his expense.

11. After pressure testing, measure the depressurization bleed down with a 5 gallon bucket upon release of the pressure in the casing. The bleed down fluid will be properly disposed of by the Contractor.

12. The Contractor shall deflate the packer and withdraw it from the casing.

13. The Contractor shall reassemble the wellhead and connecting piping using new gaskets.

14. Prior to geophysical logging, the fluid used to "kill" the well, or for pressure testing the casing shall be flushed from the well and the well will be shut-in for a minimum of 12 hours.

MIT Video Surveys

A Video Survey inside the injection well casing be performed using the following procedures.

.A 6-inch diameter stripper head assembly will be bolted to the wellhead assembly above the existing 6-inch diameter gate valve. The stripper head will be of dimensions that allow the video operator to put his camera between the gate valve and the pack off and close both the valve and the pack off. The lower part of the assembly shall consist of a 4-inch tee and valve through which potable water may be introduced into the well.
.
Prior to performance of the survey and for a period of 24 hours, fresh water from an adjacent fire hydrant will be introduced into the well through a 4-inch diameter valve located on the stripper head assembly. Fresh water shall be pumped into the well to provide clarity for the survey.

3. If, after 24 hours of pumping potable water into the well, the water quality does not permit a clear picture of the inside of the well, the CONTRACTOR may be required to perform additional pumping services to assure a good survey as specified above.

4. The pumping of the potable water will continue at a rate of approximately 0 to 250 gpm during video surveying. If the open hole portion of the well is not clean, or visibility in any part of the well is poor, the CONTRACTOR shall perform additional pumping services to ensure a good video survey before running another or continuing with the survey.

5. During the video survey, the CONTRACTOR shall stop the camera's progress as instructed by the ENGINEER at depths where there may be potential flaws in the casing or other features to allow for thorough examination at those locations.

Upon reaching the total depth of the well with the video camera and obtaining a video survey satisfactory to the ENGINEER, the camera shall be removed from the well, and the well placed back in service.

MIT Radioisotope Tracer Survey and Temperature Survey

A radioisotope tracer survey shall be used to detect any fluid movement outside of the injection casing from the injection zone into the overlaying aquifers. The tool configuration shown below, or approved equal is required. The tool must be capable of ejecting the radioactive tracer and simultaneously monitoring the gamma ray sensors. No time lag between ejection and monitoring is permitted. A casing collar locator (CCL) shall be positioned below the tool as shown below, to precisely locate the bottom of the casing. Two low flow dynamic test runs, shall be performed. Additional low flow dynamic test runs can be done if results warrant additional testing, as determined by the ENGINEER in consultation with FDEP staff.

A temperature survey log shall also be performed from land surface to the total depth of the well. The temperature log shall be performed logging down at a rate of not more than 60 feet per minute. The temperature survey shall be performed after the well has been "shut in" and stabilized for at least 12 hours prior to the dynamic and static tests.

The Contractor shall perform an initial background gamma ray survey extending from the base of the land surface to the total depth of the well. The background gamma ray log shall be taken at a rate of not more than 60 feet per minute.

After the dynamic tests are completed, another background gamma ray survey shall be taken from the base of the casing to the base of the intermediate casing.

If additional radioisotope tracer survey work is ordered by the Engineer, it will be paid for at the hourly price proposed for additional radioisotope tracer surveys.

Radioactive Tracer Survey (RTS)

A RTS will be performed in the injection well. The tool used for testing will be configured according to information to be supplied by the service company performing the logs and as approved by the ENGINEER. Below is an example of a typical RTS tool that will be used for these surveys. The CONTRACTOR will provide a specific tool configuration with the logs.

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)
			CHD-SDSCHD (SDS) Cable Head	1.00	1.50	5.00
GR#3	23.83					
			GR #3 -GR#3 (GR#3_T) GR#3_TOP	9.33	1.69	50.00
			TREJCT-A (RTS) EJECTOR 14.5' FROM TOOL BOTTOM	3.00	1.69	10.00
			GR #2 -GR#2 (GR#2_M) GR#2_MIDDLE	3.58	1.69	25.00
GR#2	11.17					
CCL	9.63		CCL-000 (000001) RTS_CCL	0.75	1.69	5.00
			TRDET-GR#1 (GR#1_B) GR#1_BOTTOM	8.67	1.69	50.00
GR#1	0.58		TEMP-11116Temp (11116HT)	0.58	1.69	5.00
TEMP	0.17		RTS_TEMP			

Dataset: sdiw1.db: field/well/run1/FINBK
Total Length: 26.92 ft
Total Weight: 150.00 lb
O.D. 1.69 in

RTS tool Typical Configuration

The sequence of the tests shall be as follows:

First Low Flow Dynamic: The low flow run of the radioactive tracer survey shall be performed with a pumping-in velocity of 3 to 5 feet per minute. This would require a volume of between 65 gpm and 108 gpm to be injected during the survey. This is for the 24 inch wells, for Well I-5, which has a 20 inch casing this volume is 44 gpm and 73 gpm. Potable water from the same source as used for the video survey would be used as the most appropriate water supply for this portion of the test.

1) After beginning the flow of water into the well, the tool will be placed at a depth of approximately 5 feet above the base of the final casing, and a slug of 2 millicuries radioactive Iodine 131 is ejected. The tool will remain in place for a period of approximately one hour and the three gamma ray detectors in the "time drive" mode will record the movement of the slug. If tracer is detected at the uppermost detector, indicating potential staining of the tool, the tool may be moved upward to an alternate location.

2) After the one hour waiting period, a log out-of-position will be performed between the ejection point and a minimum of 200 feet above the highest point of tracer detection.

3) Upon completion of logging, the casing will be flushed with 3 to 5 casing volumes of effluent.

4) After flushing, the tool will immediately be run to the base of the casing, then the interval between the ejection point and 200 feet above the highest point of tracer detection will be logged.

Second Low Flow Dynamic: The process described above for the low flow dynamic log will be repeated to include a log out-of-position, a casing flush, and an after flush pass. A slug of tracer greater than or equal to 3 millicuries shall be used as determined by the ENGINEER.

If, during testing, no apparent anomalies appear that may indicate a lack of mechanical integrity in the injection well, the RTS will be concluded. If anomalies do occur, the RTS will be altered to track the radioactive tracer material. After RTS is complete, the RTS tool will be discharged in the injection zone and the well shall be flushed with 3 to 5 volumes of effluent. A second background log will be run from the bottom to the top of the well.

MIT Deadlines (sorted by date MIT pressure test due)

SDWWTP MIT Schedule of Completion

Well	Pressure Test	RTS/Video
IW-2	7/13/2013	7/25/2013
IW-1[1]	7/20/2013	7/31/2013
IW-3	7/24/2013	8/7/2013
IW-9[1]	7/30/2013	8/12/2013
IW-10[1]	8/6/2013	8/21/2013
IW-11	8/20/2013	9/3/2013
IW-12	8/25/2013	9/19/2013
IW-14	9/9/2013	9/26/2013
IW-13	9/16/2013	10/6/2013
IW-4	9/25/2013	10/14/2013
IW-6	9/30/2013	10/20/2013
IW-5	10/19/2013	10/27/2013
IW-7[2]	10/26/2013	1/7/2014
IW-8	11/2/2013	11/12/2013
IW-17	11/11/2013	11/19/2013
IW-16	11/18/2013	12/9/2013
IW-15	12/3/2013	12/16/2013

NOTES:
1.The original video was not clear enough and therefore a new video was done at the end of the MITs at SDWWTP.
2.The Computer failed during the RTS, because the Iodine 131 had already been injected, FDEP and DOH required 46 days b/f the RTS could be redone.

NDWWTP MIT Schedule of Completion

Well	Pressure Test	RTS/Video
IW-1N	3/14/2014	3/26/2014
IW-2N	3/25/2014	4/9/2014
IW-3N	4/2/2014	4/17/2014
IW-4N	4/9/2014	4/24/2014

REPAIR PLAN:

The following repair plans apply to wells at SDWWTP and NDWWTP.

1. Kill well and remove 24 inch gate valve and 4 inch bypass valves. Remove 1 inch pressure transmitter line and weld hold closed. Please see drawings included in below.

2. Sand existing casing in concrete pits and coat with Bitumastic. Please see drawings included in below.

3. Chip concrete around outer casing 1 inch deep, in order to embed PVC sleeve. Please see drawings included in below.

4. Install C905 PVC sleeve around casing pipe, embed 1 inch deep and fill annular space with grout, using Type II Neat cement. Slope top edge to create 30 degree watershed and seal at edges with sealant. Please see drawings included in below.

5. Relocate 1 inch pressure transmitter as indicated in drawings. Weld the hole. Please see drawings included in below.

6. At the NDWWTP IW-1N, IW-3N and IW-4N install new magmeters with any necessary spool pieces to be field determined. Please see drawings included in below.

7. Reassemble wellheads including installation of new 24 inch butterfly valve on horizontal part of well. Mega flanges will be used to ensure the layout of the pipe and the vales match. Please see drawings included in below.

8. On IW-4N at NDWWTP, install electric actuator for butterfly valve at base of injection well. Please see drawings included in below.

Appendix B

FDEP Approval of MIT Plan for SDWWTP and NDWWTP

November 26, 2012

Villamil, Sonia (WASD)

From: May, Joseph [redacted]
Sent: Monday, November 26, 2012 2:40 PM
To: Villamil, Sonia (WASD)
Cc: Vandor, Heidi; Silverman, Mark; Walsh, Virginia (WASD); Goldenberg, Bertha M. (WASD); Fallon Jr., Howard J. (WASD); Arrebola, Vicente (WASD); Macfarlane, Maria (WASD); Oakley, Clint (WASD)
Subject: RE: MDWASD MIT and Repair Plan Submittal

Importance: High

Hello all,

The Department approves the plan with the following understandings:

1) Medicinal grade I-131 should be specified since this solution is filtered to reduce precipitate material, as opposed to regular grade I-131, in the vial causing a tool malfunction. It has been our experience that an activity of ~1mCi/ml has been the easiest to work with in the field.
2) Please contact me a minimum of three days prior to mobilization to each site. Due to the travel time from West Palm Beach to the sites close coordination would be appreciated between myself and a designated contact person from the utility so that each pressure and RTS can be witnessed.

Thank you,

Joe

Please take a few minutes to share your comments on the service you received from the department by clicking on this link. DEP Customer Survey.

From: Villamil, Sonia (WASD) [mailto:[redacted]
Sent: Wednesday, October 17, 2012 9:42 AM
To: May, Joseph
Cc: Vandor, Heidi; Silverman, Mark; Walsh, Virginia (WASD); Goldenberg, Bertha M. (WASD); Fallon Jr., Howard J. (WASD); Arrebola, Vicente (WASD); Macfarlane, Maria (WASD); Oakley, Clint (WASD)
Subject: MDWASD MIT and Repair Plan Submittal

Hello Mr. May,

The MDWASD respectfully submits the attached MIT testing and repair plan for your approval. The paper copy is being sent via regular mail as well.

Thank you,

Sonia Villamil
Engineer II
Miami Dade Water and Sewer Department
3071 SW 38th Ave Room 554-8
Miami, FL 33146
[redacted]
fax: 786-552-8640
miamidade.gov

Appendix C

Field Notes from tests including gauge certification and pressure charts.

MIAMI-DADE WATER AND SEWER DEPARTMENT

MECHANICAL INTEGRITY TESTING OF DEEP INJECTION WELLS AND ASSOCIATED SERVICES

BID NO.: RPQ P0086

PRESSURE TEST IW - 2

WITNESS LIST

June 4, 2013

NAME	SIGNATURE	COMPANY/AGENCY	TELEPHONE
Sonia Villamil	[redacted]	WASD	[redacted]
CHRIS HARP		YBI	
Miguel Martinez		YBI	
GLEN HUGHES		YBI	
Alexey Cerin va		YBI	
Joe May		DEP	
Michael Ashe		WASD	
Jules Du RAN		WASD	

MIAMI-DADE WATER AND SEWER DEPARTMENT

MECHANICAL INTEGRITY TESTING OF DEEP INJECTION WELLS AND ASSOCIATED SERVICES

BID NO.: RPQ P0086

PRESSURE TEST IW - 2

SV 6/4/13

June 4, 2013

* During pressure test the recorder had an error + so Data lost from 8:32 - 8:37 were lost. Joe May said ok b/c we have live, recording of test.

TIME	CASING PRESSURE (psi)	PACKER PRESSURE (psi)
8:07	150.5	365
8:12	150.5	365
8:17	150	365
8:22	150	365
8:27	150	365
8:32	150	365
8:37	150	365
8:42	149.5	365
8:47	149	365
8:52	149	365
8:57	149	365
9:02	149	365
9:07	148.5 +	360

BREAK OFF TEST

GALLONS	CASING PRESSURE (psi)	PACKER PRESSURE (psi)
5	148.5+ - 124	360 - 355
10	100	345
15	76	340
20	52.5	330
25	28	320
30	4	310
35.5	0	305
~~40~~		

Top of Packer: 2473.62 **feet**

Bottom of Casing: 2523 **feet**

In-Situ Inc.

Test name: IW-2

Test defined on: 7:58:35
Test started on: 8:08:08
Test stopped on:
Test extracted on: 9:32:55

	Chan[1]	Chan[0]
Date Time	PSI	Inches Hg
-------- --------	----------	----------
6/4/2013 8:08	151.3	30.07
6/4/2013 8:09	151.2	30.04
6/4/2013 8:10	151.2	30.03
6/4/2013 8:11	151.3	30.07
6/4/2013 8:12	151.3	30.09
6/4/2013 8:13	151.3	30.10
6/4/2013 8:14	151.2	30.11
6/4/2013 8:15	151.2	30.11
6/4/2013 8:16	151.1	30.12
6/4/2013 8:17	151.1	30.12
6/4/2013 8:18	151.1	30.12
6/4/2013 8:19	151.1	30.12
6/4/2013 8:20	151.0	30.12
6/4/2013 8:21	151.0	30.12
6/4/2013 8:22	151.0	30.11
6/4/2013 8:23	150.9	30.12
6/4/2013 8:24	150.9	30.13
6/4/2013 8:25	150.9	30.13
6/4/2013 8:26	150.8	30.13
6/4/2013 8:27	150.8	30.13
6/4/2013 8:28	150.8	30.13
6/4/2013 8:29	150.8	30.13
6/4/2013 8:30	150.7	30.13
6/4/2013 8:31	150.7	30.13
6/4/2013 8:32	150.7	30.13
6/4/2013 8:33	150.6	30.13
6/4/2013 8:34	150.6	30.13
6/4/2013 8:35	150.6	30.13
6/4/2013 8:36	150.5	30.13
6/4/2013 8:37	150.5	30.13
6/4/2013 8:38	150.5	30.14
6/4/2013 8:39	150.3	30.13
6/24/2013 8:40 to 8:49 Issue with pressure transducer, data not recorded. Have hand recorded data for this time period.		

6/4/2013 8:50	150.0	30.02
6/4/2013 8:51	150.0	30.02
6/4/2013 8:52	149.9	30.02
6/4/2013 8:53	149.9	30.02
6/4/2013 8:54	150.0	30.03
6/4/2013 8:55	150.0	30.08
6/4/2013 8:56	150.0	30.10
6/4/2013 8:57	149.9	30.11
6/4/2013 8:58	149.9	30.12
6/4/2013 8:59	149.9	30.13
6/4/2013 9:00	149.8	30.13
6/4/2013 9:01	149.8	30.13
6/4/2013 9:02	149.8	30.13
6/4/2013 9:03	149.8	30.13
6/4/2013 9:04	149.7	30.14
6/4/2013 9:05	149.7	30.14
6/4/2013 9:06	149.7	30.14
6/4/2013 9:07	149.6	30.14
6/4/2013 9:08	149.6	30.14
6/4/2013 9:09	149.4	30.09

Miami Dade South District

Date: 6-3-13 MON

IW# 2

Packer Tally 2483.62 ℄ OF PACKER

Joint #	Length (ft.)	Total Length (ft)	Joint #	Length (ft.)	Total Length (ft)	Joint #	Length (ft.)	Total Length (ft)
1	31.25	31.25	35	30.78	1071.98	68	30.68	2082.55
2	30.62	61.87	36	30.57	1102.55	69	30.57	2113.12
3	30.55	92.42	37	30.56	1133.11	70	30.6	2143.72
4	30.65	123.07	38	30.8	1163.91	71	30.55	2174.27
5	30.54	153.61	39	30.34	1194.25	72	30.53	2204.8
6	30.55	184.16	40	30.63	1224.88	73	30.8	2235.6
7	30.68	214.84	41	30.53	1255.41	74	30.63	2266.23
8	30.55	245.39	42	30.58	1285.99	75	30.53	2296.76
9	30.57	275.96	43	30.78	1316.77	76	30.6	2327.36
10	30.57	306.53	44	30.64	1347.41	77	30.63	2357.99
11	30.56	337.09	45	30.55	1377.96	78	30.56	2388.55
12	30.6	367.69	46	30.8	1408.76	79	30.56	2419.11
13	30.59	398.28	47	30.71	1439.47	80	30.67	2449.78
14	30.85	429.13	48	30.55	1470.02	81	30.6	2480.38
15	30.57	459.7	49	30.53	1500.55	82	30.71	2511.09
16	30.65	490.35	50	30.64	1531.19	83	30.65	2541.74
17	30.58	520.93	51	30.59	1561.78	84	30.55	2572.29
18	30.6	551.53	52	30.6	1592.38	85	30.55	2602.84
19	30.64	582.17	53	30.6	1622.98	86	30.63	2633.47
20	30.6	612.77	54	30.58	1653.56	87	30.74	2664.21
21	30.53	643.3	55	30.53	1684.09	88	30.82	2695.03
22	30.53	673.83	56	30.7	1714.79	89	30.69	2725.72
23	30.82	704.65	57	30.55	1745.34	90	30.6	2756.32
24	30.65	735.3	58	30.68	1776.02	91	30.6	2786.92
25	30.72	766.02	59	30.55	1806.57	92	30.72	2817.64
26	30.6	796.62	60	30.6	1837.17	93	30.53	2848.17
27	30.72	827.34	61	30.75	1867.92	94	30.74	2878.91
28	30.58	857.92	62	30.6	1898.52	95	30.67	2909.58
29	30.58	888.5	63	30.57	1929.09	96	30.63	2940.21
30	30.63	919.13	64	30.63	1959.72	97	30.57	2970.78
31	30.58	949.71	65	30.8	1990.52	98	30.6	3001.38
32	30.67	980.38	66	30.57	2021.09	99	30.53	3031.91
33	30.25	1010.63	67	30.78	2051.87	100	30.65	3062.56
34	30.57	1041.2						

IW2 6-3-13

FLANGE 2.08

TUBG STICKUP - 5.00

PACKER ℄	10.32	
81 JT'S	2480.38	
	2490.07	
- FLANGE & TUBG	- 7.08	
	2483.62	℄ OF PACKER.

PACKER & BRUSH	25.55	
81 JT'S	2480.38	
	2505.93	
- STICK UP	- 7.00	
	2498.93	BOTTOM OF BRUSH.
	2505.93	EXTENT OF BRUSHING.

Appendix D

RTS and RTS Tool Configuration

RADIOACTIVE TRACER SURVEY LOG

Company	MIAMI-DADE WATER & SEWER
Well	IW-#2
Field	S.D.W.W.T.P.
County	MIAMI-DADE
State	FL

Company MIAMI-DADE WATER & SEWER
Well IW-#2
Field S.D.W.W.T.P.
County MIAMI-DADE
State FL

Company MIAMI-DADE WATER & SEWER
Well IW-#2
Field S.D.W.W.T.P.
County MIAMI-DADE State FL

Location: API # :

SEC TWP RGE

Other Services

Elevation

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

Date	10-JUN-2013		
Run Number	2013 MIT		
Depth Driller	2531'		
Depth Logger	2531'		
Bottom Logged Interval	2531'		
Top Log Interval	SURFACE		
Open Hole Size	24"		
Type Fluid	WATER		
Density / Viscosity	NA		
Max. Recorded Temp.	NA		
Estimated Cement Top	NA		
Time Well Ready	UPON ARRIVAL		
Time Logger on Bottom	1130		
Equipment Number	102		
Location	FT. MYERS		
Recorded By	MOREY	RIVES	
Witnessed By	S. VILLAMIL	M. MACFARLANE	

Borehole Record				Borehole Record			
Run Number	Bit	From	To	Run No	Bit	From	To

Casing Record	Size	Wgt/Ft	Top	Bottom
Surface String				
Prot. String				
Production String	24"	.500" W.T	SURFACE	2517'
Liner				

<< Fold Here >>>

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

Comments

HIGH RESOLUTION TEMPERATURE

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)

GR#3	24.00	GR #3 -RTST (951T)	11.50	1.69	30.00
		TREJCT-A (951)	1.00	1.69	10.00
		GR #2 -RTSM (951M)	3.00	1.69	10.00
GR#2	10.50				
CCL	9.60	CCL-1.68GRRTS (951)	0.75	1.69	10.00
		GR-RTSB (951B)	9.25	1.69	10.00
GR	1.20				

Dataset: sdwwtp-iw2.db: field/well/run1/pass12
Total Length: 25.50 ft
Total Weight: 70.00 lb
O.D. 1.69 in

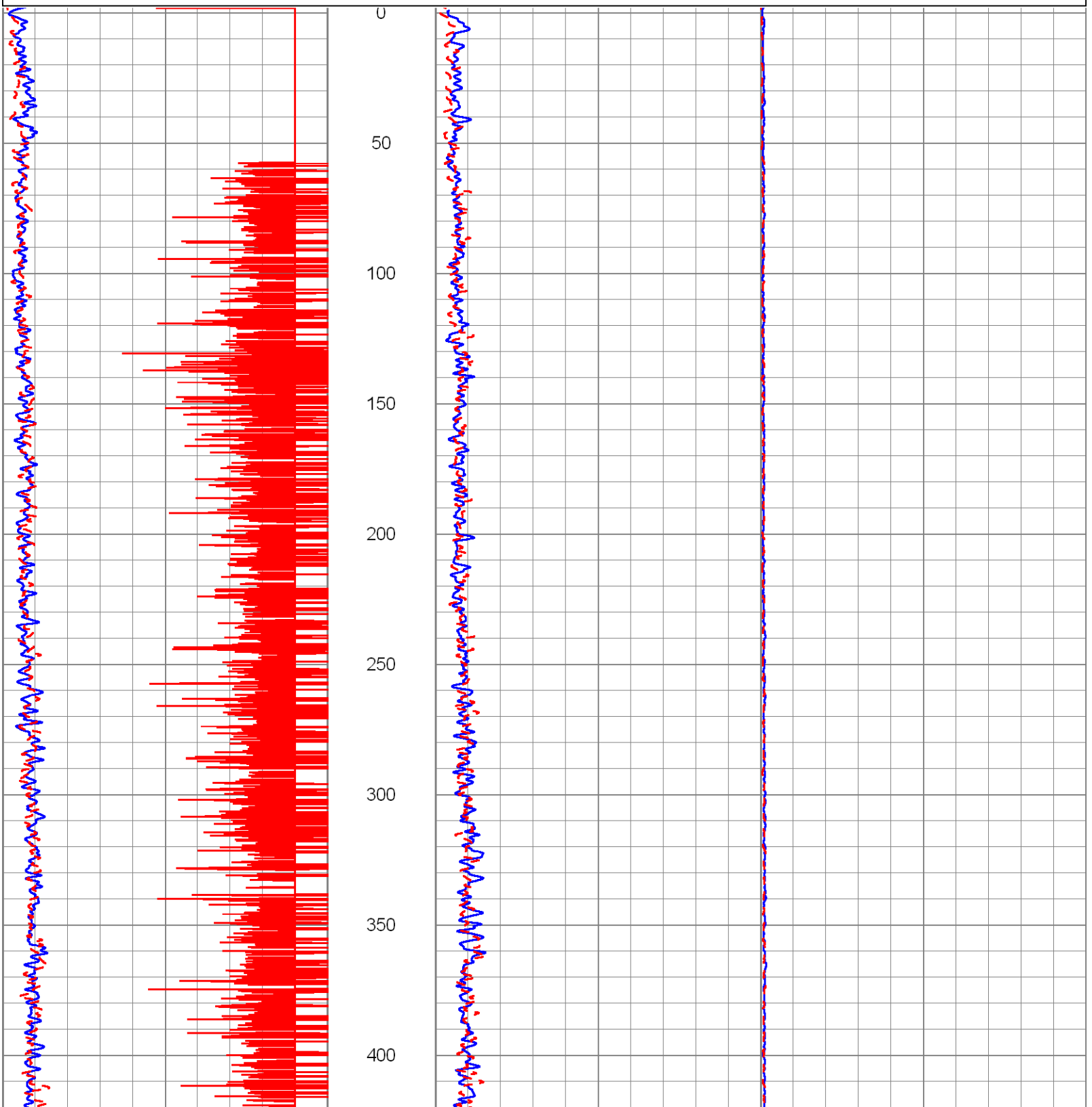
YOUNGQUIST

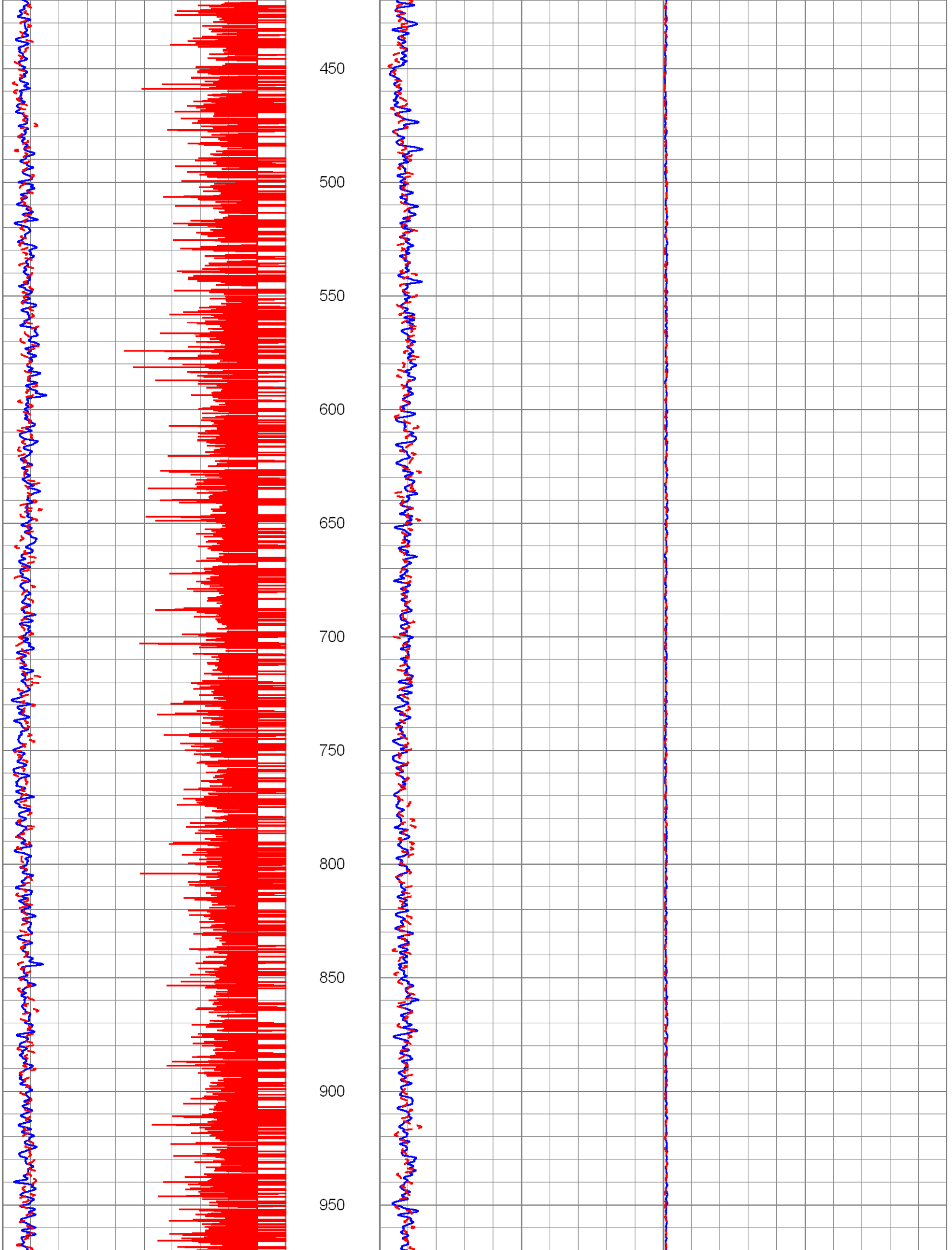
FINAL BACKGROUND

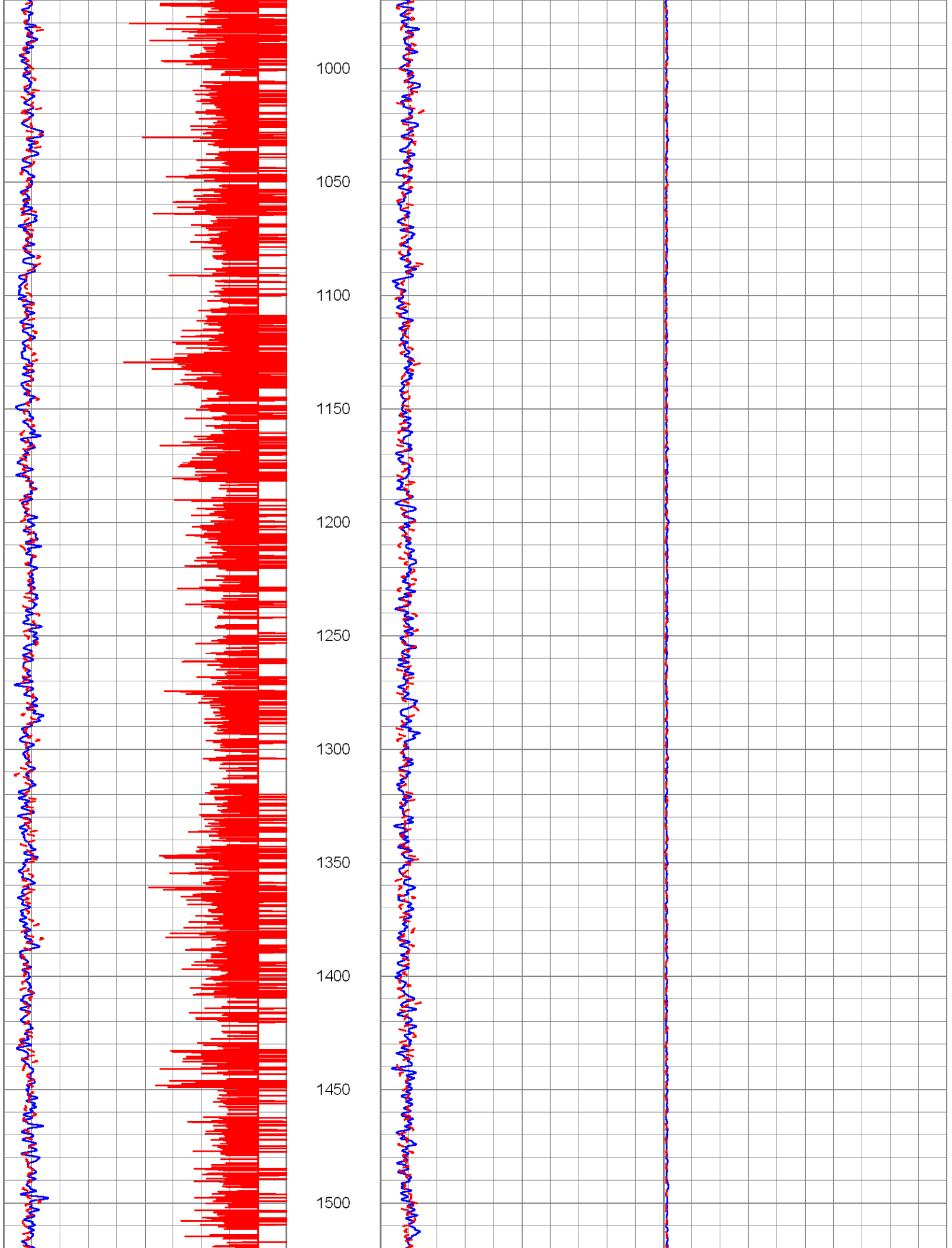
FINAL BACKGROUND

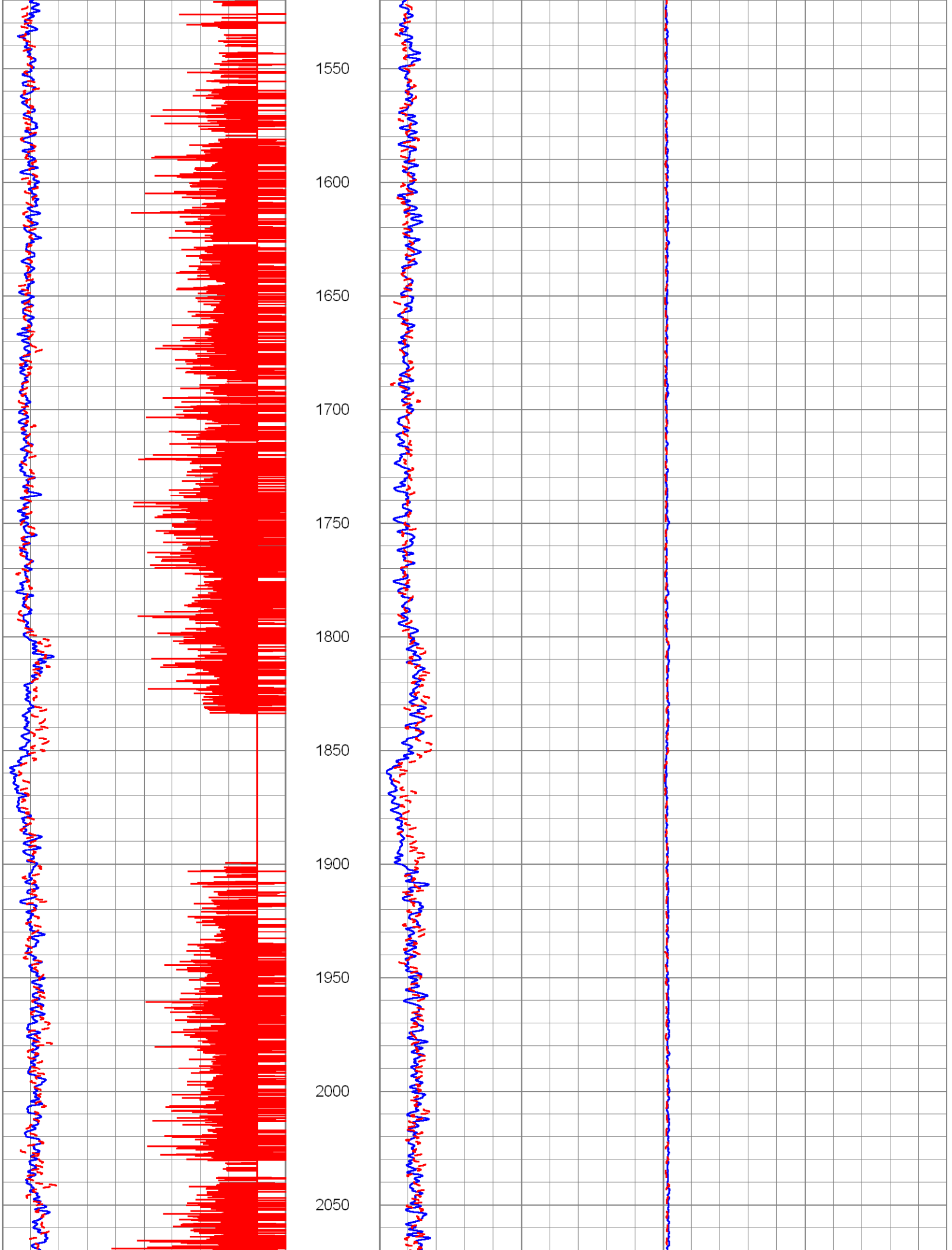
Database File:	sdwwtp-iw2.db
Dataset Pathname:	pass12
Presentation Format:	rts
Dataset Creation:	Mon Jun 10 16:35:17 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:600

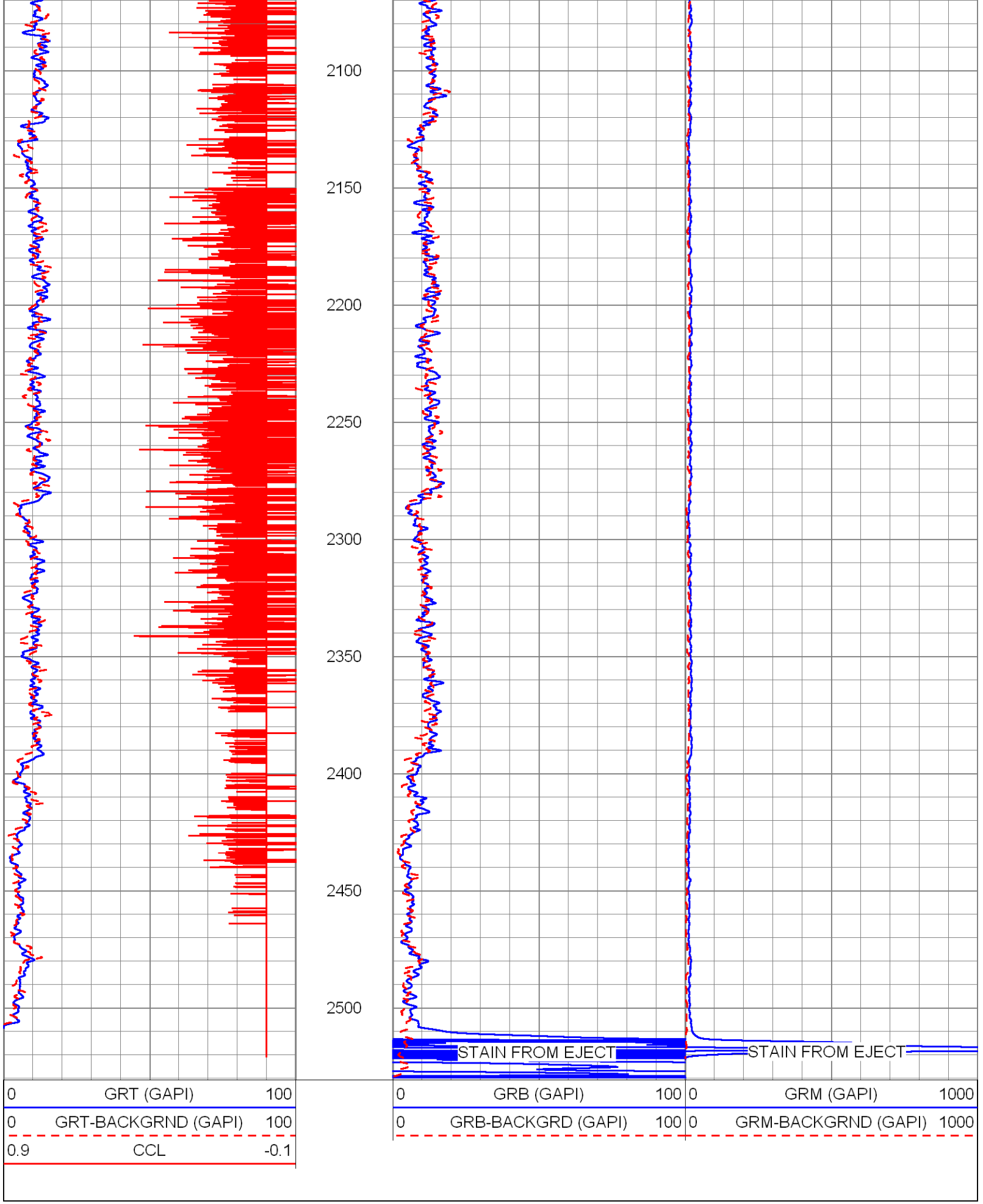
0	GRT (GAPI)	100		0	GRB (GAPI)	100	0	GRM (GAPI)	1000
0	GRT-BACKGRND (GAPI)	100		0	GRB-BACKGRD (GAPI)	100	0	GRM-BACKGRND (GAPI)	1000
0.9	CCL	-0.1							




450
500
550
600
650
700
750
800
850
900
950


1000
1050
1100
1150
1200
1250
1300
1350
1400
1450
1500


1550
1600
1650
1700
1750
1800
1850
1900
1950
2000
2050



YOUNGQUIST

LOP #2

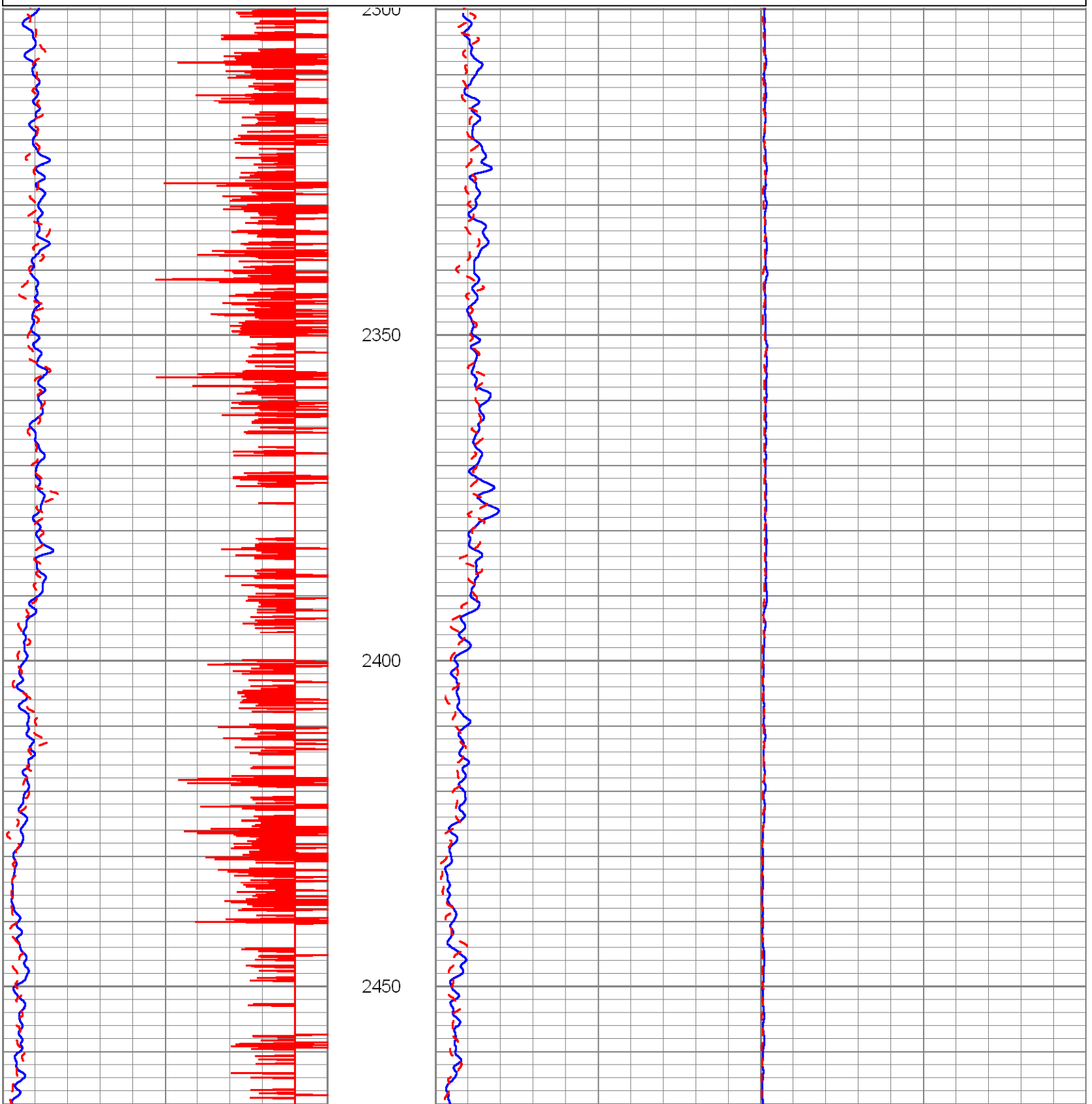
LOP #2

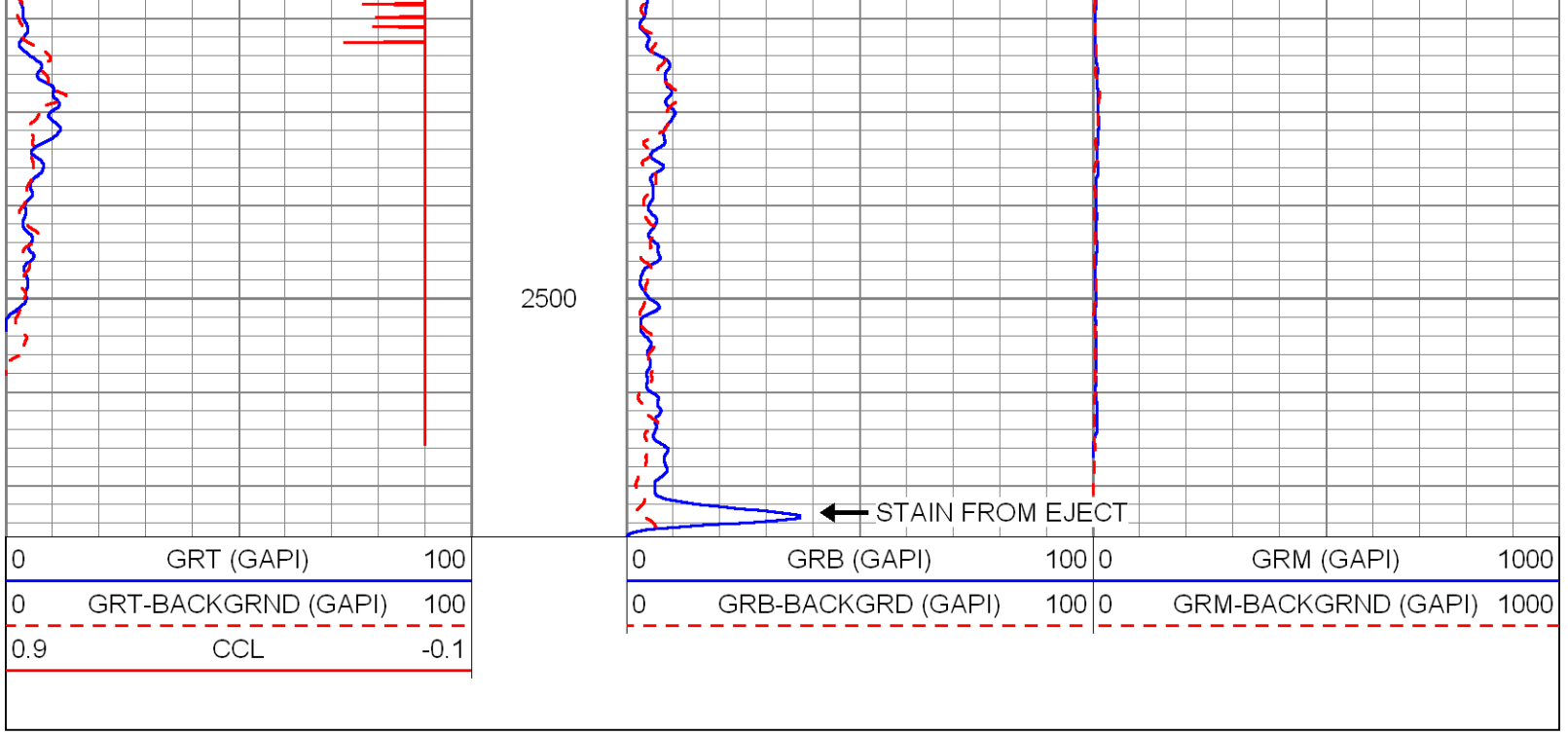
Database File:	sdwwtp-iw2.db
Dataset Pathname:	pass11
Presentation Format:	rts
Dataset Creation:	Mon Jun 10 16:07:35 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:240

0	GRT (GAPI)	100
0	GRT-BACKGRND (GAPI)	100
0.9	CCL	-0.1

0	GRB (GAPI)	100
0	GRB-BACKGRD (GAPI)	100

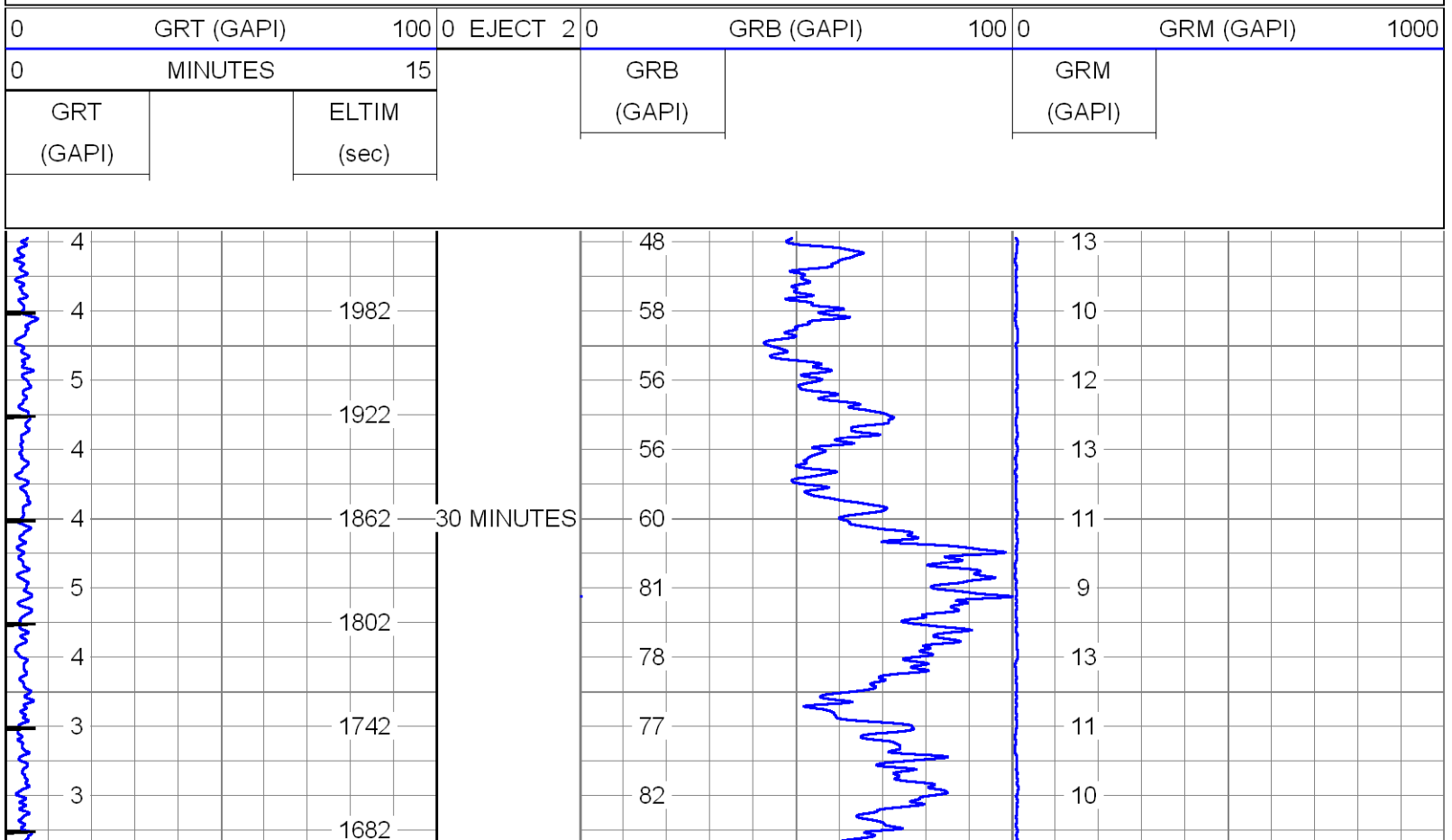
0	GRM (GAPI)	1000
0	GRM-BACKGRND (GAPI)	1000

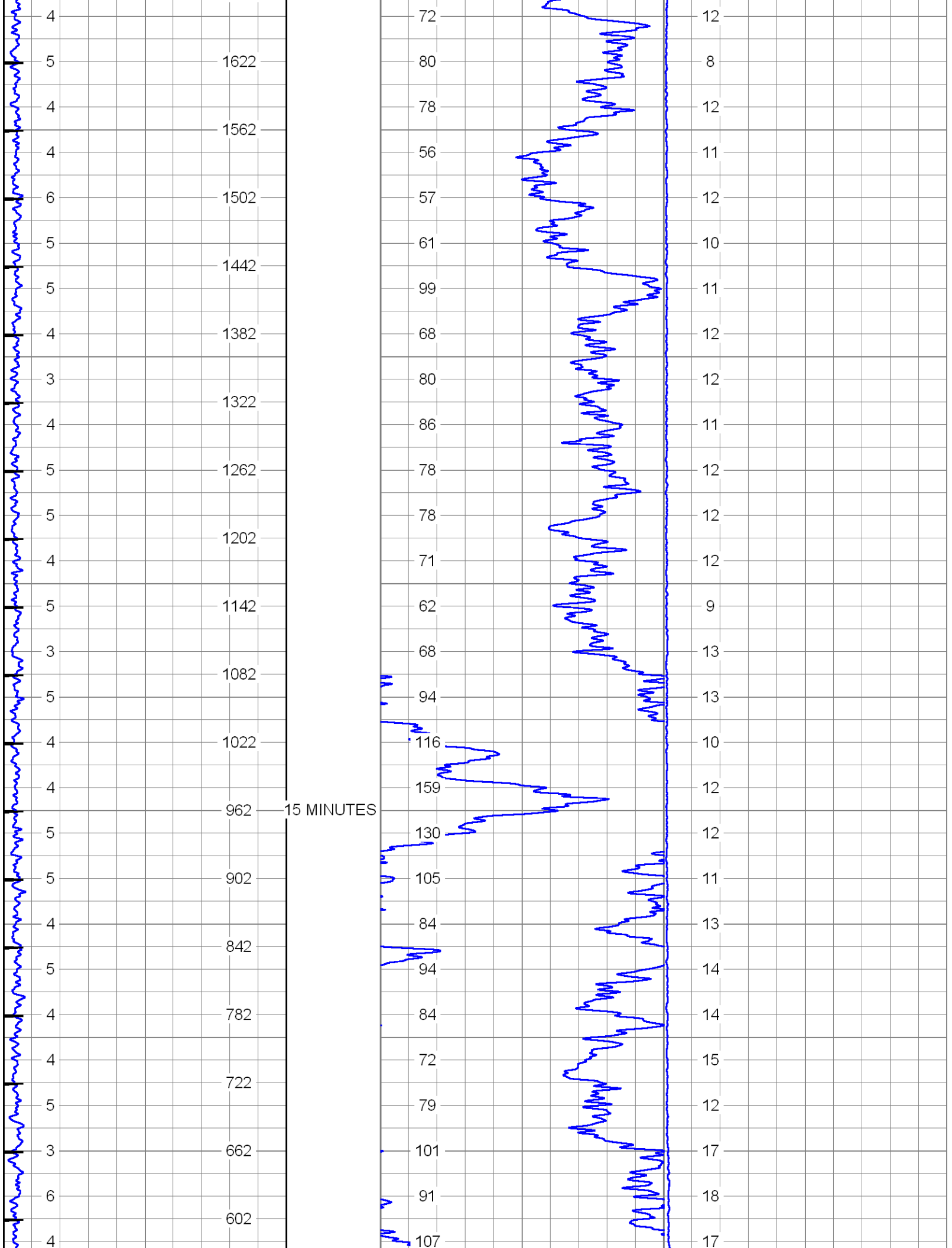


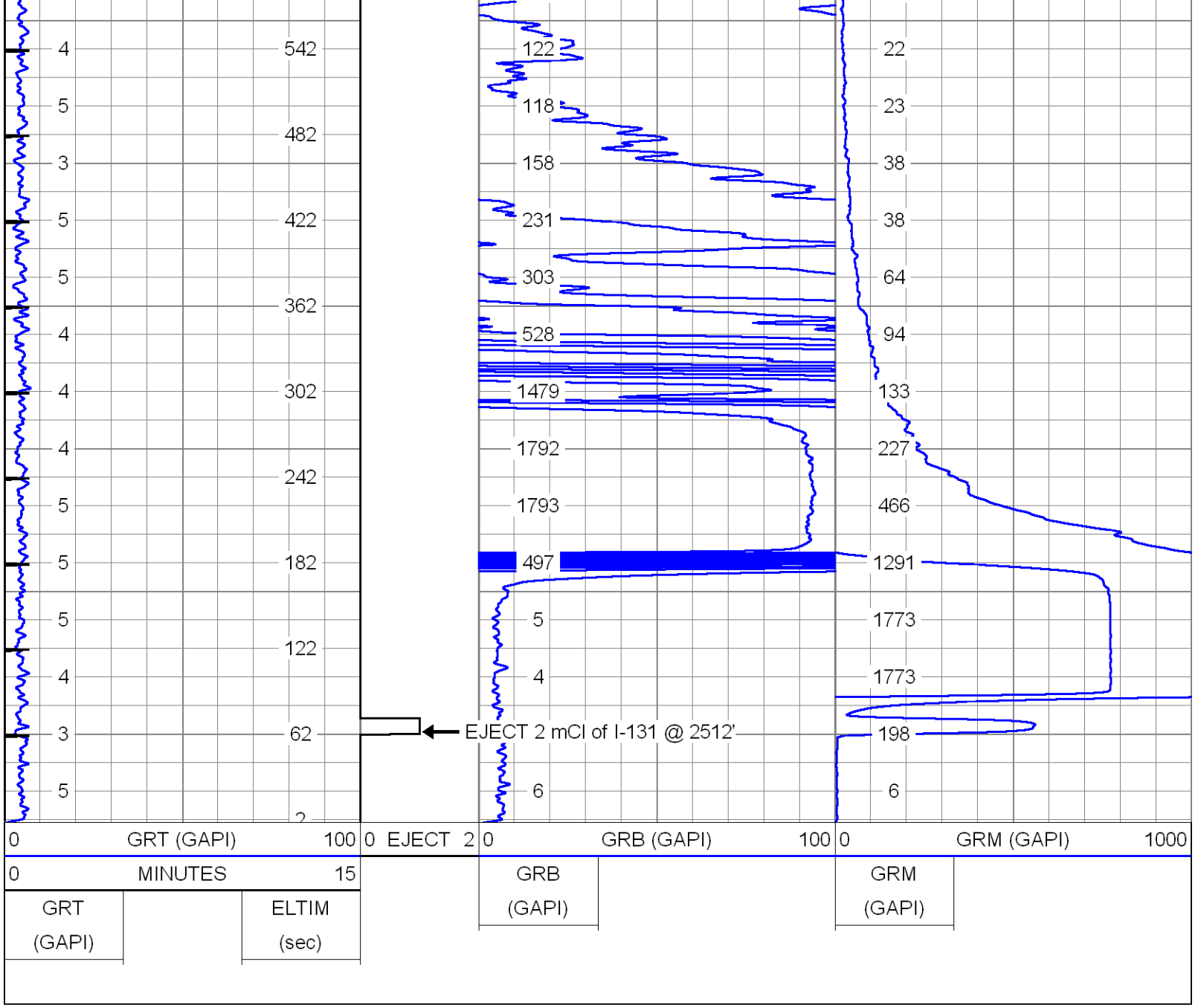


DYNAMIC TEST #2 (75 GPM)

Database File:	sdwwtp-iw2.db
Dataset Pathname:	pass10
Presentation Format:	rtstime
Dataset Creation:	Mon Jun 10 15:31:46 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:600



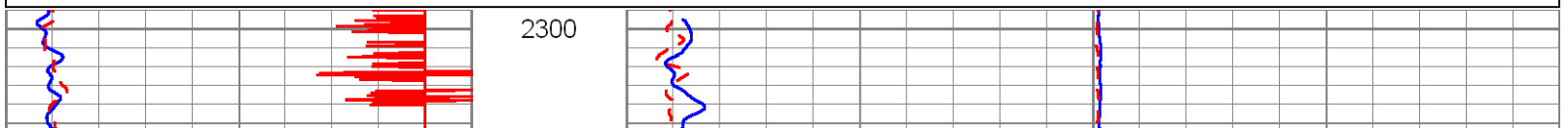

4
5
4
6
5
5
4
3
4
5
5
4
5
3
5
4
4
5
5
4
4
5
3
6
4
1622
1562
1502
1442
1382
1322
1262
1202
1142
1082
1022
962
902
842
782
722
662
602
15 MINUTES
72
80
78
56
57
61
99
68
80
86
78
78
71
62
68
94
116
159
130
105
84
94
84
72
79
101
91
107
12
8
12
11
12
10
11
12
12
11
12
12
12
9
13
13
10
12
12
11
13
14
14
15
12
17
18
17

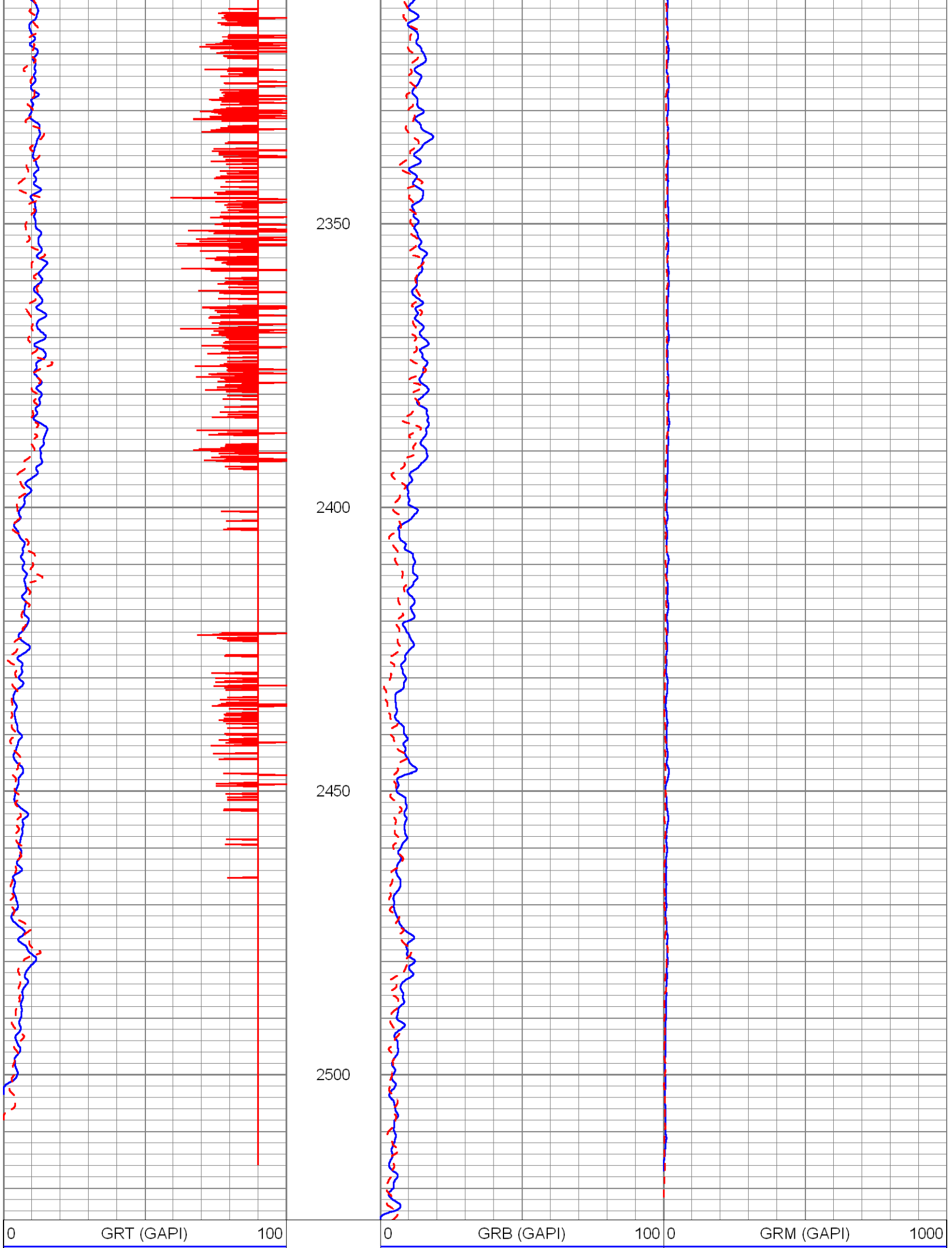


LOP #1

Database File:	sdwwtp-iw2.db
Dataset Pathname:	pass9
Presentation Format:	rts
Dataset Creation:	Mon Jun 10 15:08:37 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:240

0	GRT (GAPI)	100		0	GRB (GAPI)	100	0	GRM (GAPI) 1000
0	GRT-BACKGRND (GAPI)	100		0	GRB-BACKGRD (GAPI)	100	0	GRM-BACKGRND (GAPI) 1000
0.9	CCL	-0.1						




2350
2400
2450
2500
0
GRT (GAPI)
100
0
GRB (GAPI)
100
0
GRM (GAPI)
1000

0	GRT-BACKGRND (GAPI)	100
0.9	CCL	-0.1

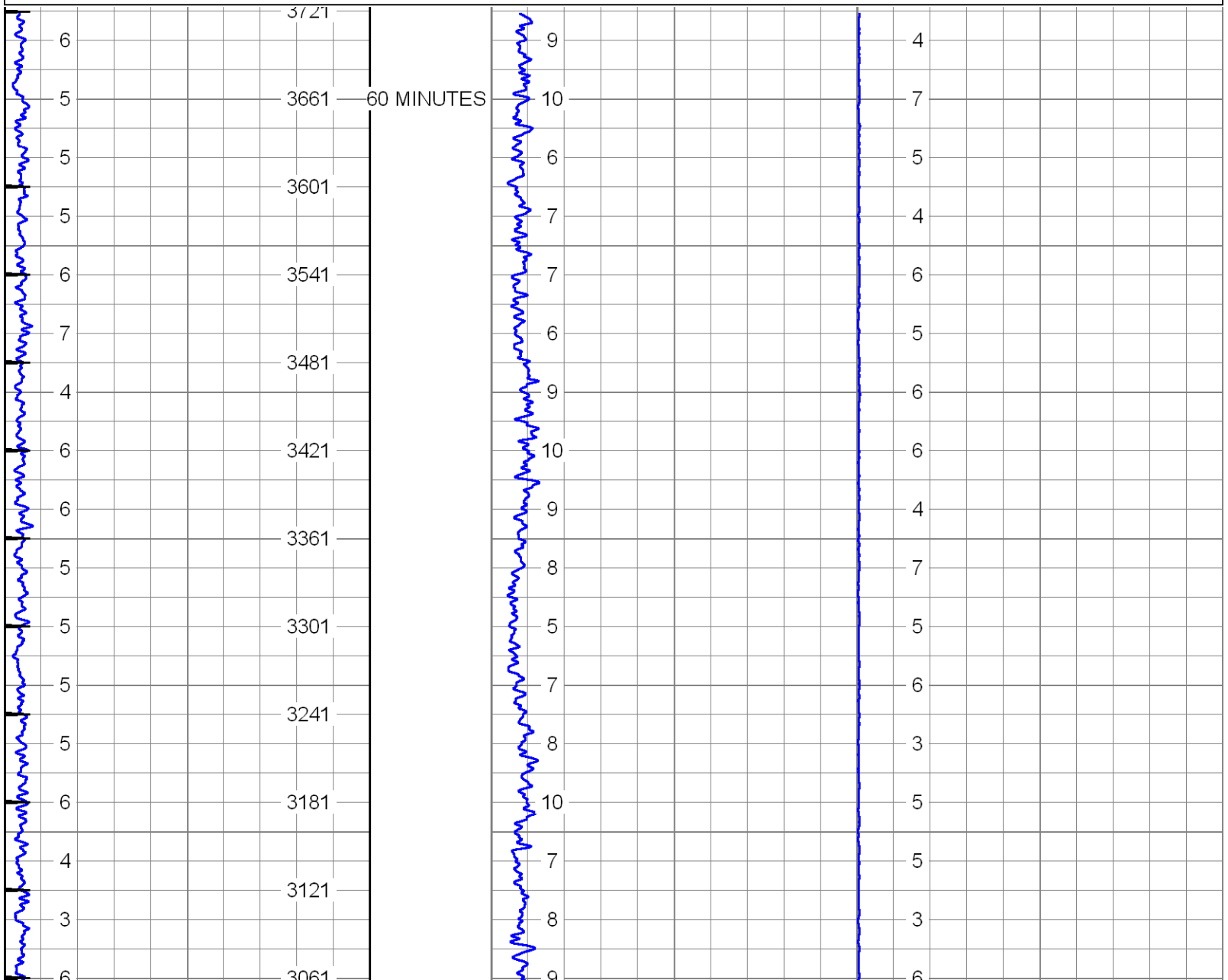
0	GRB-BACKGRD (GAPI)	100

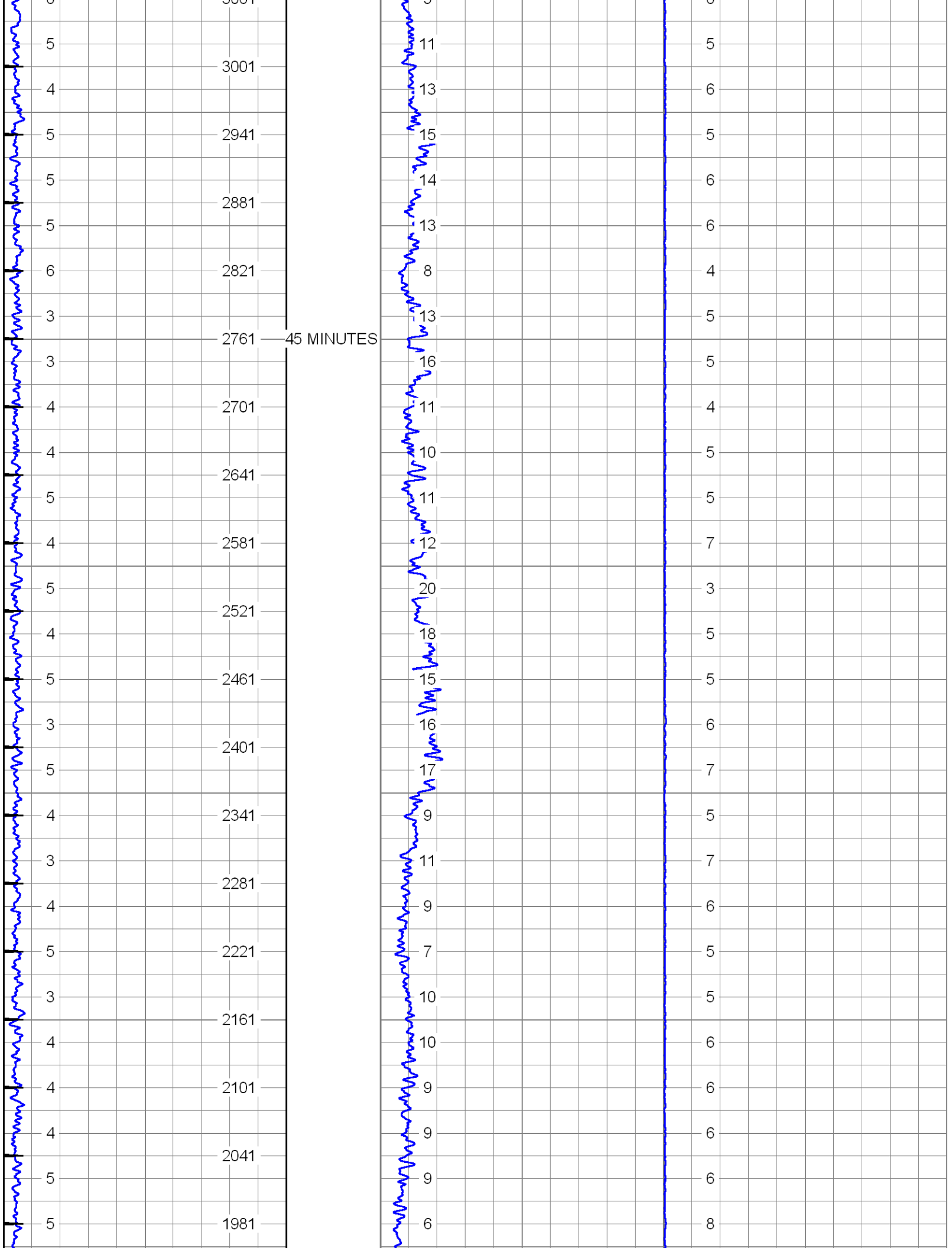
0	GRM-BACKGRND (GAPI)	1000

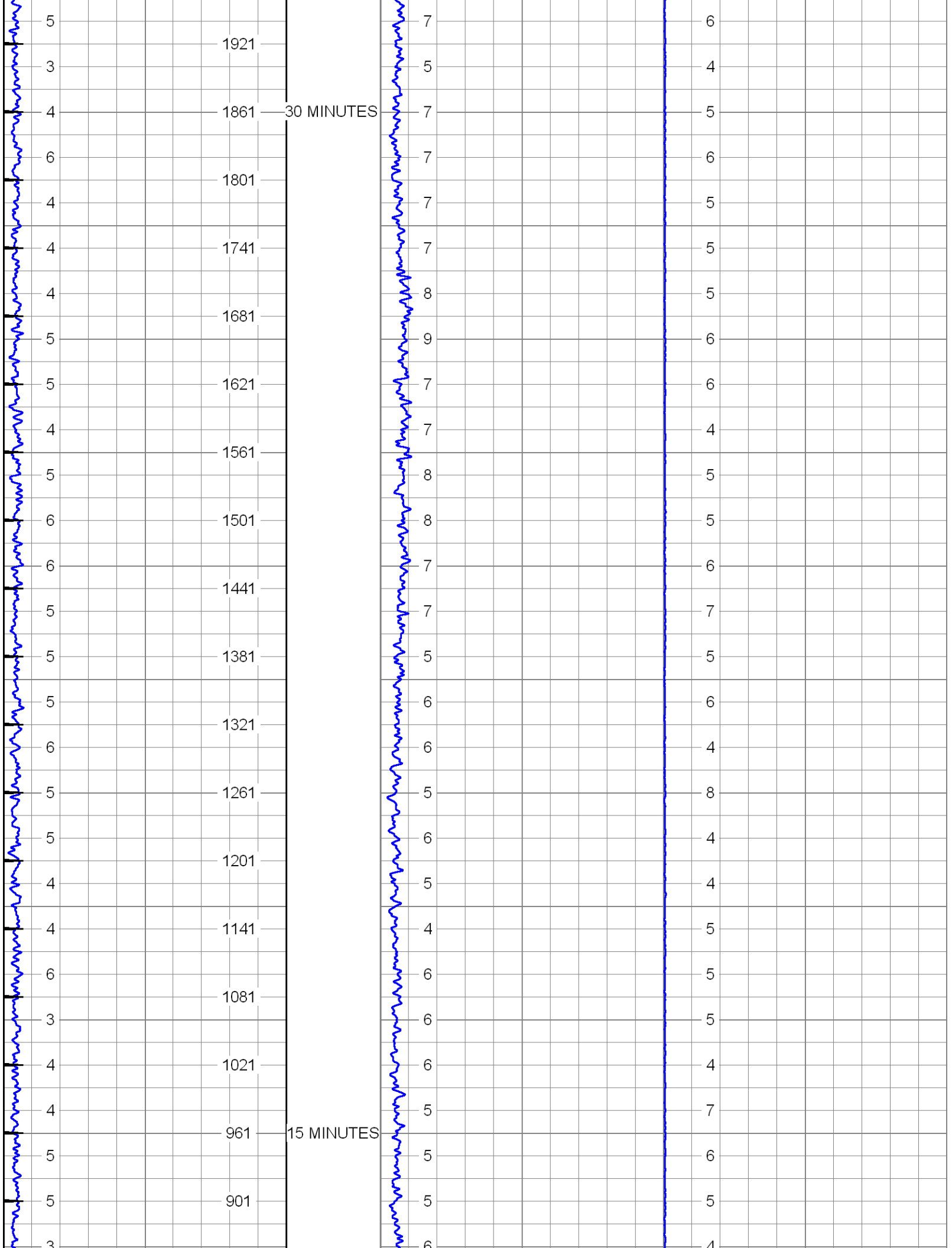
DYNAMIC TEST #1 (88 GPM)

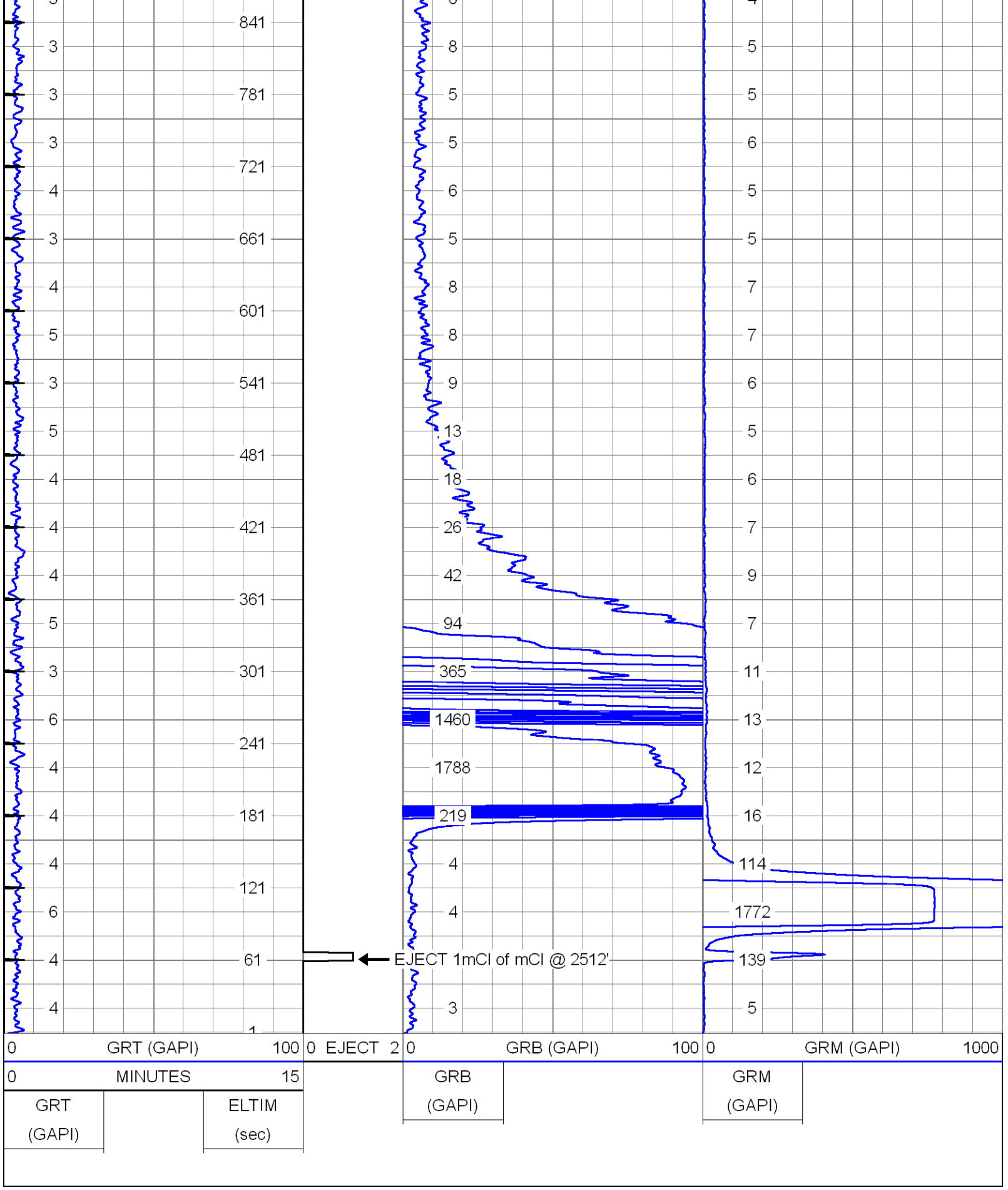
Database File:	sdwwtp-iw2.db
Dataset Pathname:	pass8
Presentation Format:	rtstime
Dataset Creation:	Mon Jun 10 14:04:45 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:600

0	GRT (GAPI)	100	0 EJECT 2	0	GRB (GAPI)	100	0	GRM (GAPI) 1000
0	MINUTES	15			GRB (GAPI)			GRM (GAPI)
GRT (GAPI)		ELTIM (sec)						




3001
2941
2881
2821
2761
45 MINUTES
2701
2641
2581
2521
2461
2401
2341
2281
2221
2161
2101
2041
1981

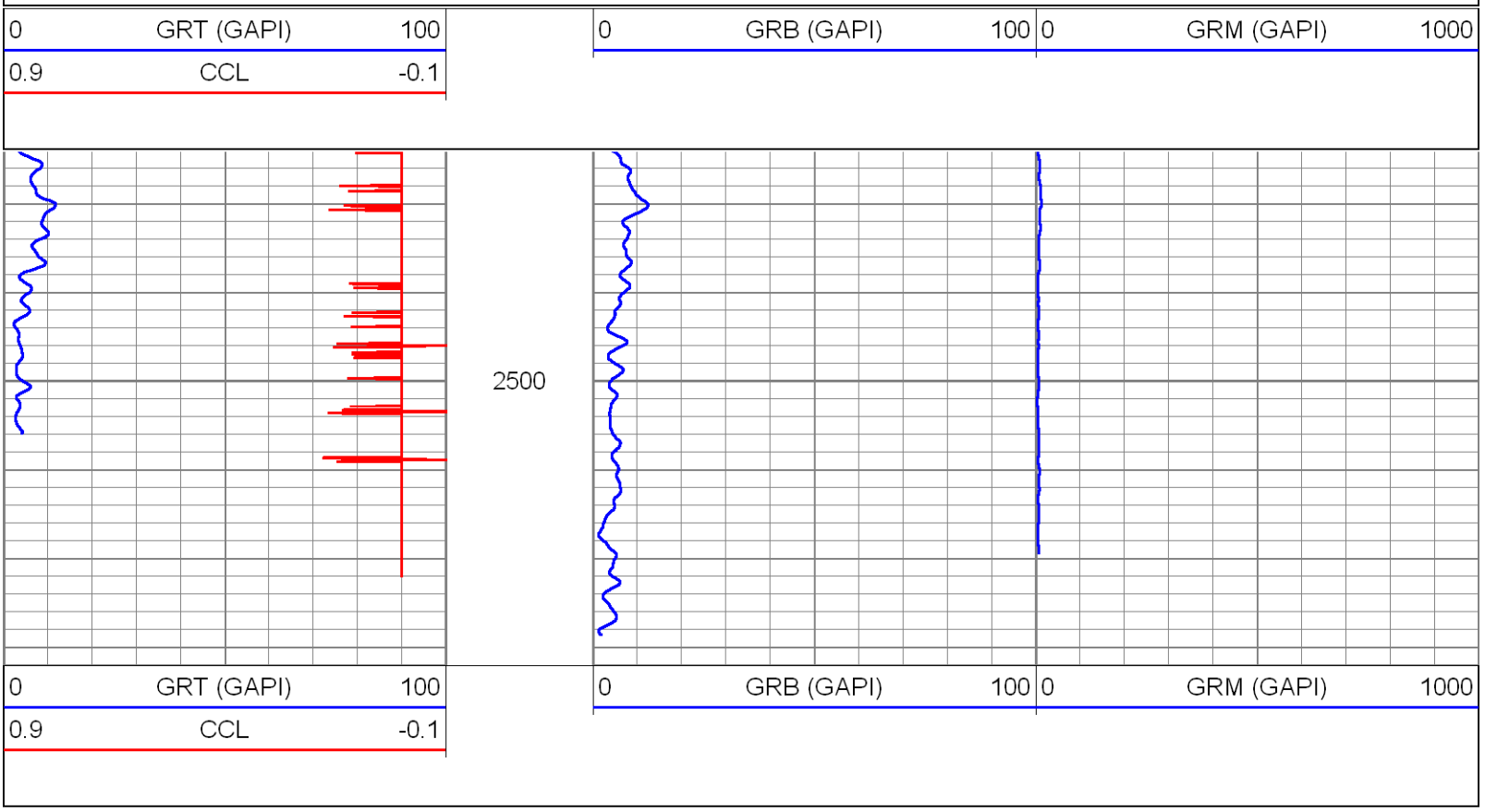

1921
1861
30 MINUTES
1801
1741
1681
1621
1561
1501
1441
1381
1321
1261
1201
1141
1081
1021
961
15 MINUTES
901



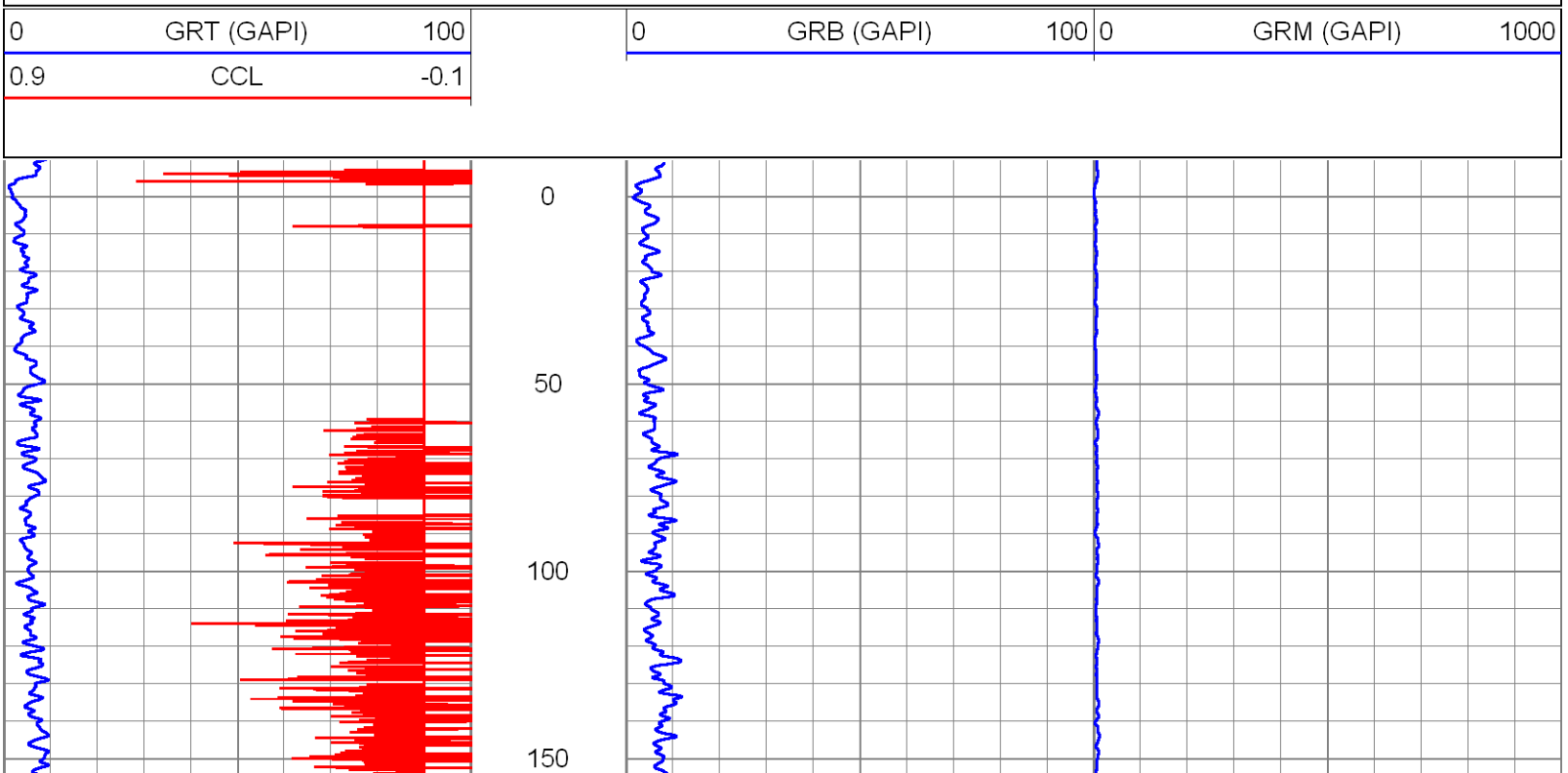
YOUNGQUIST BROTHERS

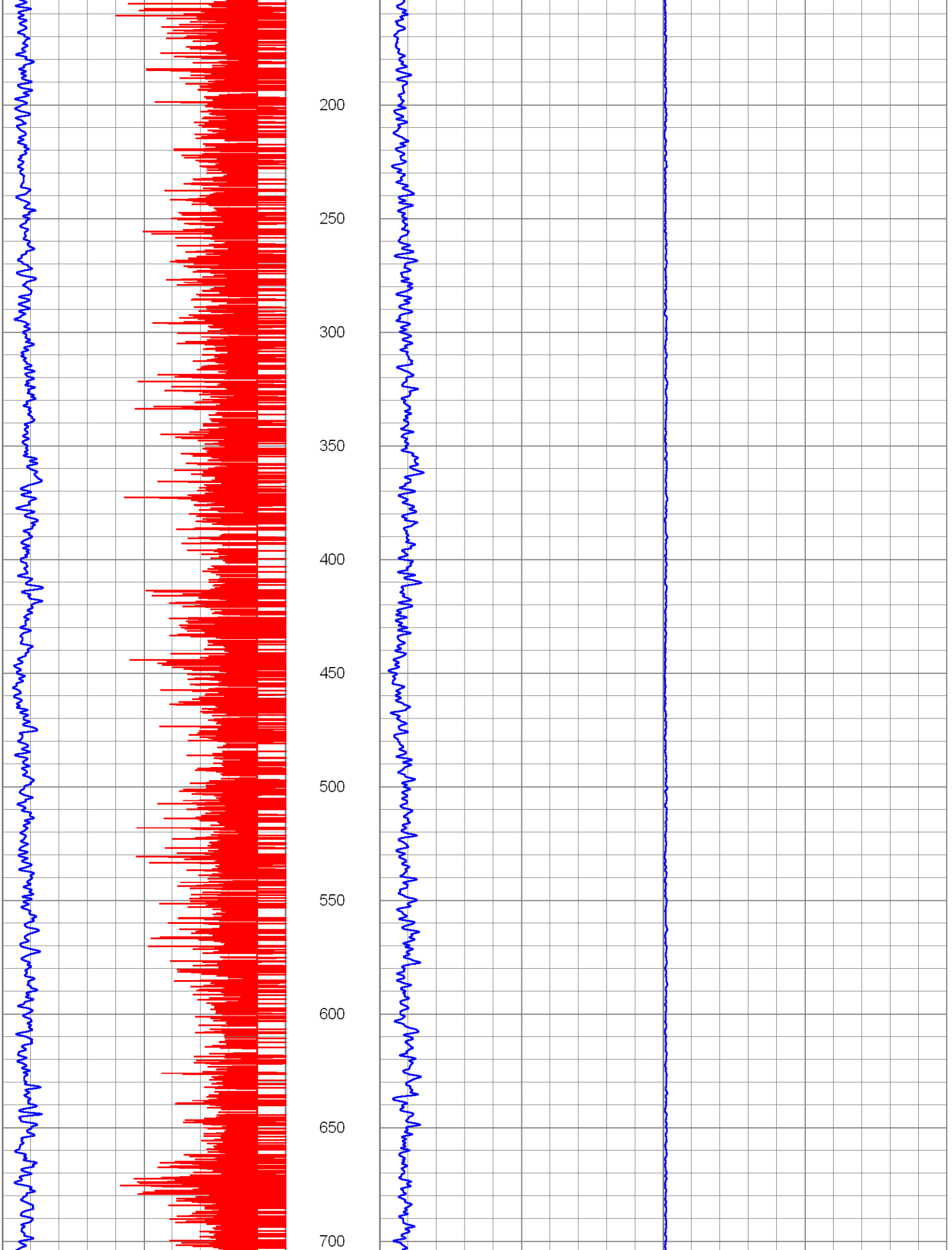
CASING TIE IN

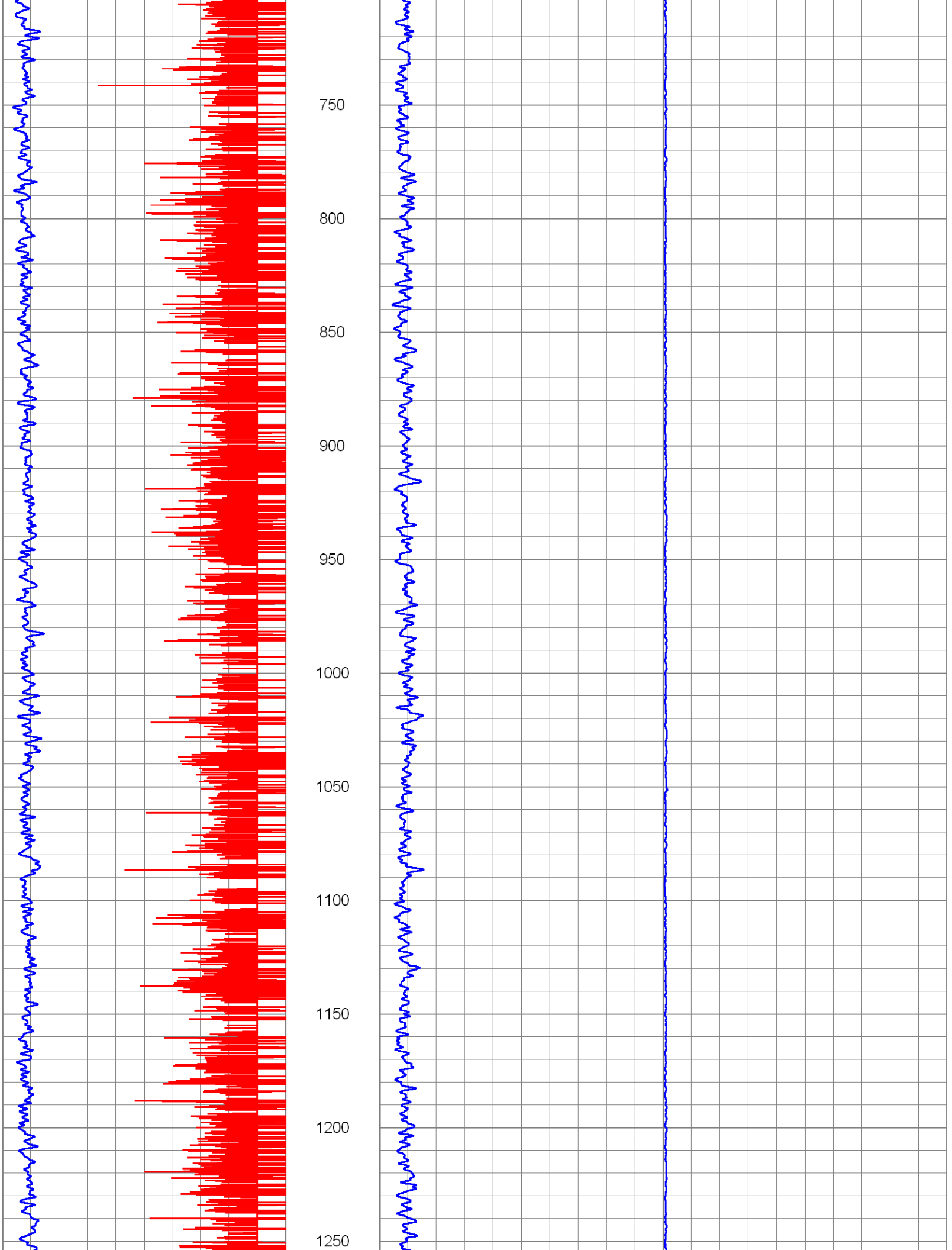
Database File: sdwwtp-iw2.db
Dataset Pathname: pass7
Presentation Format: rts
Dataset Creation: Mon Jun 10 13:56:20 2013 by Log SOC 110722
Charted by: Depth in Feet scaled 1:240

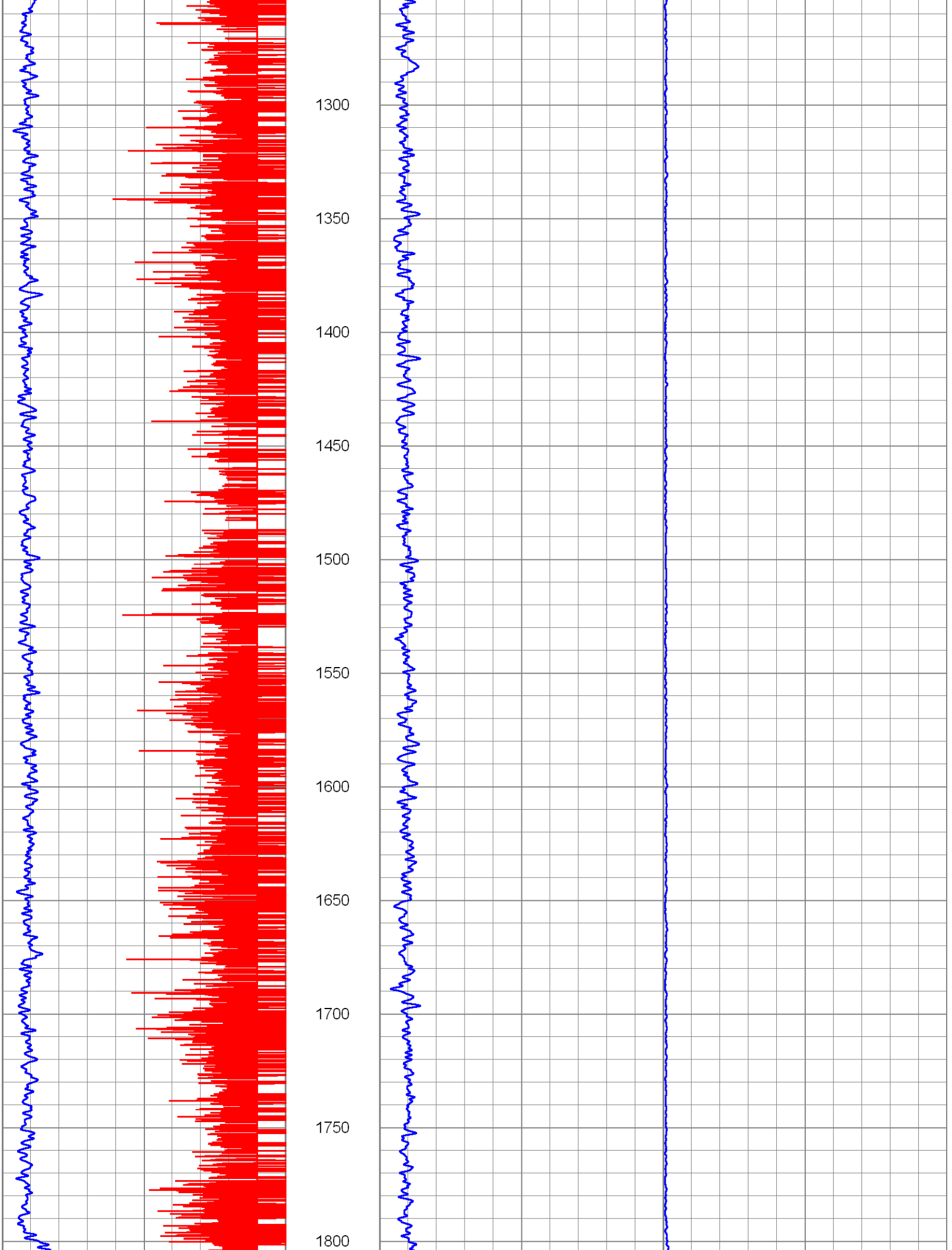


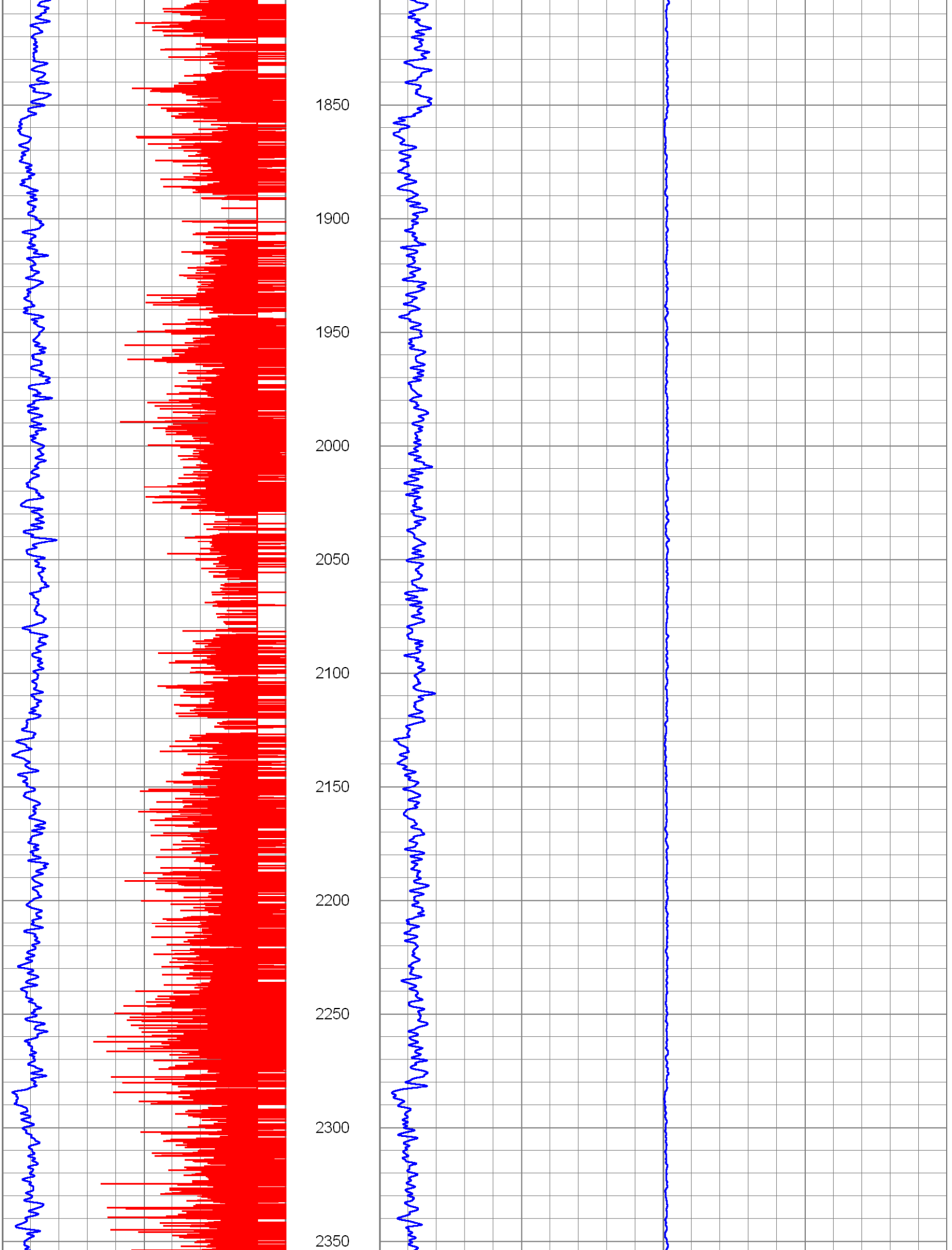
Database File: sdwwtp-iw2.db
Dataset Pathname: pass3
Presentation Format: rts
Dataset Creation: Mon Jun 10 11:24:45 2013 by Log SOC 110722
Charted by: Depth in Feet scaled 1:600

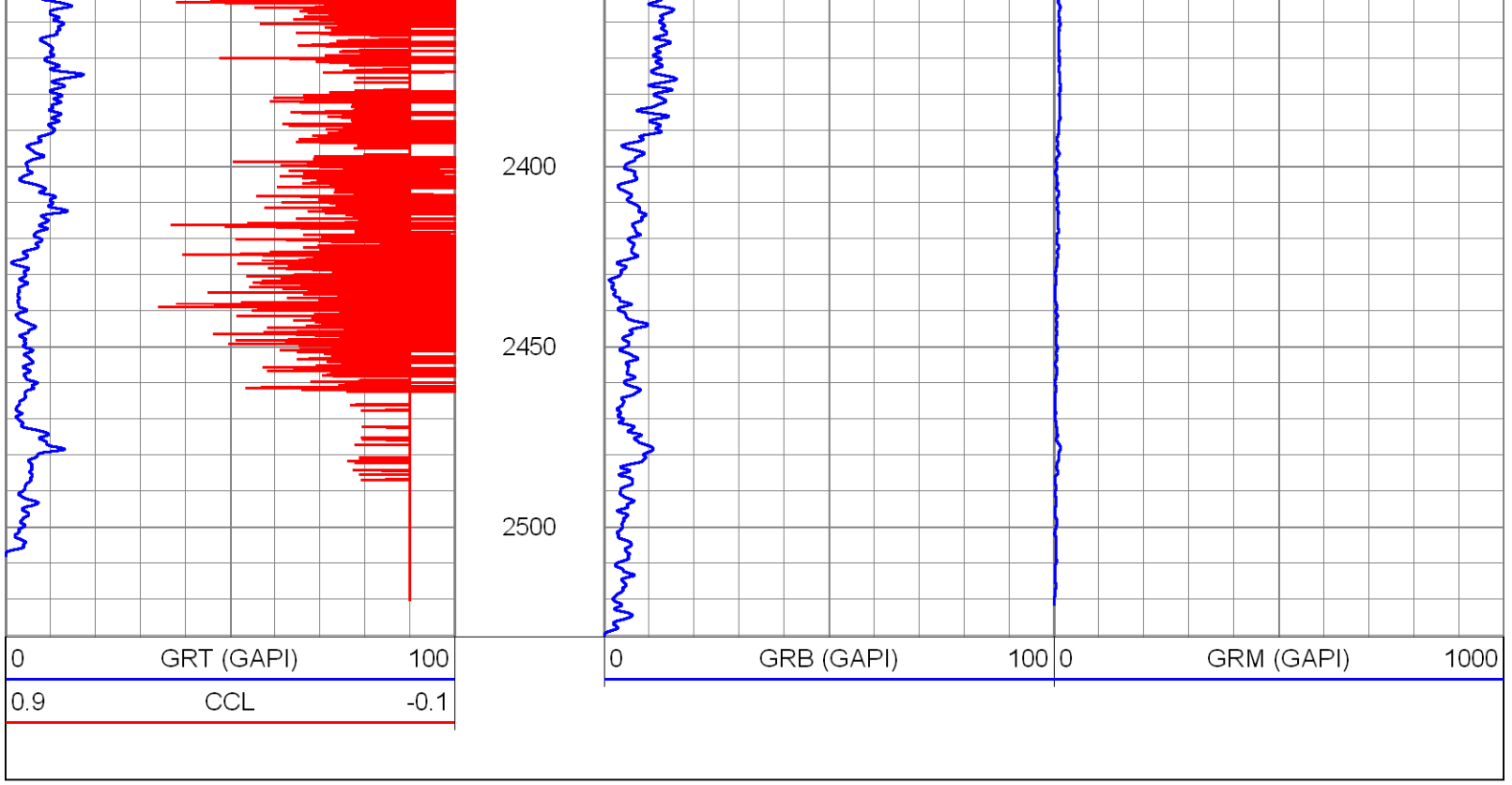



200
250
300
350
400
450
500
550
600
650
700


750
800
850
900
950
1000
1050
1100
1150
1200
1250


1300
1350
1400
1450
1500
1550
1600
1650
1700
1750
1800


1850
1900
1950
2000
2050
2100
2150
2200
2250
2300
2350



Calibration Report

Database File: sdwwtp-iw2.db
Dataset Pathname: pass3
Dataset Creation: Mon Jun 10 11:24:45 2013 by Log SOC 110722

Gamma Ray Calibration Report

Serial Number:	951B	
Tool Model:	RTSB	
Performed:	Mon Jun 10 08:08:53 2013	
Calibrator Value:	90.0	GAPI
Background Reading:	37.1	cps
Calibrator Reading:	198.5	cps
Sensitivity:	0.5578	GAPI/cps

Gamma Ray Calibration Report

Serial Number:	951M	
Tool Model:	RTSM	
Performed:	Mon Jun 10 08:11:19 2013	
Calibrator Value:	90.0	GAPI
Background Reading:	25.3	cps
Calibrator Reading:	188.6	cps
Sensitivity:	0.5511	GAPI/cps

Gamma Ray Calibration Report

Serial Number:	951T	
Tool Model:	RTST	
Performed:	Mon Jun 10 08:12:52 2013	
Calibrator Value:	90.0	GAPI

Background Reading:	22.8	cps
Calibrator Reading:	186.9	cps
Sensitivity:	0.5485	GAPI/cps

Appendix E

Temperature Log

HIGH RESOLUTION TEMPERATURE LOG

Company MIAMI-DADE WATER & SEWER
Well IW-#2
Field S.D.W.W.T.P.
County MIAMI-DADE
State FL

Company MIAMI-DADE WATER & SEWER

Well IW-#2

Field S.D.W.W.T.P.

County MIAMI-DADE State FL

Location: API # :

SEC TWP RGE

Other Services

Elevation

Permanent Datum G.L Elevation

Log Measured From

Drilling Measured From

K.B.
D.F.
G.L.

Date	10-JUN-2013		
Run Number	2013 MIT		
Depth Driller	2531'		
Depth Logger	2531'		
Bottom Logged Interval	2531'		
Top Log Interval	SURFACE		
Open Hole Size	24"		
Type Fluid	WATER		
Density / Viscosity	NA		
Max. Recorded Temp.	81.7 degF		
Estimated Cement Top	NA		
Time Well Ready	UPON ARRIVAL		
Time Logger on Bottom	1130		
Equipment Number	102		
Location	FT. MYERS		
Recorded By	MOREY	RIVES	
Witnessed By	S. VILLAMIL	M. MACFARLANE	

Borehole Record				Borehole Record			
Run Number	Bit	From	To	Run No	Bit	From	To

Casing Record	Size	Wgt/Ft	Top	Bottom
Surface String				
Prot. String				
Production String	24"	.500" W.T	SURFACE	2517'
Liner				

<< Fold Here >>>

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

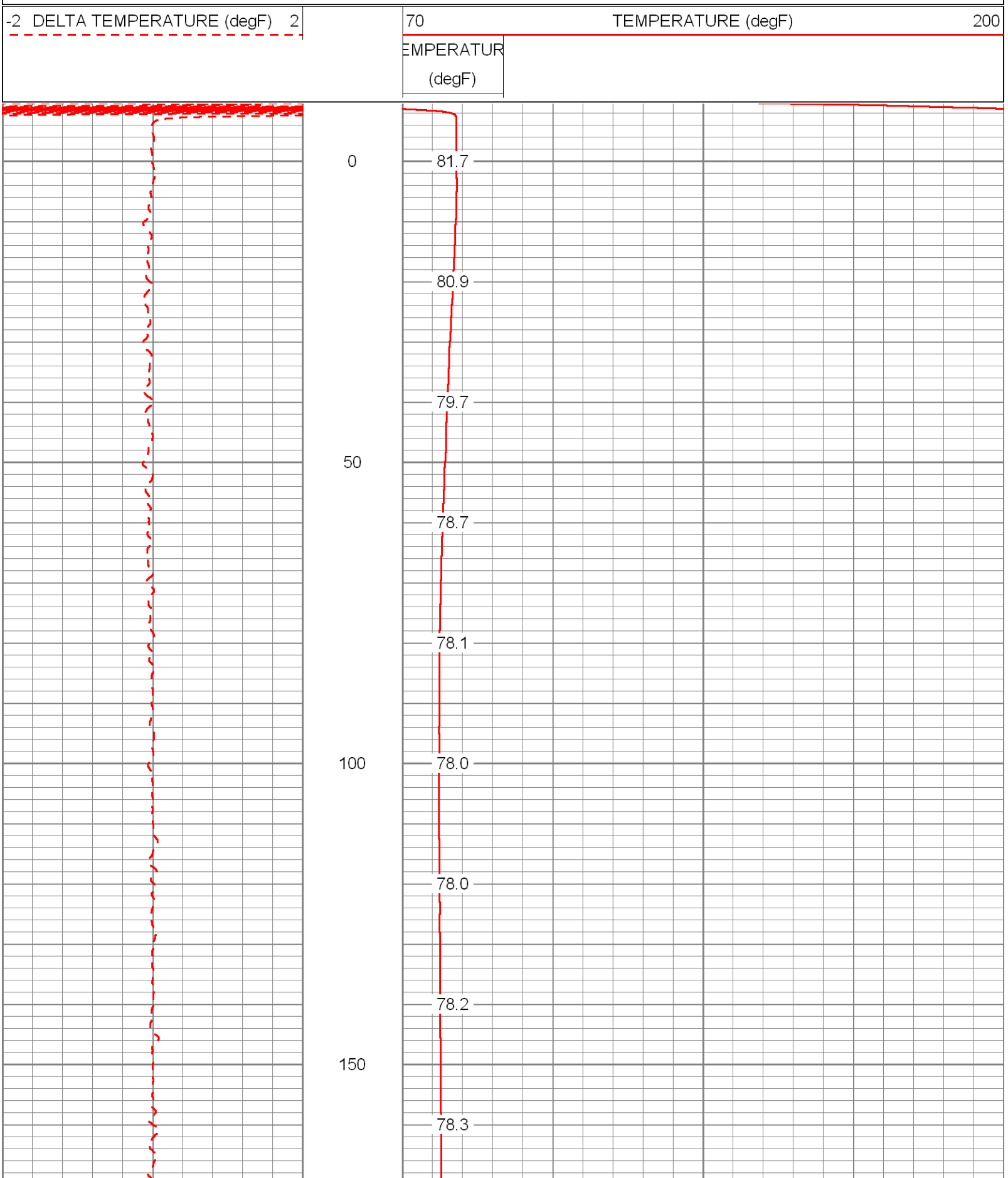
Comments

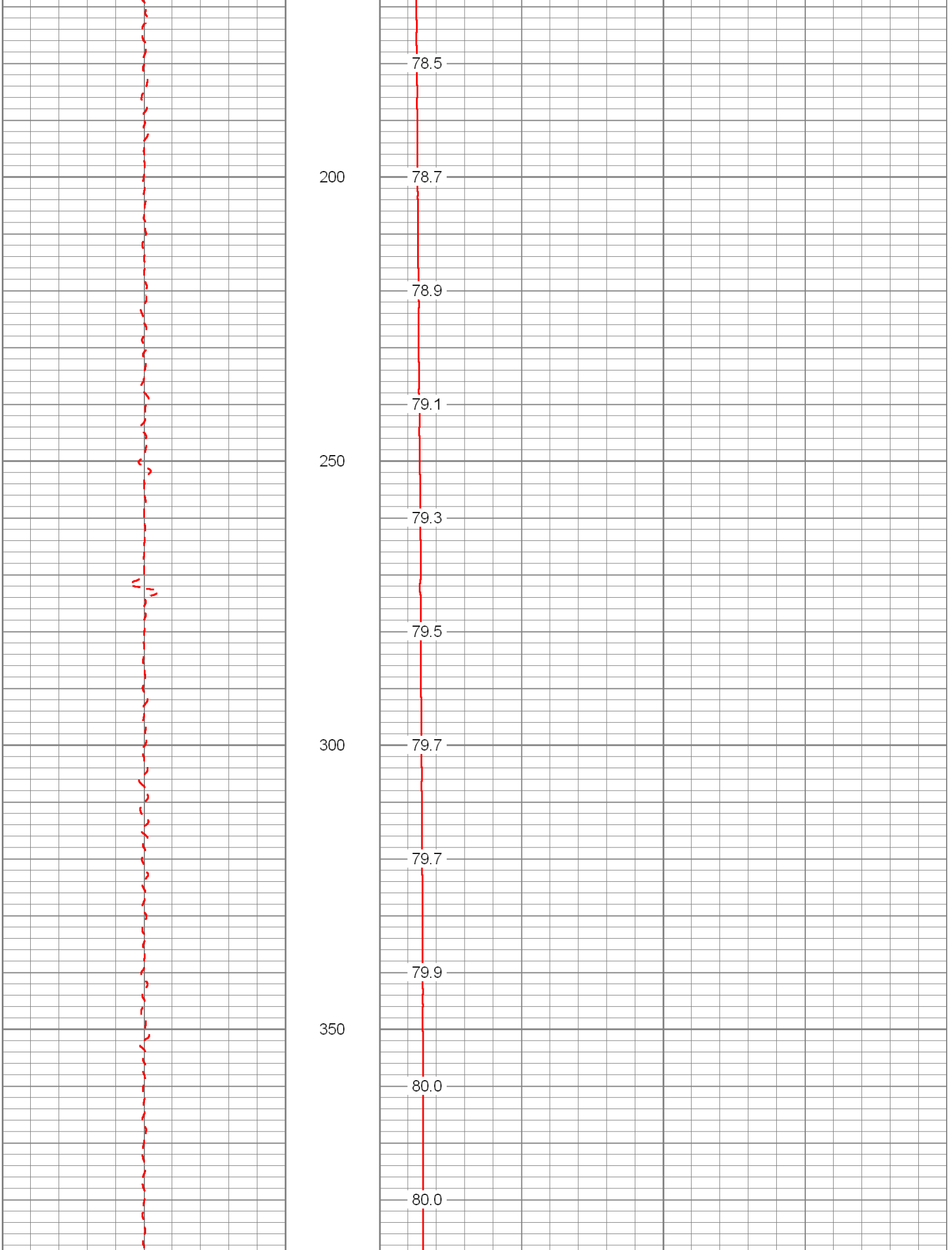
RADIOACTIVE TRACER SURVEY

TEMPERATURE

BROTHERS

Database File:	sdwwtp-iw2.db
Dataset Pathname:	pass2
Presentation Format:	temp
Dataset Creation:	Mon Jun 10 10:34:01 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:240

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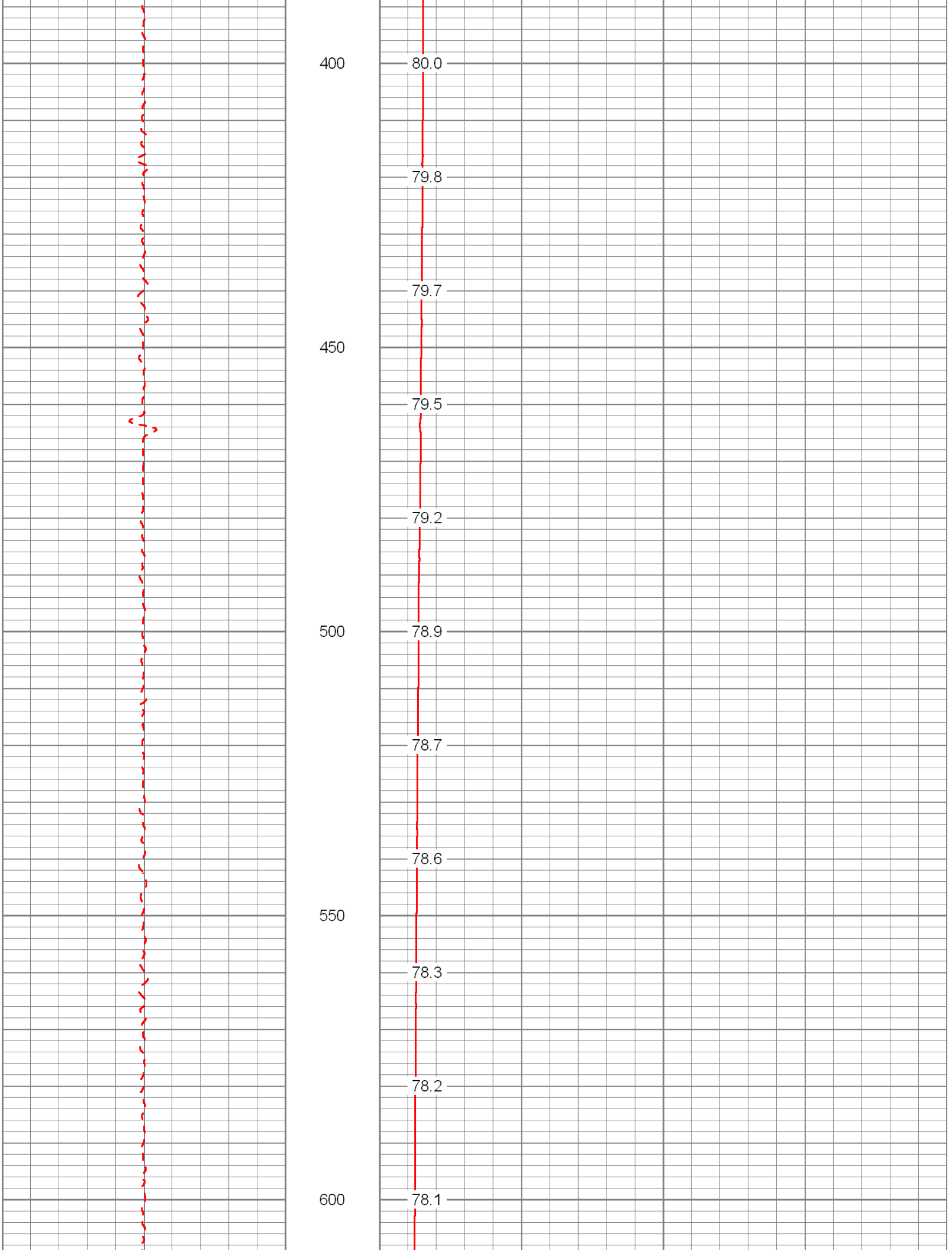
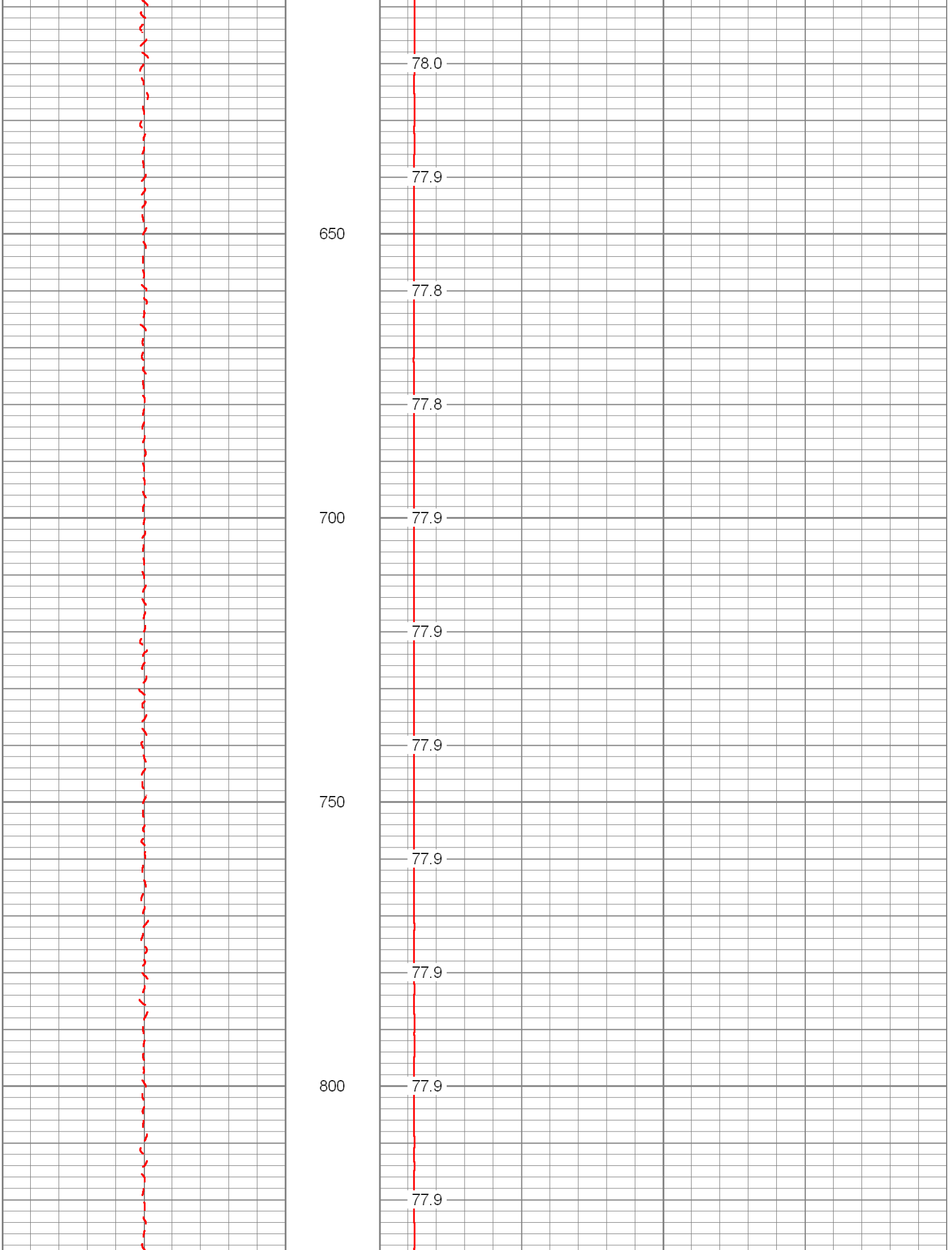
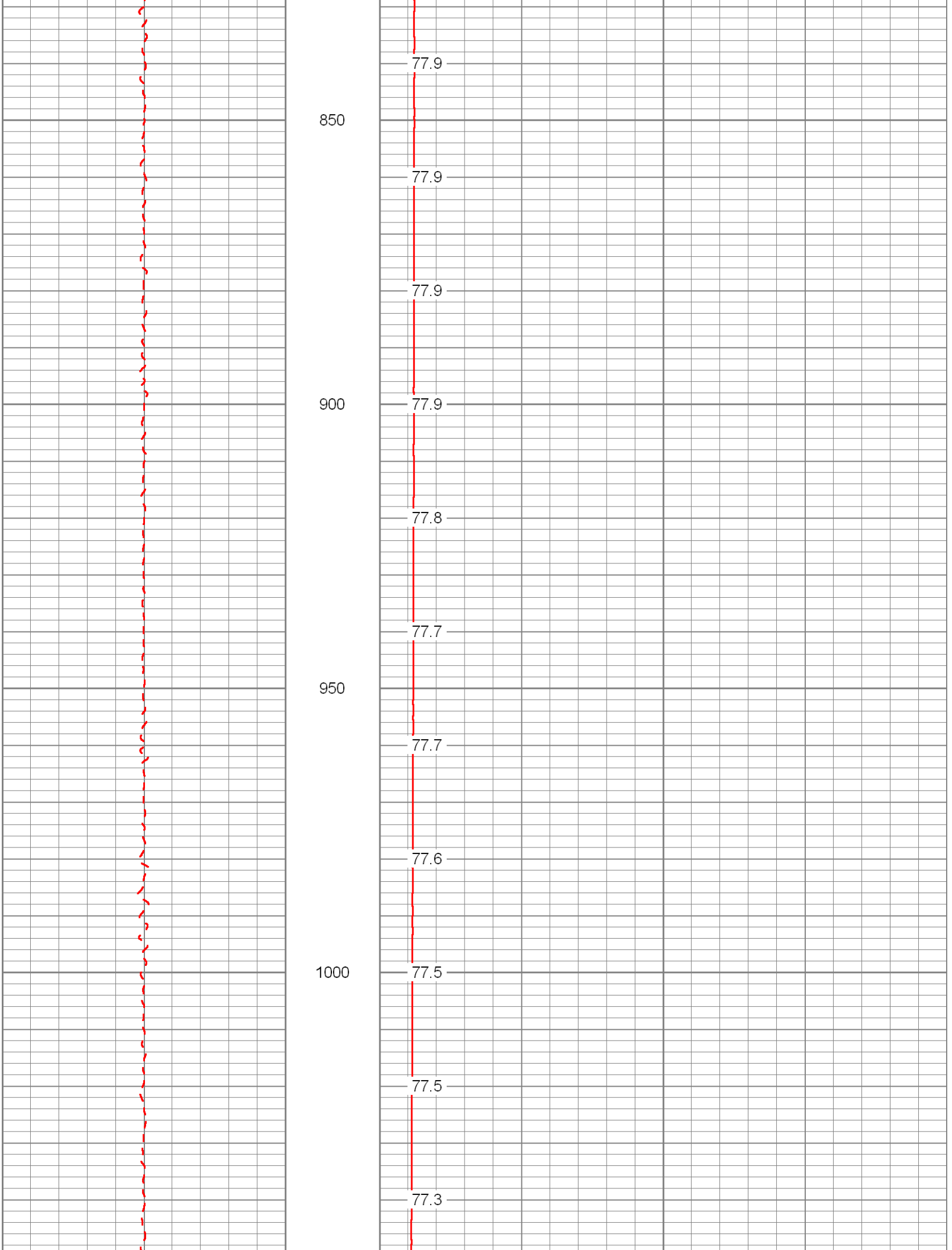
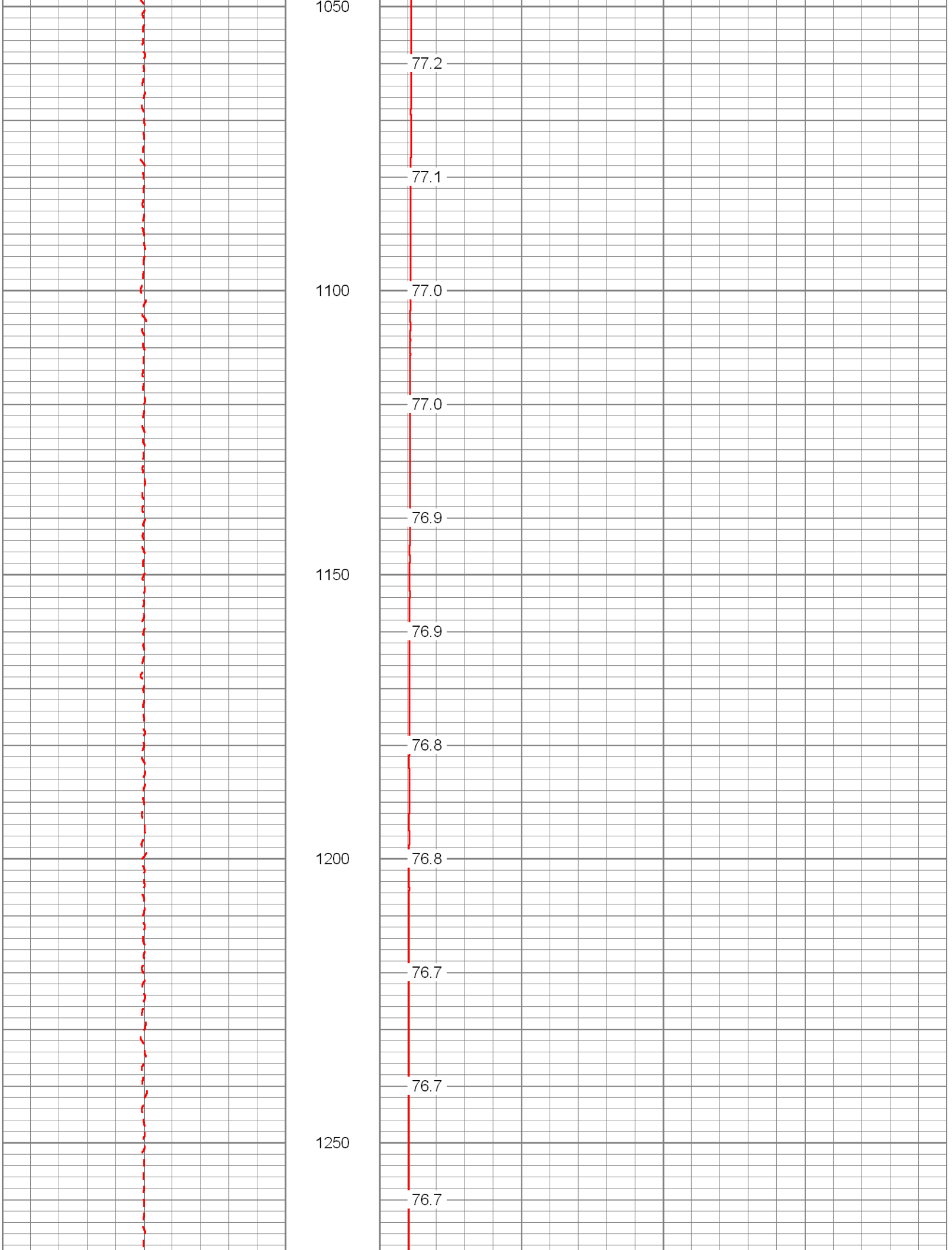
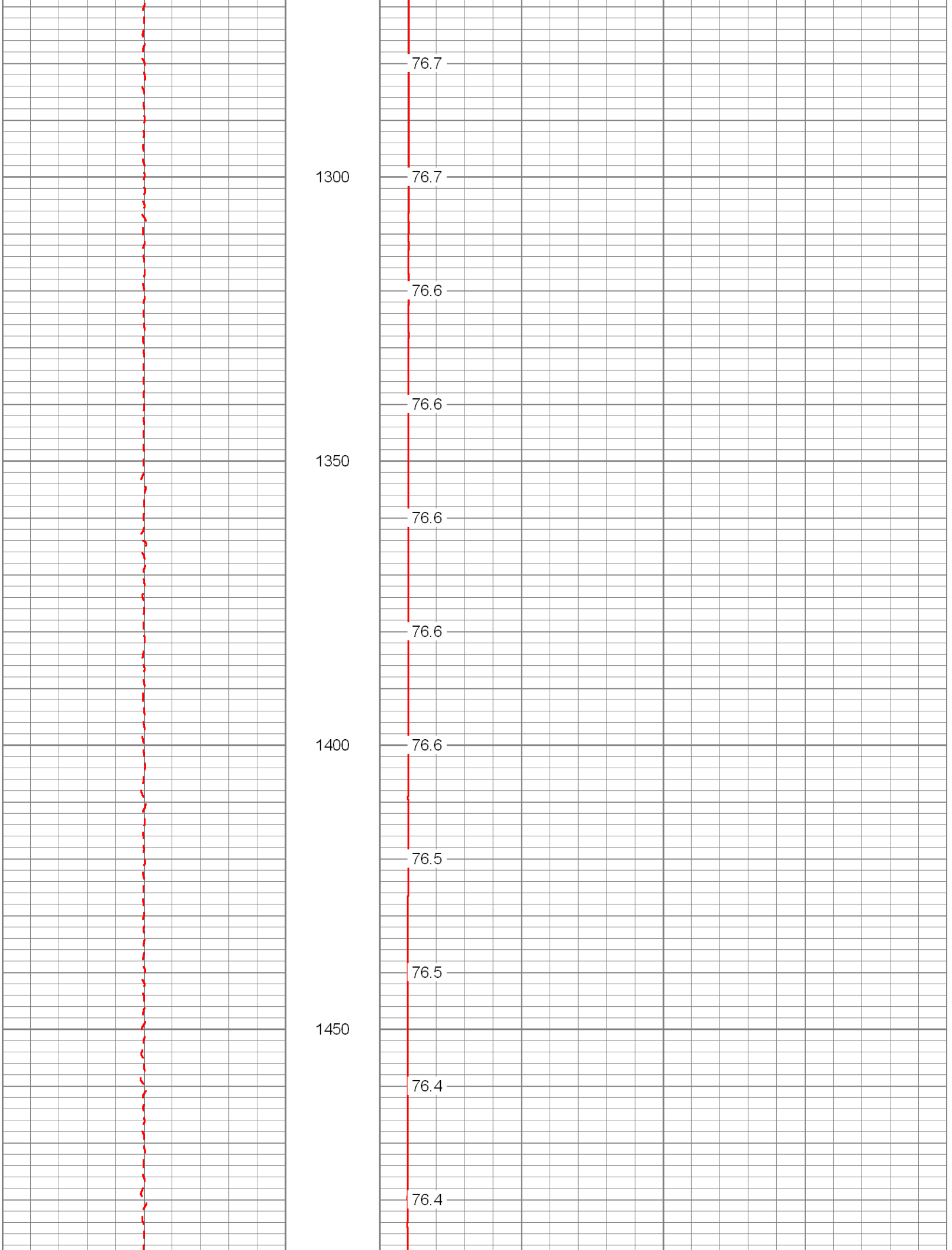
200
78.7
78.9
79.1
250
79.3
79.5
300
79.7
79.7
79.9
350
80.0
80.0

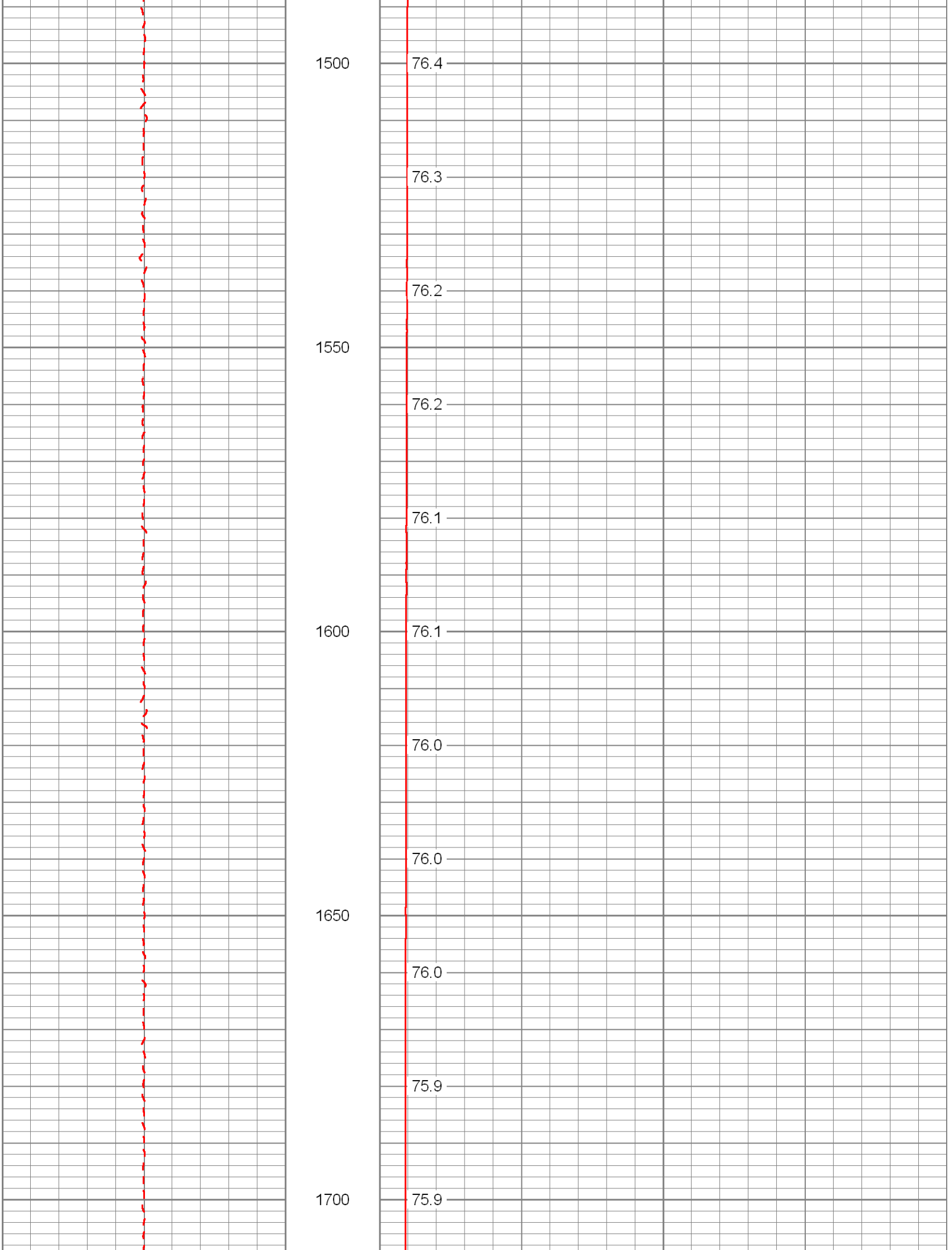

400
450
500
550
600
80.0
79.8
79.7
79.5
79.2
78.9
78.7
78.6
78.3
78.2
78.1


78.0
77.9
650
77.8
77.8
700
77.9
77.9
77.9
750
77.9
77.9
800
77.9
77.9


850
900
950
1000
77.9
77.9
77.9
77.9
77.8
77.7
77.7
77.6
77.5
77.5
77.3


1050
77.2
77.1
1100
77.0
77.0
76.9
1150
76.9
76.8
1200
76.8
76.7
76.7
1250
76.7


76.7
1300
76.7
76.6
76.6
1350
76.6
76.6
76.6
1400
76.6
76.5
76.5
1450
76.4
76.4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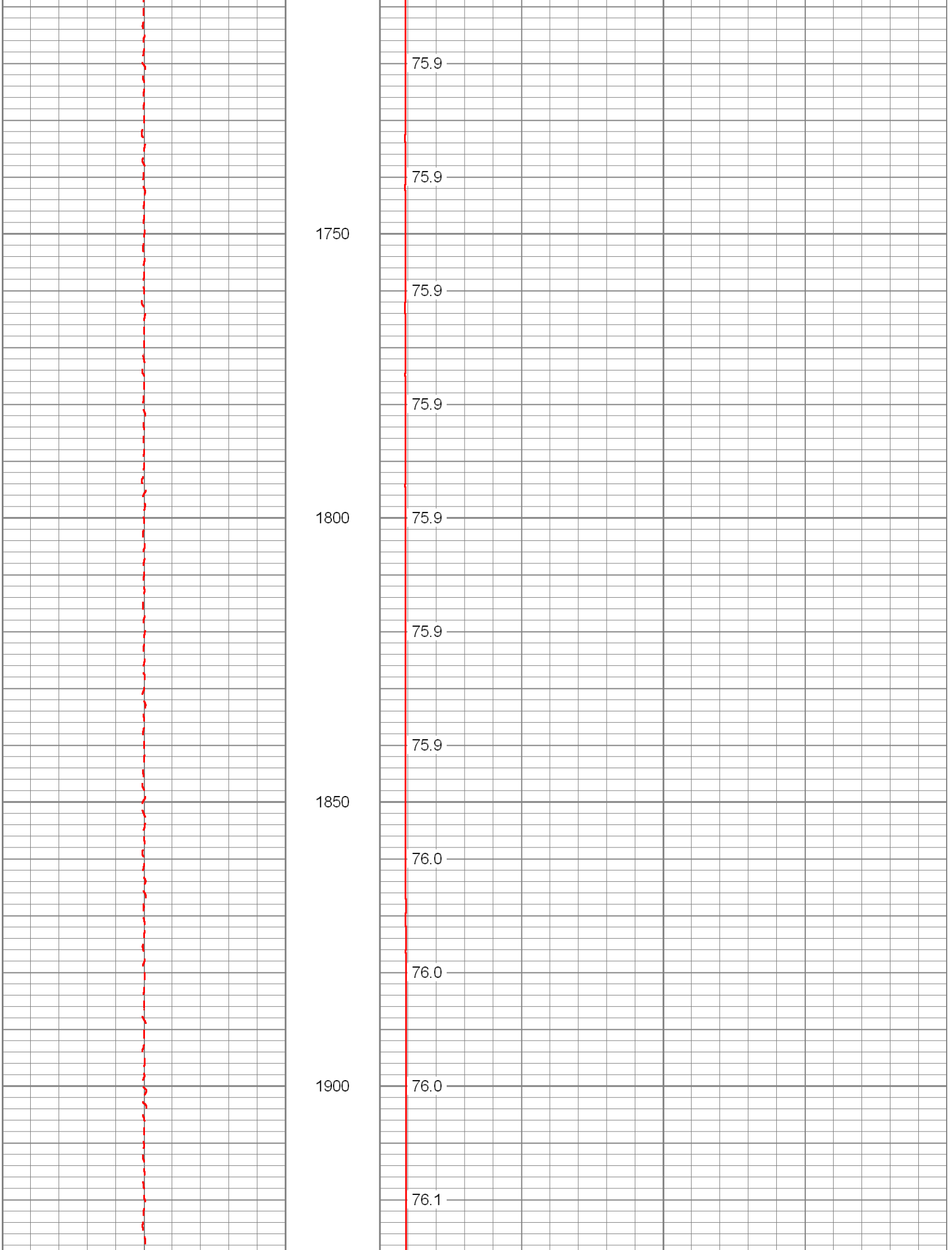
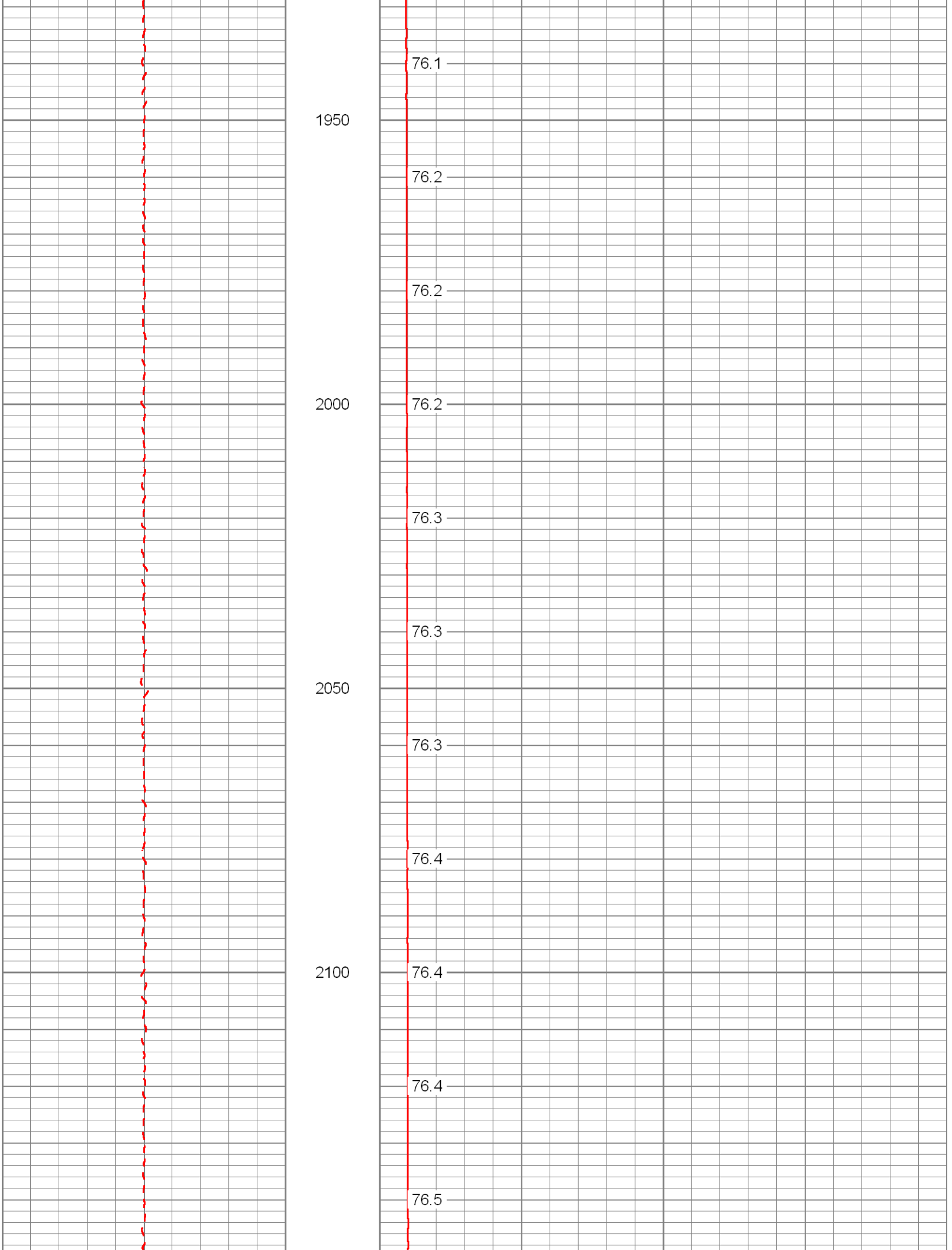
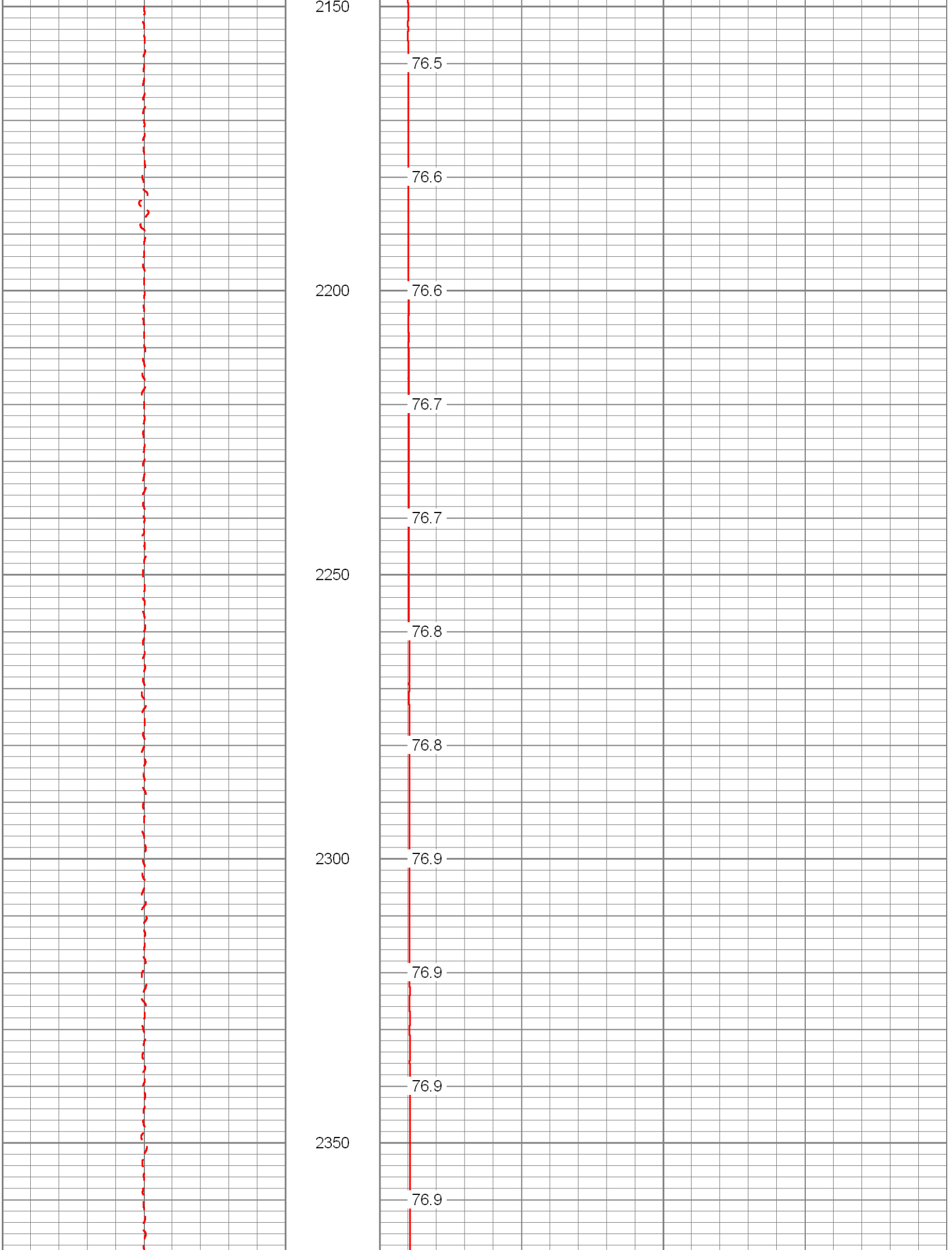
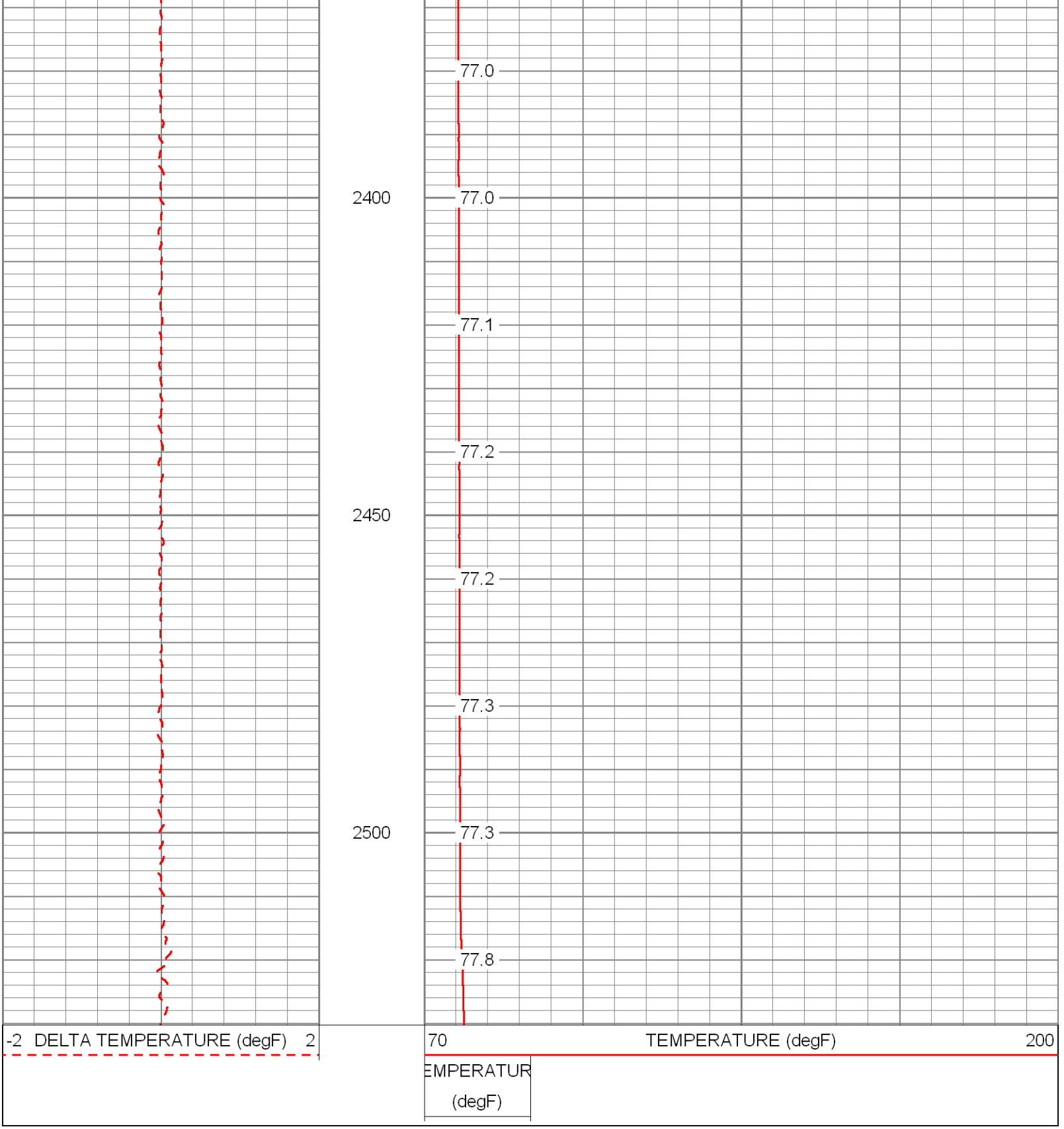
76.4
76.3
76.2
1550
76.2
76.1
1600
76.1
76.0
76.0
1650
76.0
75.9
1700
75.9


75.9
75.9
1750
75.9
75.9
1800
75.9
75.9
75.9
1850
76.0
76.0
1900
76.0
76.1


76.1
1950
76.2
76.2
2000
76.2
76.3
76.3
2050
76.3
76.4
2100
76.4
76.4
76.5


2150
76.5
76.6
2200
76.6
76.7
76.7
2250
76.8
76.8
2300
76.9
76.9
76.9
2350
76.9



Calibration Report

Database File: sdwwtp-iw2.db
Dataset Pathname: pass2
Dataset Creation: Mon Jun 10 10:34:01 2013 by Log SOC 110722

Temperature Calibration Report

Serial Number: 951
Tool Model: RTS
Performed: Mon Oct 08 09:35:10 2012

Point #	Reading		Reference	
1	414.44	cps	33.00	degF
2	892.98	cps	85.00	degF
3	1755.38	cps	170.00	degF
4		cps		degF
5		cps		degF
6		cps		degF
7		cps		degF
8		cps		degF
9		cps		degF
10		cps		degF

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)
			TEMP-RTS (951)	25.50	1.69	70.00

TEMP	0.10					

Dataset: sdwwtp-iw2.db: field/well/run1/pass2
Total Length: 25.50 ft
Total Weight: 70.00 lb
O.D. 1.69 in

Appendix F

Television Survey

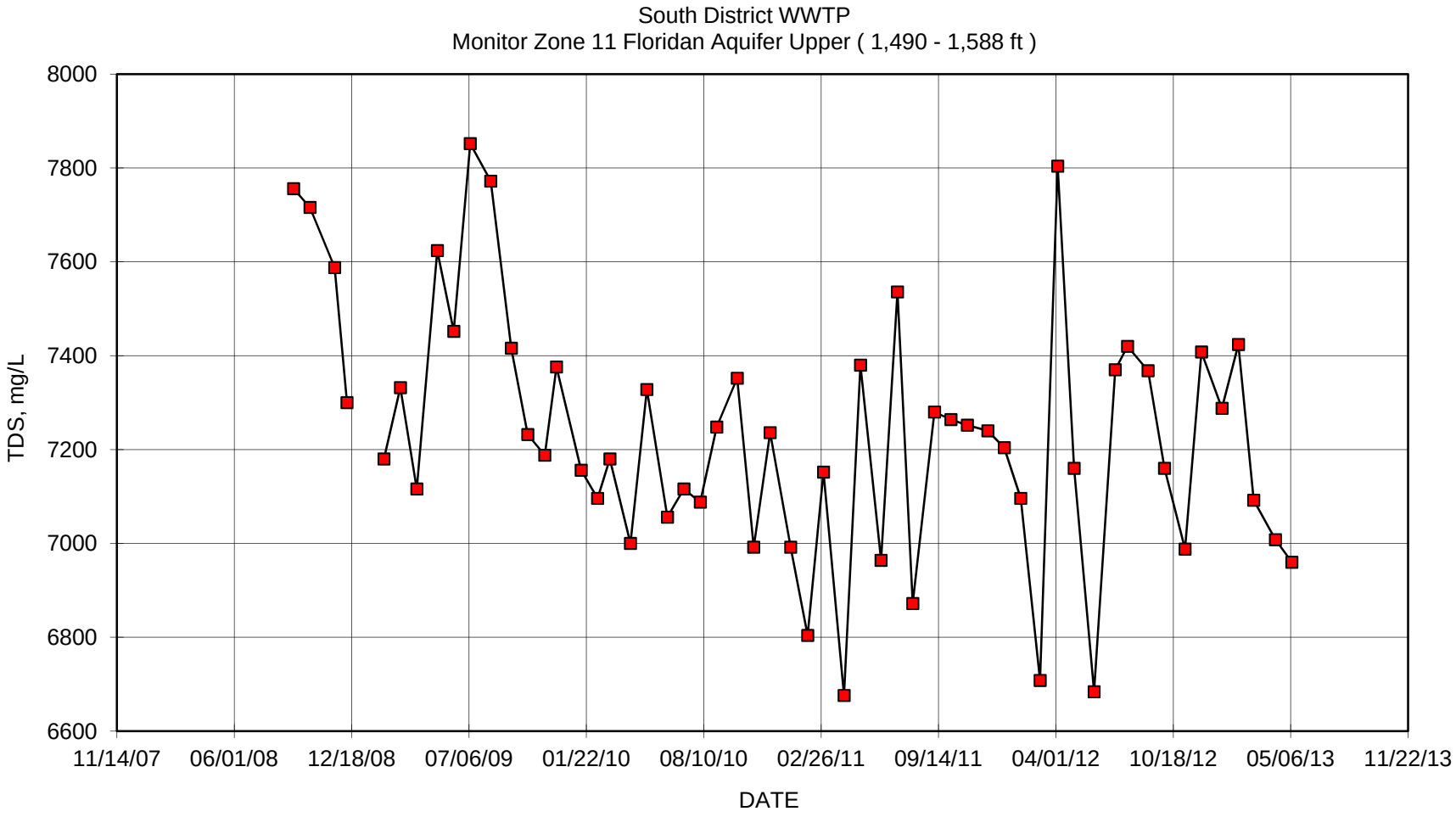
Appendix G

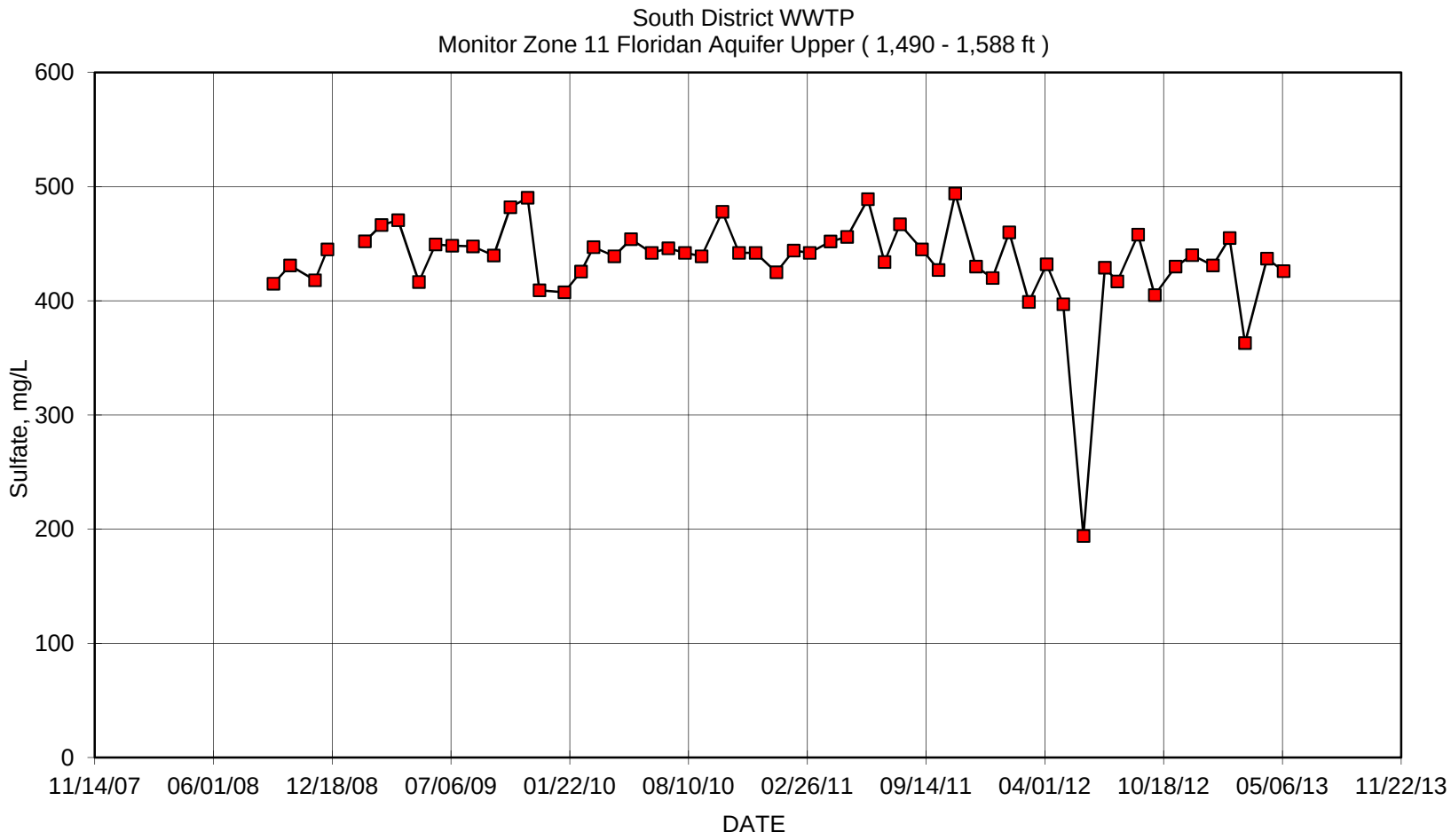
5 year Monitoring Data

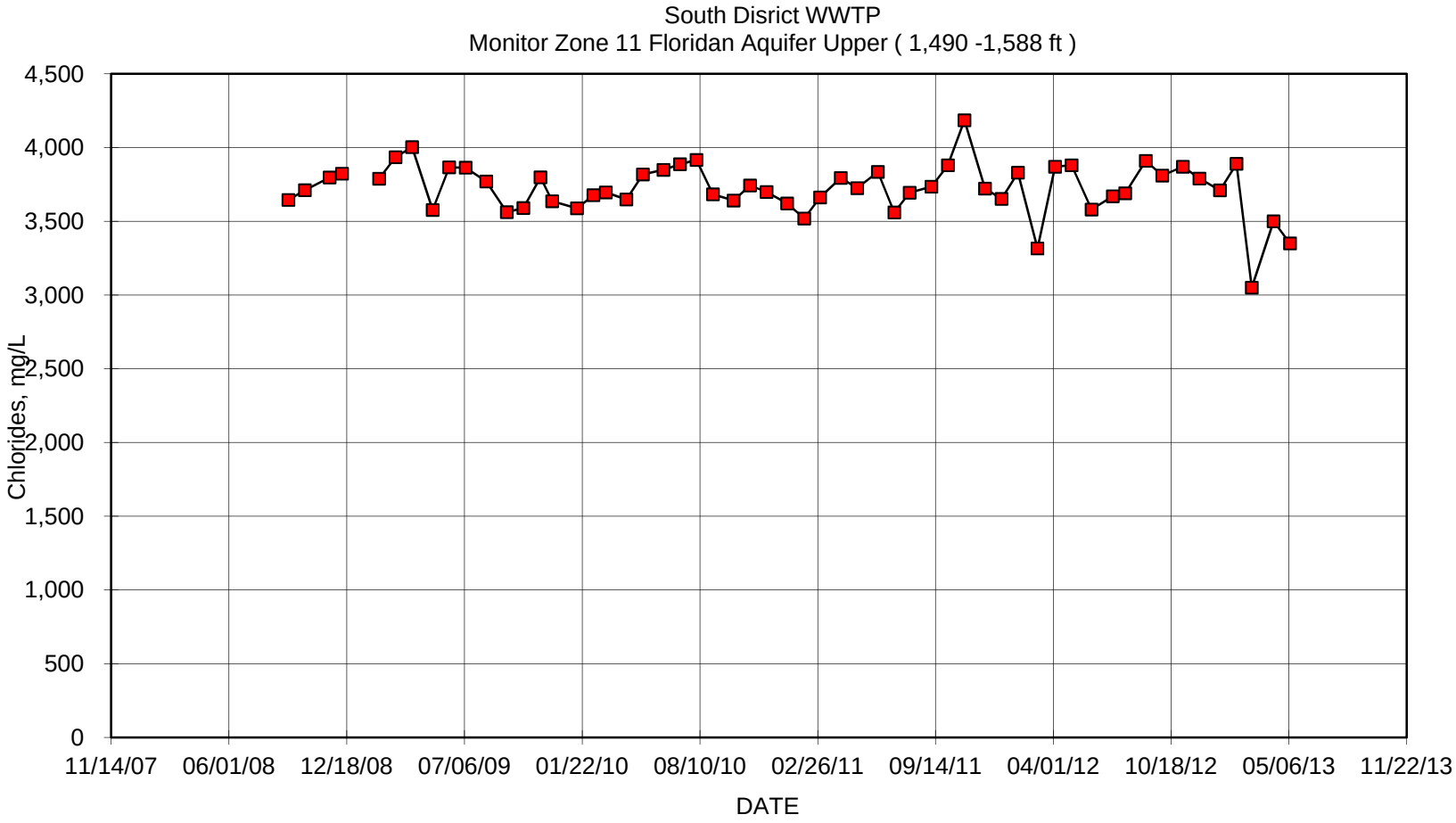
FA-11 Upper

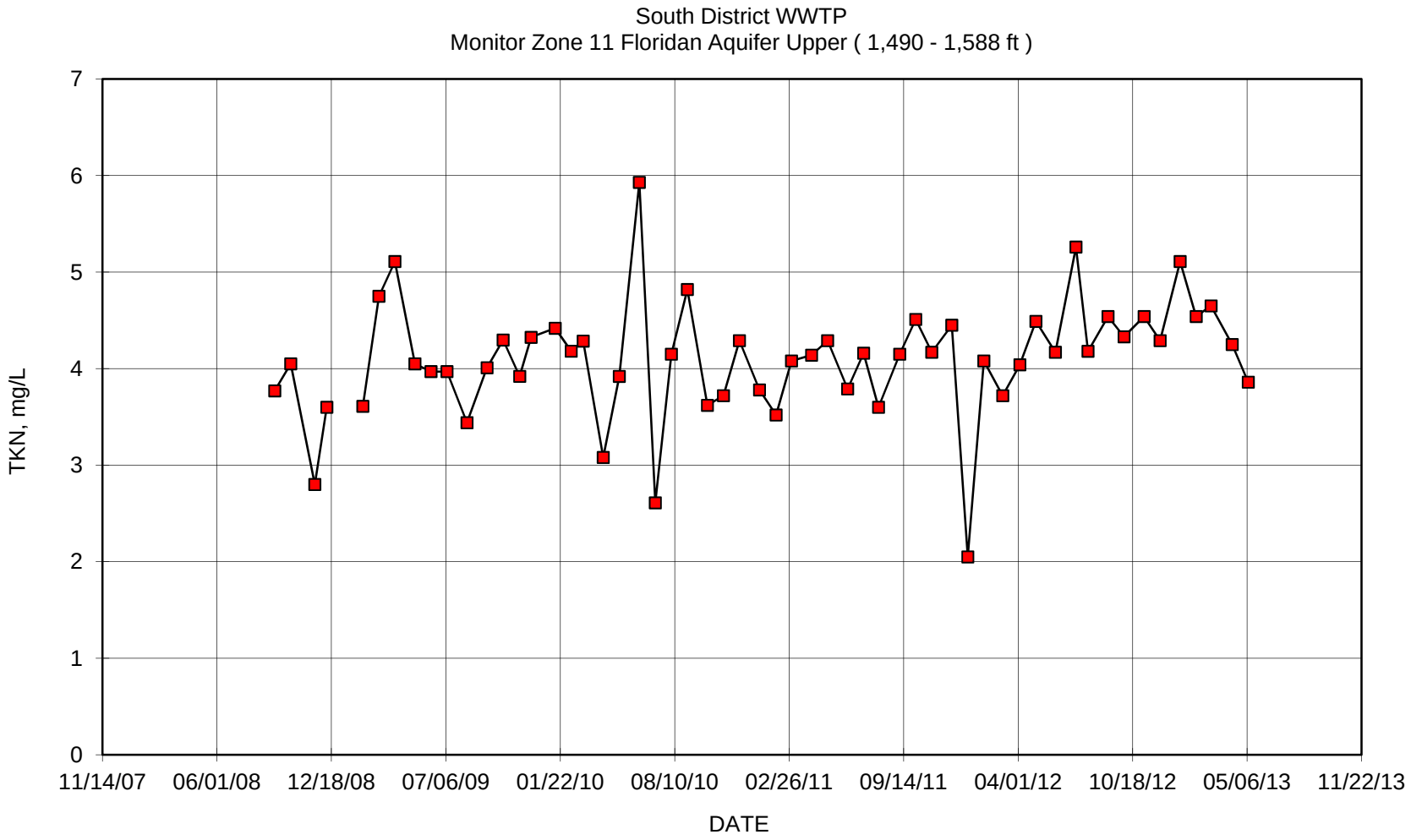
Date	TDS, mg/L	Sulfate, mg/L	Chlorides, mg/L	TKN, mg/L	NH3, mg/L	Conductivity, Micromho/cm	Temp., C	Temp., F	pH	TP, mg/L	TSS, mg/L	NO_3, mg/L	NO_2, mg/L	Sodium, mg/L	Gross Alpha pCi/LL	Radium 226 pCi/LL	Radium 228 pCi/LL
07/09/08																	
08/13/08																	
09/10/08	7,756	415	3,645	3.77	3.32	11,720	24	76	7.8	0.01	8.00	0.08	0.05				
10/08/08	7,716	431	3,711	4.05	2.82	12,330	24	74	7.6	0.08	1.76	0.03	0.00				
11/19/08	7,588	418	3,797	2.80	2.83	11,840	23	74	7.6	0.00	11.60	0.03	0.01				
12/10/08	7,300	445	3,823	3.60	2.89	11,690	23	73	7.5	0.02	4.80	0.03	0.01				
01/14/09																	
02/11/09	7,180	452	3,789	3.61	3.66	12,060	24	75	7.4	0.08	12.30	0.00	0.01				
03/11/09	7,332	466	3,935	4.75	2.80	12,000	22	72	7.5	0.26	3.20	0.00	0.00				
04/08/09	7,116	471	4,003	5.11	4.31	12,100	22	71	7.6	0.02	6.00	0.00	0.00				
05/13/09	7,624	417	3,577	4.05	4.17	12,180	24	74	7.6	0.00	5.00	0.00	0.02				
06/10/09	7,452	449	3,866	3.97	4.12	11,850	24	75	7.8	0.14	3.80	0.00	0.00				
07/08/09	7,852	448	3,864	3.97	3.48	12,050	24	76	7.6	0.03	5.00	0.00	0.00				
08/12/09	7,772	448	3,770	3.44	3.93	12,420	24	76	7.5	0.01	7.00	0.00	0.00				
09/16/09	7,416	440	3,562	4.01	3.50	11,950			7.4	0.01		0.05	0.01	1,940	20.4	8.0	1.0
10/14/09	7,232	482	3,590	4.30	3.58	11,650			7.6	0.03		0.00	0.00	1,960	21.9	6.2	0.9
11/12/09	7,188	490	3,798	3.92	3.58	12,130			7.6	0.02		0.00	0.00	1800	14.6	6.9	0.8
12/02/09	7,376	409	3,636	4.32	3.78	11,660	24	75	7.7	0.02	4.40	0.00	0.00	1830	16.1	9.7	1
01/13/10	7,156	408	3,588	4.42	3.57	11,450	22	72	7.6	0.02	4.60	0.00	0.00	1600	13.8	5.7	0.9
02/10/10	7,096	426	3,677	4.18	3.76	11,400	22	72	7.7	0.02	5.80	0.00	0.00	2100	11.8	5.3	0.9
03/03/10	7,180	447	3,696	4.29	3.63	11,790	22	72	7.5	0.02	4.40	0.00	0.00	1910	14.2	6.5	0.6
04/07/10	7,000	439	3,648	3.08	2.90	11,440	24	75	7.4	0.01	3.60	0.00	0.00	1860	11.1	5.1	0.8
05/05/10	7,328	454	3,818	3.92	3.41	11,660	25	76	7.6	0.01	1.20	0.01	0.00	2010	19.7	6.5	0.9
06/09/10	7,056	442	3,849	5.93	3.96	11,950	24	76	7.6	0.05	4.60	0.00	0.00	1900	13	6.3	0.7
07/07/10	7,116	446	3,887	2.61	3.56	11,810	24	75	7.7	0.01	6.60	0.01	0.00	1850	11.8	6	0.6
08/04/10	7,088	442	3,916	4.15	4.09	11,050	25	76	7.6	0.19	4.30	0.00	0.00	1860	10.8	5.9	0.9
09/01/10	7,248	439	3,683	4.82	3.85	11,770	25	76	7.5	0.02	13.20	0.01	0.00	1890	16.4	7.5	1.0
10/06/10	7,352	478	3,641	3.62	4.00	11,650	23	74	7.4	0.02	3.80	0.00	0.00	1910	13.6	7.0	0.9
11/03/10	6,992	442	3,743	3.72	3.01	11,300	23	74	7.5	0.04	2.50	0.00	0.00	1990	13.6	6.5	0.9
12/01/10	7,236	442	3,699	4.29	4.02	11,600	24	75	7.7	0.02	4.50	0.00	0.00	1830	18.8	5.8	0.8
01/05/11	6,992	425	3,621	3.78	3.88	11,270	24	75	7.6	0.27	3.10	0.00	0.00	1920	21.7	5.4	0.7
02/03/11	6,804	444	3,519	3.52	2.97	10,570	24	75	7.4	0.12	2.10	0.01	0.01	1670	16.1	6.3	0.7
03/02/11	7,152	442	3,662	4.08	3.68	11,590	23	74	7.5	0.02	6.30	0.00	0.00	1740	9.8	7.4	0.9
04/06/11	6,676	452	3,794	4.14	4.09	11,150	23	74	7.7	0.02	4.70	0.00	0.00	1850	15	6.8	0.8

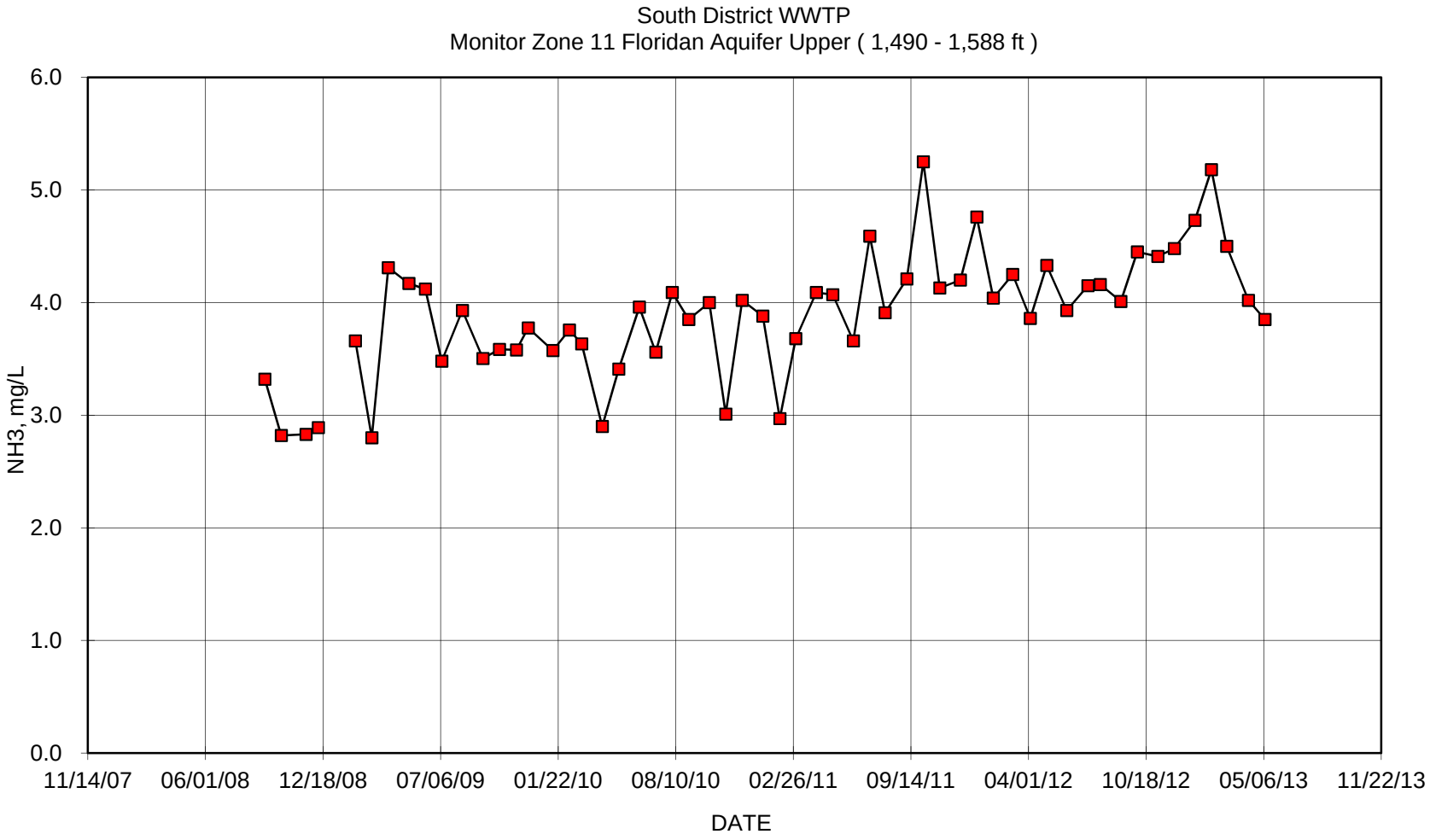
Date	TDS, mg/L	Sulfate, mg/L	Chlorides, mg/L	TKN, mg/L	NH3, mg/L	Conductivity, Micromho/cm	Temp., C	Temp., F	pH	TP, mg/L	TSS, mg/L	NO_3, mg/L	NO_2, mg/L	Sodium, mg/L	Gross Alpha pCi/LL	Radium 226 pCi/LL	Radium 228 pCi/LL
05/04/11	7,380	456	3,725	4.29	4.07	11,320	23	74	7.6	0.02	2.00	0.00	0.00	1850	19.4	0.4	0.8
06/08/11	6,964	489	3,835	3.79	3.66	11,530	23	74	7.5	0.05	1.00	0.00	0.00	2060	17.4	5.9	0.8
07/06/11	7,536	434	3,560	4.16	4.59	11,270	24	74	7.5	0.02	3.50	0.00	0.00	2010	14.2	5.9	0.7
08/01/11	6,872	467	3,694	3.60	3.91	10,680	24	75	7.5	0.02	5.90	0.00	0.00	1930	16.5	6.8	0.8
09/07/11	7,280	445	3,735	4.15	4.21	11,220	24	75	7.7	0.05	5.20	0.00	0.00	1920	16.2	5.4	1.0
10/05/11	7,264	427	3,880	4.51	5.25	11,060	24	75	7.7	0.03	7.70	0.00	0.00	1960	11.8	5.1	0.8
11/02/11	7,252	494	4,185	4.17	4.13	11,430	23	74	7.6	0.01	0.80	0.00	0.00	2000	25.6	5.6	0.9
12/07/11	7,240	430	3,722	4.45	4.20	11,607	23	74	8.0	0.03	6.50	0.00	0.00	1960	15.5	4.7	0.8
01/04/12	7,204	420	3,652	2.05	4.76	10,744	23	73	7.6	0.02	4.80	0.00	0.00	1690	13.8	4.5	0.9
02/01/12	7,096	460	3,830	4.08	4.04	9,382	23	74	7.6	0.02	4.20	0.00	0.00	2050	14.7	5.9	0.9
03/05/12	6,708	399	3,316	3.72	4.25	11,064	23	74	7.4	0.01	5.00	0.01	0.00	2000	13.1	6.1	0.7
04/04/12	7,804	432	3,870	4.04	3.86	11,728	23	74	7.7	0.03	8.20	0.50	0.50	2020	20.7	5.3	0.8
05/02/12	7,160	397	3,880	4.49	4.33	11,840	24	74	7.7	0.04	8.50	0.00	0.00	1930	12.0	5.0	0.9
06/05/12	6,684	194	3,580	4.17	3.93	11,070	29	84	9.0	0.01	6.50	0.01	0.00	1000	14.0	2.9	0.8
07/11/12	7,370	429	3,670	5.26	4.15	11,810	23	74	7.6	0.00	4.50	0.01	0.00	2030	20.0	6.1	0.8
08/01/12	7,420	417	3,690	4.18	4.16	11,732	24	75	8.0	0.03	0.30	0.02	0.00	2160	12.4	5.6	0.9
09/05/12	7,368	458	3,910	4.54	4.01	11,590	23	74	7.8	0.04	2.30	0.00	0.00	1860	12.5	6.2	0.8
10/03/12	7,160	405	3,810	4.33	4.45	11,250	24	75	7.8	0.06	8.50	0.00	0.00	1920	12.1	5.1	0.8
11/07/12	6,988	430	3,870	4.54	4.41	10,890	23	73	7.5	0.01	4.00	0.01	0.00	1970	15.6	5.8	0.8
12/05/12	7,408	440	3,790	4.29	4.48	11,730	23	74	7.6	0.03	2.70	0.00	0.00	2020	30	5.3	0.9
01/09/13	7,288	431	3,710	5.11	4.73	11,673	23	74	7.7	0.12	5.50	0.00	0.00	2020	20.9	5.1	0.8
02/06/13	7,424	455	3,890	4.54	5.18	11,789	24	75	7.7	0.02	6.00	0.02	0.00	2060	11.5	4.5	0.8
03/04/13	7,092	363	3,050	4.65	4.50	11,682	23	73	7.6	0.03	4.00	0.02	0.00	2280	30.4	6.0	1.8
04/10/13	7,008	437	3,500	4.25	4.02	11,310	23	74	7.4	0.01	0.01	0.00	0.01	1860	17.0	6.0	0.8
05/08/13	6,960	426	3,350	3.86	3.85	11,605	24	74	7.6	0.02	0.02	0.01	0.00	1960	25.4	5.4	0.9

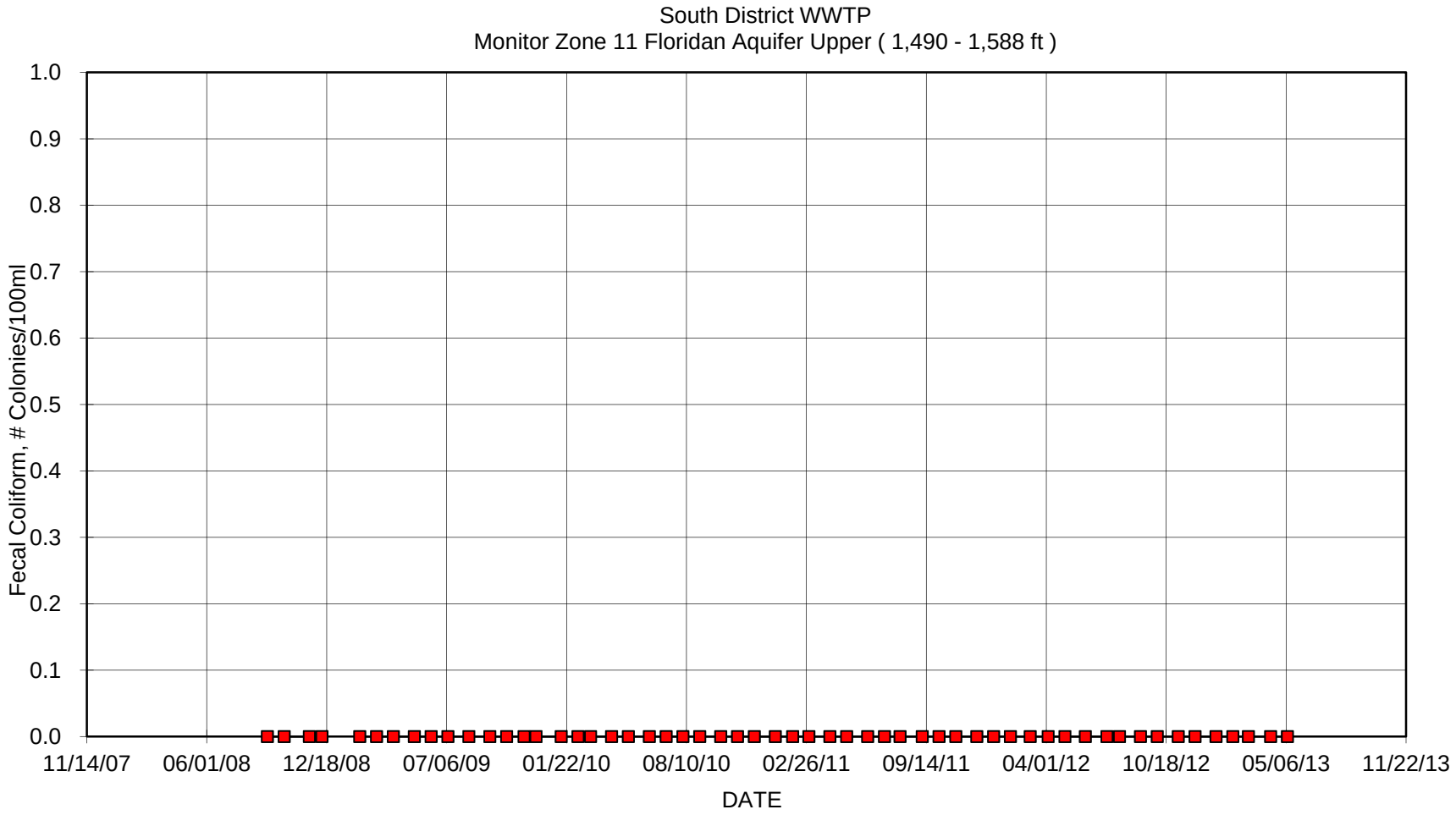

South District WWTP
Monitor Zone 11 Floridan Aquifer Upper (1,490 - 1,588 ft)
TDS, mg/L
8000
7800
7600
7400
7200
7000
6800
6600
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

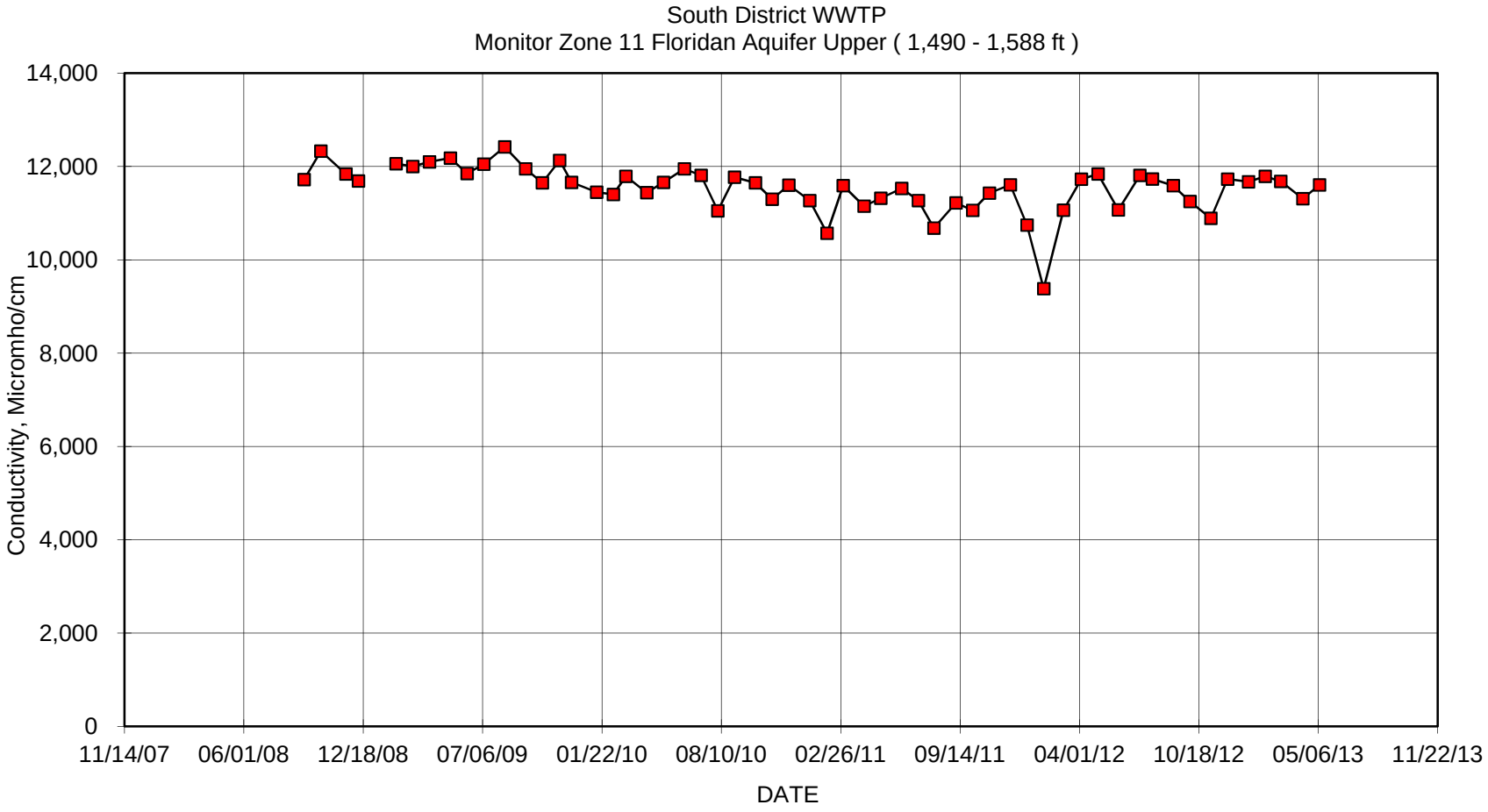

South District WWTP
Monitor Zone 11 Floridan Aquifer Upper (1,490 - 1,588 ft)
Sulfate, mg/L
600
500
400
300
200
100
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

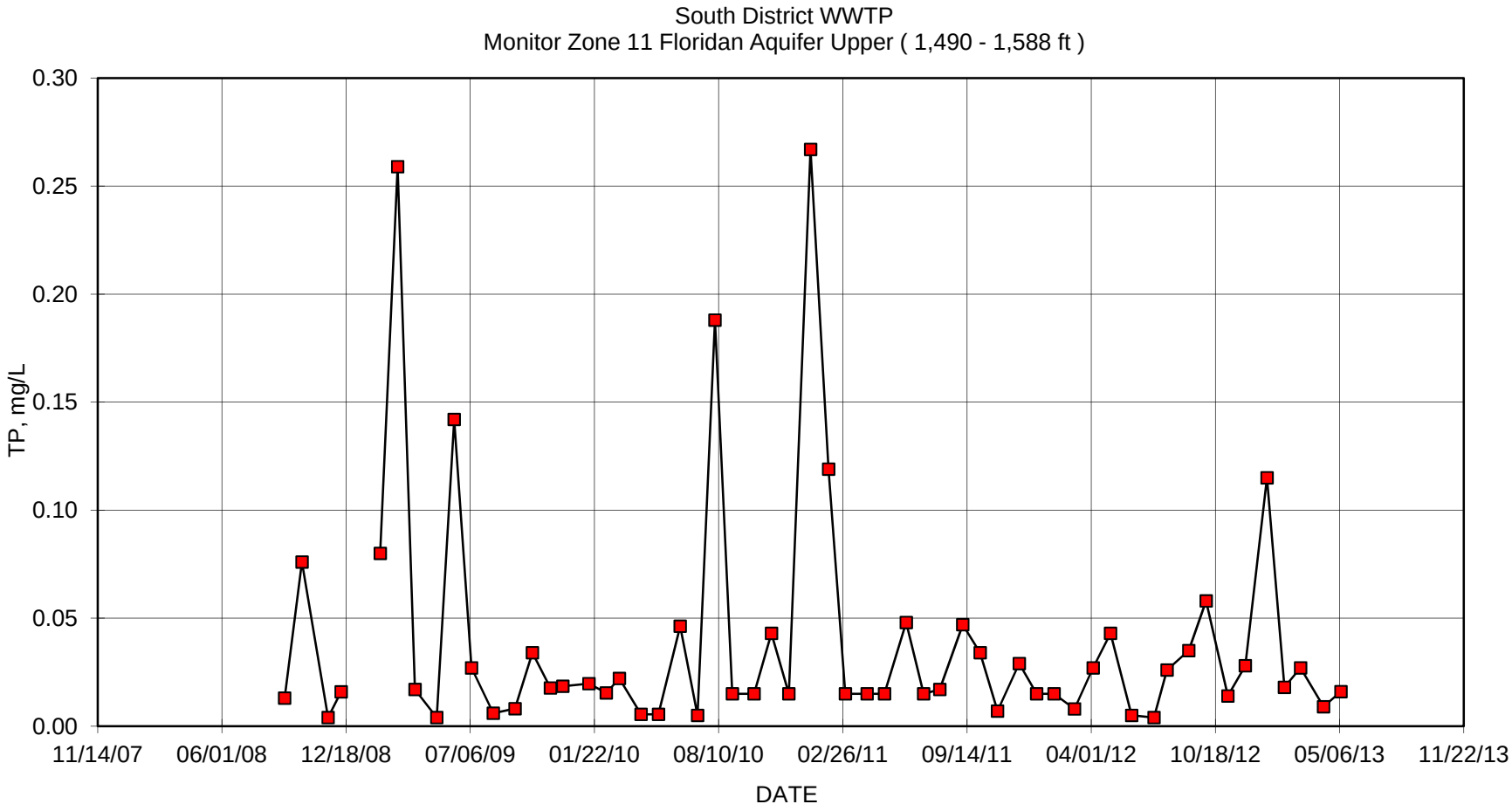

South Disrict WWTP
Monitor Zone 11 Floridan Aquifer Upper (1,490 -1,588 ft)
Chlorides, mg/L
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

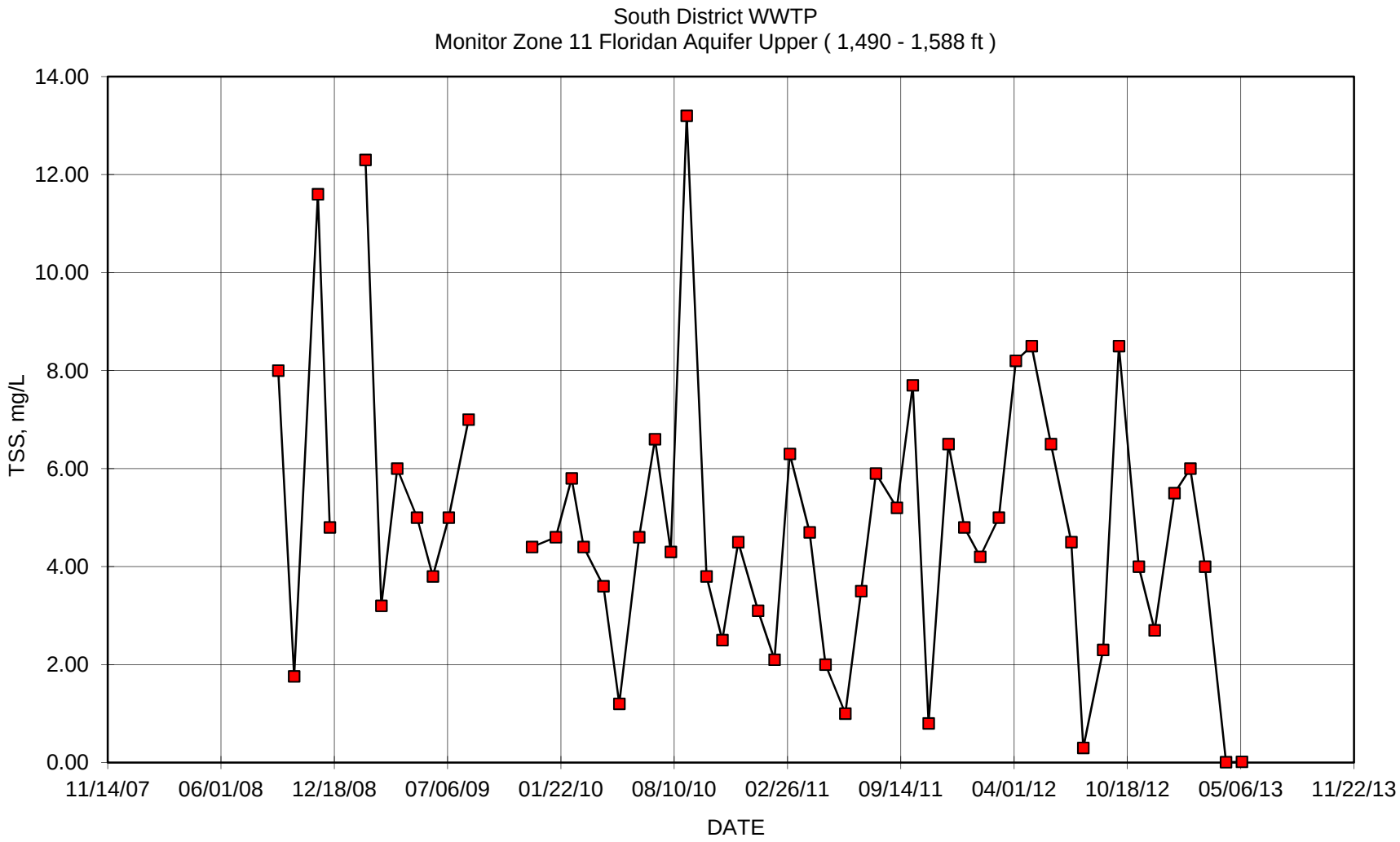

South District WWTP
Monitor Zone 11 Floridan Aquifer Upper (1,490 - 1,588 ft)
TKN, mg/L
0
1
2
3
4
5
6
7
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 11 Floridan Aquifer Upper (1,490 - 1,588 ft)
NH3, mg/L
6.0
5.0
4.0
3.0
2.0
1.0
0.0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 11 Floridan Aquifer Upper (1,490 - 1,588 ft)
Fecal Coliform, # Colonies/100ml
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 11 Floridan Aquifer Upper (1,490 - 1,588 ft)
Conductivity, Micromho/cm
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

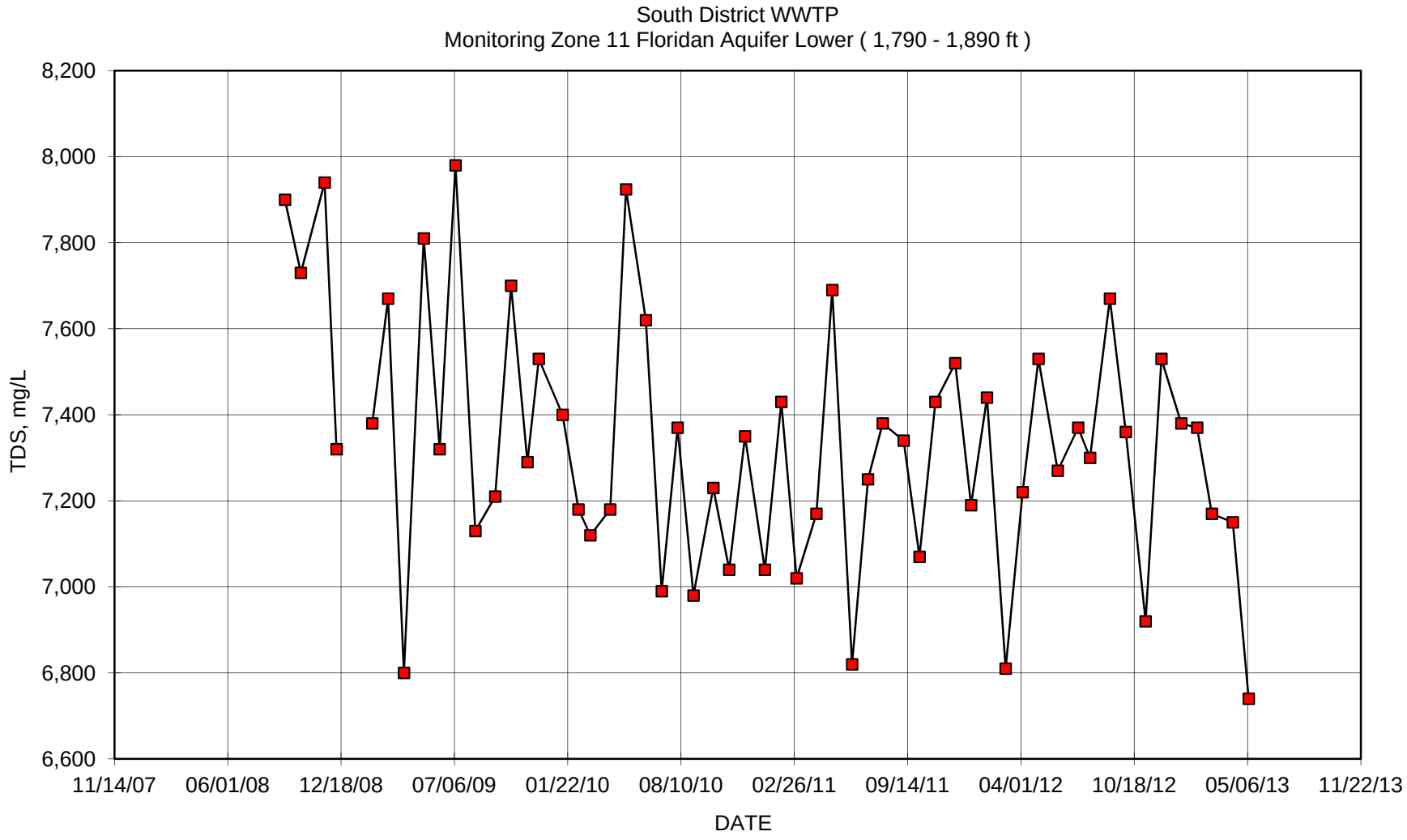

South District WWTP
Monitor Zone 11 Floridan Aquifer Upper (1,490 - 1,588 ft)
TP, mg/L
0.30
0.25
0.20
0.15
0.10
0.05
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

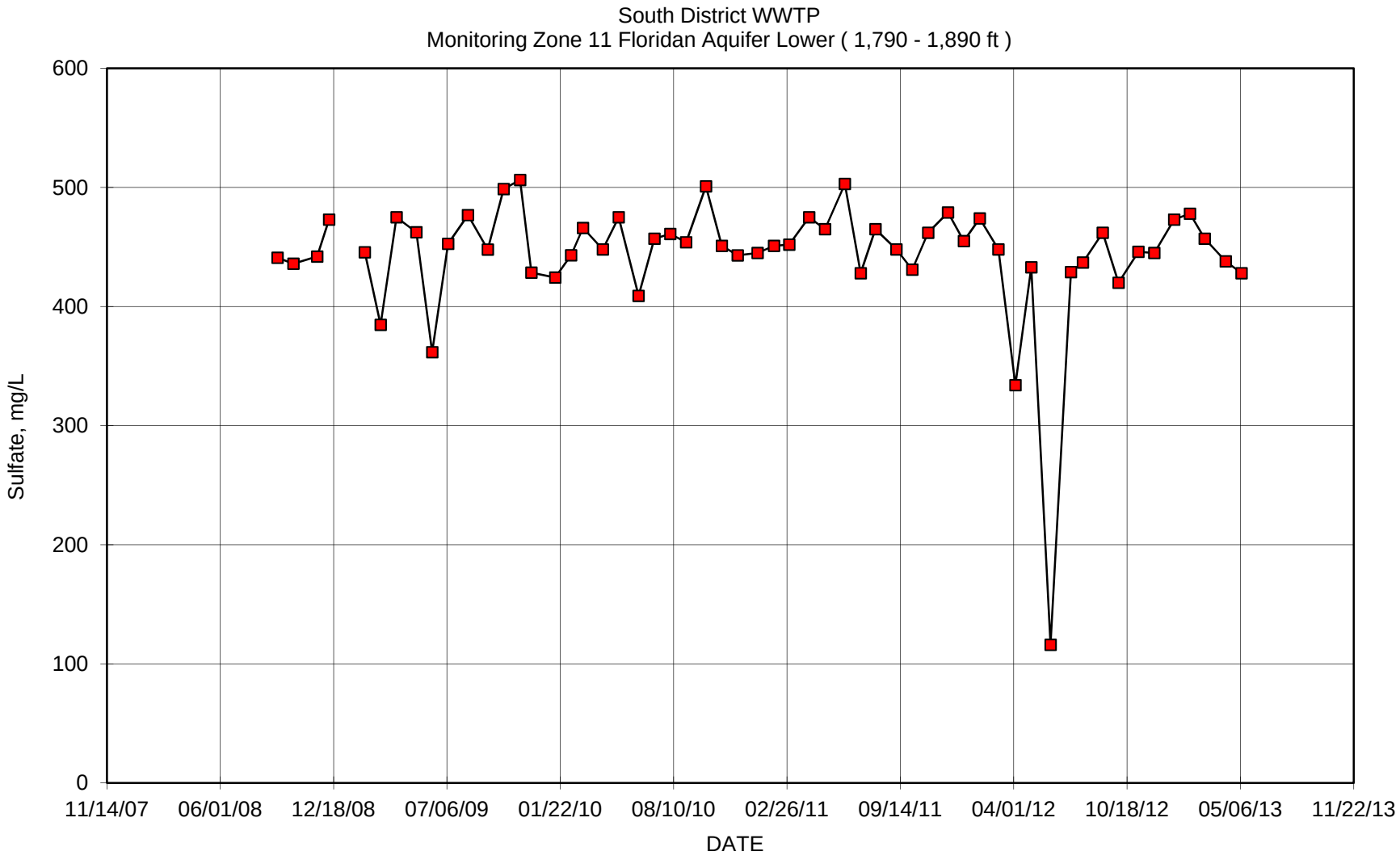

South District WWTP
Monitor Zone 11 Floridan Aquifer Upper (1,490 - 1,588 ft)
TSS, mg/L
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

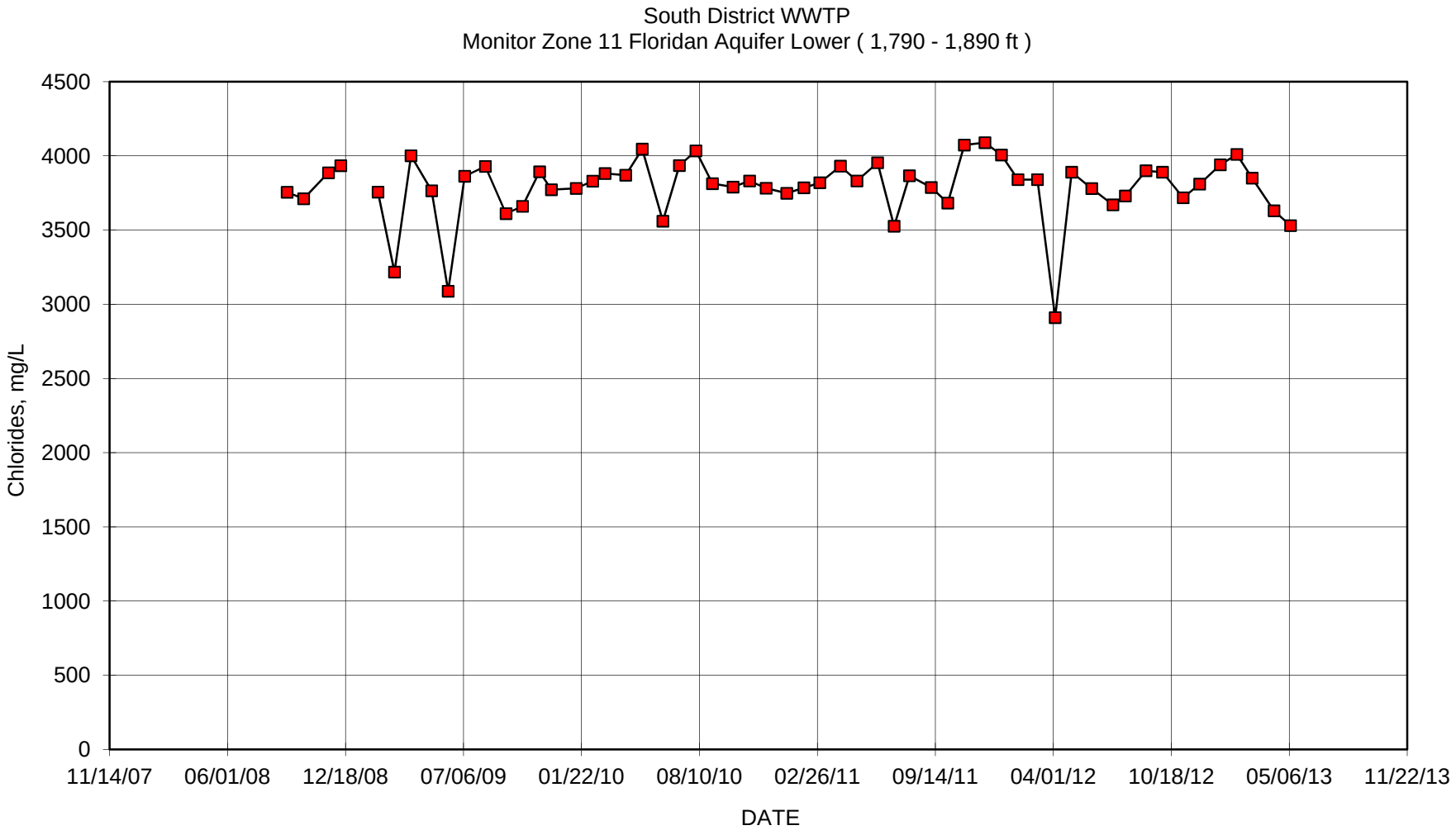
FA-11 Lower Data

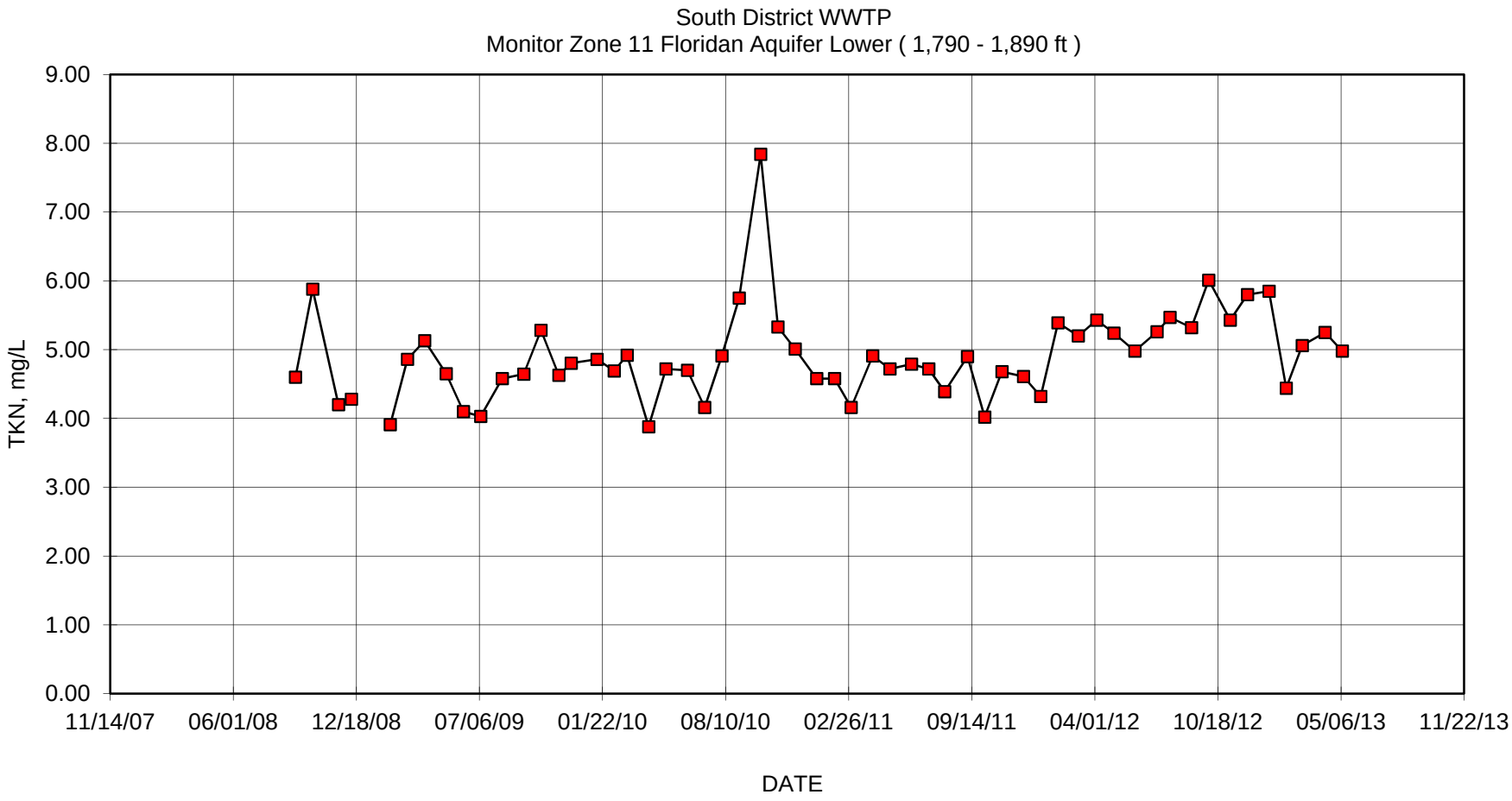
Date	TDS, mg/L	Sulfate, mg/L	Chlorides, mg/L	TKN, mg/L	NH3, mg/L	Conductivity, Micromho/cm	Temp., C	Temp., F	pH	TP, mg/L	TSS mg/L	NO_3 mg/L	NO_2 mg/L	Sodium, mg/L	Gross Alpha, pCi/L	Radio 226, pCi/L	Radio 228, pCi/L
07/09/08																	
08/13/08																	
09/10/08	7,900	441	3,755	4.60	4.16	10,910	24	75	7.5	0.02	6.60	0.08	0.05				
10/08/08	7,730	436	3,711	5.88	4.40	11,390	24	75	7.9	0.08	9.60	0.03	0.00				
11/19/08	7,940	442	3,886	4.20	2.59	12,250	23	74	7.5	0.00	7.80	0.03	0.00				
12/10/08	7,320	473	3,934	4.28	3.61	12,110	23	73	7.4	0.02	6.20	0.03	0.00				
01/14/09																	
02/11/09	7,380	446	3,756	3.91	3.67	12,660	24	75	7.8	0.08	8.50	0.01	0.00				
03/11/09	7,670	385	3,217	4.86	4.28	12,600	22	72	7.4	0.24	4.00	0.01	0.00				
04/08/09	6,800	475	4,001	5.13	4.27	12,310	22	71	7.4	0.03	6.00	0.00	0.00				
05/13/09	7,810	462	3,765	4.65	4.79	12,170	24	75	7.6	0.00	4.40	0.00	0.02				
06/10/09	7,320	362	3,088	4.10	4.16	12,890	23	74	7.5	0.22	5.20	0.00	0.00				
07/08/09	7,980	453	3,863	4.03	3.47	12,080	24	74	7.4	0.03	5.80	0.00	0.00				
08/12/09	7,130	477	3,929	4.58	4.62	12,350	24	75	7.5	0.01	3.40	0.00	0.00				
09/16/09	7,210	448	3,611	4.64	3.83	12,160			7.5	0.01		0.05	0.01	2080	19.0	6.7	0.9
10/14/09	7,700	499	3,660	5.28	4.05	11,970			7.4	0.01		0.00	0.00	1950	23.6	6.9	0.9
11/12/09	7,290	506	3,893	4.63	4.03	11,130			7.3	0.02		0.00	0.00	1530	21.4	6.8	0.9
12/02/09	7,530	429	3,772	4.80	4.07	11,680	23	74	7.5	0.28	7.20	0.00	0.02	1810	19.6	7.0	0.8
01/13/10	7,400	424	3,781	4.86	4.18	11,670	23	73	7.2	0.02	4.80	0.00	0.00	1660	7.2	6.3	0.8
02/10/10	7,180	443	3,830	4.69	4.15	11,700	22	72	7.5	0.02	6.80	0.00	0.00	1700	11.7	2.0	0.8
03/03/10	7,120	466	3,881	4.92	4.15	12,180	22	72	7.4	0.02	3.20	0.00	0.00	1980	17.6	6.0	0.7
04/07/10	7,180	448	3,870	3.88	4.05	12,180	24	75	7.4	0.02	3.80	0.00	0.00	1940	11.3	4.3	0.7
05/05/10	7,924	475	4,046	4.72	3.80	11,850	25	77	7.4	0.01	7.20	0.01	0.00	2070	17.9	6.7	0.8
06/09/10	7,620	409	3,560	4.70	3.40	11,980	25	76	7.6	0.03	2.20	0.00	0.00	1800	12.2	6.6	0.7
07/07/10	6,990	457	3,935	4.16	3.97	12,010	24	75	7.4	0.11	3.60	0.01	0.00	2010	15.4	6.7	0.7
08/04/10	7,370	461	4,034	4.91	4.68	11,740	24	76	7.4	0.19	6.00	0.00	0.00	2060	24.4	5.2	0.8
09/01/10	6,980	454	3,813	5.75	4.63	12,070	25	76	7.4	0.02	13.00	0.01	0.00	1990	17.9	8.0	0.8
10/06/10	7,230	501	3,790	7.84	4.70	11,910	23	74	7.5	0.02	1.80	0.00	0.00	1980	12.3	5.5	0.8
11/03/10	7,040	451	3,831	5.33	4.42	11,820	23	74	7.4	0.04	2.40	0.00	0.00	1990	30.9	5.9	0.8
12/01/10	7,350	443	3,782	5.01	4.69	11,850	24	75	7.5	0.02	3.80	0.00	0.01	1920	17.3	4.2	0.9
01/05/11	7,040	445	3,748	4.58	4.79	11,460	24	75	7.6	0.02	2.30	0.00	0.00	2020	6.2	5.0	0.7
02/03/11	7,430	451	3,785	4.58	3.89	11,320	24	75	7.5	0.23	2.30	0.00	0.01	1880	10.3	6.9	0.8
03/02/11	7,020	452	3,819	4.16	4.14	11,880	23	74	7.5	0.02	4.90	0.00	0.00	1950	13.1	6.8	0.8
04/06/11	7,170	475	3,931	4.91	4.81	11,620	23	73	7.3	0.02	3.30	0.00	0.00	1910	17.6	6.9	0.7

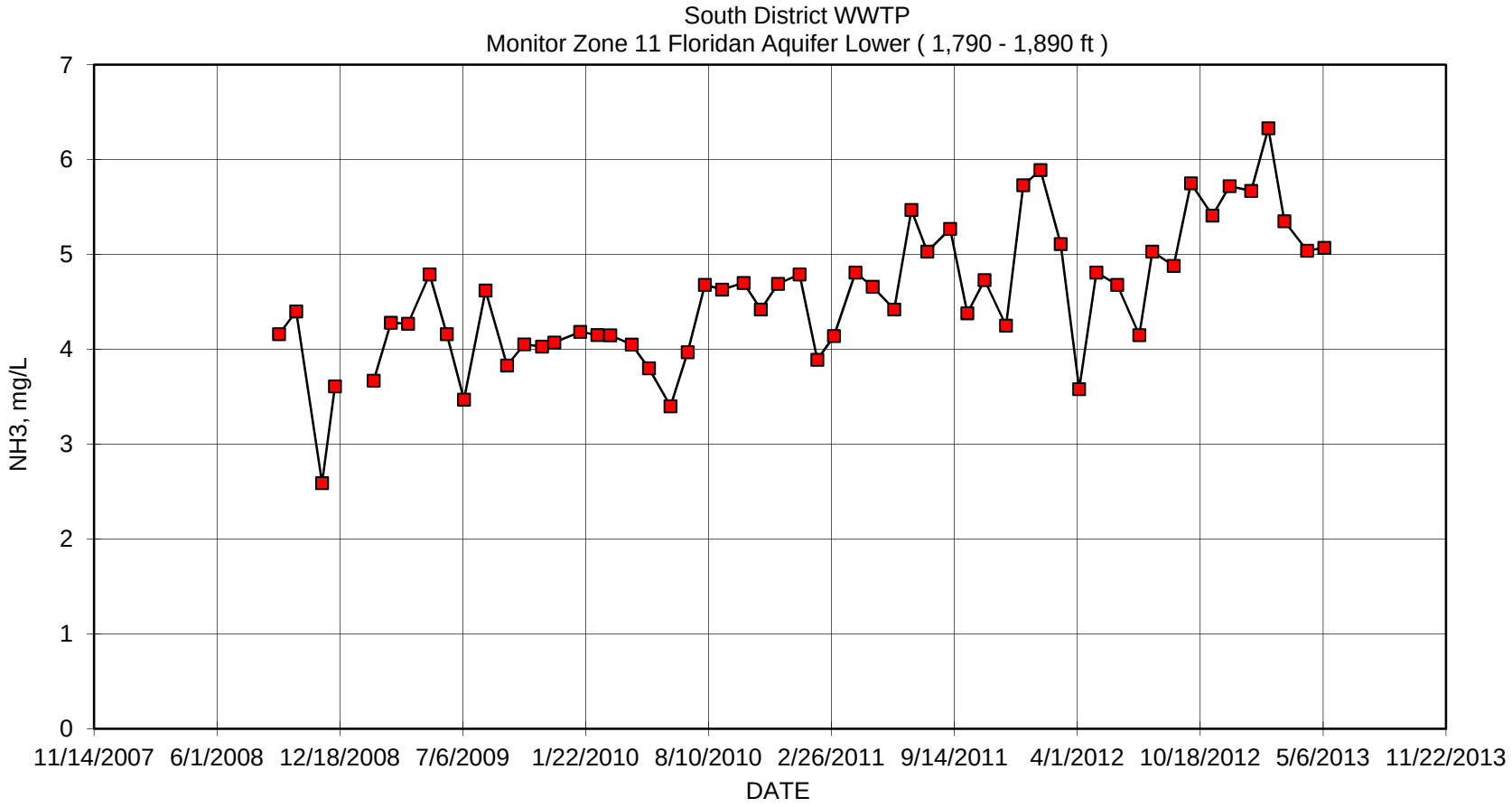
Date	TDS, mg/L	Sulfate, mg/L	Chlorides, mg/L	TKN, mg/L	NH3, mg/L	Conductivity, Micromho/cm	Temp., C	Temp., F	pH	TP, mg/L	TSS mg/L	NO_3 mg/L	NO_2 mg/L	Sodium, mg/L	Gross Alpha, pCi/L	Radio 226, pCi/L	Radio 228, pCi/L
05/04/11	7,690	465	3,831	4.72	4.66	12,470	23	74	7.5	0.02	2.70	0.00	0.00	1820	16.3	5.9	0.9
06/08/11	6,820	503	3,954	4.79	4.42	12,000	23	74	7.6	0.05	1.70	0.00	0.00	1930	20.8	6.4	0.8
07/06/11	7,250	428	3,526	4.72	5.47	11,810	23	74	7.6	0.02	3.60	0.00	0.00	2180	13.9	6.3	0.9
08/01/11	7,380	465	3,866	4.39	5.03	11,120	24	75	7.6	0.02	4.10	0.00	0.00	1900	17.8	6.6	0.8
09/07/11	7,340	448	3,787	4.90	5.27	12,080	24	74	7.7	0.05	3.50	0.00	0.00	1980	26.3	6.1	1.0
10/05/11	7,070	431	3,682	4.02	4.38	11,510	24	75	7.5	0.04	13.20	0.00	0.00	1950	14.5	5.3	0.9
11/02/11	7,430	462	4,073	4.68	4.73	11,130	23	74	7.5	0.03	1.70	0.01	0.00	2050	11.9	5.6	0.8
12/07/11	7,520	479	4,089	4.61	4.25	10,630	23	74	7.8	0.04	2.30	0.00	0.00	2080	20.5	6.7	0.8
01/04/12	7,190	455	4,006	4.32	5.73	10,540	23	73	7.1	0.02	3.80	0.00	0.00	1960	17.3	4.2	0.8
02/01/12	7,440	474	3,840	5.39	5.89	11,703	23	74	7.6	0.02		0.01	0.00	2040	19.7	5.4	0.7
03/05/12	6,810	448	3,840	5.20	5.11	9,917	23	74	7.5	0.01		0.00	0.00	2060	25.3	4.6	0.8
04/04/12	7,220	334	2,910	5.43	3.58	10,430	23	74	7.4	0.02	22.90	0.50	0.50	2070	10.6	0.1	0.9
05/02/12	7,530	433	3,890	5.24	4.81	11,054	23	74	7.6	0.03	16.80	0.01	0.01	2270	16.0	6.4	0.6
06/05/12	7,270	116	3,780	4.98	4.68	10,455	25	78	8.2	0.00	53.70	0.00	0.00	2010	14.2	2.6	0.9
07/11/12	7,370	429	3,670	5.26	4.15	11,810	23	74	7.6	0.00	4.50	0.01	0.00	2030	20.0	6.1	0.8
08/01/12	7,300	437	3,730	5.47	5.03	11,370	24	74	8.2	0.03	72.80	0.00	0.00	2040	27.4	6.3	0.8
09/05/12	7,670	462	3,900	5.32	4.88	11,870	23	74	7.5	0.03	13.30	0.00	0.00	1940	15.7	6.2	0.8
10/03/12	7,360	420	3,890	6.01	5.75	12,136	24	75	7.7	0.03	9.50	0.00	0.00	2020	17.5	5.0	0.7
11/07/12	6,920	446	3,718	5.43	5.41	11,596	23	73	7.5	0.04	6.50	0.00	0.00	2150	21.0	5.6	0.9
12/05/12	7,530	445	3,810	5.80	5.72	11,851	23	73	7.5	0.02	8.80	0.00	0.01	2070	18.0	3.4	0.9
01/09/13	7,380	473	3,940	5.85	5.67	11,950	23	74	7.5	0.10	4.00	0.00	0.00	2180	25.5	3.8	0.8
02/06/13	7,370	478	4,010	4.44	6.33	11,426	24	75	7.6	0.04	20.90	0.01	0.00	2030	28.5	5.2	0.8
03/04/13	7,170	457	3,850	5.06	5.35	12,041	23	73	7.4	0.03	2.00	0.00	0.00	2190	35.5	5.6	1.1
04/10/13	7,150	438	3,630	5.25	5.04	11,909	23	74	7.4	0.03	0.03	0.06	0.01	2040	26.3	5.3	0.9
05/08/13	6,740	428	3,530	4.98	5.07	11,896	23	74	7.6	0.02	0.02	0.01	0.00	2030	24.7	4.5	0.9

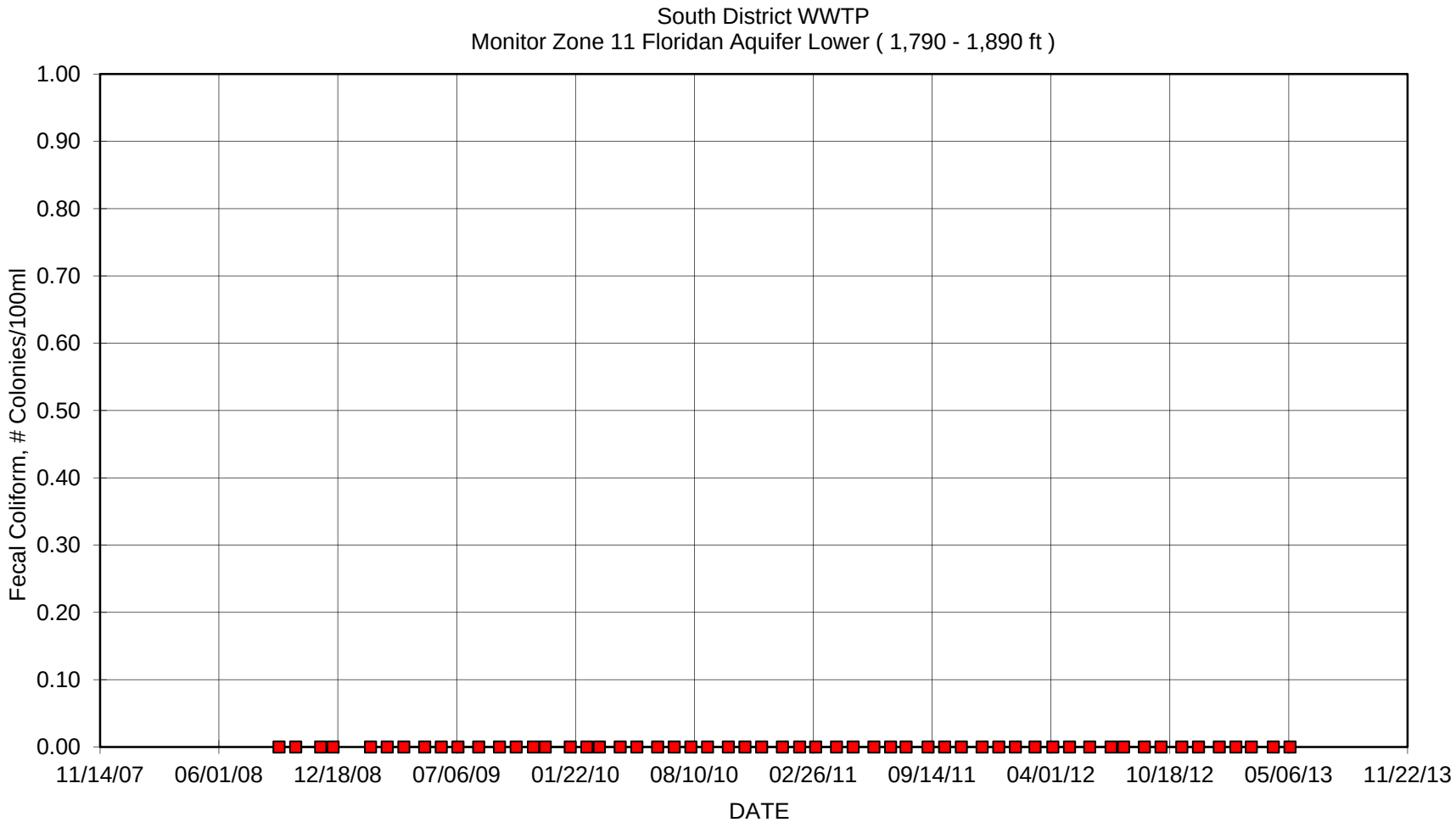

South District WWTP
Monitoring Zone 11 Floridan Aquifer Lower (1,790 - 1,890 ft)
TDS, mg/L
8,200
8,000
7,800
7,600
7,400
7,200
7,000
6,800
6,600
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

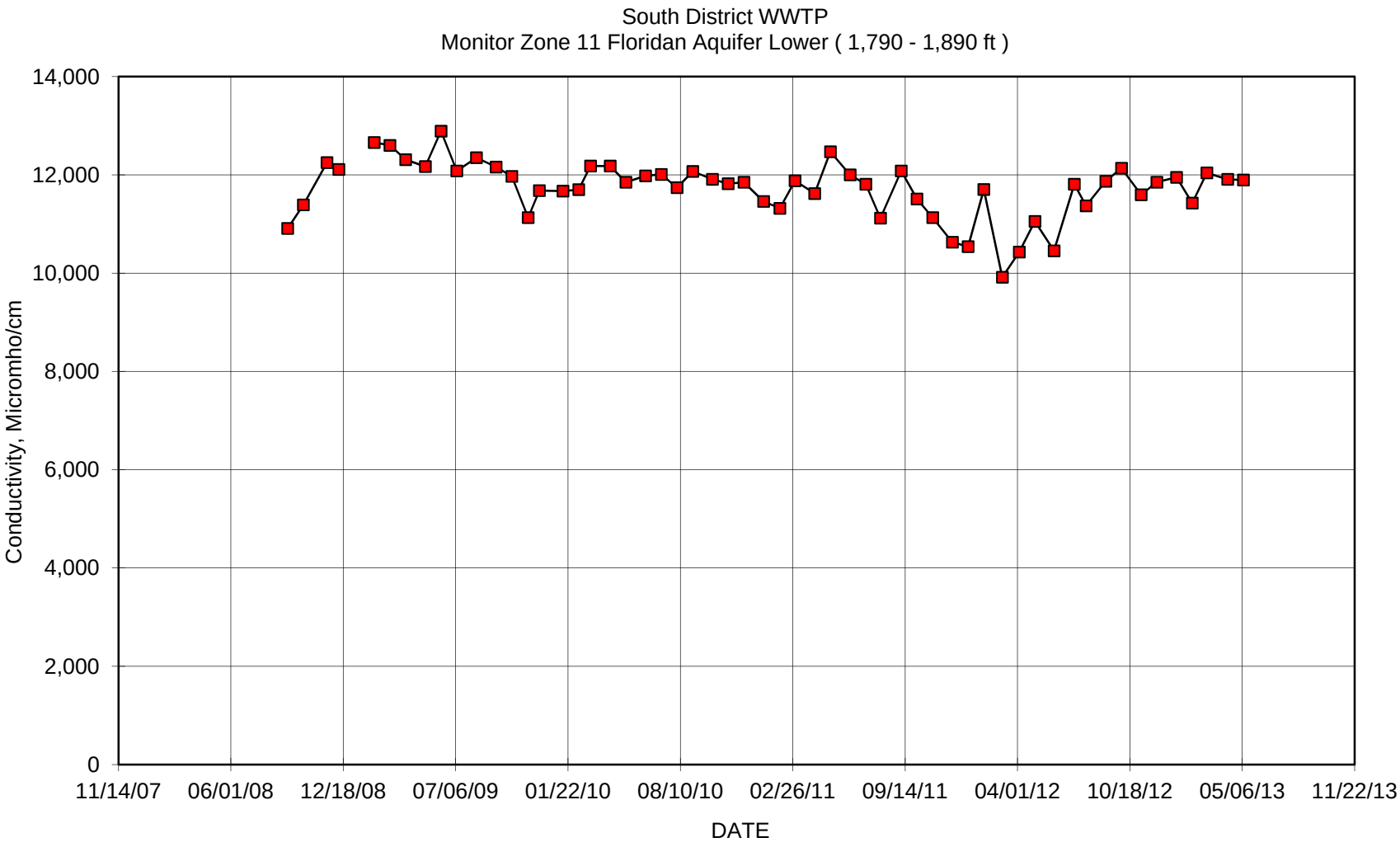

South District WWTP
Monitoring Zone 11 Floridan Aquifer Lower (1,790 - 1,890 ft)
Sulfate, mg/L
600
500
400
300
200
100
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

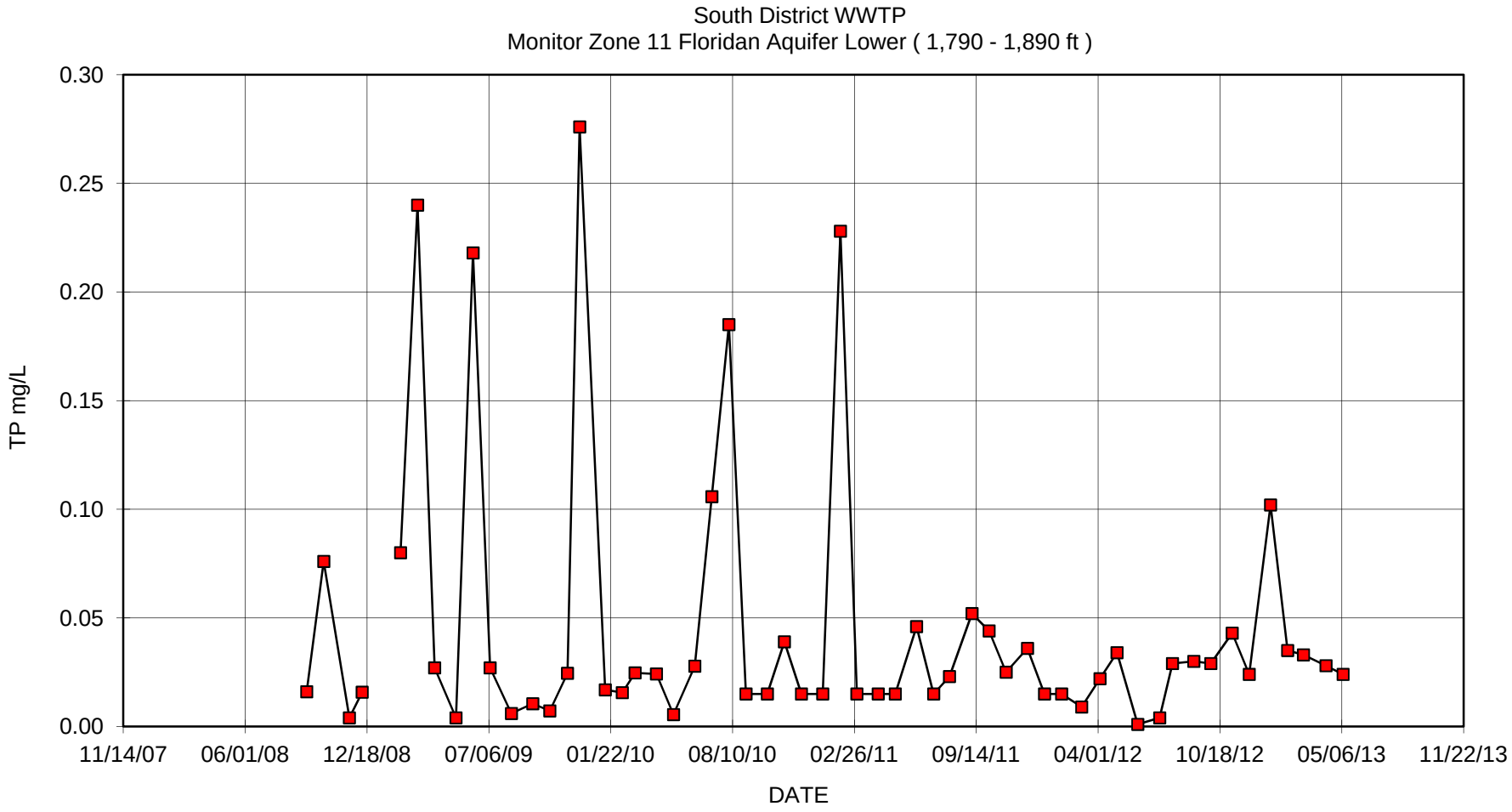

South District WWTP
Monitor Zone 11 Floridan Aquifer Lower (1,790 - 1,890 ft)
Chlorides, mg/L
4500
4000
3500
3000
2500
2000
1500
1000
500
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 11 Floridan Aquifer Lower (1,790 - 1,890 ft)
TKN, mg/L
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 11 Floridan Aquifer Lower (1,790 - 1,890 ft)
NH3, mg/L
0
1
2
3
4
5
6
7
11/14/2007
6/1/2008
12/18/2008
7/6/2009
1/22/2010
8/10/2010
2/26/2011
9/14/2011
4/1/2012
10/18/2012
5/6/2013
11/22/2013
DATE


South District WWTP
Monitor Zone 11 Floridan Aquifer Lower (1,790 - 1,890 ft)
Fecal Coliform, # Colonies/100ml
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 11 Floridan Aquifer Lower (1,790 - 1,890 ft)
Conductivity, Micromho/cm
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 11 Floridan Aquifer Lower (1,790 - 1,890 ft)
TP mg/L
0.30
0.25
0.20
0.15
0.10
0.05
0.00
11/14/07
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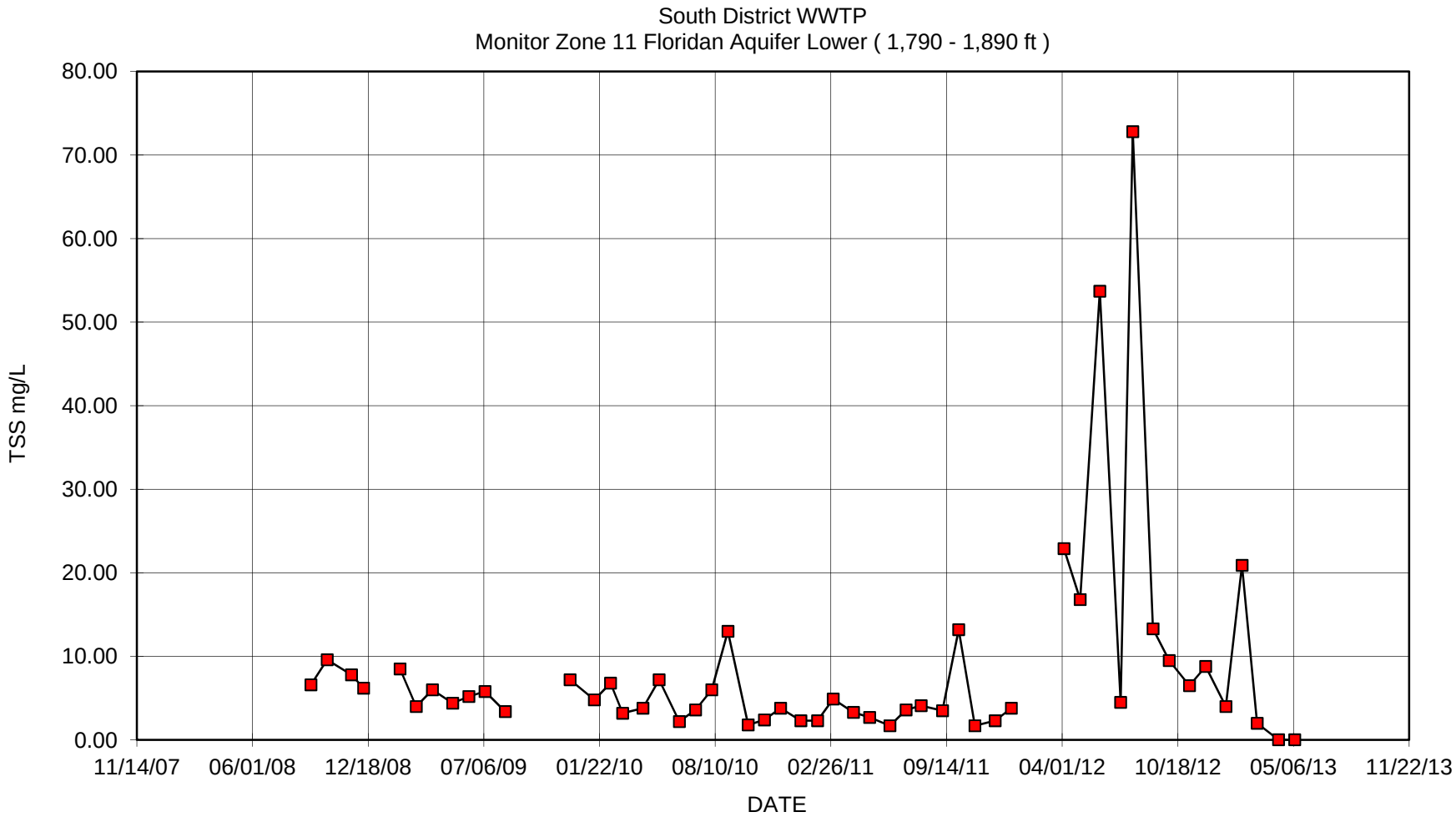
DATE


South District WWTP
Monitor Zone 11 Floridan Aquifer Lower (1,790 - 1,890 ft)
TSS mg/L
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
11/14/07
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04/01/12
10/18/12
05/06/13
11/22/13
DATE

MIAMI-DADE COUNTY
miamidade.gov

Water and Sewer
PO Box 330316 • 3071 SW 38 Avenue
Miami, Florida 33233-3016
T 305-665-7471

September 24, 2013

Mr. Joseph R. May, P.G.
Florida Department of Environmental Protection
400 North Congress Avenue, 3rd Floor
West Palm Beach, Florida 33401

CCN: 57714

Reference: Miami-Dade Water and Sewer Department -- Mechanical Integrity Testing (MIT) Report for Deep Injection Well No. IW-4 at the SDWWTP Site.

Dear Mr. May:

Enclosed please find the Certificate of Mechanical Integrity and the MIT Report on the re-testing of Deep Injection Well No. IW-4 at the South District Wastewater Treatment Plant site in Miami-Dade County.

All the tests were conducted in strict adherence to the specifications submitted to and approved by your office. The testing results for the well were good. Both external and internal mechanical integrity were demonstrated. The well casing and the wellhead components are in good condition. All the well head valves and all the well head components are scheduled to be rust-proofed and repainted when all the MITs are completed. Based on the results of the well testing we conclude that the well retains full mechanical integrity and recommend that MDWASD be allowed to continue operating the well in its normal mode.

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

The demonstration of mechanical integrity is being submitted per Chapter 62-528.300(6)(b)2., 62-528.300(6)(c), and 62-528.425(1)(d), F.A.C. and specific condition 3.j. of Permit 0061787-022-UO.

If you have any questions or require additional explanation of any item in the report, please do not hesitate to contact me at [redacted] or Sonia Villamil at [redacted]

Assistant Director- Wastewater Operation Systems

Enclosures: Certificate of Mechanical Integrity
MIT Report Well IW-4 (1 copy)

cc: Joseph Haberfeld, FDEP - Tallahassee

Delivering Excellence Every Day

Mechanical Integrity Test Report
Deep Injection Well No. IW-4
South District Wastewater Treatment Plant

Prepared by:
Miami-Dade Water and Sewer Department
3071 SW 38th Avenue
Miami, Florida 33146

CERTIFICATE OF MECHANICAL INTEGRITY

The **South District WWTP** deep injection well **IW-4** operated by **Miami-Dade Water and Sewer Department** has been tested for mechanical integrity. The tests followed standard engineering practices and used methods presented in the United States Environmental Protection Agency regulations for the purposes of these tests. The external and internal mechanical integrity tests followed Florida Department of Environmental Protection (FDEP) pre-approved testing specifications and all the critical test events were witnessed by representatives of the FDEP, the MDWASD and the contractor.

Having supervised the engineer and geologists that were present during the testing, conducted the examining of the results and the preparation this mechanical integrity report as part of this certification, the undersigned certifies that deep injection well **IW-4** operated by **Miami-Dade Water and Sewer Department** at the **South District Wastewater Treatment Plant Site in Miami-Dade County, Florida** has successfully passed all the test requirements for mechanical integrity under rules of Chapter 62-528 of the Florida Administrative Code and is therefore determined to have mechanical integrity.

Certified on September 24, 2013

[redacted]

Howard J. Fallon Jr., P.E.
Professional Engineer
License Number 24153

MECHANICAL INTEGRITY TEST REPORT
FOR
DEEP INJECTION WELL No. IW-4
AT THE
SOUTH DISTRICT WASTEWATER TREATMENT PLANT

Prepared by:

MIAMI-DADE WATER AND SEWER DEPARTMENT
3071 SW 38th Avenue
Miami, Florida 33146

For Submittal To:

UNDERGROUND INJECTION CONTROL
FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

September 2013

ABSTRACT

The internal mechanical integrity was investigated through a pressure test performed on the injection casing. The pressure test was conducted at 153 pounds per square inch (psi) which is approximately 1.5 times the maximum (100 psi) potential injection pressure and more than 1.7 times the maximum operational pressure that the well will be under when operating at its full permitted injection velocity of 10 feet per second (ft/sec). FDEP permits a 5% loss in pressure during the hour long test in order for the internal mechanical integrity to pass the pressure test.
IW-4 successfully passed the pressure test because the casing only lost 1 psi. The successful results of the pressure test for internal mechanical integrity were reinforced by the results of the second internal mechanical integrity test, the TV survey of the casing. The TV survey confirmed that the casing and the casing joints are in good condition and that the well has internal mechanical integrity down to 2,667 ft bls.

The external mechanical integrity was investigated using two test procedures, a Radioactive Tracer Survey (RTS) and a Temperature Log. Results of the RTS confirmed the integrity of the cement around the casing and the continued competence of its seal with the geologic strata. The temperature test showed that there are no anomalies that would indicate points where injected fluids could escape through the casing and cement into the formation. Similarly there were no temperature anomalies that would indicate injection fluids entering the formations at other than the approved injection depth.

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Section 1

1. INTRODUCTION

1.1 BACKGROUND

On October 12, 2012, (see Appendix A) the Miami-Dade Water and Sewer Department (MDWASD) submitted the County's proposed plan and testing specifications for conducting the mechanical integrity tests (MITs) and repairs on some of the injection wells at the South District Wastewater Treatment Plant (SDWWTP) site (see Figure 1) to the Florida Department of Environmental Protection (FDEP). The plan, represented by the specifications, described the step-by-step procedure to be followed and included the testing schedule required to meet the 5-year MIT re-testing conditions of the FDEP permit for each of the injection wells. After receipt of these documents, the FDEP Staff reviewed the proposed plan and sent an approval on June 5, 2013 (see Appendix B).

The contract documents for conducting the MITs were let out for bids, and the winning bid was submitted on February 28, 2013 by Youngquist Brothers, Inc., a well drilling contractor from Ft. Meyers, Florida. After the contract was approved by the Board of Country Commissioners and signed by the County Manager, the MDWASD issued the notice to proceed on May 17, 2013 and the contractor began mobilizing to the site.

1.2 PURPOSE AND SCOPE

The purpose of this report is to provide FDEP with a document that describes the re-testing procedures for mechanical integrity applied to each of the SDWWTP deep injection wells (see Figure 2). The report also presents the field reports (see Appendix C), and the results of the tests in a single volume for ease of reference. The mechanical integrity re-testing operations involved conducting a pressure test on the well casing to show that there are no leaks in the casing, and conducting a TV survey on the well to reinforce the data from the pressure test. The re-testing includes tracking a radioactive liquid-tracer (iodine isotope I-131) injected down the well to show that there is no fluid movement upward behind the casing, into underground sources of drinking water (USDW). The radioactive test information is reinforced with temperature logs run on the well. Gamma ray logs are used to detect the movement of the radioactive tracer.

Figure 1. South District Wastewater Treatment Plant Site

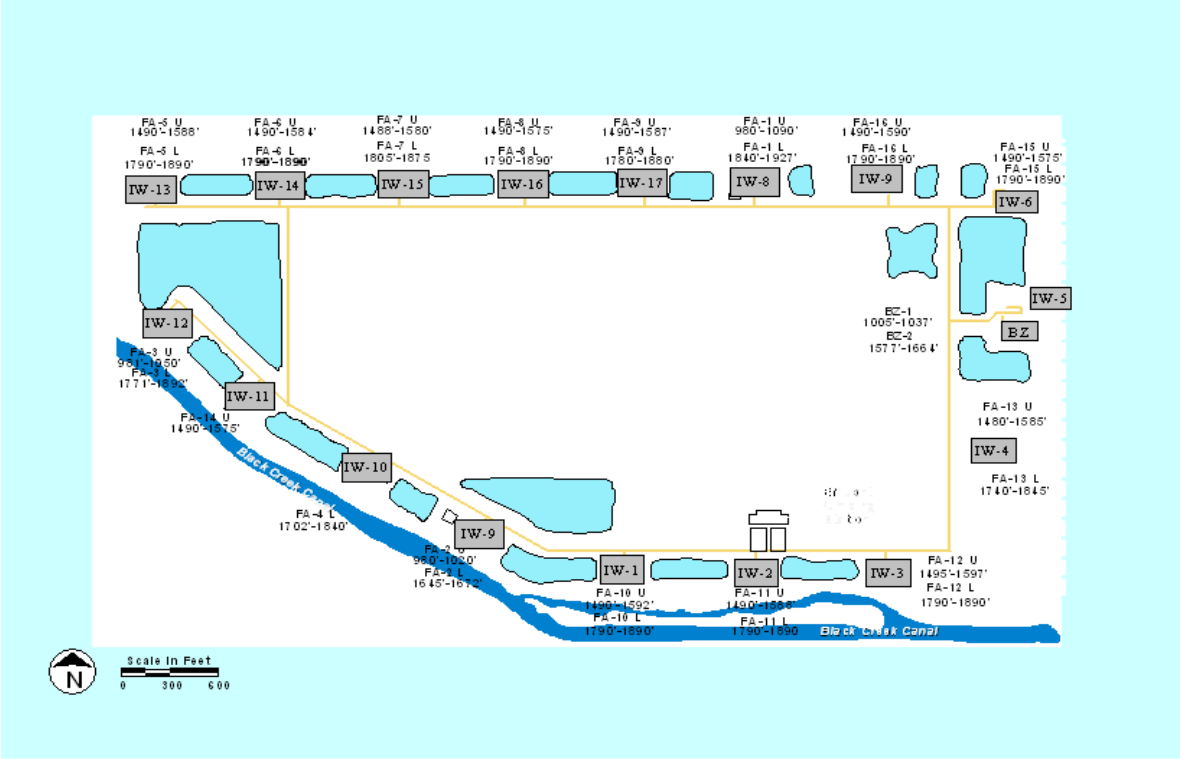

Figure 2. Well Locations Layout

Section 2

2. MECHANICAL INTEGRITY TESTING (MIT)

2.1 METHODS USED

The MIT program is designed to test two elements of the injection well system: 1. Internal integrity and 2. External integrity. The first test element, the internal mechanical integrity test of the well, tests the condition of the injection casing. The second test element, the external mechanical integrity test of the well, tests for leaks outside the casing. This is achieved through a series of field tests including a pressure test and a TV survey for the internal testing, and the temperature log, gamma ray log and RTS survey for the external testing. The first test element, the internal mechanical integrity test, tests for leaks in the injection pipe (casing). The second test element tests for leaks in the annular space outside the casing (cement-filled space between the periphery of the drilled hole and the casing) and in the near-to-the-well geologic strata.

2.2 CASING SCRUBBING

Because the mechanical integrity of injection wells has to be tested every five years, and because a TV inspection of the well is part of the test requirements, MITs provide a timely opportunity to clean the well of deposits that may have formed on the inside of the casing during the intervening years and at the same time provide a cleaner casing for the TV inspection. Cleaning the inside of the well casing is achieved by running a scrubbing brush up and down the casing. However, before the cleaning can be performed, flow out of the well must be controlled. The column of water inside the casing is fresh water and results in a positive hydraulic head inside the well. That head must first be controlled to prevent water from flowing out of the well during the cleaning operation.

2.2.1 Flow Suppression

Suppression of the fresh water head was achieved by first pre-mixing water with salt (NaCl) to form a heavy brine, and then pumping the brine down the well casing, through a 6-inch gate valve on the wellhead. This procedure results in the displacement down the well of the fresh water at the top of the column and replacement of the displaced fresh water with the brine solution. An equal volume of fresh water is displaced out of the well at the bottom of the casing. The procedure is repeated until the pressure head inside the well is suppressed. This method of displacement is used because it achieves flow suppression without first having to open the well to insert a tremie pipe to the bottom of the casing for introduction of the brine. This displacement method also provides a safe way of “killing” the well that at the same time reduces the volume of injected salt solution that would enter the formation at the bottom of the well. One additional advantage is that using this method the brine can be recovered and reused in flow suppression at other wells.

The brine was prepared in 1,000-gallon (gal.) batches by mixing the salt from a 2,000-pound (lbs.) sack in a 1,000 gal. tank of fresh water. The 1,000 gal. solution was then pumped down the well before other similarly mixed batches of salt solution were mixed and pumped down the well (see Figure 3). In the end, the operation was repeated 13 times, and a total of 13 sacks (approximately 26,000 lbs. of salt) were used to suppress the head in the well. This salt concentration represents a theoretical specific gravity of 1.239 for the brine, calculated from the salt solution used in the field of 10.3 lbs per gallon. The 26,000 lbs of salt suppressed the pressure head from approximately 26 feet above the top of the casing to approximately 15 feet below.

Figure 3. Flow Suppression Equipment

2.2.2 Scrubbing Operation

The brush used to clean the casing is made with an old drill rod that has an outside diameter of 7 inches with thick steel wire inserted and secured sticking out of the drill rod. The total diameter of the brush with the steel wire bristles is 24 inches. The brush is attached to the bottom of the packer and inserted into the well (see Figure 4). A 24-inch flange was bolted to the top of the well and pressure fittings installed to be used for packer inflation later on in the process. Then Youngquist lowers the brush and packer by attaching drill rods to the top of the packer and then raising and lowering the brush several times using a 50 ton crane. This process was repeated until the casing was scrubbed and the packer was at the depth required to perform the packer test on the well.

Figure 4. Scrubbing Brush and Hydraulic Packer

2.3 INTERNAL MECHANICAL INTEGRITY (CASING TESTS)

2.3.1 Pressure Test

After the pressure head was suppressed and the casing scrubbed, and the inflatable packer was placed at a depth of 2,626 ft bls. This well is cased to a depth of 2,667 ft bls so the packer is in the bottom 50 feet of the casing. Additional pressure fittings were installed on the flange to pressurize the casing with water. A bleeder valve atop the 24-inch flange allows passage of the drill pipes that support the packer without loss of pressure in the casing (see Figure 5). A pretest was conducted on the casing to determine that the pressure was holding and that all the installed testing equipment was operating properly, then FDEP was informed that the well was ready for their inspection. The next day, June 25, 2013, the pressure test was repeated in the presence of FDEP Staff. The packer had been previously sealed against the casing, at an inflation pressure of 350 pounds per square inch (psi) and at 8:00 AM the casing was pressurized with water to a pressure of 153 psi.

Figure 5. Well-Head and Recorder Set Up for Pressure Test

At 8:43 A.M.. the one-hour pressure test was started in the presence of Joseph May, P.G. representing FDEP and witnessed by Sonia Villamil, Maria Macfarlane, and Michael Ashe representing MDWASD, and by Chris Harp and others representing the drilling contractor. The pressure test ran for the required one-hour period. The pressure deviation (loss) in that time was 1 psi, well below the 7.5 psi deviation allowable under the 5 % criteria in the rules (see Table 2-1). The packer inflation pressure and the pressure in the casing were measured using certified gages (see Appendix C) graduated from 0 to 200 psi in increments of 1 psi. The pressure was read in person and recorded by hand at five minute intervals during the test. The pressure was also recorded on an In-Situ pressure transducer attached to the stand with the pressure gauges (see Figure 5).

Table 2-1 Casing Pressure Readings

Time	Casing Pressure (psi)	Pressure Change (psi)	Packer Pressure (psi)
8:43	153	0.0	340
8:48	153	0.0	340
8:53	153	0.0	340
8:58	153	0.0	340
9:03	153	0.0	340
9:08	153	0.0	340
9:13	153	0.0	340
9:18	153	0.0	340
9:23	152	1.0	340
9:28	152	0.0	340
9:33	152	0.0	340
9:38	152	0.0	340
9:43	152	0.0	340

2.3.2 Bleed-Off Calculations

At the completion of the pressure test the casing pressure was bled-off and the discharged volume from the bleeding was measured (see Table 2-2). Bleeding until the pressure resulted in zero flow produced approximately 32.5 gallons. This exercise provides a reasonable assurance that the packer is placed at the depth in the well that is within the last 50 feet of the casing.

Table 2-2. Bleeding Volumes versus Pressure

Bled Volume (gallons)	0	5	10	15	20	25	30	32.5
Casing Pressure (psi)	152	127	103	79	55	32	10	0

2.3.3 Television Survey

A closed circuit color television camera, encased in a pressure vessel capable of withstanding the pressures exerted at the depths to be televised, and equipped with a fish-eye lens, was introduced into the well through a pack-off stripper device on a standpipe above the injection well (see Figure 6). The camera is centralized in the casing, and is preceded down the well with a light source attached below the camera. The camera televises a view of the full circumference of the inside of the casing and the image is recorded on video tape. Prior to the video survey, the well was scrubbed and flushed with potable water to provide the best picture possible. The video

survey began at land surface and continued down to 2,913 feet, where the camera runs into an obstruction. At selected intervals of interest, the camera was used to pan the intervals in a horizontal format prior to continuing the normal vertical recording.

A review of the video (see Appendix F) indicates that the casing is in good condition down to 2,667 feet. The video also shows that the scrubbing operation was successful. The scrubber has scrubbed the casing free of all growth down to 2,659 feet and this is confirmed by visible vertical scratches throughout that length of the casing; indicating that the scrubber had brushed the steel casing effectively. All the scratches are superficial, and do not detract from the physical and mechanical integrity of the casing. There are no gouges, grooves, nicks, or other physical damage visible in the casing for its whole length. Below 2,659 feet the casing was not scrubbed to avoid hanging the scrubber with the edge of the bottom of the casing at 2,667 feet. There are some growths and/or deposits visible inside the casing below 2,659 feet.

In summary, the video picture meets the quality standards that are needed for a visual evaluation of the well. This video survey presents a clear view of the casing and of the welded joints of the casing. All the joints are clean and appear to be tight. From the TV survey it is concluded that this casing is in good condition throughout its whole depth from land surface to 2,667 feet.

Figure 6. Television Survey (Standpipe and Logging Truck)

2.4 EXTERNAL MECHANICAL INTEGRITY (CEMENT AND FORMATIONS)

The external mechanical integrity test consisted of two low flow dynamic tests The RTS and temperature survey, conducted on June 28 2013, for the external mechanical integrity portion of the test was witnessed by the representative of FDEP (Joseph May, P.G.), by representatives of MDWASD (Sonia Villamil and Maria Macfarlane) and by representatives of the contractor (Luis Morey).

2.4.1 Radioactive Tracer Survey (RTS)

The radioactive tracer survey uses an isotope of iodine (I-131) as a tracer of water movement inside and outside the casing. Iodine –131 is used because it is a radioactive isotope commonly used in medical practice and therefore it is more easily available and lower in cost than other potential tracers. I-131 also has the advantage of having a half-life of 8 days. That half-life is quite suitable because it is long enough to allow time for transportation to the well site with little decay but also short enough so that it would quickly be reduced if there were any unexpected spills or if there were mechanical failures through which the isotope could travel with the water. The radiation levels of I-131 at the concentration used for RTS testing is in millicurie-range, which if it were considered a waste, would be characterized as a low level waste by the US Atomic Energy Commission.

The I-131 is first loaded into a container located in the logging tool. This container is electronically activated from the logging truck to eject the desired quantity of tracer at the desired depth through an ejection port. In addition to the tracer container, the logging tool is also assembled with three gamma ray detectors. One detector, the top gamma ray detector (GRT), is located 10 feet above the ejector. The other two detectors, the middle one (GRM) and the bottom one (GRB) are located immediately below the ejector at about 3 feet and 12.4 feet below the ejector respectively. The bottom of the logging tool also includes a temperature tool at the very bottom, and a casing collar locator (CCL) 1 foot below the GRM. Figure 7 shows the configuration of the RTS logging tool. The RTS log in the appendix (Appendix D) shows the distances between each of the logging tool components described above.

2.4.1.1 First Low Flow Dynamic Test

Prior to starting the low flow dynamic test, a background gamma ray log was conducted to establish the natural conditions. It was conducted right after the temperature log. Since the temperature log was run downward starting at land surface, the temperature log had ended with the logging tool at the bottom. The background gamma ray log was conducted from the bottom (2,913 feet) up to the surface.

From the surface, the logging tool was again lowered down the well and the casing collar locator (CCL) used to locate the bottom of the casing. The magnetic coils on the CCL give out a magnetic field and detect a change in the mass. If there is growth on the casing it is harder for the CCL to have a clean line. If the growth has some iron on it, it can cause a sort of interference with the CCL making it harder for the CCL to find the end of the casing. The CCL shows that the bottom of the casing is at 2,666 feet bls. After the bottom of the casing was located, the well was ready for the low-flow dynamic RTS test.
The ejector port of the I-131container was set at 2,661 feet and 1 millicurie (mCi) of I-131 was

released while the flow down the well was kept at a constant rate of 82 gallons per minute (gpm). The logging tool was kept immobile after the ejection of the I-131 and the three gamma ray detectors continued to record in place. One (1) mCi of I-131 was ejected into the well. The middle detector, located 3 feet below the ejector port, picked up the radioactive tracer 24 seconds after the ejection. The bottom detector, which is located over 12 feet below the ejector, picked up the tracer 1 minute and 54 seconds after the ejection. The middle detector returned to background levels very quickly, but then about 10 minutes into the test began to creep up and see readings of around 100 GAPI which lasted for approximately 20 minutes. The bottom detector however did not detect any of the elevated signal that the middle detector saw. This may be that there is no grout behind the last 4 feet of casing so the I-131 rose up and was stuck behind the casing but only up to about 2,662 feet. The test ran for 60 minutes and the top detector did not pick up any tracer.

After the first low flow test ended, the tool was then raised up more than 200 feet, to a depth of 2,450 feet, to log out of position to make sure that the tracer did not migrate up the casing or the formation outside of the casing. There was a signal of I-131 from 2,662 to the bottom of the casing, but not above that depth. This confirms that there may be a lack of grout behind the last 4 feet of casing in the well, but the well maintains its external integrity because the tracer did not travel any higher than 2,662 feet which is well below the confining unit for the boulder zone.
No migration above 2,662 was detected.

Once the log out of position was conducted and the tool was placed back to depth, a small amount of staining on the casing was found but because the amount did not travel any further up into the well so it was determined that no interference for the second RTS. Therefore, with the approval of Joseph May, P.G. from FDEP, the well was not flushed prior to the second RTS test.

Figure 7. RTS Tool and Temperature Probe

2.4.1.2 Second Low Flow Dynamic Test

The tool was placed back to a depth were the ejector was located at 2,661 feet with a flow of 79 gallons per minute set down the well. For this test, 2 milicuries of I-131 were ejected into the casing. The middle detector started picking up the tracer about 36 seconds after it was ejected. The bottom detector, which is located over 12 feet below the ejector, picked up the tracer 2 minutes and 24 seconds after the ejection. Again the middle detector began to see an increase in the detection level approximately 15 minutes into the test. Again the increase was only seen in the middle detector and did not travel any further up the well. The upper detector did not pick up any tracer for the duration of the test, which lasted 30 minutes.

After the second low flow test ended, the tool was then raised up more than 200 feet, to a depth of 2,450 feet, to log out of position to make sure that the tracer did not migrate up the casing or the formation outside of the casing. Again there was a signal of I-131 from 2,662 to the bottom of the casing, but not above that depth.

With the last low flow dynamic test, the mechanical integrity test was concluded, but before bringing the geophysical tools out of the well, the leftover I-131in the container was ejected and the container flushed-clean to insure that any remaining radioactive iodine was well dispersed. The tool was placed at a depth of 2,893.5ft bls. The ejector was located at 2,880 ft bls, and the remaining Iodine 131 was ejected and the well was flushed with effluent at a rate of over 4,800 gallons per minute to ensure no staining of the tool. The logging tool was then brought up from the bottom and on the way up a final gamma ray log was made. Then the final gamma ray log was compared to the background gamma ray log, and the comparison showed that there are no noticeable differences in the two except for a residual stain at the bottom of the casing where the I-131 had been repeatedly released during the testing, and just below there, where the tracer exited the casing. Injection of water down the well at a rate of 5,200 gpm continued for the next hour to completely flush out the well.

2.4.2 Temperature Log

Youngquist Brothers Inc. conducted the temperature log on June 28, 2013 starting at about 8:15 A.M. and logging down to 2,913 feet. The temperature probe (Figure 7) was run from the surface downward to minimize the disturbing effect of the movement of the logging tool on the temperature of the water in the well. The temperature log was started more than 24 hours after the well had last been disturbed by outside influences. The TV survey was the last disturbance in the well.

The temperature log (see Appendix H) shows the warmest interval is in the section from 2,600 to 2,667 feet. This is consistent with the higher temperature of the injected water in that interval. The temperature log did not detect any anomalies that would indicate that injection fluids are present outside the casing, and there is no indication of any upward movement of warm injection water either. The similarity of the temperature oscillations in this temperature log (in the interval from land surface down to the bottom of the casing) to those in the temperature logs from previous MITs and to those in the temperature log when the well was constructed, indicates that there has been no apparent change in the cased interval, and no upward movement of the injected

water in the last 5 years.

2.5 WELL HEAD REPAIRS AND RE-INSTALLATION

The work associated with the MIT ended when the wellhead was replaced. The air and vacuum release surge check valves were replaced prior to reinstallation of the wellhead. The 6 inch gate valve and air release were replaced. The wellheads are scheduled to be sandblasted, rust proofed and repainted after the MITs on all the other wells are completed. Injection well IW-4 has been placed back on line and flow from the plant's pump station is again discharging to this injection well.

Section 3

3. CONCLUSIONS AND RECOMMENDATIONS

3.1 CONCLUSIONS

The pressure test was conducted successfully and it was concluded from the results that there is internal mechanical integrity. This conclusion is reinforced by the analysis of the TV survey down to the injection level at 2,418 feet. The TV survey indicated that the casing is in good condition and that all the casing joints appear to be tight and in good working order.

The two successful RTS conducted at low flow rates indicate that there is no upward movement of water outside the casing. Therefore, it was concluded that the RTS results show that there is external mechanical integrity. The temperature survey reinforced the results of the RTS by showing that there has been no movement of injected water anywhere except the injection zone.

3.2 RECOMMENDATIONS

The successful completion of all the tests for mechanical integrity confirms that IW-4 retains full mechanical integrity and as such it is appropriate to continue using this injection well. MDWASD also recommends that FDEP review the results of the tests presented in this report and based on those results determine that the well has mechanical integrity and may continue to be used for its intended purpose.

Finally, MDWASD recommends that although the well head will not be painted until all the MIT tests are completed on the other wells, IW-4 should receive mechanical integrity certification.

Appendix A

Mechanical Integrity Testing Procedures Submitted by MDWASD to FDEP
October 12, 2012

Miami-Dade Water and Sewer Department
Mechanical Integrity Testing Procedures

Miami-Dade Water and Sewer Department
Mechanical Integrity Testing and Repair Procedures
October 12, 2012

MECHANICAL INTEGRITY TESTING and REPAIR PLAN (SDWWTP and NDWWTP Injection Wells)

General Information

The Contractor shall carefully coordinate his activities with the Department to minimize interference with any existing operations or the operations of the Department. Department forces will isolate the well and turn over to the Contractor. Existing valves shall only be operated by Department personnel. The Contractor's personnel, under no circumstances, shall operate any such valve.

The Contractor shall provide all barricades and/or flashing warning lights necessary to warn workers and employee of the testing throughout the Project. This shall be done at the Contractor's expense and to the satisfaction of the Engineer. Every effort must be made to reduce inconvenience and nuisances to a minimum.

The Contractor shall at all times, use the assigned entrance to the Plants to bring in materials, equipment etc. required for the Project. Materials and equipment shall be stored in areas designated by the Engineer, and shall not interfere with the daily operations at the site or with other Projects. Suitable platforms shall be used for material storage to prevent damage to the landscaping. The Contractor shall exercise extreme caution when transporting equipment or materials within the Plant area.

The conveying vehicles shall be properly selected, and equipped, to prevent damage to paved areas, landscaping and other existing facilities including wells, well pads, fencing, underground pipelines, pipe chases, etc. If necessary, suitable wooden skids shall be used to distribute loads, and to prevent damage.

If any of the above existing structures, including the wells, or any other parts of the project area, are damaged, the contractor shall make suitable repairs or replacement at his expense, in a manner described by the Engineer, and to his satisfaction.

The Contractor shall also exercise extreme caution to prevent any spillage of sewage effluent. The County may charge t he Contractor for any cost incurred or penalties imposed on the County as a result of such spillage.

The wells to be tested are Injection Wells IW-l through IW-17 at the South District Wastewater Treatment Plant and IW-1N through IW-4N at the North District Wastewater Treatment! Plant

The Injection Wells have a 24-inch outside diameter (OD), 0.500-inch wall thickness injection casing set to total depths of 2,450 to 2,850 feet below land surface (bls), and were constructed with a nominal 22-inch diameter open borehole extending from the bottom of the casing to approximately 3,000 feet bls.
Except IW-5 at the SDWWTP, has a 20-inch outside diameter (OD), and 0.500 inch wall thickness.

The CONTRACTOR will perform internal and external mechanical integrity tests on the casings of twenty one deep injection wells and perform all appurtenant work in accordance with the above

Contract Documents.

The work shall be performed by a competent crew with equipment that is adequate to complete all phases of the testing and instruments of sufficient accuracy and resolution to identify anomalous responses to the tests. If the CONTRACTOR'S equipment is not capable of satisfactorily performing the work provided for in these specifications, the CONTRACTOR at his own expense shall substitute equipment.

The CONTRACTOR shall have not less than 5 years experience in constructing and testing wells and shall have tested not less than 5 wells of similar type and capacity. The CONTRACTOR shall be licensed by the State of Florida and the license number shall be affixed to all correspondence and reports.

All work shall comply with and be in full conformance with this Mechanical Integrity Test Plan submitted to FDEP together with subsequent response letters for the injection wells at the South and North District Wastewater Treatment Plants and with the appropriate sections of Chapter 62-528 FAC.

If remedial work or re-testing is required prior to final acceptance of the work to meet regulatory requirements and the specifications of the Contract Documents due to defective materials, accident, loss of equipment or equipment malfunction, or for any other cause directly attributable to the CONTRACTOR's actions, the CONTRACTOR shall bear the entire cost of the remediation or re-testing, including all additional materials, labor, and equipment required and any necessary additional Engineering costs. In the event of a problem, the ENGINEER shall be notified immediately, and the following shall apply:

1. The CONTRACTOR shall propose a method of correcting the problem, in writing, to The ENGINEER, who shall review the method of corrective action, and accept the plan in writing before work can proceed.

2. All work on the well must be in accordance with all applicable local, state and federal regulations.

The CONTRACTOR shall notify the ENGINEER a minimum of 72 hours prior to conducting the pressure test, geophysical logging and the radioactive tracer survey so that the ENGINEER and regulatory agency staff can be properly notified.

The CONTRACTOR shall provide all facilities, equipment and materials required for the removal of waste fluids from the well site.

The CONTRACTOR shall kill the well using a dense food- grade salt solution. No barite or mud-based additives shall be used in the well.

The CONTRACTOR shall comply with the OSHA regulations contained in 29CFR Section 1910 for General Industry Regulations and 29CFR Section 1926 for Construction Regulations.

Equipment and Procedures

1. Wellhead Assembly: The stripper head assembly used during the video survey, Geophysical logging, and the radioactive survey shall be bolted to the wellhead above the 6-inch gate valve. The stripper head assembly used must be of sufficient length to house the longest of the wire line tools used for the testing between the gate valve and the pack-off mounted at the top of the assembly. The pack-off must be adjusted so that the tools can be moved freely up and down the well with minimal leakage from the well. The assembly shall include a 4-inch valve and tee, which will be used to inject potable water during the surveys. The assembly shall be fitted with a

pressure gauge for use during the tests.

2. Wellhead Hardware: Should the nuts and/or bolts at the wellhead assembly become stripped during the CONTRACTOR's efforts, the CONTRACTOR shall replace them with equivalent hardware.

3. Water Line: The CONTRACTOR shall provide a potable water supply line for use during the video surveys. This line shall be connected to the existing 4-inch valve on the CONTRACTOR's stripper head. It shall be equipped with a check value to prevent the backflow of effluent into the water supply source. It shall also be equipped with a continuous recording digital flow meter and totalizer capable of measuring flows accurately in the range of 0 to 250 gpm.

Mechanical Integrity Testing (MIT)

The mechanical integrity testing under this Contract shall be accomplished using the following methods and general sequence, however the Contractor shall submit a more detailed sequence to the Engineer for approval before he begins work. The Contractor shall use extreme caution to prevent any loss of equipment, tools or other items into the wells and shall be fully responsible for retrieving any such items immediately, at no expense to the Department. All pressure tests must be conducted in the presence of the Engineer or his authorized representative.

MIT Clean and Pressure Test the Casing

1. The Contractor shall set up all equipment required to prepare for suppressing the density differential pressure, cleaning, performing the pressure test and the radioisotope and closed circuit television surveys.

2. The Contractor shall inject sufficient salt solution into the well to balance the differential pressure and disassemble the wellhead. The brine solution shall remain in the well during the cleaning and pressure testing steps, after which time it shall be transferred to another well if clean enough for reuse, or shall otherwise be disposed of by the Contractor. Under no circumstances shall brine solution be spilled or disposed of on the ground surface, however it may be disposed of into the injection well.

3. The Contractor shall clean the casing before proceeding with the pressure test. The entire length of casing shall be cleaned. If the later television survey indicates insufficient cleaning, the well shall be re-cleaned by the Contractor, at his expense, to the satisfaction of the Engineer. If the television survey must be repeated because of insufficient cleaning, in the opinion of the Engineer, it shall also be at the Contractor's expense.

4. The Contractor shall, when requested by the Engineer, place the packer through a stand-pipe with a packoff device to a point near the top of the well (but within the concrete encasement area) and test its integrity. This shall be accomplished as described in Steps 6, 7, and 8 below. If the packer fails the integrity test it shall be replaced with one that will meet the test. The Engineer is aware that packers have limited inflation cycles and will attempt to minimize the verification of packer operation. However, any integrity failure for which the packer operation can not be eliminated must be repeated at the Contractor's cost. It is anticipated that each new packer will be tested at the wellhead to verify its capacity to seat and deflate.

5. The Contractor shall lower and place the packer to a point within the lower 40 feet of the casing, but not the last 10 feet. The CONTRACTOR will be responsible to assure the proper seating of the packer. A preliminary test shall be performed to ensure proper operation of the test set-up. The CONTRACTOR shall notify the ENGINEER at least 24 hours before running the preliminary test. The test will be run following the same test program as the actual pressure test, as described below. IW-2 at SDWWTP will have the packer placed within 40 feet of the tear in the casing.

6. The Contractor shall inflate the packer to a pressure not exceeding 350 psig over the static condition as measured at the wellhead on a calibrated gauge to create a positive seal.

7. The Contractor shall pressurize the casing to 150 psig with no air in the casing or wellhead. The pressure shall be recorded on a chart and signed by the Engineer, the Contractor and any witnesses present. The pressure test gauge shall be calibrated within 6 months of performing the pressure test. The CONTRACTOR must present proof of calibration of the pressure gauge to the ENGINEER and FDEP staff at the time of testing each well. The pressure gauge must be mounted at or near eye level in order to ensure maximum visibility.

8. The test will be considered successful if the pressure does not change more than 5% psi in one hour.

9. If the test fails, the Contractor shall move the packer upwards for approximately 10 feet, and repeat Steps 6, 7 and 8.

10. If the test still fails, additional repositioning of the packer and repeating of Steps 6, 7 and 8 shall be as ordered by the Engineer. If the test still fails, and subsequent radioisotope surveys indicate no casing failure, it will be presumed that the Contractor's packer did not create a positive seal, and the Contractor shall be required to repeat Steps 4 through 8 at his expense. No payments will be made to the Contractor if it is subsequently determined that the test failure was caused by the seating of the packer. If the packer fails during packer operation verification, it will be concluded that the packer was faulty during any previous test that did not demonstrate casing integrity. The Contractor shall repeat this test at his expense.

11. After pressure testing, measure the depressurization bleed down with a 5 gallon bucket upon release of the pressure in the casing. The bleed down fluid will be properly disposed of by the Contractor.

12. The Contractor shall deflate the packer and withdraw it from the casing.

13. The Contractor shall reassemble the wellhead and connecting piping using new gaskets.

14. Prior to geophysical logging, the fluid used to "kill" the well, or for pressure testing the casing shall be flushed from the well and the well will be shut-in for a minimum of 12 hours.

MIT Video Surveys

A Video Survey inside the injection well casing be performed using the following procedures.

.A 6-inch diameter stripper head assembly will be bolted to the wellhead assembly above the existing 6-inch diameter gate valve. The stripper head will be of dimensions that allow the video operator to put his camera between the gate valve and the pack off and close both the valve and the pack off. The lower part of the assembly shall consist of a 4-inch tee and valve through which potable water may be introduced into the well.
.
Prior to performance of the survey and for a period of 24 hours, fresh water from an adjacent fire hydrant will be introduced into the well through a 4-inch diameter valve located on the stripper head assembly. Fresh water shall be pumped into the well to provide clarity for the survey.

3. If, after 24 hours of pumping potable water into the well, the water quality does not permit a clear picture of the inside of the well, the CONTRACTOR may be required to perform additional pumping services to assure a good survey as specified above.

4. The pumping of the potable water will continue at a rate of approximately 0 to 250 gpm during video surveying. If the open hole portion of the well is not clean, or visibility in any part of the well is poor, the CONTRACTOR shall perform additional pumping services to ensure a good video survey before running another or continuing with the survey.

5. During the video survey, the CONTRACTOR shall stop the camera's progress as instructed by the ENGINEER at depths where there may be potential flaws in the casing or other features to allow for thorough examination at those locations.

Upon reaching the total depth of the well with the video camera and obtaining a video survey satisfactory to the ENGINEER, the camera shall be removed from the well, and the well placed back in service.

MIT Radioisotope Tracer Survey and Temperature Survey

A radioisotope tracer survey shall be used to detect any fluid movement outside of the injection casing from the injection zone into the overlaying aquifers. The tool configuration shown below, or approved equal is required. The tool must be capable of ejecting the radioactive tracer and simultaneously monitoring the gamma ray sensors. No time lag between ejection and monitoring is permitted. A casing collar locator (CCL) shall be positioned below the tool as shown below, to precisely locate the bottom of the casing. Two low flow dynamic test runs, shall be performed. Additional low flow dynamic test runs can be done if results warrant additional testing, as determined by the ENGINEER in consultation with FDEP staff.

A temperature survey log shall also be performed from land surface to the total depth of the well. The temperature log shall be performed logging down at a rate of not more than 60 feet per minute. The temperature survey shall be performed after the well has been "shut in" and stabilized for at least 12 hours prior to the dynamic and static tests.

The Contractor shall perform an initial background gamma ray survey extending from the base of the land surface to the total depth of the well. The background gamma ray log shall be taken at a rate of not more than 60 feet per minute.

After the dynamic tests are completed, another background gamma ray survey shall be taken from the base of the casing to the base of the intermediate casing.

If additional radioisotope tracer survey work is ordered by the Engineer, it will be paid for at the hourly price proposed for additional radioisotope tracer surveys.

Radioactive Tracer Survey (RTS)

A RTS will be performed in the injection well. The tool used for testing will be configured according to information to be supplied by the service company performing the logs and as approved by the ENGINEER. Below is an example of a typical RTS tool that will be used for these surveys. The CONTRACTOR will provide a specific tool configuration with the logs.

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)
			CHD-SDSCHD (SDS) Cable Head	1.00	1.50	5.00
GR#3	23.83					
			GR #3 -GR#3 (GR#3_T) GR#3_TOP	9.33	1.69	50.00
			TREJCT-A (RTS) EJECTOR 14.5' FROM TOOL BOTTOM	3.00	1.69	10.00
			GR #2 -GR#2 (GR#2_M) GR#2_MIDDLE	3.58	1.69	25.00
GR#2	11.17					
CCL	9.63		CCL-000 (000001) RTS_CCL	0.75	1.69	5.00
			TRDET-GR#1 (GR#1_B) GR#1_BOTTOM	8.67	1.69	50.00
GR#1	0.58		TEMP-11116Temp (11116HT)	0.58	1.69	5.00
TEMP	0.17		RTS_TEMP			

Dataset: sdiw1.db: field/well/run1/FINBK
Total Length: 26.92 ft
Total Weight: 150.00 lb
O.D. 1.69 in

RTS tool Typical Configuration

The sequence of the tests shall be as follows:

First Low Flow Dynamic: The low flow run of the radioactive tracer survey shall be performed with a pumping-in velocity of 3 to 5 feet per minute. This would require a volume of between 65 gpm and 108 gpm to be injected during the survey. This is for the 24 inch wells, for Well I-5, which has a 20 inch casing this volume is 44 gpm and 73 gpm. Potable water from the same source as used for the video survey would be used as the most appropriate water supply for this portion of the test.

1) After beginning the flow of water into the well, the tool will be placed at a depth of approximately 5 feet above the base of the final casing, and a slug of 2 millicuries radioactive Iodine 131 is ejected. The tool will remain in place for a period of approximately one hour and the three gamma ray detectors in the "time drive" mode will record the movement of the slug. If tracer is detected at the uppermost detector, indicating potential staining of the tool, the tool may be moved upward to an alternate location.

2) After the one hour waiting period, a log out-of-position will be performed between the ejection point and a minimum of 200 feet above the highest point of tracer detection.

3) Upon completion of logging, the casing will be flushed with 3 to 5 casing volumes of effluent.

4) After flushing, the tool will immediately be run to the base of the casing, then the interval between the ejection point and 200 feet above the highest point of tracer detection will be logged.

Second Low Flow Dynamic: The process described above for the low flow dynamic log will be repeated to include a log out-of-position, a casing flush, and an after flush pass. A slug of tracer greater than or equal to 3 millicuries shall be used as determined by the ENGINEER.

If, during testing, no apparent anomalies appear that may indicate a lack of mechanical integrity in the injection well, the RTS will be concluded. If anomalies do occur, the RTS will be altered to track the radioactive tracer material. After RTS is complete, the RTS tool will be discharged in the injection zone and the well shall be flushed with 3 to 5 volumes of effluent. A second background log will be run from the bottom to the top of the well.

MIT Deadlines (sorted by date MIT pressure test due)

SDWWTP MIT Schedule of Completion

Well	Pressure Test	RTS/Video
IW-2	7/13/2013	7/25/2013
IW-1[1]	7/20/2013	7/31/2013
IW-3	7/24/2013	8/7/2013
IW-9[1]	7/30/2013	8/12/2013
IW-10[1]	8/6/2013	8/21/2013
IW-11	8/20/2013	9/3/2013
IW-12	8/25/2013	9/19/2013
IW-14	9/9/2013	9/26/2013
IW-13	9/16/2013	10/6/2013
IW-4	9/25/2013	10/14/2013
IW-6	9/30/2013	10/20/2013
IW-5	10/19/2013	10/27/2013
IW-7[2]	10/26/2013	1/7/2014
IW-8	11/2/2013	11/12/2013
IW-17	11/11/2013	11/19/2013
IW-16	11/18/2013	12/9/2013
IW-15	12/3/2013	12/16/2013

NOTES:
1.The original video was not clear enough and therefore a new video was done at the end of the MITs at SDWWTP.
2.The Computer failed during the RTS, because the Iodine 131 had already been injected, FDEP and DOH required 46 days b/f the RTS could be redone.

NDWWTP MIT Schedule of Completion

Well	Pressure Test	RTS/Video
IW-1N	3/14/2014	3/26/2014
IW-2N	3/25/2014	4/9/2014
IW-3N	4/2/2014	4/17/2014
IW-4N	4/9/2014	4/24/2014

REPAIR PLAN:

The following repair plans apply to wells at SDWWTP and NDWWTP.

1. Kill well and remove 24 inch gate valve and 4 inch bypass valves. Remove 1 inch pressure transmitter line and weld hold closed. Please see drawings included in below.

2. Sand existing casing in concrete pits and coat with Bitumastic. Please see drawings included in below.

3. Chip concrete around outer casing 1 inch deep, in order to embed PVC sleeve. Please see drawings included in below.

4. Install C905 PVC sleeve around casing pipe, embed 1 inch deep and fill annular space with grout, using Type II Neat cement. Slope top edge to create 30 degree watershed and seal at edges with sealant. Please see drawings included in below.

5. Relocate 1 inch pressure transmitter as indicated in drawings. Weld the hole. Please see drawings included in below.

6. At the NDWWTP IW-1N, IW-3N and IW-4N install new magmeters with any necessary spool pieces to be field determined. Please see drawings included in below.

7. Reassemble wellheads including installation of new 24 inch butterfly valve on horizontal part of well. Mega flanges will be used to ensure the layout of the pipe and the vales match. Please see drawings included in below.

8. On IW-4N at NDWWTP, install electric actuator for butterfly valve at base of injection well. Please see drawings included in below.

Appendix B

FDEP Approval of MIT Plan for SDWWTP and NDWWTP

November 26, 2012

Villamil, Sonia (WASD)

From: May, Joseph [redacted]
Sent: Monday, November 26, 2012 2:40 PM
To: Villamil, Sonia (WASD)
Cc: Vandor, Heidi; Silverman, Mark; Walsh, Virginia (WASD); Goldenberg, Bertha M. (WASD); Fallon Jr., Howard J. (WASD); Arrebola, Vicente (WASD); Macfarlane, Maria (WASD); Oakley, Clint (WASD)
Subject: RE: MDWASD MIT and Repair Plan Submittal

Importance: High

Hello all,

The Department approves the plan with the following understandings:

1) Medicinal grade I-131 should be specified since this solution is filtered to reduce precipitate material, as opposed to regular grade I-131, in the vial causing a tool malfunction. It has been our experience that an activity of ~1mCi/ml has been the easiest to work with in the field.
2) Please contact me a minimum of three days prior to mobilization to each site. Due to the travel time from West Palm Beach to the sites close coordination would be appreciated between myself and a designated contact person from the utility so that each pressure and RTS can be witnessed.

Thank you,

Joe

Please take a few minutes to share your comments on the service you received from the department by clicking on this link. DEP Customer Survey.

From: Villamil, Sonia (WASD) [mailto:[redacted]
Sent: Wednesday, October 17, 2012 9:42 AM
To: May, Joseph
Cc: Vandor, Heidi; Silverman, Mark; Walsh, Virginia (WASD); Goldenberg, Bertha M. (WASD); Fallon Jr., Howard J. (WASD); Arrebola, Vicente (WASD); Macfarlane, Maria (WASD); Oakley, Clint (WASD)
Subject: MDWASD MIT and Repair Plan Submittal

Hello Mr. May,

The MDWASD respectfully submits the attached MIT testing and repair plan for your approval. The paper copy is being sent via regular mail as well.

Thank you,

Sonia Villamil
Engineer II
Miami Dade Water and Sewer Department
3071 SW 38th Ave Room 554-8
Miami, FL 33146
[redacted]
fax: 786-552-8640
miamidade.gov

Appendix C

Field Notes from tests including gauge certification and pressure charts.

MIAMI-DADE WATER AND SEWER DEPARTMENT

MECHANICAL INTEGRITY TESTING OF DEEP INJECTION WELLS AND ASSOCIATED SERVICES

BID NO.: RPQ P0086

PRESSURE TEST IW - 4

June 25, 2013

TIME	CASING PRESSURE (psi)	PACKER PRESSURE (psi)
8:43	153+ psi	340- psi
8:48	153+	340-
8:53	153	340-
8:58	153	340-
9:03	153	340-
9:08	153	340-
9:13	153-	340-
9:18	153-	340-
9:23	152	340-
9:28	152	340-
9:33	152	340-
9:38	152	340-
9:43	152	340-

MIAMI-DADE WATER AND SEWER DEPARTMENT

MECHANICAL INTEGRITY TESTING OF DEEP INJECTION WELLS AND ASSOCIATED SERVICES

BID NO.: RPQ P0086

BREAK OFF TEST IW - 4

9:47 am

June 25, 2013

GALLONS	CASING PRESSURE (psi)	PACKER PRESSURE (psi)
0	152	340-
5	127+	320+
10	103+	320
15	79	300+
20	55+	300-
25	32-	300-
30	10-	280
32 1/2	0	280

Top of Packer: 2387.87 feet

Bottom of Casing: 2418 feet

MIAMI-DADE WATER AND SEWER DEPARTMENT

MECHANICAL INTEGRITY TESTING OF DEEP INJECTION WELLS AND ASSOCIATED SERVICES

BID NO.: RPQ P0086

PRESSURE TEST IW - 4

WITNESS LIST

June 25, 2013

NAME	SIGNATURE	COMPANY/AGENCY	TELEPHONE
Michael Ashe	[redacted]	WASD	[redacted]
Joe May		FDEP	
Maria MacFarlane		WASD	
Sonia Villamil		WASD	
[illegible]		[illegible]	
Amamaria Sarmie		WASD	
[illegible] Tagle		WASD	

Certificate of Calibration

OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

Ozone Industries, Inc.
Precision Measurement Equipment Division

Purchase Order #

Calibration Performed By:
OZONE INDUSTRIES, INC.
15551 PINE RIDGE RD.
FORT MYERS, FL 33908

For:
YOUNGQUIST BROTHERS, INC.
15465 PINE RIDGE RD.
FORT MYERS, FL 33908

EQUIPMENT INFORMATION:

Description: PRESSURE GAUGE
Manufacter: MCDANIELS
Model Number: 300PSI
Part Number: N/A
Range: 0-300 PSI

Serial Number: 972062-1
Customer I.D.:
Cust. Barcode: N/A
Cust. Location: N/A
Specifications: +/- 0.25% FS

Cal Date: 6/6/2013
Cal. Due Date: 8/5/2013
Cal. Interval 60 DAYS
Received: IN TOLERANCE
Calibration Result: PASS
Environmental Conditions: 74 DEG F / 20% H
Performed By: Daniel McKissick

Procedure: STANDARD

This is to certify that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure at the points tested (unless otherwise noted). It has been Calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration is in accordance with Ozone Industries, Inc Quality Assurance Manual. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

Calibration Remarks:
THIS UNIT WAS FOUND TO BE IN TOLERANCE AT THE TIME OF CALIBRATION.
PERFORMED ROUTINE CALIBRATION / CERTIFICATION

Standards Used to Calibrate Equipment:

Company	I.D.	Description	Last Cal.	Cal. Due Date
OZONE	A1731	EATON UPC5000 PNEUMATIC CALIBRATOR	12/12/2012	12/12/2013

Signatures:

Certified by:
Print: Daniel McKissick
Date: 06/06/13
[redacted]

Approved by:
Print: Daniel McKissick
[redacted]

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ØZONE
INDUSTRIES
CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

PH: 239-433-3400
FAX: 239-489-3877

CONTROL NO: 032509-1

CUSTOMER: YBI15465

CALIBRATION DATA FORM

MFR:	MCDANIELS	**DESCRIPTION**	PRESSURE GAUGE
MODEL NO:	300 PSI .25%	**TECHNICIAN:**	0030
SERIAL NO:	972062-1	**CAL. DATE:**	06/06/13
CUST. ID:	N/A	**DUE DATE:**	08/05/13

* IF NO "AS LEFT" READING IS SHOWN ON THIS CHART, IT MEANS THE UNIT WAS IN TOLERANCE AND THERE WERE NO ADJUSTMENTS MADE TO IT.

RANGE: 0-300 PSI

NOMINAL	AS FOUND	AS LEFT *	LOW LIMIT	HIGH LIMIT
50	50.26		49.25	50.75
100	100.31		99.25	100.75
150	150.38		149.25	150.75
200	200.49		199.25	200.75
300	300.6		299.25	300.75

Certificate of Calibration

OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

Ozone Industries, Inc.
Precision Measurement Equipment Division

Purchase Order #

Calibration Performed By:
OZONE INDUSTRIES, INC.
15551 PINE RIDGE RD.
FORT MYERS, FL 33908

For:
YOUNGQUIST BROTHERS, INC.
15465 PINE RIDGE RD.
FORT MYERS, FL 33908

EQUIPMENT INFORMATION:

Description: PRESSURE GAUGE
Manufacter: McDaniel
Model Number: 300PSI
Part Number: N/A
Range: 0-300 PSI

Serial Number: 972034-2
Customer I.D.:
Cust. Barcode: N/A
Cust. Location: N/A
Specifications: +/- 0.25% FS

Cal Date: 5/17/2013
Cal. Due Date: 11/17/2013
Cal. Interval 6 MONTHS
Received: IN TOLERANCE
Calibration Result: PASS
Environmental Conditions: 74 DEG F / 80% H
Performed By: Daniel McKissick

Procedure: STANDARD

This is to certify that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure at the points tested (unless otherwise noted). It has been Calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration is in accordance with Ozone Industries, Inc Quality Assurance Manual. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

Calibration Remarks:
THIS UNIT WAS FOUND TO BE IN TOLERANCE AT THE TIME OF CALIBRATION.
PERFORMED ROUTINE CALIBRATION / CERTIFICATION

Standards Used to Calibrate Equipment:

Company	I.D.	Description	Last Cal.	Cal. Due Date
OZONE	A1731	EATON UPC5000 PNEUMATIC CALIBRATOR	12/12/2012	12/12/2013

Signatures:

Certified by:
Print: Daniel McKissick
[redacted]

Approved by:
Print: Daniel McKissick
[redacted]

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ØZONE
INDUSTRIES
CORPORATION

15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

PH: 239-433-3400
FAX: 239-489-3877

CONTROL NO: 100809-7

CUSTOMER: YBI15465

CALIBRATION DATA FORM

MFR:	PIC	**DESCRIPTION**	PRESSURE GAUGE
MODEL NO:	300 PSI .25%	**TECHNICIAN:**	0030
SERIAL NO:	972034-2	**CAL. DATE:**	05/17/13
CUST. ID:	N/A	**DUE DATE:**	11/17/13

* IF NO "AS LEFT" READING IS SHOWN ON THIS CHART, IT MEANS THE UNIT WAS IN TOLERANCE AND THERE WERE NO ADJUSTMENTS MADE TO IT.

RANGE: 0-300 PSI

NOMINAL	AS FOUND	AS LEFT *	LOW LIMIT	HIGH LIMIT
50	49.59		49.25	50.75
100	99.47		99.25	100.75
150	149.45		149.25	150.75
200	199.43		199.25	200.75
300	299.4		299.25	300.75

Certificate of Calibration

OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

Ozone Industries, Inc.

Precision Measurement Equipment Division

Purchase Order #

Calibration Performed By:
OZONE INDUSTRIES, INC.
15551 PINE RIDGE RD.
FORT MYERS, FL 33908

For:
YOUNGQUIST BROTHERS, INC.
15465 PINE RIDGE RD.
FORT MYERS, FL 33908

EQUIPMENT INFORMATION:

Description: PRESSURE GAUGE
Manufacter: MCDANIELS
Model Number: 300PSI
Part Number: N/A
Range: 0-300 PSI

Serial Number: AB30128
Customer I.D.:
Cust. Barcode: N/A
Cust. Location: N/A
Specifications: +/- 0.25% FS

Cal Date: 6/17/2013
Cal. Due Date: 12/17/2013
Cal. Interval 6 MONTHS
Received: IN TOLERANCE
Calibration Result: PASS
Environmental Conditions: 73 DEG F / 40% H
Performed By: Daniel McKissick

Procedure: STANDARD

This is to certify that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure at the points tested (unless otherwise noted). It has been Calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration is in accordance with Ozone Industries, Inc Quality Assurance Manual. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

Calibration Remarks:

THIS UNIT WAS FOUND TO BE IN TOLERANCE AT THE TIME OF CALIBRATION.
PERFORMED ROUTINE CALIBRATION / CERTIFICATION

Standards Used to Calibrate Equipment:

Company	I.D.	Description	Last Cal.	Cal. Due Date
OZONE	A1731	EATON UPC5000 PNEUMATIC CALIBRATOR	12/12/2012	12/12/2013

Signatures:

Certified by:
Print: Daniel McKissick
[redacted]

Approved by:
Print: Daniel McKissick
[redacted]

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OZONE
INDUSTRIES
CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

PH: 239-433-3400
FAX: 239-489-3877

CONTROL NO: 080709-2

CUSTOMER: YBI15465

CALIBRATION DATA FORM

MFR:	MCDANIELS	**DESCRIPTION**	PRESSURE GAUGE
MODEL NO:	300 PSI .25%	**TECHNICIAN:**	0030
SERIAL NO:	AB30128	**CAL. DATE:**	06/17/13
CUST. ID:	N/A	**DUE DATE:**	12/17/13

* IF NO "AS LEFT" READING IS SHOWN ON THIS CHART, IT MEANS THE UNIT WAS IN TOLERANCE AND THERE WERE NO ADJUSTMENTS MADE TO IT.

RANGE: 0-200 PSI

NOMINAL	AS FOUND	AS LEFT *	LOW LIMIT	HIGH LIMIT
50	50.18		49.25	50.75
100	100.19		99.25	100.75
150	150.22		149.25	150.75
200	200.31		199.25	200.75
250	250.33		249.25	250.75
300	300.39		299.25	300.75

Appendix D

RTS and RTS Tool Configuration

RADIOACTIVE TRACER SURVEY LOG

Company MIAMI-DADE WATER & SEWER
Well IW-#4
Field S.D.W.W.T.P.
County MIAMI-DADE
State FL

Company MIAMI-DADE WATER & SEWER

Well IW-#4

Field S.D.W.W.T.P.

County MIAMI-DADE State FL

Location: API # :

SEC TWP RGE

Other Services

Elevation

Permanent Datum G.L Elevation

Log Measured From

Drilling Measured From

K.B.
D.F.
G.L.

Date	28-JUN-2013		
Run Number	2013 MIT		
Depth Driller	2913'		
Depth Logger	2913'		
Bottom Logged Interval	2913'		
Top Log Interval	SURFACE		
Open Hole Size	24"		
Type Fluid	WATER		
Density / Viscosity	NA		
Max. Recorded Temp.	NA		
Estimated Cement Top	NA		
Time Well Ready	UPON ARRIVAL		
Time Logger on Bottom	0915		
Equipment Number	102		
Location	FT. MYERS		
Recorded By	MOREY	RIVES	
Witnessed By	S. VILLAMIL	M. MACFARLANE	

Borehole Record				Borehole Record			
Run Number	Bit	From	To	Run No	Bit	From	To

Casing Record	Size	Wgt/Ft	Top	Bottom
Surface String				
Prot. String				
Production String	24"	.500" W.T	SURFACE	2666'
Liner				

<< Fold Here >>>

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

Comments

HIGH RESOLUTION TEMPERATURE

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)

GR#3	24.00					
			GR #3 -RTST (952T)	11.50	1.69	30.00
			TREJCT-A (952)	1.00	1.69	10.00
			GR #2 -RTSM (952M)	3.00	1.69	10.00
GR#2	10.50					
CCL	9.60		CCL-1.68GRRTS (952)	0.75	1.69	10.00
			GR-RTSB (952B)	9.25	1.69	10.00
GR	1.20					

Dataset: sdwwtp-iw-4.db: field/well/run1/pass2
Total Length: 25.50 ft
Total Weight: 70.00 lb
O.D. 1.69 in

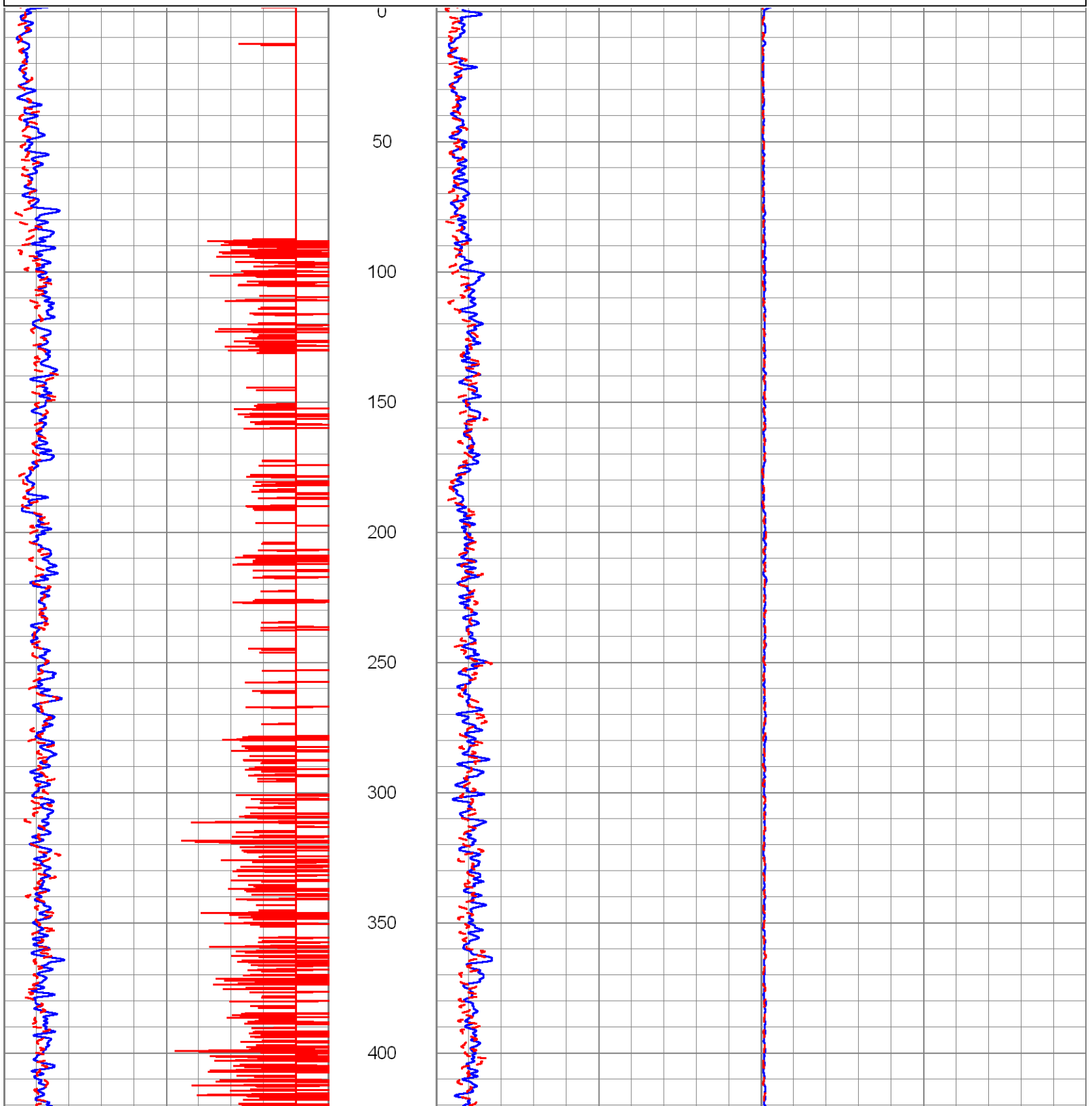
YOUNGQUIST

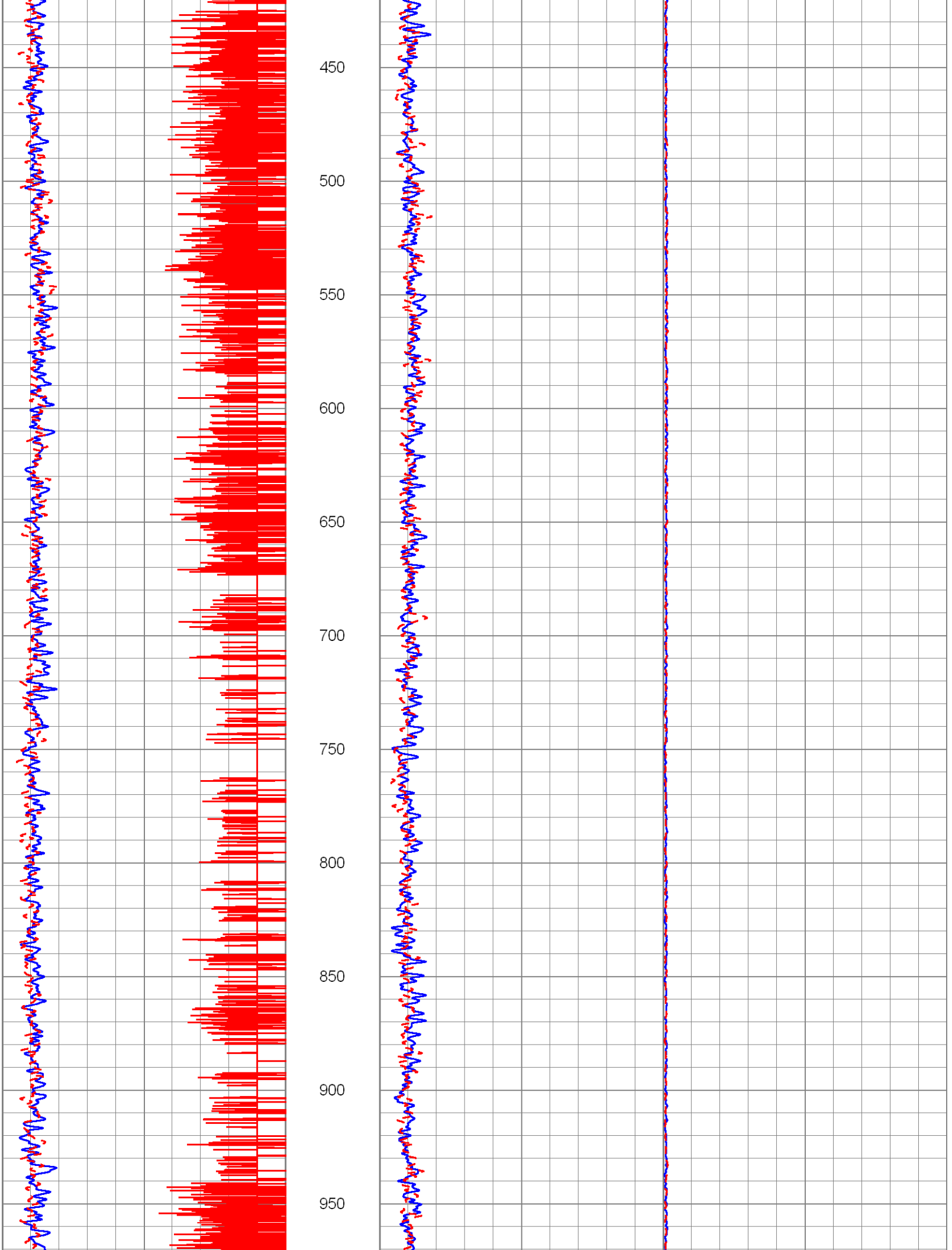
FINAL BACKGROUND

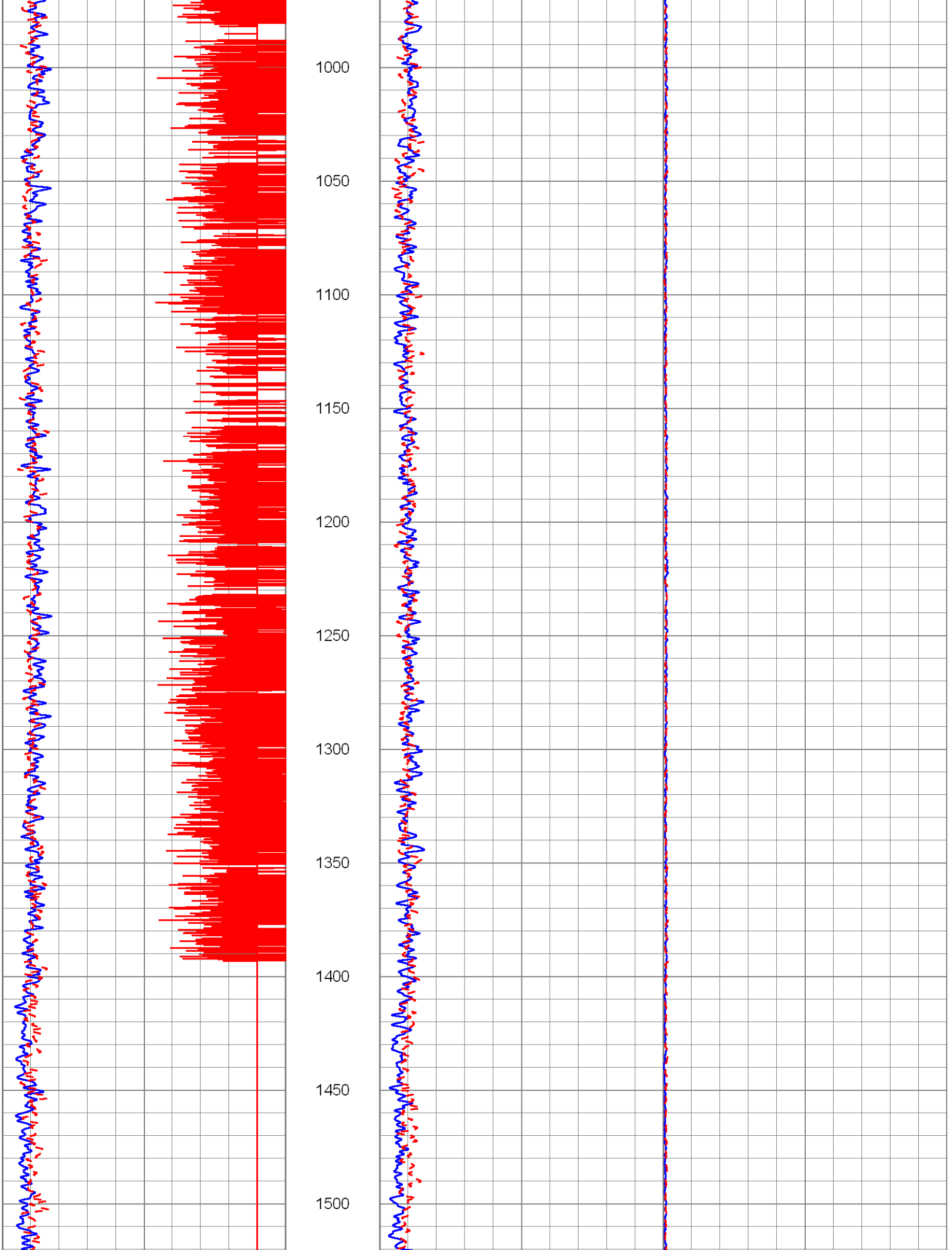
FINAL BACKGROUND

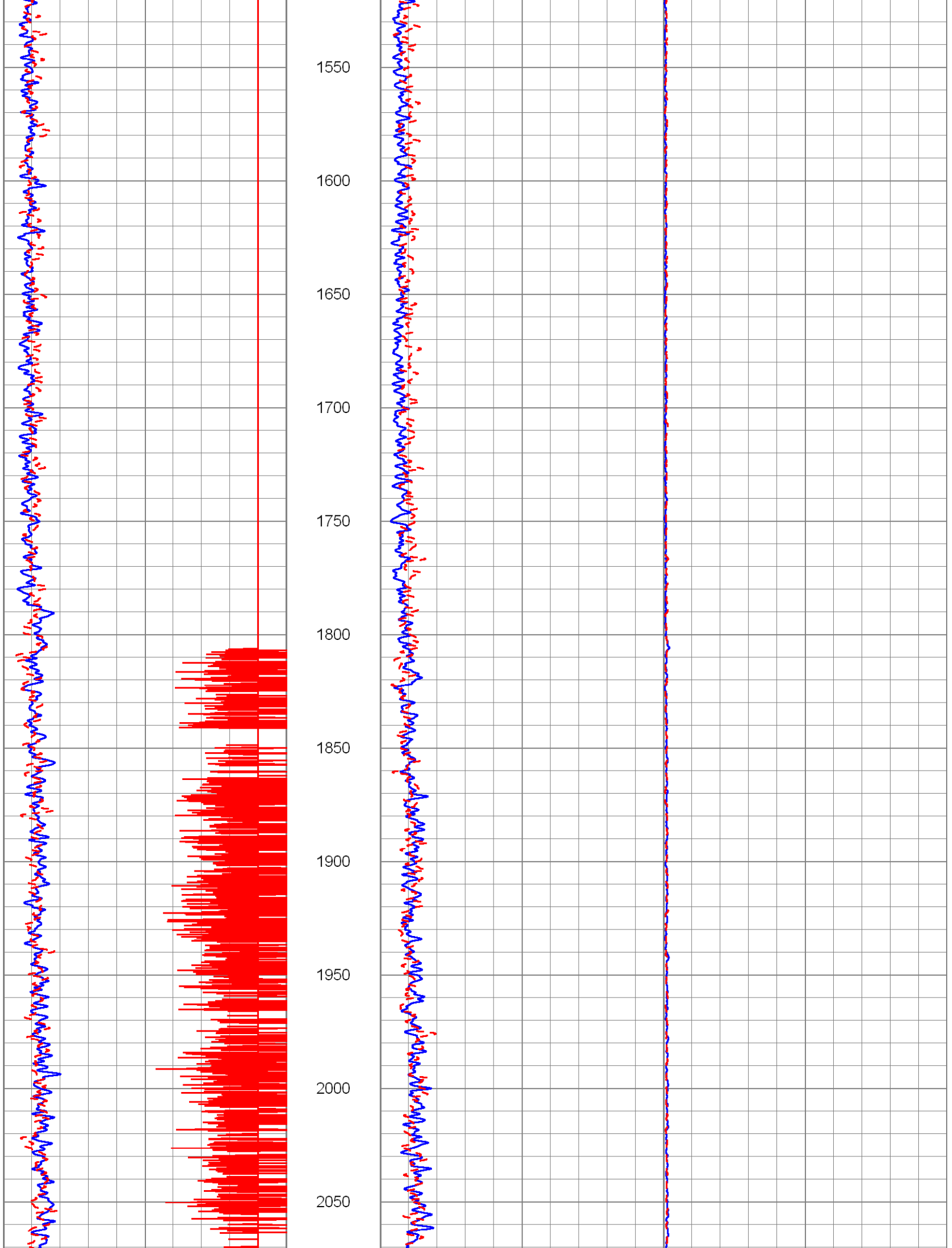
Database File:	sdwwtp-iw-4.db
Dataset Pathname:	pass10
Presentation Format:	rts
Dataset Creation:	Fri Jun 28 14:33:22 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:600

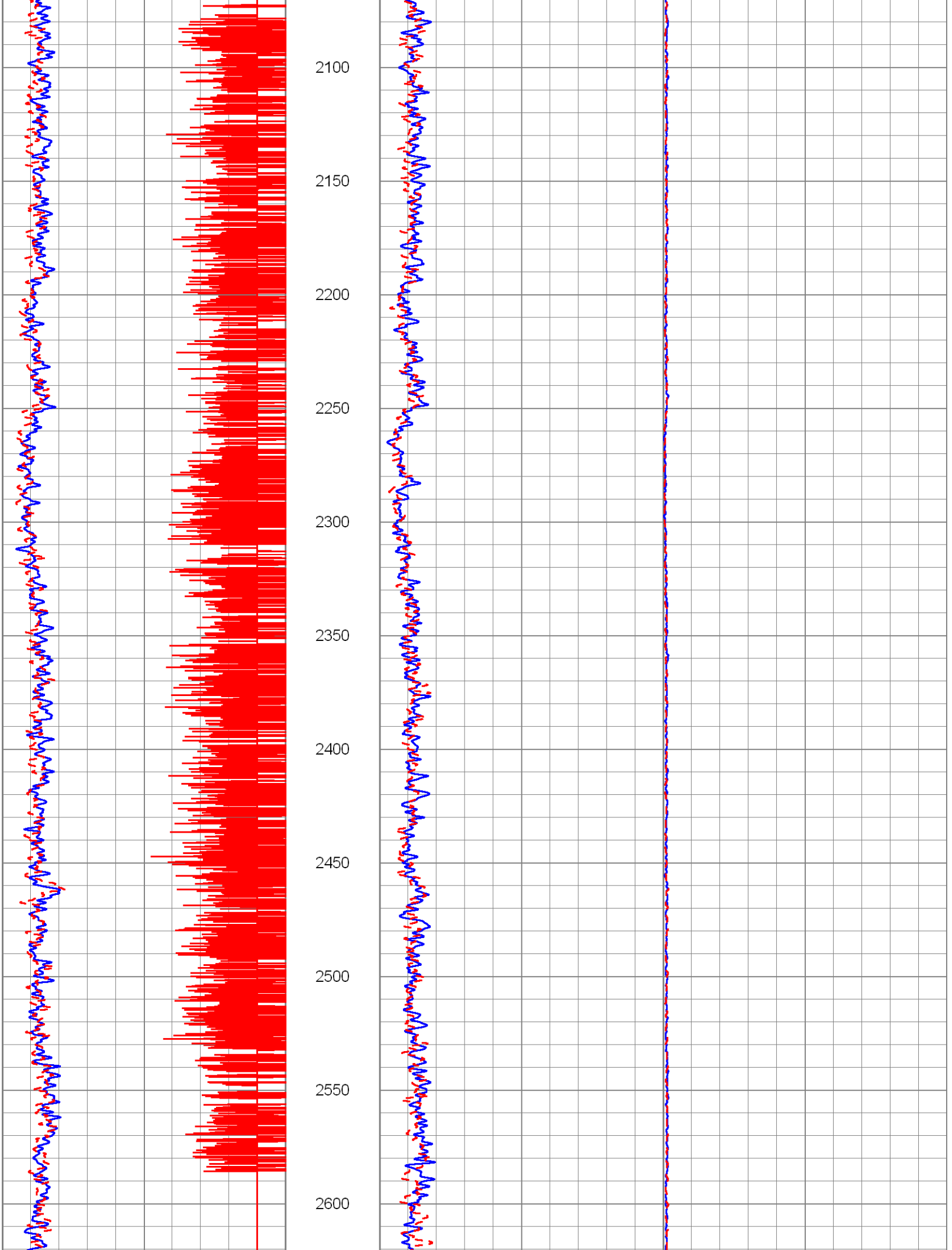
0	GRT (GAPI)	100	0	GRB (GAPI)	100	0	GRM (GAPI) 1000
0	GRT-BACKGRND (GAPI)	100	0	GRB-BACKGRD (GAPI)	100	0	GRM-BACKGRND (GAPI) 1000
0.9	CCL	-0.1					

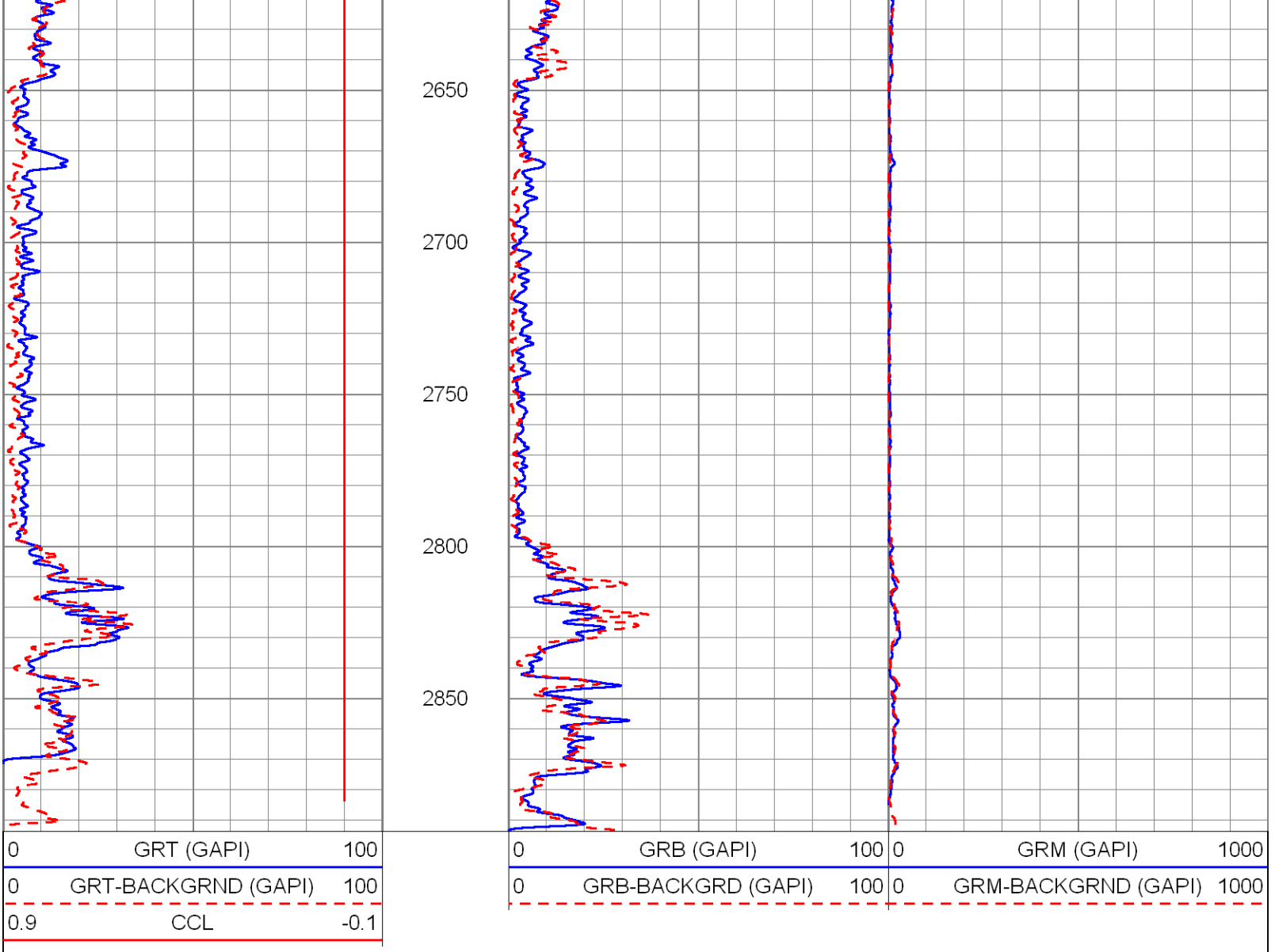



450
500
550
600
650
700
750
800
850
900
950


1000
1050
1100
1150
1200
1250
1300
1350
1400
1450
1500

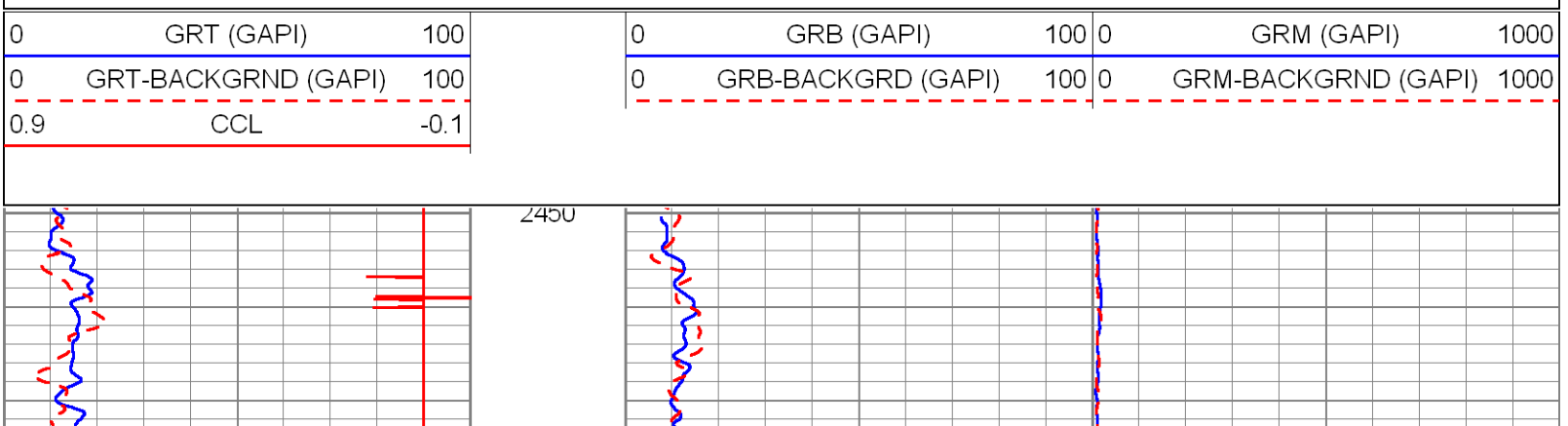

1550
1600
1650
1700
1750
1800
1850
1900
1950
2000
2050

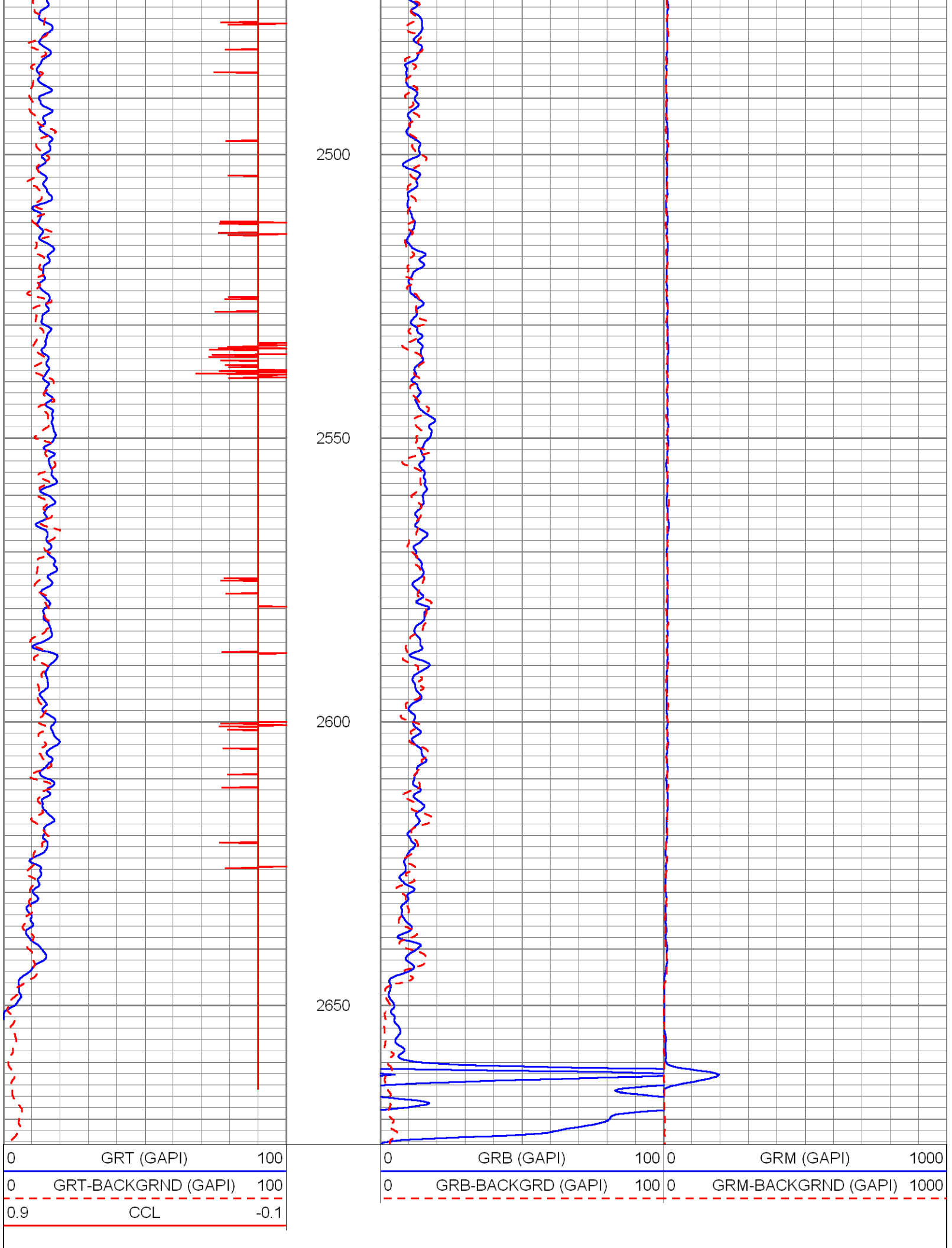

2100
2150
2200
2250
2300
2350
2400
2450
2500
2550
2600



LOP #2

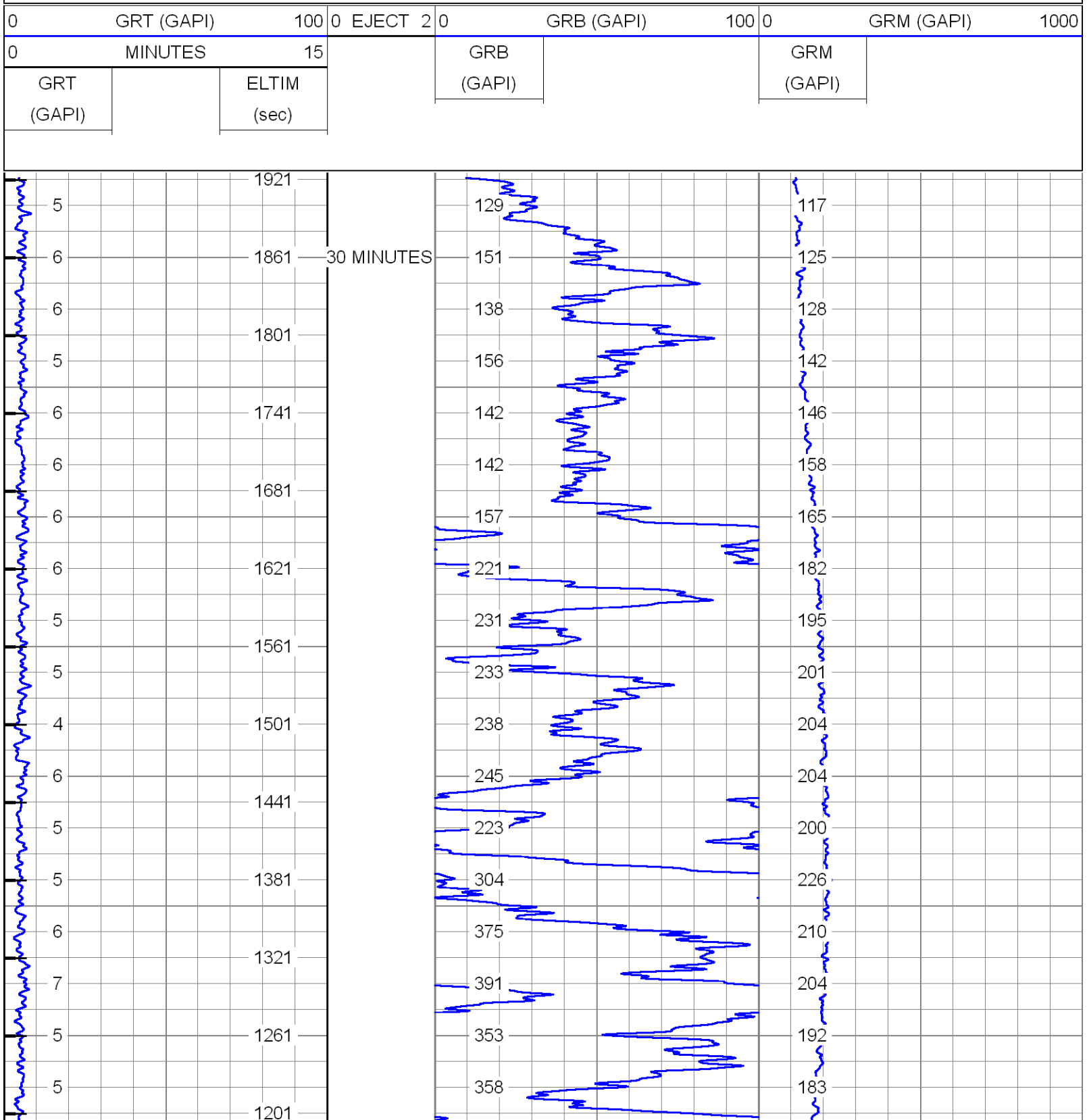
Database File:	sdwwtp-iw-4.db
Dataset Pathname:	pass9
Presentation Format:	rts
Dataset Creation:	Fri Jun 28 14:02:07 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:240

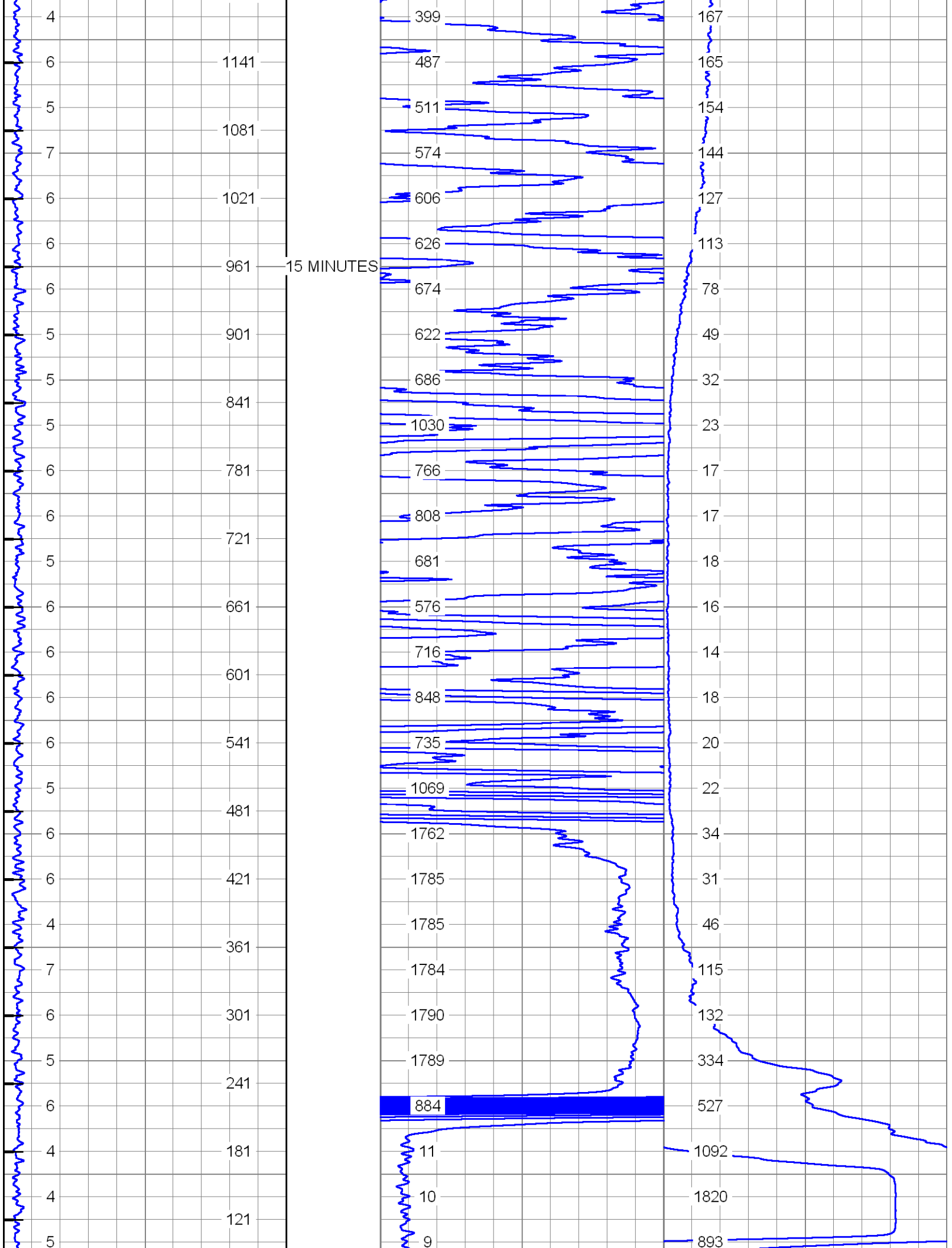


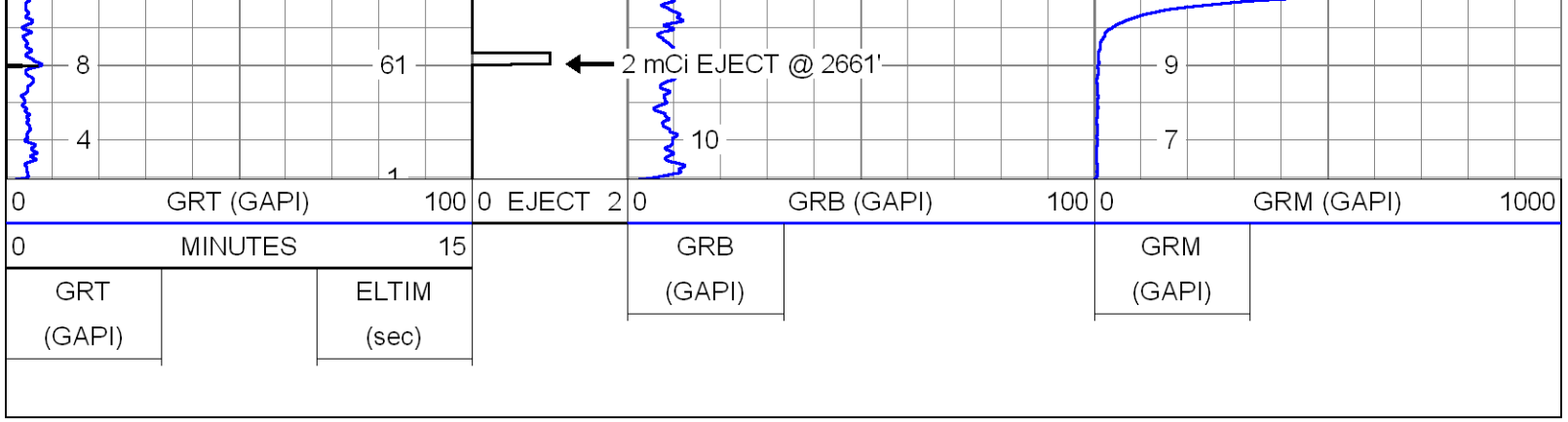

2500
2550
2600
2650
0 GRT (GAPI) 100
0 GRT-BACKGRND (GAPI) 100
0.9 CCL -0.1
0 GRB (GAPI) 100
0 GRB-BACKGRD (GAPI) 100
0 GRM (GAPI) 1000
0 GRM-BACKGRND (GAPI) 1000

DYNAMIC TEST #2 (79 GPM)

Database File:	sdwwtp-iw-4.db
Dataset Pathname:	pass8
Presentation Format:	rtstime
Dataset Creation:	Fri Jun 28 13:28:57 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:600



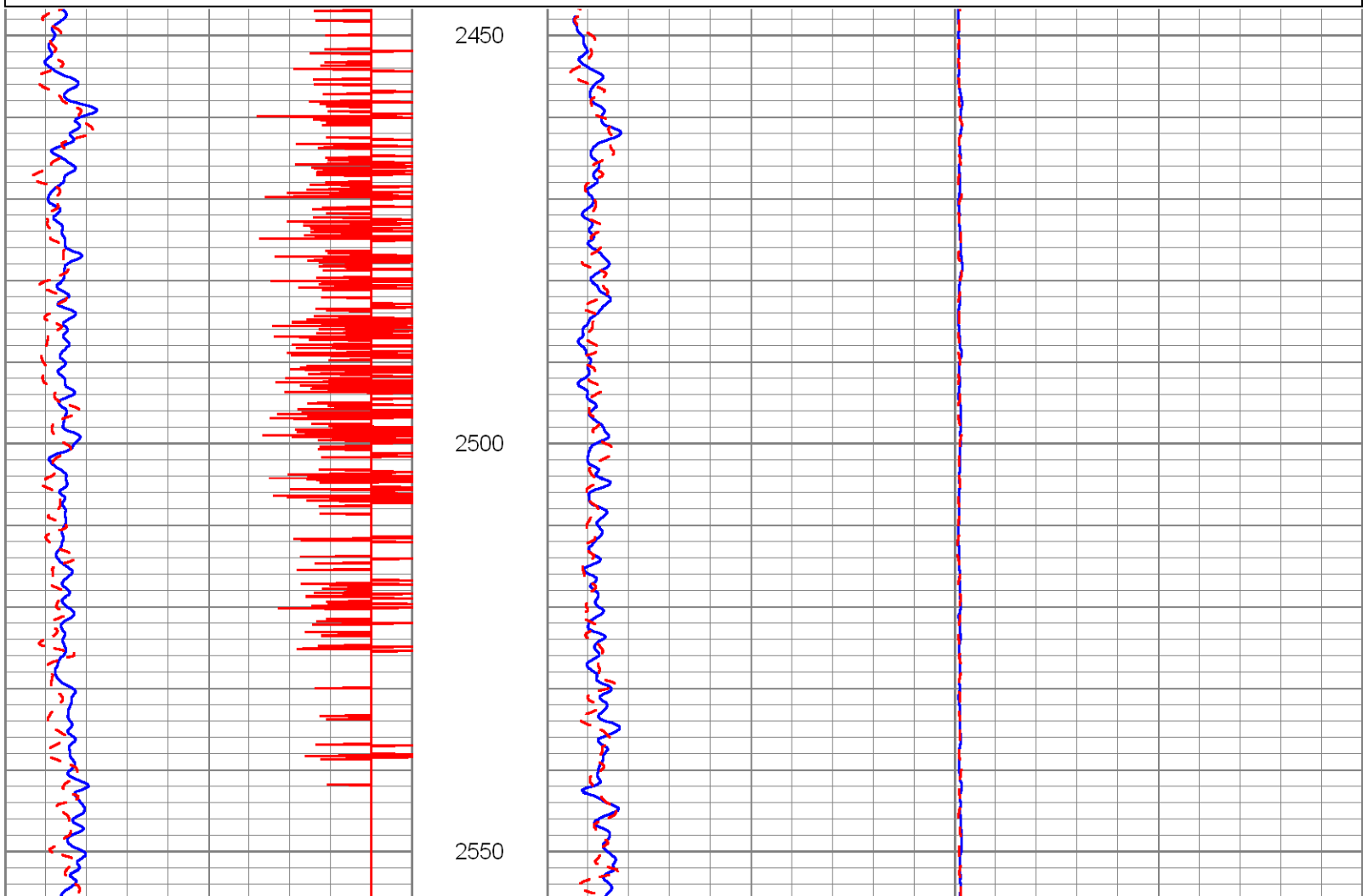

15 MINUTES
4
6
5
7
6
6
6
5
5
5
6
6
5
6
6
6
6
5
6
4
7
6
5
6
4
4
5
1141
1081
1021
961
901
841
781
721
661
601
541
481
421
361
301
241
181
121
399
487
511
574
606
626
674
622
686
1030
766
808
681
576
716
848
735
1069
1762
1785
1785
1784
1790
1789
884
11
10
9
167
165
154
144
127
113
78
49
32
23
17
17
18
16
14
18
20
22
34
31
46
115
132
334
527
1092
1820
893

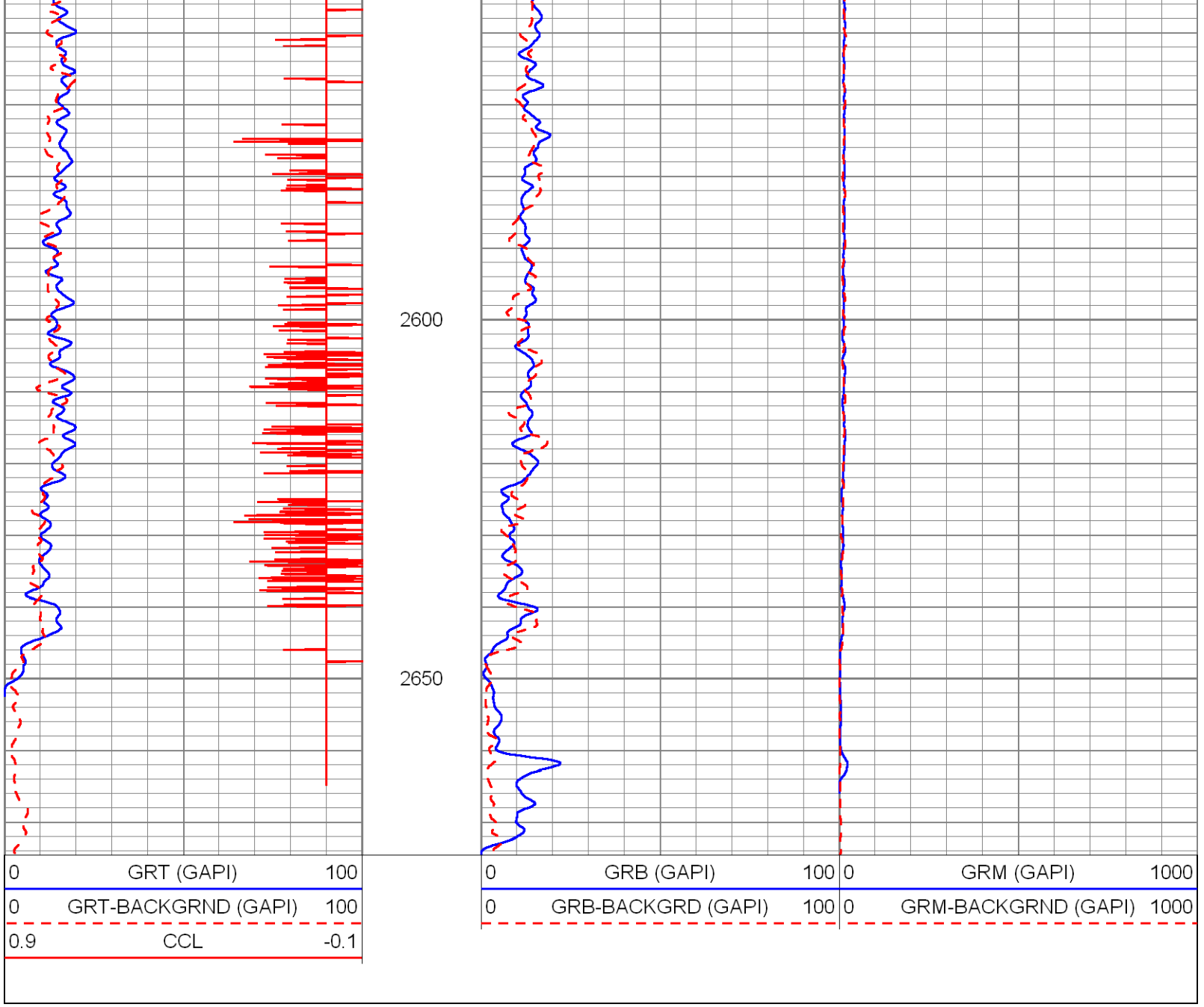


LOP #1

Database File: sdwwtp-iw-4.db
Dataset Pathname: pass7
Presentation Format: rts
Dataset Creation: Fri Jun 28 13:09:11 2013 by Log SOC 110722
Charted by: Depth in Feet scaled 1:240

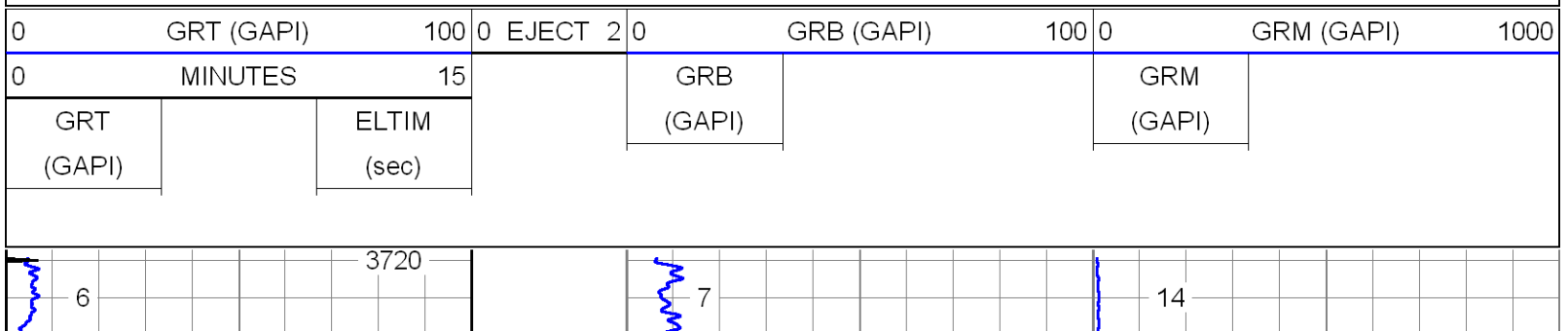
0	GRT (GAPI)	100		0	GRB (GAPI)	100	0	GRM (GAPI) 1000
0	GRT-BACKGRND (GAPI)	100		0	GRB-BACKGRD (GAPI)	100	0	GRM-BACKGRND (GAPI) 1000
0.9	CCL	-0.1						

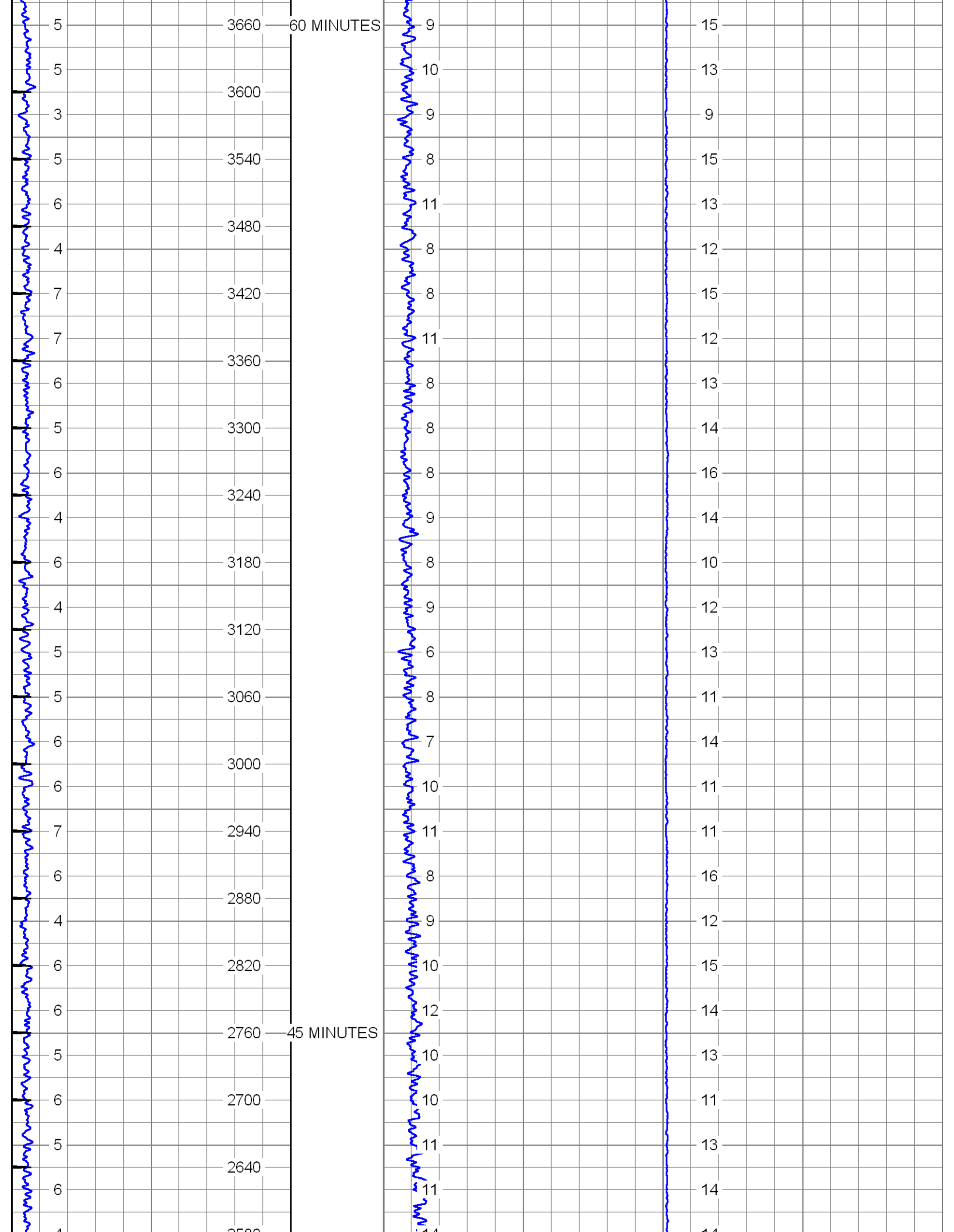


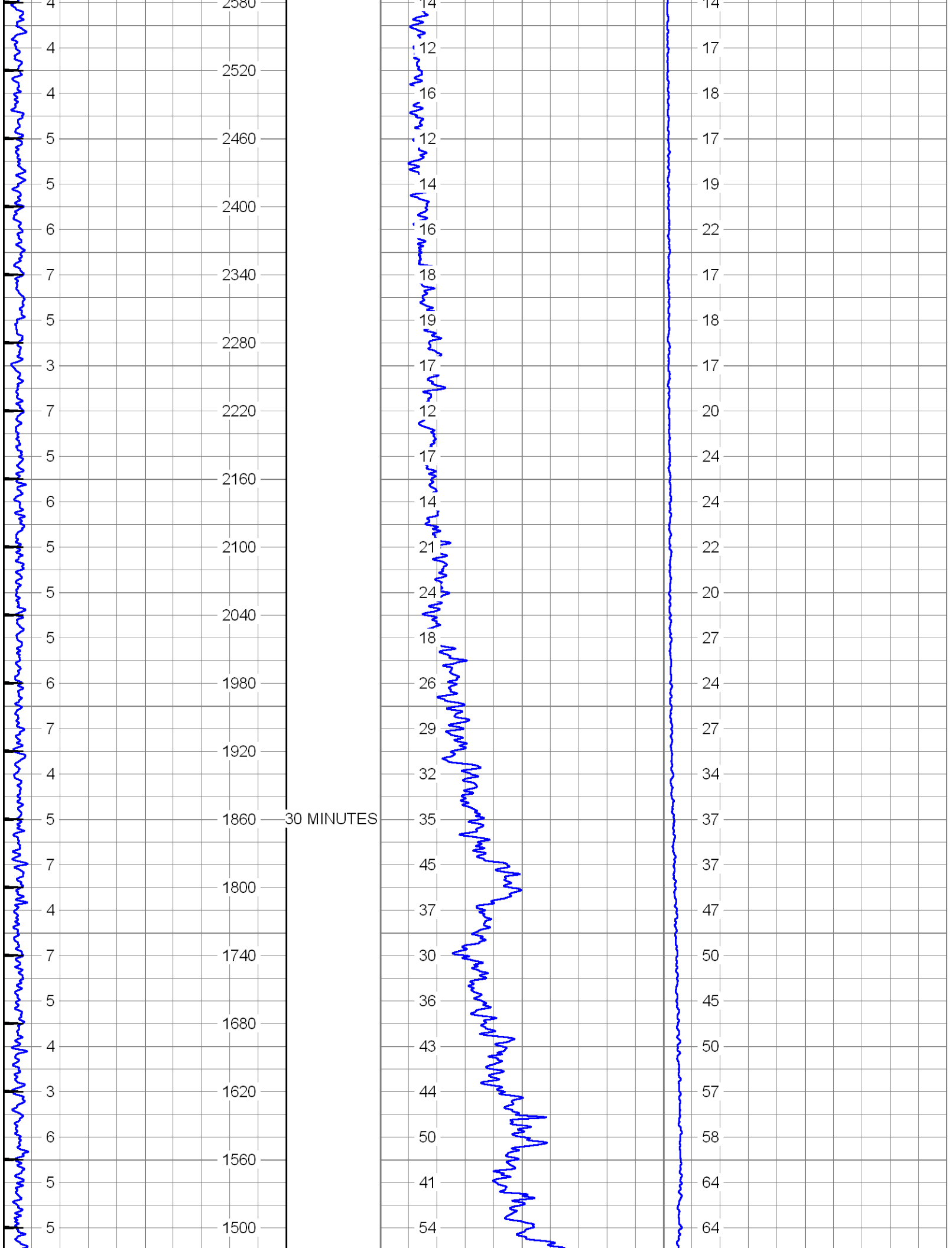


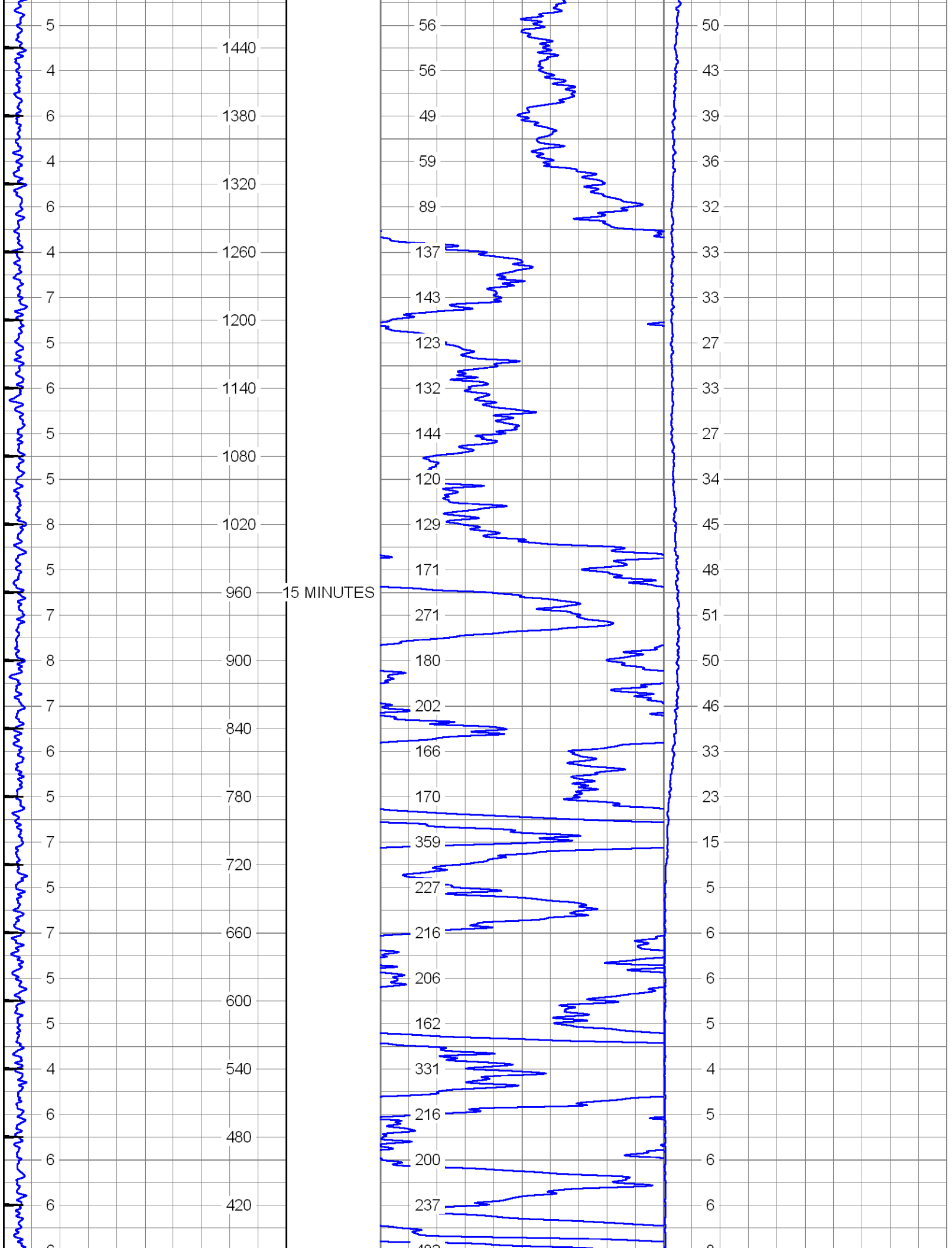
DYNAMIC TEST #1 (82 GPM)

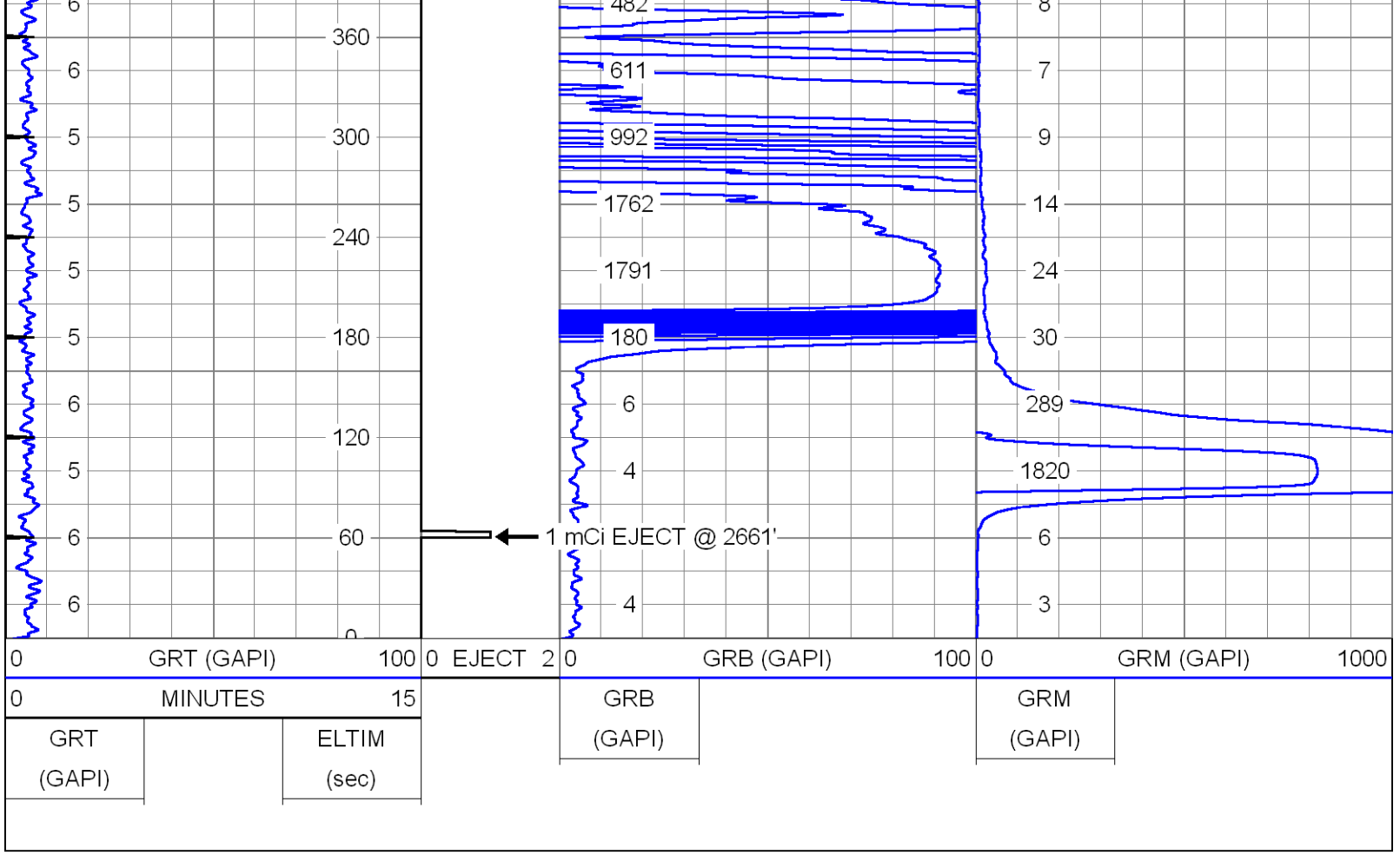
Database File:	sdwwtp-iw-4.db
Dataset Pathname:	pass5
Presentation Format:	rtstime
Dataset Creation:	Fri Jun 28 12:05:27 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:600




3660
60 MINUTES
3600
3540
3480
3420
3360
3300
3240
3180
3120
3060
3000
2940
2880
2820
2760
45 MINUTES
2700
2640

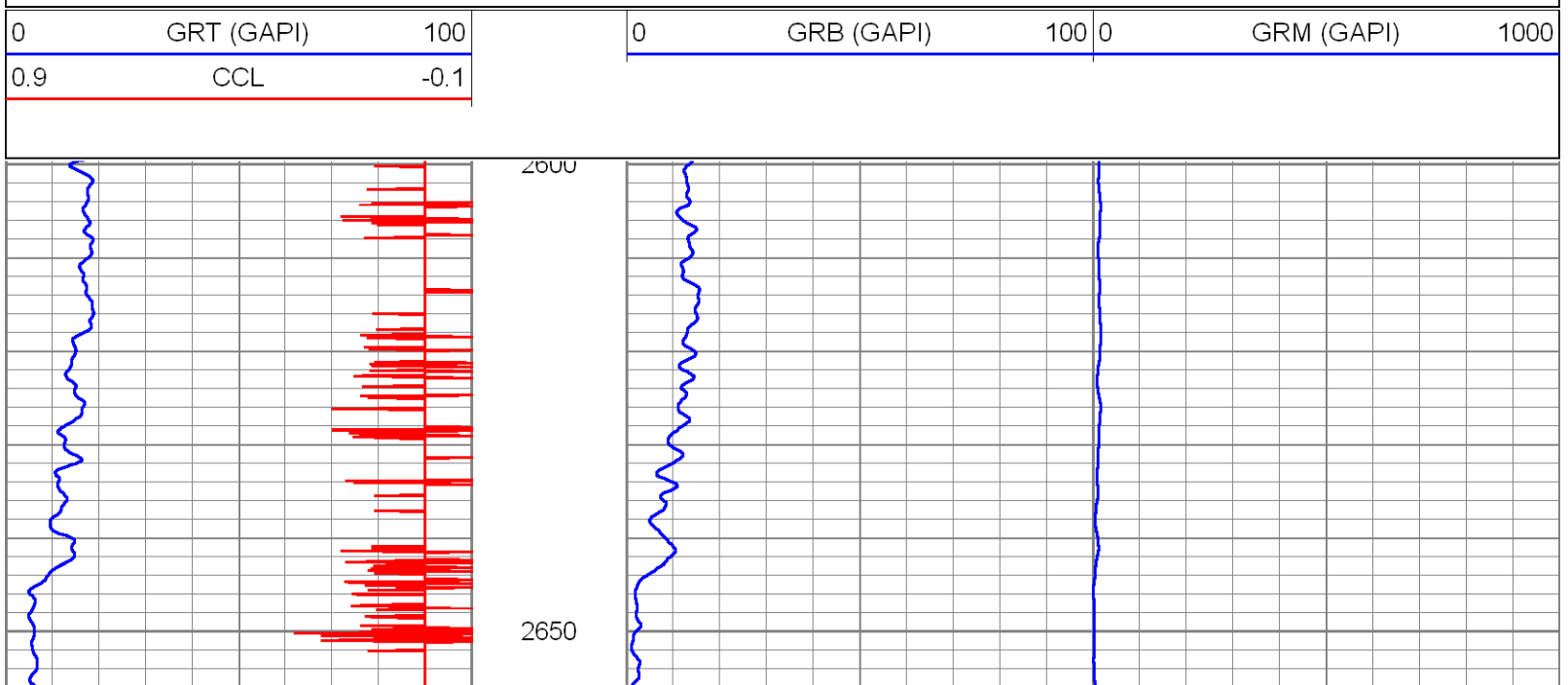

30 MINUTES

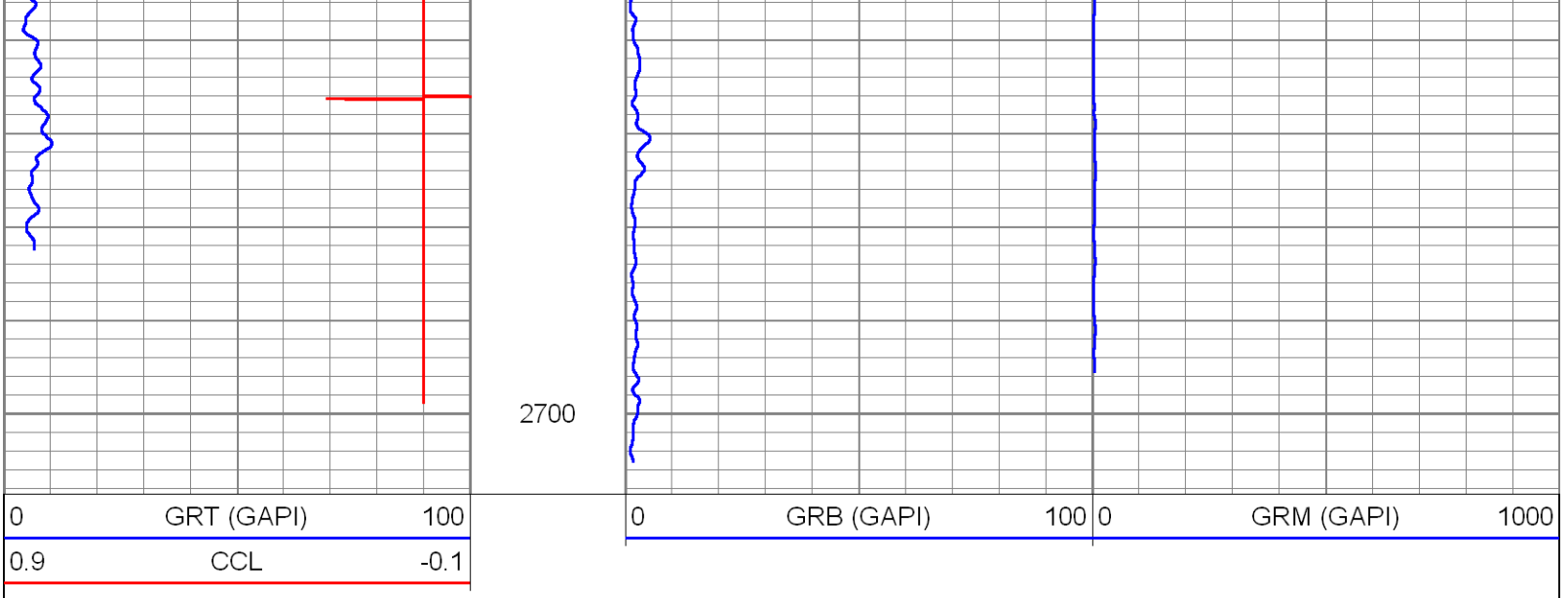

15 MINUTES
1440
1380
1320
1260
1200
1140
1080
1020
960
900
840
780
720
660
600
540
480
420
5 4 6 4 6 4 7 5 6 5 6 8 5 7 8 7 6 5 7 5 7 5 5 4 6 6 6 6
56 56 49 59 89 137 143 123 132 144 120 129 171 271 180 202 166 170 359 227 216 206 162 331 216 200 237
50 43 39 36 32 33 33 27 33 27 34 45 48 51 50 46 33 23 15 5 6 6 5 4 5 6 6



CASING TIE-IN

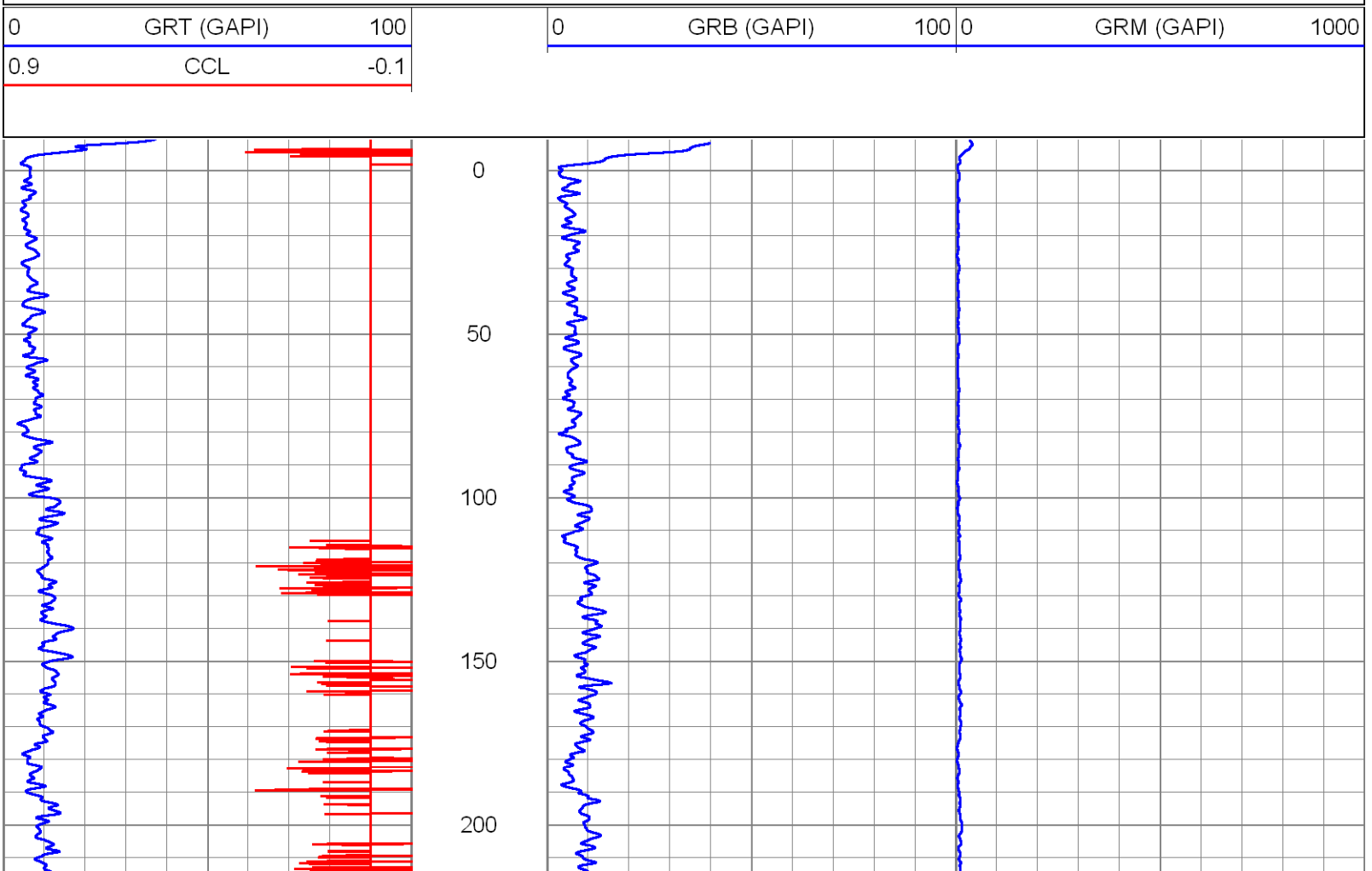
Database File:	sdwwtp-iw-4.db
Dataset Pathname:	pass3
Presentation Format:	rts
Dataset Creation:	Fri Jun 28 11:27:16 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:240

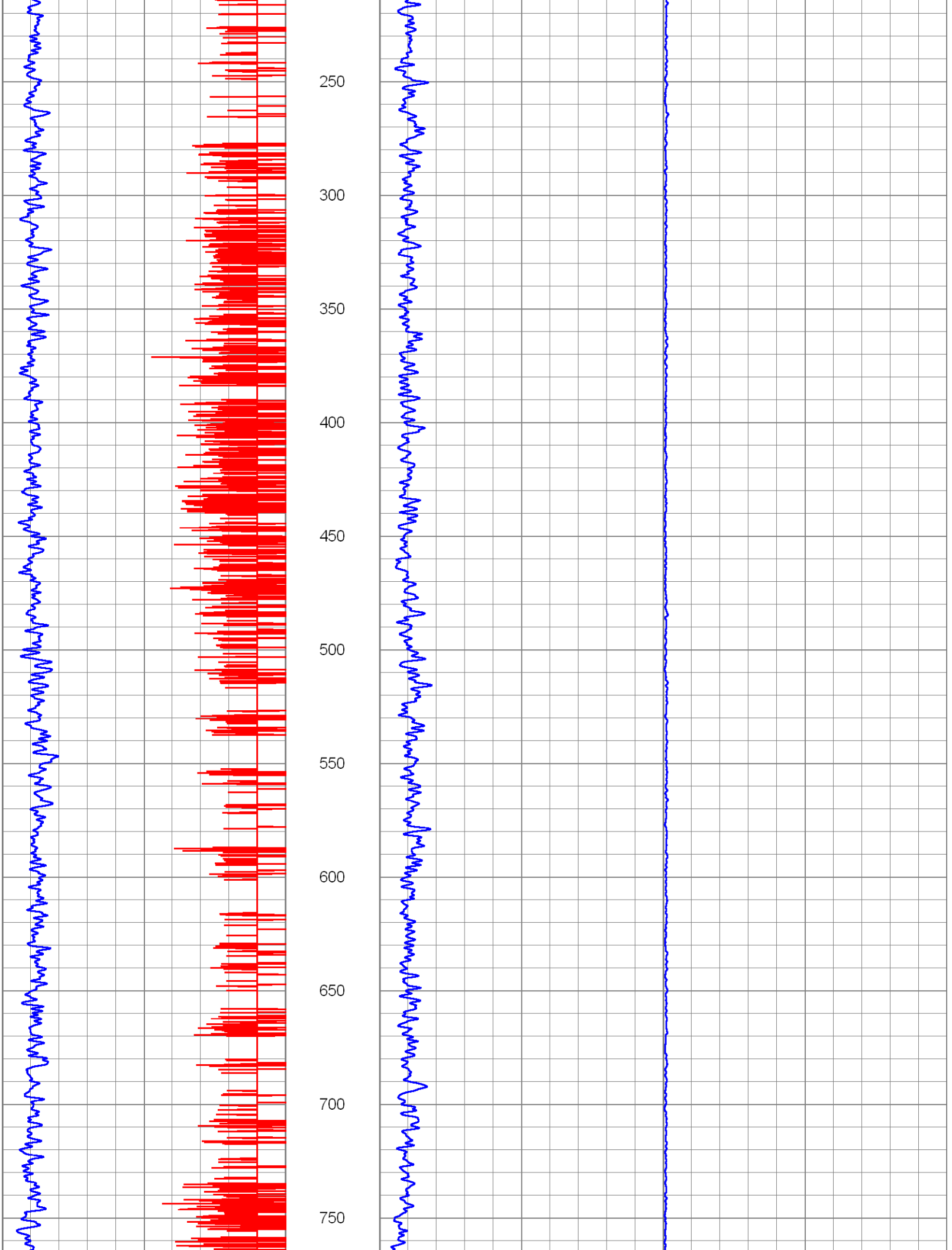


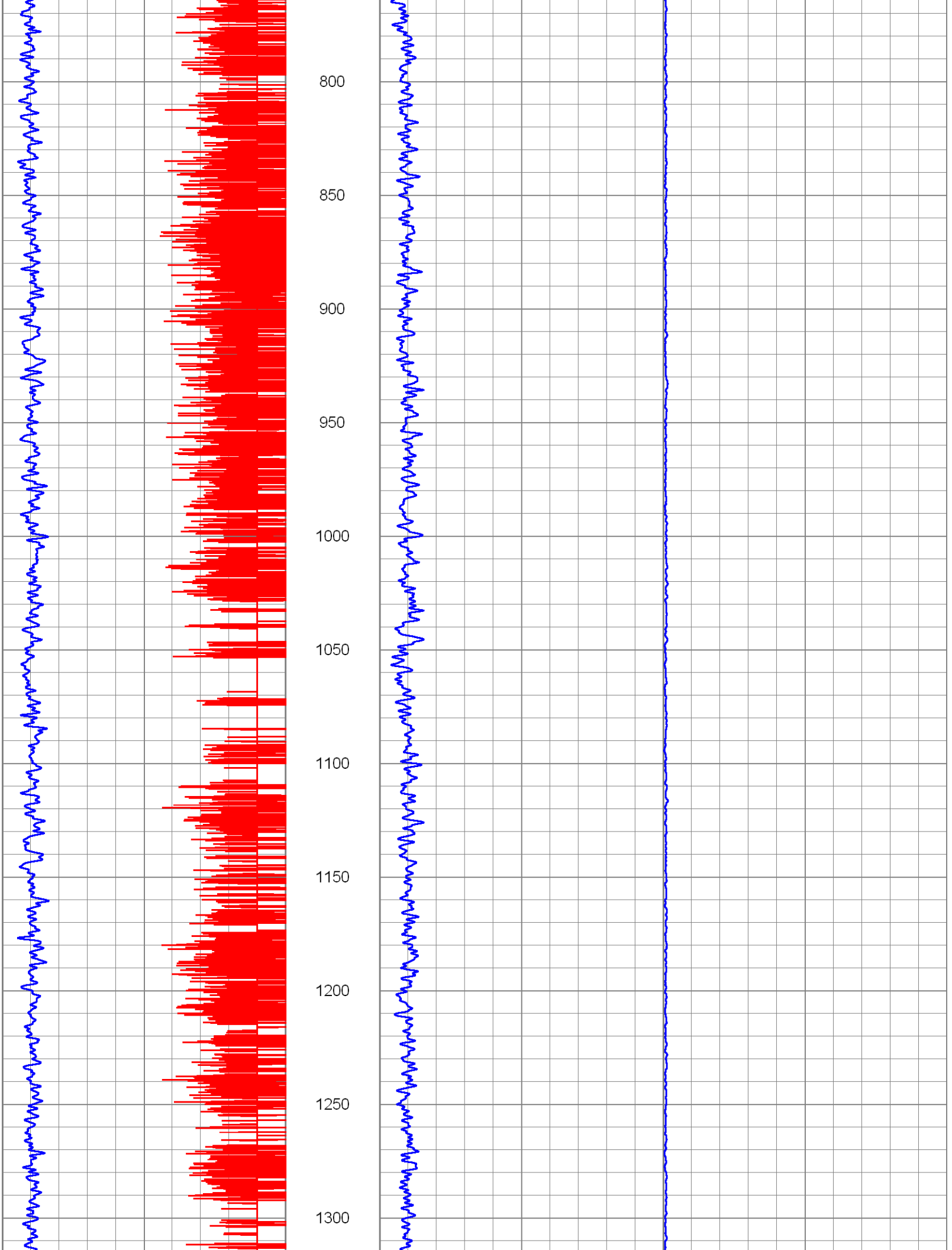


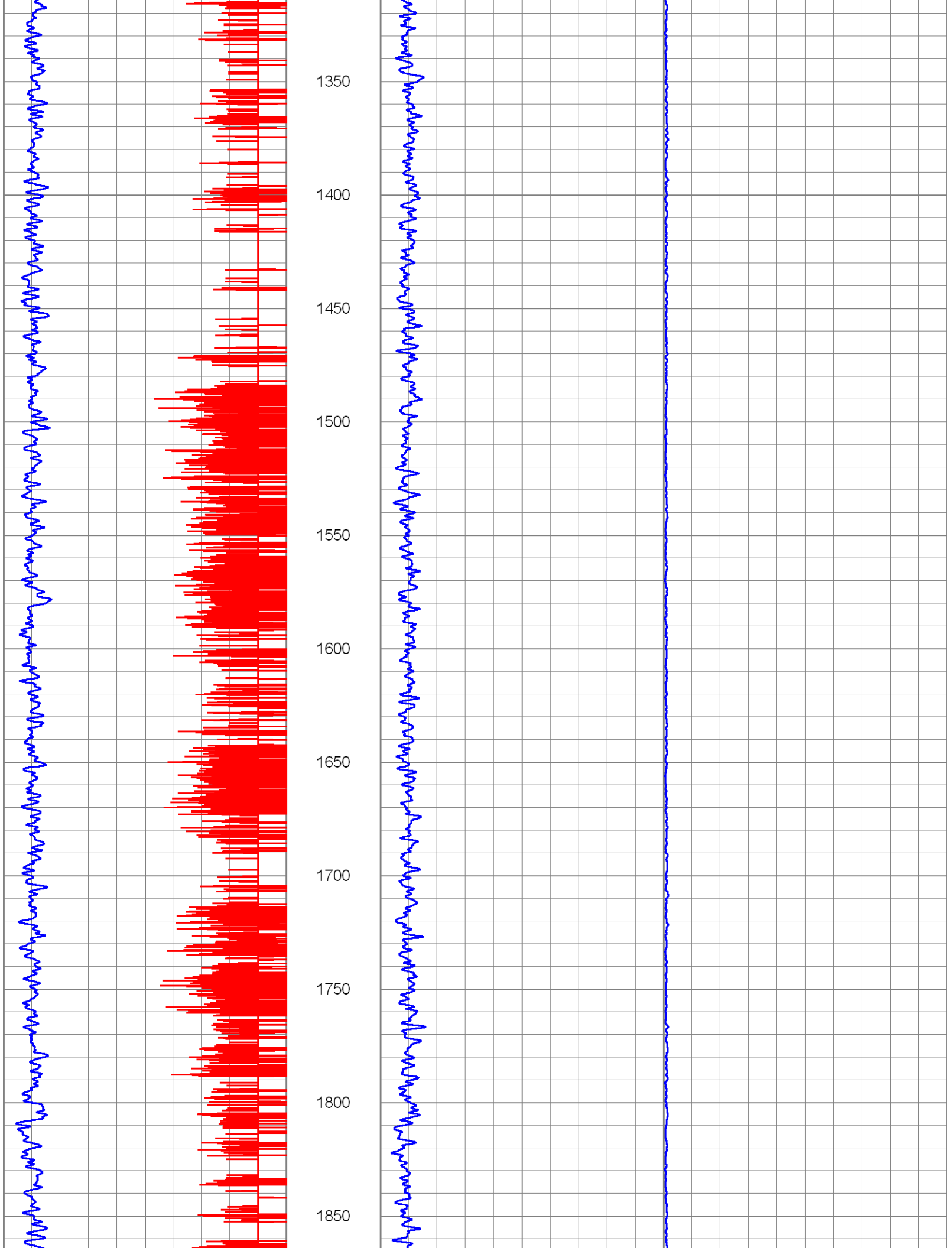
GAMMA-RAY BACKGROUND

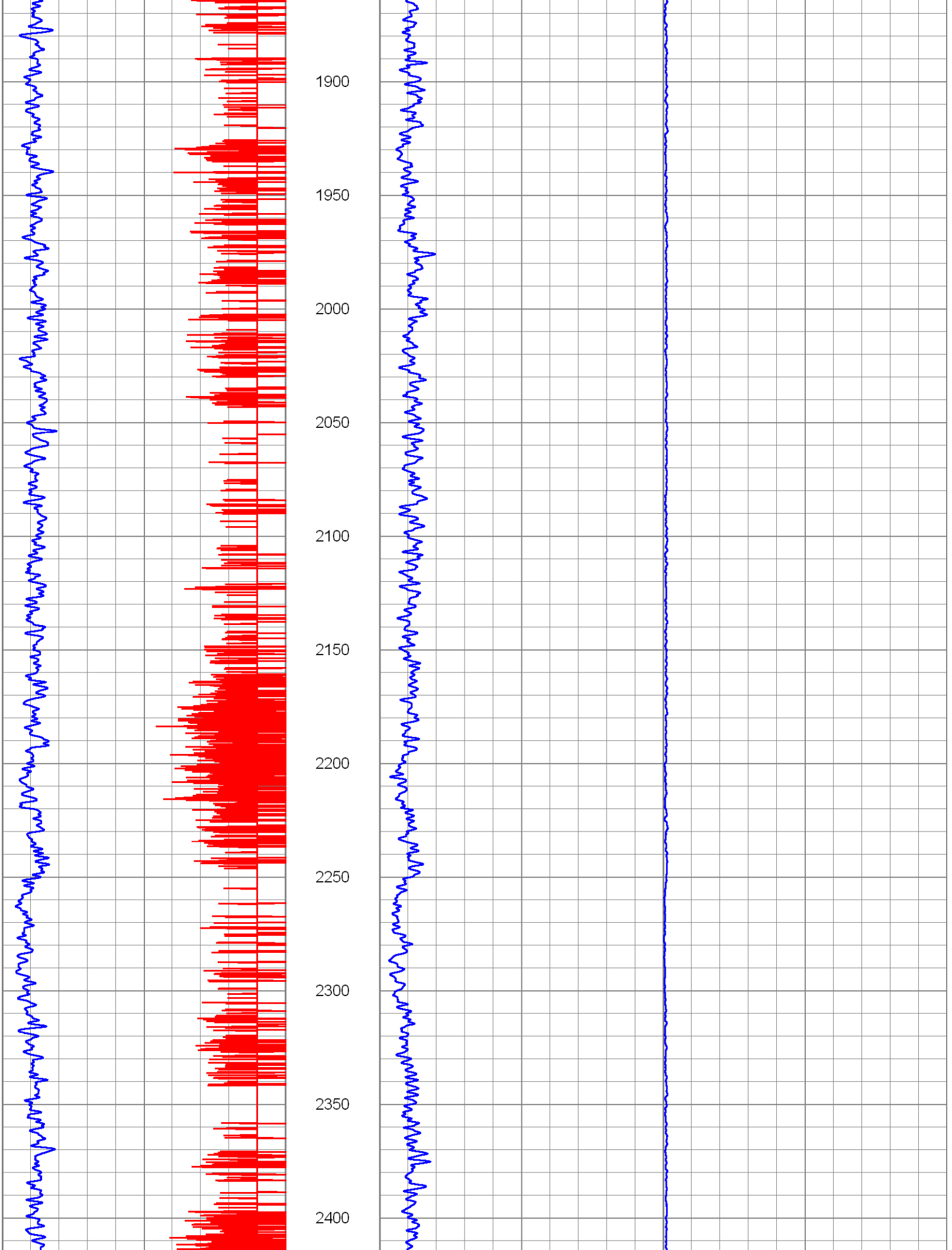
Database File:	sdwwtp-iw-4.db
Dataset Pathname:	pass2
Presentation Format:	rts
Dataset Creation:	Fri Jun 28 09:25:39 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:600

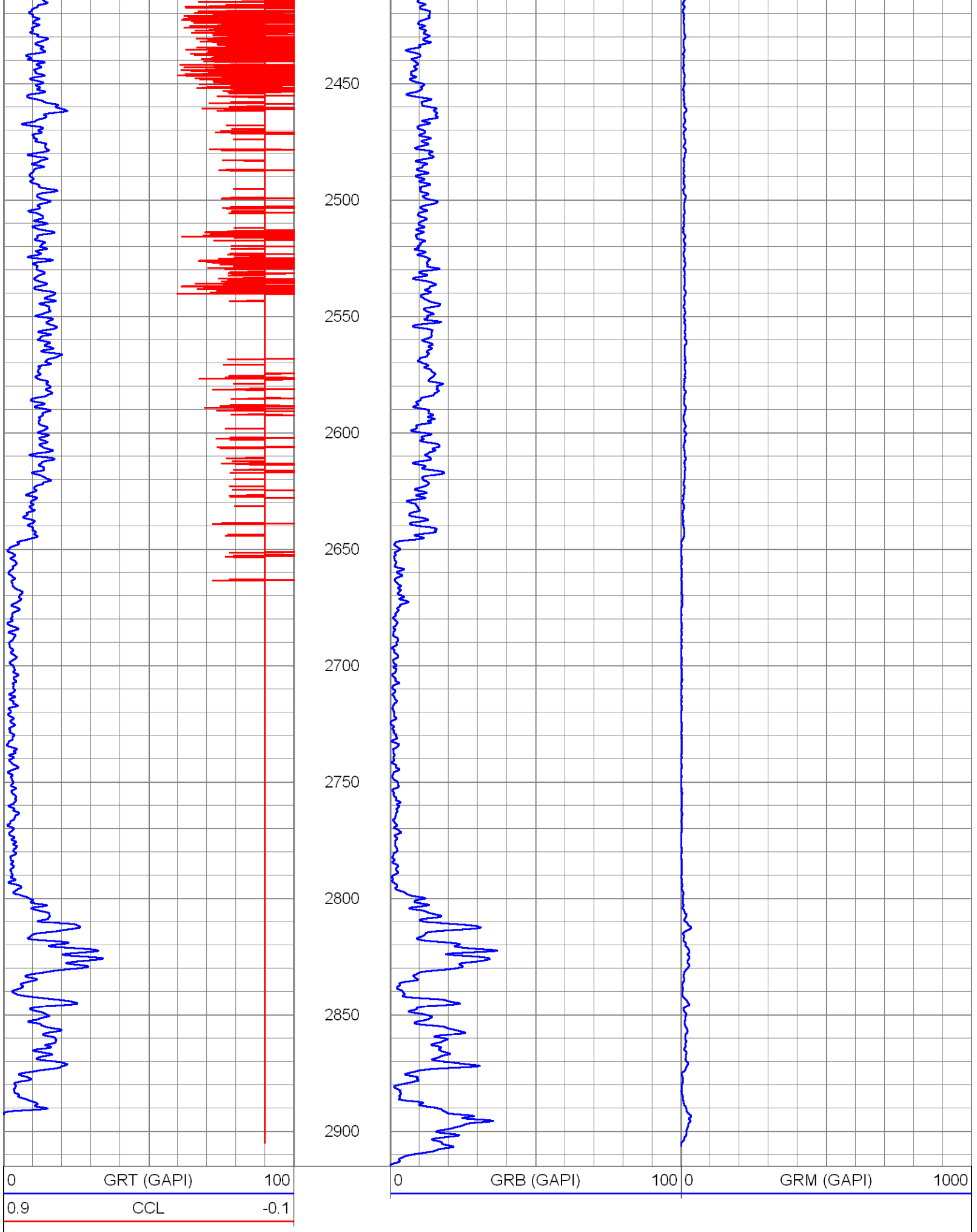



250
300
350
400
450
500
550
600
650
700
750


800
850
900
950
1000
1050
1100
1150
1200
1250
1300


1350
1400
1450
1500
1550
1600
1650
1700
1750
1800
1850


1900
1950
2000
2050
2100
2150
2200
2250
2300
2350
2400


2450
2500
2550
2600
2650
2700
2750
2800
2850
2900
0
GRT (GAPI)
100
0.9
CCL
-0.1
0
GRB (GAPI)
100
0
GRM (GAPI)
1000

Calibration Report

Database File: sdwwtp-iw-4.db
Dataset Pathname: pass2
Dataset Creation: Fri Jun 28 09:25:39 2013 by Log SOC 110722

Gamma Ray Calibration Report

Serial Number:	952B	
Tool Model:	RTSB	
Performed:	Fri Jun 28 07:55:23 2013	
Calibrator Value:	90.0	GAPI
Background Reading:	84.6	cps
Calibrator Reading:	246.2	cps
Sensitivity:	0.5568	GAPI/cps

Gamma Ray Calibration Report

Serial Number:	952M	
Tool Model:	RTSM	
Performed:	Fri Jun 28 07:55:35 2013	
Calibrator Value:	90.0	GAPI
Background Reading:	168.9	cps
Calibrator Reading:	328.1	cps
Sensitivity:	0.5655	GAPI/cps

Gamma Ray Calibration Report

Serial Number:	952T	
Tool Model:	RTST	
Performed:	Fri Jun 28 07:55:54 2013	
Calibrator Value:	90.0	GAPI
Background Reading:	101.1	cps
Calibrator Reading:	270.2	cps
Sensitivity:	0.5322	GAPI/cps

YOUNGQUIST

GEOPHYSICAL LOGGING DIVISION

Radioactive Tracer Survey Tool Diagram

Date: 06/28/13 Job: SD-WWTP_IW-4

Internal RTS: ___ External RTS: ✓ YB I Logger: Morey/Rives

BOTTOM OF CASING: 2666'

-5' IN CASING: 2661'

+13.5' FOR BOTTOM OF TOOL: 2674.5

Eject #1: 1 mCi Eject #2: 2 mCi

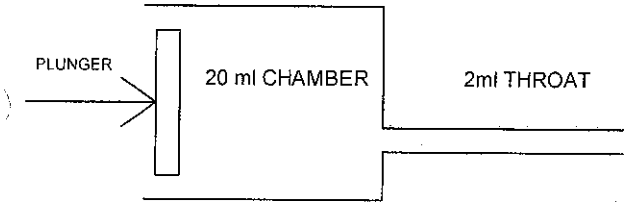
Eject #3: mCi Eject #4: mCi

Eject #5: mCi Eject #6: mCi

Total mCi of I-131 loaded in tool: 5 **1ml =1mCi**

Total volume of Chamber and Throat:22ml

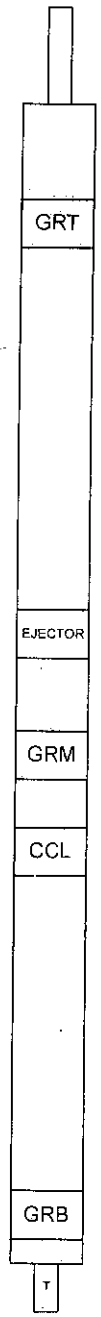
EJECTOR PORT DIAGRAM



Total Eject Cycle Time (22ml): 13 **Sec**

Eject Cycle Time Per ml (Total Time / 22): 0.6 **Sec**

Throat Eject Cycle Time (2*Time Per ml): 1.2 **Sec**



TOP OF TOOL (25ft 2in)

GAMMA RAY TOP DECTOR (23ft 6in)

ALL MEASUREMENTS ARE FROM THE BOTTOM OF THE TOOL.

TOOL DIAMETER IS 1-11/16".

EJECTOR PORT (13ft 6in)

GAMMA RAY MIDDLE DECTOR (10ft 6in)

COLLAR LOCATOR (9ft 6in)

GAMMA RAY BOTTOM DECTOR (1ft 2in)

TEMPERATURE PROBE

TIME PER EJECT

(Total ml of I-131)/(20ml)= mCi per ml in the chamber

(5)/(20)=0.25 mCi per ml

mCi = Throat Eject Cycle Time + (ml of Chamber Required)*(Eject Cycle Time Per ml)

1 mCi = 1.2 + (4)*(0.6) = 3.6 **seconds**

2 mCi = 1.2 + (8)*(0.6) = 6.0 **seconds**

3 mCi = + ( )*( ) = **seconds**

4 mCi = + ( )*( ) = **seconds**

Appendix E

Temperature Log

HIGH RESOLUTION TEMPERATURE LOG

Company	MIAMI-DADE WATER & SEWER
Well	IW-#4
Field	S.D.W.W.T.P.
County	MIAMI-DADE
State	FL

Company MIAMI-DADE WATER & SEWER
Well IW-#4
Field S.D.W.W.T.P.
County MIAMI-DADE
State FL

Company MIAMI-DADE WATER & SEWER
Well IW-#4
Field S.D.W.W.T.P.
County MIAMI-DADE State FL

Location: API # :

SEC TWP RGE

Other Services

Elevation

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

Date	28-JUN-2013		
Run Number	2013 MIT		
Depth Driller	2913'		
Depth Logger	2913'		
Bottom Logged Interval	2913'		
Top Log Interval	SURFACE		
Open Hole Size	24"		
Type Fluid	WATER		
Density / Viscosity	NA		
Max. Recorded Temp.	80.0 degf		
Estimated Cement Top	NA		
Time Well Ready	UPON ARRIVAL		
Time Logger on Bottom	0915		
Equipment Number	102		
Location	FT. MYERS		
Recorded By	RIVES	MOREY	
Witnessed By	S. VILLAMIL	M. MACFARLANE	

Borehole Record				Borehole Record			
Run Number	Bit	From	To	Run No	Bit	From	To

Casing Record	Size	Wgt/Ft	Top	Bottom
Surface String				
Prot. String				
Production String	24"	.500" W.T	SURFACE	2666'
Liner				

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

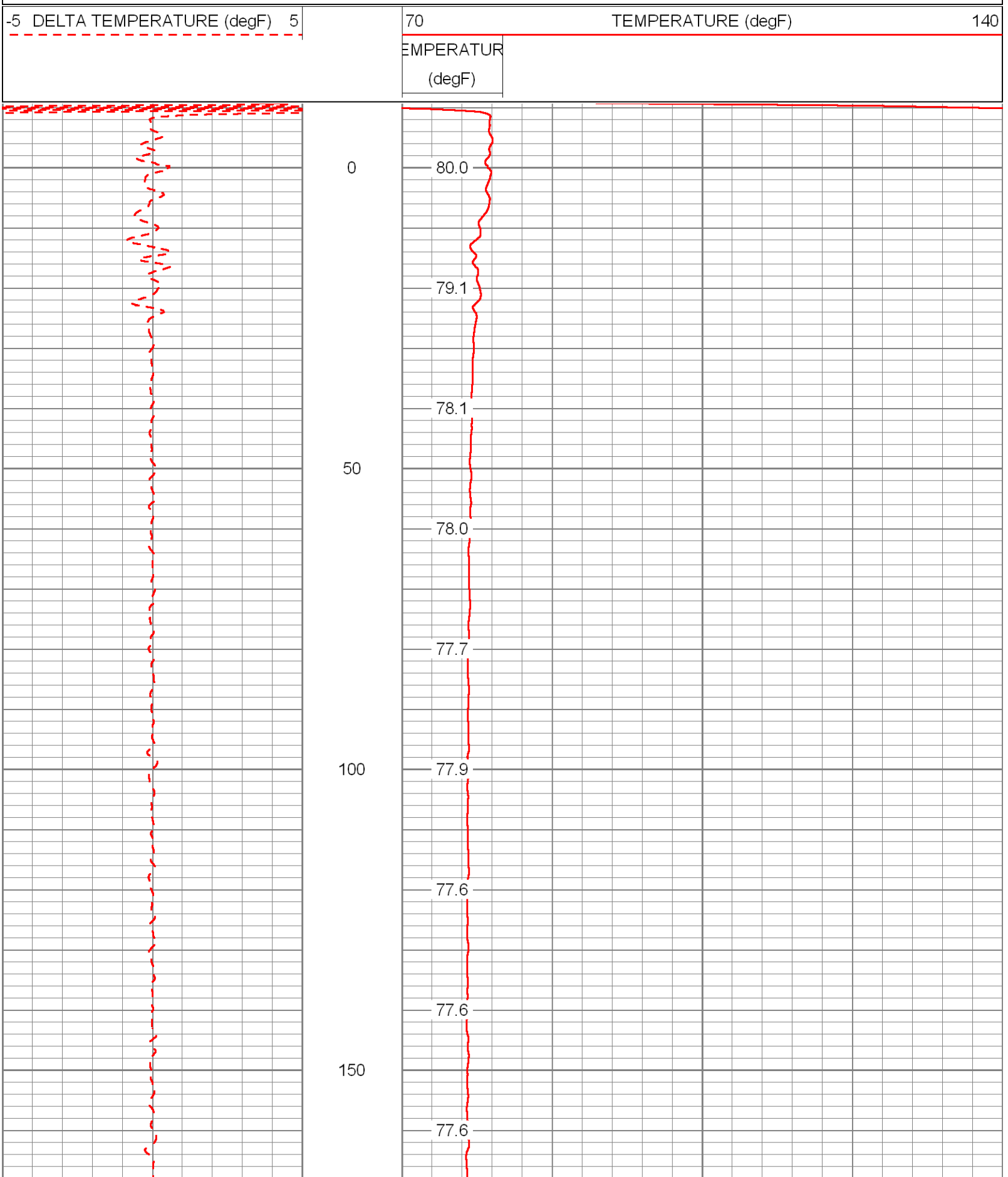
Comments

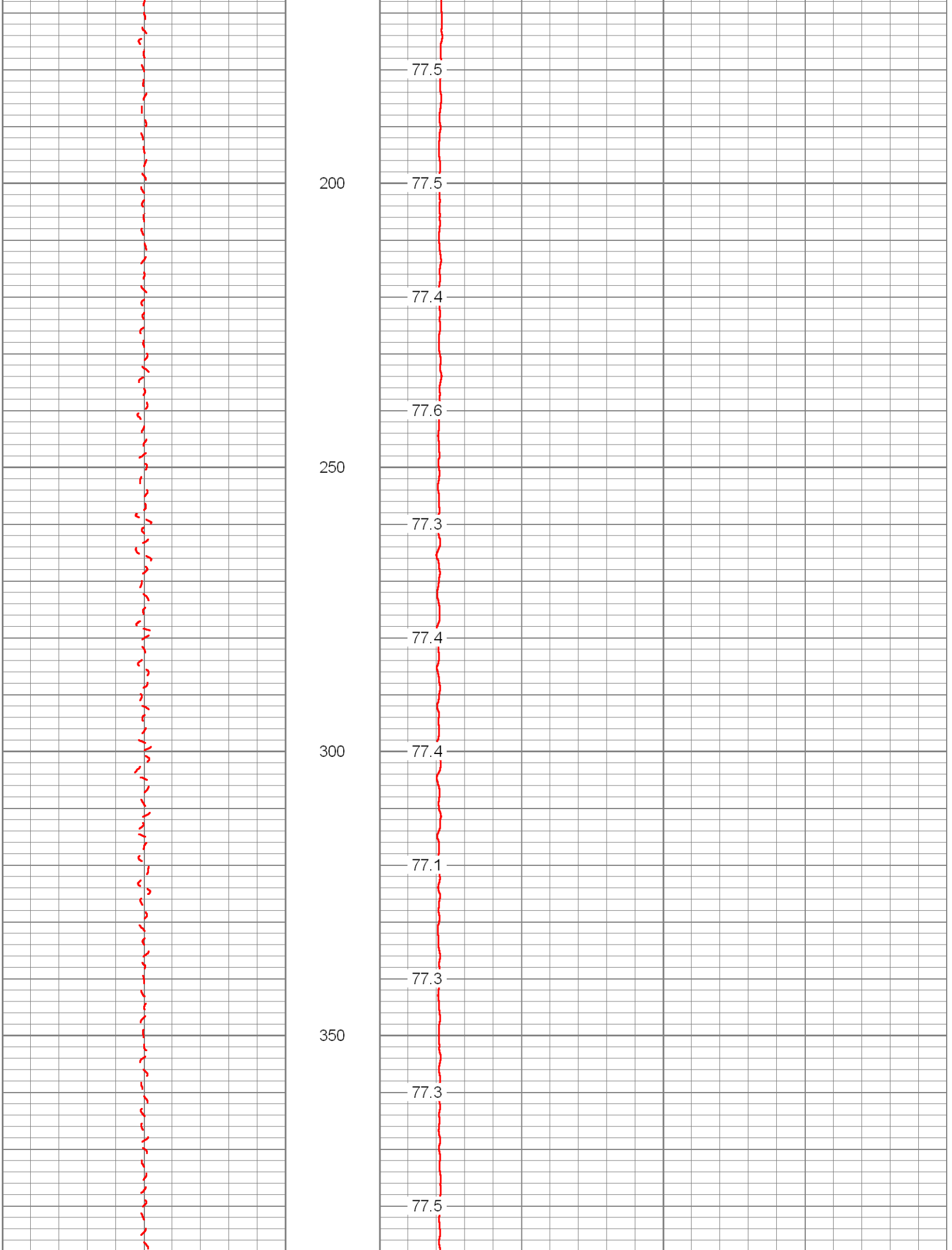
RADIOACTIVE TRACER SURVEY

TEMPERATURE

BROTHERS

Database File:	sdwwtp-iw-4.db
Dataset Pathname:	pass1
Presentation Format:	temp
Dataset Creation:	Fri Jun 28 08:12:49 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:240

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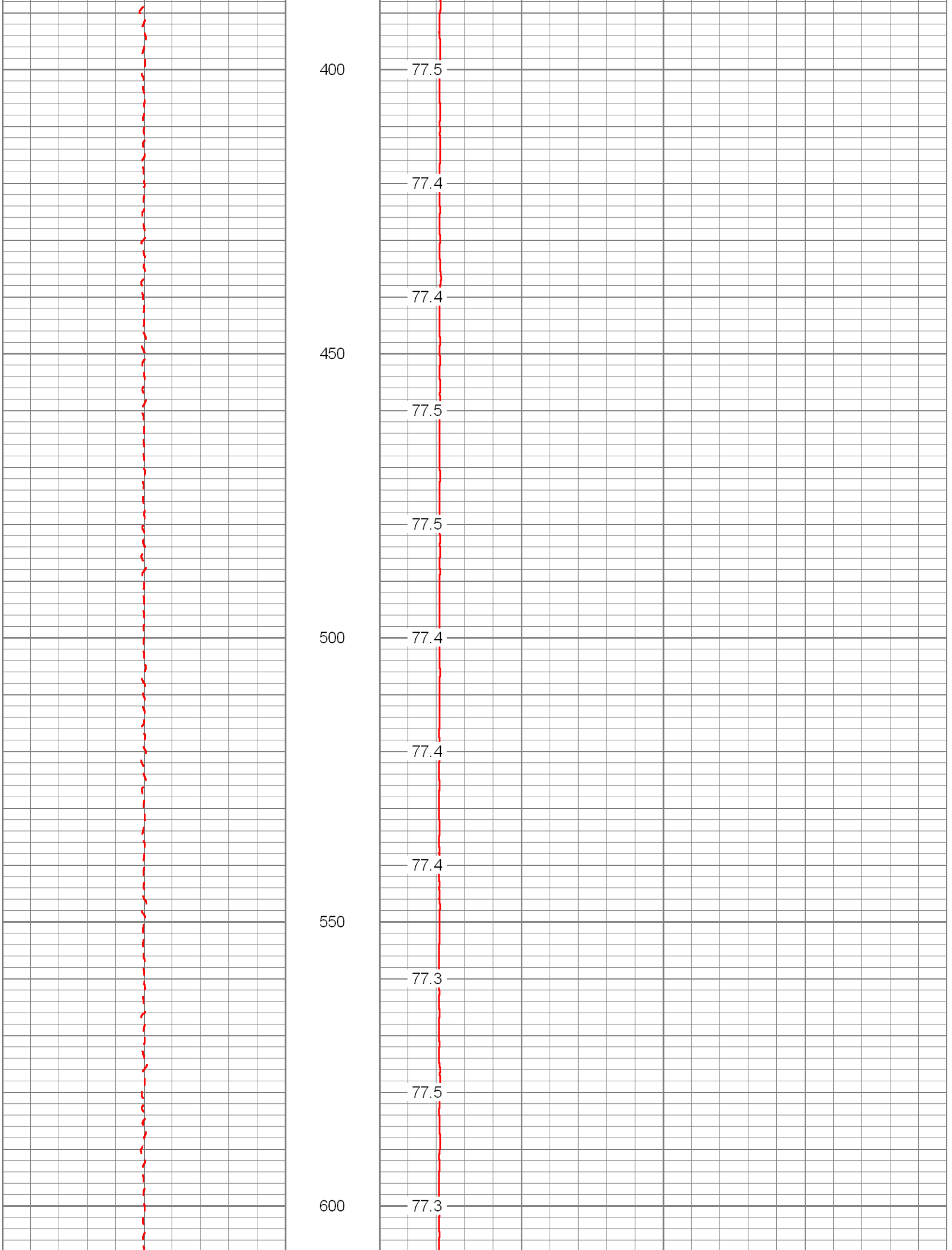
77.5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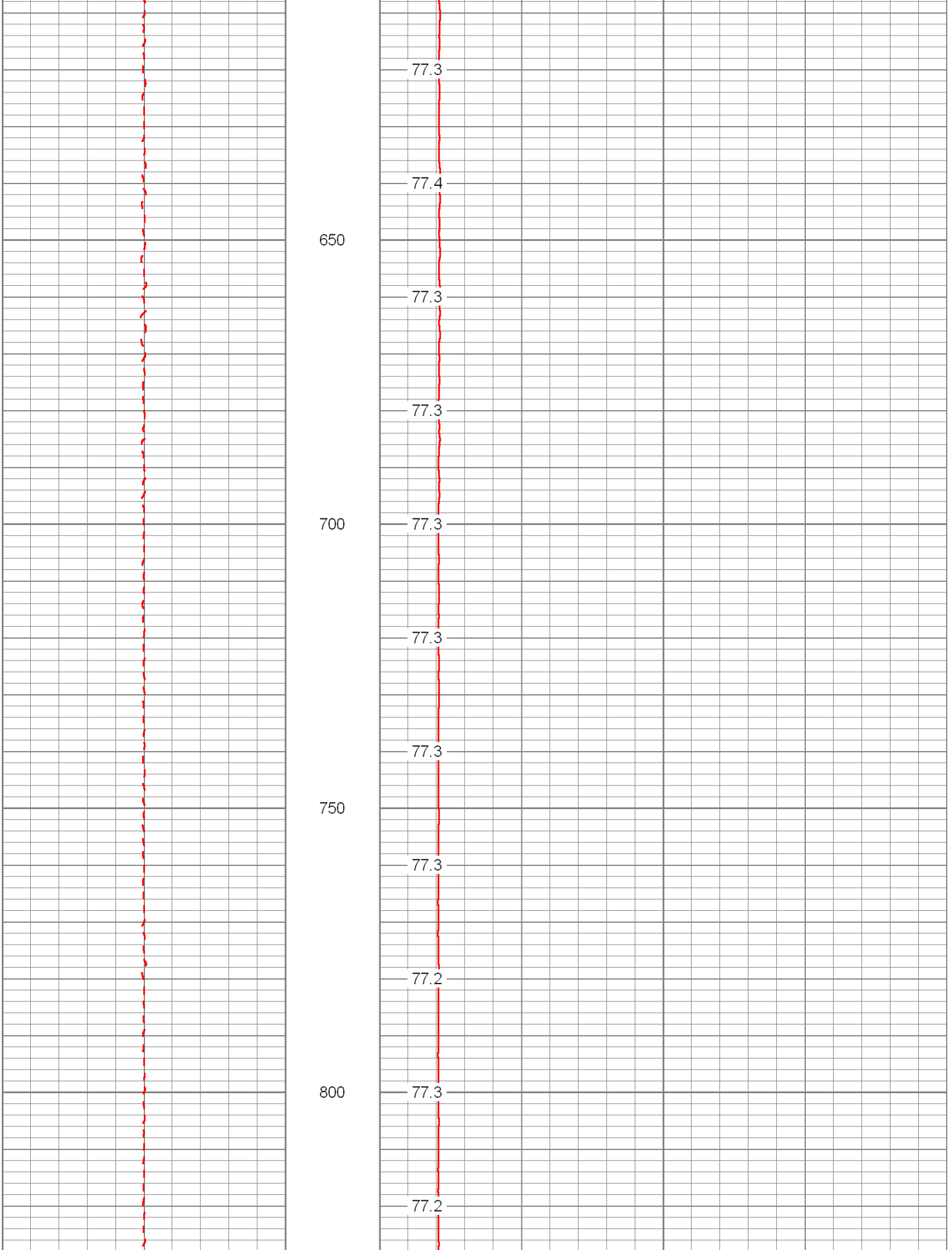
77.3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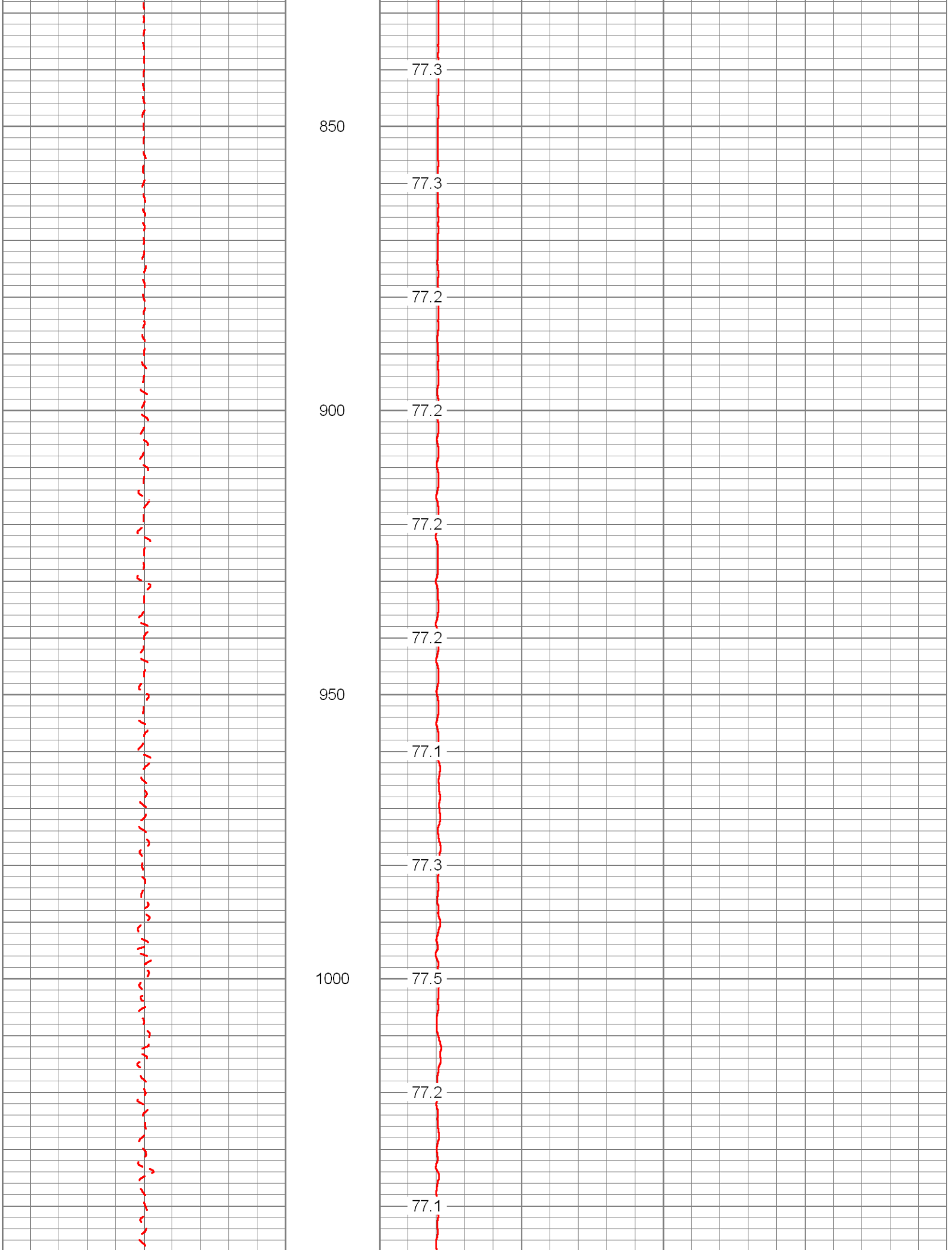
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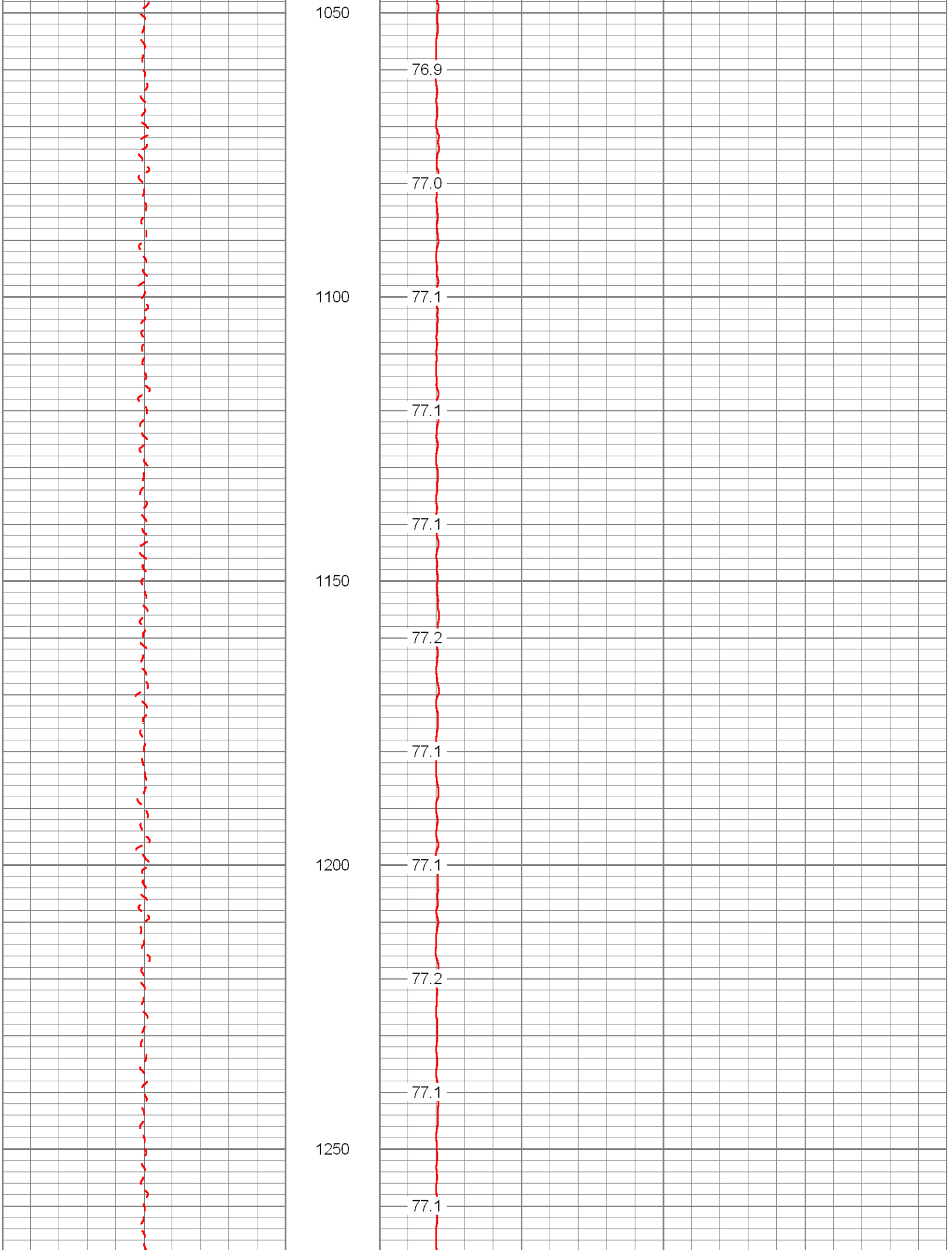
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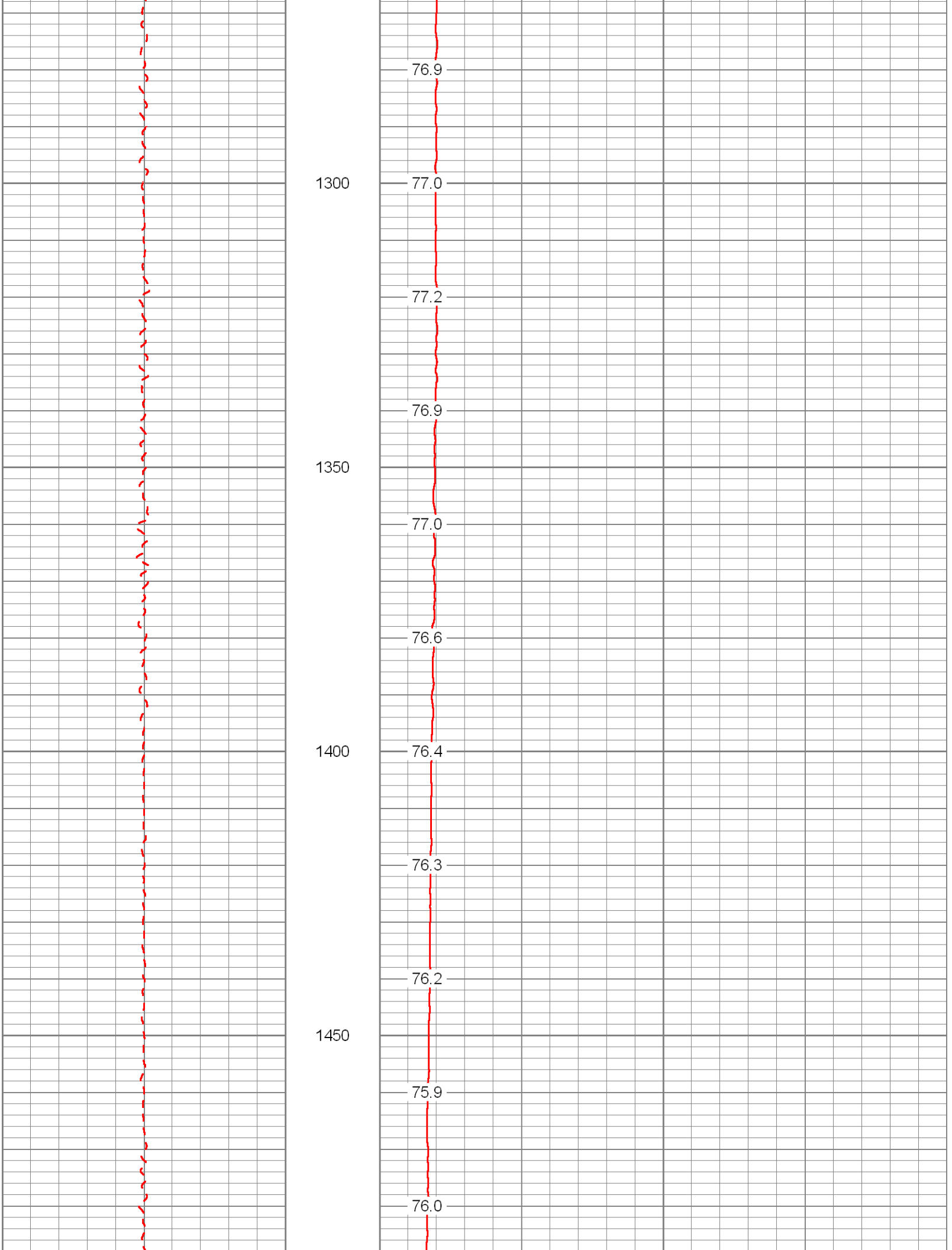
77.1
77.2
77.1
1250
77.1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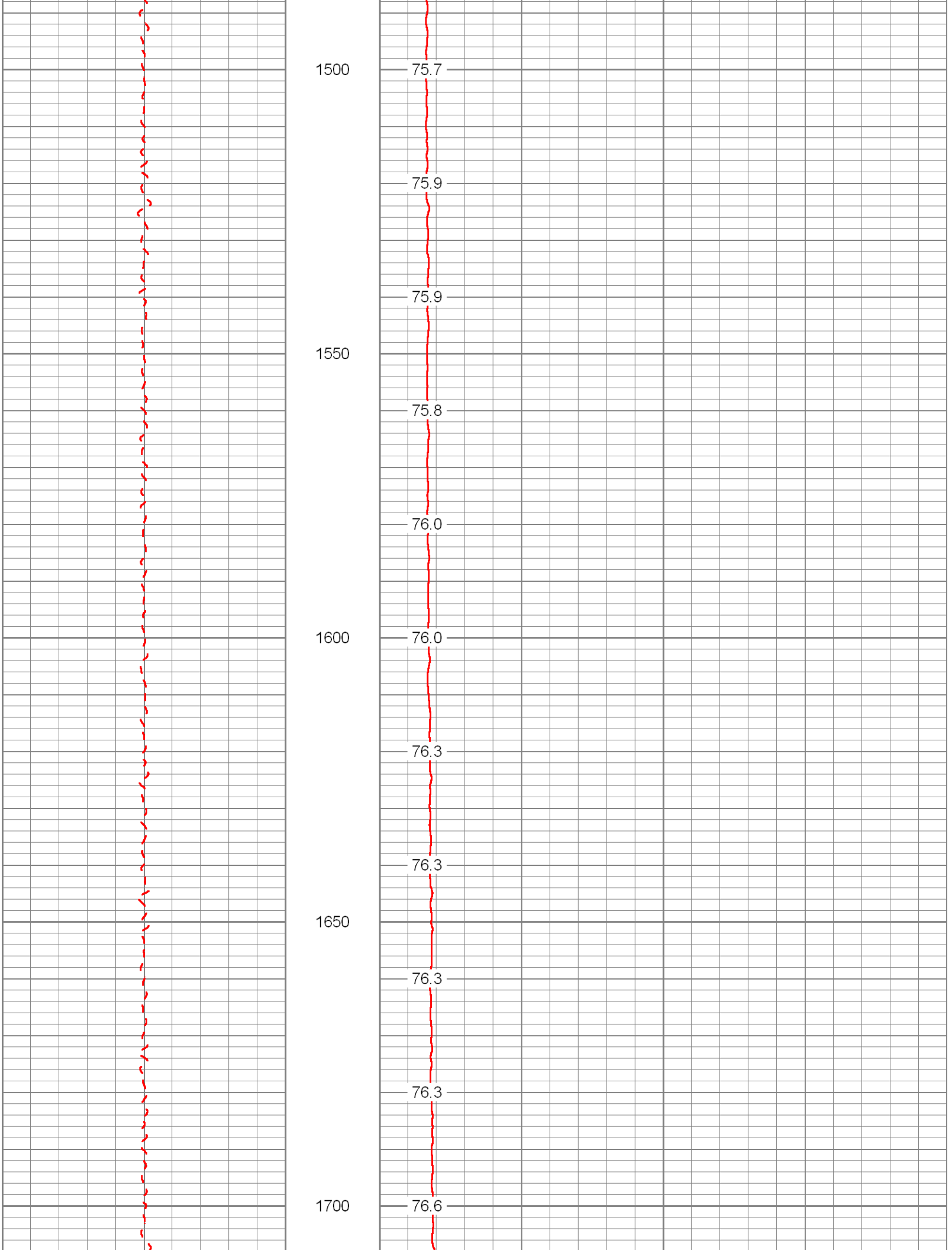
76.0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75.9
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1600
76.0
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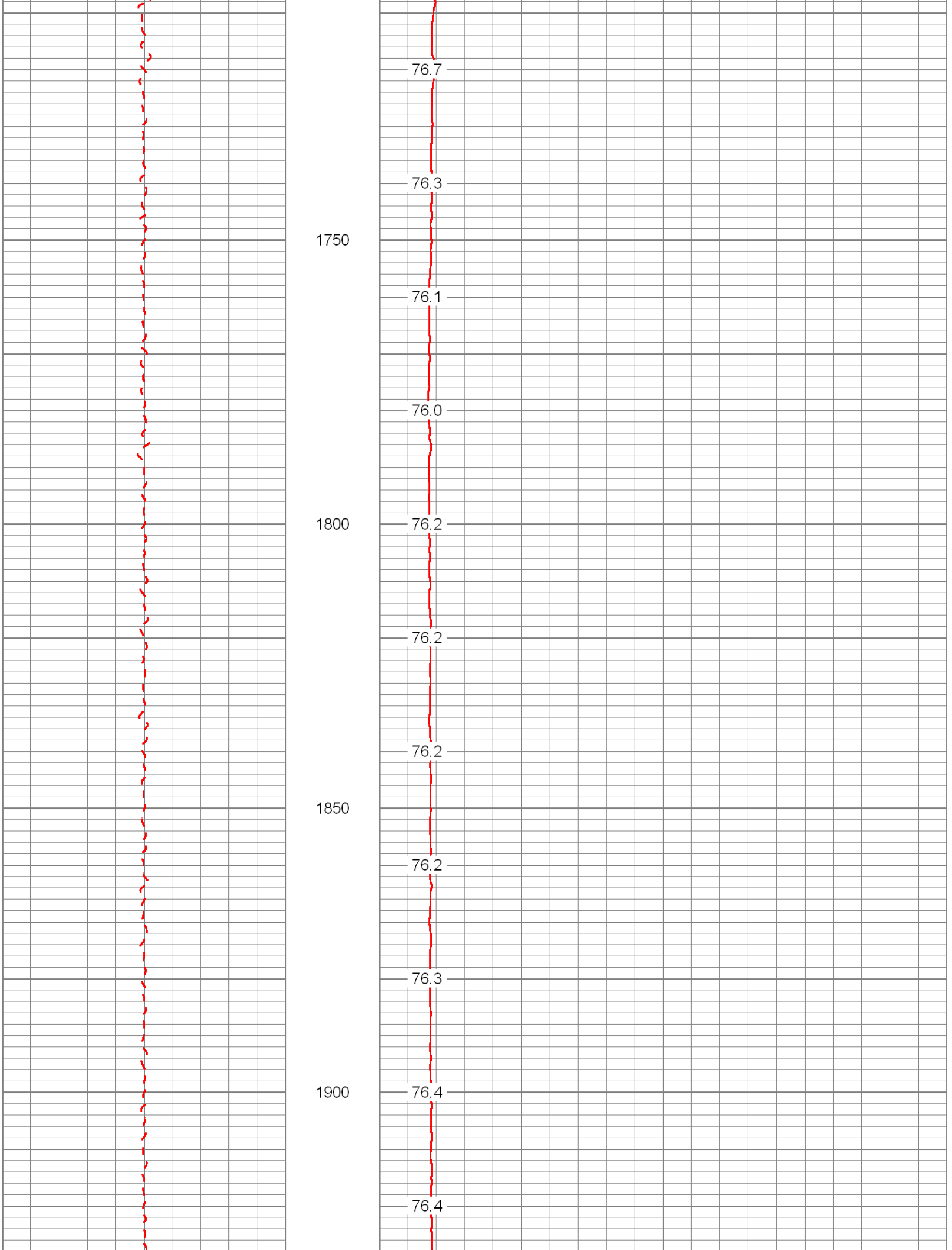
76.3
76.3
1700
76.6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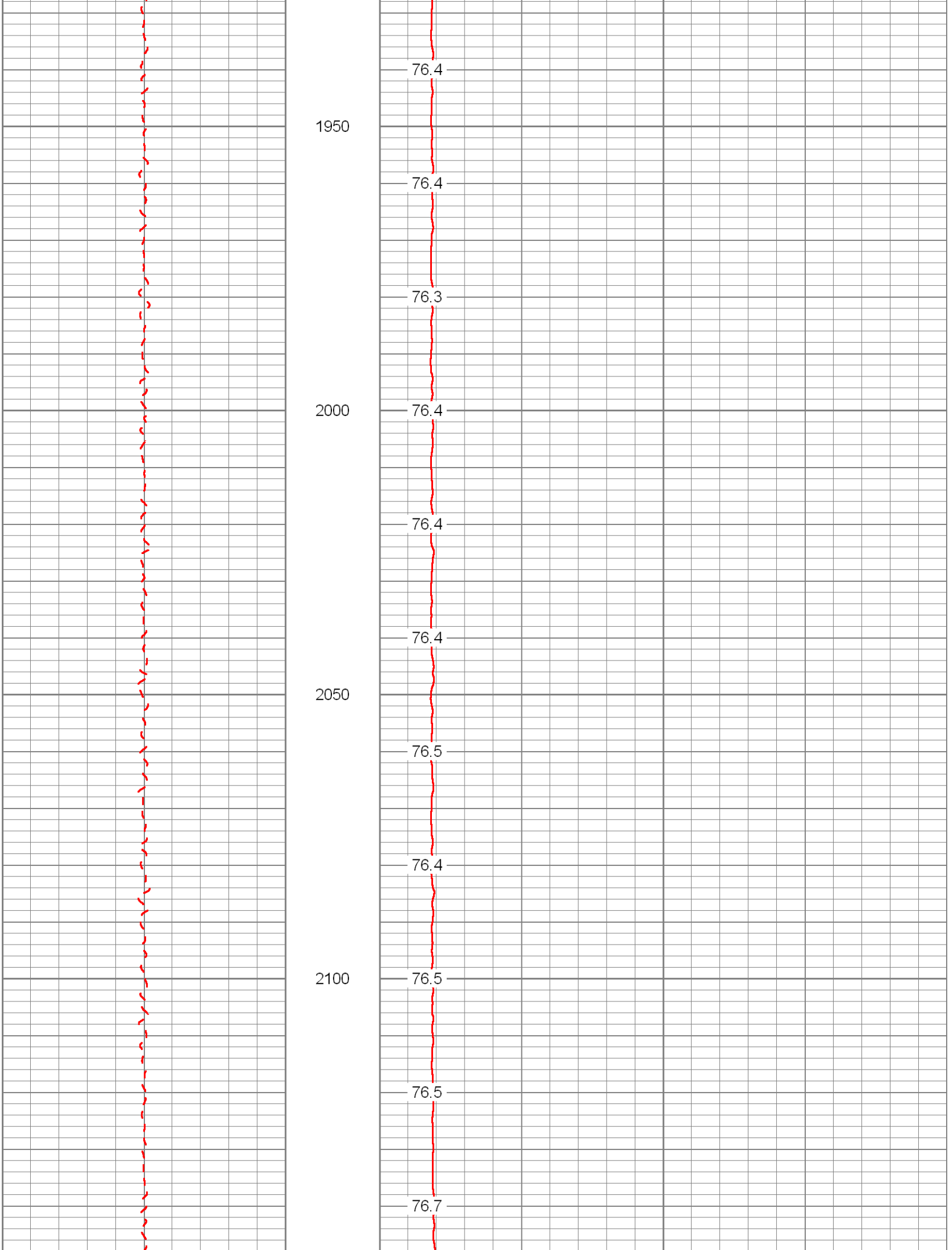
76.2
76.2
1850
76.2
76.3
1900
76.4
76.4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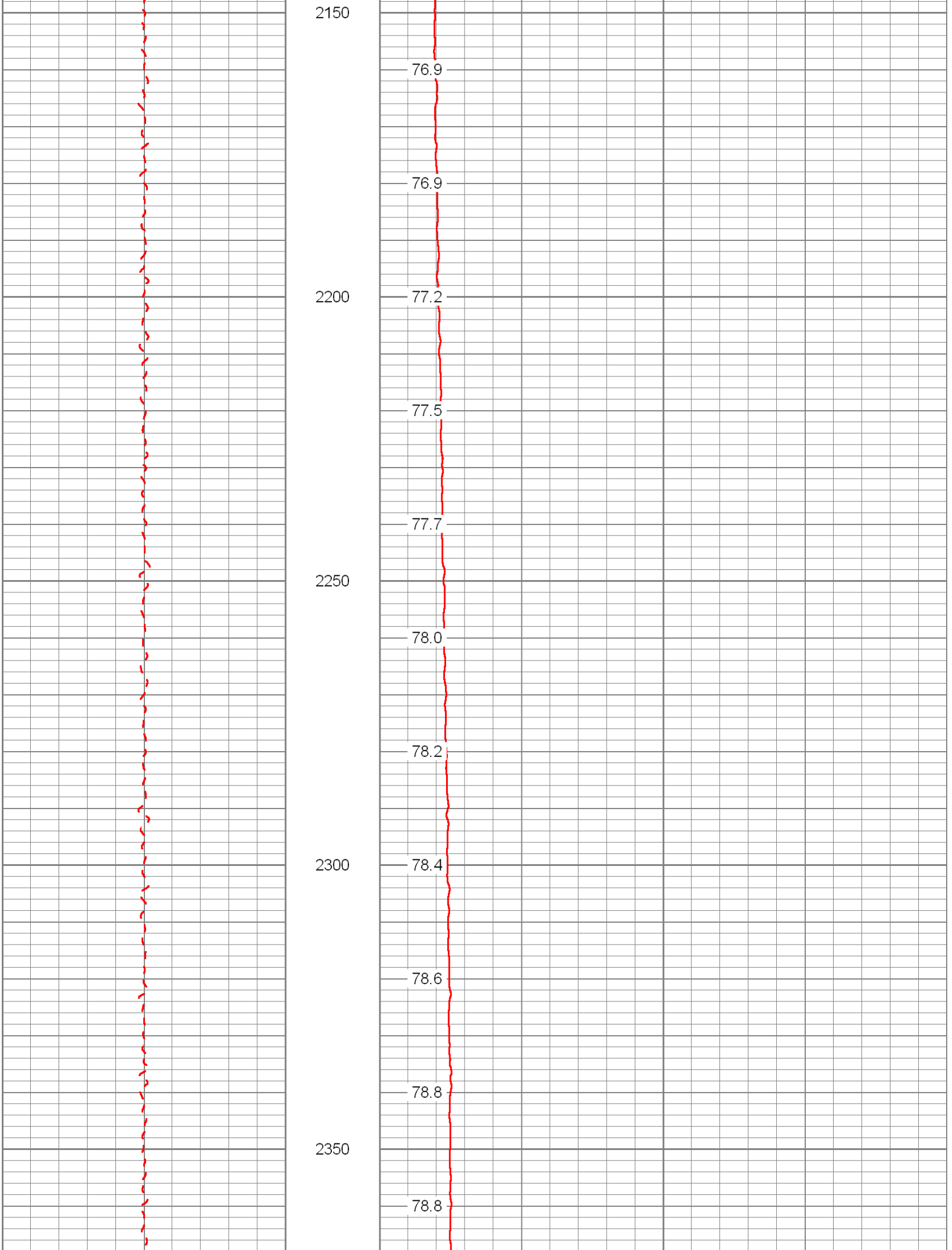
76.4
2050
76.5
76.4
2100
76.5
76.5
76.7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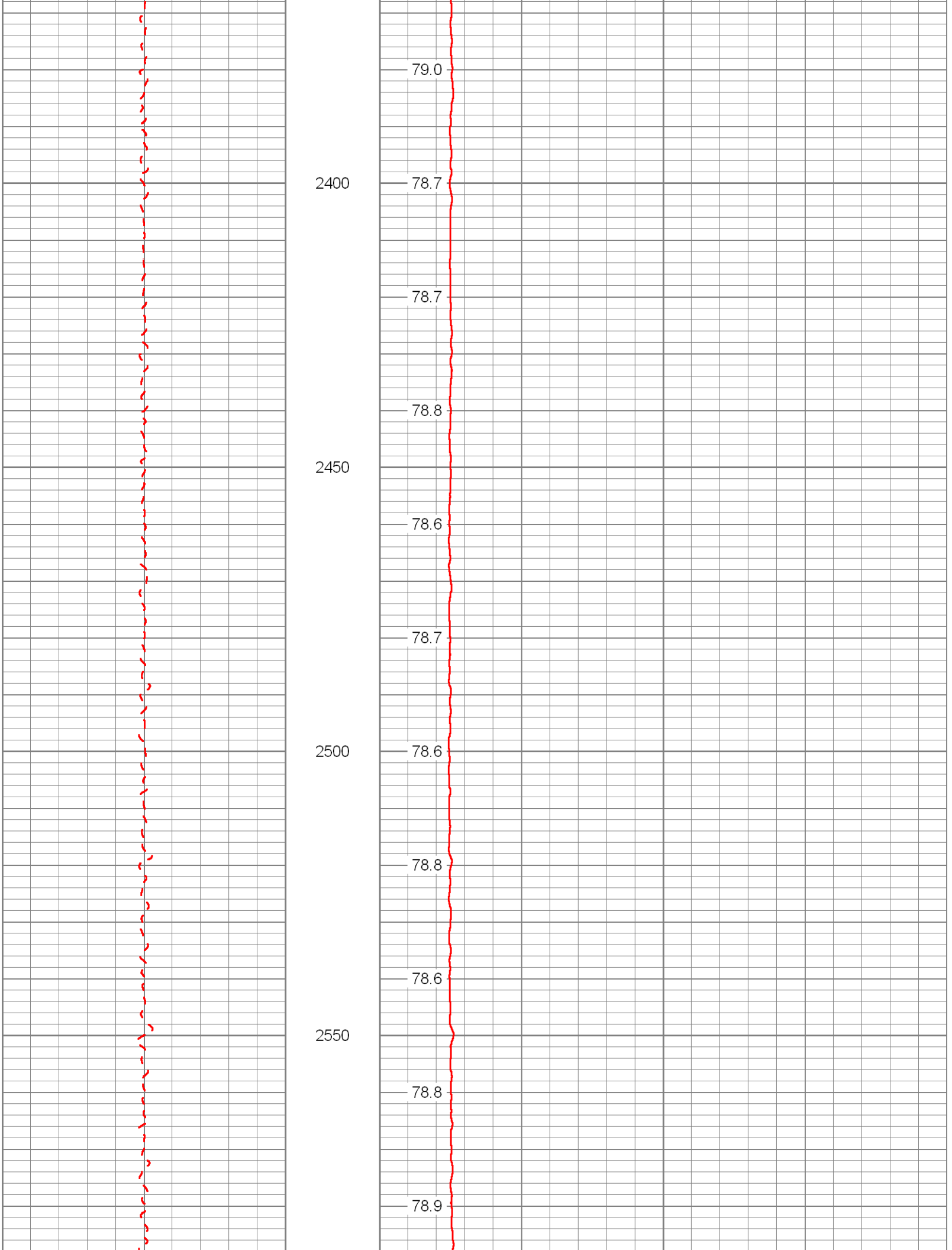
78.8
2350
78.8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2400
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2500
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78.8
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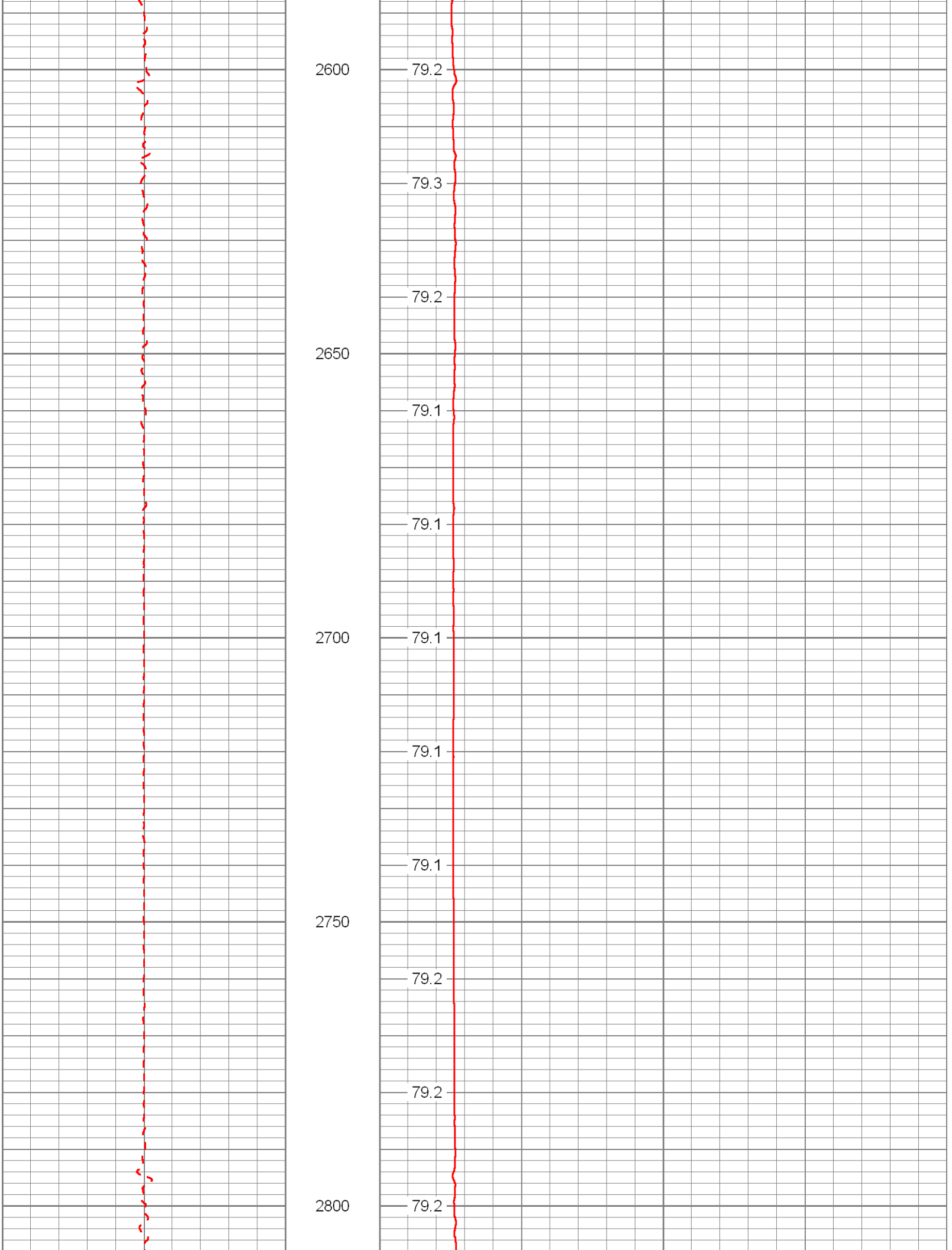
2550
78.8
78.9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79.3
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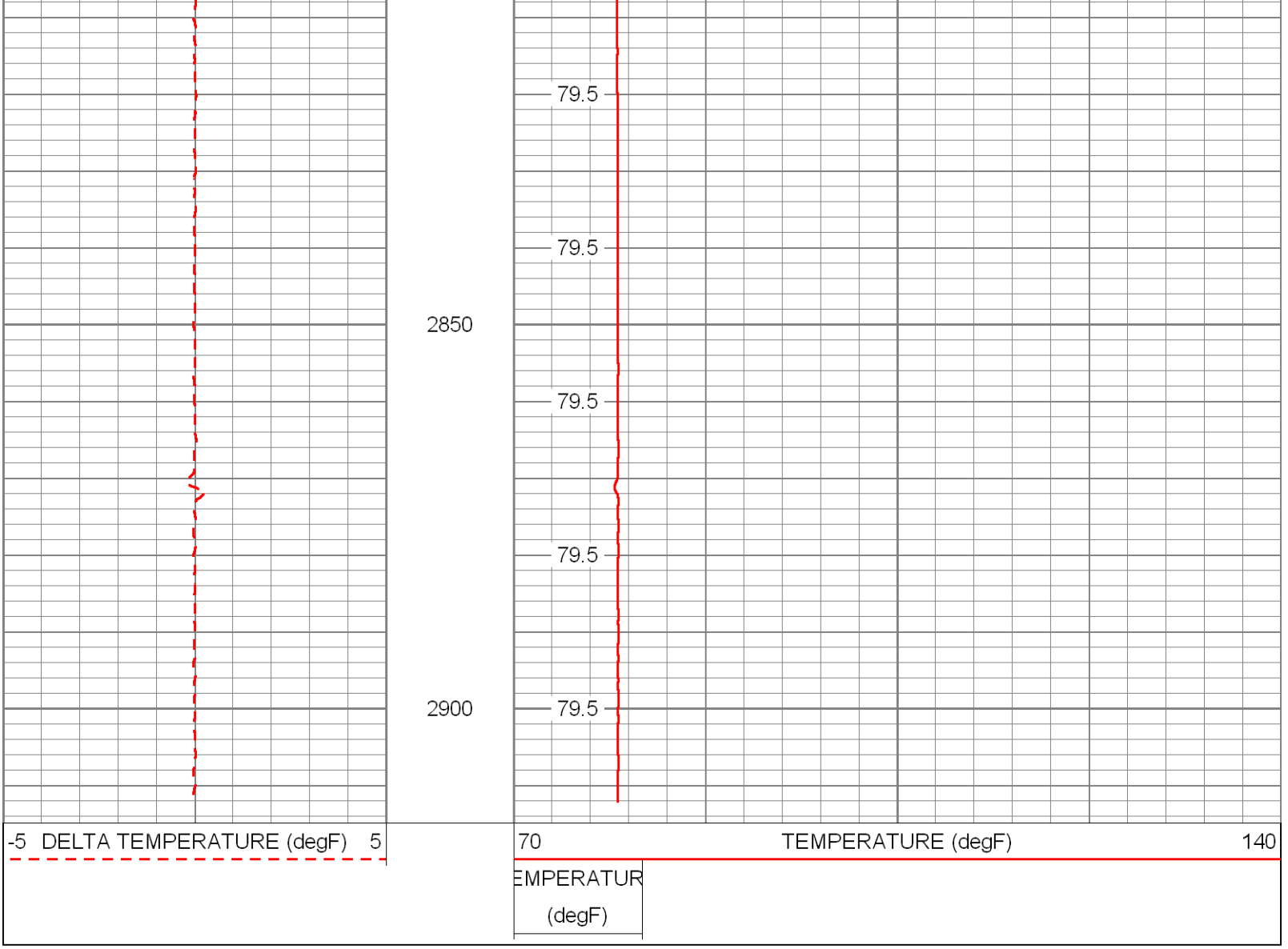
2650
79.1
79.1
2700
79.1
79.1
79.1
2750
79.2
79.2
2800
79.2



Calibration Report

Database File: sdwwtp-iw-4.db
Dataset Pathname: pass1
Dataset Creation: Fri Jun 28 08:12:49 2013 by Log SOC 110722

Temperature Calibration Report

Serial Number: 952
Tool Model: RTS
Performed: Wed Jun 19 08:20:23 2013

Point #	Reading		Reference	
1	439.20	cps	33.00	degF
2	912.13	cps	85.00	degF
3	1637.63	cps	155.00	degF
4		cps		degF
5		cps		degF
6		cps		degF
7		cps		degF
8		cps		degF
9		cps		degF
10		cps		degF

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)

				TEMP-RTS (952)	25.50	1.69	70.00
TEMP	0.10						

Dataset: sdwwtp-iw-4.db: field/well/run1/pass1
Total Length: 25.50 ft
Total Weight: 70.00 lb
O.D. 1.69 in

Appendix F

Television Survey

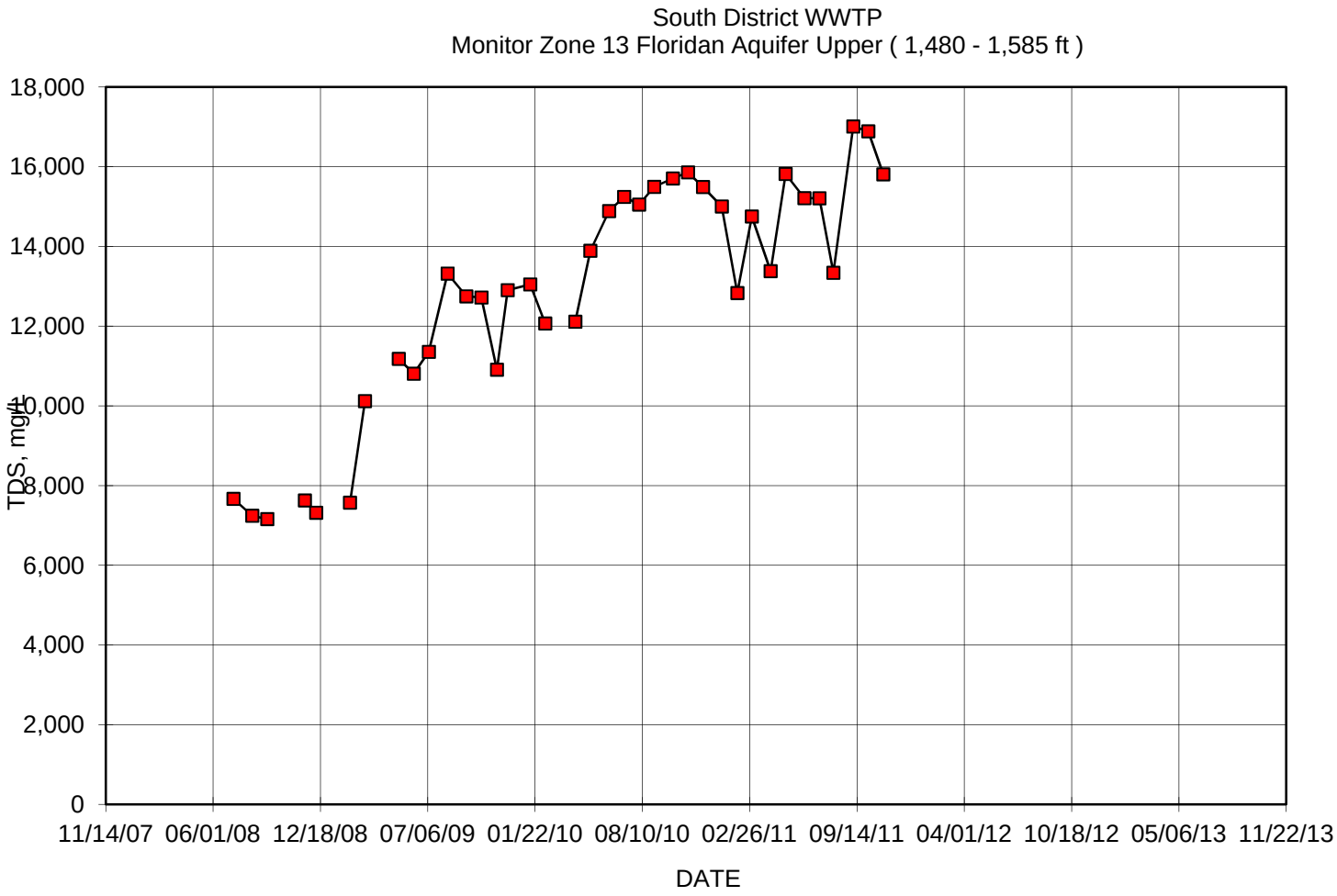
Appendix G

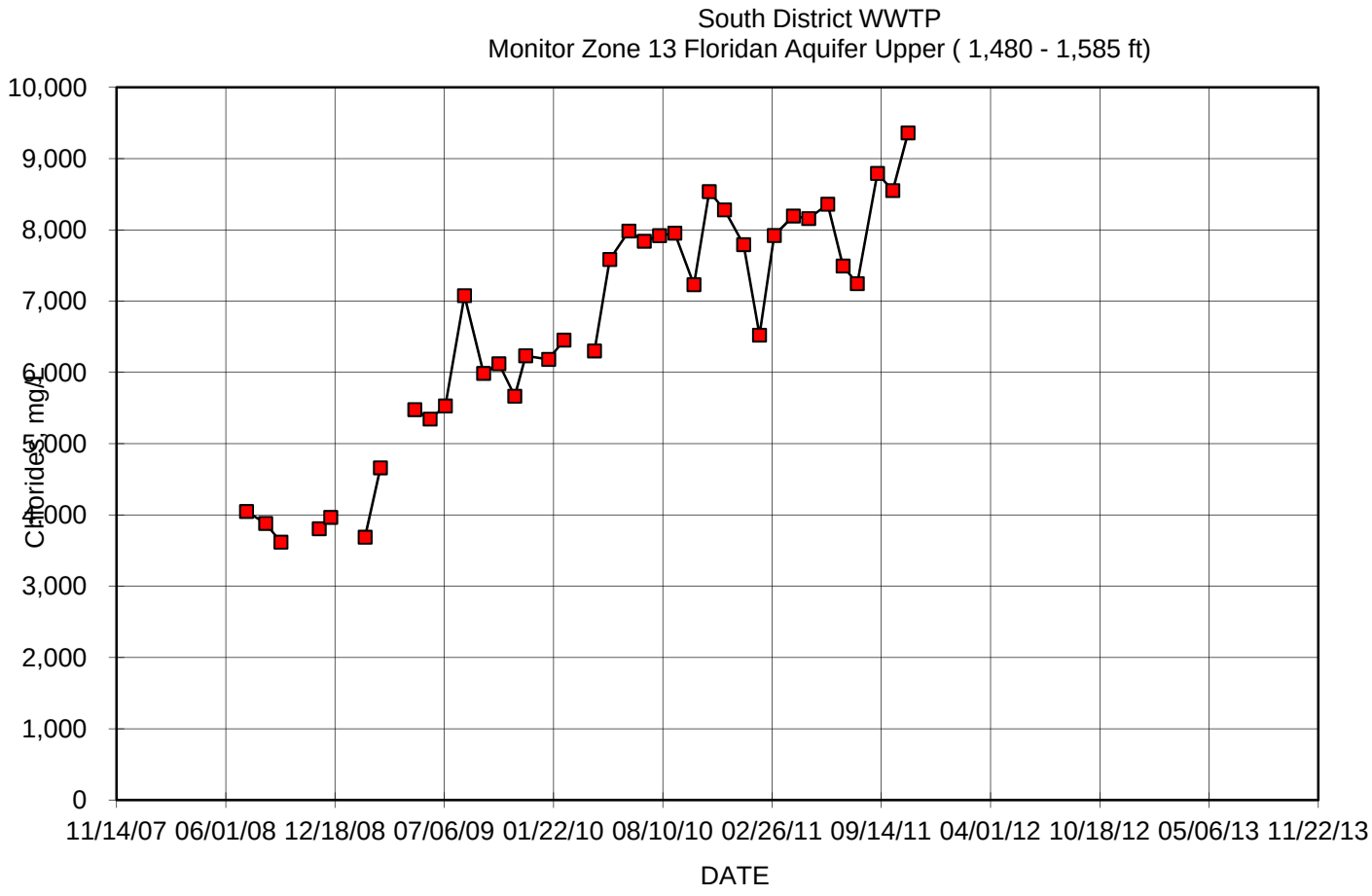
5 year Monitoring Data

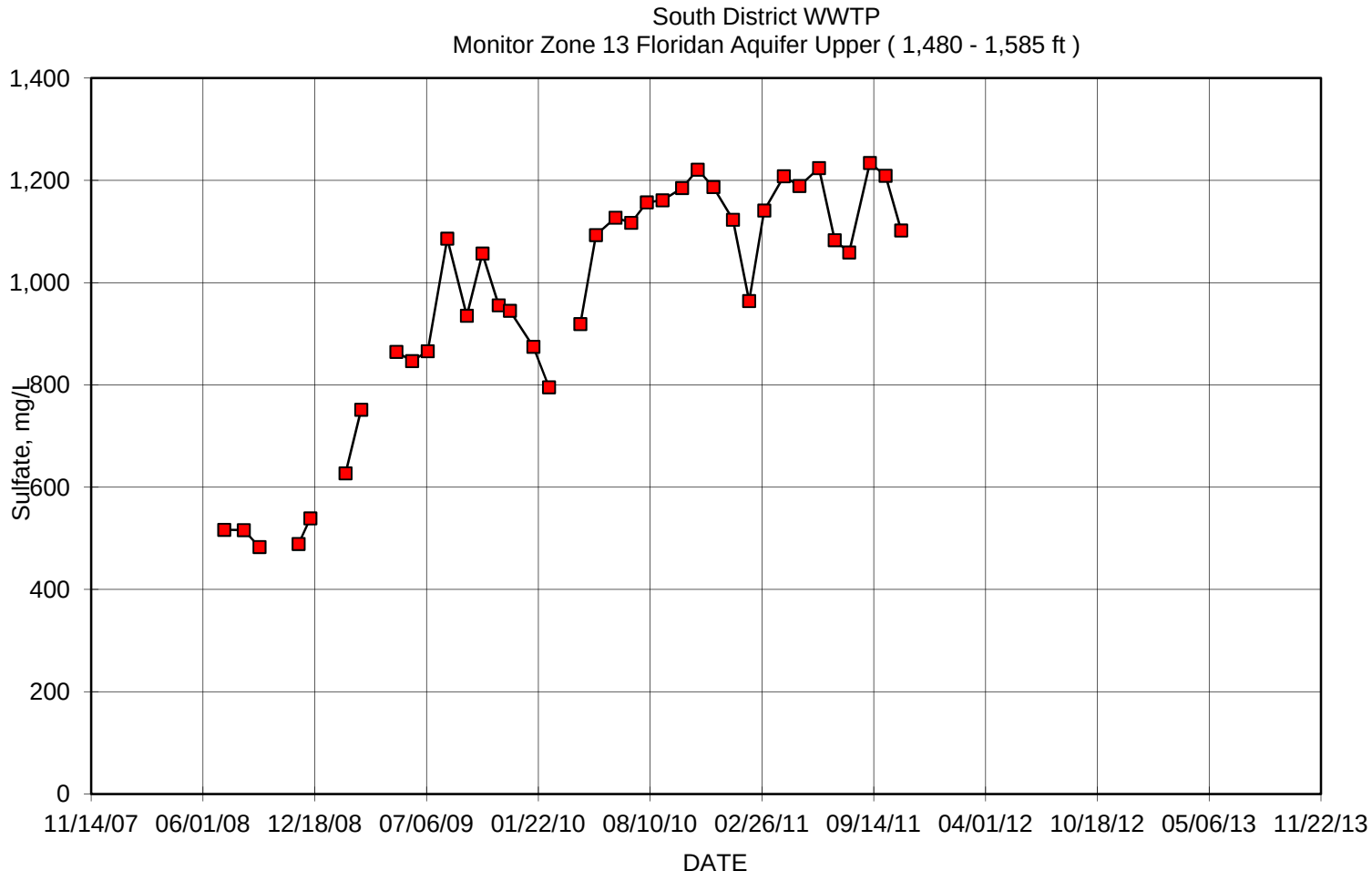
FA-13 Upper

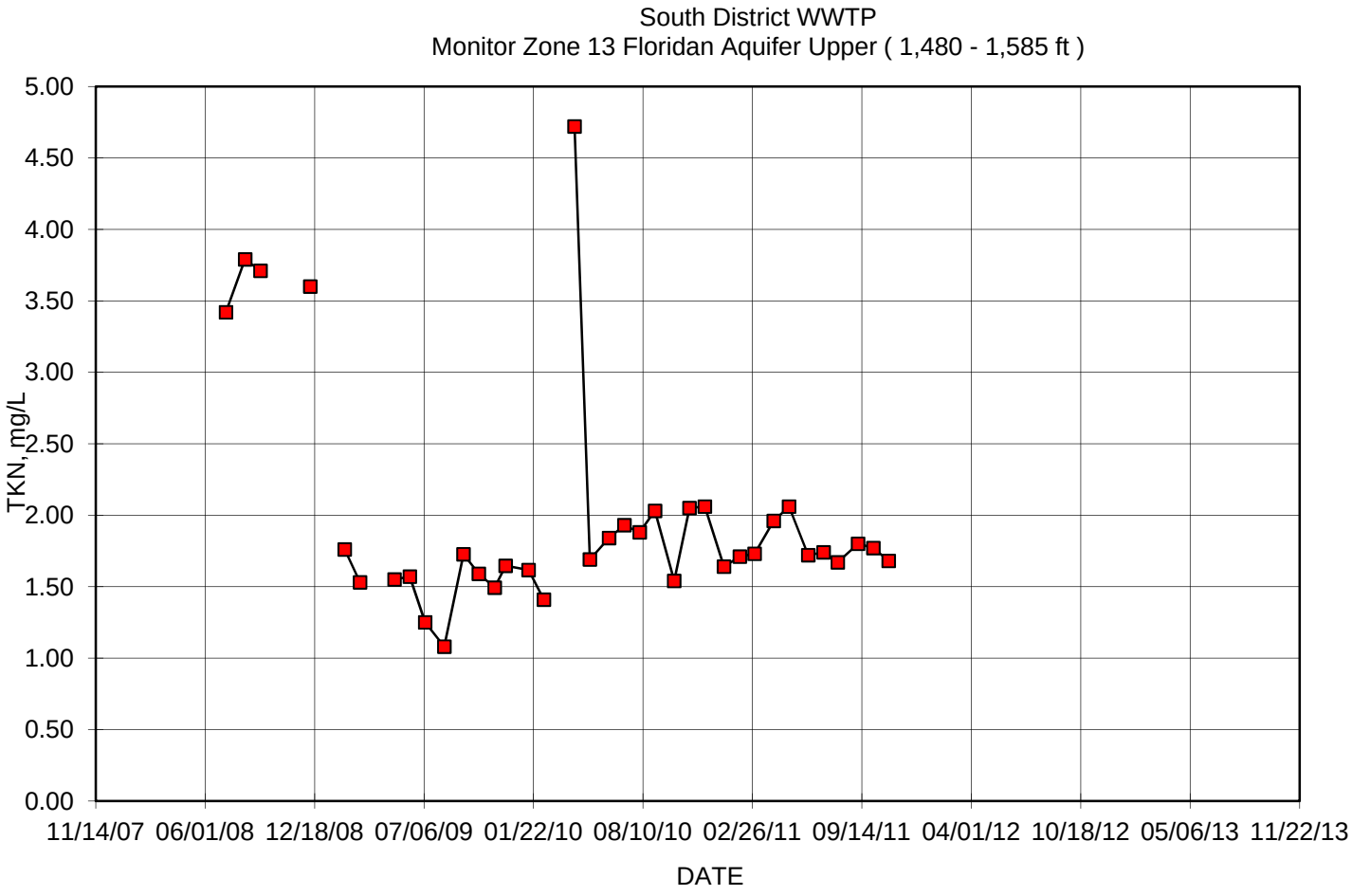
Date	TDS, mg/L	Sulfate, mg/L	Chlorides, mg/L	TKN, mg/L	NH3, mg/L	Conductivity, Micromho/cm	Temp., C	Temp., F	pH	TP, mg/L	TSS mg/L	NO_3 mg/L	NO_2 mg/L	Sodium, mg/L	Gross Alpha, pCi/L	Radium 226, pCi/L	Radium 228, pCi/L
07/09/08	7,668	517	4,049	3.42	1.79	11,820	24	74	7.9	0.01	1.76	0.03	0.00				
08/13/08	7,244	516	3,881	3.79	2.91	11,920	24	75	7.9	0.01	5.80	0.08	0.05				
09/10/08	7,160	483	3,618	3.71	2.76	11,830	25	76	7.6	0.03	1.76	0.08	0.05				
10/08/08																	
11/19/08	7,628	489	3,806			12,000	24	74	7.9	0.00	5.80	0.03	0.01				
12/10/08	7,320	539	3,966	3.60	2.76	11,810	23	74	7.7	0.02	3.60	0.03	0.00				
01/14/09																	
02/11/09	7,572	627	3,688	1.76	1.36	12,890	23	73	7.5	0.21	2.20	0.01	0.00				
03/11/09	10,120	752	4,661	1.53	1.15	14,320	23	73	7.3	0.24	4.20	0.00	0.00				
04/08/09																	
05/13/09	11,180	865	5,478	1.55	1.24	16,700	23	74	7.8	0.00	4.20	0.00	0.00				
06/10/09	10,808	847	5,345	1.57	1.15	16,030	24	76	7.9	0.24	3.60	0.00	0.00				
07/08/09	11,356	866	5,529	1.25	0.87	17,340	24	75	7.7	0.03	7.00	0.00	0.00				
08/12/09	13,320	1,086	7,077	1.08	1.43	21,800	24	76	7.6	0.01	6.80	0.00	0.00				
09/16/09	12,748	935	5,986	1.73	1.09	24,430			7.6	0.01		0.05	0.01	3420	6.2	5.8	0.9
10/14/09	12,720	1,057	6,121	1.59	1.23	19,730			7.6	0.02		0.02	0.02	3530	6.4	5.7	0.8
11/12/09	10,908	956	5,666	1.49	1.20	17,700			7.7	0.02		0.00	0.00	2960	5.9	4.4	1.0
12/02/09	12,904	945	6,233	1.65	1.29	19,280	24	76	7.8	0.02	8.00	0.00	0.00	3150	5.3	4.9	0.8
01/13/10	13,048	875	6,183	1.62	1.32	19,820	21	70	7.8	0.01	10.20	0.00	0.00	2840	6.5	6.1	0.7
02/10/10	12,068	795	6,453	1.41	1.19	19,300	24	75	7.8	0.01	5.20	0.00	0.00	3670	4.4	3.1	0.9
03/03/10																	
04/07/10	12,112	919	6,301	4.72	1.55	18,760	24	75	7.6	0.01	3.20	0.01	0.00	3250	7.2	5.7	0.9
05/05/10	13,892	1,093	7,584	1.69	1.22	21,130	25	76	7.8	0.01	3.60	0.01	0.00	3880	8.3	6.1	0.9
06/09/10	14,888	1,127	7,983	1.84	1.31	22,870	24	75	7.7	0.07	7.00	0.01	0.00	3740	7.5	7.0	0.7
07/07/10	15,244	1,117	7,840	1.93	1.52	23,580	24	75	7.8	0.01	5.60	0.01	0.00	3840	6.8	7.0	0.9
08/04/10	15,052	1,157	7,918	1.88	1.82	21,610	24	76	7.7	0.13	2.80	0.00	0.00	4080	7.9	6.2	0.7
09/01/10	15,496	1,161	7,953	2.03	1.92	23,640	24	76	7.4	0.02	28.40	0.01	0.00	3970	6.5	5.2	0.8
10/06/10	15,708	1,185	7,230	1.54	1.91	24,060	24	74	7.5	0.02	3.80	0.01	0.00	4310	5.4	5.0	0.8
11/03/10	15,860	1,221	8,536	2.05	1.81	23,690	23	73	7.6	0.02	5.40	0.00	0.00	4390	5.0	5.5	0.7
12/01/10	15,492	1,187	8,280	2.06	1.84	23,900	24	75	7.8	0.02	4.60	0.01	0.00	4050	7.2	6.6	0.9
01/05/11	15,004	1,123	7,792	1.64	1.78	22,550	24	75	7.7	0.02	3.60	0.01	0.01	4150	6.8	6.5	0.7
02/03/11	12,832	964	6,522	1.71	1.64	18,430	23	74	7.2	0.23	3.20	0.01	0.00	3360	5.5	5.8	0.7
03/02/11	14,752	1,141	7,920	1.73	2.03	23,020	23	74	7.4	0.02	10.50	0.00	0.00	4000	8.0	7.3	0.8

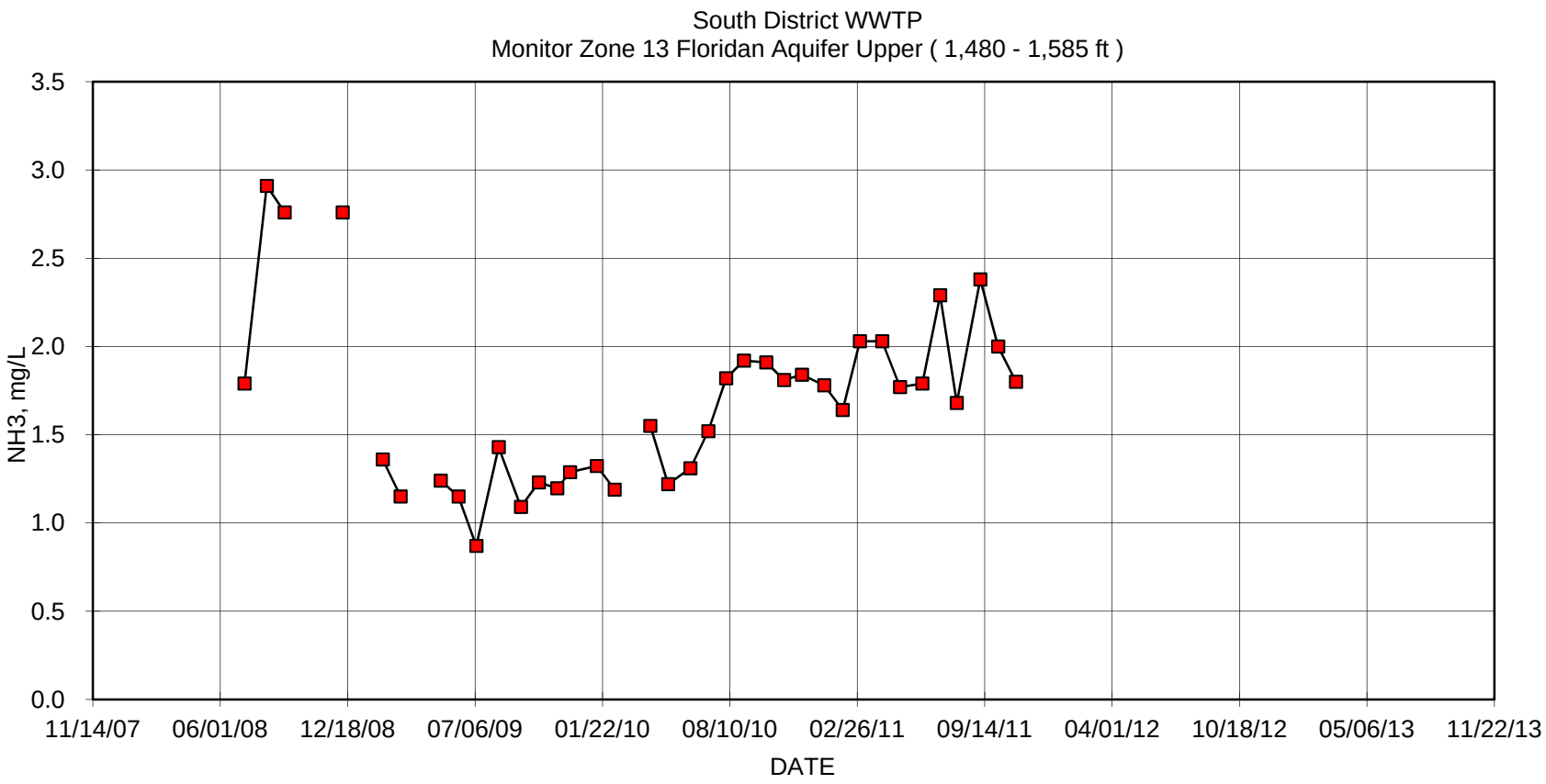
04/06/11	13,380	1,208	8,194	1.96	2.03	21,920	23	74	7.9	0.02	5.10	0.01	0.00	3940	6.6	6.1	0.8
05/04/11	15,820	1,189	8,158	2.06	1.77	23,040	24	75	7.9	0.02	6.30	0.01	0.00	4120	6.3	5.4	0.8
06/08/11	15,212	1,224	8,359	1.72	1.79	23,200	24	76	7.7	0.04	4.70	0.01	0.00	4170	5.1	4.8	0.8
07/06/11	15,210	1,083	7,492	1.74	2.29	22,980	24	75	7.6	0.02	5.60	0.01	0.00	4190	5.7	5.0	0.7
08/01/11	13,340	1,059	7,245	1.67	1.68	20,420	25	77	7.6	0.02	6.90	0.00	0.00	3850	5.8	5.3	0.9
09/07/11	17,010	1,234	8,792	1.80	2.38	24,990	24	76	7.7	0.04	5.50	0.01	0.00	4700	6.9	6.5	1.0
10/05/11	16,890	1,209	8,551	1.77	2.00	23,950	24	75	7.8	0.04	6.10	0.00	0.00	4620	7.2	7.1	1.0
11/02/11	15,810	1,102	9,360	1.68	1.80	24,280	27	81	7.0	0.03	5.30	0.01	0.00	4680	6.1	5.2	1.1
12/07/11																	
01/04/12																	
02/06/13																	
03/04/13																	

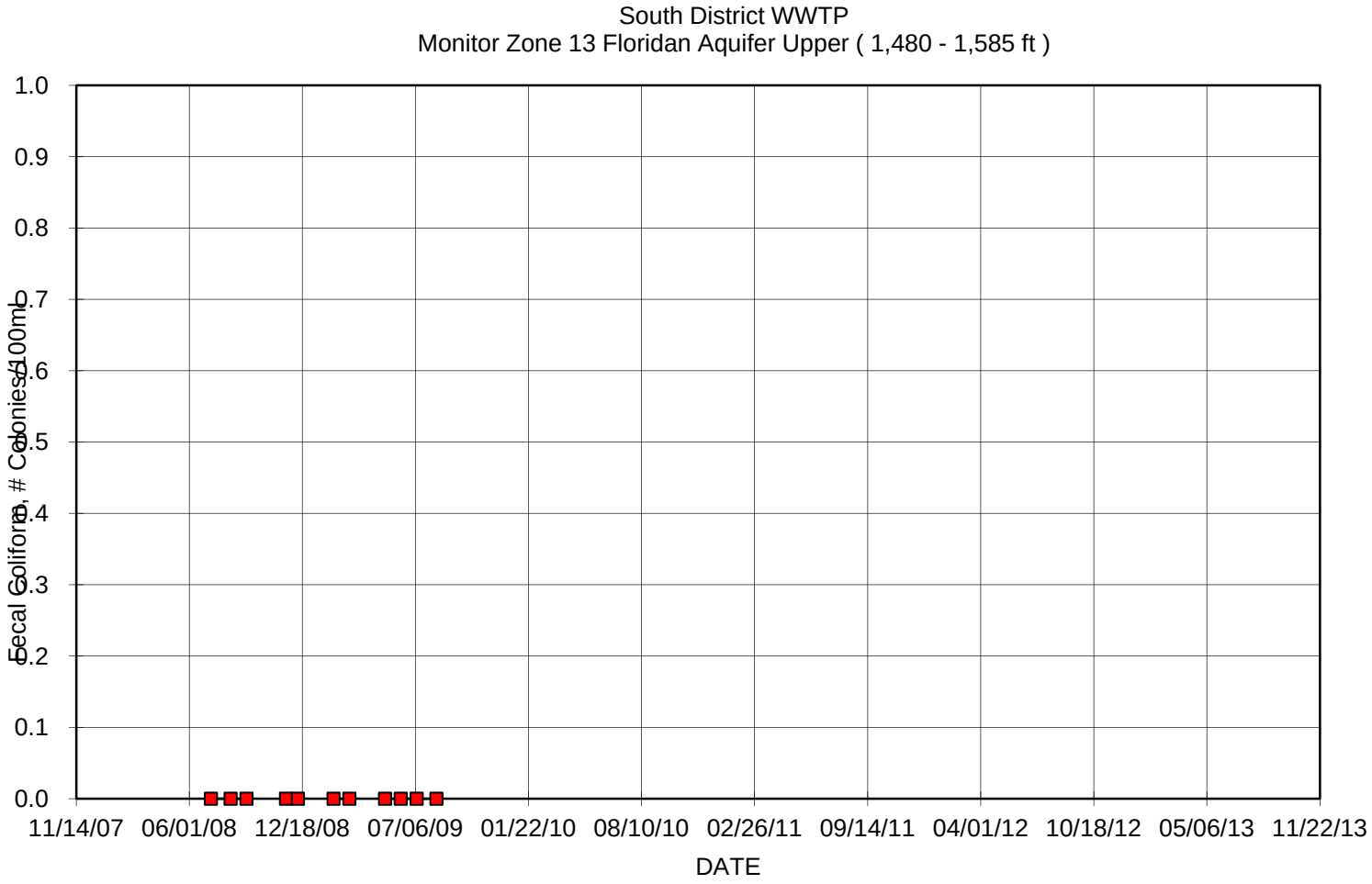

South District WWTP
Monitor Zone 13 Floridan Aquifer Upper (1,480 - 1,585 ft)
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
TDS, mg/L
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

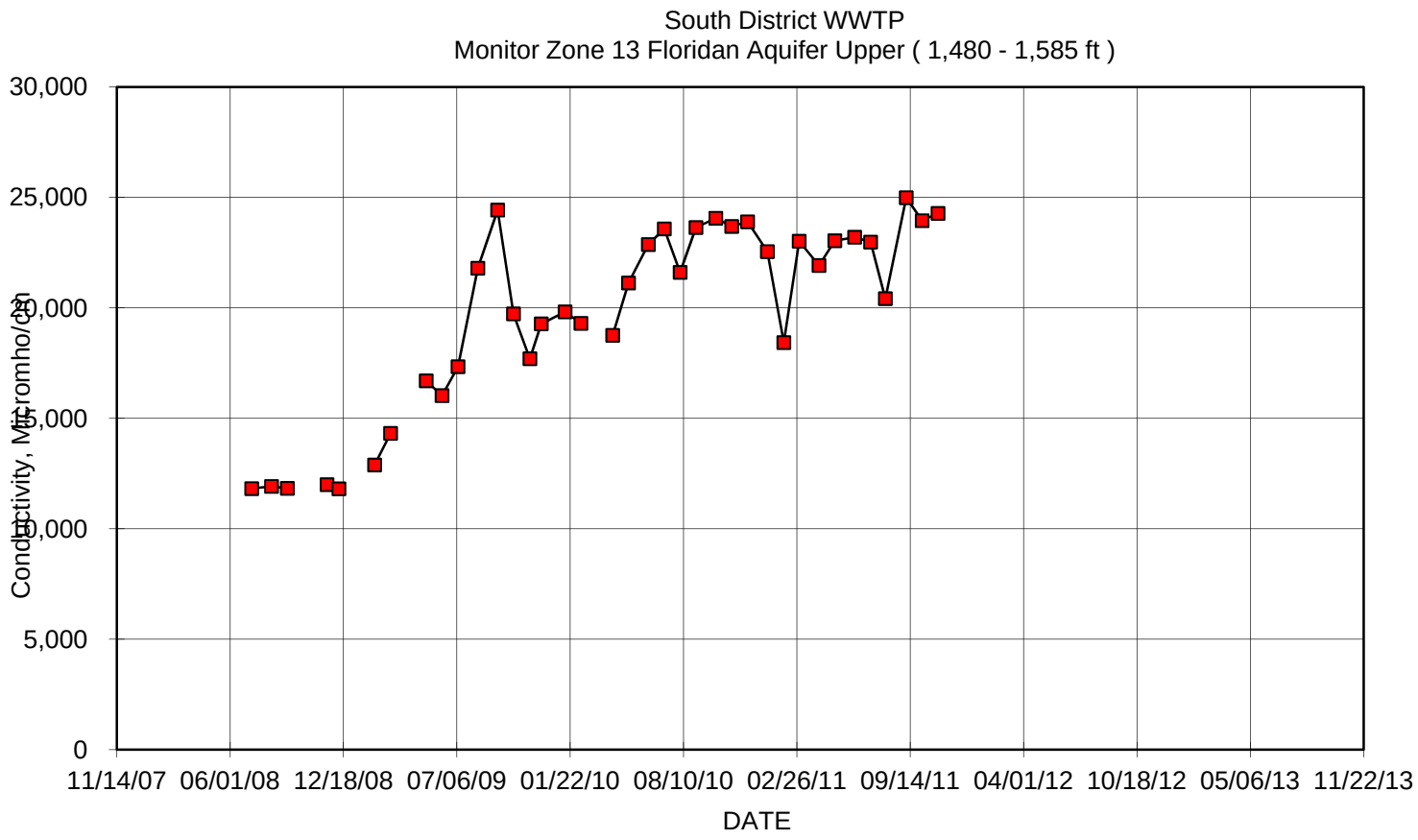

South District WWTP
Monitor Zone 13 Floridan Aquifer Upper (1,480 - 1,585 ft)
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
Chlorides, mg/L
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

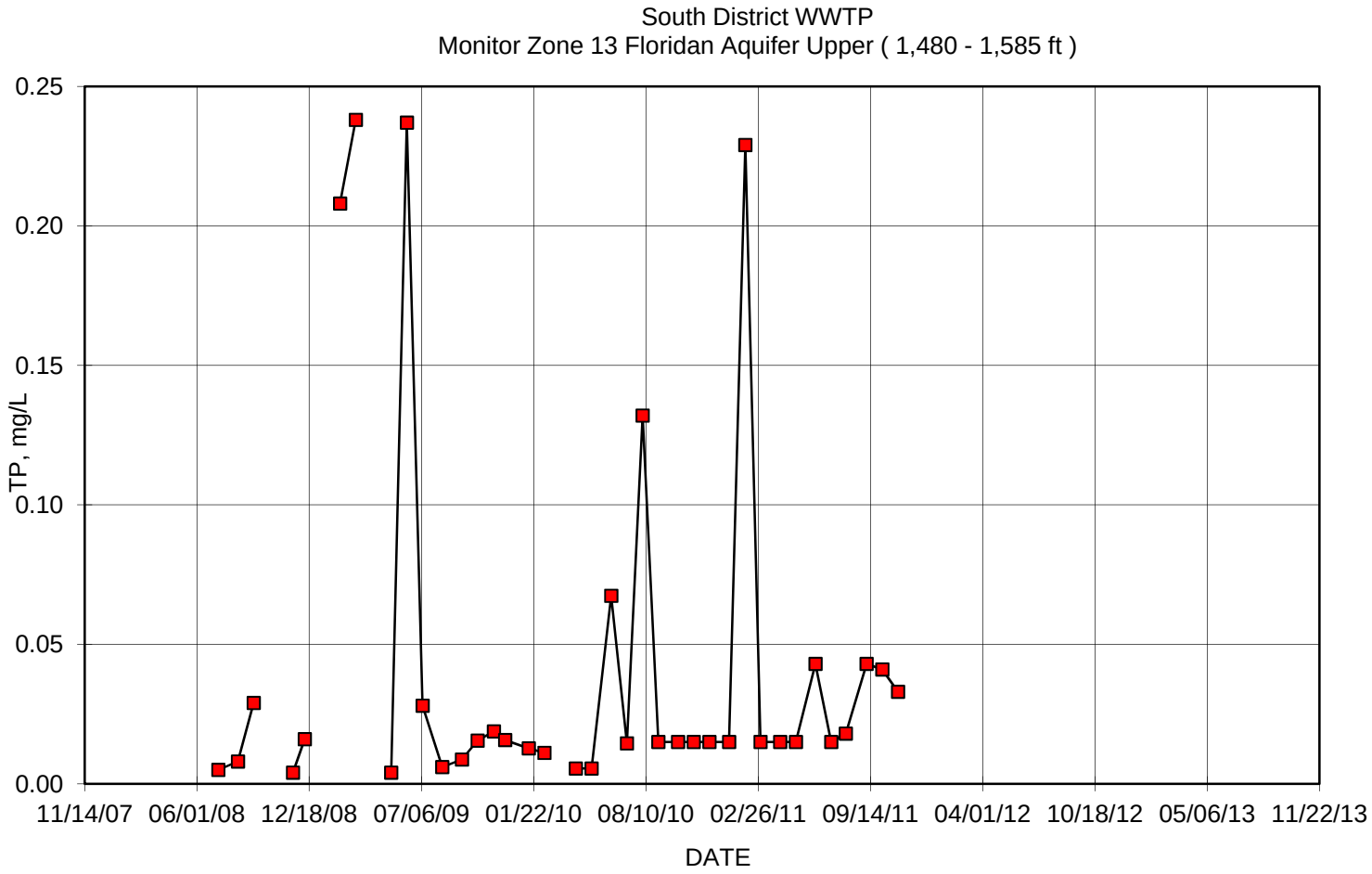

South District WWTP
Monitor Zone 13 Floridan Aquifer Upper (1,480 - 1,585 ft)
Sulfate, mg/L
1,400
1,200
1,000
800
600
400
200
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

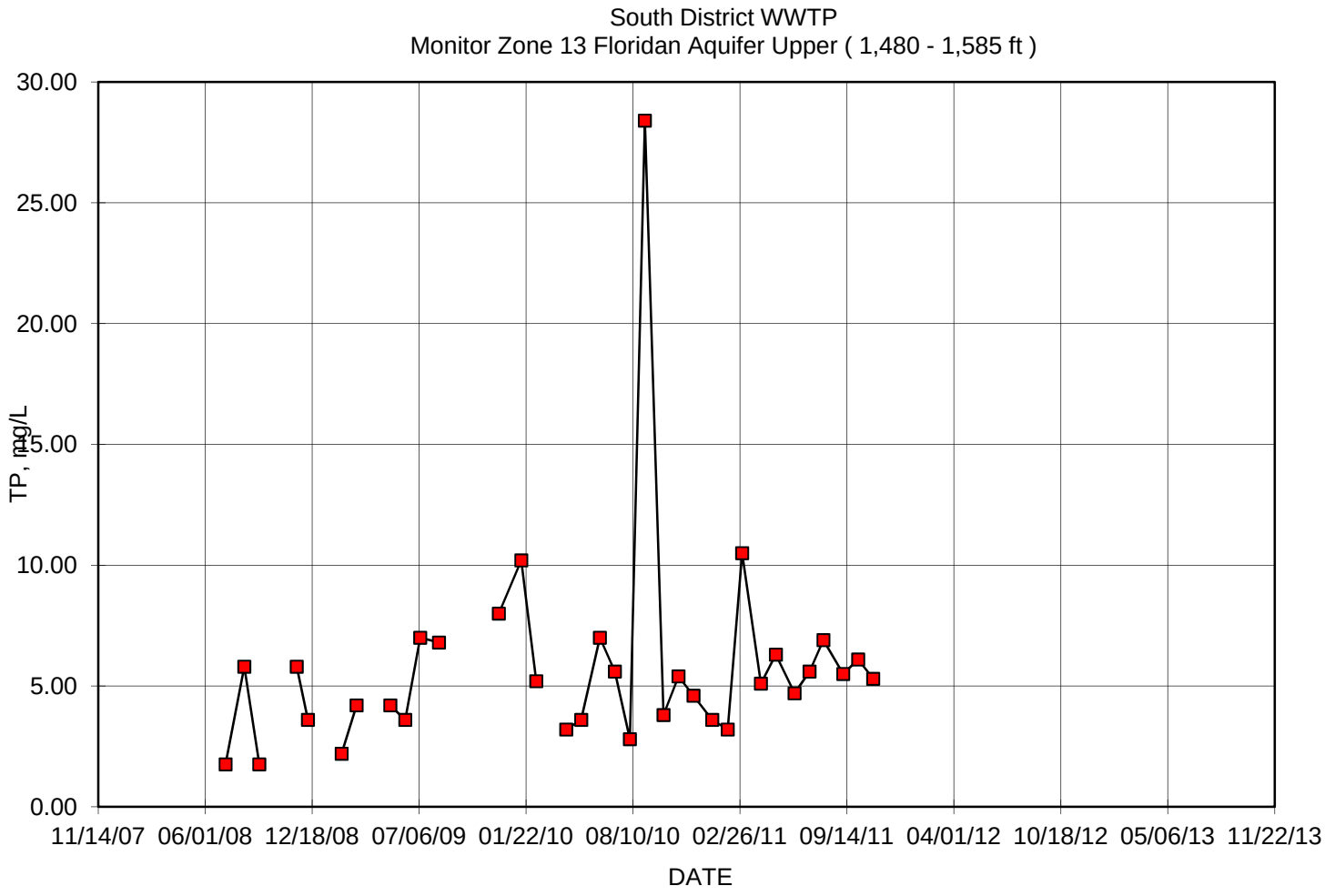

South District WWTP
Monitor Zone 13 Floridan Aquifer Upper (1,480 - 1,585 ft)
TKN, mg/L
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 13 Floridan Aquifer Upper (1,480 - 1,585 ft)
NH3, mg/L
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 13 Floridan Aquifer Upper (1,480 - 1,585 ft)
Fecal Coliform, # Colonies/100mL
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 13 Floridan Aquifer Upper (1,480 - 1,585 ft)
30,000
25,000
20,000
15,000
10,000
5,000
0
Conductivity, Micromho/cm
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

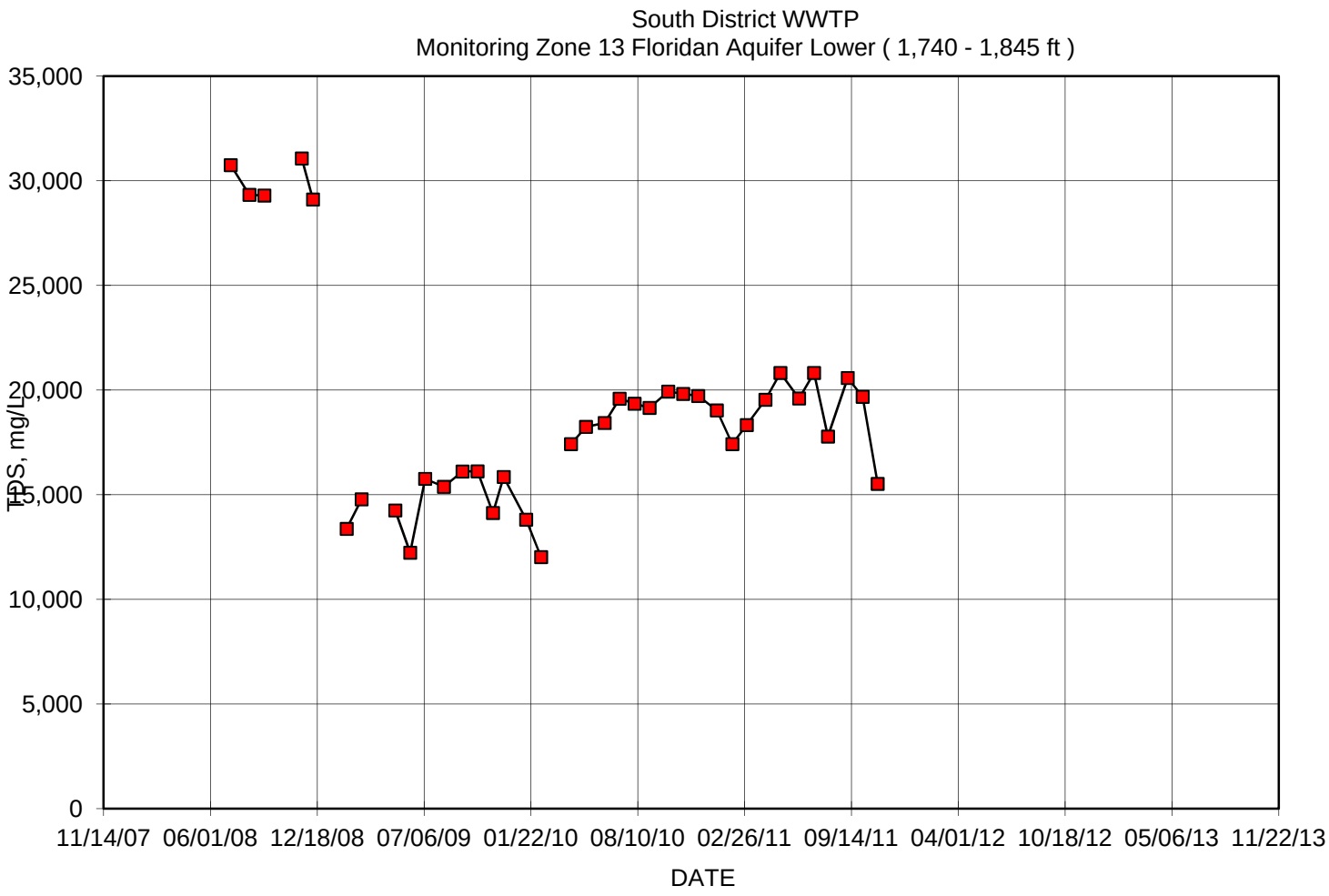

South District WWTP
Monitor Zone 13 Floridan Aquifer Upper (1,480 - 1,585 ft)
TP, mg/L
0.25
0.20
0.15
0.10
0.05
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

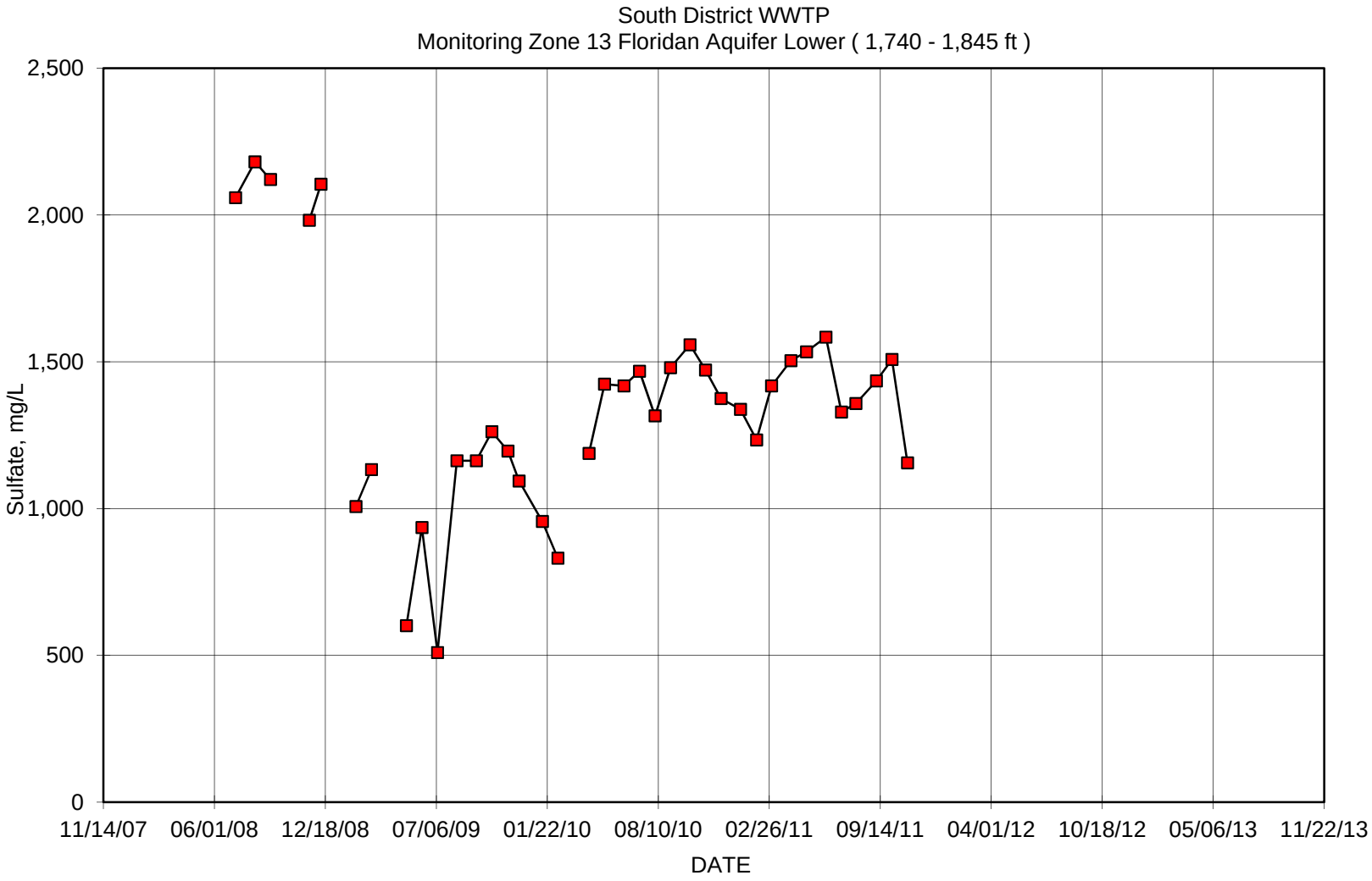

South District WWTP
Monitor Zone 13 Floridan Aquifer Upper (1,480 - 1,585 ft)
30.00
25.00
20.00
15.00
10.00
5.00
0.00
TP, mg/L
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

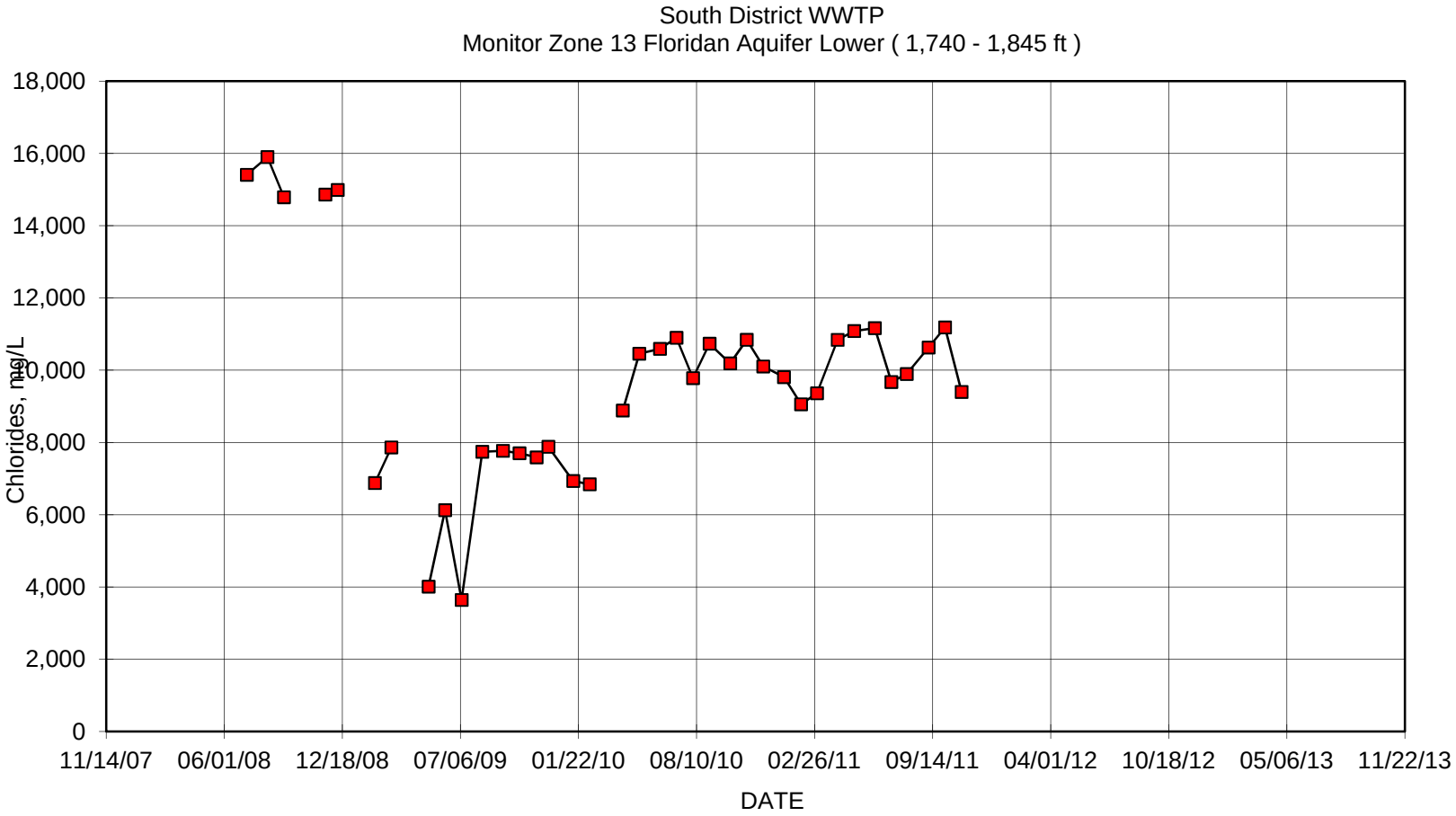
FA-13 Lower Data

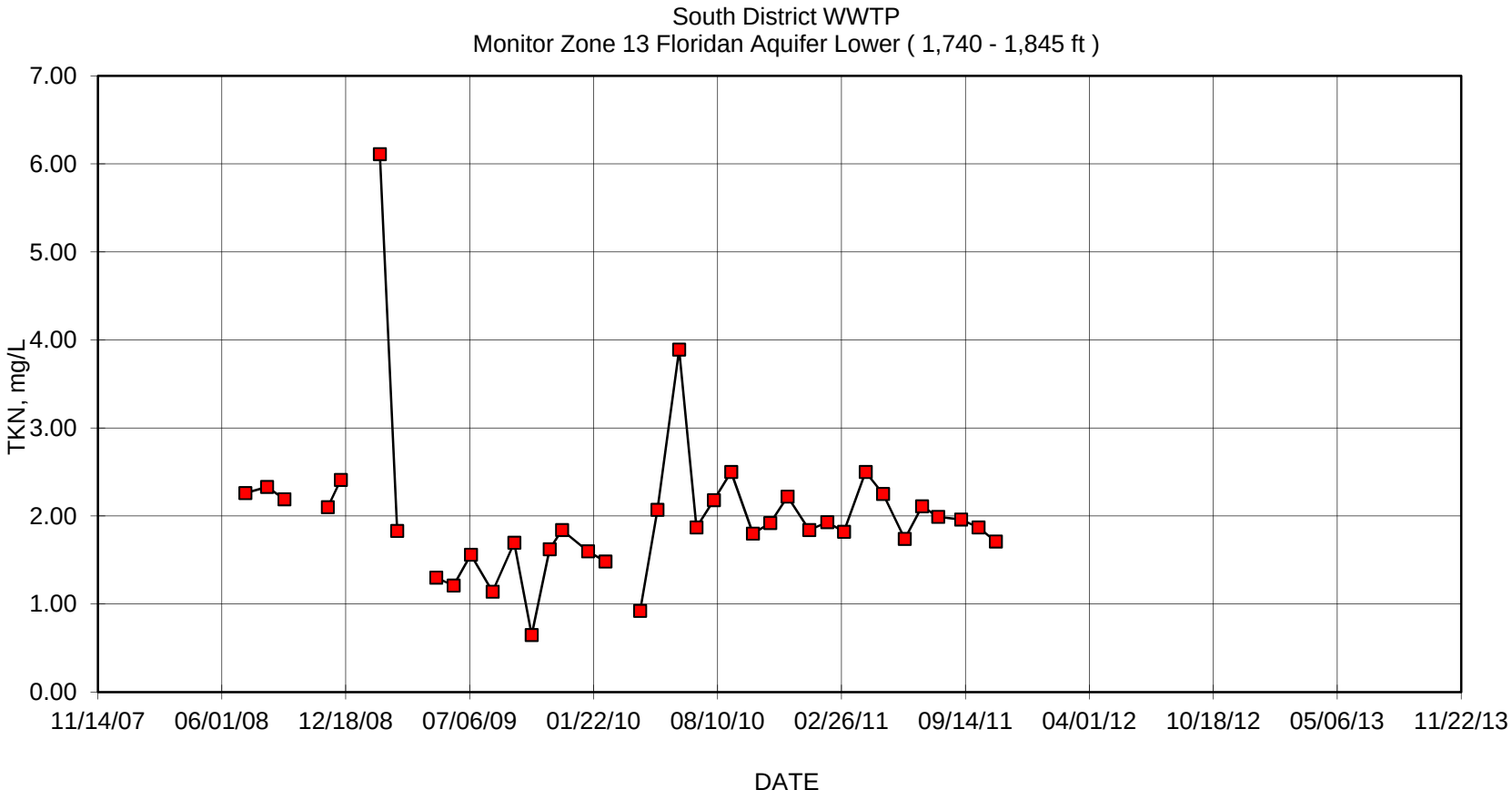
Date	TDS, mg/L	Sulfate, mg/L	Chlorides, mg/L	TKN, mg/L	NH3, mg/L	Conductivity, Micromho/cm	Temp., C	Temp., F	pH	TP, mg/L	TSS mg/L	NO_3 mg/L	NO_2 mg/L	Sodium, pCi/L	Gross Alpha, pCi/L	Radium 226, pCi/L	Radium 228, pCi/L
07/09/08	30,750	2,059	15,409	2.26	1.09	43,250	24	74	7.5	0.01	17.60	0.03	0.00				
08/13/08	29,330	2,181	15,900	2.33	1.78	42,390	24	75	7.4	0.01	21.80	0.08	0.05				
09/10/08	29,300	2,121	14,788	2.19	1.92	40,390	25	76	7.5	0.02	19.80	0.08	0.05				
10/08/08																	
11/19/08	31,070	1,982	14,861	2.10	2.50	42,630	23	74	7.7	0.00	21.60	0.03	0.00				
12/10/08	29,110	2,105	14,990	2.41	1.77	42,610	23	74	7.3	0.02	21.40	0.03	0.00				
01/14/09																	
02/11/09	13,370	1,007	6,878	6.11	1.73	20,880	23	73	7.4	0.30	8.00	0.00	0.00				
03/11/09	14,780	1,133	7,864	1.83	1.47	23,360	22	72	7.3	0.97	7.40	0.00	0.00				
04/08/09																	
05/13/09	14,250	601	4,010	1.30	1.39	21,020	23	74	7.7	0.00	7.40	0.00	0.00				
06/10/09	12,230	936	6,127	1.21	1.13	19,230	24	75	7.6	0.21	6.00	0.00	0.00				
07/08/09	15,760	510	3,642	1.56	1.01	23,900	24	75	7.6	0.10	8.40	0.00	0.00				
08/12/09	15,380	1,163	7,743	1.14	1.68	22,450	25	76	7.9	0.01	8.40	0.00	0.00				
09/16/09	16,110	1,163	7,769	1.70	1.17	24,430			7.6	0.01		0.05	0.01	3400	7.5	4.9	0.9
10/14/09	16,120	1,262	7,702	0.65	1.38	24,760			7.5			0.00	0.00	4230	7.1	6.3	0.9
11/12/09	14,130	1,196	7,588	1.62	1.32	20,650			7.1	0.02		0.00	0.00	3610	7.7	6.2	0.9
12/02/09	15,850	1,094	7,881	1.84	1.45	24,040	24	76	7.7	0.02	4.40	0.00	0.00	3820	7.1	6.5	0.8
01/13/10	13,810	956	6,934	1.60	1.31	20,550	22	72	7.7	1.60	7.20	0.00	0.00	2850	5.9	5.4	0.9
02/10/10	12,020	831	6,843	1.48	1.18	19,090	23	73	8.2	0.01	10.80	0.00	0.00	3710	4.6	3.2	0.8
03/03/10																	
04/07/10	17,420	1,188	8,885	0.92	1.22	26,140	24	75	7.4	0.02	7.00	0.01	0.00	4820	7.1	6.2	0.9
05/05/10	18,244	1,424	10,458	2.07	1.36	27,890	25	77	7.7	0.01	13.60	0.00	0.00	5230	7.2	5.9	1.1
06/09/10	18,430	1,418	10,591	3.89	1.49	30,050	24	76	7.7	0.03	4.60	0.00	0.00	5150	7.5	7.9	0.6
07/07/10	19,590	1,468	10,898	1.87	1.79	29,770	24	75	7.7	0.01	9.40	0.00	0.00	5600	8.3	7.6	0.8
08/04/10	19,350	1,316	9,782	2.18	1.91	28,470	24	75	7.6	0.18	9.40	0.00	0.00	5470	8.0	7.1	0.7
09/01/10	19,150	1,480	10,735	2.50	1.89	29,740	24	76	7.6	0.02	24.60	0.00	0.00	5330	6.5	5.9	0.7
10/06/10	19,930	1,558	10,189	1.80	1.97	29,850	23	74	7.8	0.02	7.00	0.03	0.00	5600	5.3	5.9	0.7
11/03/10	19,820	1,472	10,842	1.92	2.00	29,980	23	73	7.7	0.02	3.40	0.00	0.00	6030	6.4	7.1	0.7
12/01/10	19,720	1,375	10,104	2.22	1.97	29,900	24	75	7.6	0.04	7.40	0.00	0.00	5460	9.4	8.1	0.7
01/05/11	19,030	1,338	9,809	1.84	2.00	28,280	24	75	7.6	0.02	4.20	0.00	0.01	5620	9.6	7.2	0.8
02/03/11	17,420	1,234	9,057	1.93	1.86	2,552	24	75	7.5	0.19	4.80	0.00	0.00	4850	8.1	7.4	0.8
03/02/11	18,330	1,418	9,362	1.82	2.28	29,030	23	74	7.5	0.02	18.20	0.00	0.00	5140	9.1	8.3	0.8

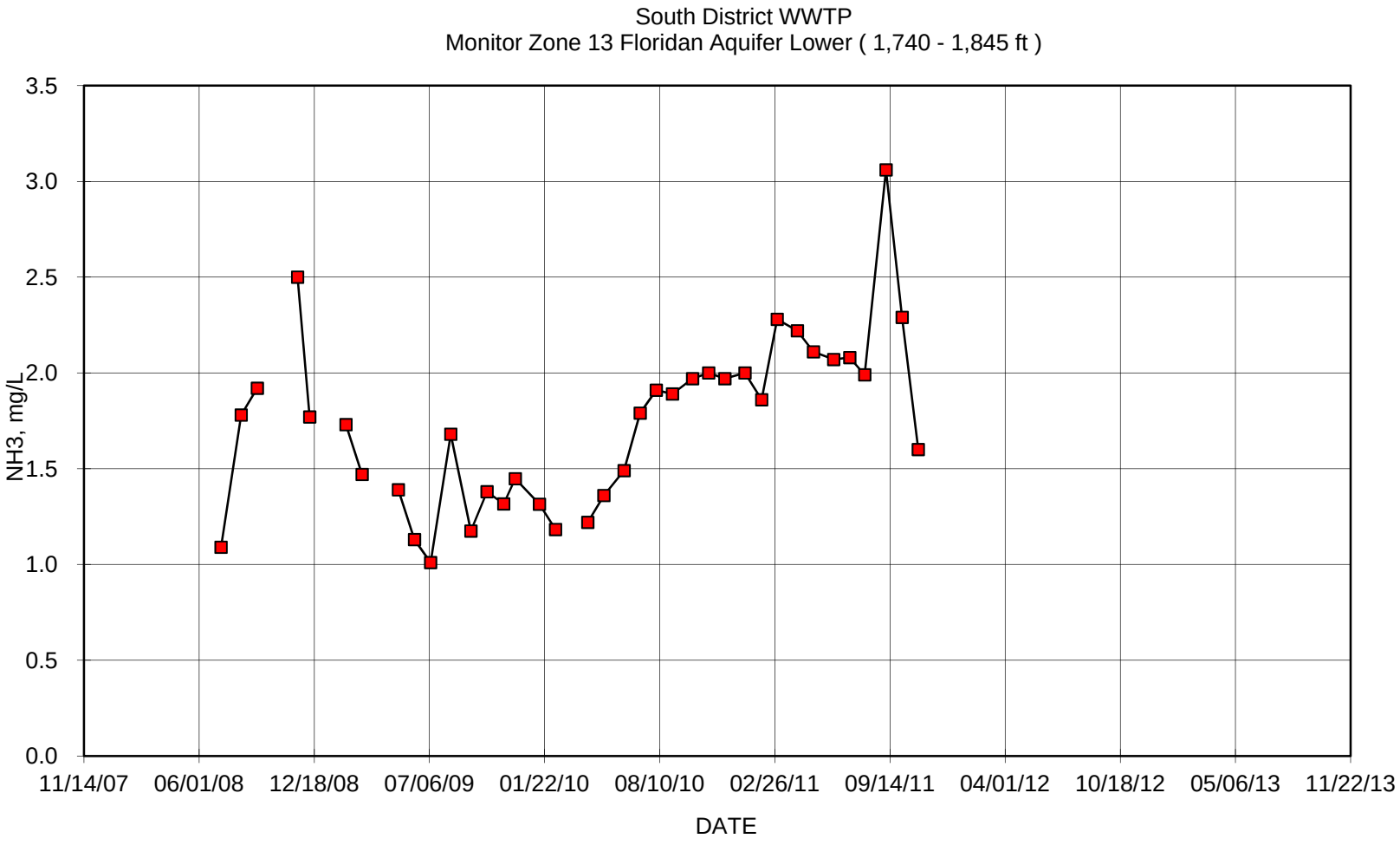
04/06/11	19,540	1,504	10,841	2.50	2.22	28,510	24	74	7.1	0.02	10.00	0.00	0.00	5350	9.0	7.1	0.8
05/04/11	20,820	1,534	11,085	2.25	2.11	31,090	24	75	7.8	0.02	4.20	0.00	0.00	5690	8.2	7.4	1.0
06/08/11	19,600	1,584	11,165	1.74	2.07	29,740	24	76	7.5	0.04	8.40	0.01	0.00	5540	6.1	6.1	0.7
07/06/11	20,820	1,329	9,674	2.11	2.08	30,120	24	75	7.9	0.02	5.40	0.01	0.00	5380	5.6	5.2	0.8
08/01/11	17,780	1,358	9,895	1.99	1.99	26,850	25	77	7.9	0.01	8.60	0.00	0.00	5260	6.9	6.7	0.9
09/07/11	20,580	1,435	10,628	1.96	3.06	30,990	24	76	7.8	0.04	6.90	0.00	0.00	5950	7.8	8.2	0.9
10/05/11	19,680	1,508	11,185	1.87	2.29	29,710	24	75	7.8	0.03	7.50	0.00	0.01	5780	7.5	7.8	1.0
11/02/11	15,520	1,156	9,400	1.71	1.60	24,470	29	84	8.3	0.04	3.90	0.01	0.00	4850	4.3	4.0	1.0
12/07/11																	
01/04/12																	
02/06/13																	
03/04/13																	

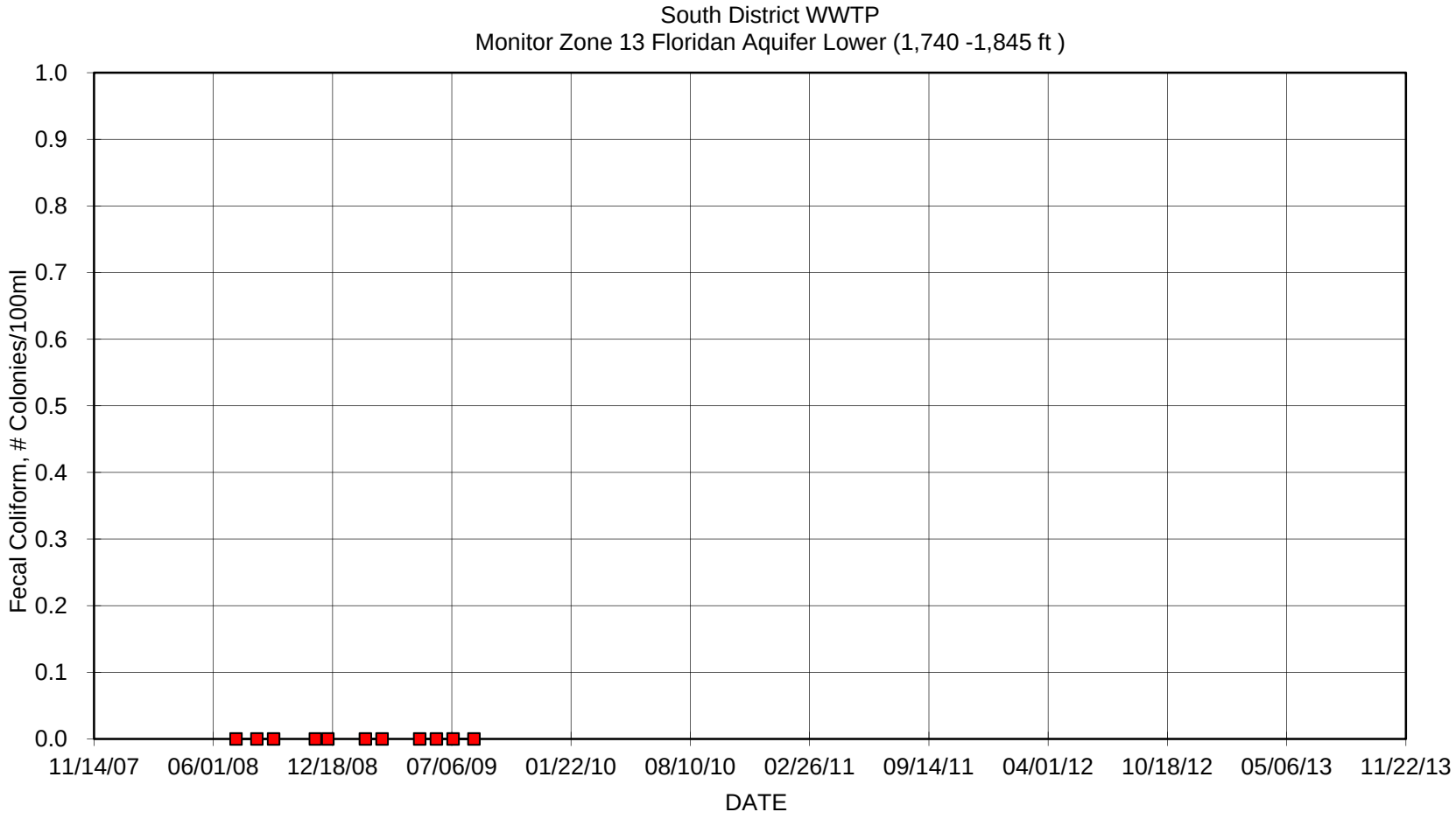

South District WWTP
Monitoring Zone 13 Floridan Aquifer Lower (1,740 - 1,845 ft)
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
TDS, mg/L
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

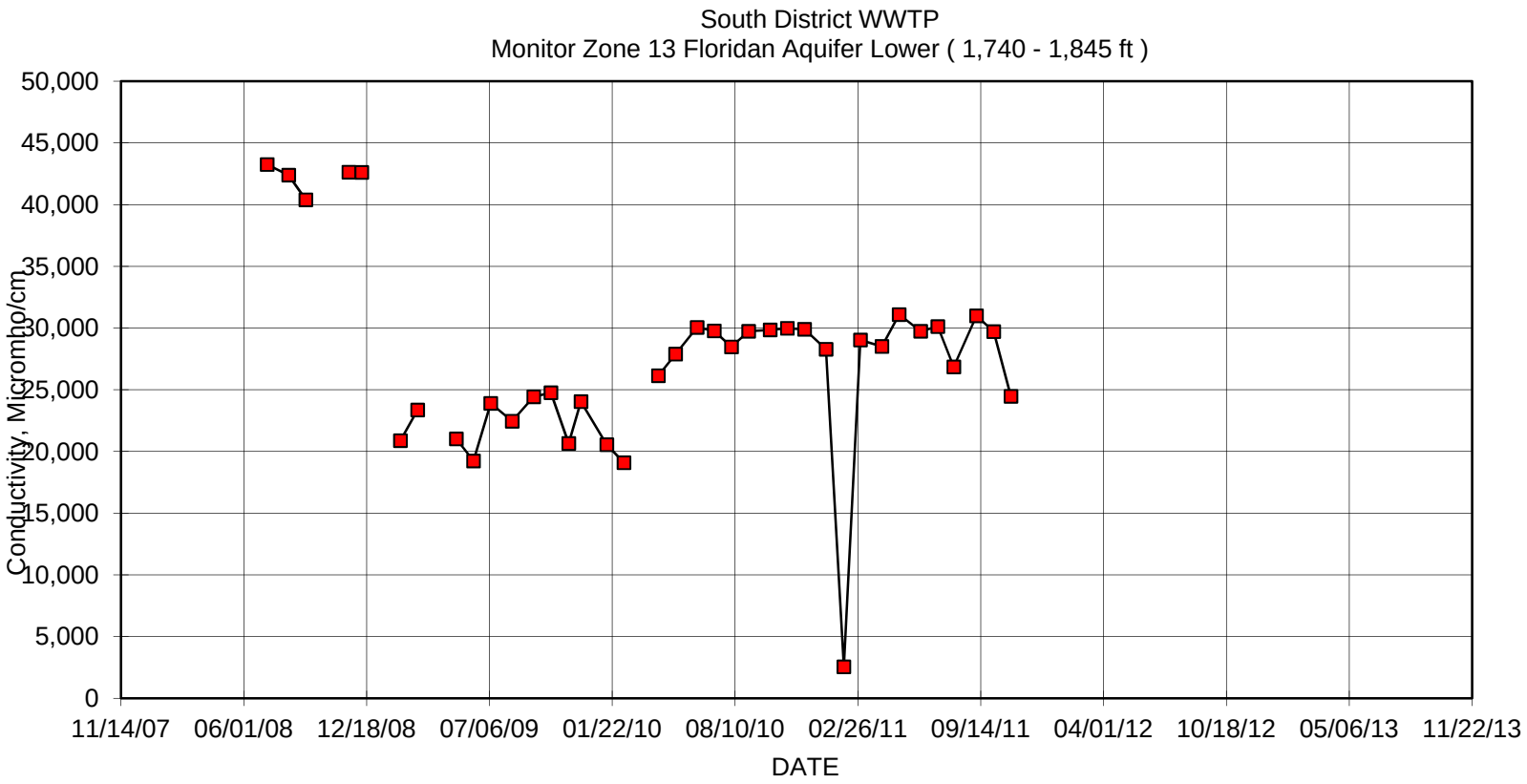

South District WWTP
Monitoring Zone 13 Floridan Aquifer Lower (1,740 - 1,845 ft)
Sulfate, mg/L
2,500
2,000
1,500
1,000
500
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

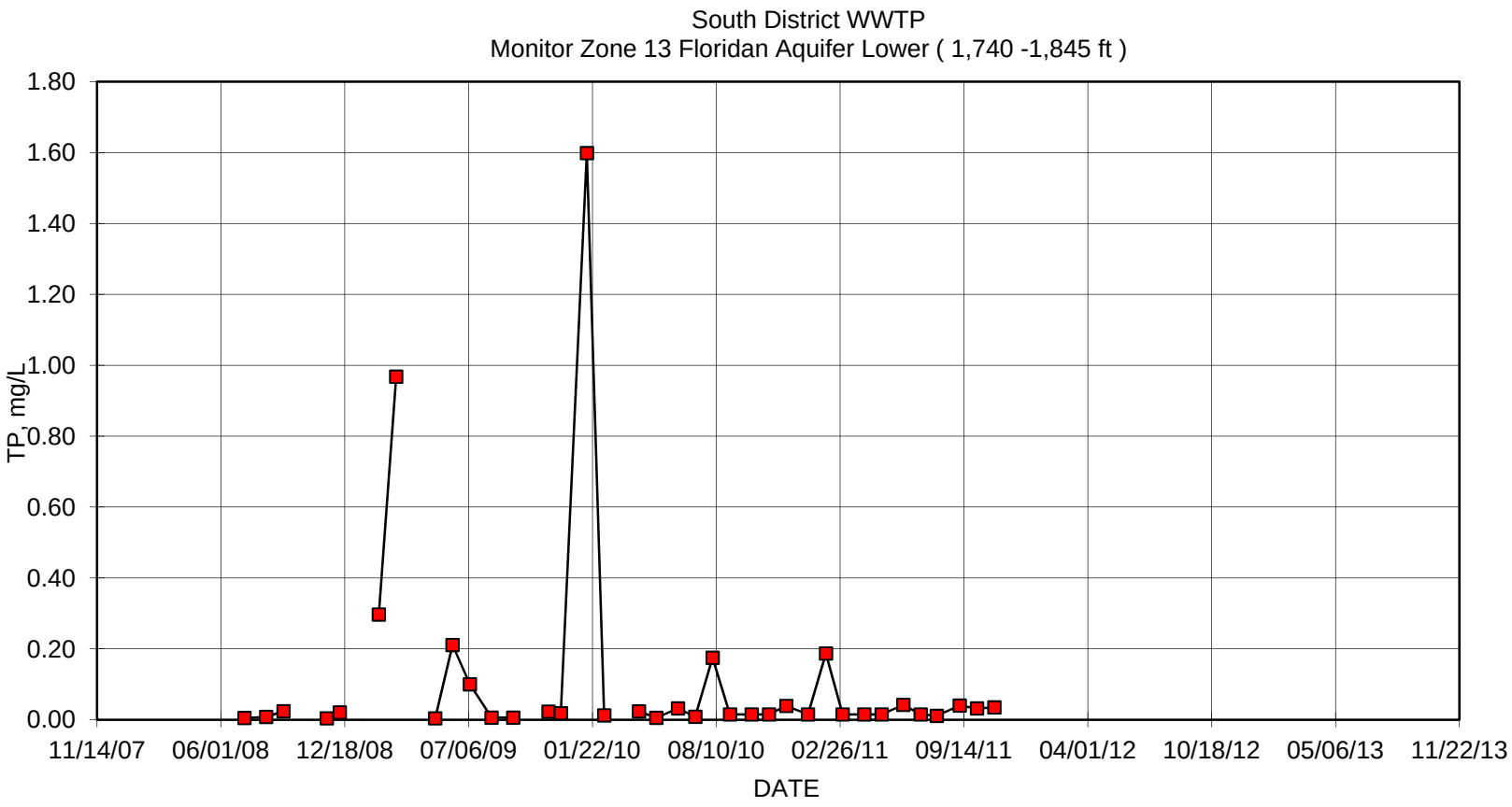

South District WWTP
Monitor Zone 13 Floridan Aquifer Lower (1,740 - 1,845 ft)
Chlorides, mg/L
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

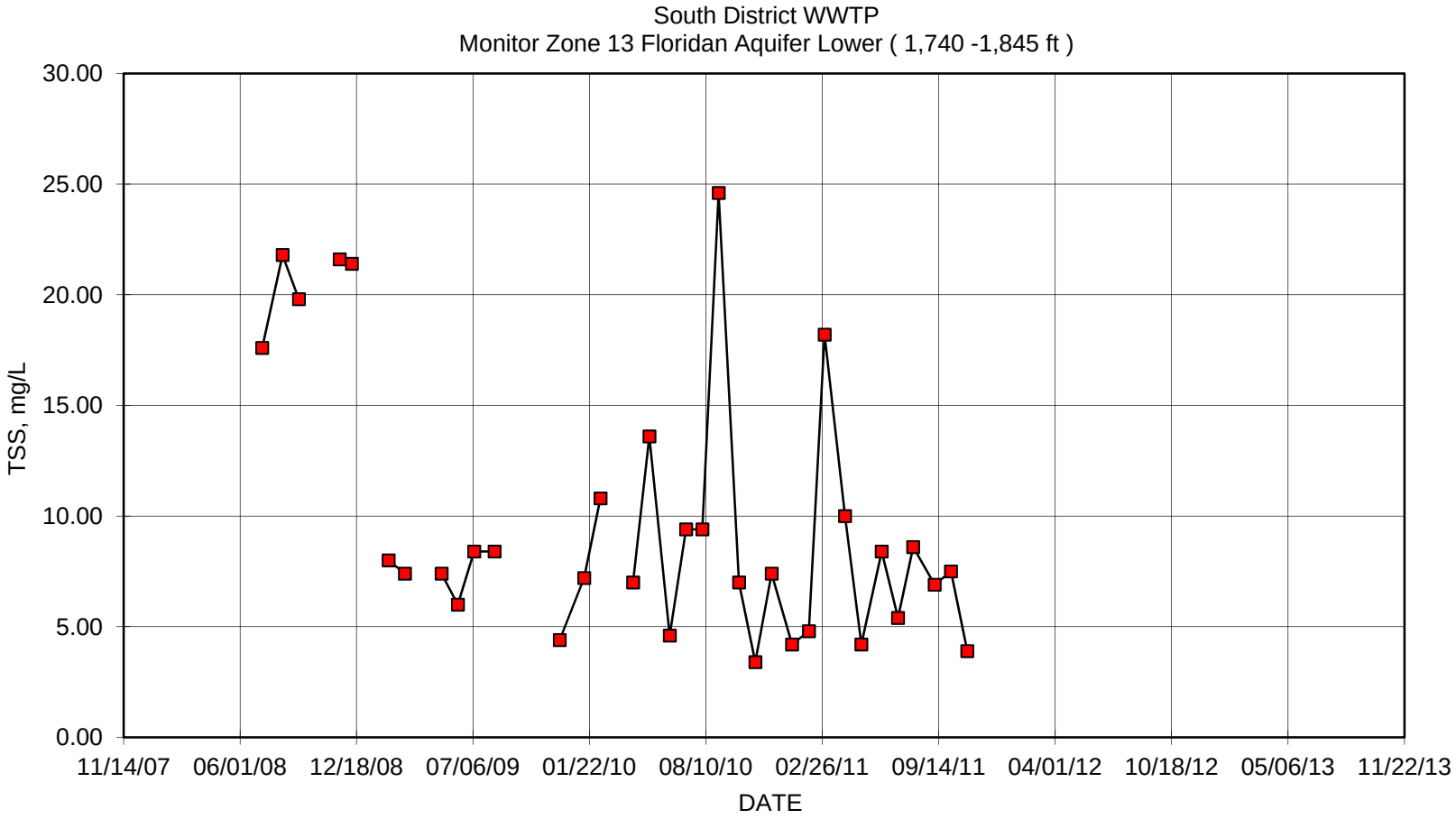

South District WWTP
Monitor Zone 13 Floridan Aquifer Lower (1,740 - 1,845 ft)
TKN, mg/L
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 13 Floridan Aquifer Lower (1,740 - 1,845 ft)
NH3, mg/L
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 13 Floridan Aquifer Lower (1,740 -1,845 ft)
Fecal Coliform, # Colonies/100ml
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 13 Floridan Aquifer Lower (1,740 - 1,845 ft)
Conductivity, Micromho/cm
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 13 Floridan Aquifer Lower (1,740 -1,845 ft)
TP, mg/L
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 13 Floridan Aquifer Lower (1,740 -1,845 ft)
TSS, mg/L
30.00
25.00
20.00
15.00
10.00
5.00
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

MIAMI-DADE COUNTY
miamidade.gov

Water and Sewer
PO Box 330316 • 3071 SW 38 Avenue
Miami, Florida 33233-3016
T 305-665-7471

December 19, 2013

Mr. Joseph R. May, P.G.
Florida Department of Environmental Protection
400 North Congress Avenue, 3rd Floor
West Palm Beach, Florida 33401

CCN: 57825

Reference: Miami-Dade Water and Sewer Department -- Mechanical Integrity Testing (MIT) Report for Deep Injection Well No. IW-5 at the SDWWTP Site.

Dear Mr. May:

Enclosed please find the Certificate of Mechanical Integrity and the MIT Report on the re-testing of Deep Injection Well No. IW-5 at the South District Wastewater Treatment Plant site in Miami-Dade County.

All the tests were conducted in strict adherence to the specifications submitted to and approved by your office. The testing results for the well were good. Both external and internal mechanical integrity were demonstrated. The well casing and the wellhead components are in good condition. All the well head valves and all the well head components are scheduled to be rust-proofed and repainted when all the MITs are completed. Based on the results of the well testing we conclude that the well retains full mechanical integrity and recommend that MDWASD be allowed to continue operating the well in its normal mode.

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

The demonstration of mechanical integrity is being submitted per Chapter 62-528.300(6)(b)2., 62-528.300(6)(c), and 62-528.425(1)(d), F.A.C. and specific condition 3.j. of Permit 0061787-022-UO.

If you have any questions or require additional explanation of any item in the report, please do not hesitate to contact me at [redacted] or Sonia Villamil at [redacted]

Sincer[redacted]

Rafael A. Terrero, P.E.
Assistant Director- Wastewater Operation Systems

Enclosures: Certificate of Mechanical Integrity
MIT Report Well IW-5 (1 copy)

cc: Joseph Haberfeld, FDEP - Tallahassee

Delivering Excellence Every Day

Mechanical Integrity Test Report
Deep Injection Well No. IW-5
South District Wastewater Treatment Plant

Prepared by:
Miami-Dade Water and Sewer Department
3071 SW 38th Avenue
Miami, Florida 33146

CERTIFICATE OF MECHANICAL INTEGRITY

The **South District WWTP** deep injection well **IW-5** operated by **Miami-Dade Water and Sewer Department** has been tested for mechanical integrity. The tests followed standard engineering practices and used methods presented in the United States Environmental Protection Agency regulations for the purposes of these tests. The external and internal mechanical integrity tests followed Florida Department of Environmental Protection (FDEP) pre-approved testing specifications and all the critical test events were witnessed by representatives of the FDEP, the MDWASD and the contractor.

Having supervised the engineer and geologists that were present during the testing, conducted the examining of the results and the preparation this mechanical integrity report as part of this certification, the undersigned certifies that deep injection well **IW-5** operated by **Miami-Dade Water and Sewer Department** at the **South District Wastewater Treatment Plant Site in Miami-Dade County, Florida** has successfully passed all the test requirements for mechanical integrity under rules of Chapter 62-528 of the Florida Administrative Code and is therefore determined to have mechanical integrity.

Certified on December 19, 2013

[redacted]

Howard J. Fallon Jr., P.E.
Professional Engineer
License Number 24153

MECHANICAL INTEGRITY TEST REPORT
FOR
DEEP INJECTION WELL No. IW-5
AT THE
SOUTH DISTRICT WASTEWATER TREATMENT PLANT

Prepared by:

MIAMI-DADE WATER AND SEWER DEPARTMENT
3071 SW 38th Avenue
Miami, Florida 33146

For Submittal To:

UNDERGROUND INJECTION CONTROL
FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

December 2013

ABSTRACT

The internal mechanical integrity was investigated through a pressure test performed on the injection casing. The pressure test was conducted at 155.5 pounds per square inch (psi) which is approximately 1.5 times the maximum (100 psi) potential injection pressure and more than 1.7 times the maximum operational pressure that the well will be under when operating at its full permitted injection velocity of 10 feet per second (ft/sec). FDEP permits a 5% loss in pressure during the hour long test in order for the internal mechanical integrity to pass the pressure test.
IW-5 successfully passed the pressure test because the casing only lost 1.5 psi. The successful results of the pressure test for internal mechanical integrity were reinforced by the results of the second internal mechanical integrity test, the TV survey of the casing. The TV survey confirmed that the casing and the casing joints are in good condition and that the well has internal mechanical integrity down to 2,752 ft bls.

The external mechanical integrity was investigated using two test procedures, a Radioactive Tracer Survey (RTS) and a Temperature Log. Results of the RTS confirmed the integrity of the cement around the casing and the continued competence of its seal with the geologic strata. The temperature test showed that there are no anomalies that would indicate points where injected fluids could escape through the casing and cement into the formation. Similarly there were no temperature anomalies that would indicate injection fluids entering the formations at other than the approved injection depth.

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Section 1

1. INTRODUCTION

1.1 BACKGROUND

On October 12, 2012, (see Appendix A) the Miami-Dade Water and Sewer Department (MDWASD) submitted the County's proposed plan and testing specifications for conducting the mechanical integrity tests (MITs) and repairs on some of the injection wells at the South District Wastewater Treatment Plant (SDWWTP) site (see Figure 1) to the Florida Department of Environmental Protection (FDEP). The plan, represented by the specifications, described the step-by-step procedure to be followed and included the testing schedule required to meet the 5-year MIT re-testing conditions of the FDEP permit for each of the injection wells. After receipt of these documents, the FDEP Staff reviewed the proposed plan and sent an approval on June 5, 2013 (see Appendix B).

The contract documents for conducting the MITs were let out for bids, and the winning bid was submitted on February 28, 2013 by Youngquist Brothers, Inc., a well drilling contractor from Ft. Meyers, Florida. After the contract was approved by the Board of Country Commissioners and signed by the County Manager, the MDWASD issued the notice to proceed on May 17, 2013 and the contractor began mobilizing to the site.

1.2 PURPOSE AND SCOPE

The purpose of this report is to provide FDEP with a document that describes the re-testing procedures for mechanical integrity applied to each of the SDWWTP deep injection wells (see Figure 2). The report also presents the field reports (see Appendix C), and the results of the tests in a single volume for ease of reference. The mechanical integrity re-testing operations involved conducting a pressure test on the well casing to show that there are no leaks in the casing, and conducting a TV survey on the well to reinforce the data from the pressure test. The re-testing includes tracking a radioactive liquid-tracer (iodine isotope I-131) injected down the well to show that there is no fluid movement upward behind the casing, into underground sources of drinking water (USDW). The radioactive test information is reinforced with temperature logs run on the well. Gamma ray logs are used to detect the movement of the radioactive tracer.

Figure 1. South District Wastewater Treatment Plant Site

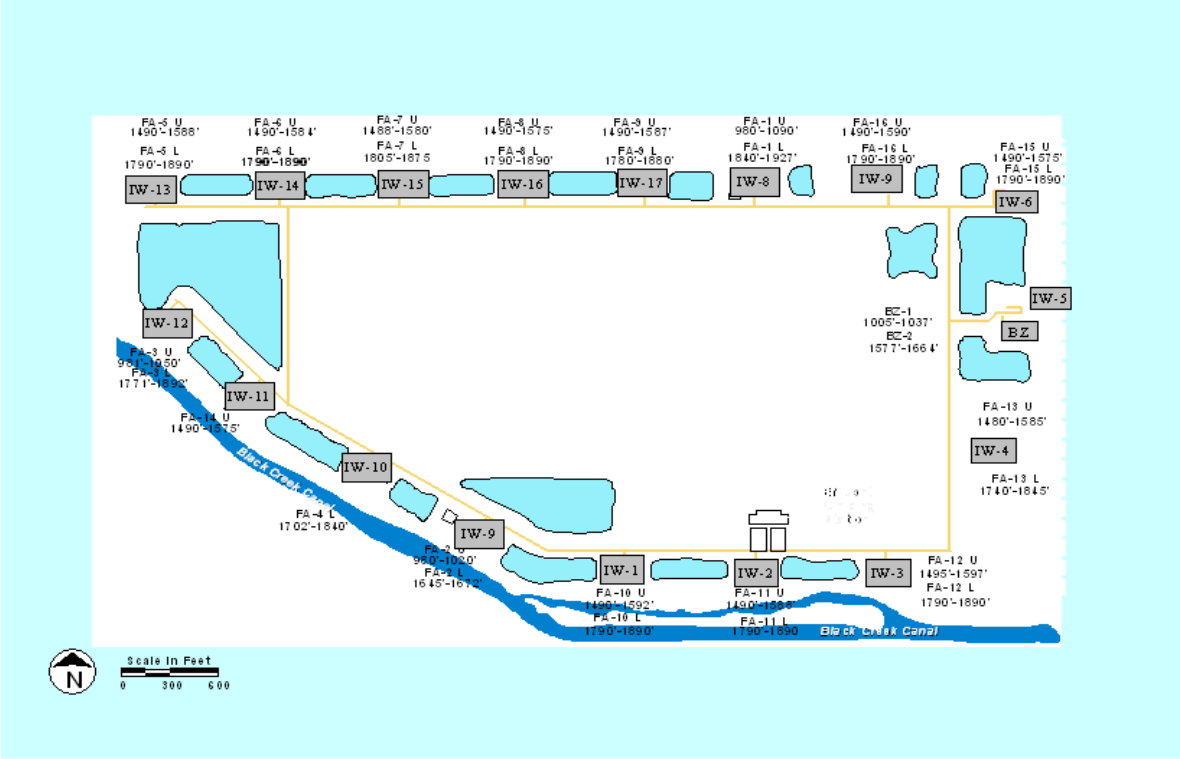

Figure 2. Well Locations Layout

Section 2

2. MECHANICAL INTEGRITY TESTING (MIT)

2.1 METHODS USED

The MIT program is designed to test two elements of the injection well system: 1. Internal integrity and 2. External integrity. The first test element, the internal mechanical integrity test of the well, tests the condition of the injection casing. The second test element, the external mechanical integrity test of the well, tests for leaks outside the casing. This is achieved through a series of field tests including a pressure test and a TV survey for the internal testing, and the temperature log, gamma ray log and RTS survey for the external testing. The first test element, the internal mechanical integrity test, tests for leaks in the injection pipe (casing). The second test element tests for leaks in the annular space outside the casing (cement-filled space between the periphery of the drilled hole and the casing) and in the near-to-the-well geologic strata.

2.2 CASING SCRUBBING

Because the mechanical integrity of injection wells has to be tested every five years, and because a TV inspection of the well is part of the test requirements, MITs provide a timely opportunity to clean the well of deposits that may have formed on the inside of the casing during the intervening years and at the same time provide a cleaner casing for the TV inspection. Cleaning the inside of the well casing is achieved by running a scrubbing brush up and down the casing. However, before the cleaning can be performed, flow out of the well must be controlled. The column of water inside the casing is fresh water and results in a positive hydraulic head inside the well. That head must first be controlled to prevent water from flowing out of the well during the cleaning operation.

2.2.1 Flow Suppression

Suppression of the fresh water head was achieved by first pre-mixing water with salt (NaCl) to form a heavy brine, and then pumping the brine down the well casing, through a 6-inch gate valve on the wellhead. This procedure results in the displacement down the well of the fresh water at the top of the column and replacement of the displaced fresh water with the brine solution. An equal volume of fresh water is displaced out of the well at the bottom of the casing. The procedure is repeated until the pressure head inside the well is suppressed. This method of displacement is used because it achieves flow suppression without first having to open the well to insert a tremie pipe to the bottom of the casing for introduction of the brine. This displacement method also provides a safe way of “killing” the well that at the same time reduces the volume of injected salt solution that would enter the formation at the bottom of the well. One additional advantage is that using this method the brine can be recovered and reused in flow suppression at other wells.

The brine was prepared in 1,000-gallon (gal.) batches by mixing the salt from a 2,000-pound (lbs.) sack in a 1,000 gal. tank of fresh water. The 1,000 gal. solution was then pumped down the well before other similarly mixed batches of salt solution were mixed and pumped down the well (see Figure 3). In the end, the operation was repeated 13 times, and a total of 13 sacks (approximately 26,000 lbs. of salt) were used to suppress the head in the well. This salt concentration represents a theoretical specific gravity of 1.239 for the brine, calculated from the salt solution used in the field of 10.3 lbs per gallon. The 26,000 lbs of salt suppressed the pressure head from approximately 26 feet above the top of the casing to approximately 15 feet below.

Figure 3. Flow Suppression Equipment

2.2.2 Scrubbing Operation

The brush used to clean the casing is made with an old drill rod that has an outside diameter of 7 inches with thick steel wire inserted and secured sticking out of the drill rod. The total diameter of the brush with the steel wire bristles is 20inches. The brush is attached to the bottom of the packer and inserted into the well (see Figure 4). A 20-inch flange was bolted to the top of the well and pressure fittings installed to be used for packer inflation later on in the process. Then Youngquist lowers the brush and packer by attaching drill rods to the top of the packer and then raising and lowering the brush several times using a 50 ton crane. This process was repeated until the casing was scrubbed and the packer was at the depth required to perform the packer test on the well.

Figure 4. Scrubbing Brush and Hydraulic Packer

2.3 INTERNAL MECHANICAL INTEGRITY (CASING TESTS)

2.3.1 Pressure Test

After the pressure head was suppressed and the casing scrubbed, and the inflatable packer was placed at a depth of 2,698 ft bls. This well is cased to a depth of 2,752 ft bls so the packer is in the bottom 50 feet of the casing. Additional pressure fittings were installed on the flange to pressurize the casing with water. A bleeder valve atop the 20-inch flange allows passage of the drill pipes that support the packer without loss of pressure in the casing (see Figure 5). A pretest was conducted on the casing to determine that the pressure was holding and that all the installed testing equipment was operating properly, then FDEP was informed that the well was ready for their inspection. The next day, September 13, 2013, the pressure test was repeated in the presence of FDEP Staff. The packer had been previously sealed against the casing, at an inflation pressure of 380 pounds per square inch (psi) and at 8:00 AM the casing was pressurized with water to a pressure of 155.5 psi.

Figure 5. Well-Head and Recorder Set Up for Pressure Test

At 9:30 A.M.. the one-hour pressure test was started in the presence of Joseph May, P.G. representing FDEP and witnessed by Sonia Villamil, Maria Macfarlane, and Michael Ashe representing MDWASD, and by Chris Harp and others representing the drilling contractor. The pressure test ran for the required one-hour period. The pressure deviation (loss) in that time was 1 psi, well below the 7.5 psi deviation allowable under the 5 % criteria in the rules (see Table 2-1). The packer inflation pressure and the pressure in the casing were measured using certified gages (see Appendix C) graduated from 0 to 200 psi in increments of 1 psi. The pressure was read in person and recorded by hand at five minute intervals during the test. The pressure was also recorded on an In-Situ pressure transducer attached to the stand with the pressure gauges (see Figure 5).

Table 2-1 Casing Pressure Readings

Time	Casing Pressure (psi)	Pressure Change (psi)	Packer Pressure (psi)
9:30	155.5	0.0	380
9:35	155.5	0.0	380
9:40	155.5	0.0	380
9:45	155	0.5	380
9:50	155	0.0	380
9:55	155	0.0	380
10:00	155	0.0	380
10:05	154.5	0.5	380
10:10	154.5	0.0	380
10:15	154	0.5	380
10:20	154	0.0	380
10:25	154	0.0	380
10:30	154	0.0	380

2.3.2 Bleed-Off Calculations

At the completion of the pressure test the casing pressure was bled-off and the discharged volume from the bleeding was measured (see Table 2-2). Bleeding until the pressure resulted in zero flow produced approximately 26.5 gallons. This exercise provides a reasonable assurance that the packer is placed at the depth in the well that is within the last 50 feet of the casing.

Table 2-2. Bleeding Volumes versus Pressure

Bled Volume (gallons)	0	5	10	15	20	26.5
Casing Pressure (psi)	154	117	81	46	10.5	0

2.3.3 Television Survey

A closed circuit color television camera, encased in a pressure vessel capable of withstanding the pressures exerted at the depths to be televised, and equipped with a fish-eye lens, was introduced into the well through a pack-off stripper device on a standpipe above the injection well (see Figure 6). The camera is centralized in the casing, and is preceded down the well with a light source attached below the camera. The camera televises a view of the full circumference of the inside of the casing and the image is recorded on video tape. Prior to the video survey, the well was scrubbed and flushed with potable water to provide the best picture possible. The video

survey began at land surface and continued down to 2,830 feet, where the camera runs into an obstruction. At selected intervals of interest, the camera was used to pan the intervals in a horizontal format prior to continuing the normal vertical recording.

A review of the video (see Appendix F) indicates that the casing is in good condition down to 2,752 feet. The video also shows that the scrubbing operation was successful. The scrubber has scrubbed the casing free of all growth down to 2,717 feet and this is confirmed by visible vertical scratches throughout that length of the casing; indicating that the scrubber had brushed the steel casing effectively. All the scratches are superficial, and do not detract from the physical and mechanical integrity of the casing. There are no gouges, grooves, nicks, or other physical damage visible in the casing for its whole length. Below 2,717 feet the casing was not scrubbed to avoid hanging the scrubber with the edge of the bottom of the casing at 2,752 feet.

In summary, the video picture meets the quality standards that are needed for a visual evaluation of the well. This video survey presents a clear view of the casing and of the welded joints of the casing. All the joints are clean and appear to be tight. From the TV survey it is concluded that this casing is in good condition throughout its whole depth from land surface to 2,752 feet.

Figure 6. Television Survey (Standpipe and Logging Truck)

2.4 EXTERNAL MECHANICAL INTEGRITY (CEMENT AND FORMATIONS)

The external mechanical integrity test consisted of two low flow dynamic tests The RTS and temperature survey, conducted on September 23 2013, for the external mechanical integrity portion of the test was witnessed by the representative of FDEP (Joseph May, P.G.), by representatives of MDWASD (Sonia Villamil and Maria Macfarlane) and by representatives of the contractor (Luis Morey).

2.4.1 Radioactive Tracer Survey (RTS)

The radioactive tracer survey uses an isotope of iodine (I-131) as a tracer of water movement inside and outside the casing. Iodine –131 is used because it is a radioactive isotope commonly used in medical practice and therefore it is more easily available and lower in cost than other potential tracers. I-131 also has the advantage of having a half-life of 8 days. That half-life is quite suitable because it is long enough to allow time for transportation to the well site with little decay but also short enough so that it would quickly be reduced if there were any unexpected spills or if there were mechanical failures through which the isotope could travel with the water. The radiation levels of I-131 at the concentration used for RTS testing is in millicurie-range, which if it were considered a waste, would be characterized as a low level waste by the US Atomic Energy Commission.

The I-131 is first loaded into a container located in the logging tool. This container is electronically activated from the logging truck to eject the desired quantity of tracer at the desired depth through an ejection port. In addition to the tracer container, the logging tool is also assembled with three gamma ray detectors. One detector, the top gamma ray detector (GRT), is located 10 feet above the ejector. The other two detectors, the middle one (GRM) and the bottom one (GRB) are located immediately below the ejector at about 3 feet and 12.4 feet below the ejector respectively. The bottom of the logging tool also includes a temperature tool at the very bottom, and a casing collar locator (CCL) 1 foot below the GRM. Figure 7 shows the configuration of the RTS logging tool. The RTS log in the appendix (Appendix D) shows the distances between each of the logging tool components described above.

2.4.1.1 First Low Flow Dynamic Test

Prior to starting the low flow dynamic test, a background gamma ray log was conducted to establish the natural conditions. It was conducted right after the temperature log. Since the temperature log was run downward starting at land surface, the temperature log had ended with the logging tool at the bottom. The background gamma ray log was conducted from the bottom (2,913 feet) up to the surface.

From the surface, the logging tool was again lowered down the well and the casing collar locator (CCL) used to locate the bottom of the casing. The magnetic coils on the CCL give out a magnetic field and detect a change in the mass. If there is growth on the casing it is harder for the CCL to have a clean line. If the growth has some iron on it, it can cause a sort of interference with the CCL making it harder for the CCL to find the end of the casing. The CCL shows that the bottom of the casing is at 2,752 feet bls. After the bottom of the casing was located, the well was ready for the low-flow dynamic RTS test.
The ejector port of the I-131container was set at 2,747 feet and 1 millicurie (mCi) of I-131 was

released while the flow down the well was kept at a constant rate of 64 gallons per minute (gpm). This well is a 20 inch OD casing, therefore the flow rate is lower than what is used on 24 inch wells. The 64 gpm represent between 3-5 feet per second The logging tool was kept immobile after the ejection of the I-131 and the three gamma ray detectors continued to record in place. One (1) mCi of I-131 was ejected into the well. The middle detector, located 3 feet below the ejector port, picked up the radioactive tracer 28 seconds after the ejection. The bottom detector, which is located over 12 feet below the ejector, picked up the tracer 2 minute and 44 seconds after the ejection. The test ran for 60 minutes and the top detector did not pick up any tracer.

After the first low flow test ended, the tool was then raised up more than 200 feet, to a depth of 2,550 feet, to log out of position to make sure that the tracer did not migrate up the casing or the formation outside of the casing. No migration was found above 2,752 was detected.

Once the log out of position was conducted and the tool was placed back to depth, a small amount of staining on the casing was found but because the amount did not travel any further up into the well so it was determined that no interference for the second RTS. Therefore, with the approval of Joseph May, P.G. from FDEP, the well was not flushed prior to the second RTS test.

Figure 7. RTS Tool and Temperature Probe

2.4.1.2 Second Low Flow Dynamic Test

The tool was placed back to a depth were the ejector was located at 2,747 feet with a flow of 71 gallons per minute set down the well. For this test, 2 milicuries of I-131 were ejected into the casing. The middle detector started picking up the tracer about 20 seconds after it was ejected. The bottom detector, which is located over 12 feet below the ejector, picked up the tracer 2 minutes and 8 seconds after the ejection. The upper detector did not pick up any tracer for the duration of the test, which lasted 30 minutes.

After the second low flow test ended, the tool was then raised up more than 200 feet, to a depth of 2,550 feet, to log out of position to make sure that the tracer did not migrate up the casing or the formation outside of the casing. No migration was found.

With the last low flow dynamic test, the mechanical integrity test was concluded, but before bringing the geophysical tools out of the well, the leftover I-131in the container was ejected and the container flushed-clean to insure that any remaining radioactive iodine was well dispersed. The tool was placed at a depth of 2,830 ft bls. The ejector was located at 2,816.5 ft bls, and the remaining Iodine 131 was ejected and the well was flushed with effluent at a rate of over 3,000 gallons per minute to ensure no staining of the tool. The logging tool was then brought up from the bottom and on the way up a final gamma ray log was made. Then the final gamma ray log was compared to the background gamma ray log, and the comparison showed that there are no noticeable differences in the two except for a residual stain at the bottom of the casing where the I-131 had been repeatedly released during the testing, and just below there, where the tracer exited the casing. Injection of water down the well at a rate of 3,000 gpm continued for the next hour to completely flush out the well.

2.4.2 Temperature Log

Youngquist Brothers Inc. conducted the temperature log on September 23 2013 starting at about 8:15 A.M. and logging down to 2,830 feet. The temperature probe (Figure 7) was run from the surface downward to minimize the disturbing effect of the movement of the logging tool on the temperature of the water in the well. The temperature log was started more than 24 hours after the well had last been disturbed by outside influences. The TV survey was the last disturbance in the well.

The temperature log (see Appendix H) shows the warmest interval is in the section from 2,700 to 2,752 feet. This is consistent with the higher temperature of the injected water in that interval. The temperature log did not detect any anomalies that would indicate that injection fluids are present outside the casing, and there is no indication of any upward movement of warm injection water either. The similarity of the temperature oscillations in this temperature log (in the interval from land surface down to the bottom of the casing) to those in the temperature logs from previous MITs and to those in the temperature log when the well was constructed, indicates that there has been no apparent change in the cased interval, and no upward movement of the injected water in the last 5 years.

2.5 WELL HEAD REPAIRS AND RE-INSTALLATION

The work associated with the MIT ended when the wellhead was replaced. The air and vacuum release surge check valves were replaced prior to reinstallation of the wellhead. The 6 inch gate valve and air release were replaced. The wellheads are scheduled to be sandblasted, rust proofed and repainted after the MITs on all the other wells are completed. Injection well IW-5 has been placed back on line and flow from the plant's pump station is again discharging to this injection well.

Section 3

3. CONCLUSIONS AND RECOMMENDATIONS

3.1 CONCLUSIONS

The pressure test was conducted successfully and it was concluded from the results that there is internal mechanical integrity. This conclusion is reinforced by the analysis of the TV survey down to the injection level at 2,752 feet. The TV survey indicated that the casing is in good condition and that all the casing joints appear to be tight and in good working order.

The two successful RTS conducted at low flow rates indicate that there is no upward movement of water outside the casing. Therefore, it was concluded that the RTS results show that there is external mechanical integrity. The temperature survey reinforced the results of the RTS by showing that there has been no movement of injected water anywhere except the injection zone.

3.2 RECOMMENDATIONS

The successful completion of all the tests for mechanical integrity confirms that IW-5 retains full mechanical integrity and as such it is appropriate to continue using this injection well. MDWASD also recommends that FDEP review the results of the tests presented in this report and based on those results determine that the well has mechanical integrity and may continue to be used for its intended purpose.

Finally, MDWASD recommends that although the well head will not be painted until all the MIT tests are completed on the other wells, IW-5 should receive mechanical integrity certification.

Appendix A

Mechanical Integrity Testing Procedures Submitted by MDWASD to FDEP
October 12, 2012

Miami-Dade Water and Sewer Department
Mechanical Integrity Testing Procedures

Miami-Dade Water and Sewer Department
Mechanical Integrity Testing and Repair Procedures
October 12, 2012

MECHANICAL INTEGRITY TESTING and REPAIR PLAN (SDWWTP and NDWWTP Injection Wells)

General Information

The Contractor shall carefully coordinate his activities with the Department to minimize interference with any existing operations or the operations of the Department. Department forces will isolate the well and turn over to the Contractor. Existing valves shall only be operated by Department personnel. The Contractor's personnel, under no circumstances, shall operate any such valve.

The Contractor shall provide all barricades and/or flashing warning lights necessary to warn workers and employee of the testing throughout the Project. This shall be done at the Contractor's expense and to the satisfaction of the Engineer. Every effort must be made to reduce inconvenience and nuisances to a minimum.

The Contractor shall at all times, use the assigned entrance to the Plants to bring in materials, equipment etc. required for the Project. Materials and equipment shall be stored in areas designated by the Engineer, and shall not interfere with the daily operations at the site or with other Projects. Suitable platforms shall be used for material storage to prevent damage to the landscaping. The Contractor shall exercise extreme caution when transporting equipment or materials within the Plant area.

The conveying vehicles shall be properly selected, and equipped, to prevent damage to paved areas, landscaping and other existing facilities including wells, well pads, fencing, underground pipelines, pipe chases, etc. If necessary, suitable wooden skids shall be used to distribute loads, and to prevent damage.

If any of the above existing structures, including the wells, or any other parts of the project area, are damaged, the contractor shall make suitable repairs or replacement at his expense, in a manner described by the Engineer, and to his satisfaction.

The Contractor shall also exercise extreme caution to prevent any spillage of sewage effluent. The County may charge t he Contractor for any cost incurred or penalties imposed on the County as a result of such spillage.

The wells to be tested are Injection Wells IW-l through IW-17 at the South District Wastewater Treatment Plant and IW-1N through IW-5N at the North District Wastewater Treatment! Plant

The Injection Wells have a 24-inch outside diameter (OD), 0.500-inch wall thickness injection casing set to total depths of 2,450 to 2,850 feet below land surface (bls), and were constructed with a nominal 22-inch diameter open borehole extending from the bottom of the casing to approximately 3,000 feet bls.
Except IW-5 at the SDWWTP, has a 20-inch outside diameter (OD), and 0.500 inch wall thickness.

The CONTRACTOR will perform internal and external mechanical integrity tests on the casings of twenty one deep injection wells and perform all appurtenant work in accordance with the above

Contract Documents.

The work shall be performed by a competent crew with equipment that is adequate to complete all phases of the testing and instruments of sufficient accuracy and resolution to identify anomalous responses to the tests. If the CONTRACTOR'S equipment is not capable of satisfactorily performing the work provided for in these specifications, the CONTRACTOR at his own expense shall substitute equipment.

The CONTRACTOR shall have not less than 5 years experience in constructing and testing wells and shall have tested not less than 5 wells of similar type and capacity. The CONTRACTOR shall be licensed by the State of Florida and the license number shall be affixed to all correspondence and reports.

All work shall comply with and be in full conformance with this Mechanical Integrity Test Plan submitted to FDEP together with subsequent response letters for the injection wells at the South and North District Wastewater Treatment Plants and with the appropriate sections of Chapter 62-528 FAC.

If remedial work or re-testing is required prior to final acceptance of the work to meet regulatory requirements and the specifications of the Contract Documents due to defective materials, accident, loss of equipment or equipment malfunction, or for any other cause directly attributable to the CONTRACTOR's actions, the CONTRACTOR shall bear the entire cost of the remediation or re-testing, including all additional materials, labor, and equipment required and any necessary additional Engineering costs. In the event of a problem, the ENGINEER shall be notified immediately, and the following shall apply:

1. The CONTRACTOR shall propose a method of correcting the problem, in writing, to The ENGINEER, who shall review the method of corrective action, and accept the plan in writing before work can proceed.

2. All work on the well must be in accordance with all applicable local, state and federal regulations.

The CONTRACTOR shall notify the ENGINEER a minimum of 72 hours prior to conducting the pressure test, geophysical logging and the radioactive tracer survey so that the ENGINEER and regulatory agency staff can be properly notified.

The CONTRACTOR shall provide all facilities, equipment and materials required for the removal of waste fluids from the well site.

The CONTRACTOR shall kill the well using a dense food- grade salt solution. No barite or mud-based additives shall be used in the well.

The CONTRACTOR shall comply with the OSHA regulations contained in 29CFR Section 1910 for General Industry Regulations and 29CFR Section 1926 for Construction Regulations.

Equipment and Procedures

1. Wellhead Assembly: The stripper head assembly used during the video survey, Geophysical logging, and the radioactive survey shall be bolted to the wellhead above the 6-inch gate valve. The stripper head assembly used must be of sufficient length to house the longest of the wire line tools used for the testing between the gate valve and the pack-off mounted at the top of the assembly. The pack-off must be adjusted so that the tools can be moved freely up and down the well with minimal leakage from the well. The assembly shall include a 4-inch valve and tee, which will be used to inject potable water during the surveys. The assembly shall be fitted with a

pressure gauge for use during the tests.

2. Wellhead Hardware: Should the nuts and/or bolts at the wellhead assembly become stripped during the CONTRACTOR's efforts, the CONTRACTOR shall replace them with equivalent hardware.

3. Water Line: The CONTRACTOR shall provide a potable water supply line for use during the video surveys. This line shall be connected to the existing 4-inch valve on the CONTRACTOR's stripper head. It shall be equipped with a check value to prevent the backflow of effluent into the water supply source. It shall also be equipped with a continuous recording digital flow meter and totalizer capable of measuring flows accurately in the range of 0 to 250 gpm.

Mechanical Integrity Testing (MIT)

The mechanical integrity testing under this Contract shall be accomplished using the following methods and general sequence, however the Contractor shall submit a more detailed sequence to the Engineer for approval before he begins work. The Contractor shall use extreme caution to prevent any loss of equipment, tools or other items into the wells and shall be fully responsible for retrieving any such items immediately, at no expense to the Department. All pressure tests must be conducted in the presence of the Engineer or his authorized representative.

MIT Clean and Pressure Test the Casing

1. The Contractor shall set up all equipment required to prepare for suppressing the density differential pressure, cleaning, performing the pressure test and the radioisotope and closed circuit television surveys.

2. The Contractor shall inject sufficient salt solution into the well to balance the differential pressure and disassemble the wellhead. The brine solution shall remain in the well during the cleaning and pressure testing steps, after which time it shall be transferred to another well if clean enough for reuse, or shall otherwise be disposed of by the Contractor. Under no circumstances shall brine solution be spilled or disposed of on the ground surface, however it may be disposed of into the injection well.

3. The Contractor shall clean the casing before proceeding with the pressure test. The entire length of casing shall be cleaned. If the later television survey indicates insufficient cleaning, the well shall be re-cleaned by the Contractor, at his expense, to the satisfaction of the Engineer. If the television survey must be repeated because of insufficient cleaning, in the opinion of the Engineer, it shall also be at the Contractor's expense.

4. The Contractor shall, when requested by the Engineer, place the packer through a stand-pipe with a packoff device to a point near the top of the well (but within the concrete encasement area) and test its integrity. This shall be accomplished as described in Steps 6, 7, and 8 below. If the packer fails the integrity test it shall be replaced with one that will meet the test. The Engineer is aware that packers have limited inflation cycles and will attempt to minimize the verification of packer operation. However, any integrity failure for which the packer operation can not be eliminated must be repeated at the Contractor's cost. It is anticipated that each new packer will be tested at the wellhead to verify its capacity to seat and deflate.

5. The Contractor shall lower and place the packer to a point within the lower 40 feet of the casing, but not the last 10 feet. The CONTRACTOR will be responsible to assure the proper seating of the packer. A preliminary test shall be performed to ensure proper operation of the test set-up. The CONTRACTOR shall notify the ENGINEER at least 24 hours before running the preliminary test. The test will be run following the same test program as the actual pressure test, as described below. IW-2 at SDWWTP will have the packer placed within 40 feet of the tear in the casing.

6. The Contractor shall inflate the packer to a pressure not exceeding 350 psig over the static condition as measured at the wellhead on a calibrated gauge to create a positive seal.

7. The Contractor shall pressurize the casing to 150 psig with no air in the casing or wellhead. The pressure shall be recorded on a chart and signed by the Engineer, the Contractor and any witnesses present. The pressure test gauge shall be calibrated within 6 months of performing the pressure test. The CONTRACTOR must present proof of calibration of the pressure gauge to the ENGINEER and FDEP staff at the time of testing each well. The pressure gauge must be mounted at or near eye level in order to ensure maximum visibility.

8. The test will be considered successful if the pressure does not change more than 5% psi in one hour.

9. If the test fails, the Contractor shall move the packer upwards for approximately 10 feet, and repeat Steps 6, 7 and 8.

10. If the test still fails, additional repositioning of the packer and repeating of Steps 6, 7 and 8 shall be as ordered by the Engineer. If the test still fails, and subsequent radioisotope surveys indicate no casing failure, it will be presumed that the Contractor's packer did not create a positive seal, and the Contractor shall be required to repeat Steps 4 through 8 at his expense. No payments will be made to the Contractor if it is subsequently determined that the test failure was caused by the seating of the packer. If the packer fails during packer operation verification, it will be concluded that the packer was faulty during any previous test that did not demonstrate casing integrity. The Contractor shall repeat this test at his expense.

11. After pressure testing, measure the depressurization bleed down with a 5 gallon bucket upon release of the pressure in the casing. The bleed down fluid will be properly disposed of by the Contractor.

12. The Contractor shall deflate the packer and withdraw it from the casing.

13. The Contractor shall reassemble the wellhead and connecting piping using new gaskets.

14. Prior to geophysical logging, the fluid used to "kill" the well, or for pressure testing the casing shall be flushed from the well and the well will be shut-in for a minimum of 12 hours.

MIT Video Surveys

A Video Survey inside the injection well casing be performed using the following procedures.

.A 6-inch diameter stripper head assembly will be bolted to the wellhead assembly above the existing 6-inch diameter gate valve. The stripper head will be of dimensions that allow the video operator to put his camera between the gate valve and the pack off and close both the valve and the pack off. The lower part of the assembly shall consist of a 4-inch tee and valve through which potable water may be introduced into the well.
.
Prior to performance of the survey and for a period of 24 hours, fresh water from an adjacent fire hydrant will be introduced into the well through a 4-inch diameter valve located on the stripper head assembly. Fresh water shall be pumped into the well to provide clarity for the survey.

3. If, after 24 hours of pumping potable water into the well, the water quality does not permit a clear picture of the inside of the well, the CONTRACTOR may be required to perform additional pumping services to assure a good survey as specified above.

4. The pumping of the potable water will continue at a rate of approximately 0 to 250 gpm during video surveying. If the open hole portion of the well is not clean, or visibility in any part of the well is poor, the CONTRACTOR shall perform additional pumping services to ensure a good video survey before running another or continuing with the survey.

5. During the video survey, the CONTRACTOR shall stop the camera's progress as instructed by the ENGINEER at depths where there may be potential flaws in the casing or other features to allow for thorough examination at those locations.

Upon reaching the total depth of the well with the video camera and obtaining a video survey satisfactory to the ENGINEER, the camera shall be removed from the well, and the well placed back in service.

MIT Radioisotope Tracer Survey and Temperature Survey

A radioisotope tracer survey shall be used to detect any fluid movement outside of the injection casing from the injection zone into the overlaying aquifers. The tool configuration shown below, or approved equal is required. The tool must be capable of ejecting the radioactive tracer and simultaneously monitoring the gamma ray sensors. No time lag between ejection and monitoring is permitted. A casing collar locator (CCL) shall be positioned below the tool as shown below, to precisely locate the bottom of the casing. Two low flow dynamic test runs, shall be performed. Additional low flow dynamic test runs can be done if results warrant additional testing, as determined by the ENGINEER in consultation with FDEP staff.

A temperature survey log shall also be performed from land surface to the total depth of the well. The temperature log shall be performed logging down at a rate of not more than 60 feet per minute. The temperature survey shall be performed after the well has been "shut in" and stabilized for at least 12 hours prior to the dynamic and static tests.

The Contractor shall perform an initial background gamma ray survey extending from the base of the land surface to the total depth of the well. The background gamma ray log shall be taken at a rate of not more than 60 feet per minute.

After the dynamic tests are completed, another background gamma ray survey shall be taken from the base of the casing to the base of the intermediate casing.

If additional radioisotope tracer survey work is ordered by the Engineer, it will be paid for at the hourly price proposed for additional radioisotope tracer surveys.

Radioactive Tracer Survey (RTS)

A RTS will be performed in the injection well. The tool used for testing will be configured according to information to be supplied by the service company performing the logs and as approved by the ENGINEER. Below is an example of a typical RTS tool that will be used for these surveys. The CONTRACTOR will provide a specific tool configuration with the logs.

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)
			CHD-SDSCHD (SDS) Cable Head	1.00	1.50	5.00
GR#3	23.83					
			GR #3 -GR#3 (GR#3_T) GR#3_TOP	9.33	1.69	50.00
			TREJCT-A (RTS) EJECTOR 14.5' FROM TOOL BOTTOM	3.00	1.69	10.00
			GR #2 -GR#2 (GR#2_M) GR#2_MIDDLE	3.58	1.69	25.00
GR#2	11.17					
CCL	9.63		CCL-000 (000001) RTS_CCL	0.75	1.69	5.00
			TRDET-GR#1 (GR#1_B) GR#1_BOTTOM	8.67	1.69	50.00
GR#1	0.58		TEMP-11116Temp (11116HT)	0.58	1.69	5.00
TEMP	0.17		RTS_TEMP			

Dataset: sdiw1.db: field/well/run1/FINBK
Total Length: 26.92 ft
Total Weight: 150.00 lb
O.D. 1.69 in

RTS tool Typical Configuration

The sequence of the tests shall be as follows:

First Low Flow Dynamic: The low flow run of the radioactive tracer survey shall be performed with a pumping-in velocity of 3 to 5 feet per minute. This would require a volume of between 65 gpm and 108 gpm to be injected during the survey. This is for the 24 inch wells, for Well I-5, which has a 20 inch casing this volume is 44 gpm and 73 gpm. Potable water from the same source as used for the video survey would be used as the most appropriate water supply for this portion of the test.

1) After beginning the flow of water into the well, the tool will be placed at a depth of approximately 5 feet above the base of the final casing, and a slug of 2 millicuries radioactive Iodine 131 is ejected. The tool will remain in place for a period of approximately one hour and the three gamma ray detectors in the "time drive" mode will record the movement of the slug. If tracer is detected at the uppermost detector, indicating potential staining of the tool, the tool may be moved upward to an alternate location.

2) After the one hour waiting period, a log out-of-position will be performed between the ejection point and a minimum of 200 feet above the highest point of tracer detection.

3) Upon completion of logging, the casing will be flushed with 3 to 5 casing volumes of effluent.

4) After flushing, the tool will immediately be run to the base of the casing, then the interval between the ejection point and 200 feet above the highest point of tracer detection will be logged.

Second Low Flow Dynamic: The process described above for the low flow dynamic log will be repeated to include a log out-of-position, a casing flush, and an after flush pass. A slug of tracer greater than or equal to 3 millicuries shall be used as determined by the ENGINEER.

If, during testing, no apparent anomalies appear that may indicate a lack of mechanical integrity in the injection well, the RTS will be concluded. If anomalies do occur, the RTS will be altered to track the radioactive tracer material. After RTS is complete, the RTS tool will be discharged in the injection zone and the well shall be flushed with 3 to 5 volumes of effluent. A second background log will be run from the bottom to the top of the well.

MIT Deadlines (sorted by date MIT pressure test due)

SDWWTP MIT Schedule of Completion

Well	Pressure Test	RTS/Video
IW-2	7/13/2013	7/25/2013
IW-1[1]	7/20/2013	7/31/2013
IW-3	7/24/2013	8/7/2013
IW-9[1]	7/30/2013	8/12/2013
IW-10[1]	8/6/2013	8/21/2013
IW-11	8/20/2013	9/3/2013
IW-12	8/25/2013	9/19/2013
IW-14	9/9/2013	9/26/2013
IW-13	9/16/2013	10/6/2013
IW-4	9/25/2013	10/14/2013
IW-6	9/30/2013	10/20/2013
IW-5	10/19/2013	10/27/2013
IW-7[2]	10/26/2013	1/7/2014
IW-8	11/2/2013	11/12/2013
IW-17	11/11/2013	11/19/2013
IW-16	11/18/2013	12/9/2013
IW-15	12/3/2013	12/16/2013

NOTES:
1.The original video was not clear enough and therefore a new video was done at the end of the MITs at SDWWTP.
2.The Computer failed during the RTS, because the Iodine 131 had already been injected, FDEP and DOH required 46 days b/f the RTS could be redone.

NDWWTP MIT Schedule of Completion

Well	Pressure Test	RTS/Video
IW-1N	3/14/2014	3/26/2014
IW-2N	3/25/2014	4/9/2014
IW-3N	4/2/2014	4/17/2014
IW-4N	4/9/2014	4/24/2014

REPAIR PLAN:

The following repair plans apply to wells at SDWWTP and NDWWTP.

1. Kill well and remove 24 inch gate valve and 4 inch bypass valves. Remove 1 inch pressure transmitter line and weld hold closed. Please see drawings included in below.

2. Sand existing casing in concrete pits and coat with Bitumastic. Please see drawings included in below.

3. Chip concrete around outer casing 1 inch deep, in order to embed PVC sleeve. Please see drawings included in below.

4. Install C905 PVC sleeve around casing pipe, embed 1 inch deep and fill annular space with grout, using Type II Neat cement. Slope top edge to create 30 degree watershed and seal at edges with sealant. Please see drawings included in below.

5. Relocate 1 inch pressure transmitter as indicated in drawings. Weld the hole. Please see drawings included in below.

6. At the NDWWTP IW-1N, IW-3N and IW-4N install new magmeters with any necessary spool pieces to be field determined. Please see drawings included in below.

7. Reassemble wellheads including installation of new 24 inch butterfly valve on horizontal part of well. Mega flanges will be used to ensure the layout of the pipe and the vales match. Please see drawings included in below.

8. On IW-4N at NDWWTP, install electric actuator for butterfly valve at base of injection well. Please see drawings included in below.

Appendix B

FDEP Approval of MIT Plan for SDWWTP and NDWWTP

November 26, 2012

Villamil, Sonia (WASD)

From: May, Joseph [redacted]
Sent: Monday, November 26, 2012 2:40 PM
To: Villamil, Sonia (WASD)
Cc: Vandor, Heidi; Silverman, Mark; Walsh, Virginia (WASD); Goldenberg, Bertha M. (WASD); Fallon Jr., Howard J. (WASD); Arrebola, Vicente (WASD); Macfarlane, Maria (WASD); Oakley, Clint (WASD)
Subject: RE: MDWASD MIT and Repair Plan Submittal

Importance: High

Hello all,

The Department approves the plan with the following understandings:

1) Medicinal grade I-131 should be specified since this solution is filtered to reduce precipitate material, as opposed to regular grade I-131, in the vial causing a tool malfunction. It has been our experience that an activity of ~1mCi/ml has been the easiest to work with in the field.
2) Please contact me a minimum of three days prior to mobilization to each site. Due to the travel time from West Palm Beach to the sites close coordination would be appreciated between myself and a designated contact person from the utility so that each pressure and RTS can be witnessed.

Thank you,

Joe

Please take a few minutes to share your comments on the service you received from the department by clicking on this link. DEP Customer Survey.

From: Villamil, Sonia (WASD) [mailto:[redacted]
Sent: Wednesday, October 17, 2012 9:42 AM
To: May, Joseph
Cc: Vandor, Heidi; Silverman, Mark; Walsh, Virginia (WASD); Goldenberg, Bertha M. (WASD); Fallon Jr., Howard J. (WASD); Arrebola, Vicente (WASD); Macfarlane, Maria (WASD); Oakley, Clint (WASD)
Subject: MDWASD MIT and Repair Plan Submittal

Hello Mr. May,

The MDWASD respectfully submits the attached MIT testing and repair plan for your approval. The paper copy is being sent via regular mail as well.

Thank you,

Sonia Villamil
Engineer II
Miami Dade Water and Sewer Department
3071 SW 38th Ave Room 554-8
Miami, FL 33146
[redacted]
fax: 786-552-8640
miamidade.gov

Appendix C

Field Notes from tests including gauge certification and pressure charts.

MIAMI-DADE WATER AND SEWER DEPARTMENT

MECHANICAL INTEGRITY TESTING OF DEEP INJECTION WELLS AND ASSOCIATED SERVICES

BID NO.: RPQ P0086

PRESSURE TEST IW – 5

September 13, 2013

TIME	CASING PRESSURE (psi)	PACKER PRESSURE (psi)
9:30	155.5	380
9:35	155.5	380
9:40	155.5	380
9:45	155	380
9:50	155	380
9:55	155	380
10:00	155	380
10:05	154.5	380
10:10	154.5	380
10:15	154	380
10:20	154	380
10:25	154	380
10:30	154	380

MIAMI-DADE WATER AND SEWER DEPARTMENT

MECHANICAL INTEGRITY TESTING OF DEEP INJECTION WELLS AND ASSOCIATED SERVICES

BID NO.: RPQ P0086

BREAK OFF TEST IW – 5

September 13, 2013

GALLONS	CASING PRESSURE (psi)	PACKER PRESSURE (psi)
0	154	380
5	117	370
10	81	355
15	46	350
20	10.5	348
~~25~~ 26.5	0	~~346~~ 336
30		

Top of Packer: _____ **feet**

Bottom of Casing: 2746 **feet**

MIAMI-DADE WATER AND SEWER DEPARTMENT

MECHANICAL INTEGRITY TESTING OF DEEP INJECTION WELLS AND ASSOCIATED SERVICES

BID NO.: RPQ P0086

PRESSURE TEST IW – 5

WITNESS LIST

September 13, 2013

NAME	SIGNATURE	COMPANY/AGENCY	TELEPHONE
Sonia Villamil	[redacted]	WASD	[redacted]
Maria MacFarlane		WASD	
Joe May		FDEP	
Michael Ashe		WASD	
CHRIS HARP		YBI	

IW-5 PT

Sensor/Session information

SensorSN	21325011	Modbus Ac	2
Sensor Typ	PT2X	Initialized v	2. 9
Sensor Nar	INW Smart Sensor	Uploaded	Aqua4Plus 1.9.3
Session Na	1MIN	Exported	Aqua4Plus 1.9.3
# Records	180		

Statistical Data

	Temperatu	Pressure(psi)

Rec #	Date/Time	Temperatu	Pressure(psi)
1	9/13/2013 9:27	79.2	155.203
2	9/13/2013 9:28	81.5	155.176
3	9/13/2013 9:29	83.4	155.142
4	9/13/2013 9:30	85	155.11
5	9/13/2013 9:31	86.3	155.071
6	9/13/2013 9:32	87.5	155.033
7	9/13/2013 9:33	87.6	155.002
8	9/13/2013 9:34	87.2	154.953
9	9/13/2013 9:35	87	154.914
10	9/13/2013 9:36	87.3	154.872
11	9/13/2013 9:37	88.2	154.835
12	9/13/2013 9:38	89.1	154.799
13	9/13/2013 9:39	90.2	154.763
14	9/13/2013 9:40	90.8	154.728
15	9/13/2013 9:41	91.4	154.695
16	9/13/2013 9:42	92.1	154.65
17	9/13/2013 9:43	92.7	154.616
18	9/13/2013 9:44	93.4	154.572
19	9/13/2013 9:45	94	154.539
20	9/13/2013 9:46	94.4	154.506
21	9/13/2013 9:47	94.9	154.463
22	9/13/2013 9:48	95	154.422
23	9/13/2013 9:49	94.5	154.384
24	9/13/2013 9:50	94.3	154.355
25	9/13/2013 9:51	94.3	154.304
26	9/13/2013 9:52	94	154.265
27	9/13/2013 9:53	93.8	154.236
28	9/13/2013 9:54	93.4	154.197
29	9/13/2013 9:55	93.3	154.158
30	9/13/2013 9:56	93.3	154.127
31	9/13/2013 9:57	92.7	154.09
32	9/13/2013 9:58	92.4	154.041
33	9/13/2013 9:59	91.8	154.004
34	9/13/2013 10:00	91.4	153.966

35	9/13/2013 10:01	91.1	153.927
36	9/13/2013 10:02	90.7	153.889
37	9/13/2013 10:03	90.5	153.849
38	9/13/2013 10:04	90.3	153.81
39	9/13/2013 10:05	90.3	153.77
40	9/13/2013 10:06	90.4	153.739
41	9/13/2013 10:07	90.4	153.698
42	9/13/2013 10:08	90.4	153.668
43	9/13/2013 10:09	90.4	153.627
44	9/13/2013 10:10	90.6	153.596
45	9/13/2013 10:11	90.9	153.553
46	9/13/2013 10:12	91.3	153.511
47	9/13/2013 10:13	91.8	153.477
48	9/13/2013 10:14	92.3	153.444
49	9/13/2013 10:15	92.5	153.412
50	9/13/2013 10:16	92.9	153.37
51	9/13/2013 10:17	93.2	153.338
52	9/13/2013 10:18	93.5	153.296
53	9/13/2013 10:19	93.8	153.264
54	9/13/2013 10:20	93.9	153.223
55	9/13/2013 10:21	94.1	153.191
56	9/13/2013 10:22	94.2	153.16
57	9/13/2013 10:23	94.2	153.12
58	9/13/2013 10:24	94.2	153.079
59	9/13/2013 10:25	94.2	153.049
60	9/13/2013 10:26	94.1	153.009
61	9/13/2013 10:27	94.2	152.968
62	9/13/2013 10:28	94.4	149.514
63	9/13/2013 10:29	94.9	130.273
64	9/13/2013 10:30	95.1	110.567
65	9/13/2013 10:31	95.6	112.004
66	9/13/2013 10:32	95.4	72.413
67	9/13/2013 10:33	95.4	80.746
68	9/13/2013 10:34	95.6	56.121
69	9/13/2013 10:35	95.9	35.546
70	9/13/2013 10:36	96	26.231
71	9/13/2013 10:37	96.2	11.944
72	9/13/2013 10:38	96.5	10.526
73	9/13/2013 10:39	96.6	2.193
74	9/13/2013 10:40	96.8	-0.743
75	9/13/2013 10:41	96.8	-0.905
76	9/13/2013 10:42	97	0.118
77	9/13/2013 10:43	96.8	0.007
78	9/13/2013 10:44	96	0.006
79			
80			
81			

Certificate of Calibration

OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

Ozone Industries, Inc.
Precision Measurement Equipment Division

Purchase Order #

Calibration Performed By:
OZONE INDUSTRIES, INC.
15551 PINE RIDGE RD.
FORT MYERS, FL 33908

For:
YOUNGQUIST BROTHERS, INC.
15465 PINE RIDGE RD.
FORT MYERS, FL 33908

EQUIPMENT INFORMATION:

Description: PRESSURE GAUGE
Manufacter: MCDANIELS
Model Number: 300PSI
Part Number: N/A
Range: 0-300 PSI

Serial Number: 972062-1
Customer I.D.:
Cust. Barcode: N/A
Cust. Location: N/A
Specifications: +/- 0.25% FS

Cal Date: 6/6/2013
Cal. Due Date: 8/5/2013
Cal. Interval 60 DAYS
Received: IN TOLERANCE
Calibration Result: PASS
Environmental Conditions: 74 DEG F / 20% H
Performed By: Daniel McKissick

Procedure: STANDARD

This is to certify that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure at the points tested (unless otherwise noted). It has been Calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration is in accordance with Ozone Industries, Inc Quality Assurance Manual. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

Calibration Remarks:
THIS UNIT WAS FOUND TO BE IN TOLERANCE AT THE TIME OF CALIBRATION.
PERFORMED ROUTINE CALIBRATION / CERTIFICATION

Standards Used to Calibrate Equipment:

Company	I.D.	Description	Last Cal.	Cal. Due Date
OZONE	A1731	EATON UPC5000 PNEUMATIC CALIBRATOR	12/12/2012	12/12/2013

Signatures:

Certified by:
Print: Daniel McKissick
Date: 06/06/13
[redacted]

Approved by:
Print: Daniel McKissick
[redacted]

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15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

PH: 239-433-3400
FAX: 239-489-3877

CONTROL NO: 032509-1

CUSTOMER: YBI15465

CALIBRATION DATA FORM

MFR:	MCDANIELS	**DESCRIPTION**	PRESSURE GAUGE
MODEL NO:	300 PSI .25%	**TECHNICIAN:**	0030
SERIAL NO:	972062-1	**CAL. DATE:**	06/06/13
CUST. ID:	N/A	**DUE DATE:**	08/05/13

* IF NO "AS LEFT" READING IS SHOWN ON THIS CHART, IT MEANS THE UNIT WAS IN TOLERANCE AND THERE WERE NO ADJUSTMENTS MADE TO IT.

RANGE: 0-300 PSI

NOMINAL	AS FOUND	AS LEFT *	LOW LIMIT	HIGH LIMIT
50	50.26		49.25	50.75
100	100.31		99.25	100.75
150	150.38		149.25	150.75
200	200.49		199.25	200.75
300	300.6		299.25	300.75

Certificate of Calibration

OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

Ozone Industries, Inc.
Precision Measurement Equipment Division

Purchase Order #

Calibration Performed By:
OZONE INDUSTRIES, INC.
15551 PINE RIDGE RD.
FORT MYERS, FL 33908

For:
YOUNGQUIST BROTHERS, INC.
15465 PINE RIDGE RD.
FORT MYERS, FL 33908

EQUIPMENT INFORMATION:

Description: PRESSURE GAUGE
Manufacter: McDaniel
Model Number: 300PSI
Part Number: N/A
Range: 0-300 PSI

Serial Number: 972034-2
Customer I.D.:
Cust. Barcode: N/A
Cust. Location: N/A
Specifications: +/- 0.25% FS

Cal Date: 5/17/2013
Cal. Due Date: 11/17/2013
Cal. Interval 6 MONTHS
Received: IN TOLERANCE
Calibration Result: PASS
Environmental Conditions: 74 DEG F / 80% H
Performed By: Daniel McKissick

Procedure: STANDARD

This is to certify that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure at the points tested (unless otherwise noted). It has been Calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration is in accordance with Ozone Industries, Inc Quality Assurance Manual. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

Calibration Remarks:
THIS UNIT WAS FOUND TO BE IN TOLERANCE AT THE TIME OF CALIBRATION.
PERFORMED ROUTINE CALIBRATION / CERTIFICATION

Standards Used to Calibrate Equipment:

Company	I.D.	Description	Last Cal.	Cal. Due Date
OZONE	A1731	EATON UPC5000 PNEUMATIC CALIBRATOR	12/12/2012	12/12/2013

Signatures:

Certified by:
Print: Daniel McKissick
[redacted]

Approved by:
Print: Daniel McKissick
Date: [redacted] 05/17/13
[redacted]

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15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

PH: 239-433-3400
FAX: 239-489-3877

CONTROL NO: 100809-7

CUSTOMER: YBI15465

CALIBRATION DATA FORM

MFR:	PIC	**DESCRIPTION**	PRESSURE GAUGE
MODEL NO:	300 PSI .25%	**TECHNICIAN:**	0030
SERIAL NO:	972034-2	**CAL. DATE:**	05/17/13
CUST. ID:	N/A	**DUE DATE:**	11/17/13

* IF NO "AS LEFT" READING IS SHOWN ON THIS CHART, IT MEANS THE UNIT WAS IN TOLERANCE AND THERE WERE NO ADJUSTMENTS MADE TO IT.

RANGE: 0-300 PSI

NOMINAL	AS FOUND	AS LEFT *	LOW LIMIT	HIGH LIMIT
50	49.59		49.25	50.75
100	99.47		99.25	100.75
150	149.45		149.25	150.75
200	199.43		199.25	200.75
300	299.4		299.25	300.75

Certificate of Calibration

OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

Ozone Industries, Inc.
Precision Measurement Equipment Division

Purchase Order #

Calibration Performed By:
OZONE INDUSTRIES, INC.
15551 PINE RIDGE RD.
FORT MYERS, FL 33908

For:
YOUNGQUIST BROTHERS, INC.
15465 PINE RIDGE RD.
FORT MYERS, FL 33908

EQUIPMENT INFORMATION:

Description: PRESSURE GAUGE
Manufacter: MCDANIELS
Model Number: 300PSI
Part Number: N/A
Range: 0-300 PSI

Serial Number: AB30128
Customer I.D.:
Cust. Barcode: N/A
Cust. Location: N/A
Specifications: +/- 0.25% FS

Cal Date: 6/17/2013
Cal. Due Date: 12/17/2013
Cal. Interval 6 MONTHS
Received: IN TOLERANCE
Calibration Result: PASS
Environmental Conditions: 73 DEG F / 40% H
Performed By: Daniel McKissick

Procedure: STANDARD

This is to certify that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure at the points tested (unless otherwise noted). It has been Calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration is in accordance with Ozone Industries, Inc Quality Assurance Manual. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

Calibration Remarks:
THIS UNIT WAS FOUND TO BE IN TOLERANCE AT THE TIME OF CALIBRATION.
PERFORMED ROUTINE CALIBRATION / CERTIFICATION

Standards Used to Calibrate Equipment:

Company	I.D.	Description	Last Cal.	Cal. Due Date
OZONE	A1731	EATON UPC5000 PNEUMATIC CALIBRATOR	12/12/2012	12/12/2013

Signatures:

Certified by:
Print: Daniel McKissick
Date: 06/17/13
[redacted]

Approved by:
Print: Daniel McKissick
Date: 06/17/13
[redacted]

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OZONE
INDUSTRIES
CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

PH: 239-433-3400
FAX: 239-489-3877

CONTROL NO: 080709-2

CUSTOMER: YBI15465

CALIBRATION DATA FORM

MFR:	MCDANIELS	**DESCRIPTION**	PRESSURE GAUGE
MODEL NO:	300 PSI .25%	**TECHNICIAN:**	0030
SERIAL NO:	AB30128	**CAL. DATE:**	06/17/13
CUST. ID:	N/A	**DUE DATE:**	12/17/13

* IF NO "AS LEFT" READING IS SHOWN ON THIS CHART, IT MEANS THE UNIT WAS IN TOLERANCE AND THERE WERE NO ADJUSTMENTS MADE TO IT.

RANGE: 0-200 PSI

NOMINAL	AS FOUND	AS LEFT *	LOW LIMIT	HIGH LIMIT
50	50.18		49.25	50.75
100	100.19		99.25	100.75
150	150.22		149.25	150.75
200	200.31		199.25	200.75
250	250.33		249.25	250.75
300	300.39		299.25	300.75

Appendix D

RTS and RTS Tool Configuration

RADIOACTIVE TRACER SURVEY LOG

Company	SOUTH MIAMI-DADE W.W.T.P.
Well	IW-5
Field	S.D.W.W.T.P.
County	MIAMI-DADE
State	FLORIDA

Location: API # :

SEC TWP RGE

Other Services

Permanent Datum	PAD	Elevation	PAD
Log Measured From	PAD		
Drilling Measured From	PAD		

Elevation
K.B.
D.F.
G.L.

Date	23-SEP-2013		
Run Number	2013 MIT		
Depth Driller	2898'		
Depth Logger	2830'		
Bottom Logged Interval	2830'		
Top Log Interval	SURFACE		
Open Hole Size	18"		
Type Fluid	WATER		
Density / Viscosity	NA		
Max. Recorded Temp.	NA		
Estimated Cement Top	NA		
Time Well Ready	ON ARRIVAL		
Time Logger on Bottom	0800		
Equipment Number	102		
Location	FT MYERS		
Recorded By	V.RIVES	R. GARCIA	A.GARCIA
Witnessed By	S. VILLAMIL		

Borehole Record				Borehole Record			
Run Number	Bit	From	To	Run No	Bit	From	To

Casing Record	Size	Wgt/Ft	Top	Bottom
Surface String				
Prot. String				
Production String	20"	.500" W.T.	SURFACE	2752'
Liner				

<< Fold Here >>>

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

Comments

HIGH RESOLUTION TEMPERATURE

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)

GR#3	24.00				
		GR #3 -RTST (952T)	11.50	1.69	30.00
		TREJCT-A (952)	1.00	1.69	10.00
		GR #2 -RTSM (952M)	3.00	1.69	10.00
GR#2	10.50				
CCL	9.60	CCL-1.68GRRTS (952)	0.75	1.69	10.00
		GR-RTSB (952B)	9.25	1.69	10.00
GR	1.20				

Dataset: sdwwtp-iw5.db: field/well/run1/pass4
Total Length: 25.50 ft
Total Weight: 70.00 lb
O.D. 1.69 in

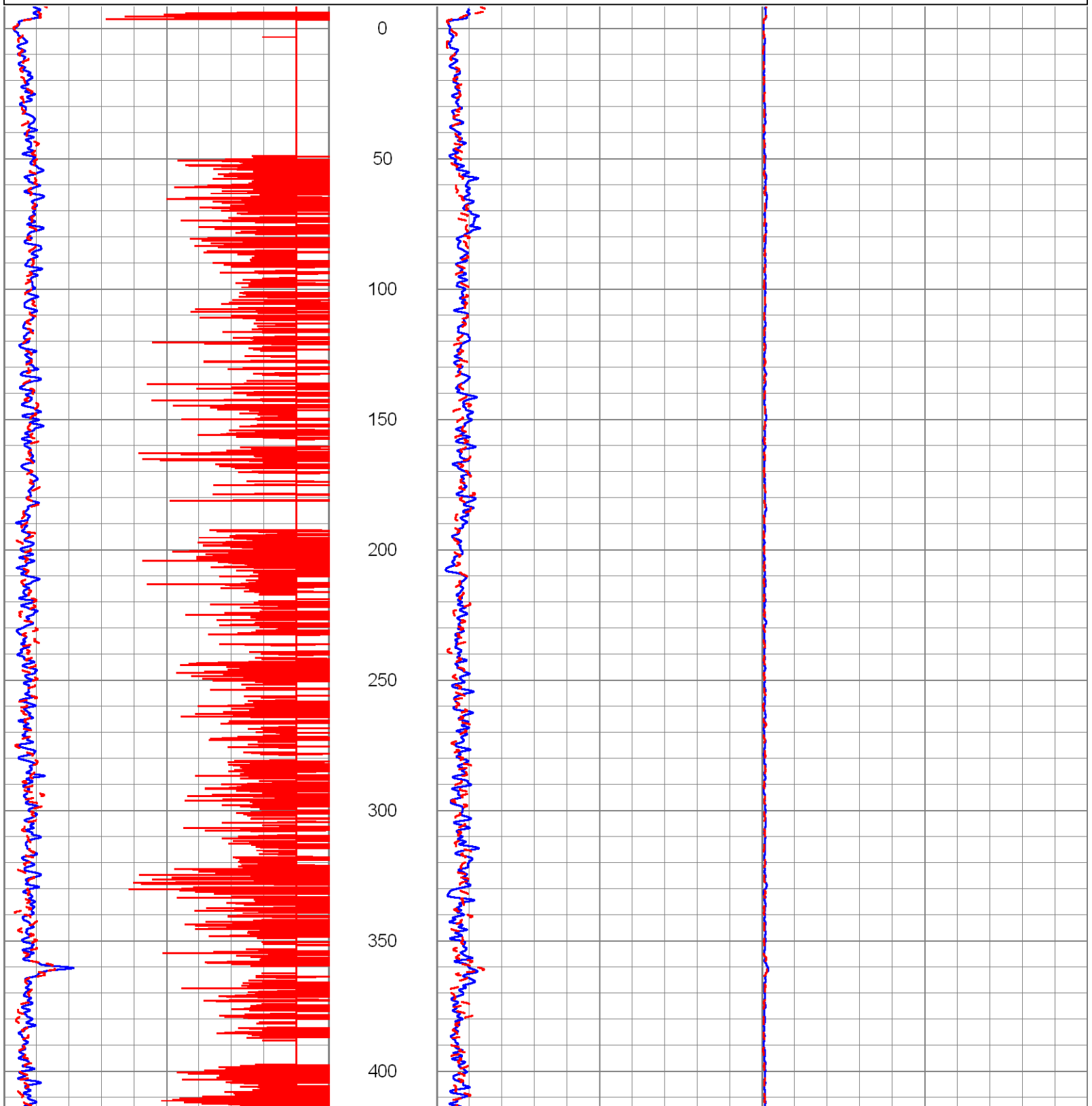
YOUNGQUIST

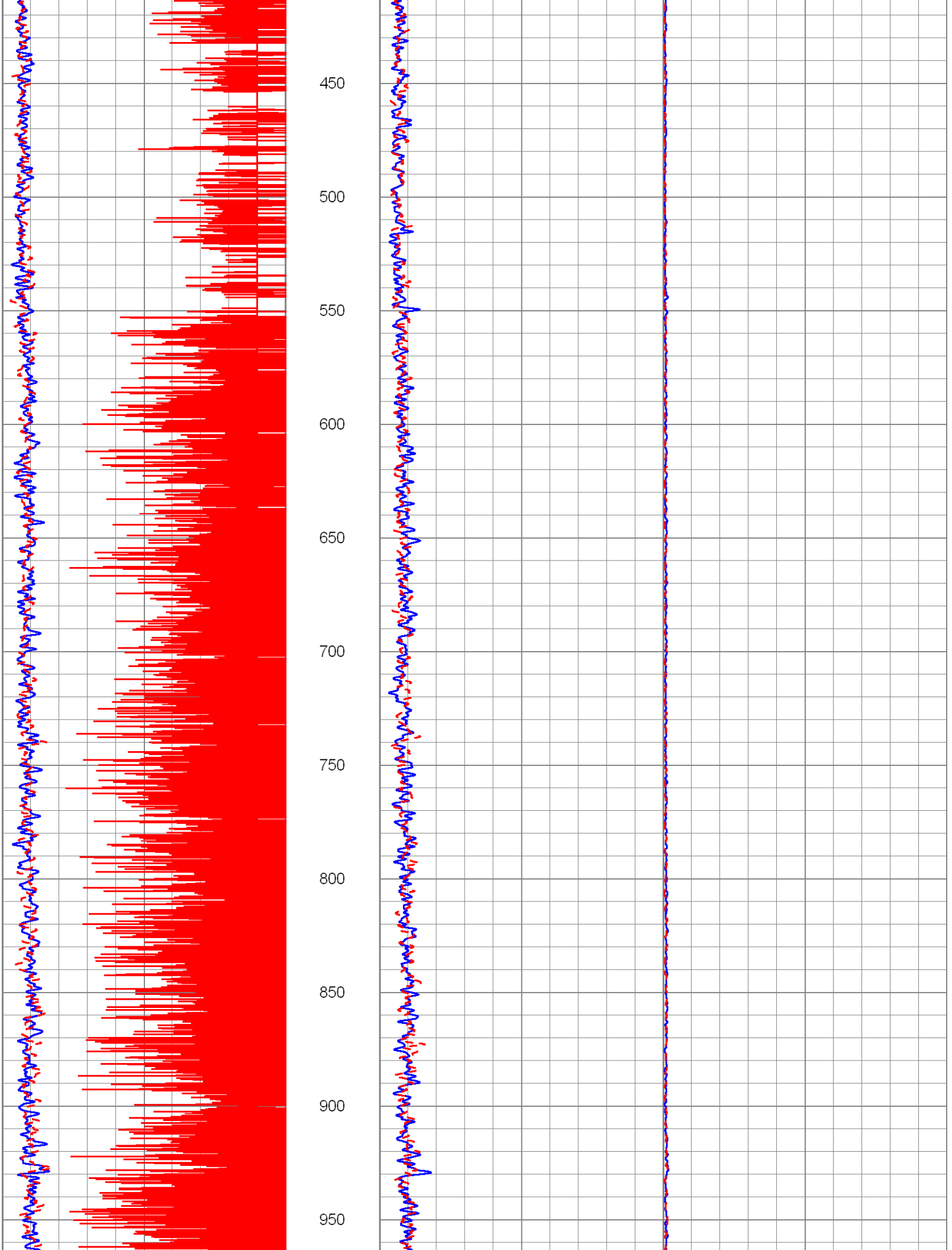
FINAL BACKGROUND

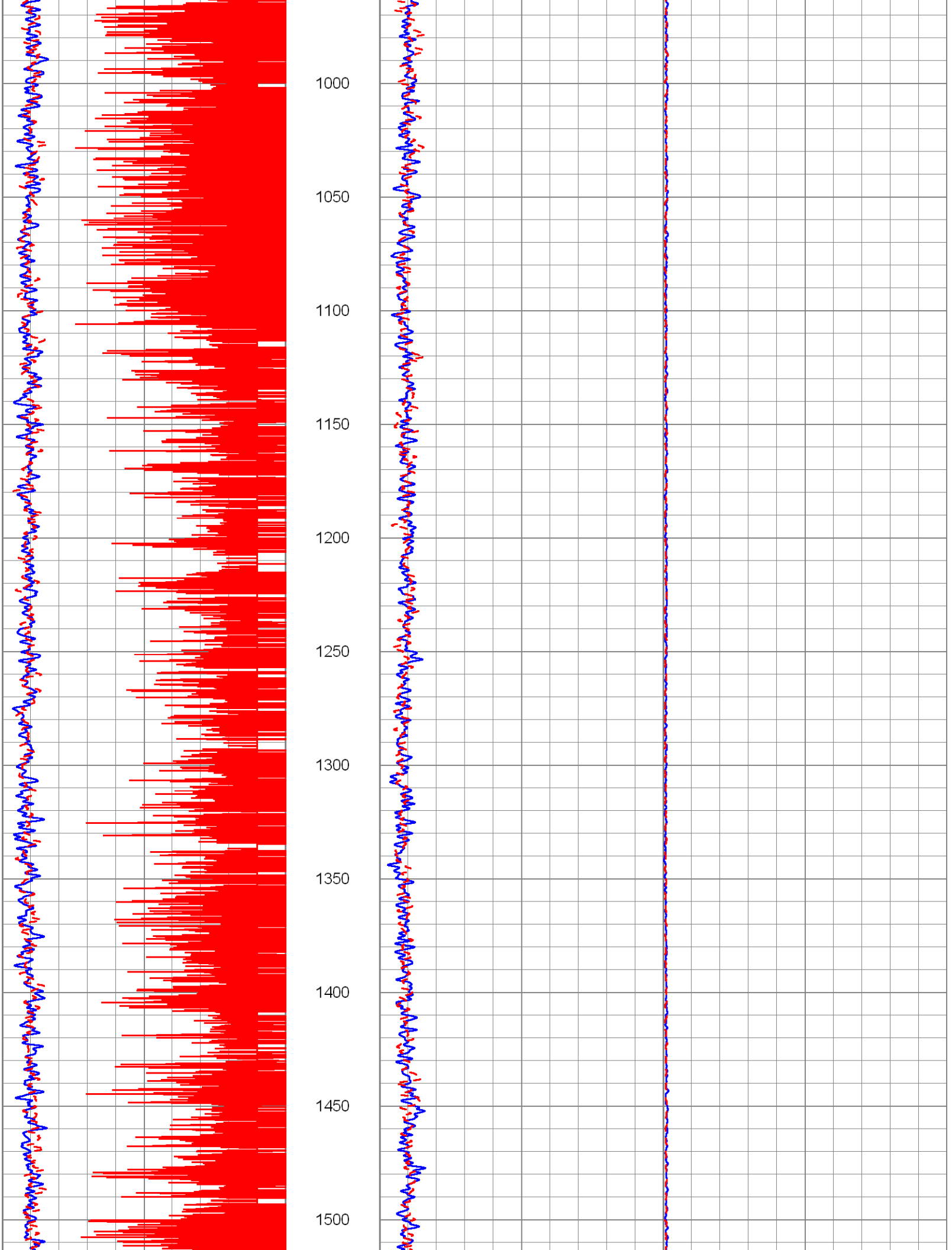
FINAL BACKGROUND

Database File:	sdwwtp-iw5.db
Dataset Pathname:	pass13
Presentation Format:	rts
Dataset Creation:	Mon Sep 23 15:17:08 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:600

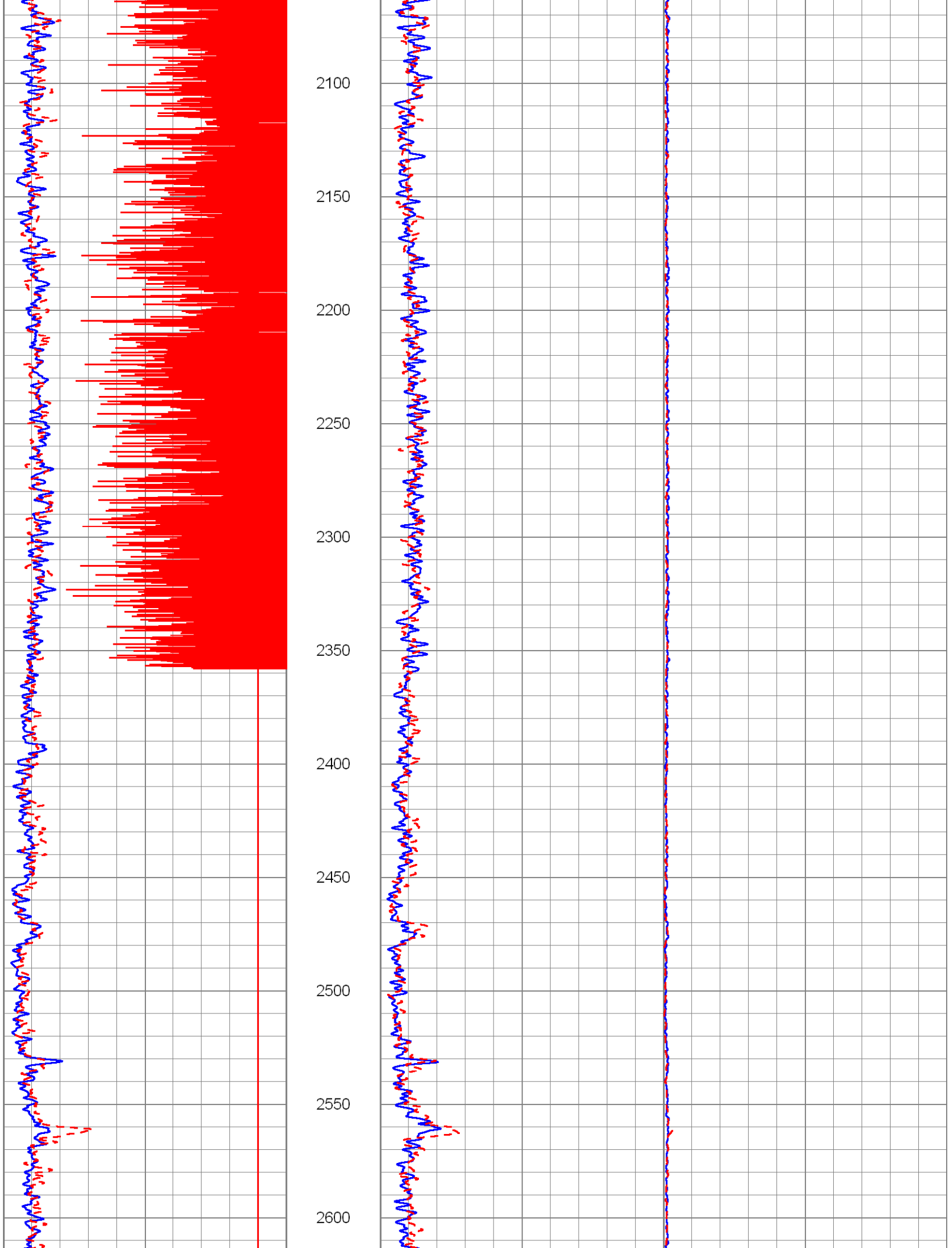
0	GRT (GAPI)	100		0	GRB (GAPI)	100	0	GRM (GAPI)	1000
0	GRT-BACKGRND (GAPI)	100		0	GRB-BACKGRD (GAPI)	100	0	GRM-BACKGRND (GAPI)	1000
0.9	CCL	-0.1							

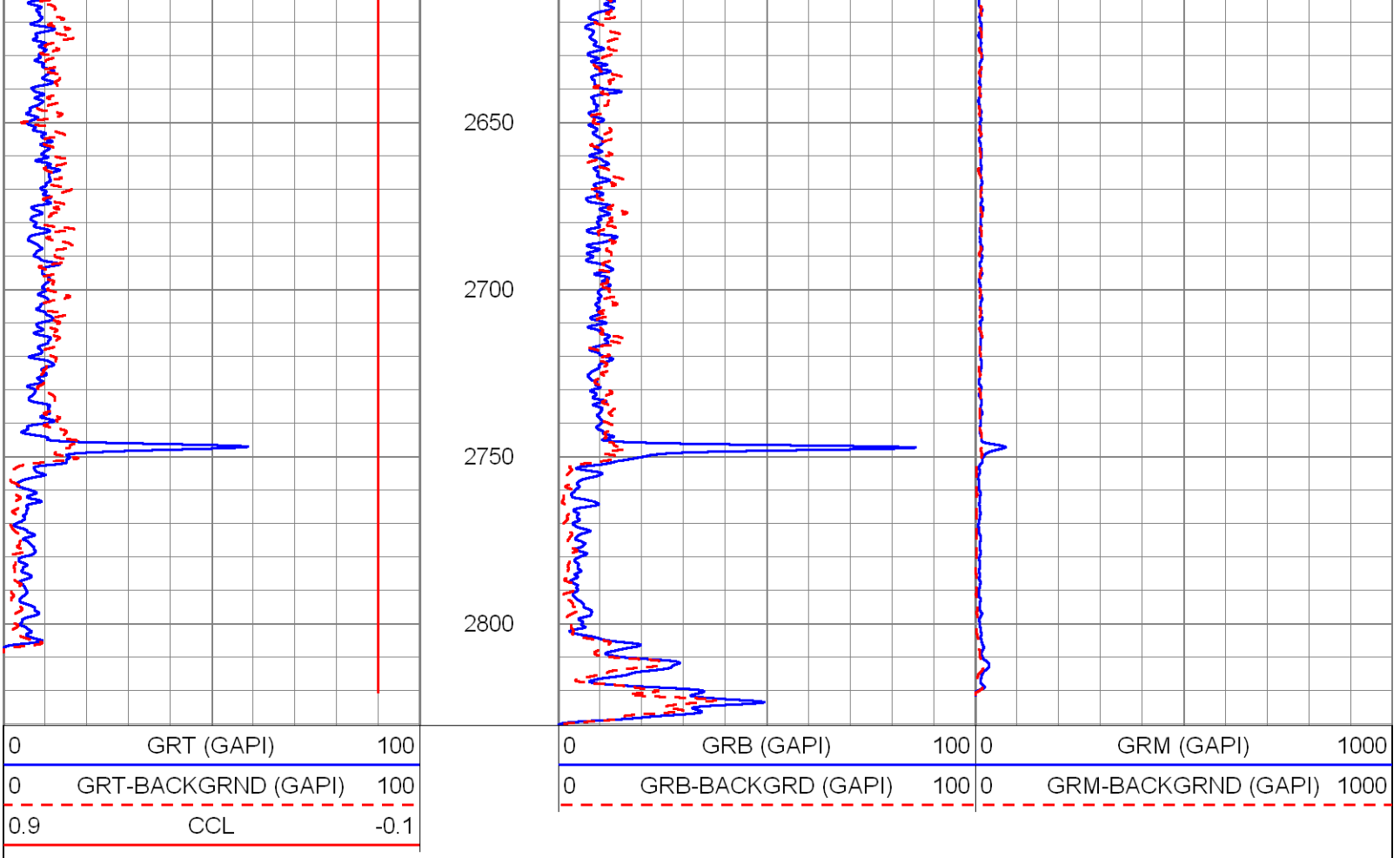



450
500
550
600
650
700
750
800
850
900
950


1000
1050
1100
1150
1200
1250
1300
1350
1400
1450
1500

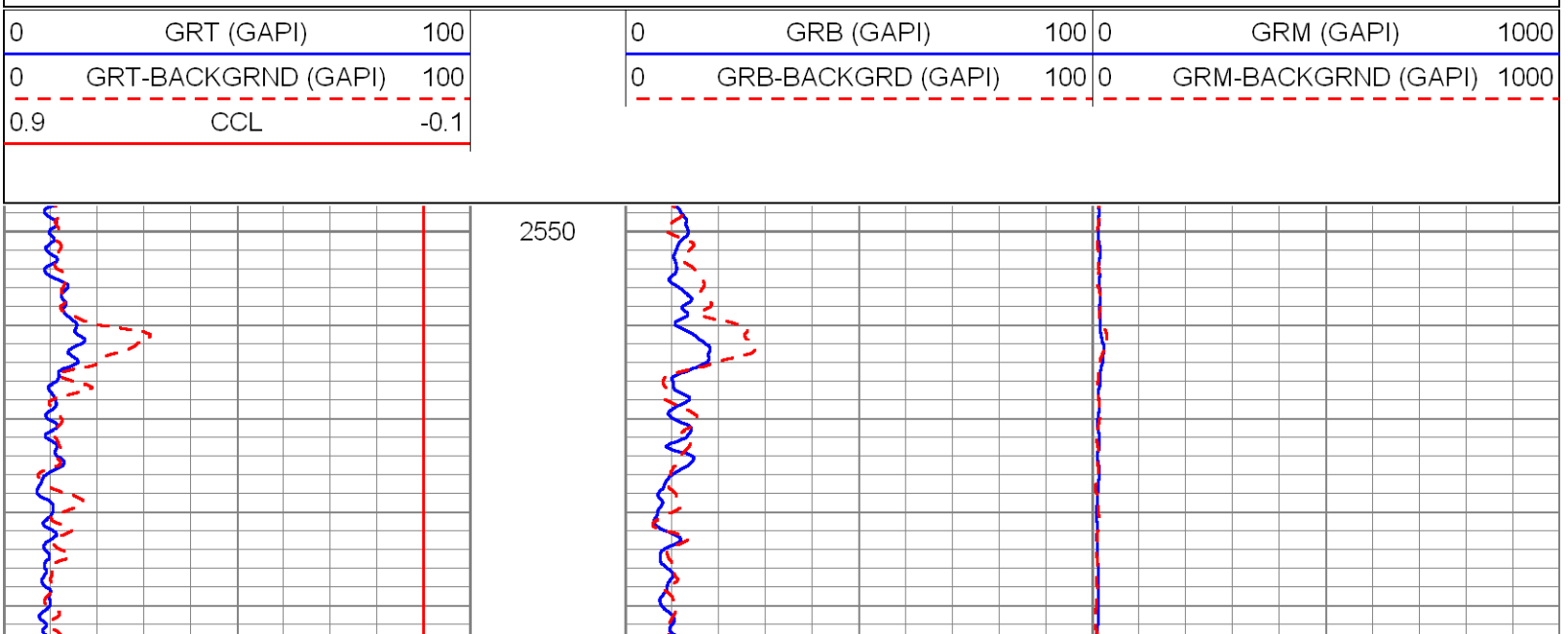
1550
1600
1650
1700
1750
1800
1850
1900
1950
2000
2050

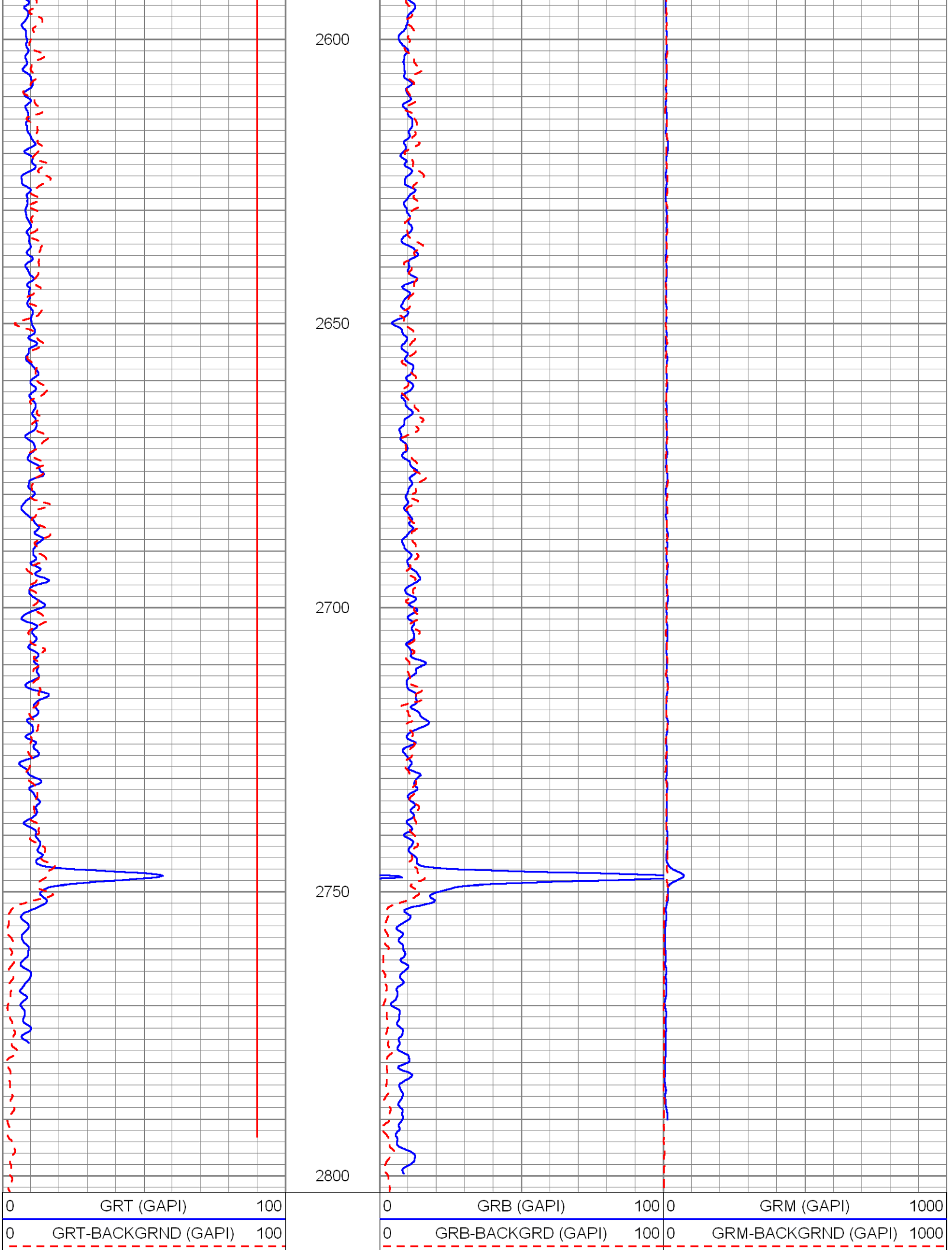

2100
2150
2200
2250
2300
2350
2400
2450
2500
2550
2600



LAF #2

Database File: sdwwtp-iw5.db
Dataset Pathname: pass12
Presentation Format: rts
Dataset Creation: Mon Sep 23 14:58:27 2013 by Log SOC 110722
Charted by: Depth in Feet scaled 1:240



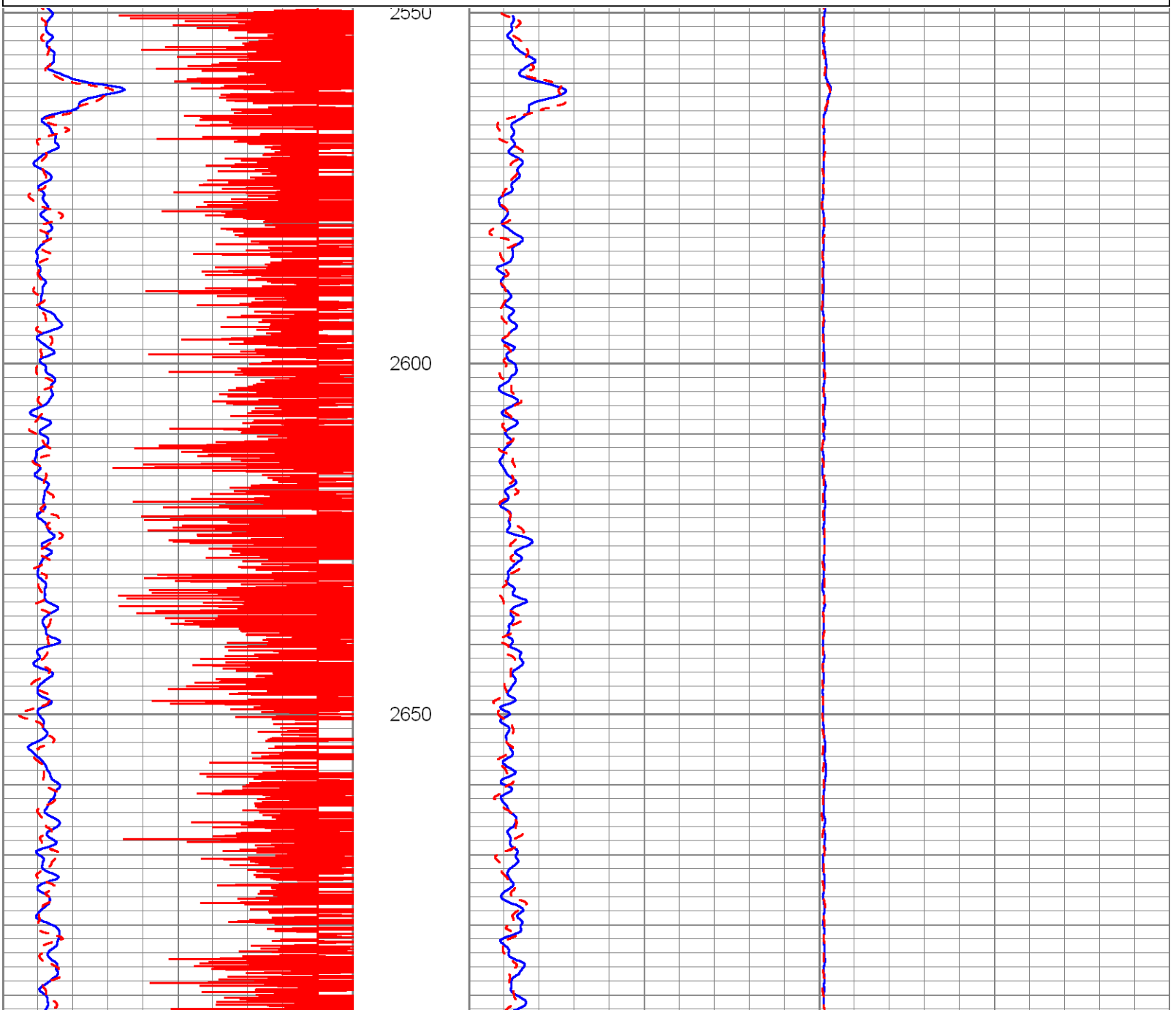

2600
2650
2700
2750
2800
0 GRT (GAPI) 100
0 GRT-BACKGRND (GAPI) 100
0 GRB (GAPI) 100
0 GRB-BACKGRD (GAPI) 100
0 GRM (GAPI) 1000
0 GRM-BACKGRND (GAPI) 1000

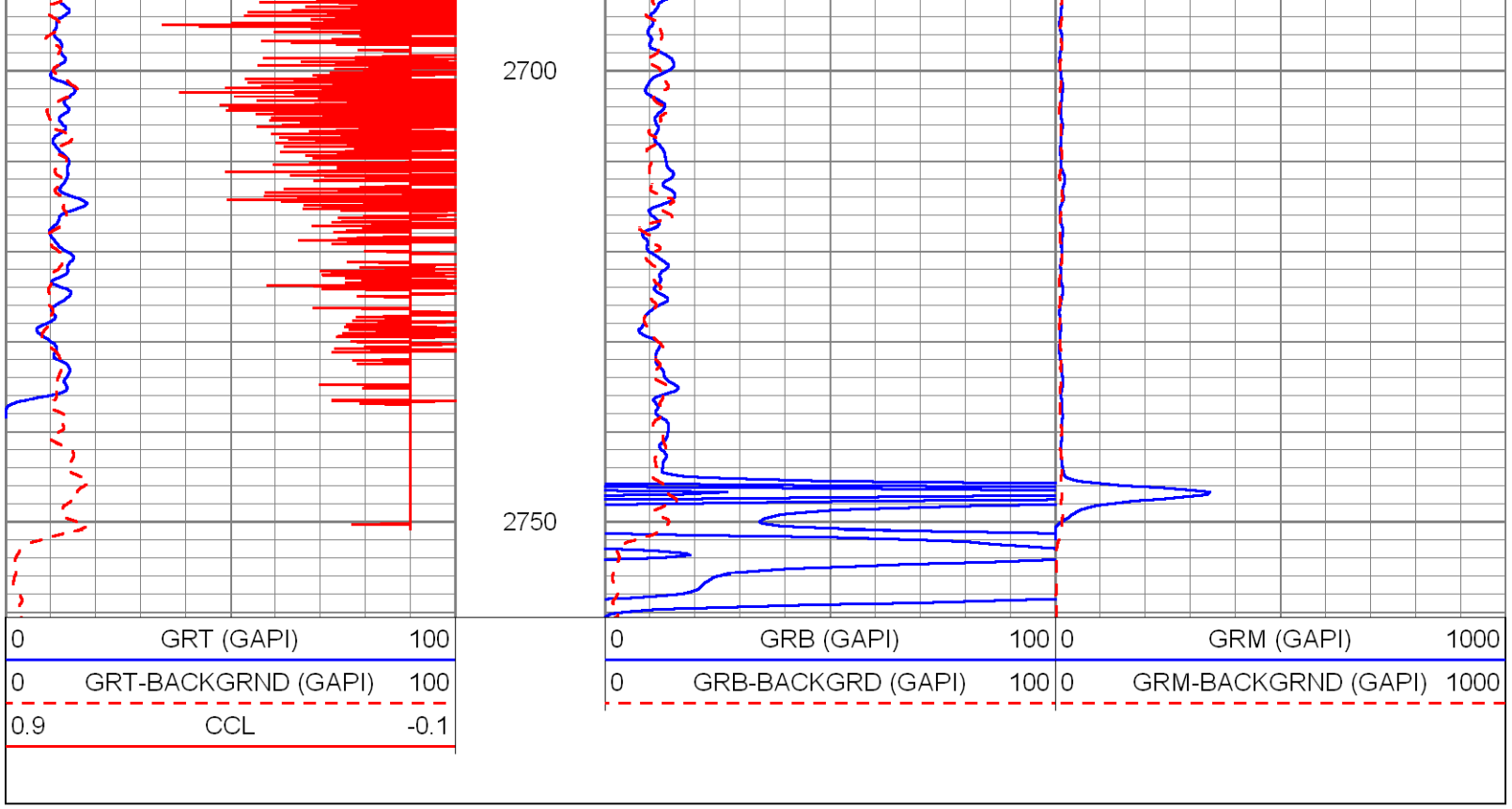
0.9	CCL	-0.1

LOP #2

Database File:	sdwwtp-iw5.db
Dataset Pathname:	pass11
Presentation Format:	rts
Dataset Creation:	Mon Sep 23 14:43:49 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:240

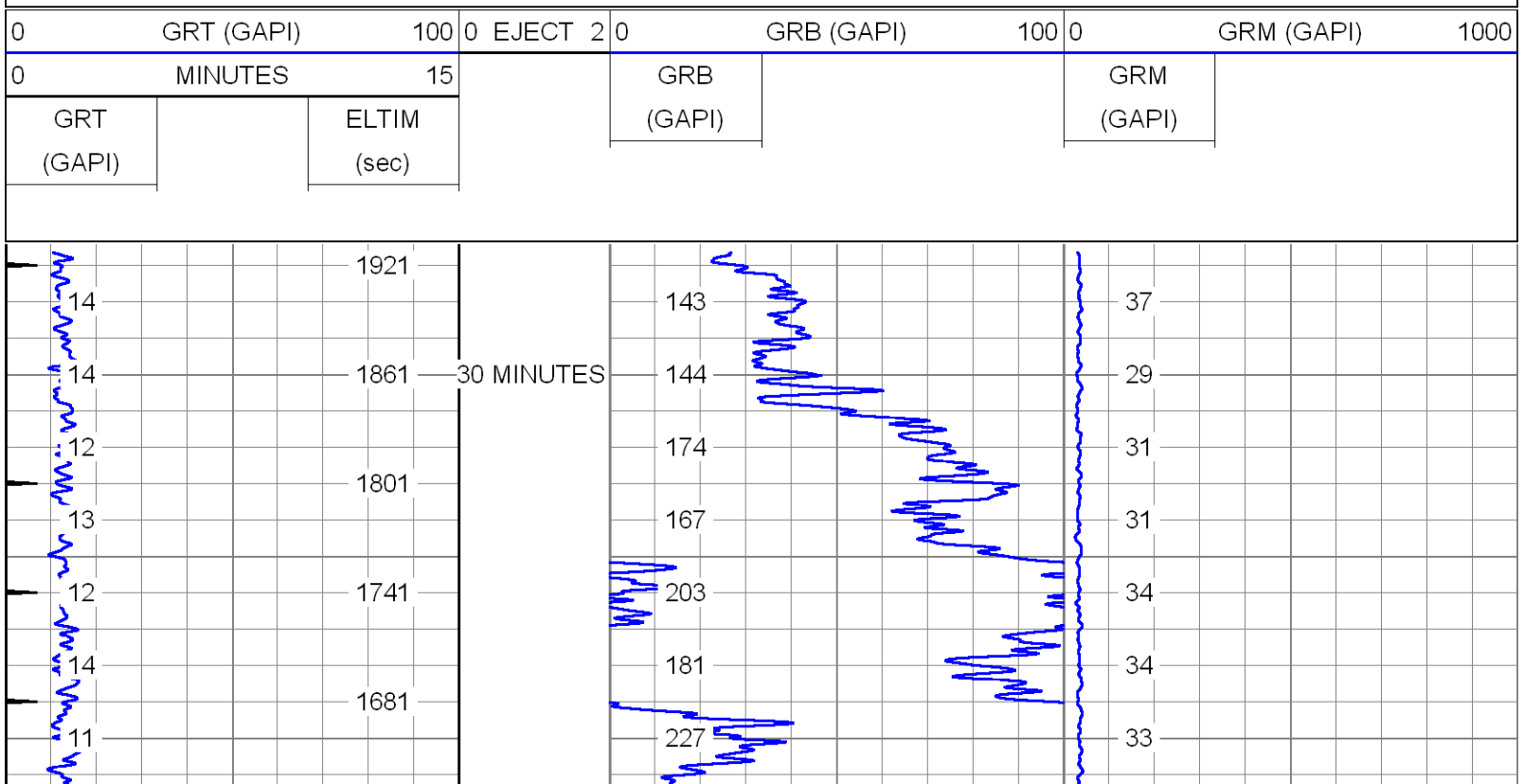
0	GRT (GAPI)	100	0	GRB (GAPI)	100	0	GRM (GAPI) 1000
0	GRT-BACKGRND (GAPI)	100	0	GRB-BACKGRD (GAPI)	100	0	GRM-BACKGRND (GAPI) 1000
0.9	CCL	-0.1					

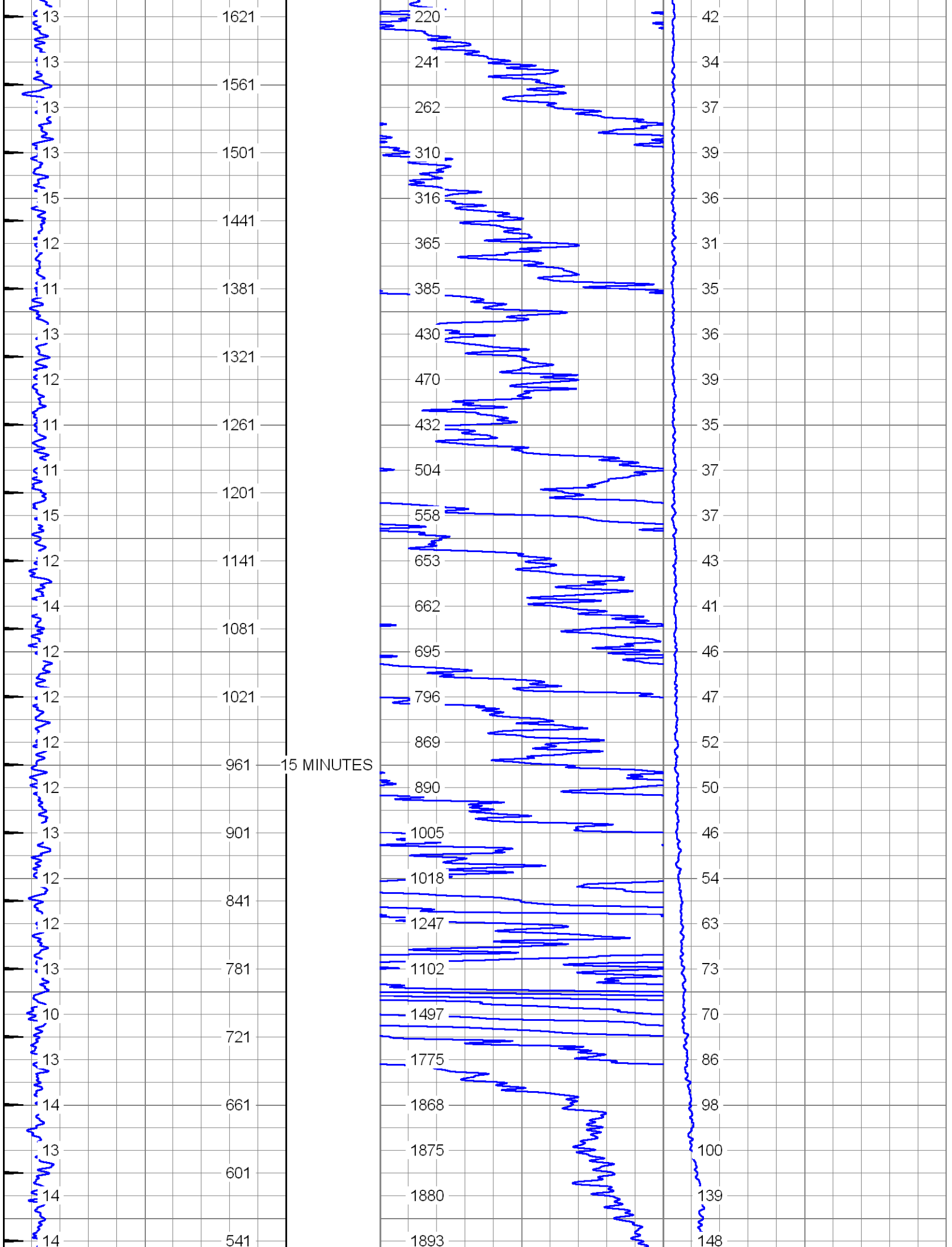


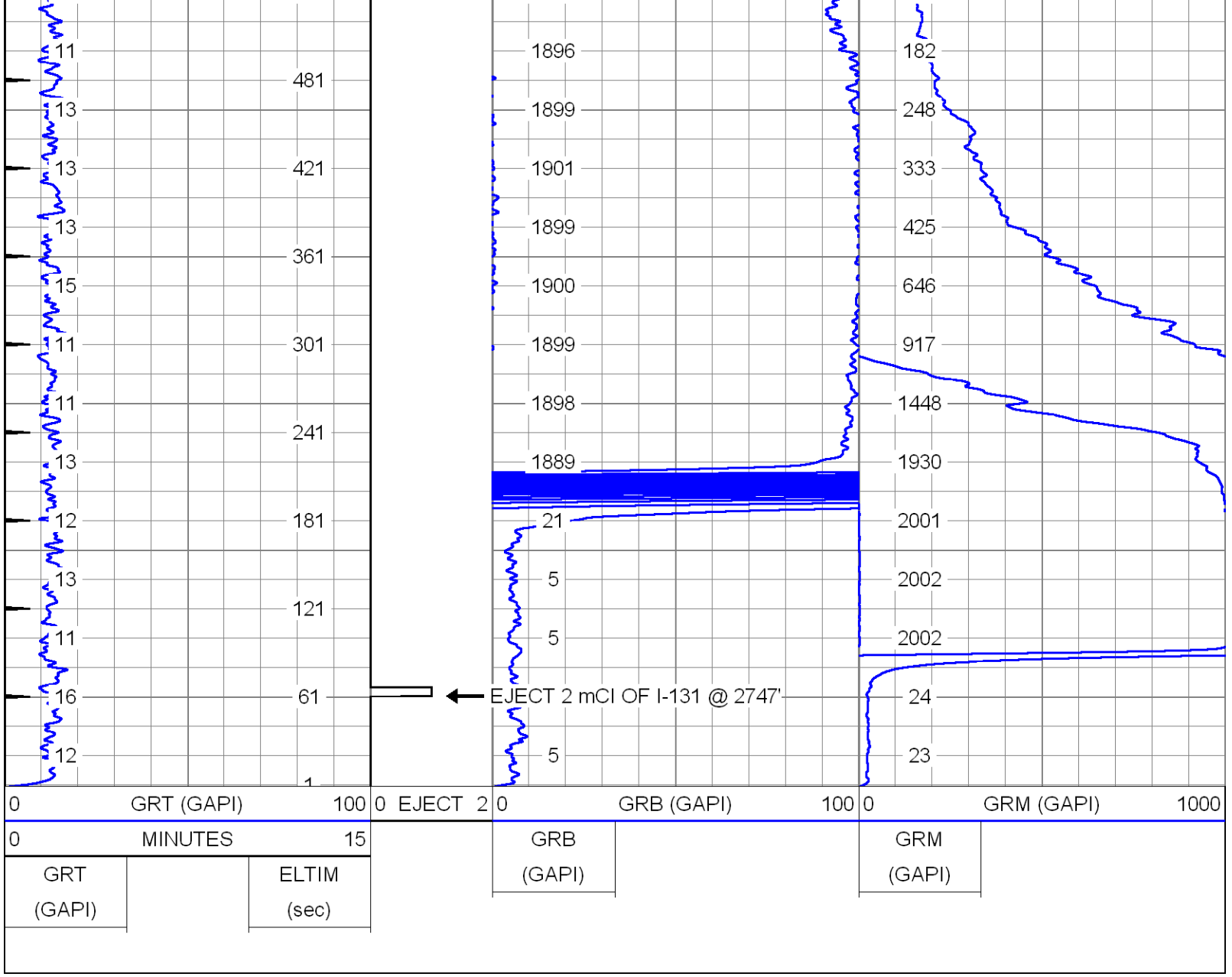


DYNAMIC TEST #2 (71 GPM)

Database File:	sdwwtp-iw5.db
Dataset Pathname:	pass10
Presentation Format:	rtstime
Dataset Creation:	Mon Sep 23 14:10:06 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:600

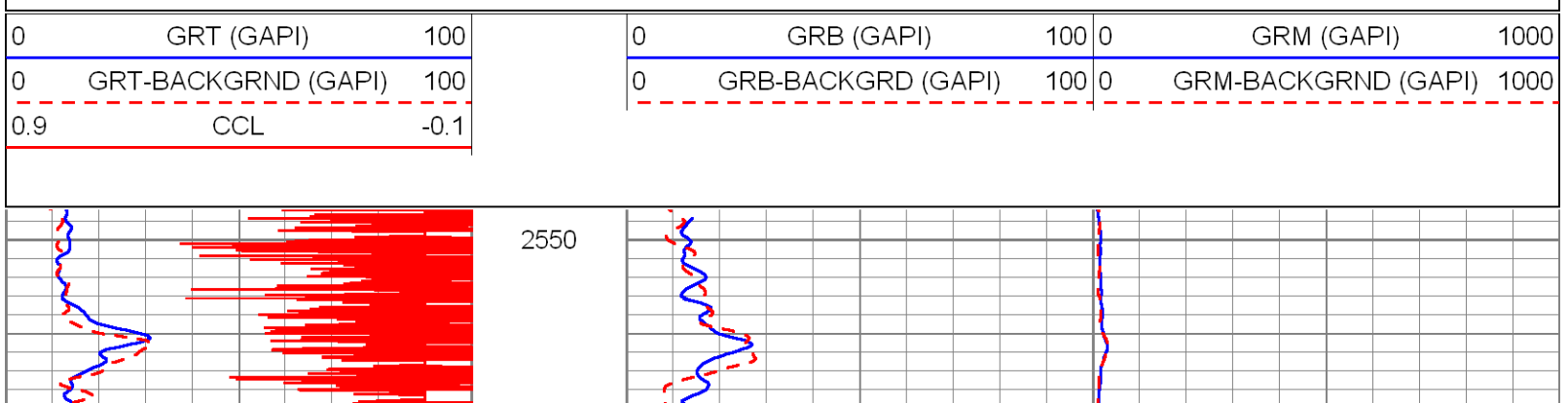


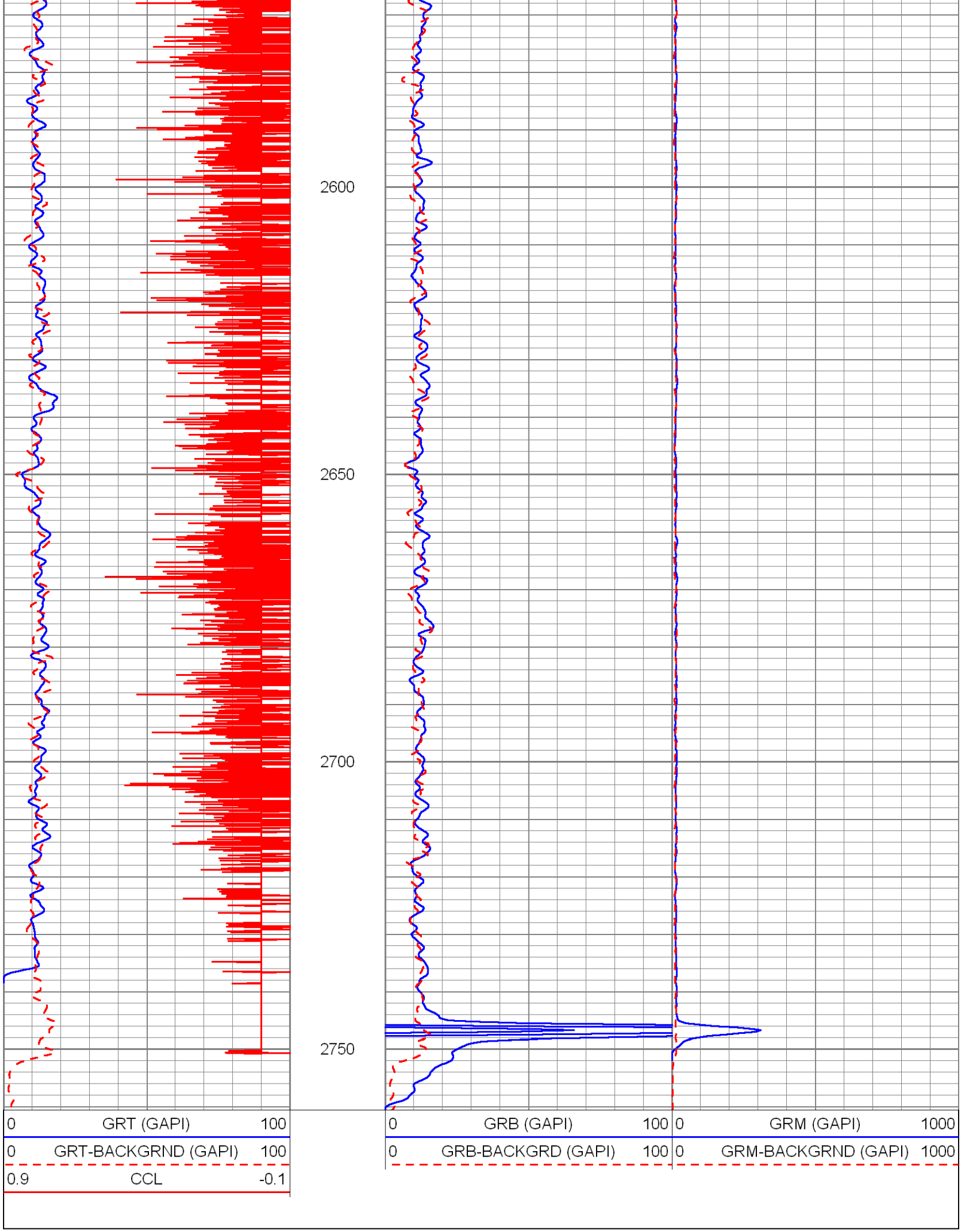

13
13
13
13
15
12
11
13
12
11
11
15
12
14
12
12
12
12
13
12
13
10
13
14
13
14
14
1621
1561
1501
1441
1381
1321
1261
1201
1141
1081
1021
961
901
841
781
721
661
601
541
15 MINUTES
220
241
262
310
316
365
385
430
470
432
504
558
653
662
695
796
869
890
1005
1018
1247
1102
1497
1775
1868
1875
1880
1893
42
34
37
39
36
31
35
36
39
35
37
37
43
41
46
47
52
50
46
54
63
73
70
86
98
100
139
148



LOP #1

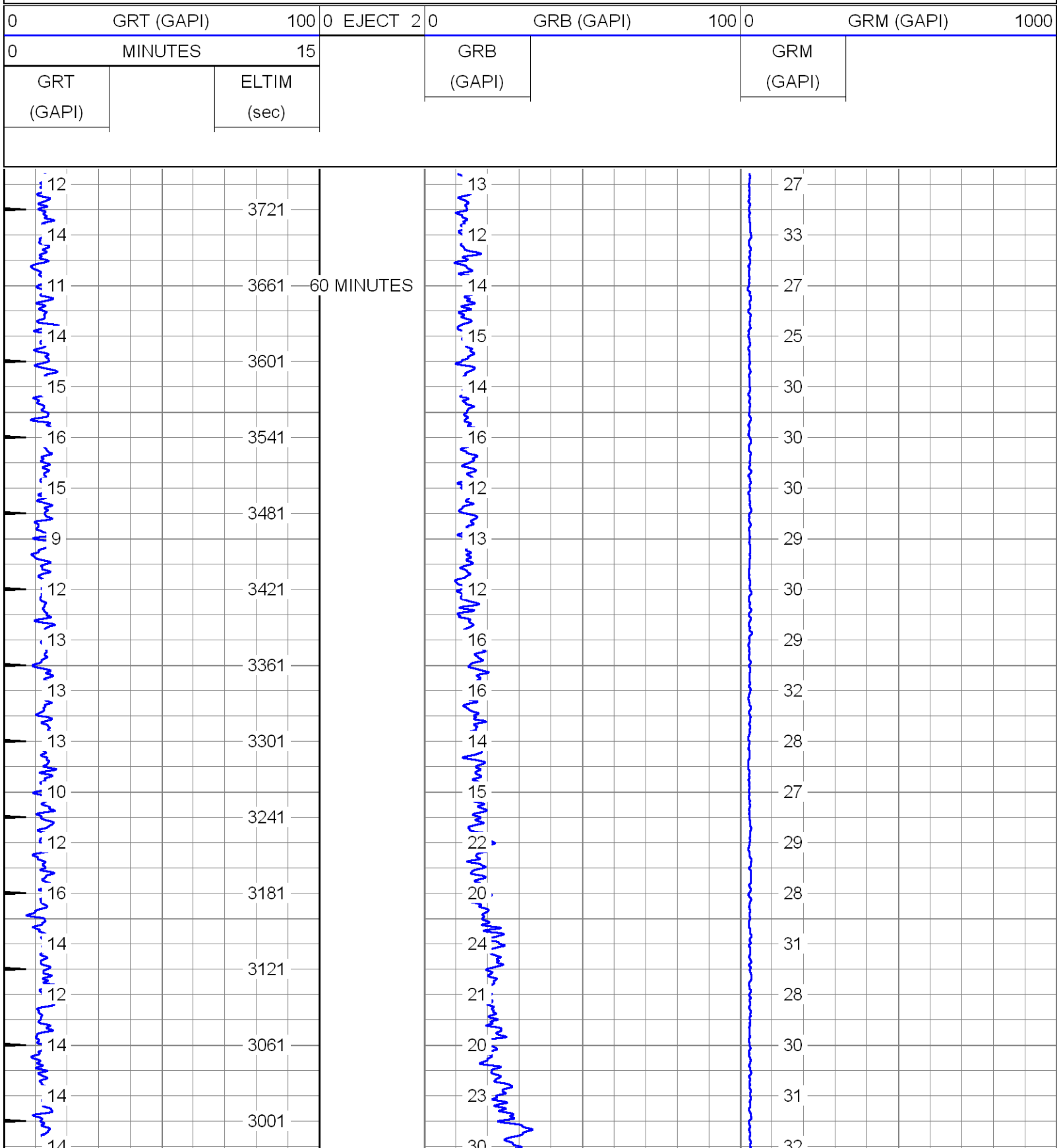
Database File: sdwwtp-iw5.db
Dataset Pathname: pass9
Presentation Format: rts
Dataset Creation: Mon Sep 23 13:24:55 2013 by Log SOC 110722
Charted by: Depth in Feet scaled 1:240

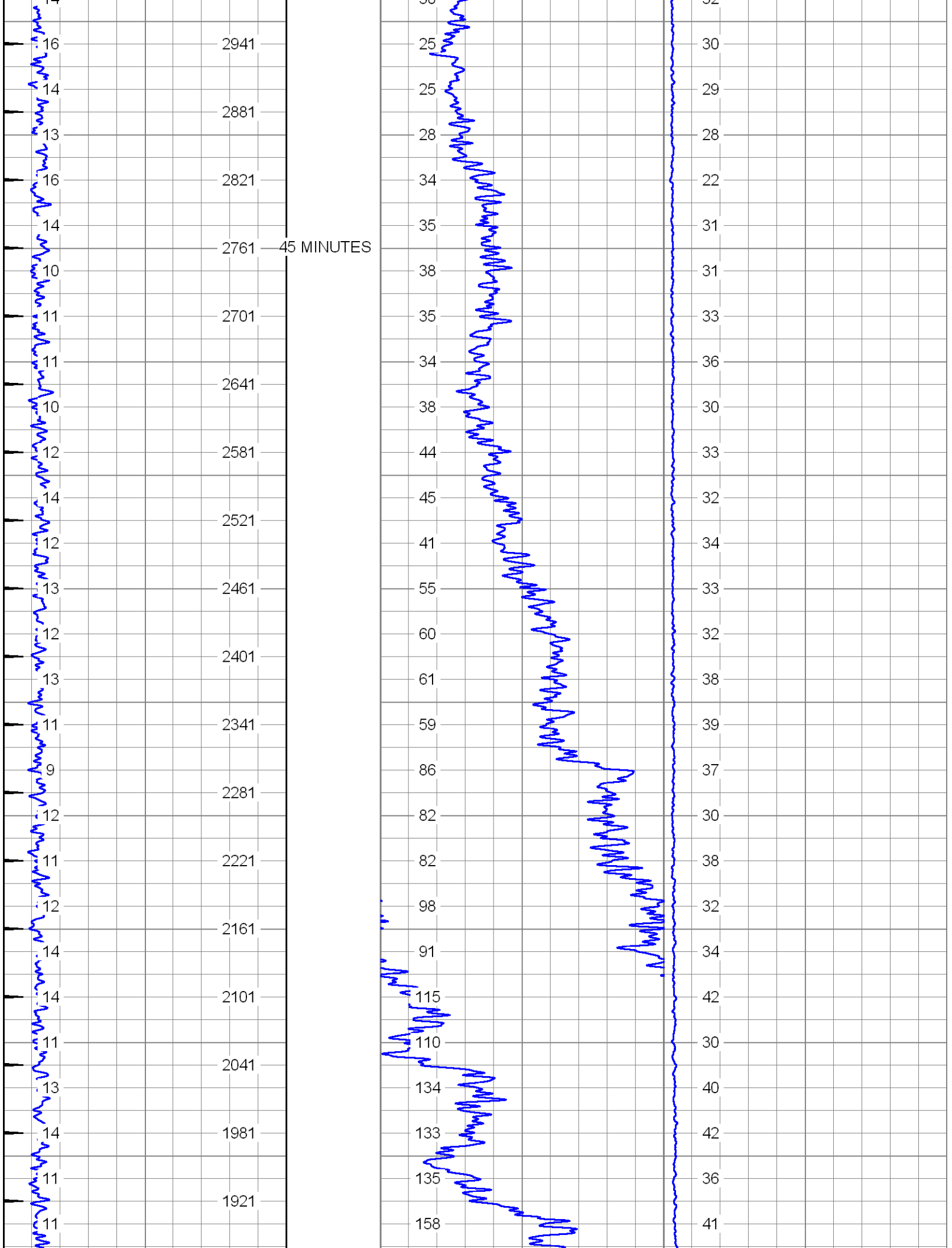



2600
2650
2700
2750
0 GRT (GAPI) 100
0 GRT-BACKGRND (GAPI) 100
0.9 CCL -0.1
0 GRB (GAPI) 100
0 GRB-BACKGRD (GAPI) 100
0 GRM (GAPI) 1000
0 GRM-BACKGRND (GAPI) 1000

DYNAMIC TEST #1 (64 GPM)

Database File:	sdwwtp-iw5.db
Dataset Pathname:	pass8
Presentation Format:	rtstime
Dataset Creation:	Mon Sep 23 12:20:52 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:600




45 MINUTES
2941
2881
2821
2761
2701
2641
2581
2521
2461
2401
2341
2281
2221
2161
2101
2041
1981
1921
16
14
13
16
14
10
11
11
10
12
14
12
13
12
13
11
9
12
11
12
14
14
11
13
14
11
11
25
25
28
34
35
38
35
34
38
44
45
41
55
60
61
59
86
82
82
98
91
115
110
134
133
135
158
30
29
28
22
31
31
33
36
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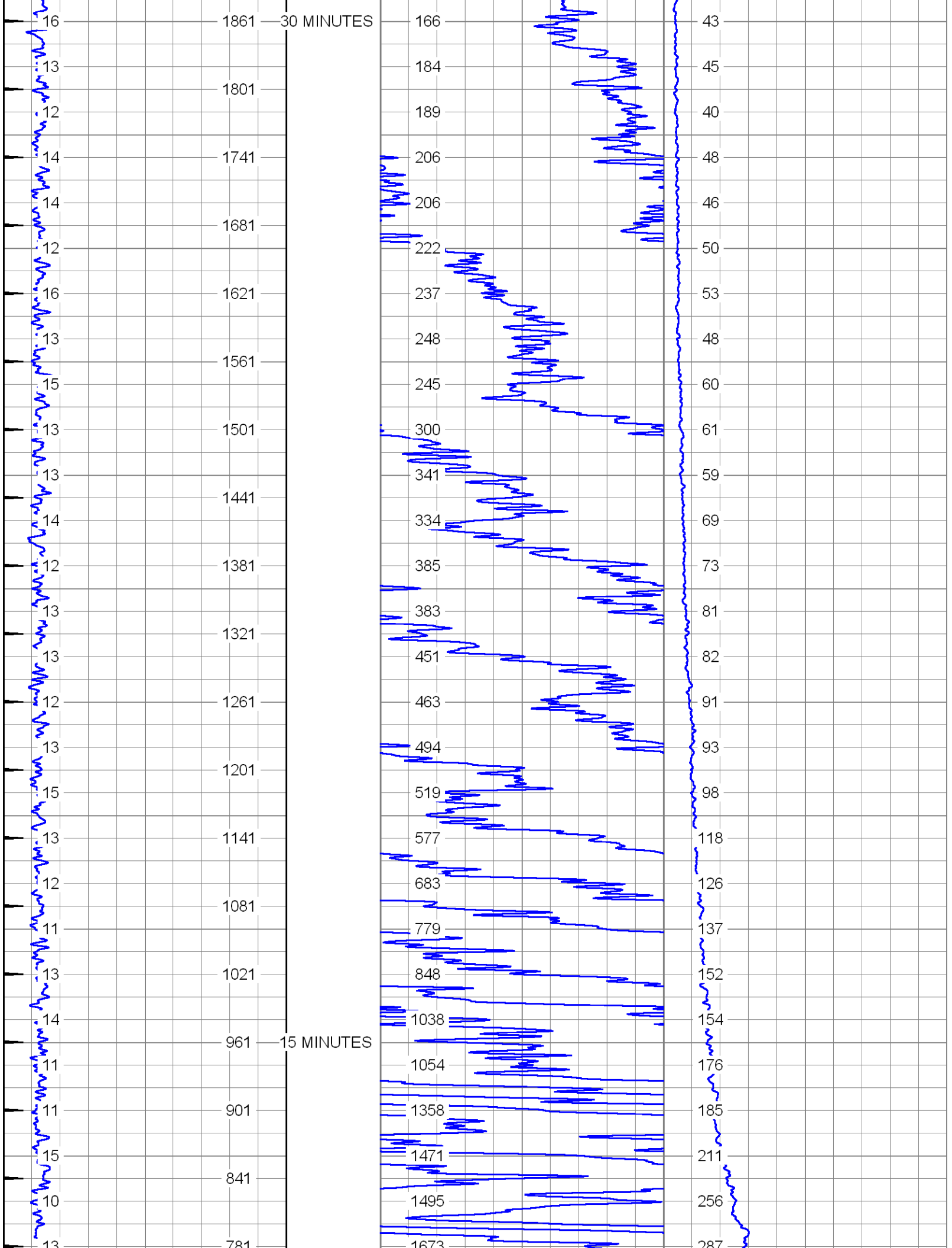
42
30
40
42
36
41


30 MINUTES
15 MINUTES
16
13
12
14
14
12
16
13
15
13
13
14
12
13
13
12
13
15
13
12
13
11
13
14
11
11
15
10
13
1861
1801
1741
1681
1621
1561
1501
1441
1381
1321
1261
1201
1141
1081
1021
961
901
841
781
166
184
189
206
206
222
237
248
245
300
341
334
385
383
451
463
494
519
577
683
779
848
1038
1054
1358
1471
1495
1673
43
45
40
48
46
50
53
48
60
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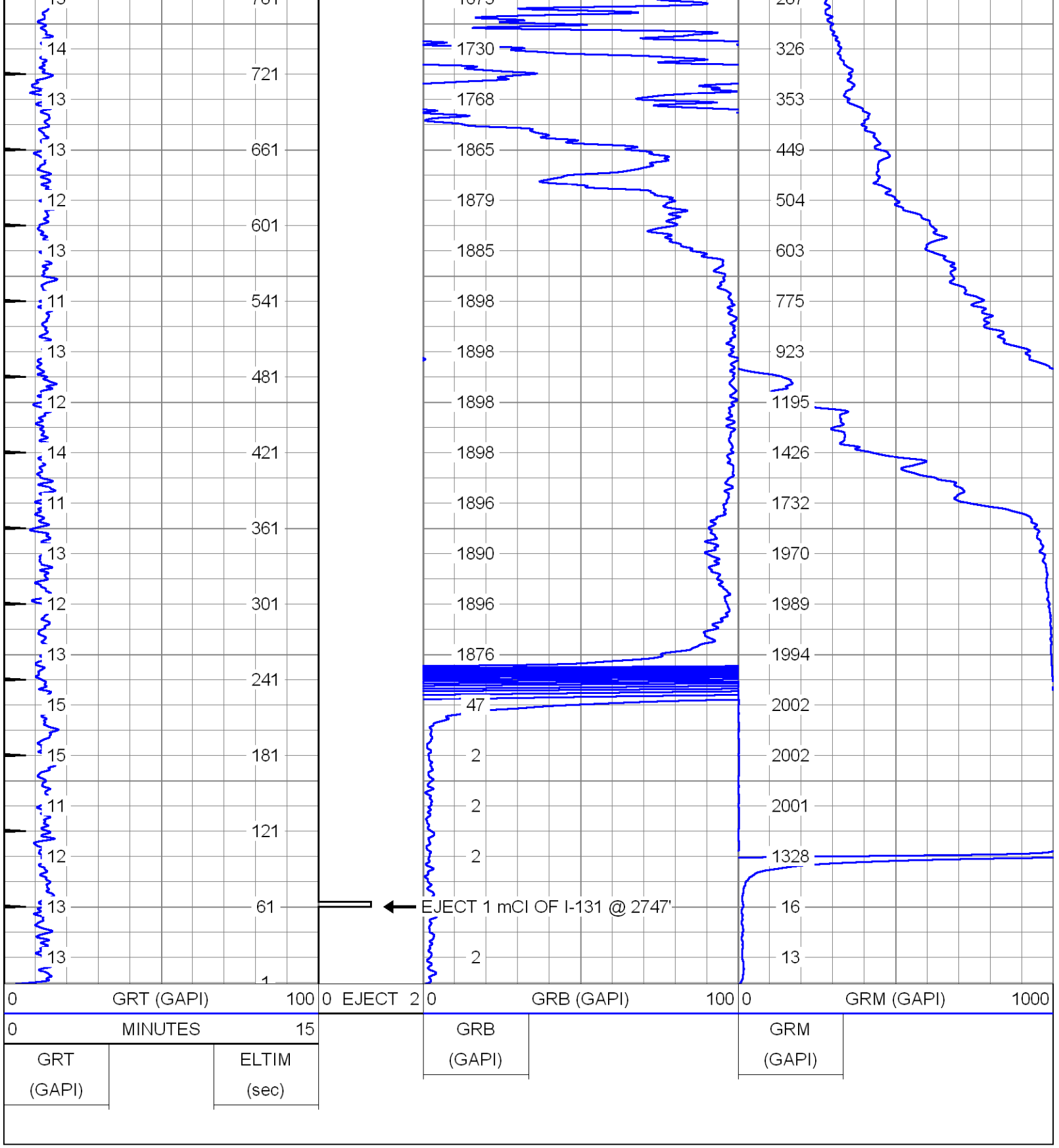
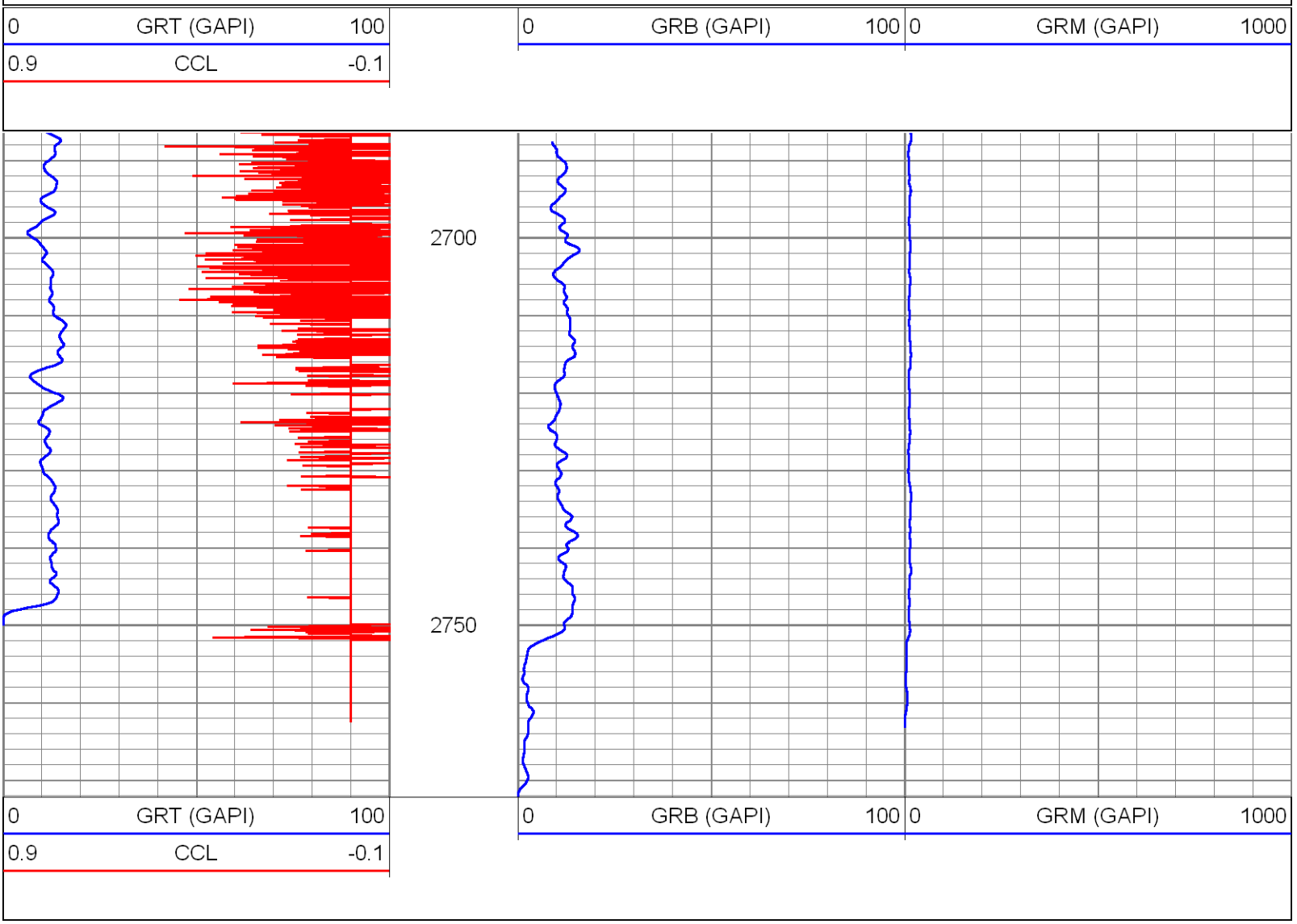
98
118
126
137
152
154
176
185
211
256
287



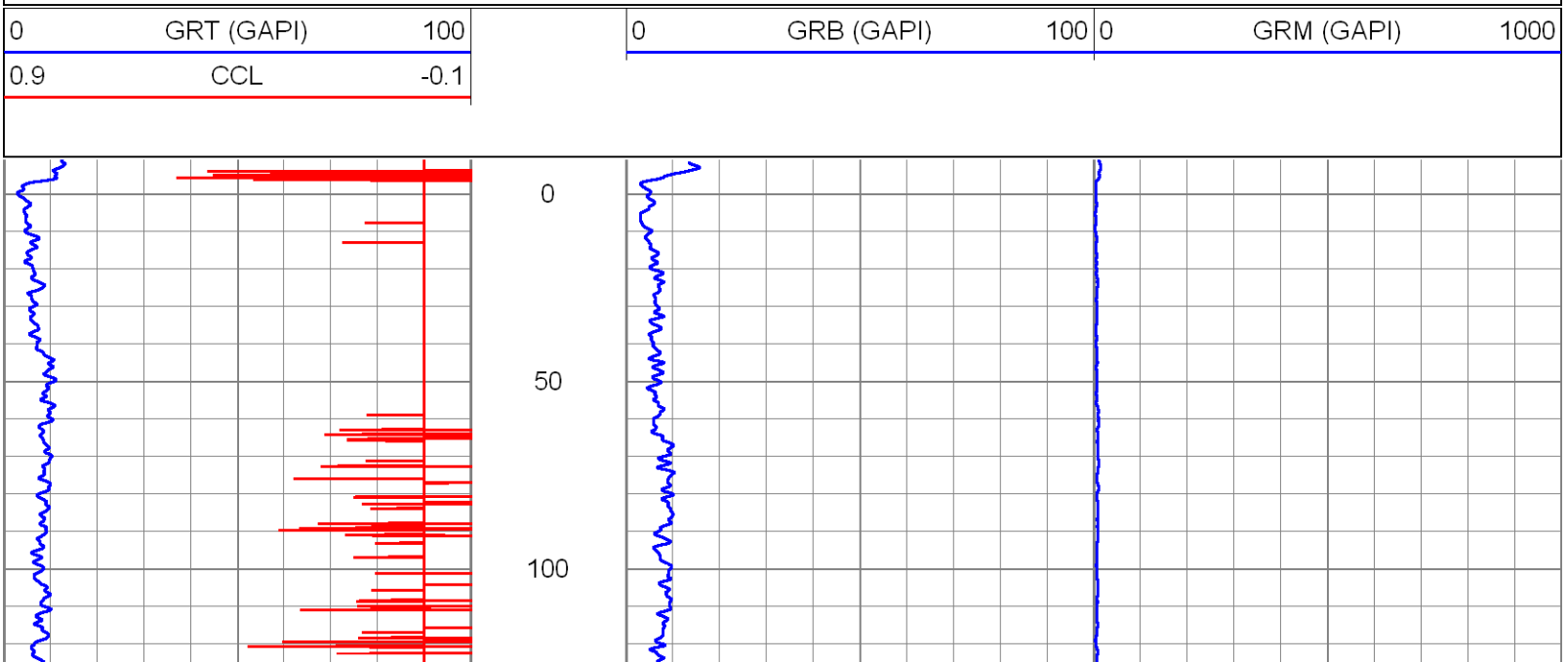
CASING TIE-IN

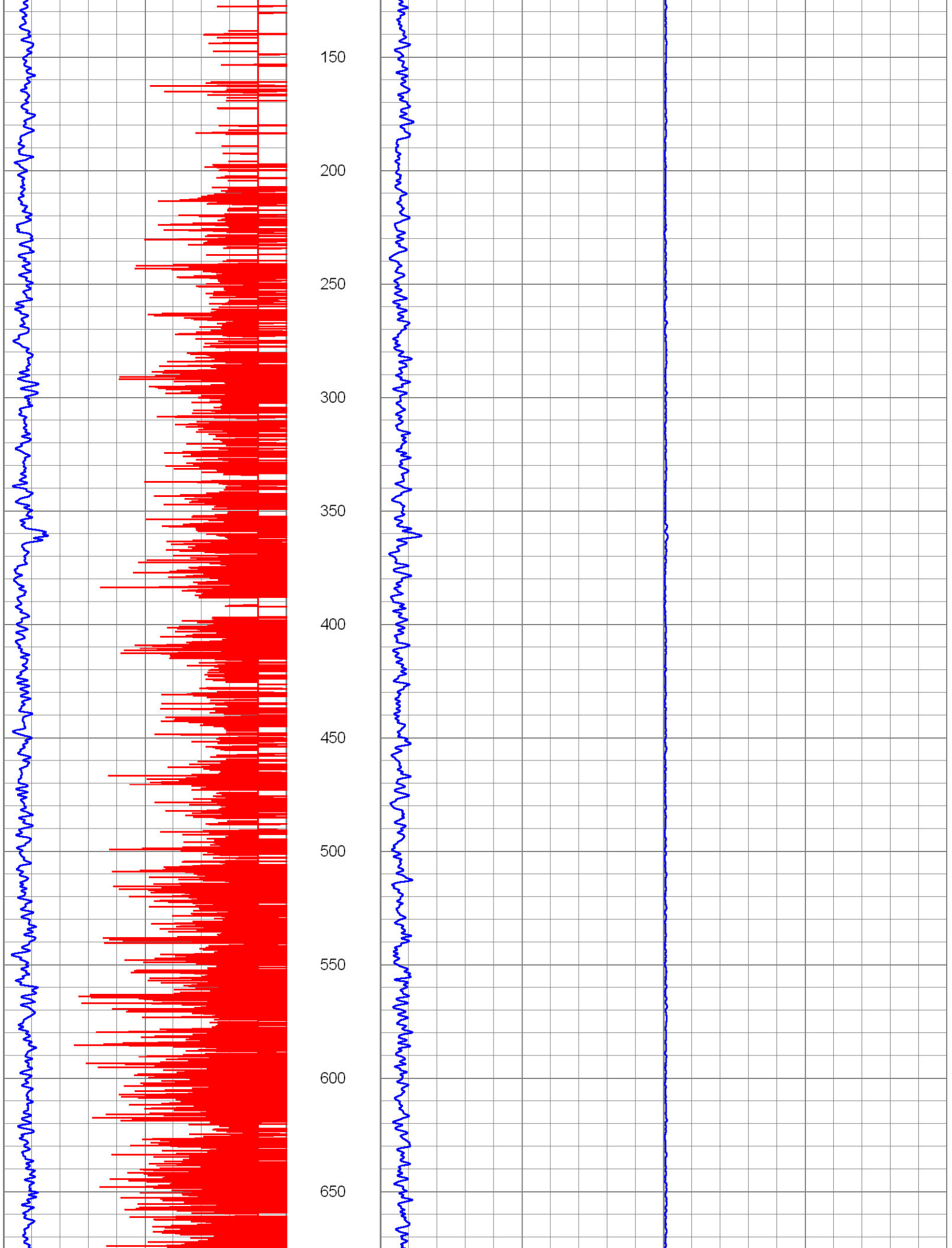
Database File: sdwwtp-iw5.db
Dataset Pathname: pass7
Presentation Format: rts
Dataset Creation: Mon Sep 23 12:00:22 2013 by Log SOC 110722

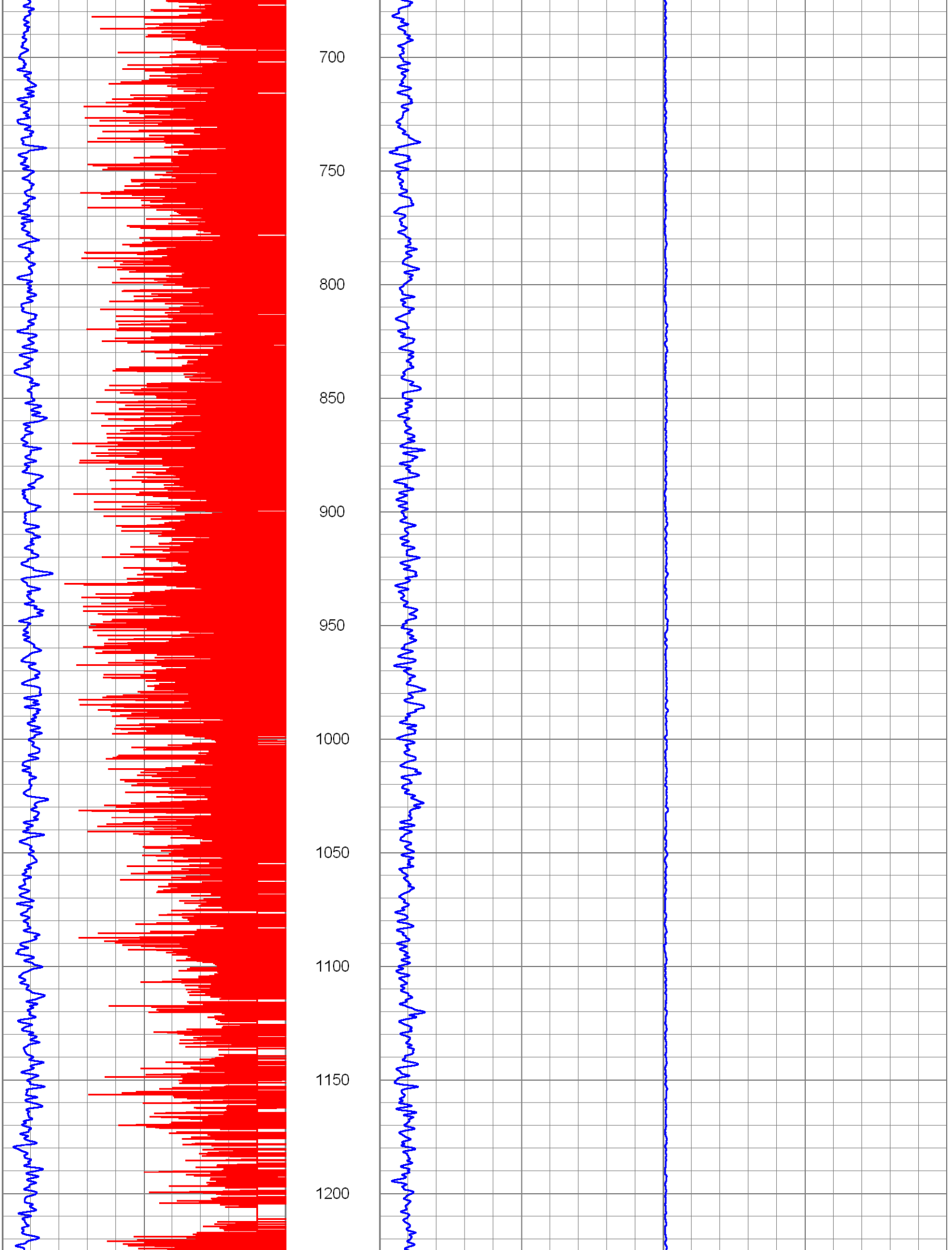
Dataset Creation: Mon Sep 23 12:00:22 2013 by Log SOC 110722
Charted by: Depth in Feet scaled 1:240

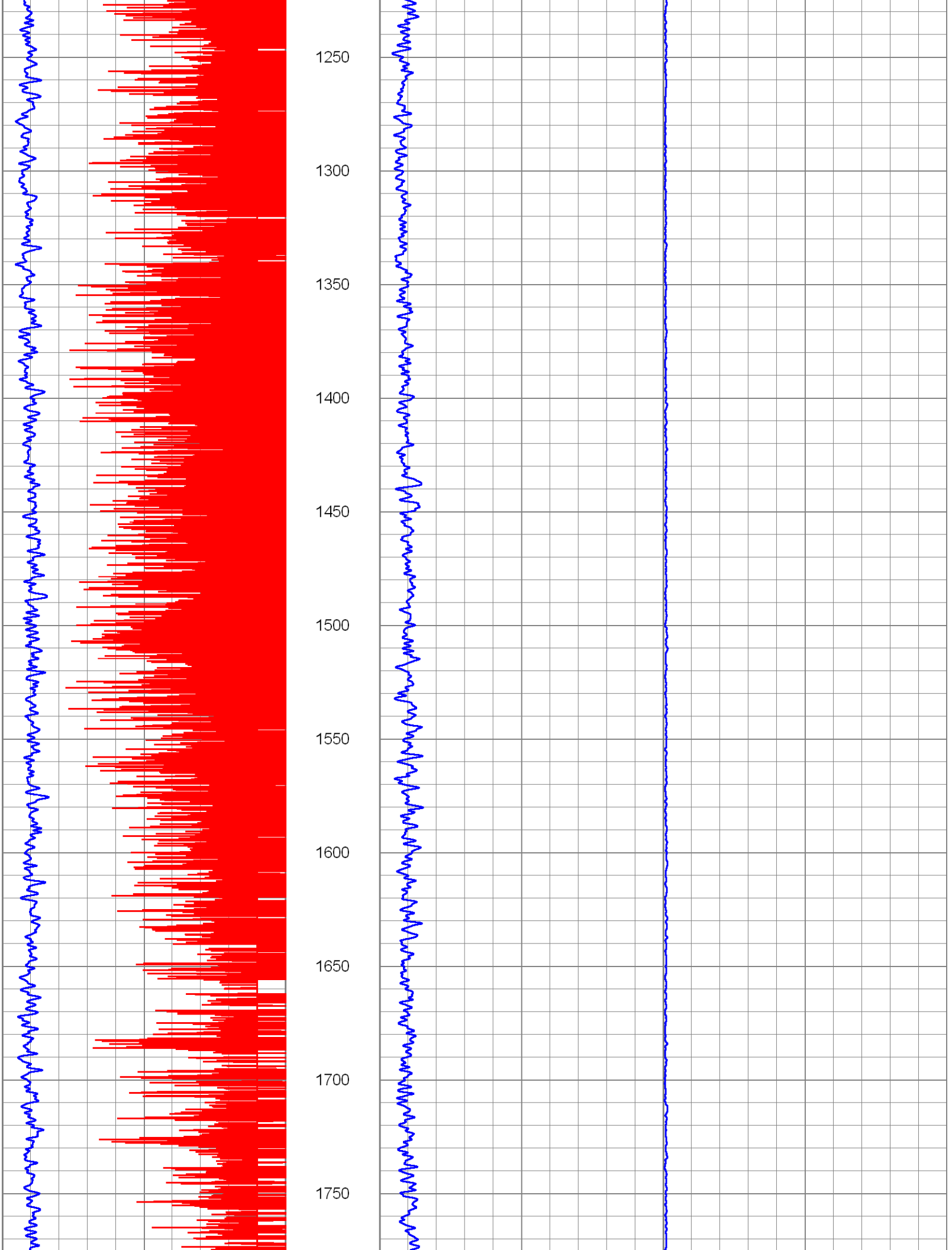


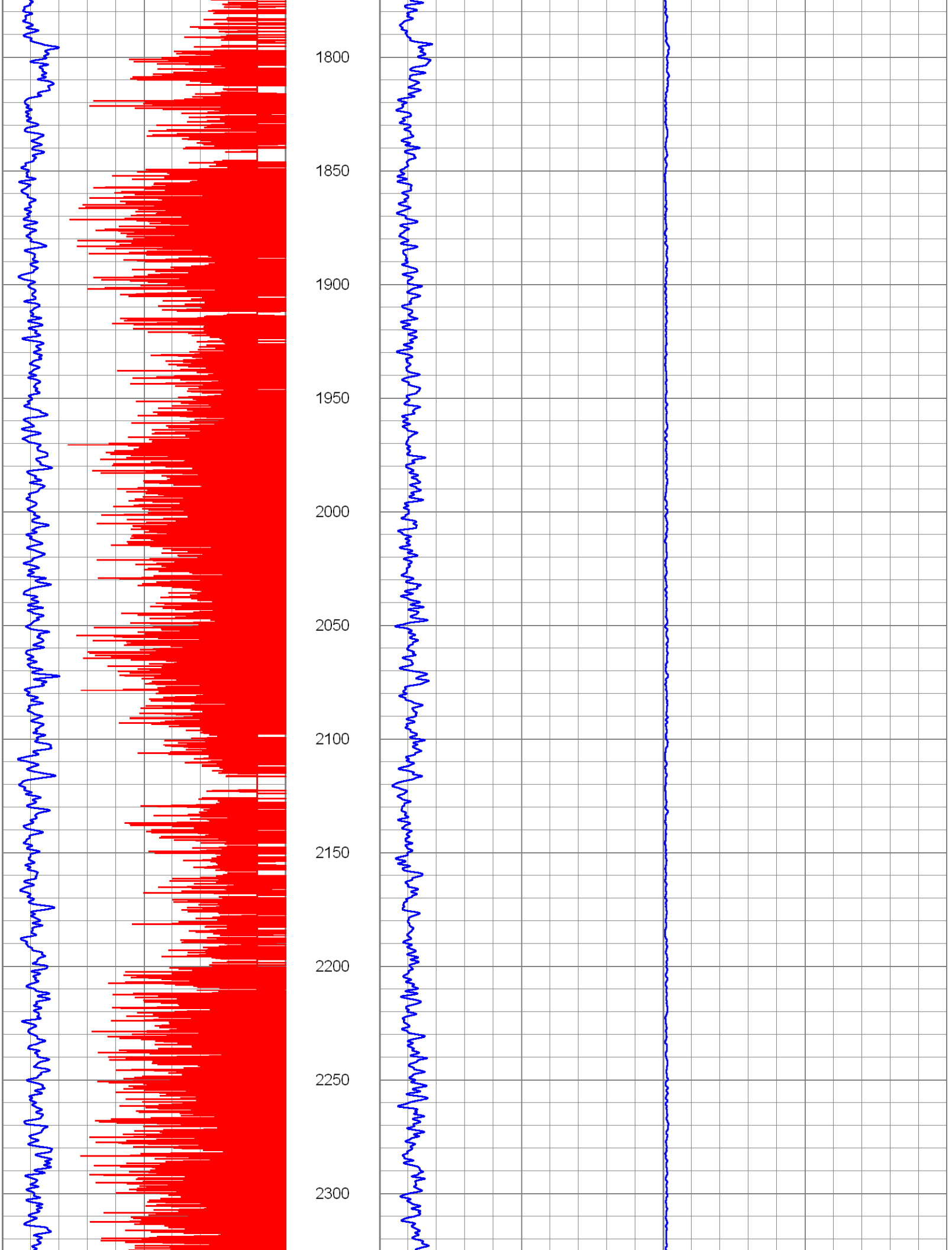
Database File: sdwwtp-iw5.db
Dataset Pathname: pass4
Presentation Format: rts
Dataset Creation: Mon Sep 23 09:30:52 2013 by Log SOC 110722
Charted by: Depth in Feet scaled 1:600

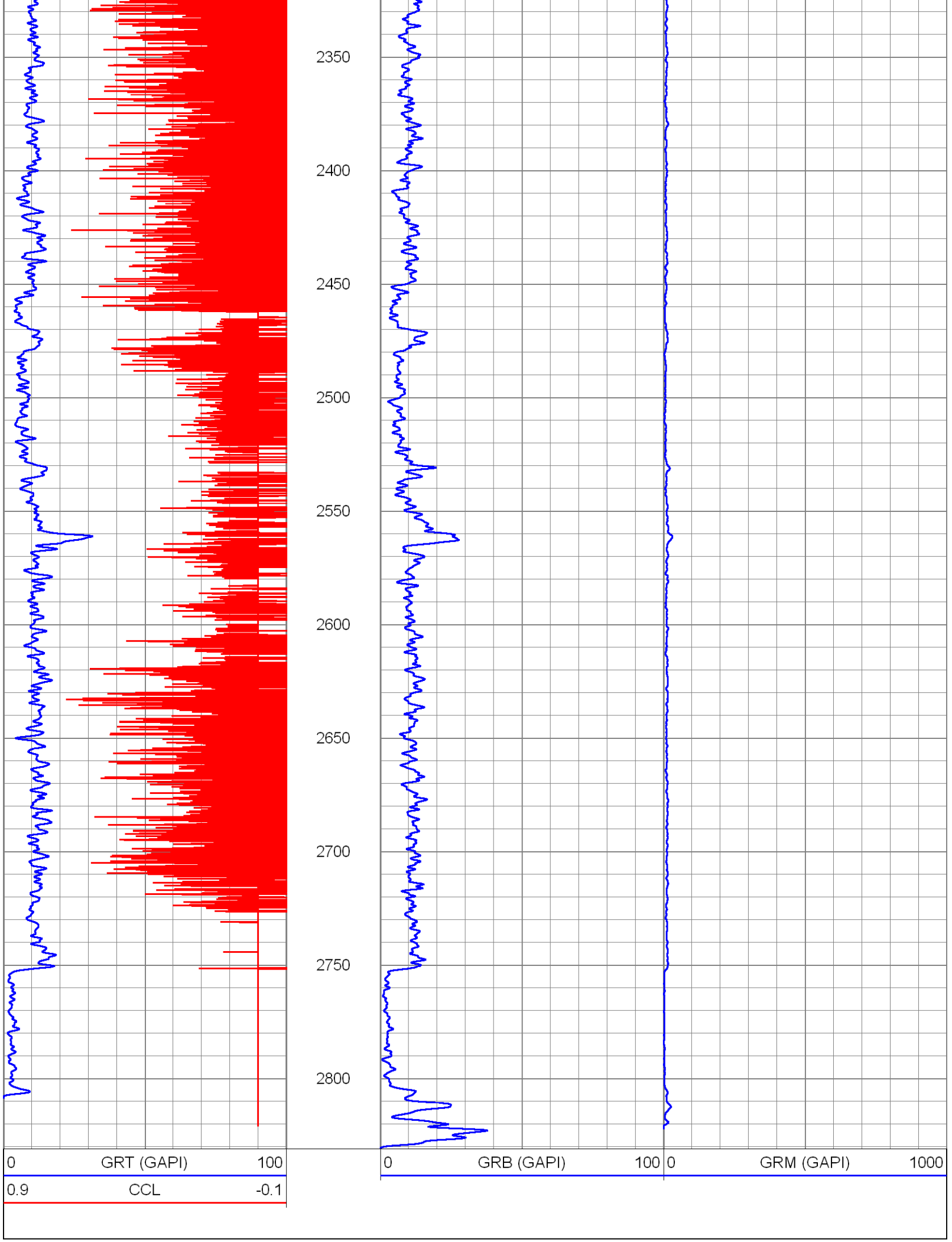



150
200
250
300
350
400
450
500
550
600
650


700
750
800
850
900
950
1000
1050
1100
1150
1200


1250
1300
1350
1400
1450
1500
1550
1600
1650
1700
1750


1800
1850
1900
1950
2000
2050
2100
2150
2200
2250
2300


2350
2400
2450
2500
2550
2600
2650
2700
2750
2800
0
GRT (GAPI)
100
0.9
CCL
-0.1
0
GRB (GAPI)
100
0
GRM (GAPI)
1000

Calibration Report

Database File: sdwwtp-iw5.db
Dataset Pathname: pass4
Dataset Creation: Mon Sep 23 09:30:52 2013 by Log SOC 110722

Gamma Ray Calibration Report

Serial Number:	952B	
Tool Model:	RTSB	
Performed:	Mon Sep 23 07:50:54 2013	
Calibrator Value:	90.0	GAPI
Background Reading:	27.1	cps
Calibrator Reading:	179.3	cps
Sensitivity:	0.5911	GAPI/cps

Gamma Ray Calibration Report

Serial Number:	952M	
Tool Model:	RTSM	
Performed:	Mon Sep 23 07:52:21 2013	
Calibrator Value:	90.0	GAPI
Background Reading:	47.1	cps
Calibrator Reading:	191.8	cps
Sensitivity:	0.6221	GAPI/cps

Gamma Ray Calibration Report

Serial Number:	952T	
Tool Model:	RTST	
Performed:	Mon Sep 23 07:53:50 2013	
Calibrator Value:	90.0	GAPI
Background Reading:	35.7	cps
Calibrator Reading:	184.0	cps
Sensitivity:	0.6071	GAPI/cps

Appendix E

Temperature Log

HIGH RESOLUTION TEMPERATURE LOG

Company	SOUTH MIAMI-DADE W.W.T.P.
Well	IW-5
Field	S.D.W.W.T.P.
County	MIAMI-DADE
State	FLORIDA

Company SOUTH MIAMI-DADE W.W.T.P.
Well IW-5
Field S.D.W.W.T.P.
County MIAMI-DADE
State FLORIDA

Location: API # :

SEC TWP RGE

Other Services

Permanent Datum	PAD	Elevation	PAD
Log Measured From	PAD		
Drilling Measured From	PAD		

Elevation
K.B.
D.F.
G.L.

Date	23-SEP-2013		
Run Number	2013 MIT		
Depth Driller	2898'		
Depth Logger	2830'		
Bottom Logged Interval	2830'		
Top Log Interval	SURFACE		
Open Hole Size	22"		
Type Fluid	WATER		
Density / Viscosity	NA		
Max. Recorded Temp.	79.9 degF		
Estimated Cement Top	NA		
Time Well Ready	ON ARRIVAL		
Time Logger on Bottom	0800		
Equipment Number	102		
Location	FT MYERS		
Recorded By	A.GARCIA	R. GARCIA	V.RIVES
Witnessed By	S. VILLAMIL		

Borehole Record				Borehole Record			
Run Number	Bit	From	To	Run No	Bit	From	To

Casing Record	Size	Wgt/Ft	Top	Bottom
Surface String				
Prot. String				
Production String	20"	.500" W.T.	SURFACE	2426'
Liner				

<< Fold Here >>

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

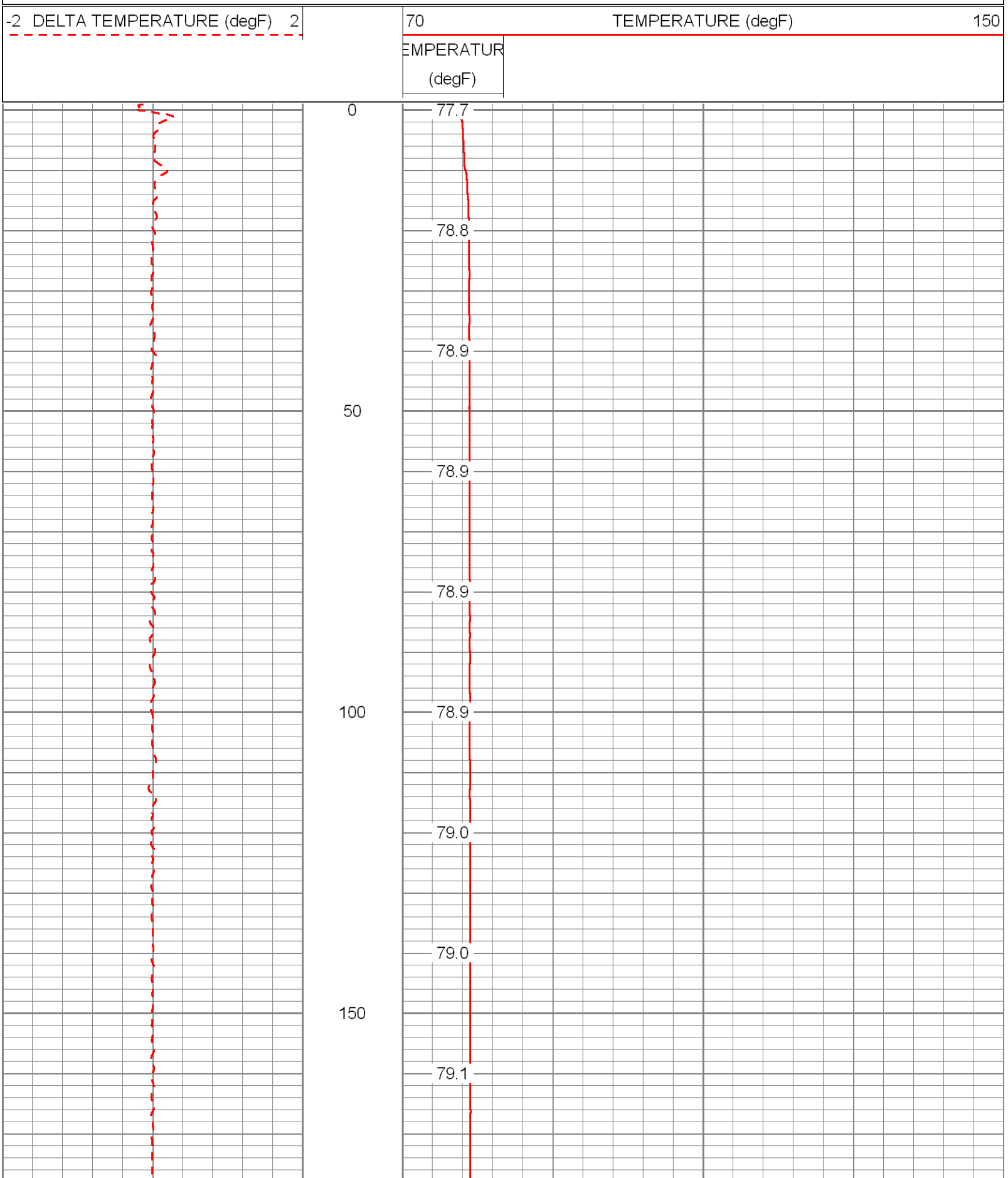
Comments

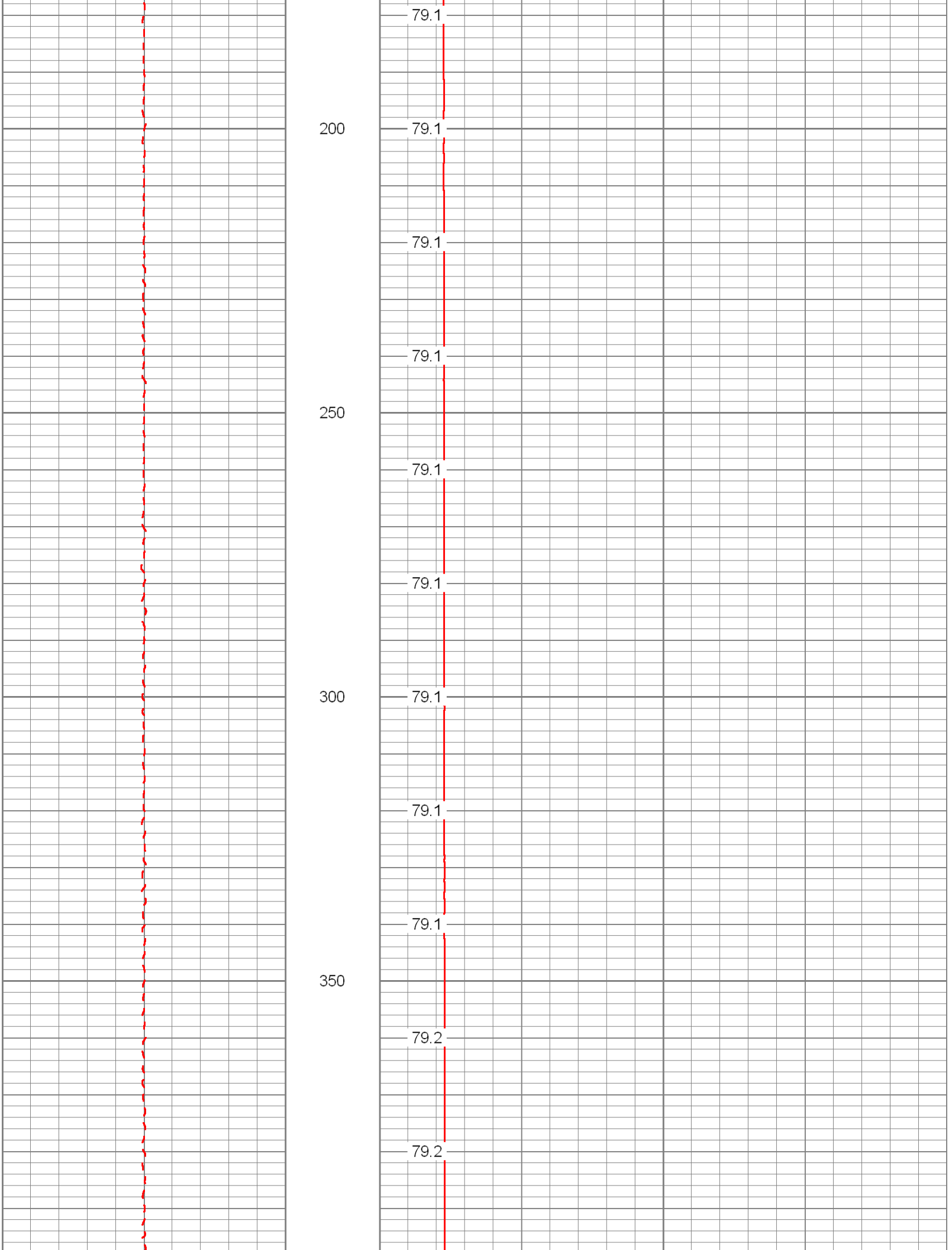
RADIOACTIVE TRACER SURVEY

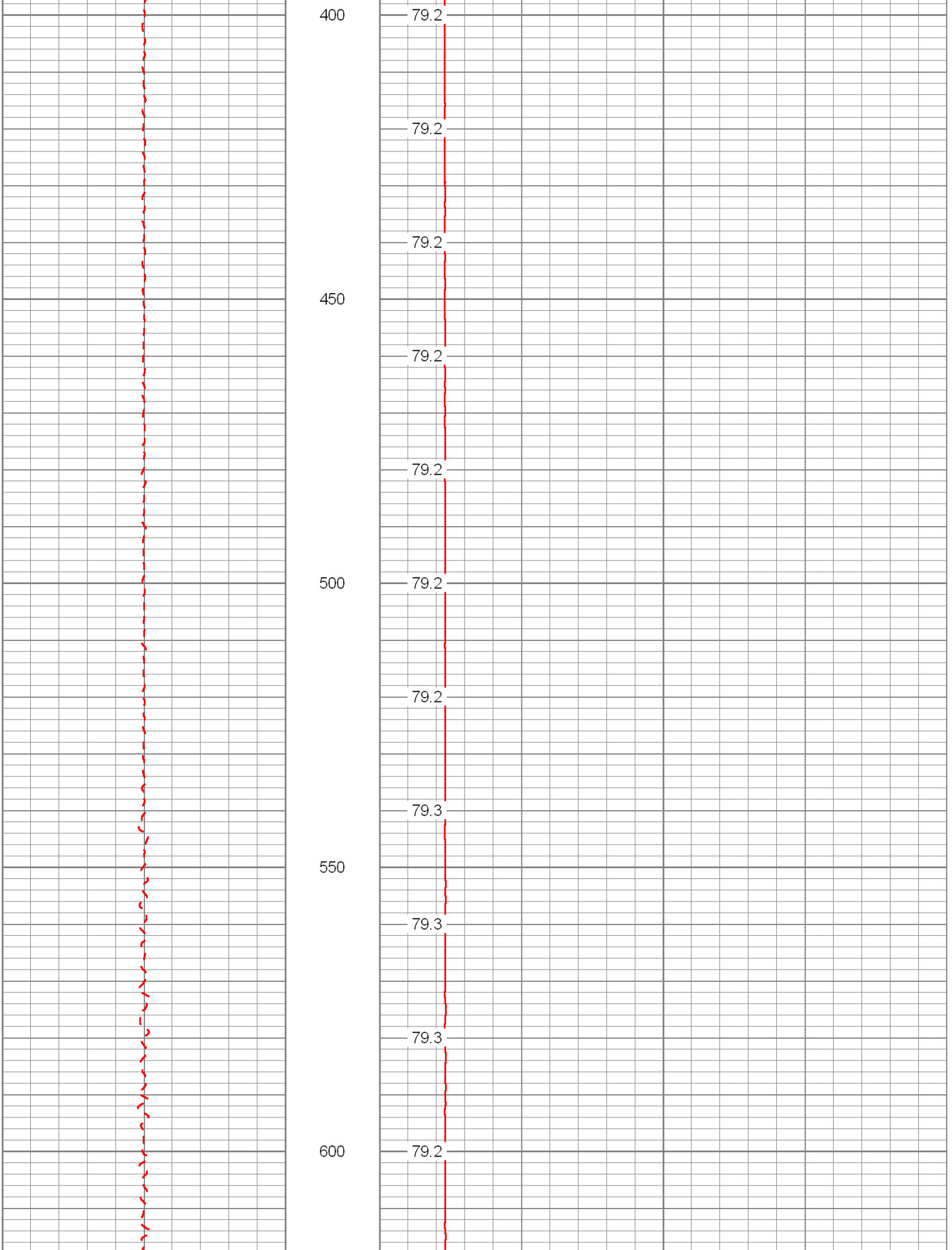
TEMPERATURE

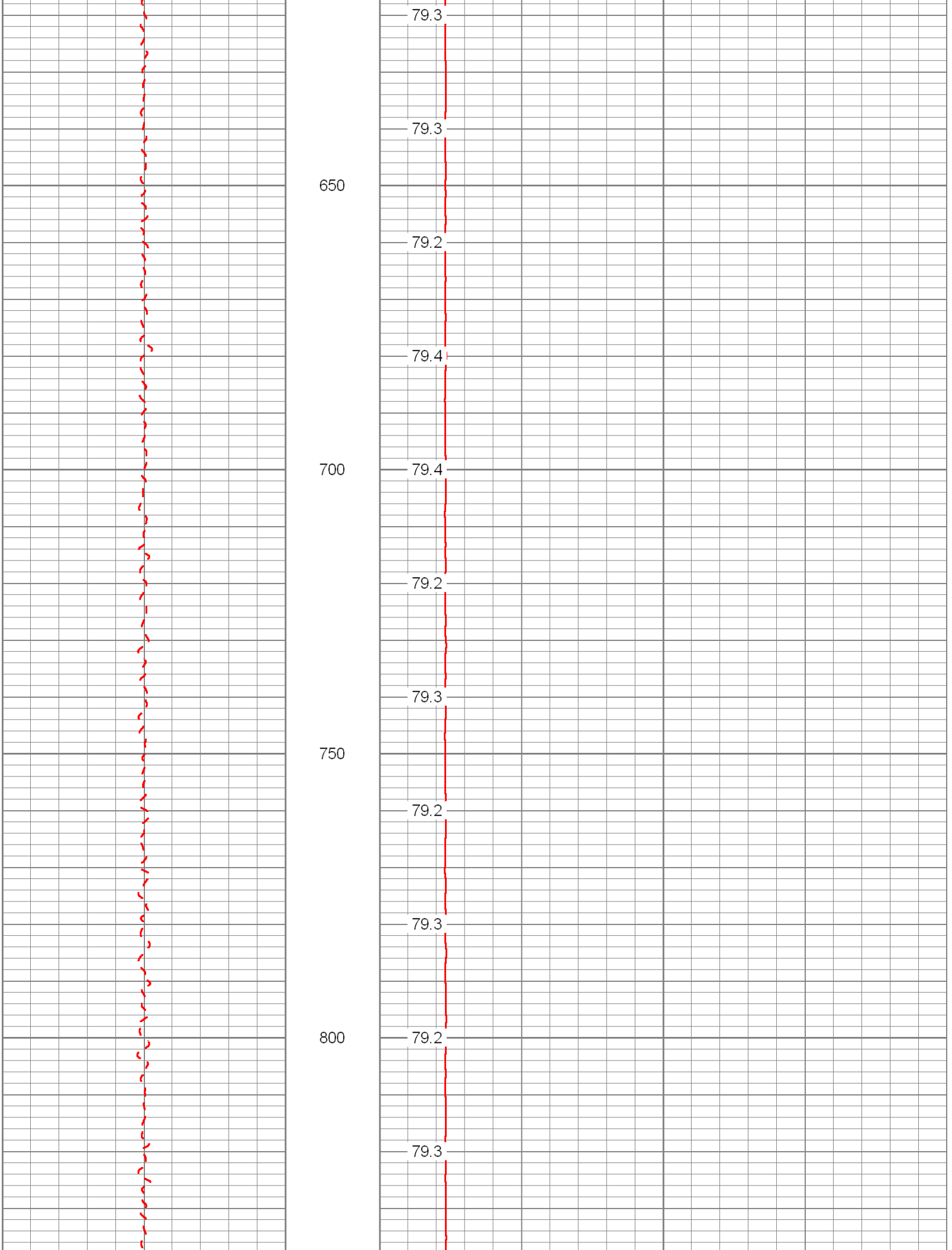
BROTHERS

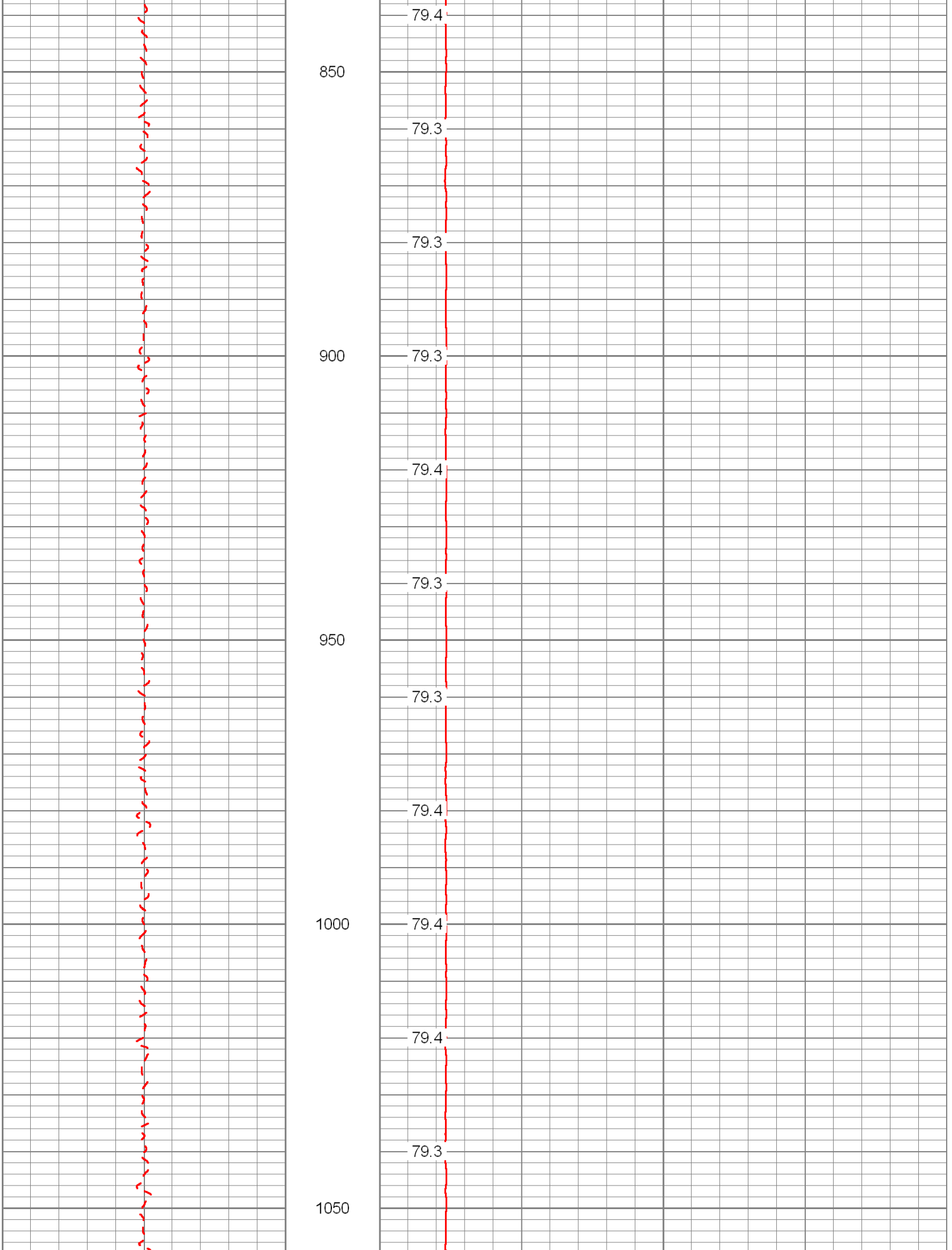
Database File: sdwwtp-iw5.db
Dataset Pathname: pass3
Presentation Format: temp
Dataset Creation: Mon Sep 23 08:26:57 2013 by Log SOC 110722
Charted by: Depth in Feet scaled 1:240




79.1
200
79.1
79.1
79.1
250
79.1
79.1
300
79.1
79.1
79.1
350
79.2
79.2


400
79.2
79.2
79.2
450
79.2
79.2
500
79.2
79.2
79.3
550
79.3
79.3
600
79.2


79.3
79.3
650
79.2
79.4
700
79.4
79.2
79.3
750
79.2
79.3
800
79.2
79.3


79.4
850
79.3
79.3
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79.3
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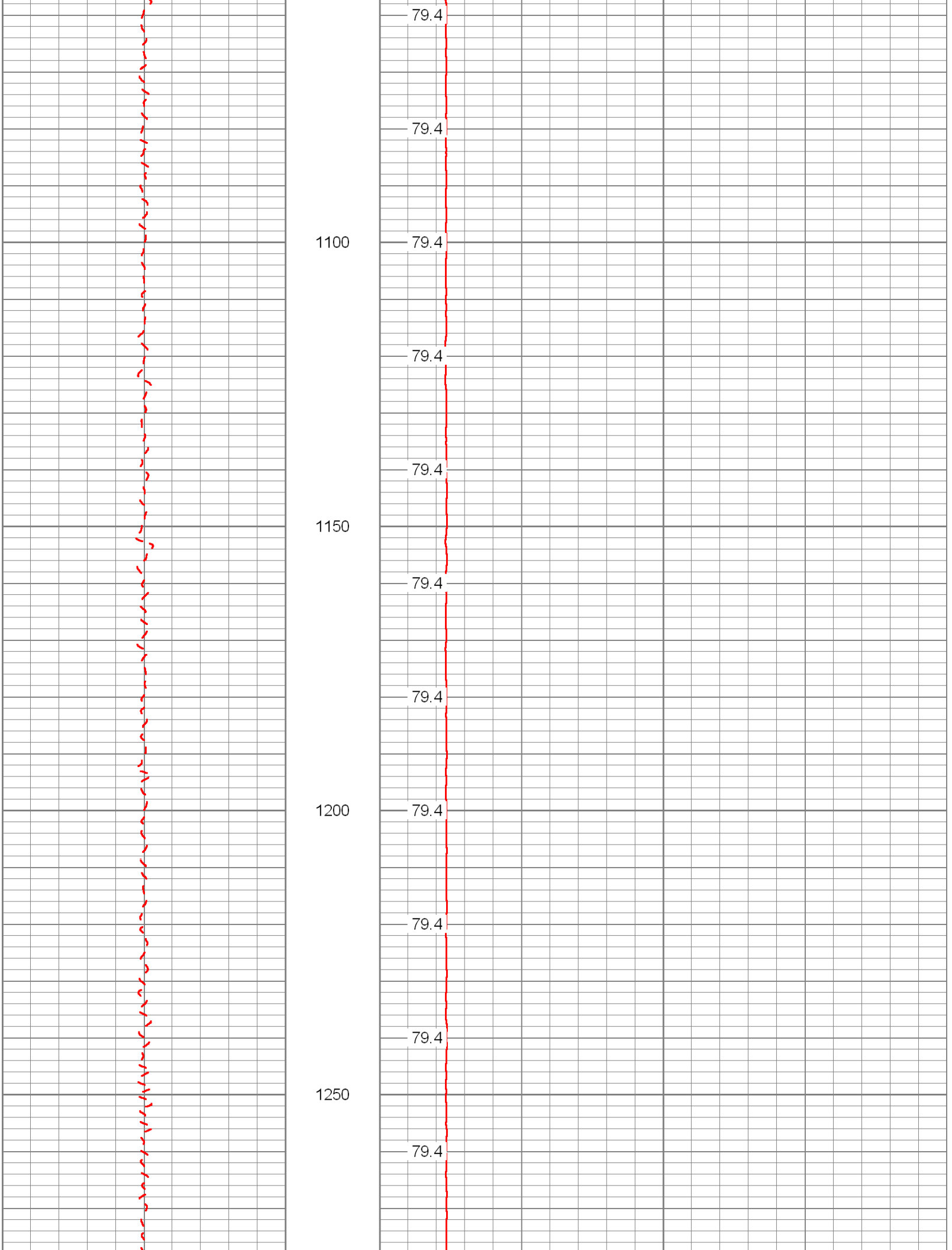
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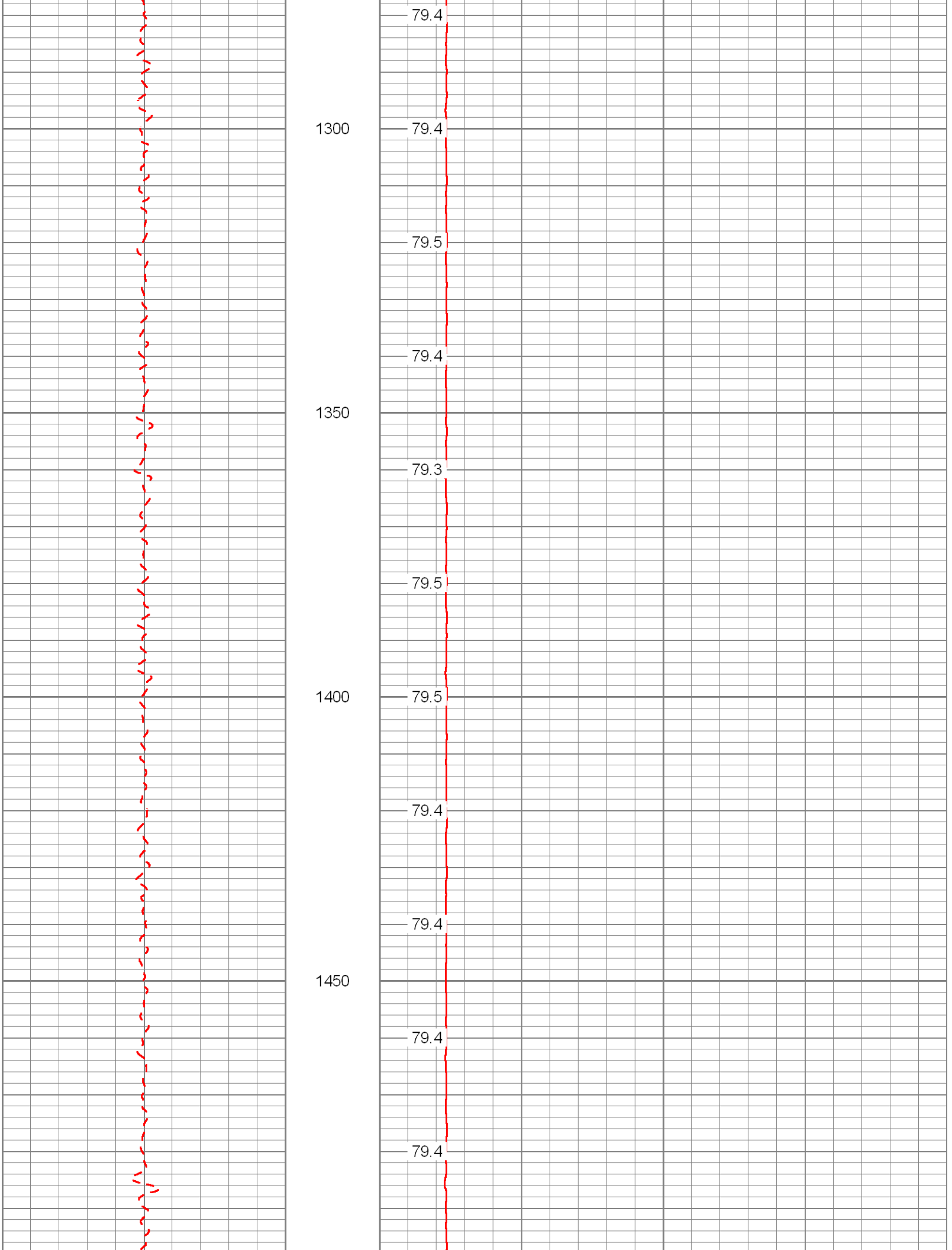
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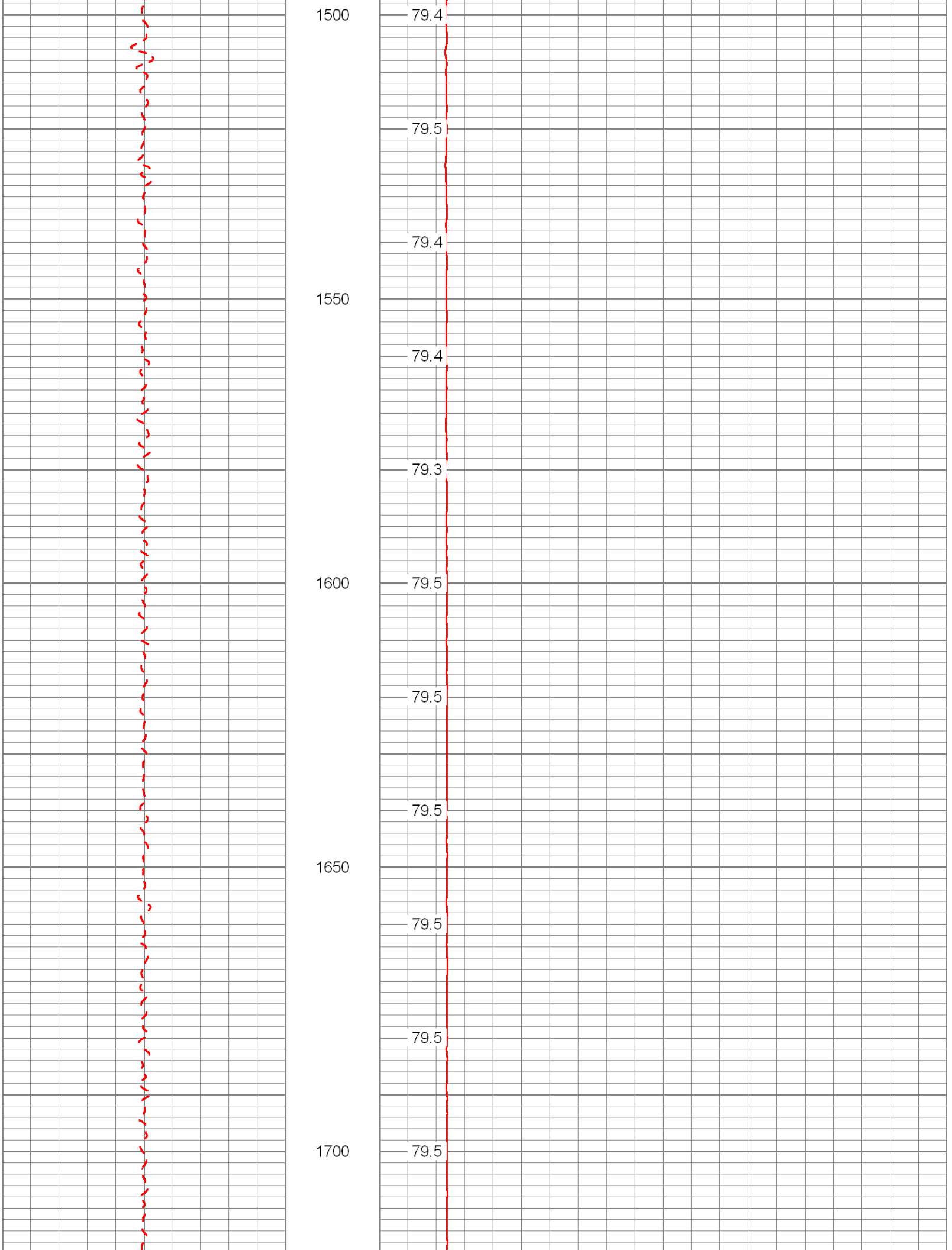
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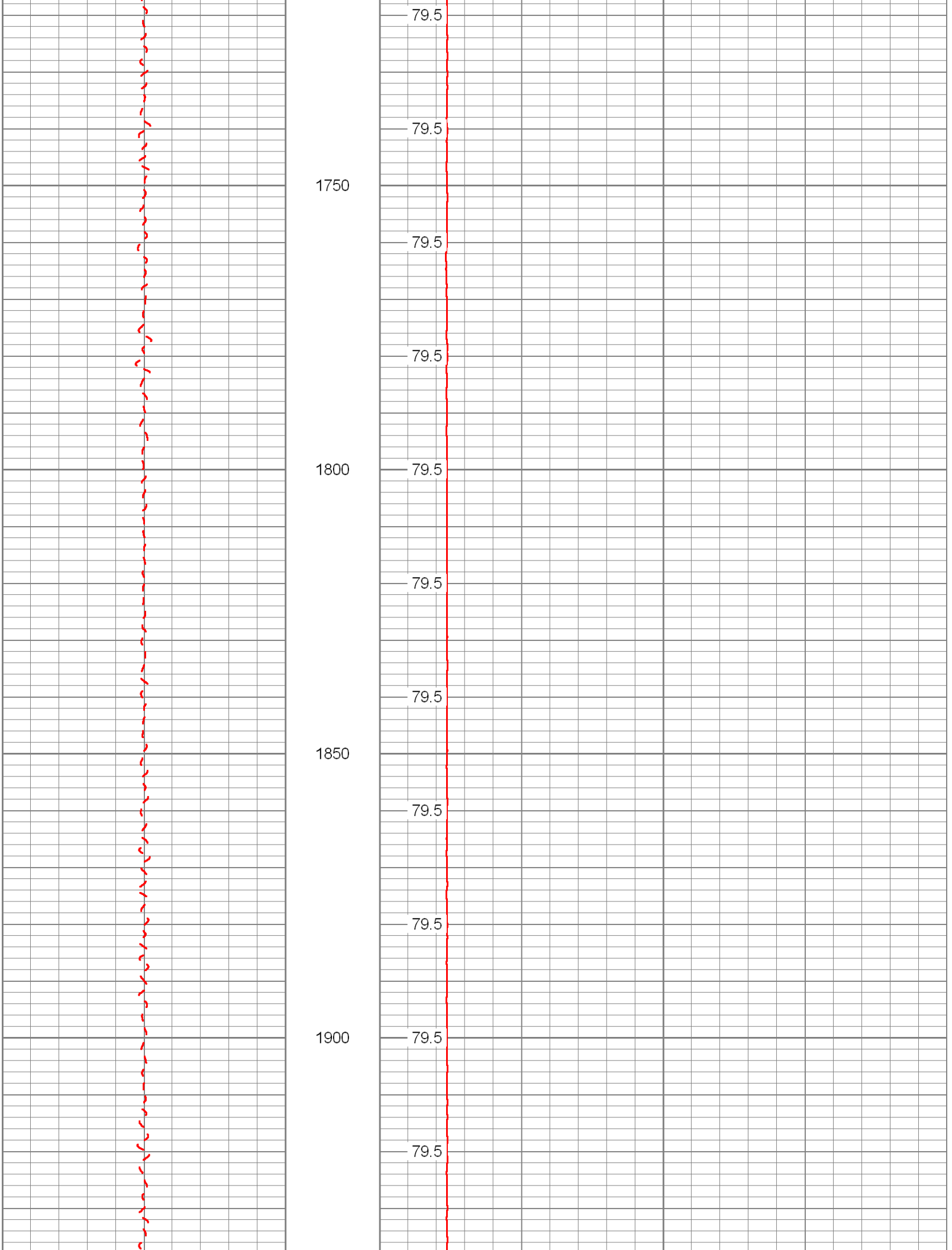
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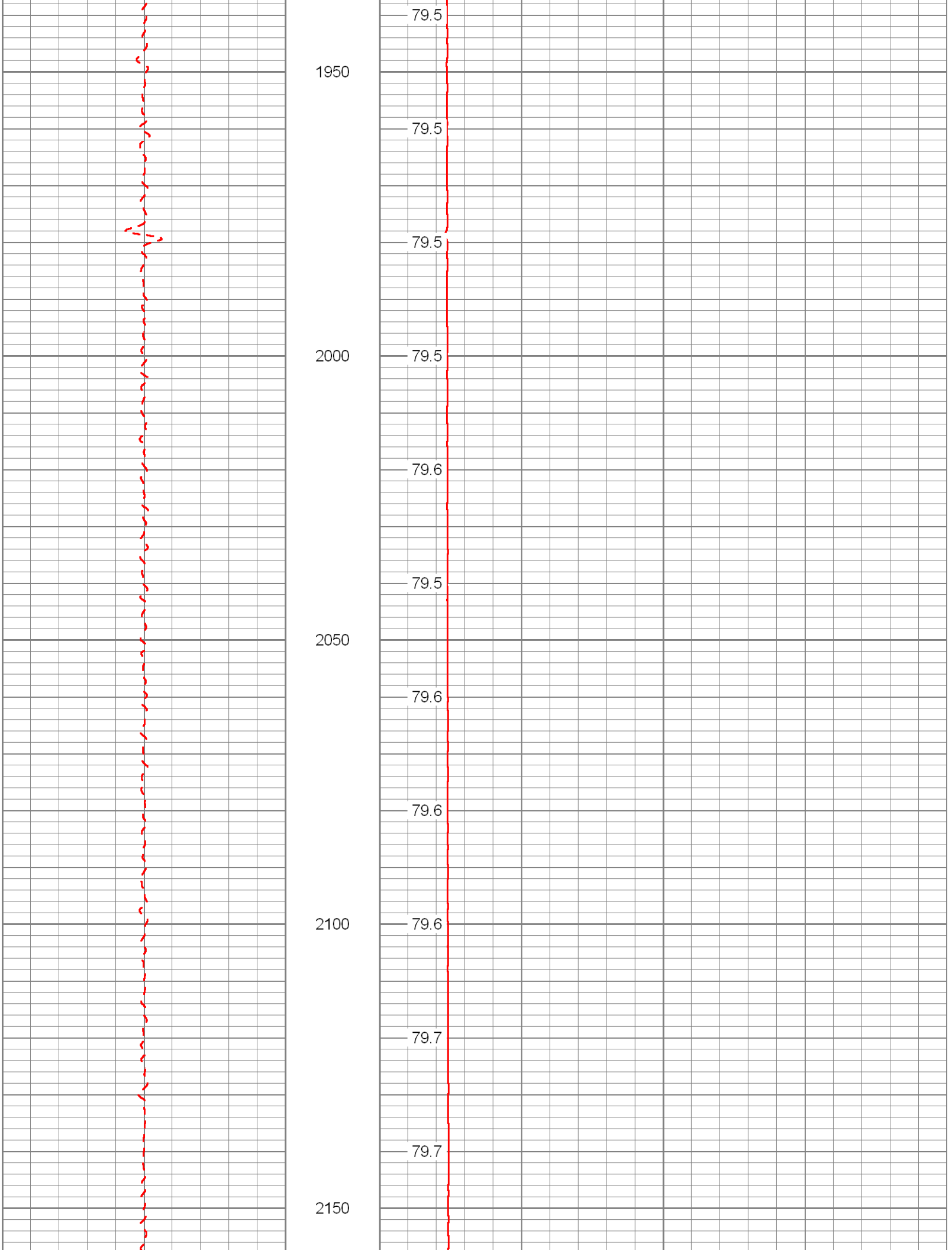
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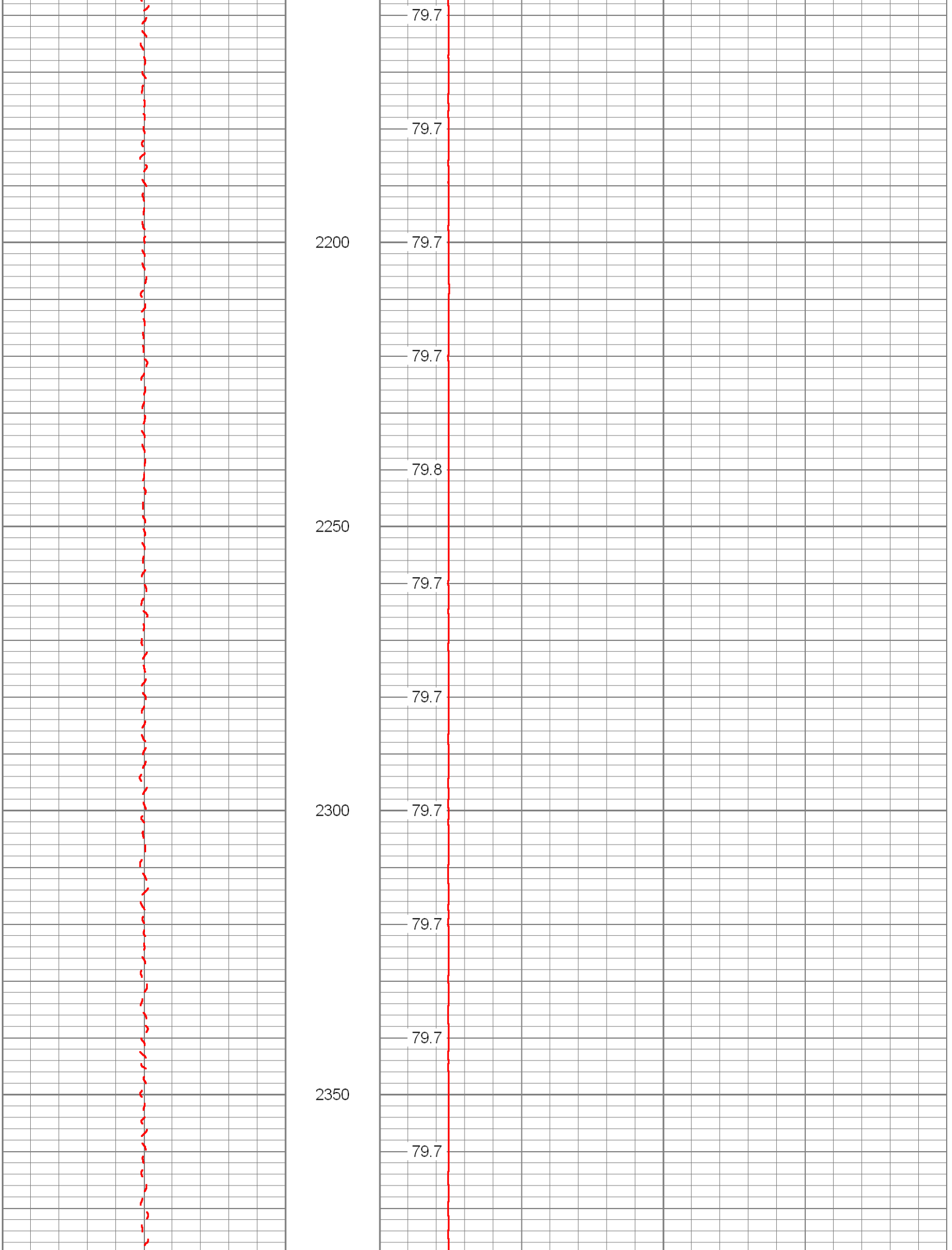
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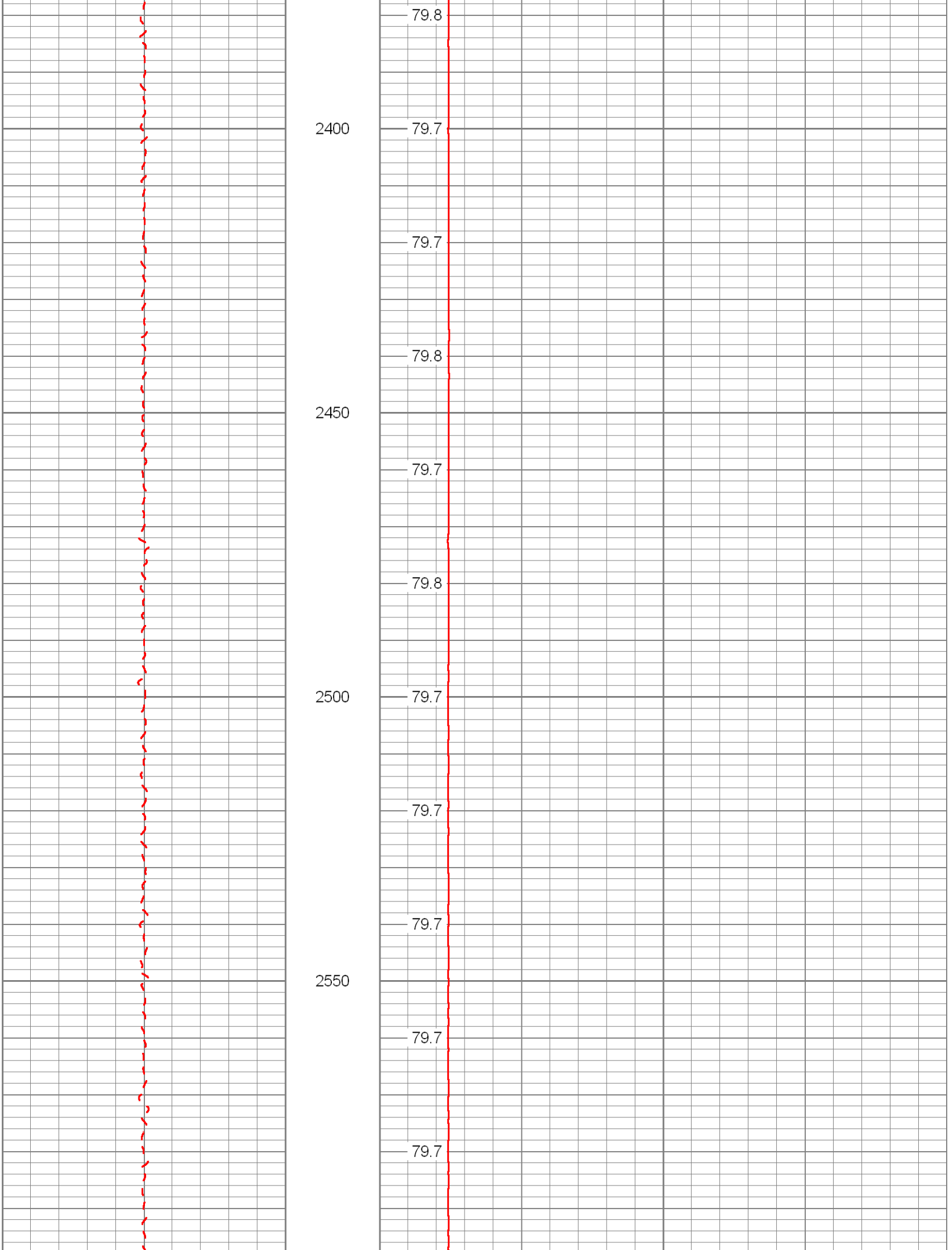
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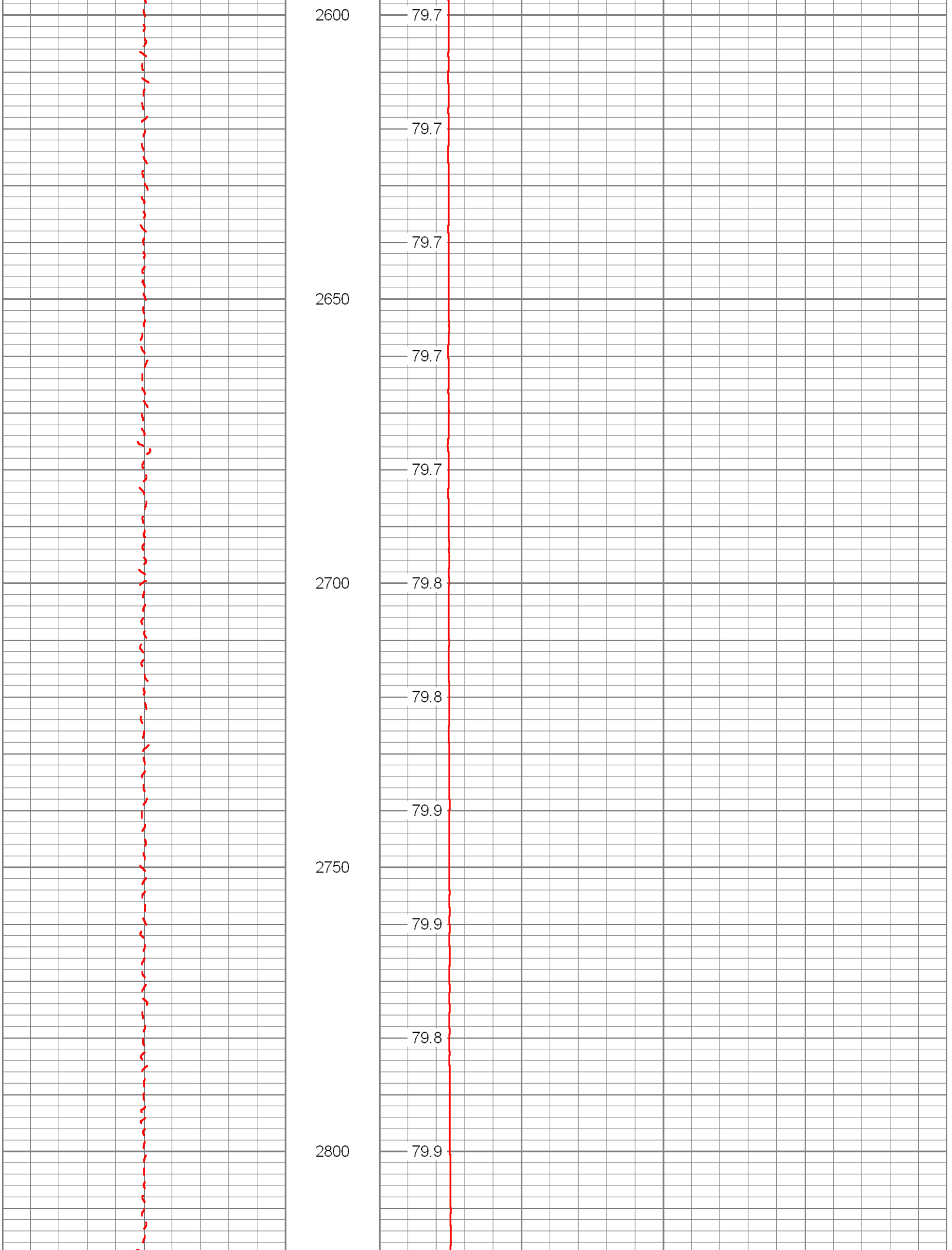
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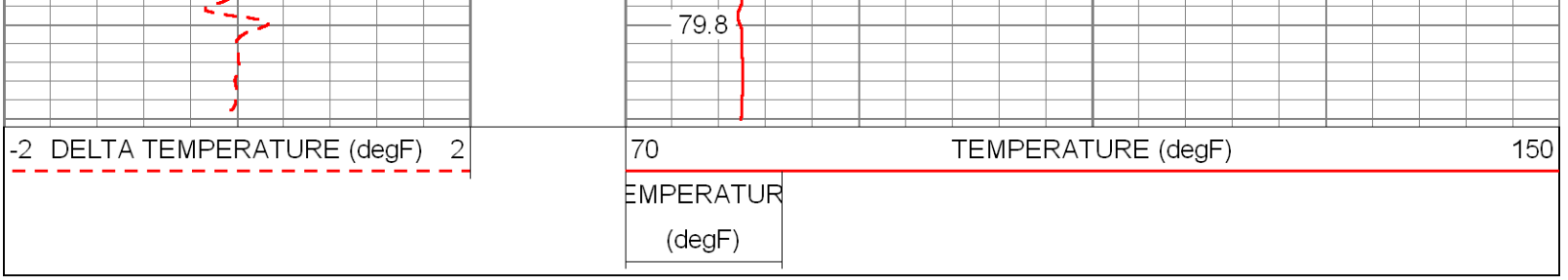


Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)
			TEMP-RTS (952)	25.50	1.69	70.00

TEMP	0.10					

Dataset: sdwwtp-iw5.db: field/well/run1/pass3
Total Length: 25.50 ft
Total Weight: 70.00 lb
O.D. 1.69 in

Calibration Report

Database File: sdwwtp-iw5.db
Dataset Pathname: pass3
Dataset Creation: Mon Sep 23 08:26:57 2013 by Log SOC 110722

Temperature Calibration Report

Serial Number: 952
Tool Model: RTS
Performed: Wed Jun 19 08:20:23 2013

Point #	Reading		Reference	
1	439.20	cps	33.00	degF
2	912.13	cps	85.00	degF
3	1637.63	cps	155.00	degF
4		cps		degF
5		cps		degF
6		cps		degF
7		cps		degF
8		cps		degF
9		cps		degF
10		cps		degF

Appendix F

Television Survey

Appendix G

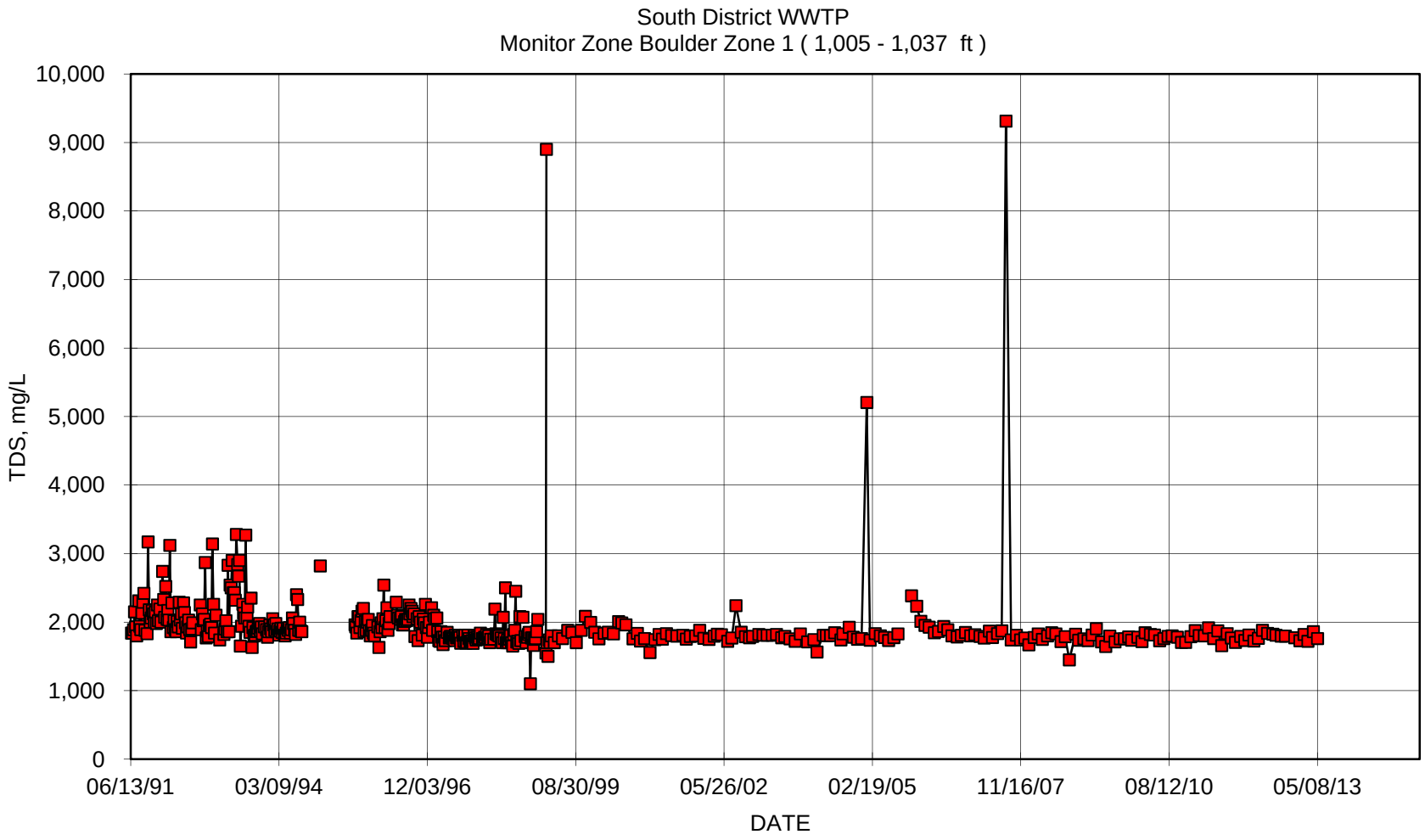
5 year Monitoring Data

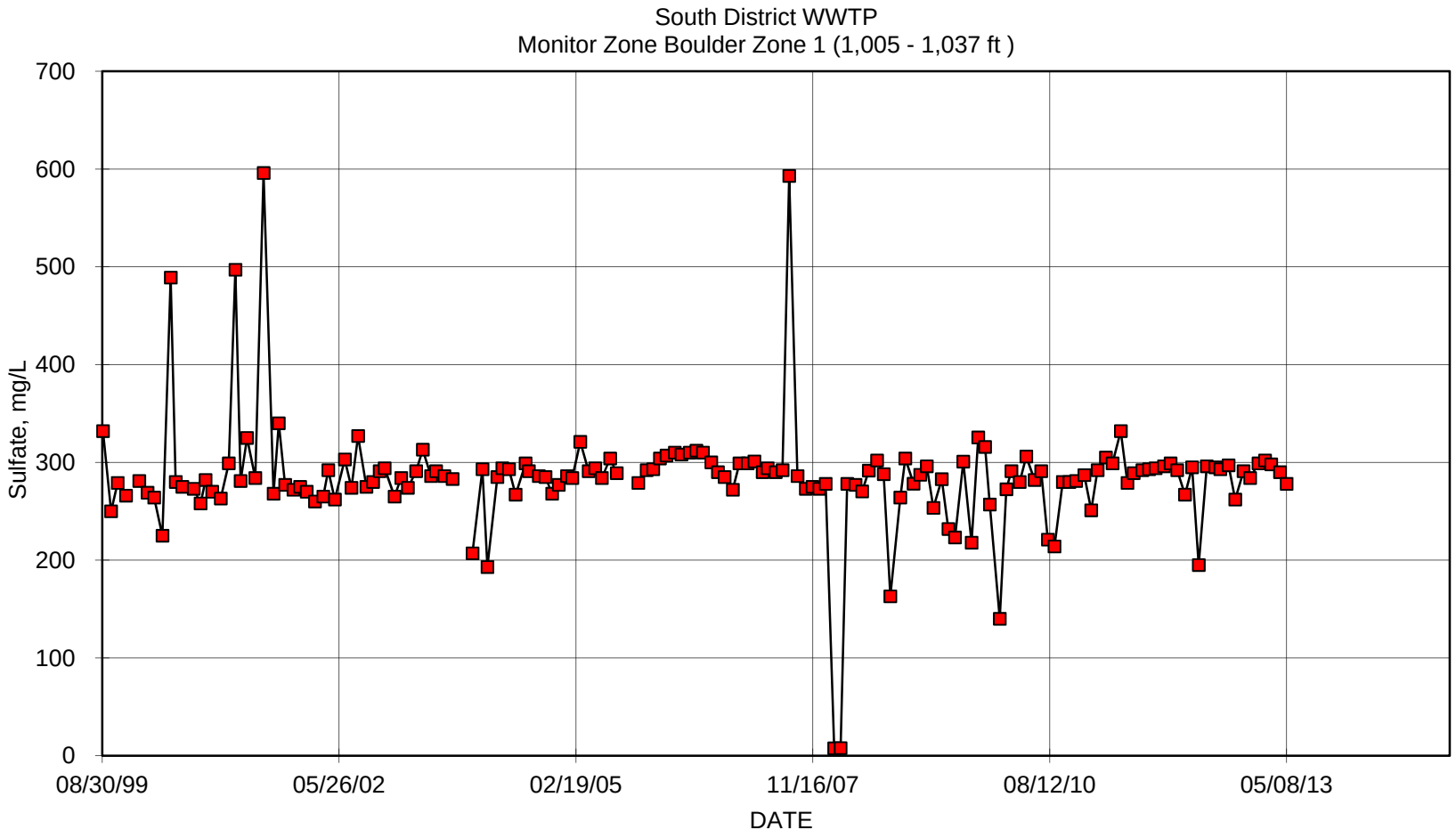
BZ- Upper

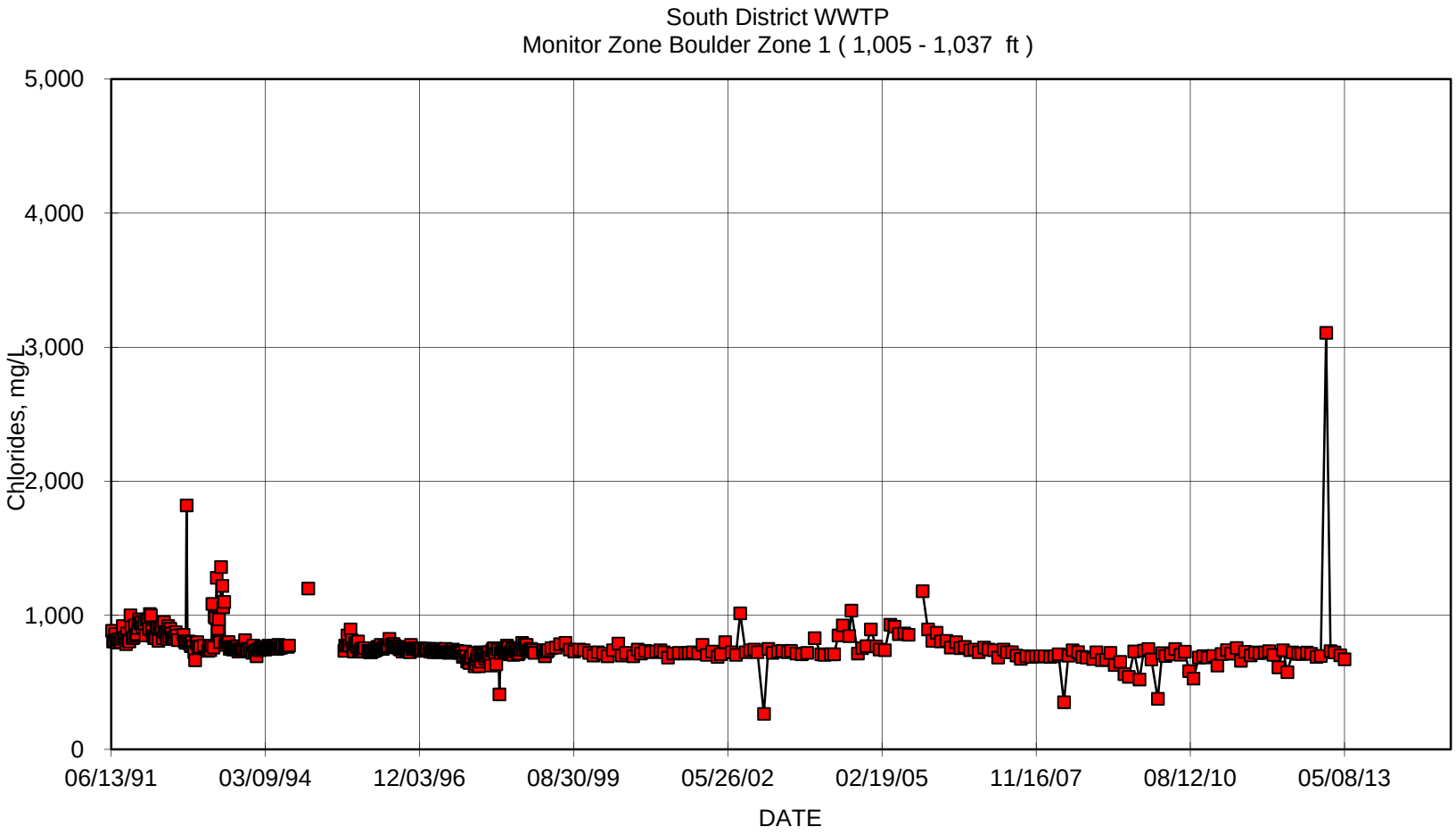
02/14/08	1,776	7.53	690	0.32	0.09	3,101	20	68	7.5	0.00	1.20	0.01	0.00				
03/12/08	1,828	7.77	695	0.61	0.09	3,245	20	68	7.8	0.00	3.60	0.01	0.00				
04/09/08	1,748	278	710	0.42	0.10	3,181	25	77	7.9	0.00	1.76	0.01	0.00				
05/14/08	1,800	277	352	0.27	0.08	3,124	23	74	7.6	0.02	1.76	0.01	0.00				
06/11/08	1,844	270	699	0.22	0.32	3,173	25	77	7.7	0.02	1.76	0.03	0.01				
07/09/08	1,828	292	740	0.19	0.01	3,063	24	76	7.8	0.01	1.76	0.03	0.00				
08/13/08	1,716	302	726	0.12	0.46	3,070	25	78	7.8	0.01	1.76	0.08	0.05				
09/10/08	1,788	288	690	0.33	0.08	3,119	25	77	7.9	0.01	1.76	0.08	0.05				
10/08/08	1,448	163	685	0.42	0.12	2,762	26	79	9.0	0.02		0.03	0.00				
11/19/08	1,824	264	674	9.50	7.43	3,130	25	77	7.8	0.00	1.76	0.03	0.01				
12/10/08	1,736	304	725	0.46	0.15	0	25	76	7.9	0.02	0.20	0.03	0.00				
01/14/09	1,756	278	666	0.46	0.19	2,962	23	74	7.1	0.04	1.20	0.03	0.00				
02/11/09	1,730	287	669	0.38	0.14	3,034	24	76	7.6	0.08	1.00	0.00	0.00				
03/11/09	1,812	296	721	0.26	0.15	3,145	24	76	7.7	0.27	1.00	0.00	0.00				
04/08/09	1,904	254	629	0.22	0.16	3,195	24	76	7.8	0.03	1.20	0.00	0.00				
05/13/09	1,712	283	653	0.22	0.22	3,167	26	78	8.0	0.00	1.00	0.00	0.01				
06/10/09	1,644	232	561	0.43	0.17	3,143	25	77	7.8	0.15	0.40	0.01	0.00				
07/08/09	1,796	223	542	0.25	0.02	3,131	25	77	7.8	0.02	1.00	0.00	0.01				
08/12/09	1,712	301	731	0.33	0.16	3,216	24	75	7.6	0.01	1.00	0.01	0.00				
09/16/09	1,756	218	521	0.45	0.17	3,067			7.8	0.01		0.05	0.01	473	7.6	2.1	0.7
10/14/09	1,756	326	737	0.40	0.16	2,942			7.8	0.01		0.01	0.00	451	5.1	3.1	0.8
11/12/09	1,784	316	749	0.46	0.18	2,863			7.9	0.01		0.01	0.00	466	6.6	2.0	0.9
12/02/09	1,736	257	671	0.67	0.17	3,061	25	77	7.8	0.02	1.40	0.01	0.00	425	2.9	2.1	0.7
01/13/10	1,780	140	378	0.40	0.18	3,056	21	69	7.0	0.01	0.80	0.00	0.01	425	5.5	1.8	0.9
02/10/10	1,716	273	718	0.54	0.31	3,023	22	72	7.9	0.01	1.80	0.00	0.01	389	6.9	2.8	0.8
03/03/10	1,844	291	697	0.55	0.13	3,129	22	72	7.7	0.02	0.60	0.00	0.00	485	6.1	2.8	0.8
04/07/10	1,820	280	710	0.32	0.20	3,132	26	78	7.7	0.04	0.20	0.00	0.00	475	4.6	2.6	0.8

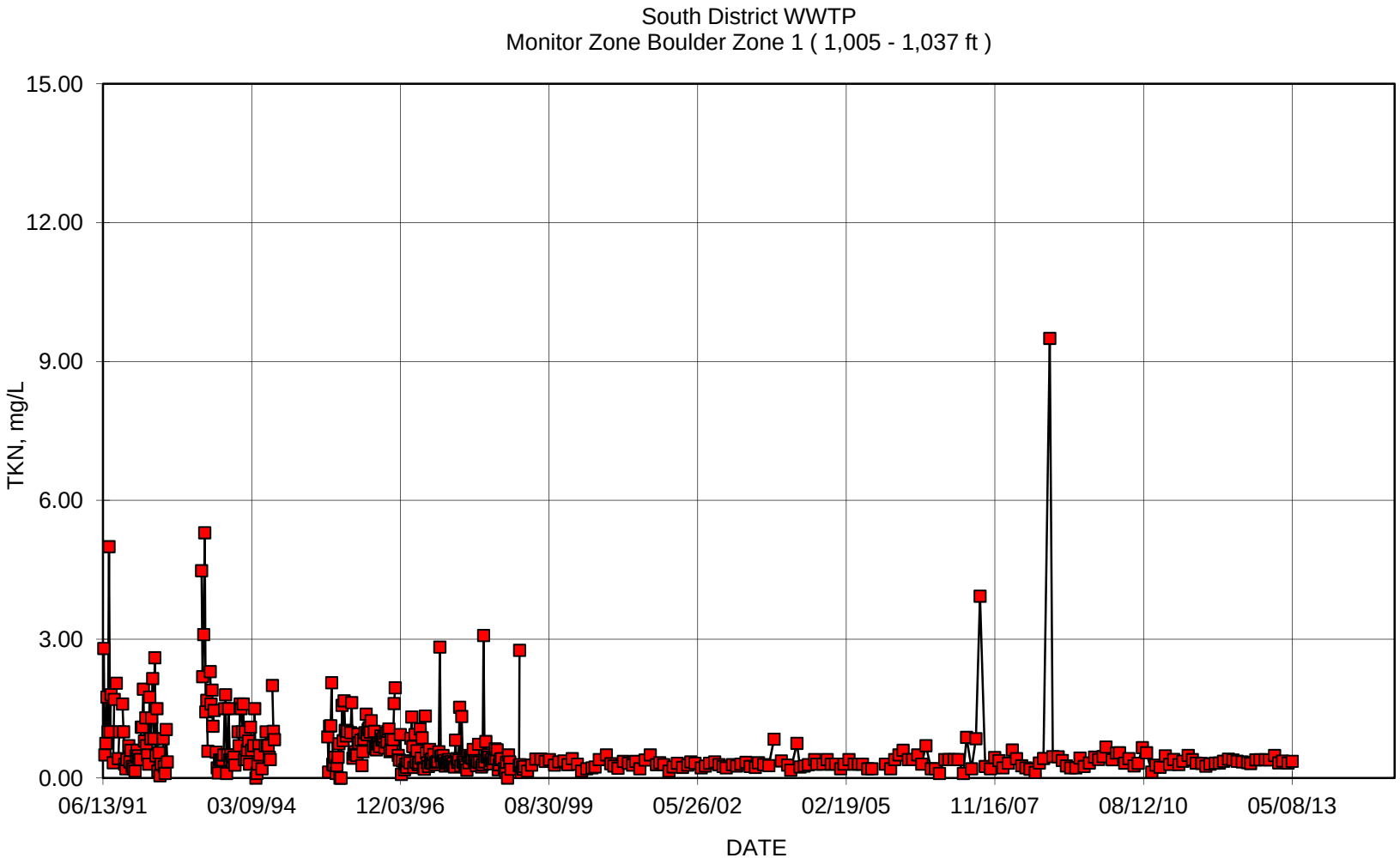
05/05/10	1,812	306	749	0.42	0.14	3,094	24	76	7.7	0.01	1.00	0.00	0.00	510	13.4	1.8	0.7
06/09/10	1,728	282	706	0.26	0.13	3,153	27	80	7.8	0.03	1.00	0.00	0.01	504	9.5	2.3	0.8
07/07/10	1,760	291	729	0.32	0.25	3,125	26	78	7.7	0.10	0.20	0.00	0.00	478	5.8	2.4	0.7
08/04/10	1,792	221	584	0.66	0.24	2,895	24	75	7.8	0.21	1.20	0.00	0.00	478	3.1	1.8	0.8
09/01/10	1,800	214	528	0.55	0.20	3,135	25	77	7.8	0.02	2.20	0.00	0.01	468	13.9	2.6	0.7
10/06/10	1,780	280	685	0.13	0.19	3,057	24	74	7.3	0.02	0.40	0.00	0.00	470	15.4	7.2	0.8
11/03/10	1,704	280	696	0.28	0.17	3,022	24	75	7.7	0.02	0.60	0.00	0.00	504	4.3	2.3	0.8
12/01/10	1,704	281	686	0.23	0.18	3,071	24	75	7.8	0.02	0.60	0.00	0.00	493	10.0	1.8	0.9
01/05/11	1,788	287	697	0.48	0.18	2,968	24	74	7.6	0.02	1.00	0.00	0.01	490	5.7	3.3	0.8
02/03/11	1,876	251	625	0.30	0.17	2,940	23	73	7.7	0.02	0.30	0.00	0.00	490	5.6	2.4	0.7
03/02/11	1,804	292	712	0.40	0.45	3,117	23	74	7.3	0.01	0.40	0.00	0.00	494	6.2	2.6	0.7
04/06/11	1,800	305	741	0.29	0.18	2,969	23	73	7.7	0.02	0.30	0.00	0.00	501	4.6	2.7	0.9
05/04/11	1,916	299	714	0.36	0.21	3,052	23	74	7.7	0.02	14.70	0.00	0.00	456	4.9	2.3	0.9
06/08/11	1,760	332	757	0.49	0.14	3,087	24	76	7.8	0.08	0.30	0.00	0.00	482	7.3	2.5	0.9
07/06/11	1,872	279	661	0.40	0.20	2,986	26	78	7.6	0.02	1.60	0.01	0.00	461	4.7	2.8	0.8
08/01/11	1,656	289	728	0.32	0.20	2,940	26	79	8.2	0.02	2.40	0.00	0.00	485	4.4	1.9	0.7
09/07/11	1,832	292	701	0.32	0.22	2,978	24	75	8.0	0.03	0.00	0.00	0.00	486	7.2	3.2	0.8
10/05/11	1,768	293	723	0.26	0.22	2,928	23	74	7.8	0.02	7.70	0.00	0.01	480	7.7	1.5	0.9
11/02/11	1,704	294	718	0.30	0.19	2,786	24	74	7.9	0.03	0.10	0.00	0.00	538	5.8	0.3	1.0
12/07/11	1,792	296	724	0.32	0.21	3,020	23	74	7.9	0.02	1.50	0.01	0.00	518	5.8	2.8	0.8
01/04/12	1,732	299	733	0.33	0.15	2,614	21	70	7.1	0.02	0.80	0.00	0.00	499	5.6	2.3	0.9
02/01/12	1,812	292	705	0.36	0.14	2,870	24	75	7.6	0.02	0.10	0.00	0.00	500	4.7	2.5	0.8
03/05/12	1,724	267	612	0.41	0.17	2,640	24	75	7.3	0.00	1.20	0.01	0.00	527	6.3	2.5	0.7
04/04/12	1,764	295	740	0.39	0.10	2,784	24	74	7.0	0.02	2.80	0.25	0.25	479	6.3	2.2	0.8
05/02/12	1,880	195	576	0.36	0.19	2,514	24	75	7.1	0.01	1.20	0.00	0.01	516	7.5	1.7	0.8
06/05/12	1,836	296	724	0.35	0.19	3,071	24	76	8.1	0.02	71.80	0.00	0.00	472	6.1	2.2	0.8
07/11/12	1,824	295	713	0.34	0.14	3,079	24	75	7.8	0.01	1.20	0.01	0.00	567	8.3	2.1	1.0
08/01/12	1,808	293	713	0.31	0.18	3,065	24	75	7.9	0.02	3.50	0.01	0.00	515	10.4	2.6	0.8
09/05/12	1,796	297	722	0.39	0.16	3,056	24	75	7.7	0.04	0.10	0.01	0.01	453	7.5	1.9	0.9
10/03/12	1,796	262	713	0.40	0.17	2,979	24	75	7.8	0.03	1.30	0.01	0.00	504	5.9	2.8	0.9

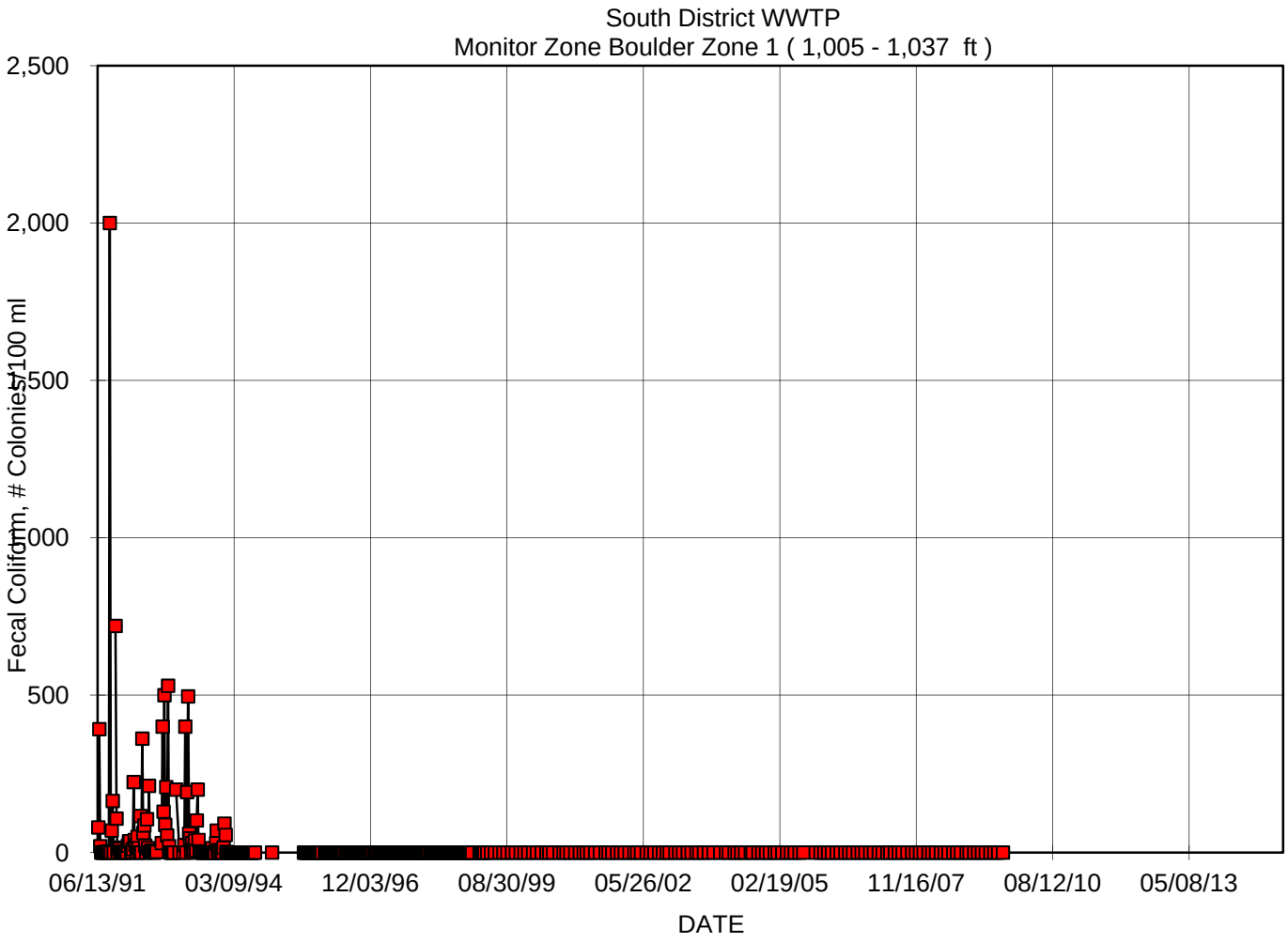
11/07/12		291	690	0.40	0.21	2,884	23	73	7.9	0.00	0.40	0.00	0.00	634	5.9	1.7	0.9
12/05/12	1,772	284	697	0.39	0.15	3,093	24	75	7.7	0.01	0.50	0.02	0.12	511	7.2	2.0	0.9
01/09/13	1,728	299	3,107	0.49	0.16	3,107	24	74	7.7	0.08	0.10	0.00	0.00	525	8.8	2.7	0.7
02/06/13	1,820	302	733	0.33	0.16	3,091	24	75	7.8	0.02	1.10	0.00	0.01	524	10.7	2.4	1.0
03/04/13	1,720	298	723	0.37	0.15	3,139	21	70	7.7	0.03	0.90	0.00	0.00	554	5.8	3.1	0.9
04/10/13	1,860	290	702	0.32	0.19	3,129	24	74	7.5	0.00	0.00	0.02	0.01	509	5.1	1.9	0.8
05/08/13	1,760	278	672	0.36	0.18	3,215	24	74	7.6	0.02	0.02	0.01	0.01	513	4.9	2.2	0.9

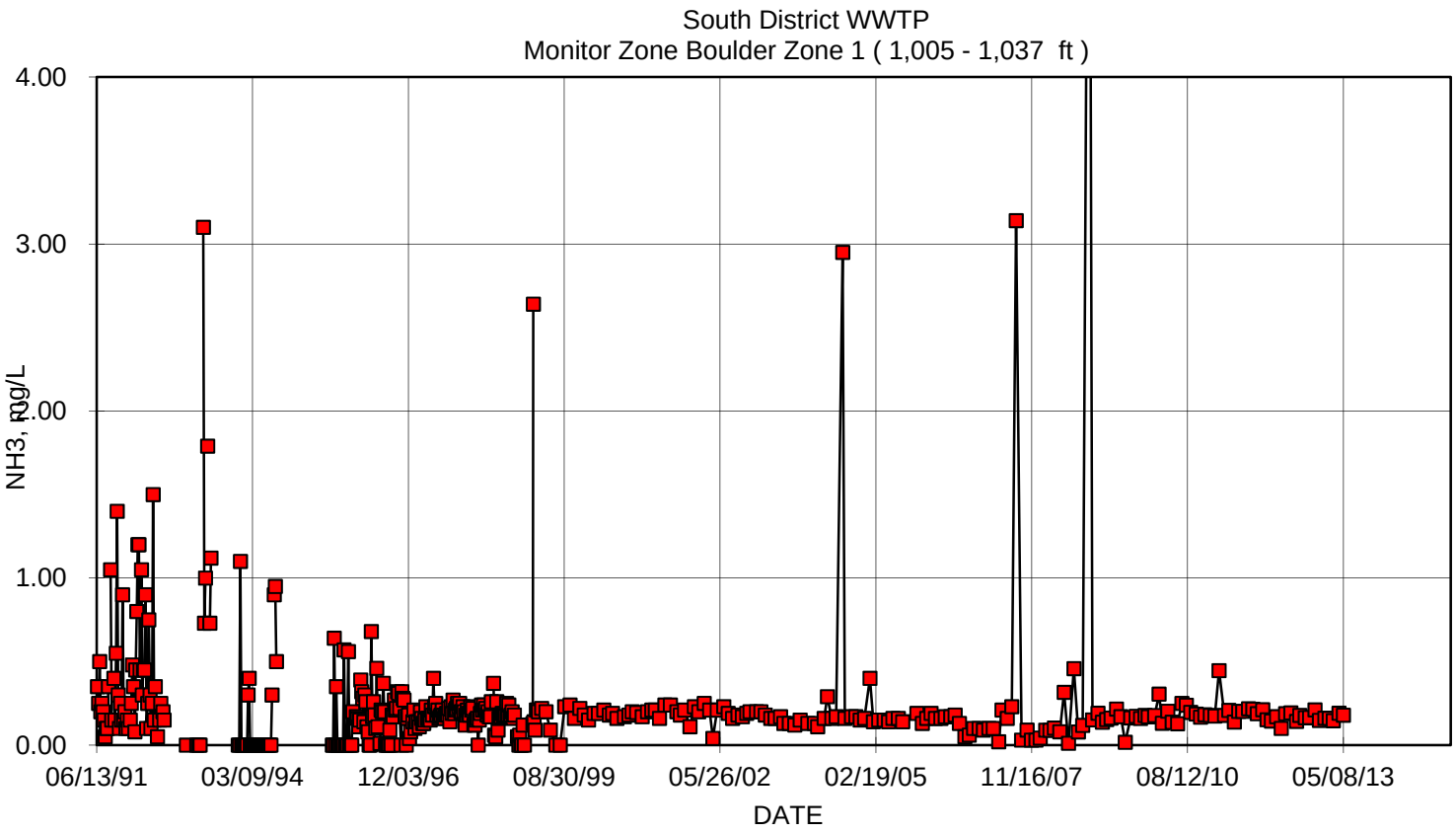

South District WWTP
Monitor Zone Boulder Zone 1 (1,005 - 1,037 ft)
TDS, mg/L
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
06/13/91
03/09/94
12/03/96
08/30/99
05/26/02
02/19/05
11/16/07
08/12/10
05/08/13
DATE

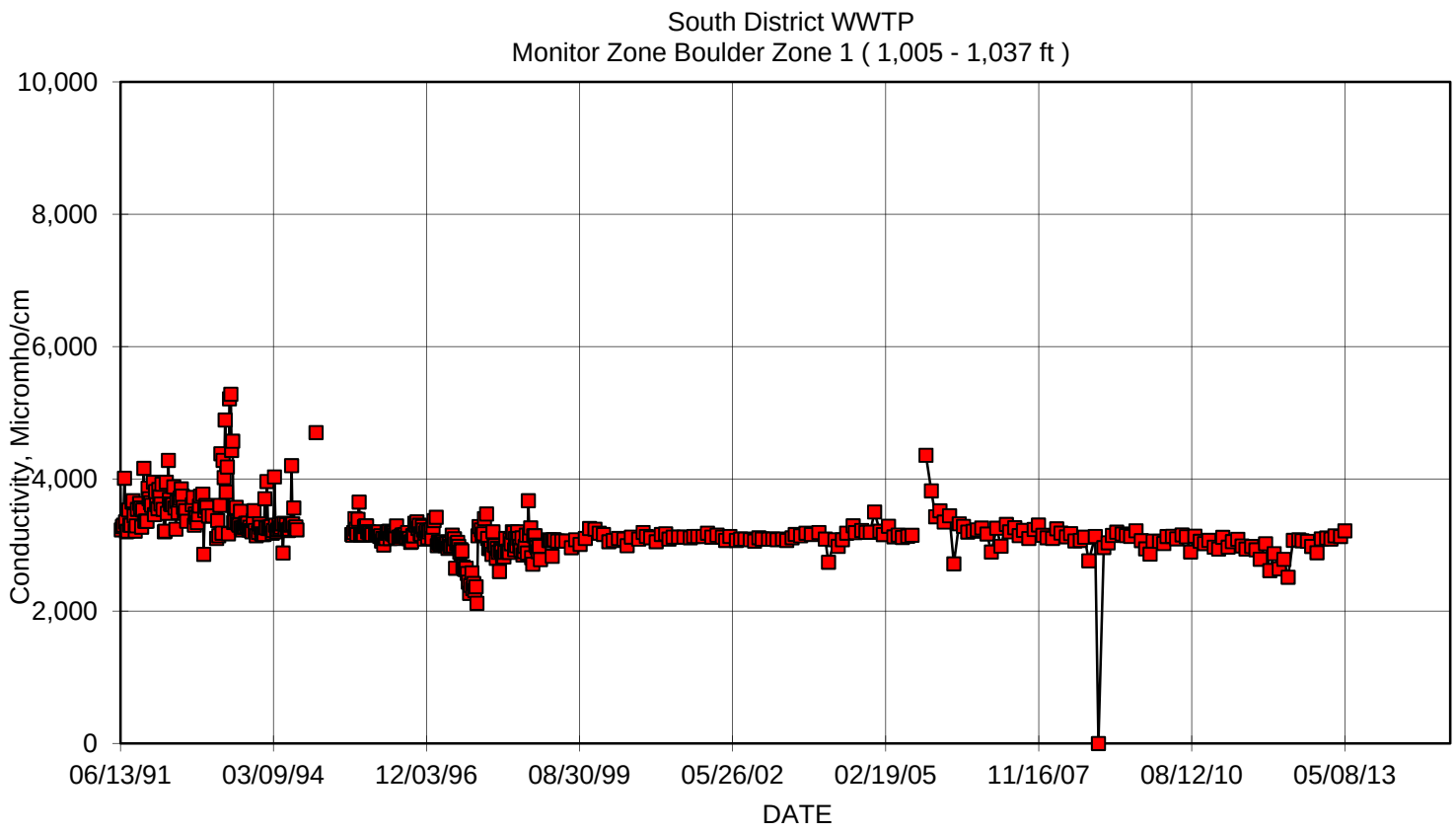

South District WWTP
Monitor Zone Boulder Zone 1 (1,005 - 1,037 ft)
Sulfate, mg/L
700
600
500
400
300
200
100
0
08/30/99
05/26/02
02/19/05
11/16/07
08/12/10
05/08/13
DATE

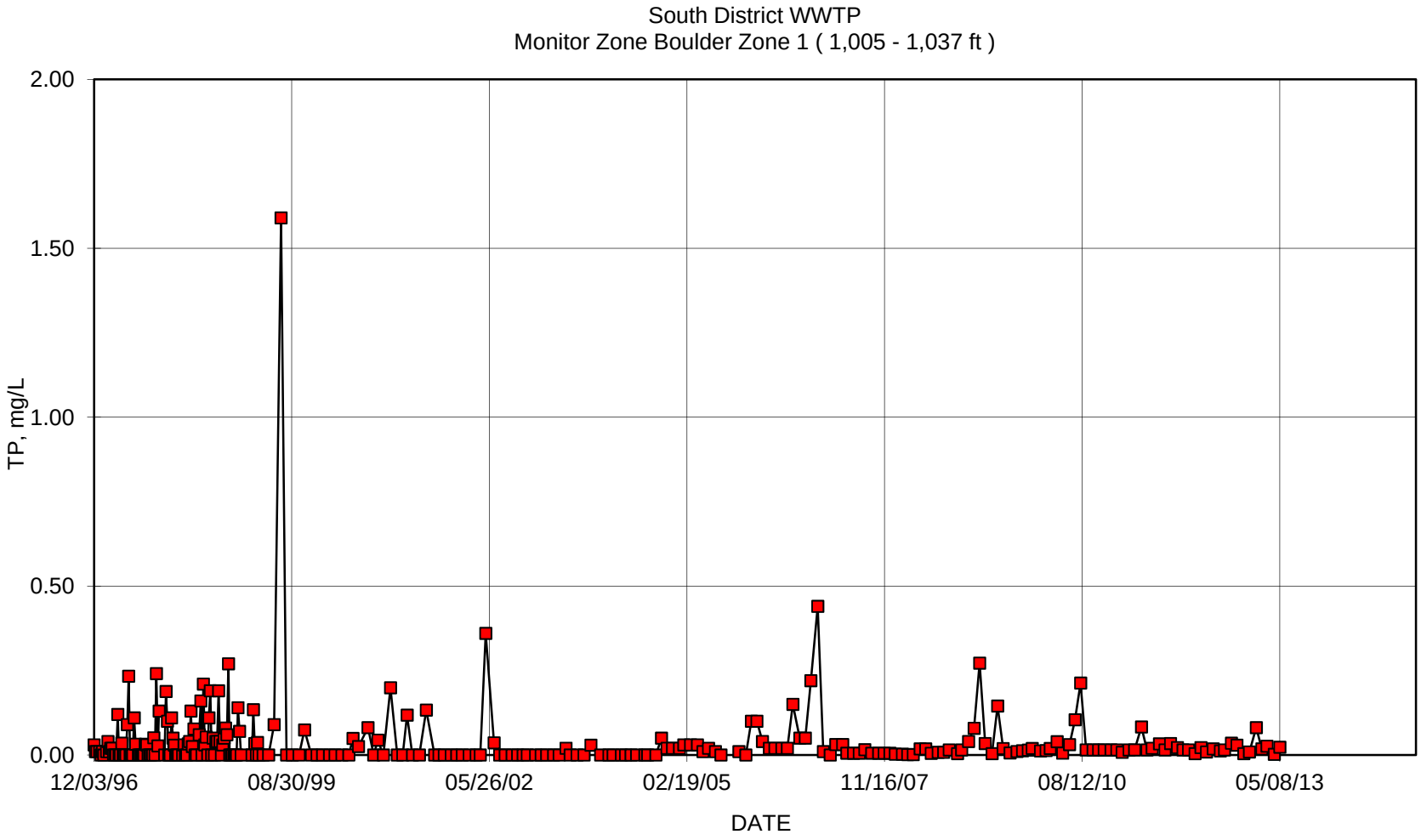

South District WWTP
Monitor Zone Boulder Zone 1 (1,005 - 1,037 ft)
Chlorides, mg/L
5,000
4,000
3,000
2,000
1,000
0
06/13/91
03/09/94
12/03/96
08/30/99
05/26/02
02/19/05
11/16/07
08/12/10
05/08/13
DATE

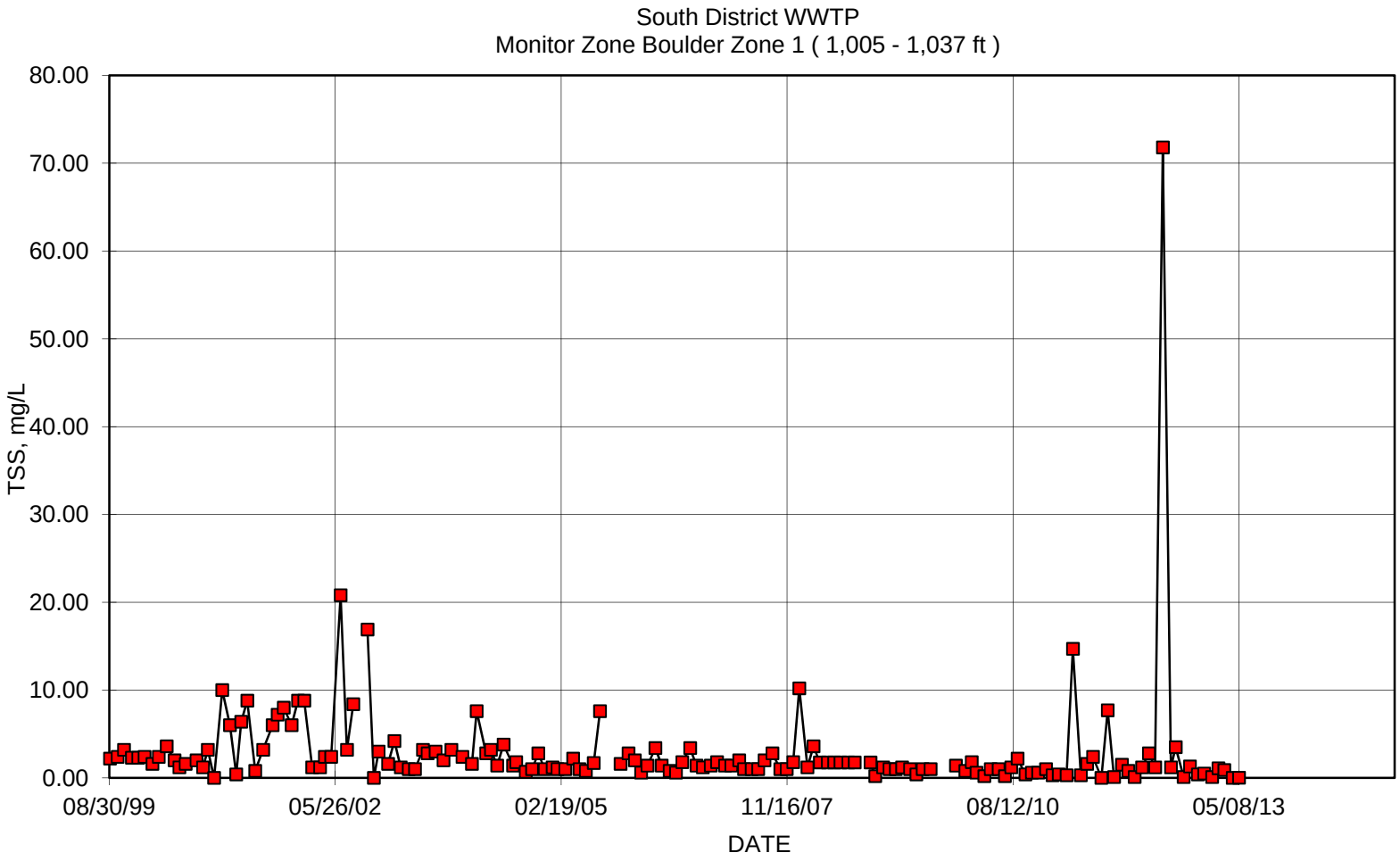

South District WWTP
Monitor Zone Boulder Zone 1 (1,005 - 1,037 ft)
15.00
12.00
9.00
6.00
3.00
0.00
TKN, mg/L
06/13/91
03/09/94
12/03/96
08/30/99
05/26/02
02/19/05
11/16/07
08/12/10
05/08/13
DATE


South District WWTP
Monitor Zone Boulder Zone 1 (1,005 - 1,037 ft)
Fecal Coliform, # Colonies/100 ml
2,500
2,000
1,500
1,000
500
0
06/13/91
03/09/94
12/03/96
08/30/99
05/26/02
02/19/05
11/16/07
08/12/10
05/08/13
DATE


South District WWTP
Monitor Zone Boulder Zone 1 (1,005 - 1,037 ft)
4.00
3.00
2.00
1.00
0.00
NH3, mg/L
06/13/91
03/09/94
12/03/96
08/30/99
05/26/02
02/19/05
11/16/07
08/12/10
05/08/13
DATE


South District WWTP
Monitor Zone Boulder Zone 1 (1,005 - 1,037 ft)
Conductivity, Micromho/cm
10,000
8,000
6,000
4,000
2,000
0
06/13/91
03/09/94
12/03/96
08/30/99
05/26/02
02/19/05
11/16/07
08/12/10
05/08/13
DATE


South District WWTP
Monitor Zone Boulder Zone 1 (1,005 - 1,037 ft)
TP, mg/L
2.00
1.50
1.00
0.50
0.00
12/03/96
08/30/99
05/26/02
02/19/05
11/16/07
08/12/10
05/08/13
DATE


South District WWTP
Monitor Zone Boulder Zone 1 (1,005 - 1,037 ft)
TSS, mg/L
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
08/30/99
05/26/02
02/19/05
11/16/07
08/12/10
05/08/13
DATE

FA-BZ Lower Data

Date	TDS, mg/L	Sulfate, mg/L	Chlorides, mg/L	TKN, mg/L	NH3, mg/L	Conductivity, Micromho/cm	Temp., C	Temp., F	pH	TP, mg/L	TSS mg/L	NO_3 mg/L	NO_2 mg/L	Sodium mg/L	Gross Alpha, pCi/L	Radium 226, pCi/L	Radium 228, pCi/L
07/01/83			3,555														
09/01/83	2,058		1,350						7.8								
12/01/83	7,140		3,920	0.7		11,100		75	6.8								
03/01/84	7,564		3,630	0.55	0.22	11,000		75	6.4								
06/01/84	7,224		3,890	0.32	0.28	10,500		75	6.7								
09/01/84	7,680		1,640	1.20	0.43	10,000		79	6.4								
12/01/84	7,700		3,400		0.28	9,500		73	7.8								
03/01/85	7,108		3,420	0.72	0.22	9,600		75	8.0								
06/01/85	7,600		3,780	0.62	0.37	7,700		77	7.2								
09/01/85	7,108		3,530	0.43	0.32	8,200		77	7.4								
12/01/85	7,120		3,850	0.45	0.35	8,000		75	7.6								
03/01/86	7,720		700	1.50	0.15	9,800		75	7.4								
06/01/86	6,824		3,600	0.75	0.35	9,000		84	8								
09/01/86	8,400		3,270	0.36	0.30	8,200		75	7.3								
12/01/86	6,404		3,700	0.40	0.30	8,400		76	6.6								
03/01/87	6,636		2,350	3.1	0.50	10,000			7.3								
06/01/87	7,000		2,840	0.70	0.45	10,000		79	7.3								
09/01/8	7,020		3,850	0.58	0.27			84	7.								

7							6	
12/01/87	6,252	4,950	0.35	0.35	9,500	75	7.6	
06/01/88								
06/01/89								
06/01/90								
06/01/91								
06/01/92								
06/01/93								
06/01/94								
08/03/95	8,720	4,300	2.48	0.78	13,400	76	9.1	0.07
08/08/95	8,010	4,375	0.92	0.68	12,600	77	9.1	0.04
08/15/95	7,680	4,325	2.10	0.95	12,600	79	8.4	0.03
08/23/95	7,980	4,275	0.64	0.68	12,600	76	8.2	0.03
08/29/95	8,240	4,275	1.80	1.18	12,600	80	8.3	0.01
09/05/95	8,130	4,325	1.10	1.00	13,200	76	7.9	0.22
09/12/95	8,040	3,825	2.20	0.51	12,500	75	7.6	0.02
09/19/95	8,790	4,250	1.33	0.48	13,500	75	7.9	0.02
09/28/95	8,800	4,375	1.72	0.77	12,900	75	7.8	0.01
10/03/95	8,550	4,450	1.74	0.65	13,200	78	7.9	0.01
10/11/95	7,630	4,125	1.11	0.78	12,800	76	7.9	0.00
10/17/95	7,600	4,075	1.74	1.66	12,700	76	7.8	0.02
10/24/95	8,200	4,175	1.24	0.61	13,000	76	7.6	0.00
10/31/9	8,492	4,325	1.49	0.50	13,000	77	7.	0.00

5							9	
11/07/95	7,940	4,125	1.34	0.23	13,000	76	7.6	0.00
11/14/95	7,320	4,250	0.75	0.65	13,000	75	7.6	0.00
11/21/95	7,820	4,250	1.47	0.74	13,000	75	7.5	0.00
11/28/95	7,810	4,250	1.02	0.83	13,000	76	7.5	0.01
12/05/95	8,100	4,715	0.08	0.00	12,800	76	7.6	0.00
12/12/95	8,350	4,275	1.44	0.57	12,800	78	7.3	0.01
12/19/95								
12/29/95								
01/04/96	8,180	4,200	1.71	0.91	12,800	79	7.6	0.01
01/11/96	8,400	4,175	1.58	0.87	12,900	78	7.2	0.03
01/19/96	8,380	4,250	1.36	0.94	13,000	78	7.3	0.01
01/25/96	8,360	4,250	1.96	0.88	13,100	78	7.3	0.00
02/01/96	8,010	4,250	1.30	0.90	13,000	79	7.1	0.04
02/07/96	7,980	4,375	1.40	0.90	13,000	72	7.4	0.02
02/13/96	9,830	4,225	1.40	1.19	13,100	76	7.0	0.04
02/21/96	8,400	4,350	1.88	1.05	14,000	68	6.8	0.10
02/27/96	8,430	4,225	1.69	1.32	12,700	75	7.1	0.07
03/05/96	8,700	4,500		1.13	13,100	78	7.1	
03/12/96	7,970	4,700	1.31	0.93	13,300	78	7.2	0.00
03/20/96	8,350	4,550	1.53	0.07	13,600	75	7.0	0.00
03/26/96	8,520	4,825	2.05	1.10	13,700	76	6.9	0.00
04/02/9		4,650	2.25	0.87	13,900	73	7.	0.00

6							1	
04/09/96		4,850	1.77	1.46	13,600	74	6.9	0.00
04/17/96		4,725	2.81	1.17	14,000	75	7.6	1.39
04/23/96		4,750	2.07	1.32	13,700	76	7.5	0.00
04/30/96		4,775	1.93	1.21	13,600	76	7.6	0.00
05/07/96	8,560	4,750	1.79	1.05	13,700	78	7.5	0.04
05/14/96	8,310	4,825	2.26	0.95	13,700	74	7.5	0.02
05/21/96	8,270	4,500	2.39	1.20	12,500	73	7.6	0.03
05/28/96								
06/04/96	8,440	4,975	3.36	0.97	13,800	73	7.4	0.01
06/11/96	8,360	4,825	2.85	1.39	13,700	73	7.5	0.02
06/18/96	8,400	4,825	2.56	1.36	14,000	74	7.4	0.03
06/25/96	8,620	4,825	2.49	1.48	14,000	74	7.6	0.02
07/02/96	8,550	4,825	2.64	1.51	14,000	74	7.5	0.03
07/09/96	8,480	4,825	2.41	1.06	13,900	74	7.4	0.03
07/16/96	8,180	4,825	2.78	1.21	14,000	74	7.5	0.04
07/25/96	8,360	4,975	2.65	1.46	14,000	74	7.5	0.05
08/01/96		4,750	2.60	1.31	14,000	75	7.4	0.04
08/06/96	8,150	4,850	2.48	1.22	14,000	75	7.4	0.02
08/14/96	8,320	4,850	2.99	1.32	16,000	76	7.5	0.01
08/21/96	8,370	4,750	1.91	1.55	14,000	76	7.4	
08/27/96	8,190	4,750	2.67	1.71	14,000	75	7.4	0.02
09/04/9	8,110	4,800	2.65	1.61	14,300	76	7.	

6							4	
09/10/96	8,610	4,875	2.61	1.52	14,200	76	7.4	
09/17/96	8,520	4,825	2.85	1.60	14,400	77	7.3	0.03
09/24/96	8,140	4,875	2.20	1.72	14,500	76	7.4	
10/01/96	8,390	4,825	2.91	1.69	14,700	76	7.4	
10/08/96	8,060	4,875	3.00	1.57	14,100	76	7.4	0.02
10/16/96	8,380	5,025	2.19	1.43	14,200	74	7.4	0.02
10/22/96		5,000	3.90	1.71	13,800	74	7.4	0.02
10/29/96	8,030	5,000	5.68	1.65	13,000	74	7.4	0.01
11/05/96	9,210	4,950		1.91	13,900	75	7.4	0.02
11/12/96	8,430	4,875		1.61	14,200	74	7.3	0.02
11/19/96	8,650	4,875	2.10	1.64	13,600	75	7.4	0.00
11/26/96	8,480	5,000	1.66	1.25	13,600	75	7.7	0.03
12/03/96	7,960	4,950	1.68	1.62	14,000	73	7.4	0.00
12/10/96	8,860	4,875	1.94	1.26	13,340	76	7.6	0.01
12/17/96	8,630	4,875	1.95	1.37	13,900	73	7.3	0.04
12/24/96	9,080	4,800	1.80	1.61	13,800	72	7.4	0.00
12/31/96	9,350	4,725	1.72	1.30	14,200	74	7.6	0.01
01/07/97	9,110	4,750	2.01	1.67	13,400	74	7.4	0.01
01/14/97	9,060	4,750	1.70	1.41	14,370	74	7.4	0.00
01/21/97	8,860	4,675	2.14	1.52	14,560	74	7.3	0.01
01/28/97	8,930	4,700	2.28	1.59	14,100	74	7.3	0.02
02/04/9	8,840	4,750	2.06	1.44	14,120	74	7.	0.02

7							5	
02/11/97	8,780	4,650	2.18	1.25	13,130	74		0.00
02/18/97	8,780	4,675	2.16	1.45	13,520	75	7.5	0.02
02/25/97	8,760	4,650	2.23	1.50	13,250	76	7.6	0.02
03/04/97	8,820	4,650	1.67	1.36	13,430	75	7.5	0.01
03/11/97	9,000	4,625	1.96	1.65	13,250	76	7.5	0.40
03/18/97	8,656	4,750	1.85	1.45	13,380	76	7.4	0.00
03/25/97	8,456	4,725	1.95	1.69	13,350	75	7.4	0.00
04/02/97	8,800	4,675	1.95	1.38	13,320	75	7.4	0.00
04/08/97	8,050	4,625	2.32	1.36	13,310	76	7.5	0.07
04/15/97	8,460	4,650	2.37	1.39	13,300	75	7.4	0.03
04/22/97	8,930	4,675	1.67	1.28	13,060	76	7.4	0.07
04/29/97	8,350	4,675	1.61	1.52	13,240	75	7.4	0.07
05/06/97	8,830	4,625	1.67	1.39	12,920	75	7.3	0.04
05/13/97	8,520	4,675	1.90	1.46	13,040	75	7.4	0.04
05/20/97	8,460	4,700	3.51	1.68	13,850	74	7.4	0.07
05/27/97	8,480	4,575	1.79	1.72	13,140	75	7.4	0.22
06/03/97	8,940	4,620	1.65	1.42	13,500	75	7.4	0.00
06/10/97	8,830	4,670	1.79	1.66	12,750	75	7.3	0.00
06/17/97	8,400	4,700	2.29	1.56	13,100	75	7.4	0.07
06/24/97	8,800	4,720	2.06	1.58	13,130	76	7.4	0.00
07/01/97	8,800	4,650	1.87	1.54	12,800	76	7.3	0.10
07/08/9	8,818	4,500	2.31	1.73	12,160	75	7.	

7							3	
07/15/97	8,682	4,650	2.10	1.69	12,220	76	7.3	0.06
07/22/97	9,228	4,650	1.85	1.47	12,120	76	7.3	0.00
07/29/97	9,006	4,650	2.81	1.64	10,860	76	7.5	0.05
08/05/97	8,744	5,175	1.97	1.61	10,390	75	7.5	0.00
08/12/97	8,770	4,625	1.94	1.52	10,430	75	7.5	0.00
08/19/97	8,254	4,775	2.34	1.77	10,240	74	7.4	0.03
08/26/97	8,688	4,675	1.83	1.55	9,650	75	7.6	0.00
09/02/97	8,660	4,775	2.02	1.67	9,280	78	7.4	0.05
09/10/97	8,380	4,850	1.74	1.70	8,900	77	7.5	0.00
09/16/97	7,980	4,750	2.64	2.18	8,420	74	7.5	0.04
09/25/97	8,800	4,775	1.69	1.63	8,990	75	7.5	0.00
10/01/97	8,990	4,750	2.07	1.65	8,420	75	7.3	0.05
10/07/97	8,510	4,775	2.03	1.82	7,840	74	7.5	0.03
10/14/97	4,500	4,775	2.09	1.93	8,040	75	7.3	0.08
10/22/97	8,720	4,750	2.05	1.93	8,000	74	7.2	0.08
10/28/97	8,480	4,775	1.98	1.85	6,480	74	7.3	0.14
11/04/97	8,540	4,775	1.74	1.62	13,580	74	7.3	0.00
11/11/97	8,630	4,800	2.11	1.64	14,160	74	7.3	
11/18/97	8,900	4,750	2.96	1.80		73	7.3	
11/25/97	8,450	4,775	2.39	1.65	14,450	74	7.2	0.00
12/02/97	8,740	4,800	1.76	1.64	14,420	75	7.2	0.20
12/09/9	9,160	4,675	1.98	1.88	13,980	73	7.	0.06

7							6	
12/16/97	8,680	4,625	2.61	1.93	14,200	73	7.2	0.03
12/23/97	8,510	4,675	2.04	1.70		75	7.6	0.03
12/30/97	8,330	4,675	2.10	1.63	13,600	72	7.4	0.12
01/06/98	8,820	4,725	1.97	1.62	14,000	74		0.07
01/13/98	8,770	4,700	2.26	2.00	13,700	77	7.3	0.00
01/20/98	8,700	4,725	3.80	2.18	13,100	73	7.3	0.00
01/27/98	8,900	4,675	2.01	1.87	13,700	73	7.4	0.00
02/03/98	9,160	4,625	2.05	1.67	13,400	73	7.2	0.06
02/10/98		4,625	1.82	1.41	13,800	75	7.2	
02/17/98		4,650	1.93	1.58	13,900	75	7.5	
02/24/98	8,725	4,725	1.99	1.31	13,500	75	7.3	0.00
03/03/98	9,140	4,800	2.48	1.67	12,900	72	7.2	0.09
03/10/98	9,020	4,775	2.82	1.86	13,100	72	7.7	0.06
03/17/98	8,700	4,750	2.06	1.93	12,500	73	7.8	0.03
03/24/98	8,590	4,725	2.47	2.12	12,200	73	7.6	0.05
03/31/98	8,290	4,650	2.23	2.21	13,000	73	7.5	0.05
04/07/98	8,620	4,775	2.10	1.91	13,000	73	7.4	0.10
04/14/98	9,030	4,800	2.21	2.04	13,000	72	7.6	0.10
04/22/98	8,500	4,725	2.24	1.77	12,800	73	7.4	0.00
04/28/98	8,580	4,750		1.83	13,100	73	7.3	0.06
05/05/98	8,570	4,775	2.00	1.79	13,500	73	7.4	0.00
05/13/9	8,520	4,725	3.23	1.87	12,000	73	7.	0.00

8							4	
05/19/98	8,400	4,800	2.24	2.07	12,900	73	7.3	0.00
05/27/98	8,430	4,775			13,000	75	7.6	0.17
06/02/98	8,320	3,875	2.33		13,900	75	7.6	0.06
06/09/98	8,720	4,800	2.35	1.93	19,000	75	7.6	0.05
06/16/98	8,566	4,800	3.48	2.47	13,800	74	7.6	0.05
06/23/98	8,970	4,725	1.98		12,760	74	7.2	0.03
07/01/98	8,750	4,925	2.87	1.63	12,670	74	7.4	0.03
07/07/98	8,310	4,675	2.65	1.86	13,900	77	7.7	0.05
07/14/98	8,520	4,800	2.31	2.29	13,100	75	7.6	0.14
07/21/98	9,170	4,850	3.39	2.24	14,400	75	7.5	0.00
07/28/98	8,850	4,800	3.33	2.25	13,800	75	7.6	0.06
08/04/98	8,360	4,675	2.58	2.25	13,100	74	7.5	0.00
08/11/98	8,220	4,675	2.32	2.30	13,000	76	7.7	0.19
08/18/98	8,270	4,725	3.00	2.45	13,800	77	7.7	0.00
08/25/98	8,750	4,725	2.57	2.27	12,200	75	7.7	0.21
09/01/98		4,375	2.72	2.44	12,800	75	7.6	0.10
09/08/98	8,840	4,700	2.95	2.36	13,100	75	7.5	0.00
09/15/98		4,800	3.62	2.53	14,600	74	7.6	0.04
09/22/98	8,190	4,850	2.89	2.62	12,650	74	7.3	0.05
09/29/98	8,700	4,925	2.81	2.48	13,500	75	7.5	0.10
10/06/98	8,650	4,700	2.71	2.41	15,300	75	7.6	0.09
10/14/9	7,700	4,950	2.88	2.58	13,090	74	7.	0.07

8									4			
10/20/98	8,650		4,900		2.58	12,800		75	7.6	0.03		
10/28/98	9,100		4,975			11,100		76	7.8	0.46		
11/03/98	9,150		4,775	2.00	1.85	13,760		78	7.5	0.00		
11/12/98	8,918	450	4,825	2.78	1.46	13,710		76	7.4	0.00		
11/17/98	8,930	430	4,700	3.00	2.20	13,230		73	7.6	0.00		
11/24/98	8,700	542	4,600	2.84	2.01	13,600		74	7.5	0.04		
12/01/98	8,776	475	4,950	2.80	2.40	12,630		74	7.7	0.16		
12/09/98	4,750	275	4,800	2.30	2.00	12,930		74	7.7	0.03		
12/17/98	9,700	536	4,700	2.30	1.90	11,610		72	7.6	0.00		
12/22/98												
01/05/99												
01/12/99												
01/20/99												
01/27/99												
02/03/99	1,880	255	4,775	0.39	0.00	14,190		74	7.7	0.00		
02/10/99	9,920	460	4,923	2.41	1.10	14,140		74	7.6	0.00		
02/17/99	8,300	517	4,799	2.39	1.60	14,140		73	7.6	0.00		
02/24/99	2,800	475	7,150	2.44	2.30	14,270		72	7.5	0.07		
03/04/99	14,190	450	4,699	2.52	2.31	12,000	23	74	7.6	0.05		0.00
03/10/99	9,000	500	4,774	2.34	2.20	14,320	23	74	7.5	0.05	9.60	0.00
03/17/99	9,000	599	4,923	3.69	0.00	14,230	23	74	7.7	0.09	12.00	0.00
03/24/9												

9												
04/07/99	9,000	496	4,998	2.99	2.48	14,220	24	75	7.6	0.03	9.80	0.00
05/05/99	9,650	534	4,848	2.53	2.45	14,140	25	77	7.4	0.04	7.00	0.00
06/02/99	9,000	514	4,898	2.71	2.49	14,200	24	75	6.8	0.06	10.60	0.00
07/07/99	9,950	462	4,873	2.71	2.23	13,790	25	77	7.7	0.06	12.20	0.00
08/04/99	9,900	549	5,023	2.54	2.60	14,130	24	76	7.7	0.00	6.60	0.00
09/02/99	8,800	622	4,824	2.67	2.80	13,790	23	74	7.5	0.00	9.80	0.00
10/06/99	8,600	475	4,923	2.58	2.80	14,380	24	76	7.7	0.00	10.80	0.01
11/03/99	9,324	519	4,749	2.66	2.22	14,500	24	74	7.7	0.10	10.40	0.01
12/08/99	9,116	371	4,800	2.66	2.44	14,680	25	77	7.9	0.06	12.30	0.00
01/05/00	9,632	538	4,749	2.60	2.13	14,890	24	74	7.6	0.00	10.30	0.01
02/02/00	8,796	536	4,799	2.82	2.05	14,710	23	74	7.5	0.05	13.60	0.01
03/08/00	8,880	494	4,774	2.40	2.32	14,270	25	76	7.5	0.00	26.00	0.01
04/05/00	8,796	513	4,724	2.66	2.21	14,370	23	74	7.6	0.00	12.00	0.00
05/10/00	9,180	488	4,873	2.41	2.38	14,500	24	76	7.6	0.00	12.80	0.01
06/14/00	9,592	250	4,923	2.54	2.06	14,430	24	76	7.7	0.00	12.40	0.01
07/05/00	9,620	499	4,948	2.25	2.17	14,010	24	76	7.4	0.00	8.00	0.01
08/02/00	9,180	525	4,799	2.50	1.91	14,710	24	75	7.6	0.03	12.40	0.01
09/19/00	8,064	534	4,848	2.69	2.04	14,620	24	75	7.7	0.05	12.00	0.02
10/18/00	9,080	522	4,898	2.20	1.92	14,730	24	75	7.7	0.00	12.80	0.02
11/08/00	8,360	535	4,898	2.23	2.07	14,720	25	77	7.7	0.04	11.60	0.02
12/06/00	8,332	366	4,848	2.46	1.91	14,710	24	75	7.6	0.00	20.00	0.03
01/11/0	8,152	547	4,898	2.21	1.82	14,510	23	74	7.	0.20	44.4	0.01

1									5		0	
02/14/01	8,368	583	4,923	2.20	1.99	14,990	24	75	7.9	0.00	30.00	0.08
03/14/01	9,052	711	4,873	2.55	1.95	14,960	24	75	7.7	0.00	19.20	0.01
04/05/01	8,456	1,056	4,774	2.14	1.86	14,400	25	76	7.6	0.10	51.60	0.01
05/02/01	9,032	600	4,848	2.30	1.90	14,750	24	74	7.9	0.00	47.60	0.01
06/06/01	9,008	600	4,898	2.32	2.04	14,750	24	75	7.7	0.10	4.00	0.01
07/11/01	8,760	565	4,898	2.48	2.12	14,720	24	74	7.6	0.09	19.20	0.01
08/22/01	9,128	584	4,824	2.25	2.08	14,610	24	74	7.4	0.00	36.80	0.01
09/13/01	8,348	468	4,799	2.13	1.69	14,310	25	77	7.3	0.00	49.60	0.02
10/10/01	8,900	499	4,873	2.76	2.12	14,630	24	74	7.7	0.00	47.20	0.02
11/14/01	8,856	454	4,774	2.31	1.85	14,730	23	73	7.7	0.00	28.00	0.02
12/12/01	8,832	539	4,724	2.22	2.06	14,620	24	75	7.1	0.00	26.00	0.02
01/09/02	8,888	524	4,873	2.80	2.09	14,710	23	73	7.8	0.03	48.40	0.02
02/13/02	8,832	488	4,449	2.05	2.35	14,710	23	73	7.6	0.05	12.00	0.03
03/20/02	8,716	497	4,624	2.34	2.09	14,160	24	74	7.5	0.00	11.60	0.03
04/10/02	8,628	585	4,749	2.72	1.82	14,310	23	74	7.3	0.02	11.20	0.02
05/08/02	8,932	560	4,799	2.53	2.38	14,530	23	74	7.5	0.03	34.40	0.03
06/19/02	8,444	545	4,824	2.23	2.37	14,330	24	74	7.6	0.03	40.00	0.02
07/17/02	8,696	554	4,774	2.50	2.20	14,350	24	75	7.5	0.00	14.40	0.02
08/14/02	8,216	539	4,799	2.30	2.20	14,180	25	76	7.3	0.00	30.80	0.00
09/18/02	8,392	624	4,873	2.41	2.27	14,360	24	76	7.6	0.00	31.20	0.00
10/16/02	8,536	512	4,824	2.37	1.84	14,220	23	74	7.7	0.00	18.00	0.00
11/13/0	8,640	544	4,898	2.10	2.18	14,480	23	74	7.	0.00	13.0	0.01

2									8		0		
12/04/02	8,696	565	4,824	2.25	1.98	14,360	23	74	7.5	0.00	12.00	0.01	
01/15/03	8,416	555	4,774	2.51	2.28	14,280	23	73	7.8	0.02	9.60	0.01	
02/12/03	8,304	569	4,749	2.37	2.20	13,600	23	74	7.9	0.00	17.70	0.00	
03/13/03	8,900	552	4,923	2.42	2.04	14,150	23	74	7.6	0.04	12.00	0.00	
04/16/03	8,360	579	4,848	2.45	2.22	14,120	23	74	7.8	0.00	12.80	0.00	
05/14/03	8,156	582	4,774	2.40	2.22	13,960	23	74	7.6	0.00	12.00	0.01	
06/18/03	8,304	568	4,724	2.42	2.14	14,250	24	76	7.6	0.02	13.60	0.01	
07/09/03	8,304	507	4,674	2.39	2.16	14,040	24	76	7.2	0.00	34.00	0.01	
08/13/03	8,340	544	4,599	2.51	2.32	14,430	27	80	7.7	0.00	13.50	0.00	
09/17/03	8,368	643	4,549	2.45	2.07	14,550	24	76	7.8	0.00	13.60	0.00	
10/22/03	8,240	553	4,699	2.46	2.26	14,280	23	73	7.5	0.00	13.20	0.00	
11/12/03													Unable to sample due to Mechanical Integrity Test Activities
12/10/03	7,608	323	4,749	2.05	1.50	13,750	22	71	8.8	0.00	8.80	0.00	0.00
01/21/04	8,512	569	4,749	2.35	2.02	14,030	23	74	7.7	0.00	8.80	0.00	0.00
02/11/04	8,786	475	4,599	2.12	2.23	13,675	25	76	8.2	0.00	14.00	0.00	0.00
03/24/04	8,640	550	4,624	2.39	2.27	13,870	23	74	7.6	0.00	13.20	0.00	0.00
04/14/04	8,656	566	4,624	2.42	2.12	13,550	22	72	7.8	0.02	16.40	0.00	0.00
05/12/04	8,640	570	4,699	2.69	2.49	13,770	24	75	7.4	0.00	14.40	0.00	0.00
06/09/04	8,128	644	4,848	2.82	2.22	14,380	26	78	7.6	0.00	7.60	0.00	0.00
07/21/0	8,540	572	4,861	2.70	0.10	14,675	23	74	7.	0.03	10.7	0.00	0.00

4									3		0		
08/04/04	9,096	552	4,923	2.90	2.37	14,320	23	74	7.2	0.00	9.20	0.00	0.00
09/15/04	8,690	541	4,549	3.00	2.22	13,960	24	75	6.9	0.00	11.60	0.00	0.00
10/13/04	9,408	569	4,849	2.60	2.29	14,080	23	74	7.6	0.02	9.20	0.00	
11/10/04	9,032	530	4,898	2.80	2.37	14,140	24	75	7.5	0.02	10.80	0.01	
12/08/04	8,692	570	4,749	2.60	2.21	14,100	24	74	7.3	0.00	10.20	0.01	0.00
01/12/05	5,410	536	4,824	2.50	2.36	14,470	23	73	7.0	0.03	8.60	0.01	0.01
02/03/05	8,560	530	4,848	2.60	2.30	13,990	23	73	6.9	0.03	9.60	0.01	0.00
03/09/05	8,432	565	4,587	2.50	2.36	14,410	23	73	6.9	0.03	31.50	0.01	0.00
04/13/05	8,368	552	4,599	2.60	2.32	13,810	24	75	7.2	0.03	6.60	0.01	0.01
05/11/05	8,500	559	4,624	2.80	2.22	13,880	23	73	7.1	0.01	8.80	0.01	0.00
06/08/05	8,244	552	4,562	2.40	1.98	13,750	26	78	7.2	0.02	14.40	0.01	0.01
07/13/05	8,060	565	4,574	2.60	2.32	13,630	24	76	7.1	0.01	11.00	0.01	0.01
08/10/05	8,752	584	4,599	2.30	2.23	13,830	25	77	6.7	0.01	2.00	0.01	0.01
09/28/05													
10/12/05													
11/09/05	8,600	503	4,449	2.70	2.57	13,890	25	76	6.5	0.01	14.00	0.01	0.00
12/14/05	8,844	540	4,524	2.80	2.49	13,625	23	73	6.9	0.02	12.10	0.01	0.00
01/11/06	7,916	542	4,499	2.60	2.56	13,720	24	74	7.0	0.10	7.60	0.01	0.01
02/08/06	7,810	580	4,537	3.40	2.22	13,535	21	70	7.2	0.10	8.80	0.00	0.00
03/08/06	7,912	548	4,524	3.20	2.17	13,430	22	72	8.0	0.04	16.80	0.00	0.00
04/12/06	8,108	516	4,699	3.30	2.33	13,740	23	74	7.9	0.02	22.40	0.01	0.00
05/10/0	8,052	553	4,499	2.80	2.39	11,710	24	75	7.	0.02	8.20	0.00	0.00

6									6				
06/14/06	8,900	552	4,549	3.20	2.44	13,940	24	75	7.1	0.02	7.40	0.00	0.00
07/12/06	8,656	547	4,374	2.80	2.35	13,480	24	75	8.4	0.02	9.20	0.01	0.00
08/09/06	8,116	548	4,424	3.00	2.60	13,310	24	75	7.6	0.15	12.00	0.00	0.00
09/13/06	8,016	530	4,474	3.40	2.40	13,880	24	75	7.7	0.05	16.40	0.00	0.00
10/11/06	8,532	540	4,499	2.70	2.50	13,720	23	74	7.2	3.90	9.20	0.00	0.00
11/08/06	8,848	586	4,524	3.00	3.04	13,540	24	74	7.3	0.22	6.00	0.00	0.00
12/13/06	8,424	495	4,574	2.40	2.68	13,780	25	77	7.6	0.44	13.40	0.01	0.00
01/10/07	8,268	534	4,424	3.20	2.54	13,030	22	71	7.7	0.00	12.80	0.00	0.00
02/14/07	8,448	573	4,424	3.10	2.83	14,210	25	76	8.0	0.03	11.20	0.00	0.00
03/14/07	8,844	429	4,474	3.60	2.82	13,780	23	74	7.9	0.03	16.20	0.00	0.00
04/18/07	8,504	548	4,724	3.30	1.60	14,530	24	75	7.7	0.06	22.40	0.00	0.00
05/09/07	8,336	549	4,549	5.59	3.14	14,060	24	74	7.7	0.01	19.80	0.00	0.00
06/12/07	8,200	555	4,274	3.70	2.87	14,420	25	78	7.6	0.01	11.60	0.00	0.00
07/11/07	8,860	540	4,324	2.75	2.78	14,030	26	78	6.8	0.01	27.60	0.00	0.00
08/08/07	1,920	313	4,469	0.33	0.03	14,520	26	79	7.9	0.01	15.60	0.00	0.00
09/12/07	8,304	543	4,499	2.99	2.64	13,950	24	76	7.7	0.01	12.60	0.00	0.00
10/17/07	8,748	521	4,474	2.96	2.63	14,710	25	76	7.6	0.01	14.80	0.01	0.01
11/14/07	9,060	521	4,674	3.20	2.85	14,950	24	74	7.6	0.01	5.80	0.00	0.00
12/13/07	9,092	504	4,449	3.38	2.87	14,080	25	78	7.3	0.01	24.60	0.00	0.01
01/09/08	8,576	509	4,724	3.14	2.24	14,420	23	74	7.7	0.00	15.40	0.00	0.00
02/14/08	9,648	7.62	4,649	3.36	1.50	14,700	21	71	7.6	0.00	13.60	0.01	0.00
03/12/0	9,592	7.71	5,298	3.74	2.89	13,560	20	69	7.	0.00	20.8	0.01	0.00

8									7		0						
04/09/08	8,708	280	4,873	3.73	2.97	14,460	25	78	7.5	0.00	10.40	0.01	0.00				
05/14/08	9,200	551	2,415	3.18	3.29	14,600	23	74	7.5	0.02	17.80	0.01	0.01				
06/11/08	9,580	541	4,755	3.25	3.11	15,280	25	77	7.2	0.02	20.00	0.03	0.03				
07/09/08	9,832	564	4,911	4.07	2.10	14,740	24	75	7.6	0.01	15.40	0.03	0.00				
08/13/08	9,300	593	4,962	0.12	3.06	14,500	26	79	7.7	0.01	18.20	0.08	0.05				
09/10/08	9,360	572	4,687	3.82	3.35	13,840	25	77	7.6	0.02	16.60	0.08	0.05				
10/08/08	8,696	362	4,641	3.52	2.82	13,940	31	89	8.4	0.02	17.60	0.03	0.00				
11/19/08	9,716	561	4,941	0.22	0.02	15,250	25	77	7.6	0.00	17.60	0.03	0.00				
12/10/08	9,848	626	5,097	3.80	3.06	15,360	25	77	7.6	0.03	13.00	0.03	0.00				
01/14/09	9,136	565	4,679	3.45	3.13	14,430	23	73	7.0	0.05	11.00	0.03	0.01				
02/11/09																	
03/11/09	10,576	622	5,119	4.46	3.90	15,650	24	76	7.4	0.60	11.40	0.00	0.02				
04/08/09		648	5,317	3.90	4.25	16,020	25	76	7.3	0.03	10.00	0.00	0.00				
05/13/09	4,052	612	5,003	4.12	4.02	15,800	27	80	7.6	0.00	13.40	0.00	0.00				
06/10/09	4,144	623	5,144	5.01	3.99	16,820	25	76	7.4	0.23	12.40	0.00	0.00				
07/08/09	10,204	629	5,203	3.74	3.32	15,660	25	78	7.3	0.00	10.40	0.00	0.00				
08/12/09	10,268	658	5,323	3.29	4.10	15,960	24	75	7.6	0.05	9.20	0.00	0.00				
09/16/09	10,092	638	5,264	4.57	3.65	15,630			7.5	0.01		0.05	0.01	2680	5.0	0.2	0.8
10/14/09	10,008	681	5,056	4.82	3.72	15,460			7.4	0.02		0.00	0.00	2640	13.8	11.3	0.8
11/12/09	10,312	692	5,175	4.71	3.91	16,200			8.5	0.02		0.00	0.00	2490	9.2	9.4	0.9
12/02/09	10,220	597	5,065	4.66	4.10	1,570	26	78	7.6	0.02	10.20	0.00	0.00	2520	11.6	9.3	0.9
01/13/1	10,12	582	5,189	4.22	4.05	15,580	18	64	7.	0.02	16.6	0.00	0.00	2200	9.2	8.0	0.9

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02/10/10	9,808	614	5,144	4.40	4.08	15,660	20	68	7.6	0.02	20.00	0.00	0.00	2450	11.0	9.5	0.7
03/03/10	9,768	612	5,023	4.53	4.15	16,170	22	71	7.5	0.03	12.60	0.00	0.00	2940	9.9	7.8	1.0
04/07/10	10,260	631	5,487	3.79	3.83	16,270	25	77	7.4	0.02	12.00	0.01	0.00	3010	9.6	9.7	0.7
05/05/10	10,928	511	4,325	4.48	3.68	15,850	24	75	7.5	0.01	8.80	0.00	0.00	2770	9.4	8.2	0.7
06/09/10	10,132	642	5,481	4.70	3.73	16,550	26	78	7.7	0.05	15.00	0.01	0.01	2600	11.1	8.3	0.9
07/07/10	10,216	655	5,519	4.15	4.15	16,350	26	78	7.5	0.05	9.20	0.00	0.00	2840	8.9	9.7	0.7
08/04/10	10,344	658	5,536	5.18	4.53	15,830	24	74	7.6	0.09	14.80	0.00	0.00	2730	33.4	8.7	0.8
09/01/10	10,756	649	5,347	5.03	4.40	16,520	26	78	7.6	0.02	24.20	0.01	0.00	2730	17.3	8.3	0.9
10/06/10	10,408	692	5,079	4.20	4.62	16,320	24	75	7.8	0.02	15.00	0.00	0.00	2840	8.3	2.3	0.8
11/03/10	10,264	655	5,461	4.90	4.50	16,200	24	75	7.6	0.02	10.40	0.00	0.00	2970	1.8	0.8	0.7
12/01/10	9,576	646	5,370	4.63	4.50	16,300	24	75	7.7	0.02	16.00	0.00	0.01	2860	10.8	9.8	0.9
01/05/11	10,240	669	5,568	4.86	4.39	15,910	24	74	7.4	0.02	13.80	0.00	0.01	2810	11.1	10.4	0.8
02/03/11	10,408	650	5,417	6.12	4.03	15,420	23	73	7.6	0.00	9.00	0.01	0.00	2730	11.6	10.0	0.9
03/02/11	10,188	681	5,633	4.70	4.29	16,360	23	74	7.5	0.01	19.70	0.00	0.00	2850	11.8	11.2	0.8
04/06/11	11,020	725	5,866	4.94	4.89	16,010	23	73	7.0	0.02	15.00	0.01	0.00	2910	9.6	8.9	0.9
05/04/11	11,090	700	5,661	5.18	4.78	17,120	23	74	7.7	0.02	10.40	0.00	0.00	2650	9.0	8.8	0.7
06/08/11	10,304	735	5,794	4.54	4.37	16,650	25	76	7.1	0.07	9.70	0.01	0.00	2990	8.7	7.2	0.8
07/06/11	10,800	633	5,174	4.25	5.03	16,410	26	78	7.9	0.02	9.00	0.01	0.00	2650	7.9	7.5	0.7
08/01/11	10,190	703	5,768	4.42	5.05	15,420	27	81	7.8	0.02	24.20	0.00	0.01	3030	8.8	7.8	0.8
09/07/11	10,832	292	701	0.32	0.22	2,978	24	75	8.0	0.03	0.00	0.00	0.00	486	7.2	3.2	0.8
10/05/11	10,470	676	5,586	4.92	5.10	16,310	23	74	7.7	0.05	13.20	0.00	0.00	2920	10.3	9.9	0.8
11/02/1	10,81	695	5,753	4.76	4.56	16,390	24	75	7.	0.05	12.9	0.02	0.00	3240	3.4	6.5	0.9

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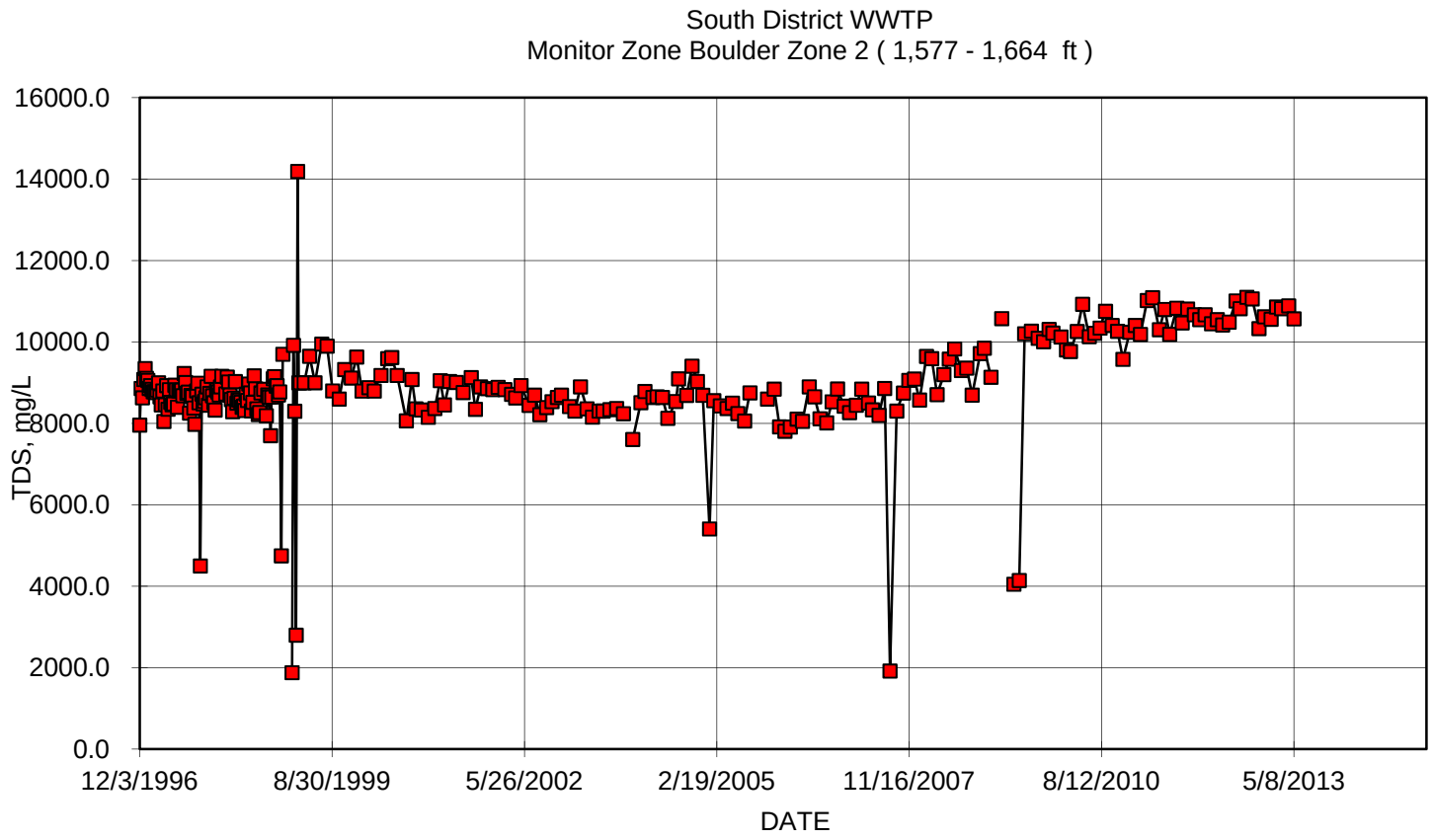
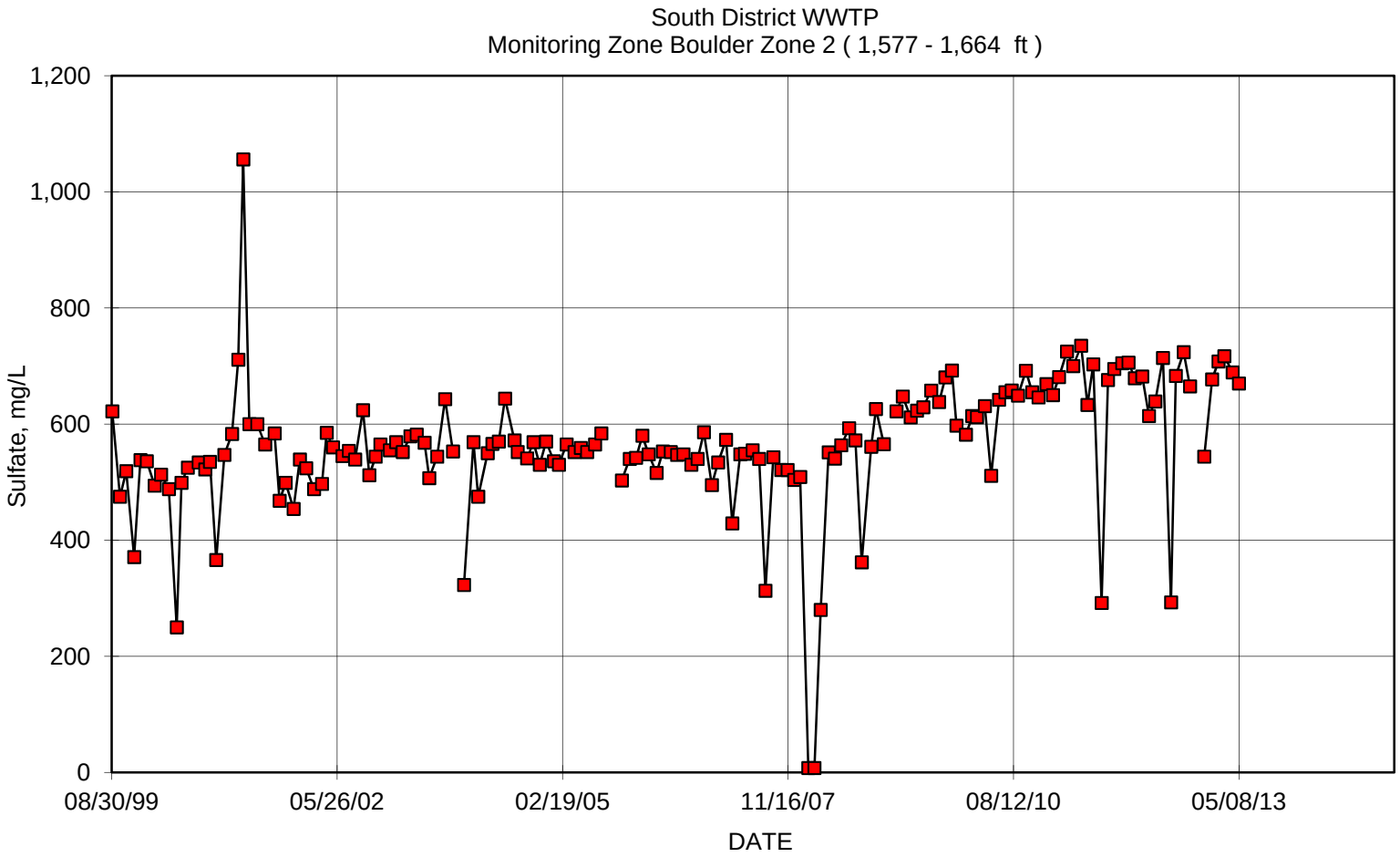
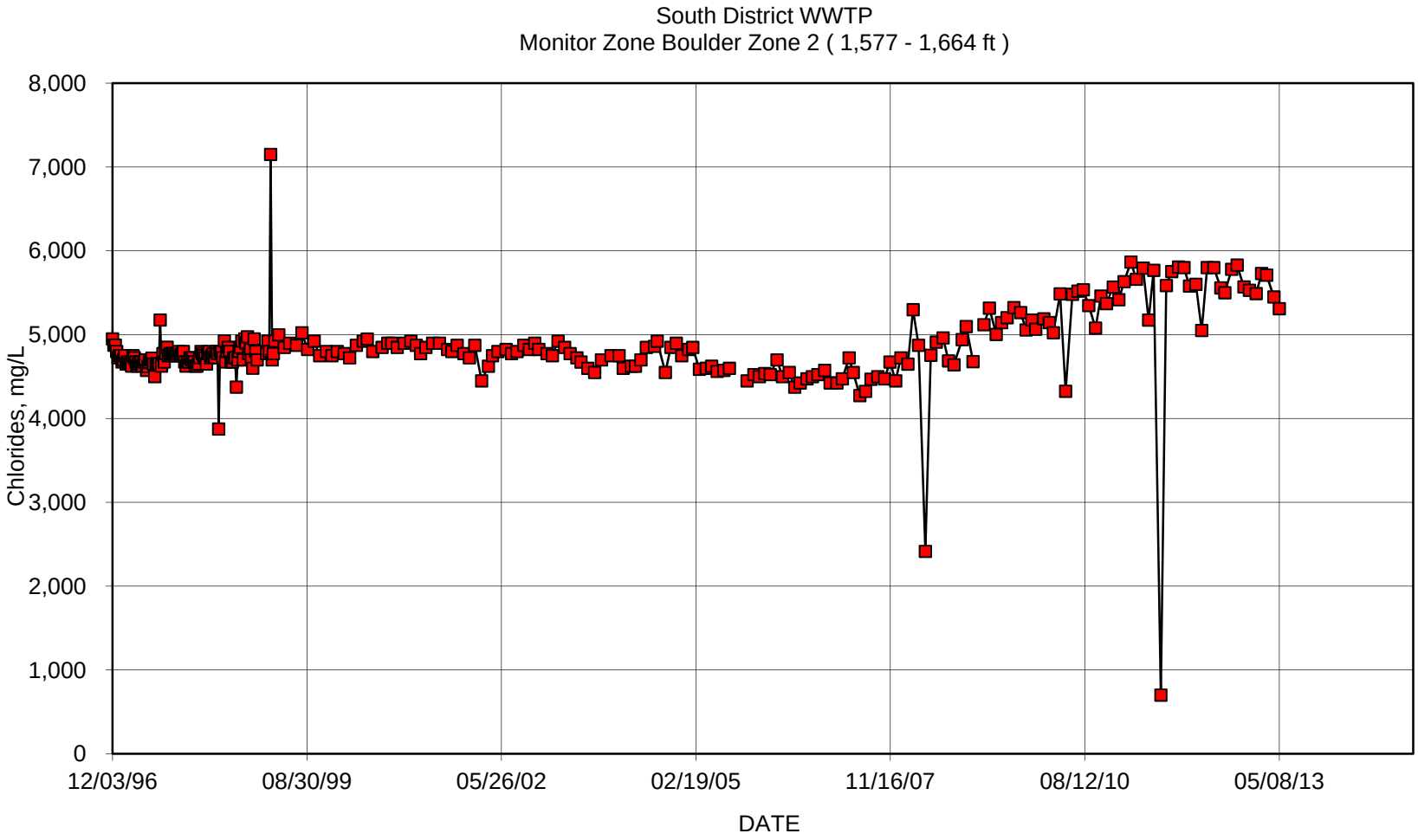
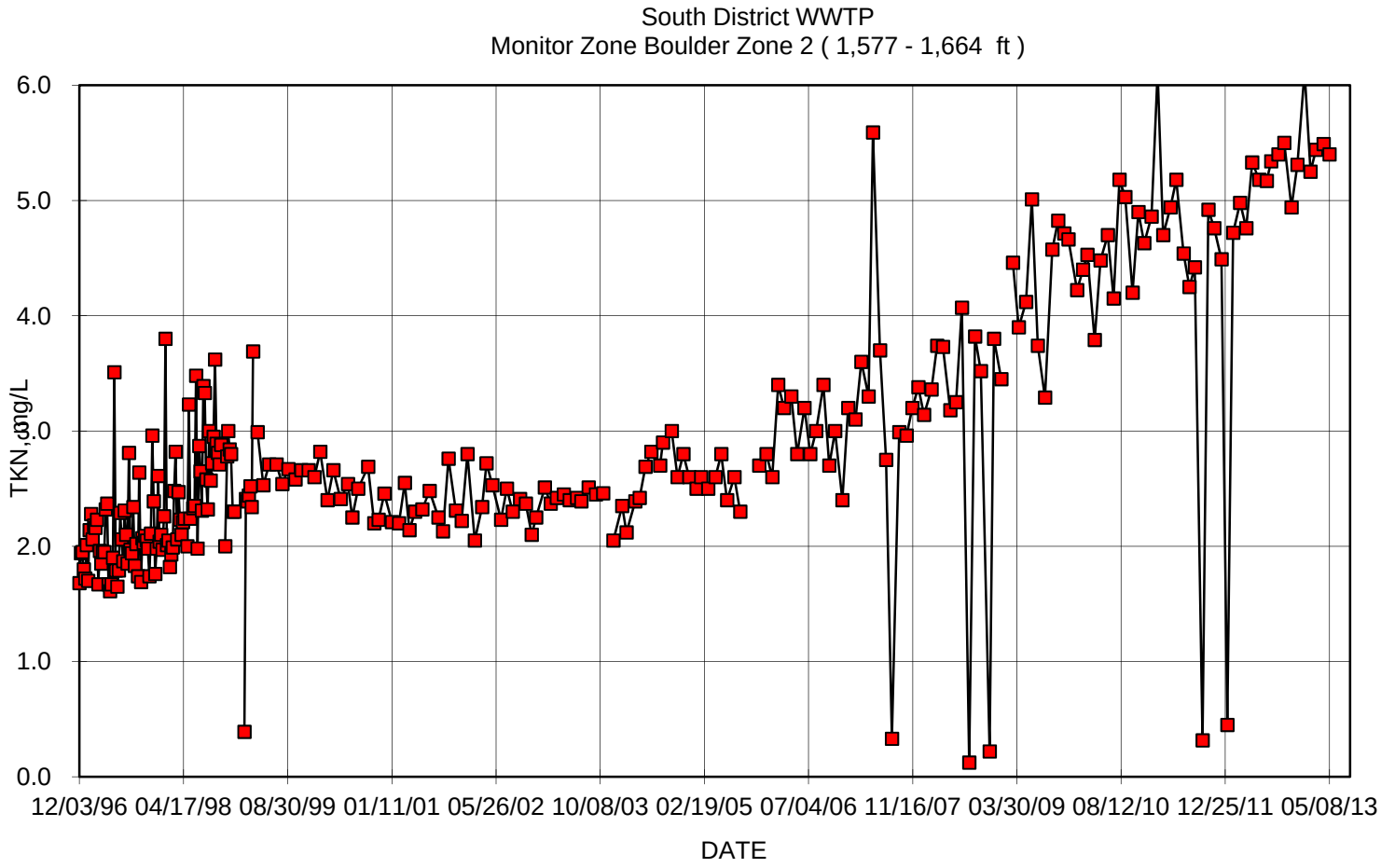
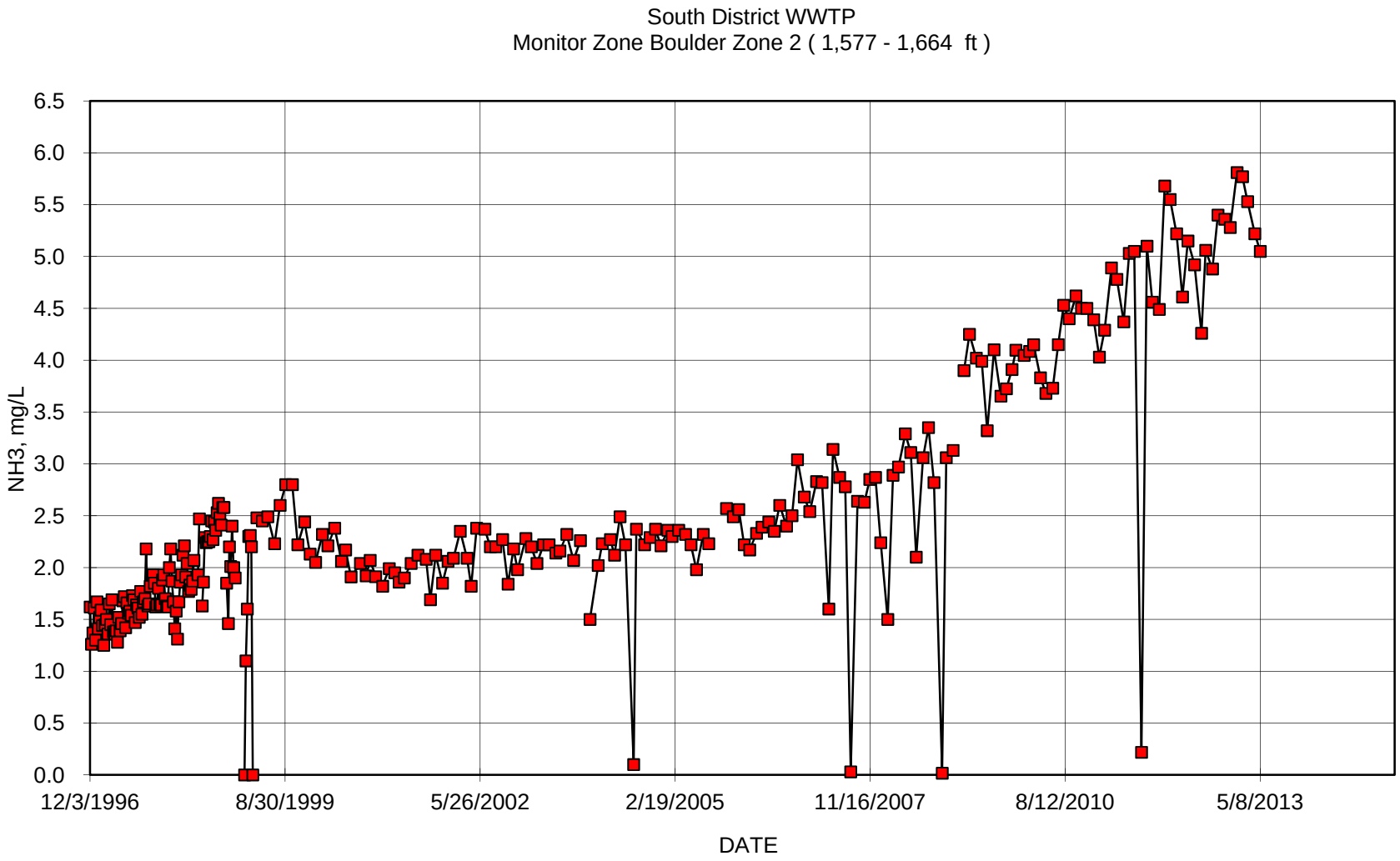
12/07/11	10,670	705	5,807	4.49	4.49	14,920	23	74	8.0	0.03	10.90	0.00	0.00	3120	9.0	7.4	1.0
01/04/12	10,550	706	5,800	0.45	5.68	14,430	21	70	7.5	0.02	10.50	0.01	0.00	3070	10.0	10.2	0.9
02/01/12	10,670	679	5,580	4.72	5.55	16,392	24	75	7.3	0.02	14.70	0.01	0.00	2960	8.1	6.2	0.8
03/05/12	10,450	682	5,600	4.98	5.22	13,670	24	75	7.6	0.01	9.50	0.00	0.01	3110	9.1	8.8	0.8
04/04/12	10,550	614	5,050	4.76	4.61	14,980	23	74	7.5	0.03	13.20	0.50	0.50	2930	9.5	9.0	1.0
05/02/12	10,420	639	5,800	5.33	5.15	16,980	24	75	7.9	0.03	11.70	0.00	0.01	3310	5.3	4.7	0.9
06/05/12	10,490	714	5,800	5.18	4.92	14,776	24	76	7.2	0.02	8.50	0.01	0.00	2800	10.3	10.3	0.9
07/11/12	11,010	293	5,558	5.17	4.26	16,760	24	75	7.8	0.02	11.00	0.01	0.00	2970	8.1	7.1	0.8
08/01/12	10,820	683	5,500	5.34	5.06	16,000	24	75	8.3	0.02	6.00	0.01	0.00	3180	2.7	0.7	0.8
09/05/12	11,100	724	5,780	5.40	4.88	16,690	24	75	7.6	0.04	13.20	0.00	0.00	2830	7.7	5.2	0.8
10/03/12	11,060	665	5,830	5.50	5.40	17,086	24	75	7.8	0.03	14.50	0.01	0.01	2890	9.4	9.9	0.9
11/07/12	10,330		5,570	4.94	5.36	16,377	23	73	7.7	0.02	12.70		0.00	3170	14.1	11.0	0.8
12/05/12	10,620	544	5,530	5.31	5.28	16,380	25	77	8.4	0.01	3.50	0.00	0.00	3090	5.6	5.2	0.9
01/09/13	10,560	677	5,490	6.12	5.81	16,620	24	74	7.6	0.10	9.50	0.02	0.00	3110	10.6	10.3	0.8
02/06/13	10,860	708	5,730	5.25	5.77	16,090	23	73	7.6	0.03	6.70	0.01	0.01	3080	27.2	9.7	0.8
03/04/13	10,820	717	5,710	5.44	5.53	17,026	21	70	7.8	0.03	7.10	0.00	0.00	3450	11.9	11.5	2.5
04/10/13	10,890	689	5,450	5.49	5.22	16,925	24	74	7.5	0.03	0.03	0.00	0.01	2960	9.1	8.2	0.9
05/08/13	10,570	670	5,310	5.40	5.05	17,324	24	75	7.6	0.06	0.06	0.01	0.00	3010	10.5	8.3	0.7

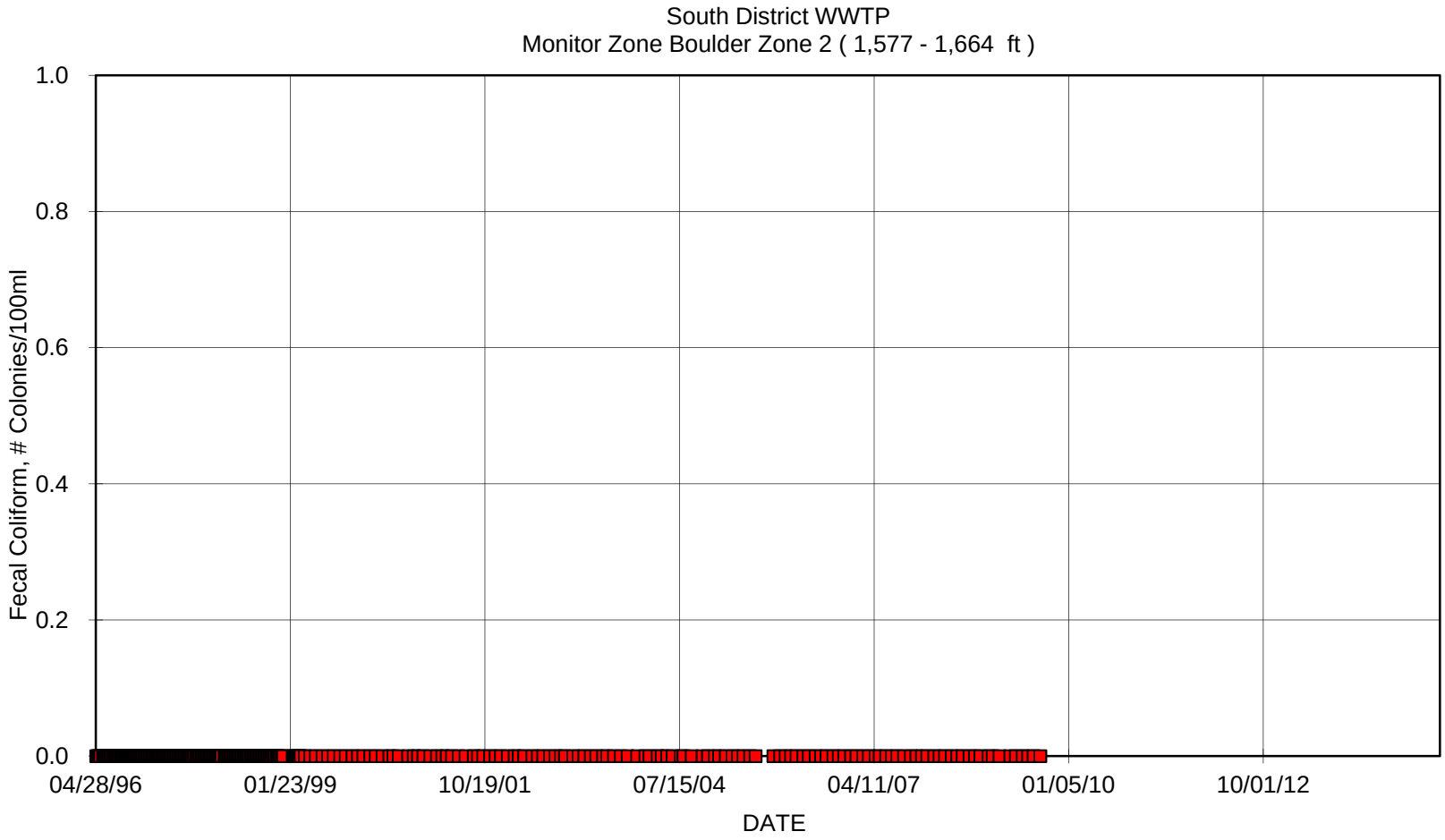

South District WWTP
Monitor Zone Boulder Zone 2 (1,577 - 1,664 ft)
16000.0
14000.0
12000.0
10000.0
8000.0
6000.0
4000.0
2000.0
0.0
TDS, mg/L
12/3/1996
8/30/1999
5/26/2002
2/19/2005
11/16/2007
8/12/2010
5/8/2013
DATE

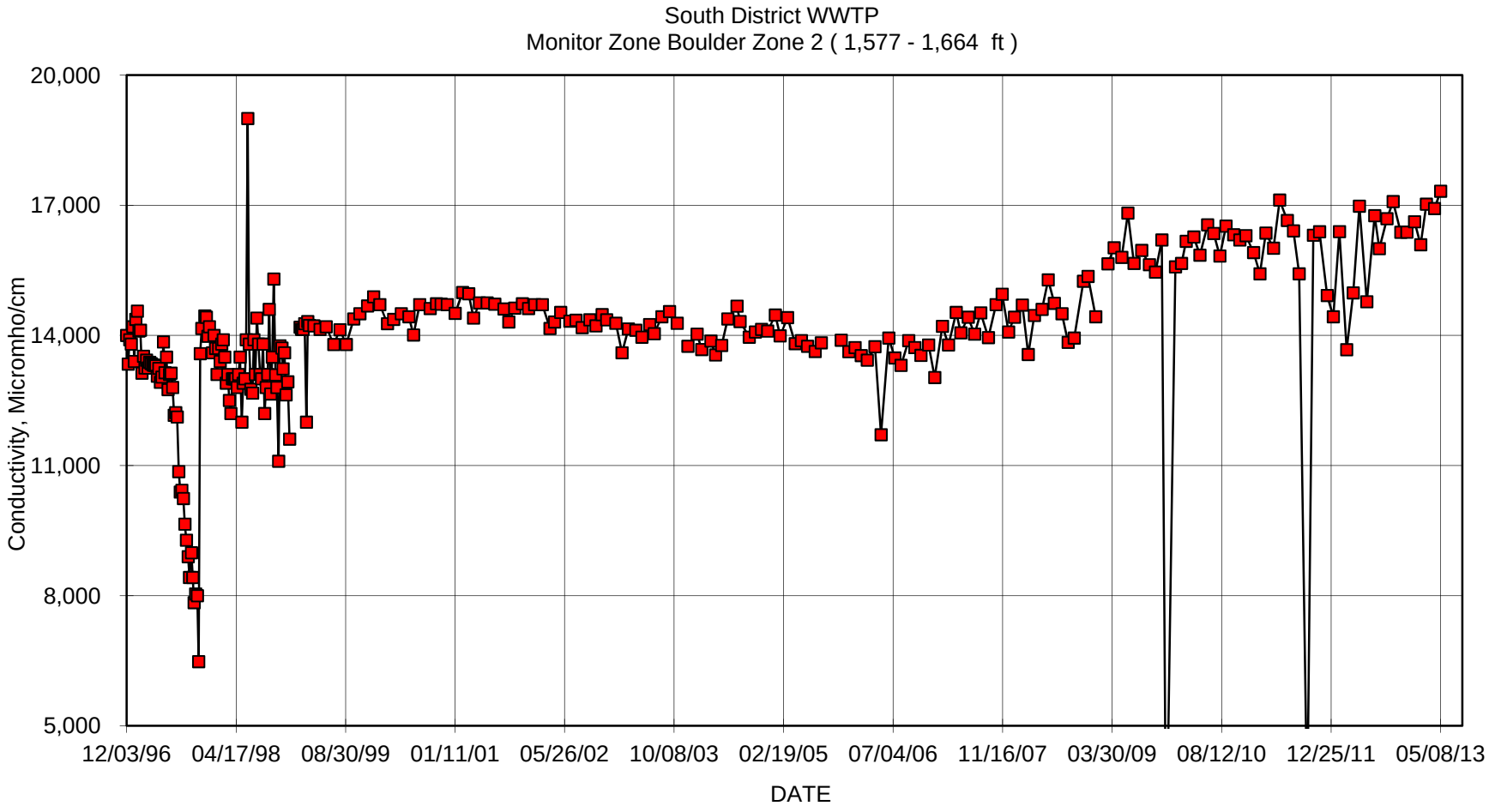

South District WWTP
Monitoring Zone Boulder Zone 2 (1,577 - 1,664 ft)
Sulfate, mg/L
1,200
1,000
800
600
400
200
0
08/30/99
05/26/02
02/19/05
11/16/07
08/12/10
05/08/13
DATE

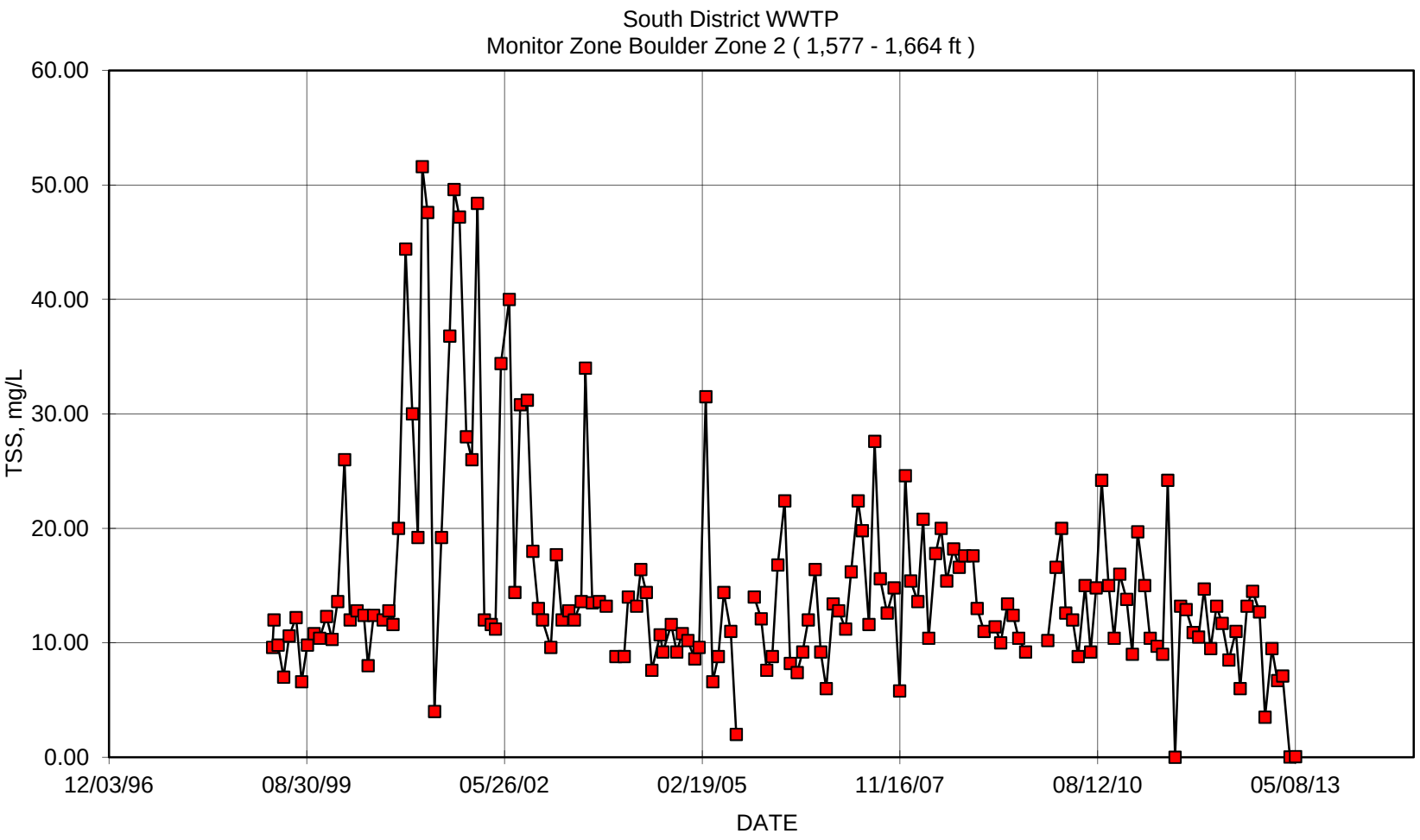

South District WWTP
Monitor Zone Boulder Zone 2 (1,577 - 1,664 ft)
Chlorides, mg/L
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
12/03/96
08/30/99
05/26/02
02/19/05
11/16/07
08/12/10
05/08/13
DATE

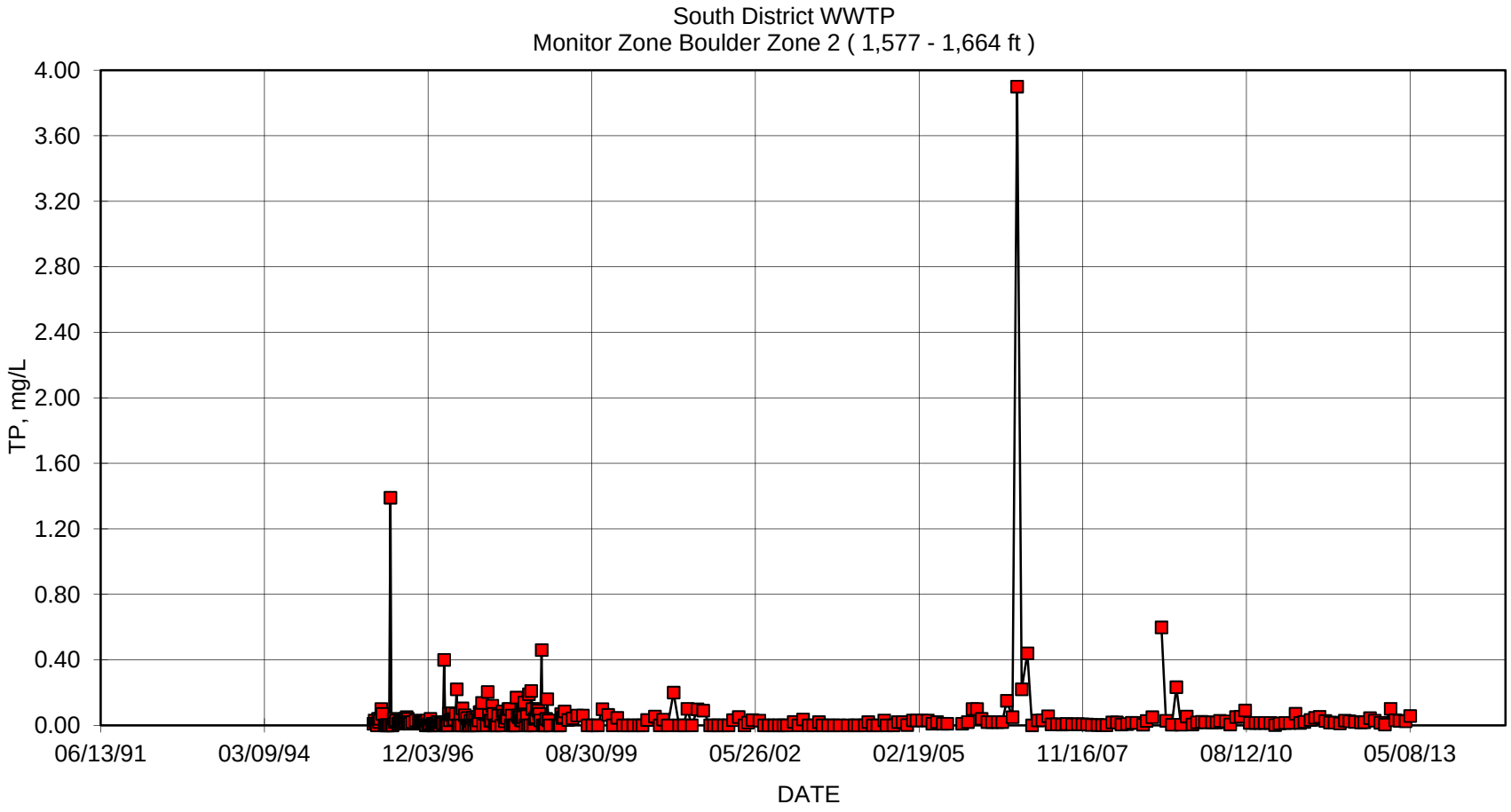

South District WWTP
Monitor Zone Boulder Zone 2 (1,577 - 1,664 ft)
6.0
5.0
4.0
3.0
2.0
1.0
0.0
TKN, mg/L
12/03/96
04/17/98
08/30/99
01/11/01
05/26/02
10/08/03
02/19/05
07/04/06
11/16/07
03/30/09
08/12/10
12/25/11
05/08/13
DATE


South District WWTP
Monitor Zone Boulder Zone 2 (1,577 - 1,664 ft)
NH3, mg/L
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
12/3/1996
8/30/1999
5/26/2002
2/19/2005
11/16/2007
8/12/2010
5/8/2013
DATE


South District WWTP
Monitor Zone Boulder Zone 2 (1,577 - 1,664 ft)
Fecal Coliform, # Colonies/100ml
1.0
0.8
0.6
0.4
0.2
0.0
04/28/96
01/23/99
10/19/01
07/15/04
04/11/07
01/05/10
10/01/12
DATE


South District WWTP
Monitor Zone Boulder Zone 2 (1,577 - 1,664 ft)
Conductivity, Micromho/cm
20,000
17,000
14,000
11,000
8,000
5,000
12/03/96
04/17/98
08/30/99
01/11/01
05/26/02
10/08/03
02/19/05
07/04/06
11/16/07
03/30/09
08/12/10
12/25/11
05/08/13
DATE


South District WWTP
Monitor Zone Boulder Zone 2 (1,577 - 1,664 ft)
TSS, mg/L
60.00
50.00
40.00
30.00
20.00
10.00
0.00
12/03/96
08/30/99
05/26/02
02/19/05
11/16/07
08/12/10
05/08/13
DATE


South District WWTP
Monitor Zone Boulder Zone 2 (1,577 - 1,664 ft)
TP, mg/L
4.00
3.60
3.20
2.80
2.40
2.00
1.60
1.20
0.80
0.40
0.00
06/13/91
03/09/94
12/03/96
08/30/99
05/26/02
02/19/05
11/16/07
08/12/10
05/08/13
DATE

MIAMI-DADE COUNTY
miamidade.gov

Water and Sewer
PO Box 330316 • 3071 SW 38 Avenue
Miami, Florida 33233-3016
T 305-665-7471

November 21, 2013

Mr. Joseph R. May, P.G.
Florida Department of Environmental Protection
400 North Congress Avenue, 3rd Floor
West Palm Beach, Florida 33401

CCN: 57821

Reference: Miami-Dade Water and Sewer Department -- Mechanical Integrity Testing (MIT) Report for Deep Injection Well No. IW-6 at the SDWWTP Site.

Dear Mr. May:

Enclosed please find the Certificate of Mechanical Integrity and the MIT Report on the re-testing of Deep Injection Well No. IW-6 at the South District Wastewater Treatment Plant site in Miami-Dade County.

All the tests were conducted in strict adherence to the specifications submitted to and approved by your office. The testing results for the well were good. Both external and internal mechanical integrity were demonstrated. The well casing and the wellhead components are in good condition. All the well head valves and all the well head components are scheduled to be rust-proofed and repainted when all the MITs are completed. Based on the results of the well testing we conclude that the well retains full mechanical integrity and recommend that MDWASD be allowed to continue operating the well in its normal mode.

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

The demonstration of mechanical integrity is being submitted per Chapter 62-528.300(6)(b)2., 62-528.300(6)(c), and 62-528.425(1)(d), F.A.C. and specific condition 3.j. of Permit 0061787-022-UO.

If you have any questions or require additional explanation of any item in the report, please do not hesitate to contact me at [redacted] or Sonia Villamil at [redacted]

Sincerely,

[redacted]

Bertha M. Goldenberg, P.E.
Assistant Director-Regulatory Compliance & Planning

Enclosures: Certificate of Mechanical Integrity
MIT Report Well IW-6 (1 copy)

cc: Joseph Haberfeld, FDEP - Tallahassee

MIAMI-DADE COUNTY
Delivering Excellence Every Day

Mechanical Integrity Test Report
Deep Injection Well No. IW-6
South District Wastewater Treatment Plant

Prepared by:
Miami-Dade Water and Sewer Department
3071 SW 38th Avenue
Miami, Florida 33146

CERTIFICATE OF MECHANICAL INTEGRITY

The **South District WWTP** deep injection well **IW-6** operated by **Miami-Dade Water and Sewer Department** has been tested for mechanical integrity. The tests followed standard engineering practices and used methods presented in the United States Environmental Protection Agency regulations for the purposes of these tests. The external and internal mechanical integrity tests followed Florida Department of Environmental Protection (FDEP) pre-approved testing specifications and all the critical test events were witnessed by representatives of the FDEP, the MDWASD and the contractor.

Having supervised the engineer and geologists that were present during the testing, conducted the examining of the results and the preparation this mechanical integrity report as part of this certification, the undersigned certifies that deep injection well **IW-6** operated by **Miami-Dade Water and Sewer Department** at the **South District Wastewater Treatment Plant Site in Miami-Dade County, Florida** has successfully passed all the test requirements for mechanical integrity under rules of Chapter 62-528 of the Florida Administrative Code and is therefore determined to have mechanical integrity.

Certified on November 22, 2013

[redacted]

Howard J. Fallon Jr., P.E.
Professional Engineer
License Number 24153

MECHANICAL INTEGRITY TEST REPORT
FOR
DEEP INJECTION WELL No. IW-6
AT THE
SOUTH DISTRICT WASTEWATER TREATMENT PLANT

Prepared by:

MIAMI-DADE WATER AND SEWER DEPARTMENT
3071 SW 38th Avenue
Miami, Florida 33146

For Submittal To:

UNDERGROUND INJECTION CONTROL
FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

November 2013

ABSTRACT

The internal mechanical integrity was investigated through a pressure test performed on the injection casing. The pressure test was conducted at 153.5 pounds per square inch (psi) which is approximately 1.5 times the maximum (100 psi) potential injection pressure and more than 1.7 times the maximum operational pressure that the well will be under when operating at its full permitted injection velocity of 10 feet per second (ft/sec). FDEP permits a 5% loss in pressure during the hour long test in order for the internal mechanical integrity to pass the pressure test.
IW-6 successfully passed the pressure test because the casing only lost 2.5 psi. The successful results of the pressure test for internal mechanical integrity were reinforced by the results of the second internal mechanical integrity test, the TV survey of the casing. The TV survey confirmed that the casing and the casing joints are in good condition and that the well has internal mechanical integrity down to 2,746 ft bls.

The external mechanical integrity was investigated using two test procedures, a Radioactive Tracer Survey (RTS) and a Temperature Log. Results of the RTS confirmed the integrity of the cement around the casing and the continued competence of its seal with the geologic strata. The temperature test showed that there are no anomalies that would indicate points where injected fluids could escape through the casing and cement into the formation. Similarly there were no temperature anomalies that would indicate injection fluids entering the formations at other than the approved injection depth.

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Section 1

1. INTRODUCTION

1.1 BACKGROUND

On October 12, 2012, (see Appendix A) the Miami-Dade Water and Sewer Department (MDWASD) submitted the County's proposed plan and testing specifications for conducting the mechanical integrity tests (MITs) and repairs on some of the injection wells at the South District Wastewater Treatment Plant (SDWWTP) site (see Figure 1) to the Florida Department of Environmental Protection (FDEP). The plan, represented by the specifications, described the step-by-step procedure to be followed and included the testing schedule required to meet the 5-year MIT re-testing conditions of the FDEP permit for each of the injection wells. After receipt of these documents, the FDEP Staff reviewed the proposed plan and sent an approval on June 5, 2013 (see Appendix B).

The contract documents for conducting the MITs were let out for bids, and the winning bid was submitted on February 28, 2013 by Youngquist Brothers, Inc., a well drilling contractor from Ft. Meyers, Florida. After the contract was approved by the Board of Country Commissioners and signed by the County Manager, the MDWASD issued the notice to proceed on May 17, 2013 and the contractor began mobilizing to the site.

1.2 PURPOSE AND SCOPE

The purpose of this report is to provide FDEP with a document that describes the re-testing procedures for mechanical integrity applied to each of the SDWWTP deep injection wells (see Figure 2). The report also presents the field reports (see Appendix C), and the results of the tests in a single volume for ease of reference. The mechanical integrity re-testing operations involved conducting a pressure test on the well casing to show that there are no leaks in the casing, and conducting a TV survey on the well to reinforce the data from the pressure test. The re-testing includes tracking a radioactive liquid-tracer (iodine isotope I-131) injected down the well to show that there is no fluid movement upward behind the casing, into underground sources of drinking water (USDW). The radioactive test information is reinforced with temperature logs run on the well. Gamma ray logs are used to detect the movement of the radioactive tracer.

Figure 1. South District Wastewater Treatment Plant Site

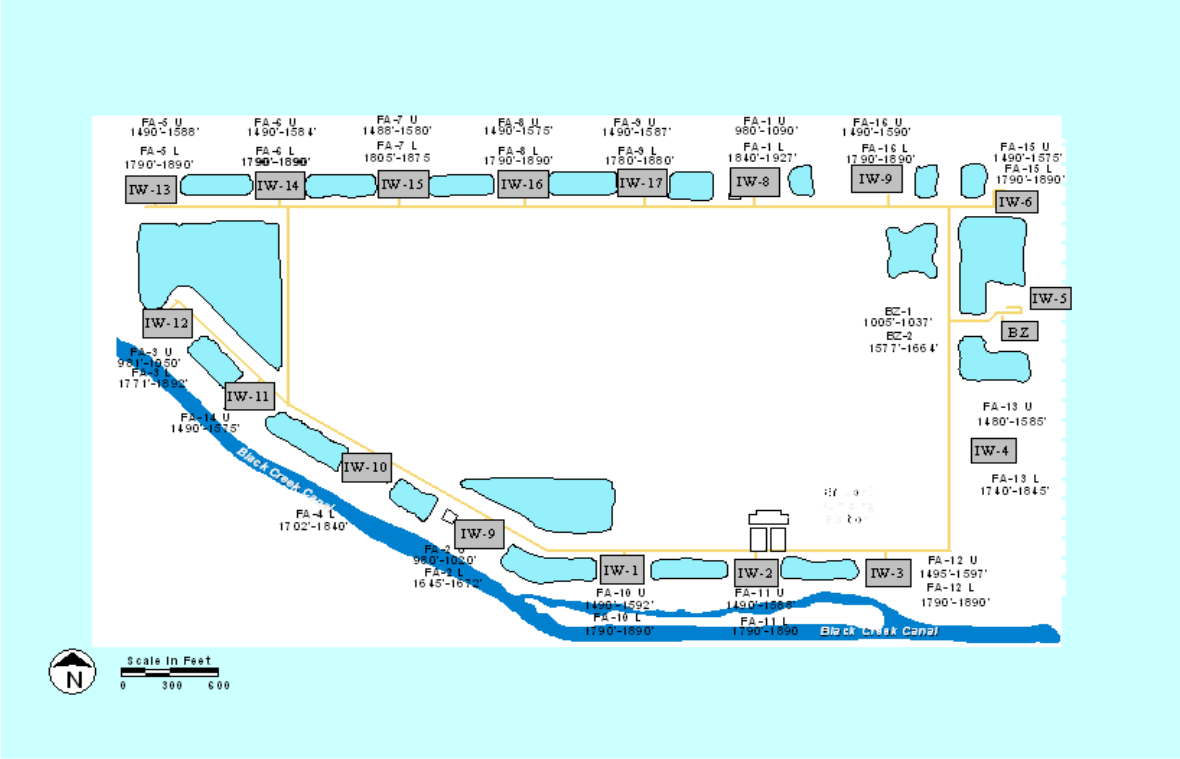

Figure 2. Well Locations Layout

Section 2

2. MECHANICAL INTEGRITY TESTING (MIT)

2.1 METHODS USED

The MIT program is designed to test two elements of the injection well system: 1. Internal integrity and 2. External integrity. The first test element, the internal mechanical integrity test of the well, tests the condition of the injection casing. The second test element, the external mechanical integrity test of the well, tests for leaks outside the casing. This is achieved through a series of field tests including a pressure test and a TV survey for the internal testing, and the temperature log, gamma ray log and RTS survey for the external testing. The first test element, the internal mechanical integrity test, tests for leaks in the injection pipe (casing). The second test element tests for leaks in the annular space outside the casing (cement-filled space between the periphery of the drilled hole and the casing) and in the near-to-the-well geologic strata.

2.2 CASING SCRUBBING

Because the mechanical integrity of injection wells has to be tested every five years, and because a TV inspection of the well is part of the test requirements, MITs provide a timely opportunity to clean the well of deposits that may have formed on the inside of the casing during the intervening years and at the same time provide a cleaner casing for the TV inspection. Cleaning the inside of the well casing is achieved by running a scrubbing brush up and down the casing. However, before the cleaning can be performed, flow out of the well must be controlled. The column of water inside the casing is fresh water and results in a positive hydraulic head inside the well. That head must first be controlled to prevent water from flowing out of the well during the cleaning operation.

2.2.1 Flow Suppression

Suppression of the fresh water head was achieved by first pre-mixing water with salt (NaCl) to form a heavy brine, and then pumping the brine down the well casing, through a 6-inch gate valve on the wellhead. This procedure results in the displacement down the well of the fresh water at the top of the column and replacement of the displaced fresh water with the brine solution. An equal volume of fresh water is displaced out of the well at the bottom of the casing. The procedure is repeated until the pressure head inside the well is suppressed. This method of displacement is used because it achieves flow suppression without first having to open the well to insert a tremie pipe to the bottom of the casing for introduction of the brine. This displacement method also provides a safe way of “killing” the well that at the same time reduces the volume of injected salt solution that would enter the formation at the bottom of the well. One additional advantage is that using this method the brine can be recovered and reused in flow suppression at other wells.

The brine was prepared in 1,000-gallon (gal.) batches by mixing the salt from a 2,000-pound (lbs.) sack in a 1,000 gal. tank of fresh water. The 1,000 gal. solution was then pumped down the well before other similarly mixed batches of salt solution were mixed and pumped down the well (see Figure 3). In the end, the operation was repeated 13 times, and a total of 13 sacks (approximately 26,000 lbs. of salt) were used to suppress the head in the well. This salt concentration represents a theoretical specific gravity of 1.239 for the brine, calculated from the salt solution used in the field of 10.3 lbs per gallon. The 26,000 lbs of salt suppressed the pressure head from approximately 26 feet above the top of the casing to approximately 15 feet below.

Figure 3. Flow Suppression Equipment

2.2.2 Scrubbing Operation

The brush used to clean the casing is made with an old drill rod that has an outside diameter of 7 inches with thick steel wire inserted and secured sticking out of the drill rod. The total diameter of the brush with the steel wire bristles is 24 inches. The brush is attached to the bottom of the packer and inserted into the well (see Figure 4). A 24-inch flange was bolted to the top of the well and pressure fittings installed to be used for packer inflation later on in the process. Then Youngquist lowers the brush and packer by attaching drill rods to the top of the packer and then raising and lowering the brush several times using a 50 ton crane. This process was repeated until the casing was scrubbed and the packer was at the depth required to perform the packer test on the well.

Figure 4. Scrubbing Brush and Hydraulic Packer

2.3 INTERNAL MECHANICAL INTEGRITY (CASING TESTS)

2.3.1 Pressure Test

After the pressure head was suppressed and the casing scrubbed, and the inflatable packer was placed at a depth of 2,698 ft bls. This well is cased to a depth of 2,746 ft bls so the packer is in the bottom 50 feet of the casing. Additional pressure fittings were installed on the flange to pressurize the casing with water. A bleeder valve atop the 24-inch flange allows passage of the drill pipes that support the packer without loss of pressure in the casing (see Figure 5). A pretest was conducted on the casing to determine that the pressure was holding and that all the installed testing equipment was operating properly, then FDEP was informed that the well was ready for their inspection. The next day, August 19, 2013, the pressure test was repeated in the presence of FDEP Staff. The packer had been previously sealed against the casing, at an inflation pressure of 380 pounds per square inch (psi) and at 7:00 AM the casing was pressurized with water to a pressure of 153.5 psi.

Figure 5. Well-Head and Recorder Set Up for Pressure Test

At 8:55 A.M.. the one-hour pressure test was started in the presence of Joseph May, P.G. representing FDEP and witnessed by Sonia Villamil, Maria Macfarlane, and Michael Ashe representing MDWASD, and by Chris Harp and others representing the drilling contractor. The pressure test ran for the required one-hour period. The pressure deviation (loss) in that time was1 psi, well below the 7.5 psi deviation allowable under the 5 % criteria in the rules (see Table 2-1). The packer inflation pressure and the pressure in the casing were measured using certified gages (see Appendix C) graduated from 0 to 200 psi in increments of 1 psi. The pressure was read in person and recorded by hand at five minute intervals during the test. The pressure was also recorded on an In-Situ pressure transducer attached to the stand with the pressure gauges (see Figure 5).

Table 2-1 Casing Pressure Readings

Time	Casing Pressure (psi)	Pressure Change (psi)	Packer Pressure (psi)
8:55	153.5	0.0	380
9:00	153	0.5	380
9:05	153	0.0	380
9:10	153	0.0	380
9:15	153	0.0	380
9:20	152.5	0.5	380
9:25	152	0.5	380
9:30	152	0.0	380
9:35	152	0.0	380
9:40	151.5	0.5	380
9:45	151	0.5	380
9:50	151	0.0	380
9:55	151	0.0	380

2.3.2 Bleed-Off Calculations

At the completion of the pressure test the casing pressure was bled-off and the discharged volume from the bleeding was measured (see Table 2-2). Bleeding until the pressure resulted in zero flow produced approximately 33.1 gallons. This exercise provides a reasonable assurance that the packer is placed at the depth in the well that is within the last 50 feet of the casing.

Table 2-2. Bleeding Volumes versus Pressure

Bled Volume (gallons)	0	5	10	15	20	25	30	33.1
Casing Pressure (psi)	151	127	104	80	57	35	13	0

2.3.3 Television Survey

A closed circuit color television camera, encased in a pressure vessel capable of withstanding the pressures exerted at the depths to be televised, and equipped with a fish-eye lens, was introduced into the well through a pack-off stripper device on a standpipe above the injection well (see Figure 6). The camera is centralized in the casing, and is preceded down the well with a light source attached below the camera. The camera televises a view of the full circumference of the inside of the casing and the image is recorded on video tape. Prior to the video survey, the well was scrubbed and flushed with potable water to provide the best picture possible. The video

survey began at land surface and continued down to 2,753 feet, where the camera runs into an obstruction. At selected intervals of interest, the camera was used to pan the intervals in a horizontal format prior to continuing the normal vertical recording.

A review of the video (see Appendix F) indicates that the casing is in good condition down to 2,746 feet. The video also shows that the scrubbing operation was successful. The scrubber has scrubbed the casing free of all growth down to 2,720 feet and this is confirmed by visible vertical scratches throughout that length of the casing; indicating that the scrubber had brushed the steel casing effectively. All the scratches are superficial, and do not detract from the physical and mechanical integrity of the casing. There are no gouges, grooves, nicks, or other physical damage visible in the casing for its whole length. Below 2,720 feet the casing was not scrubbed to avoid hanging the scrubber with the edge of the bottom of the casing at 2,746 feet. There are some growths and/or deposits visible inside the casing below 2,746 feet.

In summary, the video picture meets the quality standards that are needed for a visual evaluation of the well. This video survey presents a clear view of the casing and of the welded joints of the casing. All the joints are clean and appear to be tight. From the TV survey it is concluded that this casing is in good condition throughout its whole depth from land surface to 2,746 feet.

Figure 6. Television Survey (Standpipe and Logging Truck)

2.4 EXTERNAL MECHANICAL INTEGRITY (CEMENT AND FORMATIONS)

The external mechanical integrity test consisted of two low flow dynamic tests The RTS and temperature survey, conducted on August 23, 2013, for the external mechanical integrity portion of the test was witnessed by the representative of FDEP (Joseph May, P.G.), by representatives of MDWASD (Sonia Villamil and Howard Fallon) and by representatives of the contractor (Luis Morey).

2.4.1 Radioactive Tracer Survey (RTS)

The radioactive tracer survey uses an isotope of iodine (I-131) as a tracer of water movement inside and outside the casing. Iodine –131 is used because it is a radioactive isotope commonly used in medical practice and therefore it is more easily available and lower in cost than other potential tracers. I-131 also has the advantage of having a half-life of 8 days. That half-life is quite suitable because it is long enough to allow time for transportation to the well site with little decay but also short enough so that it would quickly be reduced if there were any unexpected spills or if there were mechanical failures through which the isotope could travel with the water. The radiation levels of I-131 at the concentration used for RTS testing is in millicurie-range, which if it were considered a waste, would be characterized as a low level waste by the US Atomic Energy Commission.

The I-131 is first loaded into a container located in the logging tool. This container is electronically activated from the logging truck to eject the desired quantity of tracer at the desired depth through an ejection port. In addition to the tracer container, the logging tool is also assembled with three gamma ray detectors. One detector, the top gamma ray detector (GRT), is located 10 feet above the ejector. The other two detectors, the middle one (GRM) and the bottom one (GRB) are located immediately below the ejector at about 3 feet and 12.4 feet below the ejector respectively. The bottom of the logging tool also includes a temperature tool at the very bottom, and a casing collar locator (CCL) 1 foot below the GRM. Figure 7 shows the configuration of the RTS logging tool. The RTS log in the appendix (Appendix D) shows the distances between each of the logging tool components described above.

This well has an obstruction at 2753.5 ft bls that did not permit the RTS tool to be lowered any further into the well. Because of this, the tool was only loaded with 3 mCi of I-131 so that no excess I-131 would need to be disposed of at the end of the RTS. This RTS was also conducted a bit different because the length of the logging tool is such that with the obstruction, the ejector could not be placed within the last 5 feet of casing. Instead the ejector was located 8 feet from the bottom of the casing. The location of the ejector was discussed with FDEP (Joseph May, P.G.) and was approved prior to conducting the test.

2.4.1.1 First Low Flow Dynamic Test

Prior to starting the low flow dynamic test, a background gamma ray log was conducted to establish the natural conditions. It was conducted right after the temperature log. Since the temperature log was run downward starting at land surface, the temperature log had ended with the logging tool at the bottom. The background gamma ray log was conducted from the bottom (2,753.5 feet) up to the surface.

From the surface, the logging tool was again lowered down the well and the casing collar locator (CCL) used to locate the bottom of the casing. The magnetic coils on the CCL give out a magnetic field and detect a change in the mass. If there is growth on the casing it is harder for the CCL to have a clean line. If the growth has some iron on it, it can cause a sort of interference with the CCL making it harder for the CCL to find the end of the casing. The CCL shows that the bottom of the casing is at 2,747 feet bls. After the bottom of the casing was located, the well was ready for the low-flow dynamic RTS test.

The ejector port of the I-131container was set at 2,739.5 feet and 1 millicurie (mCi) of I-131 was released while the flow down the well was kept at a constant rate of 76 gallons per minute (gpm). The logging tool was kept immobile after the ejection of the I-131 and the three gamma ray detectors continued to record in place. One (1) mCi of I-131 was ejected into the well. The middle detector, located 3 feet below the ejector port, picked up the radioactive tracer 28 seconds after the ejection. The bottom detector, which is located over 12 feet below the ejector, picked up the tracer 9 minutes and 50 seconds after the ejection. The flow was checked 10 minutes into the test and confirmed to be at now 86 gpm. The bottom detector was located at 2,751.8 ft bls, so it is 4.8 ft below the casing. Because this well is cased down to 2,746 it is injecting directly into the Oldsmare formation (boulder zone). So we believe that the tracer sent down the well went straight into the formation and that is why it took much longer to detect and was detected at lower levels than what we have seen in other wells. However, with all this, we consider the test to be valid because we confirmed ejection of I-131 tracer and the tracer was detected below the casing yet none migrated up above the casing. Therefore this test shows that the well maintains its external integrity because no tracer was detected above the 2,747 casing depth.

After the first low flow test ended, the tool was then raised up more than 200 feet, to a depth of 2,500 feet, to log out of position to make sure that the tracer did not migrate up the casing or the formation outside of the casing. No migration was detected.

Once the log out of position was conducted and the tool was placed back to depth, no staining on the casing was found which means no interference for the second RTS. Therefore, with the approval of Joseph May, P.G. from FDEP, the well was not flushed prior to the second RTS test.

Figure 7. RTS Tool and Temperature Probe

2.4.1.2 Second Low Flow Dynamic Test

The tool was placed back to a depth were the ejector was located at 2,739.5 feet with a flow of 70 gallons per minute set down the well. For this test, 2 milicuries of I-131 were ejected into the casing. The middle detector started picking up the tracer about 24 seconds after it was ejected. The bottom detector, which is located over 12 feet below the ejector, picked up the tracer 2 minutes and 39 seconds after the ejection. This time the bottom detector did pick up the I-131 signal that is more standard during these RTS. This just confirms that the well has external integrity down to 2,747 ft bls. The upper detector did not pick up any tracer for the duration of the test, which lasted 30 minutes.

After the second low flow test ended, the tool was then raised up more than 200 feet, to a depth of 2,400 feet, to log out of position to make sure that the tracer did not migrate up the casing or the formation outside of the casing. No migration was detected.

With the last low flow dynamic test, the mechanical integrity test was concluded, the wells was flushed with 5,200 gpm in order to clean out the tool and make sure that all the remaining I-131 was sent into the boulder zone. Because the tool was only loaded with 3 mCi of I-131 the tool was emptied after the second RTS so no excess I-131 needed to be ejected. Then the final gamma ray log was compared to the background gamma ray log, and the comparison showed that there are no noticeable differences in the two except for a residual stain at the bottom of the casing where the I-131 had been repeatedly released during the testing, and just below there, where the tracer exited the casing. Injection of water down the well at a rate of 5,200 gpm continued for the next hour to completely flush out the well.

2.4.2 Temperature Log

Youngquist Brothers Inc. conducted the temperature log on August 23, 2013 starting at about 8:30 A.M. and logging down to 2,753.5 feet. The temperature probe (Figure 7) was run from the surface downward to minimize the disturbing effect of the movement of the logging tool on the temperature of the water in the well. The temperature log was started more than 24 hours after the well had last been disturbed by outside influences. The TV survey was the last disturbance in the well.

The temperature log (see Appendix H) shows the warmest interval is in the section from 2,600 to 2,746 feet. This is consistent with the higher temperature of the injected water in that interval. The temperature log did not detect any anomalies that would indicate that injection fluids are present outside the casing, and there is no indication of any upward movement of warm injection water either. The similarity of the temperature oscillations in this temperature log (in the interval from land surface down to the bottom of the casing) to those in the temperature logs from previous MITs and to those in the temperature log when the well was constructed, indicates that there has been no apparent change in the cased interval, and no upward movement of the injected water in the last 5 years.

2.5 WELL HEAD REPAIRS AND RE-INSTALLATION

The work associated with the MIT ended when the wellhead was replaced. The air and vacuum release surge check valves were replaced prior to reinstallation of the wellhead. The 6 inch gate valve and air release were replaced. The wellheads are scheduled to be sandblasted, rust proofed and repainted after the MITs on all the other wells are completed. Injection well IW-6 has been placed back on line and flow from the plant's pump station is again discharging to this injection well.

Section 3

3. CONCLUSIONS AND RECOMMENDATIONS

3.1 CONCLUSIONS

The pressure test was conducted successfully and it was concluded from the results that there is internal mechanical integrity. This conclusion is reinforced by the analysis of the TV survey down to the injection level at 2,746 feet. The TV survey indicated that the casing is in good condition and that all the casing joints appear to be tight and in good working order.

The two successful RTS conducted at low flow rates indicate that there is no upward movement of water outside the casing. Therefore, it was concluded that the RTS results show that there is external mechanical integrity. The temperature survey reinforced the results of the RTS by showing that there has been no movement of injected water anywhere except the injection zone.

3.2 RECOMMENDATIONS

The successful completion of all the tests for mechanical integrity confirms that IW-6 retains full mechanical integrity and as such it is appropriate to continue using this injection well. MDWASD also recommends that FDEP review the results of the tests presented in this report and based on those results determine that the well has mechanical integrity and may continue to be used for its intended purpose.

Finally, MDWASD recommends that although the well head will not be painted until all the MIT tests are completed on the other wells, IW-6 should receive mechanical integrity certification.

Appendix A

Mechanical Integrity Testing Procedures Submitted by MDWASD to FDEP
October 12, 2012

Miami-Dade Water and Sewer Department
Mechanical Integrity Testing Procedures

Miami-Dade Water and Sewer Department
Mechanical Integrity Testing and Repair Procedures
October 12, 2012

MECHANICAL INTEGRITY TESTING and REPAIR PLAN (SDWWTP and NDWWTP Injection Wells)

General Information

The Contractor shall carefully coordinate his activities with the Department to minimize interference with any existing operations or the operations of the Department. Department forces will isolate the well and turn over to the Contractor. Existing valves shall only be operated by Department personnel. The Contractor's personnel, under no circumstances, shall operate any such valve.

The Contractor shall provide all barricades and/or flashing warning lights necessary to warn workers and employee of the testing throughout the Project. This shall be done at the Contractor's expense and to the satisfaction of the Engineer. Every effort must be made to reduce inconvenience and nuisances to a minimum.

The Contractor shall at all times, use the assigned entrance to the Plants to bring in materials, equipment etc. required for the Project. Materials and equipment shall be stored in areas designated by the Engineer, and shall not interfere with the daily operations at the site or with other Projects. Suitable platforms shall be used for material storage to prevent damage to the landscaping. The Contractor shall exercise extreme caution when transporting equipment or materials within the Plant area.

The conveying vehicles shall be properly selected, and equipped, to prevent damage to paved areas, landscaping and other existing facilities including wells, well pads, fencing, underground pipelines, pipe chases, etc. If necessary, suitable wooden skids shall be used to distribute loads, and to prevent damage.

If any of the above existing structures, including the wells, or any other parts of the project area, are damaged, the contractor shall make suitable repairs or replacement at his expense, in a manner described by the Engineer, and to his satisfaction.

The Contractor shall also exercise extreme caution to prevent any spillage of sewage effluent. The County may charge t he Contractor for any cost incurred or penalties imposed on the County as a result of such spillage.

The wells to be tested are Injection Wells IW-l through IW-17 at the South District Wastewater Treatment Plant and IW-1N through IW-4N at the North District Wastewater Treatment! Plant

The Injection Wells have a 24-inch outside diameter (OD), 0.500-inch wall thickness injection casing set to total depths of 2,450 to 2,850 feet below land surface (bls), and were constructed with a nominal 22-inch diameter open borehole extending from the bottom of the casing to approximately 3,000 feet bls.
Except IW-5 at the SDWWTP, has a 20-inch outside diameter (OD), and 0.500 inch wall thickness.

The CONTRACTOR will perform internal and external mechanical integrity tests on the casings of twenty one deep injection wells and perform all appurtenant work in accordance with the above

Contract Documents.

The work shall be performed by a competent crew with equipment that is adequate to complete all phases of the testing and instruments of sufficient accuracy and resolution to identify anomalous responses to the tests. If the CONTRACTOR'S equipment is not capable of satisfactorily performing the work provided for in these specifications, the CONTRACTOR at his own expense shall substitute equipment.

The CONTRACTOR shall have not less than 5 years experience in constructing and testing wells and shall have tested not less than 5 wells of similar type and capacity. The CONTRACTOR shall be licensed by the State of Florida and the license number shall be affixed to all correspondence and reports.

All work shall comply with and be in full conformance with this Mechanical Integrity Test Plan submitted to FDEP together with subsequent response letters for the injection wells at the South and North District Wastewater Treatment Plants and with the appropriate sections of Chapter 62-528 FAC.

If remedial work or re-testing is required prior to final acceptance of the work to meet regulatory requirements and the specifications of the Contract Documents due to defective materials, accident, loss of equipment or equipment malfunction, or for any other cause directly attributable to the CONTRACTOR's actions, the CONTRACTOR shall bear the entire cost of the remediation or re-testing, including all additional materials, labor, and equipment required and any necessary additional Engineering costs. In the event of a problem, the ENGINEER shall be notified immediately, and the following shall apply:

1. The CONTRACTOR shall propose a method of correcting the problem, in writing, to The ENGINEER, who shall review the method of corrective action, and accept the plan in writing before work can proceed.

2. All work on the well must be in accordance with all applicable local, state and federal regulations.

The CONTRACTOR shall notify the ENGINEER a minimum of 72 hours prior to conducting the pressure test, geophysical logging and the radioactive tracer survey so that the ENGINEER and regulatory agency staff can be properly notified.

The CONTRACTOR shall provide all facilities, equipment and materials required for the removal of waste fluids from the well site.

The CONTRACTOR shall kill the well using a dense food- grade salt solution. No barite or mud-based additives shall be used in the well.

The CONTRACTOR shall comply with the OSHA regulations contained in 29CFR Section 1910 for General Industry Regulations and 29CFR Section 1926 for Construction Regulations.

Equipment and Procedures

1. Wellhead Assembly: The stripper head assembly used during the video survey, Geophysical logging, and the radioactive survey shall be bolted to the wellhead above the 6-inch gate valve. The stripper head assembly used must be of sufficient length to house the longest of the wire line tools used for the testing between the gate valve and the pack-off mounted at the top of the assembly. The pack-off must be adjusted so that the tools can be moved freely up and down the well with minimal leakage from the well. The assembly shall include a 4-inch valve and tee, which will be used to inject potable water during the surveys. The assembly shall be fitted with a

pressure gauge for use during the tests.

2. Wellhead Hardware: Should the nuts and/or bolts at the wellhead assembly become stripped during the CONTRACTOR's efforts, the CONTRACTOR shall replace them with equivalent hardware.

3. Water Line: The CONTRACTOR shall provide a potable water supply line for use during the video surveys. This line shall be connected to the existing 4-inch valve on the CONTRACTOR's stripper head. It shall be equipped with a check value to prevent the backflow of effluent into the water supply source. It shall also be equipped with a continuous recording digital flow meter and totalizer capable of measuring flows accurately in the range of 0 to 250 gpm.

Mechanical Integrity Testing (MIT)

The mechanical integrity testing under this Contract shall be accomplished using the following methods and general sequence, however the Contractor shall submit a more detailed sequence to the Engineer for approval before he begins work. The Contractor shall use extreme caution to prevent any loss of equipment, tools or other items into the wells and shall be fully responsible for retrieving any such items immediately, at no expense to the Department. All pressure tests must be conducted in the presence of the Engineer or his authorized representative.

MIT Clean and Pressure Test the Casing

1. The Contractor shall set up all equipment required to prepare for suppressing the density differential pressure, cleaning, performing the pressure test and the radioisotope and closed circuit television surveys.

2. The Contractor shall inject sufficient salt solution into the well to balance the differential pressure and disassemble the wellhead. The brine solution shall remain in the well during the cleaning and pressure testing steps, after which time it shall be transferred to another well if clean enough for reuse, or shall otherwise be disposed of by the Contractor. Under no circumstances shall brine solution be spilled or disposed of on the ground surface, however it may be disposed of into the injection well.

3. The Contractor shall clean the casing before proceeding with the pressure test. The entire length of casing shall be cleaned. If the later television survey indicates insufficient cleaning, the well shall be re-cleaned by the Contractor, at his expense, to the satisfaction of the Engineer. If the television survey must be repeated because of insufficient cleaning, in the opinion of the Engineer, it shall also be at the Contractor's expense.

4. The Contractor shall, when requested by the Engineer, place the packer through a stand-pipe with a packoff device to a point near the top of the well (but within the concrete encasement area) and test its integrity. This shall be accomplished as described in Steps 6, 7, and 8 below. If the packer fails the integrity test it shall be replaced with one that will meet the test. The Engineer is aware that packers have limited inflation cycles and will attempt to minimize the verification of packer operation. However, any integrity failure for which the packer operation can not be eliminated must be repeated at the Contractor's cost. It is anticipated that each new packer will be tested at the wellhead to verify its capacity to seat and deflate.

5. The Contractor shall lower and place the packer to a point within the lower 40 feet of the casing, but not the last 10 feet. The CONTRACTOR will be responsible to assure the proper seating of the packer. A preliminary test shall be performed to ensure proper operation of the test set-up. The CONTRACTOR shall notify the ENGINEER at least 24 hours before running the preliminary test. The test will be run following the same test program as the actual pressure test, as described below. IW-2 at SDWWTP will have the packer placed within 40 feet of the tear in the casing.

6. The Contractor shall inflate the packer to a pressure not exceeding 350 psig over the static condition as measured at the wellhead on a calibrated gauge to create a positive seal.

7. The Contractor shall pressurize the casing to 150 psig with no air in the casing or wellhead. The pressure shall be recorded on a chart and signed by the Engineer, the Contractor and any witnesses present. The pressure test gauge shall be calibrated within 6 months of performing the pressure test. The CONTRACTOR must present proof of calibration of the pressure gauge to the ENGINEER and FDEP staff at the time of testing each well. The pressure gauge must be mounted at or near eye level in order to ensure maximum visibility.

8. The test will be considered successful if the pressure does not change more than 5% psi in one hour.

9. If the test fails, the Contractor shall move the packer upwards for approximately 10 feet, and repeat Steps 6, 7 and 8.

10. If the test still fails, additional repositioning of the packer and repeating of Steps 6, 7 and 8 shall be as ordered by the Engineer. If the test still fails, and subsequent radioisotope surveys indicate no casing failure, it will be presumed that the Contractor's packer did not create a positive seal, and the Contractor shall be required to repeat Steps 4 through 8 at his expense. No payments will be made to the Contractor if it is subsequently determined that the test failure was caused by the seating of the packer. If the packer fails during packer operation verification, it will be concluded that the packer was faulty during any previous test that did not demonstrate casing integrity. The Contractor shall repeat this test at his expense.

11. After pressure testing, measure the depressurization bleed down with a 5 gallon bucket upon release of the pressure in the casing. The bleed down fluid will be properly disposed of by the Contractor.

12. The Contractor shall deflate the packer and withdraw it from the casing.

13. The Contractor shall reassemble the wellhead and connecting piping using new gaskets.

14. Prior to geophysical logging, the fluid used to "kill" the well, or for pressure testing the casing shall be flushed from the well and the well will be shut-in for a minimum of 12 hours.

MIT Video Surveys

A Video Survey inside the injection well casing be performed using the following procedures.

.A 6-inch diameter stripper head assembly will be bolted to the wellhead assembly above the existing 6-inch diameter gate valve. The stripper head will be of dimensions that allow the video operator to put his camera between the gate valve and the pack off and close both the valve and the pack off. The lower part of the assembly shall consist of a 4-inch tee and valve through which potable water may be introduced into the well.
.
Prior to performance of the survey and for a period of 24 hours, fresh water from an adjacent fire hydrant will be introduced into the well through a 4-inch diameter valve located on the stripper head assembly. Fresh water shall be pumped into the well to provide clarity for the survey.

3. If, after 24 hours of pumping potable water into the well, the water quality does not permit a clear picture of the inside of the well, the CONTRACTOR may be required to perform additional pumping services to assure a good survey as specified above.

4. The pumping of the potable water will continue at a rate of approximately 0 to 250 gpm during video surveying. If the open hole portion of the well is not clean, or visibility in any part of the well is poor, the CONTRACTOR shall perform additional pumping services to ensure a good video survey before running another or continuing with the survey.

5. During the video survey, the CONTRACTOR shall stop the camera's progress as instructed by the ENGINEER at depths where there may be potential flaws in the casing or other features to allow for thorough examination at those locations.

Upon reaching the total depth of the well with the video camera and obtaining a video survey satisfactory to the ENGINEER, the camera shall be removed from the well, and the well placed back in service.

MIT Radioisotope Tracer Survey and Temperature Survey

A radioisotope tracer survey shall be used to detect any fluid movement outside of the injection casing from the injection zone into the overlaying aquifers. The tool configuration shown below, or approved equal is required. The tool must be capable of ejecting the radioactive tracer and simultaneously monitoring the gamma ray sensors. No time lag between ejection and monitoring is permitted. A casing collar locator (CCL) shall be positioned below the tool as shown below, to precisely locate the bottom of the casing. Two low flow dynamic test runs, shall be performed. Additional low flow dynamic test runs can be done if results warrant additional testing, as determined by the ENGINEER in consultation with FDEP staff.

A temperature survey log shall also be performed from land surface to the total depth of the well. The temperature log shall be performed logging down at a rate of not more than 60 feet per minute. The temperature survey shall be performed after the well has been "shut in" and stabilized for at least 12 hours prior to the dynamic and static tests.

The Contractor shall perform an initial background gamma ray survey extending from the base of the land surface to the total depth of the well. The background gamma ray log shall be taken at a rate of not more than 60 feet per minute.

After the dynamic tests are completed, another background gamma ray survey shall be taken from the base of the casing to the base of the intermediate casing.

If additional radioisotope tracer survey work is ordered by the Engineer, it will be paid for at the hourly price proposed for additional radioisotope tracer surveys.

Radioactive Tracer Survey (RTS)

A RTS will be performed in the injection well. The tool used for testing will be configured according to information to be supplied by the service company performing the logs and as approved by the ENGINEER. Below is an example of a typical RTS tool that will be used for these surveys. The CONTRACTOR will provide a specific tool configuration with the logs.

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)
			CHD-SDSCHD (SDS) Cable Head	1.00	1.50	5.00
GR#3	23.83					
			GR #3 -GR#3 (GR#3_T) GR#3_TOP	9.33	1.69	50.00
			TREJCT-A (RTS) EJECTOR 14.5' FROM TOOL BOTTOM	3.00	1.69	10.00
			GR #2 -GR#2 (GR#2_M) GR#2_MIDDLE	3.58	1.69	25.00
GR#2	11.17					
CCL	9.63		CCL-000 (000001) RTS_CCL	0.75	1.69	5.00
			TRDET-GR#1 (GR#1_B) GR#1_BOTTOM	8.67	1.69	50.00
GR#1	0.58		TEMP-11116Temp (11116HT)	0.58	1.69	5.00
TEMP	0.17		RTS_TEMP			

Dataset: sdiw1.db: field/well/run1/FINBK
Total Length: 26.92 ft
Total Weight: 150.00 lb
O.D. 1.69 in

RTS tool Typical Configuration

The sequence of the tests shall be as follows:

First Low Flow Dynamic: The low flow run of the radioactive tracer survey shall be performed with a pumping-in velocity of 3 to 5 feet per minute. This would require a volume of between 65 gpm and 108 gpm to be injected during the survey. This is for the 24 inch wells, for Well I-5, which has a 20 inch casing this volume is 44 gpm and 73 gpm. Potable water from the same source as used for the video survey would be used as the most appropriate water supply for this portion of the test.

1) After beginning the flow of water into the well, the tool will be placed at a depth of approximately 5 feet above the base of the final casing, and a slug of 2 millicuries radioactive Iodine 131 is ejected. The tool will remain in place for a period of approximately one hour and the three gamma ray detectors in the "time drive" mode will record the movement of the slug. If tracer is detected at the uppermost detector, indicating potential staining of the tool, the tool may be moved upward to an alternate location.

2) After the one hour waiting period, a log out-of-position will be performed between the ejection point and a minimum of 200 feet above the highest point of tracer detection.

3) Upon completion of logging, the casing will be flushed with 3 to 5 casing volumes of effluent.

4) After flushing, the tool will immediately be run to the base of the casing, then the interval between the ejection point and 200 feet above the highest point of tracer detection will be logged.

Second Low Flow Dynamic: The process described above for the low flow dynamic log will be repeated to include a log out-of-position, a casing flush, and an after flush pass. A slug of tracer greater than or equal to 3 millicuries shall be used as determined by the ENGINEER.

If, during testing, no apparent anomalies appear that may indicate a lack of mechanical integrity in the injection well, the RTS will be concluded. If anomalies do occur, the RTS will be altered to track the radioactive tracer material. After RTS is complete, the RTS tool will be discharged in the injection zone and the well shall be flushed with 3 to 5 volumes of effluent. A second background log will be run from the bottom to the top of the well.

MIT Deadlines (sorted by date MIT pressure test due)

SDWWTP MIT Schedule of Completion

Well	Pressure Test	RTS/Video
IW-2	7/13/2013	7/25/2013
IW-1[1]	7/20/2013	7/31/2013
IW-3	7/24/2013	8/7/2013
IW-9[1]	7/30/2013	8/12/2013
IW-10[1]	8/6/2013	8/21/2013
IW-11	8/20/2013	9/3/2013
IW-12	8/25/2013	9/19/2013
IW-14	9/9/2013	9/26/2013
IW-13	9/16/2013	10/6/2013
IW-4	9/25/2013	10/14/2013
IW-6	9/30/2013	10/20/2013
IW-5	10/19/2013	10/27/2013
IW-7[2]	10/26/2013	1/7/2014
IW-8	11/2/2013	11/12/2013
IW-17	11/11/2013	11/19/2013
IW-16	11/18/2013	12/9/2013
IW-15	12/3/2013	12/16/2013

NOTES:
1.The original video was not clear enough and therefore a new video was done at the end of the MITs at SDWWTP.
2.The Computer failed during the RTS, because the Iodine 131 had already been injected, FDEP and DOH required 46 days b/f the RTS could be redone.

NDWWTP MIT Schedule of Completion

Well	Pressure Test	RTS/Video
IW-1N	3/14/2014	3/26/2014
IW-2N	3/25/2014	4/9/2014
IW-3N	4/2/2014	4/17/2014
IW-4N	4/9/2014	4/24/2014

REPAIR PLAN:

The following repair plans apply to wells at SDWWTP and NDWWTP.

1. Kill well and remove 24 inch gate valve and 4 inch bypass valves. Remove 1 inch pressure transmitter line and weld hold closed. Please see drawings included in below.

2. Sand existing casing in concrete pits and coat with Bitumastic. Please see drawings included in below.

3. Chip concrete around outer casing 1 inch deep, in order to embed PVC sleeve. Please see drawings included in below.

4. Install C905 PVC sleeve around casing pipe, embed 1 inch deep and fill annular space with grout, using Type II Neat cement. Slope top edge to create 30 degree watershed and seal at edges with sealant. Please see drawings included in below.

5. Relocate 1 inch pressure transmitter as indicated in drawings. Weld the hole. Please see drawings included in below.

6. At the NDWWTP IW-1N, IW-3N and IW-4N install new magmeters with any necessary spool pieces to be field determined. Please see drawings included in below.

7. Reassemble wellheads including installation of new 24 inch butterfly valve on horizontal part of well. Mega flanges will be used to ensure the layout of the pipe and the vales match. Please see drawings included in below.

8. On IW-4N at NDWWTP, install electric actuator for butterfly valve at base of injection well. Please see drawings included in below.

Appendix B

FDEP Approval of MIT Plan for SDWWTP and NDWWTP

November 26, 2012

Villamil, Sonia (WASD)

From: May, Joseph [redacted]
Sent: Monday, November 26, 2012 2:40 PM
To: Villamil, Sonia (WASD)
Cc: Vandor, Heidi; Silverman, Mark; Walsh, Virginia (WASD); Goldenberg, Bertha M. (WASD); Fallon Jr., Howard J. (WASD); Arrebola, Vicente (WASD); Macfarlane, Maria (WASD); Oakley, Clint (WASD)
Subject: RE: MDWASD MIT and Repair Plan Submittal

Importance: High

Hello all,

The Department approves the plan with the following understandings:

1) Medicinal grade I-131 should be specified since this solution is filtered to reduce precipitate material, as opposed to regular grade I-131, in the vial causing a tool malfunction. It has been our experience that an activity of ~1mCi/ml has been the easiest to work with in the field.
2) Please contact me a minimum of three days prior to mobilization to each site. Due to the travel time from West Palm Beach to the sites close coordination would be appreciated between myself and a designated contact person from the utility so that each pressure and RTS can be witnessed.

Thank you,

Joe

Please take a few minutes to share your comments on the service you received from the department by clicking on this link. DEP Customer Survey.

From: Villamil, Sonia (WASD) [mailto:[redacted]
Sent: Wednesday, October 17, 2012 9:42 AM
To: May, Joseph
Cc: Vandor, Heidi; Silverman, Mark; Walsh, Virginia (WASD); Goldenberg, Bertha M. (WASD); Fallon Jr., Howard J. (WASD); Arrebola, Vicente (WASD); Macfarlane, Maria (WASD); Oakley, Clint (WASD)
Subject: MDWASD MIT and Repair Plan Submittal

Hello Mr. May,

The MDWASD respectfully submits the attached MIT testing and repair plan for your approval. The paper copy is being sent via regular mail as well.

Thank you,

Sonia Villamil
Engineer II
Miami Dade Water and Sewer Department
3071 SW 38th Ave Room 554-8
Miami, FL 33146
[redacted]
fax: 786-552-8640
miamidade.gov

Appendix C

Field Notes from tests including gauge certification and pressure charts.

IW-6 PT TEST

Sensor/Session information

SensorSN	21325011	Modbus Ac	2
Sensor Type	PT2X	Initialized v	2. 9
Sensor Name	INW Smart Sensor	Uploaded	Aqua4Plus 1.9.3
Session Name	1MIN	Exported	Aqua4Plus 1.9.3
# Records	180		

Statistical Data		Temperature(de	Pressure(psi)
	Sensor Range	-40 - +125 degC	300 psia
	Minimum	72.4	0
	Maximum	96	153.579
	Mean	84.4	72.326
	Field Cal Date	unknown	unknown

Rec #	Date/Time	Temperature (degF)	Pressure (psi)
1	8/19/13 8:51 AM	86.4	153.579
2	8/19/13 8:52 AM	86.6	153.517
3	8/19/13 8:53 AM	86.8	153.465
4	8/19/13 8:54 AM	86.8	153.404
5	8/19/13 8:55 AM	86.9	153.343
6	8/19/13 8:56 AM	87.1	153.281
7	8/19/13 8:57 AM	87.7	153.216
8	8/19/13 8:58 AM	87.8	153.165
9	8/19/13 8:59 AM	87.6	153.116
10	8/19/13 9:00 AM	87.8	153.053
11	8/19/13 9:01 AM	88	153.001
12	8/19/13 9:02 AM	88.9	152.945
13	8/19/13 9:03 AM	89.6	152.89
14	8/19/13 9:04 AM	90.4	152.835
15	8/19/13 9:05 AM	90.9	152.791
16	8/19/13 9:06 AM	91.4	152.728
17	8/19/13 9:07 AM	92	152.684
18	8/19/13 9:08 AM	92.5	152.63
19	8/19/13 9:09 AM	92.7	152.568
20	8/19/13 9:10 AM	92.6	152.518
21	8/19/13 9:11 AM	92.9	152.466
22	8/19/13 9:12 AM	93.3	152.413
23	8/19/13 9:13 AM	93.8	152.36
24	8/19/13 9:14 AM	94.1	152.318
25	8/19/13 9:15 AM	94.3	152.266
26	8/19/13 9:16 AM	94.3	152.216
27	8/19/13 9:17 AM	94.2	152.166
28	8/19/13 9:18 AM	94	152.116
29	8/19/13 9:19 AM	93.9	152.066
30	8/19/13 9:20 AM	93.8	152.016
31	8/19/13 9:21 AM	93.8	151.976

32	8/19/13 9:22 AM	93.6	151.915
33	8/19/13 9:23 AM	93.3	151.867
34	8/19/13 9:24 AM	93	151.818
35	8/19/13 9:25 AM	92.6	151.769
36	8/19/13 9:26 AM	91.8	151.713
37	8/19/13 9:27 AM	91.4	151.675
38	8/19/13 9:28 AM	91.3	151.625
39	8/19/13 9:29 AM	91.1	151.565
40	8/19/13 9:30 AM	90.8	151.516
41	8/19/13 9:31 AM	90.5	151.477
42	8/19/13 9:32 AM	90.2	151.429
43	8/19/13 9:33 AM	89.7	151.381
44	8/19/13 9:34 AM	89.5	151.331
45	8/19/13 9:35 AM	89.3	151.282
46	8/19/13 9:36 AM	89.4	151.231
47	8/19/13 9:37 AM	89.4	151.18
48	8/19/13 9:38 AM	89.5	151.139
49	8/19/13 9:39 AM	89.7	151.087
50	8/19/13 9:40 AM	90.2	151.044
51	8/19/13 9:41 AM	90.5	151.001
52	8/19/13 9:42 AM	90.4	150.951
53	8/19/13 9:43 AM	90.4	150.901
54	8/19/13 9:44 AM	90.7	150.858
55	8/19/13 9:45 AM	91.3	150.814
56	8/19/13 9:46 AM	91.2	150.775
57	8/19/13 9:47 AM	90.7	150.726
58	8/19/13 9:48 AM	90.8	150.675
59	8/19/13 9:49 AM	91.3	150.632
60	8/19/13 9:50 AM	92.1	150.587
61	8/19/13 9:51 AM	92.6	150.544
62	8/19/13 9:52 AM	92.6	150.503
63	8/19/13 9:53 AM	92.2	141.695
64	8/19/13 9:54 AM	91.6	116.715
65	8/19/13 9:55 AM	91.3	116.382
66	8/19/13 9:56 AM	91.5	91.55
67	8/19/13 9:57 AM	91.6	93.706
68	8/19/13 9:58 AM	91.6	67.194
69	8/19/13 9:59 AM	92.3	68.276
70	8/19/13 10:00 AM	92.5	48.478
71	8/19/13 10:01 AM	93.1	46.806
72	8/19/13 10:02 AM	94	25.945
73	8/19/13 10:03 AM	94.7	31.109
74	8/19/13 10:04 AM	94.5	16.599
75	8/19/13 10:05 AM	94.4	9.693
76	8/19/13 10:06 AM	94.7	6.635
77	8/19/13 10:07 AM	95.1	2.291
78	8/19/13 10:08 AM	95.6	0

Certificate of Calibration

OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

Ozone Industries, Inc.
Precision Measurement Equipment Division

Purchase Order #

Calibration Performed By:
OZONE INDUSTRIES, INC.
15551 PINE RIDGE RD.
FORT MYERS, FL 33908

For:
YOUNGQUIST BROTHERS, INC.
15465 PINE RIDGE RD.
FORT MYERS, FL 33908

EQUIPMENT INFORMATION:

Description: PRESSURE GAUGE
Manufacter: MCDANIELS
Model Number: 300PSI
Part Number: N/A
Range: 0-300 PSI

Serial Number: 972062-1
Customer I.D.:
Cust. Barcode: N/A
Cust. Location: N/A
Specifications: +/- 0.25% FS

Cal Date: 6/6/2013
Cal. Due Date: 8/5/2013
Cal. Interval 60 DAYS
Received: IN TOLERANCE
Calibration Result: PASS
Environmental Conditions: 74 DEG F / 20% H
Performed By: Daniel McKissick

Procedure: STANDARD

This is to certify that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure at the points tested (unless otherwise noted). It has been Calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration is in accordance with Ozone Industries, Inc Quality Assurance Manual. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

Calibration Remarks:
THIS UNIT WAS FOUND TO BE IN TOLERANCE AT THE TIME OF CALIBRATION.
PERFORMED ROUTINE CALIBRATION / CERTIFICATION

Standards Used to Calibrate Equipment:

Company	I.D.	Description	Last Cal.	Cal. Due Date
OZONE	A1731	EATON UPC5000 PNEUMATIC CALIBRATOR	12/12/2012	12/12/2013

Signatures:

Certified by:
Print: Daniel McKissick
Date: 06/06/13
[redacted]

Approved by:
Print: Daniel McKissick
[redacted]

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ØZONE
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15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

PH: 239-433-3400
FAX: 239-489-3877

CONTROL NO: 032509-1

CUSTOMER: YBI15465

CALIBRATION DATA FORM

MFR:	MCDANIELS	**DESCRIPTION**	PRESSURE GAUGE
MODEL NO:	300 PSI .25%	**TECHNICIAN:**	0030
SERIAL NO:	972062-1	**CAL. DATE:**	06/06/13
CUST. ID:	N/A	**DUE DATE:**	08/05/13

* IF NO "AS LEFT" READING IS SHOWN ON THIS CHART, IT MEANS THE UNIT WAS IN TOLERANCE AND THERE WERE NO ADJUSTMENTS MADE TO IT.

RANGE: 0-300 PSI

NOMINAL	AS FOUND	AS LEFT *	LOW LIMIT	HIGH LIMIT
50	50.26		49.25	50.75
100	100.31		99.25	100.75
150	150.38		149.25	150.75
200	200.49		199.25	200.75
300	300.6		299.25	300.75

Certificate of Calibration

OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

Ozone Industries, Inc.
Precision Measurement Equipment Division

Purchase Order #

Calibration Performed By:
OZONE INDUSTRIES, INC.
15551 PINE RIDGE RD.
FORT MYERS, FL 33908

For:
YOUNGQUIST BROTHERS, INC.
15465 PINE RIDGE RD.
FORT MYERS, FL 33908

EQUIPMENT INFORMATION:

Description: PRESSURE GAUGE
Manufacter: McDaniel
Model Number: 300PSI
Part Number: N/A
Range: 0-300 PSI

Serial Number: 972034-2
Customer I.D.:
Cust. Barcode: N/A
Cust. Location: N/A
Specifications: +/- 0.25% FS

Cal Date: 5/17/2013
Cal. Due Date: 11/17/2013
Cal. Interval 6 MONTHS
Received: IN TOLERANCE
Calibration Result: PASS
Environmental Conditions: 74 DEG F / 80% H
Performed By: Daniel McKissick

Procedure: STANDARD

This is to certify that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure at the points tested (unless otherwise noted). It has been Calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration is in accordance with Ozone Industries, Inc Quality Assurance Manual. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

Calibration Remarks:
THIS UNIT WAS FOUND TO BE IN TOLERANCE AT THE TIME OF CALIBRATION.
PERFORMED ROUTINE CALIBRATION / CERTIFICATION

Standards Used to Calibrate Equipment:

Company	I.D.	Description	Last Cal.	Cal. Due Date
OZONE	A1731	EATON UPC5000 PNEUMATIC CALIBRATOR	12/12/2012	12/12/2013

Signatures:

Certified by:
Print: Daniel McKissick
[redacted]

Approved by:
Print: Daniel McKissick
Date: [redacted] 05/17/13
[redacted]

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15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

PH: 239-433-3400
FAX: 239-489-3877

CONTROL NO: 100809-7

CUSTOMER: YBI15465

CALIBRATION DATA FORM

MFR:	PIC	**DESCRIPTION**	PRESSURE GAUGE
MODEL NO:	300 PSI .25%	**TECHNICIAN:**	0030
SERIAL NO:	972034-2	**CAL. DATE:**	05/17/13
CUST. ID:	N/A	**DUE DATE:**	11/17/13

* IF NO "AS LEFT" READING IS SHOWN ON THIS CHART, IT MEANS THE UNIT WAS IN TOLERANCE AND THERE WERE NO ADJUSTMENTS MADE TO IT.

RANGE: 0-300 PSI

NOMINAL	AS FOUND	AS LEFT *	LOW LIMIT	HIGH LIMIT
50	49.59		49.25	50.75
100	99.47		99.25	100.75
150	149.45		149.25	150.75
200	199.43		199.25	200.75
300	299.4		299.25	300.75

Certificate of Calibration

OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

Ozone Industries, Inc.
Precision Measurement Equipment Division

Purchase Order #

Calibration Performed By:
OZONE INDUSTRIES, INC.
15551 PINE RIDGE RD.
FORT MYERS, FL 33908

For:
YOUNGQUIST BROTHERS, INC.
15465 PINE RIDGE RD.
FORT MYERS, FL 33908

EQUIPMENT INFORMATION:

Description: PRESSURE GAUGE
Manufacter: MCDANIELS
Model Number: 300PSI
Part Number: N/A
Range: 0-300 PSI

Serial Number: AB30128
Customer I.D.:
Cust. Barcode: N/A
Cust. Location: N/A
Specifications: +/- 0.25% FS

Cal Date: 6/17/2013
Cal. Due Date: 12/17/2013
Cal. Interval 6 MONTHS
Received: IN TOLERANCE
Calibration Result: PASS
Environmental Conditions: 73 DEG F / 40% H
Performed By: Daniel McKissick

Procedure: STANDARD

This is to certify that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure at the points tested (unless otherwise noted). It has been Calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration is in accordance with Ozone Industries, Inc Quality Assurance Manual. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

Calibration Remarks:
THIS UNIT WAS FOUND TO BE IN TOLERANCE AT THE TIME OF CALIBRATION.
PERFORMED ROUTINE CALIBRATION / CERTIFICATION

Standards Used to Calibrate Equipment:

Company	I.D.	Description	Last Cal.	Cal. Due Date
OZONE	A1731	EATON UPC5000 PNEUMATIC CALIBRATOR	12/12/2012	12/12/2013

Signatures:

Certified by:
Print: Daniel McKissick
Date: 06/17/13
[redacted]

Approved by:
Print: Daniel McKissick
Date: 06/17/13
[redacted]

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15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

PH: 239-433-3400
FAX: 239-489-3877

CONTROL NO: 080709-2

CUSTOMER: YBI15465

CALIBRATION DATA FORM

MFR:	MCDANIELS	**DESCRIPTION**	PRESSURE GAUGE
MODEL NO:	300 PSI .25%	**TECHNICIAN:**	0030
SERIAL NO:	AB30128	**CAL. DATE:**	06/17/13
CUST. ID:	N/A	**DUE DATE:**	12/17/13

* IF NO "AS LEFT" READING IS SHOWN ON THIS CHART, IT MEANS THE UNIT WAS IN TOLERANCE AND THERE WERE NO ADJUSTMENTS MADE TO IT.

RANGE: 0-200 PSI

NOMINAL	AS FOUND	AS LEFT *	LOW LIMIT	HIGH LIMIT
50	50.18		49.25	50.75
100	100.19		99.25	100.75
150	150.22		149.25	150.75
200	200.31		199.25	200.75
250	250.33		249.25	250.75
300	300.39		299.25	300.75

Appendix D

RTS and RTS Tool Configuration

RADIOACTIVE TRACER SURVEY LOG

Company	SOUTH MIAMI-DADE W.W.T.P.
Well	IW-6
Field	S.D.W.W.T.P.
County	MIAMI-DADE
State	FLORIDA

Location: API # :

SEC TWP RGE

Other Services

Permanent Datum	PAD	Elevation	PAD
Log Measured From	PAD		
Drilling Measured From	PAD		

Elevation
K.B.
D.F.
G.L.

Date	23-AUG-2013		
Run Number	2013 MIT		
Depth Driller	2753.5'		
Depth Logger	2753.5'		
Bottom Logged Interval	2753.5'		
Top Log Interval	SURFACE		
Open Hole Size	22"		
Type Fluid	WATER		
Density / Viscosity	NA		
Max. Recorded Temp.	NA		
Estimated Cement Top	NA		
Time Well Ready	ON ARRIVAL		
Time Logger on Bottom	ON ARRIVAL		
Equipment Number	102		
Location	FT MYERS		
Recorded By	R.GARCIA	MOREY	
Witnessed By	S. VILLAMIL		

Borehole Record				Borehole Record			
Run Number	Bit	From	To	Run No	Bit	From	To

Casing Record	Size	Wgt/Ft	Top	Bottom
Surface String				
Prot. String				
Production String	24"	.500" W.T.	SURFACE	2747'
Liner				

<< Fold Here >>>

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

Comments

HIGH RESOLUTION TEMPERATURE

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)

GR#3	24.00					
			GR #3 -RTST (952T)	11.50	1.69	30.00
			TREJCT-A (952)	1.00	1.69	10.00
			GR #2 -RTSM (952M)	3.00	1.69	10.00
GR#2	10.50					
CCL	9.60		CCL-1.68GRRTS (952)	0.75	1.69	10.00
			GR-RTSB (952B)	9.25	1.69	10.00
GR	1.20					

Dataset: sdwwtp-iw-6.db: field/well/run1/pass4
Total Length: 25.50 ft
Total Weight: 70.00 lb
O.D. 1.69 in

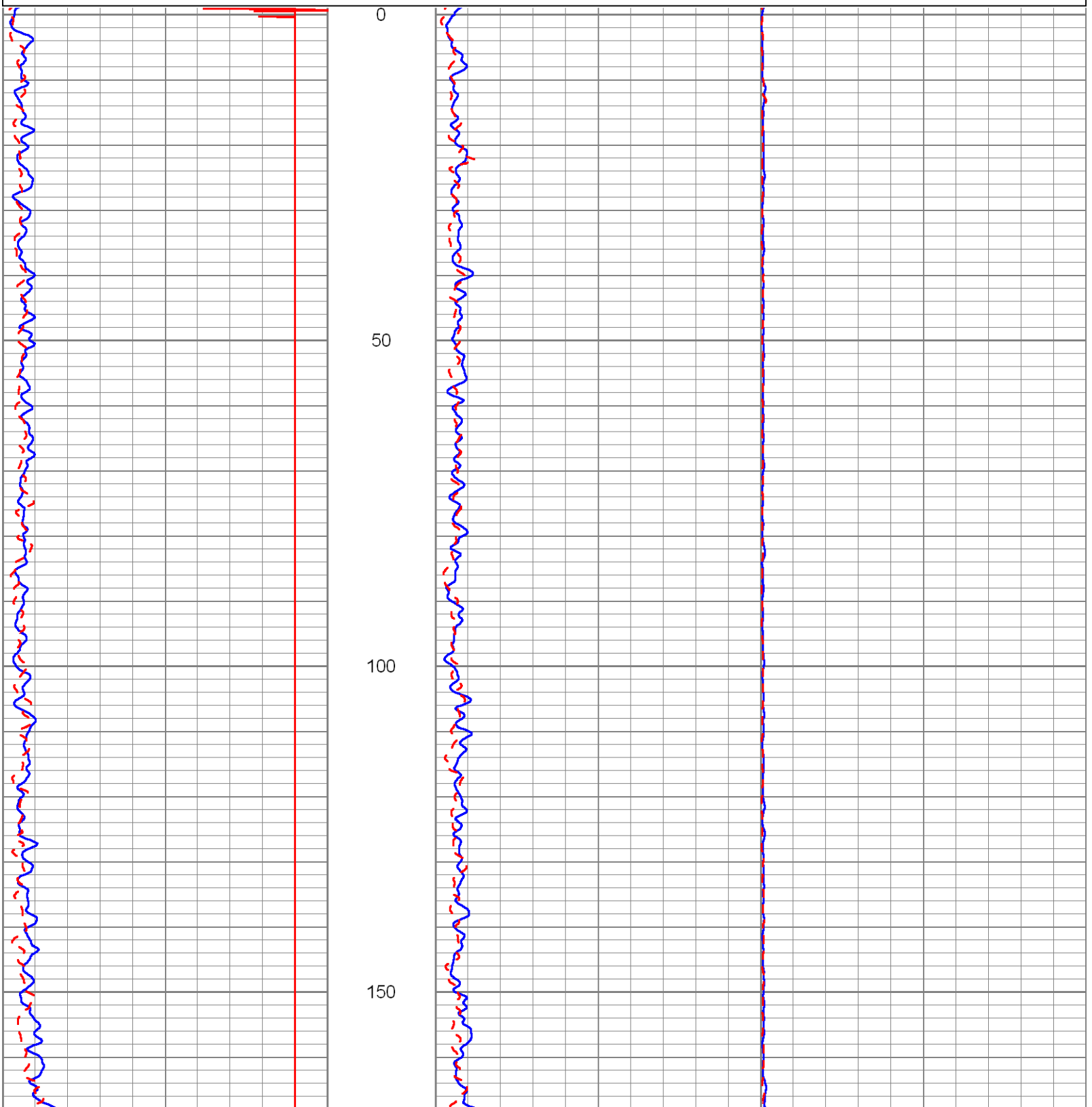
YOUNGQUIST

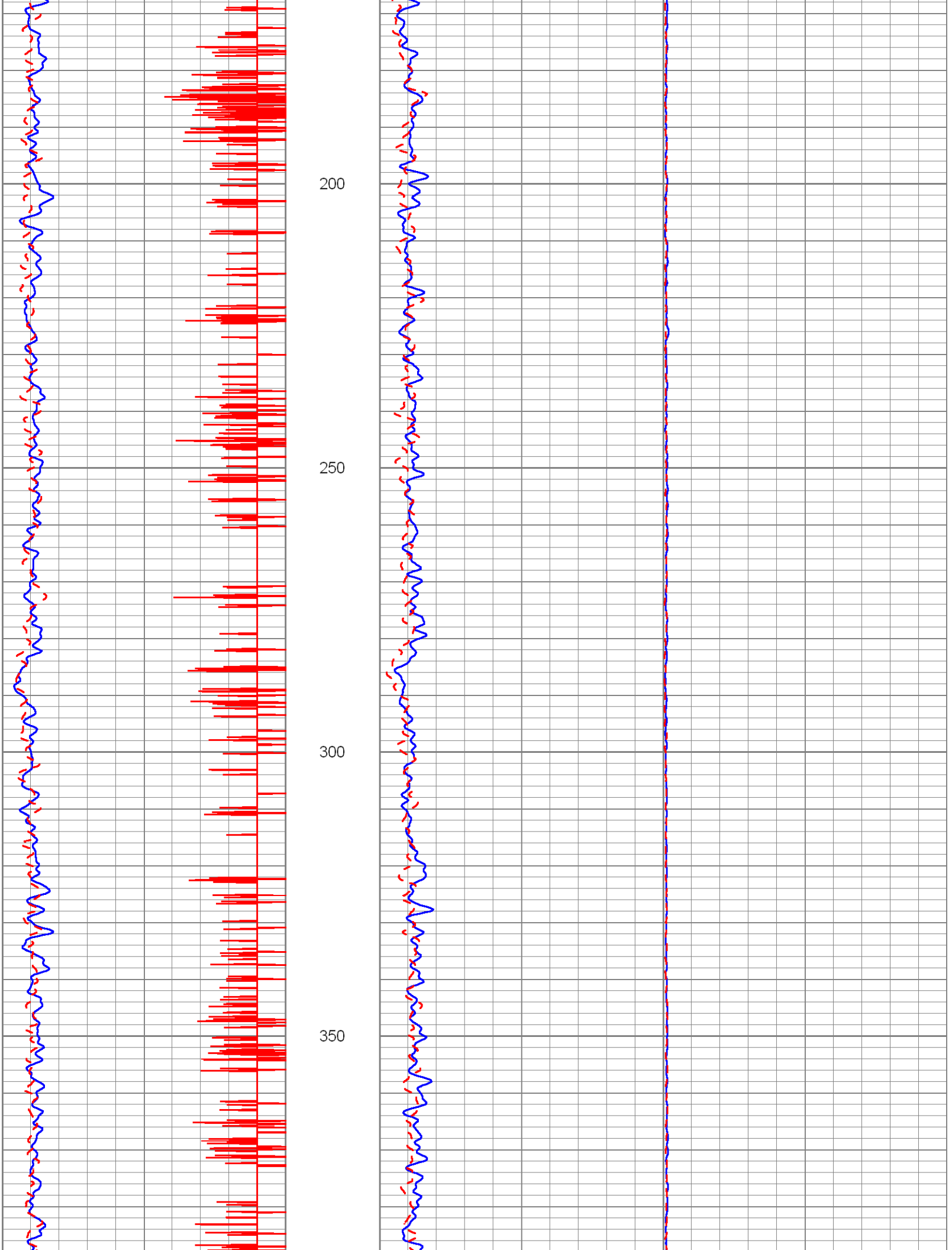
FINAL BACKGROUND

FINAL BACKGROUND

Database File:	c:\warrior\data\2013\mit\south dade\data base\sdwwtp-iw-6.db
Dataset Pathname:	pass8
Presentation Format:	rts
Dataset Creation:	Fri Aug 23 14:48:33 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:240

0	GRT (GAPI)	100		0	GRB (GAPI)	100	0 GRM (GAPI) 1000
0	GRT-BACKGRND (GAPI)	100		0	GRB-BACKGRD (GAPI)	100	0 GRM-BACKGRND (GAPI) 1000
0.9	CCL	-0.1					

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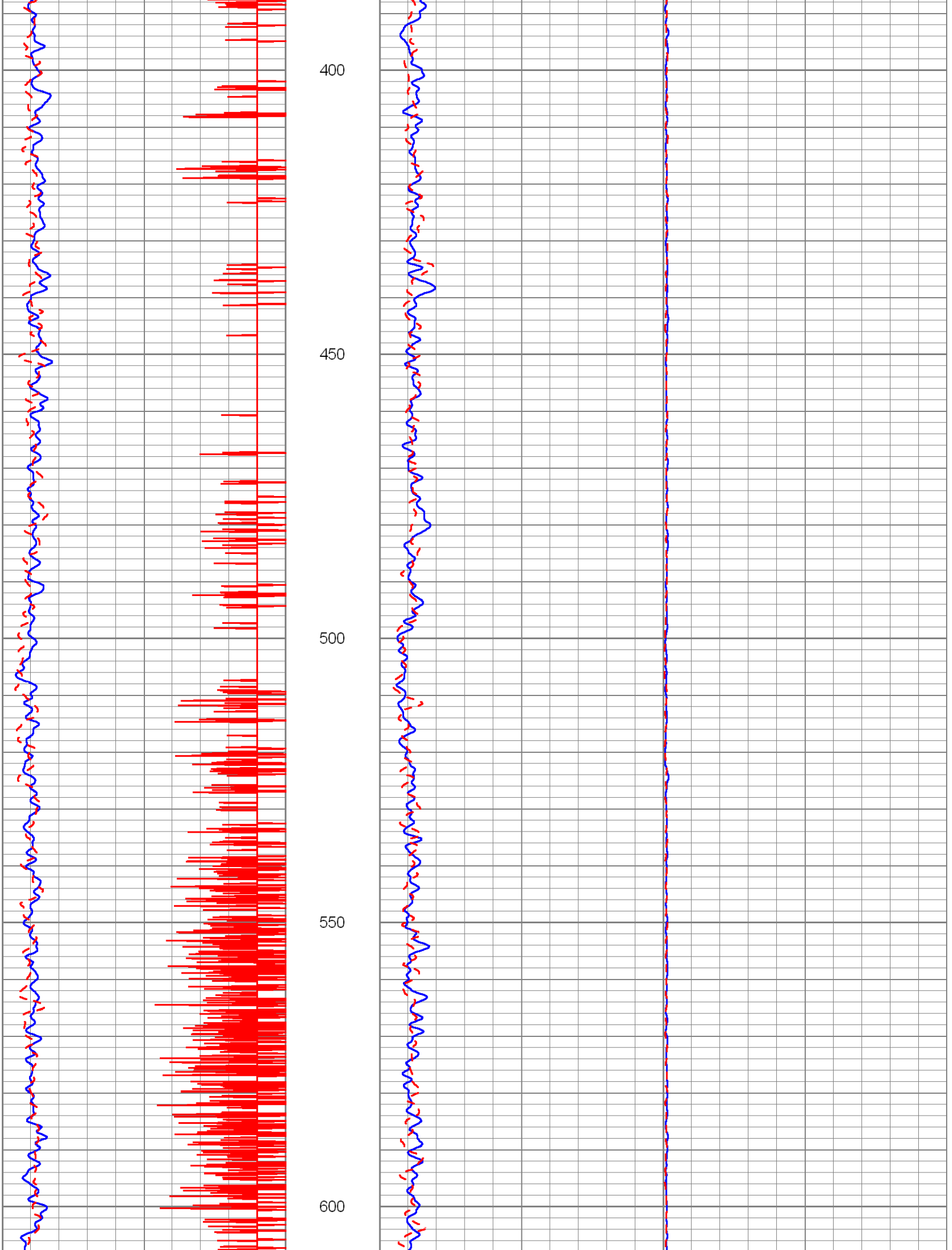
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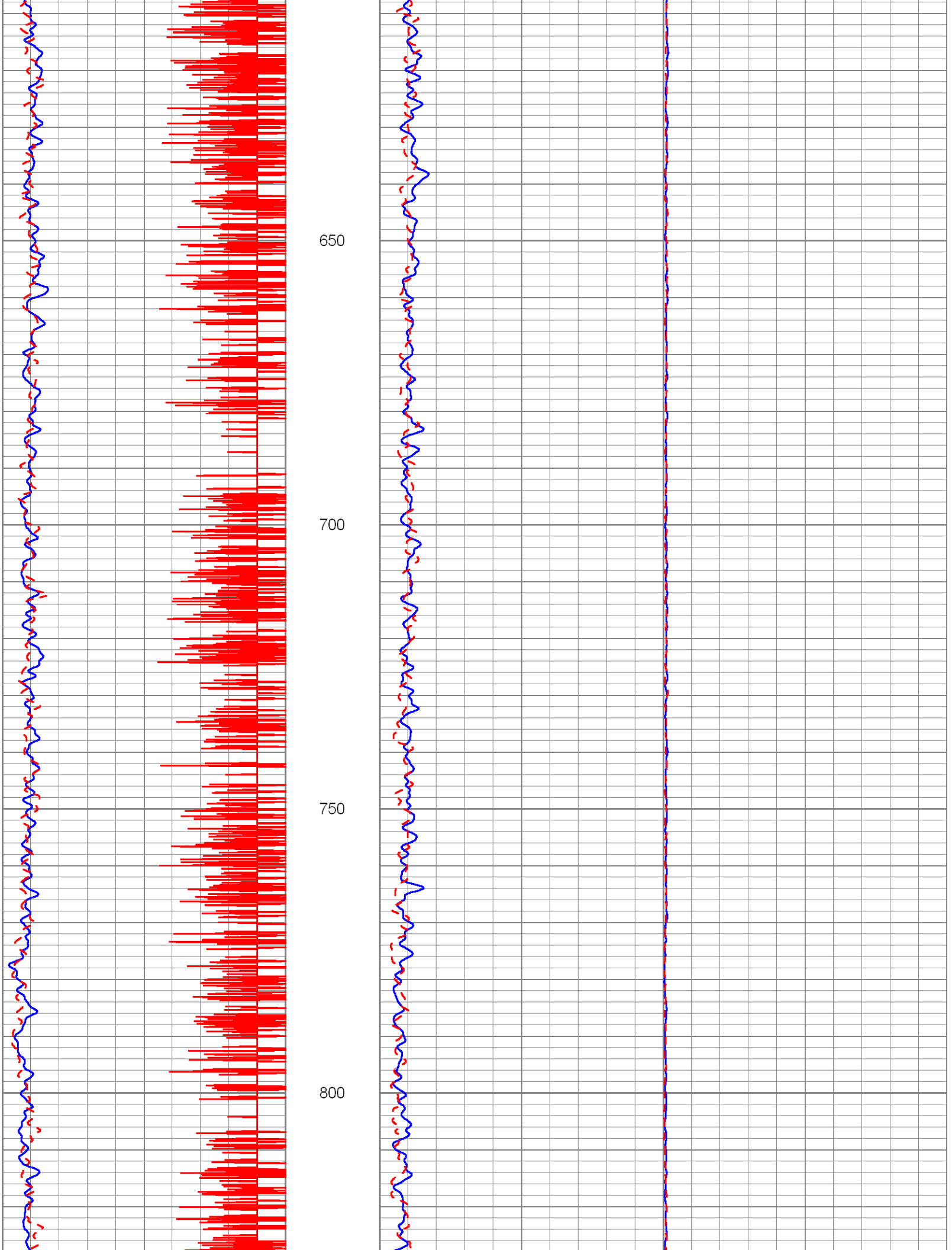
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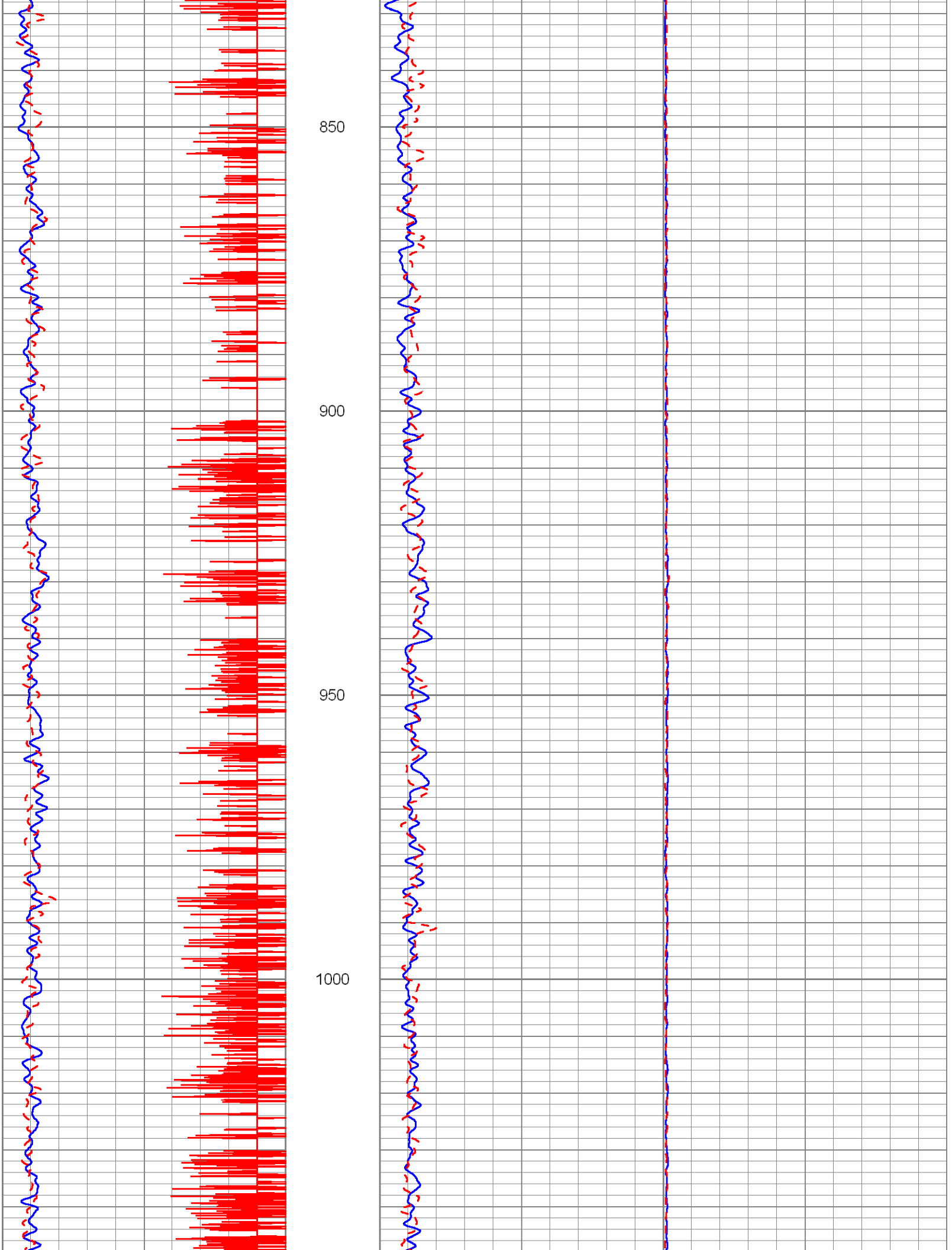
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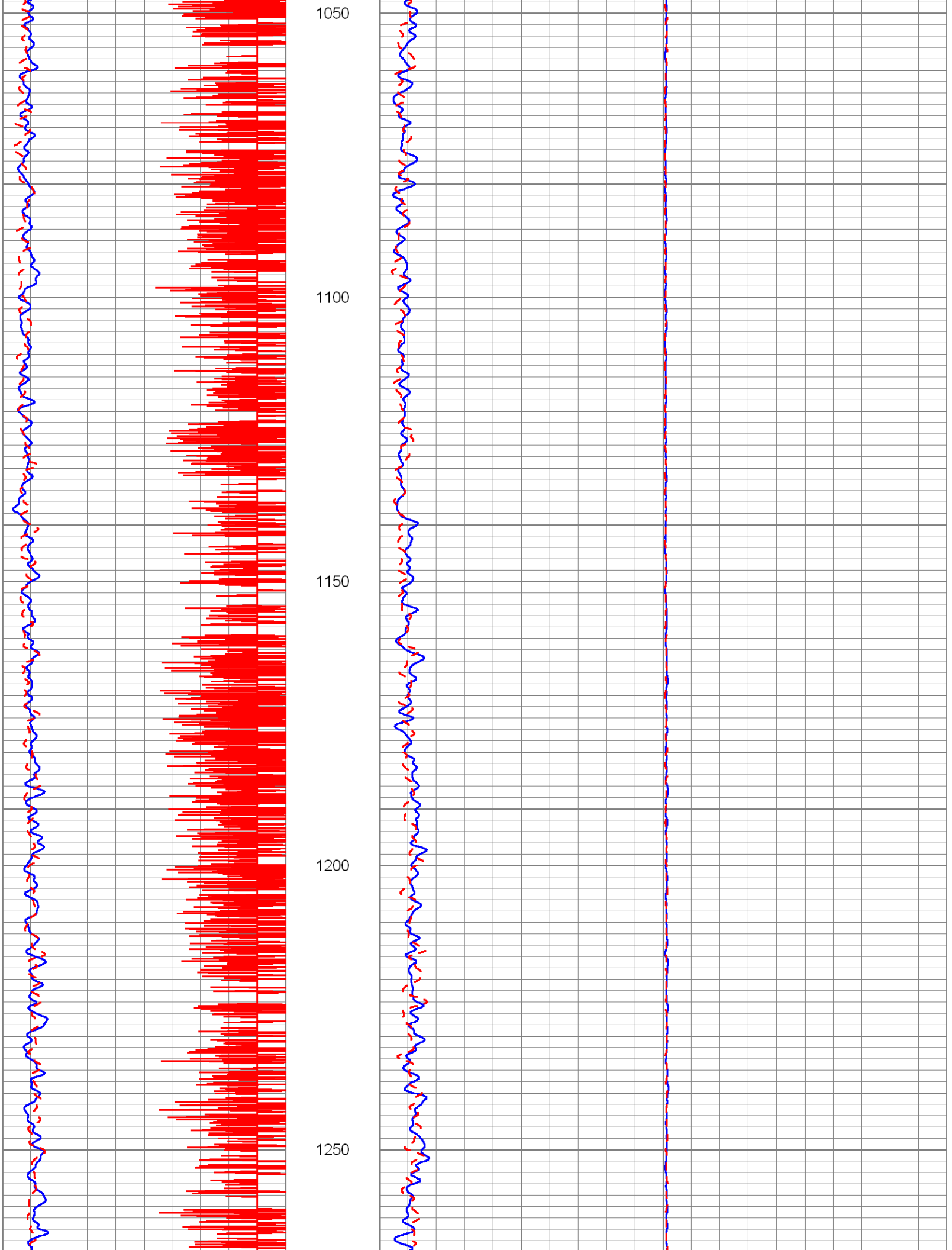
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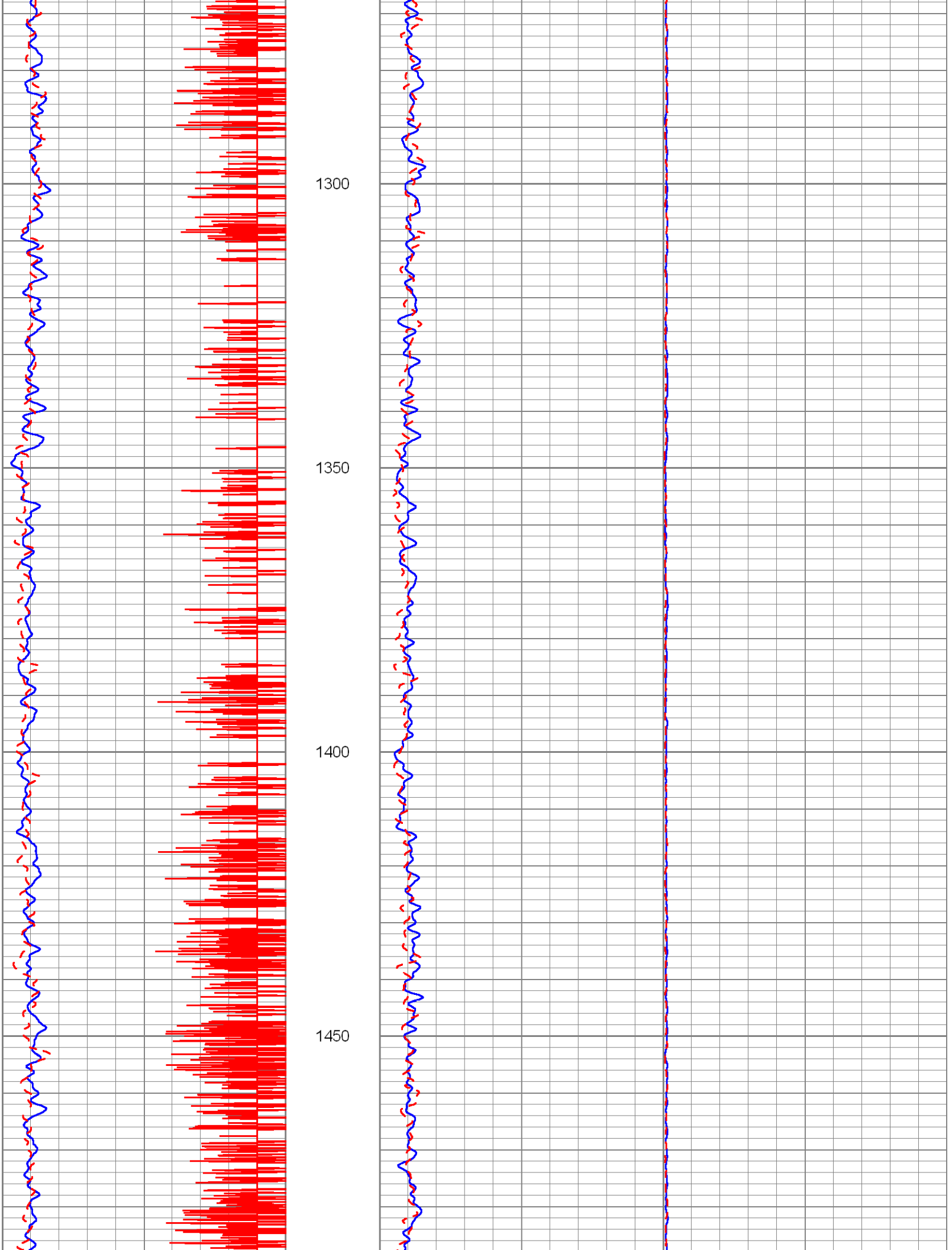
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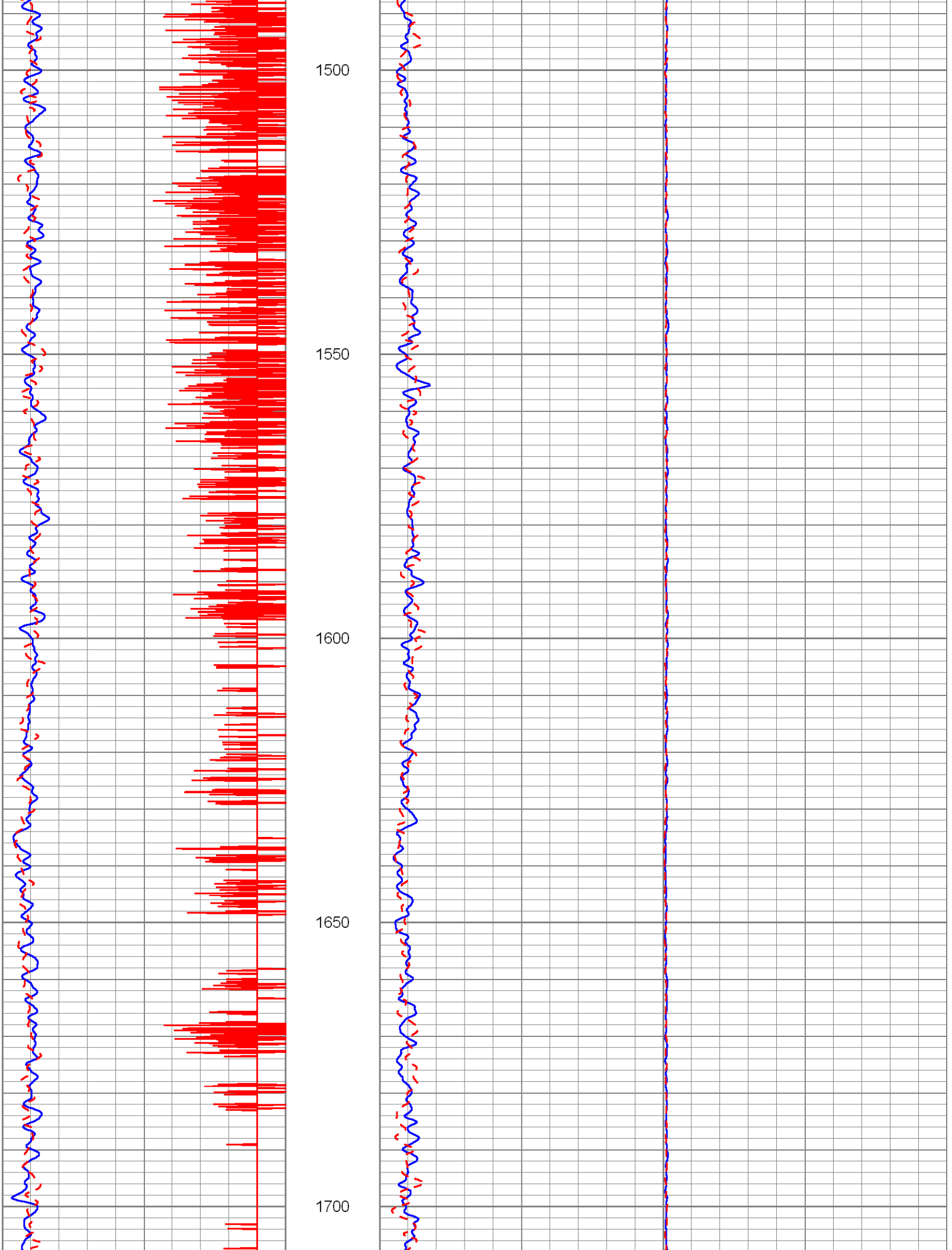
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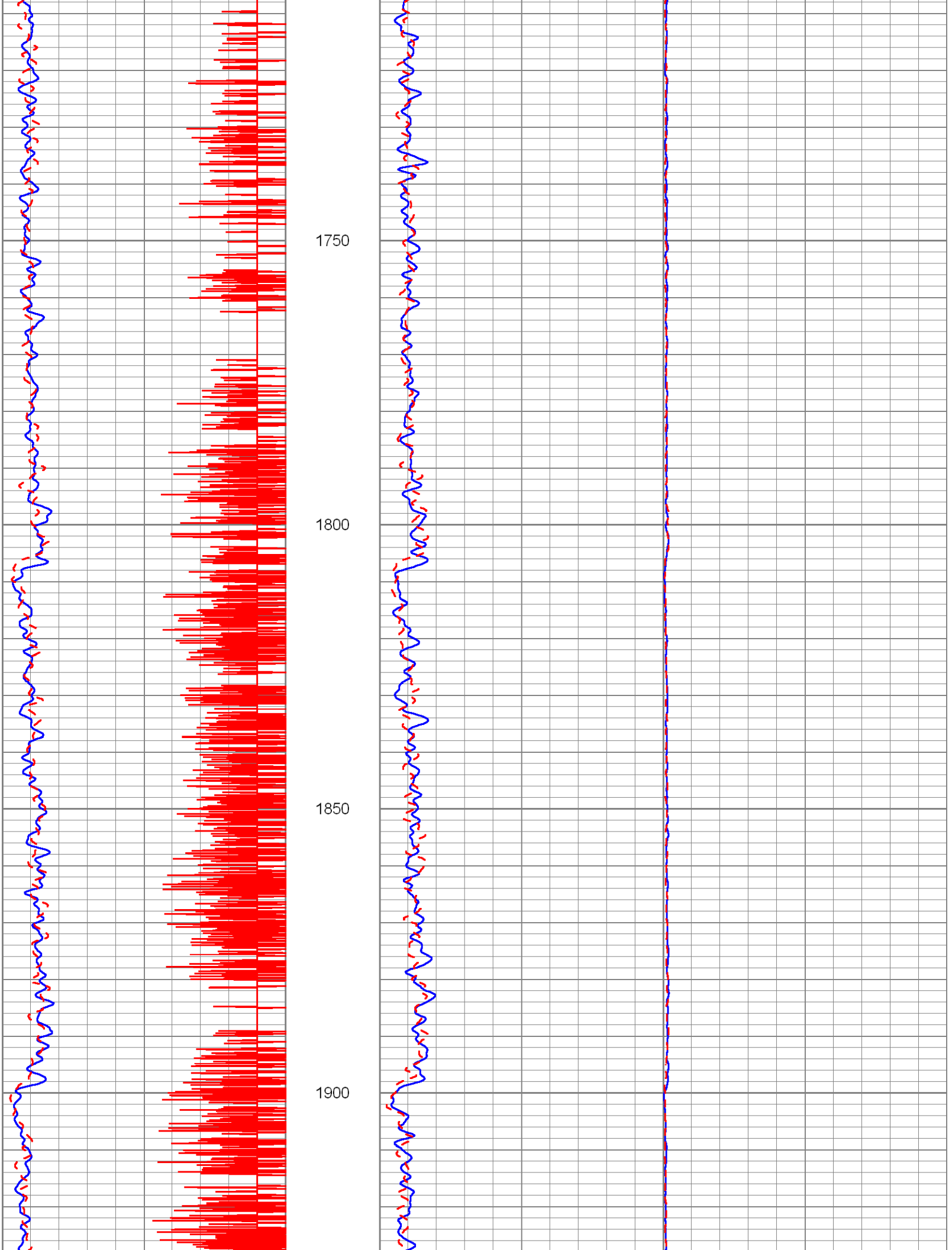
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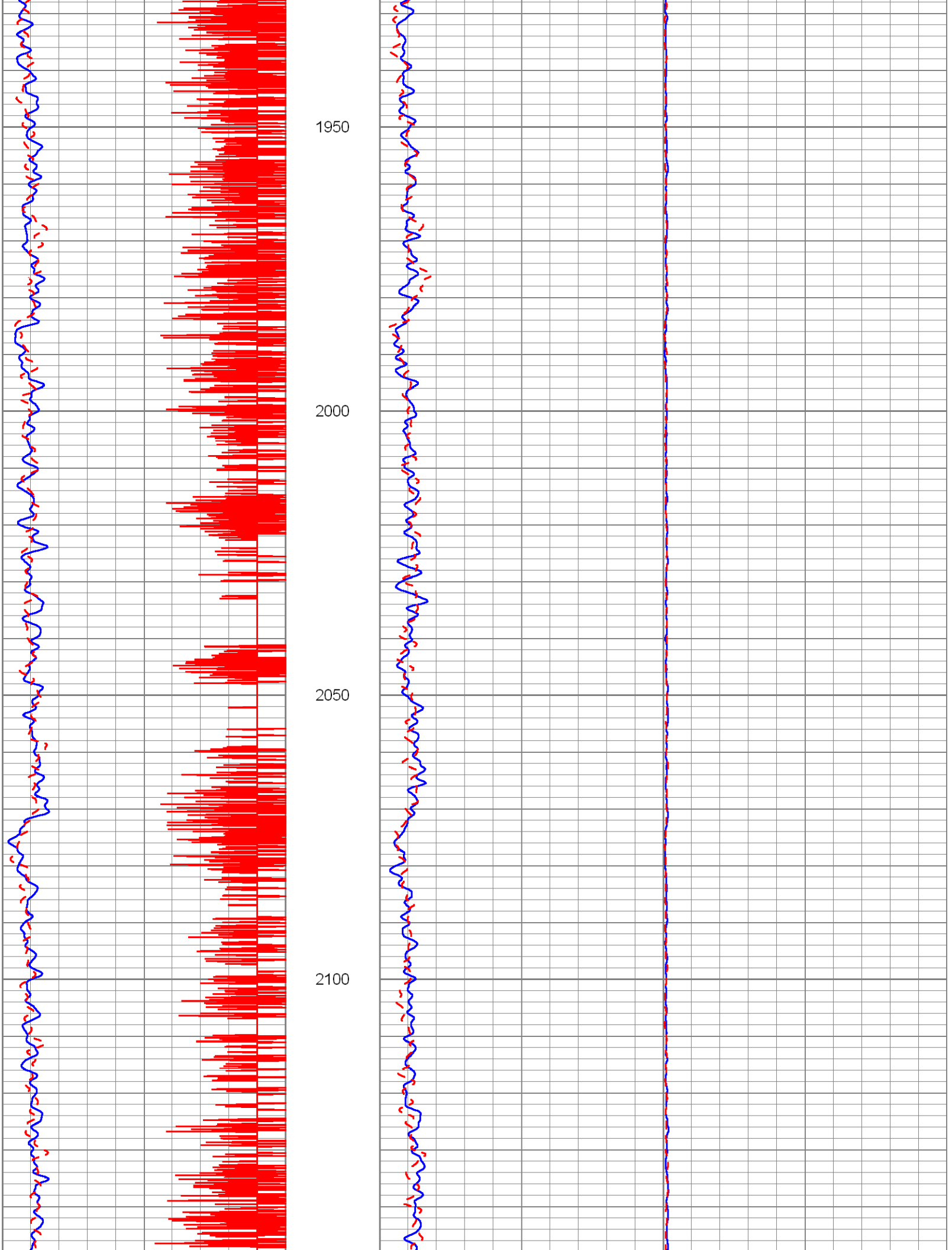
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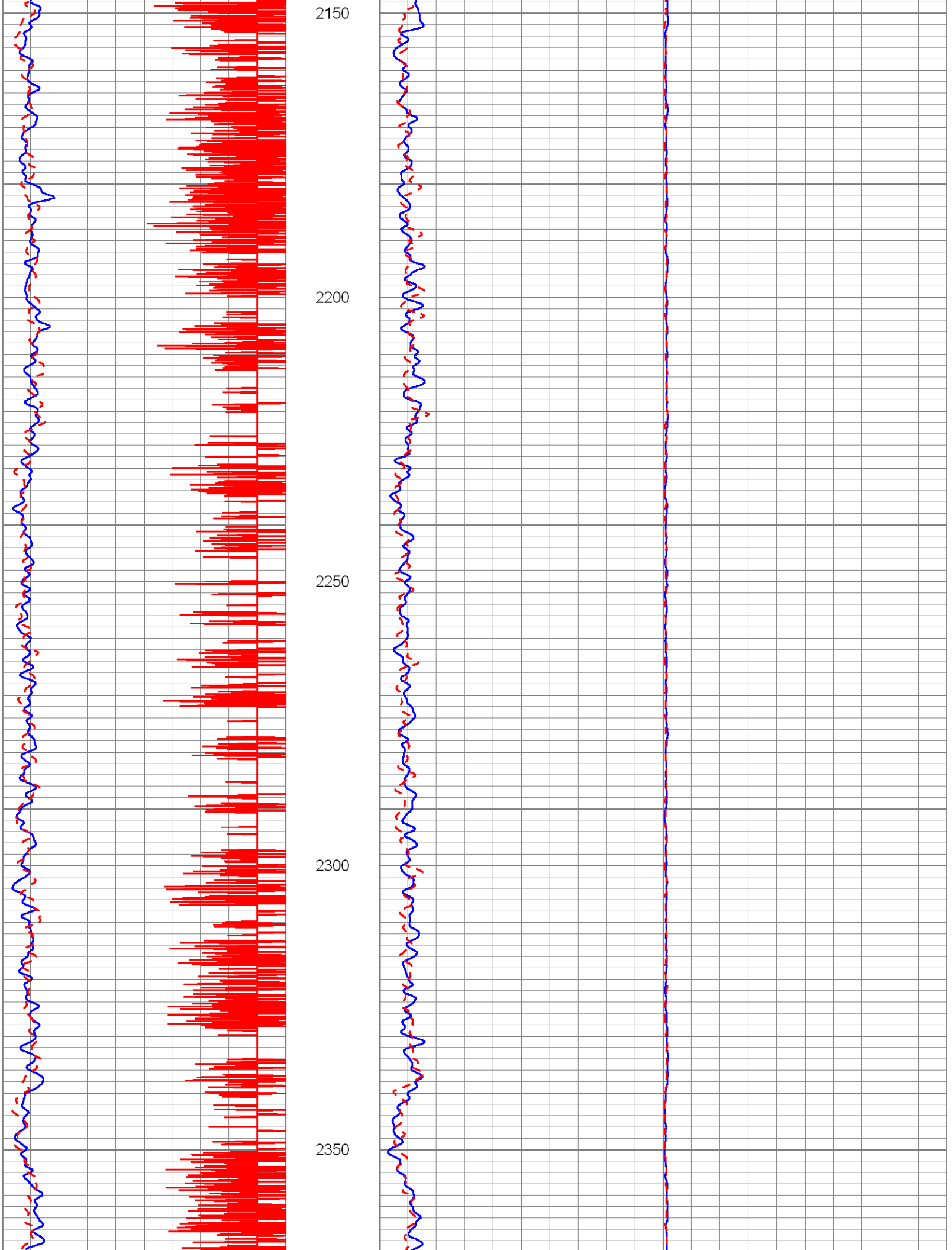
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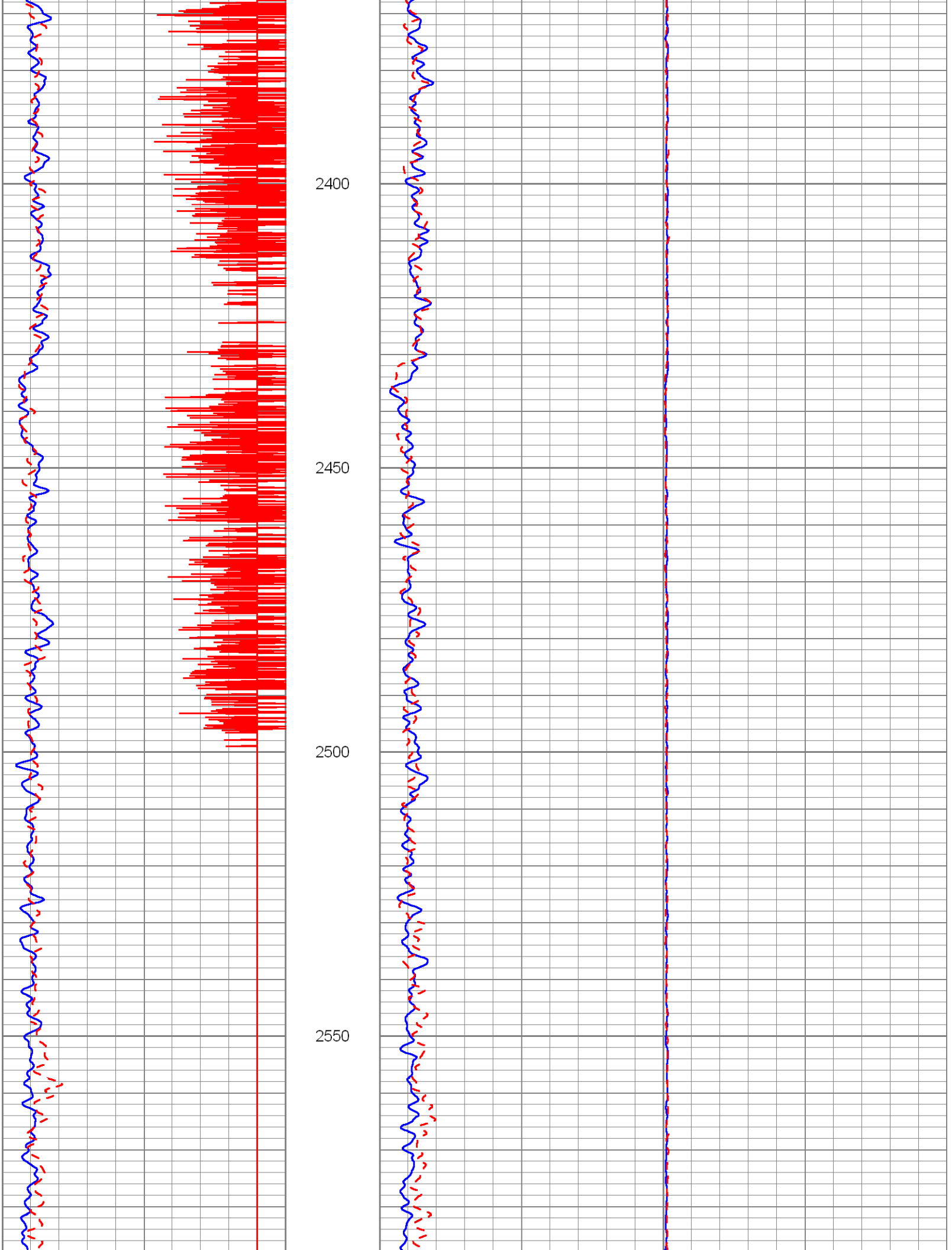
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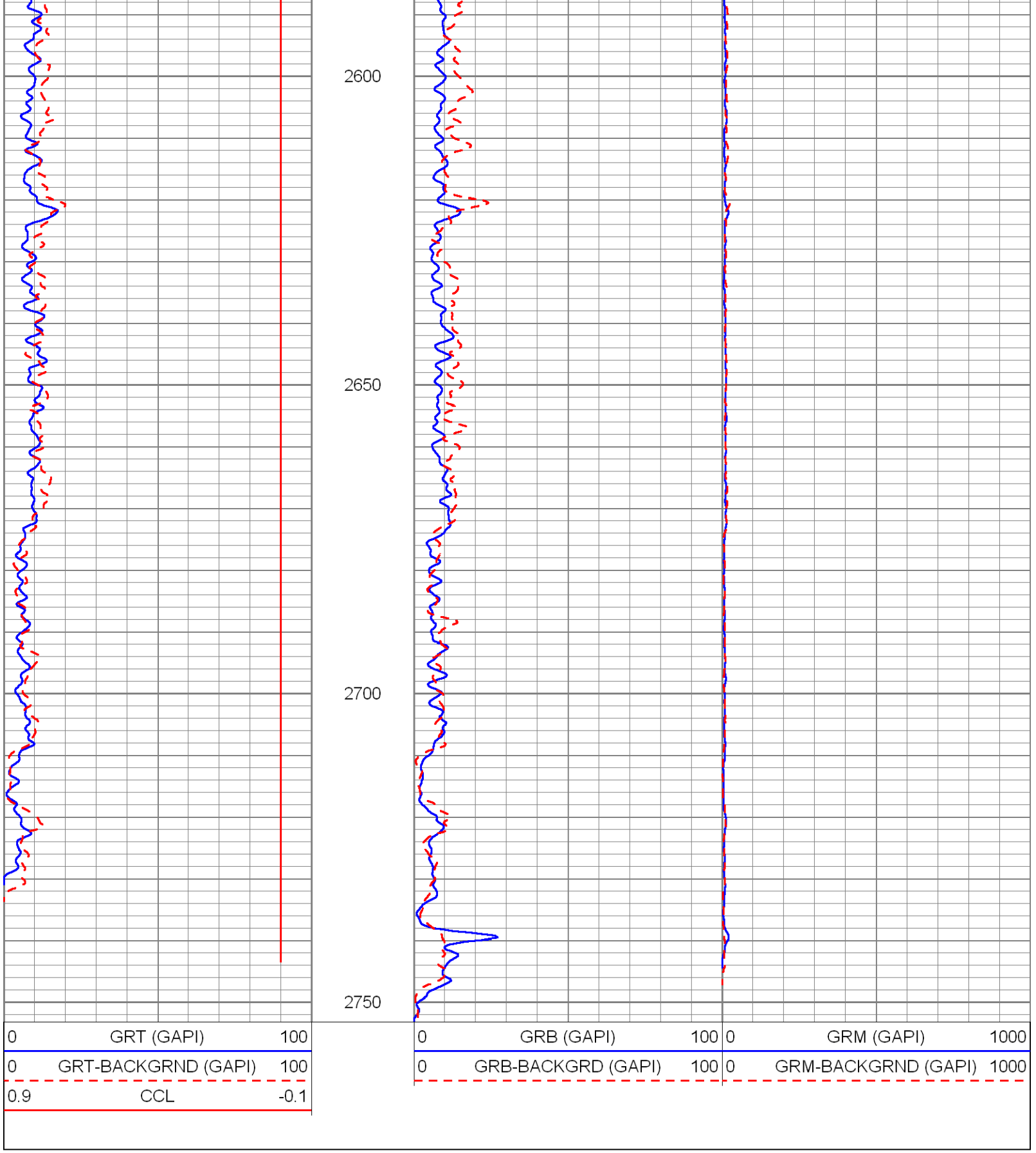
2500
2550

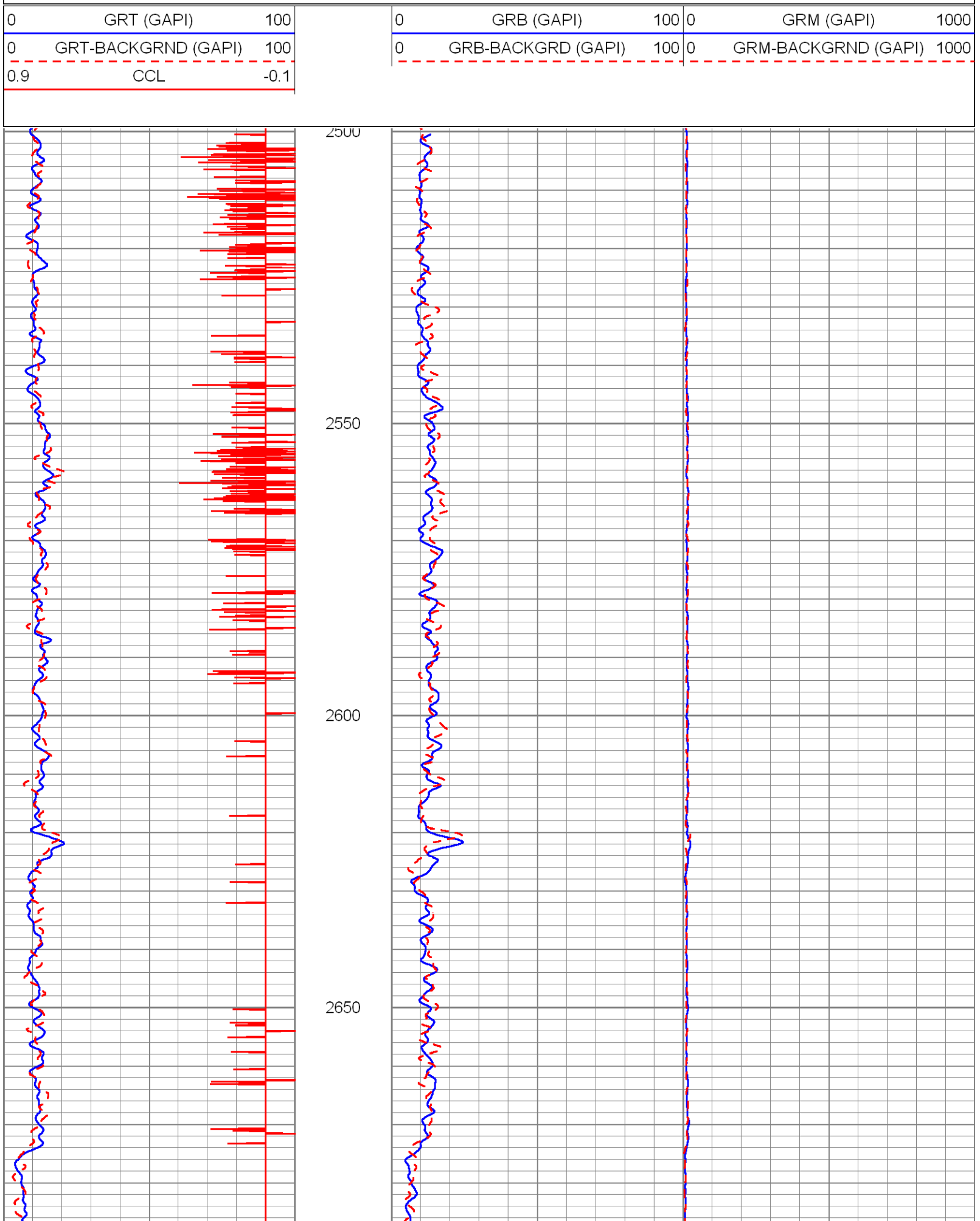


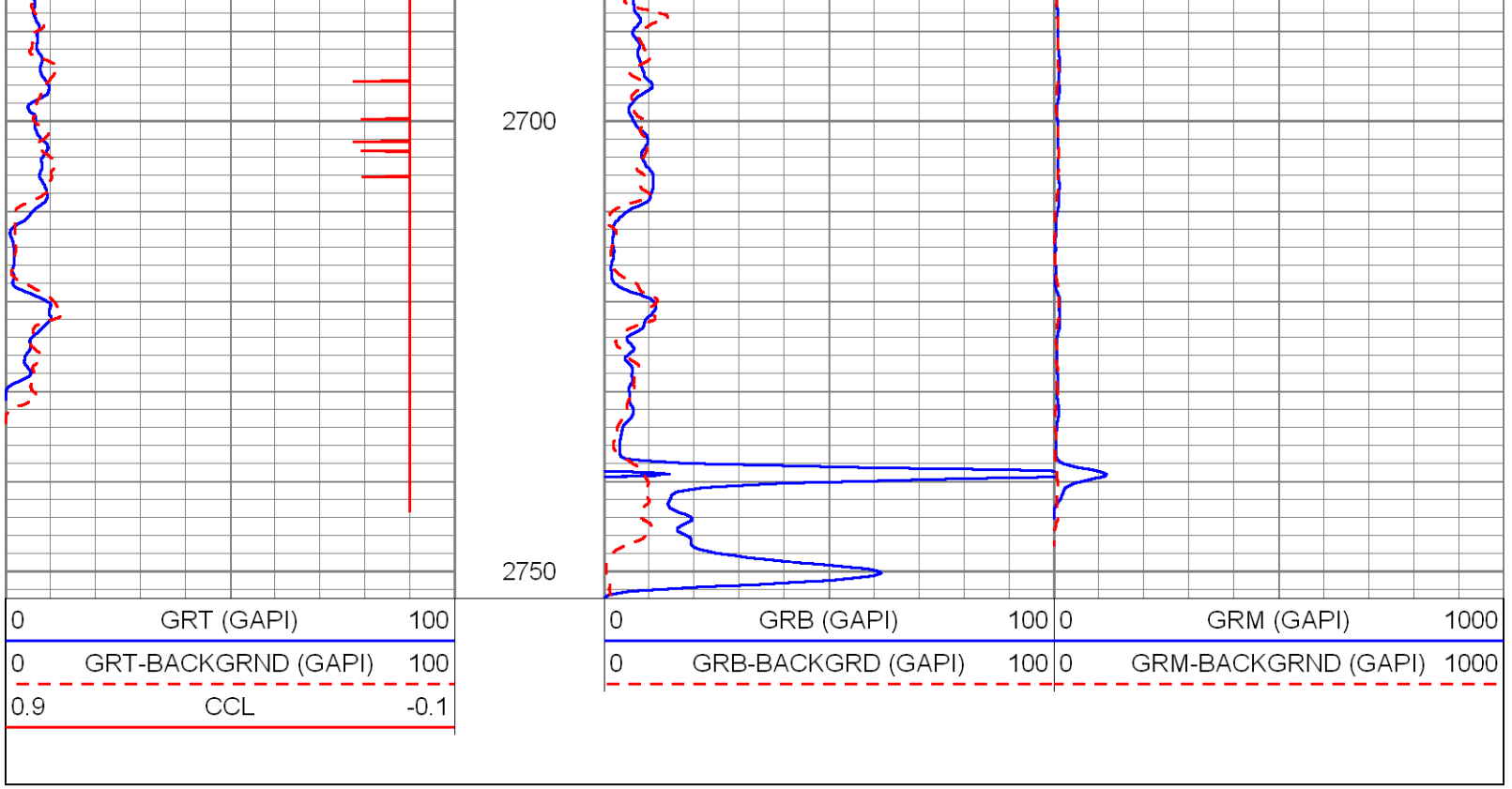
YOUNGQUIST BROTHERS

LOP #2

Database File: c:\warrior\data\2013\mit\south dade\data base\sdwwtp-iw-6.db
Dataset Pathname: pass7

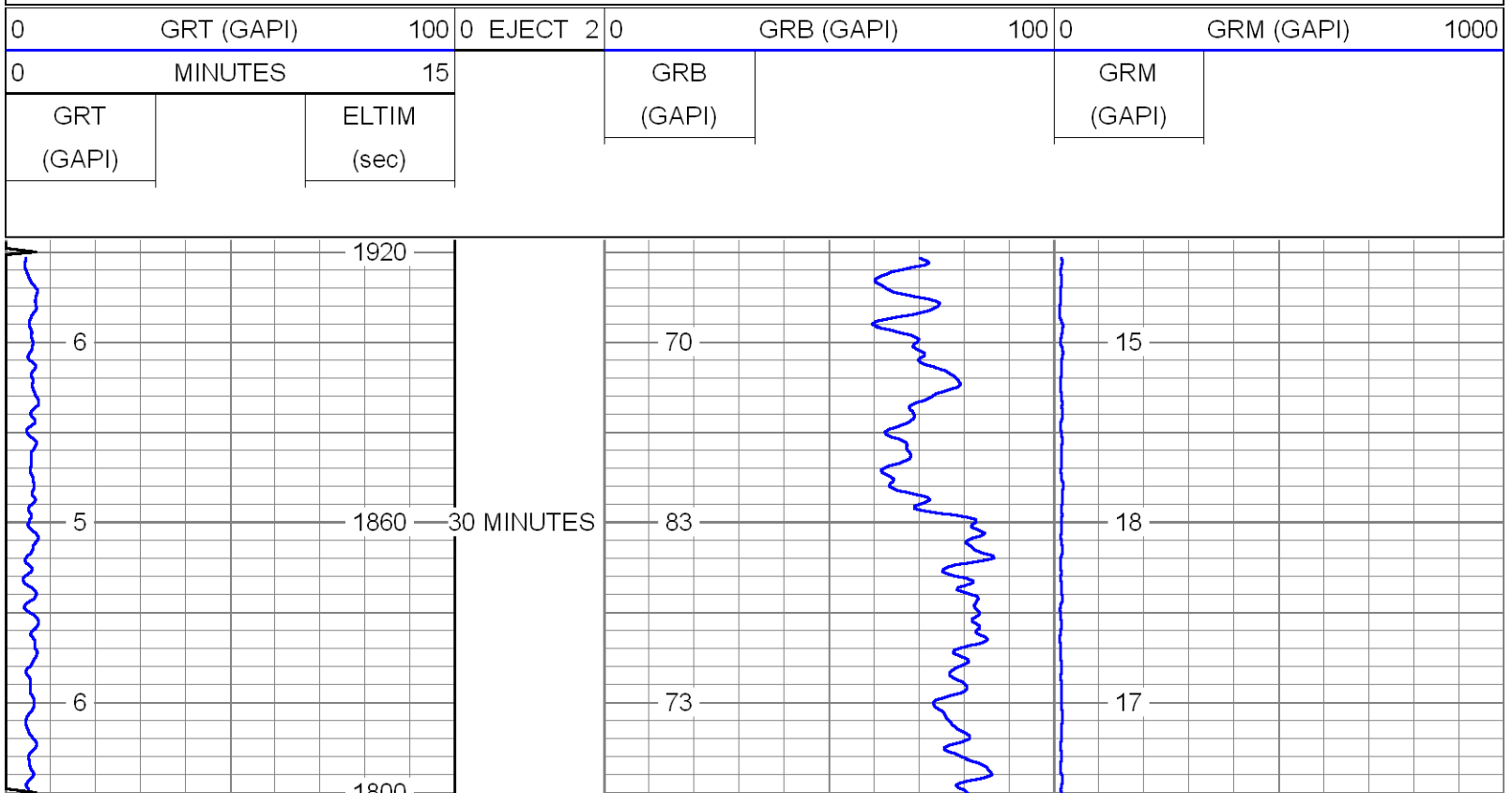
Presentation Format: rts
Dataset Creation: Fri Aug 23 14:26:56 2013 by Log SOC 110722
Charted by: Depth in Feet scaled 1:240

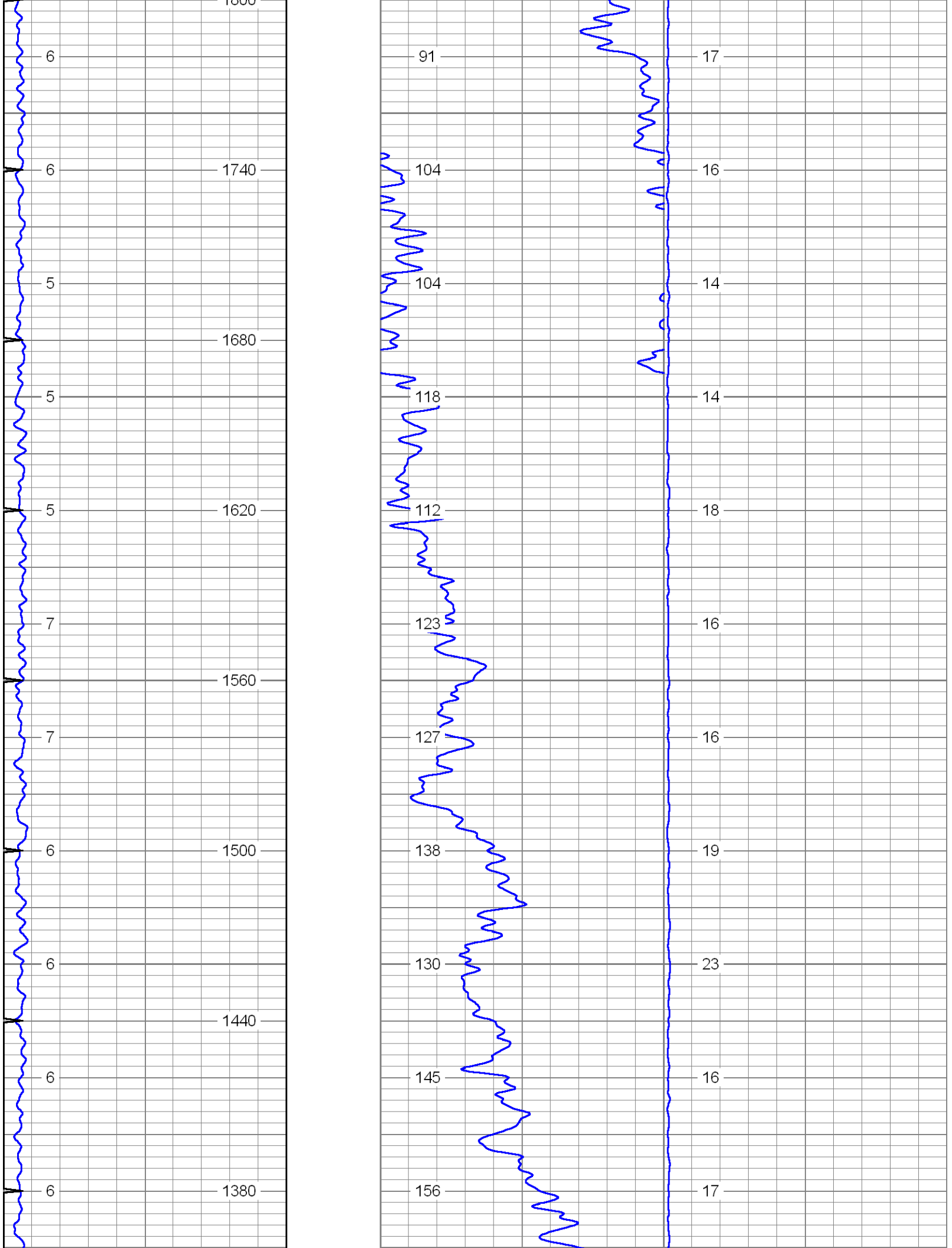


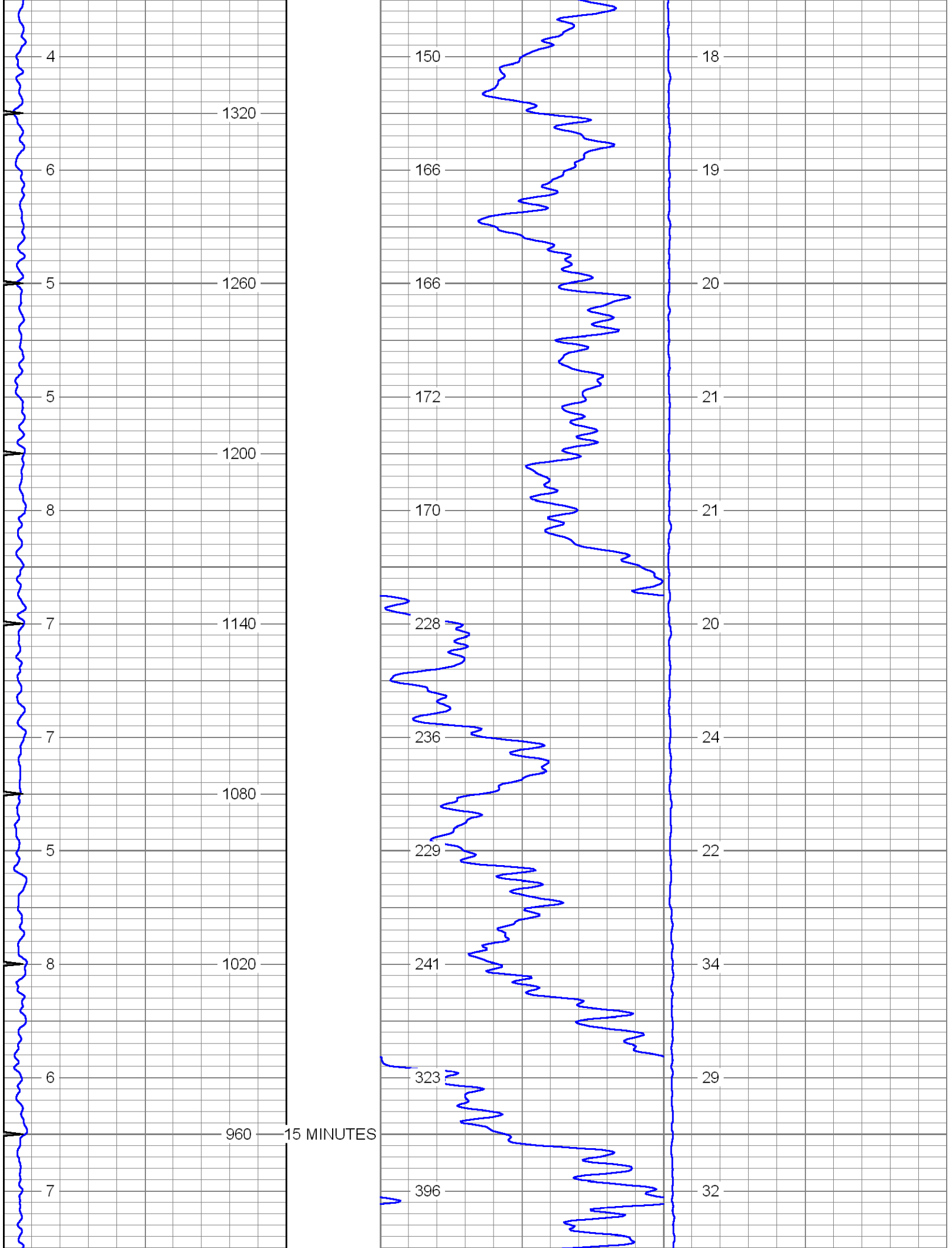


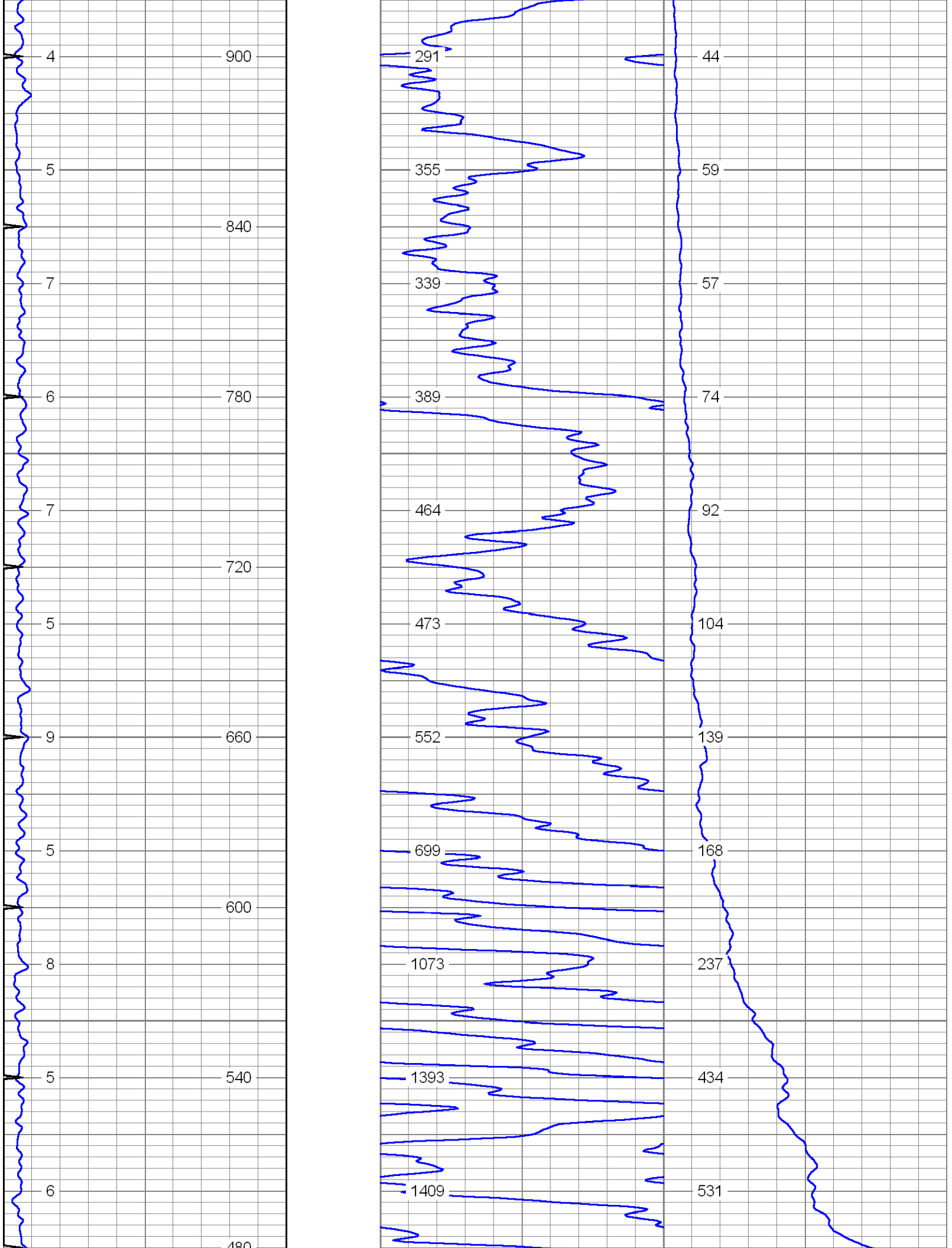
DYNAMIC TEST #2 (72 GPM)

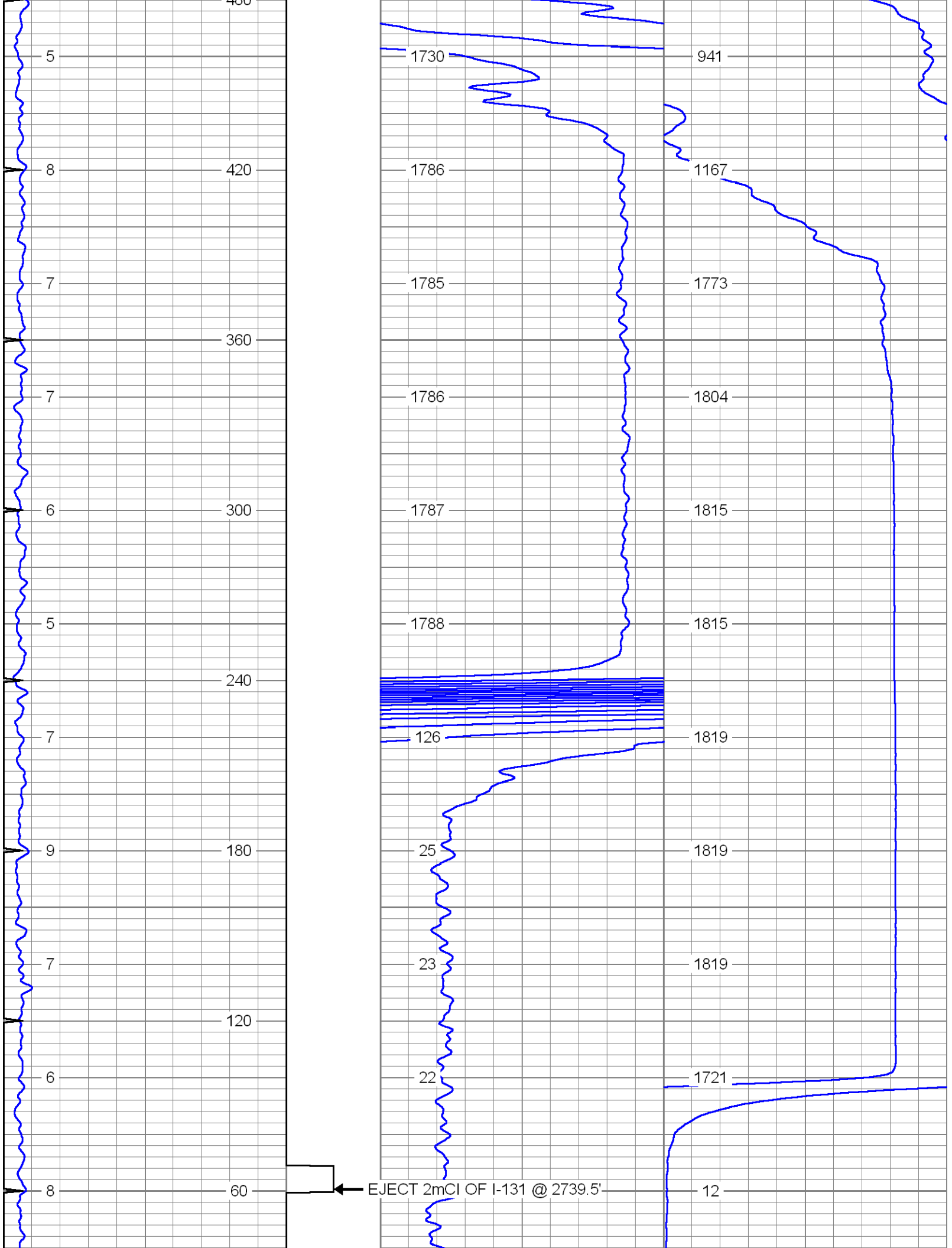
Database File: c:\warrior\data\2013\mit\south dade\data base\sdwwtp-iw-6.db
Dataset Pathname: pass6
Presentation Format: rtstime
Dataset Creation: Fri Aug 23 13:50:19 2013 by Log SOC 110722
Charted by: Depth in Feet scaled 1:240

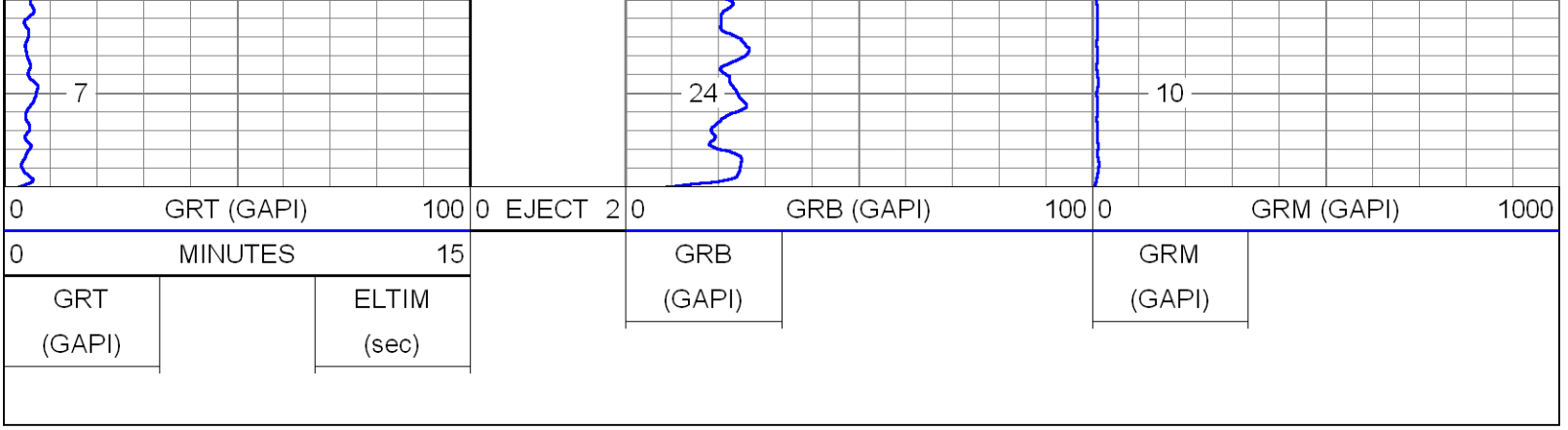



1800
6
91
17
6
1740
104
16
5
104
14
1680
5
118
14
5
1620
112
18
7
123
16
1560
7
127
16
6
1500
138
19
6
130
23
1440
6
145
16
6
1380
156
17


4
1320
6
5
1260
5
1200
8
7
1140
7
1080
5
8
1020
6
960
15 MINUTES
7
150
166
166
172
170
228
236
229
241
323
396
18
19
20
21
21
20
24
22
34
29
32

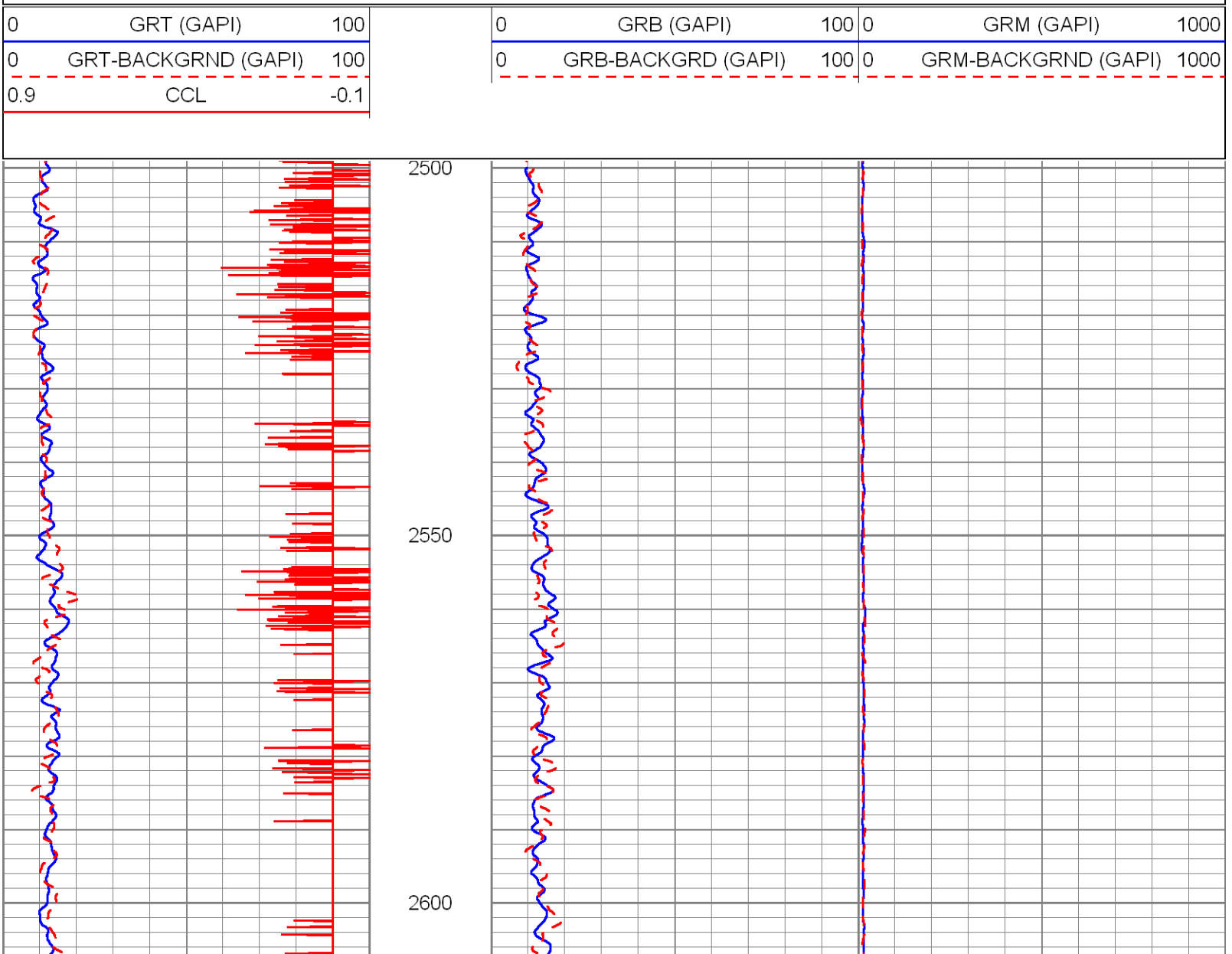

4
900
5
840
7
780
6
720
7
660
5
600
9
540
5
480
8
5
6
291
355
339
389
464
473
552
699
1073
1393
1409
44
59
57
74
92
104
139
168
237
434
531

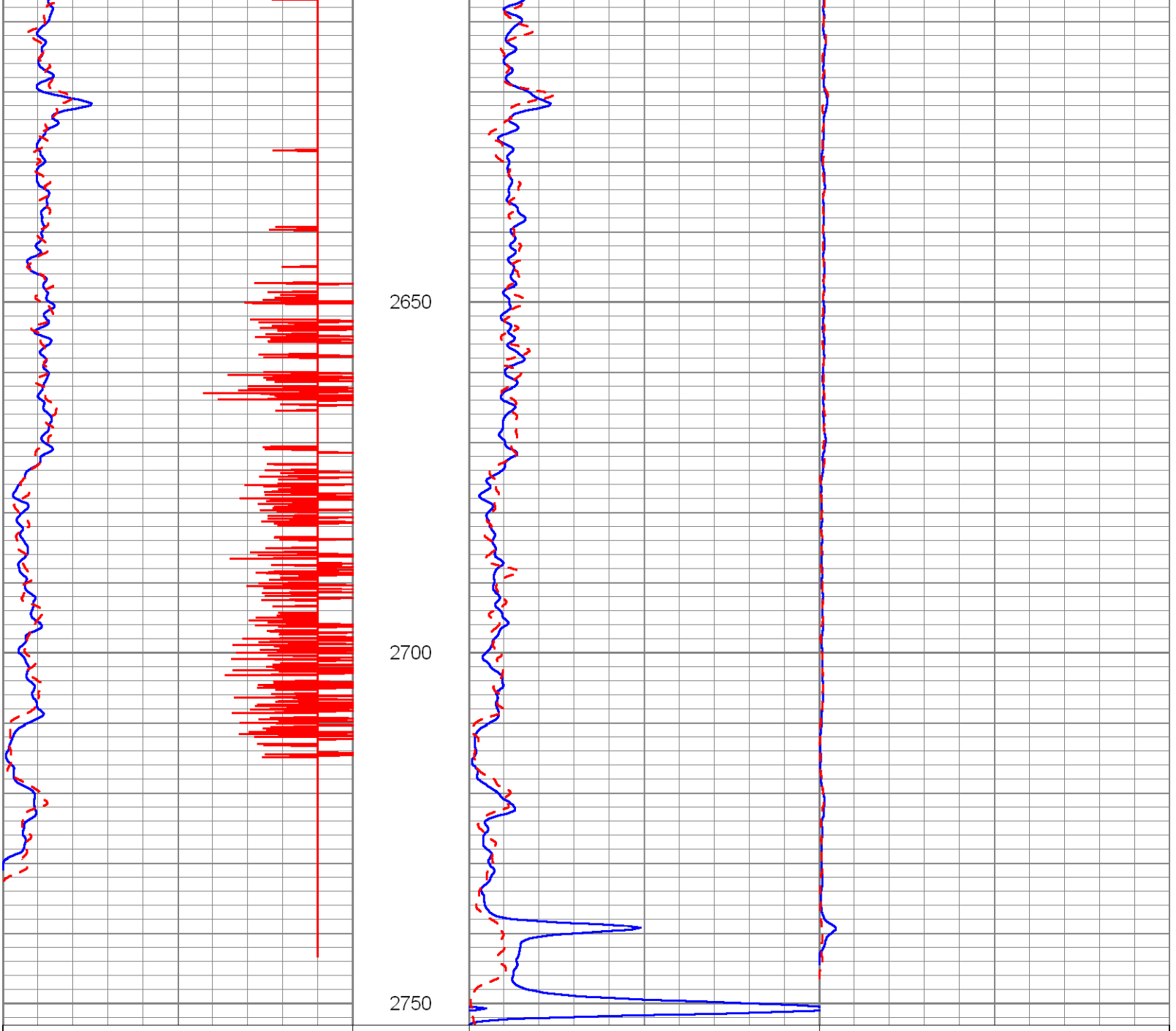

480
5
1730
941
8
420
1786
1167
7
1785
1773
360
7
1786
1804
6
300
1787
1815
5
1788
1815
240
7
126
1819
9
180
25
1819
7
23
1819
120
6
22
1721
8
60
EJECT 2mCI OF I-131 @ 2739.5'
12



LOP #1

Database File:	c:\warrior\data\2013\mit\south dade\data base\sdwwtp-iw-6.db
Dataset Pathname:	pass5
Presentation Format:	rts
Dataset Creation:	Fri Aug 23 13:03:58 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:240

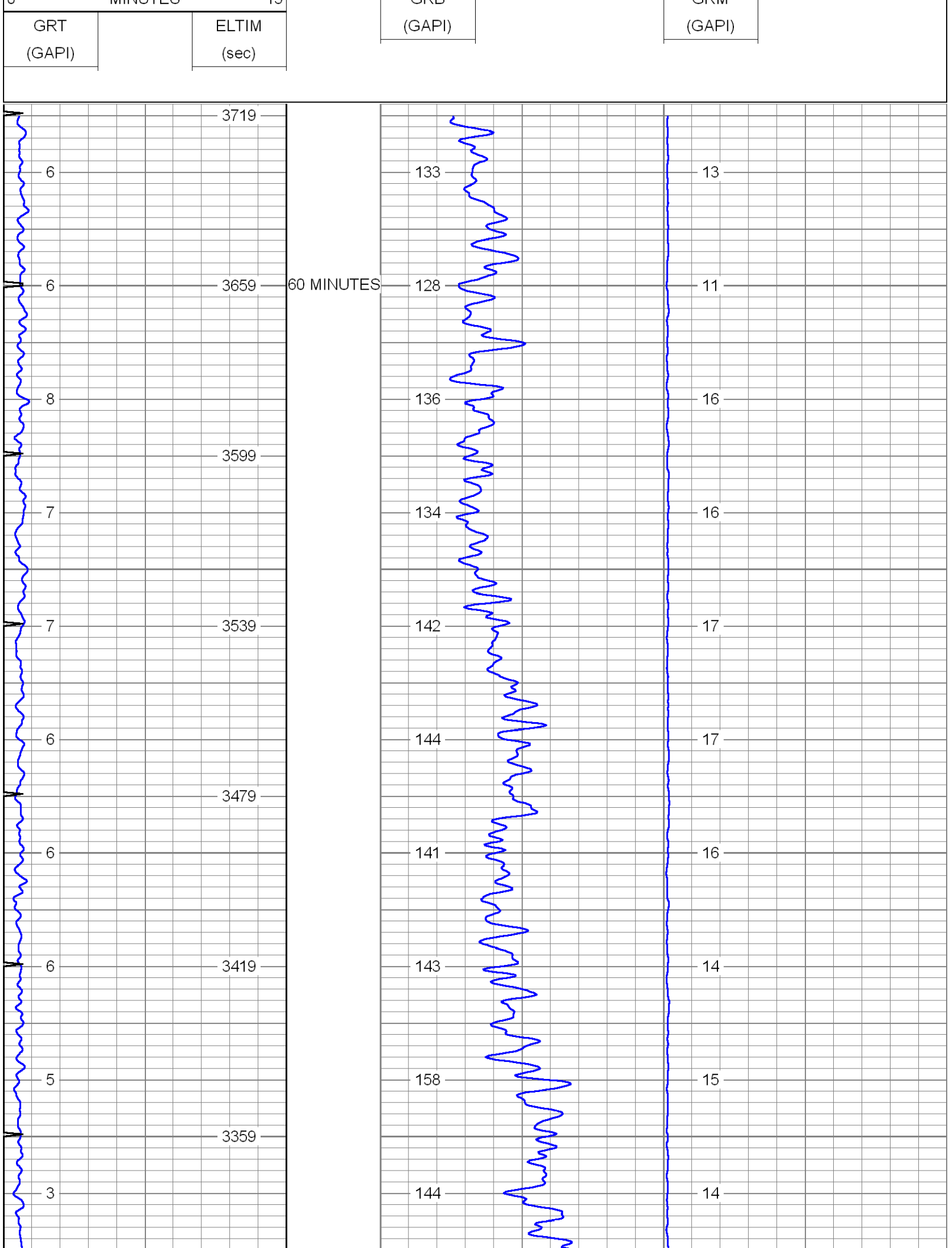


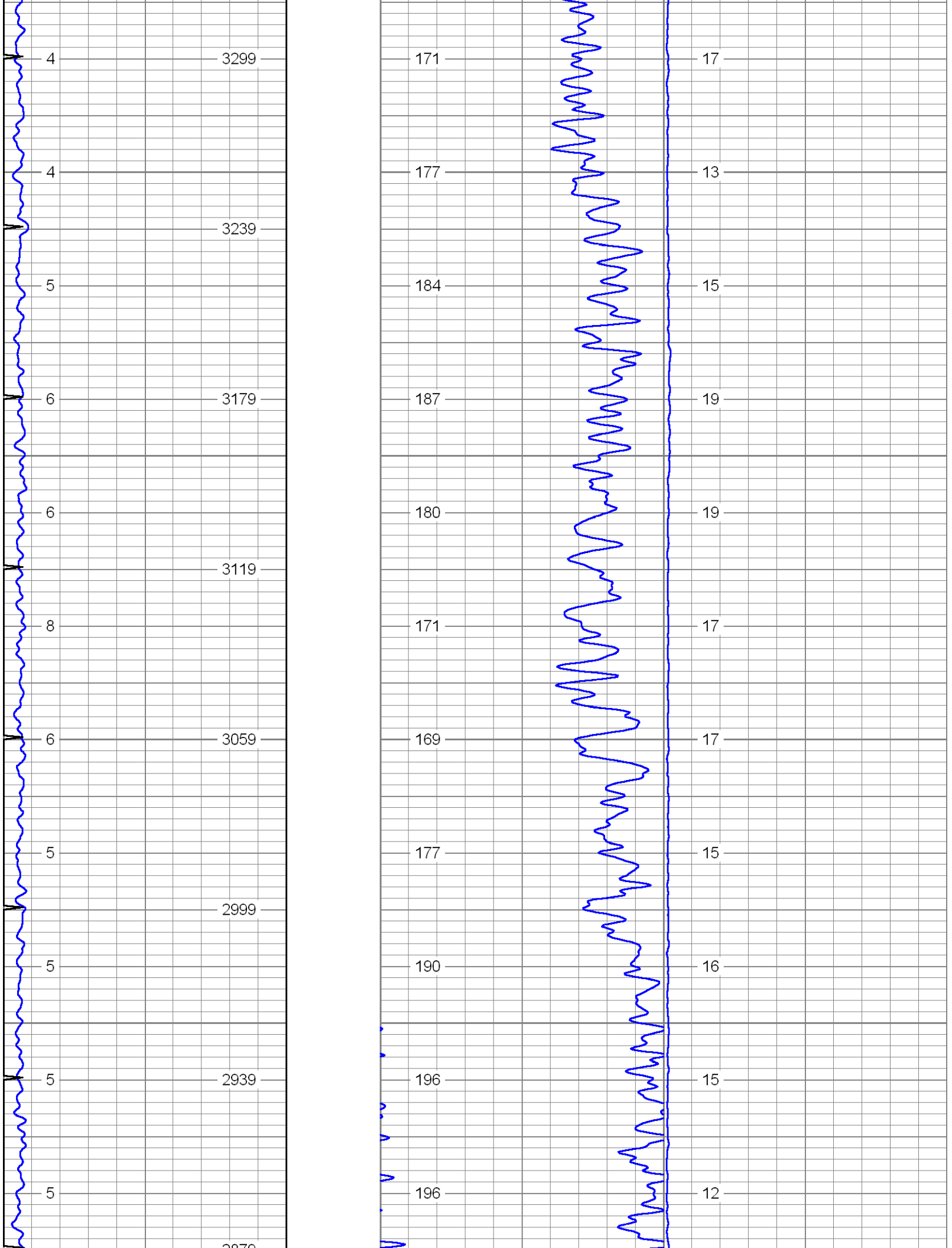


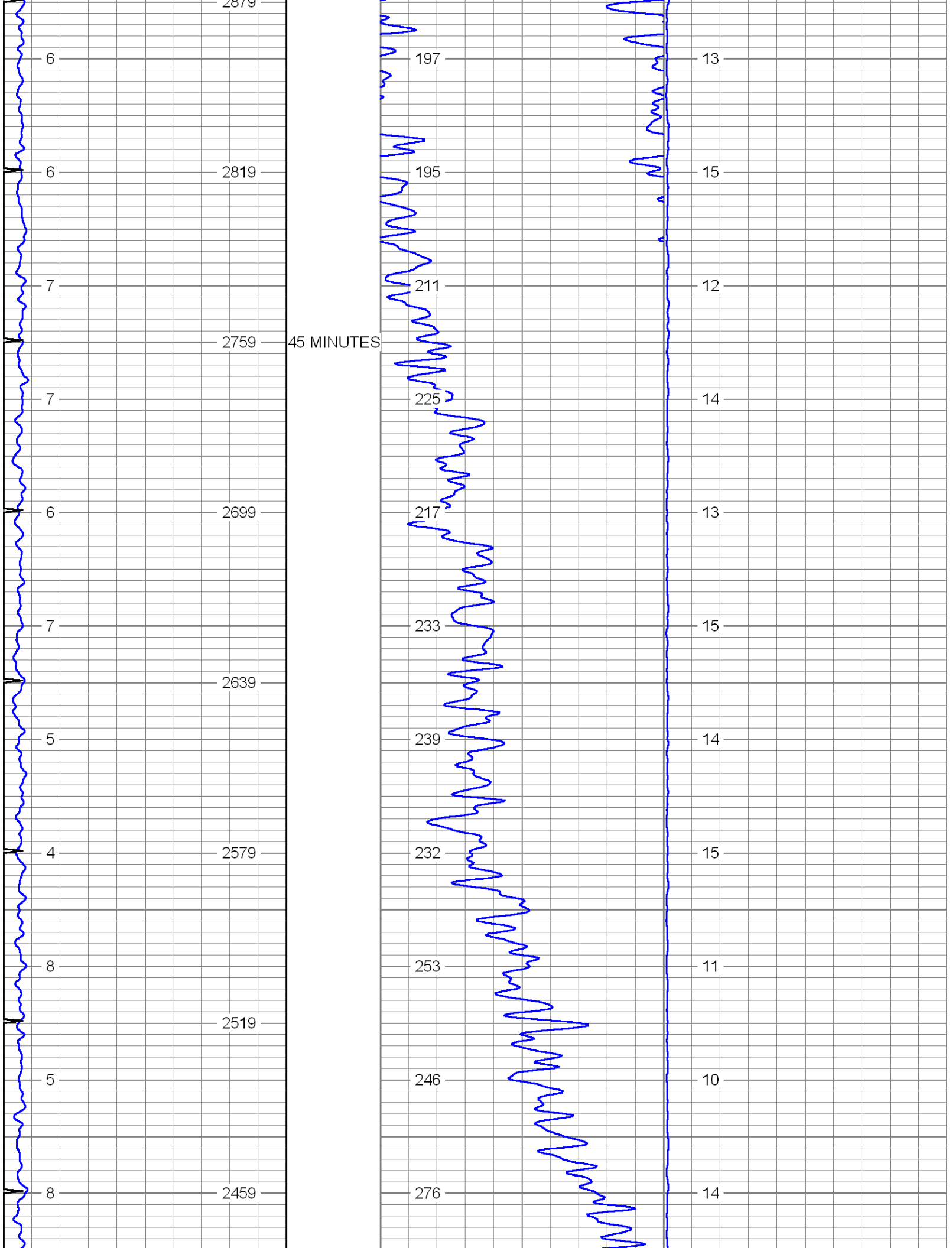
DYNAMIC TEST #1 (76 GPM)

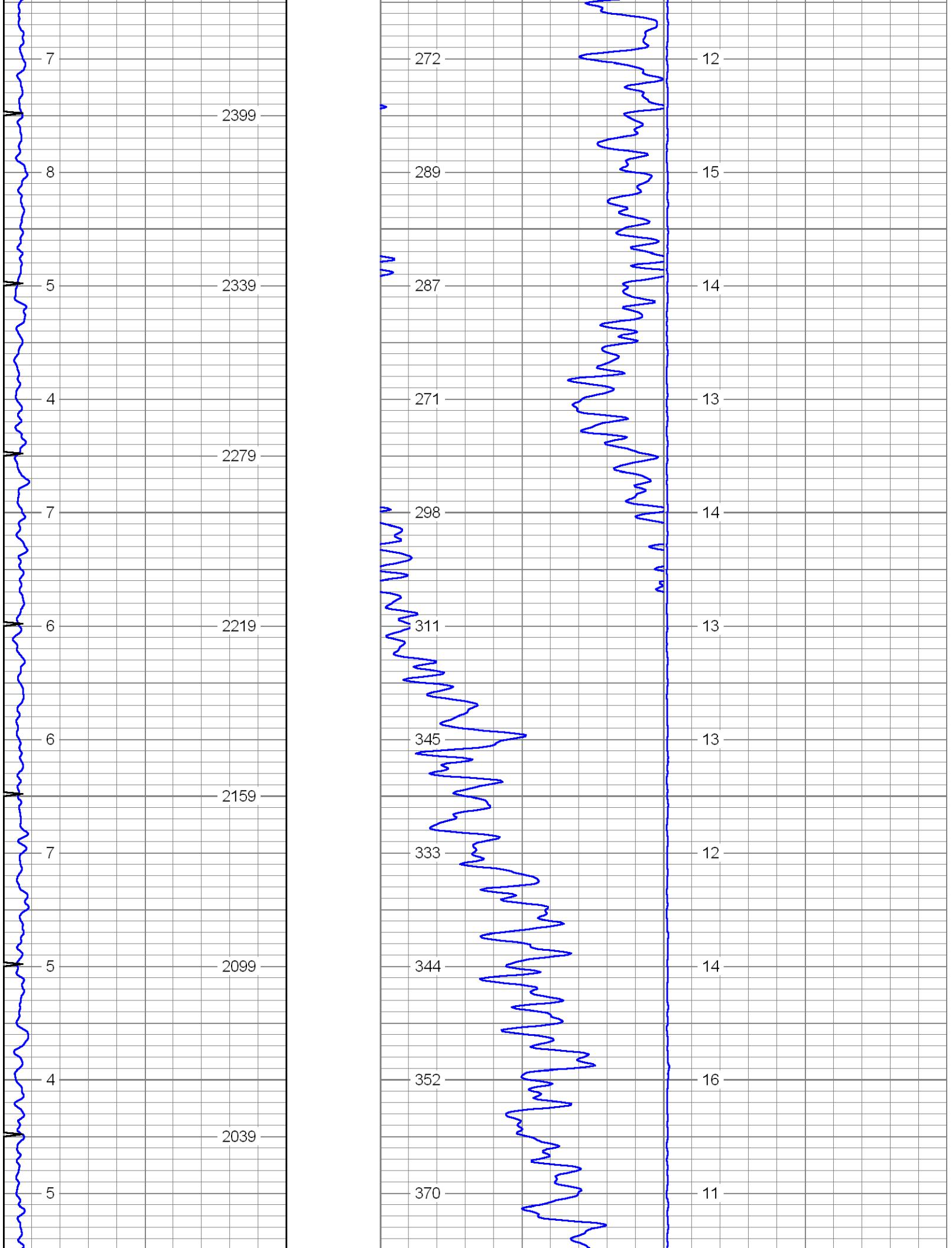
Database File:	c:\warrior\data\2013\mit\south dade\data base\sdwwtp-iw-6.db
Dataset Pathname:	pass4
Presentation Format:	rtstime
Dataset Creation:	Fri Aug 23 11:59:57 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:240

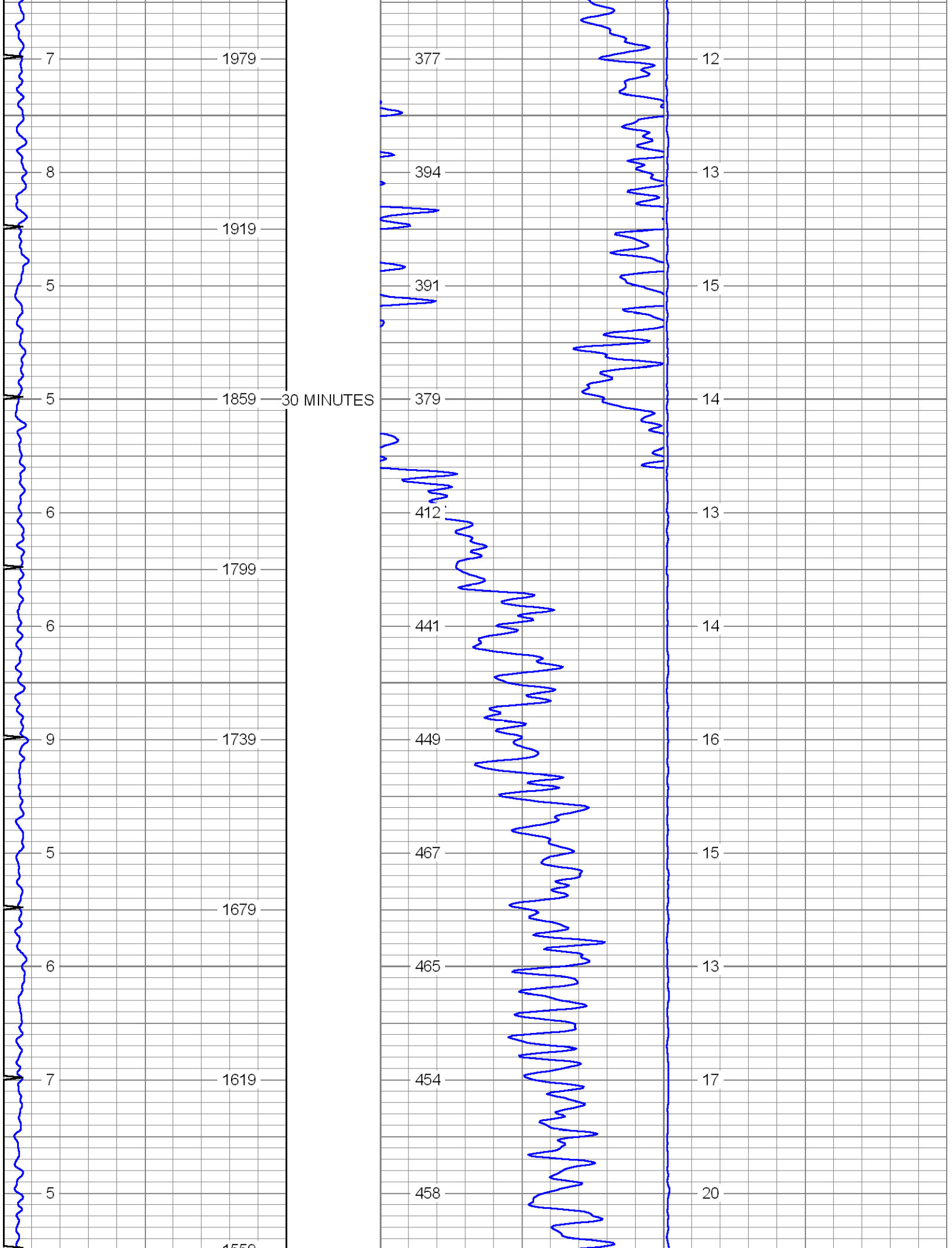
0	GRT (GAPI)	100	0 EJECT 2	0	GRB (GAPI)	100	0 GRM (GAPI) 1000
0	MINUTES	15			GRB		GRM

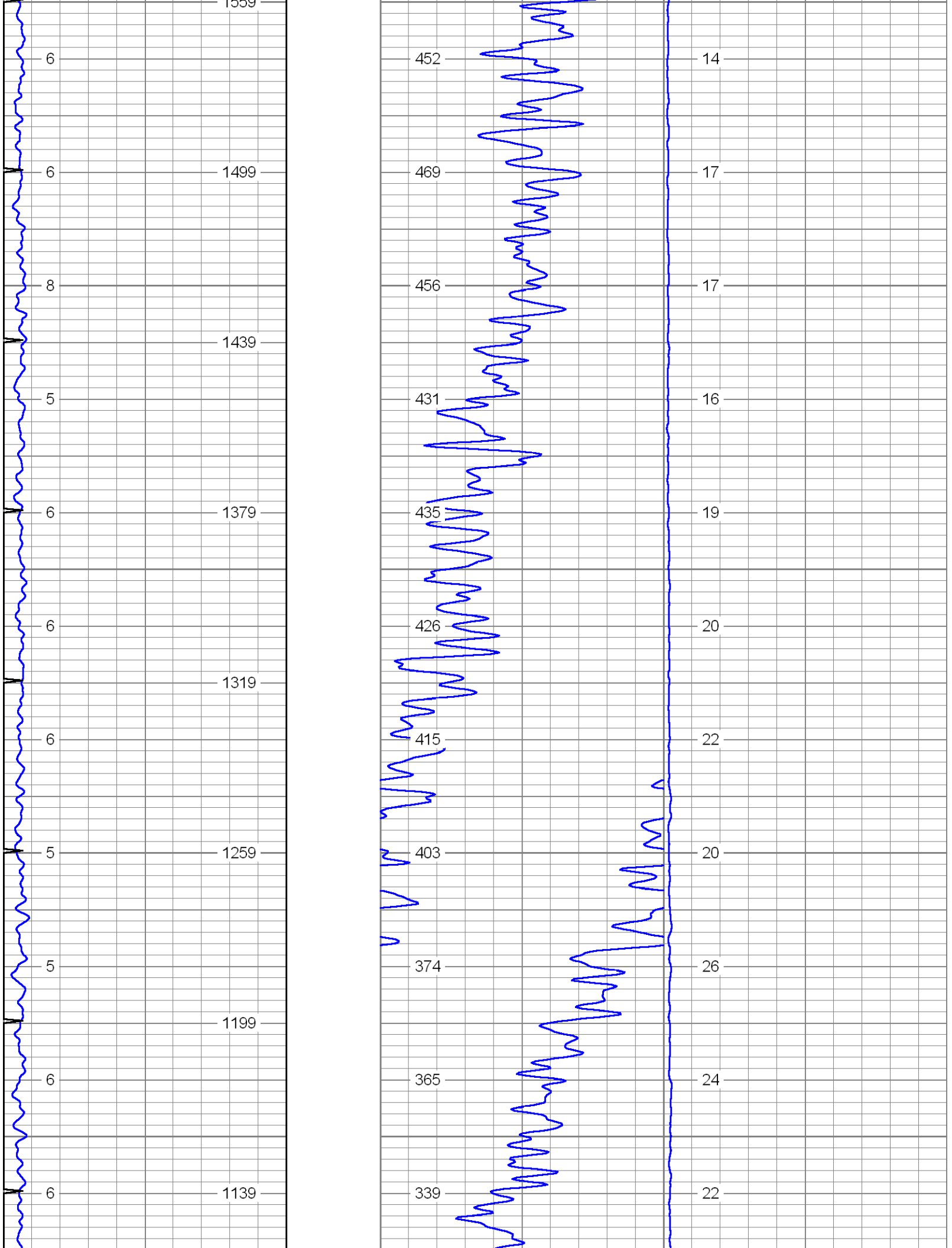

MINUTES
GRT
(GAPI)
ELTIM
(sec)
GRB
(GAPI)
GRM
(GAPI)
3719
6
133
13
6
3659
60 MINUTES
128
11
8
136
16
3599
7
134
16
7
3539
142
17
6
144
17
3479
6
141
16
6
3419
143
14
5
158
15
3359
3
144
14

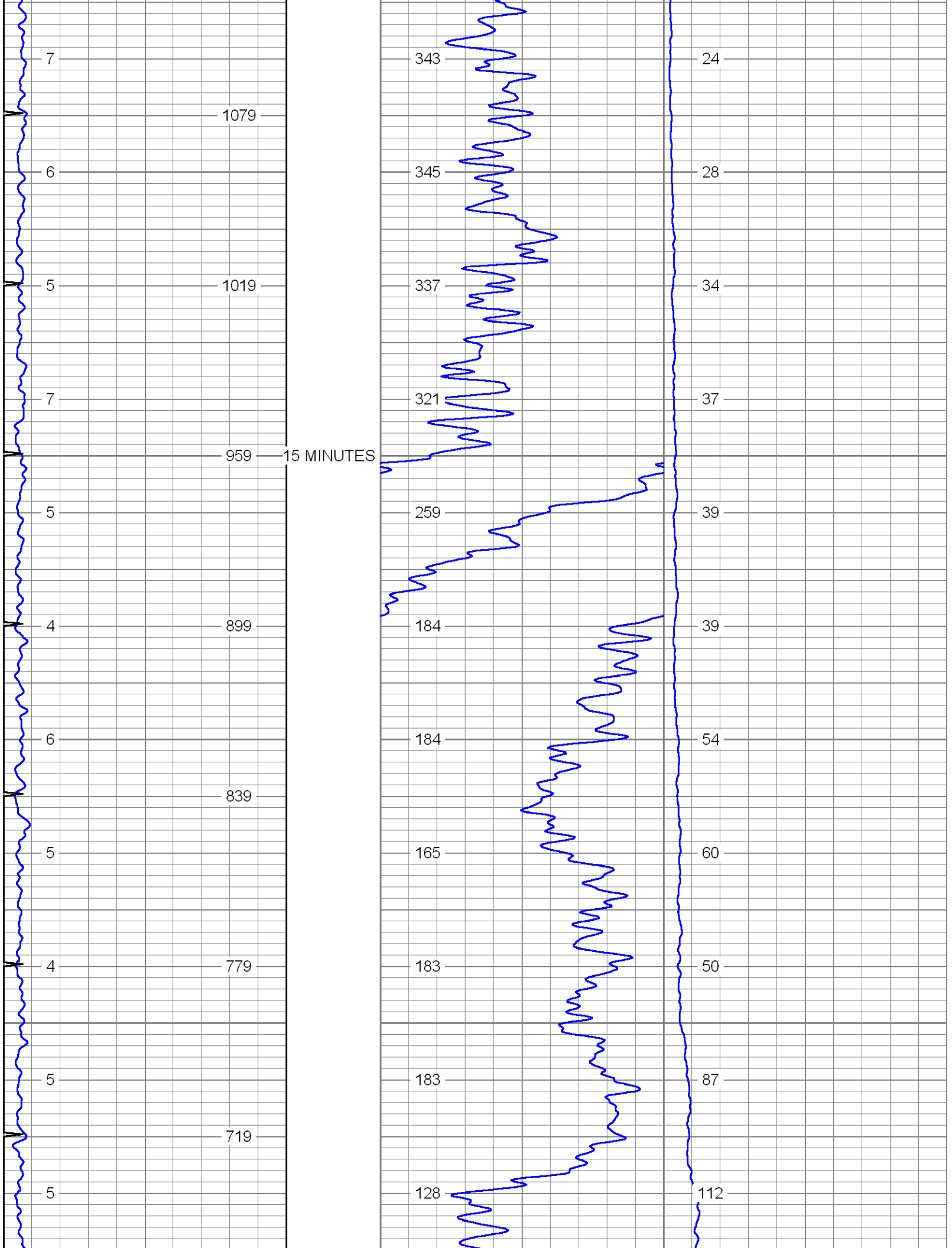

4
3299
171
17
4
177
13
3239
5
184
15
6
3179
187
19
6
180
19
3119
8
171
17
6
3059
169
17
5
177
15
2999
5
190
16
5
2939
196
15
5
196
12

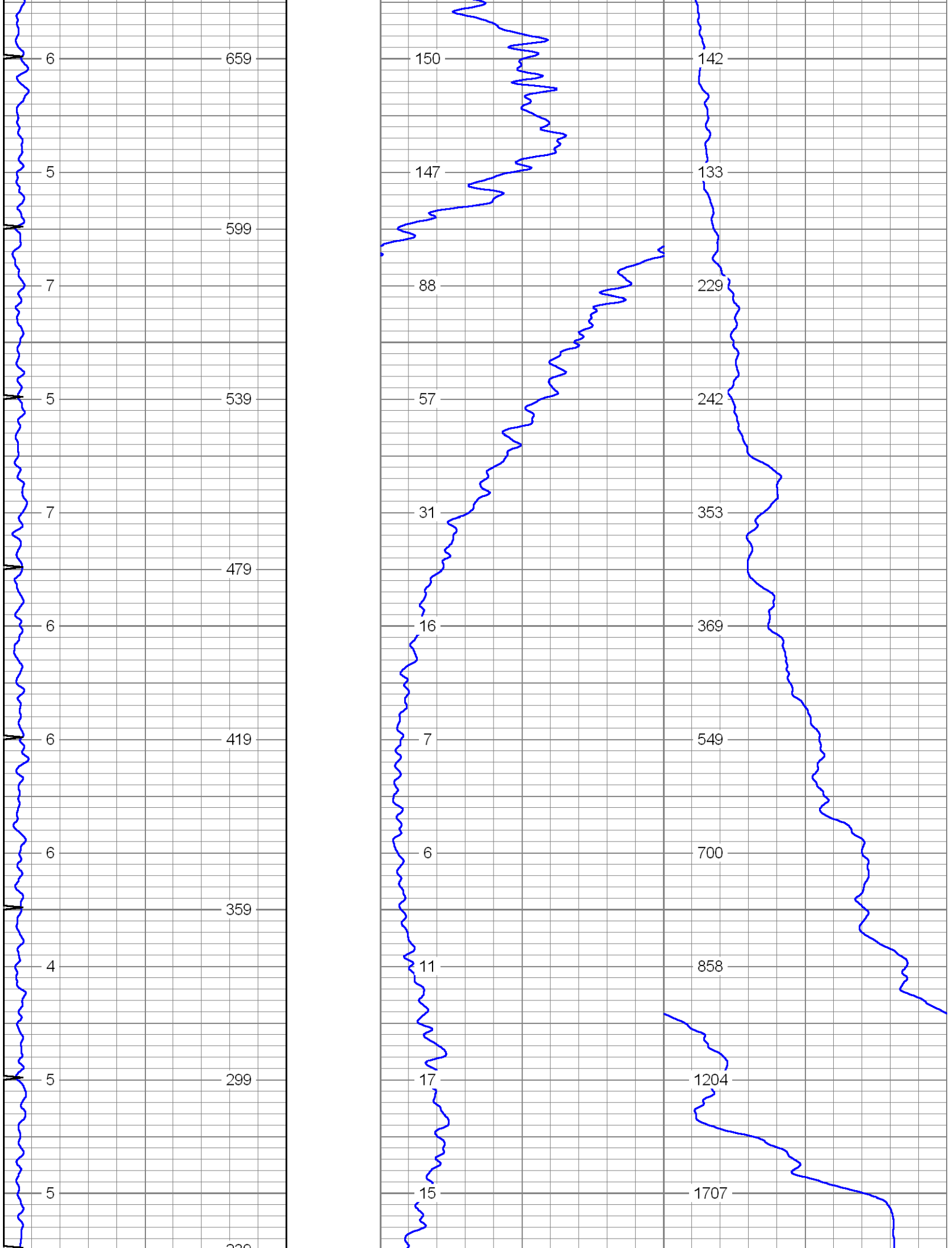

2879
6
197
13
6
2819
195
15
7
211
12
2759
45 MINUTES
7
225
14
6
2699
217
13
7
233
15
2639
5
239
14
4
2579
232
15
8
253
11
2519
5
246
10
8
2459
276
14

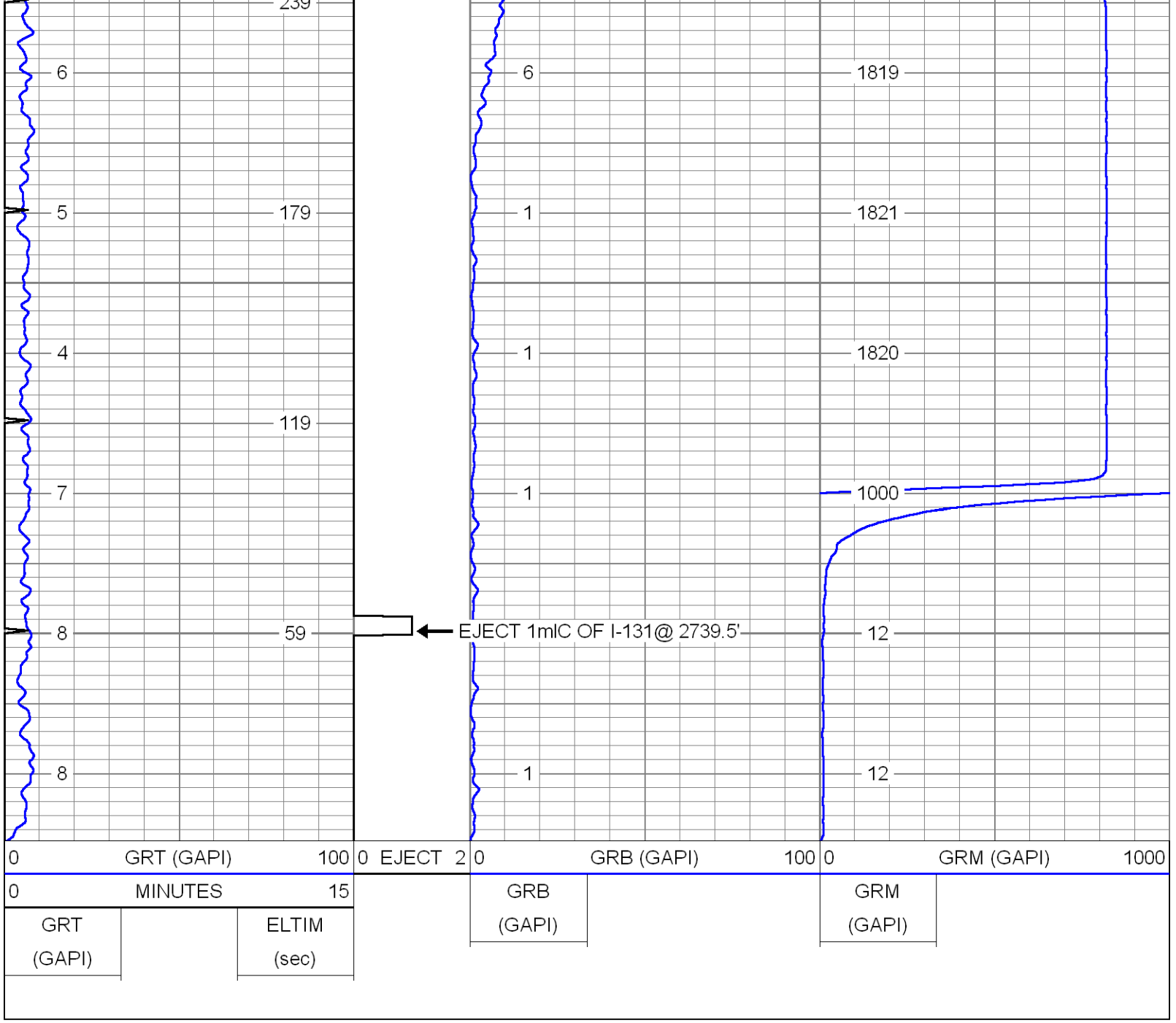

7
2399
8
5
2339
4
2279
7
6
2219
6
2159
7
5
2099
4
2039
5
272
12
289
15
287
14
271
13
298
14
311
13
345
13
333
12
344
14
352
16
370
11


7
1979
377
12
8
394
13
1919
5
391
15
5
1859
30 MINUTES
379
14
6
412
13
1799
6
441
14
9
1739
449
16
5
467
15
1679
6
465
13
7
1619
454
17
5
458
20


1559
6
452
14
6
1499
469
17
8
456
17
1439
5
431
16
6
1379
435
19
6
426
20
1319
6
415
22
5
1259
403
20
5
374
26
1199
6
365
24
6
1139
339
22

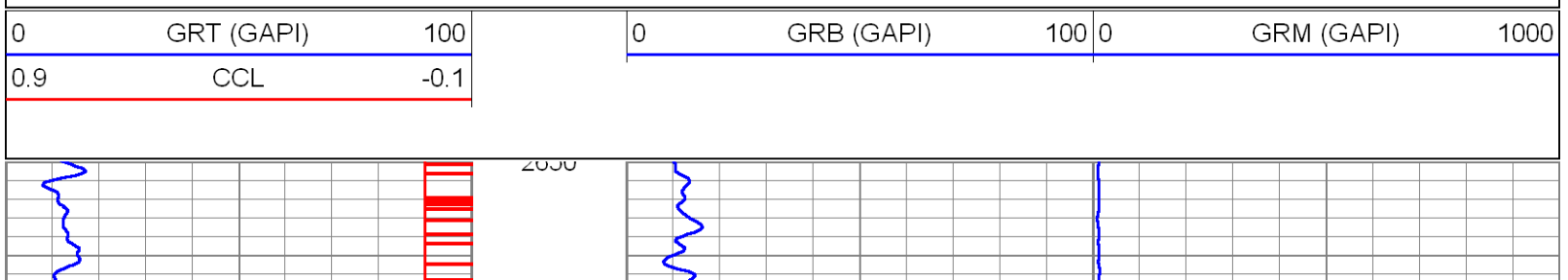

7
1079
6
5
1019
7
959
15 MINUTES
5
4
899
6
839
5
4
779
5
719
5
343
345
337
321
259
184
184
165
183
183
128
24
28
34
37
39
39
54
60
50
87
112

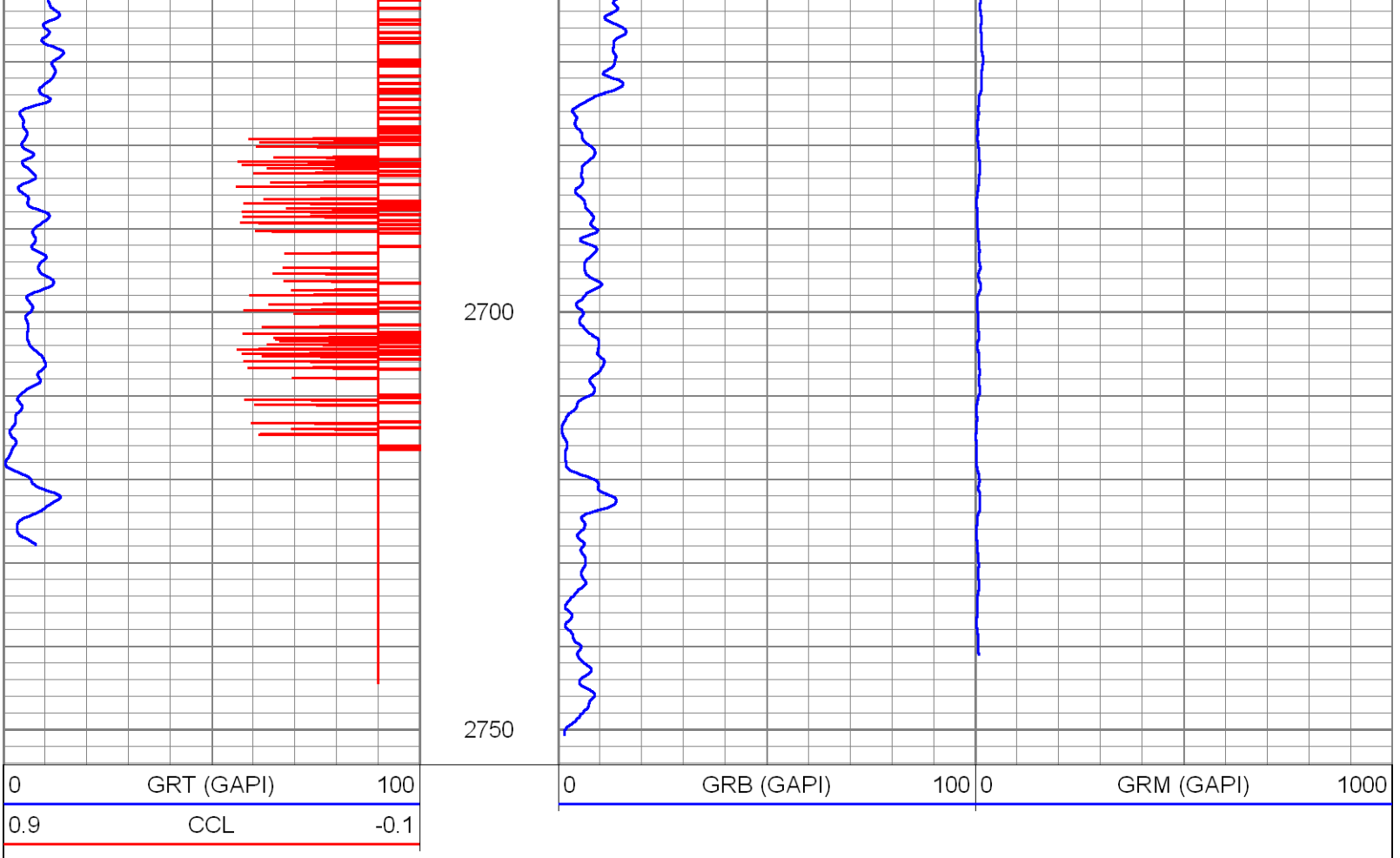

6
659
5
599
7
5
539
7
479
6
6
419
6
359
4
5
299
5
150
147
88
57
31
16
7
6
11
17
15
142
133
229
242
353
369
549
700
858
1204
1707



CASING TIE-IN

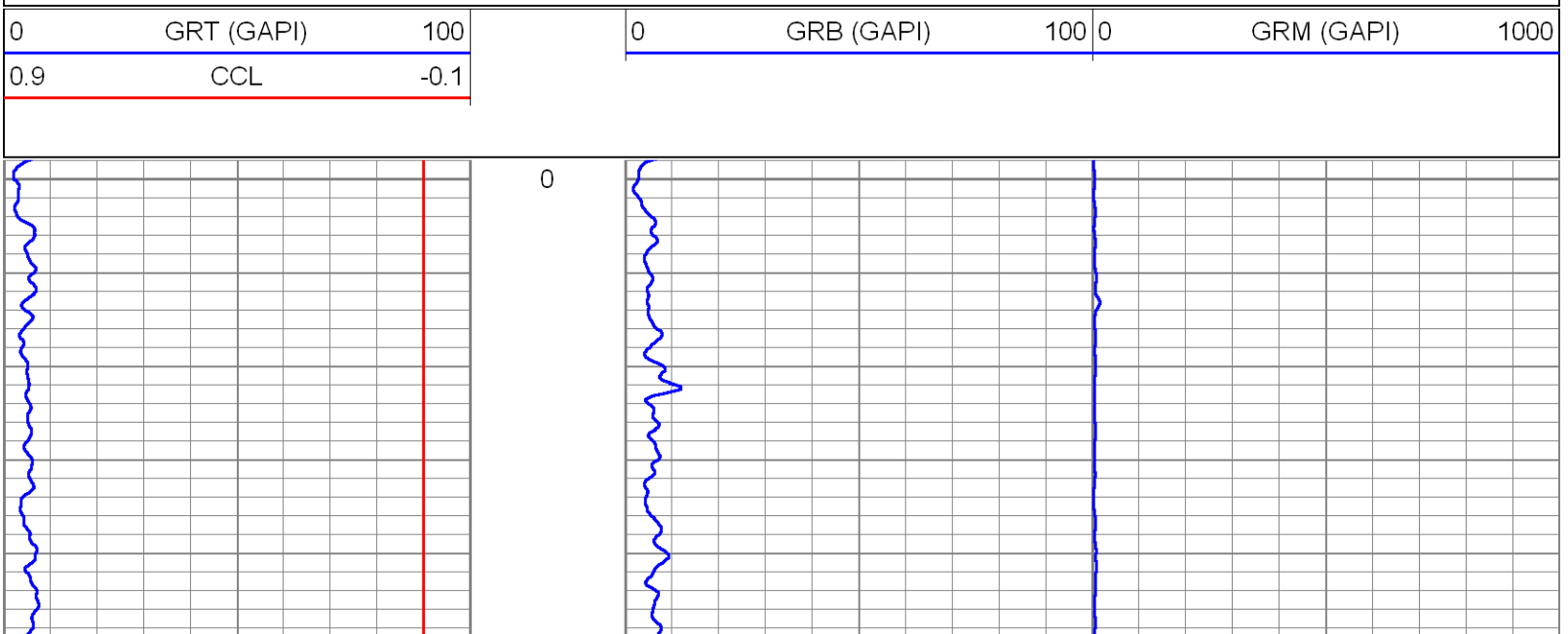
Database File: c:\warrior\data\2013\mit\south dade\data base\sdwwtp-iw-6.db
Dataset Pathname: pass3
Presentation Format: rts
Dataset Creation: Fri Aug 23 11:22:01 2013 by Log SOC 110722
Charted by: Depth in Feet scaled 1:240

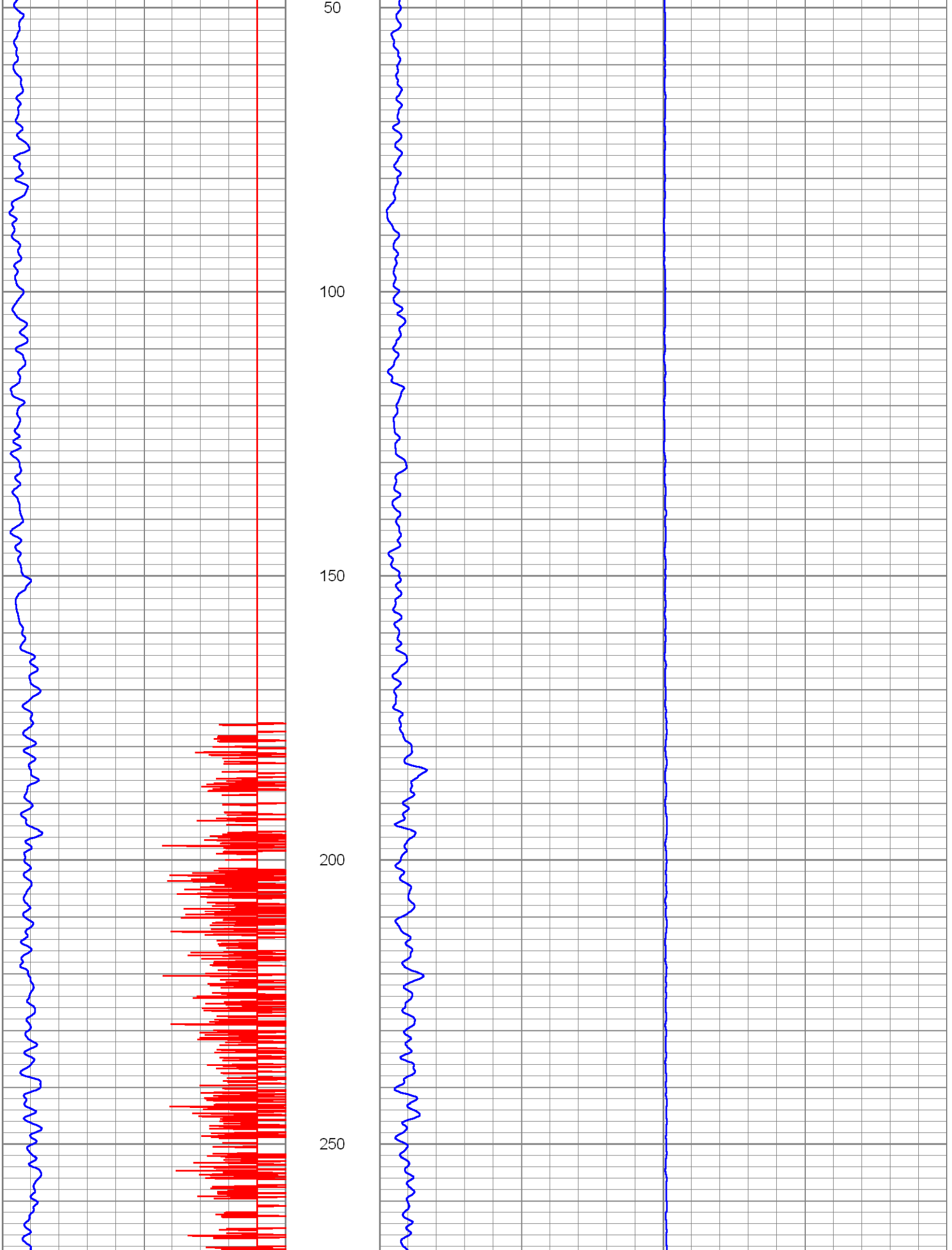


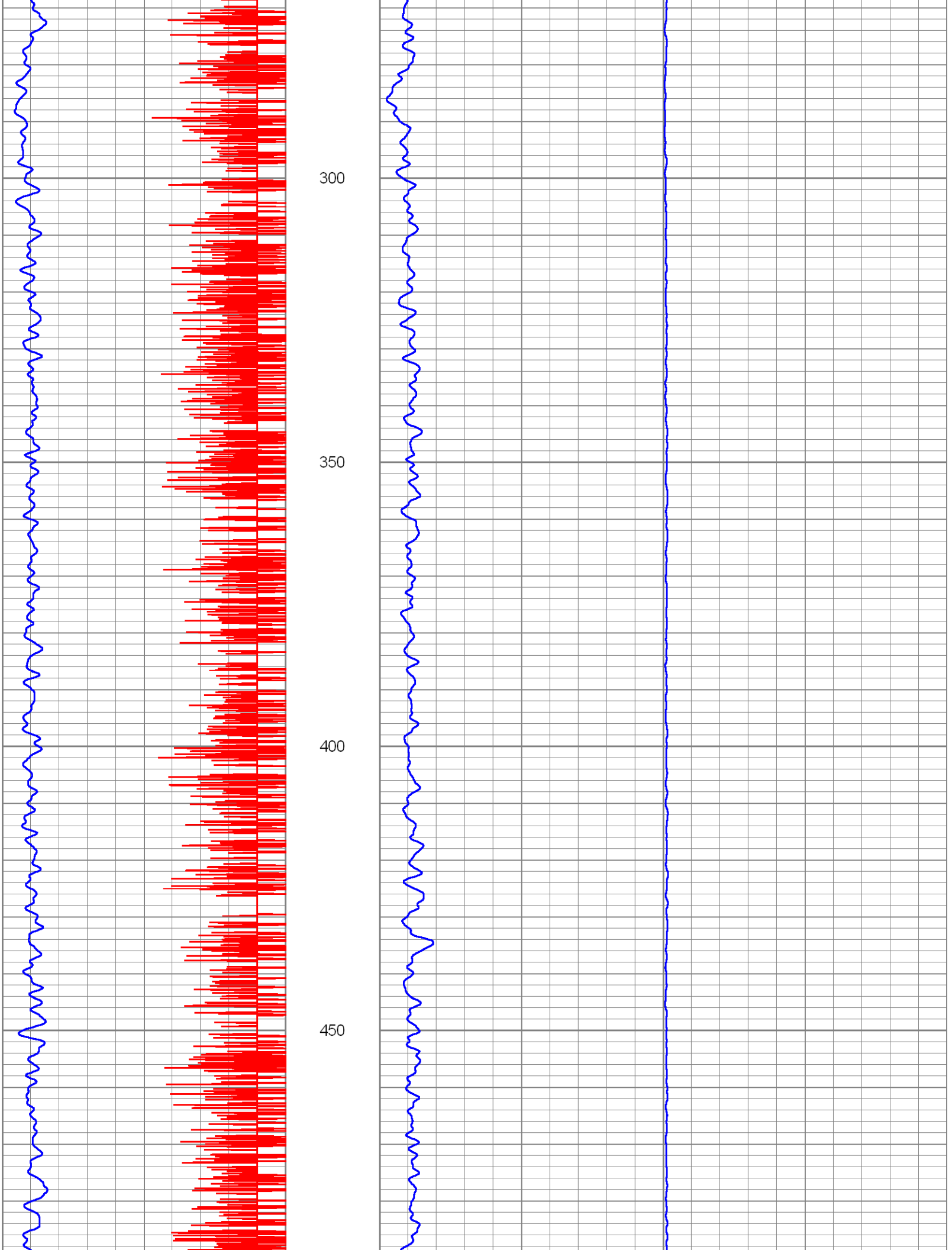


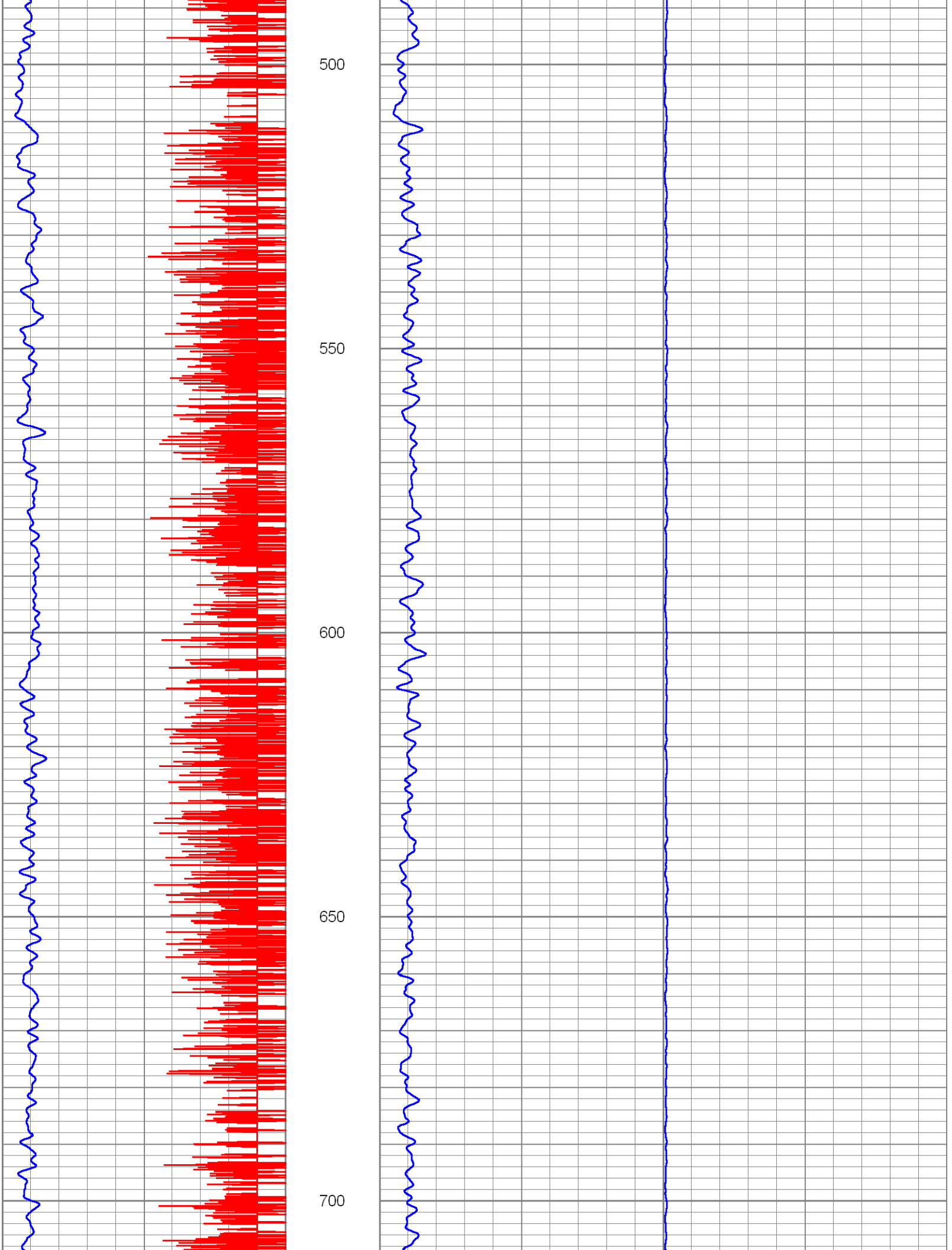
BACKGROUND

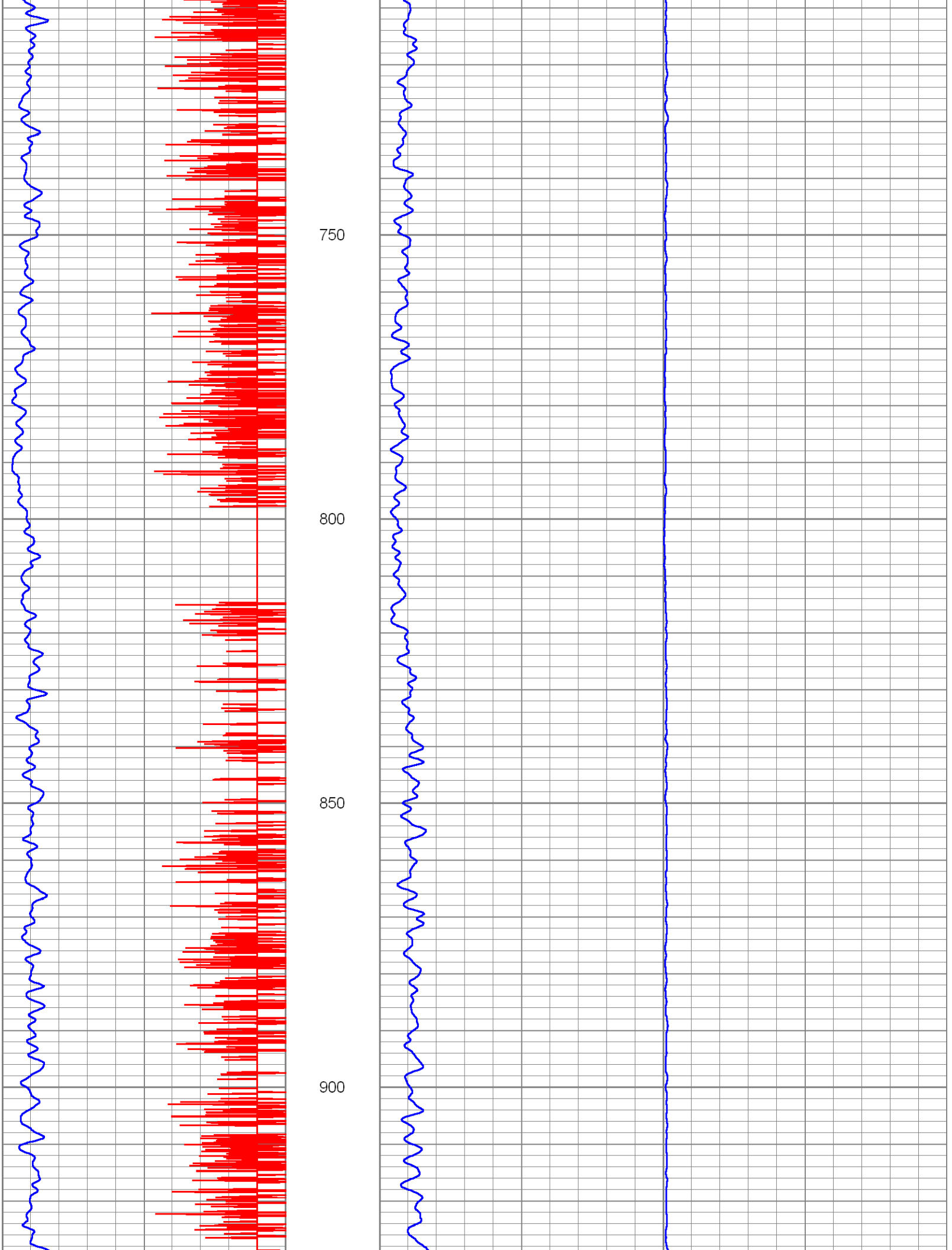
Database File:	c:\warrior\data\2013\mit\south dade\data base\sdwwtp-iw-6.db
Dataset Pathname:	pass2
Presentation Format:	rts
Dataset Creation:	Fri Aug 23 09:21:44 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:240

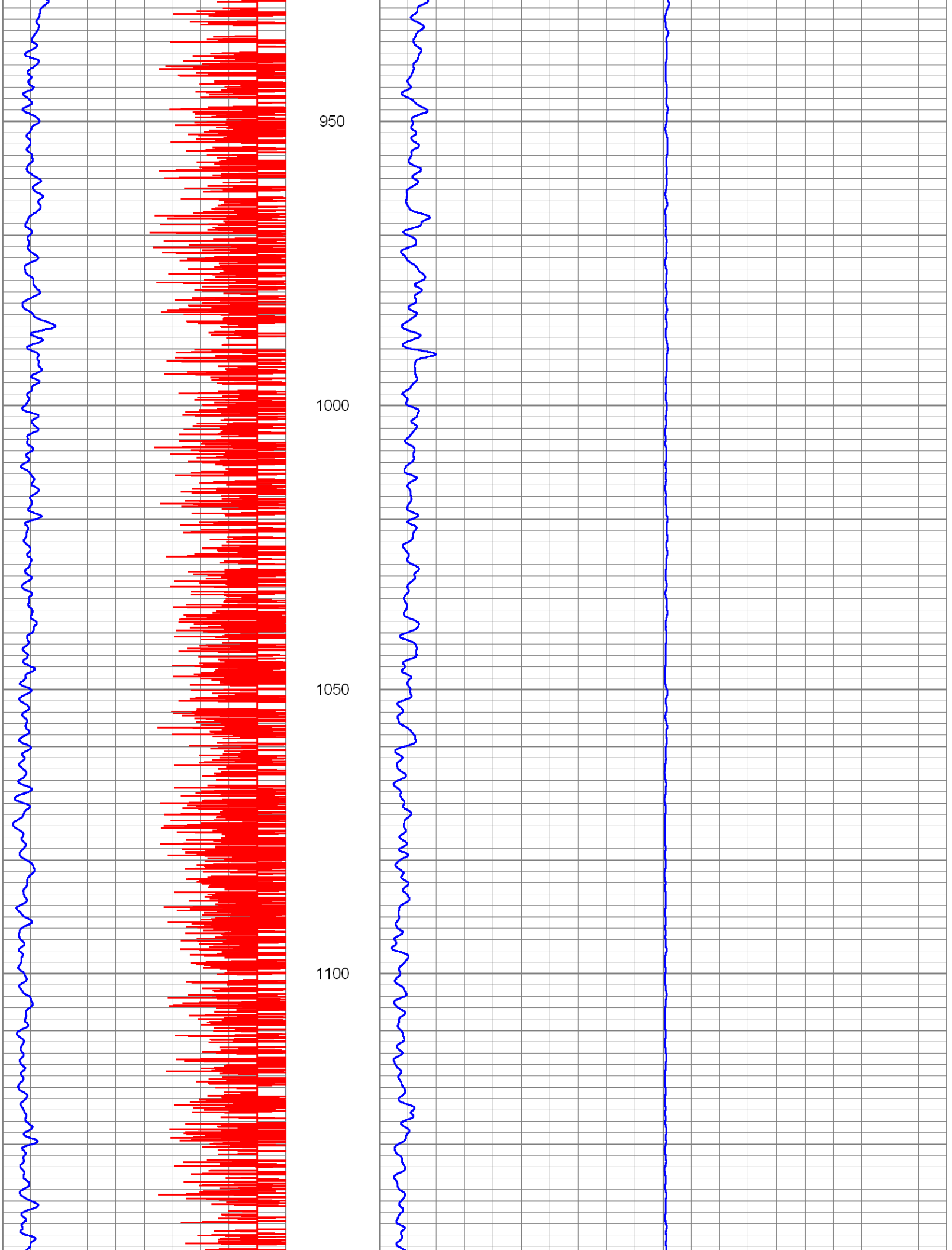


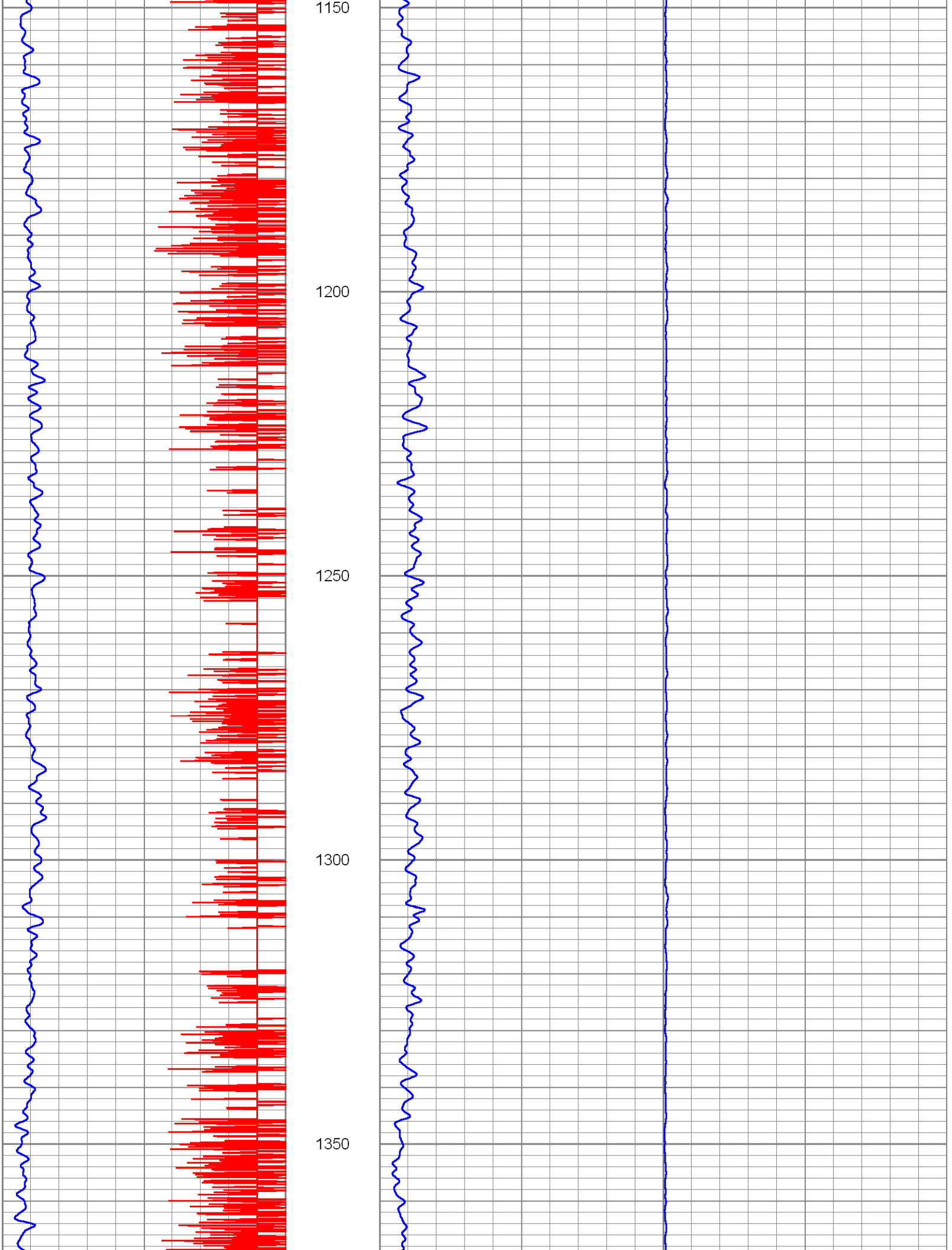

50
100
150
200
250

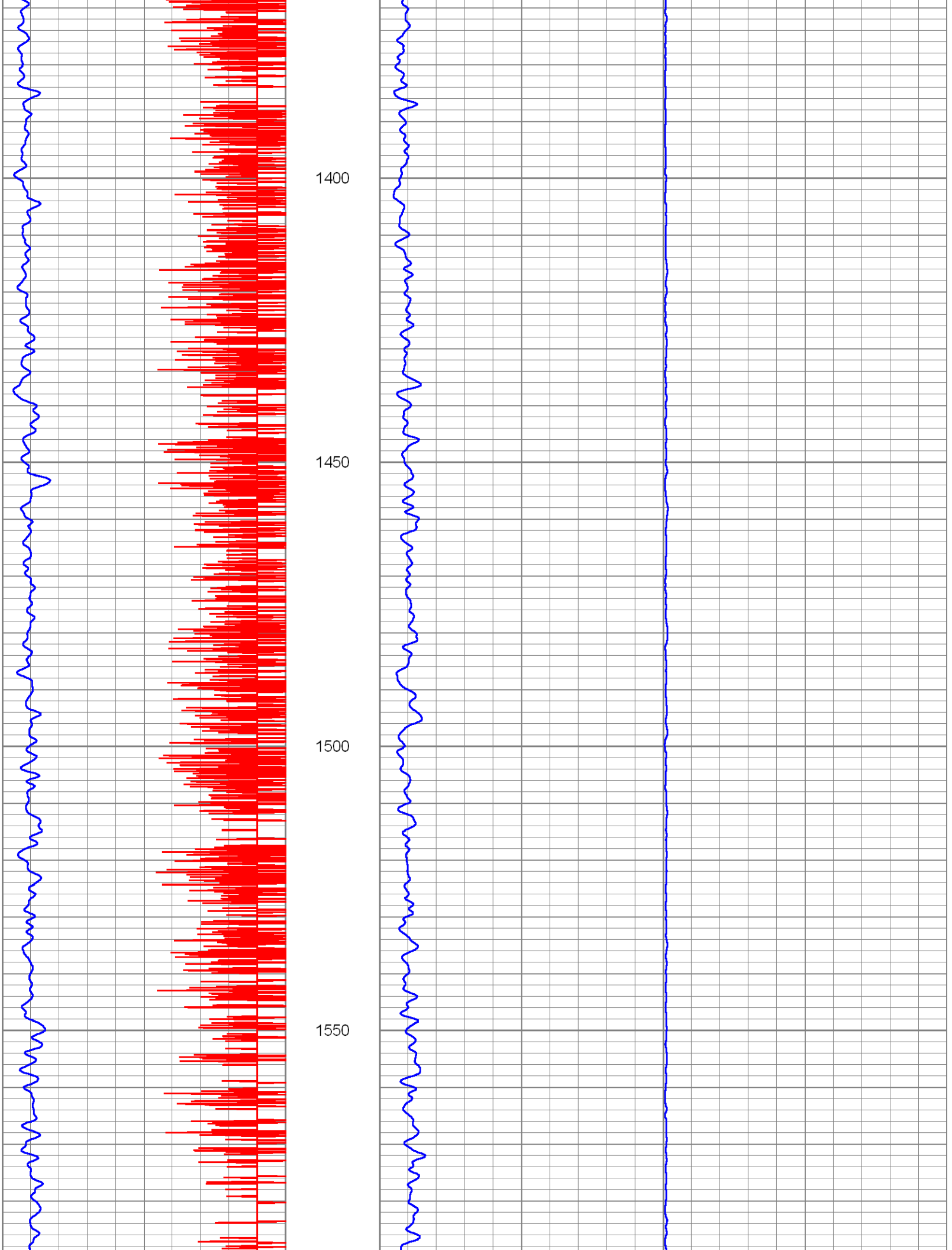

300
350
400
450

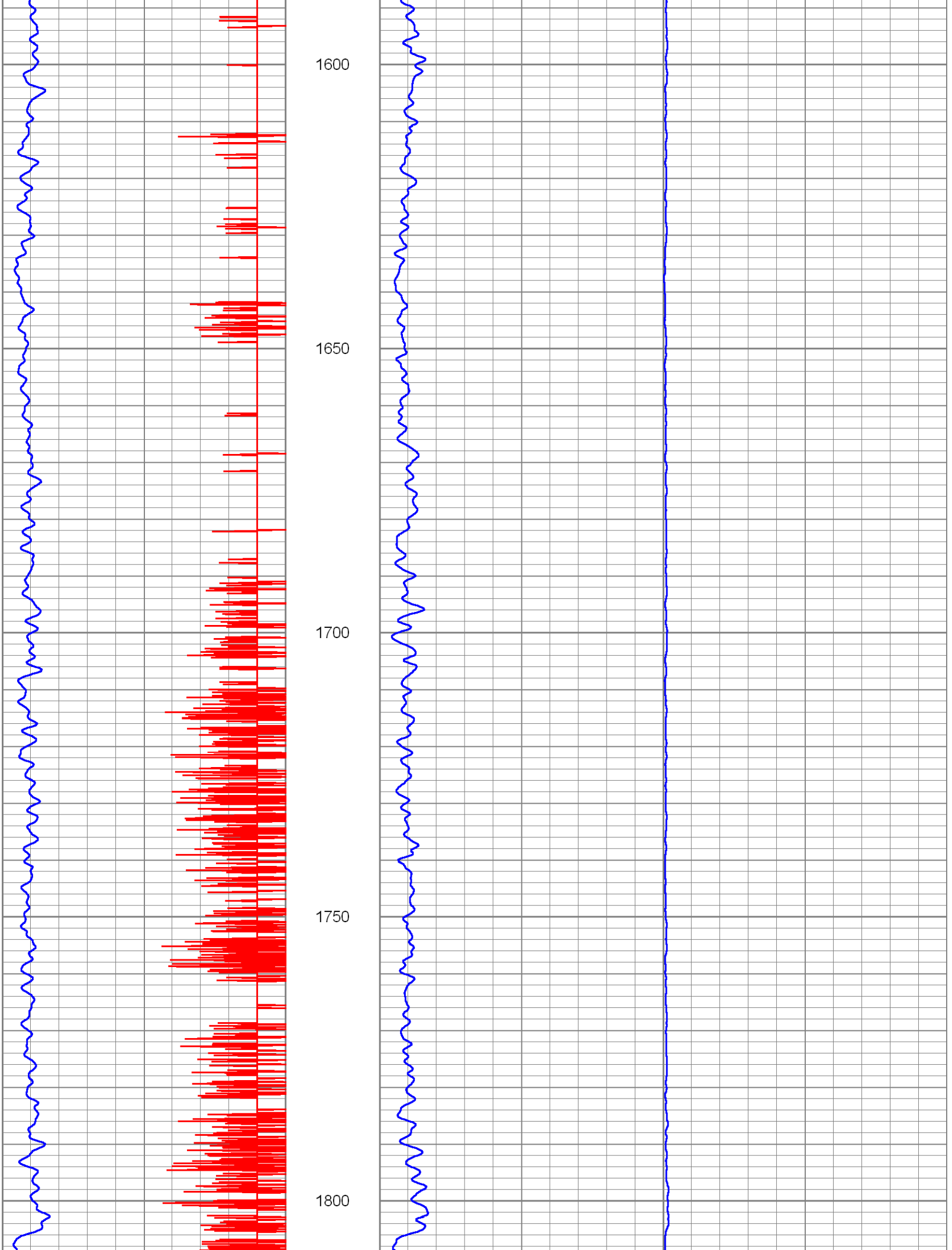

500
550
600
650
700

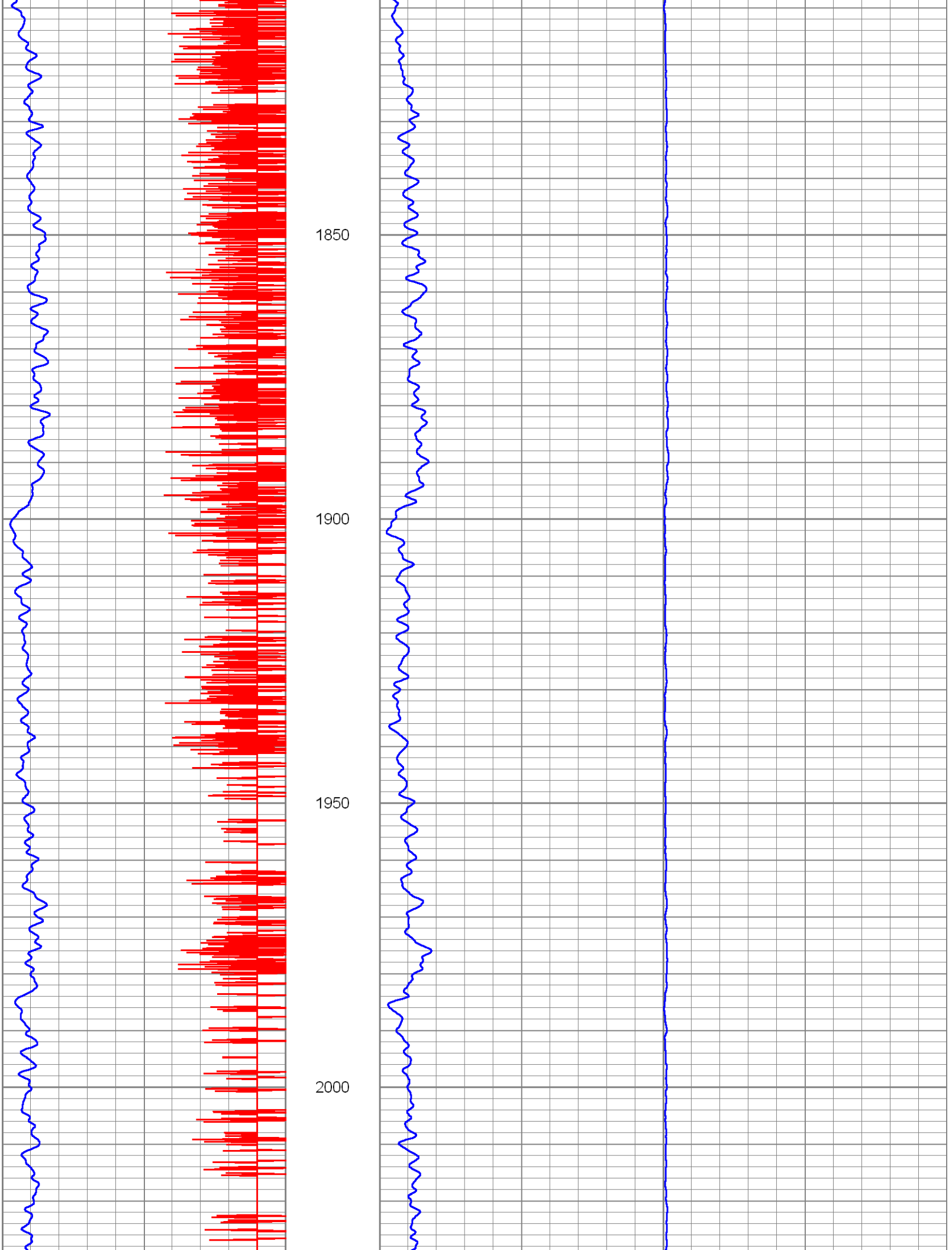

750
800
850
900

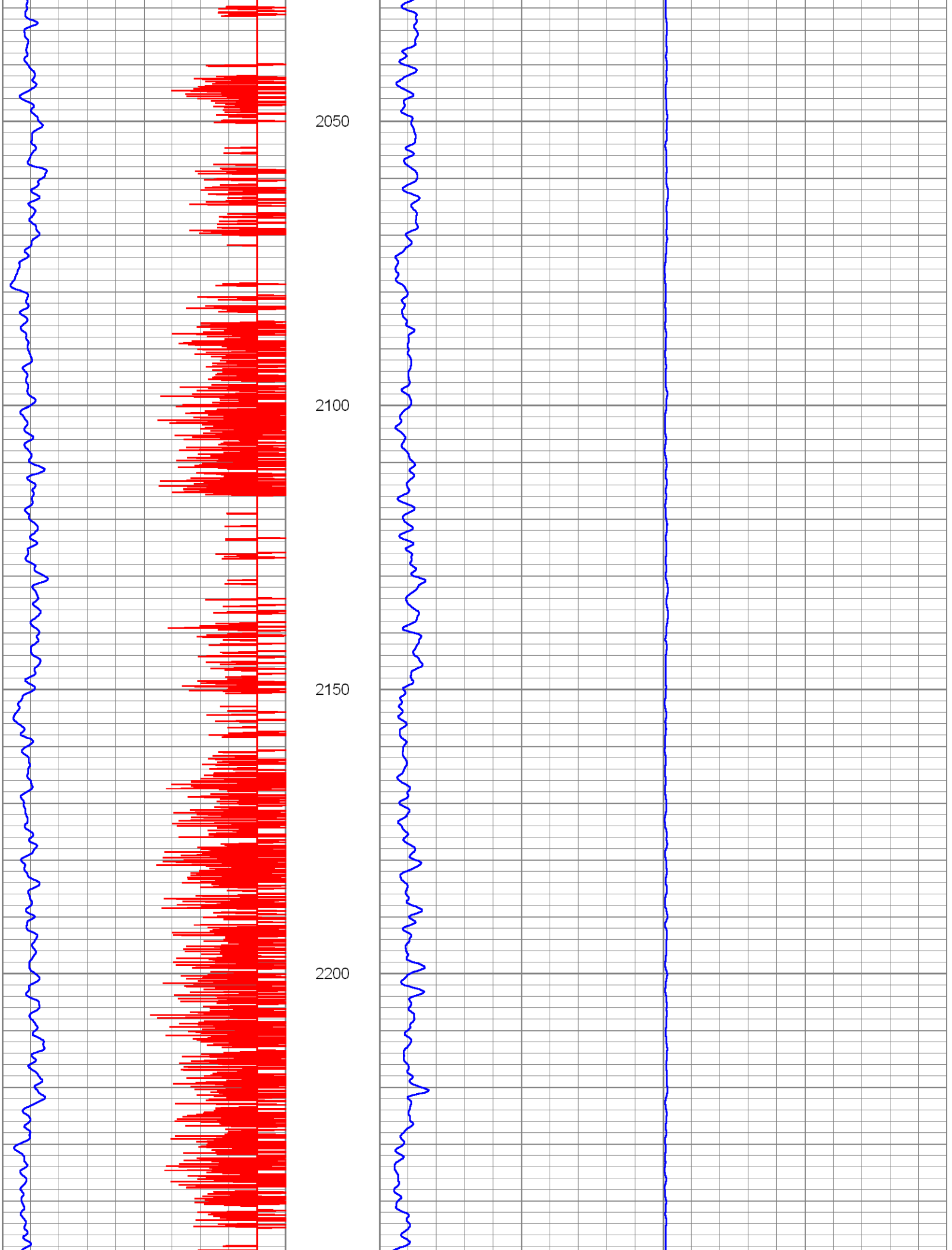

950
1000
1050
1100

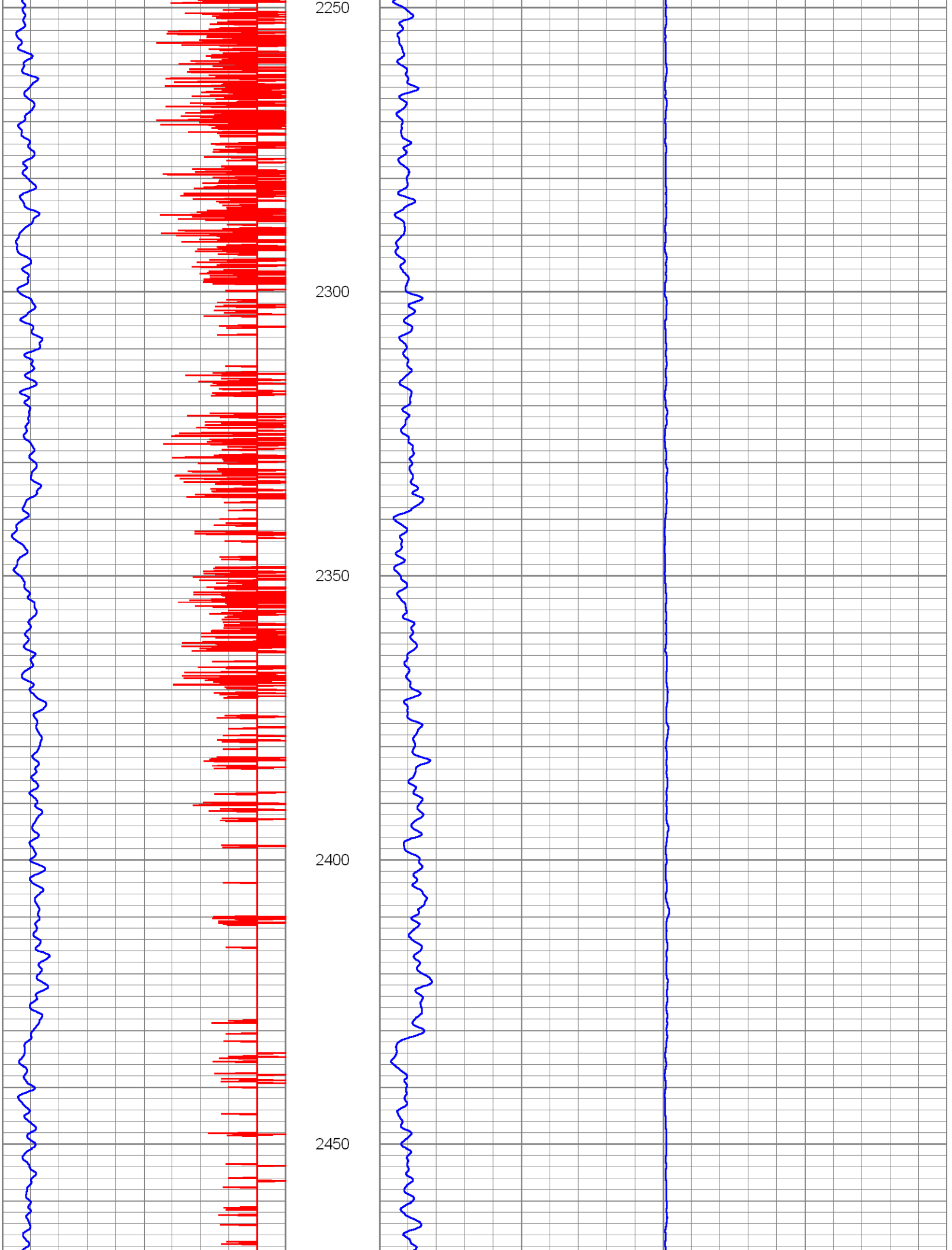

1150
1200
1250
1300
1350

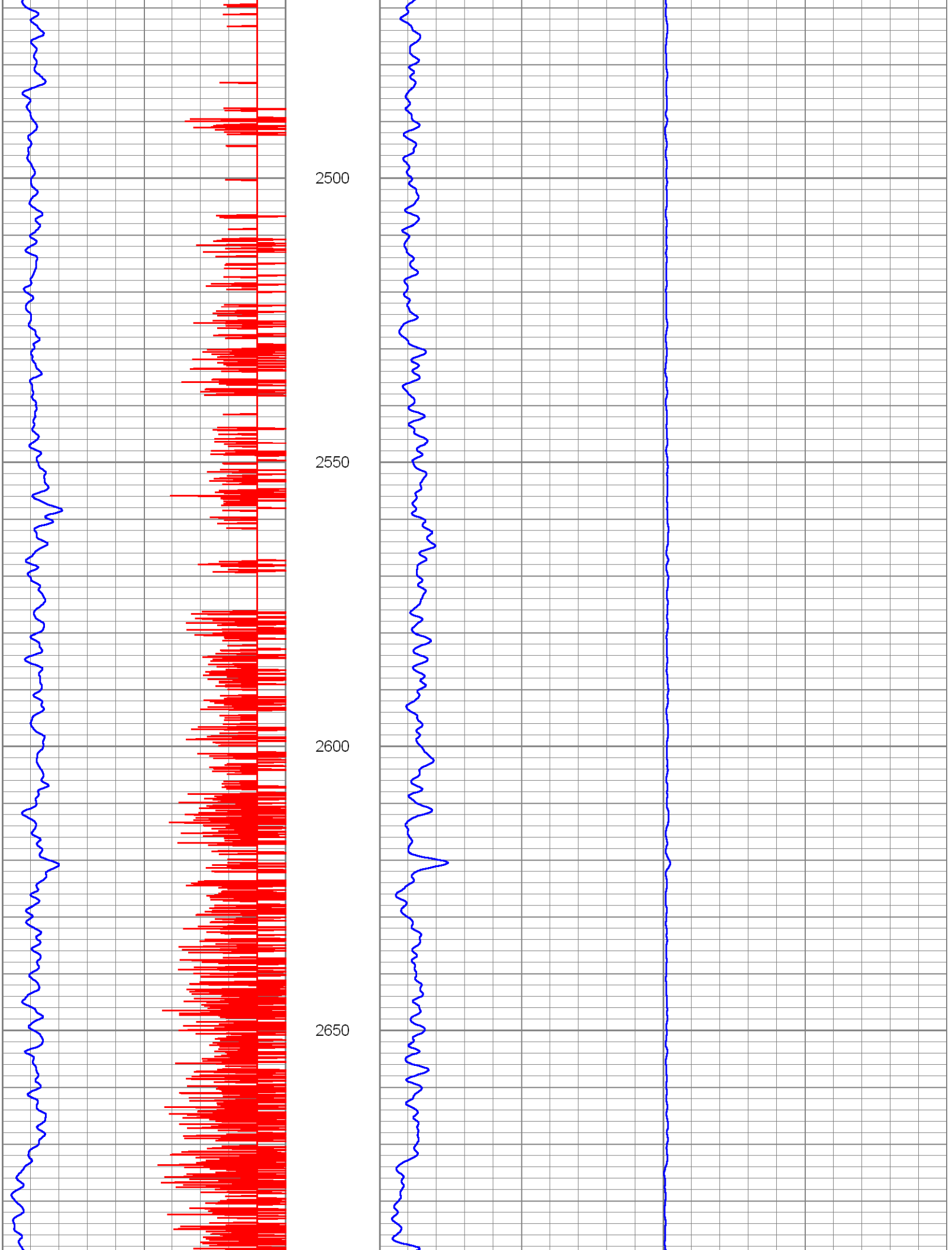

1400
1450
1500
1550

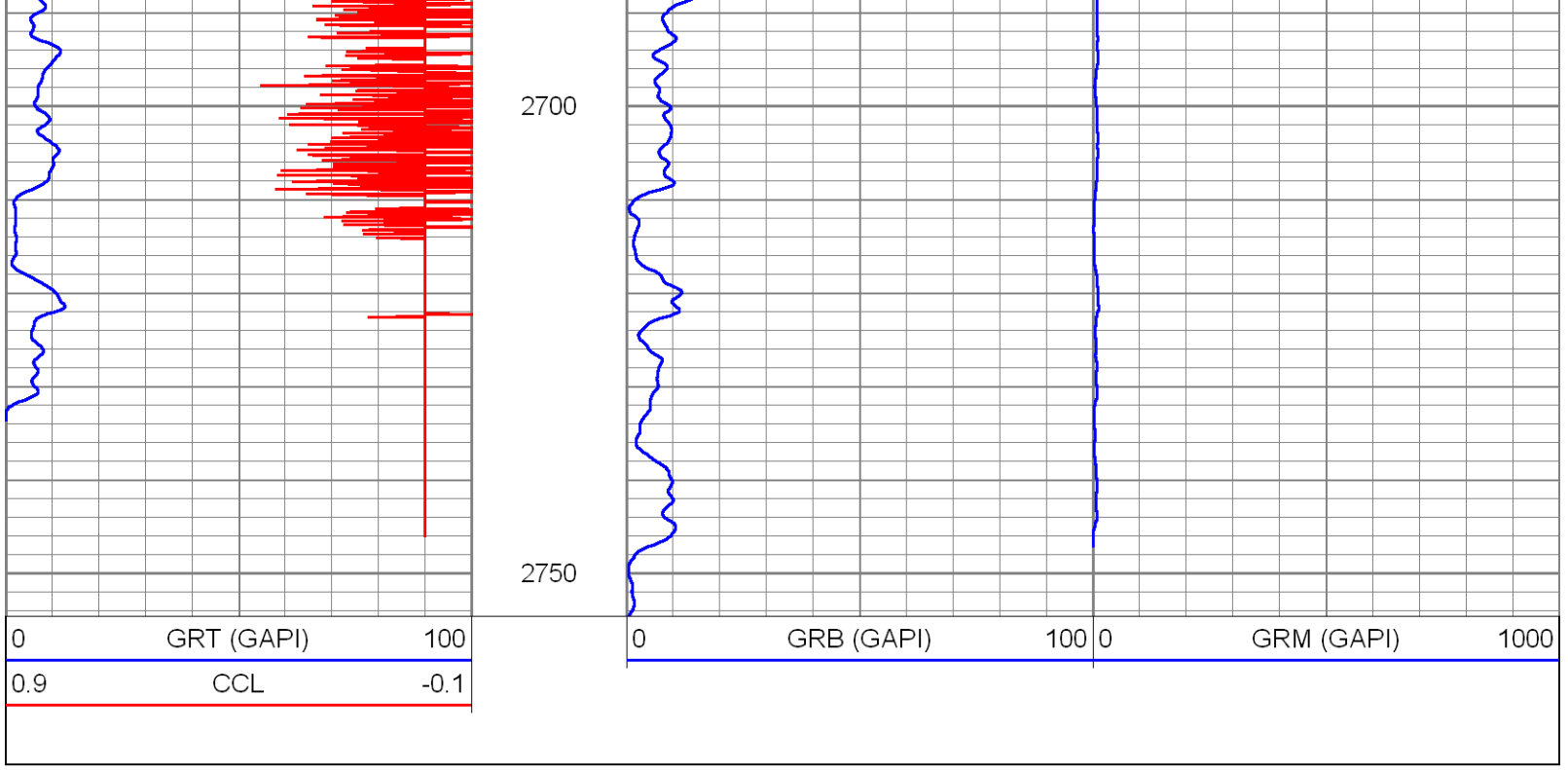

1600
1650
1700
1750
1800


1850
1900
1950
2000


2050
2100
2150
2200


2250
2300
2350
2400
2450


2500
2550
2600
2650



Calibration Report

Database File: C:\Warrior\Data\2013\MIT\SOUTH DADE\data base\sdwwtp-iw-6.db
Dataset Pathname: pass4
Dataset Creation: Fri Aug 23 11:59:57 2013 by Log SOC 110722

Gamma Ray Calibration Report

Serial Number:	952B	
Tool Model:	RTSB	
Performed:	Fri Aug 23 08:04:10 2013	
Calibrator Value:	90.0	GAPI
Background Reading:	84.6	cps
Calibrator Reading:	246.2	cps
Sensitivity:	0.5568	GAPI/cps

Gamma Ray Calibration Report

Serial Number:	952M	
Tool Model:	RTSM	
Performed:	Fri Aug 23 08:04:14 2013	
Calibrator Value:	90.0	GAPI
Background Reading:	168.9	cps
Calibrator Reading:	328.1	cps
Sensitivity:	0.5654	GAPI/cps

Gamma Ray Calibration Report

Serial Number:	952T	
Tool Model:	RTST	
Performed:	Fri Aug 23 08:04:20 2013	
Calibrator Value:	90.0	GAPI
Background Reading:	101.1	cps
Calibrator Reading:	270.2	cps

Calibrator Reading:	276.2	cps
Sensitivity:	0.5322	GAPI/cps

MIAMI-DADE WATER AND SEWER DEPARTMENT

MECHANICAL INTEGRITY TESTING OF DEEP INJECTION WELLS AND ASSOCIATED SERVICES

BID NO.: RPQ P0086

RADIOISOTOPE TRACER SURVEY AND TEMPERATURE SURVEY
IW -6

August 23, 2013, 11:00 A.M.

SURVEY SEQUENCE

TIME	DESCRIPTION	REMARKS Boc
7:00	Start Rig Up	
8:00	Calibrate Tools	
8:15	Put RTS Tool in Well	
8:30	Start Temperature Background Down	
9:25	Background GR Up Pass	
10:30	Load Tool	
10:35	Back in Hole	
11:00	SCG Bottom Tie-in	BOC 2747, BOC ~~2746~~
	Low Flow Dynamic No. 1	BOH 2753.5
	Q = 76 gpm	
12:00	Eject 1 mci at 2739.5 feet	B/c obstruct at 2753.5 we had to move tool up ~~higher than the~~ 5' from the bottom of the tool up 3 feet from normal eject pt. of 2742.
28 sec	Middle Detection	
9 min 50 sec.	Bottom Detection	
None	Top Detection @ 10 min into test checked flow at 816 gpm.	
	Log out of Position 200 feet to depth of 2500	The bottom detector is at 2751.8 so it is 4.8 feet out of the casing. B/c this well is cased down to 2746, we are in the Oldsmare formation (Boulder Zone) ~~the~~ we are in the injection zone so we believe that the tracer went down and ~~got stu~~ went straight into the formation & that is why the results are different from the other wells.
None	Flush	
	Log after Flush	

Low Flow Dynamic No. 2

Q = 70 gpm

13:50	Eject 2 mci at 2731.5 feet	BOT 2752.5
24 sec.	Middle Detection	
2 min 39 sec	Bottom Detection	
None	Top Detection	flow checked at end of test 78 gpm,
14:31	Log out of Position 200 feet to depth of	2400
14:45	Flush	5200 gpm
	Log after Flush	

Low Flow Dynamic No. 3

Q = _____ gpm, location of bottom of tool_____

	Eject ____ mci at _____ feet	
	Middle Detection	
	Bottom Detection	
	Top Detection	
	Log out of Position 200 feet to depth of	
	Flush	

Release of Additional Iodine 131

14:45 NONE	Flush at a flow of _____ gpm	
2700 – cleaned tool	Release _____ mci at _____ feet	
	Bottom of tool at _____ feet	
	Rigging Down	

B/C obstruction on well, only had tool loaded with 3 mCi of Iodine 131 so not to have issues dumping extra Iodine so no Release needed.

YOUNGQUIST

GEOPHYSICAL LOGGING DIVISION

Radioactive Tracer Survey Tool Diagram

Date: 8/23/13 Job: SDWWTP IW6

Internal RTS: ___ External RTS: ✓ YB I Logger: R. GARCIA

BOTTOM OF CASING: 2747'

Eject #1: 1 mCi Eject #2: 2 mCi

-5' IN CASING: 2742'

Eject #3: mCi Eject #4: mCi

Eject #5: mCi Eject #6: mCi

+13.5' FOR BOTTOM OF TOOL: 2755.5

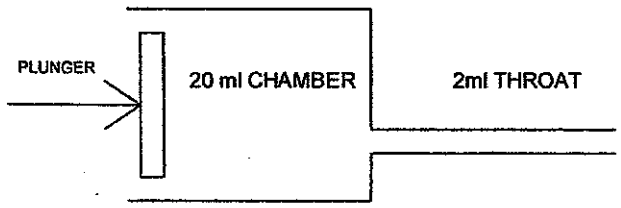
Obstruction @ 2753.0 → New Bottom of tool

New Ejection Depth @ ~~2740~~ 2739.5'

Total mCi of I-131 loaded in tool: 3 **1ml =1mCi**

Total volume of Chamber and Throat:22ml

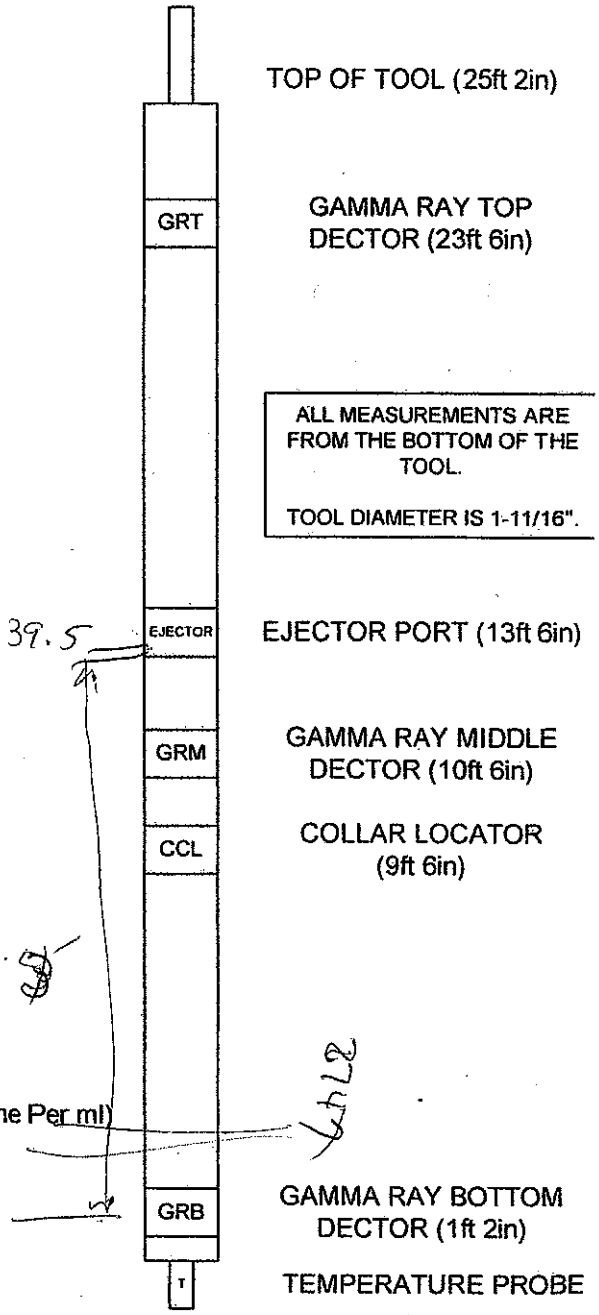
EJECTOR PORT DIAGRAM



Total Eject Cycle Time (22ml): 13 **Sec**

Eject Cycle Time Per ml (Total Time / 22): 0.6 **Sec**

Throat Eject Cycle Time (2*Time Per ml): 1.2 **Sec**



TIME PER EJECT

(Total ml of I-131)/(20ml)= mCi per ml in the chamber

(3)/(20)=0.15 mCi per ml

mCi = Throat Eject Cycle Time + (ml of Chamber Required)*(Eject Cycle Time Per ml)

1 mCi = 1.2 + (6.66)*(0.6) = 5.2 **seconds**

2 mCi = 1.2 + (13.3)*(0.6) = 9.18 **seconds**

3 mCi = + ( )*( ) = **seconds**

4 mCi = + ( )*( ) = **seconds**

Appendix E

Temperature Log

HIGH RESOLUTION TEMPERATURE LOG

Company	SOUTH MIAMI-DADE W.W.T.P.
Well	IW-6
Field	S.D.W.W.T.P.
County	MIAMI-DADE
State	FLORIDA

Location: API # :

SEC TWP RGE

Other Services

Permanent Datum	PAD	Elevation	PAD
Log Measured From	PAD		
Drilling Measured From	PAD		

Elevation
K.B.
D.F.
G.L.

Date	23-AUG-2013		
Run Number	2013 MIT		
Depth Driller	2753.5'		
Depth Logger	2753.5'		
Bottom Logged Interval	2753.5'		
Top Log Interval	SURFACE		
Open Hole Size	22"		
Type Fluid	WATER		
Density / Viscosity	NA		
Max. Recorded Temp.	83 degF		
Estimated Cement Top	NA		
Time Well Ready	ON ARRIVAL		
Time Logger on Bottom	ON ARRIVAL		
Equipment Number	102		
Location	FT MYERS		
Recorded By	R.GARCIA	MOREY	
Witnessed By	S. VILLAMIL		

Borehole Record				Borehole Record			
Run Number	Bit	From	To	Run No	Bit	From	To

Casing Record	Size	Wgt/Ft	Top	Bottom
Surface String				
Prot. String				
Production String	24"	.500" W.T.	SURFACE	2747'
Liner				

<< Fold Here >>>

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

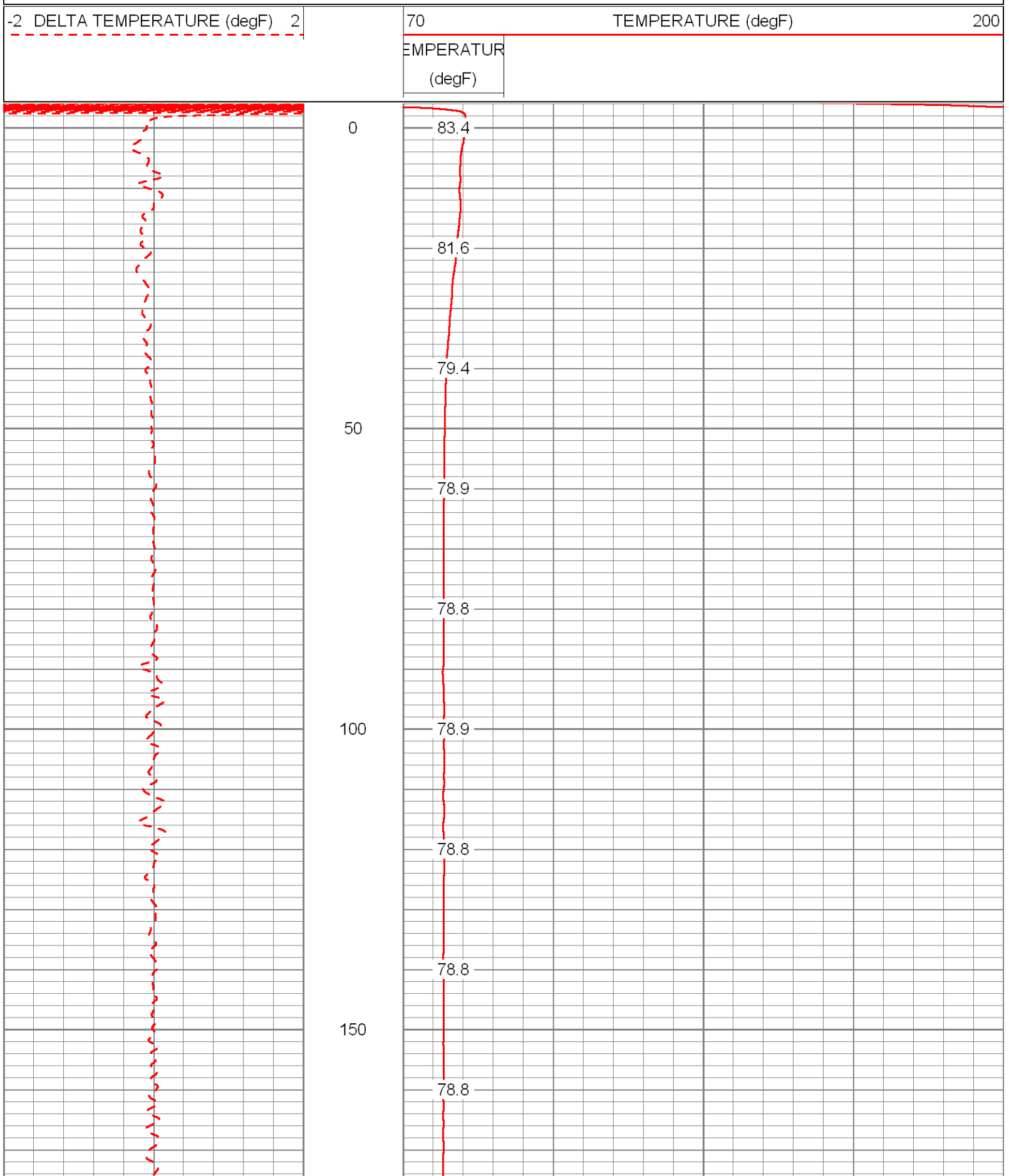
Comments

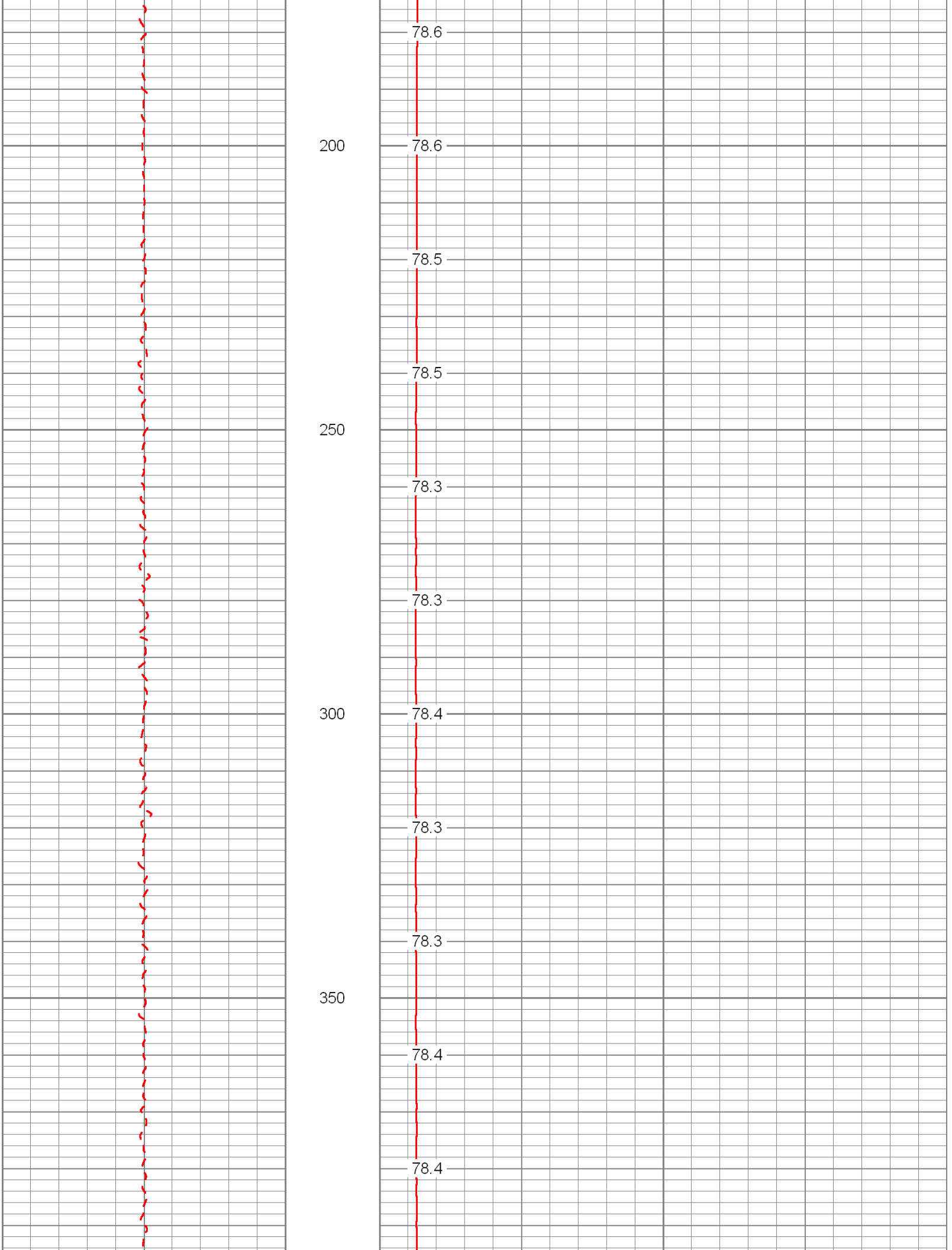
RADIOACTIVE TRACER SURVEY

TEMPERATURE

BROTHERS

Database File:	c:\warrior\data\2013\mit\south dade\data base\sdwwtp-iw-6.db
Dataset Pathname:	pass1
Presentation Format:	temp
Dataset Creation:	Fri Aug 23 08:28:41 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:240

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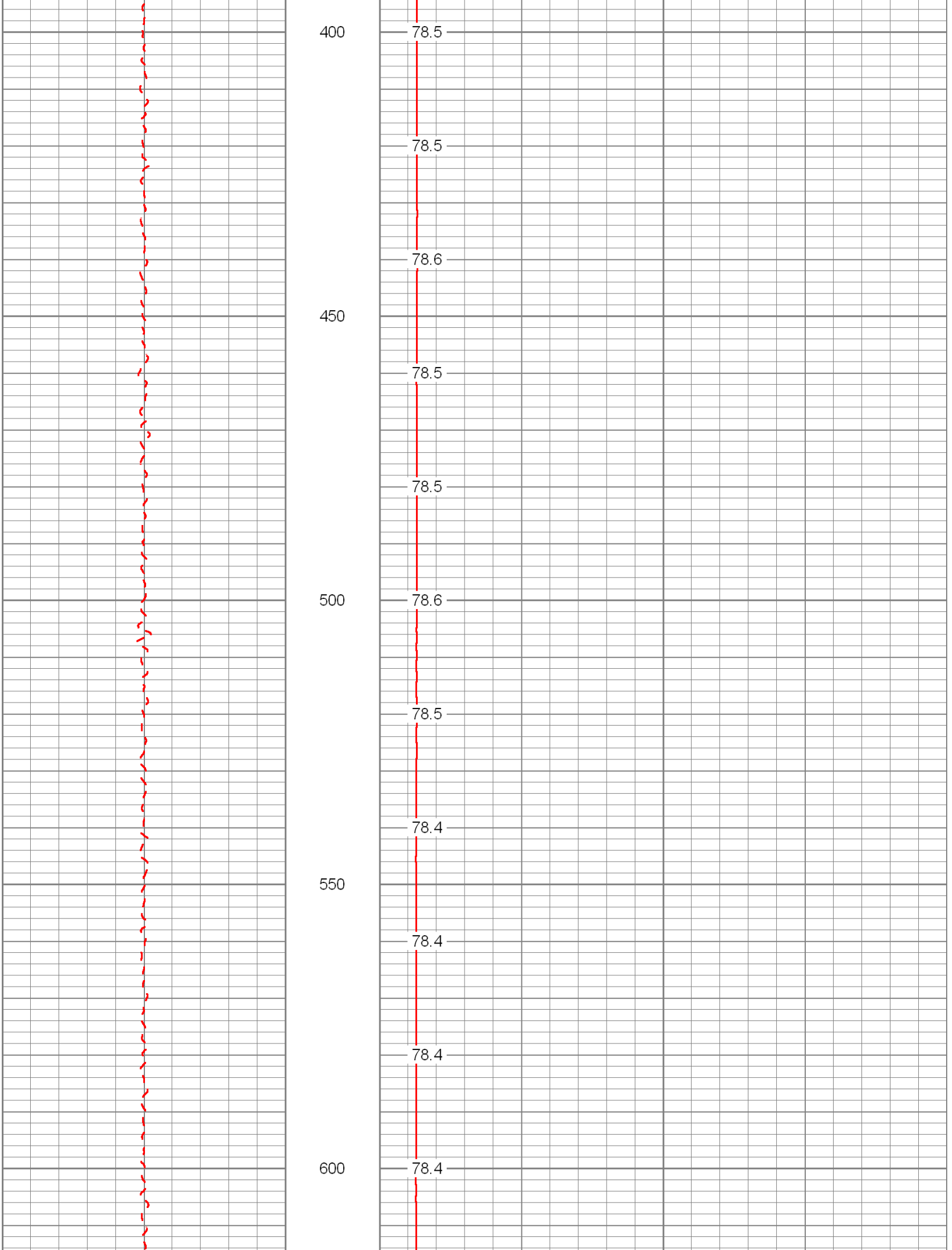
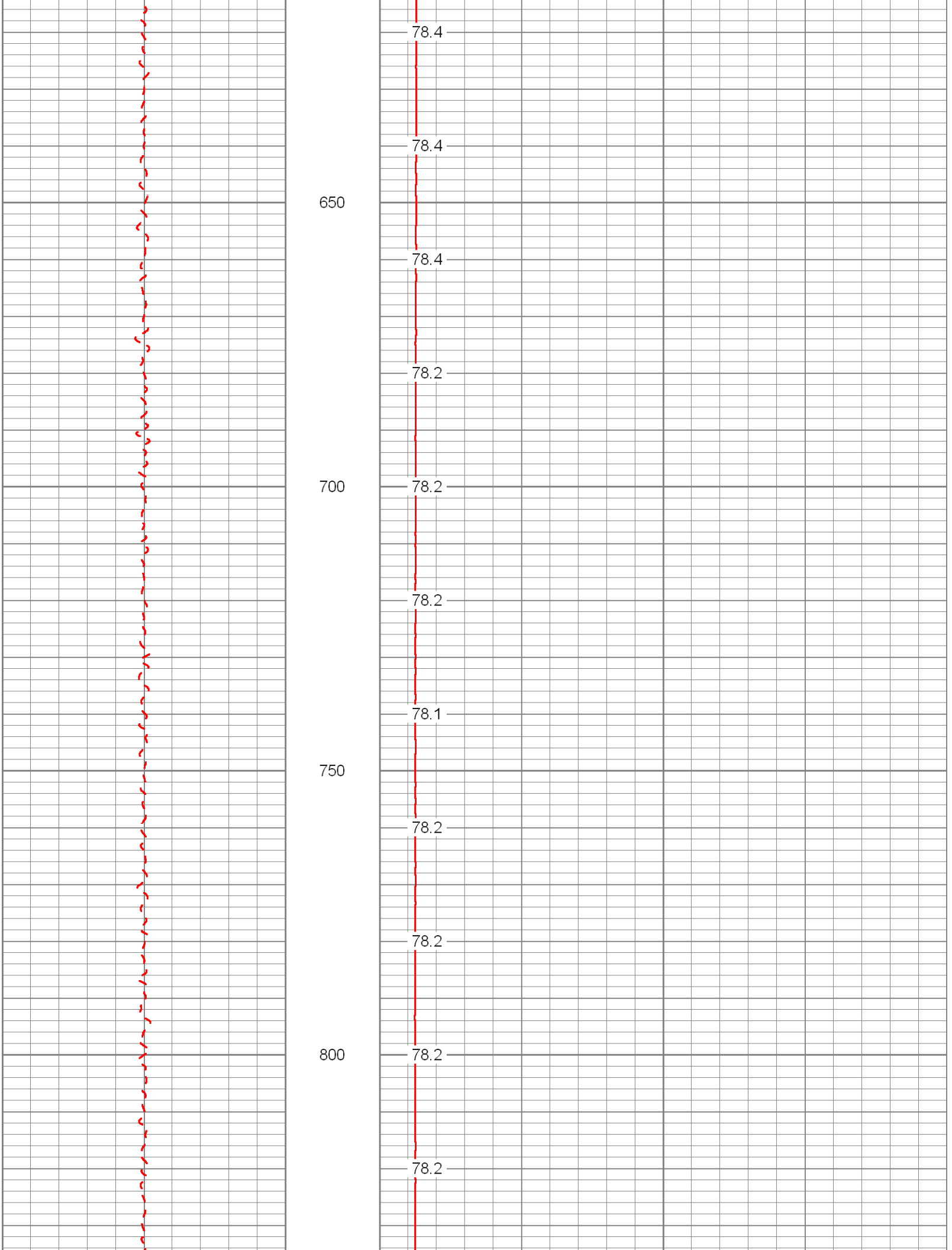
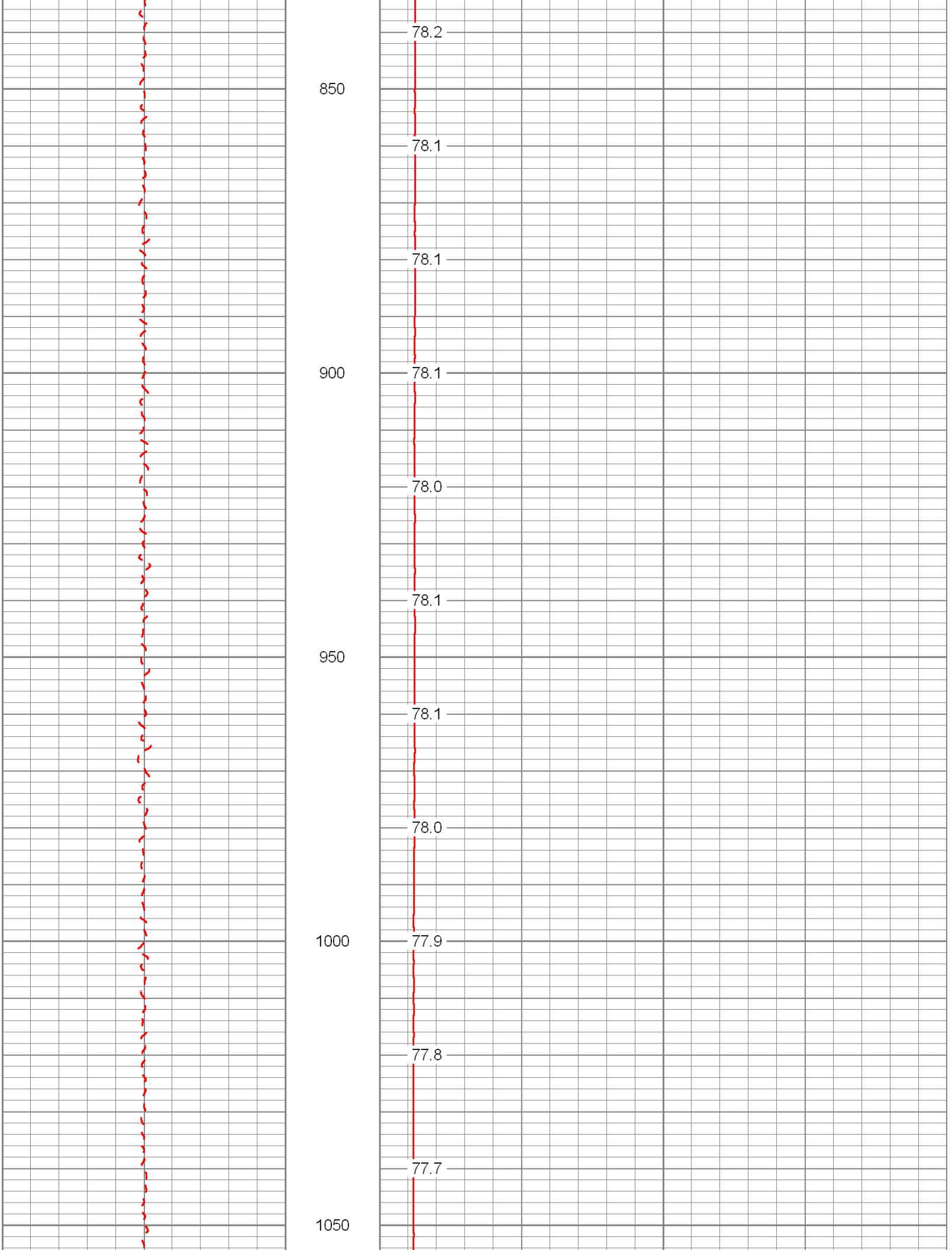
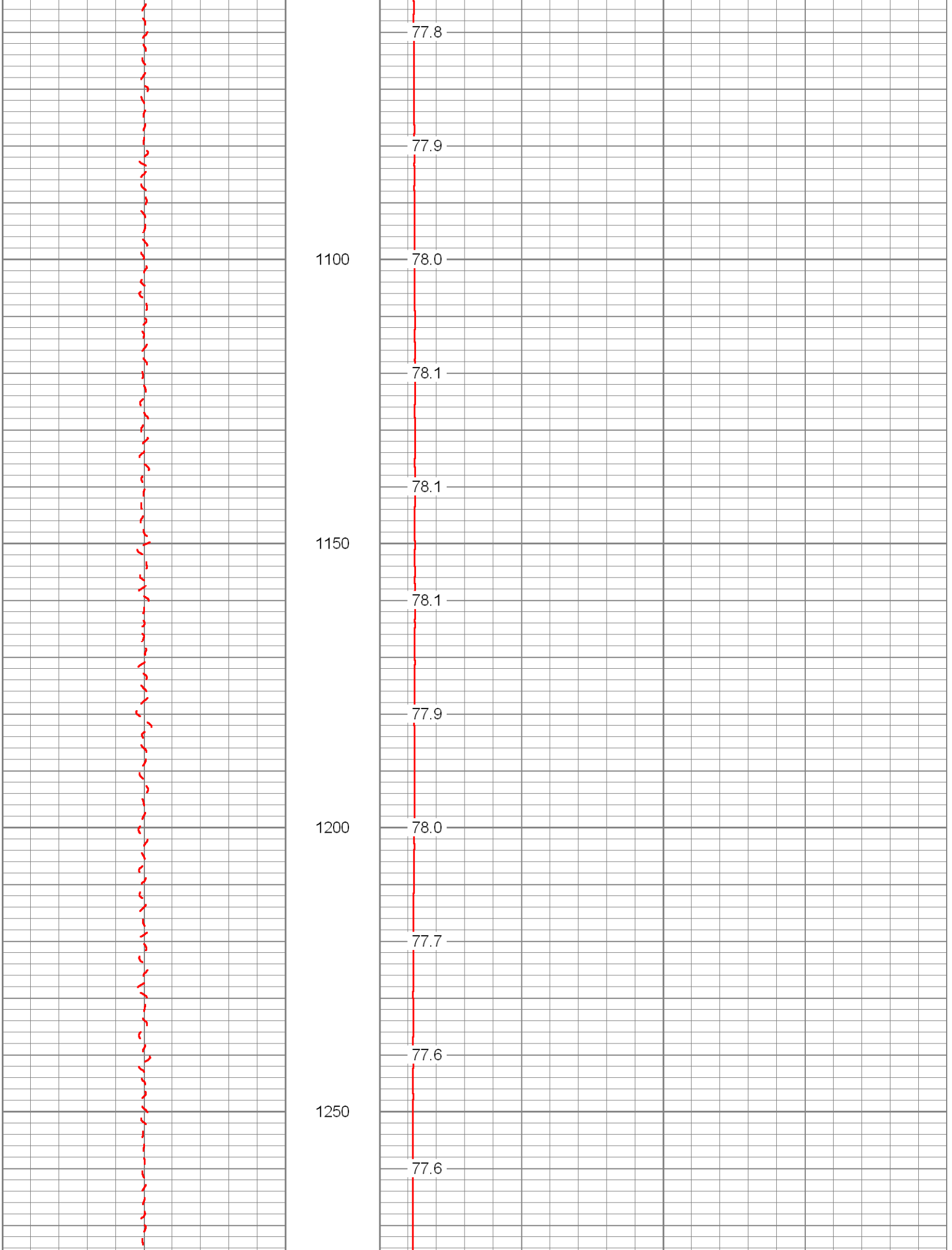
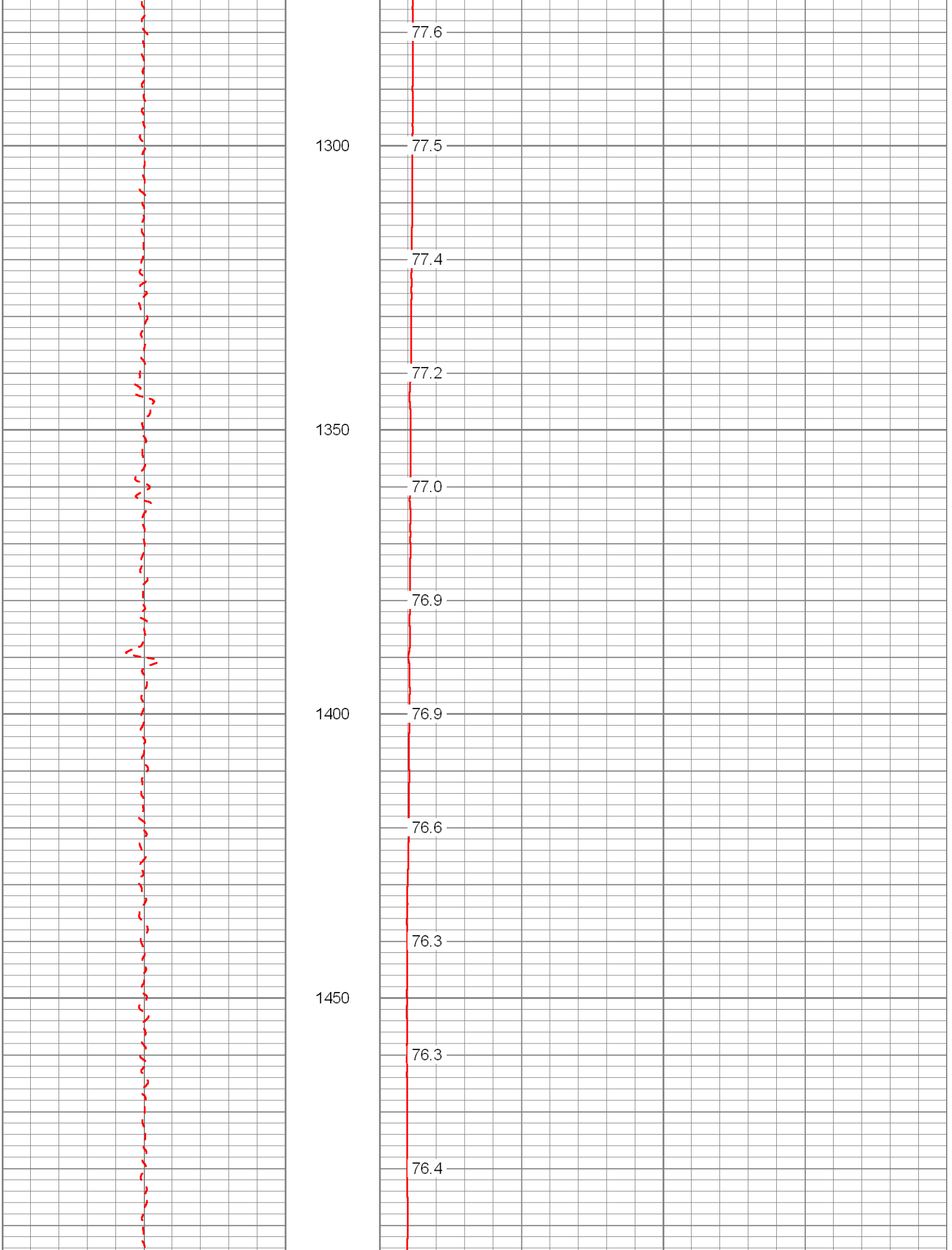
200
78.6
78.5
78.5
250
78.3
78.3
300
78.4
78.3
78.3
350
78.4
78.4

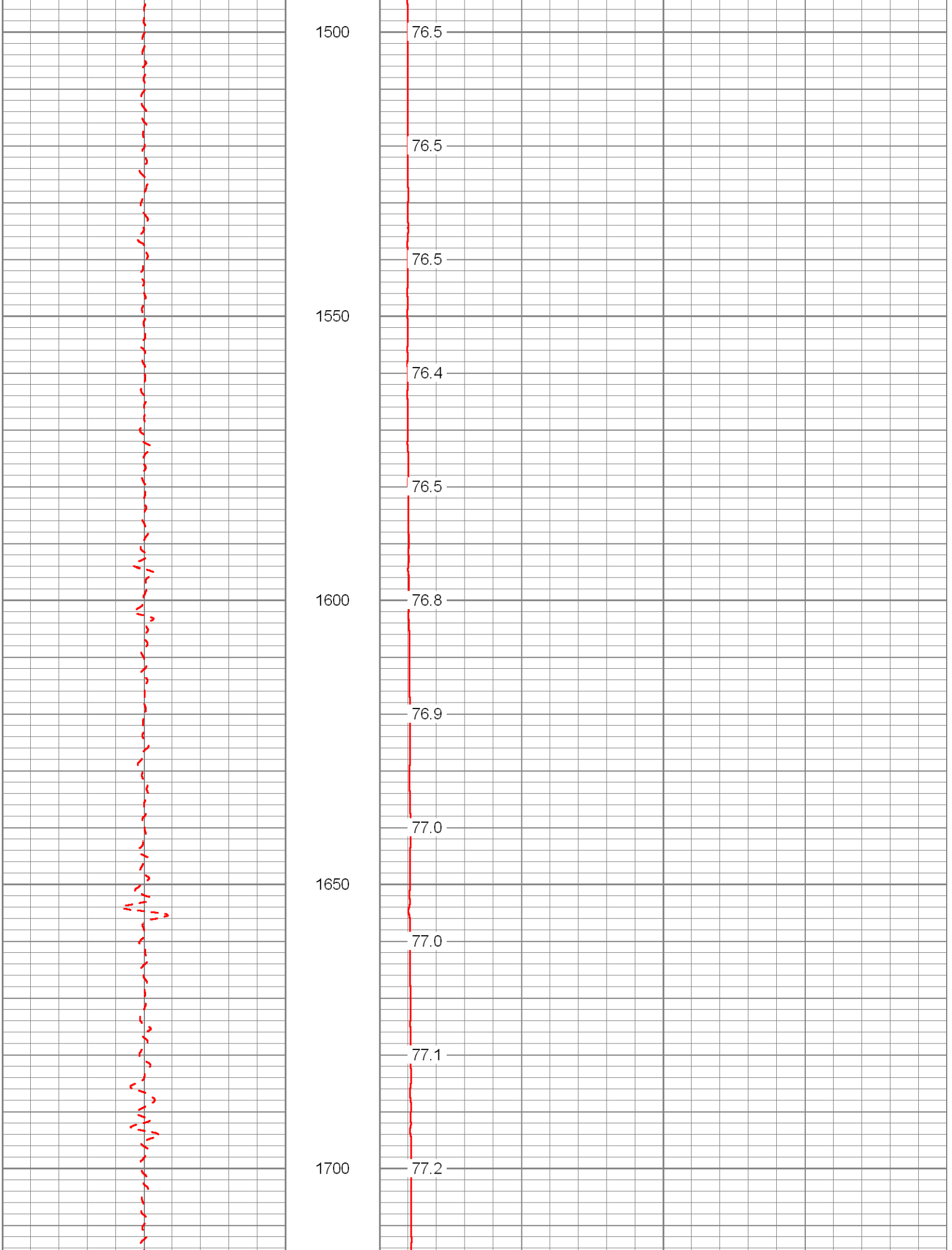

400
78.5
78.5
78.6
450
78.5
78.5
500
78.6
78.5
78.4
550
78.4
78.4
600
78.4

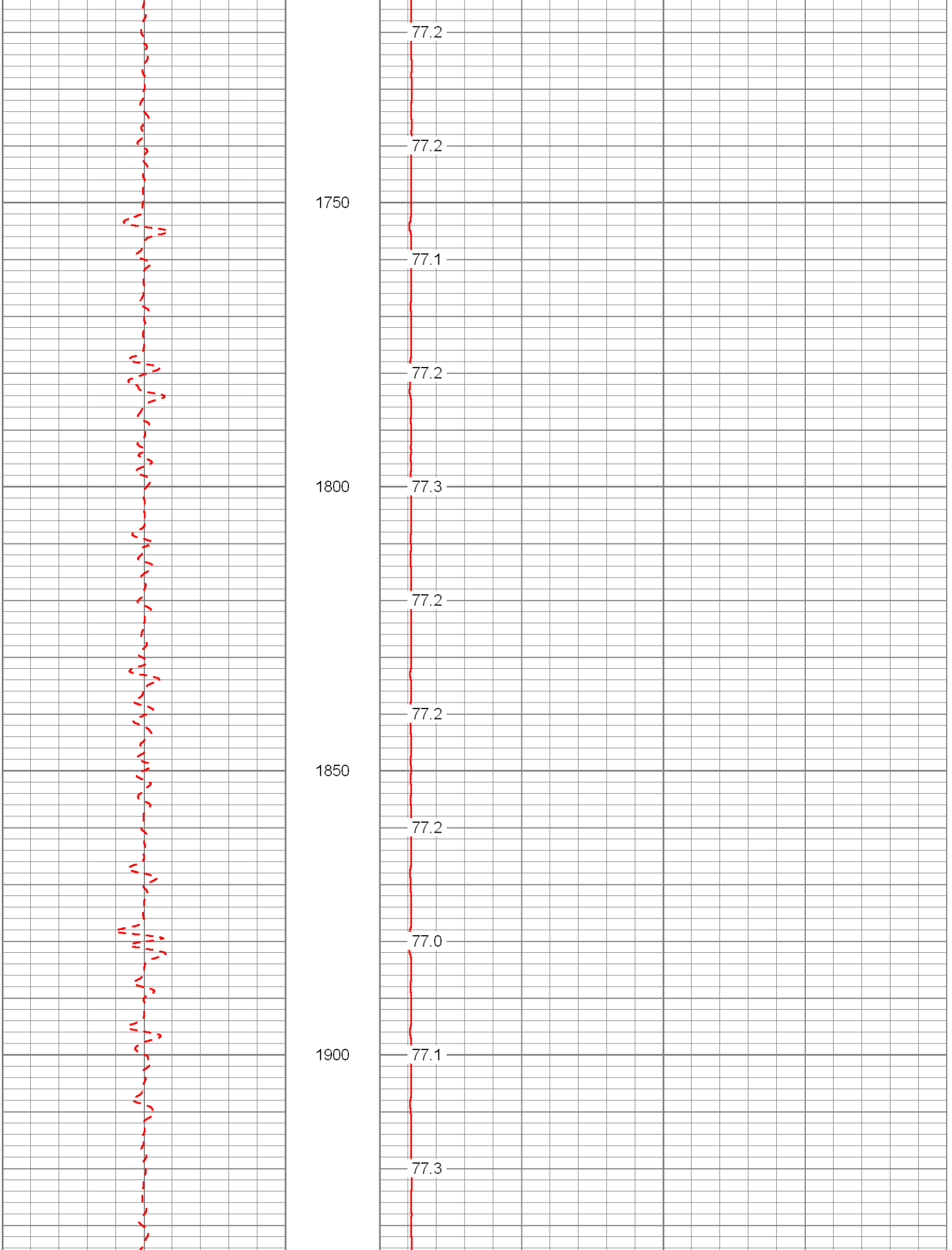

78.4
78.4
650
78.4
78.2
700
78.2
78.2
78.1
750
78.2
78.2
800
78.2
78.2

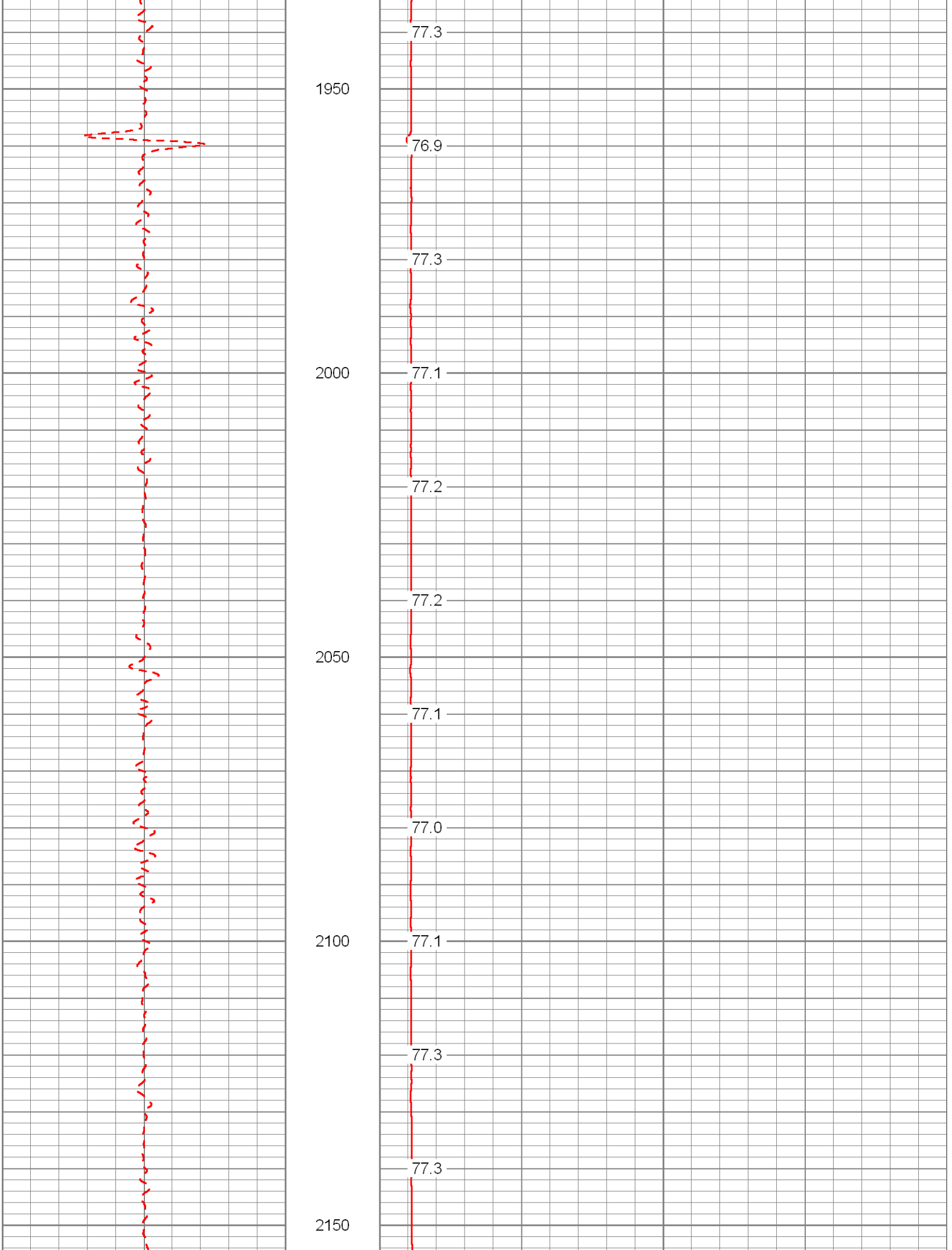

850
900
950
1000
1050
78.2
78.1
78.1
78.1
78.0
78.1
78.1
78.0
77.9
77.8
77.7

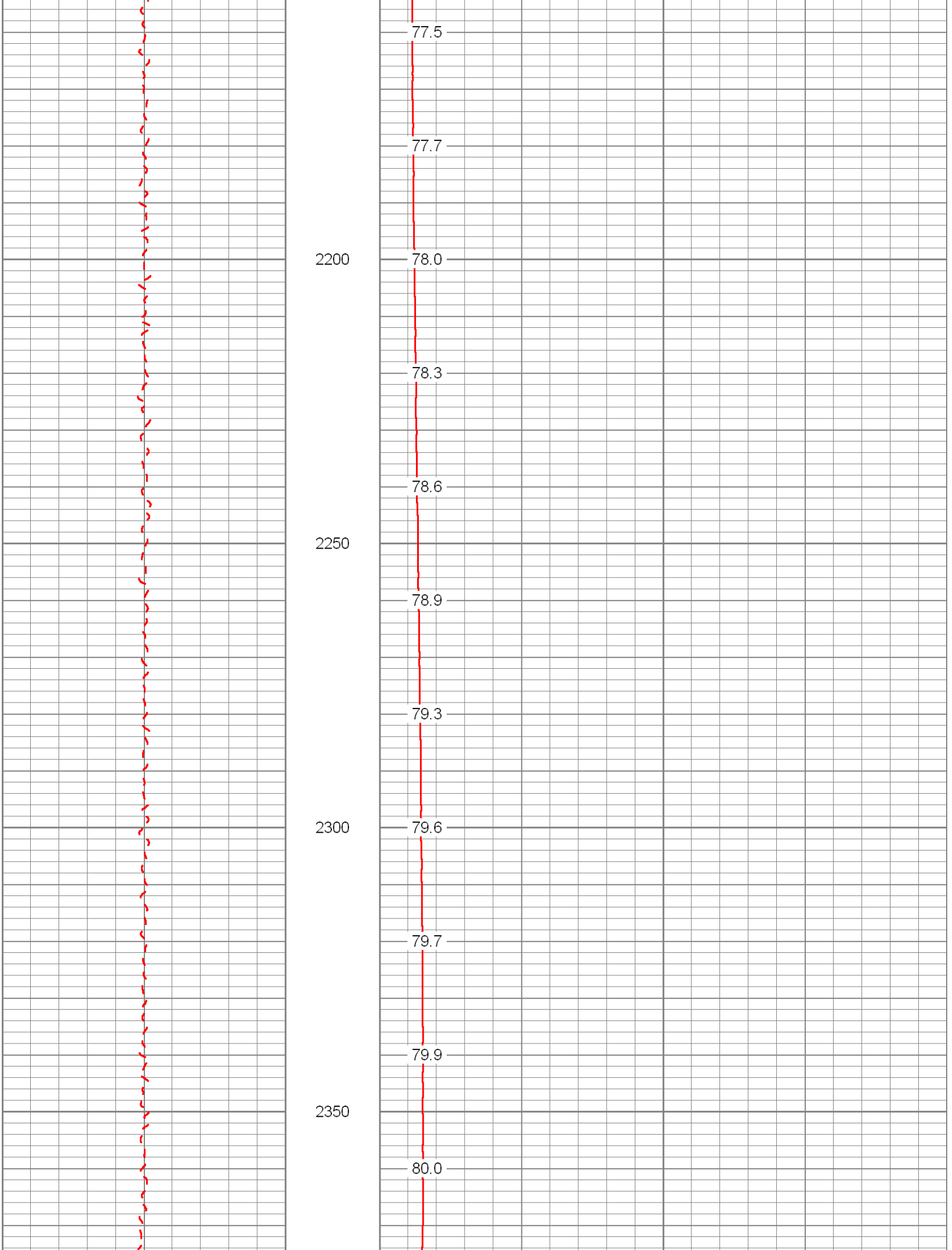

77.8
77.9
1100
78.0
78.1
78.1
1150
78.1
77.9
1200
78.0
77.7
77.6
1250
77.6

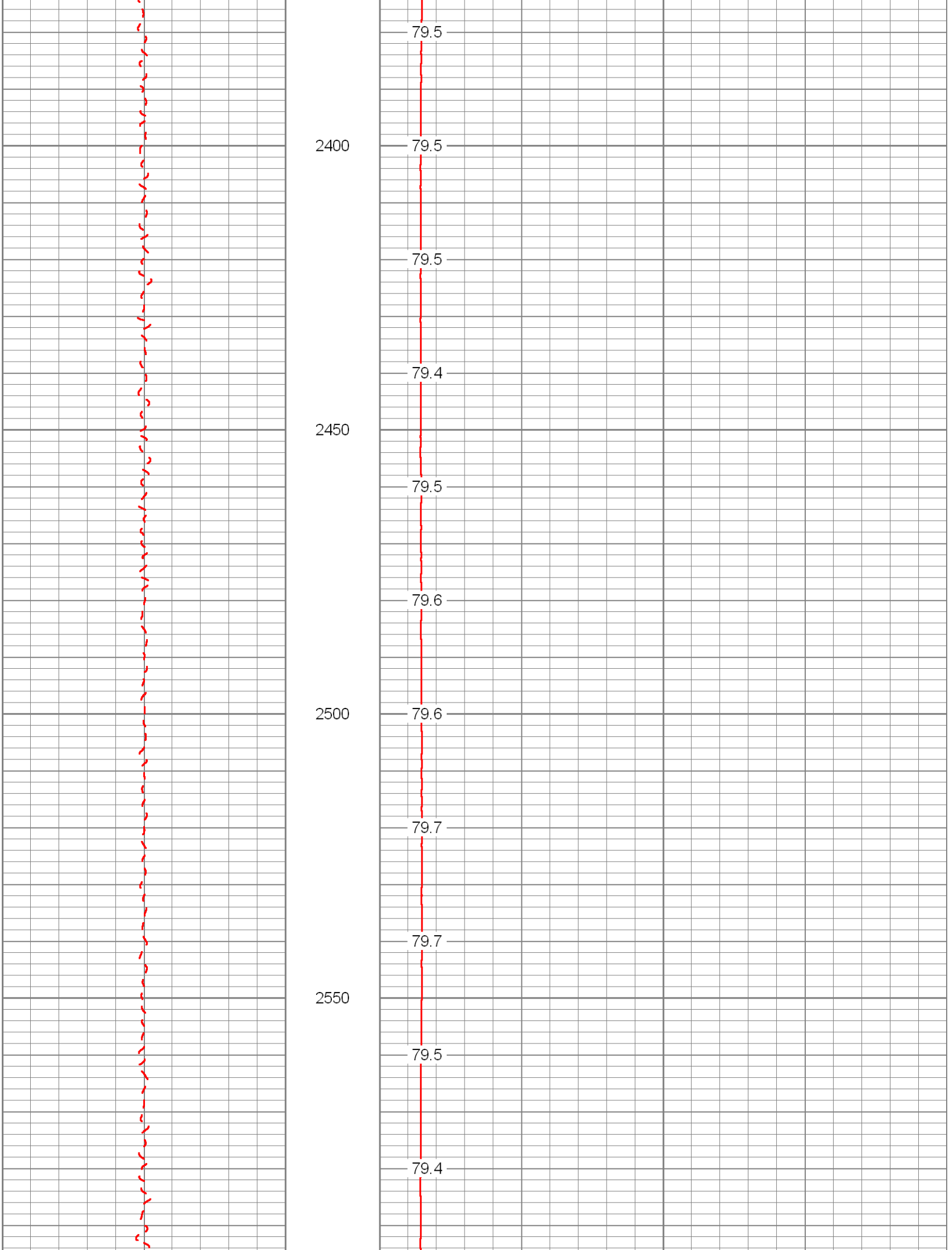

77.6
1300
77.5
77.4
77.2
1350
77.0
76.9
1400
76.9
76.6
76.3
1450
76.3
76.4

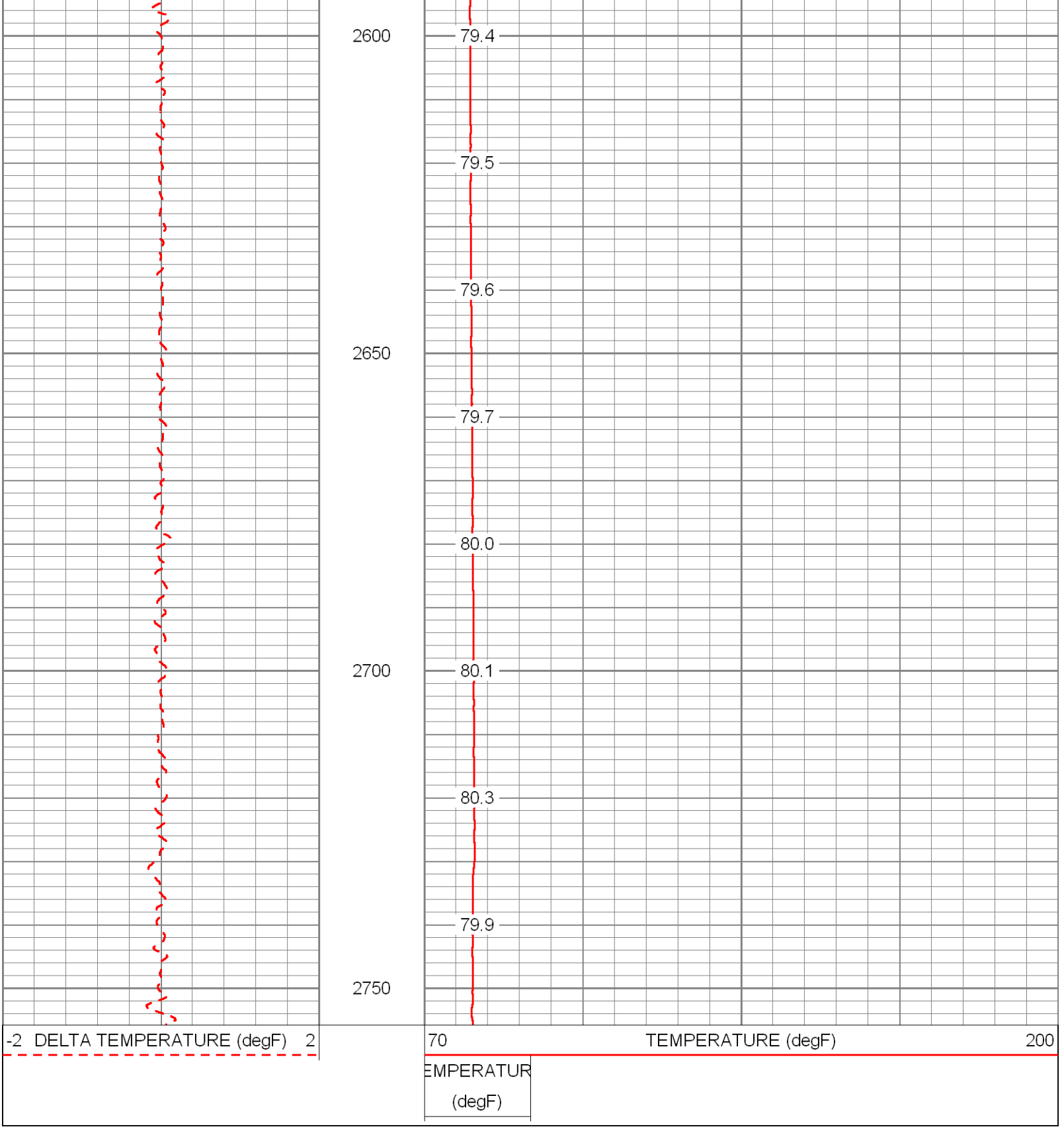

1500
76.5
76.5
76.5
1550
76.4
76.5
1600
76.8
76.9
77.0
1650
77.0
77.1
1700
77.2


77.2
77.2
1750
77.1
77.2
1800
77.3
77.2
77.2
1850
77.2
77.0
1900
77.1
77.3


77.3
1950
76.9
77.3
2000
77.1
77.2
77.2
2050
77.1
77.0
2100
77.1
77.3
77.3
2150


77.5
77.7
2200
78.0
78.3
78.6
2250
78.9
79.3
2300
79.6
79.7
79.9
2350
80.0


79.5
2400
79.5
79.5
79.4
2450
79.5
79.6
2500
79.6
79.7
79.7
2550
79.5
79.4



Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)

			TEMP-RTS (952)	25.50	1.69	70.00
TEMP	0.10					

Dataset:	sdwwtp-iw-6.db: field/well/run1/pass1
Total Length:	25.50 ft
Total Weight:	70.00 lb
O.D.	1.69 in

Calibration Report

Database File:	C:\Warrior\Data\2013\MIT\SOUTH DADE\data base\sdwwtp-iw-6.db
Dataset Pathname:	pass1
Dataset Creation:	Fri Aug 23 08:28:41 2013 by Log SOC 110722

Temperature Calibration Report

Serial Number:	952
Tool Model:	RTS
Performed:	Wed Jun 19 08:20:23 2013

Performed: Wed Jun 19 08:20:23 2013

Point #	Reading		Reference	
1	439.20	cps	33.00	degF
2	912.13	cps	85.00	degF
3	1637.63	cps	155.00	degF
4		cps		degF
5		cps		degF
6		cps		degF
7		cps		degF
8		cps		degF
9		cps		degF
10		cps		degF

Appendix F

Television Survey

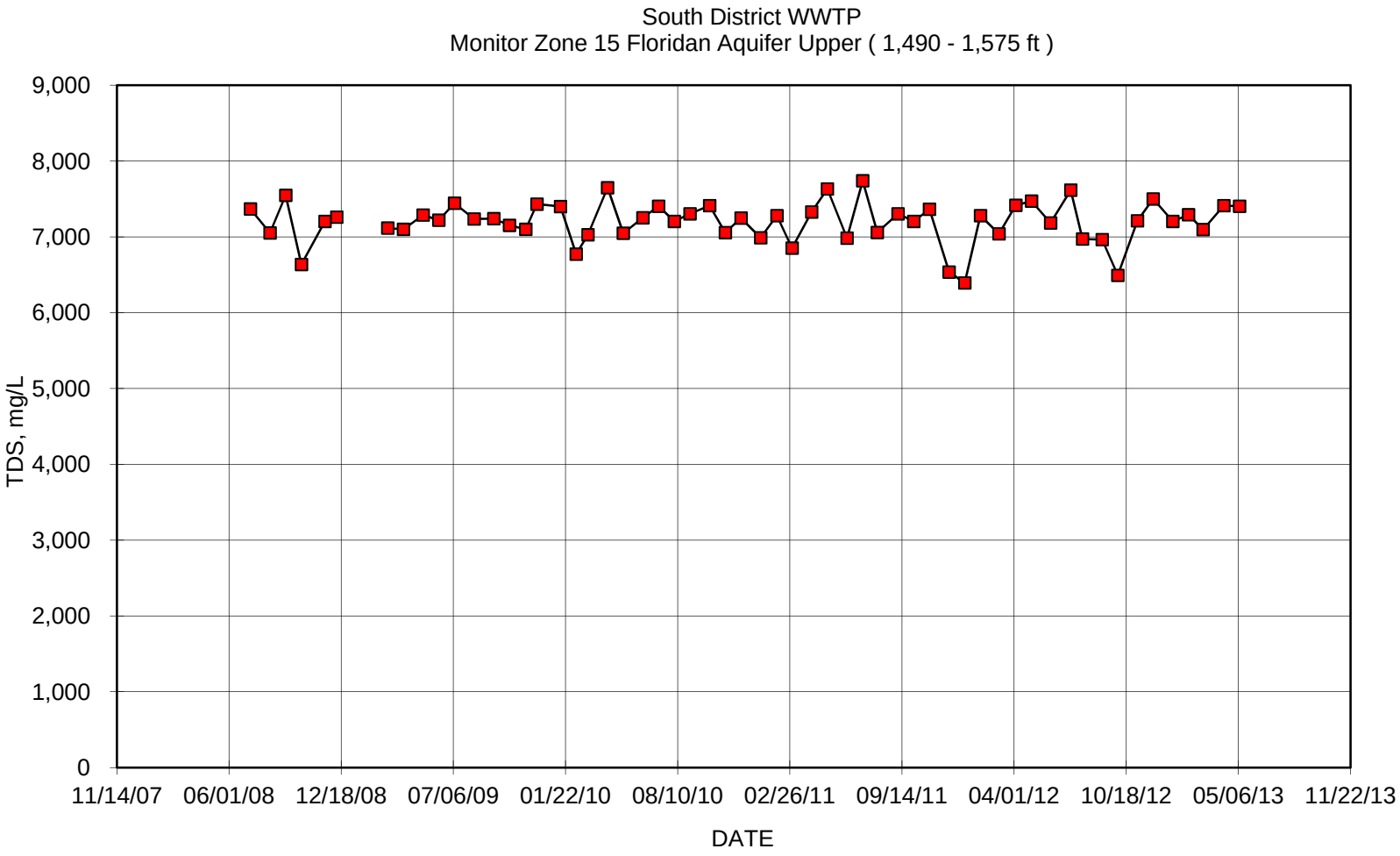
Appendix G

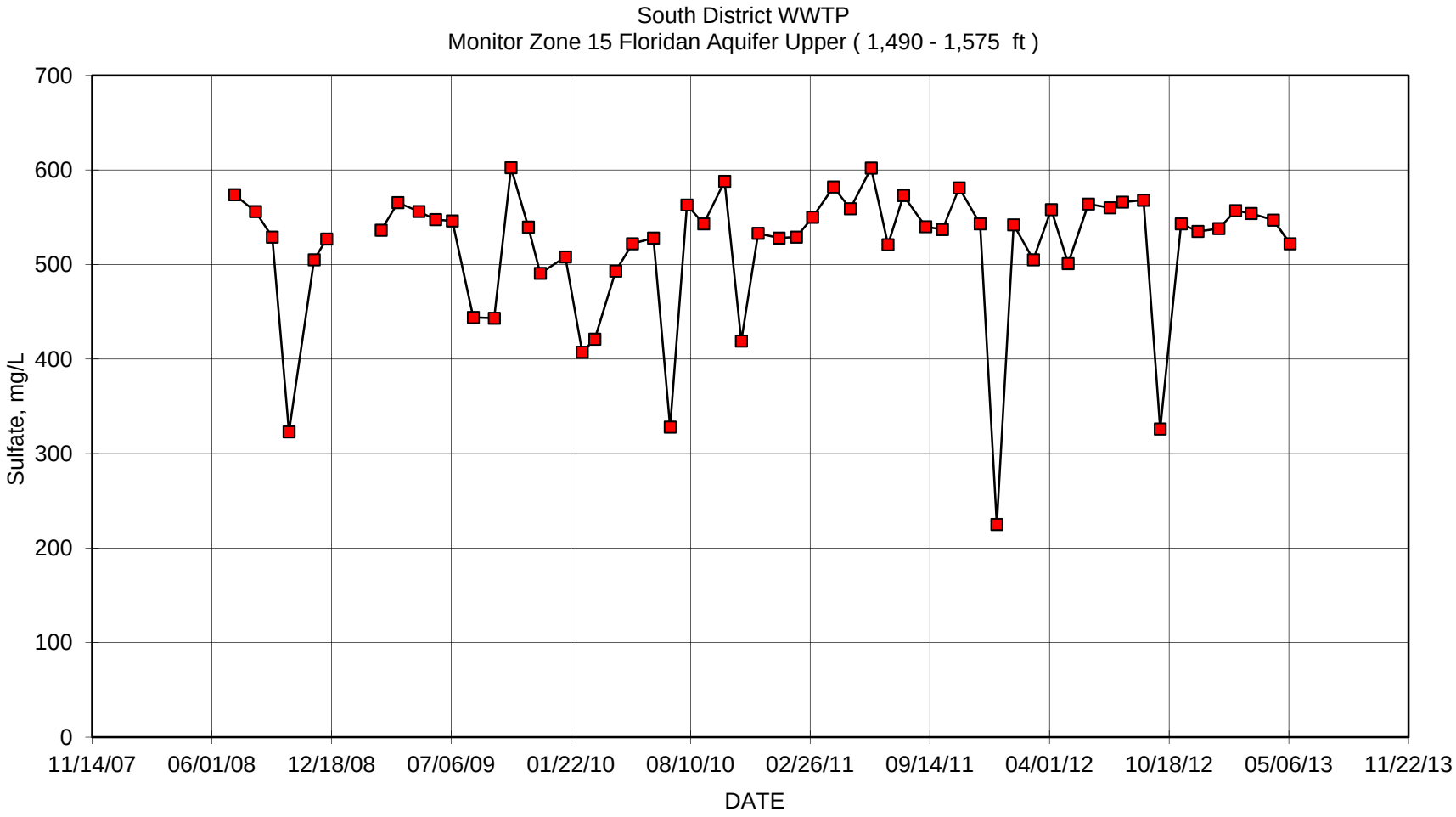
5 year Monitoring Data

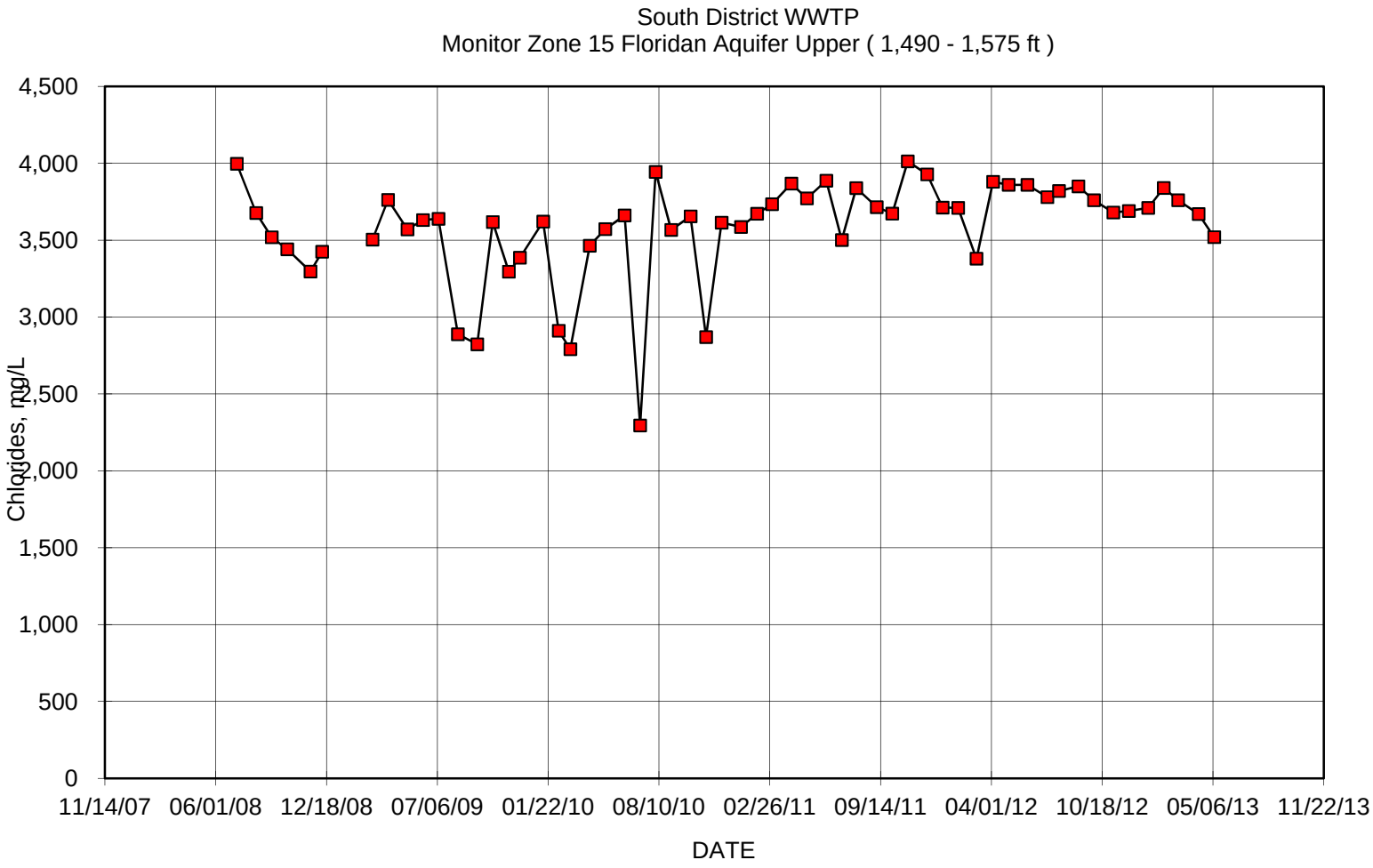
FA-15 Upper

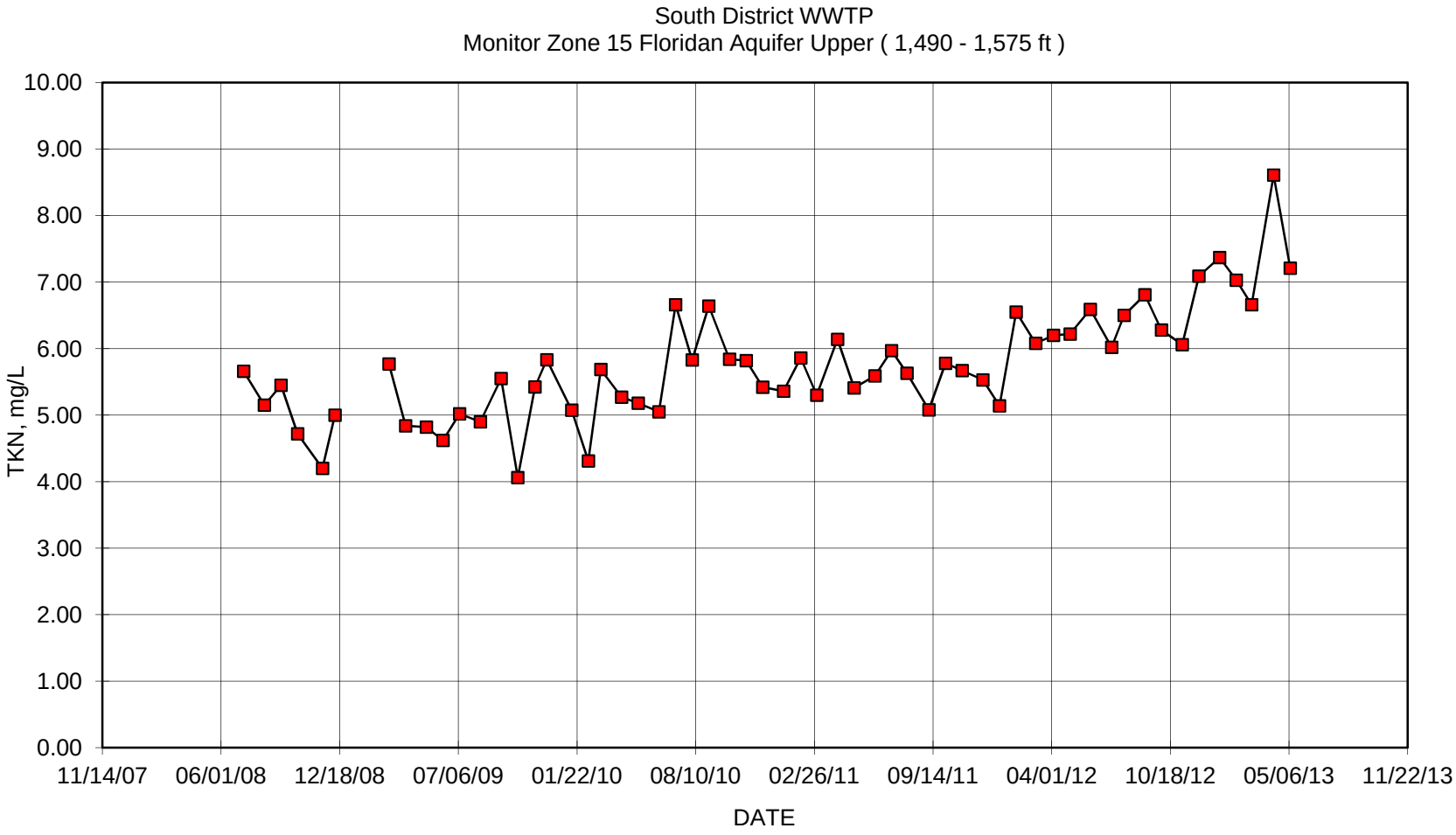
Date	TDS, mg/L	Sulfate, mg/L	Chlorides, mg/L	TKN, mg/L	NH3, mg/L	Conductivity, Micromho/cm	Temp., C	Temp., F	pH	TP, mg/L	TSS mg/L	NO_3 mg/L	NO_2 mg/L	Sodium, mg/L	Gross Alpha, pCi/L	Radium 226, pCi/L	Radium 228, pCi/L
07/09/08	7,368	574	3,997	5.66	3.77	11,460	27	80	7.9	0.01	1.76	0.03	0.00				
08/13/08	7,052	556	3,677	5.15	4.05	11,490	25	77	7.9	0.01	5.60	0.08	0.05				
09/10/08	7,548	529	3,519	5.45	4.63	11,680	25	77	7.8	0.02	1.76	0.08	0.05				
10/08/08	6,636	323	3,441	4.72	3.80	11,300	28	82	8.6	0.02	1.76	0.03	0.00				
11/19/08	7,204	505	3,296	4.20	3.42	10,600	22	72	7.2	0.00	6.60	0.03	0.00				
12/10/08	7,260	527	3,425	5.00	4.22	11,710	24	75	7.7	0.02	2.00	0.03	0.00				
01/14/09																	
02/11/09																	
03/11/09	7,116	536	3,504	5.77	5.03	11,700	23	74	7.3	0.26	3.40	0.00	0.00				
04/08/09	7,100	566	3,762	4.84	4.61	11,870	23	74	7.8	0.02	3.80	0.00	0.00				
05/13/09	7,288	556	3,570	4.82	4.91	11,810	24	76	7.9	0.00	6.60	0.00	0.01				
06/10/09	7,220	548	3,631	4.62	4.94	11,780	24	76	7.8	0.13	5.40	0.02	0.00				
07/08/09	7,444	546	3,639	5.02	4.27	11,850	25	77	7.7	0.06	7.60	0.00	0.02				
08/12/09	7,236	444	2,888	4.90	4.62	12,404	23	74	7.7	0.01	5.40	0.00	0.00				
09/16/09	7,240	443	2,823	5.55	4.43	11,600			7.7	0.00		0.05	0.01	1990	25.6	3.7	0.8
10/14/09	7,152	602	3,618	4.06	4.59	11,020			7.8	0.02		0.00	0.00	1930	12.0	4.8	0.7
11/12/09	7,100	540	3,295	5.42	4.82	10,650			7.8	0.02		0.00	0.00	1870	13.1	4.70	0.9
12/02/09	7,432	491	3,386	5.83	5.00	11,490	24	75	7.7	0.02	5.80	0.00	0.00	1850	14.0	4.60	0.9
01/13/10	7,400	508	3,621	5.07	4.77	11,520	19	66	7.8	0.01	3.80	0.00	0.00	1620	10.4	5.40	0.7
02/10/10	6,772	407	2,911	4.31	3.89	11,260	24	75	8.0	0.01	2.00	0.04	0.00	1780	13.6	4.40	0.9
03/03/10	7,028	421	2,791	5.69	4.89	11,820	21	70	7.6	0.02	7.00	0.00	0.00	1940	10.3	4.90	0.6
04/07/10	7,648	493	3,464	5.27	4.68	11,880	24	76	7.5	0.01	5.80	0.00	0.00	2010	10.5	4.80	0.8
05/05/10	7,048	522	3,572	5.18	4.67	11,610	24	75	7.8	0.01	7.60	0.00	0.00	2020	17.0	3.30	0.8
06/09/10	7,252	528	3,661	5.05	4.37	12,060	32	90	7.8	0.24	3.20	0.00	0.00	1830	22.4	5.00	0.7
07/07/10	7,404	328	2,295	6.66	5.03	11,890	26	78	7.8	0.04	2.20	0.02	0.00	2000	15.4	4.00	0.8
08/04/10	7,204	563	3,944	5.83	5.72	11,110	25	76	7.8	0.18	5.80	0.01	0.00	1910	18.7	5.00	0.8
09/01/10	7,304	543	3,567	6.64	5.34	11,880	25	77	7.8	0.02	12.00	0.01	0.00	1940	13.0	4.20	0.8
10/06/10	7,412	588	3,655	5.84	5.76	11,780	23	73	7.5	0.02	4.00	0.00	0.00	1920	20.1	5.30	0.8
11/03/10	7,056	419	2,870	5.82	5.35	11,410	23	74	7.8	0.02	4.20	0.00	0.00	1940	21.9	4.10	0.6
12/01/10	7,248	533	3,614	5.42	5.64	11,710	23	73	7.8	0.02	3.80	0.00	0.00	1900	21.5	4.70	0.6
01/05/11	6,988	528	3,586	5.36	5.43	11,330	23	74	7.6	0.02	1.70	0.00	0.01	2000	15.3	4.90	0.7
02/03/11	7,280	529	3,672	5.86	4.76	11,020	22	72	7.7	0.22	2.70	0.01	0.00	1980	22.0	4.30	0.7
03/02/11	6,852	550	3,734	5.30	5.26	11,750	23	73	7.5	0.02	6.30	0.00	0.00	1980	7.4	5.10	0.8

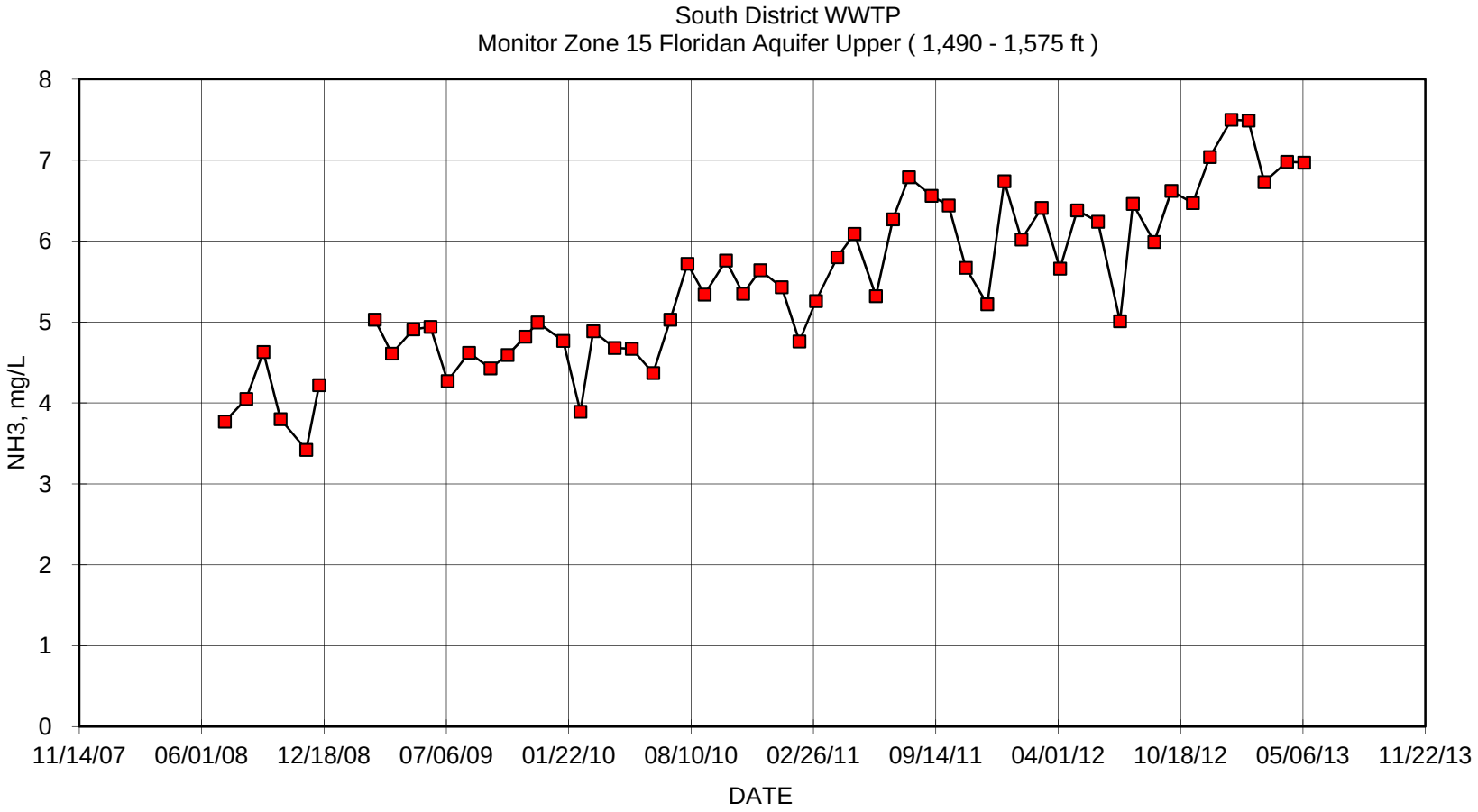
04/06/11	7,328	582	3,868	6.14	5.80	11,230	23	73	7.8	0.02	3.90	0.01	0.00	1980	13.0	5.40	0.7
05/04/11	7,632	559	3,772	5.41	6.09	11,410	23	74	7.8	0.02	2.30	0.00	0.00	2020	15.8	2.40	0.8
06/08/11	6,984	602	3,887	5.59	5.32	11,670	24	74	7.8	0.04	2.20	0.01	0.00	2070	25.4	3.90	0.8
07/06/11	7,740	521	3,501	5.97	6.27	11,410	24	75	7.7	0.02	4.30	0.00	0.00	1950	24.0	3.40	0.7
08/01/11	7,058	573	3,839	5.63	6.79	11,300	25	77	7.7	0.04	6.80	0.00	0.00	2040	17.2	5.60	0.9
09/07/11	7,304	540	3,715	5.08	6.56	11,190	24	75	7.9	0.07	4.10	0.00	0.00	1940	15.4	5.30	0.9
10/05/11	7,204	537	3,673	5.78	6.44	10,920	23	73	7.8	0.04	2.80	0.00	0.00	1970	17.7	5.20	0.9
11/02/11	7,364	581	4,013	5.67	5.67	10,540	23	74	8.0	0.04	1.50	0.00	0.00	2130	18.6	3.50	0.9
12/07/11	6,536	543	3,928	5.53	5.22	11,013	25	78	9.1	0.03	2.50	0.00	0.00	2100	10.0	2.50	0.7
01/04/12	6,392	225	3,712	5.14	6.74	9,967	20	67	8.7	0.02	1.90	0.00	0.00	2180	18.9	1.90	1.0
02/01/12	7,280	542	3,710	6.55	6.02	9,707	23	74	7.7	0.02	0.01	0.01	0.00	2110	10.5	4.80	0.8
03/05/12	7,040	505	3,380	6.08	6.41	10,776	23	74	7.5	0.01	2.80	0.00	0.00	2220	24.5	4.80	0.7
04/04/12	7,416	558	3,880	6.20	5.66	11,104	23	74	7.3	0.04	0.04	0.50	0.50	1980	15.2	4.50	0.8
05/02/12	7,472	501	3,860	6.22	6.38	10,365	23	74	7.3	0.03	5.20	0.01	0.01	2140	13.1	3.40	0.9
06/05/12	7,184	564	3,860	6.59	6.24	11,690	25	76	8.2	0.02	1.50	0.01	0.00	1950	11.1	5.70	0.8
07/11/12	7,616	560	3,780	6.02	5.01	11,650	23	74	7.9	0.03	1.50	0.01	0.00	2130	3.7	2.90	1.0
08/01/12	6,972	566	3,820	6.50	6.46	11,673	23	74	7.9	0.02	2.00	0.01	0.00	2060	4.9	3.90	0.8
09/05/12	6,964	568	3,850	6.81	5.99	11,667	24	74	7.9	0.04	3.30	0.01	0.00	1910	12.1	3.10	0.8
10/03/12	6,492	326	3,760	6.28	6.62	10,720	28	82	8.9	0.03	1.50	0.00	0.00	2040	25.4	2.20	0.8
11/07/12	7,212	543	3,680	6.06	6.47	10,880	3	37	7.9	0.01	1.80	0.00	0.00	2110	10.2	4.80	0.8
12/05/12	7,500	535	3,690	7.09	7.04	11,737	23	74	7.9	0.01	0.90	0.02	0.01	2070	21.2	3.90	0.9
01/09/13	7,204	538	3,710	7.37	7.50	11,827	23	74	7.9	0.06	1.20	0.00	0.00	2140	8.3	7.70	0.8
02/06/13	7,292	557	3,840	7.03	7.49	11,995	24	75	7.9	0.02	2.50	0.00	0.01	2040	11.3	4.30	0.8
03/04/13	7,096	554	3,760	6.66	6.73	11,928	21	70	7.8	0.05	2.80	0.00	0.00	2210	25.4	5.80	0.8
04/10/13	7,412	547	3,670	8.61	6.98	11,857	23	73	7.5	0.01	0.01	0.04	0.01	2040	12.7	5.10	0.8
05/08/13	7,404	522	3,520	7.21	6.97	12,256	23	74	7.6	0.04	0.04	0.01	0.00	2130	16.5	4.60	0.7

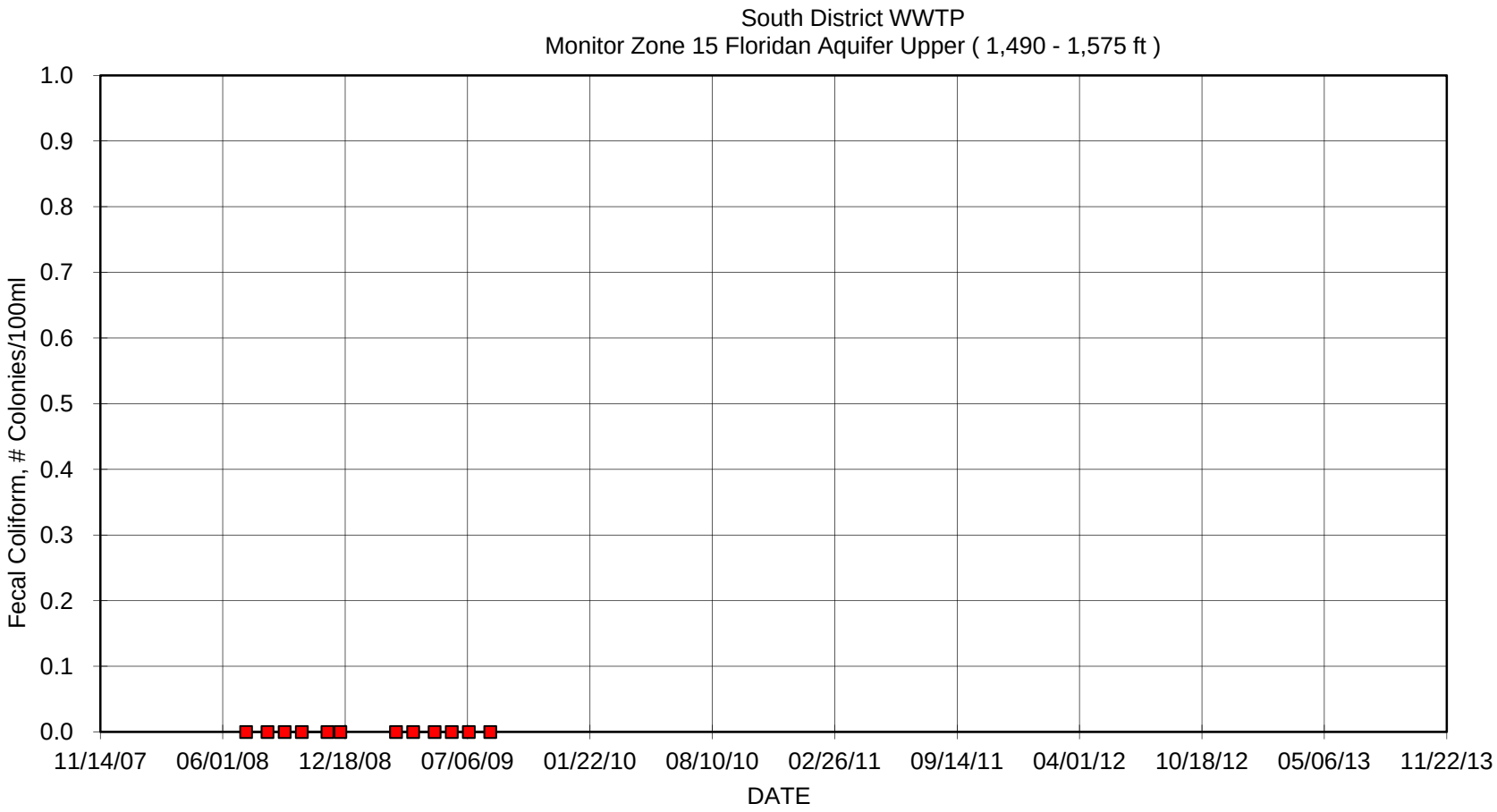

South District WWTP
Monitor Zone 15 Floridan Aquifer Upper (1,490 - 1,575 ft)
TDS, mg/L
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

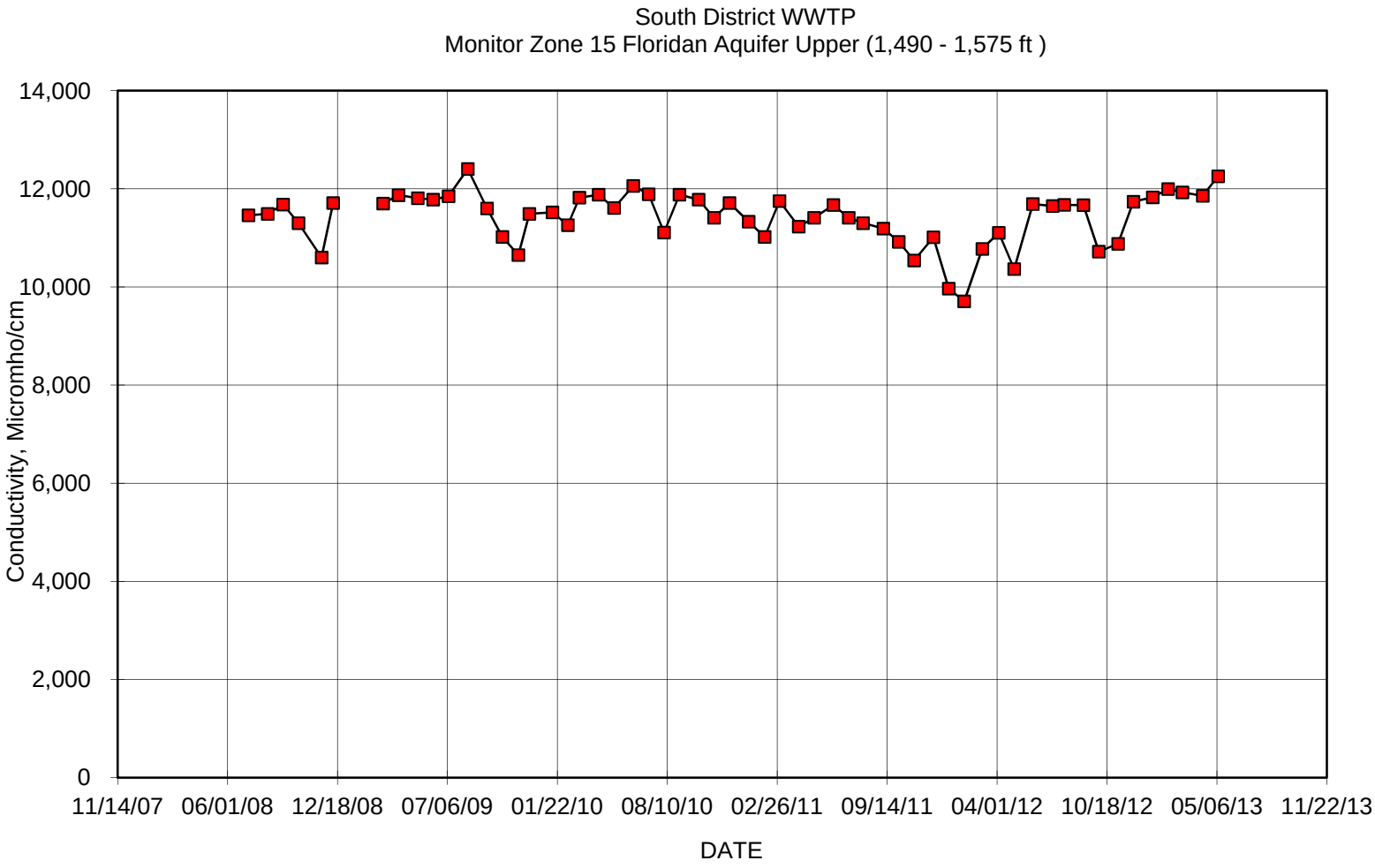

South District WWTP
Monitor Zone 15 Floridan Aquifer Upper (1,490 - 1,575 ft)
Sulfate, mg/L
700
600
500
400
300
200
100
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

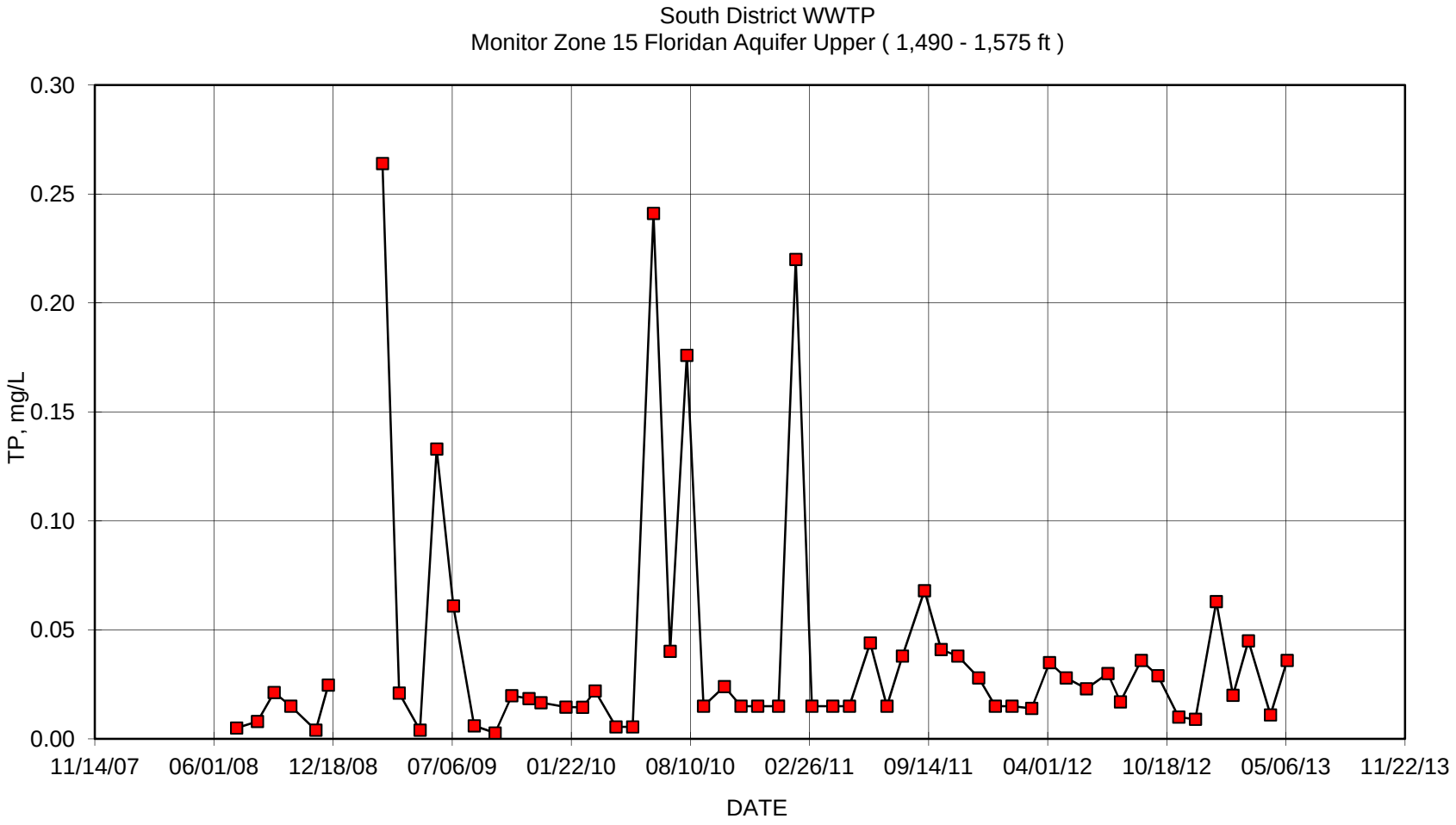

South District WWTP
Monitor Zone 15 Floridan Aquifer Upper (1,490 - 1,575 ft)
Chlorides, mg/L
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

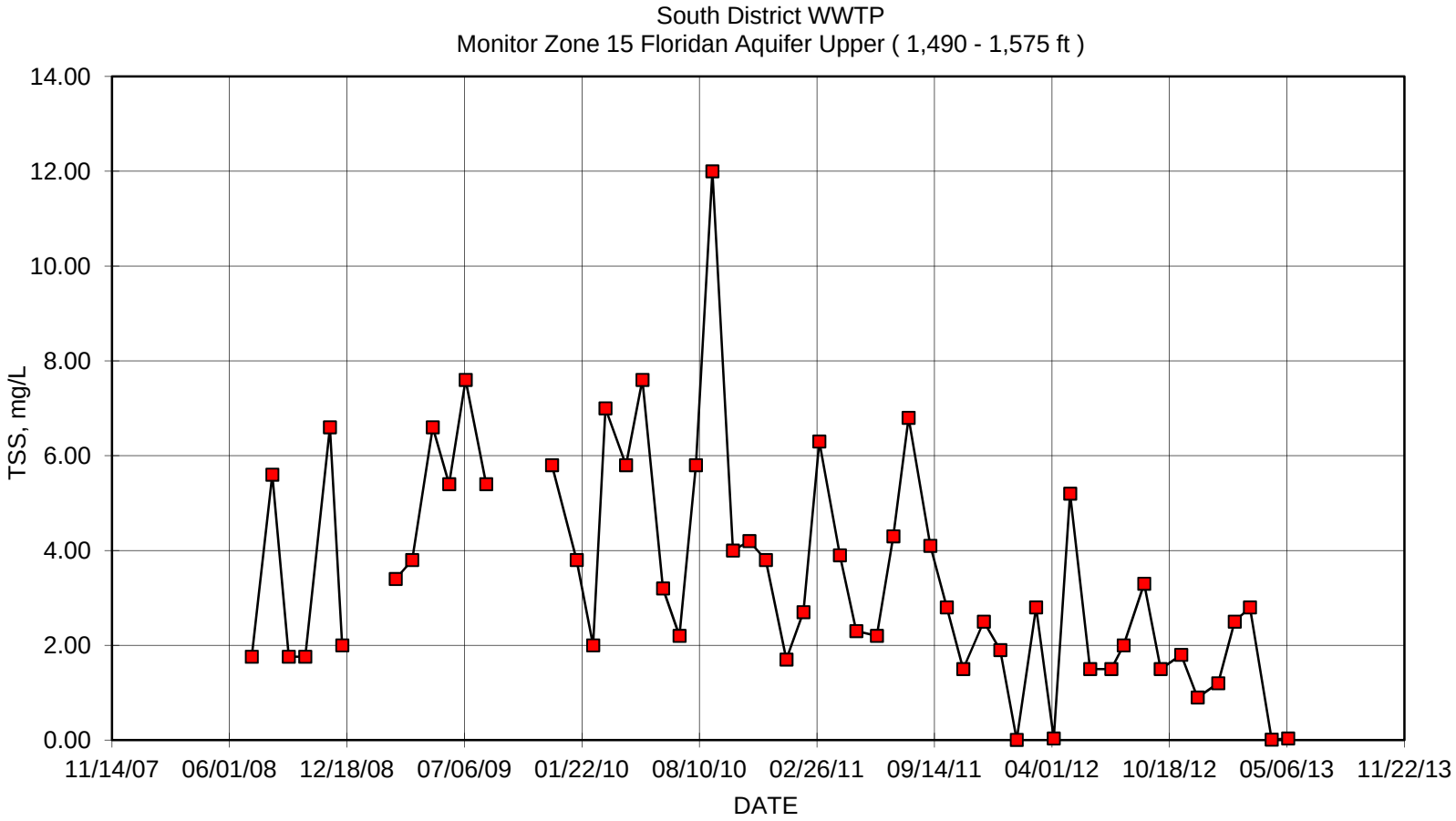

South District WWTP
Monitor Zone 15 Floridan Aquifer Upper (1,490 - 1,575 ft)
TKN, mg/L
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 15 Floridan Aquifer Upper (1,490 - 1,575 ft)
NH3, mg/L
0
1
2
3
4
5
6
7
8
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 15 Floridan Aquifer Upper (1,490 - 1,575 ft)
Fecal Coliform, # Colonies/100ml
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 15 Floridan Aquifer Upper (1,490 - 1,575 ft)
Conductivity, Micromho/cm
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

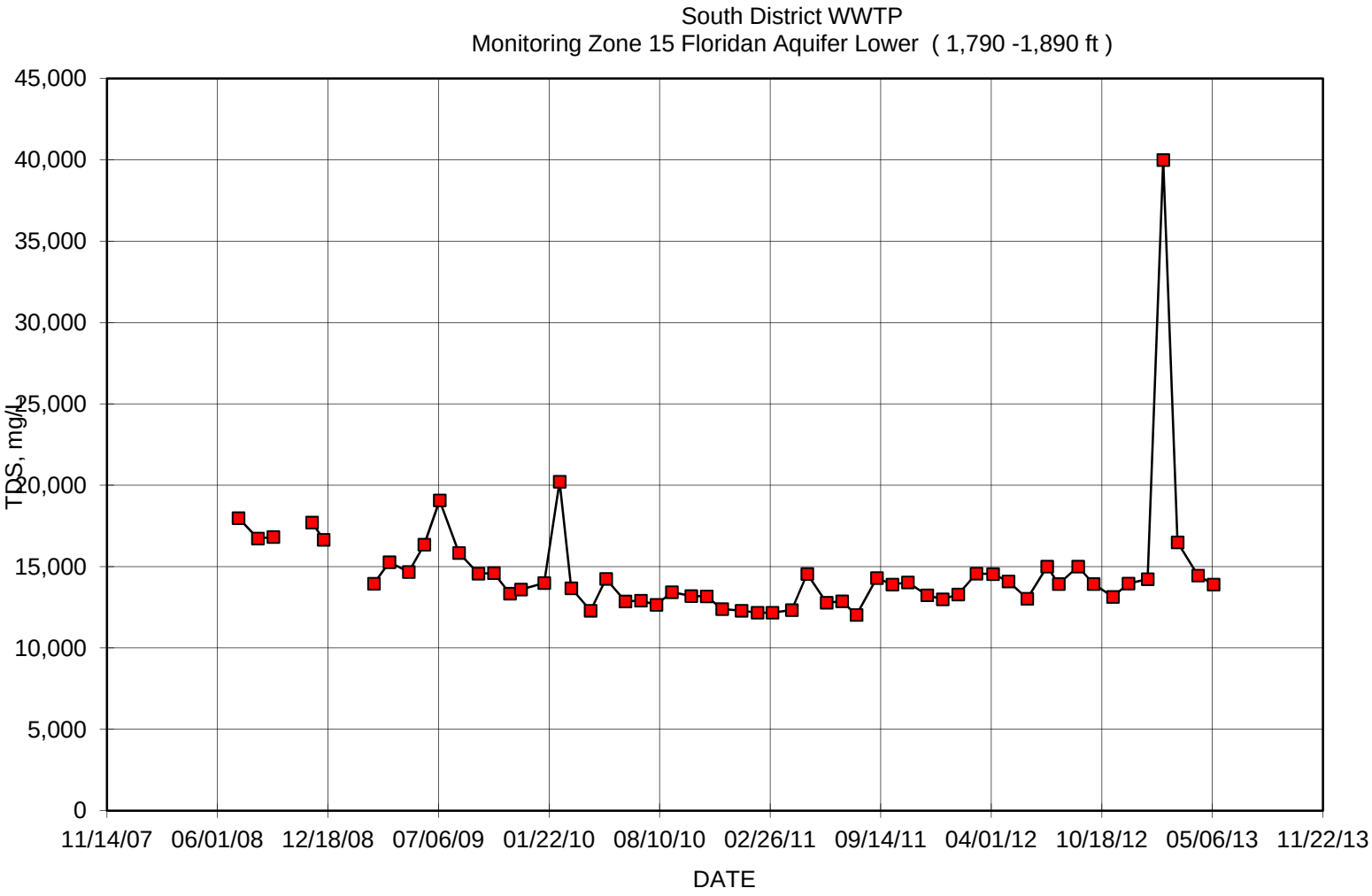

South District WWTP
Monitor Zone 15 Floridan Aquifer Upper (1,490 - 1,575 ft)
TP, mg/L
0.30
0.25
0.20
0.15
0.10
0.05
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

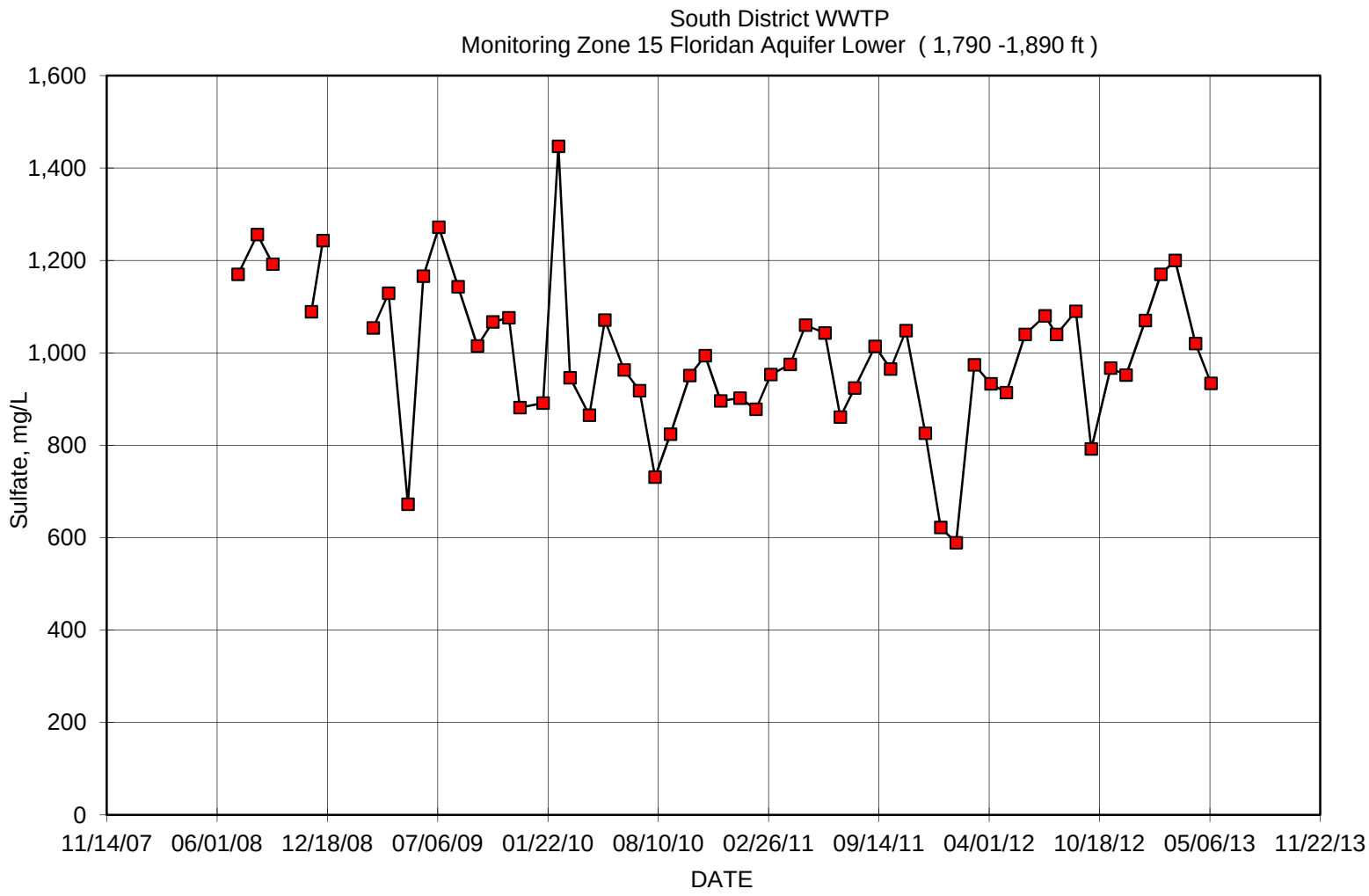

South District WWTP
Monitor Zone 15 Floridan Aquifer Upper (1,490 - 1,575 ft)
TSS, mg/L
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

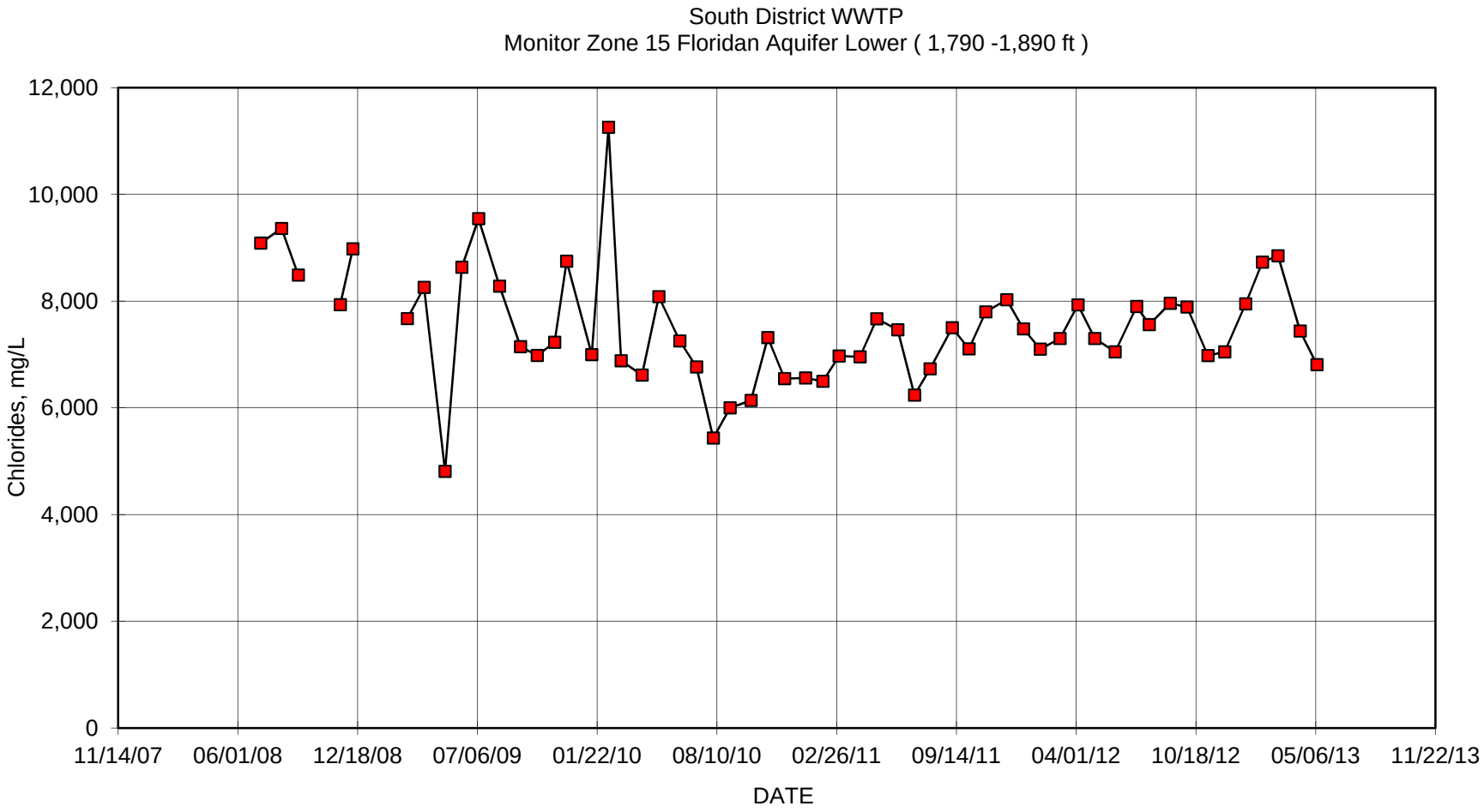
FA-15 Lower Data

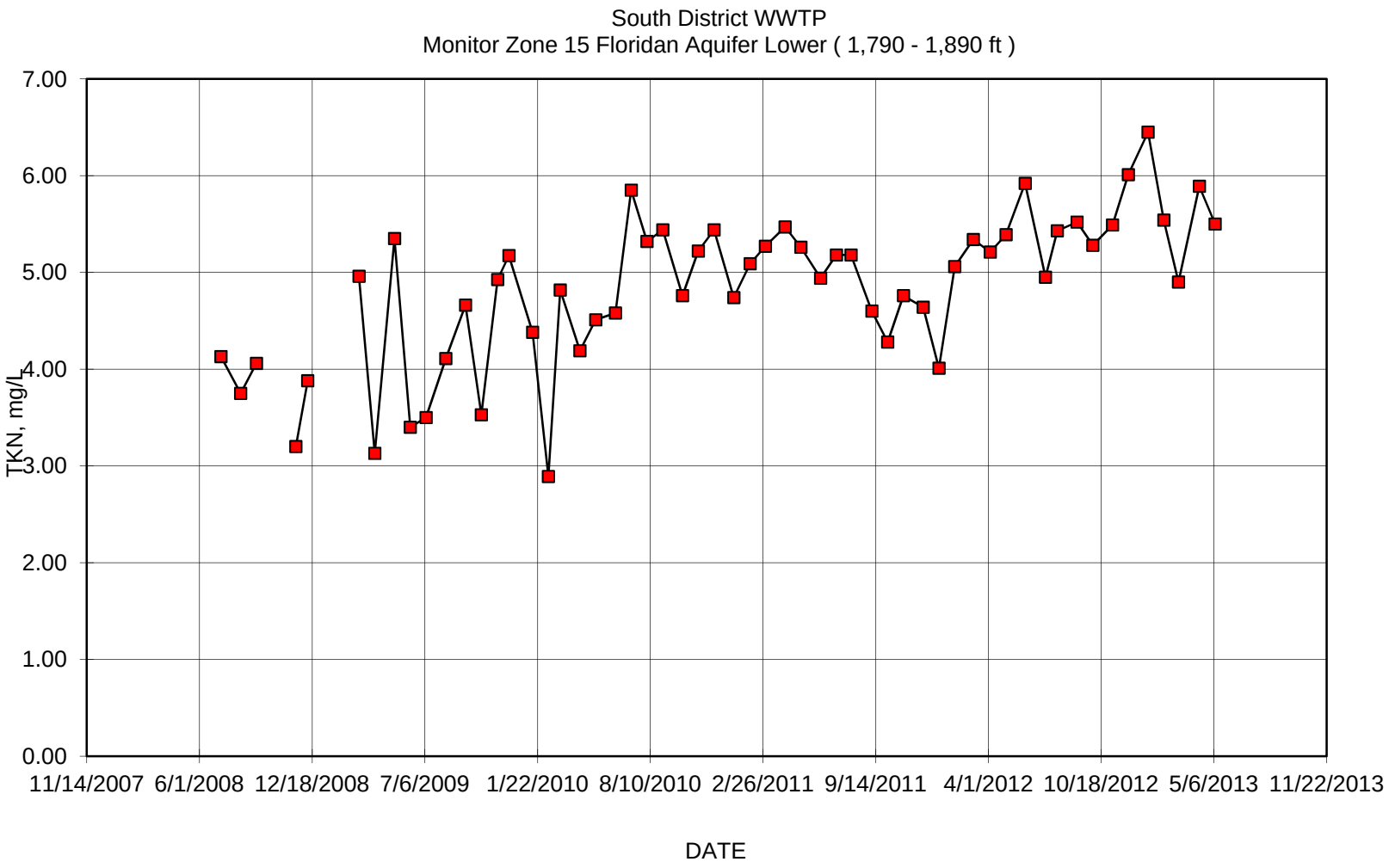
Date	TDS, mg/L	Sulfate, mg/L	Chlorides, mg/L	TKN, mg/L	NH3, mg/L	Conductivity, Micromho/cm	Temp., C	Temp., F	pH	TP, mg/L	TSS, mg/L	NO_3, mg/L	NO_2, mg/L	Sodium, mg/L	Gross Alpha, pCi/L	Radium 226, pCi/L	Radium 228, pCi/L
07/09/08	17,980	1,170	9,087	4.13	1.98	26,460	26	80	7.6	0.01	1.76	0.03	0.00				
08/13/08	16,730	1,256	9,362	3.75	3.12	26,280	24	76	7.5	0.01	11.00	0.08	0.05				
09/10/08	16,820	1,192	8,488	4.06	3.61	23,920	25	77	7.5	0.02	8.60	0.08	0.05				
10/08/08																	
11/19/08	17,710	1,089	7,933	3.20	2.60	23,340	22	71	7.3	0.00	8.00	0.03	0.00				
12/10/08	16,650	1,243	8,981	3.88	3.26	25,580	24	74	7.4	0.03	5.60	0.03	0.00				
01/14/09																	
02/11/09																	
03/11/09	13,950	1,054	7,673	4.96	4.29	23,240	23	73	7.4	0.63	6.00	0.00	0.00				
04/08/09	15,270	1,129	8,258	3.13	3.80	24,320	23	74	7.4	0.02	8.20	0.00	0.00				
05/13/09	14,670	672	4,811	5.35	4.21	22,870	24	76	7.5	0.01	7.20	0.00	0.00				
06/10/09	16,350	1,166	8,635	3.40	3.98	26,770	24	75	7.5	0.37	8.00	0.00	0.00				
07/08/09	19,070	1,272	9,546	3.50	3.01	27,610	25	77	7.3	0.13	10.40	0.00	0.00				
08/12/09	15,840	1,143	8,281	4.11	3.59	24,650	23	74	7.5	0.01	6.60	0.00	0.00				
09/16/09	14,570	1,015	7,147	4.66	3.71	21,950			7.5	0.01		0.05	0.01	3960	8.0	6.8	0.8
10/14/09	14,600	1,067	6,982	3.53	3.94	21,290			7.5	0.02		0.00	0.00	3750	8.3	6.0	0.9
11/12/09	13,340	1,076	7,229	4.93	4.27	21,620			8.3	0.02		0.00	0.00	3470	9.2	7.3	0.9
12/02/09	13,590	882	8,748	5.17	4.42	20,780	25	76	7.4	0.02	8.60	0.00	0.00	3230	10.0	6.2	0.8
01/13/10	13,990	891	6,998	4.38	4.15	20,800	20	67	7.3	0.02	8.20	0.00	0.00	3030	7.3	6.6	0.9
02/10/10	20,220	1,447	11,258	2.89	2.68	30,790	23	73	7.6	0.02	11.40	0.00	0.00	5280	11.1	8.3	0.8
03/03/10	13,670	946	6,883	4.82	4.24	20,890	21	71	7.3	0.02	5.80	0.00	0.00	3640	6.4	6.2	0.7
04/07/10	12,290	865	6,616	4.19	4.26	19,080	24	75	7.3	0.01	6.00	0.01	0.00	3470	9.1	6.9	0.7
05/05/10	14,248	1,071	8,084	4.51	3.82	21,900	24	75	7.4	0.01	10.00	0.00	0.00	4030	6.6	5.6	0.8
06/09/10	12,860	963	7,254	4.58	3.86	21,530	27	81	7.6	0.05	6.80	0.01	0.00	3640	8.5	7.2	1.0
07/07/10	12,910	918	6,767	5.85	4.66	19,820	25	78	7.4	0.02	5.20	0.00	0.00	3670	7.4	6.1	0.8
08/04/10	12,650	731	5,435	5.32	5.14	19,630	25	76	7.4	0.15	5.20	0.00	0.00	3670	11.4	6.3	0.7
09/01/10	13,430	824	6,001	5.44	4.67	21,480	25	76	7.4	0.02	18.40	0.01	0.00	3910	8.2	5.1	0.8
10/06/10	13,190	951	6,140	4.76	4.99	20,050	23	73	7.5	0.02	4.00	0.00	0.00	3450	8.5	6.0	0.9
11/03/10	13,170	994	7,317	5.22	4.63	20,800	23	73	7.5	0.02	4.40	0.00	0.00	4120	8.4	6.1	0.7
12/01/10	12,390	896	6,549	5.44	5.13	19,590	23	73	7.5	0.02	5.20	0.00	0.00	3430	8.4	6.9	0.7

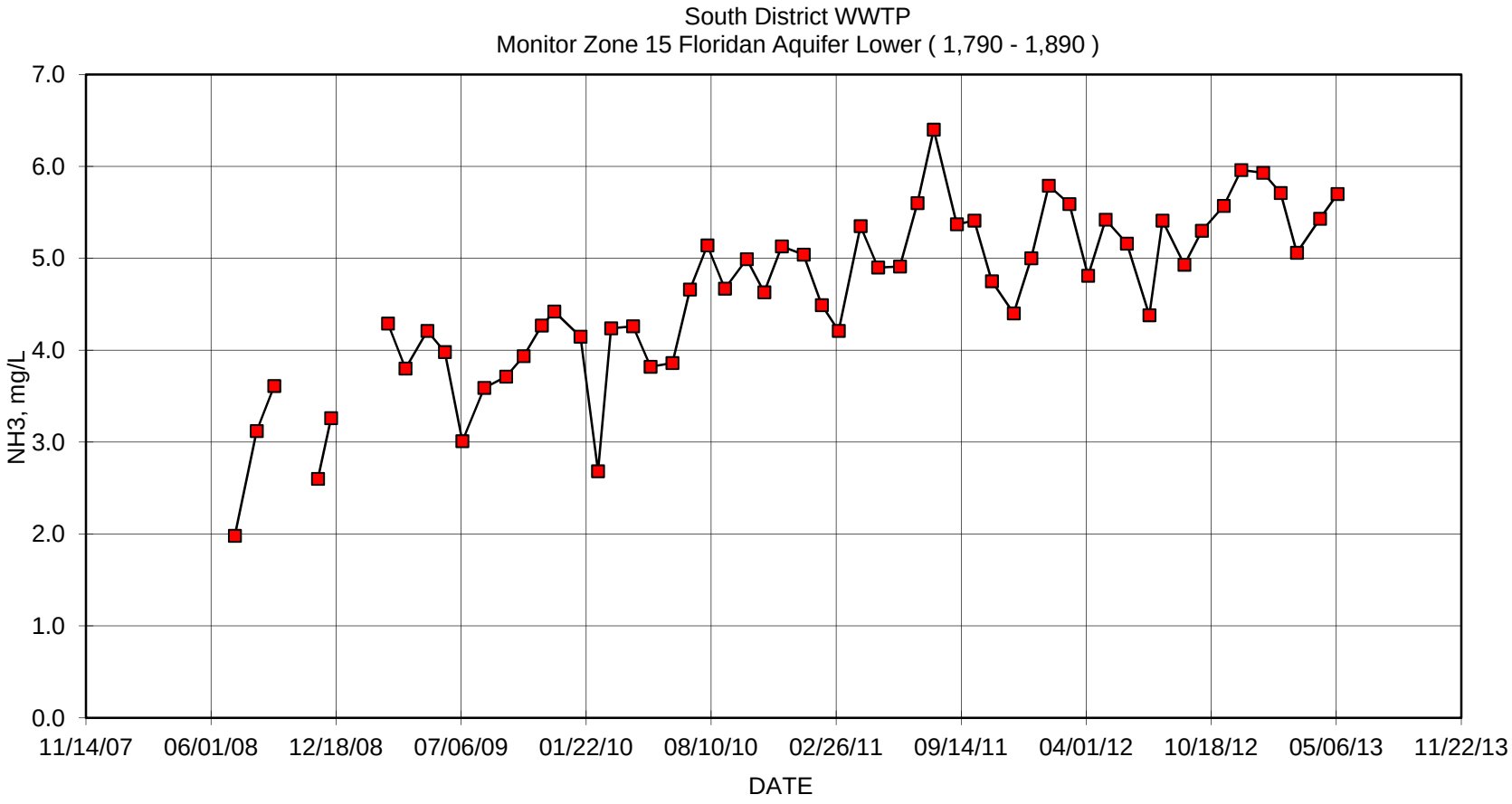
01/05/11	12,290	902	6,560	4.74	5.04	18,860	23	74	7.4	0.02	2.10	0.00	0.01	3560	7.6	7.7	0.8
02/03/11	12,170	878	6,498	5.09	4.49	18,090	23	73	7.7	0.16	3.50	0.01	0.00	3460	7.4	5.4	0.8
03/02/11	12,170	953	6,972	5.27	4.21	20,090	23	73	7.2	0.02	6.80	0.01	0.00	3740	6.8	6.3	0.7
04/06/11	12,330	975	6,957	5.47	5.35	18,710	22	72	7.1	0.02	7.10	0.00	0.00	3660	7.3	7.3	0.7
05/04/11	14,550	1,060	7,670	5.26	4.90	22,390	23	73	7.6	0.02	3.90	0.01	0.00	3880	8.1	7.1	1.0
06/08/11	12,780	1,043	7,463	4.94	4.91	21,000	23	74	7.2	0.05	3.00	0.00	0.00	3860	5.9	6.4	0.9
07/06/11	12,870	861	6,239	5.18	5.60	19,720	24	75	7.7	0.02	5.30	0.01	0.00	3750	8.0	6.3	0.8
08/01/11	12,030	924	6,732	5.18	6.40	17,400	24	76	7.6	0.04	6.40	0.01	0.00	9200	6.3	6.6	0.9
09/07/11	14,300	1,014	7,502	4.60	5.37	21,600	24	75	7.7	0.06	2.50	0.01	0.00	3960	6.2	6.6	0.9
10/05/11	13,900	965	7,106	4.28	5.41	20,740	23	73	7.5	0.09	6.50	0.00	0.00	3890	9.2	7.8	1.0
11/02/11	14,030	1,048	7,799	4.76	4.75	21,070	23	74	7.3	0.04	5.30	0.01	0.00	4370	4.4	4.0	1.0
12/07/11	13,240	826	8,026	4.64	4.40	19,570	24	76	8.9	0.02	6.00	0.01	0.00	4070	6.0	4.5	0.8
01/04/12	12,990	622	7,480	4.01	5.00	18,840	21	69	9.0	0.02	4.50	0.01	0.00	3960	5.7	5.4	0.8
02/01/12	13,290	589	7,100	5.06	5.79	20,312	23	73	7.3	0.02	4.10	0.01	0.01	4040	6.9	0.0	0.7
03/05/12	14,570	974	7,300	5.34	5.59	18,450	23	73	7.5	0.01	2.70	0.01	0.00	4660	8.4	8.3	0.8
04/04/12	14,540	933	7,930	5.21	4.81	21,350	23	73	7.4	0.04	8.70	0.50	0.50	3980	8.8	7.6	0.7
05/02/12	14,090	914	7,300	5.39	5.42	21,250	23	74	7.9	0.01	6.50	0.04	0.00	3960	6.7	6.7	0.9
06/05/12	13,028	1,040	7,050	5.92	5.16	19,359	24	75	7.3	0.02	5.50	0.00	0.00	3810	6.8	6.3	0.9
07/11/12	15,000	1,080	7,900	4.95	4.38	22,410	23	73	7.6	0.02	3.70	0.03	0.00	4250	8.3	6.7	0.9
08/01/12	13,930	1,040	7,560	5.43	5.41	20,420	23	74	8.1	0.02	2.80	0.01	0.00	4840	6.8	5.2	0.8
09/05/12	15,000	1,090	7,960	5.52	4.93	22,220	23	74	7.5	0.06	4.10	0.00	0.00	3880	7.7	6.7	0.8
10/03/12	13,930	792	7,890	5.28	5.30	22,193	25	77	8.6	0.03	10.90	0.03	0.00	4240	5.8	5.5	0.8
11/07/12	13,140	967	6,980	5.49	5.57	20,285	22	72	7.6	0.03	8.00	0.03	0.00	4050	5.6	6.2	0.9
12/05/12	13,960	952	7,050	6.01	5.96	20,860	23	73	7.5	0.01	3.30	0.00	0.01	3790	6.2	5.0	0.9
01/09/13	14,230	1,070	7,950	6.45	5.93	22,160	23	73	7.5	0.10	3.70	0.01	0.01	4350	9.5	4.6	0.8
02/06/13	39,990	1,170	8,730	5.54	5.71	22,811	23	74	7.5	0.04	3.20	0.04	0.01	4590	6.1	6.9	0.9
03/04/13	16,490	1,200	8,850	4.90	5.06	25,598	21	69	7.7	0.04	8.10	0.00	0.01	5160	8.5	7.8	0.8
04/10/13	14,450	1,020	7,440	5.89	5.43	22,213	23	73	7.5	0.03	0.03	0.00	0.01	4150	6.3	5.1	0.9
05/08/13	13,900	934	6,810	5.50	5.70	20,097	23	74	7.3	0.05	0.05	0.01	0.00	4010	7.8	6.4	0.7

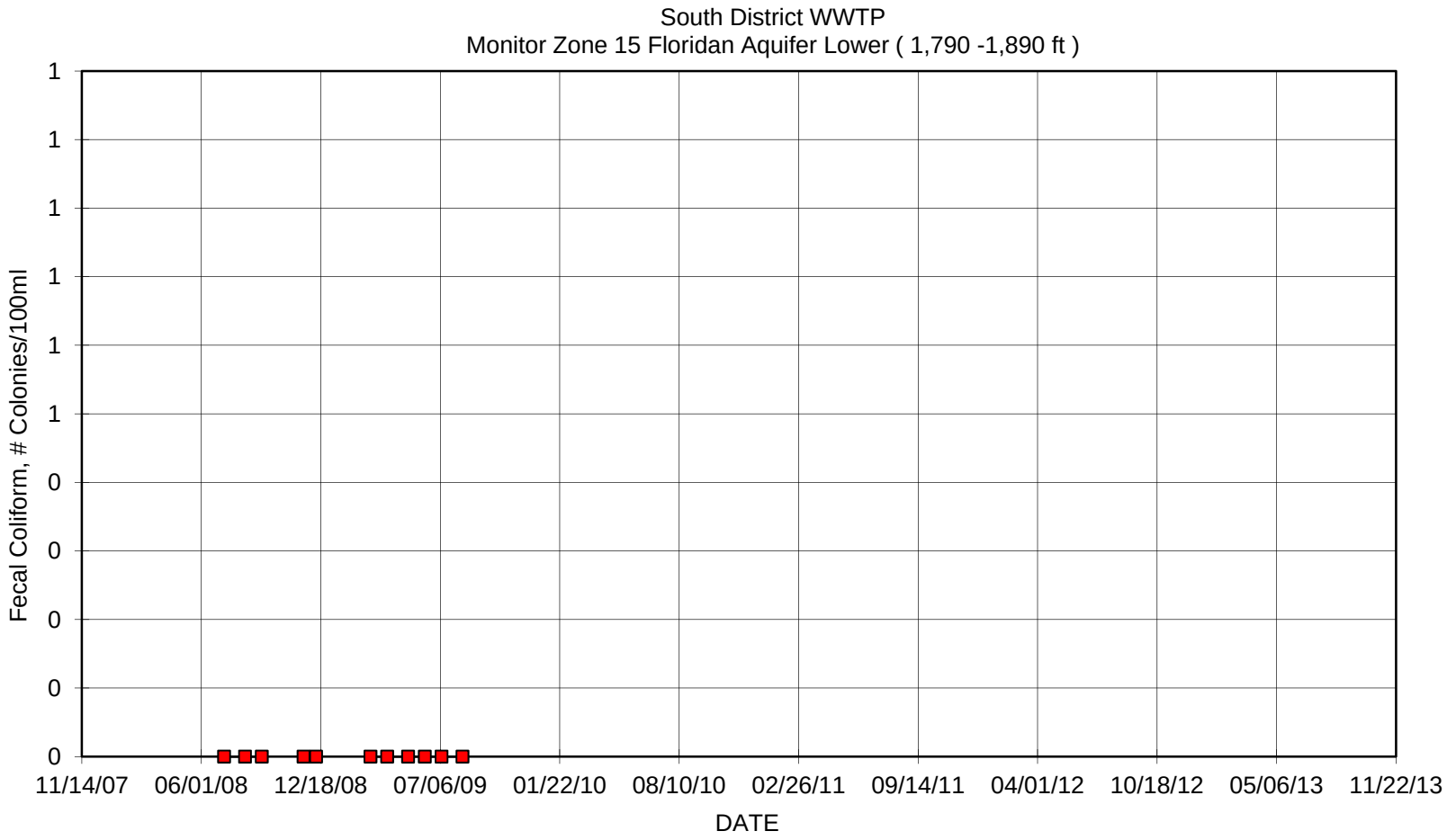

South District WWTP
Monitoring Zone 15 Floridan Aquifer Lower (1,790 -1,890 ft)
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
TDS, mg/L
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

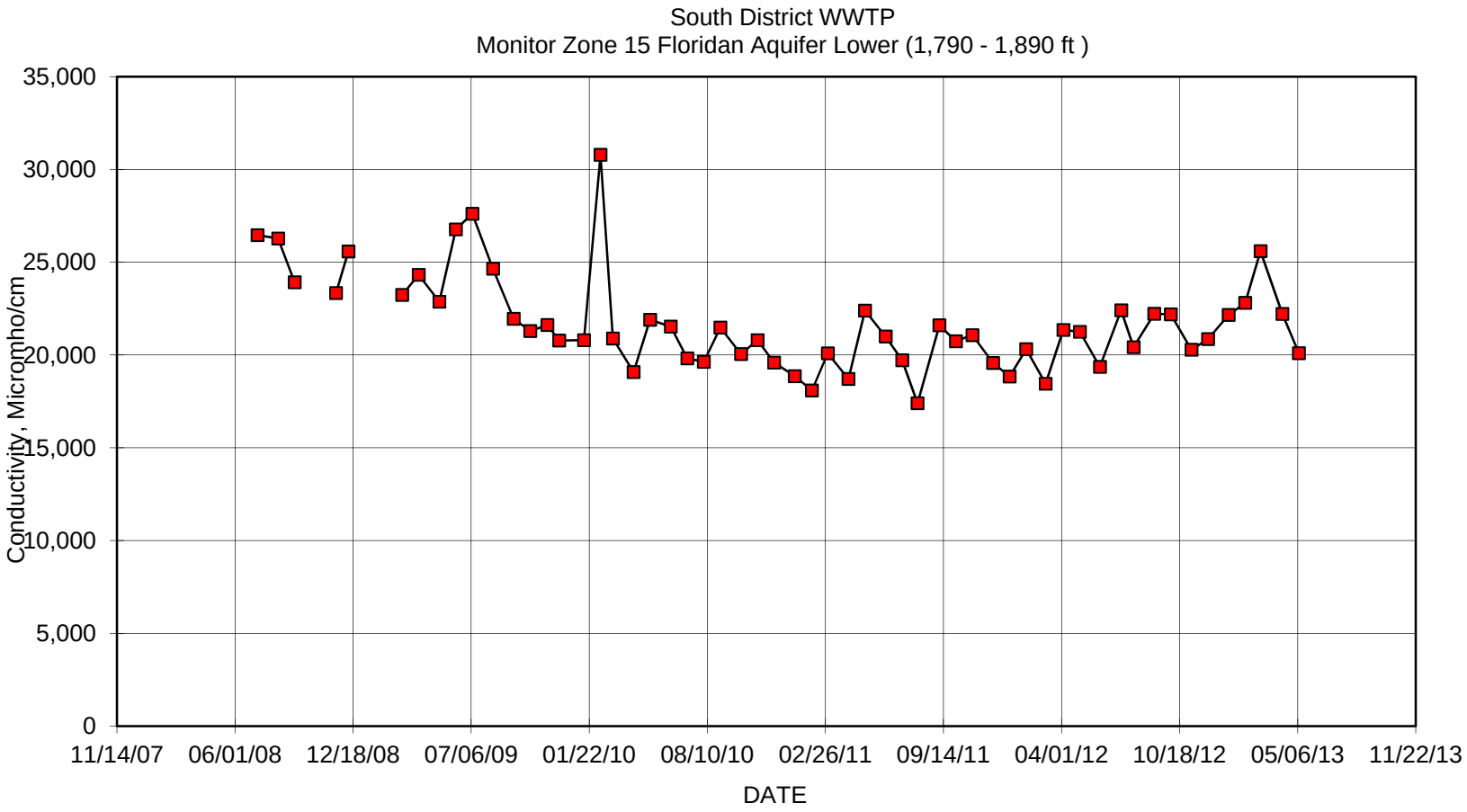

South District WWTP
Monitoring Zone 15 Floridan Aquifer Lower (1,790 -1,890 ft)
Sulfate, mg/L
1,600
1,400
1,200
1,000
800
600
400
200
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

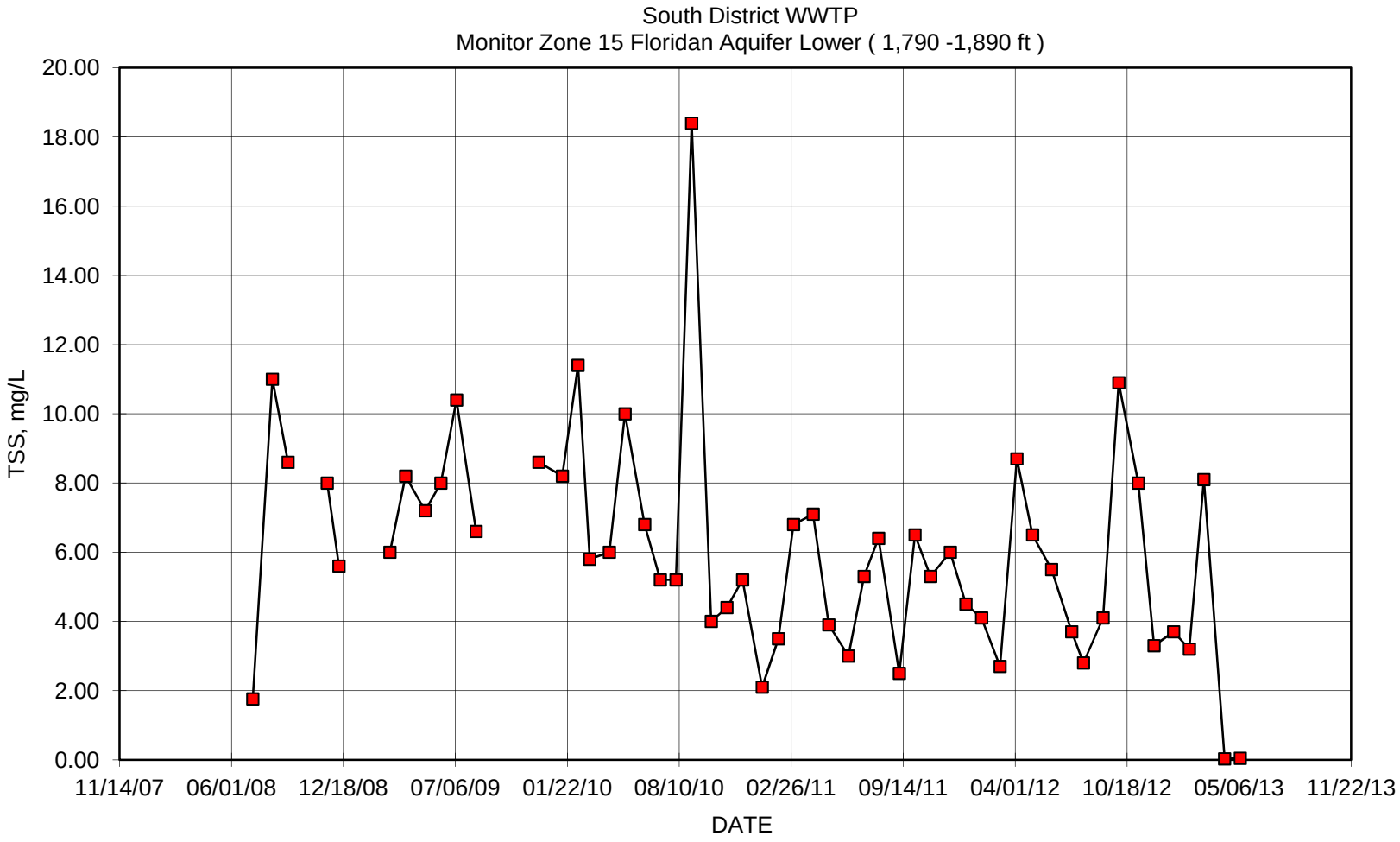

South District WWTP
Monitor Zone 15 Floridan Aquifer Lower (1,790 -1,890 ft)
Chlorides, mg/L
12,000
10,000
8,000
6,000
4,000
2,000
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 15 Floridan Aquifer Lower (1,790 - 1,890 ft)
TKN, mg/L
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
11/14/2007
6/1/2008
12/18/2008
7/6/2009
1/22/2010
8/10/2010
2/26/2011
9/14/2011
4/1/2012
10/18/2012
5/6/2013
11/22/2013
DATE


South District WWTP
Monitor Zone 15 Floridan Aquifer Lower (1,790 - 1,890)
NH3, mg/L
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 15 Floridan Aquifer Lower (1,790 -1,890 ft)
Fecal Coliform, # Colonies/100ml
1
1
1
1
1
1
0
0
0
0
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 15 Floridan Aquifer Lower (1,790 - 1,890 ft)
Conductivity, Micromho/cm
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 15 Floridan Aquifer Lower (1,790 -1,890 ft)
TSS, mg/L
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
11/14/07
06/01/08
12/18/08
07/06/09
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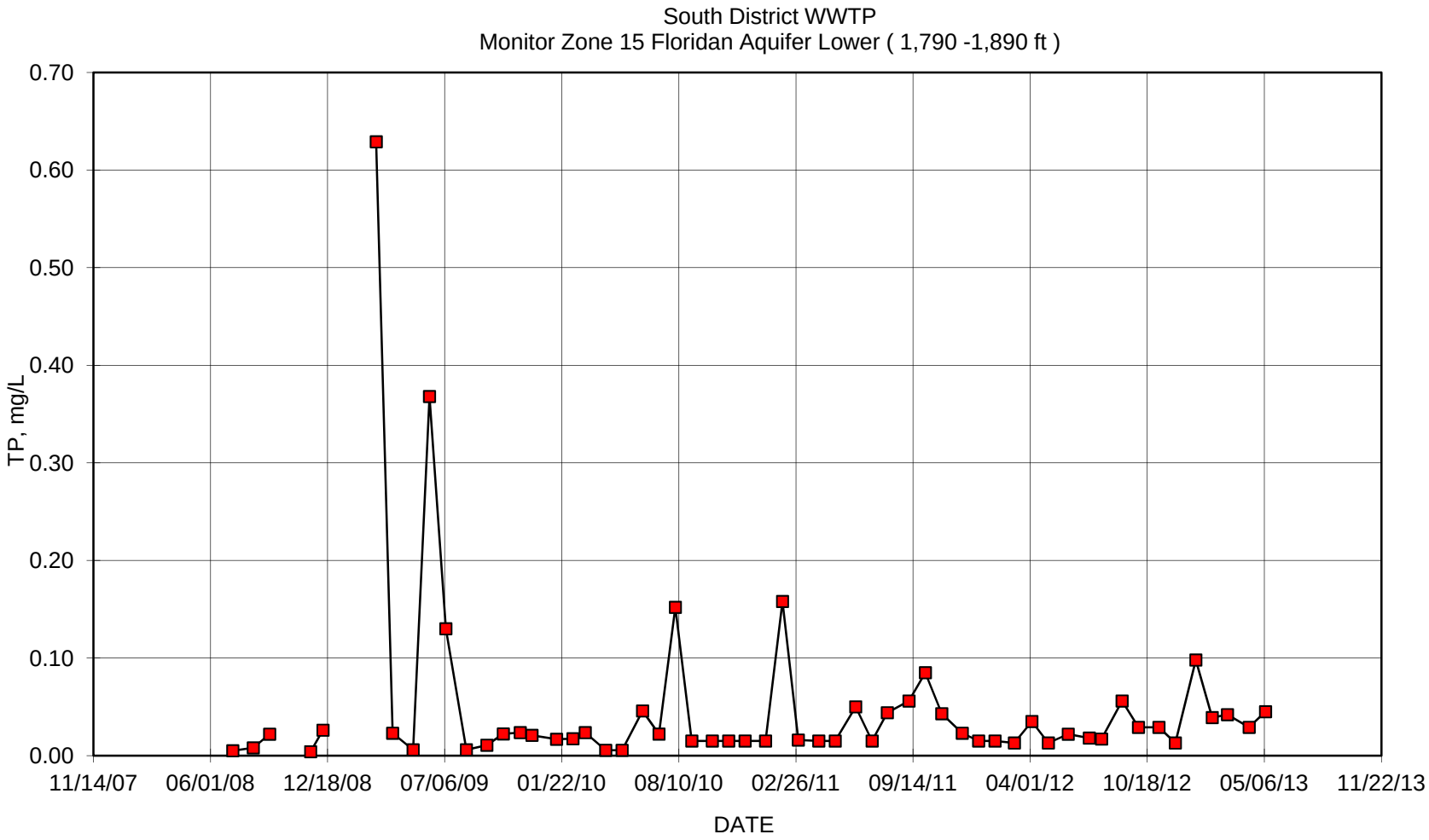
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 15 Floridan Aquifer Lower (1,790 -1,890 ft)
TP, mg/L
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

MIAMI-DADE COUNTY
miamidade.gov

Water and Sewer
PO Box 330316 • 3071 SW 38 Avenue
Miami, Florida 33233-3016
T 305-665-7471

November 18, 2013

Mr. Joseph R. May, P.G.
Florida Department of Environmental Protection
400 North Congress Avenue, 3rd Floor
West Palm Beach, Florida 33401

CCN: 57820

Reference: Miami-Dade Water and Sewer Department -- Mechanical Integrity Testing (MIT) Report for Deep Injection Well No. IW-7 at the SDWWTP Site.

Dear Mr. May:

Enclosed please find the Certificate of Mechanical Integrity and the MIT Report on the re-testing of Deep Injection Well No. IW-7 at the South District Wastewater Treatment Plant site in Miami-Dade County.

All the tests were conducted in strict adherence to the specifications submitted to and approved by your office. The testing results for the well were good. Both external and internal mechanical integrity were demonstrated. The well casing and the wellhead components are in good condition. All the well head valves and all the well head components are scheduled to be rust-proofed and repainted when all the MITs are completed. Based on the results of the well testing we conclude that the well retains full mechanical integrity and recommend that MDWASD be allowed to continue operating the well in its normal mode.

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

The demonstration of mechanical integrity is being submitted per Chapter 62-528.300(6)(b)2., 62-528.300(6)(c), and 62-528.425(1)(d), F.A.C. and specific condition 3.j. of Permit 0061787-022-UO.

If you have any questions or require additional explanation of any item in the report, please do not hesitate to contact me at [redacted] or Sonia Villamil at [redacted].

Sincerely,

[redacted]

Rafael A. Terrero, P.E.
Assistant Director- Wastewater Operation Systems

Enclosures: Certificate of Mechanical Integrity
MIT Report Well IW-7 (1 copy)

cc: Joseph Haberfeld, FDEP - Tallahassee

MIAMI-DADE COUNTY Delivering Excellence Every Day

Mechanical Integrity Test Report
Deep Injection Well No. IW-7
South District Wastewater Treatment Plant

Prepared by:
Miami-Dade Water and Sewer Department
3071 SW 38th Avenue
Miami, Florida 33146

CERTIFICATE OF MECHANICAL INTEGRITY

The **South District WWTP** deep injection well **IW-7** operated by **Miami-Dade Water and Sewer Department** has been tested for mechanical integrity. The tests followed standard engineering practices and used methods presented in the United States Environmental Protection Agency regulations for the purposes of these tests. The external and internal mechanical integrity tests followed Florida Department of Environmental Protection (FDEP) pre-approved testing specifications and all the critical test events were witnessed by representatives of the FDEP, the MDWASD and the contractor.

Having supervised the engineer and geologists that were present during the testing, conducted the examining of the results and the preparation this mechanical integrity report as part of this certification, the undersigned certifies that deep injection well **IW-7** operated by **Miami-Dade Water and Sewer Department** at the **South District Wastewater Treatment Plant Site in Miami-Dade County, Florida** has successfully passed all the test requirements for mechanical integrity under rules of Chapter 62-528 of the Florida Administrative Code and is therefore determined to have mechanical integrity.

Certified on November 18, 2013

[redacted]

Howard J. Fallon Jr., P.E.
Professional Engineer
License Number 24153

MECHANICAL INTEGRITY TEST REPORT
FOR
DEEP INJECTION WELL No. IW-7
AT THE
SOUTH DISTRICT WASTEWATER TREATMENT PLANT

Prepared by:

MIAMI-DADE WATER AND SEWER DEPARTMENT
3071 SW 38th Avenue
Miami, Florida 33146

For Submittal To:

UNDERGROUND INJECTION CONTROL
FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

November 2013

ABSTRACT

The internal mechanical integrity was investigated through a pressure test performed on the injection casing. The pressure test was conducted at 153 pounds per square inch (psi) which is approximately 1.5 times the maximum (100 psi) potential injection pressure and more than 1.7 times the maximum operational pressure that the well will be under when operating at its full permitted injection velocity of 10 feet per second (ft/sec). FDEP permits a 5% loss in pressure during the hour long test in order for the internal mechanical integrity to pass the pressure test.
IW-7 successfully passed the pressure test because the casing only lost 1 psi. The successful results of the pressure test for internal mechanical integrity were reinforced by the results of the second internal mechanical integrity test, the TV survey of the casing. The TV survey confirmed that the casing and the casing joints are in good condition and that the well has internal mechanical integrity down to 2,632 ft bls.

The external mechanical integrity was investigated using two test procedures, a Radioactive Tracer Survey (RTS) and a Temperature Log. Results of the RTS confirmed the integrity of the cement around the casing and the continued competence of its seal with the geologic strata. The temperature test showed that there are no anomalies that would indicate points where injected fluids could escape through the casing and cement into the formation. Similarly there were no temperature anomalies that would indicate injection fluids entering the formations at other than the approved injection depth.

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Section 1

1. INTRODUCTION

1.1 BACKGROUND

On October 12, 2012, (see Appendix A) the Miami-Dade Water and Sewer Department (MDWASD) submitted the County's proposed plan and testing specifications for conducting the mechanical integrity tests (MITs) and repairs on some of the injection wells at the South District Wastewater Treatment Plant (SDWWTP) site (see Figure 1) to the Florida Department of Environmental Protection (FDEP). The plan, represented by the specifications, described the step-by-step procedure to be followed and included the testing schedule required to meet the 5-year MIT re-testing conditions of the FDEP permit for each of the injection wells. After receipt of these documents, the FDEP Staff reviewed the proposed plan and sent an approval on June 5, 2013 (see Appendix B).

The contract documents for conducting the MITs were let out for bids, and the winning bid was submitted on February 28, 2013 by Youngquist Brothers, Inc., a well drilling contractor from Ft. Meyers, Florida. After the contract was approved by the Board of Country Commissioners and signed by the County Manager, the MDWASD issued the notice to proceed on May 17, 2013 and the contractor began mobilizing to the site.

1.2 PURPOSE AND SCOPE

The purpose of this report is to provide FDEP with a document that describes the re-testing procedures for mechanical integrity applied to each of the SDWWTP deep injection wells (see Figure 2). The report also presents the field reports (see Appendix C), and the results of the tests in a single volume for ease of reference. The mechanical integrity re-testing operations involved conducting a pressure test on the well casing to show that there are no leaks in the casing, and conducting a TV survey on the well to reinforce the data from the pressure test. The re-testing includes tracking a radioactive liquid-tracer (iodine isotope I-131) injected down the well to show that there is no fluid movement upward behind the casing, into underground sources of drinking water (USDW). The radioactive test information is reinforced with temperature logs run on the well. Gamma ray logs are used to detect the movement of the radioactive tracer.

Figure 1. South District Wastewater Treatment Plant Site

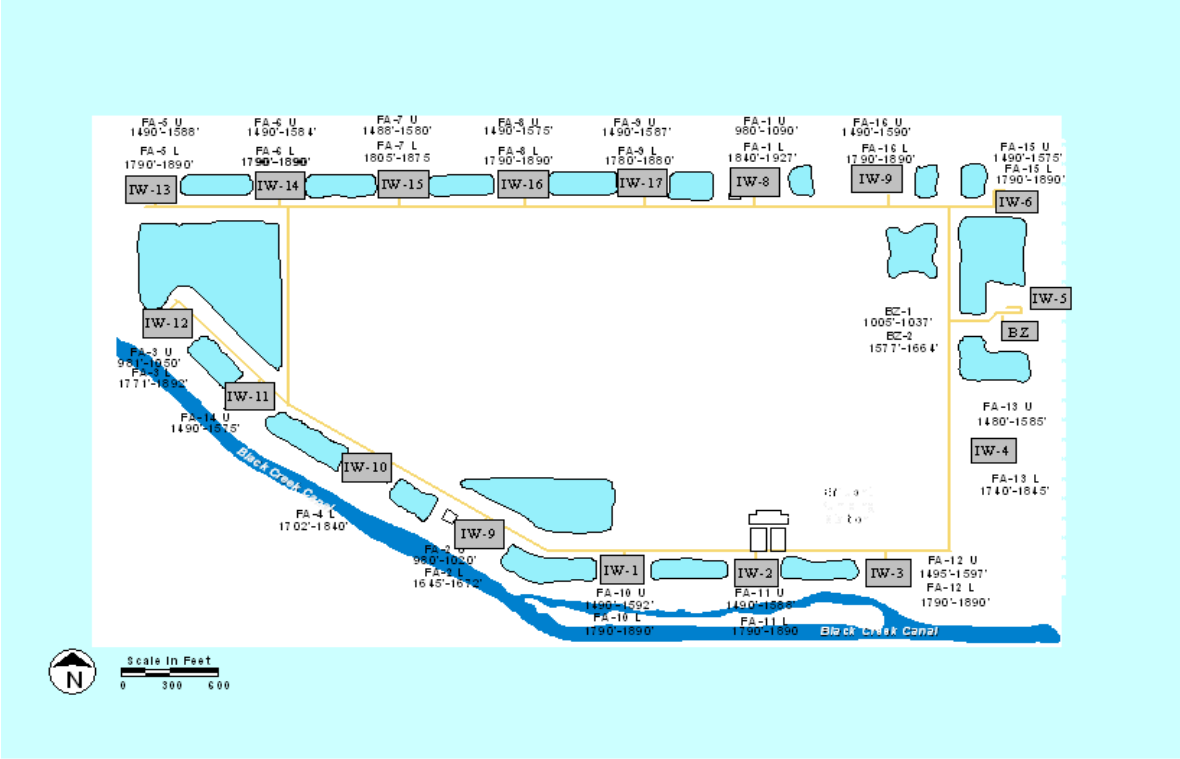


Figure 2. Well Locations Layout

Section 2

2. MECHANICAL INTEGRITY TESTING (MIT)

2.1 METHODS USED

The MIT program is designed to test two elements of the injection well system: 1. Internal integrity and 2. External integrity. The first test element, the internal mechanical integrity test of the well, tests the condition of the injection casing. The second test element, the external mechanical integrity test of the well, tests for leaks outside the casing. This is achieved through a series of field tests including a pressure test and a TV survey for the internal testing, and the temperature log, gamma ray log and RTS survey for the external testing. The first test element, the internal mechanical integrity test, tests for leaks in the injection pipe (casing). The second test element tests for leaks in the annular space outside the casing (cement-filled space between the periphery of the drilled hole and the casing) and in the near-to-the-well geologic strata.

2.2 CASING SCRUBBING

Because the mechanical integrity of injection wells has to be tested every five years, and because a TV inspection of the well is part of the test requirements, MITs provide a timely opportunity to clean the well of deposits that may have formed on the inside of the casing during the intervening years and at the same time provide a cleaner casing for the TV inspection. Cleaning the inside of the well casing is achieved by running a scrubbing brush up and down the casing. However, before the cleaning can be performed, flow out of the well must be controlled. The column of water inside the casing is fresh water and results in a positive hydraulic head inside the well. That head must first be controlled to prevent water from flowing out of the well during the cleaning operation.

2.2.1 Flow Suppression

Suppression of the fresh water head was achieved by first pre-mixing water with salt (NaCl) to form a heavy brine, and then pumping the brine down the well casing, through a 6-inch gate valve on the wellhead. This procedure results in the displacement down the well of the fresh water at the top of the column and replacement of the displaced fresh water with the brine solution. An equal volume of fresh water is displaced out of the well at the bottom of the casing. The procedure is repeated until the pressure head inside the well is suppressed. This method of displacement is used because it achieves flow suppression without first having to open the well to insert a tremie pipe to the bottom of the casing for introduction of the brine. This displacement method also provides a safe way of “killing” the well that at the same time reduces the volume of injected salt solution that would enter the formation at the bottom of the well. One additional advantage is that using this method the brine can be recovered and reused in flow suppression at other wells.

The brine was prepared in 1,000-gallon (gal.) batches by mixing the salt from a 2,000-pound (lbs.) sack in a 1,000 gal. tank of fresh water. The 1,000 gal. solution was then pumped down the well before other similarly mixed batches of salt solution were mixed and pumped down the well (see Figure 3). In the end, the operation was repeated 13 times, and a total of 13 sacks (approximately 26,000 lbs. of salt) were used to suppress the head in the well. This salt concentration represents a theoretical specific gravity of 1.239 for the brine, calculated from the salt solution used in the field of 10.3 lbs per gallon. The 26,000 lbs of salt suppressed the pressure head from approximately 26 feet above the top of the casing to approximately 15 feet below.

Figure 3. Flow Suppression Equipment

2.2.2 Scrubbing Operation

The brush used to clean the casing is made with an old drill rod that has an outside diameter of 7 inches with thick steel wire inserted and secured sticking out of the drill rod. The total diameter of the brush with the steel wire bristles is 24 inches. The brush is attached to the bottom of the packer and inserted into the well (see Figure 4). A 24-inch flange was bolted to the top of the well and pressure fittings installed to be used for packer inflation later on in the process. Then Youngquist lowers the brush and packer by attaching drill rods to the top of the packer and then raising and lowering the brush several times using a 50 ton crane. This process was repeated until the casing was scrubbed and the packer was at the depth required to perform the packer test on the well.

Figure 4. Scrubbing Brush and Hydraulic Packer

2.3 INTERNAL MECHANICAL INTEGRITY (CASING TESTS)

2.3.1 Pressure Test

After the pressure head was suppressed and the casing scrubbed, and the inflatable packer was placed at a depth of 2,596 ft bls. This well is cased to a depth of 2,632 ft bls so the packer is in the bottom 50 feet of the casing. Additional pressure fittings were installed on the flange to pressurize the casing with water. A bleeder valve atop the 24-inch flange allows passage of the drill pipes that support the packer without loss of pressure in the casing (see Figure 5). A pretest was conducted on the casing to determine that the pressure was holding and that all the installed testing equipment was operating properly, then FDEP was informed that the well was ready for their inspection. The next day, August 13, 2013, the pressure test was repeated in the presence of FDEP Staff. The packer had been previously sealed against the casing, at an inflation pressure of 380 pounds per square inch (psi) and at 7:00 AM the casing was pressurized with water to a pressure of 153 psi.

Figure 5. Well-Head and Recorder Set Up for Pressure Test

At 8:45 A.M.. the one-hour pressure test was started in the presence of Joseph May, P.G. representing FDEP and witnessed by Sonia Villamil, Maria Macfarlane, and Michael Ashe representing MDWASD, and by Chris Harp and others representing the drilling contractor. The pressure test ran for the required one-hour period. The pressure deviation (loss) in that time was1 psi, well below the 7.5 psi deviation allowable under the 5 % criteria in the rules (see Table 2-1). The packer inflation pressure and the pressure in the casing were measured using certified gages (see Appendix C) graduated from 0 to 200 psi in increments of 1 psi. The pressure was read in person and recorded by hand at five minute intervals during the test. The pressure was also recorded on an In-Situ pressure transducer attached to the stand with the pressure gauges (see Figure 5).

Table 2-1 Casing Pressure Readings

Time	Casing Pressure (psi)	Pressure Change (psi)	Packer Pressure (psi)
8:45	153	0.0	370
8:50	153	0.0	370
8:55	153	0.0	370
9:00	152.5	0.5	370
9:05	152.5	0.0	370
9:10	152.5	0.0	370
9:15	152.5	0.0	370
9:20	152.5	0.0	370
9:25	152.5	0.0	370
9:30	152.5	0.0	370
9:35	152.5	0.0	370
9:40	152	0.5	370
9:45	152	0.0	370

2.3.2 Bleed-Off Calculations

At the completion of the pressure test the casing pressure was bled-off and the discharged volume from the bleeding was measured (see Table 2-2). Bleeding until the pressure resulted in zero flow produced approximately 32.5 gallons. This exercise provides a reasonable assurance that the packer is placed at the depth in the well that is within the last 50 feet of the casing.

Table 2-2. Bleeding Volumes versus Pressure

Bled Volume (gallons)	0	5	10	15	20	25	30	32.5
Casing Pressure (psi)	152	127	103	79	56	34	9	

2.3.3 Television Survey

A closed circuit color television camera, encased in a pressure vessel capable of withstanding the pressures exerted at the depths to be televised, and equipped with a fish-eye lens, was introduced into the well through a pack-off stripper device on a standpipe above the injection well (see Figure 6). The camera is centralized in the casing, and is preceded down the well with a light source attached below the camera. The camera televises a view of the full circumference of the inside of the casing and the image is recorded on video tape. Prior to the video survey, the well was scrubbed and flushed with potable water to provide the best picture possible. The video

survey began at land surface and continued down to 2,964 feet, where the camera runs into an obstruction. At selected intervals of interest, the camera was used to pan the intervals in a horizontal format prior to continuing the normal vertical recording.

A review of the video (see Appendix F) indicates that the casing is in good condition down to 2,632 feet. The video also shows that the scrubbing operation was successful. The scrubber has scrubbed the casing free of all growth down to 2,626 feet and this is confirmed by visible vertical scratches throughout that length of the casing; indicating that the scrubber had brushed the steel casing effectively. All the scratches are superficial, and do not detract from the physical and mechanical integrity of the casing. There are no gouges, grooves, nicks, or other physical damage visible in the casing for its whole length. Below 2,626 feet the casing was not scrubbed to avoid hanging the scrubber with the edge of the bottom of the casing at 2,632 feet. There are some growths and/or deposits visible inside the casing below 2,632 feet.

In summary, the video picture meets the quality standards that are needed for a visual evaluation of the well. This video survey presents a clear view of the casing and of the welded joints of the casing. All the joints are clean and appear to be tight. From the TV survey it is concluded that this casing is in good condition throughout its whole depth from land surface to 2,632 feet.

Figure 6. Television Survey (Standpipe and Logging Truck)

2.4 EXTERNAL MECHANICAL INTEGRITY (CEMENT AND FORMATIONS)

The external mechanical integrity test consisted of two low flow dynamic tests The RTS and temperature survey, conducted on August 19, 2013, for the external mechanical integrity portion of the test was witnessed by the representative of FDEP (Joseph May, P.G.), by representatives of MDWASD (Sonia Villamil and Maria Macfarlane) and by representatives of the contractor (Luis Morey).

2.4.1 Radioactive Tracer Survey (RTS)

The radioactive tracer survey uses an isotope of iodine (I-131) as a tracer of water movement inside and outside the casing. Iodine –131 is used because it is a radioactive isotope commonly used in medical practice and therefore it is more easily available and lower in cost than other potential tracers. I-131 also has the advantage of having a half-life of 8 days. That half-life is quite suitable because it is long enough to allow time for transportation to the well site with little decay but also short enough so that it would quickly be reduced if there were any unexpected spills or if there were mechanical failures through which the isotope could travel with the water. The radiation levels of I-131 at the concentration used for RTS testing is in millicurie-range, which if it were considered a waste, would be characterized as a low level waste by the US Atomic Energy Commission.

The I-131 is first loaded into a container located in the logging tool. This container is electronically activated from the logging truck to eject the desired quantity of tracer at the desired depth through an ejection port. In addition to the tracer container, the logging tool is also assembled with three gamma ray detectors. One detector, the top gamma ray detector (GRT), is located 10 feet above the ejector. The other two detectors, the middle one (GRM) and the bottom one (GRB) are located immediately below the ejector at about 3 feet and 12.4 feet below the ejector respectively. The bottom of the logging tool also includes a temperature tool at the very bottom, and a casing collar locator (CCL) 1 foot below the GRM. Figure 7 shows the configuration of the RTS logging tool. The RTS log in the appendix (Appendix D) shows the distances between each of the logging tool components described above.

2.4.1.1 First Low Flow Dynamic Test

Prior to starting the low flow dynamic test, a background gamma ray log was conducted to establish the natural conditions. It was conducted right after the temperature log. Since the temperature log was run downward starting at land surface, the temperature log had ended with the logging tool at the bottom. The background gamma ray log was conducted from the bottom (2,967 feet) up to the surface.

From the surface, the logging tool was again lowered down the well and the casing collar locator (CCL) used to locate the bottom of the casing. The magnetic coils on the CCL give out a magnetic field and detect a change in the mass. If there is growth on the casing it is harder for the CCL to have a clean line. If the growth has some iron on it, it can cause a sort of interference with the CCL making it harder for the CCL to find the end of the casing. The CCL shows that the bottom of the casing is at 2,632 feet bls. After the bottom of the casing was located, the well was ready for the low-flow dynamic RTS test.

The ejector port of the I-131container was set at 2,627 feet and 1 millicurie (mCi) of I-131 was released while the flow down the well was kept at a constant rate of 88 gallons per minute (gpm). The logging tool was kept immobile after the ejection of the I-131 and the three gamma ray detectors continued to record in place. One (1) mCi of I-131 was ejected into the well. The middle detector, located 3 feet below the ejector port, picked up the radioactive tracer 28 seconds after the ejection. The bottom detector, which is located over 12 feet below the ejector, picked up the tracer 2 minutes and 40 seconds after the ejection. The middle detector seems to pick up some interference from the ejection motor on the tool when the ejection occurs and this shows up on the log at the same time of ejection. However, this interference is at a much lower level and is dismissed as nothing more than interference from the ejection motor. The test ran for 60 minutes and the top detector did not pick up any tracer.

After the first low flow test ended, the tool was then raised up more than 200 feet, to a depth of 2,400 feet, to log out of position to make sure that the tracer did not migrate up the casing or the formation outside of the casing. No migration was detected.

Once the log out of position was conducted and the tool was placed back to depth, no staining on the casing was found which means no interference for the second RTS. Therefore, with the approval of Joseph May, P.G. from FDEP, the well was not flushed prior to the second RTS test.

Figure 7. RTS Tool and Temperature Probe

2.4.1.2 Second Low Flow Dynamic Test

The tool was placed back to a depth were the ejector was located at 2,627 feet with a flow of 87 gallons per minute set down the well. For this test, 2 milicuries of I-131 were ejected into the casing. The middle detector started picking up the tracer about 20 seconds after it was ejected. The bottom detector, which is located over 12 feet below the ejector, picked up the tracer 2 minutes and 23 seconds after the ejection. Again the middle detector picked up some interference from the ejector motor at the time the I-131 was released. The upper detector did not pick up any tracer for the duration of the test, which lasted 30 minutes.

After the second low flow test ended, the tool was then raised up more than 200 feet, to a depth of 2,400 feet, to log out of position to make sure that the tracer did not migrate up the casing or the formation outside of the casing. No migration was detected.

With the last low flow dynamic test, the mechanical integrity test was concluded, but before bringing the geophysical tools out of the well, the leftover I-131in the container was ejected and the container flushed-clean to insure that any remaining radioactive iodine was well dispersed. The tool was placed at a depth of 2,763.5 ft bls. The ejector was located at 2,750 ft bls, and the remaining Iodine 131 was ejected and the well was flushed with effluent at a rate of over 4,500 gallons per minute to ensure no staining of the tool. The logging tool was then brought up from the bottom and on the way up a final gamma ray log was made. Then the final gamma ray log was compared to the background gamma ray log, and the comparison showed that there are no noticeable differences in the two except for a residual stain at the bottom of the casing where the I-131 had been repeatedly released during the testing, and just below there, where the tracer exited the casing. Injection of water down the well at a rate of 4,500 gpm continued for the next hour to completely flush out the well.

2.4.2 Temperature Log

Youngquist Brothers Inc. conducted the temperature log on August 13, 2013 starting at about 8:50 A.M. and logging down to 2,967 feet. The temperature probe (Figure 7) was run from the surface downward to minimize the disturbing effect of the movement of the logging tool on the temperature of the water in the well. The temperature log was started more than 24 hours after the well had last been disturbed by outside influences. The TV survey was the last disturbance in the well.

The temperature log (see Appendix H) shows the warmest interval is in the section from 2,600 to 2,632 feet. This is consistent with the higher temperature of the injected water in that interval. The temperature log did not detect any anomalies that would indicate that injection fluids are present outside the casing, and there is no indication of any upward movement of warm injection water either. The similarity of the temperature oscillations in this temperature log (in the interval from land surface down to the bottom of the casing) to those in the temperature logs from previous MITs and to those in the temperature log when the well was constructed, indicates that there has been no apparent change in the cased interval, and no upward movement of the injected water in the last 5 years.

2.5 WELL HEAD REPAIRS AND RE-INSTALLATION

The work associated with the MIT ended when the wellhead was replaced. The air and vacuum release surge check valves were replaced prior to reinstallation of the wellhead. The 6 inch gate valve and air release were replaced. The wellheads are scheduled to be sandblasted, rust proofed and repainted after the MITs on all the other wells are completed. Injection well IW-7 has been placed back on line and flow from the plant's pump station is again discharging to this injection well.

Section 3

3. CONCLUSIONS AND RECOMMENDATIONS

3.1 CONCLUSIONS

The pressure test was conducted successfully and it was concluded from the results that there is internal mechanical integrity. This conclusion is reinforced by the analysis of the TV survey down to the injection level at 2,632 feet. The TV survey indicated that the casing is in good condition and that all the casing joints appear to be tight and in good working order.

The two successful RTS conducted at low flow rates indicate that there is no upward movement of water outside the casing. Therefore, it was concluded that the RTS results show that there is external mechanical integrity. The temperature survey reinforced the results of the RTS by showing that there has been no movement of injected water anywhere except the injection zone.

3.2 RECOMMENDATIONS

The successful completion of all the tests for mechanical integrity confirms that IW-7 retains full mechanical integrity and as such it is appropriate to continue using this injection well. MDWASD also recommends that FDEP review the results of the tests presented in this report and based on those results determine that the well has mechanical integrity and may continue to be used for its intended purpose.

Finally, MDWASD recommends that although the well head will not be painted until all the MIT tests are completed on the other wells, IW-7 should receive mechanical integrity certification.

Appendix A

Mechanical Integrity Testing Procedures Submitted by MDWASD to FDEP
October 12, 2012

Miami-Dade Water and Sewer Department
Mechanical Integrity Testing Procedures

Miami-Dade Water and Sewer Department
Mechanical Integrity Testing and Repair Procedures
October 12, 2012

MECHANICAL INTEGRITY TESTING and REPAIR PLAN (SDWWTP and NDWWTP Injection Wells)

General Information

The Contractor shall carefully coordinate his activities with the Department to minimize interference with any existing operations or the operations of the Department. Department forces will isolate the well and turn over to the Contractor. Existing valves shall only be operated by Department personnel. The Contractor's personnel, under no circumstances, shall operate any such valve.

The Contractor shall provide all barricades and/or flashing warning lights necessary to warn workers and employee of the testing throughout the Project. This shall be done at the Contractor's expense and to the satisfaction of the Engineer. Every effort must be made to reduce inconvenience and nuisances to a minimum.

The Contractor shall at all times, use the assigned entrance to the Plants to bring in materials, equipment etc. required for the Project. Materials and equipment shall be stored in areas designated by the Engineer, and shall not interfere with the daily operations at the site or with other Projects. Suitable platforms shall be used for material storage to prevent damage to the landscaping. The Contractor shall exercise extreme caution when transporting equipment or materials within the Plant area.

The conveying vehicles shall be properly selected, and equipped, to prevent damage to paved areas, landscaping and other existing facilities including wells, well pads, fencing, underground pipelines, pipe chases, etc. If necessary, suitable wooden skids shall be used to distribute loads, and to prevent damage.

If any of the above existing structures, including the wells, or any other parts of the project area, are damaged, the contractor shall make suitable repairs or replacement at his expense, in a manner described by the Engineer, and to his satisfaction.

The Contractor shall also exercise extreme caution to prevent any spillage of sewage effluent. The County may charge t he Contractor for any cost incurred or penalties imposed on the County as a result of such spillage.

The wells to be tested are Injection Wells IW-l through IW-17 at the South District Wastewater Treatment Plant and IW-1N through IW-4N at the North District Wastewater Treatment! Plant

The Injection Wells have a 24-inch outside diameter (OD), 0.500-inch wall thickness injection casing set to total depths of 2,450 to 2,850 feet below land surface (bls), and were constructed with a nominal 22-inch diameter open borehole extending from the bottom of the casing to approximately 3,000 feet bls.
Except IW-5 at the SDWWTP, has a 20-inch outside diameter (OD), and 0.500 inch wall thickness.

The CONTRACTOR will perform internal and external mechanical integrity tests on the casings of twenty one deep injection wells and perform all appurtenant work in accordance with the above

Contract Documents.

The work shall be performed by a competent crew with equipment that is adequate to complete all phases of the testing and instruments of sufficient accuracy and resolution to identify anomalous responses to the tests. If the CONTRACTOR'S equipment is not capable of satisfactorily performing the work provided for in these specifications, the CONTRACTOR at his own expense shall substitute equipment.

The CONTRACTOR shall have not less than 5 years experience in constructing and testing wells and shall have tested not less than 5 wells of similar type and capacity. The CONTRACTOR shall be licensed by the State of Florida and the license number shall be affixed to all correspondence and reports.

All work shall comply with and be in full conformance with this Mechanical Integrity Test Plan submitted to FDEP together with subsequent response letters for the injection wells at the South and North District Wastewater Treatment Plants and with the appropriate sections of Chapter 62-528 FAC.

If remedial work or re-testing is required prior to final acceptance of the work to meet regulatory requirements and the specifications of the Contract Documents due to defective materials, accident, loss of equipment or equipment malfunction, or for any other cause directly attributable to the CONTRACTOR's actions, the CONTRACTOR shall bear the entire cost of the remediation or re-testing, including all additional materials, labor, and equipment required and any necessary additional Engineering costs. In the event of a problem, the ENGINEER shall be notified immediately, and the following shall apply:

1. The CONTRACTOR shall propose a method of correcting the problem, in writing, to The ENGINEER, who shall review the method of corrective action, and accept the plan in writing before work can proceed.

2. All work on the well must be in accordance with all applicable local, state and federal regulations.

The CONTRACTOR shall notify the ENGINEER a minimum of 72 hours prior to conducting the pressure test, geophysical logging and the radioactive tracer survey so that the ENGINEER and regulatory agency staff can be properly notified.

The CONTRACTOR shall provide all facilities, equipment and materials required for the removal of waste fluids from the well site.

The CONTRACTOR shall kill the well using a dense food- grade salt solution. No barite or mud-based additives shall be used in the well.

The CONTRACTOR shall comply with the OSHA regulations contained in 29CFR Section 1910 for General Industry Regulations and 29CFR Section 1926 for Construction Regulations.

Equipment and Procedures

1. Wellhead Assembly: The stripper head assembly used during the video survey, Geophysical logging, and the radioactive survey shall be bolted to the wellhead above the 6-inch gate valve. The stripper head assembly used must be of sufficient length to house the longest of the wire line tools used for the testing between the gate valve and the pack-off mounted at the top of the assembly. The pack-off must be adjusted so that the tools can be moved freely up and down the well with minimal leakage from the well. The assembly shall include a 4-inch valve and tee, which will be used to inject potable water during the surveys. The assembly shall be fitted with a

pressure gauge for use during the tests.

2. Wellhead Hardware: Should the nuts and/or bolts at the wellhead assembly become stripped during the CONTRACTOR's efforts, the CONTRACTOR shall replace them with equivalent hardware.

3. Water Line: The CONTRACTOR shall provide a potable water supply line for use during the video surveys. This line shall be connected to the existing 4-inch valve on the CONTRACTOR's stripper head. It shall be equipped with a check value to prevent the backflow of effluent into the water supply source. It shall also be equipped with a continuous recording digital flow meter and totalizer capable of measuring flows accurately in the range of 0 to 250 gpm.

Mechanical Integrity Testing (MIT)

The mechanical integrity testing under this Contract shall be accomplished using the following methods and general sequence, however the Contractor shall submit a more detailed sequence to the Engineer for approval before he begins work. The Contractor shall use extreme caution to prevent any loss of equipment, tools or other items into the wells and shall be fully responsible for retrieving any such items immediately, at no expense to the Department. All pressure tests must be conducted in the presence of the Engineer or his authorized representative.

MIT Clean and Pressure Test the Casing

1. The Contractor shall set up all equipment required to prepare for suppressing the density differential pressure, cleaning, performing the pressure test and the radioisotope and closed circuit television surveys.

2. The Contractor shall inject sufficient salt solution into the well to balance the differential pressure and disassemble the wellhead. The brine solution shall remain in the well during the cleaning and pressure testing steps, after which time it shall be transferred to another well if clean enough for reuse, or shall otherwise be disposed of by the Contractor. Under no circumstances shall brine solution be spilled or disposed of on the ground surface, however it may be disposed of into the injection well.

3. The Contractor shall clean the casing before proceeding with the pressure test. The entire length of casing shall be cleaned. If the later television survey indicates insufficient cleaning, the well shall be re-cleaned by the Contractor, at his expense, to the satisfaction of the Engineer. If the television survey must be repeated because of insufficient cleaning, in the opinion of the Engineer, it shall also be at the Contractor's expense.

4. The Contractor shall, when requested by the Engineer, place the packer through a stand-pipe with a packoff device to a point near the top of the well (but within the concrete encasement area) and test its integrity. This shall be accomplished as described in Steps 6, 7, and 8 below. If the packer fails the integrity test it shall be replaced with one that will meet the test. The Engineer is aware that packers have limited inflation cycles and will attempt to minimize the verification of packer operation. However, any integrity failure for which the packer operation can not be eliminated must be repeated at the Contractor's cost. It is anticipated that each new packer will be tested at the wellhead to verify its capacity to seat and deflate.

5. The Contractor shall lower and place the packer to a point within the lower 40 feet of the casing, but not the last 10 feet. The CONTRACTOR will be responsible to assure the proper seating of the packer. A preliminary test shall be performed to ensure proper operation of the test set-up. The CONTRACTOR shall notify the ENGINEER at least 24 hours before running the preliminary test. The test will be run following the same test program as the actual pressure test, as described below. IW-2 at SDWWTP will have the packer placed within 40 feet of the tear in the casing.

6. The Contractor shall inflate the packer to a pressure not exceeding 350 psig over the static condition as measured at the wellhead on a calibrated gauge to create a positive seal.

7. The Contractor shall pressurize the casing to 150 psig with no air in the casing or wellhead. The pressure shall be recorded on a chart and signed by the Engineer, the Contractor and any witnesses present. The pressure test gauge shall be calibrated within 6 months of performing the pressure test. The CONTRACTOR must present proof of calibration of the pressure gauge to the ENGINEER and FDEP staff at the time of testing each well. The pressure gauge must be mounted at or near eye level in order to ensure maximum visibility.

8. The test will be considered successful if the pressure does not change more than 5% psi in one hour.

9. If the test fails, the Contractor shall move the packer upwards for approximately 10 feet, and repeat Steps 6, 7 and 8.

10. If the test still fails, additional repositioning of the packer and repeating of Steps 6, 7 and 8 shall be as ordered by the Engineer. If the test still fails, and subsequent radioisotope surveys indicate no casing failure, it will be presumed that the Contractor's packer did not create a positive seal, and the Contractor shall be required to repeat Steps 4 through 8 at his expense. No payments will be made to the Contractor if it is subsequently determined that the test failure was caused by the seating of the packer. If the packer fails during packer operation verification, it will be concluded that the packer was faulty during any previous test that did not demonstrate casing integrity. The Contractor shall repeat this test at his expense.

11. After pressure testing, measure the depressurization bleed down with a 5 gallon bucket upon release of the pressure in the casing. The bleed down fluid will be properly disposed of by the Contractor.

12. The Contractor shall deflate the packer and withdraw it from the casing.

13. The Contractor shall reassemble the wellhead and connecting piping using new gaskets.

14. Prior to geophysical logging, the fluid used to "kill" the well, or for pressure testing the casing shall be flushed from the well and the well will be shut-in for a minimum of 12 hours.

MIT Video Surveys

A Video Survey inside the injection well casing be performed using the following procedures.

.A 6-inch diameter stripper head assembly will be bolted to the wellhead assembly above the existing 6-inch diameter gate valve. The stripper head will be of dimensions that allow the video operator to put his camera between the gate valve and the pack off and close both the valve and the pack off. The lower part of the assembly shall consist of a 4-inch tee and valve through which potable water may be introduced into the well.
.
Prior to performance of the survey and for a period of 24 hours, fresh water from an adjacent fire hydrant will be introduced into the well through a 4-inch diameter valve located on the stripper head assembly. Fresh water shall be pumped into the well to provide clarity for the survey.

3. If, after 24 hours of pumping potable water into the well, the water quality does not permit a clear picture of the inside of the well, the CONTRACTOR may be required to perform additional pumping services to assure a good survey as specified above.

4. The pumping of the potable water will continue at a rate of approximately 0 to 250 gpm during video surveying. If the open hole portion of the well is not clean, or visibility in any part of the well is poor, the CONTRACTOR shall perform additional pumping services to ensure a good video survey before running another or continuing with the survey.

5. During the video survey, the CONTRACTOR shall stop the camera's progress as instructed by the ENGINEER at depths where there may be potential flaws in the casing or other features to allow for thorough examination at those locations.

Upon reaching the total depth of the well with the video camera and obtaining a video survey satisfactory to the ENGINEER, the camera shall be removed from the well, and the well placed back in service.

MIT Radioisotope Tracer Survey and Temperature Survey

A radioisotope tracer survey shall be used to detect any fluid movement outside of the injection casing from the injection zone into the overlaying aquifers. The tool configuration shown below, or approved equal is required. The tool must be capable of ejecting the radioactive tracer and simultaneously monitoring the gamma ray sensors. No time lag between ejection and monitoring is permitted. A casing collar locator (CCL) shall be positioned below the tool as shown below, to precisely locate the bottom of the casing. Two low flow dynamic test runs, shall be performed. Additional low flow dynamic test runs can be done if results warrant additional testing, as determined by the ENGINEER in consultation with FDEP staff.

A temperature survey log shall also be performed from land surface to the total depth of the well. The temperature log shall be performed logging down at a rate of not more than 60 feet per minute. The temperature survey shall be performed after the well has been "shut in" and stabilized for at least 12 hours prior to the dynamic and static tests.

The Contractor shall perform an initial background gamma ray survey extending from the base of the land surface to the total depth of the well. The background gamma ray log shall be taken at a rate of not more than 60 feet per minute.

After the dynamic tests are completed, another background gamma ray survey shall be taken from the base of the casing to the base of the intermediate casing.

If additional radioisotope tracer survey work is ordered by the Engineer, it will be paid for at the hourly price proposed for additional radioisotope tracer surveys.

Radioactive Tracer Survey (RTS)

A RTS will be performed in the injection well. The tool used for testing will be configured according to information to be supplied by the service company performing the logs and as approved by the ENGINEER. Below is an example of a typical RTS tool that will be used for these surveys. The CONTRACTOR will provide a specific tool configuration with the logs.

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)
			CHD-SDSCHD (SDS) Cable Head	1.00	1.50	5.00
GR#3	23.83					
			GR #3 -GR#3 (GR#3_T) GR#3_TOP	9.33	1.69	50.00
			TREJCT-A (RTS) EJECTOR 14.5' FROM TOOL BOTTOM	3.00	1.69	10.00
			GR #2 -GR#2 (GR#2_M) GR#2_MIDDLE	3.58	1.69	25.00
GR#2	11.17					
CCL	9.63		CCL-000 (000001) RTS_CCL	0.75	1.69	5.00
			TRDET-GR#1 (GR#1_B) GR#1_BOTTOM	8.67	1.69	50.00
GR#1	0.58		TEMP-11116Temp (11116HT)	0.58	1.69	5.00
TEMP	0.17		RTS_TEMP			

Dataset: sdiw1.db: field/well/run1/FINBK
Total Length: 26.92 ft
Total Weight: 150.00 lb
O.D. 1.69 in

RTS tool Typical Configuration

The sequence of the tests shall be as follows:

First Low Flow Dynamic: The low flow run of the radioactive tracer survey shall be performed with a pumping-in velocity of 3 to 5 feet per minute. This would require a volume of between 65 gpm and 108 gpm to be injected during the survey. This is for the 24 inch wells, for Well I-5, which has a 20 inch casing this volume is 44 gpm and 73 gpm. Potable water from the same source as used for the video survey would be used as the most appropriate water supply for this portion of the test.

1) After beginning the flow of water into the well, the tool will be placed at a depth of approximately 5 feet above the base of the final casing, and a slug of 2 millicuries radioactive Iodine 131 is ejected. The tool will remain in place for a period of approximately one hour and the three gamma ray detectors in the "time drive" mode will record the movement of the slug. If tracer is detected at the uppermost detector, indicating potential staining of the tool, the tool may be moved upward to an alternate location.

2) After the one hour waiting period, a log out-of-position will be performed between the ejection point and a minimum of 200 feet above the highest point of tracer detection.

3) Upon completion of logging, the casing will be flushed with 3 to 5 casing volumes of effluent.

4) After flushing, the tool will immediately be run to the base of the casing, then the interval between the ejection point and 200 feet above the highest point of tracer detection will be logged.

Second Low Flow Dynamic: The process described above for the low flow dynamic log will be repeated to include a log out-of-position, a casing flush, and an after flush pass. A slug of tracer greater than or equal to 3 millicuries shall be used as determined by the ENGINEER.

If, during testing, no apparent anomalies appear that may indicate a lack of mechanical integrity in the injection well, the RTS will be concluded. If anomalies do occur, the RTS will be altered to track the radioactive tracer material. After RTS is complete, the RTS tool will be discharged in the injection zone and the well shall be flushed with 3 to 5 volumes of effluent. A second background log will be run from the bottom to the top of the well.

MIT Deadlines (sorted by date MIT pressure test due)

SDWWTP MIT Schedule of Completion

Well	Pressure Test	RTS/Video
IW-2	7/13/2013	7/25/2013
IW-1[1]	7/20/2013	7/31/2013
IW-3	7/24/2013	8/7/2013
IW-9[1]	7/30/2013	8/12/2013
IW-10[1]	8/6/2013	8/21/2013
IW-11	8/20/2013	9/3/2013
IW-12	8/25/2013	9/19/2013
IW-14	9/9/2013	9/26/2013
IW-13	9/16/2013	10/6/2013
IW-4	9/25/2013	10/14/2013
IW-6	9/30/2013	10/20/2013
IW-5	10/19/2013	10/27/2013
IW-7[2]	10/26/2013	1/7/2014
IW-8	11/2/2013	11/12/2013
IW-17	11/11/2013	11/19/2013
IW-16	11/18/2013	12/9/2013
IW-15	12/3/2013	12/16/2013

NOTES:
1.The original video was not clear enough and therefore a new video was done at the end of the MITs at SDWWTP.
2.The Computer failed during the RTS, because the Iodine 131 had already been injected, FDEP and DOH required 46 days b/f the RTS could be redone.

NDWWTP MIT Schedule of Completion

Well	Pressure Test	RTS/Video
IW-1N	3/14/2014	3/26/2014
IW-2N	3/25/2014	4/9/2014
IW-3N	4/2/2014	4/17/2014
IW-4N	4/9/2014	4/24/2014

REPAIR PLAN:

The following repair plans apply to wells at SDWWTP and NDWWTP.

1. Kill well and remove 24 inch gate valve and 4 inch bypass valves. Remove 1 inch pressure transmitter line and weld hold closed. Please see drawings included in below.

2. Sand existing casing in concrete pits and coat with Bitumastic. Please see drawings included in below.

3. Chip concrete around outer casing 1 inch deep, in order to embed PVC sleeve. Please see drawings included in below.

4. Install C905 PVC sleeve around casing pipe, embed 1 inch deep and fill annular space with grout, using Type II Neat cement. Slope top edge to create 30 degree watershed and seal at edges with sealant. Please see drawings included in below.

5. Relocate 1 inch pressure transmitter as indicated in drawings. Weld the hole. Please see drawings included in below.

6. At the NDWWTP IW-1N, IW-3N and IW-4N install new magmeters with any necessary spool pieces to be field determined. Please see drawings included in below.

7. Reassemble wellheads including installation of new 24 inch butterfly valve on horizontal part of well. Mega flanges will be used to ensure the layout of the pipe and the vales match. Please see drawings included in below.

8. On IW-4N at NDWWTP, install electric actuator for butterfly valve at base of injection well. Please see drawings included in below.

Appendix B

FDEP Approval of MIT Plan for SDWWTP and NDWWTP

November 26, 2012

Villamil, Sonia (WASD)

From: May, Joseph [redacted]
Sent: Monday, November 26, 2012 2:40 PM
To: Villamil, Sonia (WASD)
Cc: Vandor, Heidi; Silverman, Mark; Walsh, Virginia (WASD); Goldenberg, Bertha M. (WASD); Fallon Jr., Howard J. (WASD); Arrebola, Vicente (WASD); Macfarlane, Maria (WASD); Oakley, Clint (WASD)
Subject: RE: MDWASD MIT and Repair Plan Submittal

Importance: High

Hello all,

The Department approves the plan with the following understandings:

1) Medicinal grade I-131 should be specified since this solution is filtered to reduce precipitate material, as opposed to regular grade I-131, in the vial causing a tool malfunction. It has been our experience that an activity of ~1mCi/ml has been the easiest to work with in the field.
2) Please contact me a minimum of three days prior to mobilization to each site. Due to the travel time from West Palm Beach to the sites close coordination would be appreciated between myself and a designated contact person from the utility so that each pressure and RTS can be witnessed.

Thank you,

Joe

Please take a few minutes to share your comments on the service you received from the department by clicking on this link. DEP Customer Survey.

From: Villamil, Sonia (WASD) [mailto:[redacted]
Sent: Wednesday, October 17, 2012 9:42 AM
To: May, Joseph
Cc: Vandor, Heidi; Silverman, Mark; Walsh, Virginia (WASD); Goldenberg, Bertha M. (WASD); Fallon Jr., Howard J. (WASD); Arrebola, Vicente (WASD); Macfarlane, Maria (WASD); Oakley, Clint (WASD)
Subject: MDWASD MIT and Repair Plan Submittal

Hello Mr. May,

The MDWASD respectfully submits the attached MIT testing and repair plan for your approval. The paper copy is being sent via regular mail as well.

Thank you,

Sonia Villamil
Engineer II
Miami Dade Water and Sewer Department
3071 SW 38th Ave Room 554-8
Miami, FL 33146
[redacted]
fax: 786-552-8640
miamidade.gov

Appendix C

Field Notes from tests including gauge certification and pressure charts.

MIAMI-DADE WATER AND SEWER DEPARTMENT

MECHANICAL INTEGRITY TESTING OF DEEP INJECTION WELLS AND ASSOCIATED SERVICES

BID NO.: RPQ P0086

PRESSURE TEST IW – 7

August 13, 2013

TIME	CASING PRESSURE (psi)	PACKER PRESSURE (psi)
8:45	153	370
8:50	153	370
8:55	153	370
9:00	152+	370
9:05	152+	370
9:10	152+	370
9:15	152+	370
9:20	152+	370
9:25	152+	370
9:30	152+	370
9:35	152+	370
9:40	152	370
9:45	152	370

MIAMI-DADE WATER AND SEWER DEPARTMENT

MECHANICAL INTEGRITY TESTING OF DEEP INJECTION WELLS AND ASSOCIATED SERVICES

BID NO.: RPQ P0086

BREAK OFF TEST IW – 7

August 13, 2013

GALLONS	CASING PRESSURE (psi)	PACKER PRESSURE (psi)
0	152	370
5	127	360
10	103	350
15	79	340
20	56	340 −
25	34	320 +
30	9	320
2.5 gal	0	310

Top of Packer: _____ **feet**

Bottom of Casing: _____ **feet**

MIAMI-DADE WATER AND SEWER DEPARTMENT

MECHANICAL INTEGRITY TESTING OF DEEP INJECTION WELLS AND ASSOCIATED SERVICES

BID NO.: RPQ P0086

PRESSURE TEST IW – 7

WITNESS LIST

August 13, 2013

NAME	SIGNATURE	COMPANY/AGENCY	TELEPHONE
Joe May	[redacted]	FDEP	[redacted]
CHRIS HAAP		YSI	
Sonia Villamil		WASD	
Ida MacFarlane		WASD	
Michael Ashe		WASD	
LUCAS SCOTT		WASD	

MIAMI DADE
SOUTH DISTRICT IW7 TALLY

8-12-13

PACKER 10.32' ℄
85 JT'S 2602.84'
2613.16' ℄ OF PACKER.
-ESS STICKUP 7.00
2606.16 ℄ OF PACKER FOR THE TEST

EXTENT OF BRUSHING WILL BE 2625.89'
THE BRUSH WILL BE @ 2621.39 DURING THE TEST.

Miami Dade South District

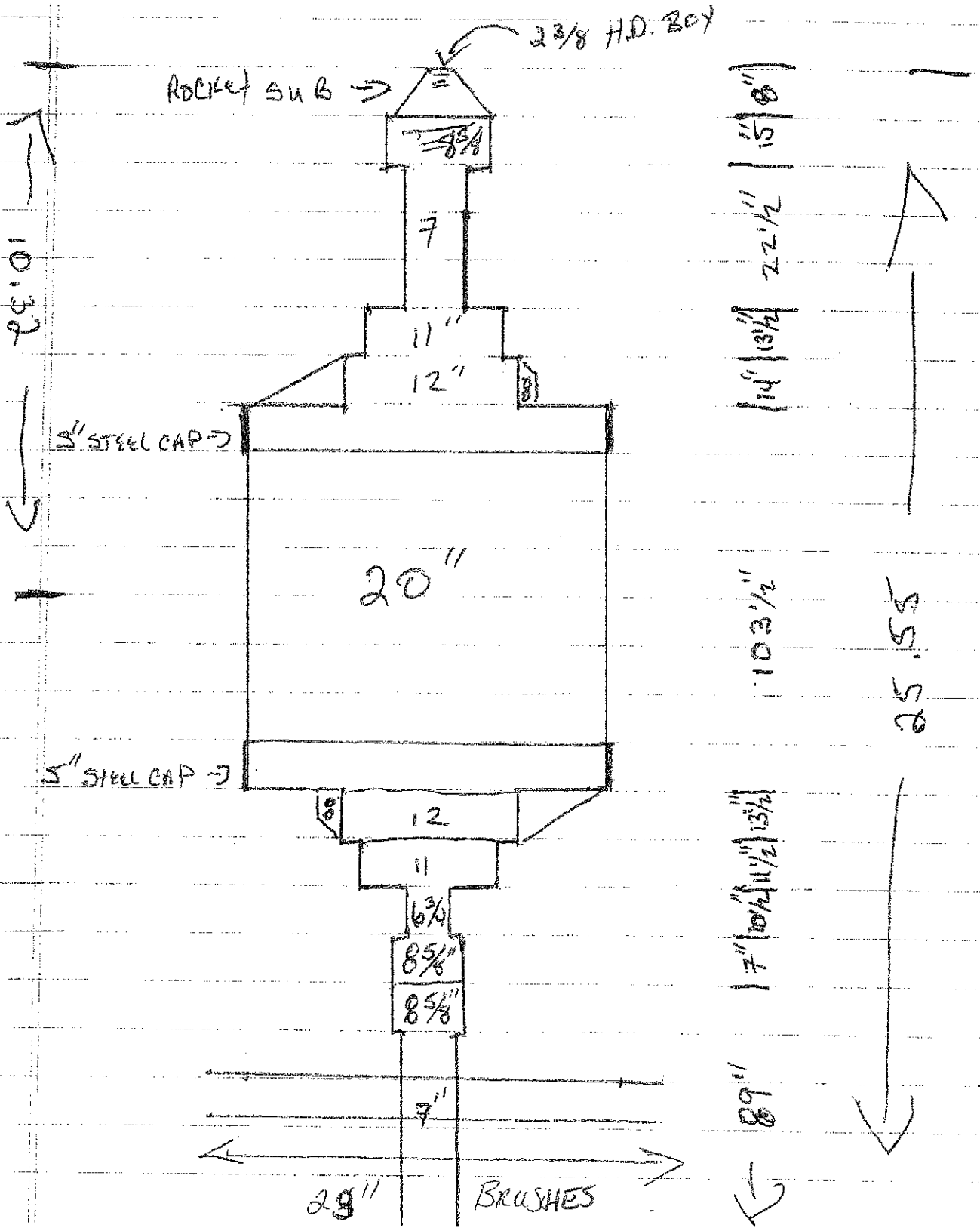
Date: 8-12-13

IW# 7

Packer Tally 2413.16'

Joint #	Length (ft.)	Total Length (ft)	Joint #	Length (ft.)	Total Length (ft)	Joint #	Length (ft.)	Total Length (ft)
1	31.25	31.25	35	30.78	1071.98	68	30.68	2082.55
2	30.62	61.87	36	30.57	1102.55	69	30.57	2113.12
3	30.55	92.42	37	30.56	1133.11	70	30.6	2143.72
4	30.65	123.07	38	30.8	1163.91	71	30.55	2174.27
5	30.54	153.61	39	30.34	1194.25	72	30.53	2204.8
6	30.55	184.16	40	30.63	1224.88	73	30.8	2235.6
7	30.68	214.84	41	30.53	1255.41	74	30.63	2266.23
8	30.55	245.39	42	30.58	1285.99	75	30.53	2296.76
9	30.57	275.96	43	30.78	1316.77	76	30.6	2327.36
10	30.57	306.53	44	30.64	1347.41	77	30.63	2357.99
11	30.56	337.09	45	30.55	1377.96	78	30.56	2388.55
12	30.6	367.69	46	30.8	1408.76	79	30.56	2419.11
13	30.59	398.28	47	30.71	1439.47	80	30.67	2449.78
14	30.85	429.13	48	30.55	1470.02	81	30.6	2480.38
15	30.57	459.7	49	30.53	1500.55	82	30.71	2511.09
16	30.65	490.35	50	30.64	1531.19	83	30.65	2541.74
17	30.58	520.93	51	30.59	1561.78	84	30.55	2572.29
18	30.6	551.53	52	30.6	1592.38	85	30.55	2602.84
19	30.64	582.17	53	30.6	1622.98	86	30.63	2633.47
20	30.6	612.77	54	30.58	1653.56	87	30.74	2664.21
21	30.53	643.3	55	30.53	1684.09	88	30.82	2695.03
22	30.53	673.83	56	30.7	1714.79	89	30.69	2725.72
23	30.82	704.65	57	30.55	1745.34	90	30.6	2756.32
24	30.65	735.3	58	30.68	1776.02	91	30.6	2786.92
25	30.72	766.02	59	30.55	1806.57	92	30.72	2817.64
26	30.6	796.62	60	30.6	1837.17	93	30.53	2848.17
27	30.72	827.34	61	30.75	1867.92	94	30.74	2878.91
28	30.58	857.92	62	30.6	1898.52	95	30.67	2909.58
29	30.58	888.5	63	30.57	1929.09	96	30.63	2940.21
30	30.63	919.13	64	30.63	1959.72	97	30.57	2970.78
31	30.58	949.71	65	30.8	1990.52	98	30.6	3001.38
32	30.67	980.38	66	30.57	2021.09	99	30.53	3031.91
33	30.25	1010.63	67	30.78	2051.87	100	30.65	3062.56
34	30.57	1041.2						

20" PACKER W/ 24" BRUSH. 5-20-13
10.32 ℄ OF PACKER ELEMENT



Certificate of Calibration

OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

Ozone Industries, Inc.
Precision Measurement Equipment Division

Purchase Order #

Calibration Performed By:
OZONE INDUSTRIES, INC.
15551 PINE RIDGE RD.
FORT MYERS, FL 33908

For:
YOUNGQUIST BROTHERS, INC.
15465 PINE RIDGE RD.
FORT MYERS, FL 33908

EQUIPMENT INFORMATION:

Description: PRESSURE GAUGE
Manufacter: MCDANIELS
Model Number: 300PSI
Part Number: N/A
Range: 0-300 PSI

Serial Number: 972062-1
Customer I.D.:
Cust. Barcode: N/A
Cust. Location: N/A
Specifications: +/- 0.25% FS

Cal Date: 6/6/2013
Cal. Due Date: 8/5/2013
Cal. Interval 60 DAYS
Received: IN TOLERANCE
Calibration Result: PASS
Environmental Conditions: 74 DEG F / 20% H
Performed By: Daniel McKissick

Procedure: STANDARD

This is to certify that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure at the points tested (unless otherwise noted). It has been Calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration is in accordance with Ozone Industries, Inc Quality Assurance Manual. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

Calibration Remarks:
THIS UNIT WAS FOUND TO BE IN TOLERANCE AT THE TIME OF CALIBRATION.
PERFORMED ROUTINE CALIBRATION / CERTIFICATION

Standards Used to Calibrate Equipment:

Company	I.D.	Description	Last Cal.	Cal. Due Date
OZONE	A1731	EATON UPC5000 PNEUMATIC CALIBRATOR	12/12/2012	12/12/2013

Signatures:

Certified by:
Print: Daniel McKissick
Date: 06/06/13
[redacted]

Approved by:
Print: Daniel McKissick
[redacted]

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ØZONE
INDUSTRIES
CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

PH: 239-433-3400
FAX: 239-489-3877

CONTROL NO: 032509-1

CUSTOMER: YBI15465

CALIBRATION DATA FORM

MFR:	MCDANIELS	**DESCRIPTION**	PRESSURE GAUGE
MODEL NO:	300 PSI .25%	**TECHNICIAN:**	0030
SERIAL NO:	972062-1	**CAL. DATE:**	06/06/13
CUST. ID:	N/A	**DUE DATE:**	08/05/13

* IF NO "AS LEFT" READING IS SHOWN ON THIS CHART, IT MEANS THE UNIT WAS IN TOLERANCE AND THERE WERE NO ADJUSTMENTS MADE TO IT.

RANGE: 0-300 PSI

NOMINAL	AS FOUND	AS LEFT *	LOW LIMIT	HIGH LIMIT
50	50.26		49.25	50.75
100	100.31		99.25	100.75
150	150.38		149.25	150.75
200	200.49		199.25	200.75
300	300.6		299.25	300.75

Certificate of Calibration

OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

Ozone Industries, Inc.
Precision Measurement Equipment Division

Purchase Order #

Calibration Performed By:
OZONE INDUSTRIES, INC.
15551 PINE RIDGE RD.
FORT MYERS, FL 33908

For:
YOUNGQUIST BROTHERS, INC.
15465 PINE RIDGE RD.
FORT MYERS, FL 33908

EQUIPMENT INFORMATION:

Description: PRESSURE GAUGE
Manufacter: McDaniel
Model Number: 300PSI
Part Number: N/A
Range: 0-300 PSI

Serial Number: 972034-2
Customer I.D.:
Cust. Barcode: N/A
Cust. Location: N/A
Specifications: +/- 0.25% FS

Cal Date: 5/17/2013
Cal. Due Date: 11/17/2013
Cal. Interval 6 MONTHS
Received: IN TOLERANCE
Calibration Result: PASS
Environmental Conditions: 74 DEG F / 80% H
Performed By: Daniel McKissick

Procedure: STANDARD

This is to certify that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure at the points tested (unless otherwise noted). It has been Calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration is in accordance with Ozone Industries, Inc Quality Assurance Manual. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

Calibration Remarks:
THIS UNIT WAS FOUND TO BE IN TOLERANCE AT THE TIME OF CALIBRATION.
PERFORMED ROUTINE CALIBRATION / CERTIFICATION

Standards Used to Calibrate Equipment:

Company	I.D.	Description	Last Cal.	Cal. Due Date
OZONE	A1731	EATON UPC5000 PNEUMATIC CALIBRATOR	12/12/2012	12/12/2013

Signatures:

Certified by:
Print: Daniel McKissick
[redacted]

Approved by:
Print: Daniel McKissick
Date: [redacted] 05/17/13
[redacted]

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ØZONE
INDUSTRIES
CORPORATION

15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

PH: 239-433-3400
FAX: 239-489-3877

CONTROL NO: 100809-7

CUSTOMER: YBI15465

CALIBRATION DATA FORM

MFR:	PIC	**DESCRIPTION**	PRESSURE GAUGE
MODEL NO:	300 PSI .25%	**TECHNICIAN:**	0030
SERIAL NO:	972034-2	**CAL. DATE:**	05/17/13
CUST. ID:	N/A	**DUE DATE:**	11/17/13

* IF NO "AS LEFT" READING IS SHOWN ON THIS CHART, IT MEANS THE UNIT WAS IN TOLERANCE AND THERE WERE NO ADJUSTMENTS MADE TO IT.

RANGE: 0-300 PSI

NOMINAL	AS FOUND	AS LEFT *	LOW LIMIT	HIGH LIMIT
50	49.59		49.25	50.75
100	99.47		99.25	100.75
150	149.45		149.25	150.75
200	199.43		199.25	200.75
300	299.4		299.25	300.75

Certificate of Calibration

OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

Ozone Industries, Inc.
Precision Measurement Equipment Division

Purchase Order #

Calibration Performed By:
OZONE INDUSTRIES, INC.
15551 PINE RIDGE RD.
FORT MYERS, FL 33908

For:
YOUNGQUIST BROTHERS, INC.
15465 PINE RIDGE RD.
FORT MYERS, FL 33908

EQUIPMENT INFORMATION:

Description: PRESSURE GAUGE
Manufacter: MCDANIELS
Model Number: 300PSI
Part Number: N/A
Range: 0-300 PSI

Serial Number: AB30128
Customer I.D.:
Cust. Barcode: N/A
Cust. Location: N/A
Specifications: +/- 0.25% FS

Cal Date: 6/17/2013
Cal. Due Date: 12/17/2013
Cal. Interval 6 MONTHS
Received: IN TOLERANCE
Calibration Result: PASS
Environmental Conditions: 73 DEG F / 40% H
Performed By: Daniel McKissick

Procedure: STANDARD

This is to certify that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure at the points tested (unless otherwise noted). It has been Calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration is in accordance with Ozone Industries, Inc Quality Assurance Manual. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

Calibration Remarks:
THIS UNIT WAS FOUND TO BE IN TOLERANCE AT THE TIME OF CALIBRATION.
PERFORMED ROUTINE CALIBRATION / CERTIFICATION

Standards Used to Calibrate Equipment:

Company	I.D.	Description	Last Cal.	Cal. Due Date
OZONE	A1731	EATON UPC5000 PNEUMATIC CALIBRATOR	12/12/2012	12/12/2013

Signatures:

Certified by:
Print: Daniel McKissick
Date: 06/17/13
[redacted]

Approved by:
Print: Daniel McKissick
Date: 06/17/13
[redacted]

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OZONE
INDUSTRIES
CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

PH: 239-433-3400
FAX: 239-489-3877

CONTROL NO: 080709-2

CUSTOMER: YBI15465

CALIBRATION DATA FORM

MFR:	MCDANIELS	**DESCRIPTION**	PRESSURE GAUGE
MODEL NO:	300 PSI .25%	**TECHNICIAN:**	0030
SERIAL NO:	AB30128	**CAL. DATE:**	06/17/13
CUST. ID:	N/A	**DUE DATE:**	12/17/13

* IF NO "AS LEFT" READING IS SHOWN ON THIS CHART, IT MEANS THE UNIT WAS IN TOLERANCE AND THERE WERE NO ADJUSTMENTS MADE TO IT.

RANGE: 0-200 PSI

NOMINAL	AS FOUND	AS LEFT *	LOW LIMIT	HIGH LIMIT
50	50.18		49.25	50.75
100	100.19		99.25	100.75
150	150.22		149.25	150.75
200	200.31		199.25	200.75
250	250.33		249.25	250.75
300	300.39		299.25	300.75

Appendix D

RTS and RTS Tool Configuration

RADIOACTIVE TRACER SURVEY LOG

Company	SOUTH MIAMI-DADE W.W.T.P.
Well	IW-7
Field	S.D.W.W.T.P.
County	MIAMI-DADE
State	FLORIDA

Location: API # :

SEC TWP RGE

Other Services

Permanent Datum	PAD	Elevation	PAD
Log Measured From	PAD		
Drilling Measured From	PAD		

Elevation
K.B.
D.F.
G.L.

Date	19-AUG-2013		
Run Number	2013 MIT		
Depth Driller	3119'		
Depth Logger	2967'		
Bottom Logged Interval	2967'		
Top Log Interval	SURFACE		
Open Hole Size	22"		
Type Fluid	WATER		
Density / Viscosity	NA		
Max. Recorded Temp.	NA		
Estimated Cement Top	NA		
Time Well Ready	ON ARRIVAL		
Time Logger on Bottom	ON ARRIVAL		
Equipment Number	102		
Location	FT MYERS		
Recorded By	RIVES	MOREY	
Witnessed By	S. VILLAMIL		

Borehole Record				Borehole Record			
Run Number	Bit	From	To	Run No	Bit	From	To

Casing Record	Size	Wgt/Ft	Top	Bottom
Surface String				
Prot. String				
Production String	24"	.500" W.T.	SURFACE	2632'
Liner				

<< Fold Here >>>

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

Comments

HIGH RESOLUTION TEMPERATURE

Company SOUTH MIAMI-DADE W.W.T.P.
Well IW-7
Field S.D.W.W.T.P.
County MIAMI-DADE
State FLORIDA

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)

GR#3	24.00				
		GR #3 -RTST (951T)	11.50	1.69	30.00
		TREJCT-A (951)	1.00	1.69	10.00
		GR #2 -RTSM (951M)	3.00	1.69	10.00
GR#2	10.50				
CCL	9.60	CCL-1.68GRRTS (951)	0.75	1.69	10.00
		GR-RTSB (951B)	9.25	1.69	10.00
GR	1.20				

Dataset: sdwwtp-iw7.db: field/well/run1/pass9
Total Length: 25.50 ft
Total Weight: 70.00 lb
O.D. 1.69 in

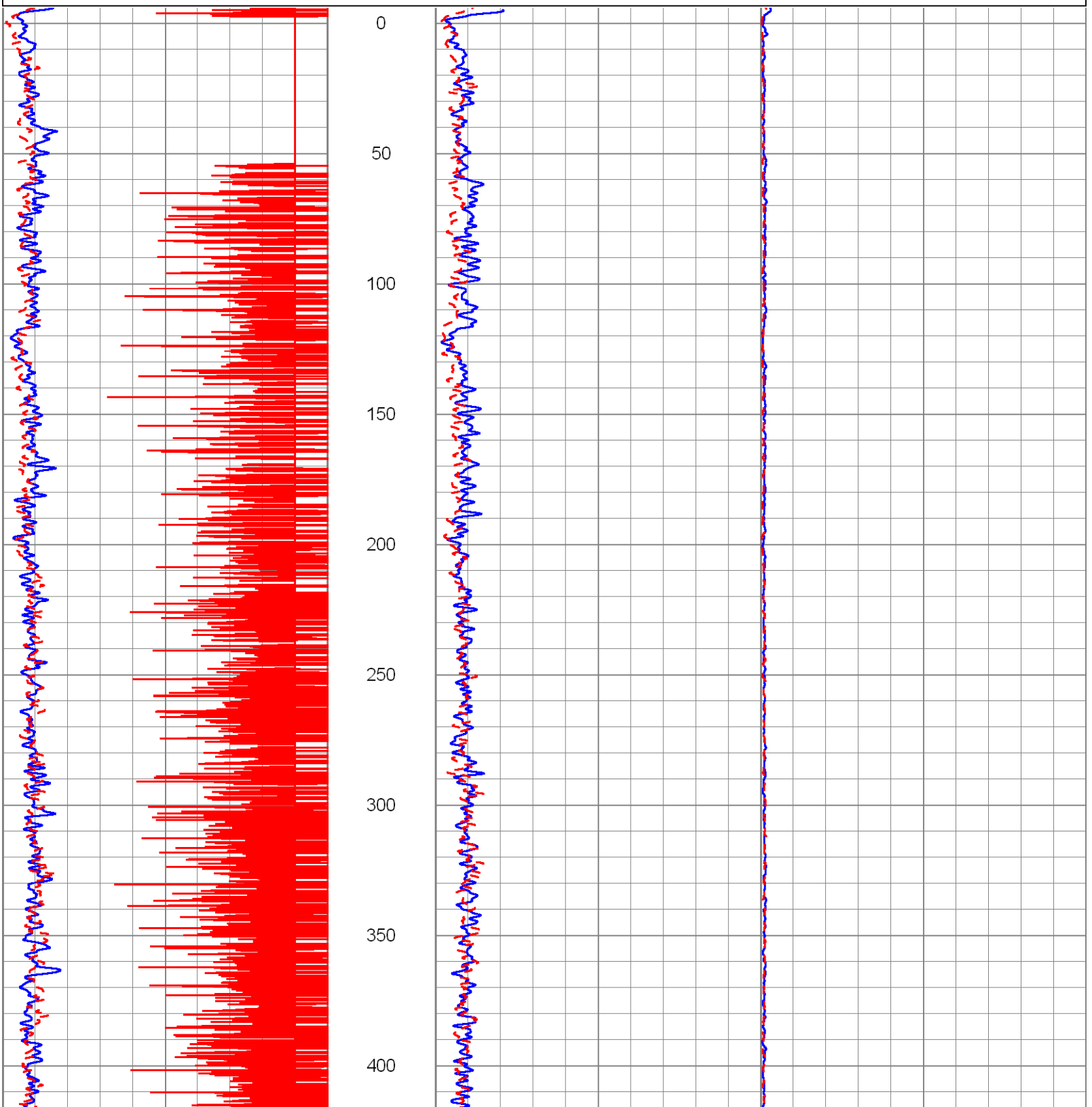
YOUNGQUIST

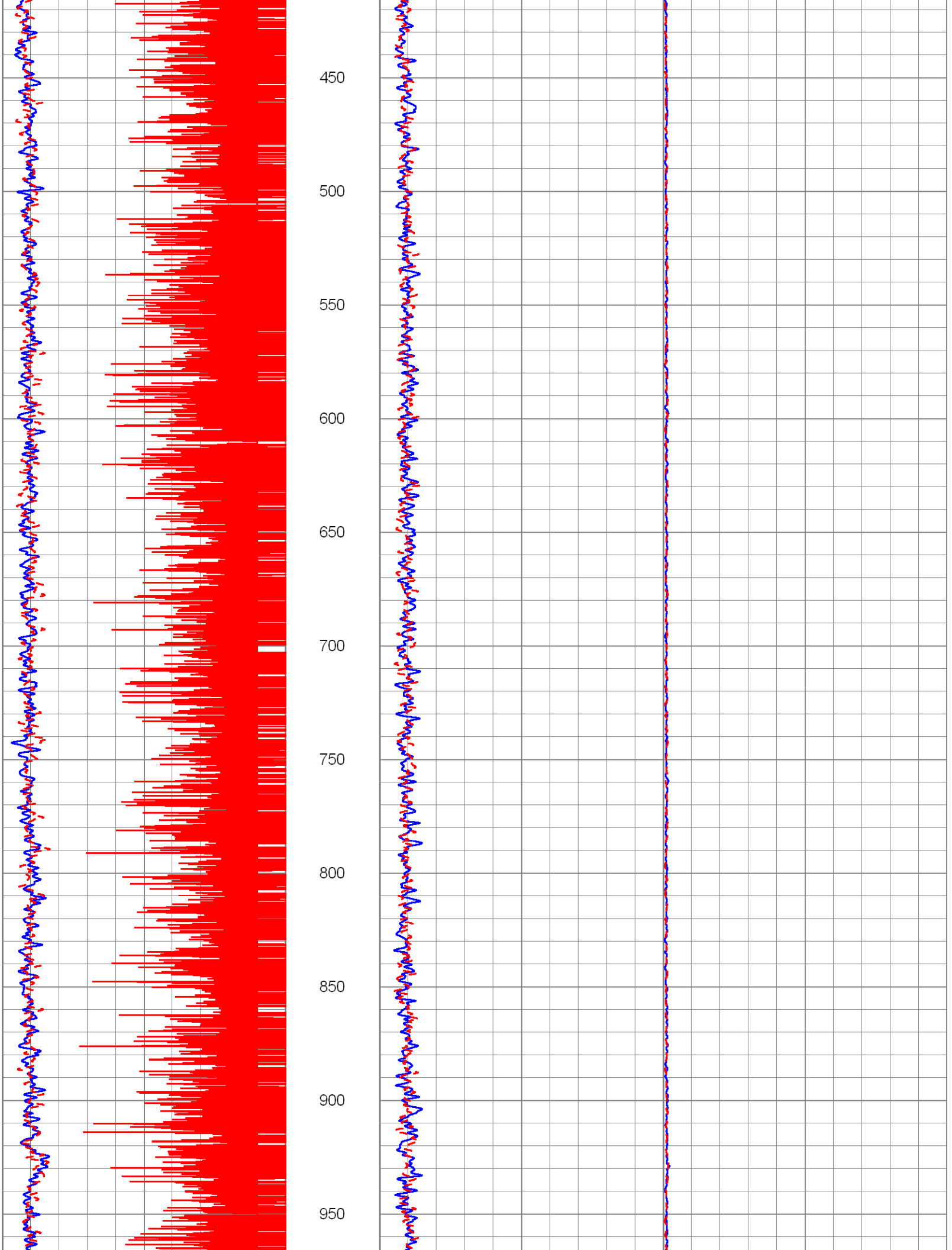
FINAL BACKGROUND

FINAL BACKGROUND

Database File:	sdwwtp-iw7.db
Dataset Pathname:	pass9
Presentation Format:	rts
Dataset Creation:	Mon Aug 19 14:49:32 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:600

0	GRT (GAPI)	100		0	GRB (GAPI)	100	0 GRM (GAPI) 1000
0	GRT-BACKGRND (GAPI)	100		0	GRB-BACKGRD (GAPI)	100	0 GRM-BACKGRND (GAPI) 1000
0.9	CCL	-0.1					

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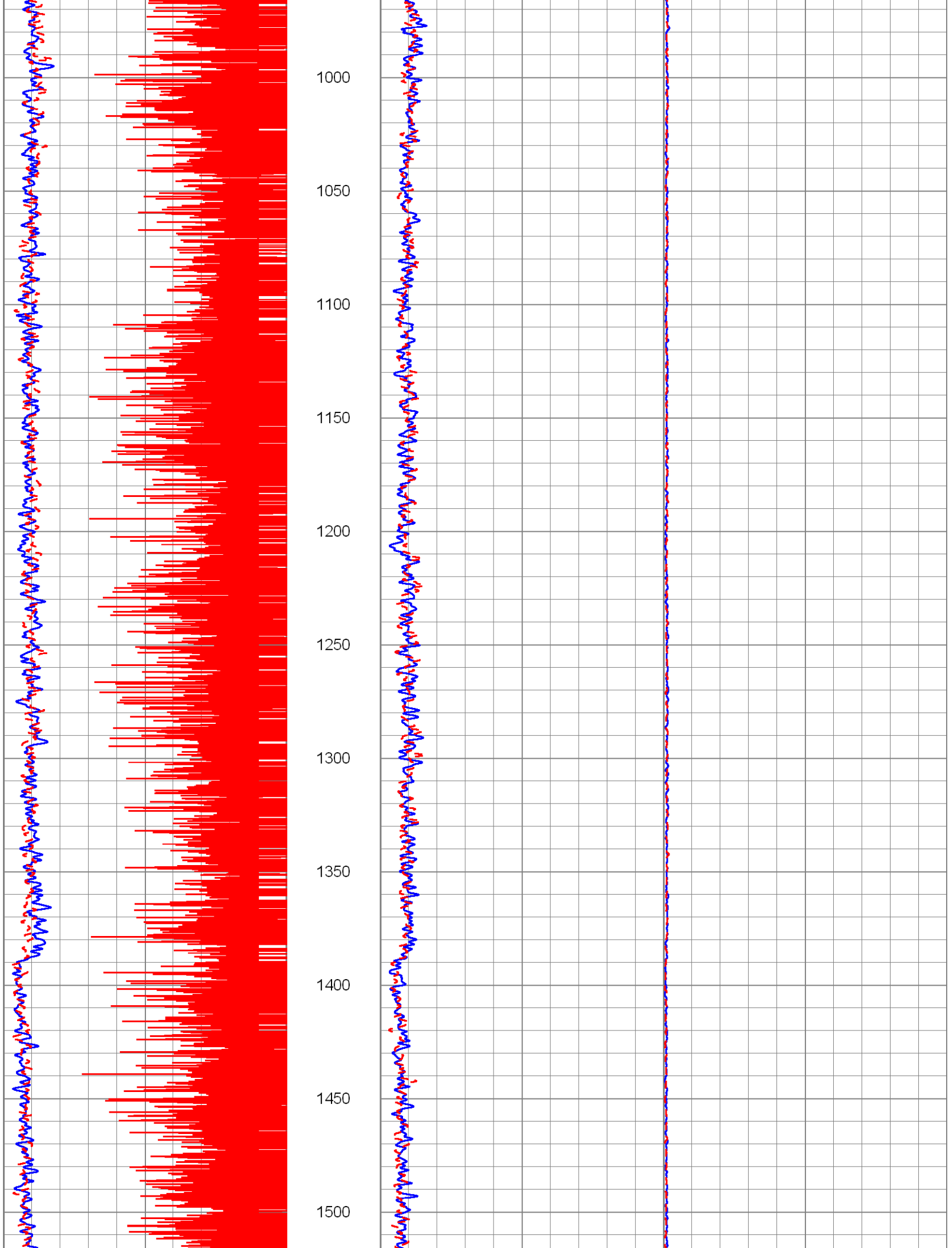
950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1200
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1900
1950
2000
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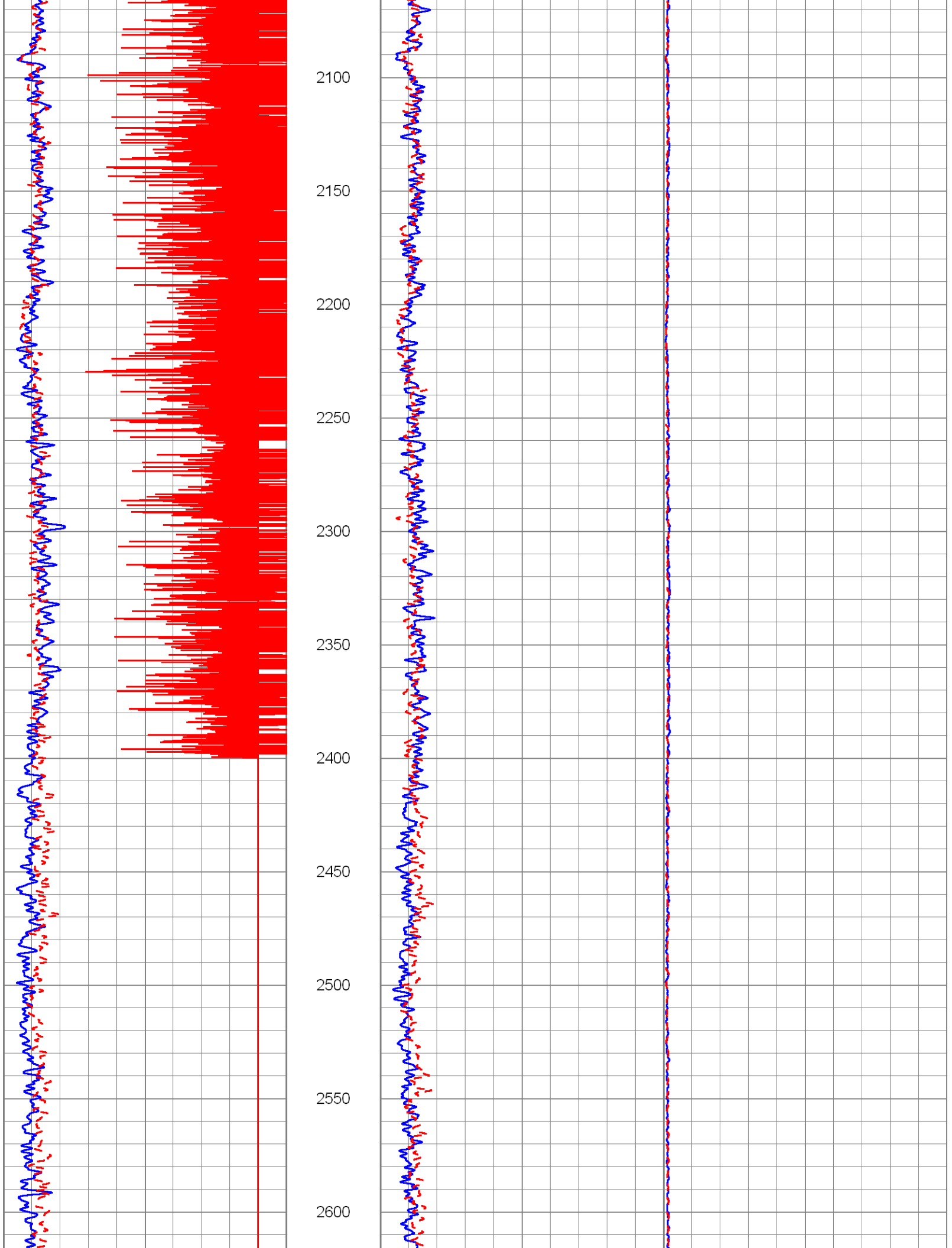
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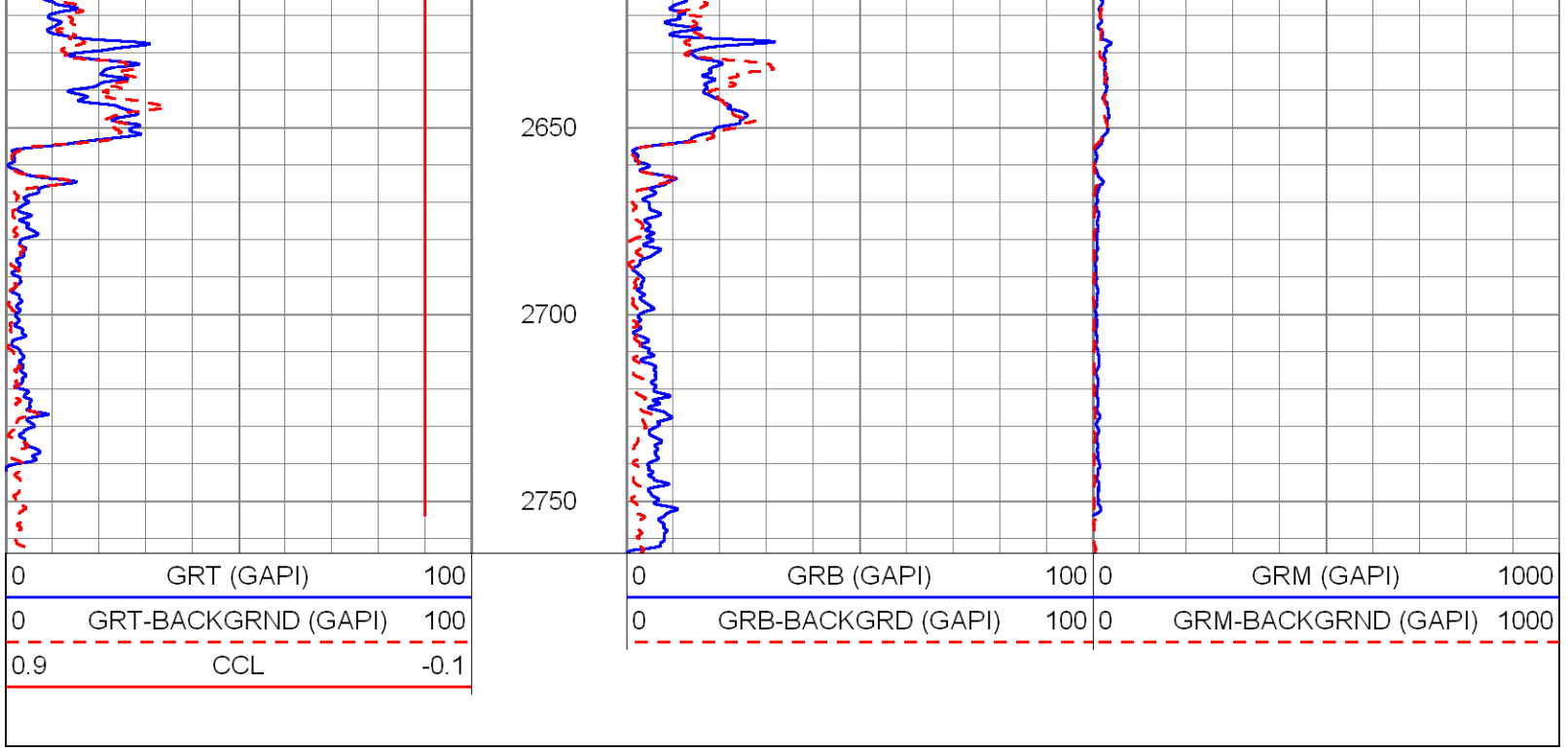
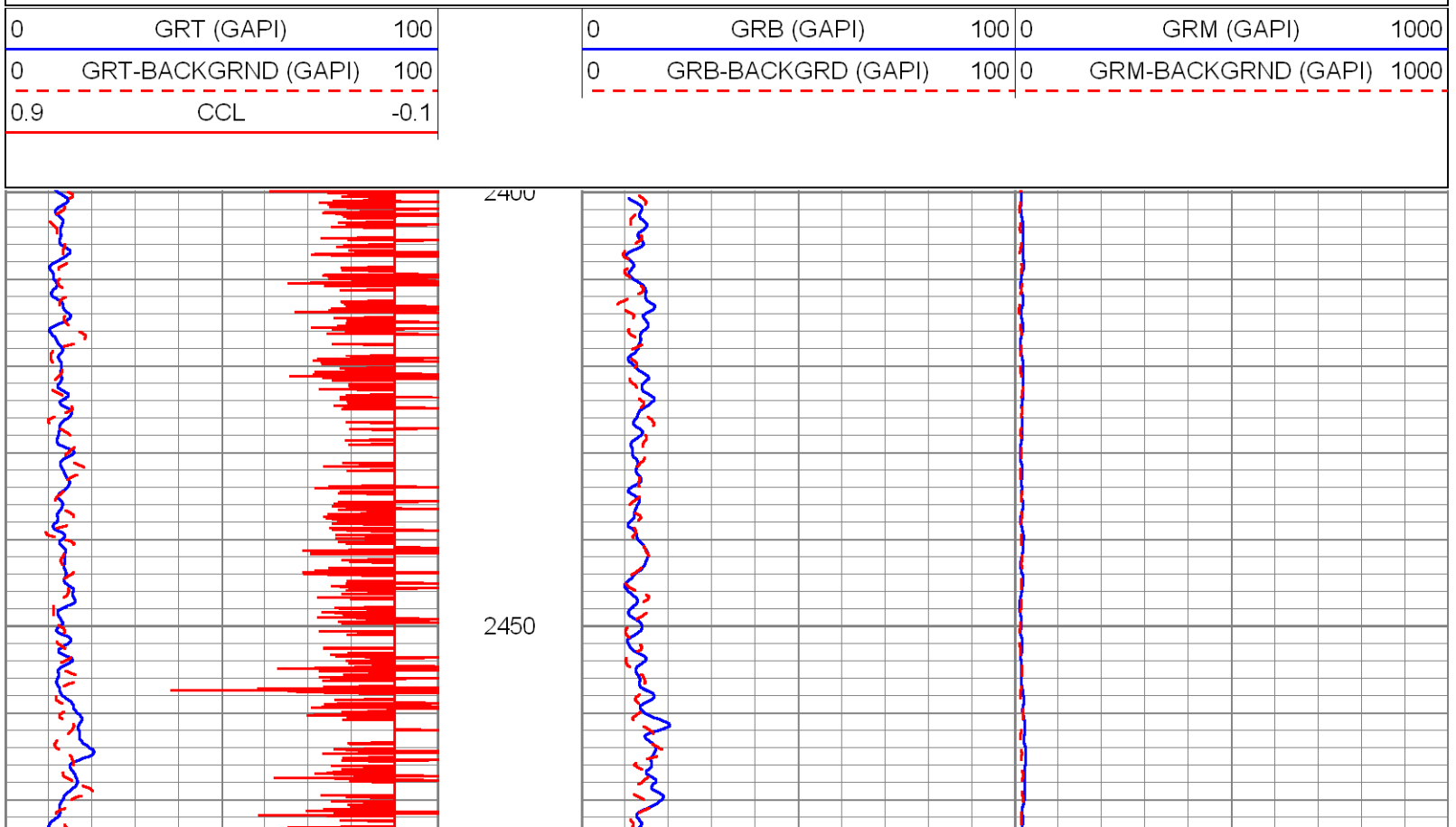
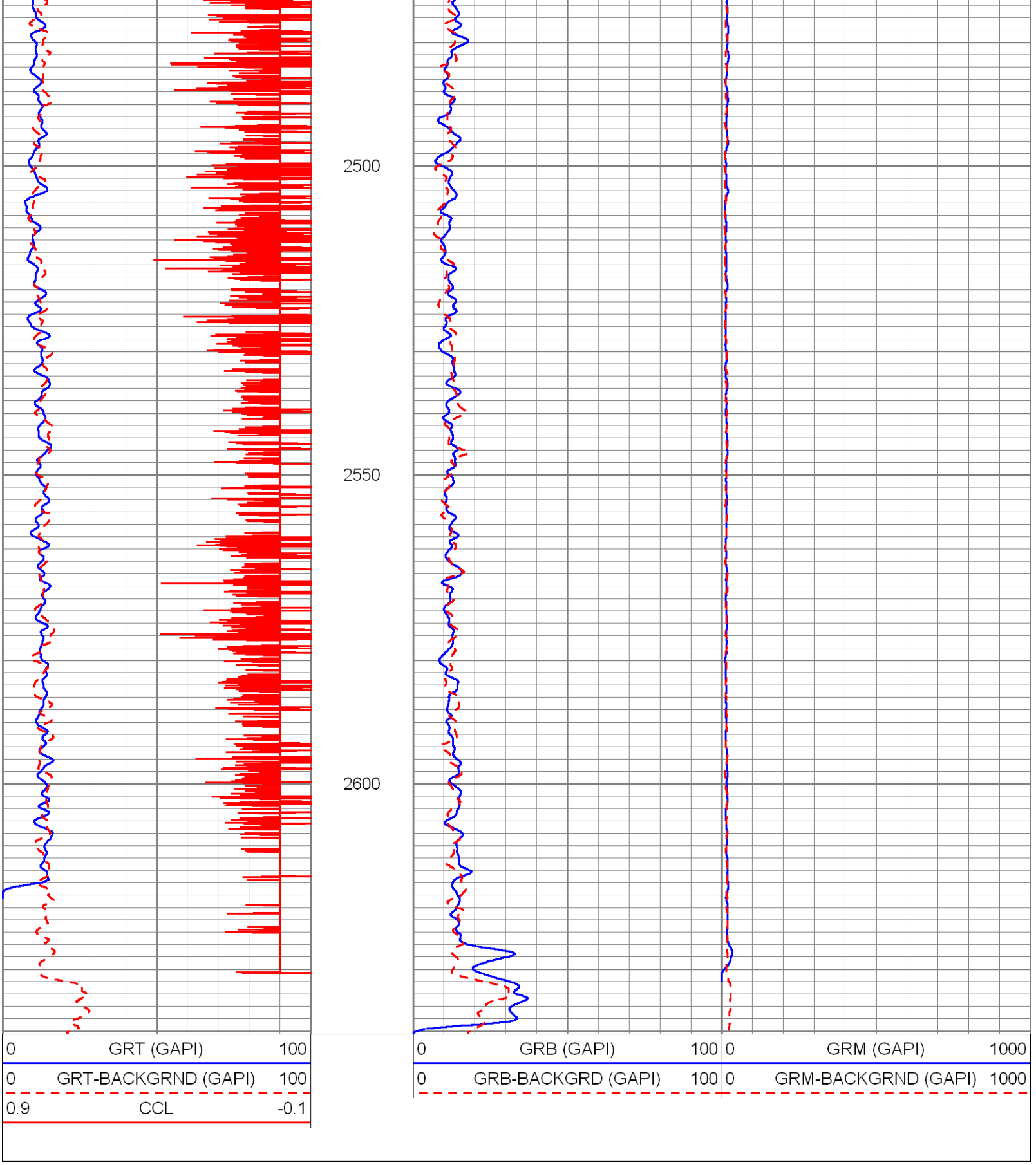
2450
2500
2550
2600



LOP #2

Database File:	sdwwtp-iw7.db
Dataset Pathname:	pass8
Presentation Format:	rts
Dataset Creation:	Mon Aug 19 14:24:37 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:240





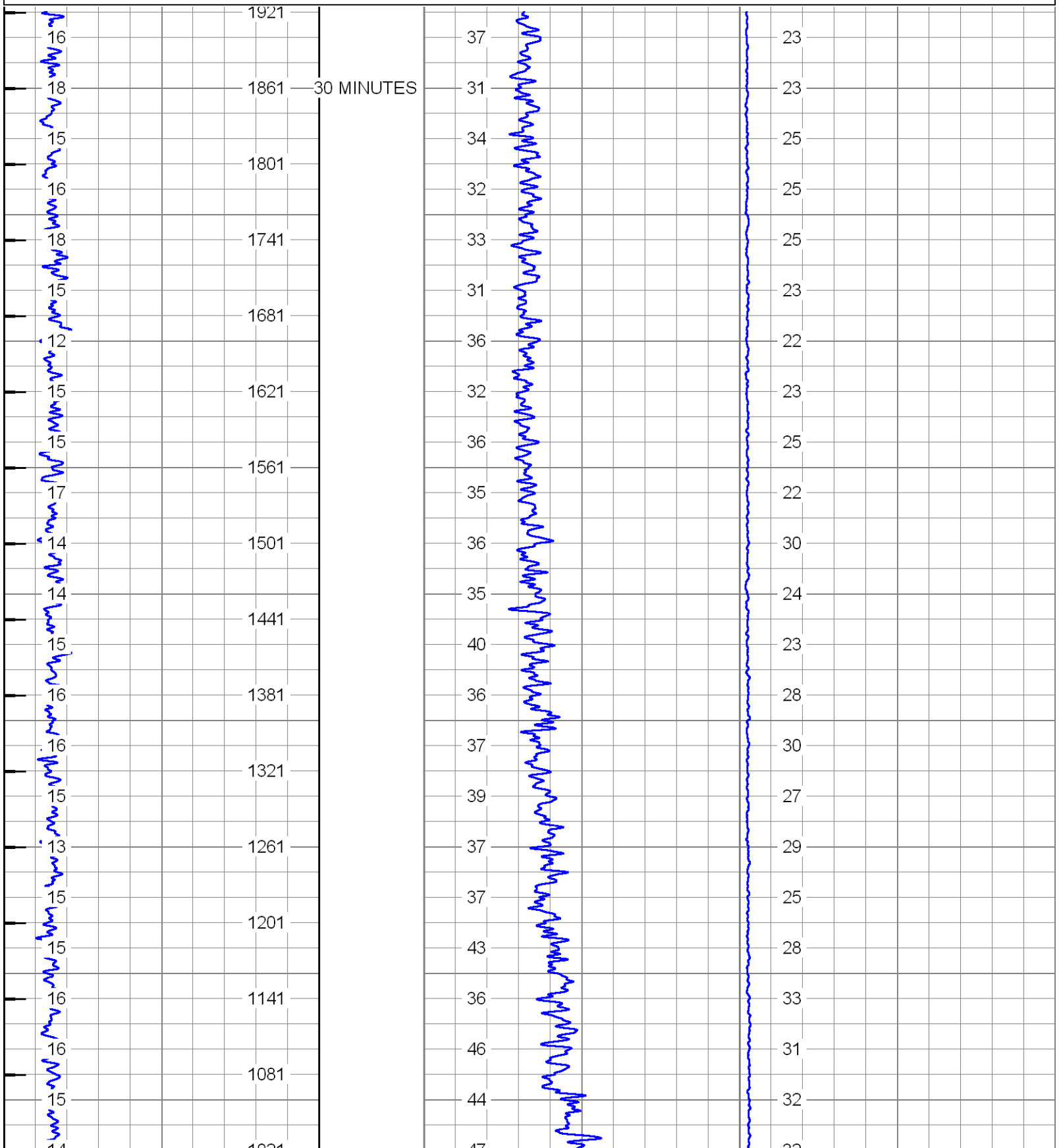
YOUNGQUIST BROTHERS

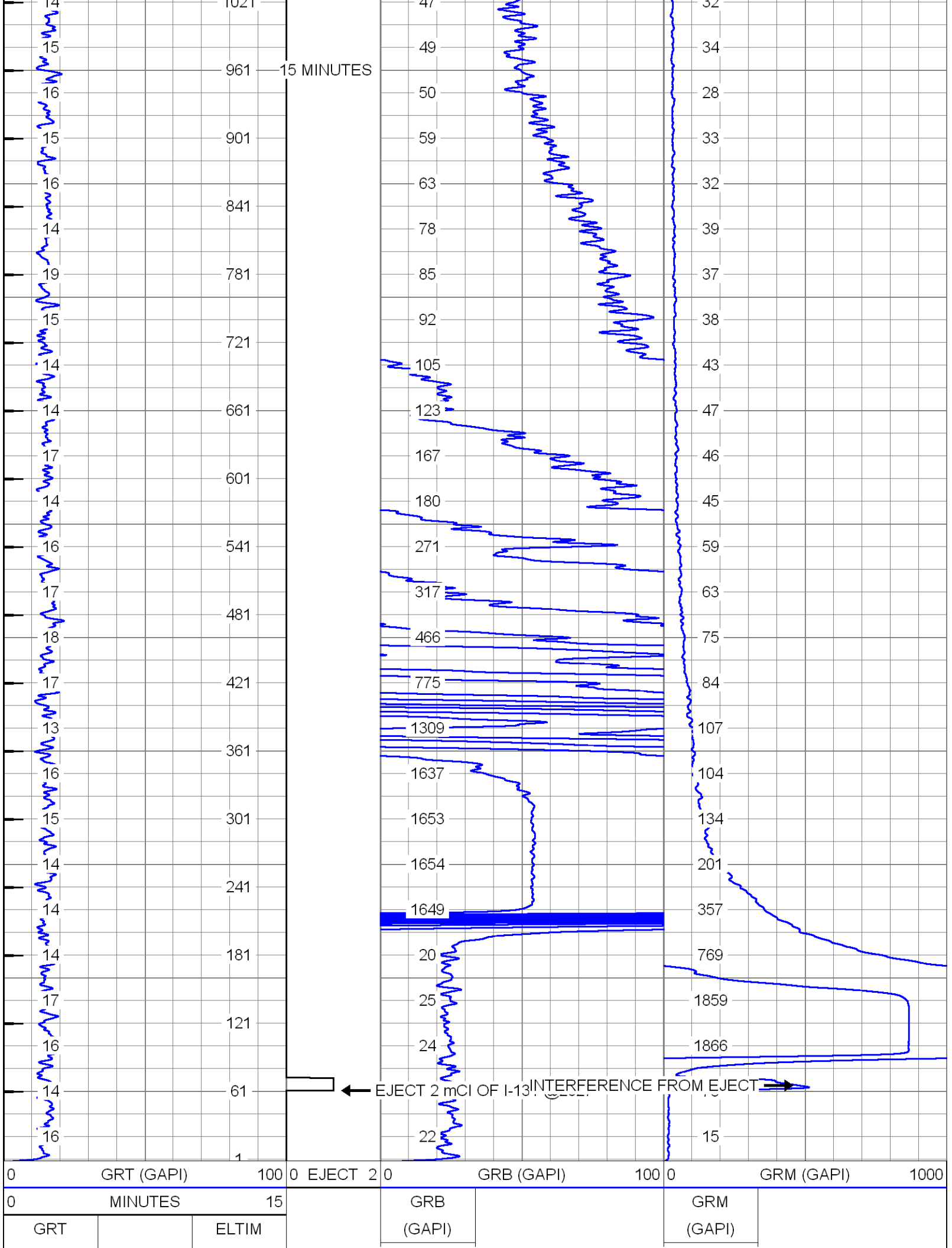
DYNAMIC TEST #2 (87 GPM)

Database File: sdwwtp-iw7.db

Dataset Pathname: pass7
Presentation Format: rtstime
Dataset Creation: Mon Aug 19 13:48:42 2013 by Log SOC 110722
Charted by: Depth in Feet scaled 1:600

0 GRT (GAPI) 100	0 EJECT 2	0 GRB (GAPI) 100	0 GRM (GAPI) 1000
0 MINUTES 15		GRB (GAPI)	GRM (GAPI)
GRT (GAPI) / ELTIM (sec)			



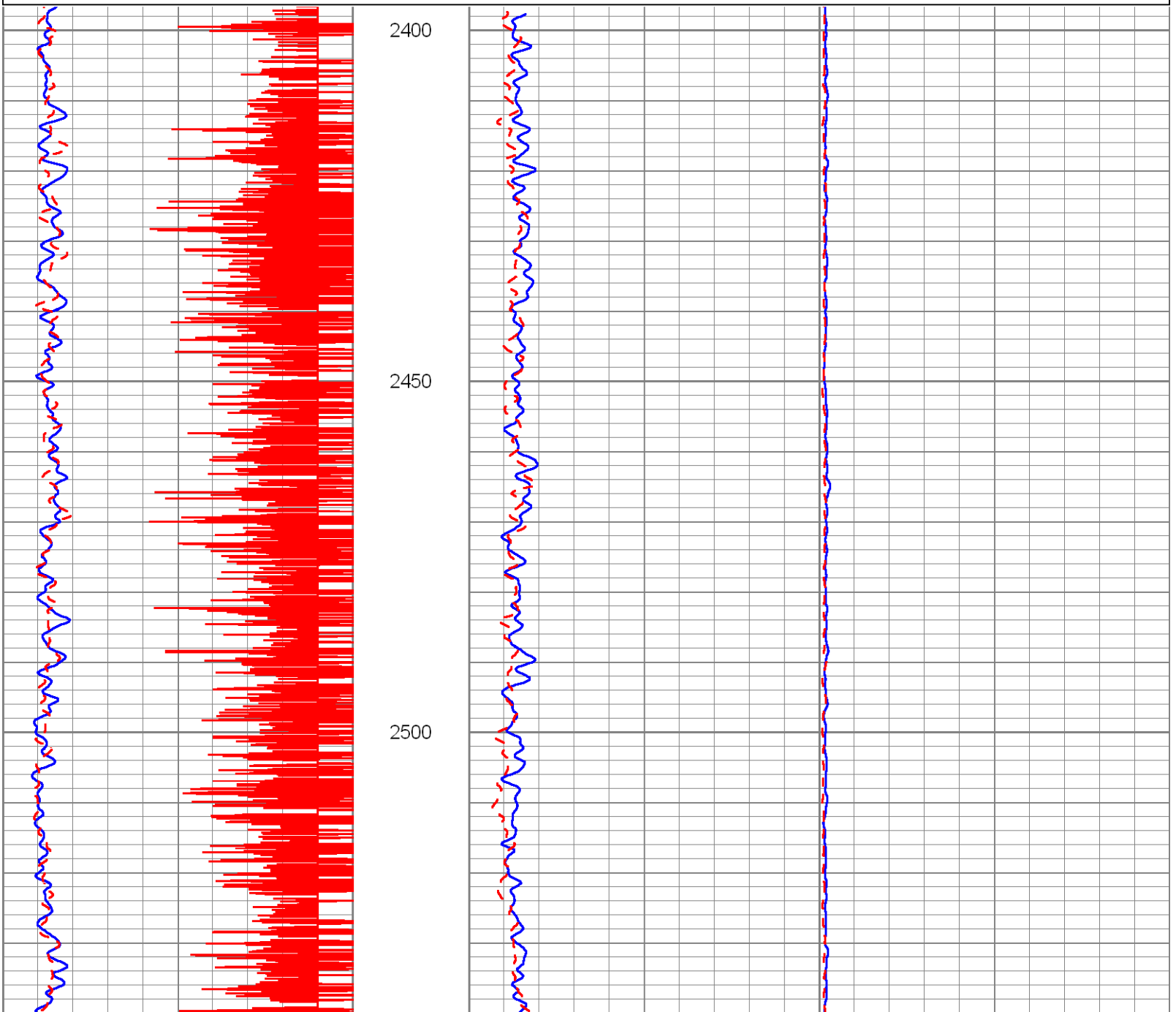

15 MINUTES
EJECT 2 mCI OF I-131
INTERFERENCE FROM EJECT
0 GRT (GAPI) 100
0 EJECT 2
0 GRB (GAPI) 100
0 GRM (GAPI) 1000
0 MINUTES 15
GRT
ELTIM
GRB (GAPI)
GRM (GAPI)

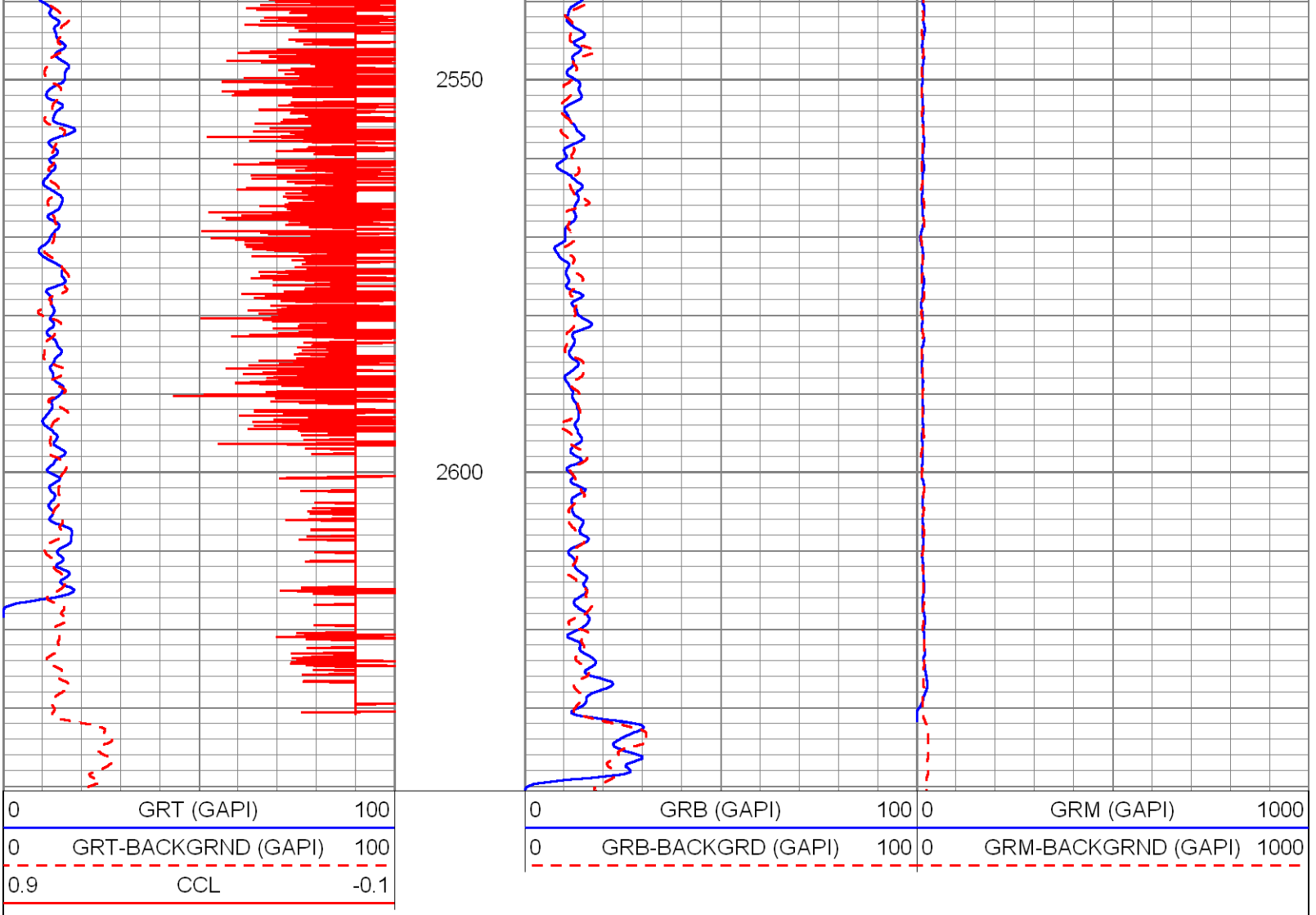
(GAPI)	(sec)

LOP #1

Database File:	sdwwtp-iw7.db
Dataset Pathname:	pass6
Presentation Format:	rts
Dataset Creation:	Mon Aug 19 13:33:35 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:240

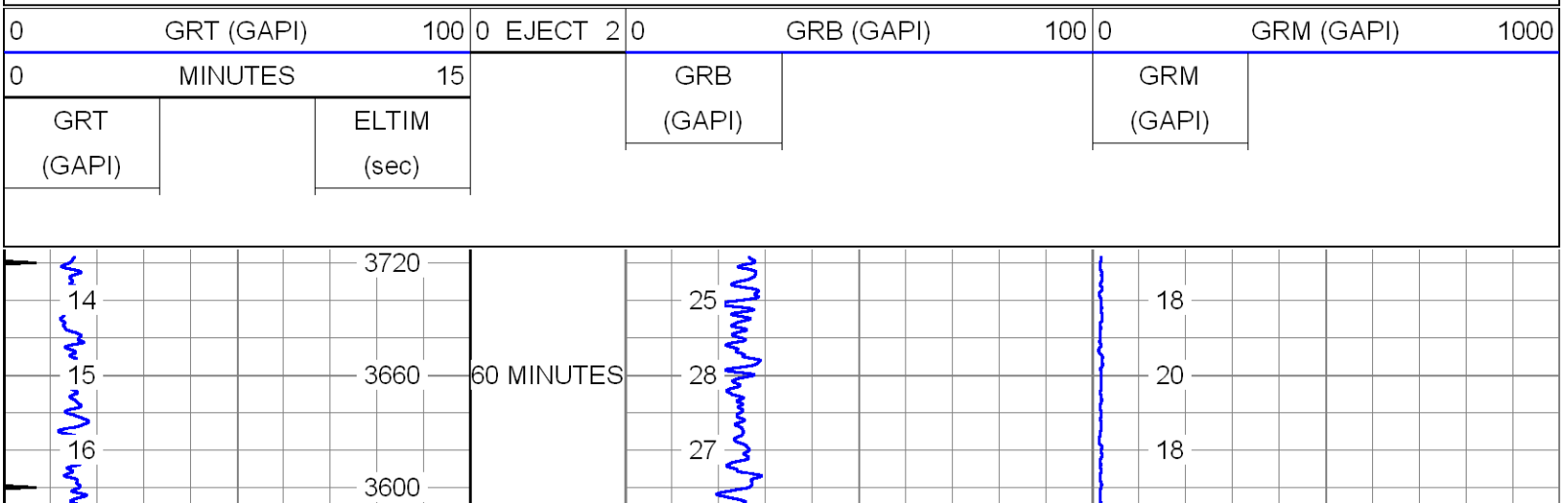
0	GRT (GAPI)	100		0	GRB (GAPI)	100	0	GRM (GAPI) 1000
0	GRT-BACKGRND (GAPI)	100		0	GRB-BACKGRD (GAPI)	100	0	GRM-BACKGRND (GAPI) 1000
0.9	CCL	-0.1						

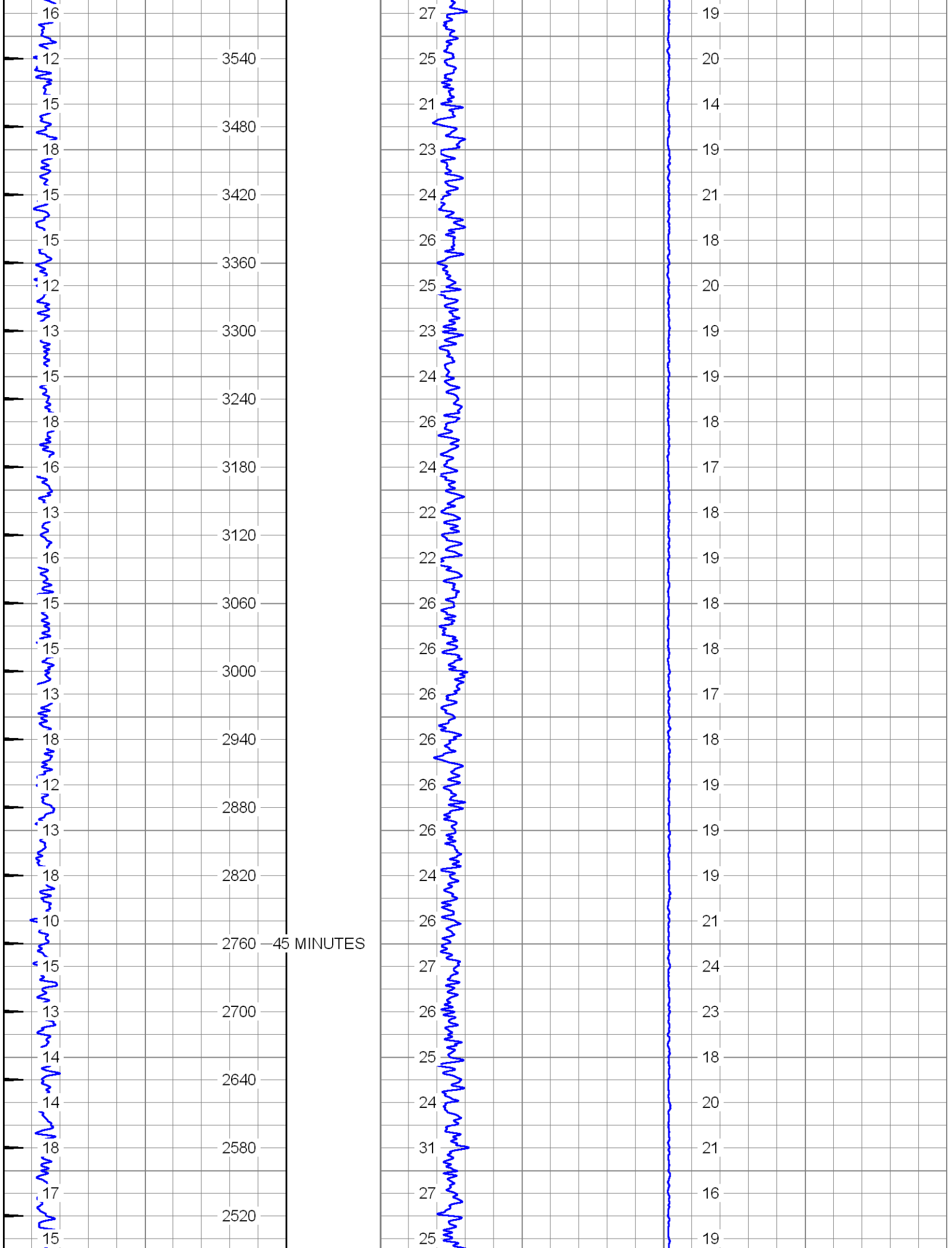




DYNAMIC TEST #1 (89 GPM)

Database File:	sdwwtp-iw7.db
Dataset Pathname:	pass5
Presentation Format:	rtstime
Dataset Creation:	Mon Aug 19 12:29:35 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:600

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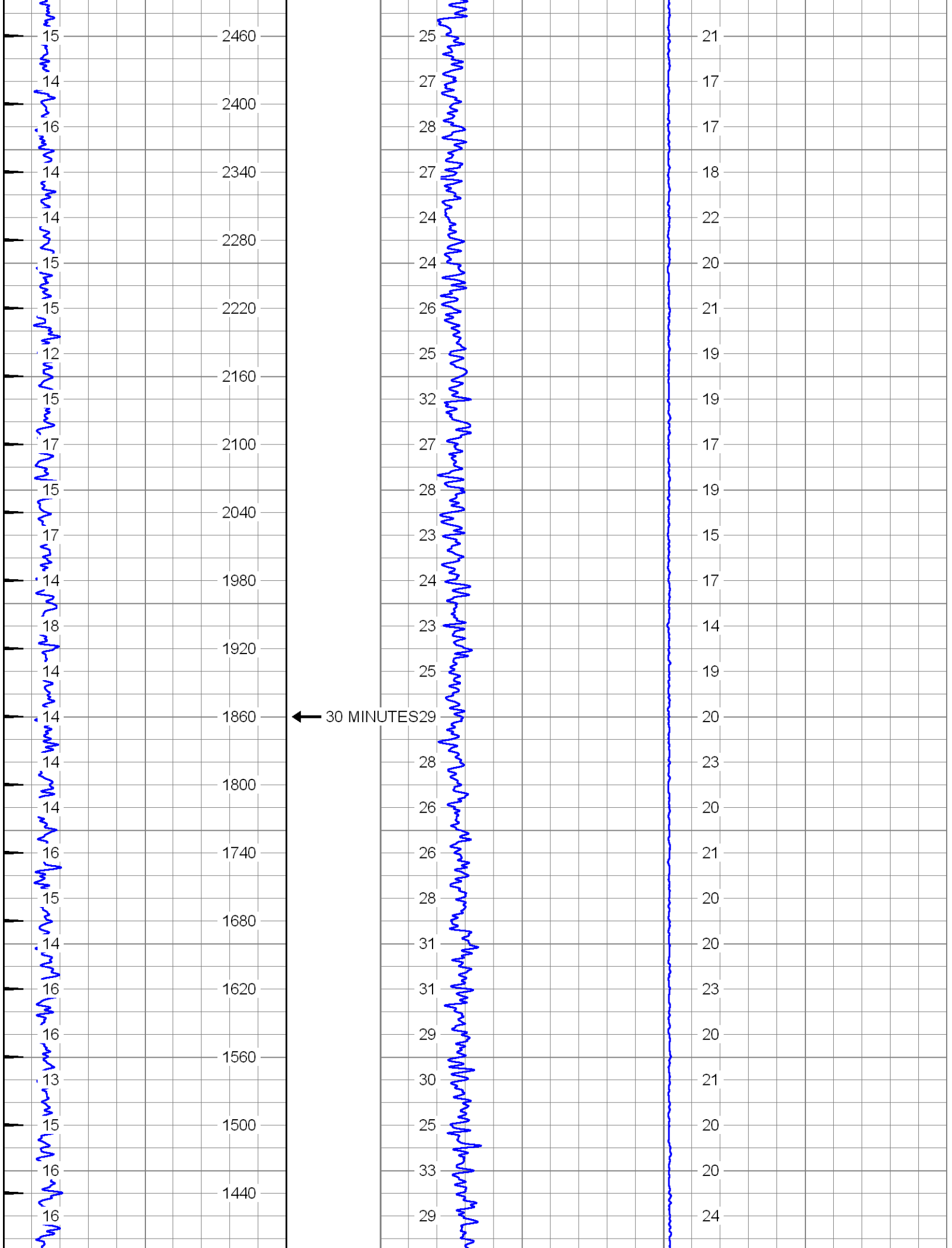
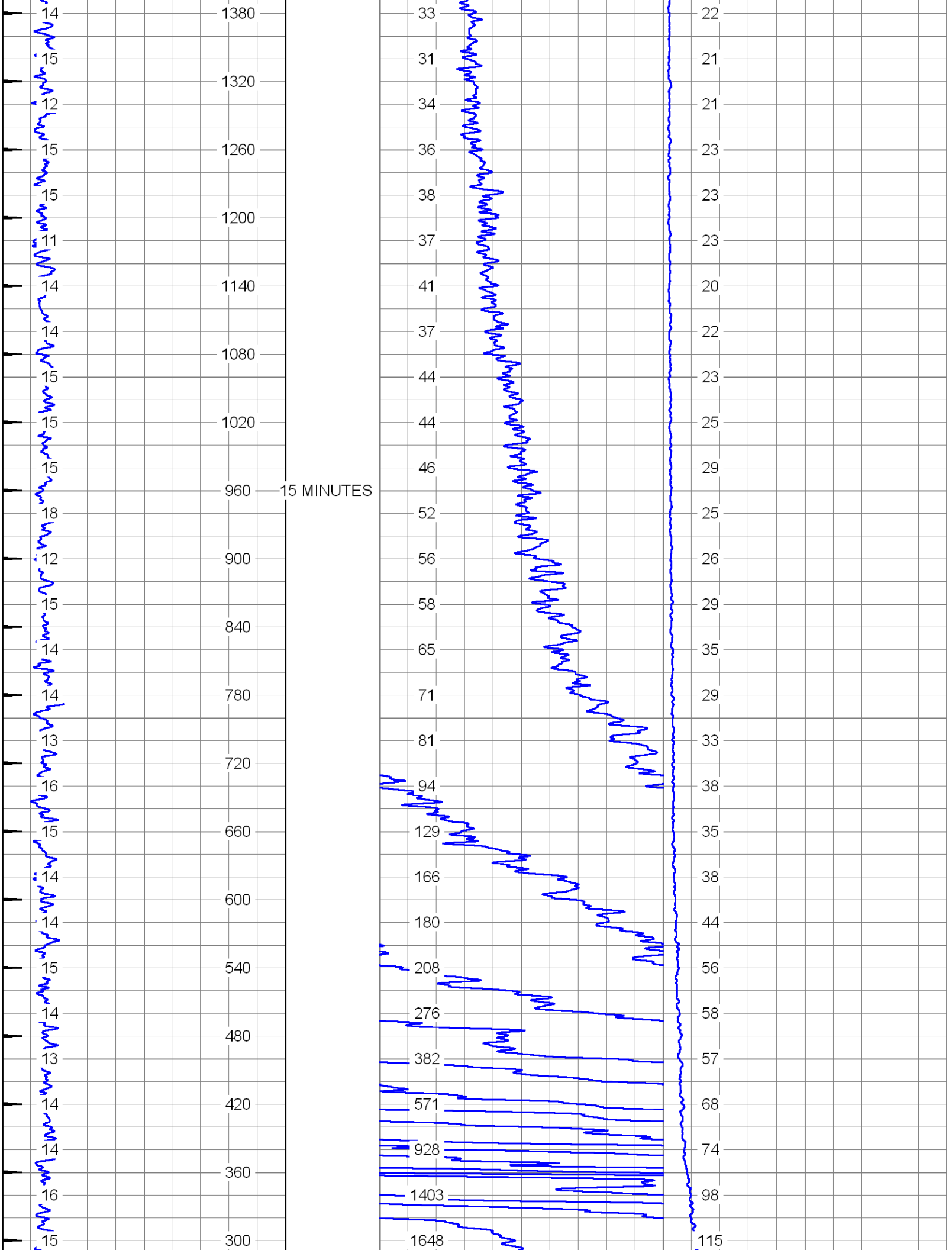

30 MINUTES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1200
1140
1080
1020
960
900
840
780
720
660
600
540
480
420
360
300
15 MINUTES
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34
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129
166
180
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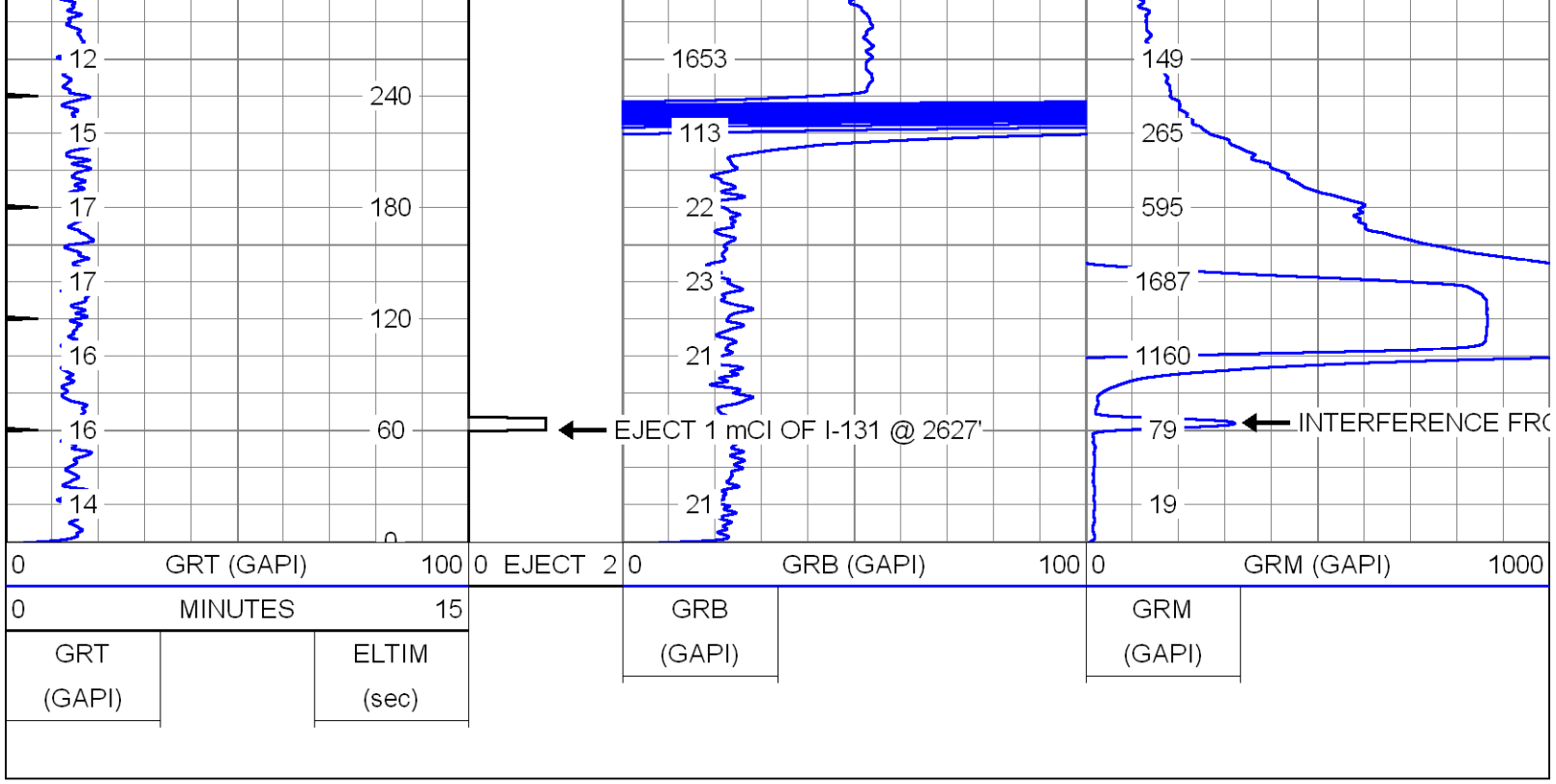
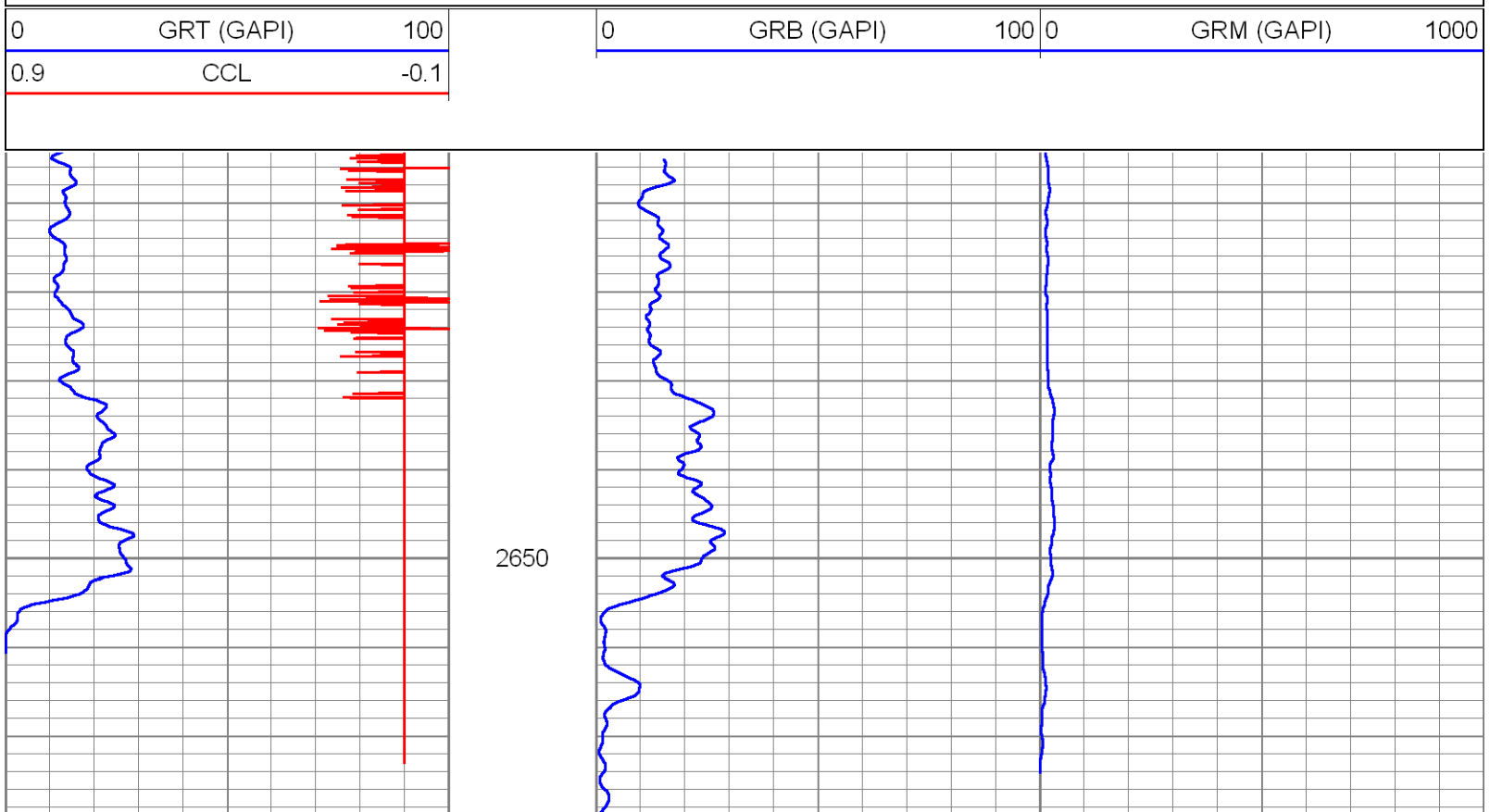
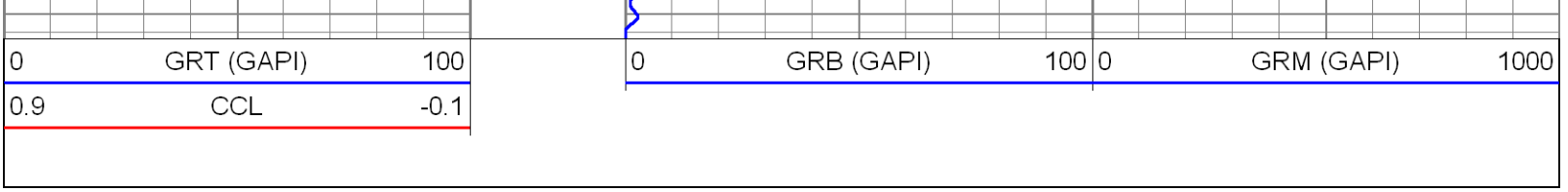


CASING TIE-IN

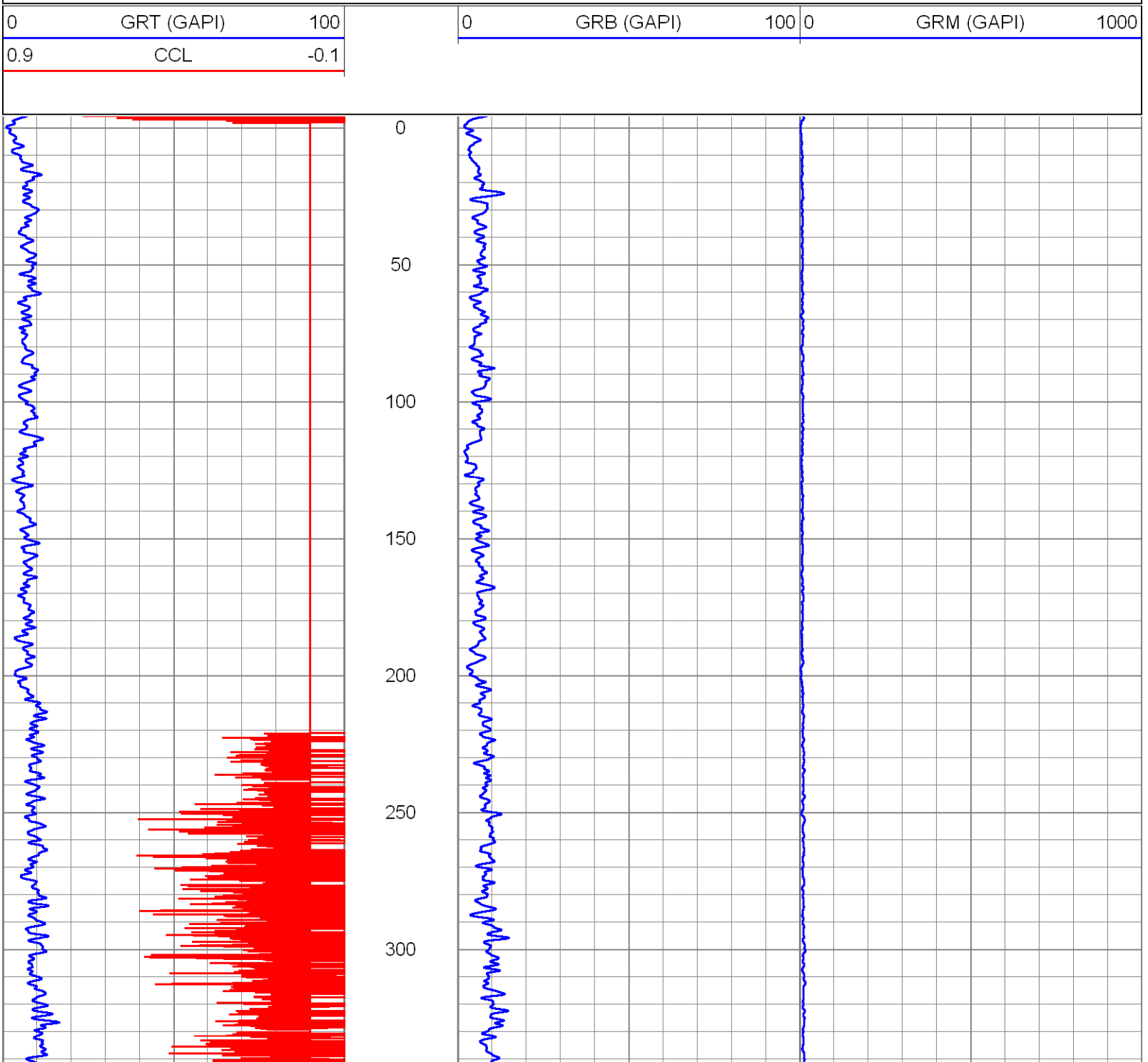
Database File:	sdwwtp-iw7.db
Dataset Pathname:	pass4
Presentation Format:	rts
Dataset Creation:	Mon Aug 19 12:15:15 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:240

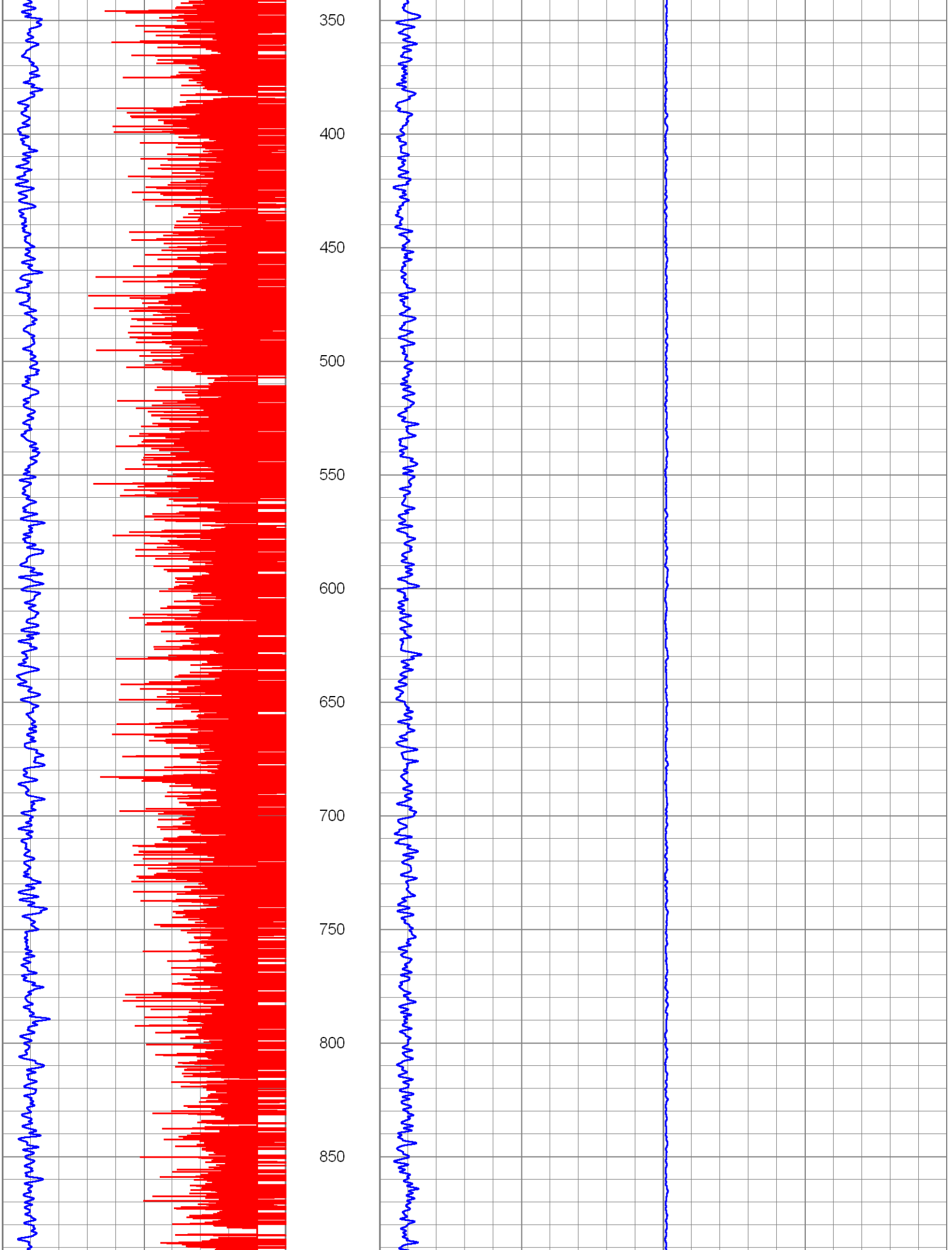


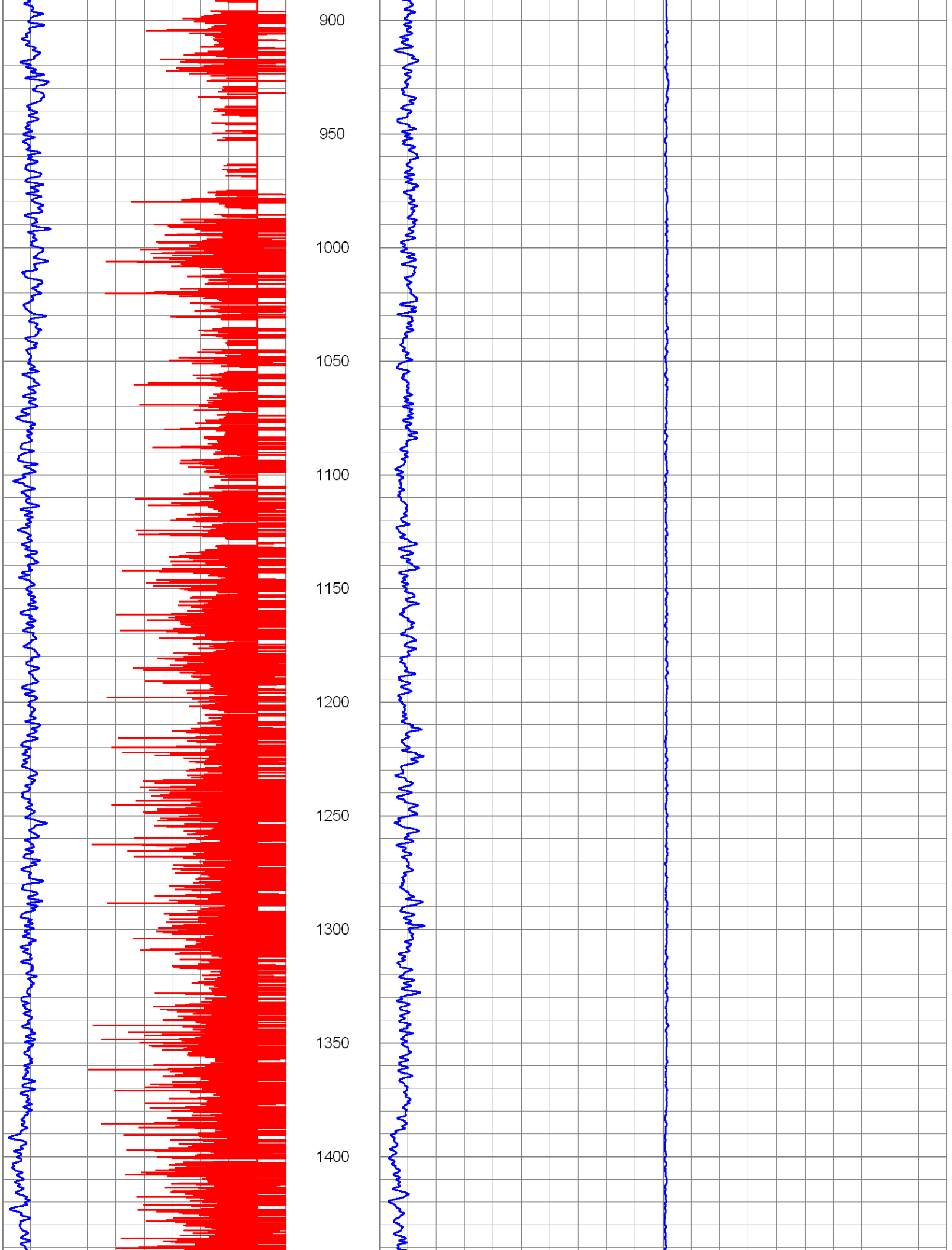


BACKGROUND GAMMA-RAY

Database File:	sdwwtp-iw7.db
Dataset Pathname:	pass2
Presentation Format:	rts
Dataset Creation:	Mon Aug 19 09:56:43 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:600




350
400
450
500
550
600
650
700
750
800
850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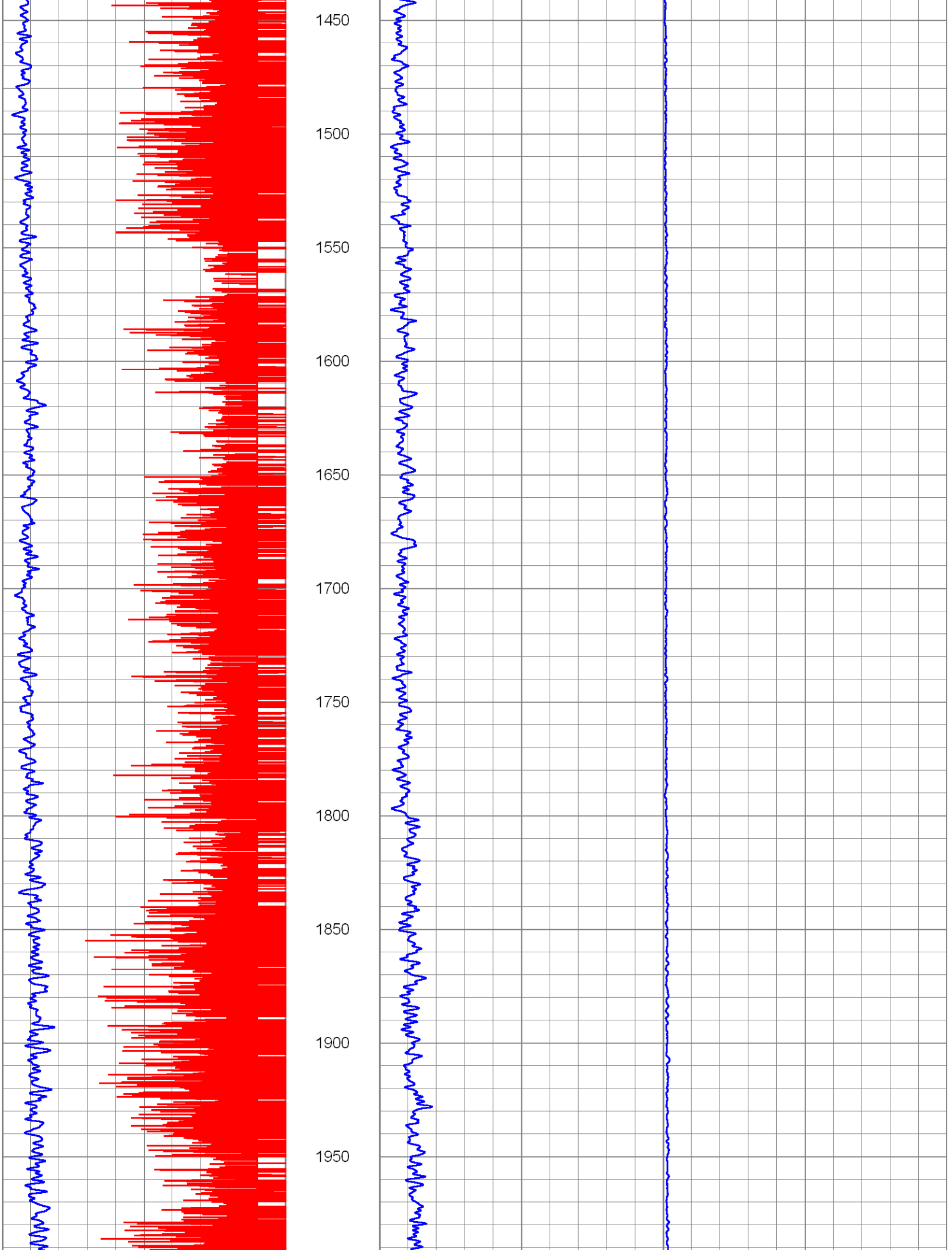
950
1000
1050
1100
1150
1200
1250
1300
1350
1400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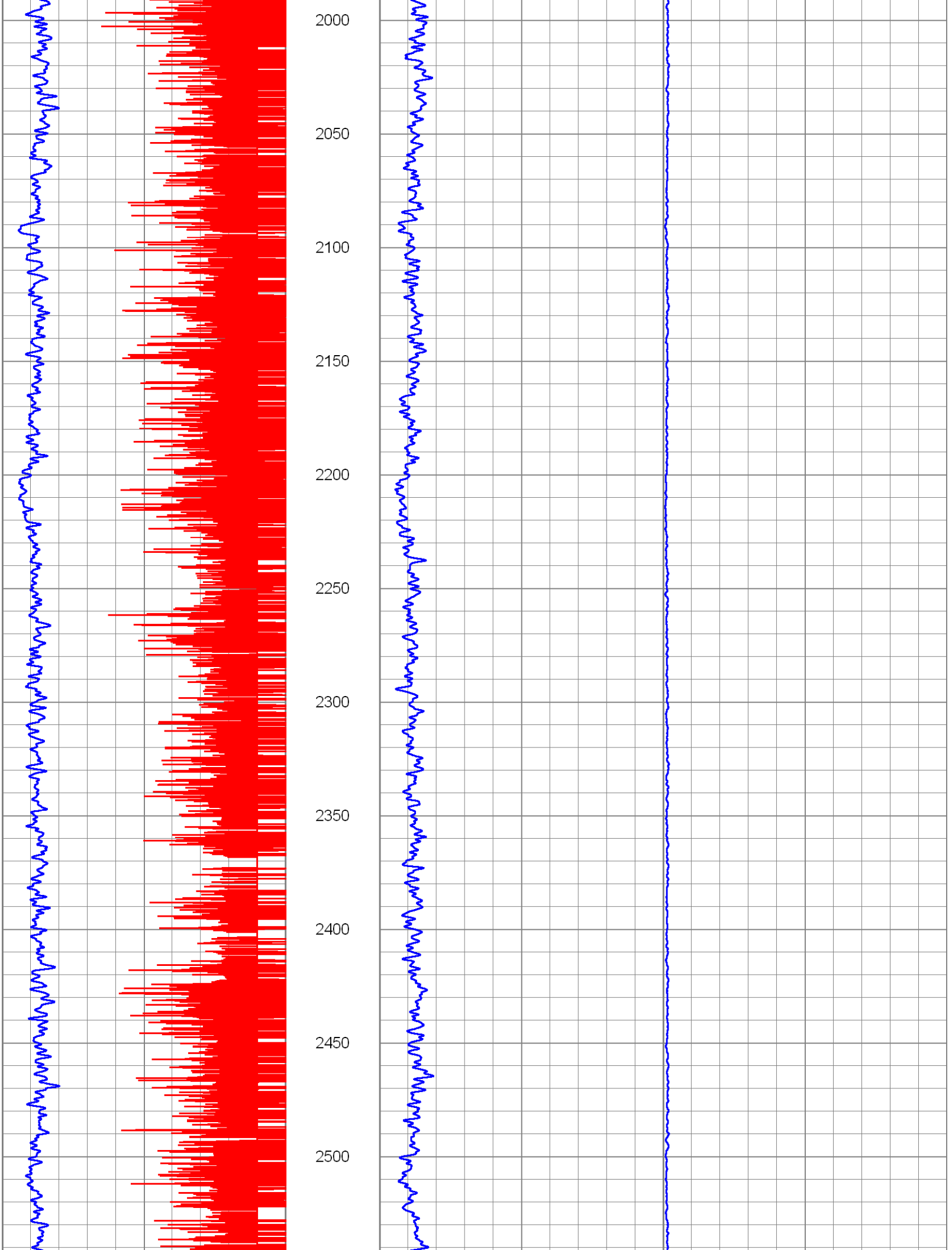
1500
1550
1600
1650
1700
1750
1800
1850
1900
1950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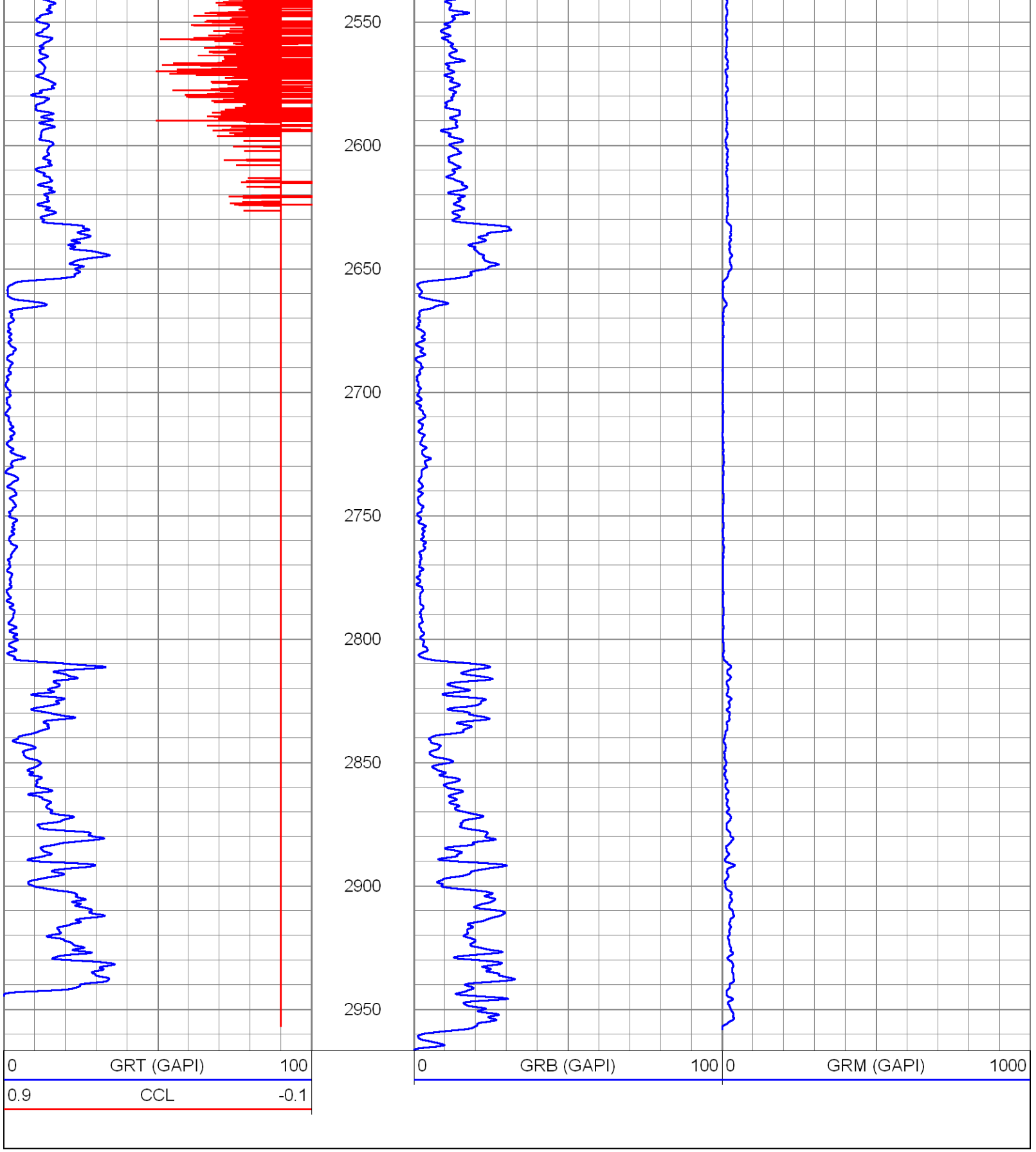
2050
2100
2150
2200
2250
2300
2350
2400
2450
2500



Calibration Report

Database File: sdwwtp-iw7.db
Dataset Pathname: pass2
Dataset Creation: Mon Aug 19 09:56:43 2013 by Log SOC 110722

Gamma Ray Calibration Report

Serial Number: 951B

Tool Model:	RTSB	
Performed:	Mon Aug 19 08:35:41 2013	
Calibrator Value:	90.0	GAPI
Background Reading:	38.7	cps
Calibrator Reading:	213.7	cps
Sensitivity:	0.5143	GAPI/cps

Gamma Ray Calibration Report

Serial Number:	951M	
Tool Model:	RTSM	
Performed:	Mon Aug 19 08:37:50 2013	
Calibrator Value:	90.0	GAPI
Background Reading:	37.4	cps
Calibrator Reading:	192.6	cps
Sensitivity:	0.5800	GAPI/cps

Gamma Ray Calibration Report

Serial Number:	951T	
Tool Model:	RTST	
Performed:	Mon Aug 19 08:37:31 2013	
Calibrator Value:	90.0	GAPI
Background Reading:	37.9	cps
Calibrator Reading:	195.0	cps
Sensitivity:	0.5730	GAPI/cps

YOUNGQUIST

GEOPHYSICAL LOGGING DIVISION

Radioactive Tracer Survey Tool Diagram

Date: 8/19/13 Job: SDWWTP INJ-7

Internal RTS: ___ External RTS: ✓ YB I Logger: Rivas/Morey

BOTTOM OF CASING: 2632'

-5' IN CASING: 2627'

+13.5' FOR BOTTOM OF TOOL: 2640.5

Eject #1: 1 mCi Eject #2: 2 mCi

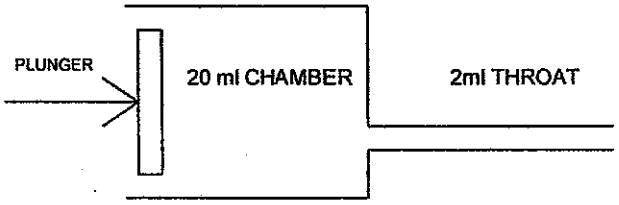
Eject #3: mCi Eject #4: mCi

Eject #5: mCi Eject #6: mCi

Total mCi of I-131 loaded in tool: 5 **1ml =1mCi**

Total volume of Chamber and Throat:22ml

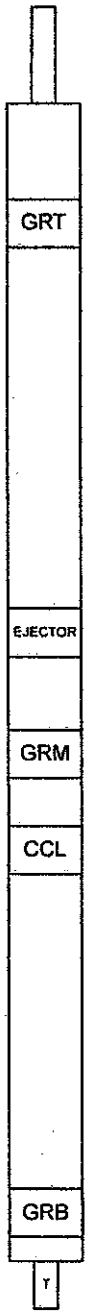
EJECTOR PORT DIAGRAM



Total Eject Cycle Time (22ml): 24 **Sec**

Eject Cycle Time Per ml (Total Time / 22): 1.1 **Sec**

Throat Eject Cycle Time (2*Time Per ml): 2.2 **Sec**



TOP OF TOOL (25ft 2in)

GAMMA RAY TOP DECTOR (23ft 6in)

ALL MEASUREMENTS ARE FROM THE BOTTOM OF THE TOOL.

TOOL DIAMETER IS 1-11/16".

EJECTOR PORT (13ft 6in)

GAMMA RAY MIDDLE DECTOR (10ft 6in)

COLLAR LOCATOR (9ft 6in)

GAMMA RAY BOTTOM DECTOR (1ft 2in)

TEMPERATURE PROBE

TIME PER EJECT

(Total ml of I-131)/(20ml)= mCi per ml in the chamber

(5)/(20)= .25 mCi per ml

mCi = Throat Eject Cycle Time + (ml of Chamber Required)*(Eject Cycle Time Per ml)

1 mCi = 2.2 + (4)*(1.1) = 6.6 **seconds**

2 mCi = 2.2 + (8)*(1.1) = 11 **seconds**

3 mCi = + ( )*( ) = **seconds**

4 mCi = + ( )*( ) = **seconds**

Appendix E

Temperature Log

HIGH RESOLUTION TEMPERATURE LOG

Company	SOUTH MIAMI-DADE W.W.T.P.
Well	IW-7
Field	S.D.W.W.T.P.
County	MIAMI-DADE
State	FLORIDA

Location: API # :

SEC TWP RGE

Other Services

Permanent Datum	PAD	Elevation	PAD
Log Measured From	PAD		
Drilling Measured From	PAD		

Elevation
K.B.
D.F.
G.L.

Date	19-AUG-2013		
Run Number	2013 MIT		
Depth Driller	3119'		
Depth Logger	2967'		
Bottom Logged Interval	2967'		
Top Log Interval	SURFACE		
Open Hole Size	22"		
Type Fluid	WATER		
Density / Viscosity	NA		
Max. Recorded Temp.	81.7 degF		
Estimated Cement Top	NA		
Time Well Ready	ON ARRIVAL		
Time Logger on Bottom	ON ARRIVAL		
Equipment Number	102		
Location	FT MYERS		
Recorded By	RIVES	MOREY	
Witnessed By	S. VILLAMIL		

Borehole Record				Borehole Record			
Run Number	Bit	From	To	Run No	Bit	From	To

Casing Record	Size	Wgt/Ft	Top	Bottom
Surface String				
Prot. String				
Production String	24"	.500" W.T.	SURFACE	2632'
Liner				

<< Fold Here >>>

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

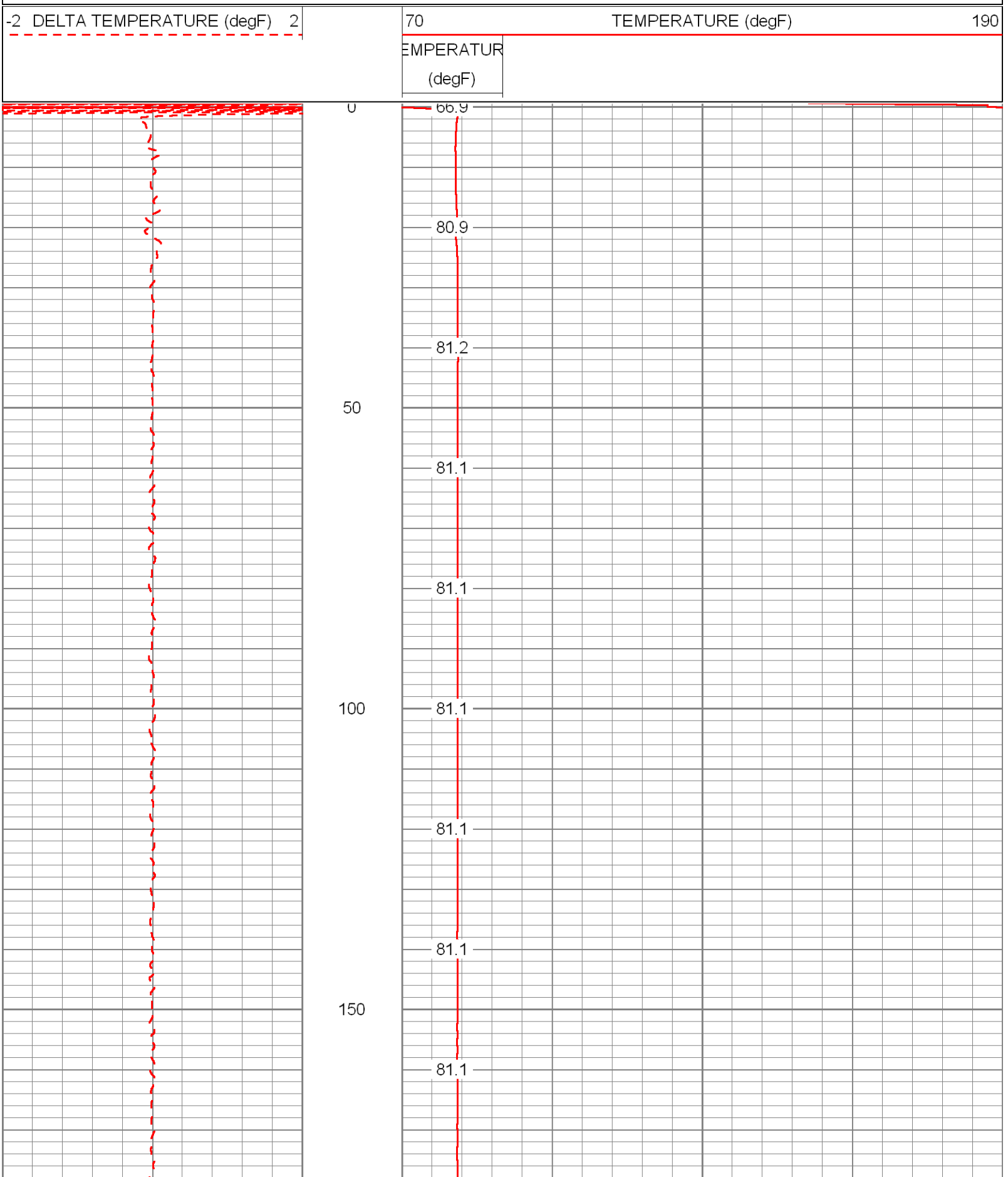
Comments

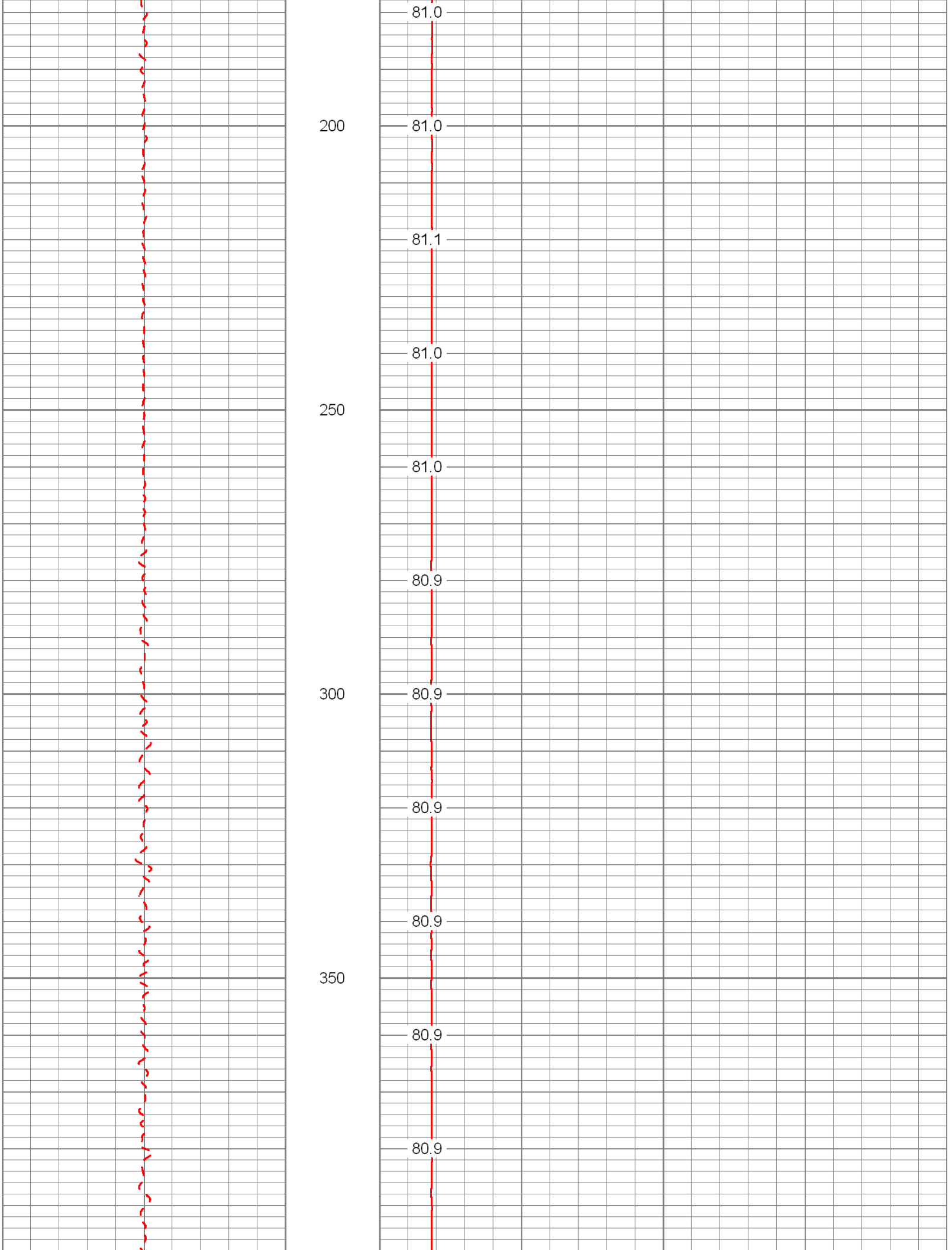
RADIOACTIVE TRACER SURVEY

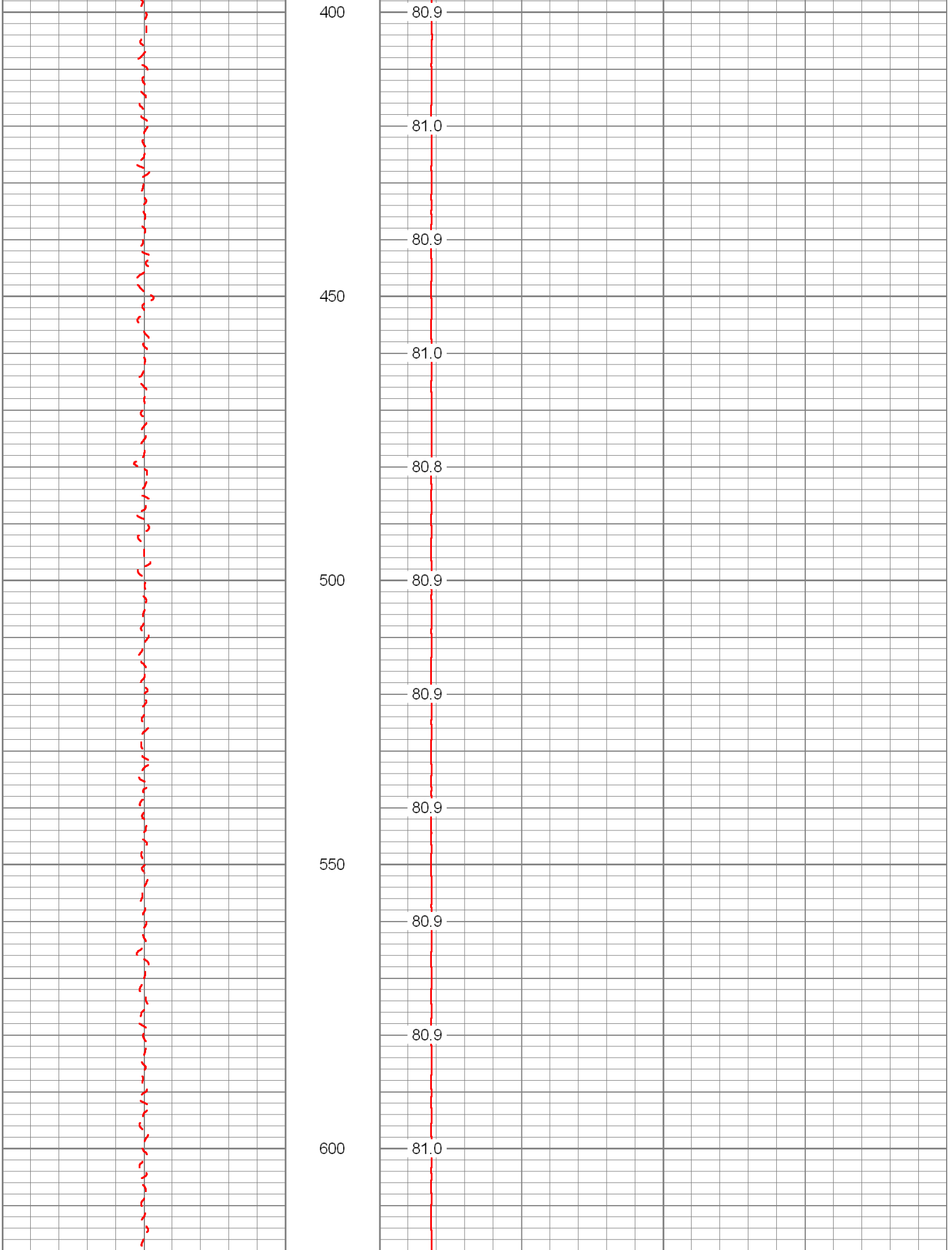
TEMPERATURE

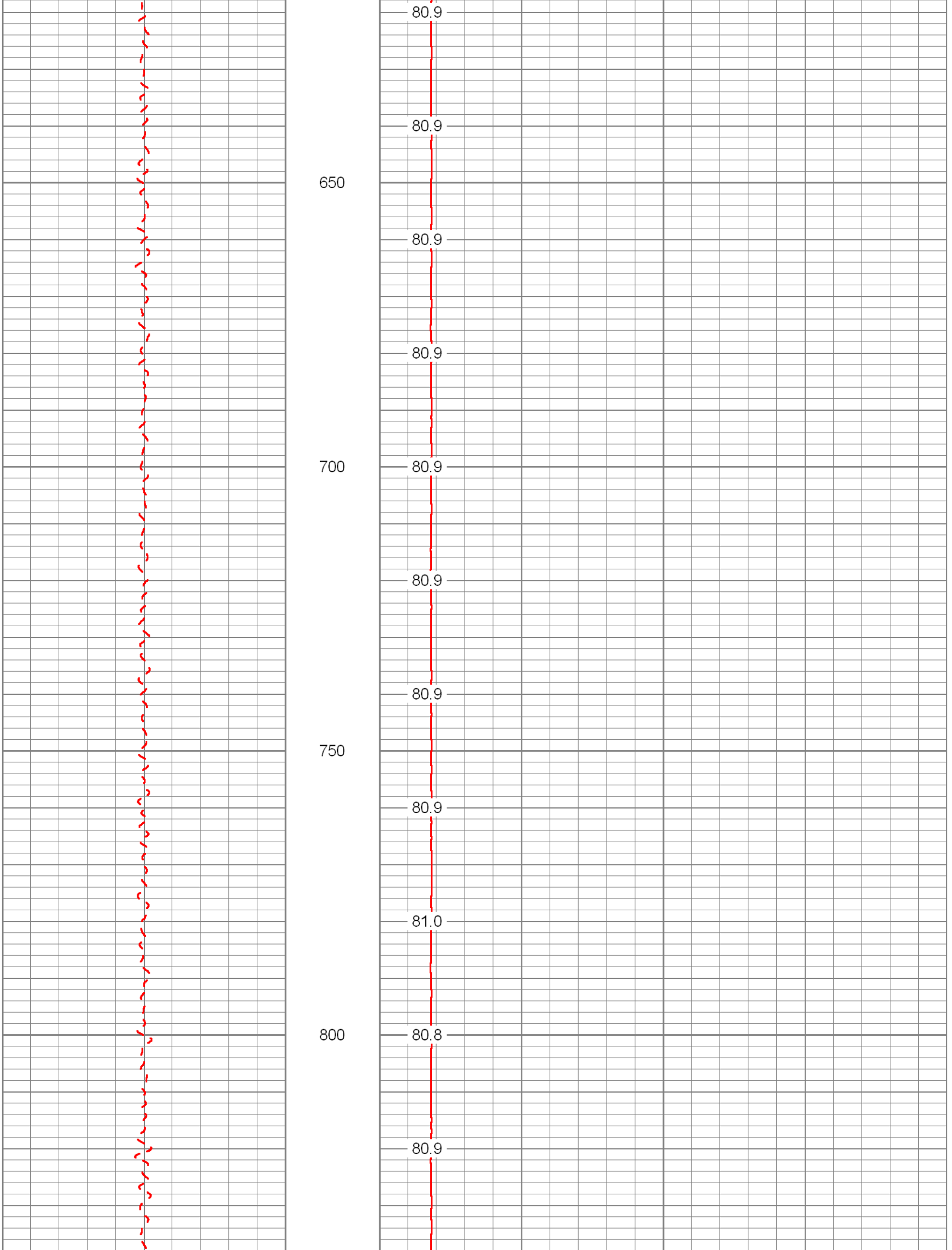
BROTHERS

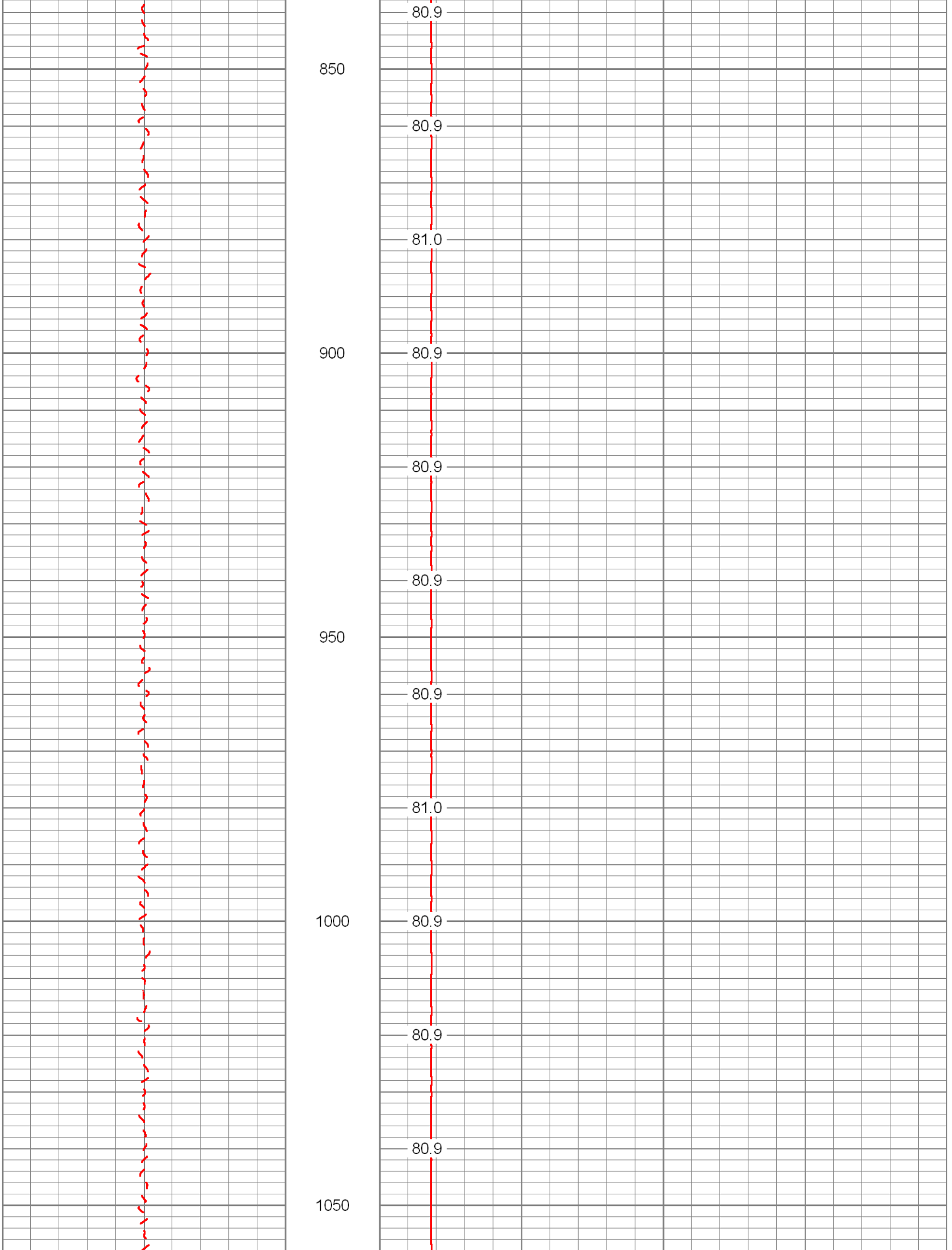
Database File:	sdwwtp-iw7.db
Dataset Pathname:	pass1
Presentation Format:	temp
Dataset Creation:	Mon Aug 19 08:50:57 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:240

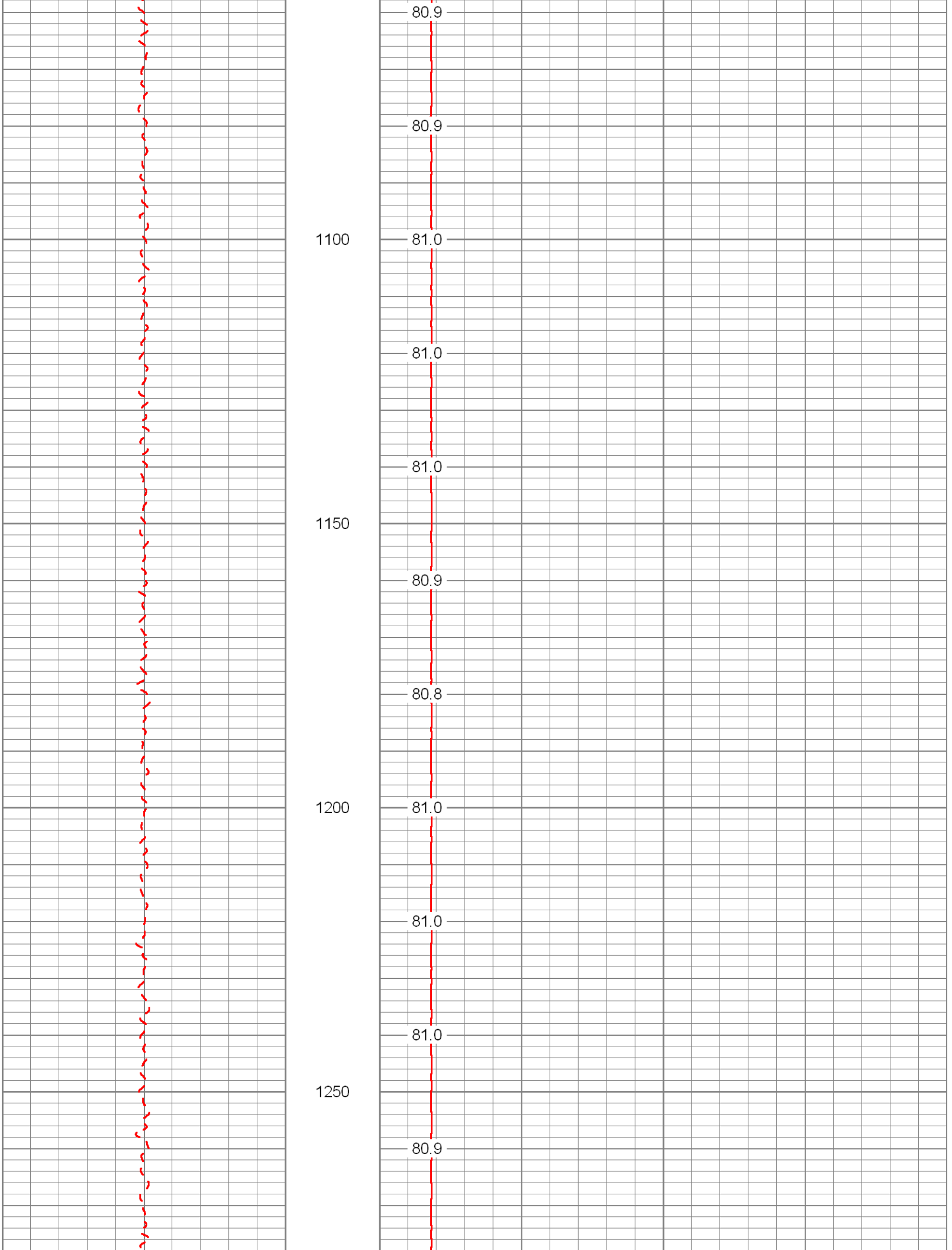


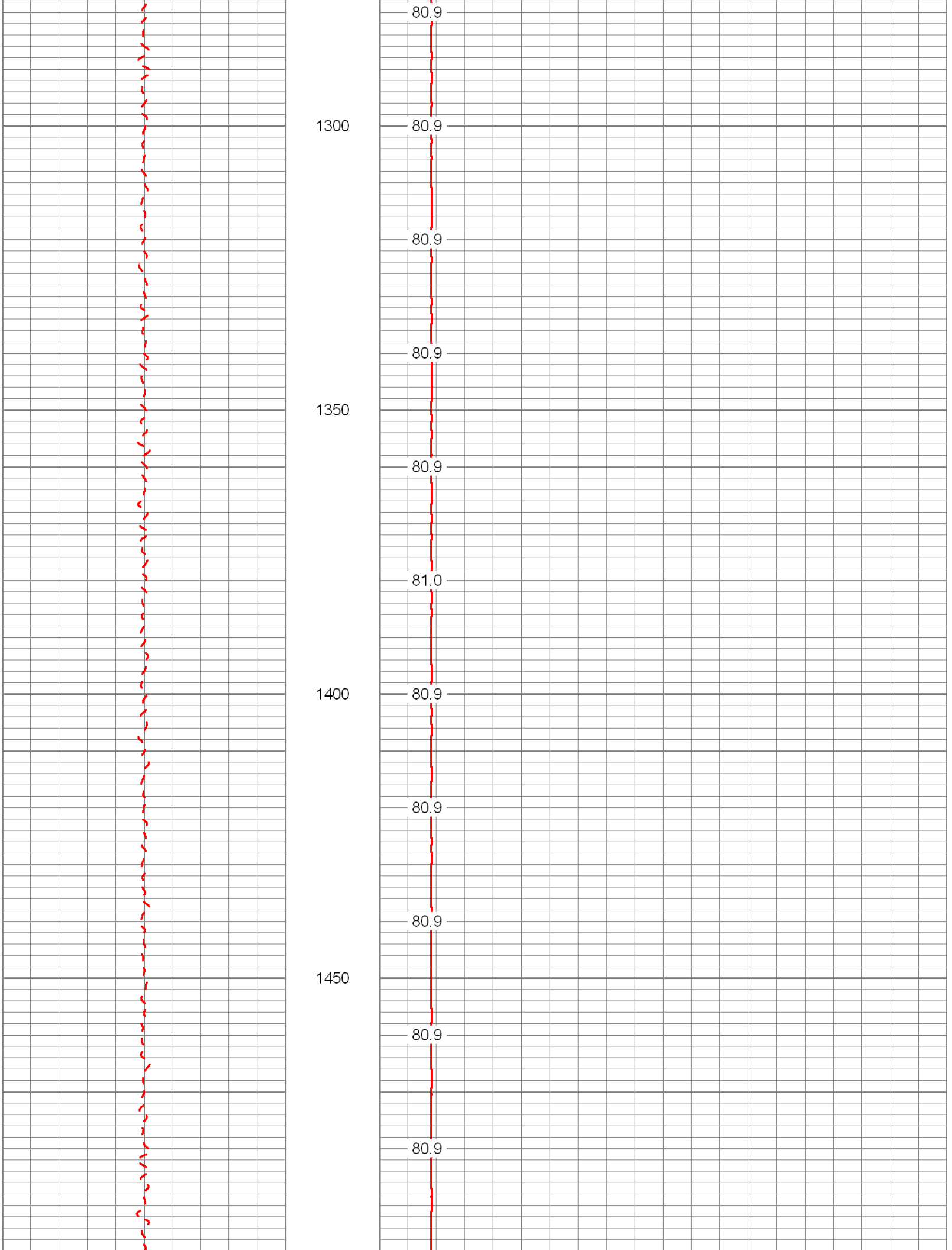

81.0
200
81.0
81.1
81.0
250
81.0
80.9
300
80.9
80.9
80.9
350
80.9
80.9

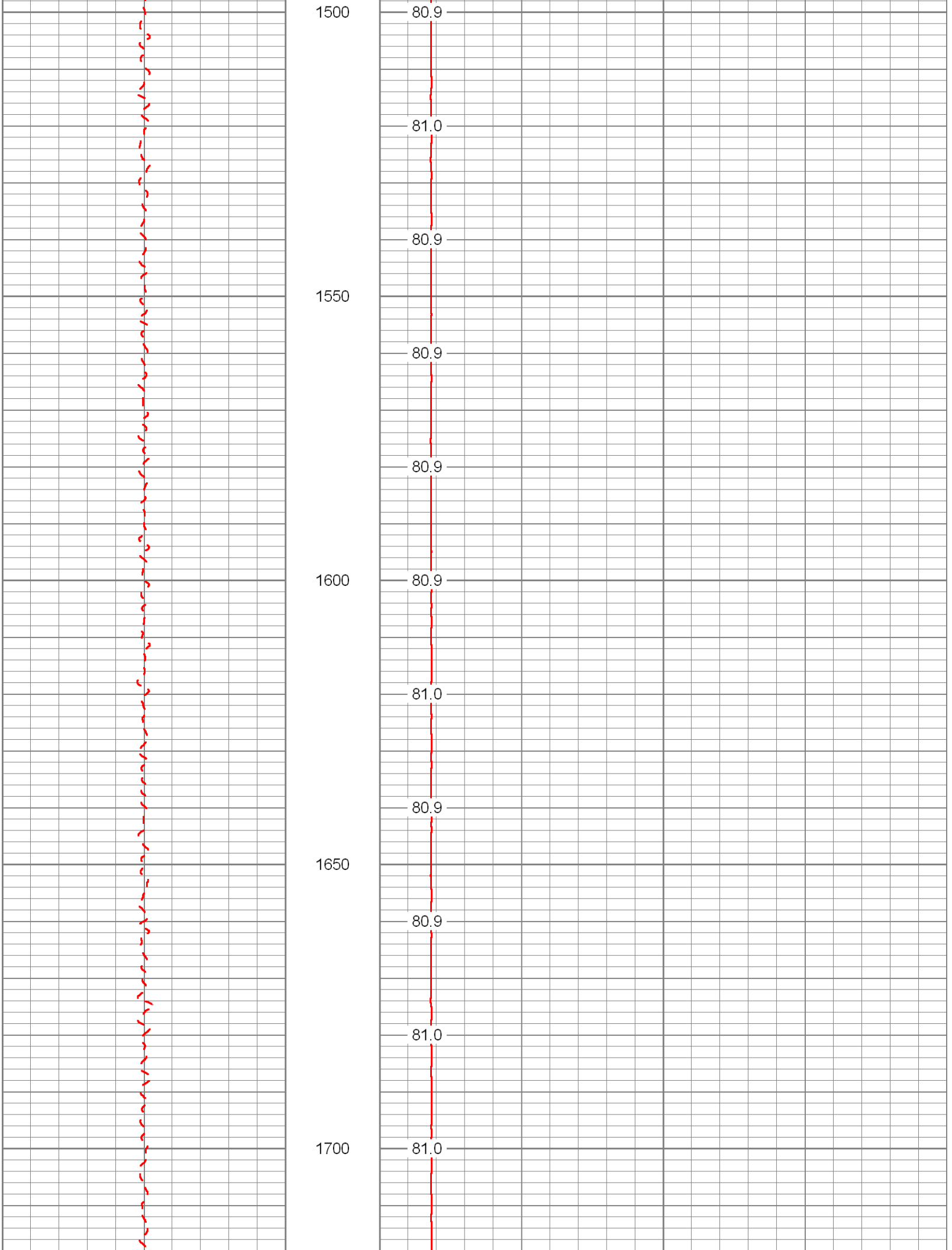

400
450
500
550
600
80.9
81.0
80.9
81.0
80.8
80.9
80.9
80.9
80.9
80.9
80.9
81.0

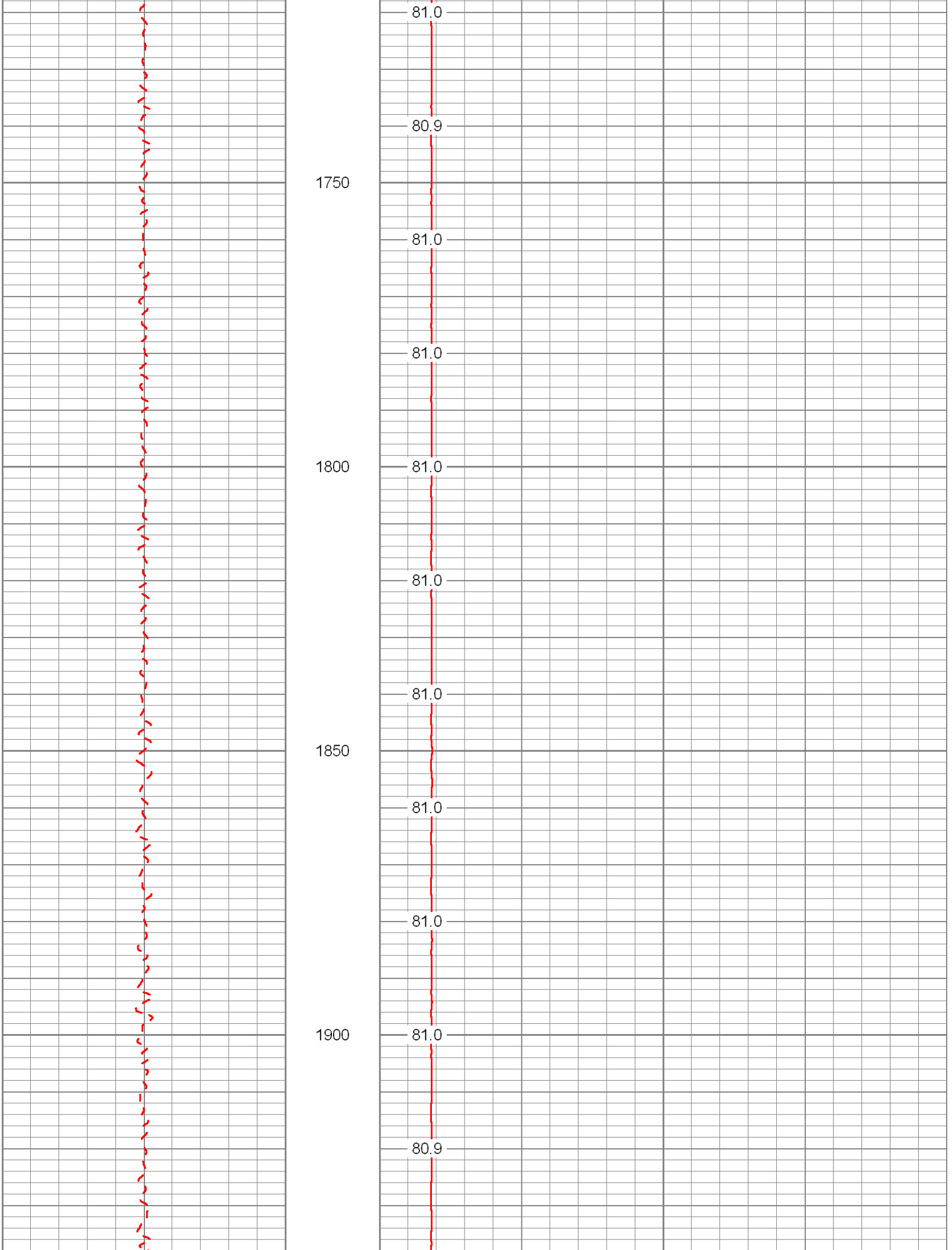

80.9
80.9
650
80.9
80.9
700
80.9
80.9
80.9
750
80.9
81.0
800
80.8
80.9

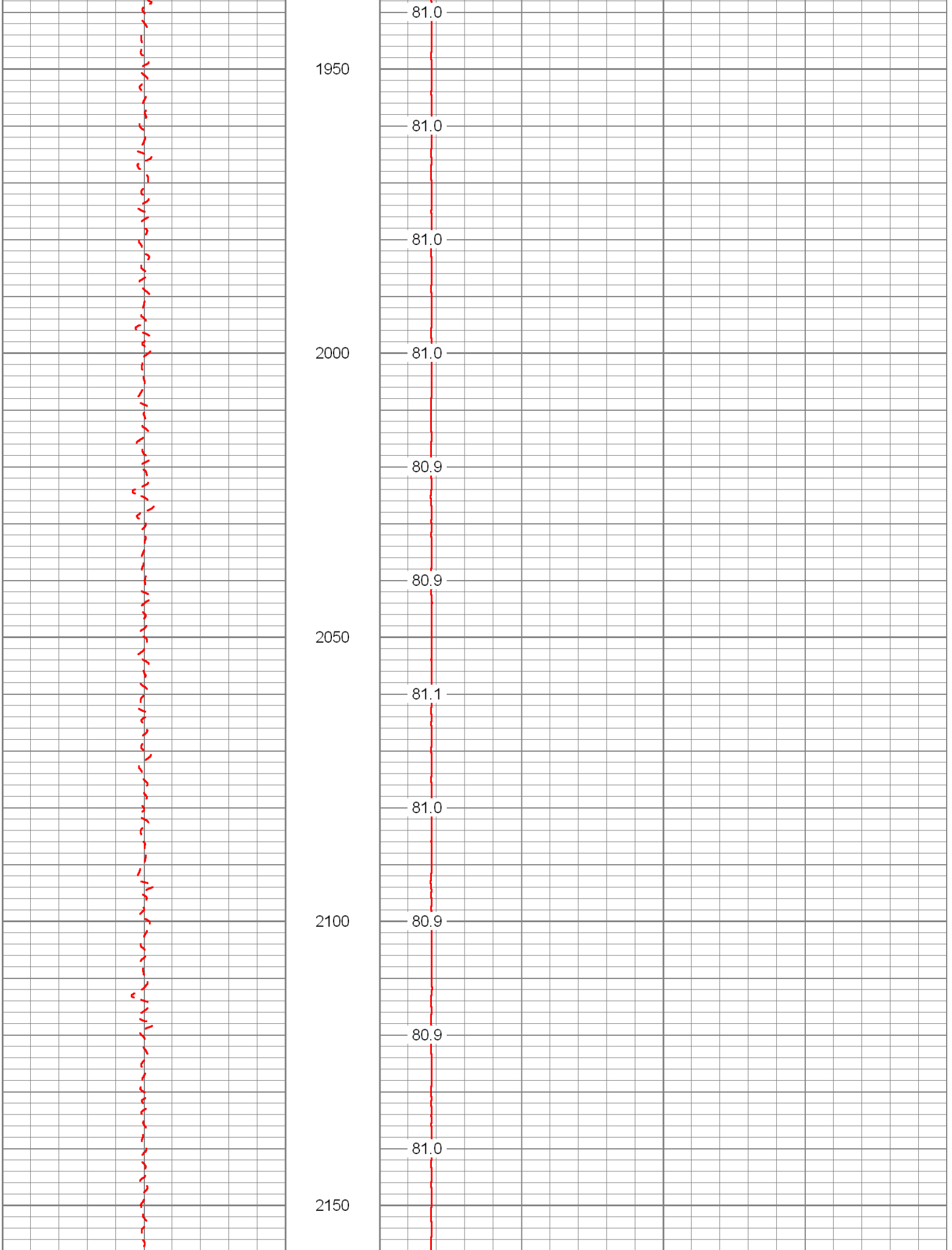

80.9
850
80.9
81.0
900
80.9
80.9
80.9
950
80.9
81.0
1000
80.9
80.9
80.9
1050

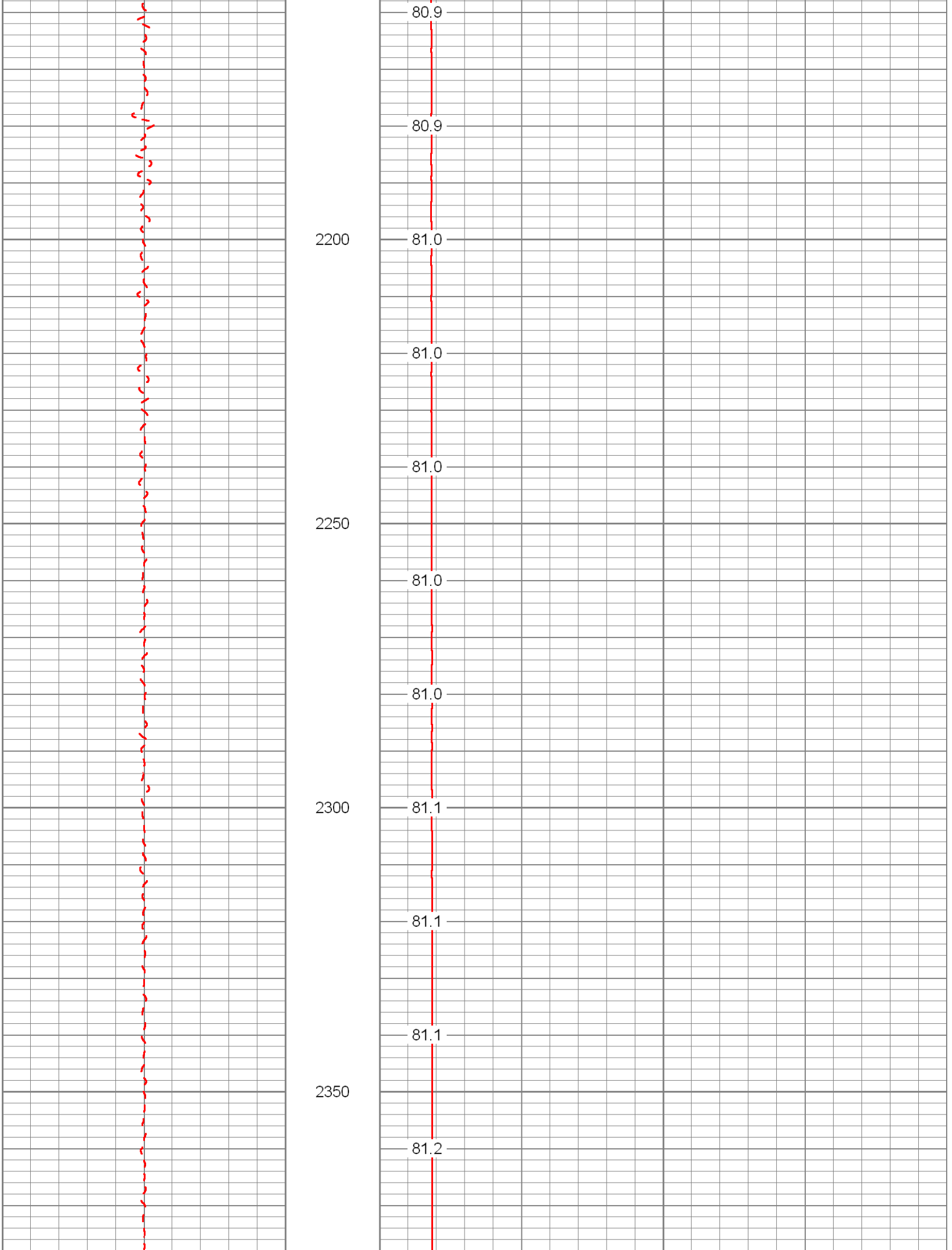

80.9
80.9
1100
81.0
81.0
81.0
1150
80.9
80.8
1200
81.0
81.0
81.0
1250
80.9

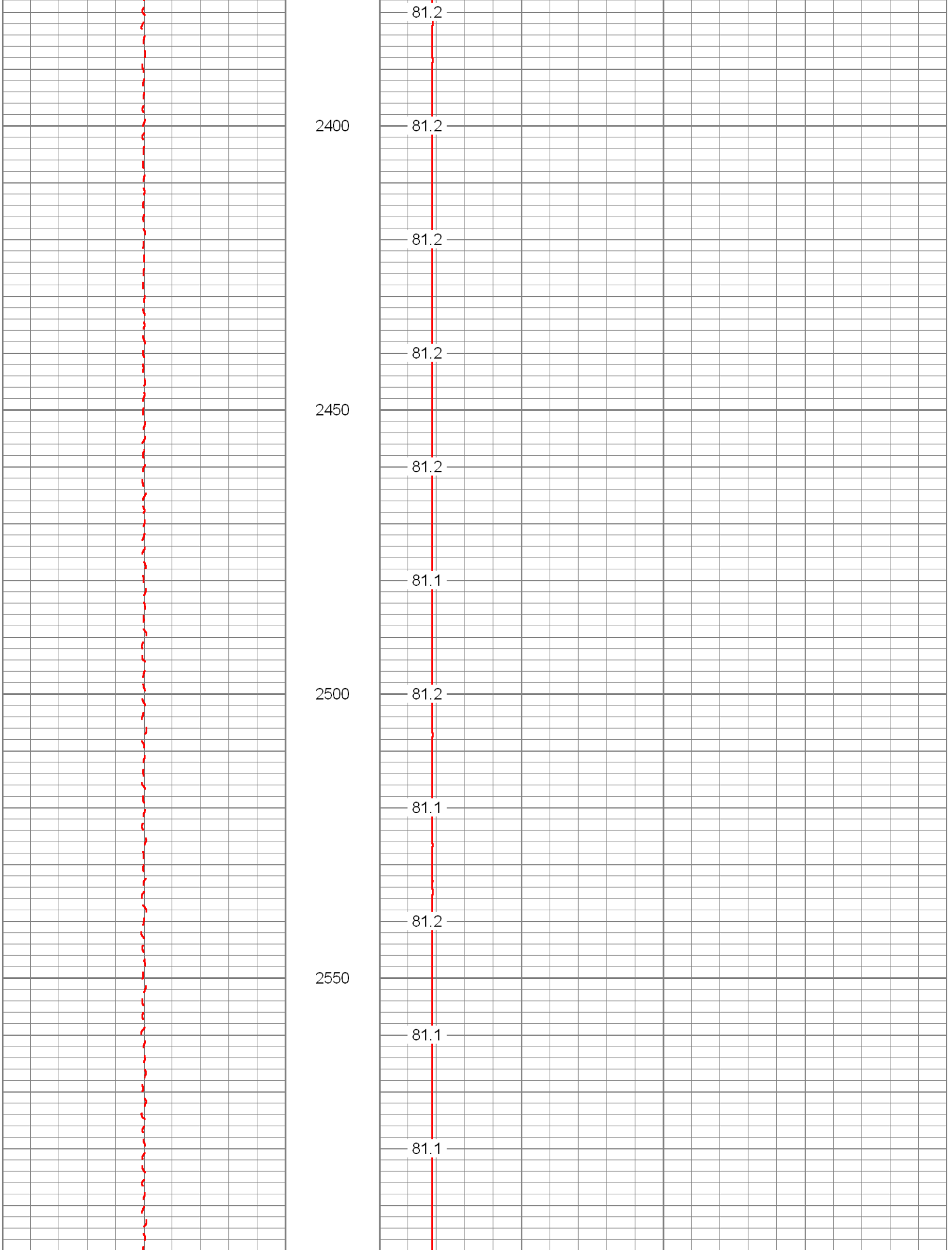

80.9
1300
80.9
80.9
80.9
1350
80.9
81.0
1400
80.9
80.9
80.9
1450
80.9
80.9

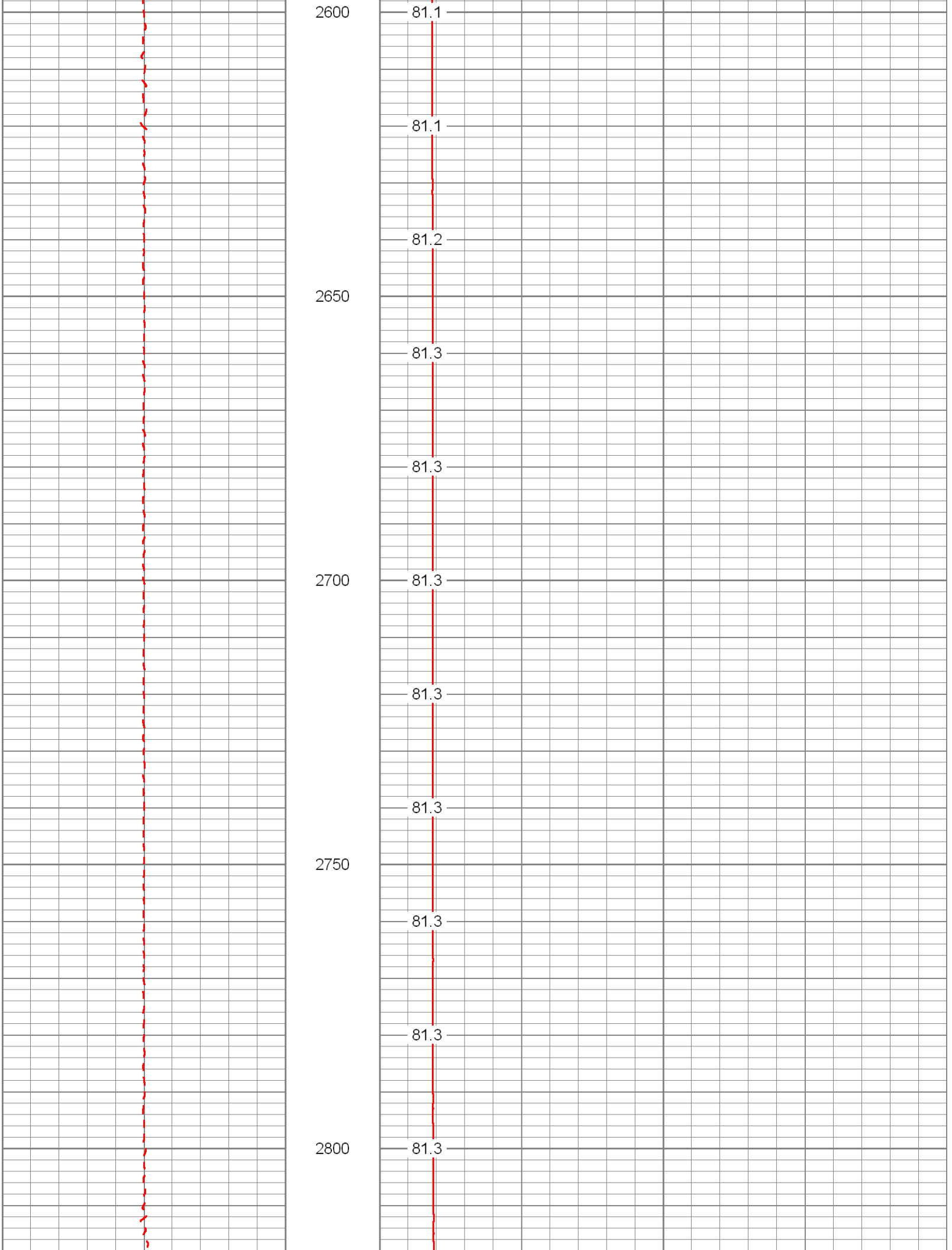

1500
80.9
81.0
80.9
1550
80.9
80.9
1600
80.9
81.0
80.9
1650
80.9
81.0
1700
81.0

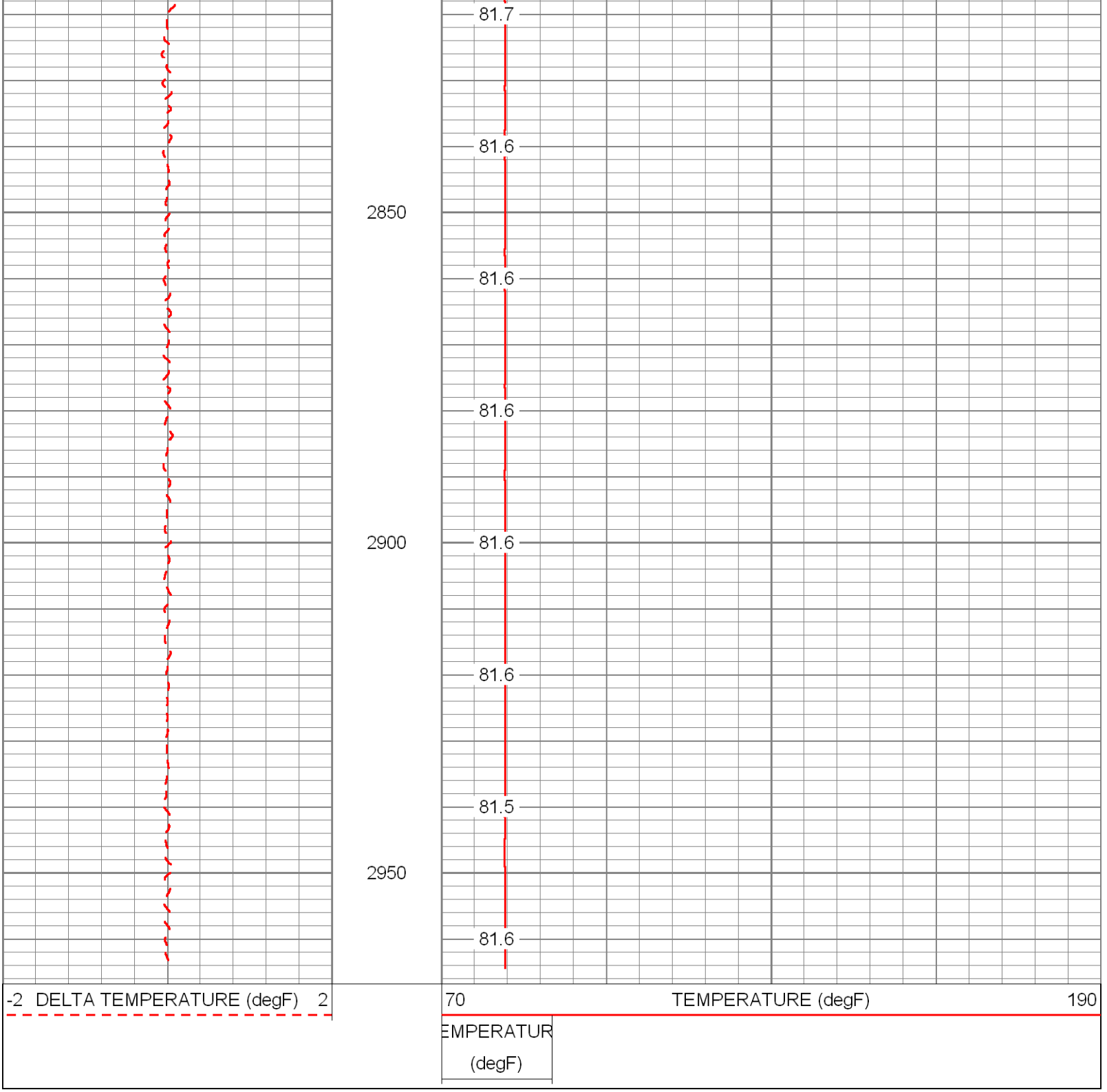

81.0
80.9
1750
81.0
81.0
1800
81.0
81.0
81.0
1850
81.0
81.0
1900
81.0
80.9


81.0
1950
81.0
81.0
2000
81.0
80.9
80.9
2050
81.1
81.0
2100
80.9
80.9
81.0
2150


80.9
80.9
2200
81.0
81.0
81.0
2250
81.0
81.0
2300
81.1
81.1
81.1
2350
81.2


81.2
2400
81.2
81.2
81.2
2450
81.2
81.1
2500
81.2
81.1
81.2
2550
81.1
81.1


2600
81.1
81.1
81.2
2650
81.3
81.3
2700
81.3
81.3
81.3
2750
81.3
81.3
2800
81.3



Calibration Report

Database File: sdwwtp-iw7.db
Dataset Pathname: pass1
Dataset Creation: Mon Aug 19 08:50:57 2013 by Log SOC 110722

Temperature Calibration Report

Serial Number: 951
Tool Model: RTS
Performed: Mon Oct 08 09:35:10 2012

Point #	Reading		Reference	
1	414.44	cps	33.00	degF
2	892.98	cps	85.00	degF

3	1755.38	cps	170.00	degF	
4		cps		degF	
5		cps		degF	
6		cps		degF	
7		cps		degF	
8		cps		degF	
9		cps		degF	
10		cps		degF	

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)
			TEMP-RTS (951)	25.50	1.69	70.00

TEMP	0.10					

Dataset: sdwwtp-iw7.db: field/well/run1/pass1
Total Length: 25.50 ft
Total Weight: 70.00 lb
O.D. 1.69 in

Appendix F

Television Survey

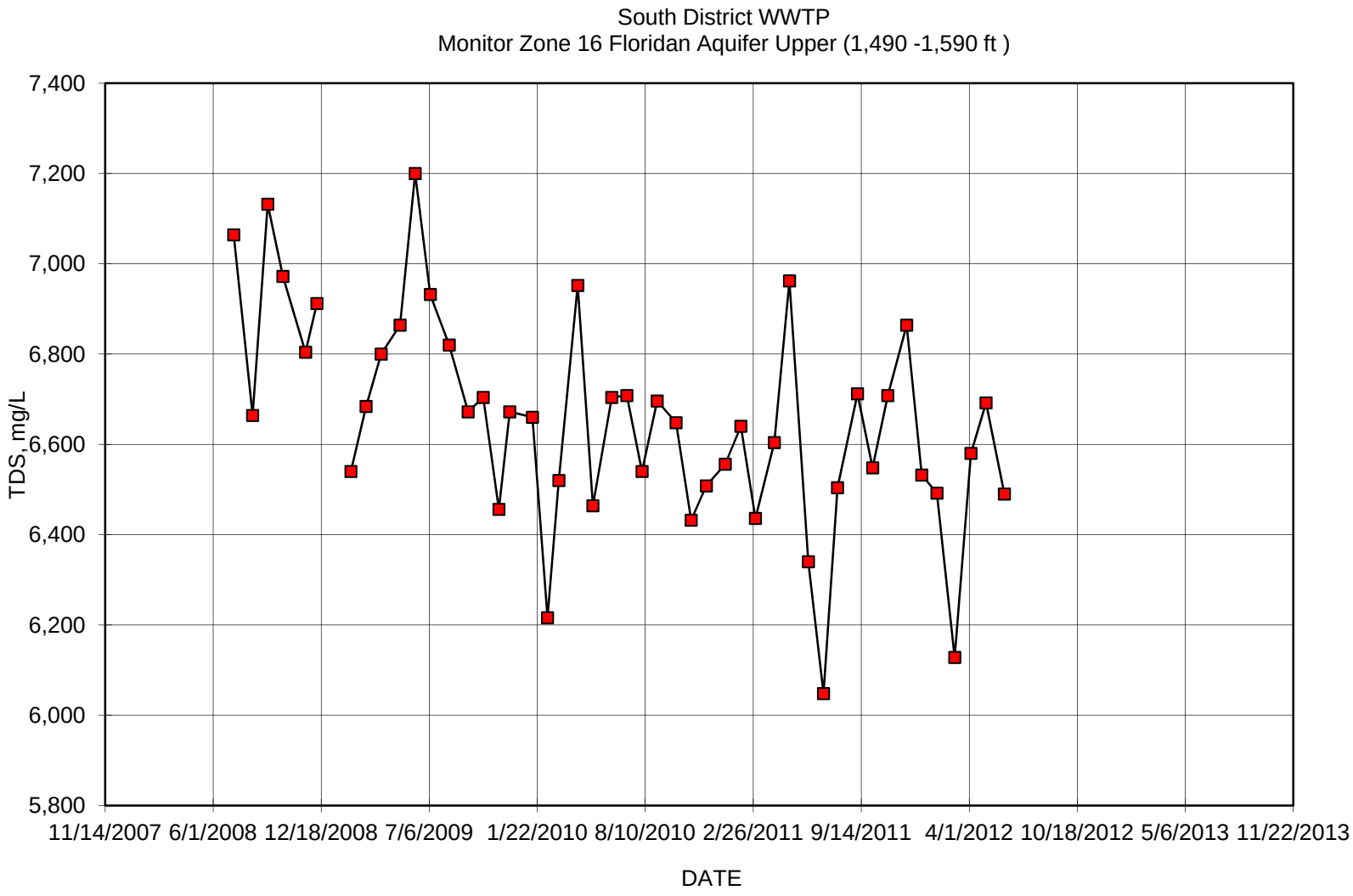
Appendix G

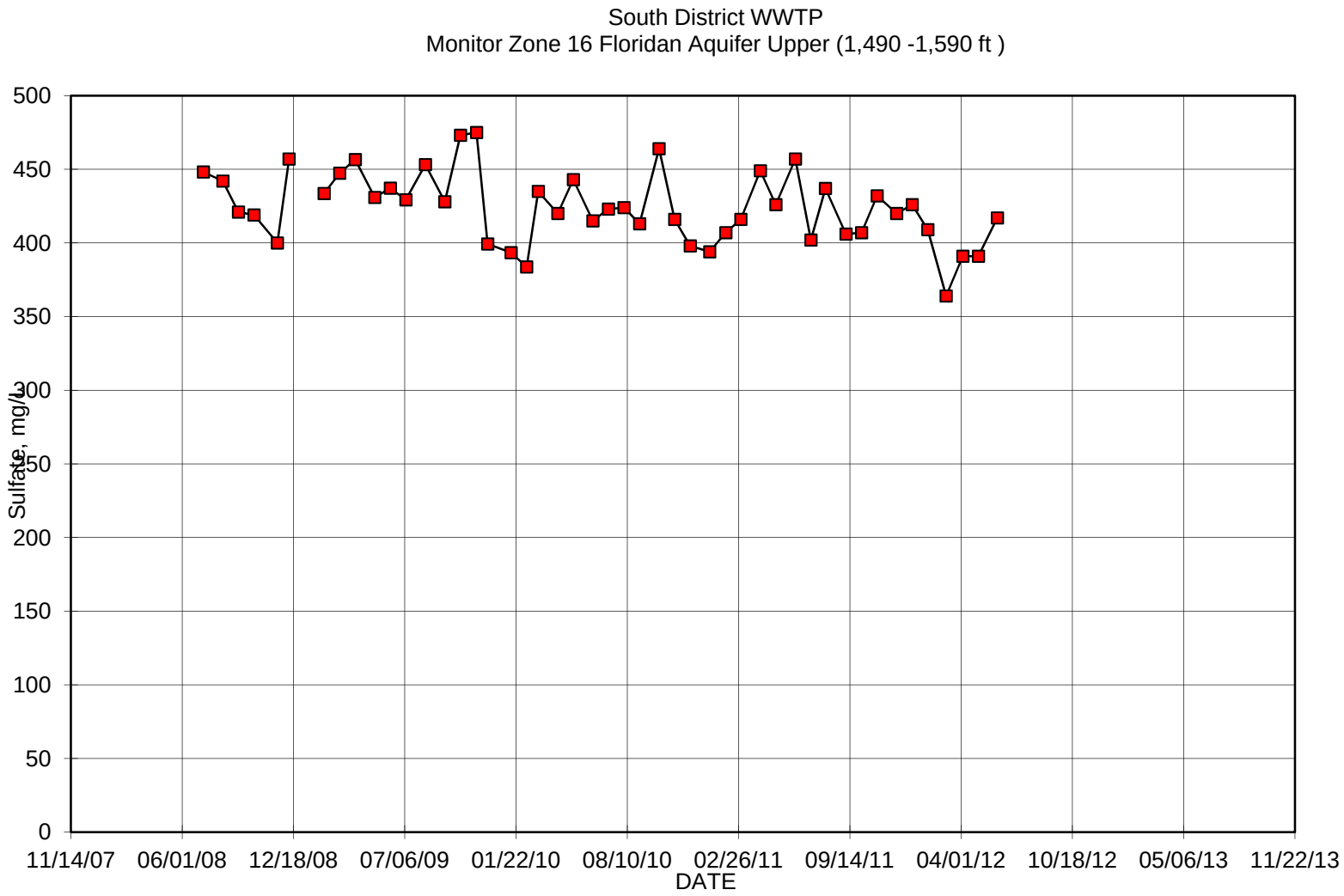
5 year Monitoring Data

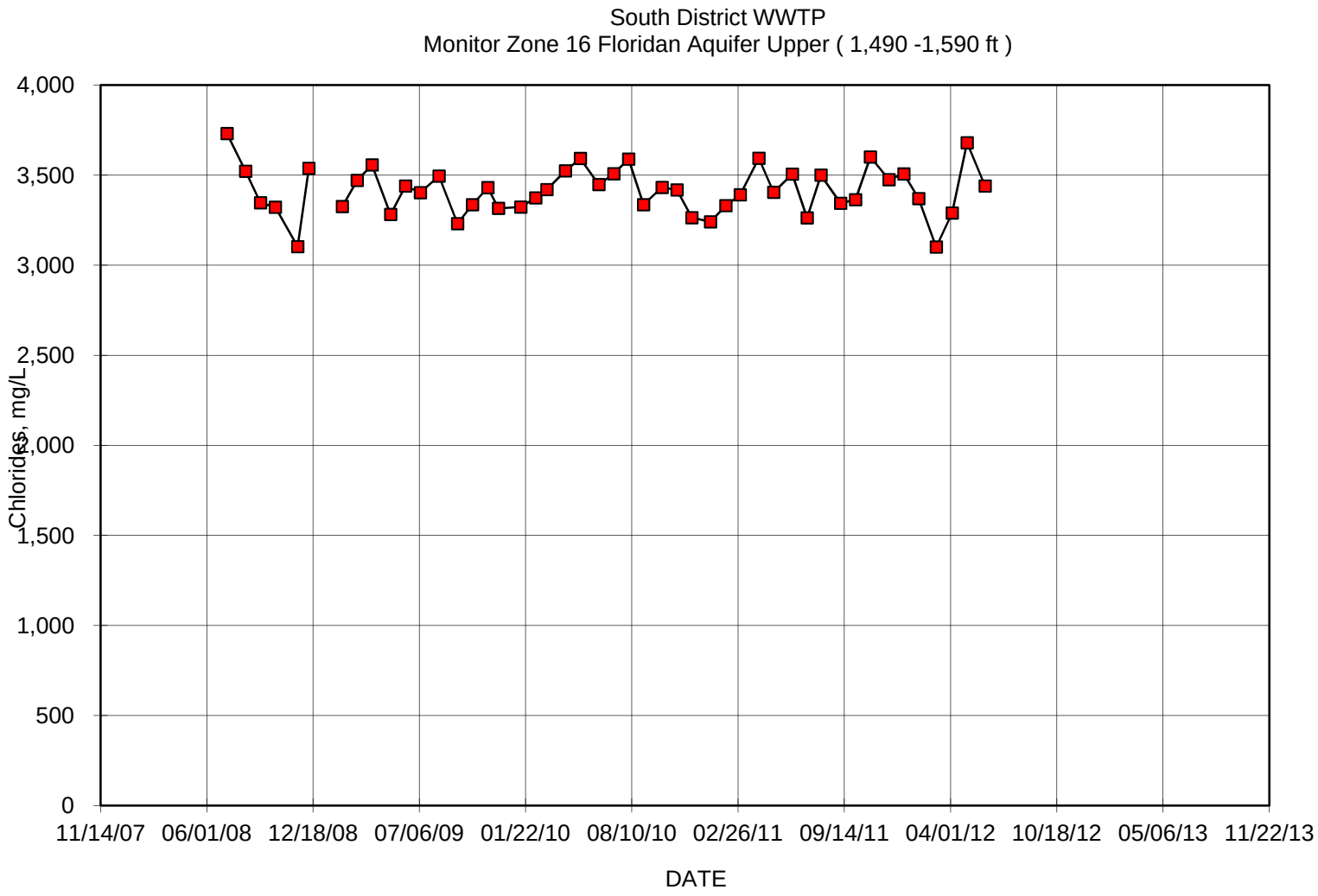
FA-16 Upper

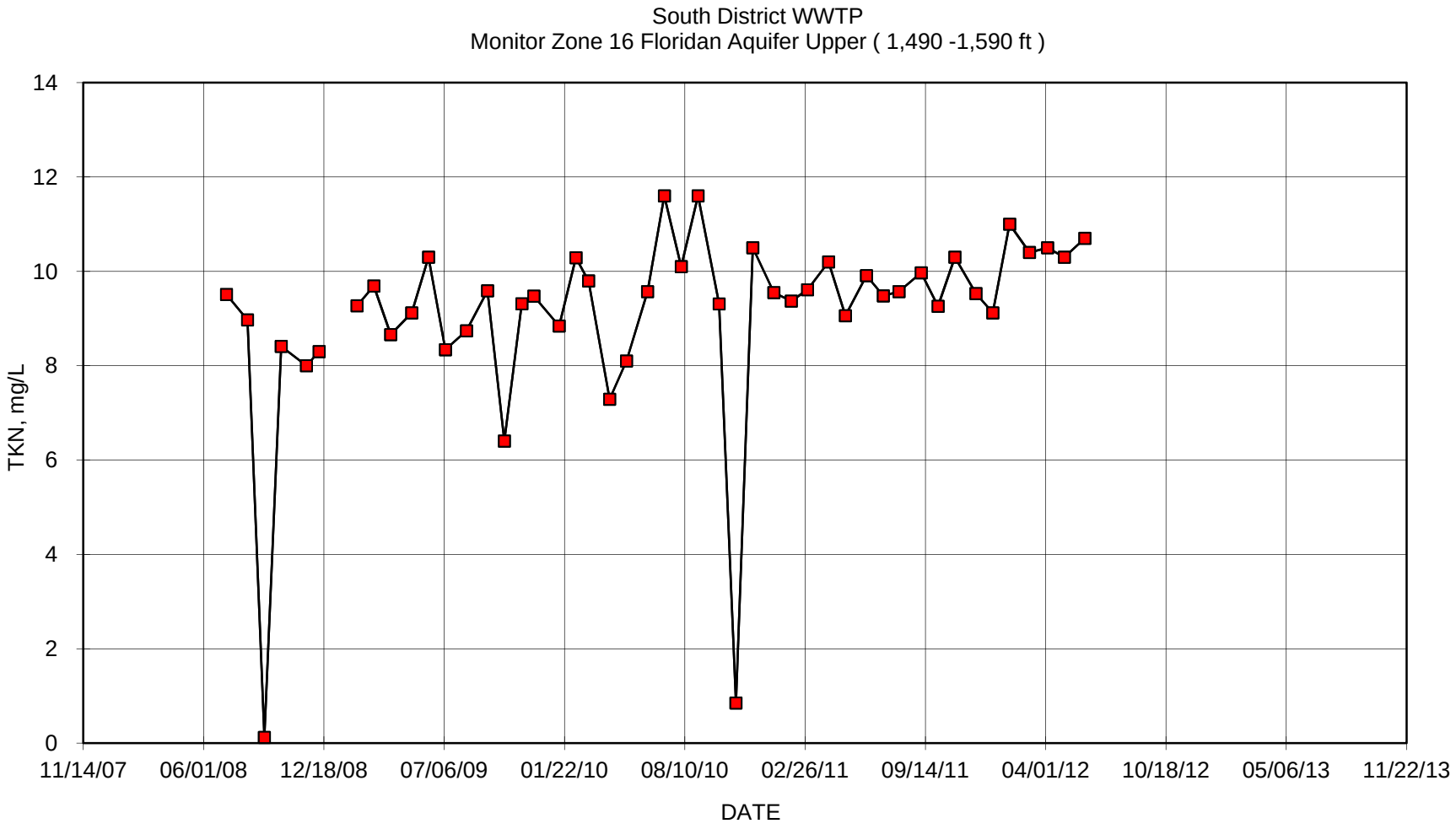
Date	TDS, mg/L	Sulfate, mg/L	Chlorides, mg/L	TKN, mg/L	NH3, mg/L	Conductivity, Micromho/cm	Temp., C	Temp., F	pH	TP, mg/L	TSS mg/L	NO_3 mg/L	NO_2 mg/L	Sodium, mg/L	Gross Alpha, pCi/L	Radium 226, pCi/L	Radium 228, pCi/L
07/09/08	7,064	448	3,731	9.51	6.84	10,950	24	75	7.7	0.00	1.76	0.03	0.00				
08/13/08	6,664	442	3,522	8.97	7.36	10,520	24	75	7.7	0.01	7.40	0.08	0.05				
09/10/08	7,132	421	3,347	0.12	7.94	11,080	25	76	7.6	0.98	8.00	0.08	0.05				
10/08/08	6,972	419	3,322	8.41	7.94	11,270	24	75	7.5	0.03	6.40	0.03	0.00				
11/19/08	6,804	400	3,103	8.00	6.51	10,340	21	71	7.7	0.00	1.76	0.03	0.00				
12/10/08	6,912	457	3,538	8.30	7.07	11,090	23	74	7.5	0.02	7.80	0.03	0.00				
01/14/09																	
02/11/09	6,540	434	3,326	9.27	7.32	11,410	24	74	7.8	0.07	10.90	0.00	0.01				
03/11/09	6,684	447	3,471	9.69	8.75	10,980	23	73	7.3	0.40	5.80	0.00	0.00				
04/08/09	6,800	457	3,557	8.66	9.52	11,230	22	72	7.5	0.04	6.20	0.00	0.00				
05/13/09	6,864	431	3,282	9.12	8.73	11,100	24	76	7.6	0.00	8.80	0.02	0.00				
06/10/09	7,200	437	3,440	10.30	8.96	11,050	24	75	7.6	0.18	7.00	0.00	0.00				
07/08/09	6,932	429	3,403	8.34	7.81	11,120	25	76	7.5	0.03	9.00	0.00	0.00				
08/12/09	6,820	453	3,495	8.74	8.92	11,320	23	74	7.5	0.01	6.20	0.00	0.00				
09/16/09	6,672	428	3,231	9.59	7.75	10,840			7.5	0.01		0.05	0.01	1790	22.5	5.8	0.8
10/14/09	6,704	473	3,336	6.40	8.28	10,270			7.6			0.00	0.00	1730	9.3	5.3	0.8
11/12/09	6,456	475	3,431	9.31	8.62	10,020			7.7			0.00	0.00	1750	14.7	5.4	0.8
12/02/09	6,672	399	3,316	9.48	8.54	10,940	24	75	7.5	0.02	8.00	0.00	0.00	1660	8.6	6.2	0.8
01/13/10	6,660	393	3,323	8.84	8.31	10,740	20	68	7.5	0.02	5.80	0.00	0.00	1470	14.7	6	0.9
02/10/10	6,216	384	3,374	10.29	9.36	10,440	23	73	8.1	0.02	2.40	0.00	0.00	1630	13	5.9	0.8
03/03/10	6,520	435	3,420	9.80	8.57	11,000	22	71	7.5	0.02	6.60	0.00	0.00	1700	10.6	6.4	0.8
04/07/10	6,952	420	3,524	7.29	8.07	10,970	23	74	7.4	0.01	8.00	0.00	0.00	1820	18.8	6.8	0.9
05/05/10	6,464	443	3,593	8.10	8.28	10,710	24	74	7.6	0.01	1.80	0.01	0.00	1830	20.9	6.2	0.8
06/09/10	6,704	415	3,448	9.57	8.02	11,030	26	78	7.7	0.05	6.00	0.01	0.01	1620	17.1	5.9	1.0
07/07/10	6,708	423	3,508	11.60	8.62	10,860	24	75	7.6	0.01	1.40	0.00	0.00	1860	16.5	5.7	0.7
08/04/10	6,540	424	3,589	10.10	10.10	10,220	24	75	7.7	0.11	5.20	0.01	0.00	1740	16.6	6.3	0.8
09/01/10	6,696	413	3,336	11.60	9.48	10,940	24	75	7.7	0.02	14.50	0.01	0.00	1750	22.9	5.7	0.8
10/06/10	6,648	464	3,432	9.31	9.94	10,850	23	73	7.5	0.02	1.70	0.00	0.00	1760	7.6	1.4	0.9
11/03/10	6,432	416	3,418	0.85	9.52	10,520	23	73	7.6	0.02	4.40	0.00	0.85	4830	17.7	6.3	0.9
12/01/10	6,508	398	3,264	10.50	10.10	10,770	23	73	7.8	0.02	9.20	0.00	0.01	1820	17.7	7.4	0.6
01/05/11	6,556	394	3,241	9.55	9.59	10,410	23	74	7.7	0.02	3.30	0.00	0.00	1840	17.4	9.8	0.9
02/03/11	6,640	407	3,331	9.37	8.94	10,150	22	72	7.5	0.10	2.40	0.00	0.01	1730	21.3	7.8	0.7
03/02/11	6,436	416	3,391	9.61	9.03	10,810	22	72	7.6	0.02	9.80	0.00	0.00	1700	23.7	6.8	0.8

04/06/11	6,604	449	3,594	10.20	10.20	10,370	23	73	7.8	0.02	5.00	0.00	0.00	1660	17.8	6.7	0.7
05/04/11	6,962	426	3,405	9.06	10.10	11,170	23	73	7.8	0.02	3.40	0.00	0.00	1740	10.1	6.6	0.8
06/08/11	6,340	457	3,506	9.91	9.09	10,720	23	74	7.7	0.05	2.00	0.00	0.00	1820	19.7	4.5	0.7
07/06/11	6,048	402	3,263	9.48	11.00	10,460	24	75	7.6	0.02	2.50	0.00	0.00	1670	14	5.5	0.8
08/01/11	6,504	437	3,500	9.57	10.80	10,320	25	76	7.5	0.03	9.50	0.00	0.00	1780	28.1	6.7	0.8
09/07/11	6,712	406	3,344	9.97	11.70	10,310	24	75	7.8	0.06	7.20	0.00	0.00	1760	13.3	7.1	0.8
10/05/11	6,548	407	3,364	9.26	10.60	10,010	23	73	7.7	0.04	7.80	0.00	0.00	1780	24.1	6.5	1.0
11/02/11	6,708	432	3,601	10.30	9.66	9,745	23	74	7.9	0.02	4.30	0.00	0.00	1990	19.3	5.2	0.9
12/07/11	6,864	420	3,475	9.53	9.28	10,534	23	73	6.1	0.03	3.20	0.00	0.00	1900	11.5	6.0	0.9
01/04/12	6,532	426	3,507	9.12		9,452	21	69	7.7	0.02	6.30	0.00	0.00	1900	14.9	5.5	0.7
02/01/12	6,492	409	3,370	11.00	11.70	8,803	23	73	7.6	0.02	2.60	0.00	0.00	1870	18.1	5.6	0.8
03/05/12	6,128	364	3,101	10.40	11.60	9,691	23	74	7.7	0.00	6.00	0.00	0.00	1820	25.4	6.0	0.8
04/04/12	6,580	391	3,290	10.50	12.00	10,094	23	73	7.5	0.03	2.90	0.50	0.50	1750	18	6.7	0.8
05/02/12	6,692	391	3,680	10.30	10.80	9,634	24	74	7.6	0.01	7.50	0.00	0.00	1990	11.9	1.9	1.0
06/05/12	6,490	417	3,440	10.70	10.80	10,690	23	74	8.1	0.02	4.50	0.01	0.00	1760	17	5.6	0.8

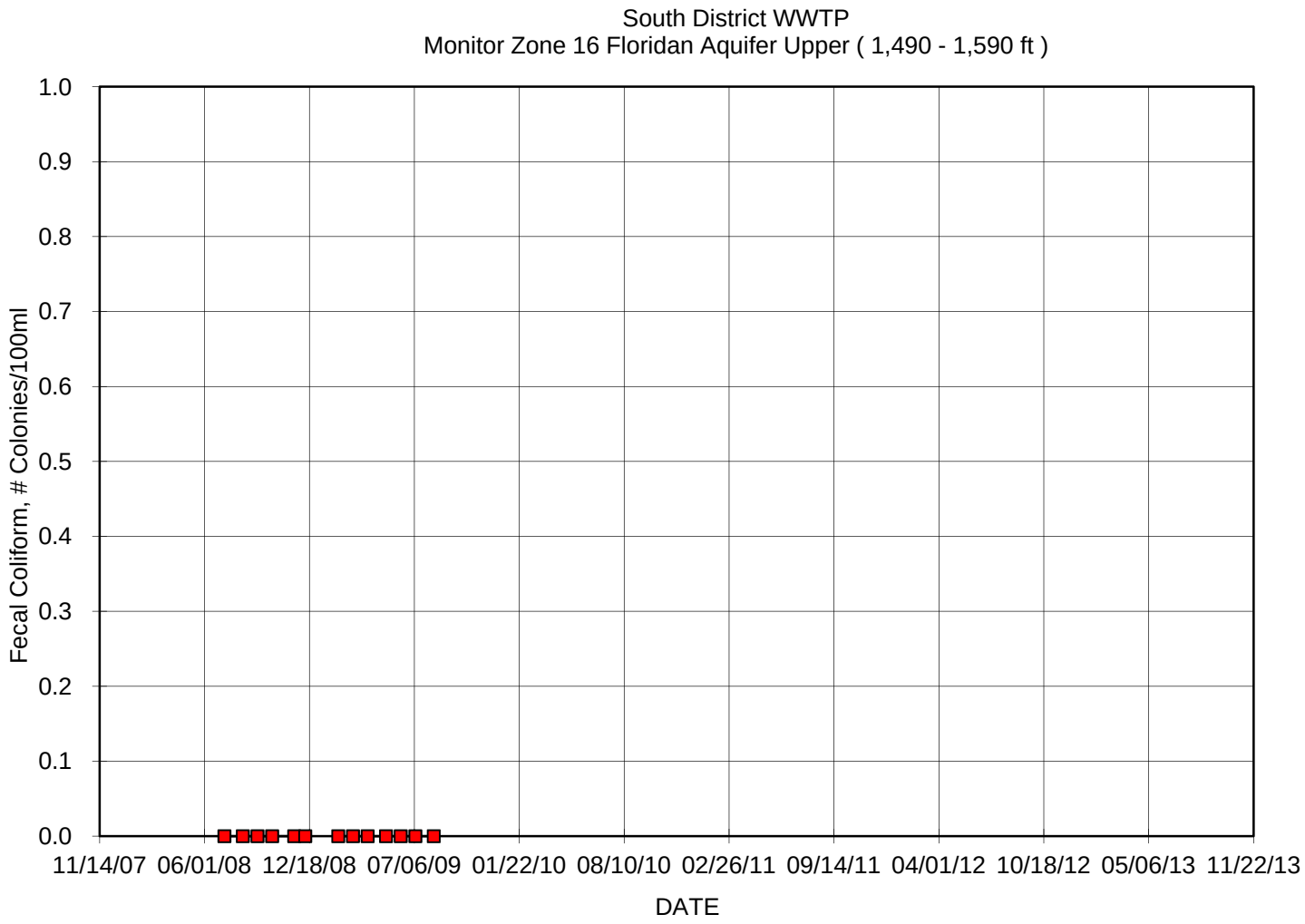

South District WWTP
Monitor Zone 16 Floridan Aquifer Upper (1,490 -1,590 ft)
7,400
7,200
7,000
6,800
6,600
6,400
6,200
6,000
5,800
TDS, mg/L
11/14/2007
6/1/2008
12/18/2008
7/6/2009
1/22/2010
8/10/2010
2/26/2011
9/14/2011
4/1/2012
10/18/2012
5/6/2013
11/22/2013
DATE

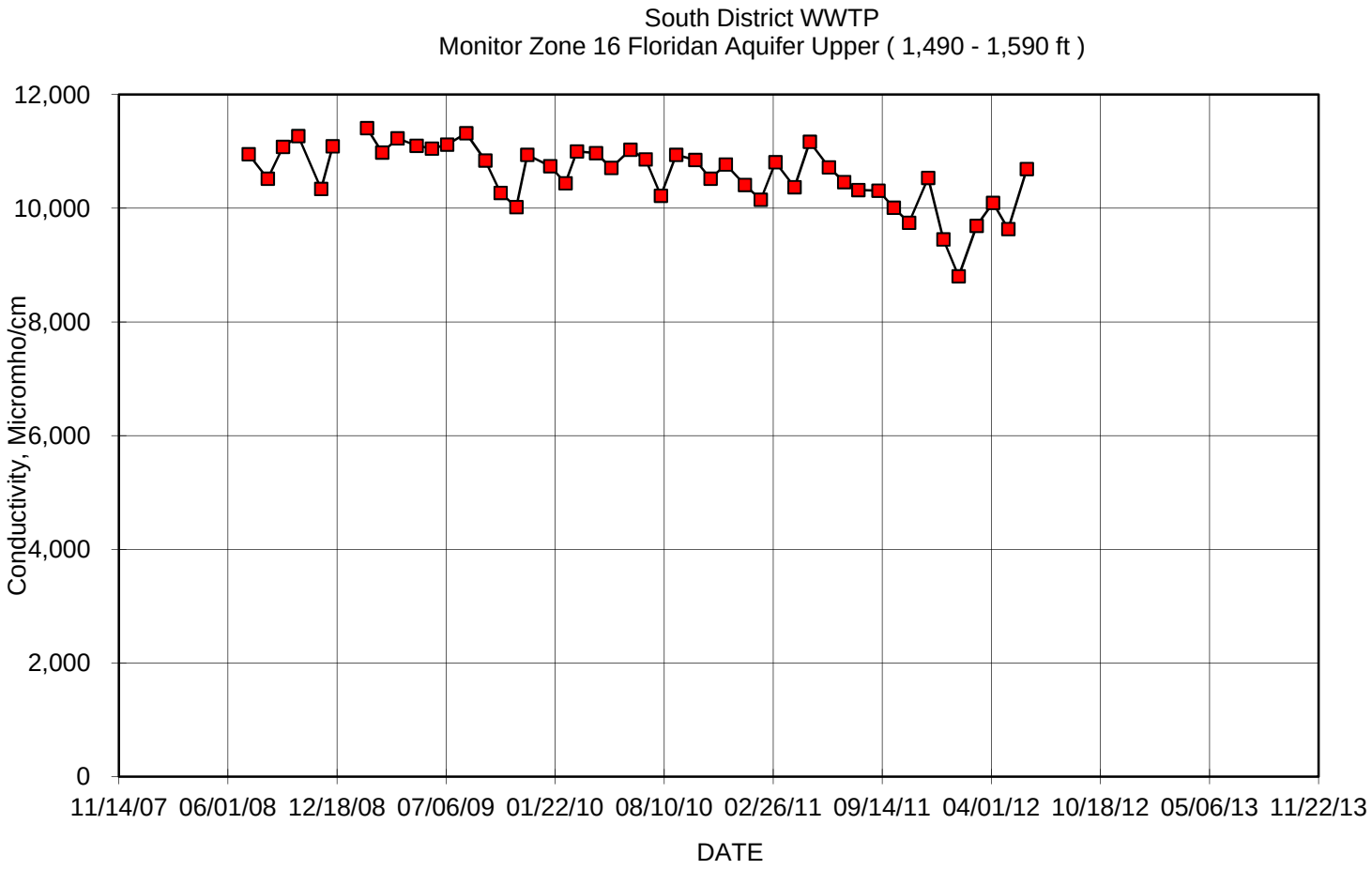

South District WWTP
Monitor Zone 16 Floridan Aquifer Upper (1,490 -1,590 ft)
Sulfate, mg/L
500
450
400
350
300
250
200
150
100
50
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

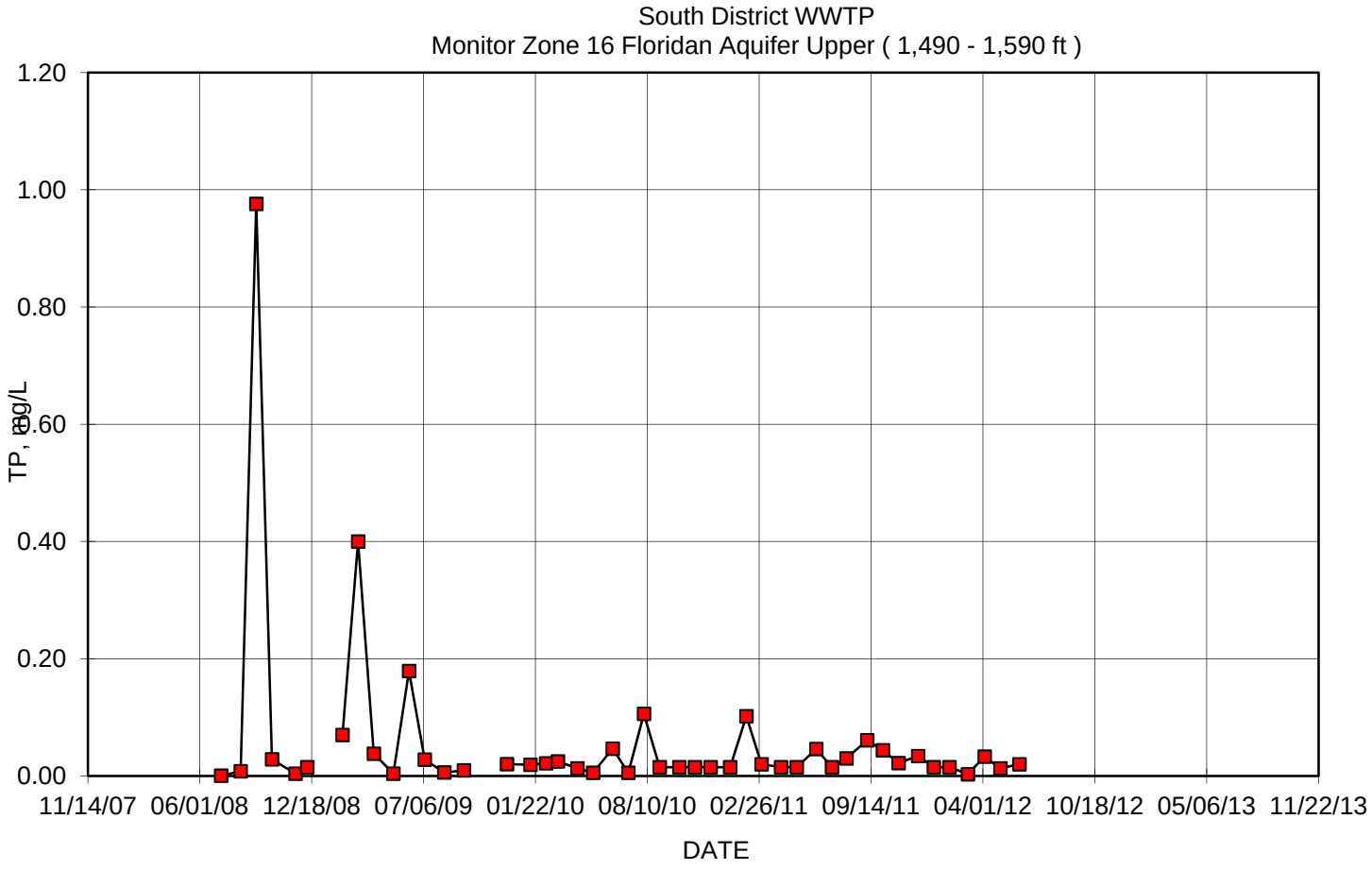

South District WWTP
Monitor Zone 16 Floridan Aquifer Upper (1,490 -1,590 ft)
Chlorides, mg/L
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

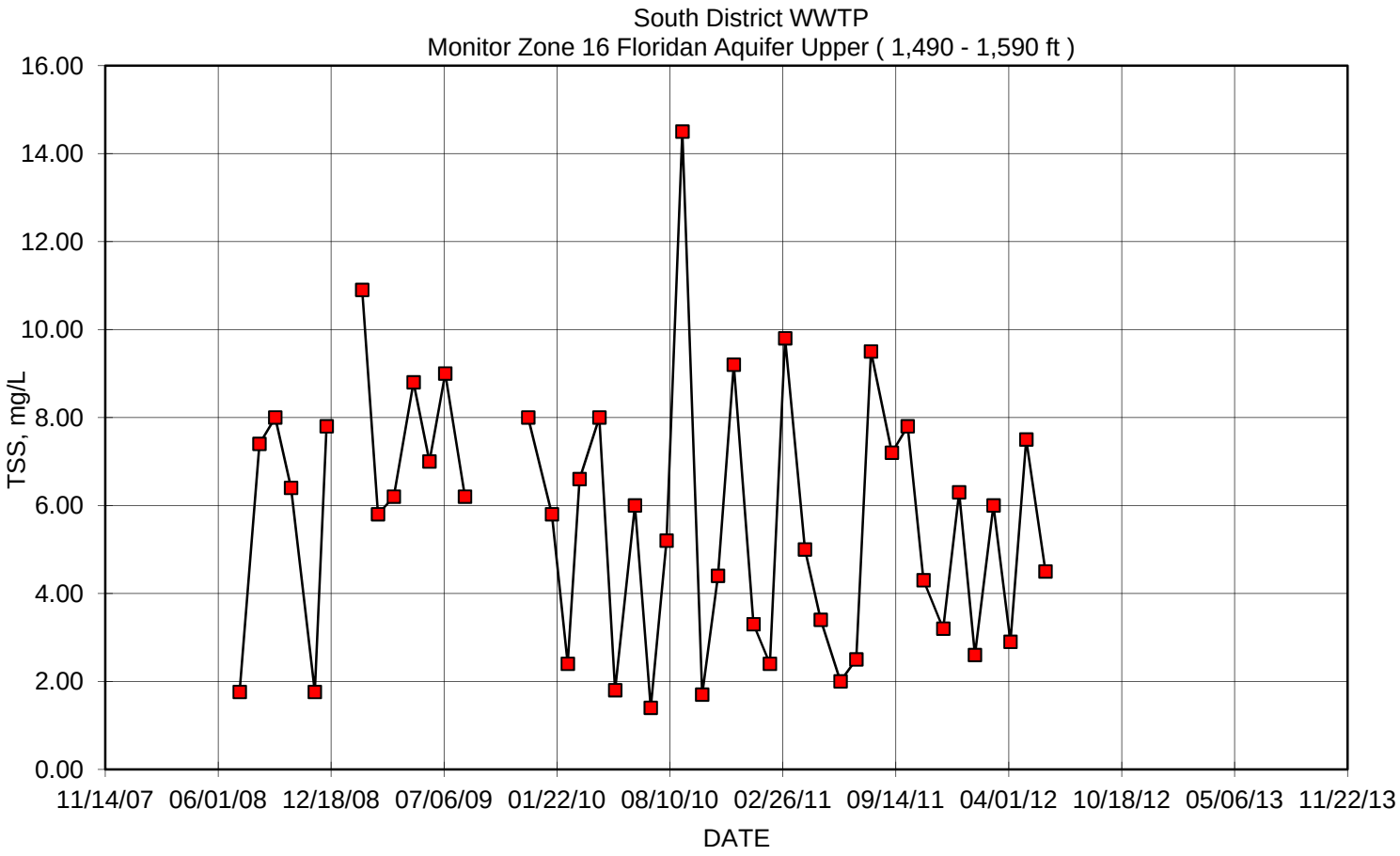

South District WWTP
Monitor Zone 16 Floridan Aquifer Upper (1,490 -1,590 ft)
TKN, mg/L
0
2
4
6
8
10
12
14
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

South District WWTP
Monitor Zone 16 Floridan Aquifer Upper (1,490 -1,590 ft)
NH3, mg/L
0
2
4
6
8
10
12
14
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 16 Floridan Aquifer Upper (1,490 - 1,590 ft)
Fecal Coliform, # Colonies/100ml
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 16 Floridan Aquifer Upper (1,490 - 1,590 ft)
Conductivity, Micromho/cm
12,000
10,000
8,000
6,000
4,000
2,000
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

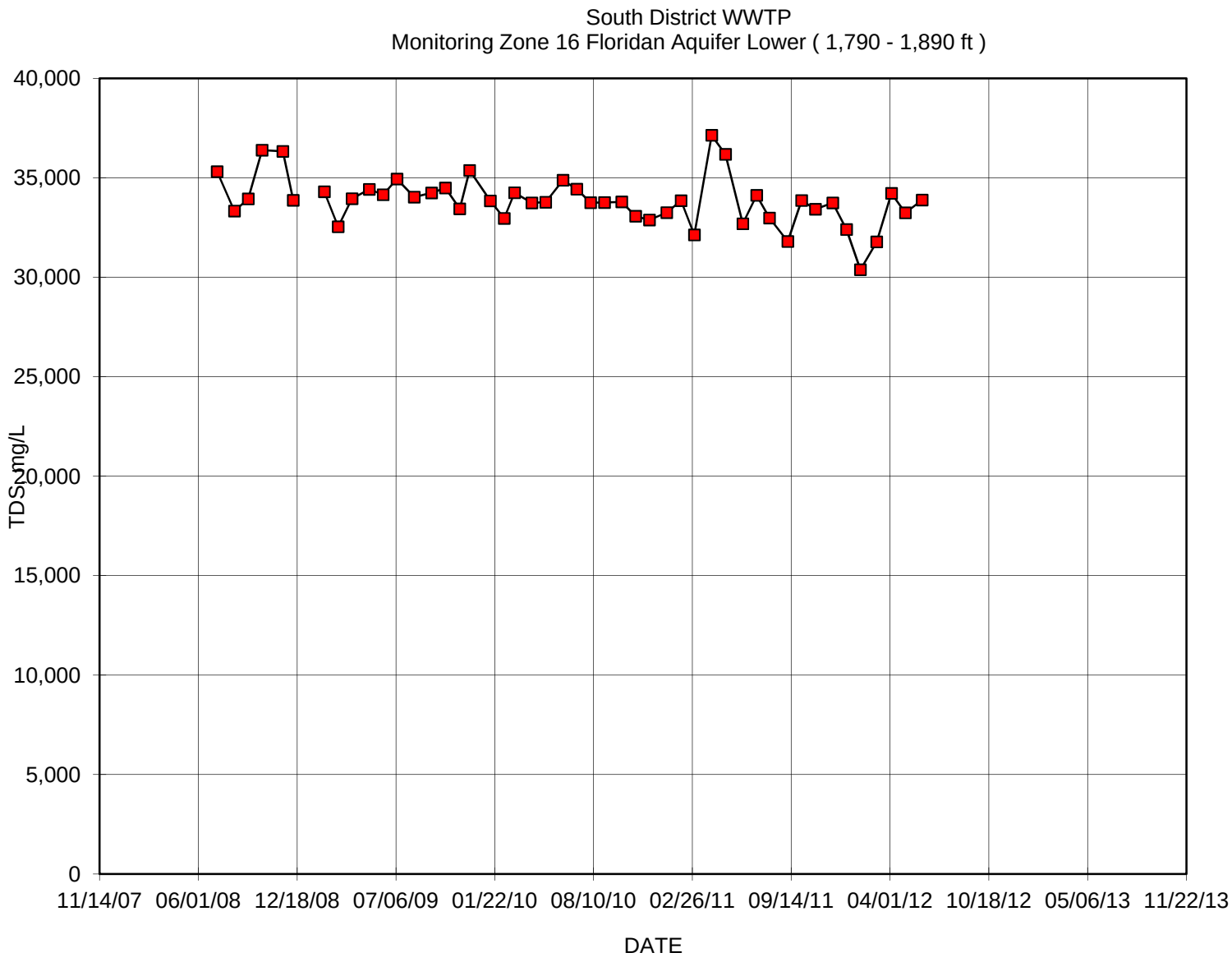

South District WWTP
Monitor Zone 16 Floridan Aquifer Upper (1,490 - 1,590 ft)
TP, mg/L
1.20
1.00
0.80
0.60
0.40
0.20
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

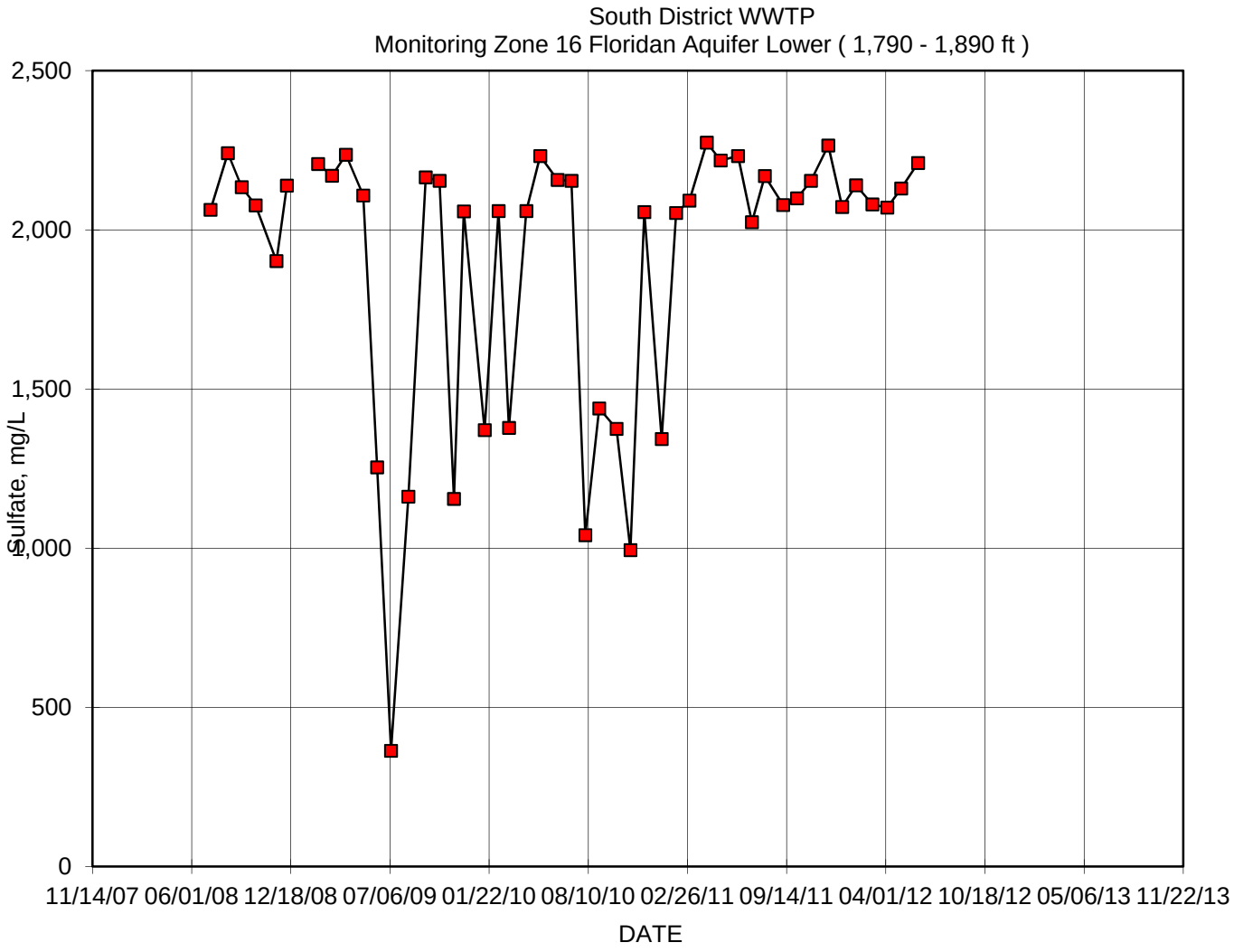

South District WWTP
Monitor Zone 16 Floridan Aquifer Upper (1,490 - 1,590 ft)
TSS, mg/L
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

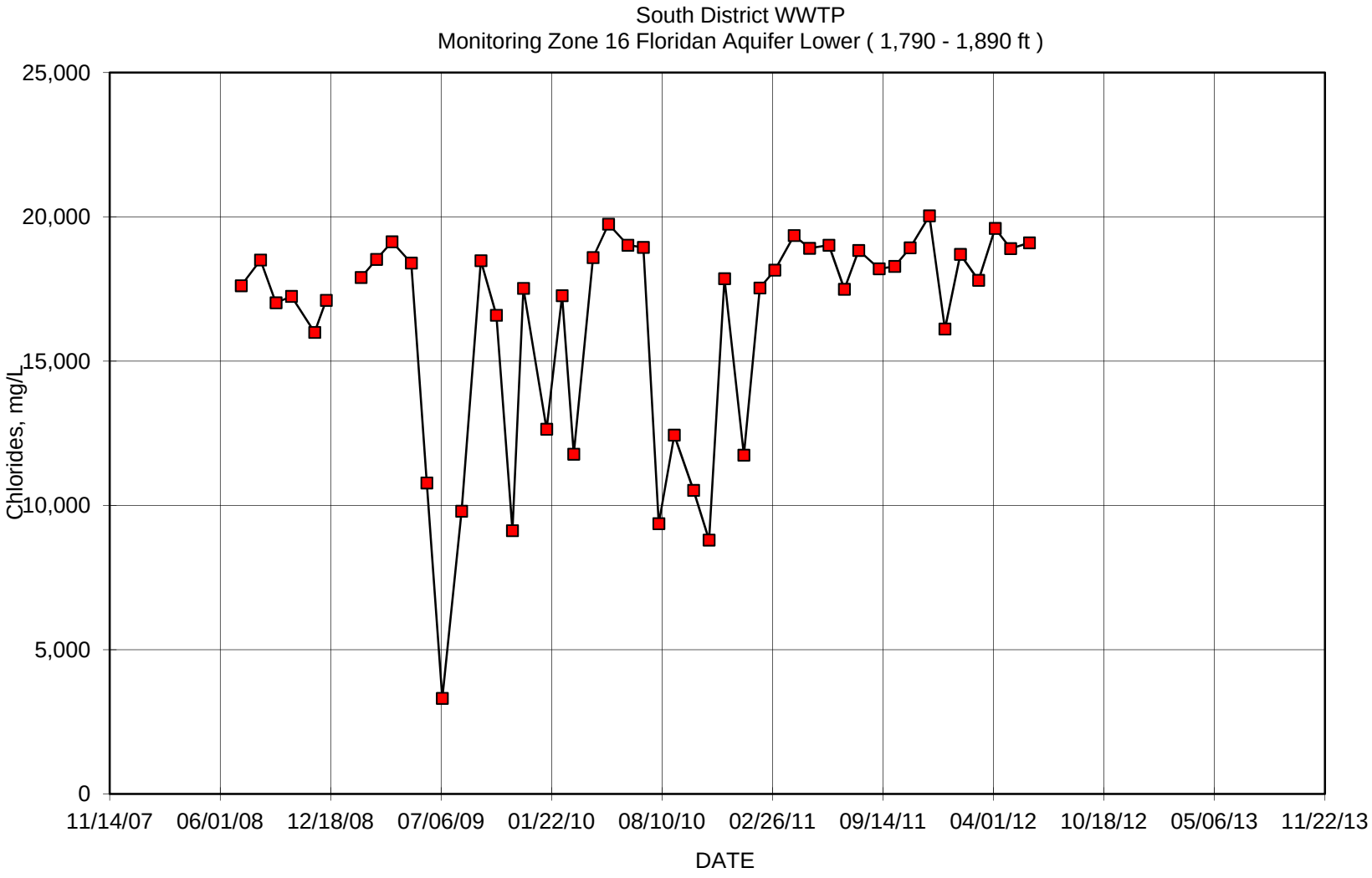
FA-16 Lower Data

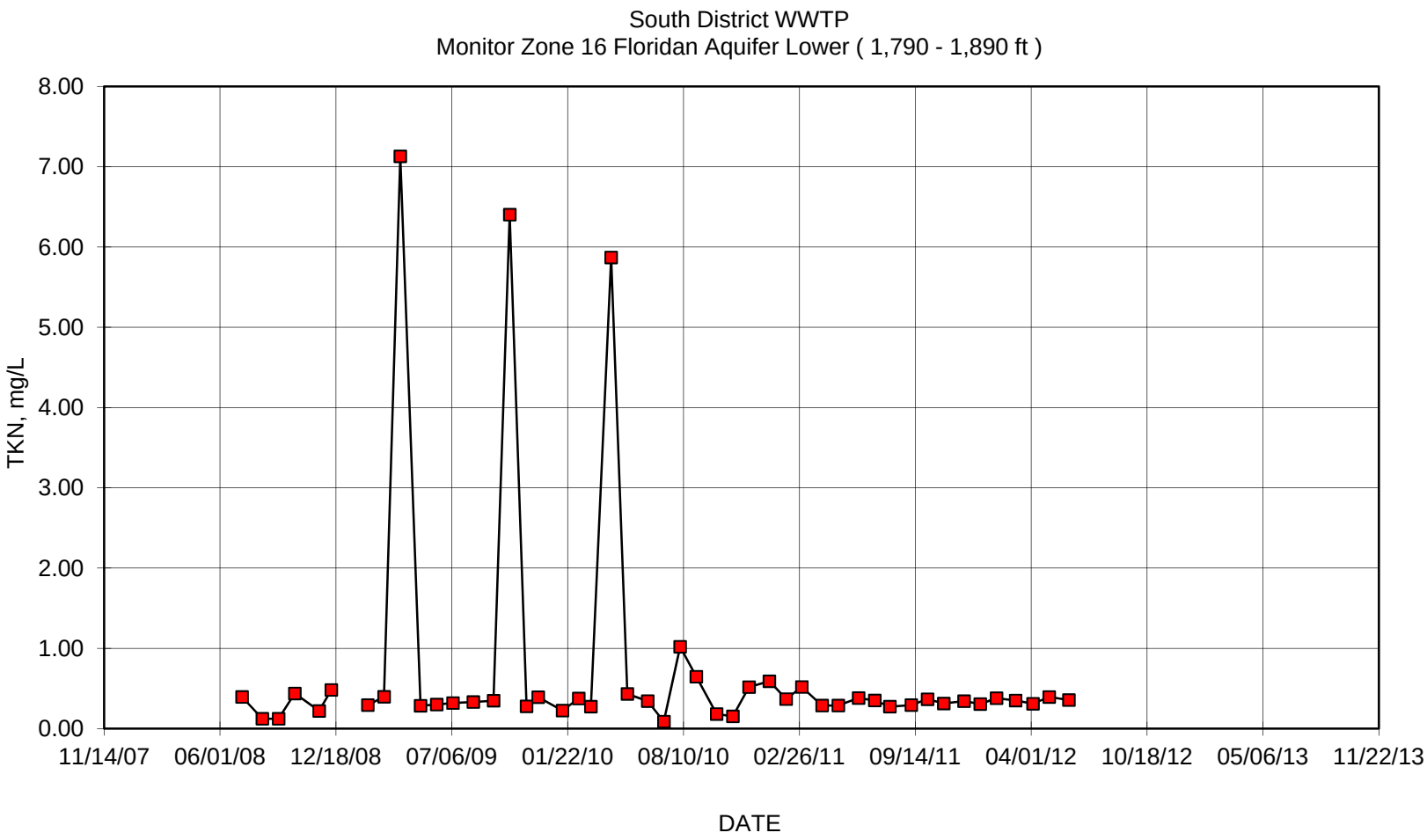
Date	TDS, mg/L	Sulfate, mg/L	Chlorides, mg/L	TKN, mg/L	NH3, mg/L	Conductivity, Micromho/cm	Temp., C	Temp., F	pH	TP, mg/L	TSS mg/L	NO_3 mg/L	NO_2 mg/L	Sodium, mg/L	Gross Alpha, pCi/L	Radium 226, pCi/L	Radium 228, pCi/L
07/09/08	35,310	2,063	17,613	0.40	0.01	48,780	24	75	7.5	0.01	17.20	0.03	0.00				
08/13/08	33,330	2,241	18,504	0.12	0.09	50,190	24	75	7.6	0.01	23.20	0.08	0.05				
09/10/08	33,940	2,134	17,021	0.12	0.03	45,730	25	77	7.5	0.06	21.40	0.08	0.05				
10/08/08	36,390	2,077	17,244	0.44	0.07	45,950	24	74	7.6	0.02	24.80	0.03	0.00				
11/19/08	36,330	1,902	15,996	0.22	0.02	45,360	21	71	7.3	0.00	18.60	0.03	0.00				
12/10/08	33,870	2,139	17,107	0.48	0.08	48,360	23	73	7.3	0.03	17.40	0.03	0.00				
01/14/09																	
02/11/09	34,300	2,207	17,899	0.29	0.07	48,420	23	74	7.1	0.07	24.90	0.00	0.00				
03/11/09	32,540	2,170	18,526	0.40	0.14	49,470	22	72	7.4	1.25	13.20	0.00	0.00				
04/08/09	33,950	2,236	19,136	7.13	0.12	50,890	23	73	7.3	0.04	22.40	0.00	0.00				
05/13/09	34,420	2,108	18,398	0.29	0.20	49,150	25	77	7.5	0.01	16.20	0.00	0.00				
06/10/09	34,150	1,254	10,779	0.30	0.16	61,900	24	75	7.4	0.32	13.00	0.00	0.00				
07/08/09	34,940	364	3,313	0.32	0.02	49,160	25	76	7.3	0.01	18.20	0.00	0.00				
08/12/09	34,030	1,162	9,800	0.33	0.14	48,770	23	74	7.6	0.01	17.80	0.00	0.00				
09/16/09	34,240	2,165	18,481	0.35	0.10	47,520			7.5	0.01		0.05	0.01	9560	16.1	12.1	0.9
10/14/09	34,490	2,154	16,589	6.40	0.13	10,270			7.6	0.03		0.00	0.00	1730	9.3	5.3	0.8
11/12/09	33,440	1,155	9,124	0.28	0.11	49,220			8.4	0.03		0.00	0.00	8170	14.0	14.2	1.0
12/02/09	35,370	2,058	17,521	0.39	0.13	50,850	24	74	7.4	0.03	15.80	0.00	0.00	10200	17.2	15.8	0.8
01/13/10	33,840	1,371	12,640	0.22	0.08	46,860	20	68	7.2	0.02	9.60	0.00	0.00	7860	14.0	12.7	1.0
02/10/10	32,960	2,059	17,267	0.38	0.08	47,120	22	72	7.4	0.03	18.20	0.00	0.00	7890	13.7	12.6	1.0
03/03/10	34,250	1,378	11,776	0.27	0.09	48,420	21	69	7.3	0.03	11.00	0.00	0.00	8820	15.3	12.4	0.8
04/07/10	33,740	2,059	18,588	5.87	7.99	49,020	24	75	7.3	0.02	12.00	0.00	0.00	8990	17.4	13.1	0.8
05/05/10	33,772	2,232	19,747	0.43	0.14	48,160	24	75	7.5	0.01	14.40	0.00	0.00	9890	13.1	10.9	0.7
06/09/10	34,880	2,157	19,017	0.34	0.11	49,640	24	76	7.4	0.04	24.80	0.00	0.00	8560	14.4	13.8	0.9
07/07/10	34,430	2,154	18,941	0.09	0.23	48,670	24	75	7.4	0.01	9.80	0.00	0.00	9420	12.4	13.8	0.7
08/04/10	33,750	1,041	9,367	1.02	1.31	46,940	24	75	7.4	0.24	18.40	0.00	0.00	9480	20.0	1.1	0.9
09/01/10	33,760	1,439	12,436	0.65	0.91	48,360	24	75	7.4	0.02	44.60	0.00	0.00	8680	13.4	13.8	0.8
10/06/10	33,790	1,375	10,522	0.18	0.84	47,680	23	73	7.6	0.01	16.40	0.00	0.00	8750	8.8	14.1	0.9
11/03/10	33,070	994	8,798	0.15	0.12	47,450	23	73	7.4	0.00	14.60	0.00	0.00	9910	10.0	10.4	0.8
12/01/10	32,880	2,056	17,856	0.52	0.83	47,570	23	73	7.4	0.02	13.60	0.00	0.00	9720	13.0	13.4	0.7
01/05/11	33,250	1,343	11,742	0.59	0.81	46,160	23	73	7.4	0.02	9.60	0.01	0.02	9400	18.5	16.8	0.7

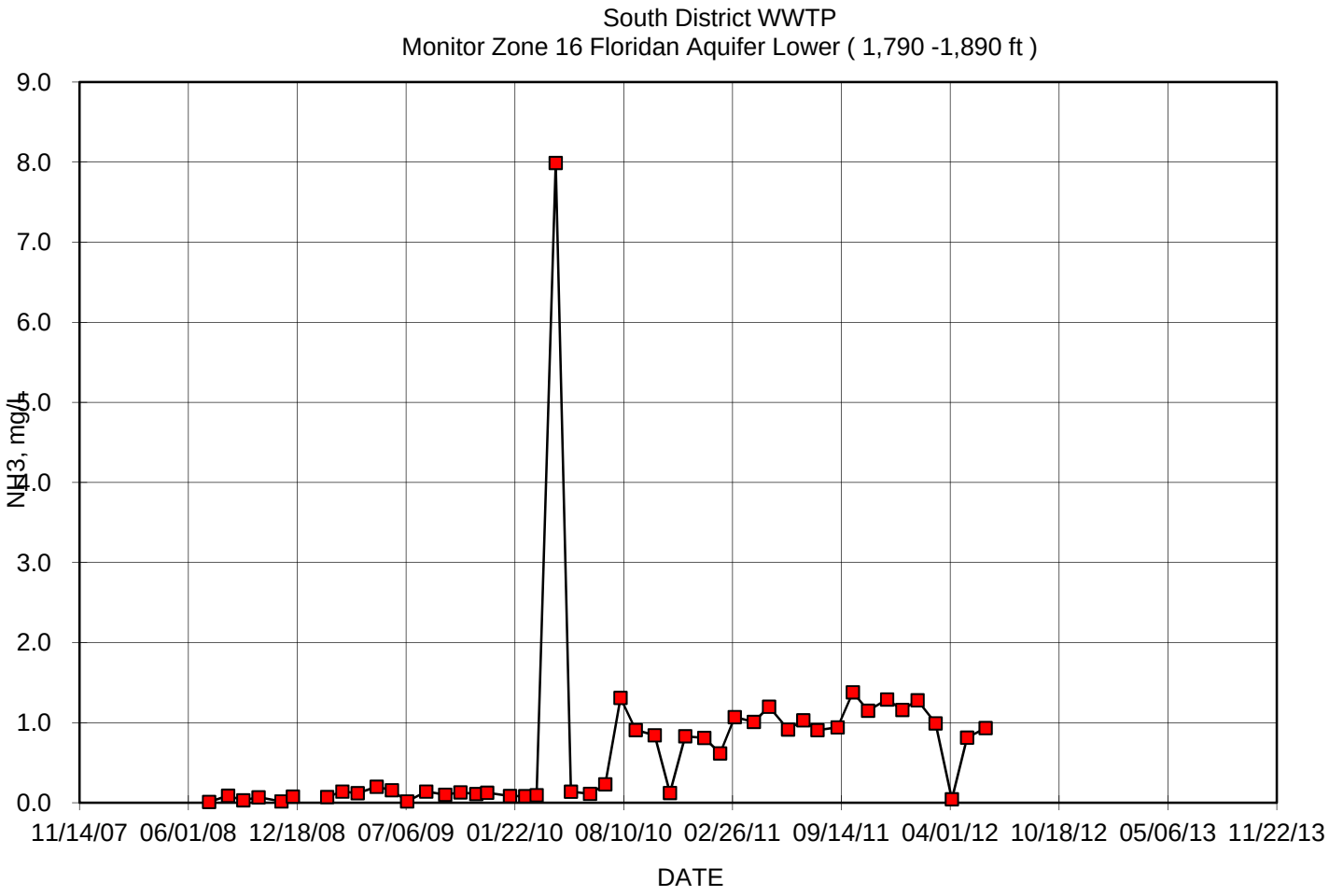
02/03/11	33,850	2,053	17,535	0.37	0.62	45,900	22	72	7.5	0.07	14.60	0.00	0.00	9210	13.3	10.3	0.7
03/02/11	32,130	2,092	18,153	0.52	1.07	47,690	22	72	7.2	0.14	23.40	0.00	0.00	8980	15.8	14.5	0.7
04/06/11	37,140	2,274	19,353	0.29	1.01	47,030	22	72	7.1	0.02	12.60	0.00	0.00	10400	14.0	13.6	0.8
05/04/11	36,180	2,218	18,910	0.29	1.20	46,570	23	73	7.4	0.02	7.20	0.00	0.00	9480	12.8	12.9	0.9
06/08/11	32,690	2,232	19,017	0.38	0.92	48,260	23	74	7.2	0.09	9.20	0.01	0.00	9840	13.4	12.0	0.8
07/06/11	34,120	2,024	17,490	0.35	1.03	48,920	24	74	7.6	0.02	13.00	0.02	0.00	9090	11.3	14.8	0.8
08/01/11	32,980	2,169	18,836	0.27	0.91	45,950	24	76	7.5	0.04	24.20	0.00	0.00	11200	11.2	11.5	0.8
09/07/11	31,800	2,078	18,199	0.29	0.94	47,940	24	75	7.4	0.05	10.80	0.02	0.00	9420	16.7	16.2	0.9
10/05/11	33,860	2,099	18,283	0.37	1.38	46,650	22	72	7.5	0.06	13.90	0.00	0.00	9550	15.2	14.5	0.9
11/02/11	33,420	2,154	18,927	0.31	1.15	47,240	23	74	7.2	0.05	8.30	0.00	0.00	10300	11.9	10.4	0.9
12/07/11	33,740	2,265	20,035	0.34	1.29	45,460	22	72	7.8	0.05	7.90	0.00	0.00	10000	14.2	13.4	0.9
01/04/12	32,400	2,072	16,113	0.31	1.16	44,820	20	68	7.4	0.02	17.80	0.01	0.00	9850	12.8	12.5	0.7
02/01/12	30,380	2,140	18,700	0.38	1.28	46,977	23	73	7.2	0.02	11.10	0.01	0.00	10400	10.9	9.8	0.7
03/05/12	31,780	2,080	17,800	0.35	0.99	42,460	23	73	7.6	0.02	10.30	0.02	0.00	10900	13.5	13.9	0.8
04/04/12	34,220	2,070	19,600	0.31	0.04	48,250	23	73	7.3	0.03	13.20	2.50	2.50	9890	15.5	14.8	0.9
05/02/12	33,240	2,130	18,900	0.39	0.81	48,900	23	74	7.6	0.03	10.00	0.03	0.00	10400	14.1	13.1	0.8
06/05/12	33,884	2,210	19,100	0.36	0.93	44,935	23	74	7.2	0.03	14.00	0.01	0.00	9650	12.7	13.2	0.9

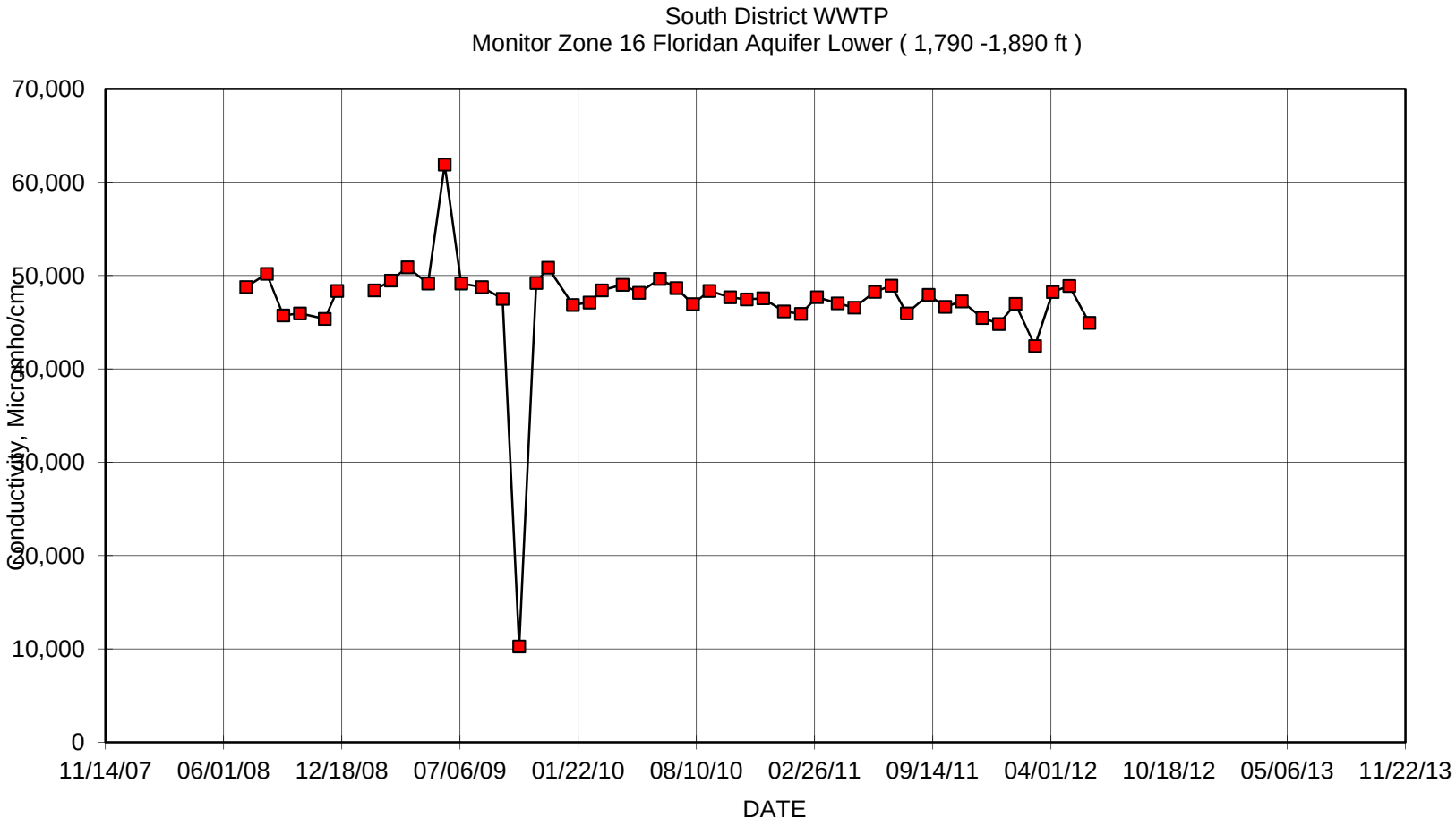

South District WWTP
Monitoring Zone 16 Floridan Aquifer Lower (1,790 - 1,890 ft)
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
TDS mg/L
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

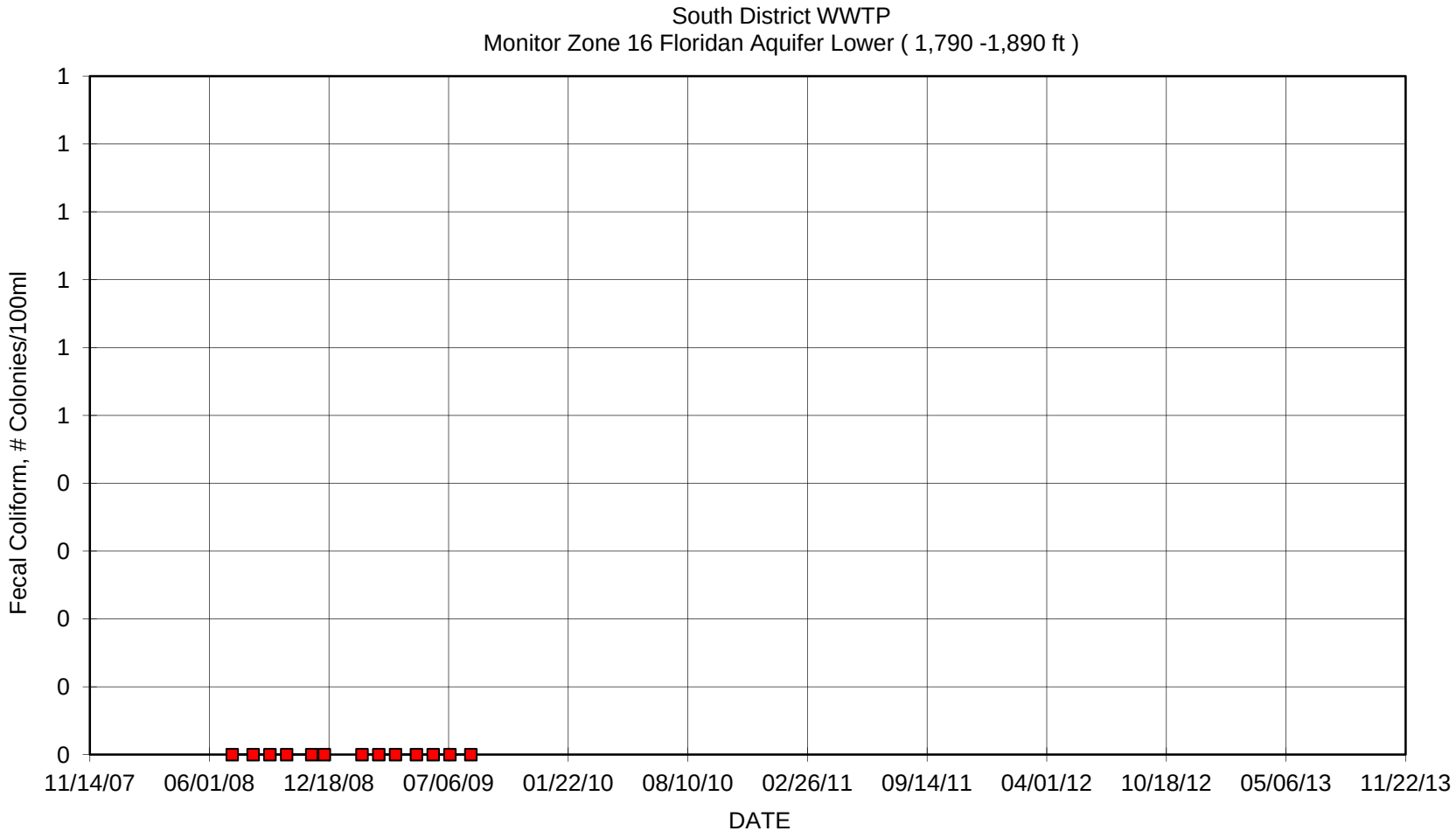

South District WWTP
Monitoring Zone 16 Floridan Aquifer Lower (1,790 - 1,890 ft)
Sulfate, mg/L
2,500
2,000
1,500
1,000
500
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

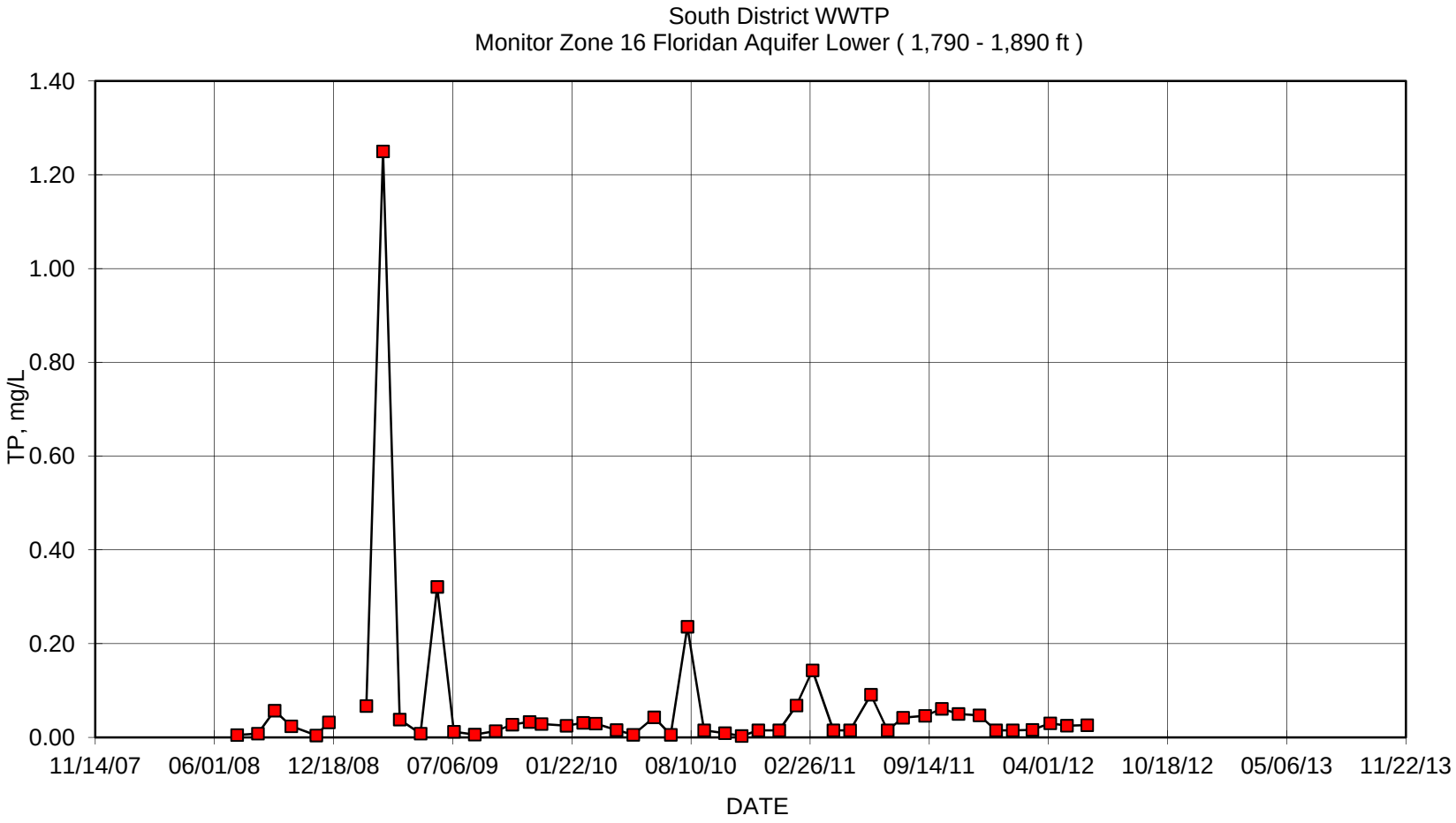

South District WWTP
Monitoring Zone 16 Floridan Aquifer Lower (1,790 - 1,890 ft)
25,000
20,000
15,000
10,000
5,000
0
Chlorides, mg/L
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 16 Floridan Aquifer Lower (1,790 - 1,890 ft)
TKN, mg/L
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 16 Floridan Aquifer Lower (1,790 -1,890 ft)
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
NH3, mg/L
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 16 Floridan Aquifer Lower (1,790 -1,890 ft)
Conductivity, Micromho/cm
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 16 Floridan Aquifer Lower (1,790 -1,890 ft)
Fecal Coliform, # Colonies/100ml
1
1
1
1
1
1
0
0
0
0
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE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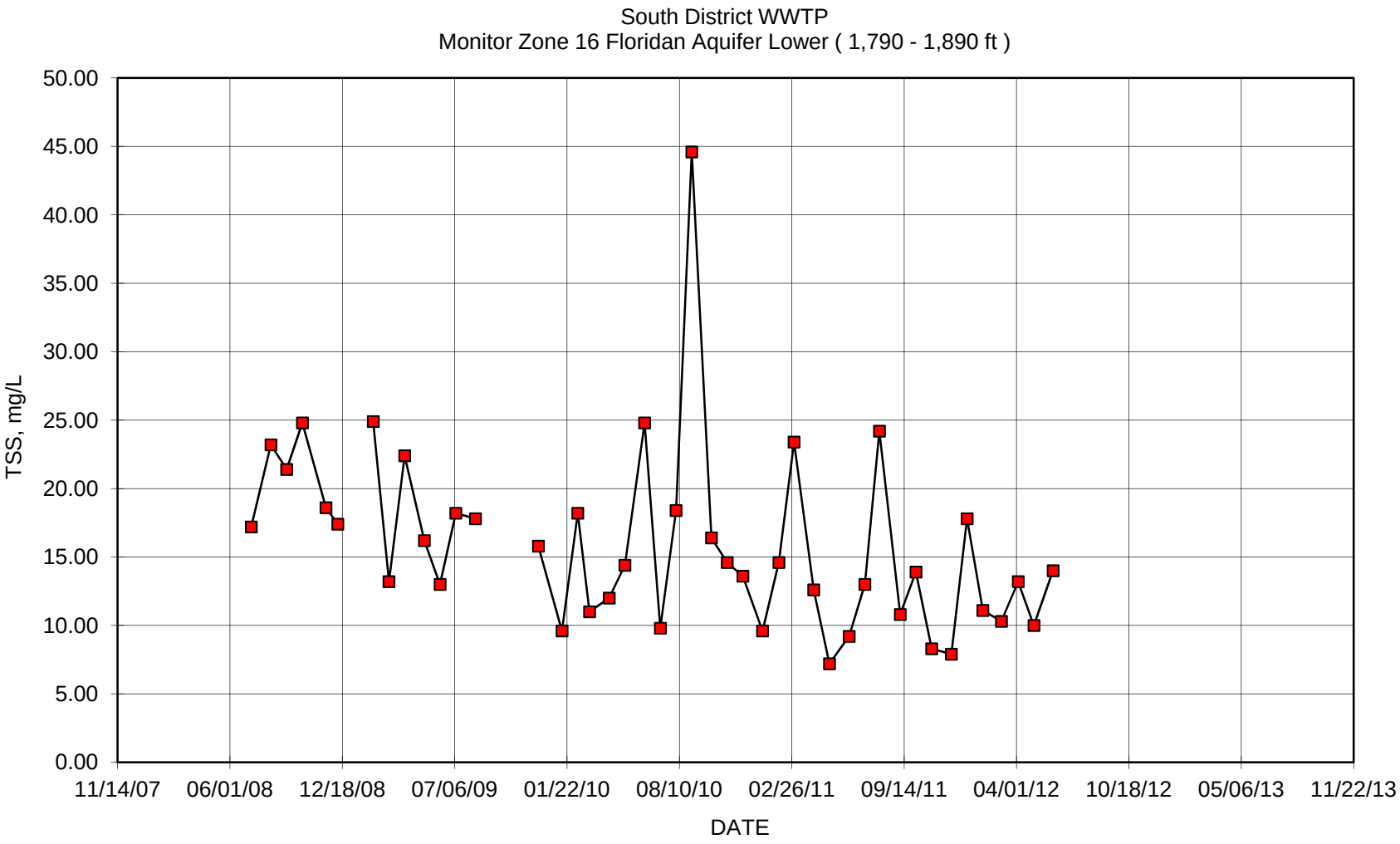
Monitor Zone 16 Floridan Aquifer Lower (1,790 - 1,890 ft)
TP, mg/L
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 16 Floridan Aquifer Lower (1,790 - 1,890 ft)
TSS, mg/L
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45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

MIAMI-DADE COUNTY
miamidade.gov

Water and Sewer
PO Box 330316 • 3071 SW 38 Avenue
Miami, Florida 33233-3016
T 305-665-7471

November 12, 2013

Mr. Joseph R. May, P.G.
Florida Department of Environmental Protection
400 North Congress Avenue, 3rd Floor
West Palm Beach, Florida 33401

CCN: 57819

Reference: Miami-Dade Water and Sewer Department -- Mechanical Integrity Testing (MIT) Report for Deep Injection Well No. IW-8 at the SDWWTP Site.

Dear Mr. May:

Enclosed please find the Certificate of Mechanical Integrity and the MIT Report on the re-testing of Deep Injection Well No. IW-8 at the South District Wastewater Treatment Plant site in Miami-Dade County.

All the tests were conducted in strict adherence to the specifications submitted to and approved by your office. The testing results for the well were good. Both external and internal mechanical integrity were demonstrated. The well casing and the wellhead components are in good condition. All the well head valves and all the well head components are scheduled to be rust-proofed and repainted when all the MITs are completed. Based on the results of the well testing we conclude that the well retains full mechanical integrity and recommend that MDWASD be allowed to continue operating the well in its normal mode.

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

The demonstration of mechanical integrity is being submitted per Chapter 62-528.300(6)(b)2., 62-528.300(6)(c), and 62-528.425(1)(d), F.A.C. and specific condition 3.j. of Permit 0061787-022-UO.

If you have any questions or require additional explanation of any item in the report, please do not hesitate to contact me at [redacted] or Sonia Villamil at [redacted]

Sincerely,

[redacted]

Rafael A. Terrero, P.E.
Assistant Director- Wastewater Operation Systems

Enclosures: Certificate of Mechanical Integrity
MIT Report Well IW-8 (1 copy)

cc: Joseph Haberfeld, FDEP - Tallahassee

MIAMI-DADE COUNTY
Delivering Excellence Every Day

Mechanical Integrity Test Report
Deep Injection Well No. IW-8
South District Wastewater Treatment Plant

Prepared by:
Miami-Dade Water and Sewer Department
3071 SW 38th Avenue
Miami, Florida 33146

CERTIFICATE OF MECHANICAL INTEGRITY

The **South District WWTP** deep injection well **IW-8** operated by **Miami-Dade Water and Sewer Department** has been tested for mechanical integrity. The tests followed standard engineering practices and used methods presented in the United States Environmental Protection Agency regulations for the purposes of these tests. The external and internal mechanical integrity tests followed Florida Department of Environmental Protection (FDEP) pre-approved testing specifications and all the critical test events were witnessed by representatives of the FDEP, the MDWASD and the contractor.

Having supervised the engineer and geologists that were present during the testing, conducted the examining of the results and the preparation this mechanical integrity report as part of this certification, the undersigned certifies that deep injection well **IW-8** operated by **Miami-Dade Water and Sewer Department** at the **South District Wastewater Treatment Plant Site in Miami-Dade County, Florida** has successfully passed all the test requirements for mechanical integrity under rules of Chapter 62-528 of the Florida Administrative Code and is therefore determined to have mechanical integrity.

Certified on November 7, 2013

[redacted]

Howard J. Fallon Jr., P.E.
Professional Engineer
License Number 24153

MECHANICAL INTEGRITY TEST REPORT
FOR
DEEP INJECTION WELL No. IW-8
AT THE
SOUTH DISTRICT WASTEWATER TREATMENT PLANT

Prepared by:

MIAMI-DADE WATER AND SEWER DEPARTMENT
3071 SW 38th Avenue
Miami, Florida 33146

For Submittal To:

UNDERGROUND INJECTION CONTROL
FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

November 2013

ABSTRACT

The internal mechanical integrity was investigated through a pressure test performed on the injection casing. The pressure test was conducted at 153.5 pounds per square inch (psi) which is approximately 1.5 times the maximum (100 psi) potential injection pressure and more than 1.7 times the maximum operational pressure that the well will be under when operating at its full permitted injection velocity of 10 feet per second (ft/sec). FDEP permits a 5% loss in pressure during the hour long test in order for the internal mechanical integrity to pass the pressure test.
IW-8 successfully passed the pressure test because the casing only lost 3.5 psi. The successful results of the pressure test for internal mechanical integrity were reinforced by the results of the second internal mechanical integrity test, the TV survey of the casing. The TV survey confirmed that the casing and the casing joints are in good condition and that the well has internal mechanical integrity down to 2,427 ft bls.

The external mechanical integrity was investigated using two test procedures, a Radioactive Tracer Survey (RTS) and a Temperature Log. Results of the RTS confirmed the integrity of the cement around the casing and the continued competence of its seal with the geologic strata. The temperature test showed that there are no anomalies that would indicate points where injected fluids could escape through the casing and cement into the formation. Similarly there were no temperature anomalies that would indicate injection fluids entering the formations at other than the approved injection depth.

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Section 1

1. INTRODUCTION

1.1 BACKGROUND

On October 12, 2012, (see Appendix A) the Miami-Dade Water and Sewer Department (MDWASD) submitted the County's proposed plan and testing specifications for conducting the mechanical integrity tests (MITs) and repairs on some of the injection wells at the South District Wastewater Treatment Plant (SDWWTP) site (see Figure 1) to the Florida Department of Environmental Protection (FDEP). The plan, represented by the specifications, described the step-by-step procedure to be followed and included the testing schedule required to meet the 5-year MIT re-testing conditions of the FDEP permit for each of the injection wells. After receipt of these documents, the FDEP Staff reviewed the proposed plan and sent an approval on June 5, 2013 (see Appendix B).

The contract documents for conducting the MITs were let out for bids, and the winning bid was submitted on February 28, 2013 by Youngquist Brothers, Inc., a well drilling contractor from Ft. Meyers, Florida. After the contract was approved by the Board of Country Commissioners and signed by the County Manager, the MDWASD issued the notice to proceed on May 17, 2013 and the contractor began mobilizing to the site.

1.2 PURPOSE AND SCOPE

The purpose of this report is to provide FDEP with a document that describes the re-testing procedures for mechanical integrity applied to each of the SDWWTP deep injection wells (see Figure 2). The report also presents the field reports (see Appendix C), and the results of the tests in a single volume for ease of reference. The mechanical integrity re-testing operations involved conducting a pressure test on the well casing to show that there are no leaks in the casing, and conducting a TV survey on the well to reinforce the data from the pressure test. The re-testing includes tracking a radioactive liquid-tracer (iodine isotope I-131) injected down the well to show that there is no fluid movement upward behind the casing, into underground sources of drinking water (USDW). The radioactive test information is reinforced with temperature logs run on the well. Gamma ray logs are used to detect the movement of the radioactive tracer.

Figure 1. South District Wastewater Treatment Plant Site

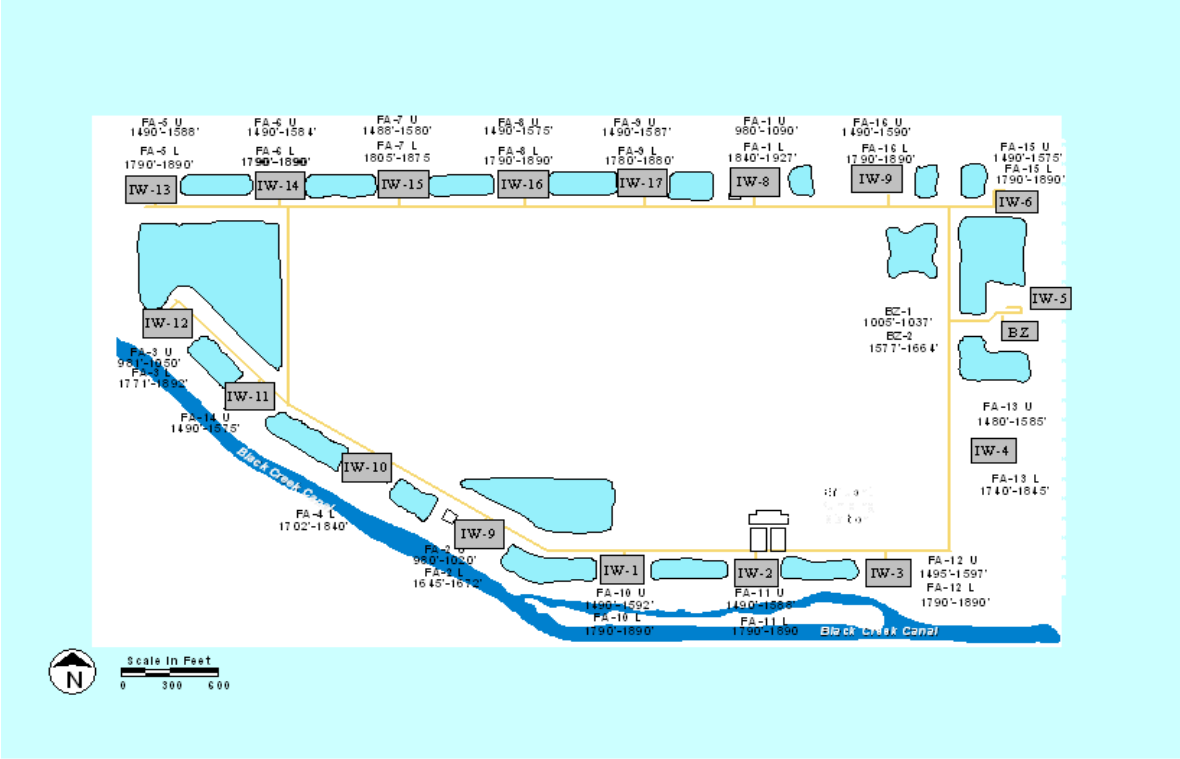

Figure 2. Well Locations Layout

Section 2

2. MECHANICAL INTEGRITY TESTING (MIT)

2.1 METHODS USED

The MIT program is designed to test two elements of the injection well system: 1. Internal integrity and 2. External integrity. The first test element, the internal mechanical integrity test of the well, tests the condition of the injection casing. The second test element, the external mechanical integrity test of the well, tests for leaks outside the casing. This is achieved through a series of field tests including a pressure test and a TV survey for the internal testing, and the temperature log, gamma ray log and RTS survey for the external testing. The first test element, the internal mechanical integrity test, tests for leaks in the injection pipe (casing). The second test element tests for leaks in the annular space outside the casing (cement-filled space between the periphery of the drilled hole and the casing) and in the near-to-the-well geologic strata.

2.2 CASING SCRUBBING

Because the mechanical integrity of injection wells has to be tested every five years, and because a TV inspection of the well is part of the test requirements, MITs provide a timely opportunity to clean the well of deposits that may have formed on the inside of the casing during the intervening years and at the same time provide a cleaner casing for the TV inspection. Cleaning the inside of the well casing is achieved by running a scrubbing brush up and down the casing. However, before the cleaning can be performed, flow out of the well must be controlled. The column of water inside the casing is fresh water and results in a positive hydraulic head inside the well. That head must first be controlled to prevent water from flowing out of the well during the cleaning operation.

2.2.1 Flow Suppression

Suppression of the fresh water head was achieved by first pre-mixing water with salt (NaCl) to form a heavy brine, and then pumping the brine down the well casing, through a 6-inch gate valve on the wellhead. This procedure results in the displacement down the well of the fresh water at the top of the column and replacement of the displaced fresh water with the brine solution. An equal volume of fresh water is displaced out of the well at the bottom of the casing. The procedure is repeated until the pressure head inside the well is suppressed. This method of displacement is used because it achieves flow suppression without first having to open the well to insert a tremie pipe to the bottom of the casing for introduction of the brine. This displacement method also provides a safe way of “killing” the well that at the same time reduces the volume of injected salt solution that would enter the formation at the bottom of the well. One additional advantage is that using this method the brine can be recovered and reused in flow suppression at other wells.

The brine was prepared in 1,000-gallon (gal.) batches by mixing the salt from a 2,000-pound (lbs.) sack in a 1,000 gal. tank of fresh water. The 1,000 gal. solution was then pumped down the well before other similarly mixed batches of salt solution were mixed and pumped down the well (see Figure 3). In the end, the operation was repeated 13 times, and a total of 13 sacks (approximately 26,000 lbs. of salt) were used to suppress the head in the well. This salt concentration represents a theoretical specific gravity of 1.239 for the brine, calculated from the salt solution used in the field of 10.3 lbs per gallon. The 26,000 lbs of salt suppressed the pressure head from approximately 26 feet above the top of the casing to approximately 15 feet below.

Figure 3. Flow Suppression Equipment

2.2.2 Scrubbing Operation

The brush used to clean the casing is made with an old drill rod that has an outside diameter of 7 inches with thick steel wire inserted and secured sticking out of the drill rod. The total diameter of the brush with the steel wire bristles is 24 inches. The brush is attached to the bottom of the packer and inserted into the well (see Figure 4). A 24-inch flange was bolted to the top of the well and pressure fittings installed to be used for packer inflation later on in the process. Then Youngquist lowers the brush and packer by attaching drill rods to the top of the packer and then raising and lowering the brush several times using a 50 ton crane. This process was repeated until the casing was scrubbed and the packer was at the depth required to perform the packer test on the well.

Figure 4. Scrubbing Brush and Hydraulic Packer

2.3 INTERNAL MECHANICAL INTEGRITY (CASING TESTS)

2.3.1 Pressure Test

After the pressure head was suppressed and the casing scrubbed, and the inflatable packer was placed at a depth of 2,398 ft bls. This well is cased to a depth of 2,427 ft bls so the packer is in the bottom 50 feet of the casing. Additional pressure fittings were installed on the flange to pressurize the casing with water. A bleeder valve atop the 24-inch flange allows passage of the drill pipes that support the packer without loss of pressure in the casing (see Figure 5). A pretest was conducted on the casing to determine that the pressure was holding and that all the installed testing equipment was operating properly, then FDEP was informed that the well was ready for their inspection. The next day, August 8, 2013, the pressure test was repeated in the presence of FDEP Staff. The packer had been previously sealed against the casing, at an inflation pressure of 380 pounds per square inch (psi) and at 7:00 AM the casing was pressurized with water to a pressure of 153.5 psi.

Figure 5. Well-Head and Recorder Set Up for Pressure Test

At 8:42 A.M.. the one-hour pressure test was started in the presence of Joseph May, P.G. representing FDEP and witnessed by Sonia Villamil, Maria Macfarlane, and Michael Ashe representing MDWASD, and by Chris Harp and others representing the drilling contractor. The pressure test ran for the required one-hour period. The pressure deviation (loss) in that time was 3.5 psi, well below the 7.5 psi deviation allowable under the 5 % criteria in the rules (see Table 2-1). The packer inflation pressure and the pressure in the casing were measured using certified gages (see Appendix C) graduated from 0 to 200 psi in increments of 1 psi. The pressure was read in person and recorded by hand at five minute intervals during the test. The pressure was also recorded on an In-Situ pressure transducer attached to the stand with the pressure gauges (see Figure 5).

Table 2-1 Casing Pressure Readings

Time	Casing Pressure (psi)	Pressure Change (psi)	Packer Pressure (psi)
8:42	153.5	0.0	380
8:47	153	0.5	380
8:52	153	0.0	380
8:57	152.5	0.5	380
9:02	152	0.5	380
9:07	152	0.0	380
9:12	152	0.0	380
9:17	151.5	0.5	380
9:22	151	0.5	380
9:27	150.5	0.5	380
9:32	150.5	0.0	380
9:37	150	0.5	380
9:42	150	0.0	380

2.3.2 Bleed-Off Calculations

At the completion of the pressure test the casing pressure was bled-off and the discharged volume from the bleeding was measured (see Table 2-2). Bleeding until the pressure resulted in zero flow produced approximately 28.5 gallons. This exercise provides a reasonable assurance that the packer is placed at the depth in the well that is within the last 50 feet of the casing.

Table 2-2. Bleeding Volumes versus Pressure

Bled Volume (gallons)	0	5	10	15	20	25	28.5
Casing Pressure (psi)	150	122	90	68	47	15	0

2.3.3 Television Survey

A closed circuit color television camera, encased in a pressure vessel capable of withstanding the pressures exerted at the depths to be televised, and equipped with a fish-eye lens, was introduced into the well through a pack-off stripper device on a standpipe above the injection well (see Figure 6). The camera is centralized in the casing, and is preceded down the well with a light source attached below the camera. The camera televises a view of the full circumference of the inside of the casing and the image is recorded on video tape. Prior to the video survey, the well was scrubbed and flushed with potable water to provide the best picture possible. The video

survey began at land surface and continued down to 2,911 feet, where the camera runs into an obstruction. At selected intervals of interest, the camera was used to pan the intervals in a horizontal format prior to continuing the normal vertical recording.

A review of the video (see Appendix F) indicates that the casing is in good condition down to 2,427 feet. The video also shows that the scrubbing operation was successful. The scrubber has scrubbed the casing free of all growth down to 2,414 feet and this is confirmed by visible vertical scratches throughout that length of the casing; indicating that the scrubber had brushed the steel casing effectively. All the scratches are superficial, and do not detract from the physical and mechanical integrity of the casing. There are no gouges, grooves, nicks, or other physical damage visible in the casing for its whole length. Below 2,414 feet the casing was not scrubbed to avoid hanging the scrubber with the edge of the bottom of the casing at 2,427 feet. There are some growths and/or deposits visible inside the casing below 2,427 feet.

In summary, the video picture meets the quality standards that are needed for a visual evaluation of the well. This video survey presents a clear view of the casing and of the welded joints of the casing. All the joints are clean and appear to be tight. From the TV survey it is concluded that this casing is in good condition throughout its whole depth from land surface to 2,427 feet.

Figure 6. Television Survey (Standpipe and Logging Truck)

2.4 EXTERNAL MECHANICAL INTEGRITY (CEMENT AND FORMATIONS)

The external mechanical integrity test consisted of two low flow dynamic tests The RTS and temperature survey, conducted on August 13, 2013, for the external mechanical integrity portion of the test was witnessed by the representative of FDEP (Joseph May, P.G.), by representatives of MDWASD (Sonia Villamil and Maria Macfarlane) and by representatives of the contractor (Luis Morey).

2.4.1 Radioactive Tracer Survey (RTS)

The radioactive tracer survey uses an isotope of iodine (I-131) as a tracer of water movement inside and outside the casing. Iodine –131 is used because it is a radioactive isotope commonly used in medical practice and therefore it is more easily available and lower in cost than other potential tracers. I-131 also has the advantage of having a half-life of 8 days. That half-life is quite suitable because it is long enough to allow time for transportation to the well site with little decay but also short enough so that it would quickly be reduced if there were any unexpected spills or if there were mechanical failures through which the isotope could travel with the water. The radiation levels of I-131 at the concentration used for RTS testing is in millicurie-range, which if it were considered a waste, would be characterized as a low level waste by the US Atomic Energy Commission.

The I-131 is first loaded into a container located in the logging tool. This container is electronically activated from the logging truck to eject the desired quantity of tracer at the desired depth through an ejection port. In addition to the tracer container, the logging tool is also assembled with three gamma ray detectors. One detector, the top gamma ray detector (GRT), is located 10 feet above the ejector. The other two detectors, the middle one (GRM) and the bottom one (GRB) are located immediately below the ejector at about 3 feet and 12.4 feet below the ejector respectively. The bottom of the logging tool also includes a temperature tool at the very bottom, and a casing collar locator (CCL) 1 foot below the GRM. Figure 7 shows the configuration of the RTS logging tool. The RTS log in the appendix (Appendix D) shows the distances between each of the logging tool components described above.

2.4.1.1 First Low Flow Dynamic Test

Prior to starting the low flow dynamic test, a background gamma ray log was conducted to establish the natural conditions. It was conducted right after the temperature log. Since the temperature log was run downward starting at land surface, the temperature log had ended with the logging tool at the bottom. The background gamma ray log was conducted from the bottom (2,910 feet) up to the surface.

From the surface, the logging tool was again lowered down the well and the casing collar locator (CCL) used to locate the bottom of the casing. The magnetic coils on the CCL give out a magnetic field and detect a change in the mass. If there is growth on the casing it is harder for the CCL to have a clean line. If the growth has some iron on it, it can cause a sort of interference with the CCL making it harder for the CCL to find the end of the casing. The CCL shows that the bottom of the casing is at 2,424 feet bls. After the bottom of the casing was located, the well was ready for the low-flow dynamic RTS test.

The ejector port of the I-131container was set at 2,419 feet and 1 millicurie (mCi) of I-131 was released while the flow down the well was kept at a constant rate of 86 gallons per minute (gpm). The logging tool was kept immobile after the ejection of the I-131 and the three gamma ray detectors continued to record in place. One (1) mCi of I-131 was ejected into the well. The middle detector, located 3 feet below the ejector port, picked up the radioactive tracer 26 seconds after the ejection. The bottom detector, which is located over 12 feet below the ejector, picked up the tracer 1 minute and 40 seconds after the ejection. The middle detector seems to pick up some interference from the ejection motor on the tool when the ejection occurs and this shows up on the log at the same time of ejection. However, this interference is at a much lower level and is dismissed as nothing more than interference from the ejection motor. The test ran for 60 minutes and the top detector did not pick up any tracer.

After the first low flow test ended, the tool was then raised up more than 200 feet, to a depth of 2,200 feet, to log out of position to make sure that the tracer did not migrate up the casing or the formation outside of the casing. No migration was detected.

Once the log out of position was conducted and the tool was placed back to depth, no staining on the casing was found which means no interference for the second RTS. Therefore, with the approval of Joseph May, P.G. from FDEP, the well was not flushed prior to the second RTS test.

Figure 7. RTS Tool and Temperature Probe

2.4.1.2 Second Low Flow Dynamic Test

The tool was placed back to a depth were the ejector was located at 2,419 feet with a flow of 92 gallons per minute set down the well. For this test, 2 milicuries of I-131 were ejected into the casing. The middle detector started picking up the tracer about 32 seconds after it was ejected. The bottom detector, which is located over 12 feet below the ejector, picked up the tracer 2 minutes and 24 seconds after the ejection. Again the middle detector picked up some interference from the ejector motor at the time the I-131 was released. The upper detector did not pick up any tracer for the duration of the test, which lasted 30 minutes.

After the second low flow test ended, the tool was then raised up more than 200 feet, to a depth of 2,200 feet, to log out of position to make sure that the tracer did not migrate up the casing or the formation outside of the casing. No migration was detected.

With the last low flow dynamic test, the mechanical integrity test was concluded, but before bringing the geophysical tools out of the well, the leftover I-131in the container was ejected and the container flushed-clean to insure that any remaining radioactive iodine was well dispersed. The tool was placed at a depth of 2,571 ft bls. The ejector was located at 2,558 ft bls, and the remaining Iodine 131 was ejected and the well was flushed with effluent at a rate of over 5,400 gallons per minute to ensure no staining of the tool. The logging tool was then brought up from the bottom and on the way up a final gamma ray log was made. Then the final gamma ray log was compared to the background gamma ray log, and the comparison showed that there are no noticeable differences in the two except for a residual stain at the bottom of the casing where the I-131 had been repeatedly released during the testing, and just below there, where the tracer exited the casing. Injection of water down the well at a rate of 5,400 gpm continued for the next hour to completely flush out the well.

2.4.2 Temperature Log

Youngquist Brothers Inc. conducted the temperature log on August 13, 2013 starting at about 8:15 A.M. and logging down to 2,912 feet. The temperature probe (Figure 7) was run from the surface downward to minimize the disturbing effect of the movement of the logging tool on the temperature of the water in the well. The temperature log was started more than 24 hours after the well had last been disturbed by outside influences. The TV survey was the last disturbance in the well.

The temperature log (see Appendix H) shows the warmest interval is in the section from 2,400 to 2,427 feet. This is consistent with the higher temperature of the injected water in that interval. The temperature log did not detect any anomalies that would indicate that injection fluids are present outside the casing, and there is no indication of any upward movement of warm injection water either. The similarity of the temperature oscillations in this temperature log (in the interval from land surface down to the bottom of the casing) to those in the temperature logs from previous MITs and to those in the temperature log when the well was constructed, indicates that there has been no apparent change in the cased interval, and no upward movement of the injected water in the last 5 years.

2.5 WELL HEAD REPAIRS AND RE-INSTALLATION

The work associated with the MIT ended when the wellhead was replaced. The air and vacuum release surge check valves were replaced prior to reinstallation of the wellhead. The 6 inch gate valve and air release were replaced. The wellheads are scheduled to be sandblasted, rust proofed and repainted after the MITs on all the other wells are completed. Injection well IW-8 has been placed back on line and flow from the plant's pump station is again discharging to this injection well.

Section 3

3. CONCLUSIONS AND RECOMMENDATIONS

3.1 CONCLUSIONS

The pressure test was conducted successfully and it was concluded from the results that there is internal mechanical integrity. This conclusion is reinforced by the analysis of the TV survey down to the injection level at 2,427 feet. The TV survey indicated that the casing is in good condition and that all the casing joints appear to be tight and in good working order.

The two successful RTS conducted at low flow rates indicate that there is no upward movement of water outside the casing. Therefore, it was concluded that the RTS results show that there is external mechanical integrity. The temperature survey reinforced the results of the RTS by showing that there has been no movement of injected water anywhere except the injection zone.

3.2 RECOMMENDATIONS

The successful completion of all the tests for mechanical integrity confirms that IW-8 retains full mechanical integrity and as such it is appropriate to continue using this injection well. MDWASD also recommends that FDEP review the results of the tests presented in this report and based on those results determine that the well has mechanical integrity and may continue to be used for its intended purpose.

Finally, MDWASD recommends that although the well head will not be painted until all the MIT tests are completed on the other wells, IW-8 should receive mechanical integrity certification.

Appendix A

Mechanical Integrity Testing Procedures Submitted by MDWASD to FDEP
October 12, 2012

Miami-Dade Water and Sewer Department
Mechanical Integrity Testing Procedures

Miami-Dade Water and Sewer Department
Mechanical Integrity Testing and Repair Procedures
October 12, 2012

MECHANICAL INTEGRITY TESTING and REPAIR PLAN (SDWWTP and NDWWTP Injection Wells)

General Information

The Contractor shall carefully coordinate his activities with the Department to minimize interference with any existing operations or the operations of the Department. Department forces will isolate the well and turn over to the Contractor. Existing valves shall only be operated by Department personnel. The Contractor's personnel, under no circumstances, shall operate any such valve.

The Contractor shall provide all barricades and/or flashing warning lights necessary to warn workers and employee of the testing throughout the Project. This shall be done at the Contractor's expense and to the satisfaction of the Engineer. Every effort must be made to reduce inconvenience and nuisances to a minimum.

The Contractor shall at all times, use the assigned entrance to the Plants to bring in materials, equipment etc. required for the Project. Materials and equipment shall be stored in areas designated by the Engineer, and shall not interfere with the daily operations at the site or with other Projects. Suitable platforms shall be used for material storage to prevent damage to the landscaping. The Contractor shall exercise extreme caution when transporting equipment or materials within the Plant area.

The conveying vehicles shall be properly selected, and equipped, to prevent damage to paved areas, landscaping and other existing facilities including wells, well pads, fencing, underground pipelines, pipe chases, etc. If necessary, suitable wooden skids shall be used to distribute loads, and to prevent damage.

If any of the above existing structures, including the wells, or any other parts of the project area, are damaged, the contractor shall make suitable repairs or replacement at his expense, in a manner described by the Engineer, and to his satisfaction.

The Contractor shall also exercise extreme caution to prevent any spillage of sewage effluent. The County may charge t he Contractor for any cost incurred or penalties imposed on the County as a result of such spillage.

The wells to be tested are Injection Wells IW-l through IW-17 at the South District Wastewater Treatment Plant and IW-1N through IW-4N at the North District Wastewater Treatment! Plant

The Injection Wells have a 24-inch outside diameter (OD), 0.500-inch wall thickness injection casing set to total depths of 2,450 to 2,850 feet below land surface (bls), and were constructed with a nominal 22-inch diameter open borehole extending from the bottom of the casing to approximately 3,000 feet bls.
Except IW-5 at the SDWWTP, has a 20-inch outside diameter (OD), and 0.500 inch wall thickness.

The CONTRACTOR will perform internal and external mechanical integrity tests on the casings of twenty one deep injection wells and perform all appurtenant work in accordance with the above

Contract Documents.

The work shall be performed by a competent crew with equipment that is adequate to complete all phases of the testing and instruments of sufficient accuracy and resolution to identify anomalous responses to the tests. If the CONTRACTOR'S equipment is not capable of satisfactorily performing the work provided for in these specifications, the CONTRACTOR at his own expense shall substitute equipment.

The CONTRACTOR shall have not less than 5 years experience in constructing and testing wells and shall have tested not less than 5 wells of similar type and capacity. The CONTRACTOR shall be licensed by the State of Florida and the license number shall be affixed to all correspondence and reports.

All work shall comply with and be in full conformance with this Mechanical Integrity Test Plan submitted to FDEP together with subsequent response letters for the injection wells at the South and North District Wastewater Treatment Plants and with the appropriate sections of Chapter 62-528 FAC.

If remedial work or re-testing is required prior to final acceptance of the work to meet regulatory requirements and the specifications of the Contract Documents due to defective materials, accident, loss of equipment or equipment malfunction, or for any other cause directly attributable to the CONTRACTOR's actions, the CONTRACTOR shall bear the entire cost of the remediation or re-testing, including all additional materials, labor, and equipment required and any necessary additional Engineering costs. In the event of a problem, the ENGINEER shall be notified immediately, and the following shall apply:

1. The CONTRACTOR shall propose a method of correcting the problem, in writing, to The ENGINEER, who shall review the method of corrective action, and accept the plan in writing before work can proceed.

2. All work on the well must be in accordance with all applicable local, state and federal regulations.

The CONTRACTOR shall notify the ENGINEER a minimum of 72 hours prior to conducting the pressure test, geophysical logging and the radioactive tracer survey so that the ENGINEER and regulatory agency staff can be properly notified.

The CONTRACTOR shall provide all facilities, equipment and materials required for the removal of waste fluids from the well site.

The CONTRACTOR shall kill the well using a dense food- grade salt solution. No barite or mud-based additives shall be used in the well.

The CONTRACTOR shall comply with the OSHA regulations contained in 29CFR Section 1910 for General Industry Regulations and 29CFR Section 1926 for Construction Regulations.

Equipment and Procedures

1. Wellhead Assembly: The stripper head assembly used during the video survey, Geophysical logging, and the radioactive survey shall be bolted to the wellhead above the 6-inch gate valve. The stripper head assembly used must be of sufficient length to house the longest of the wire line tools used for the testing between the gate valve and the pack-off mounted at the top of the assembly. The pack-off must be adjusted so that the tools can be moved freely up and down the well with minimal leakage from the well. The assembly shall include a 4-inch valve and tee, which will be used to inject potable water during the surveys. The assembly shall be fitted with a

pressure gauge for use during the tests.

2. Wellhead Hardware: Should the nuts and/or bolts at the wellhead assembly become stripped during the CONTRACTOR's efforts, the CONTRACTOR shall replace them with equivalent hardware.

3. Water Line: The CONTRACTOR shall provide a potable water supply line for use during the video surveys. This line shall be connected to the existing 4-inch valve on the CONTRACTOR's stripper head. It shall be equipped with a check value to prevent the backflow of effluent into the water supply source. It shall also be equipped with a continuous recording digital flow meter and totalizer capable of measuring flows accurately in the range of 0 to 250 gpm.

Mechanical Integrity Testing (MIT)

The mechanical integrity testing under this Contract shall be accomplished using the following methods and general sequence, however the Contractor shall submit a more detailed sequence to the Engineer for approval before he begins work. The Contractor shall use extreme caution to prevent any loss of equipment, tools or other items into the wells and shall be fully responsible for retrieving any such items immediately, at no expense to the Department. All pressure tests must be conducted in the presence of the Engineer or his authorized representative.

MIT Clean and Pressure Test the Casing

1. The Contractor shall set up all equipment required to prepare for suppressing the density differential pressure, cleaning, performing the pressure test and the radioisotope and closed circuit television surveys.

2. The Contractor shall inject sufficient salt solution into the well to balance the differential pressure and disassemble the wellhead. The brine solution shall remain in the well during the cleaning and pressure testing steps, after which time it shall be transferred to another well if clean enough for reuse, or shall otherwise be disposed of by the Contractor. Under no circumstances shall brine solution be spilled or disposed of on the ground surface, however it may be disposed of into the injection well.

3. The Contractor shall clean the casing before proceeding with the pressure test. The entire length of casing shall be cleaned. If the later television survey indicates insufficient cleaning, the well shall be re-cleaned by the Contractor, at his expense, to the satisfaction of the Engineer. If the television survey must be repeated because of insufficient cleaning, in the opinion of the Engineer, it shall also be at the Contractor's expense.

4. The Contractor shall, when requested by the Engineer, place the packer through a stand-pipe with a packoff device to a point near the top of the well (but within the concrete encasement area) and test its integrity. This shall be accomplished as described in Steps 6, 7, and 8 below. If the packer fails the integrity test it shall be replaced with one that will meet the test. The Engineer is aware that packers have limited inflation cycles and will attempt to minimize the verification of packer operation. However, any integrity failure for which the packer operation can not be eliminated must be repeated at the Contractor's cost. It is anticipated that each new packer will be tested at the wellhead to verify its capacity to seat and deflate.

5. The Contractor shall lower and place the packer to a point within the lower 40 feet of the casing, but not the last 10 feet. The CONTRACTOR will be responsible to assure the proper seating of the packer. A preliminary test shall be performed to ensure proper operation of the test set-up. The CONTRACTOR shall notify the ENGINEER at least 24 hours before running the preliminary test. The test will be run following the same test program as the actual pressure test, as described below. IW-2 at SDWWTP will have the packer placed within 40 feet of the tear in the casing.

6. The Contractor shall inflate the packer to a pressure not exceeding 350 psig over the static condition as measured at the wellhead on a calibrated gauge to create a positive seal.

7. The Contractor shall pressurize the casing to 150 psig with no air in the casing or wellhead. The pressure shall be recorded on a chart and signed by the Engineer, the Contractor and any witnesses present. The pressure test gauge shall be calibrated within 6 months of performing the pressure test. The CONTRACTOR must present proof of calibration of the pressure gauge to the ENGINEER and FDEP staff at the time of testing each well. The pressure gauge must be mounted at or near eye level in order to ensure maximum visibility.

8. The test will be considered successful if the pressure does not change more than 5% psi in one hour.

9. If the test fails, the Contractor shall move the packer upwards for approximately 10 feet, and repeat Steps 6, 7 and 8.

10. If the test still fails, additional repositioning of the packer and repeating of Steps 6, 7 and 8 shall be as ordered by the Engineer. If the test still fails, and subsequent radioisotope surveys indicate no casing failure, it will be presumed that the Contractor's packer did not create a positive seal, and the Contractor shall be required to repeat Steps 4 through 8 at his expense. No payments will be made to the Contractor if it is subsequently determined that the test failure was caused by the seating of the packer. If the packer fails during packer operation verification, it will be concluded that the packer was faulty during any previous test that did not demonstrate casing integrity. The Contractor shall repeat this test at his expense.

11. After pressure testing, measure the depressurization bleed down with a 5 gallon bucket upon release of the pressure in the casing. The bleed down fluid will be properly disposed of by the Contractor.

12. The Contractor shall deflate the packer and withdraw it from the casing.

13. The Contractor shall reassemble the wellhead and connecting piping using new gaskets.

14. Prior to geophysical logging, the fluid used to "kill" the well, or for pressure testing the casing shall be flushed from the well and the well will be shut-in for a minimum of 12 hours.

MIT Video Surveys

A Video Survey inside the injection well casing be performed using the following procedures.

.A 6-inch diameter stripper head assembly will be bolted to the wellhead assembly above the existing 6-inch diameter gate valve. The stripper head will be of dimensions that allow the video operator to put his camera between the gate valve and the pack off and close both the valve and the pack off. The lower part of the assembly shall consist of a 4-inch tee and valve through which potable water may be introduced into the well.
.
Prior to performance of the survey and for a period of 24 hours, fresh water from an adjacent fire hydrant will be introduced into the well through a 4-inch diameter valve located on the stripper head assembly. Fresh water shall be pumped into the well to provide clarity for the survey.

3. If, after 24 hours of pumping potable water into the well, the water quality does not permit a clear picture of the inside of the well, the CONTRACTOR may be required to perform additional pumping services to assure a good survey as specified above.

4. The pumping of the potable water will continue at a rate of approximately 0 to 250 gpm during video surveying. If the open hole portion of the well is not clean, or visibility in any part of the well is poor, the CONTRACTOR shall perform additional pumping services to ensure a good video survey before running another or continuing with the survey.

5. During the video survey, the CONTRACTOR shall stop the camera's progress as instructed by the ENGINEER at depths where there may be potential flaws in the casing or other features to allow for thorough examination at those locations.

Upon reaching the total depth of the well with the video camera and obtaining a video survey satisfactory to the ENGINEER, the camera shall be removed from the well, and the well placed back in service.

MIT Radioisotope Tracer Survey and Temperature Survey

A radioisotope tracer survey shall be used to detect any fluid movement outside of the injection casing from the injection zone into the overlaying aquifers. The tool configuration shown below, or approved equal is required. The tool must be capable of ejecting the radioactive tracer and simultaneously monitoring the gamma ray sensors. No time lag between ejection and monitoring is permitted. A casing collar locator (CCL) shall be positioned below the tool as shown below, to precisely locate the bottom of the casing. Two low flow dynamic test runs, shall be performed. Additional low flow dynamic test runs can be done if results warrant additional testing, as determined by the ENGINEER in consultation with FDEP staff.

A temperature survey log shall also be performed from land surface to the total depth of the well. The temperature log shall be performed logging down at a rate of not more than 60 feet per minute. The temperature survey shall be performed after the well has been "shut in" and stabilized for at least 12 hours prior to the dynamic and static tests.

The Contractor shall perform an initial background gamma ray survey extending from the base of the land surface to the total depth of the well. The background gamma ray log shall be taken at a rate of not more than 60 feet per minute.

After the dynamic tests are completed, another background gamma ray survey shall be taken from the base of the casing to the base of the intermediate casing.

If additional radioisotope tracer survey work is ordered by the Engineer, it will be paid for at the hourly price proposed for additional radioisotope tracer surveys.

Radioactive Tracer Survey (RTS)

A RTS will be performed in the injection well. The tool used for testing will be configured according to information to be supplied by the service company performing the logs and as approved by the ENGINEER. Below is an example of a typical RTS tool that will be used for these surveys. The CONTRACTOR will provide a specific tool configuration with the logs.

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)
			CHD-SDSCHD (SDS) Cable Head	1.00	1.50	5.00
GR#3	23.83					
			GR #3 -GR#3 (GR#3_T) GR#3_TOP	9.33	1.69	50.00
			TREJCT-A (RTS) EJECTOR 14.5' FROM TOOL BOTTOM	3.00	1.69	10.00
			GR #2 -GR#2 (GR#2_M) GR#2_MIDDLE	3.58	1.69	25.00
GR#2	11.17					
CCL	9.63		CCL-000 (000001) RTS_CCL	0.75	1.69	5.00
			TRDET-GR#1 (GR#1_B) GR#1_BOTTOM	8.67	1.69	50.00
GR#1	0.58		TEMP-11116Temp (11116HT)	0.58	1.69	5.00
TEMP	0.17		RTS_TEMP			

Dataset: sdiw1.db: field/well/run1/FINBK
Total Length: 26.92 ft
Total Weight: 150.00 lb
O.D. 1.69 in

RTS tool Typical Configuration

The sequence of the tests shall be as follows:

First Low Flow Dynamic: The low flow run of the radioactive tracer survey shall be performed with a pumping-in velocity of 3 to 5 feet per minute. This would require a volume of between 65 gpm and 108 gpm to be injected during the survey. This is for the 24 inch wells, for Well I-5, which has a 20 inch casing this volume is 44 gpm and 73 gpm. Potable water from the same source as used for the video survey would be used as the most appropriate water supply for this portion of the test.

1) After beginning the flow of water into the well, the tool will be placed at a depth of approximately 5 feet above the base of the final casing, and a slug of 2 millicuries radioactive Iodine 131 is ejected. The tool will remain in place for a period of approximately one hour and the three gamma ray detectors in the "time drive" mode will record the movement of the slug. If tracer is detected at the uppermost detector, indicating potential staining of the tool, the tool may be moved upward to an alternate location.

2) After the one hour waiting period, a log out-of-position will be performed between the ejection point and a minimum of 200 feet above the highest point of tracer detection.

3) Upon completion of logging, the casing will be flushed with 3 to 5 casing volumes of effluent.

4) After flushing, the tool will immediately be run to the base of the casing, then the interval between the ejection point and 200 feet above the highest point of tracer detection will be logged.

Second Low Flow Dynamic: The process described above for the low flow dynamic log will be repeated to include a log out-of-position, a casing flush, and an after flush pass. A slug of tracer greater than or equal to 3 millicuries shall be used as determined by the ENGINEER.

If, during testing, no apparent anomalies appear that may indicate a lack of mechanical integrity in the injection well, the RTS will be concluded. If anomalies do occur, the RTS will be altered to track the radioactive tracer material. After RTS is complete, the RTS tool will be discharged in the injection zone and the well shall be flushed with 3 to 5 volumes of effluent. A second background log will be run from the bottom to the top of the well.

MIT Deadlines (sorted by date MIT pressure test due)

SDWWTP MIT Schedule of Completion

Well	Pressure Test	RTS/Video
IW-2	7/13/2013	7/25/2013
IW-1[1]	7/20/2013	7/31/2013
IW-3	7/24/2013	8/7/2013
IW-9[1]	7/30/2013	8/12/2013
IW-10[1]	8/6/2013	8/21/2013
IW-11	8/20/2013	9/3/2013
IW-12	8/25/2013	9/19/2013
IW-14	9/9/2013	9/26/2013
IW-13	9/16/2013	10/6/2013
IW-4	9/25/2013	10/14/2013
IW-6	9/30/2013	10/20/2013
IW-5	10/19/2013	10/27/2013
IW-7[2]	10/26/2013	1/7/2014
IW-8	11/2/2013	11/12/2013
IW-17	11/11/2013	11/19/2013
IW-16	11/18/2013	12/9/2013
IW-15	12/3/2013	12/16/2013

NOTES:
1.The original video was not clear enough and therefore a new video was done at the end of the MITs at SDWWTP.
2.The Computer failed during the RTS, because the Iodine 131 had already been injected, FDEP and DOH required 46 days b/f the RTS could be redone.

NDWWTP MIT Schedule of Completion

Well	Pressure Test	RTS/Video
IW-1N	3/14/2014	3/26/2014
IW-2N	3/25/2014	4/9/2014
IW-3N	4/2/2014	4/17/2014
IW-4N	4/9/2014	4/24/2014

REPAIR PLAN:

The following repair plans apply to wells at SDWWTP and NDWWTP.

1. Kill well and remove 24 inch gate valve and 4 inch bypass valves. Remove 1 inch pressure transmitter line and weld hold closed. Please see drawings included in below.

2. Sand existing casing in concrete pits and coat with Bitumastic. Please see drawings included in below.

3. Chip concrete around outer casing 1 inch deep, in order to embed PVC sleeve. Please see drawings included in below.

4. Install C905 PVC sleeve around casing pipe, embed 1 inch deep and fill annular space with grout, using Type II Neat cement. Slope top edge to create 30 degree watershed and seal at edges with sealant. Please see drawings included in below.

5. Relocate 1 inch pressure transmitter as indicated in drawings. Weld the hole. Please see drawings included in below.

6. At the NDWWTP IW-1N, IW-3N and IW-4N install new magmeters with any necessary spool pieces to be field determined. Please see drawings included in below.

7. Reassemble wellheads including installation of new 24 inch butterfly valve on horizontal part of well. Mega flanges will be used to ensure the layout of the pipe and the vales match. Please see drawings included in below.

8. On IW-4N at NDWWTP, install electric actuator for butterfly valve at base of injection well. Please see drawings included in below.

Appendix B

FDEP Approval of MIT Plan for SDWWTP and NDWWTP

November 26, 2012

Villamil, Sonia (WASD)

From: May, Joseph [redacted]
Sent: Monday, November 26, 2012 2:40 PM
To: Villamil, Sonia (WASD)
Cc: Vandor, Heidi; Silverman, Mark; Walsh, Virginia (WASD); Goldenberg, Bertha M. (WASD); Fallon Jr., Howard J. (WASD); Arrebola, Vicente (WASD); Macfarlane, Maria (WASD); Oakley, Clint (WASD)
Subject: RE: MDWASD MIT and Repair Plan Submittal

Importance: High

Hello all,

The Department approves the plan with the following understandings:

1) Medicinal grade I-131 should be specified since this solution is filtered to reduce precipitate material, as opposed to regular grade I-131, in the vial causing a tool malfunction. It has been our experience that an activity of ~1mCi/ml has been the easiest to work with in the field.
2) Please contact me a minimum of three days prior to mobilization to each site. Due to the travel time from West Palm Beach to the sites close coordination would be appreciated between myself and a designated contact person from the utility so that each pressure and RTS can be witnessed.

Thank you,

Joe

Please take a few minutes to share your comments on the service you received from the department by clicking on this link. DEP Customer Survey.

From: Villamil, Sonia (WASD) [mailto:[redacted]
Sent: Wednesday, October 17, 2012 9:42 AM
To: May, Joseph
Cc: Vandor, Heidi; Silverman, Mark; Walsh, Virginia (WASD); Goldenberg, Bertha M. (WASD); Fallon Jr., Howard J. (WASD); Arrebola, Vicente (WASD); Macfarlane, Maria (WASD); Oakley, Clint (WASD)
Subject: MDWASD MIT and Repair Plan Submittal

Hello Mr. May,

The MDWASD respectfully submits the attached MIT testing and repair plan for your approval. The paper copy is being sent via regular mail as well.

Thank you,

Sonia Villamil
Engineer II
Miami Dade Water and Sewer Department
3071 SW 38th Ave Room 554-8
Miami, FL 33146
[redacted]
fax: 786-552-8640
miamidade.gov

Appendix C

Field Notes from tests including gauge certification and pressure charts.

MIAMI-DADE WATER AND SEWER DEPARTMENT

MECHANICAL INTEGRITY TESTING OF DEEP INJECTION WELLS AND ASSOCIATED SERVICES

BID NO.: RPQ P0086

PRESSURE TEST IW - 8

August 8, 2013

TIME	CASING PRESSURE (psi)	PACKER PRESSURE (psi)
8:42	153.5	380
8:47	153	380
8:52	153	380
8:57	152.5	380
9:02	152	380
9:07	152	380
9:12	152	380
9:17	151.5	380
9:22	151	380
9:27	150.5	380
9:32	150.5	380
9:37	150	380
9:42	150	380

MIAMI-DADE WATER AND SEWER DEPARTMENT

MECHANICAL INTEGRITY TESTING OF DEEP INJECTION WELLS AND ASSOCIATED SERVICES

BID NO.: RPQ P0086

PRESSURE TEST IW - 8

WITNESS LIST

August 8, 2013

NAME	SIGNATURE	COMPANY/AGENCY	TELEPHONE
Joe May	[redacted]	FDEP/SWD	[redacted]
Maria MacFarlan		WASD	
Sonia Villamil		WASD	
Michael Asto		WASD	
CHRIS HARP		YBI	

MIAMI-DADE WATER AND SEWER DEPARTMENT

MECHANICAL INTEGRITY TESTING OF DEEP INJECTION WELLS AND ASSOCIATED SERVICES

BID NO.: RPQ P0086

BREAK OFF TEST IW - 8

August 8, 2013

GALLONS	CASING PRESSURE (psi)	PACKER PRESSURE (psi)
0	150	380-
5	122	360+
10	90	360
15	68	350
20	47	340
25	15	330
~~30~~ 28.5	0	320

Top of Packer: 2409 **feet**

Bottom of Casing: 2420 **feet**

IW-8

Sensor/Session information			
SensorSN	**21325011**		**Modbus Addr.**
Sensor Type	**PT2X**		**Initialized w/fw Rev**
Sensor Name	**INW Smart Sensor**		**Uploaded**
Session Name	**1MIN**		**Exported**
# Records	**180**		

Statistical Data		Temperature(degF)	Pressure(psi)
	Sensor Range	-40 - +125 degC	300 psia
	Minimum	73.5	13.538
	Maximum	92.2	153.857
	Mean	83.4	72.952
	Std Deviation	5.81	71.3575

Rec #	Date/Time	Temperature(degF)	Pressure(psi)
1	8/8/2013 8:40:17	85.4	153.857
2	8/8/2013 8:41:17	85.8	153.774
3	8/8/2013 8:42:17	85.8	153.713
4	8/8/2013 8:43:17	86.1	153.66
5	8/8/2013 8:44:17	86.1	153.59
6	8/8/2013 8:45:17	86	153.509
7	8/8/2013 8:46:17	85.9	153.449
8	8/8/2013 8:47:17	86.2	153.386
9	8/8/2013 8:48:17	87	153.31
10	8/8/2013 8:49:17	87.6	153.246
11	8/8/2013 8:50:17	87.9	153.173
12	8/8/2013 8:51:17	88.2	153.1
13	8/8/2013 8:52:17	88.1	153.019
14	8/8/2013 8:53:17	87.9	152.96
15	8/8/2013 8:54:17	87.9	152.899
16	8/8/2013 8:55:17	88.1	152.827
17	8/8/2013 8:56:17	88.2	152.745
18	8/8/2013 8:57:17	88.2	152.684
19	8/8/2013 8:58:17	88.4	152.633
20	8/8/2013 8:59:17	88.6	152.561
21	8/8/2013 9:00:17	88.6	152.49
22	8/8/2013 9:01:17	88.4	152.431
23	8/8/2013 9:02:17	88.6	152.358
24	8/8/2013 9:03:17	88.6	152.298
25	8/8/2013 9:04:17	88.7	152.226
26	8/8/2013 9:05:17	88.8	152.154
27	8/8/2013 9:06:17	89	152.052
28	8/8/2013 9:07:17	88.9	152.032
29	8/8/2013 9:08:17	88.8	151.942

30	8/8/2013 9:09:17	88.8	151.891
31	8/8/2013 9:10:17	89	151.819
32	8/8/2013 9:11:17	89	151.758
33	8/8/2013 9:12:17	89	151.677
34	8/8/2013 9:13:17	89	151.616
35	8/8/2013 9:14:17	89	151.555
36	8/8/2013 9:15:17	89	151.485
37	8/8/2013 9:16:17	89	151.414
38	8/8/2013 9:17:17	89	151.353
39	8/8/2013 9:18:17	89	151.272
40	8/8/2013 9:19:17	88.9	151.212
41	8/8/2013 9:20:17	88.9	151.141
42	8/8/2013 9:21:17	89	151.079
43	8/8/2013 9:22:17	89	151.019
44	8/8/2013 9:23:17	89.3	150.946
45	8/8/2013 9:24:17	89.5	150.884
46	8/8/2013 9:25:17	89.6	150.813
47	8/8/2013 9:26:17	89.7	150.741
48	8/8/2013 9:27:17	89.8	150.67
49	8/8/2013 9:28:17	89.8	150.609
50	8/8/2013 9:29:17	89.6	150.539
51	8/8/2013 9:30:17	89.4	150.48
52	8/8/2013 9:31:17	89.4	150.419
53	8/8/2013 9:32:17	89.3	150.349
54	8/8/2013 9:33:17	89.3	150.298
55	8/8/2013 9:34:17	89.5	150.216
56	8/8/2013 9:35:17	89.5	150.155
57	8/8/2013 9:36:17	89.7	150.083
58	8/8/2013 9:37:17	89.9	150.031
59	8/8/2013 9:38:17	90.4	149.947
60	8/8/2013 9:39:17	90.5	149.886
61	8/8/2013 9:40:17	90.5	149.825
62	8/8/2013 9:41:17	90.2	140.429
63	8/8/2013 9:42:17	89.6	121.229
64	8/8/2013 9:43:17	88.9	118.792
65	8/8/2013 9:44:17	88.6	122.399
66	8/8/2013 9:45:17	88.4	109.79
67	8/8/2013 9:46:17	88.2	99.024
68	8/8/2013 9:47:17	88.1	95.439
69	8/8/2013 9:48:17	87.9	95.4
70	8/8/2013 9:49:17	87.8	63.627
71	8/8/2013 9:50:17	87.8	68.519
72	8/8/2013 9:51:17	87.7	54.856
73	8/8/2013 9:52:17	87.6	34.751
74	8/8/2013 9:53:17	87.7	42.195
75	8/8/2013 9:54:17	87.8	16.144
76	8/8/2013 9:55:17	87.7	9.287

77	8/8/2013 9:56:17	88	9.571
78	8/8/2013 9:57:17	88.6	3.271
79	8/8/2013 9:58:17	89.1	0.506
80	8/8/2013 9:59:17	89.6	0

Certificate of Calibration

OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

Ozone Industries, Inc.
Precision Measurement Equipment Division

Purchase Order #

Calibration Performed By:
OZONE INDUSTRIES, INC.
15551 PINE RIDGE RD.
FORT MYERS, FL 33908

For:
YOUNGQUIST BROTHERS, INC.
15465 PINE RIDGE RD.
FORT MYERS, FL 33908

EQUIPMENT INFORMATION:

Description: PRESSURE GAUGE
Manufacter: MCDANIELS
Model Number: 300PSI
Part Number: N/A
Range: 0-300 PSI

Serial Number: 972062-1
Customer I.D.:
Cust. Barcode: N/A
Cust. Location: N/A
Specifications: +/- 0.25% FS

Cal Date: 6/6/2013
Cal. Due Date: 8/5/2013
Cal. Interval 60 DAYS
Received: IN TOLERANCE
Calibration Result: PASS
Environmental Conditions: 74 DEG F / 20% H
Performed By: Daniel McKissick

Procedure: STANDARD

This is to certify that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure at the points tested (unless otherwise noted). It has been Calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration is in accordance with Ozone Industries, Inc Quality Assurance Manual. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

Calibration Remarks:
THIS UNIT WAS FOUND TO BE IN TOLERANCE AT THE TIME OF CALIBRATION.
PERFORMED ROUTINE CALIBRATION / CERTIFICATION

Standards Used to Calibrate Equipment:

Company	I.D.	Description	Last Cal.	Cal. Due Date
OZONE	A1731	EATON UPC5000 PNEUMATIC CALIBRATOR	12/12/2012	12/12/2013

Signatures:

Certified by:
Print: Daniel McKissick
Date: 06/06/13
[redacted]

Approved by:
Print: Daniel McKissick
[redacted]

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ØZONE
INDUSTRIES
CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

PH: 239-433-3400
FAX: 239-489-3877

CONTROL NO: 032509-1

CUSTOMER: YBI15465

CALIBRATION DATA FORM

MFR:	MCDANIELS	**DESCRIPTION**	PRESSURE GAUGE
MODEL NO:	300 PSI .25%	**TECHNICIAN:**	0030
SERIAL NO:	972062-1	**CAL. DATE:**	06/06/13
CUST. ID:	N/A	**DUE DATE:**	08/05/13

* IF NO "AS LEFT" READING IS SHOWN ON THIS CHART, IT MEANS THE UNIT WAS IN TOLERANCE AND THERE WERE NO ADJUSTMENTS MADE TO IT.

RANGE: 0-300 PSI

NOMINAL	AS FOUND	AS LEFT *	LOW LIMIT	HIGH LIMIT
50	50.26		49.25	50.75
100	100.31		99.25	100.75
150	150.38		149.25	150.75
200	200.49		199.25	200.75
300	300.6		299.25	300.75

Certificate of Calibration

OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

Ozone Industries, Inc.
Precision Measurement Equipment Division

Purchase Order #

Calibration Performed By:
OZONE INDUSTRIES, INC.
15551 PINE RIDGE RD.
FORT MYERS, FL 33908

For:
YOUNGQUIST BROTHERS, INC.
15465 PINE RIDGE RD.
FORT MYERS, FL 33908

EQUIPMENT INFORMATION:

Description: PRESSURE GAUGE
Manufacter: McDaniel
Model Number: 300PSI
Part Number: N/A
Range: 0-300 PSI

Serial Number: 972034-2
Customer I.D.:
Cust. Barcode: N/A
Cust. Location: N/A
Specifications: +/- 0.25% FS

Cal Date: 5/17/2013
Cal. Due Date: 11/17/2013
Cal. Interval 6 MONTHS
Received: IN TOLERANCE
Calibration Result: PASS
Environmental Conditions: 74 DEG F / 80% H
Performed By: Daniel McKissick

Procedure: STANDARD

This is to certify that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure at the points tested (unless otherwise noted). It has been Calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration is in accordance with Ozone Industries, Inc Quality Assurance Manual. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

Calibration Remarks:
THIS UNIT WAS FOUND TO BE IN TOLERANCE AT THE TIME OF CALIBRATION.
PERFORMED ROUTINE CALIBRATION / CERTIFICATION

Standards Used to Calibrate Equipment:

Company	I.D.	Description	Last Cal.	Cal. Due Date
OZONE	A1731	EATON UPC5000 PNEUMATIC CALIBRATOR	12/12/2012	12/12/2013

Signatures:

Certified by:
Print: Daniel McKissick
[redacted]

Approved by:
Print: Daniel McKissick
Date: [redacted] 05/17/13
[redacted]

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ØZONE
INDUSTRIES
CORPORATION

15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

PH: 239-433-3400
FAX: 239-489-3877

CONTROL NO: 100809-7

CUSTOMER: YBI15465

CALIBRATION DATA FORM

MFR:	PIC	**DESCRIPTION**	PRESSURE GAUGE
MODEL NO:	300 PSI .25%	**TECHNICIAN:**	0030
SERIAL NO:	972034-2	**CAL. DATE:**	05/17/13
CUST. ID:	N/A	**DUE DATE:**	11/17/13

* IF NO "AS LEFT" READING IS SHOWN ON THIS CHART, IT MEANS THE UNIT WAS IN TOLERANCE AND THERE WERE NO ADJUSTMENTS MADE TO IT.

RANGE: 0-300 PSI

NOMINAL	AS FOUND	AS LEFT *	LOW LIMIT	HIGH LIMIT
50	49.59		49.25	50.75
100	99.47		99.25	100.75
150	149.45		149.25	150.75
200	199.43		199.25	200.75
300	299.4		299.25	300.75

Certificate of Calibration

OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

Ozone Industries, Inc.
Precision Measurement Equipment Division

Purchase Order #

Calibration Performed By:
OZONE INDUSTRIES, INC.
15551 PINE RIDGE RD.
FORT MYERS, FL 33908

For:
YOUNGQUIST BROTHERS, INC.
15465 PINE RIDGE RD.
FORT MYERS, FL 33908

EQUIPMENT INFORMATION:

Description: PRESSURE GAUGE
Manufacter: MCDANIELS
Model Number: 300PSI
Part Number: N/A
Range: 0-300 PSI

Serial Number: AB30128
Customer I.D.:
Cust. Barcode: N/A
Cust. Location: N/A
Specifications: +/- 0.25% FS

Cal Date: 6/17/2013
Cal. Due Date: 12/17/2013
Cal. Interval 6 MONTHS
Received: IN TOLERANCE
Calibration Result: PASS
Environmental Conditions: 73 DEG F / 40% H
Performed By: Daniel McKissick

Procedure: STANDARD

This is to certify that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure at the points tested (unless otherwise noted). It has been Calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration is in accordance with Ozone Industries, Inc Quality Assurance Manual. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

Calibration Remarks:
THIS UNIT WAS FOUND TO BE IN TOLERANCE AT THE TIME OF CALIBRATION.
PERFORMED ROUTINE CALIBRATION / CERTIFICATION

Standards Used to Calibrate Equipment:

Company	I.D.	Description	Last Cal.	Cal. Due Date
OZONE	A1731	EATON UPC5000 PNEUMATIC CALIBRATOR	12/12/2012	12/12/2013

Signatures:

Certified by:
Print: Daniel McKissick
Date: 06/17/13
[redacted]

Approved by:
Print: Daniel McKissick
Date: 06/17/13
[redacted]

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OZONE
INDUSTRIES
CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

PH: 239-433-3400
FAX: 239-489-3877

CONTROL NO: 080709-2

CUSTOMER: YBI15465

CALIBRATION DATA FORM

MFR:	MCDANIELS	**DESCRIPTION**	PRESSURE GAUGE
MODEL NO:	300 PSI .25%	**TECHNICIAN:**	0030
SERIAL NO:	AB30128	**CAL. DATE:**	06/17/13
CUST. ID:	N/A	**DUE DATE:**	12/17/13

* IF NO "AS LEFT" READING IS SHOWN ON THIS CHART, IT MEANS THE UNIT WAS IN TOLERANCE AND THERE WERE NO ADJUSTMENTS MADE TO IT.

RANGE: 0-200 PSI

NOMINAL	AS FOUND	AS LEFT *	LOW LIMIT	HIGH LIMIT
50	50.18		49.25	50.75
100	100.19		99.25	100.75
150	150.22		149.25	150.75
200	200.31		199.25	200.75
250	250.33		249.25	250.75
300	300.39		299.25	300.75

Appendix D

RTS and RTS Tool Configuration

RADIOACTIVE TRACER SURVEY LOG

Company SOUTH MIAMI-DADE W.W.T.P.
Well IW-8
Field S.D.W.W.T.P.
County MIAMI-DADE State FLORIDA

Company SOUTH MIAMI-DADE W.W.T.P.
Well IW-8
Field S.D.W.W.T.P.
County MIAMI-DADE
State FLORIDA

Location: API # :

SEC TWP RGE

Other Services

Elevation

Permanent Datum	PAD	Elevation	PAD
Log Measured From	PAD		
Drilling Measured From	PAD		

K.B.
D.F.
G.L.

Date	13-AUG-2013		
Run Number	2013 MIT		
Depth Driller	3112'		
Depth Logger	2912'		
Bottom Logged Interval	2912'		
Top Log Interval	SURFACE		
Open Hole Size	22"		
Type Fluid	WATER		
Density / Viscosity	NA		
Max. Recorded Temp.	NA		
Estimated Cement Top	NA		
Time Well Ready	ON ARRIVAL		
Time Logger on Bottom	ON ARRIVAL		
Equipment Number	102		
Location	FT MYERS		
Recorded By	RIVES	A.GARCIA	
Witnessed By	S. VILLAMIL		

Borehole Record				Borehole Record			
Run Number	Bit	From	To	Run No	Bit	From	To

Casing Record	Size	Wgt/Ft	Top	Bottom
Surface String				
Prot. String				
Production String	24"	.500" W.T.	SURFACE	2424'
Liner				

<< Fold Here >>>

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

Comments

HIGH RESOLUTION TEMPERATURE

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)

GR#3	24.00				
		GR #3 -RTST (951T)	11.50	1.69	30.00
		TREJCT-A (951)	1.00	1.69	10.00
		GR #2 -RTSM (951M)	3.00	1.69	10.00
GR#2	10.50				
CCL	9.60	CCL-1.68GRRTS (951)	0.75	1.69	10.00
		GR-RTSB (951B)	9.25	1.69	10.00
GR	1.20				

Dataset:	sdwwtp-iw-8.db: field/well/run1/pass2
Total Length:	25.50 ft
Total Weight:	70.00 lb
O.D.	1.69 in

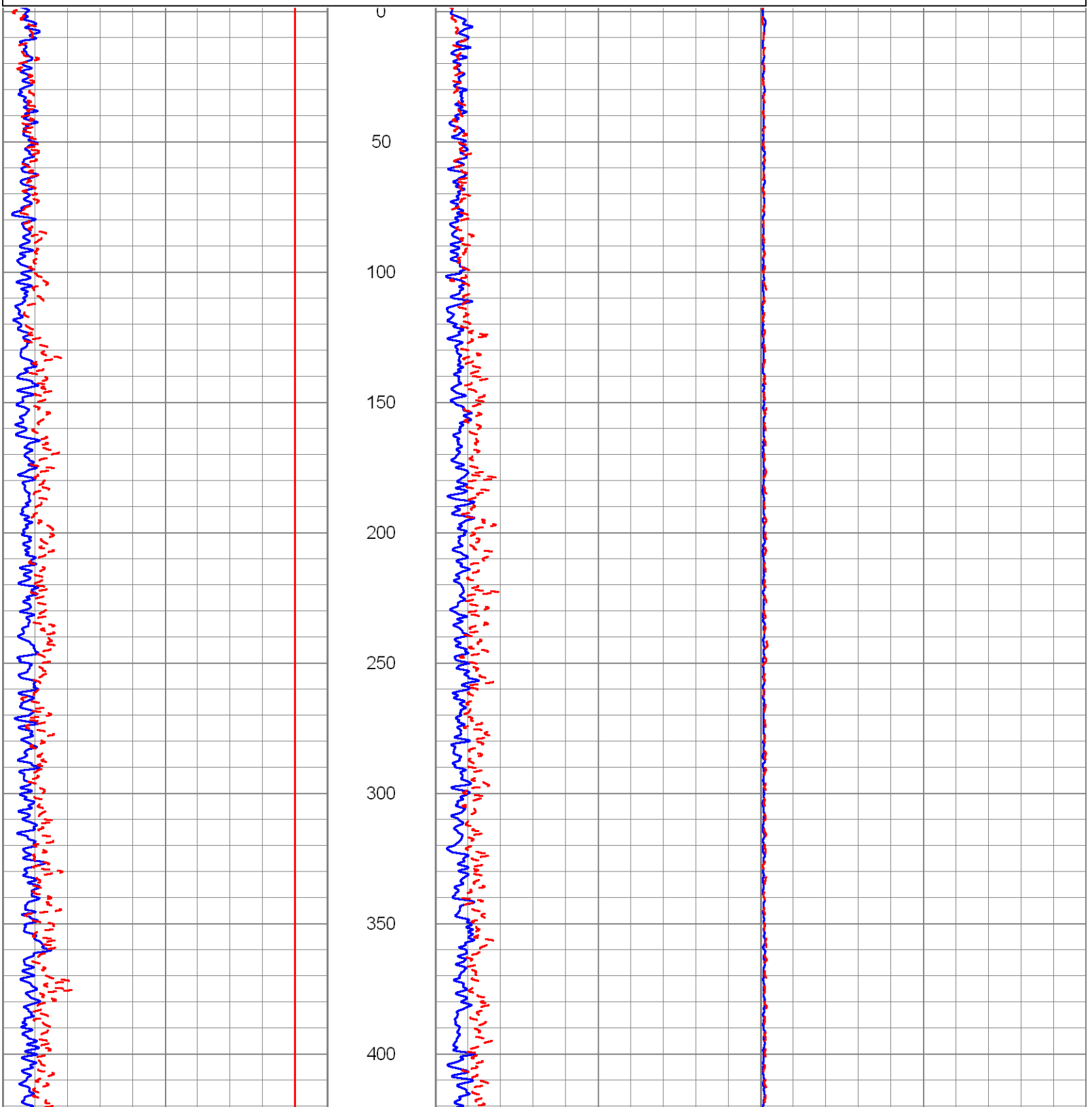
YOUNGQUIST

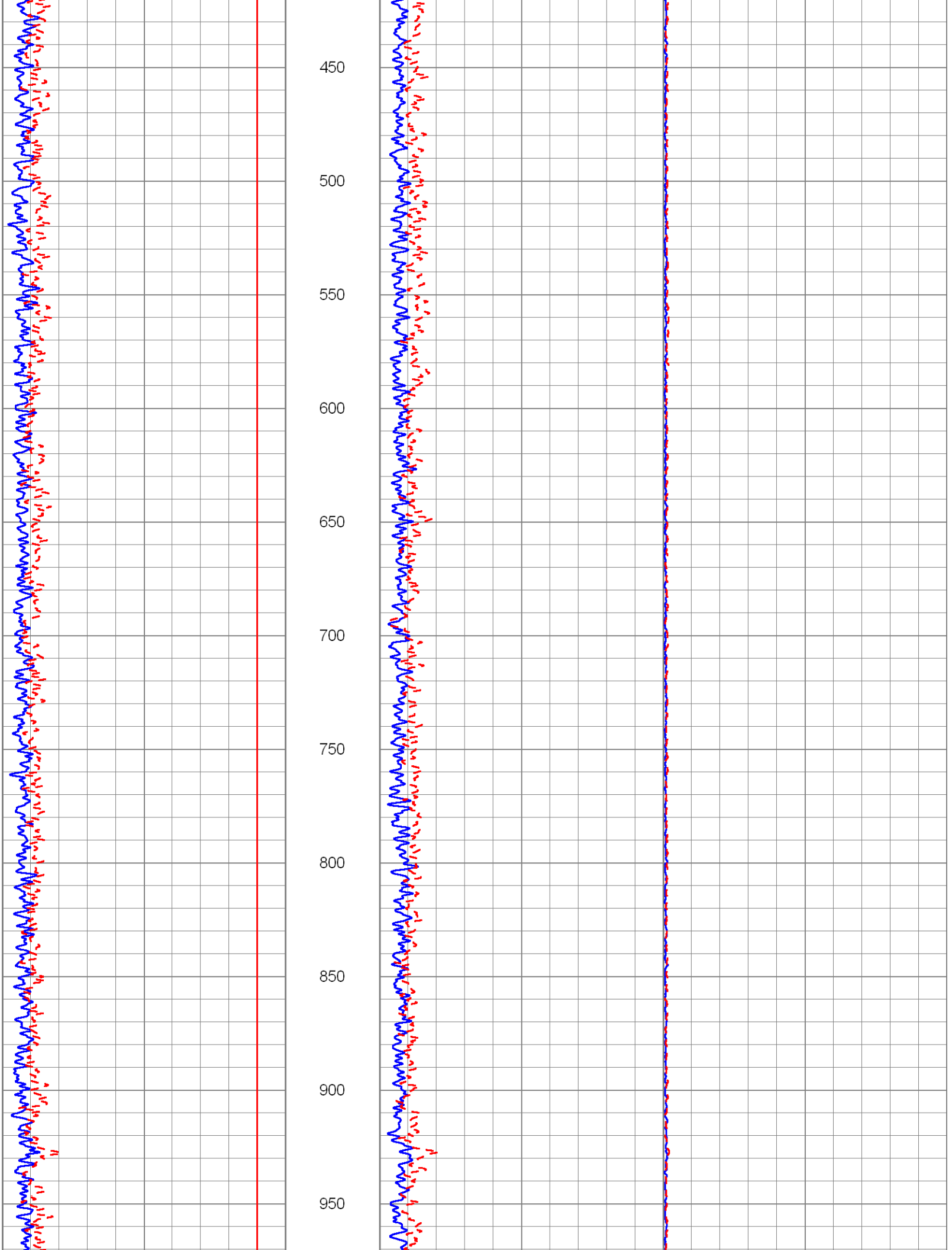
FINAL BACKGROUND

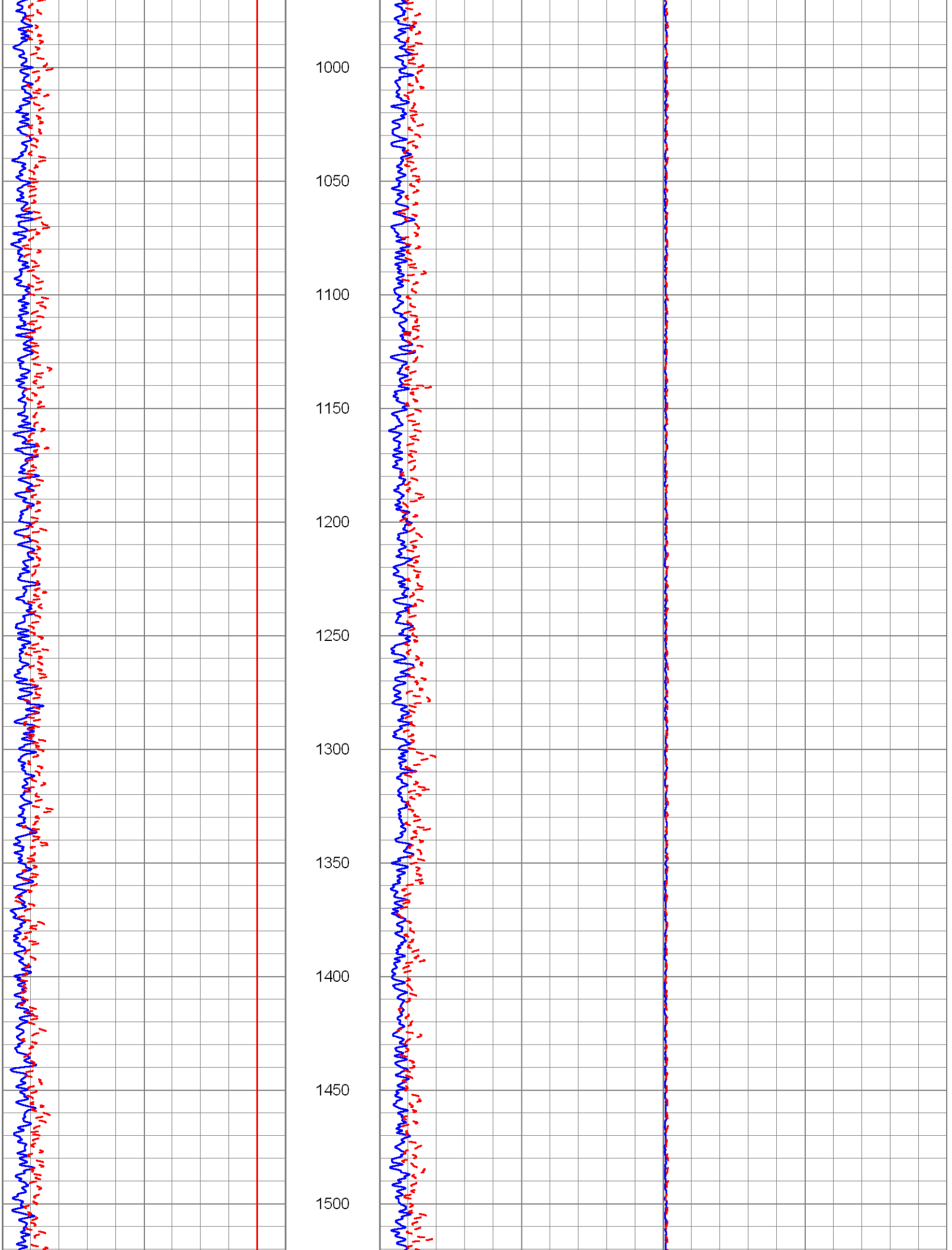
FINAL BACKGROUND

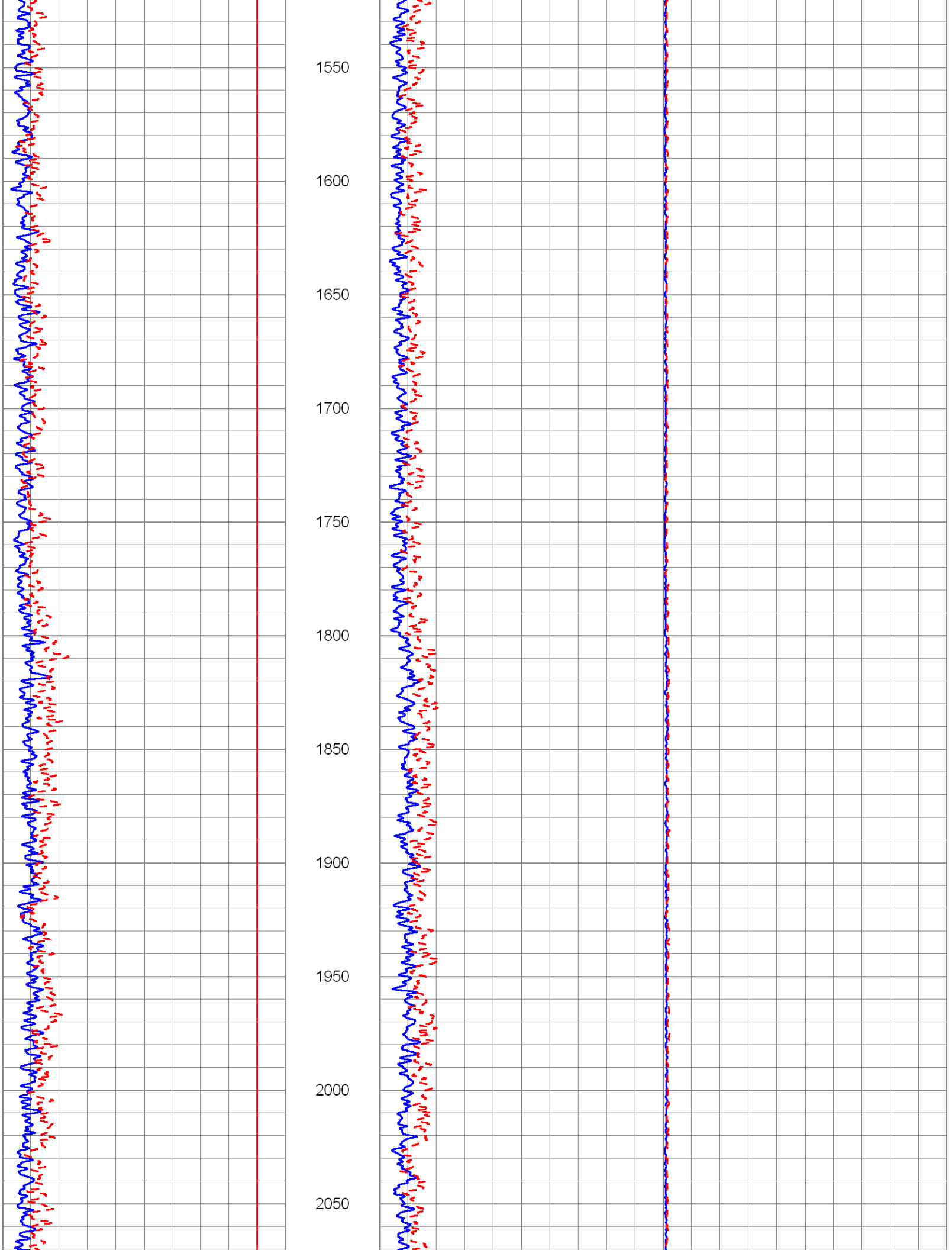
Database File:	sdwwtp-iw-8.db
Dataset Pathname:	pass16
Presentation Format:	rts
Dataset Creation:	Tue Aug 13 15:04:55 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:600

0	GRT (GAPI)	100	0	GRB (GAPI)	100	0	GRM (GAPI) 1000
0	GRT-BACKGRND (GAPI)	100	0	GRB-BACKGRD (GAPI)	100	0	GRM-BACKGRND (GAPI) 1000
0.9	CCL	-0.1					




450
500
550
600
650
700
750
800
850
900
950


1000
1050
1100
1150
1200
1250
1300
1350
1400
1450
1500


1550
1600
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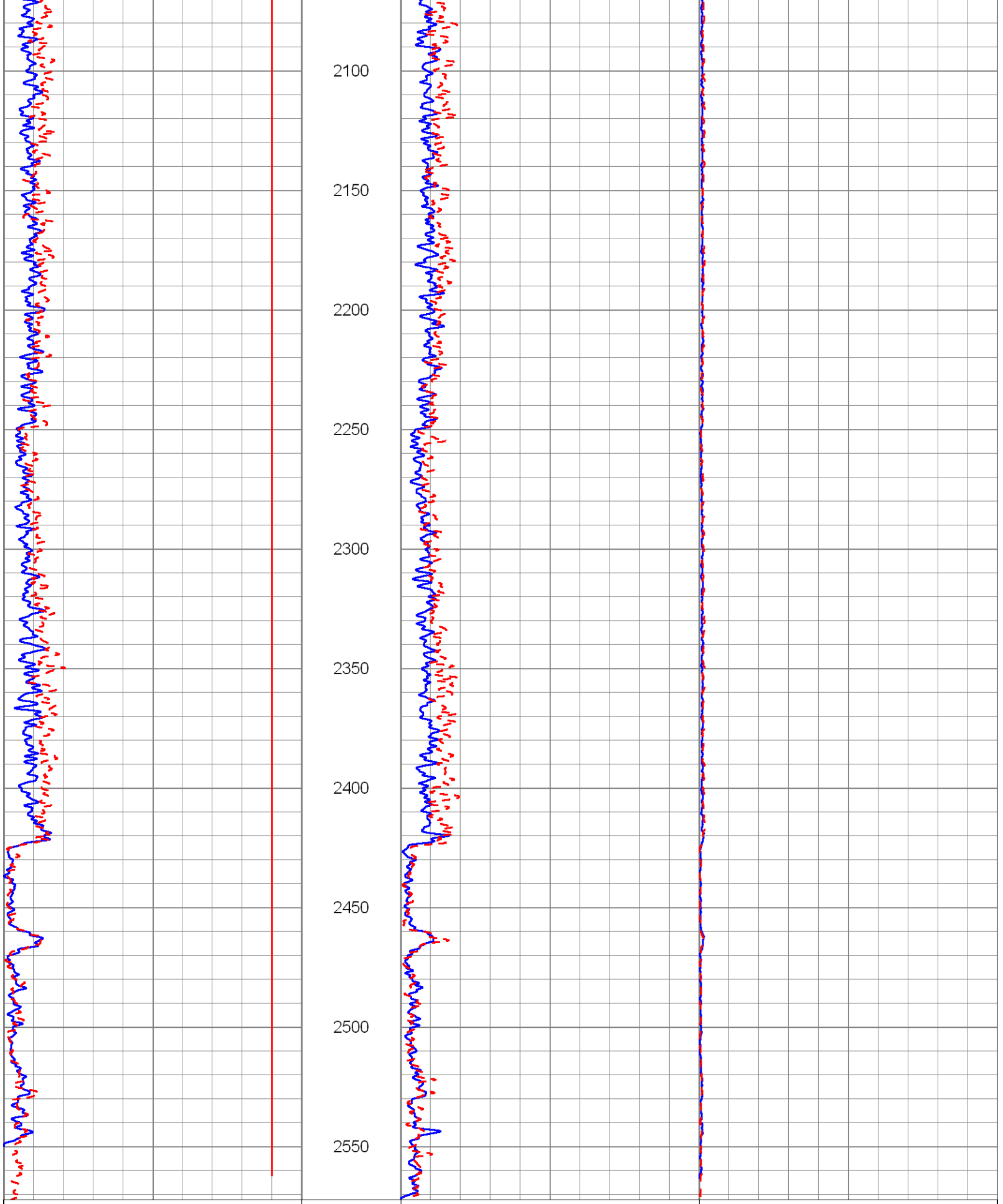
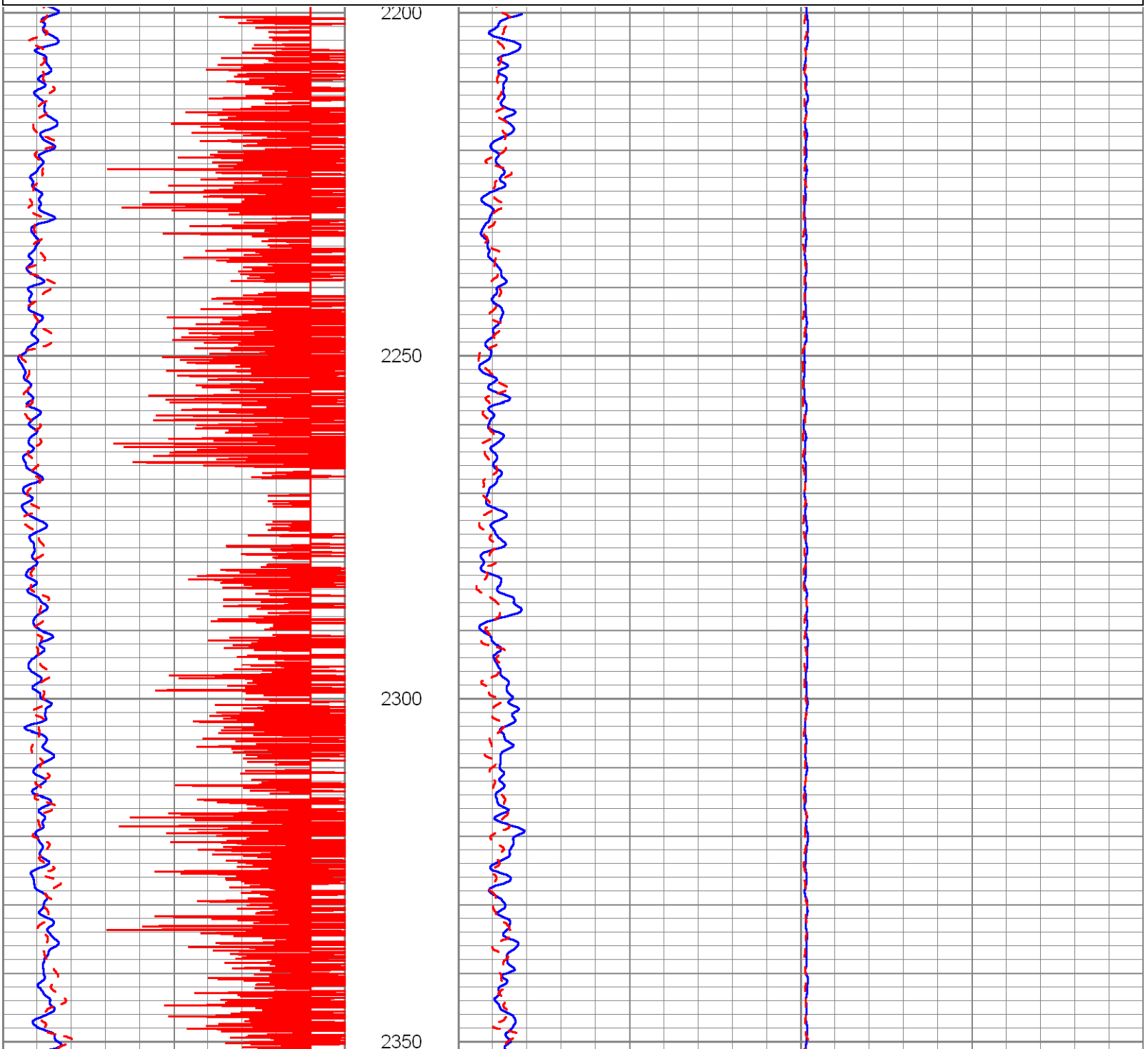
1700
1750
1800
1850
1900
1950
2000
2050

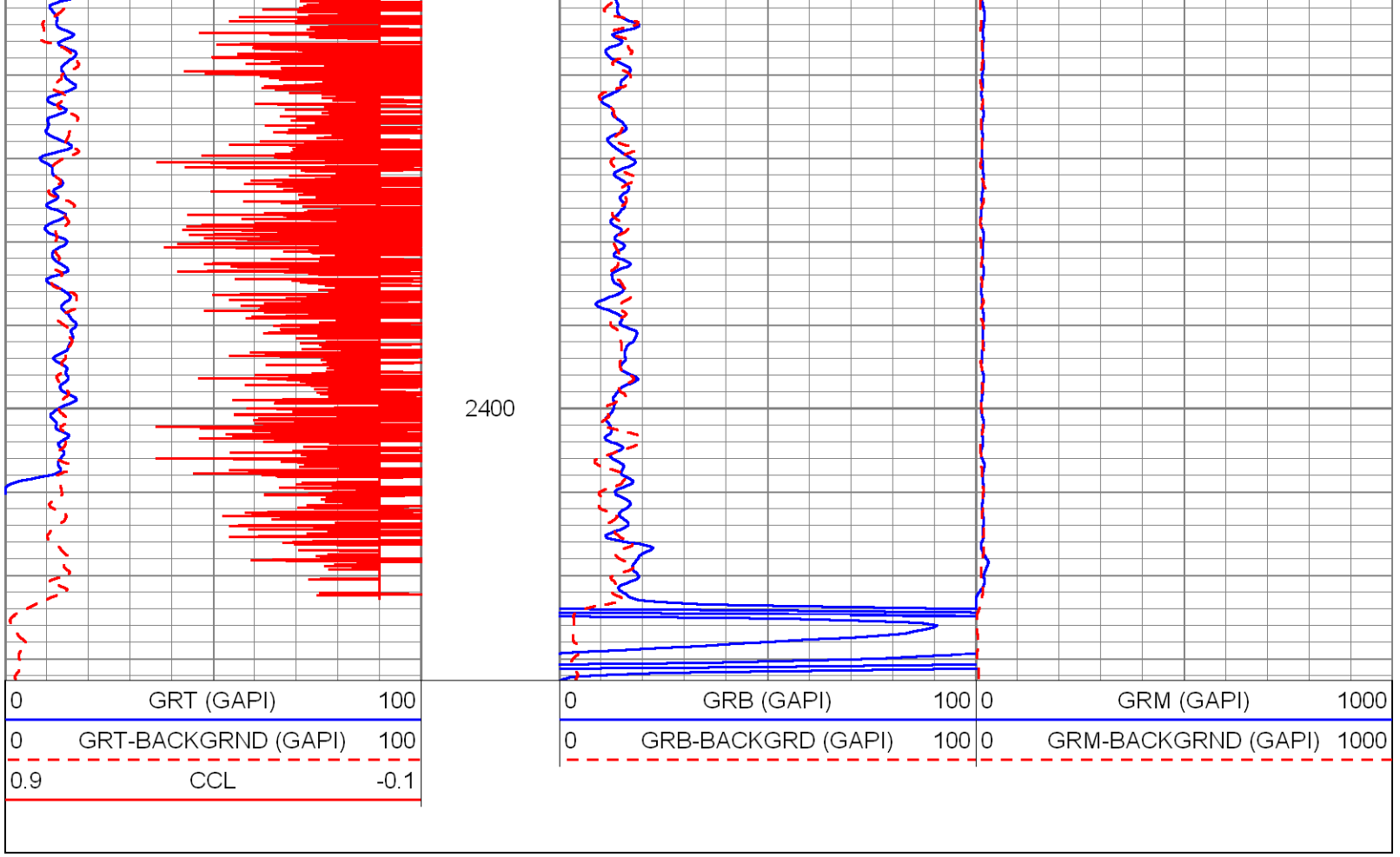

2100
2150
2200
2250
2300
2350
2400
2450
2500
2550
0 GRT (GAPI) 100
0 GRT-BACKGRND (GAPI) 100
0.9 CCL -0.1
0 GRB (GAPI) 100
0 GRB-BACKGRD (GAPI) 100
0 GRM (GAPI) 1000
0 GRM-BACKGRND (GAPI) 1000

LOP #2

Database File:	sdwwtp-iw-8.db
Dataset Pathname:	pass14
Presentation Format:	rts
Dataset Creation:	Tue Aug 13 14:38:52 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:240

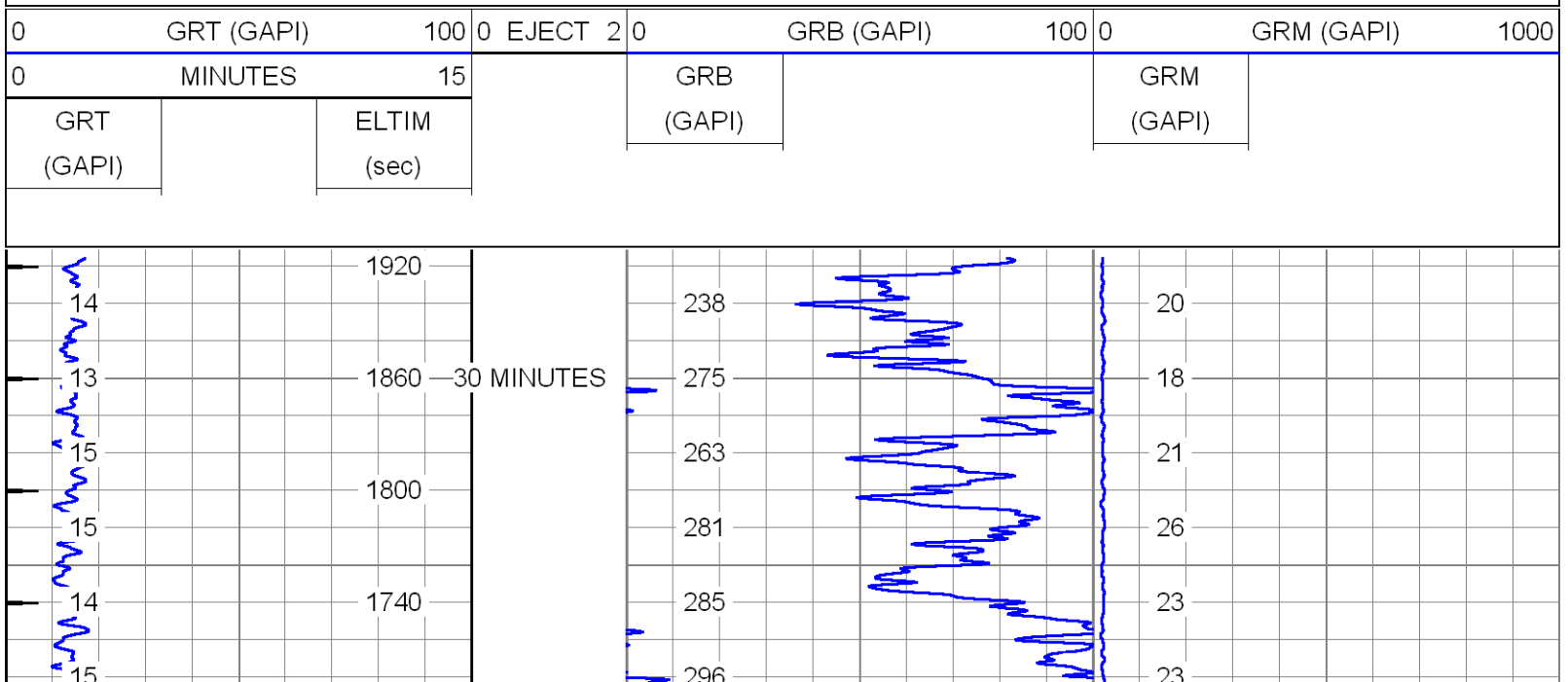
0	GRT (GAPI)	100	0	GRB (GAPI)	100	0	GRM (GAPI) 1000
0	GRT-BACKGRND (GAPI)	100	0	GRB-BACKGRD (GAPI)	100	0	GRM-BACKGRND (GAPI) 1000
0.9	CCL	-0.1					

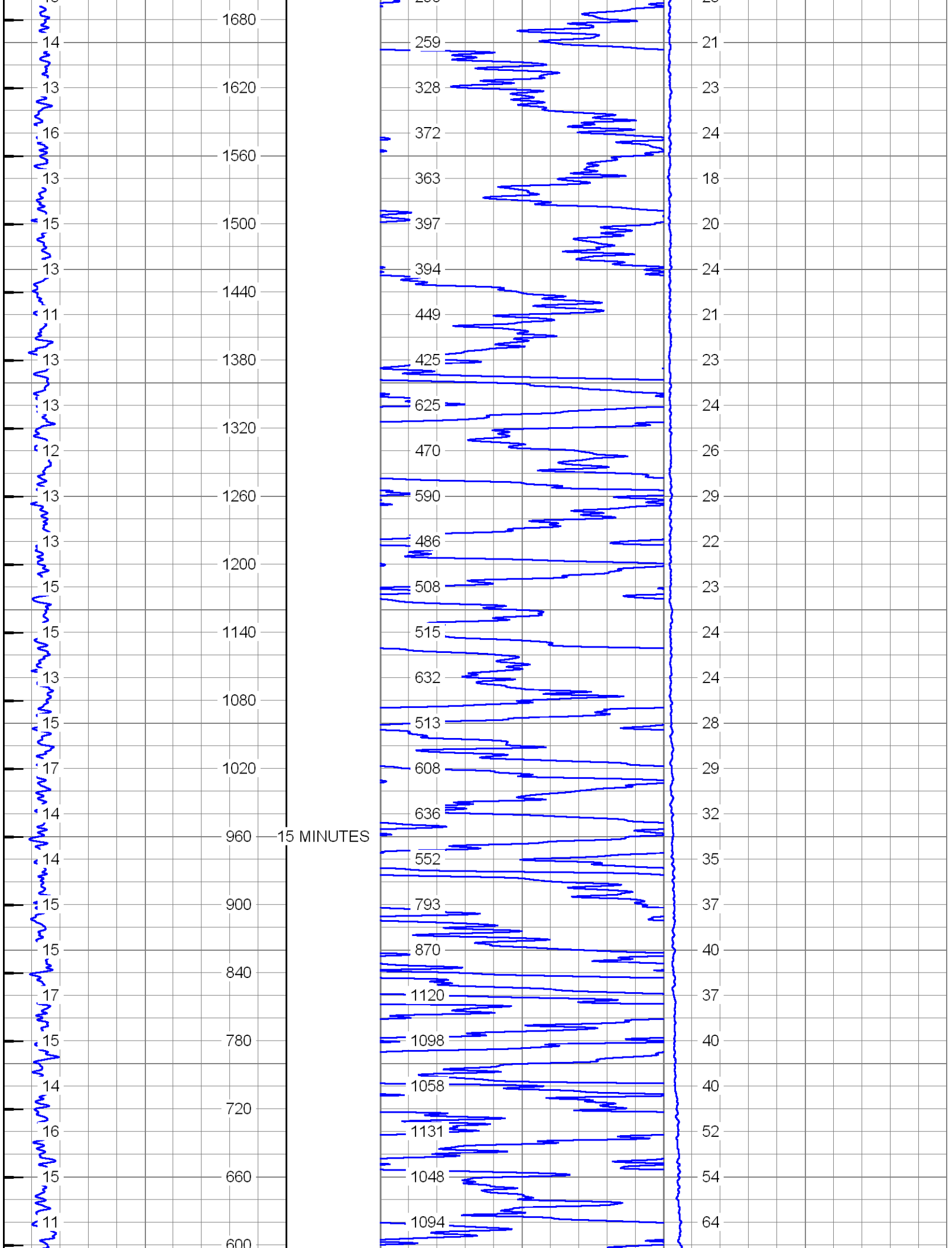




DYNAMIC TEST #2 (92 GPM)

Database File:	sdwwtp-iw-8.db
Dataset Pathname:	pass12
Presentation Format:	rtstime
Dataset Creation:	Tue Aug 13 14:04:44 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:600

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1620
1560
1500
1440
1380
1320
1260
1200
1140
1080
1020
960
15 MINUTES
900
840
780
720
660
600
14
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16
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12
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14
16
15
11
259
328
372
363
397
394
449
425
625
470
590
486
508
515
632
513
608
636
552
793
870
1120
1098
1058
1131
1048
1094
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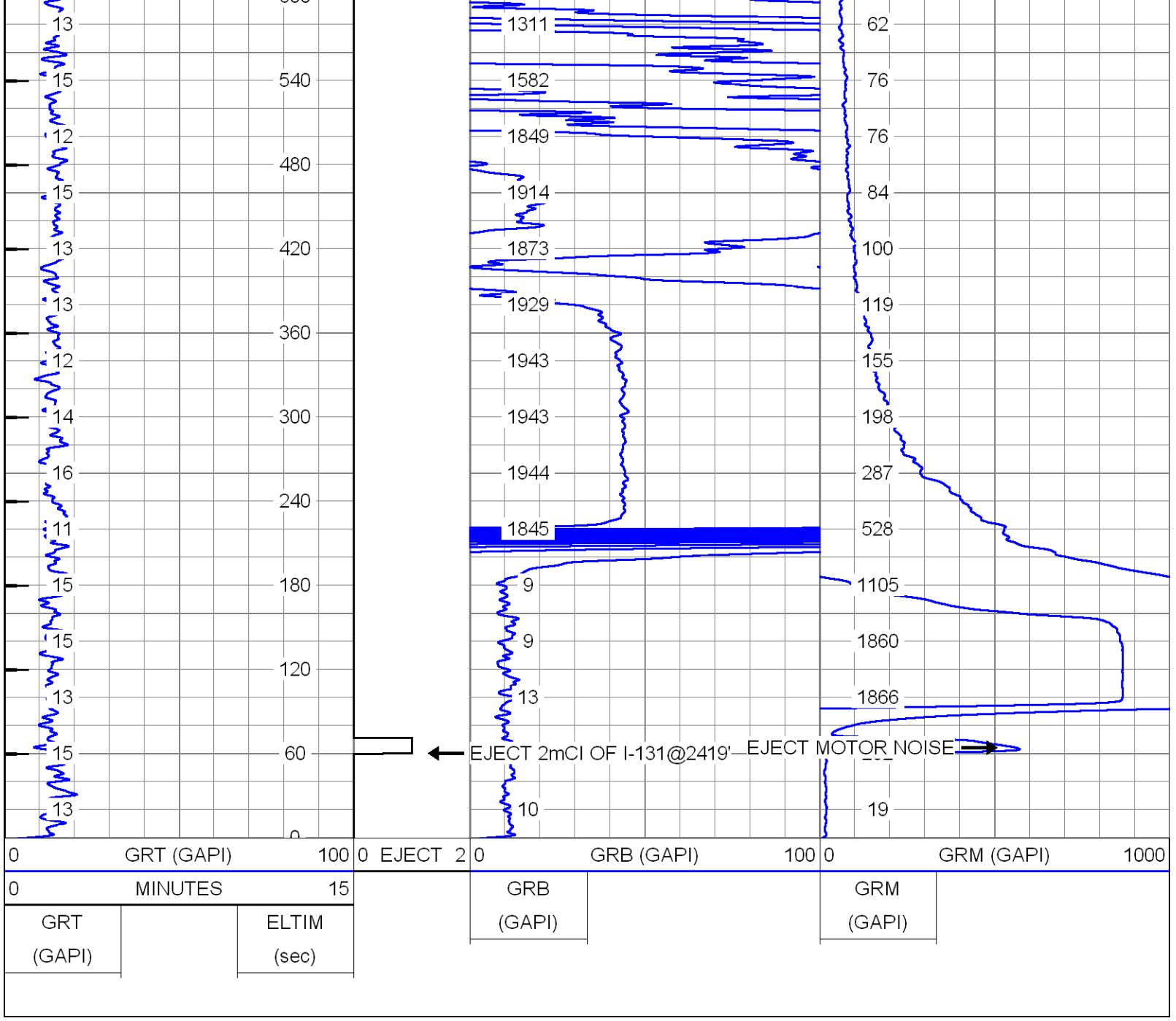
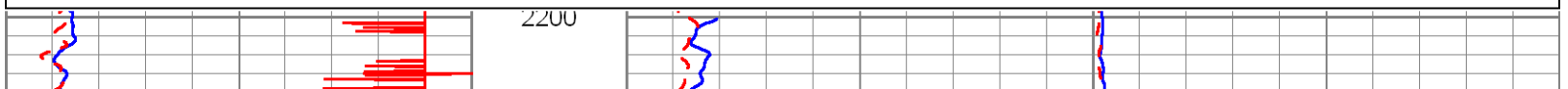
52
54
64

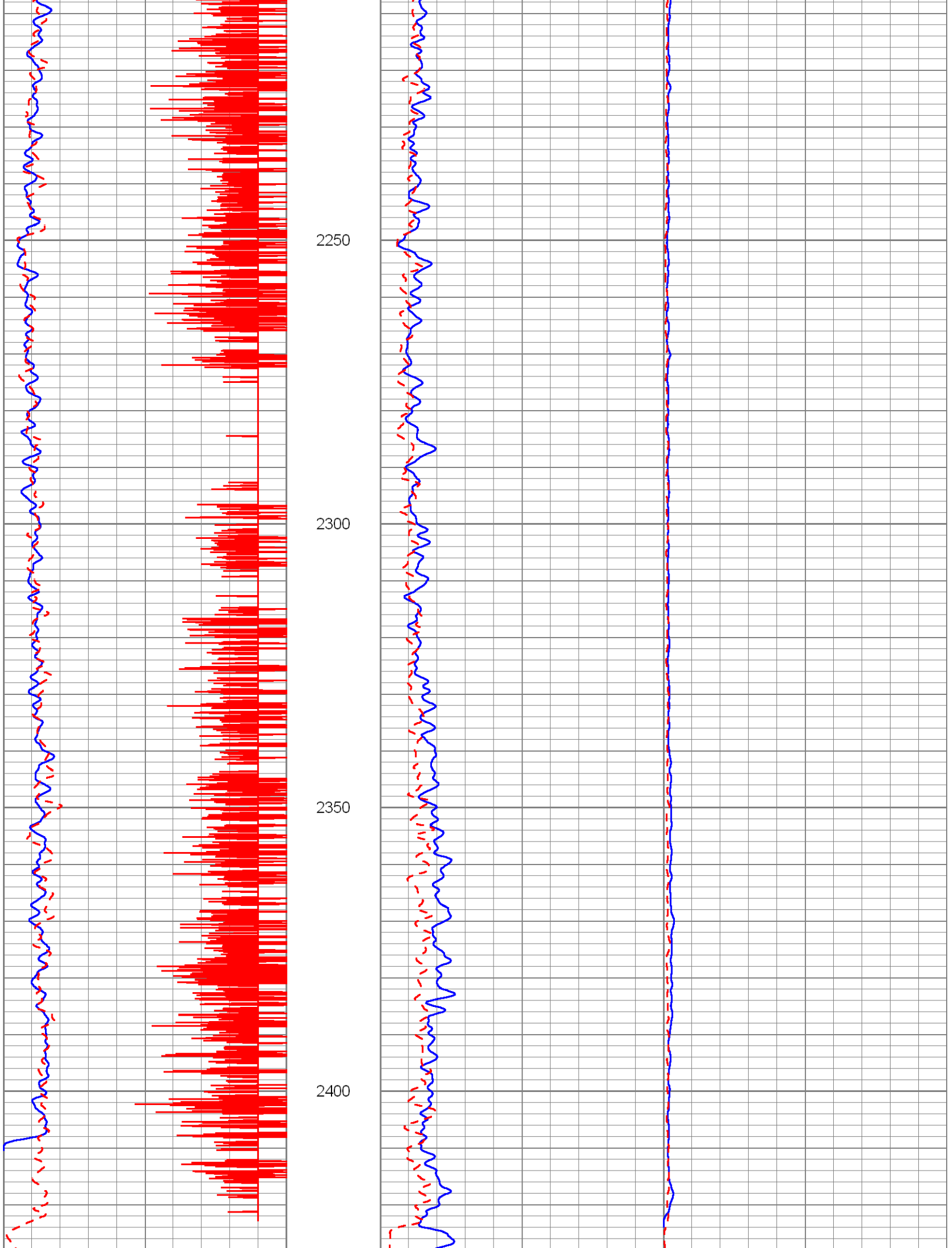


LOP #1

Database File:	sdwwtp-iw-8.db
Dataset Pathname:	pass10
Presentation Format:	rts
Dataset Creation:	Tue Aug 13 13:44:29 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:240

0	GRT (GAPI)	100		0	GRB (GAPI)	100	0	GRM (GAPI) 1000
0	GRT-BACKGRND (GAPI)	100		0	GRB-BACKGRD (GAPI)	100	0	GRM-BACKGRND (GAPI) 1000
0.9	CCL	-0.1						

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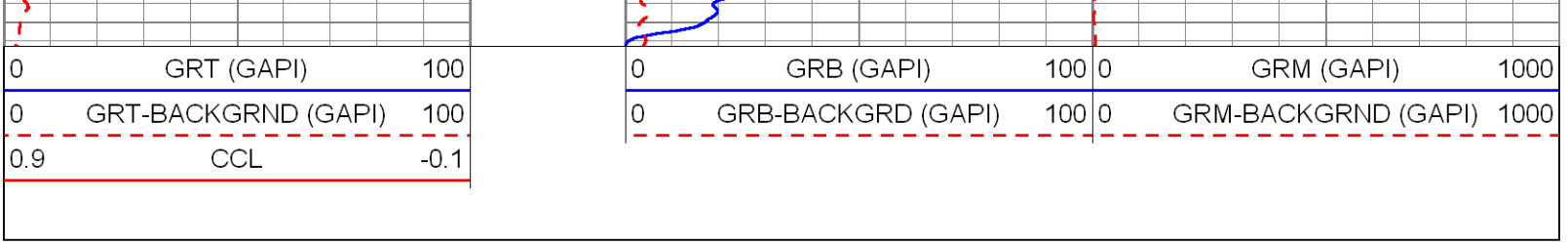
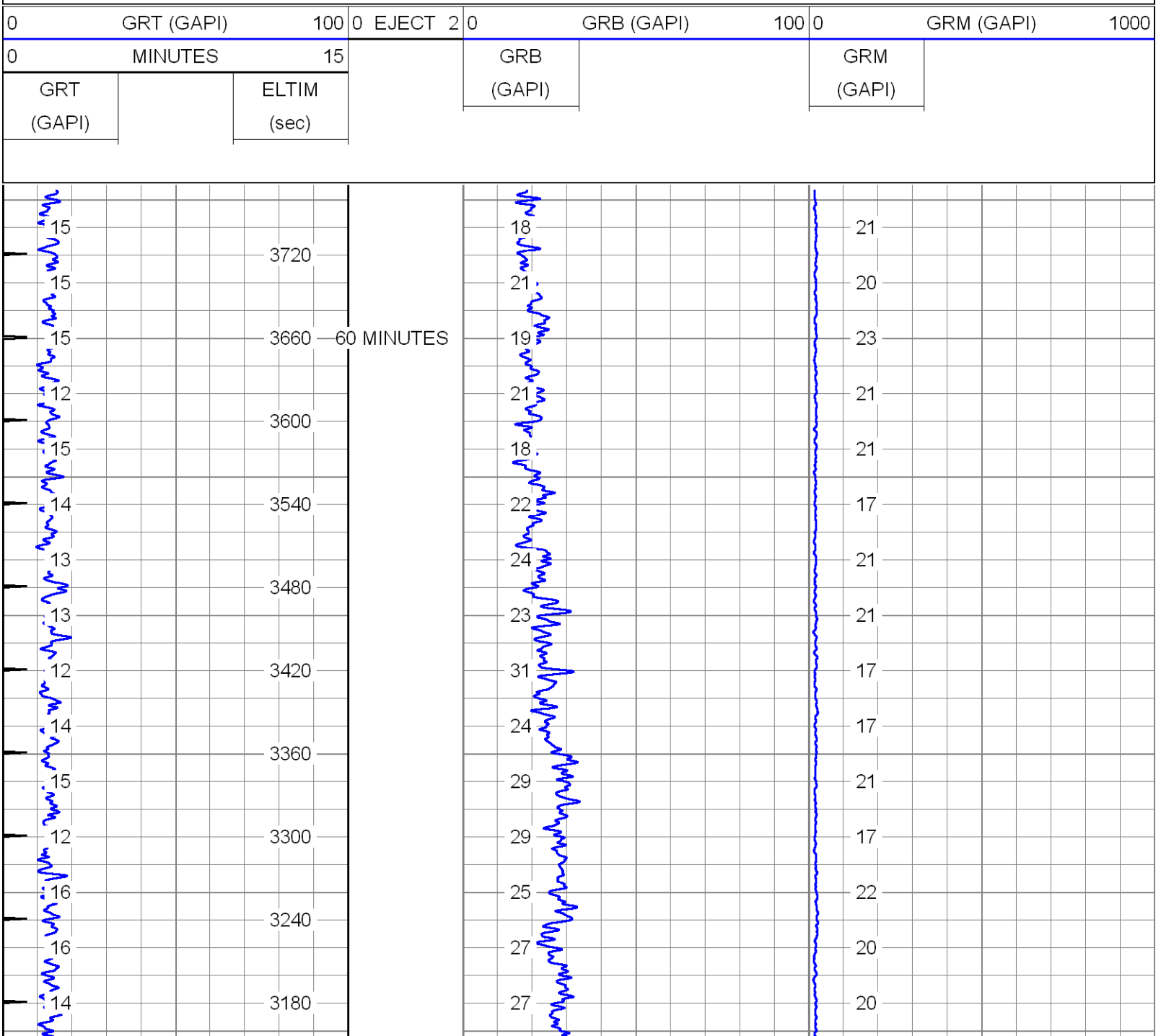
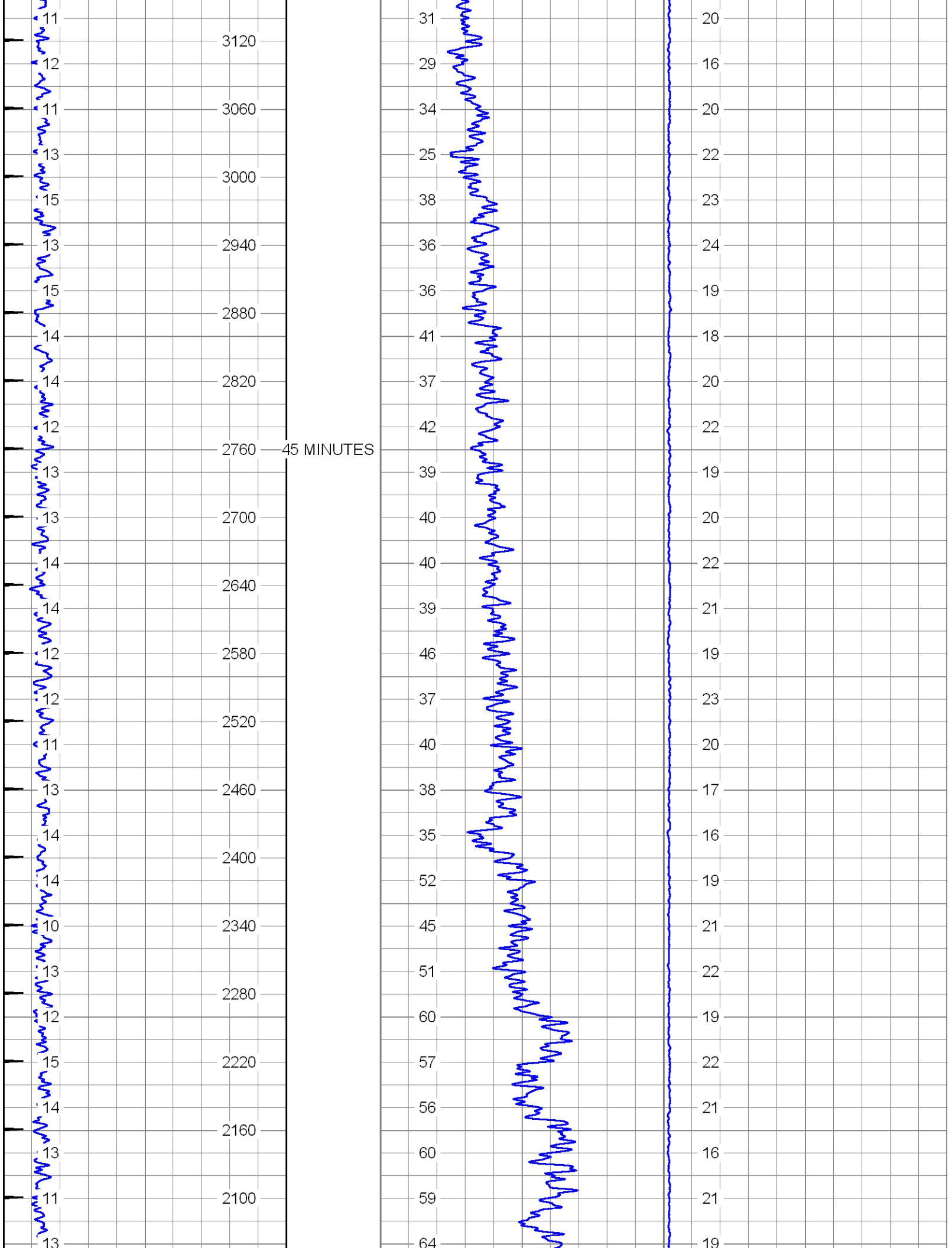
2300
2350
2400



DYNAMIC TEST#1 (86 GPM)

Database File:	sdwwtp-iw-8.db
Dataset Pathname:	pass8
Presentation Format:	rtstime
Dataset Creation:	Tue Aug 13 12:38:15 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:600




11
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3120
3060
3000
2940
2880
2820
2760
2700
2640
2580
2520
2460
2400
2340
2280
2220
2160
2100
45 MINUTES
31
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34
25
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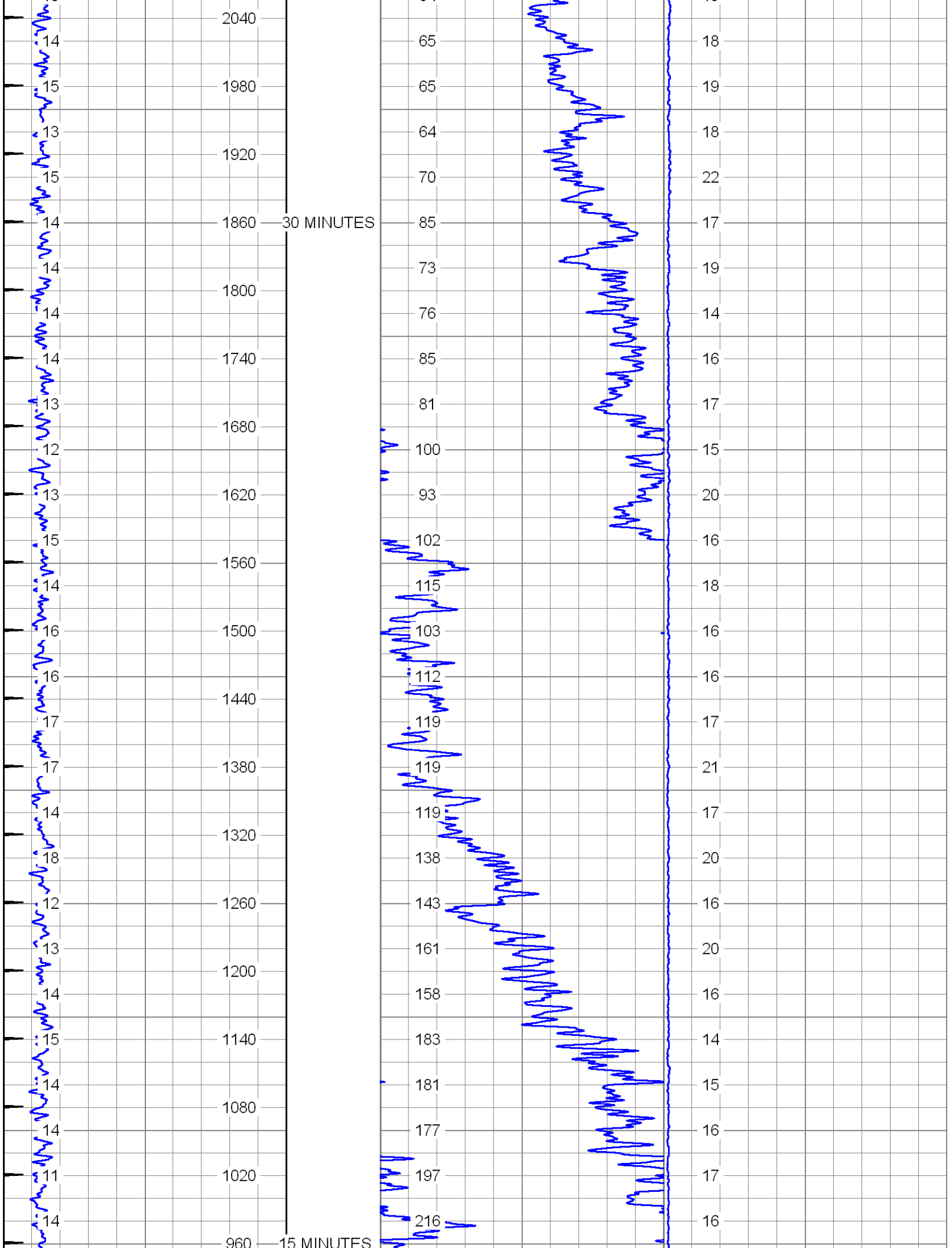
2040
1980
1920
1860
30 MINUTES
1800
1740
1680
1620
1560
1500
1440
1380
1320
1260
1200
1140
1080
1020
960
15 MINUTES
14
15
13
15
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73
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85
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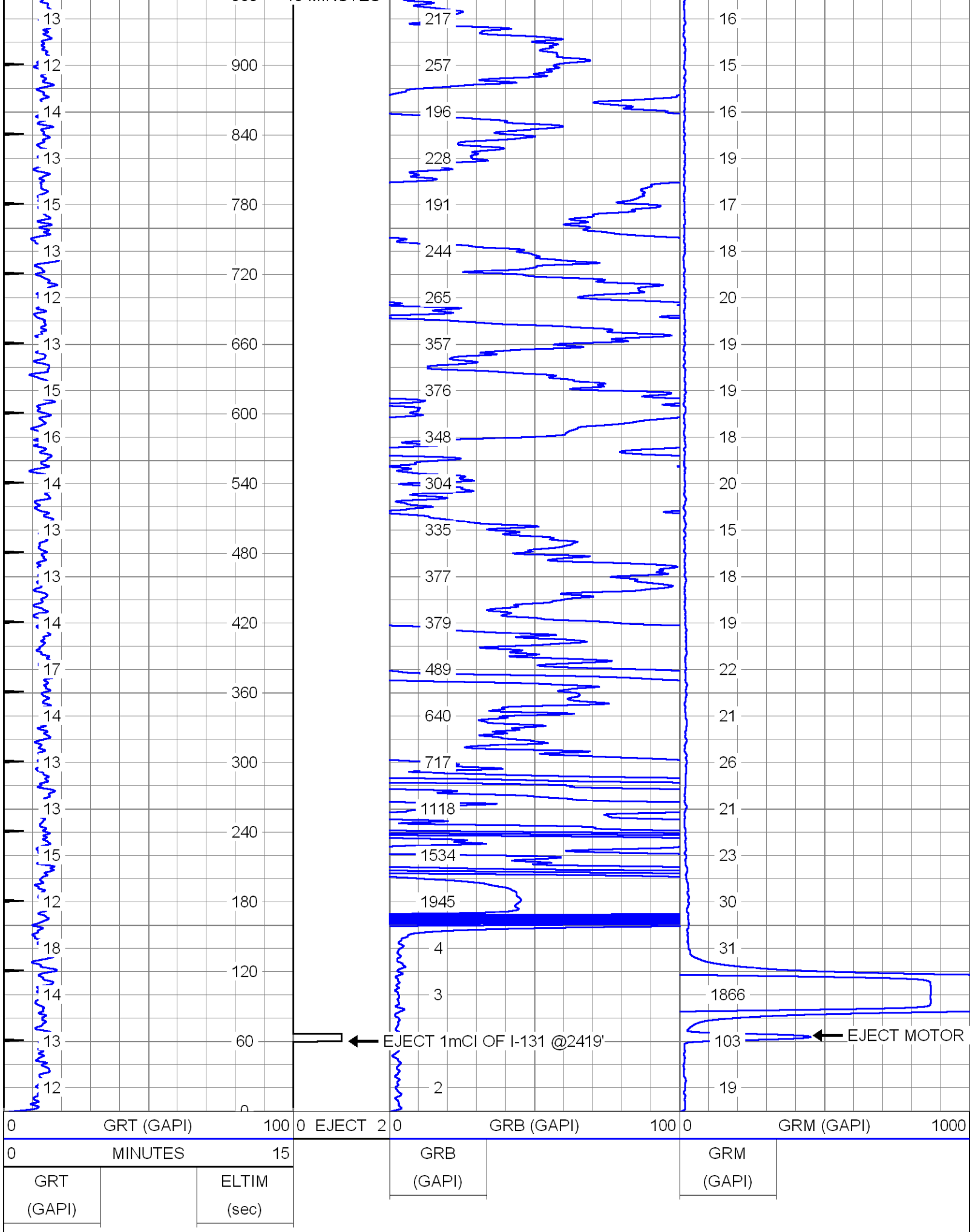
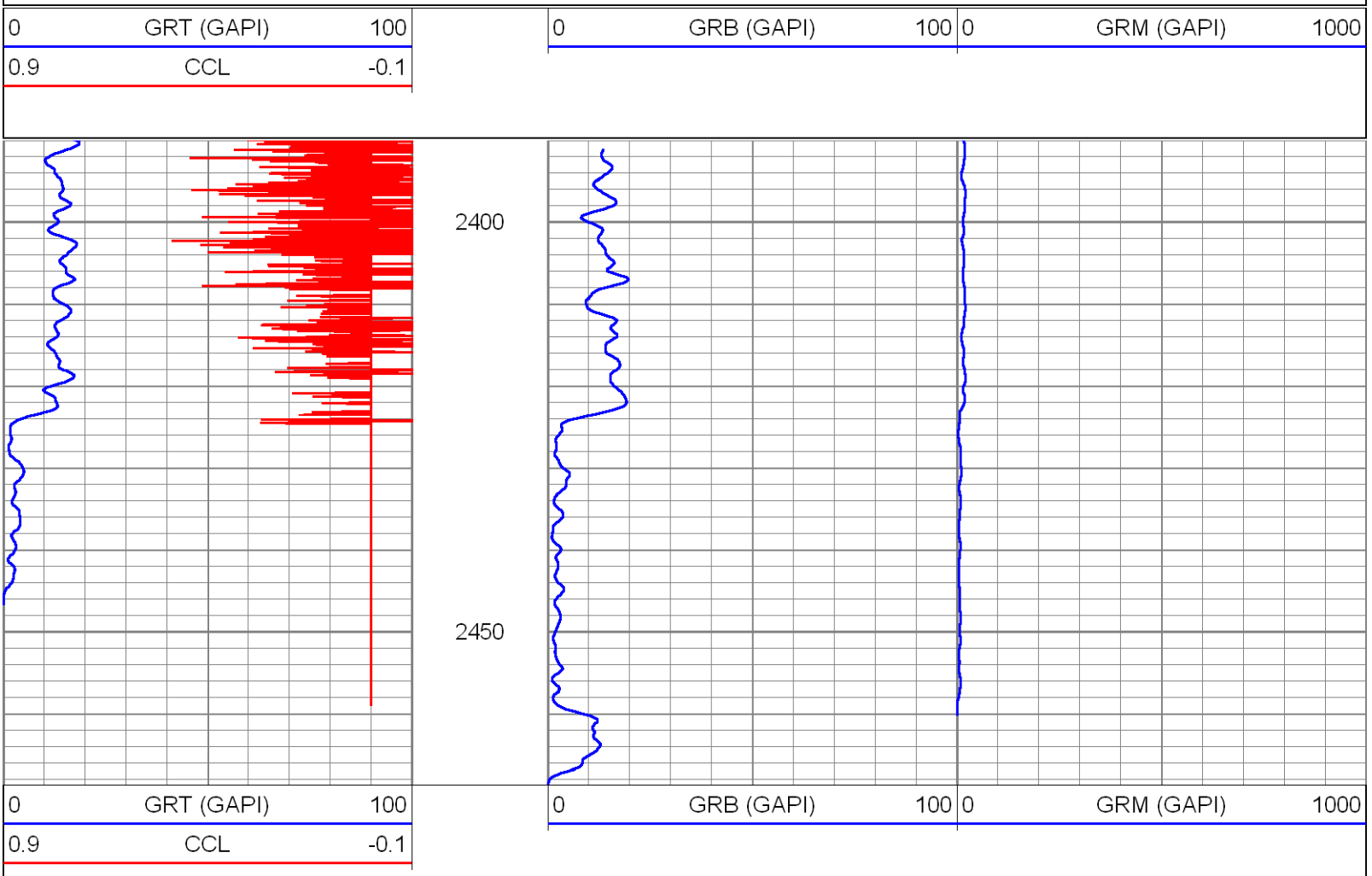

EJECT 1mCI OF I-131 @2419'
EJECT MOTOR
0 GRT (GAPI) 100
0 EJECT 2
0 GRB (GAPI) 100
0 GRM (GAPI) 1000
0 MINUTES 15
GRT (GAPI)
ELTIM (sec)
GRB (GAPI)
GRM (GAPI)

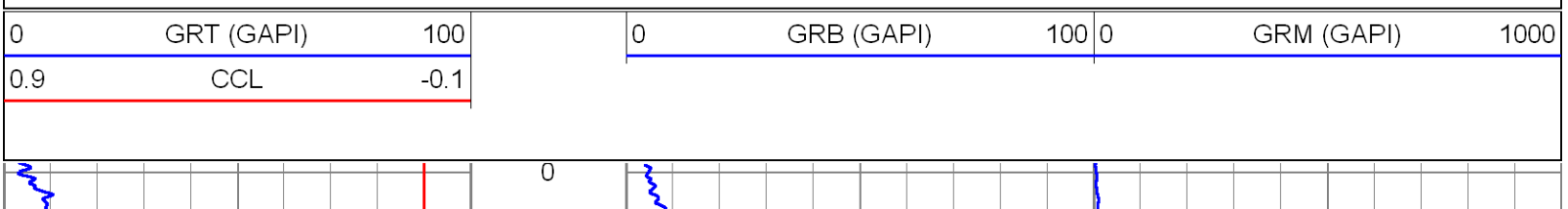
CASING TIE-IN

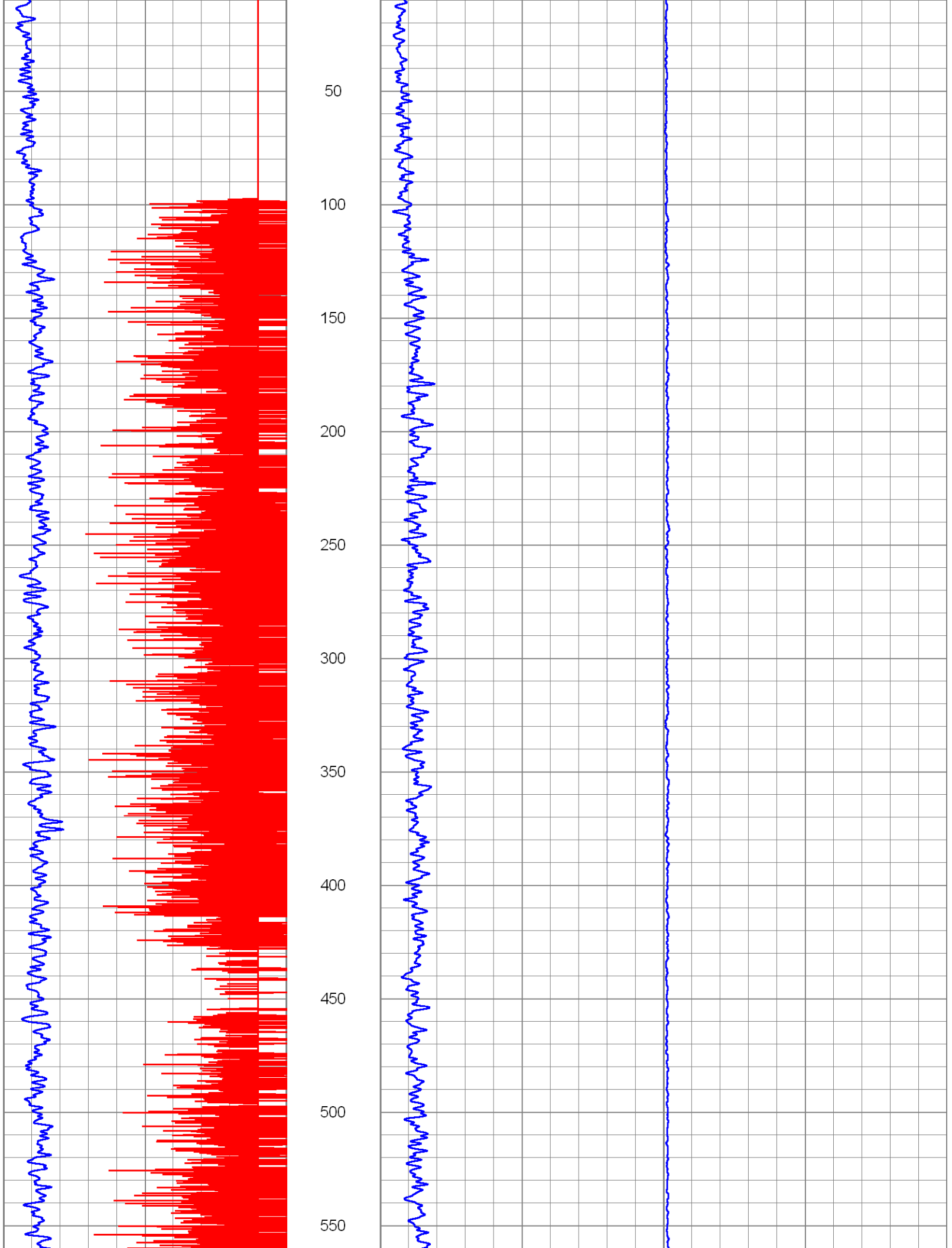
Database File: sdwwtp-iw-8.db
Dataset Pathname: pass7
Presentation Format: rts
Dataset Creation: Tue Aug 13 12:25:27 2013 by Log SOC 110722
Charted by: Depth in Feet scaled 1:240



BACKGROUND GAMMA-RAY

Database File: sdwwtp-iw-8.db
Dataset Pathname: pass2
Presentation Format: rts
Dataset Creation: Tue Aug 13 09:45:27 2013 by Log SOC 110722
Charted by: Depth in Feet scaled 1:600

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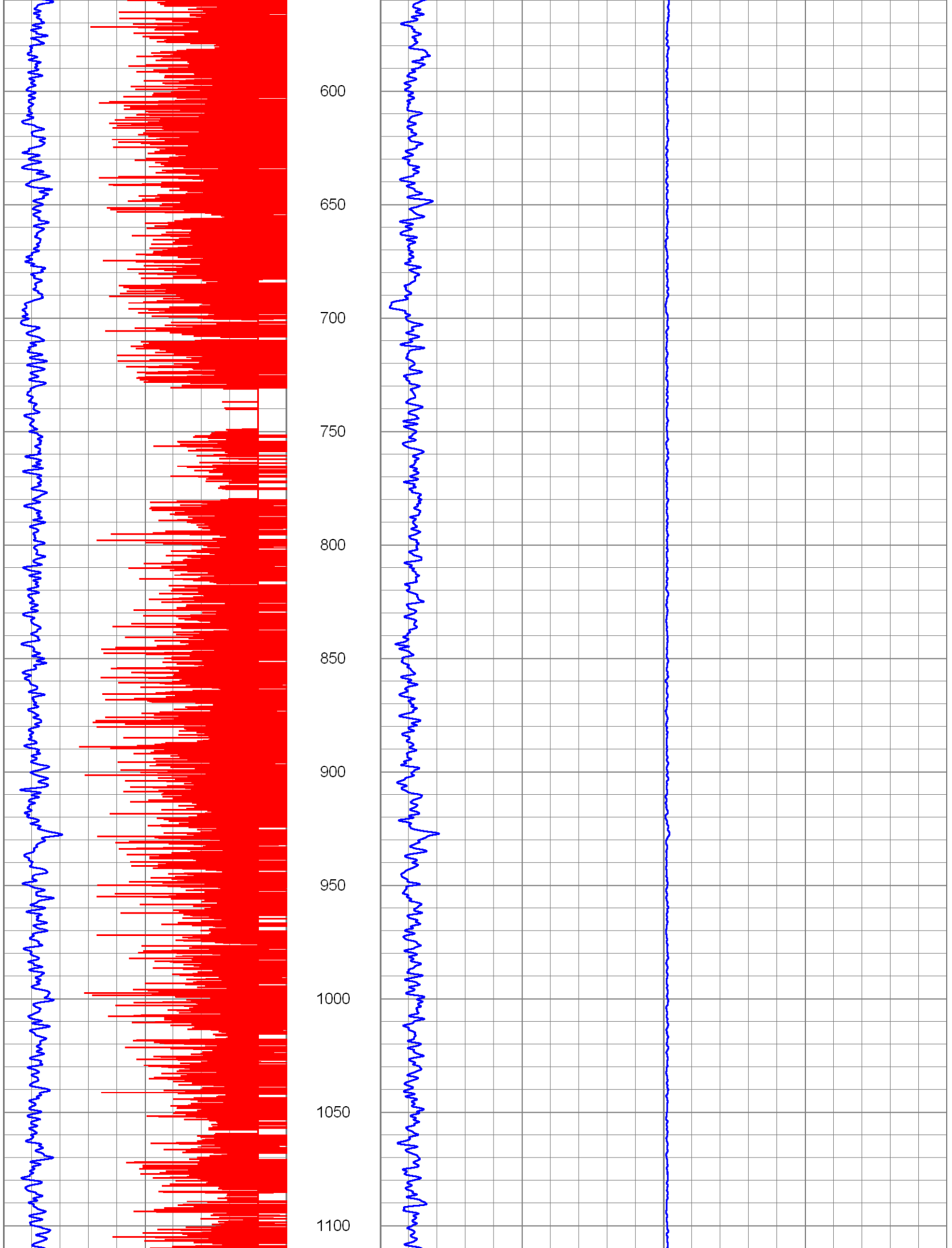
100
150
200
250
300
350
400
450
500
550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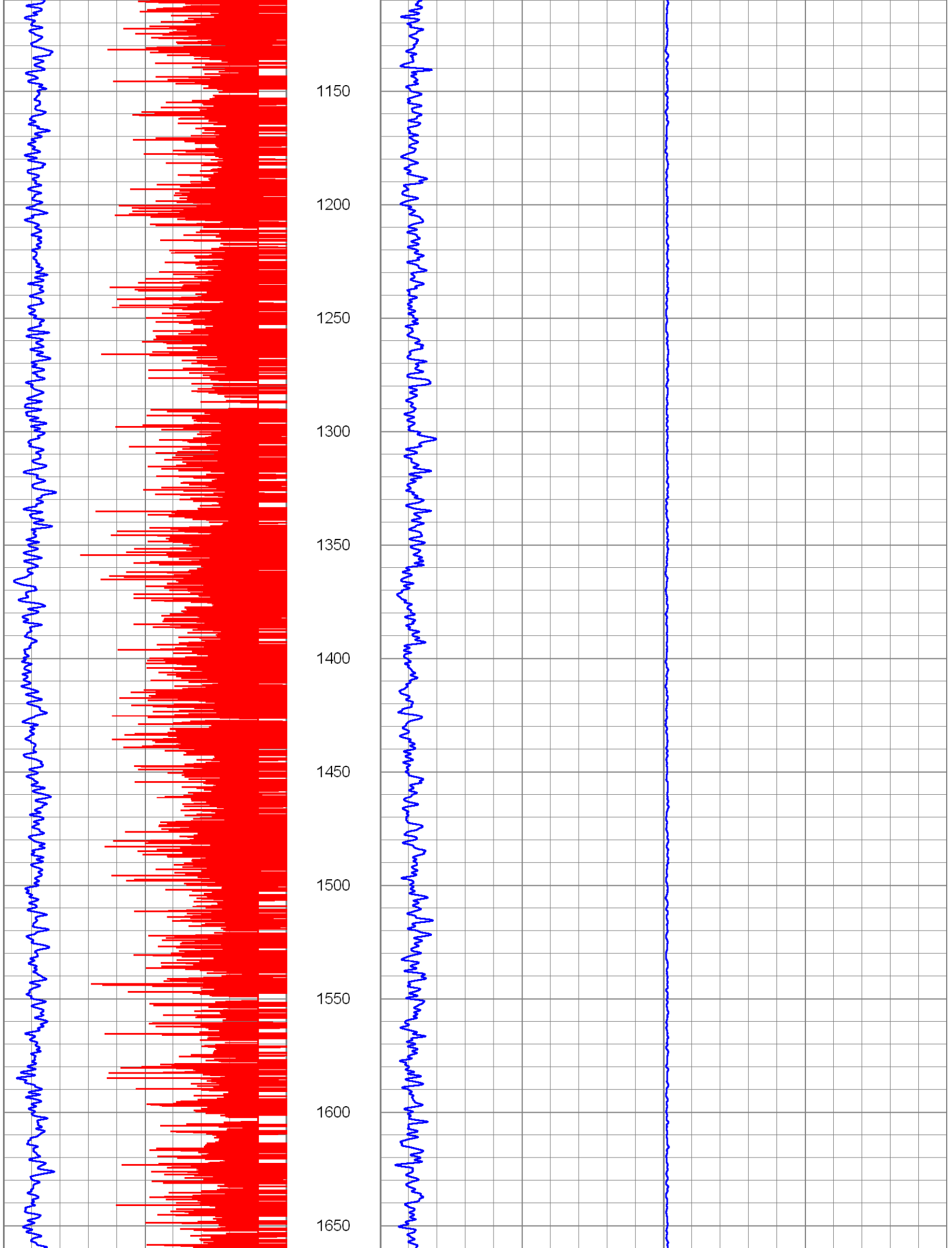
650
700
750
800
850
900
950
1000
1050
1100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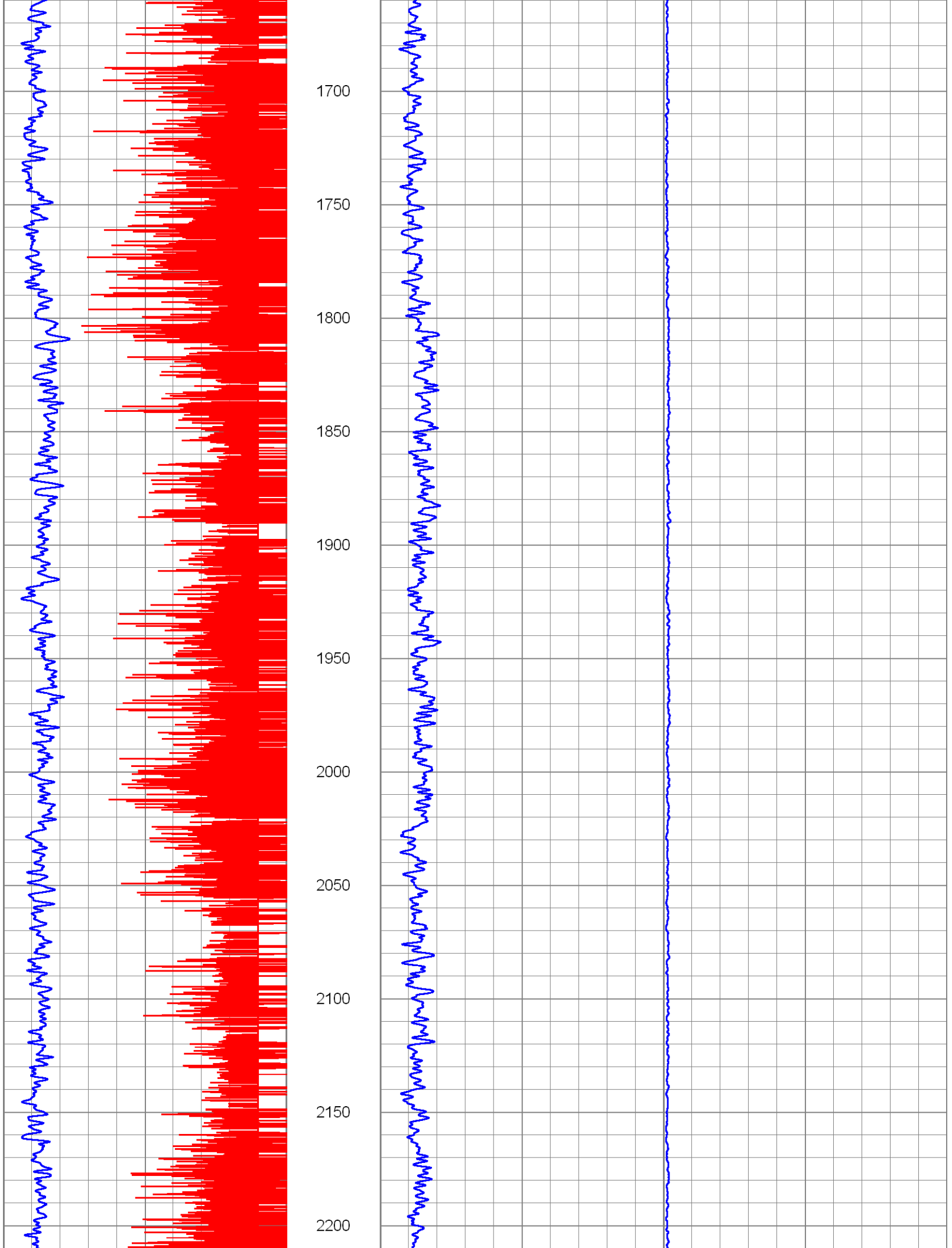
1200
1250
1300
1350
1400
1450
1500
1550
1600
1650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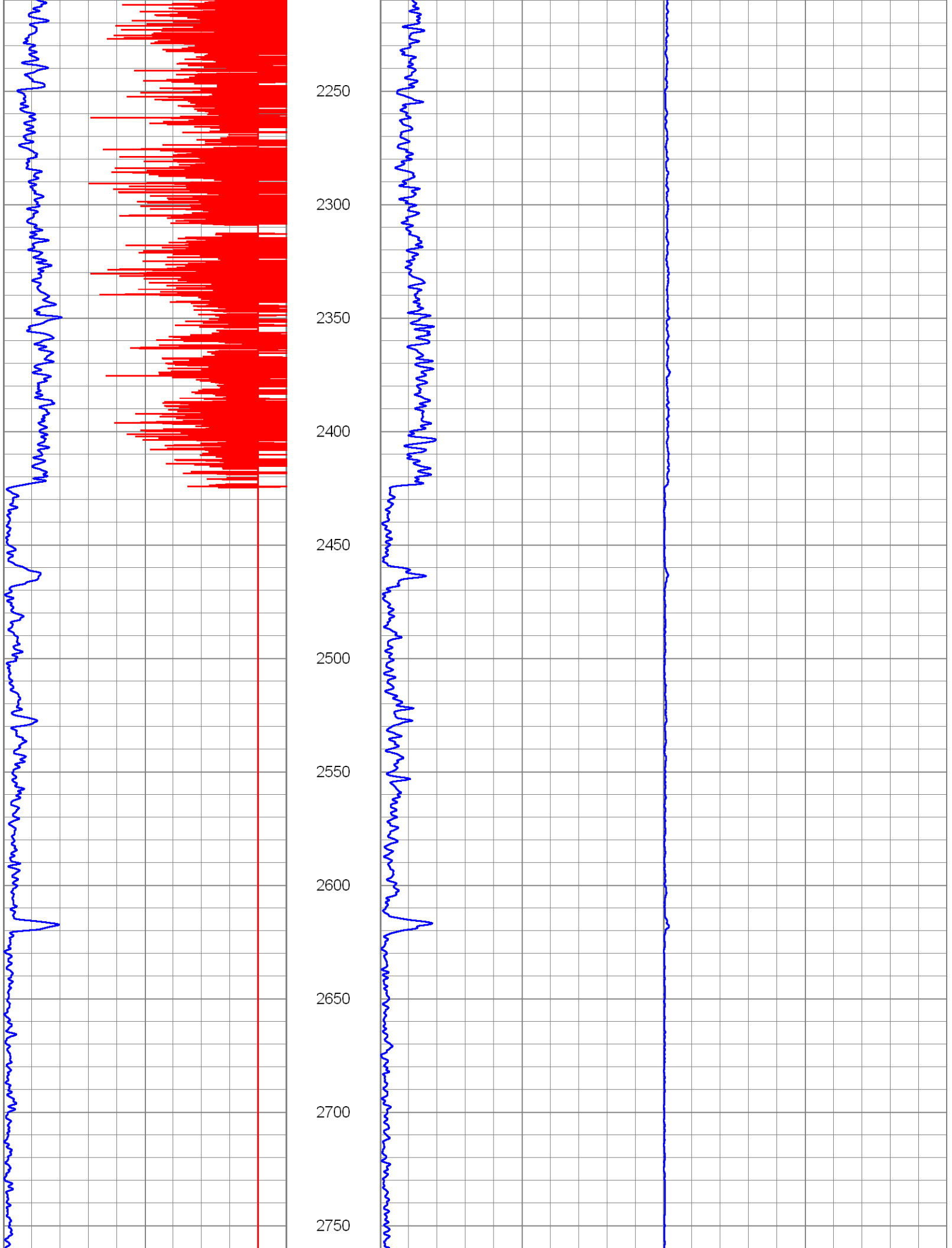
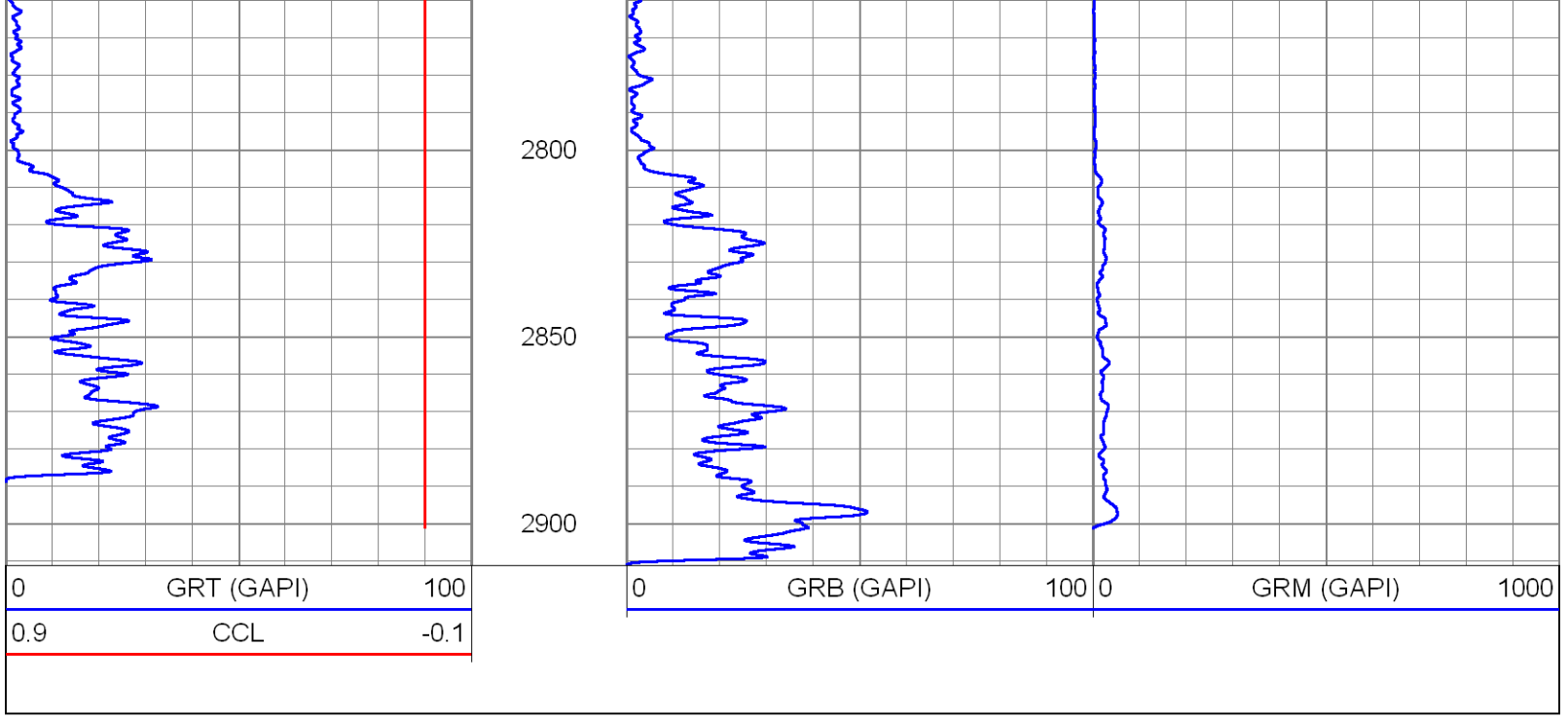
1750
1800
1850
1900
1950
2000
2050
2100
2150
2200


2250
2300
2350
2400
2450
2500
2550
2600
2650
2700
2750



Calibration Report

Database File: sdwwtp-iw-8.db
Dataset Pathname: pass2
Dataset Creation: Tue Aug 13 09:45:27 2013 by Log SOC 110722

Gamma Ray Calibration Report

Serial Number:	951B	
Tool Model:	RTSB	
Performed:	Tue Aug 13 07:57:20 2013	
Calibrator Value:	90.0	GAPI
Background Reading:	19.9	cps
Calibrator Reading:	168.8	cps
Sensitivity:	0.6046	GAPI/cps

Gamma Ray Calibration Report

Serial Number:	951M	
Tool Model:	RTSM	
Performed:	Tue Aug 13 07:57:43 2013	
Calibrator Value:	90.0	GAPI
Background Reading:	37.4	cps
Calibrator Reading:	192.6	cps
Sensitivity:	0.5800	GAPI/cps

Gamma Ray Calibration Report

Serial Number:	951T	
Tool Model:	RTST	
Performed:	Tue Aug 13 07:57:56 2013	
Calibrator Value:	90.0	GAPI
Background Reading:	32.9	cps
Calibrator Reading:	174.0	cps
Sensitivity:	0.6377	GAPI/cps

Sensitivity:	0.6377	GAPI/cps

Appendix E

Temperature Log

HIGH RESOLUTION TEMPERATURE LOG

Company	SOUTH MIAMI-DADE W.W.T.P.
Well	IW-8
Field	S.D.W.W.T.P.
County	MIAMI-DADE
State	FLORIDA

Location: API # :

SEC TWP RGE

Other Services

Permanent Datum	PAD	Elevation	PAD
Log Measured From	PAD		
Drilling Measured From	PAD		

Elevation
K.B.
D.F.
G.L.

Date	13-AUG-2013		
Run Number	2013 MIT		
Depth Driller	3112'		
Depth Logger	2912'		
Bottom Logged Interval	2912'		
Top Log Interval	SURFACE		
Open Hole Size	22"		
Type Fluid	WATER		
Density / Viscosity	NA		
Max. Recorded Temp.	82.3 degF		
Estimated Cement Top	NA		
Time Well Ready	ON ARRIVAL		
Time Logger on Bottom	ON ARRIVAL		
Equipment Number	102		
Location	FT MYERS		
Recorded By	RIVES	A.GARCIA	
Witnessed By	S. VILLAMIL		

Borehole Record				Borehole Record			
Run Number	Bit	From	To	Run No	Bit	From	To

Casing Record	Size	Wgt/Ft	Top	Bottom
Surface String				
Prot. String				
Production String	24"	.500" W.T.	SURFACE	2424'
Liner				

<< Fold Here >>>

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

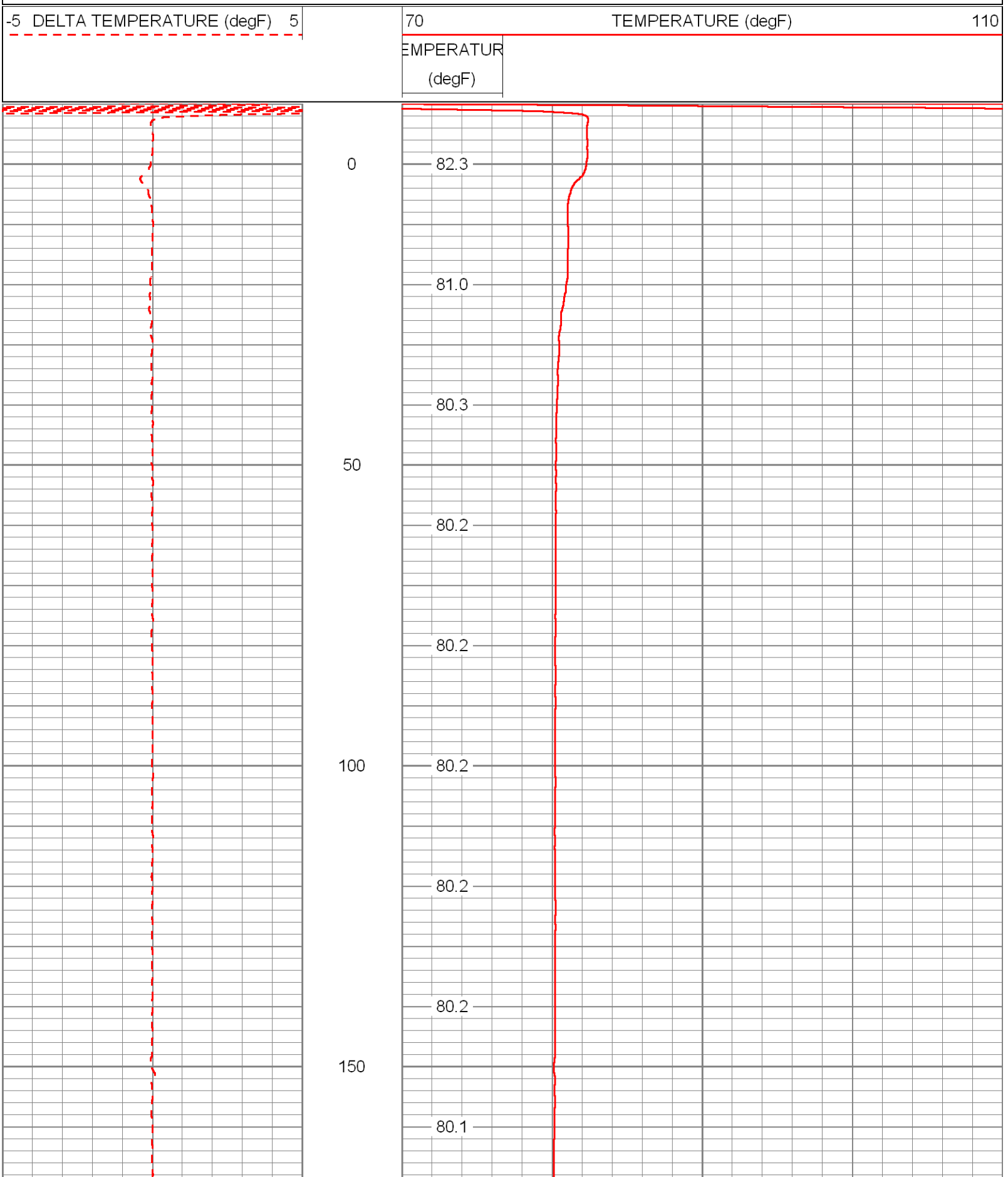
Comments

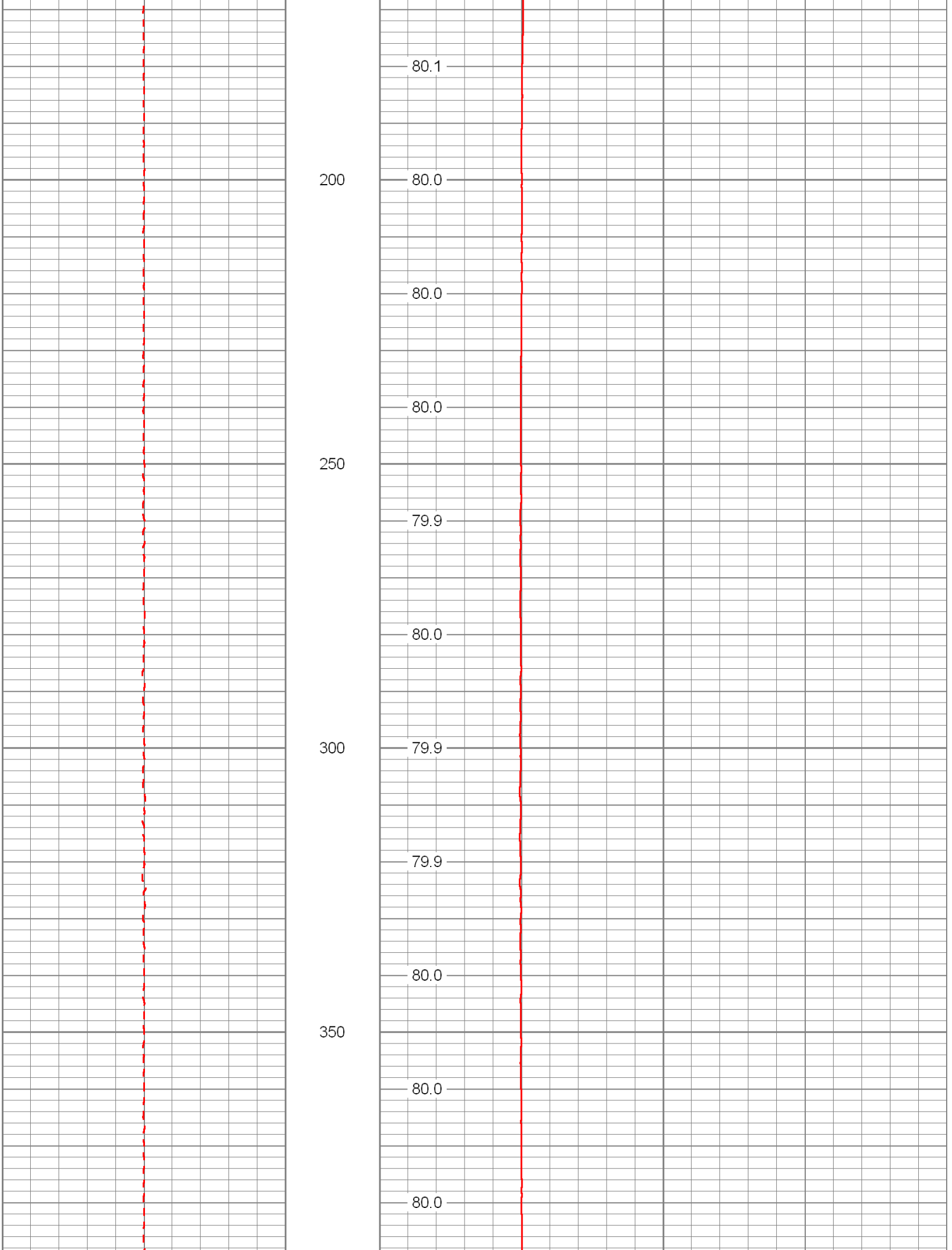
RADIOACTIVE TRACER SURVEY

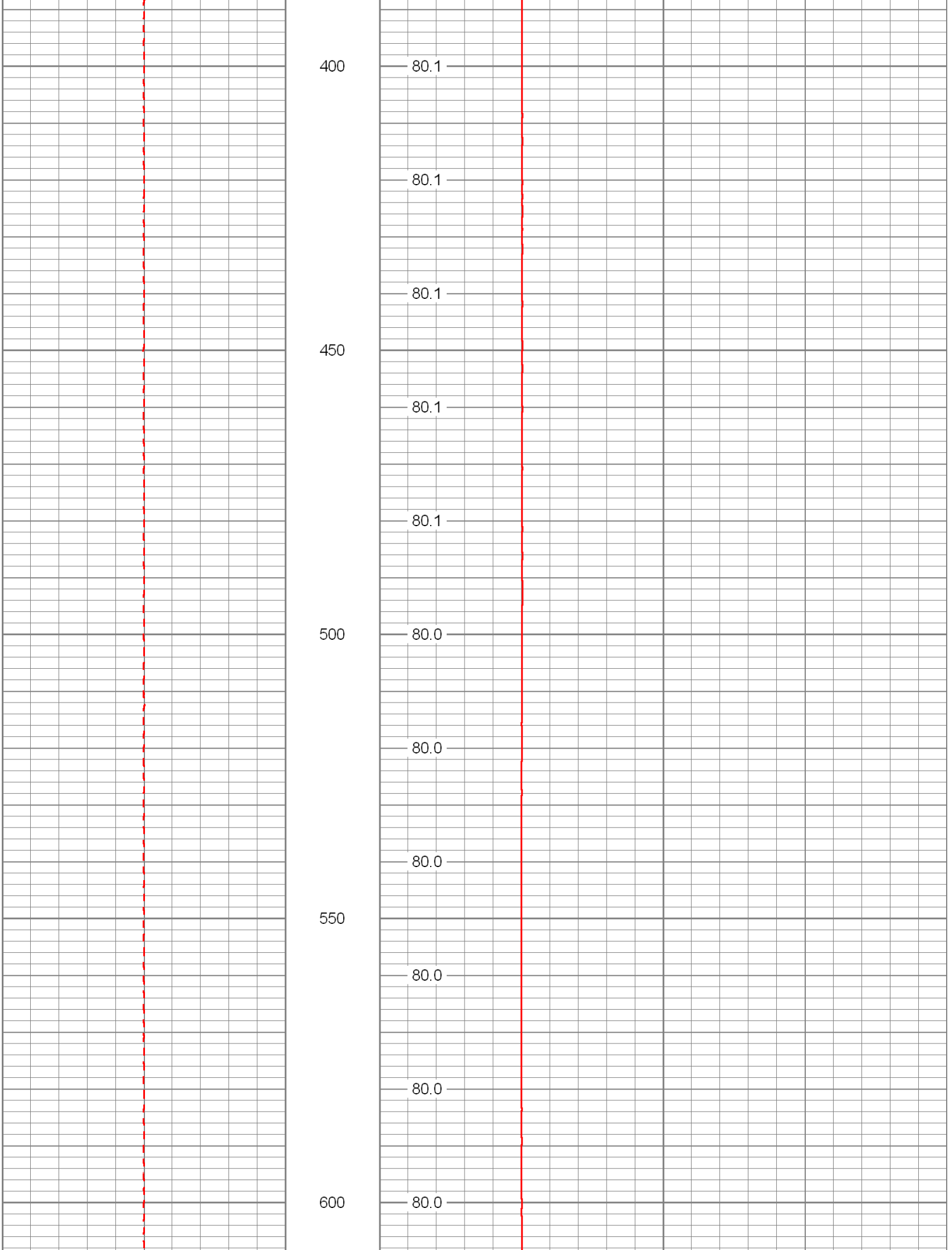
TEMPERATURE

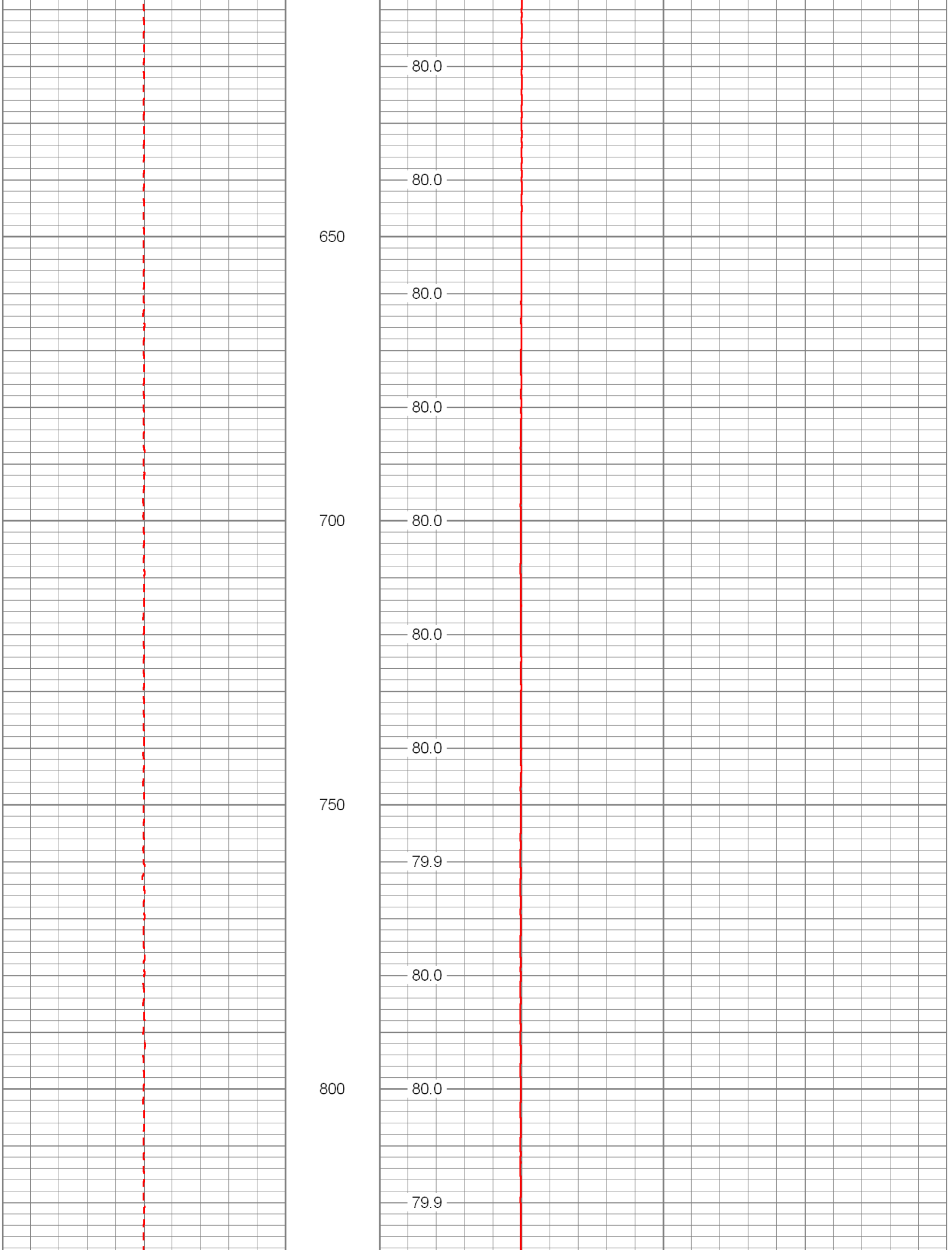
BROTHERS

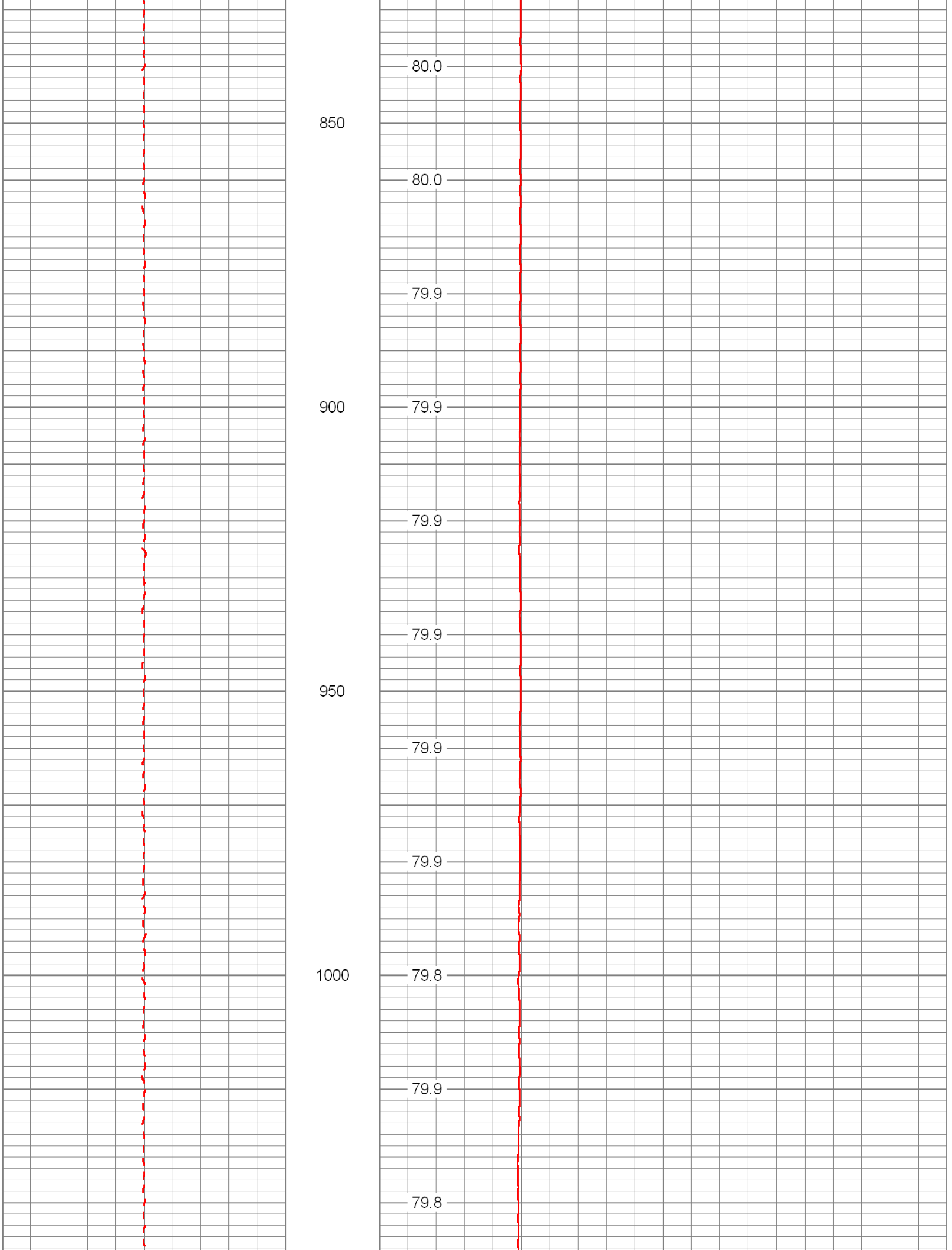
Database File:	sdwwtp-iw-8.db
Dataset Pathname:	pass1
Presentation Format:	temp
Dataset Creation:	Tue Aug 13 08:20:01 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:240




80.1
200
80.0
80.0
80.0
250
79.9
80.0
300
79.9
79.9
80.0
350
80.0
80.0


400
450
500
550
600
80.1
80.1
80.1
80.1
80.1
80.0
80.0
80.0
80.0
80.0
80.0


80.0
80.0
650
80.0
80.0
700
80.0
80.0
80.0
750
79.9
80.0
800
80.0
79.9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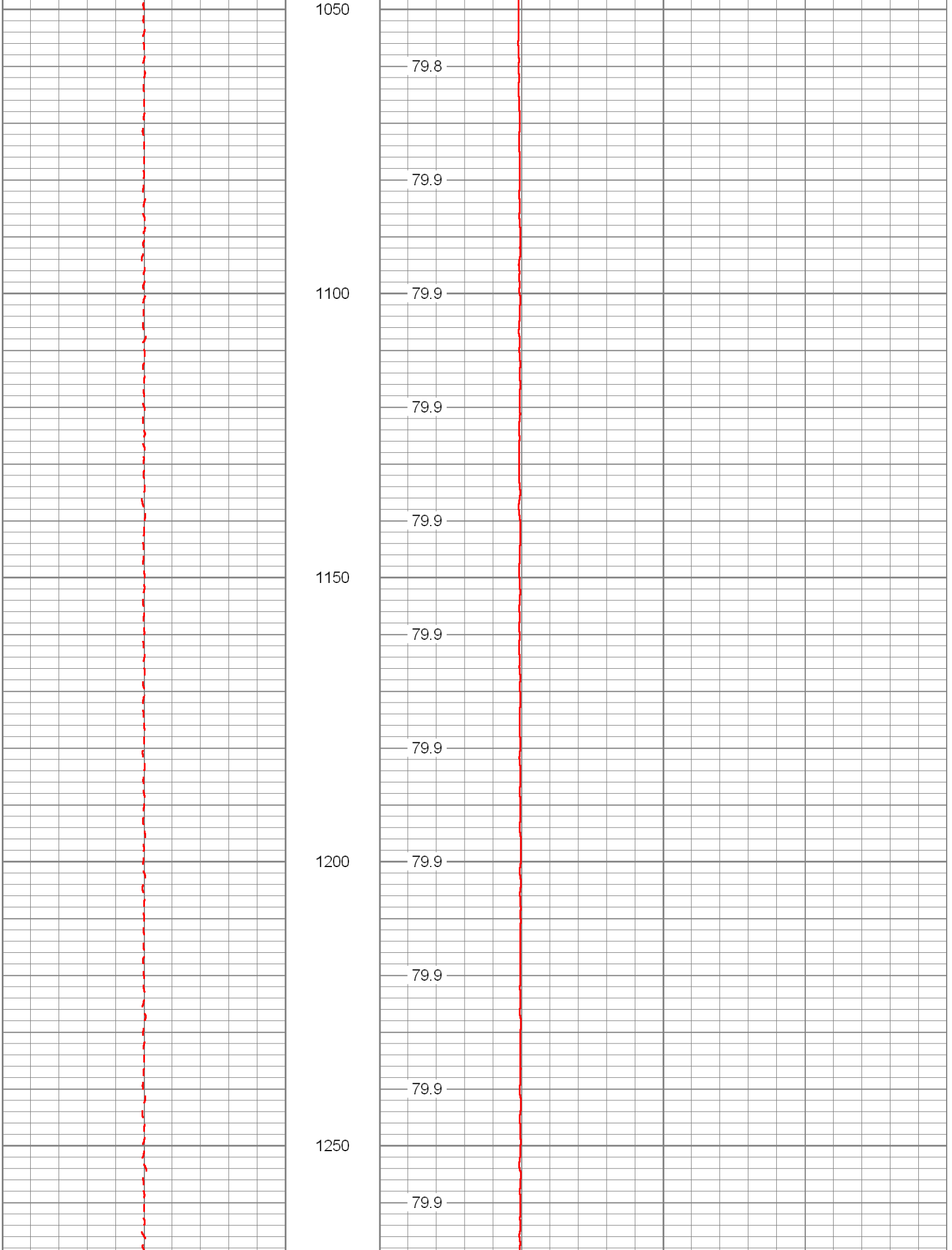
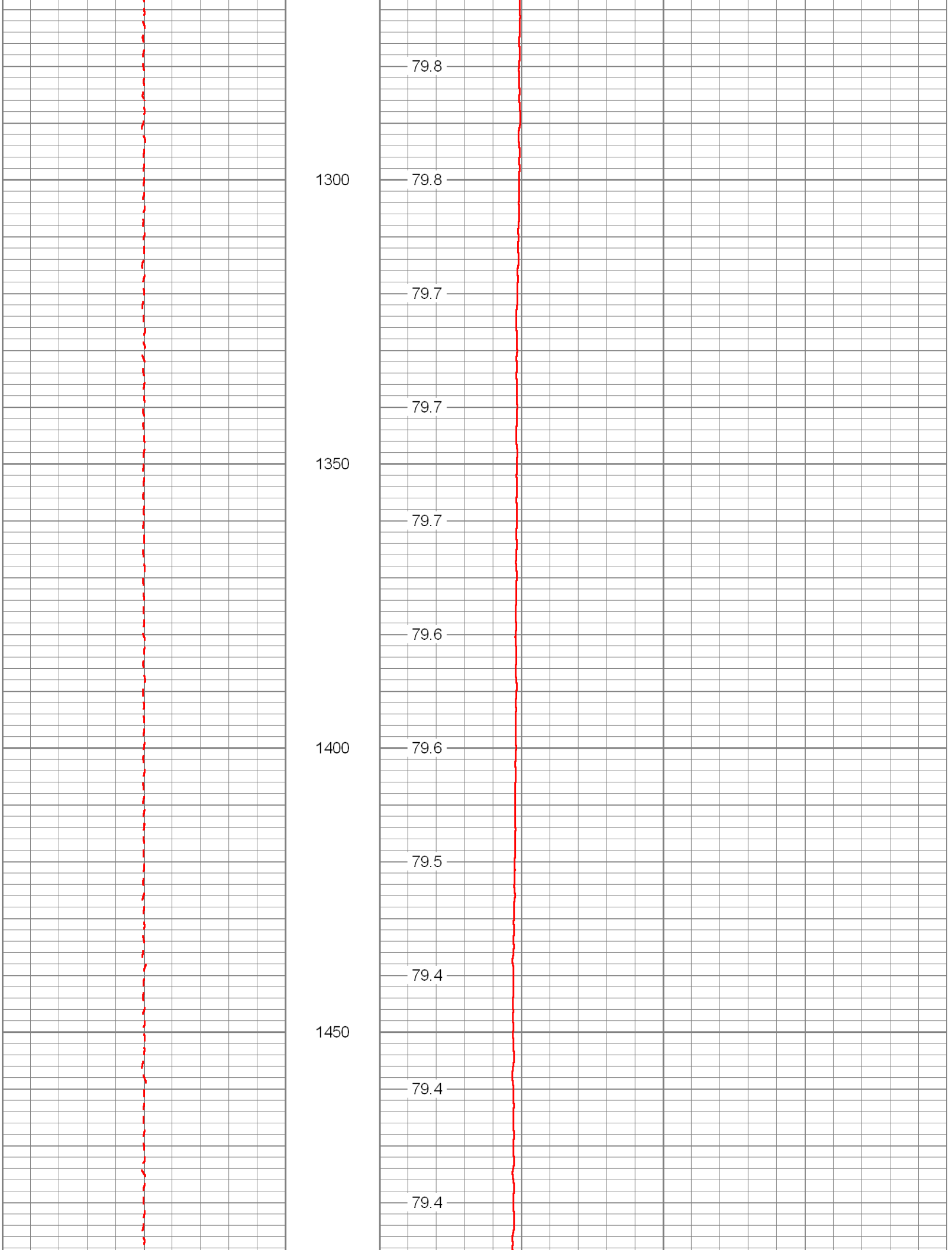
850
80.0
79.9
900
79.9
79.9
79.9
950
79.9
79.9
1000
79.8
79.9
79.8


1050
79.8
79.9
1100
79.9
79.9
79.9
1150
79.9
79.9
1200
79.9
79.9
79.9
1250
79.9


79.8
1300
79.8
79.7
79.7
1350
79.7
79.6
1400
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79.5
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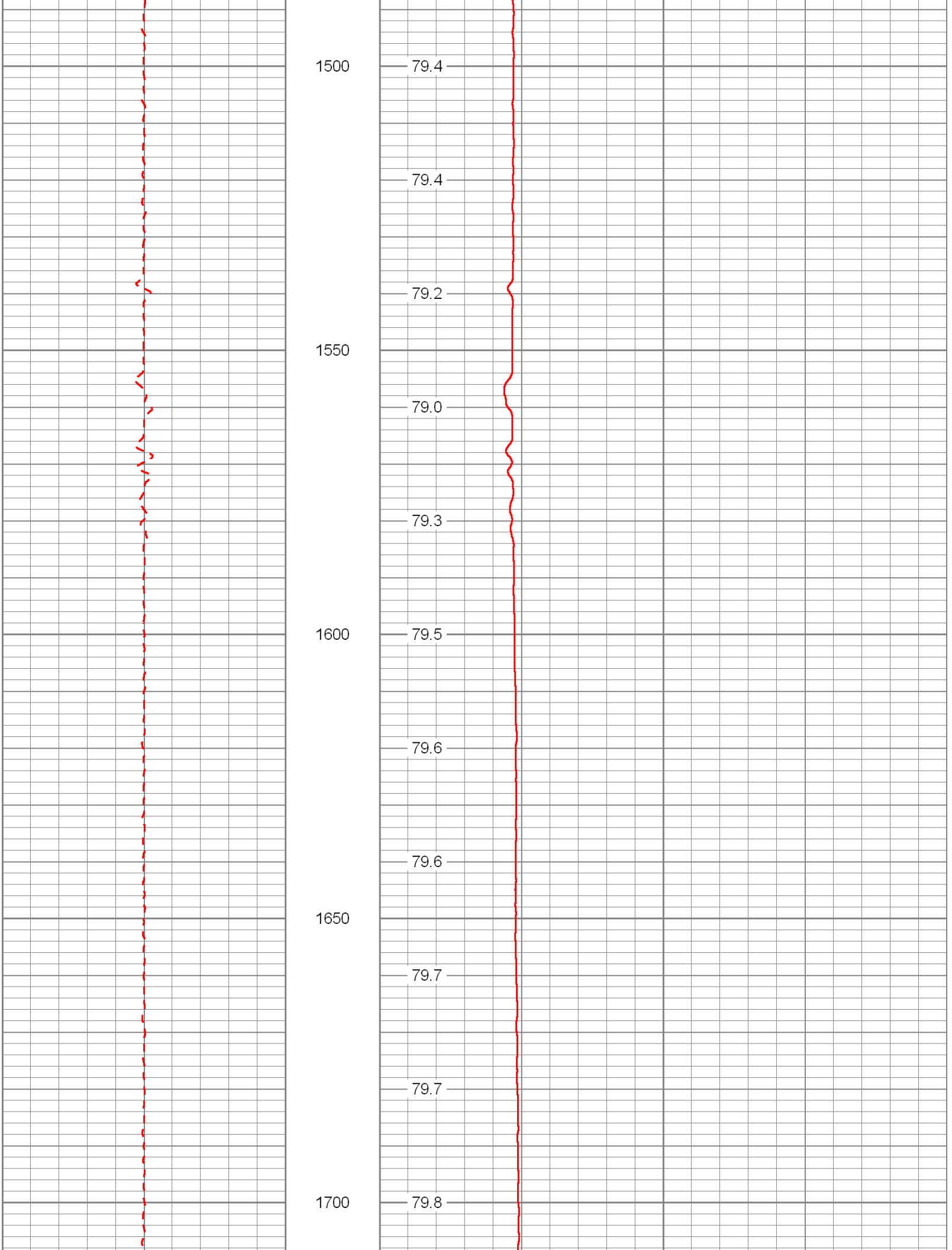
1450
79.4
79.4


1500
79.4
79.4
79.2
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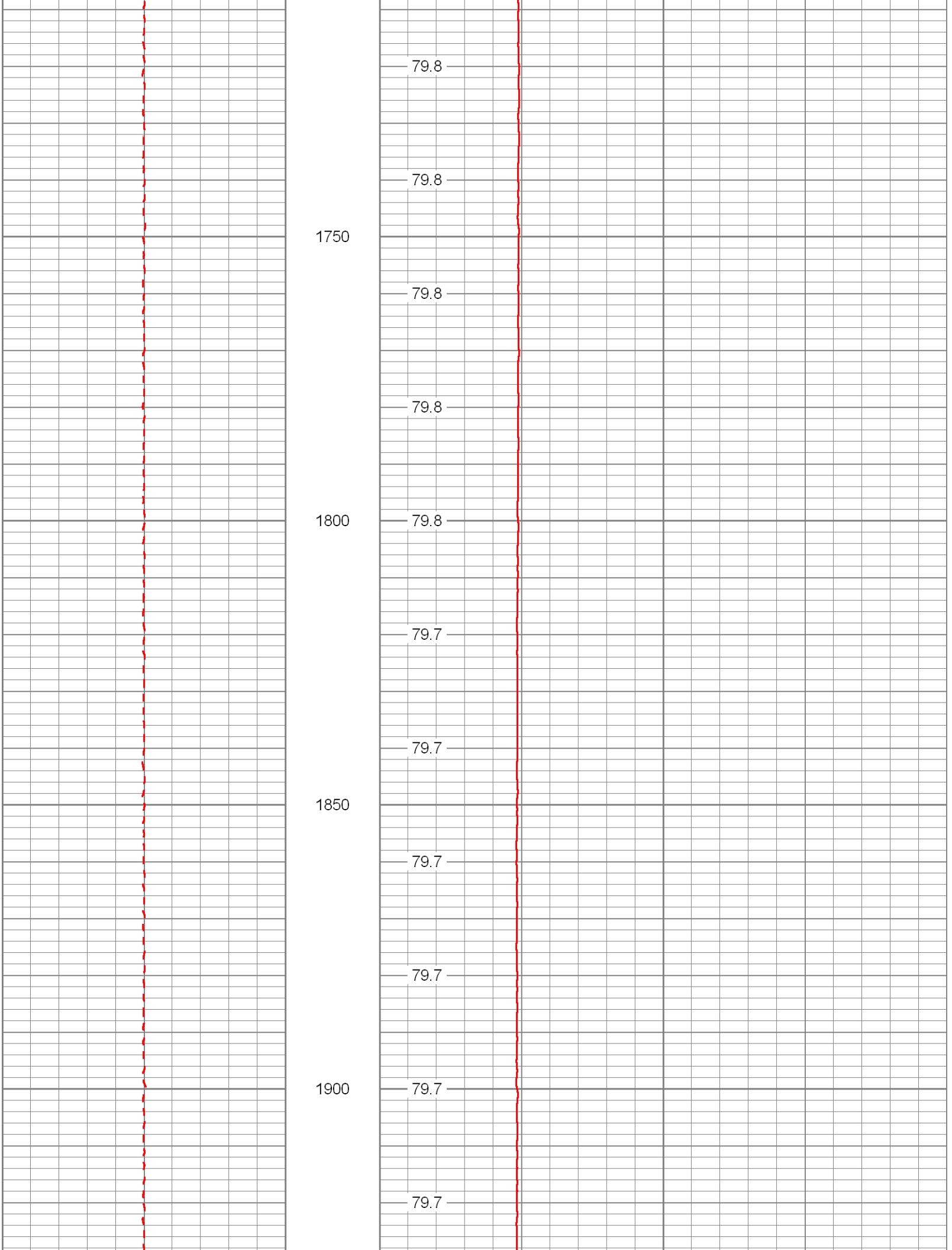
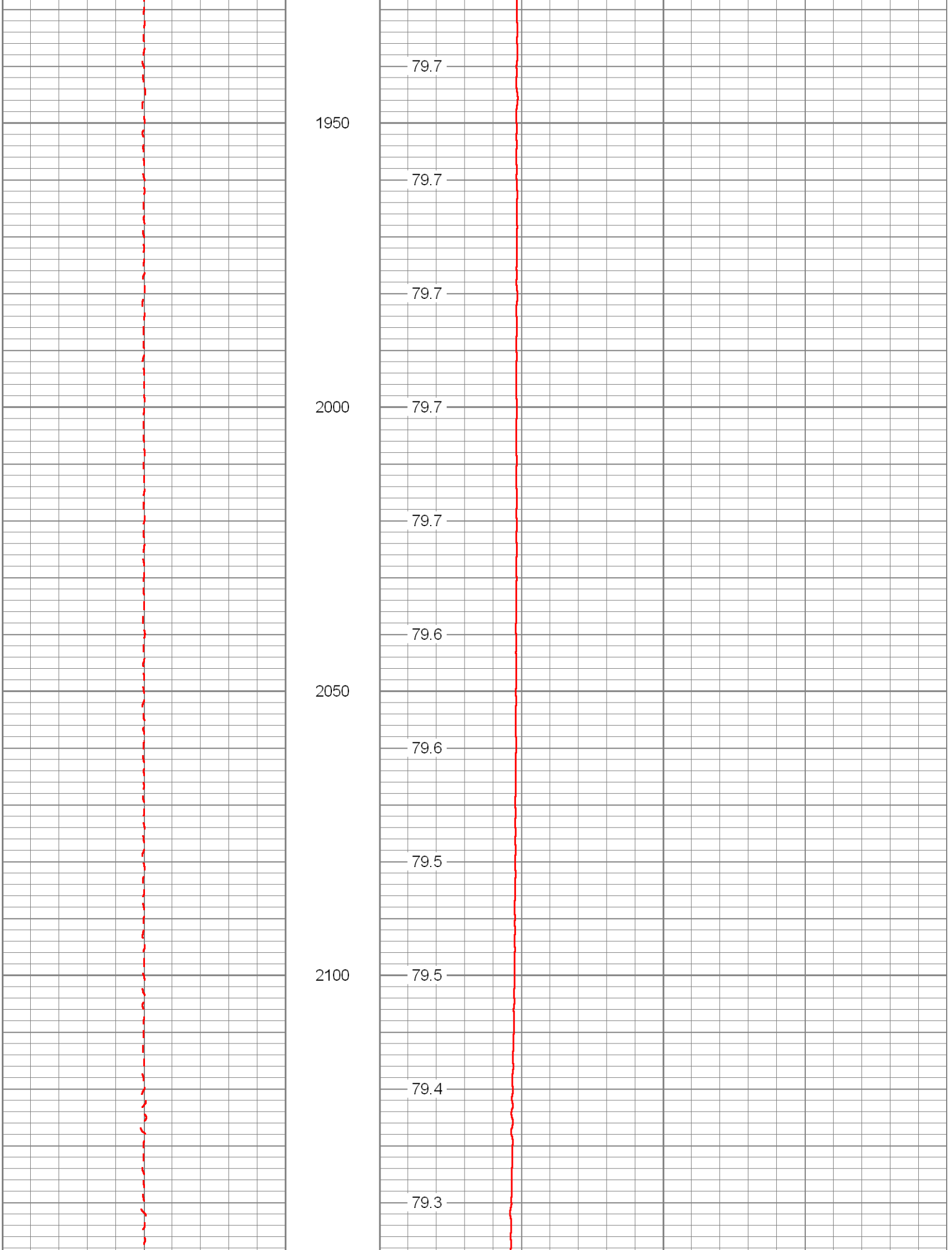
1600
79.5
79.6
79.6
1650
79.7
79.7
1700
79.8


79.8
79.8
1750
79.8
79.8
1800
79.8
79.7
79.7
1850
79.7
79.7
1900
79.7
79.7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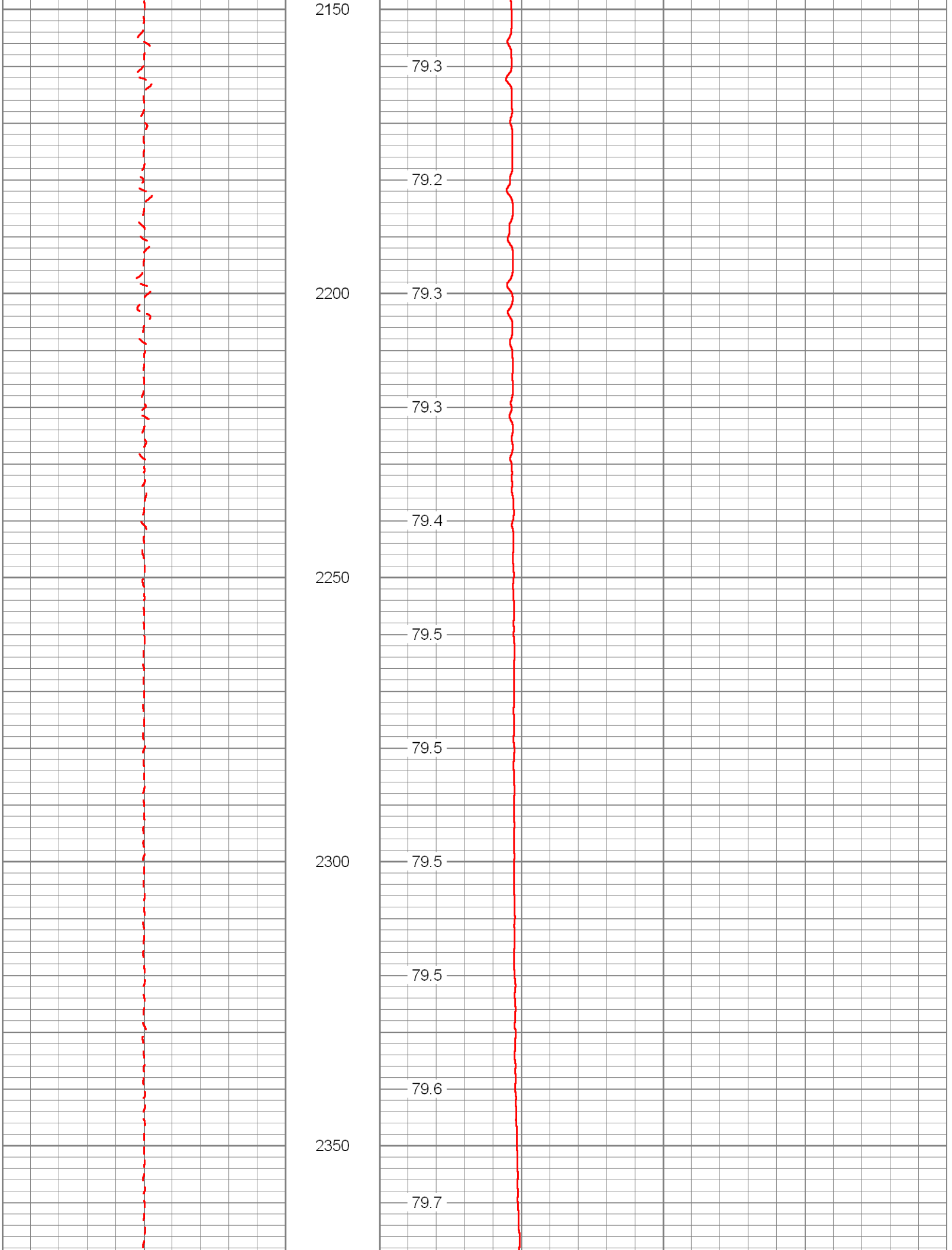
1950
79.7
79.7
2000
79.7
79.7
79.6
2050
79.6
79.5
2100
79.5
79.4
79.3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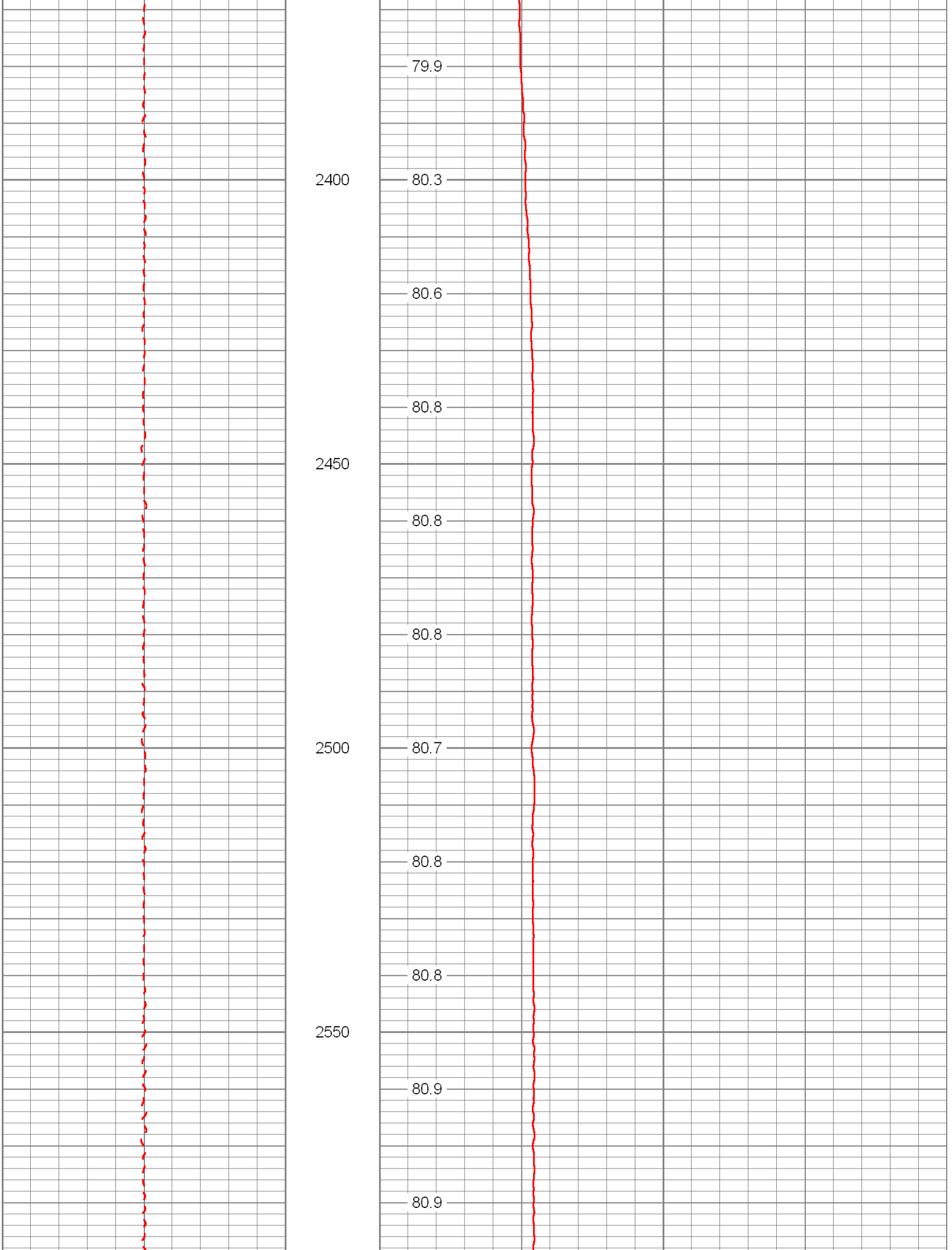
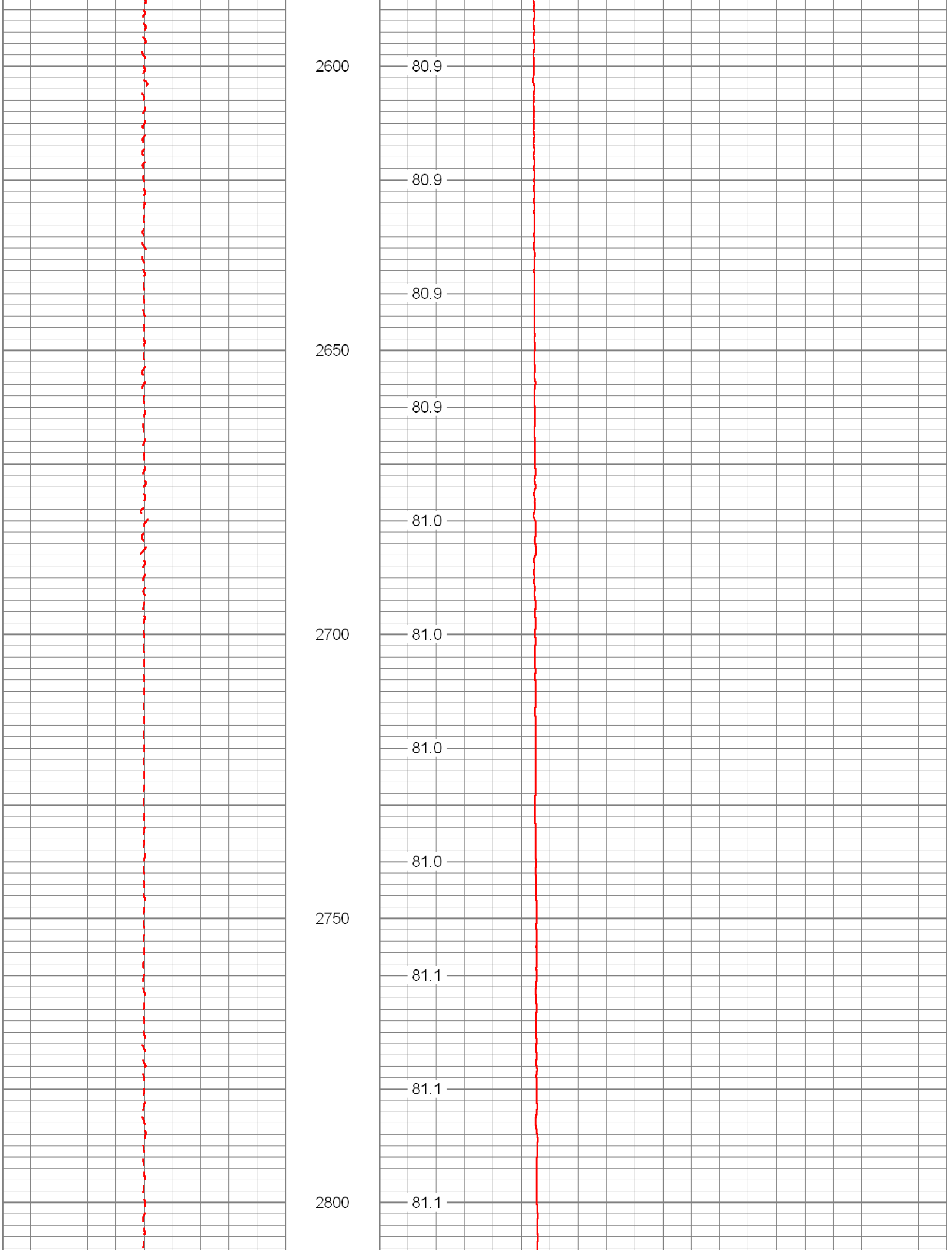
79.3
79.2
2200
79.3
79.3
79.4
2250
79.5
79.5
2300
79.5
79.5
79.6
2350
79.7


79.9
2400
80.3
80.6
80.8
2450
80.8
80.8
2500
80.7
80.8
80.8
2550
80.9
80.9


2600
80.9
80.9
80.9
2650
80.9
81.0
2700
81.0
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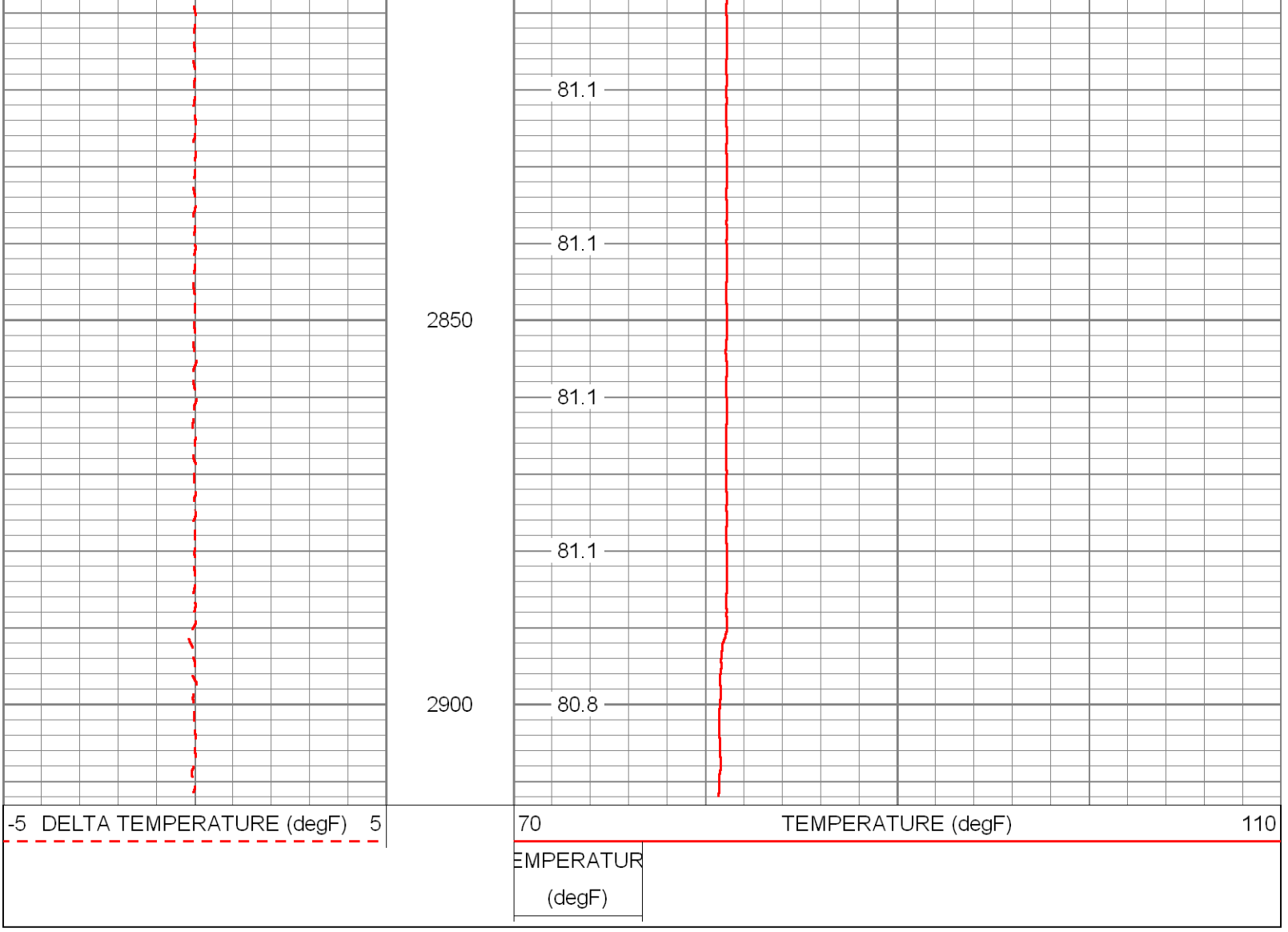
81.0
2750
81.1
81.1
2800
81.1



Calibration Report

Database File: sdwwtp-iw-8.db
Dataset Pathname: pass1
Dataset Creation: Tue Aug 13 08:20:01 2013 by Log SOC 110722

Temperature Calibration Report

Serial Number: 951
Tool Model: RTS
Performed: Mon Oct 08 09:35:10 2012

Point #	Reading		Reference	
1	414.44	cps	33.00	degF
2	892.98	cps	85.00	degF
3	1755.38	cps	170.00	degF
4		cps		degF
5		cps		degF
6		cps		degF
7		cps		degF
8		cps		degF
9		cps		degF
10		cps		degF

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)

			TEMP-RTS (951)	25.50	1.69	70.00
TEMP	0.10					

Dataset: sdwwtp-iw-8.db: field/well/run1/pass1
Total Length: 25.50 ft
Total Weight: 70.00 lb
O.D. 1.69 in

Appendix F

Television Survey

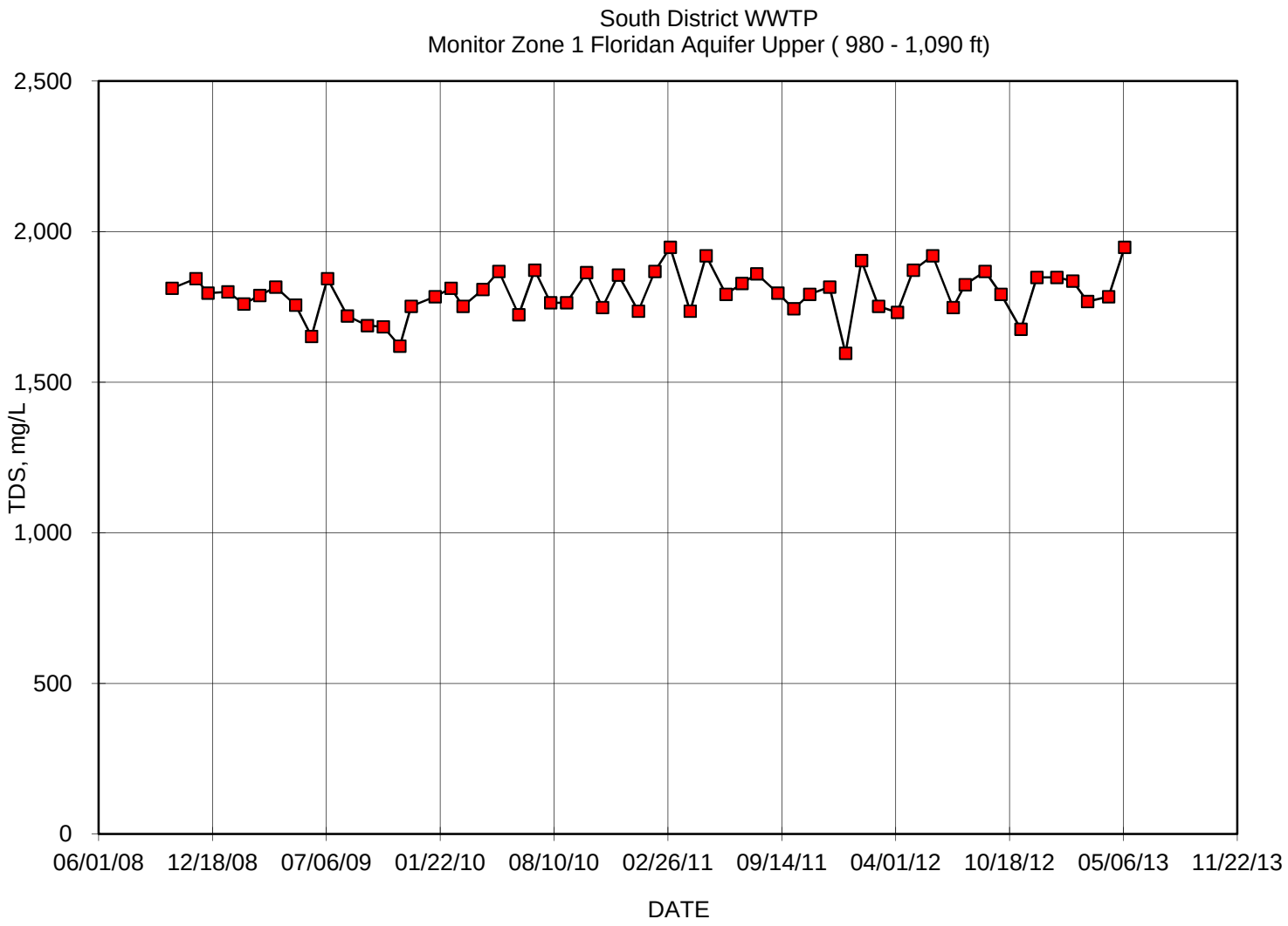
Appendix G

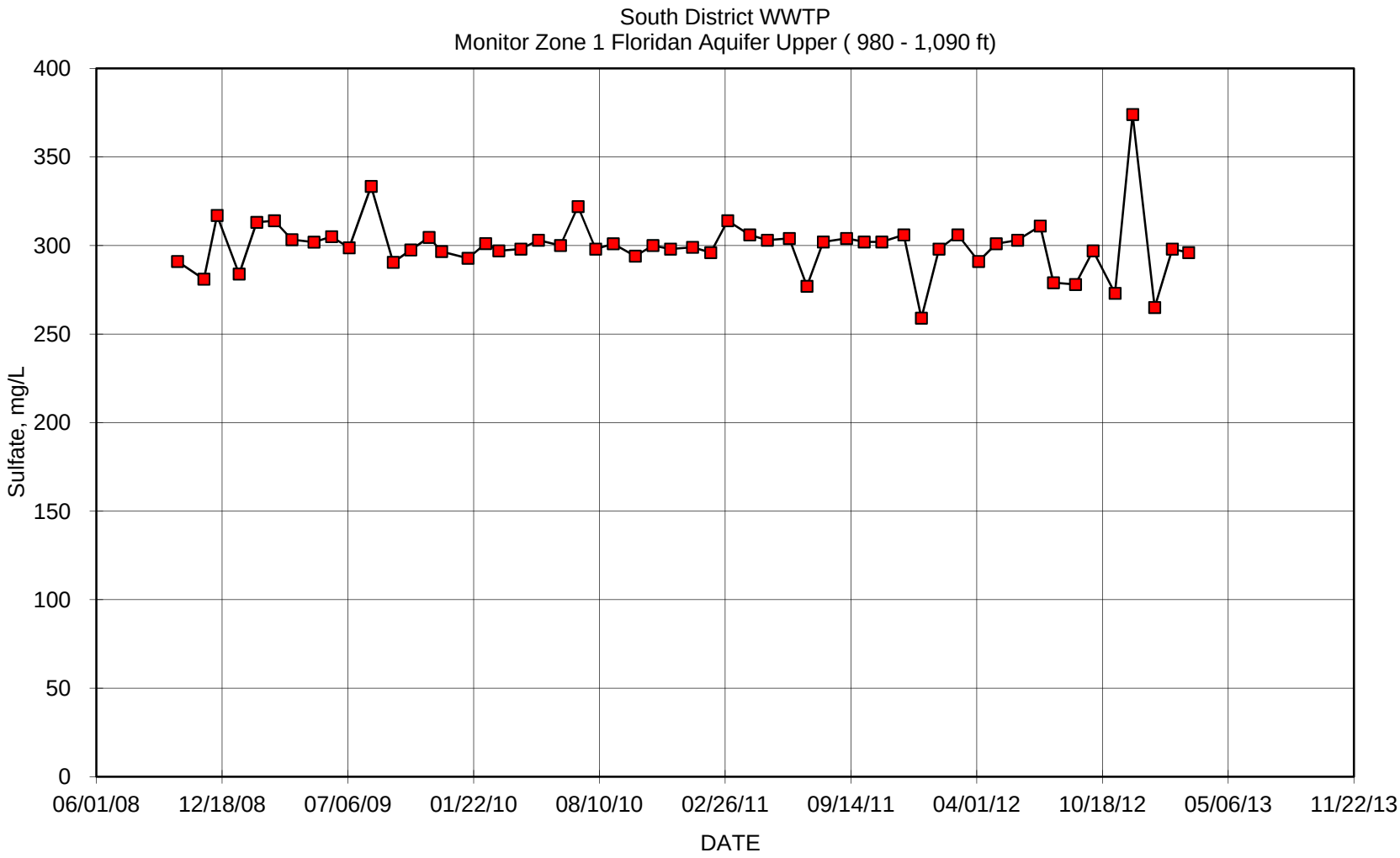
5 year Monitoring Data

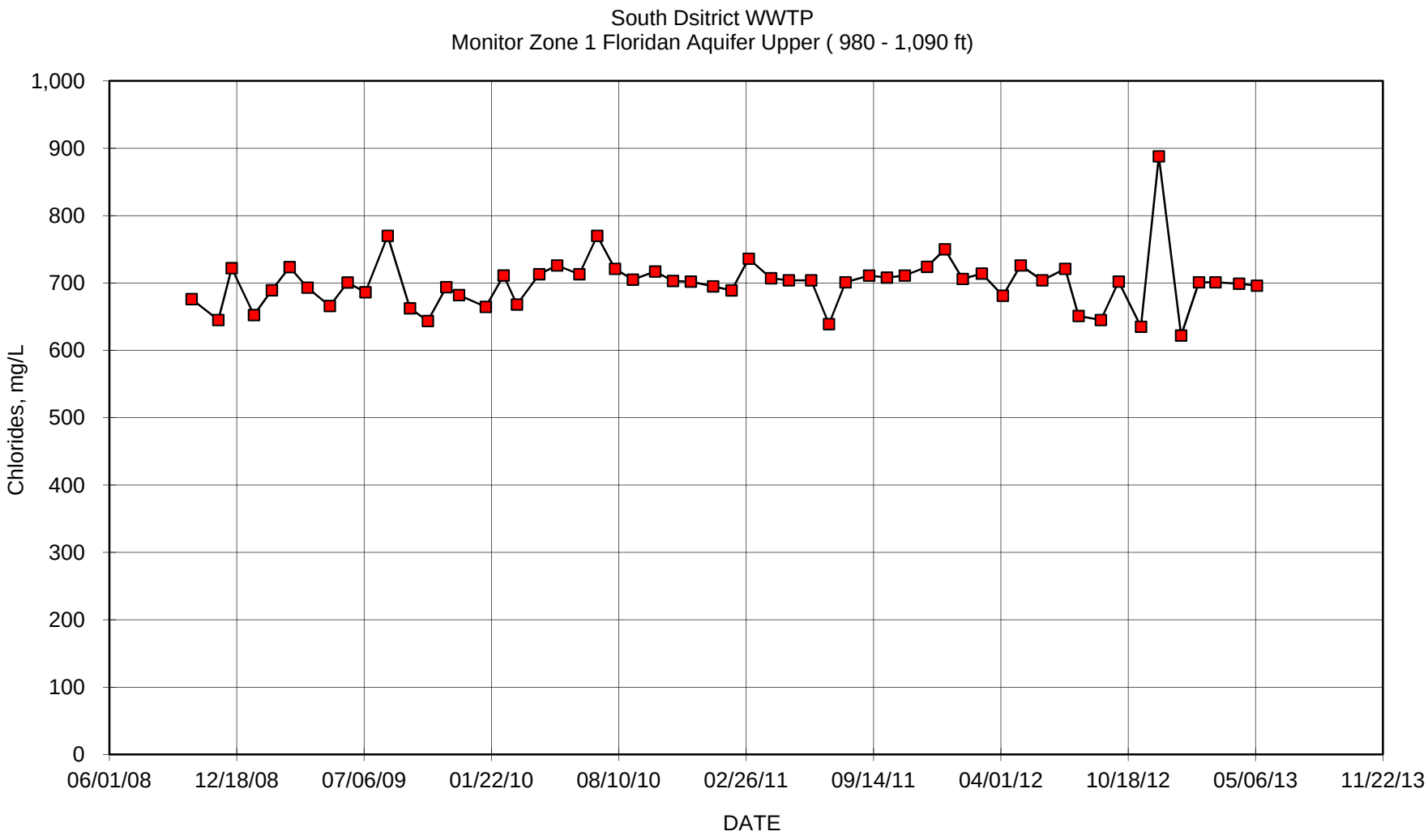
FA-1 Upper

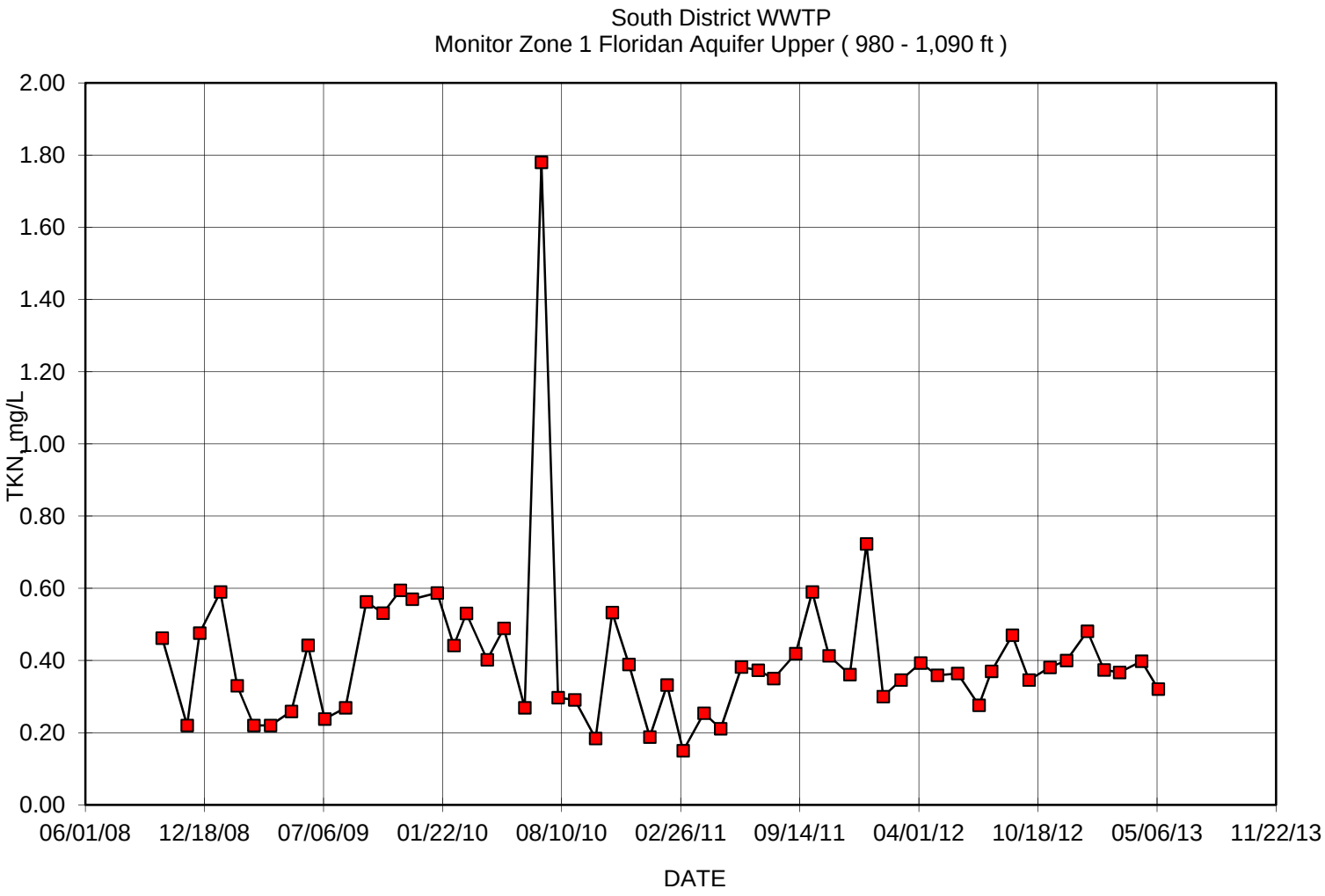
Date	TDS, mg/L	Sulfate, mg/L	Chlorides, mg/L	TKN, mg/L	NH3, mg/L	Conductivity, Micromho/cm	Temp., C	Temp., F	pH	TP, mg/L	TSS, mg/L	NO_3, mg/L	NO_2, mg/L	Sodium, mg/L	Gross Alpha pCi/L	Radium 226 pCi/L	Radium 228 pCi/L
10/08/08	1,812	291	676	0.46	0.15	3,188	24	75	8.0	0.04	1.8	0.03	0.0				
11/19/08	1,844	281	645	0.22	0.02	2,977	22	71	8.1	0.00	1.8	0.03	0.0				
12/10/08	1,796	317	722	0.48	0.16	3,153	24	75	7.9	0.02	0.4	0.03	0.0				
01/14/09	1,800	284	652	0.59	0.17	2,953	22	71	7.5	0.04	0.4	0.03	0.0				
02/11/09	1,760	313	689	0.33	0.16	3,099	23	74	7.8	0.07	1.1	0.00	0.0				
03/11/09	1,788	314	724	0.22	0.17	3,173	23	74	7.5	0.04	0.2	0.00	0.0				
04/08/09	1,816	303	693	0.22	0.17	3,213	23	74	7.8	0.02	0.8	0.00	0.0				
05/13/09	1,756	302	666	0.26	0.27	3,183	25	77	8.1	0.03	0.4	0.00	0.0				
06/10/09	1,652	305	701	0.44	0.21	3,172	25	76	7.9	0.14	0.8	0.00	0.0				
07/08/09	1,844	299	686	0.24	0.02	3,167	25	76	7.8	0.00	0.6	0.00	0.0				
08/12/09	1,720	333	770	0.27	0.24	3,228	24	75	8.0	0.01	1.8	0.01	0.0				
09/16/09	1,688	291	662	0.56	0.18	3,114			7.9	0.03		0.05	0.0	472	4.5	2.5	0.8
10/14/09	1,684	298	644	0.53	0.23	2,933			8.0	0.01		0.00	0.0	483	5.6	2.0	0.9
11/12/09	1,620	305	694	0.59	0.21	2,918			7.9	0.02		0.00	0.0	481	4.8	2.0	0.7
12/02/09	1,752	297	682	0.57	0.20	3,011	24	75	8.1	0.02	0.2	0.00	0.0	494	5.8	2.5	1.0
01/13/10	1,784	293	665	0.59	0.13	3,067	21	70	8.0	0.02	1.2	0.00	0.0	419	19.9	2.4	0.7
02/10/10	1,812	301	711	0.44	0.20	3,062	23	74	8.2	0.02	0.6	0.01	0.0	478	4.8	2.3	0.9
03/03/10	1,752	297	668	0.53	0.15	3,160	22	71	8.0	0.02	1.8	0.00	0.0	476	4.9	2.4	0.7
04/07/10	1,808	298	713	0.40	0.21	3,162	24	75	7.9	0.01	1.6	0.00	0.0	480	7.1	2.5	0.8
05/05/10	1,868	303	726	0.49	0.13	3,098	25	76	8.3	0.01	1.2	0.00	0.0	537	6.5	1.9	0.7
06/09/10	1,724	300	713	0.27	0.15	3,214	25	78	8.0	0.03	0.8	0.00	0.3	487	6.3	1.7	0.6
07/07/10	1,872	322	770	1.78	0.22	3,156	25	77	8.0	0.07	0.4	0.00	0.0	481	5.3	2.2	0.7
08/04/10	1,764	298	721	0.30	0.24	2,951	24	75	8.0	0.13	0.8	0.00	0.0	491	9.2	3.0	0.8
09/01/10	1,764	301	705	0.29	0.19	3,159	24	75	8.0	0.02	1.0	0.00	0.0	466	5.8	2.3	0.8
10/06/10	1,864	294	717	0.18	0.18	3,114	24	74	7.8	0.02	1.6	0.00	0.0	498	6.5	2.8	0.9
11/03/10	1,748	300	703	0.53	0.20	3,040	23	74	8.0	0.02	1.0	0.00	0.0	535	6.6	2.2	0.7
12/01/10	1,856	298	702	0.39	0.17	3,094	24	75	8.2	0.02	1.0	0.00	0.0	490	5.2	2.8	0.6
01/05/11	1,736	299	695	0.19	0.21	3,027	23	74	8.1	0.02	0.4	0.01	0.0	474	5.1	2.7	0.9
02/03/11	1,868	296	689	0.33	0.19	2,956	23	73	7.9	0.02	0.4	0.00	0.0	468	8.7	2.4	0.7
03/02/11	1,948	314	736	0.15	0.13	3,143	23	73	8.0	0.02	0.4	0.00	0.0	452	5.1	2.4	0.8
04/06/11	1,736	306	707	0.25	0.23	3,014	23	73	8.2	0.02	0.8	0.00	0.0	503	6.0	3.4	0.9

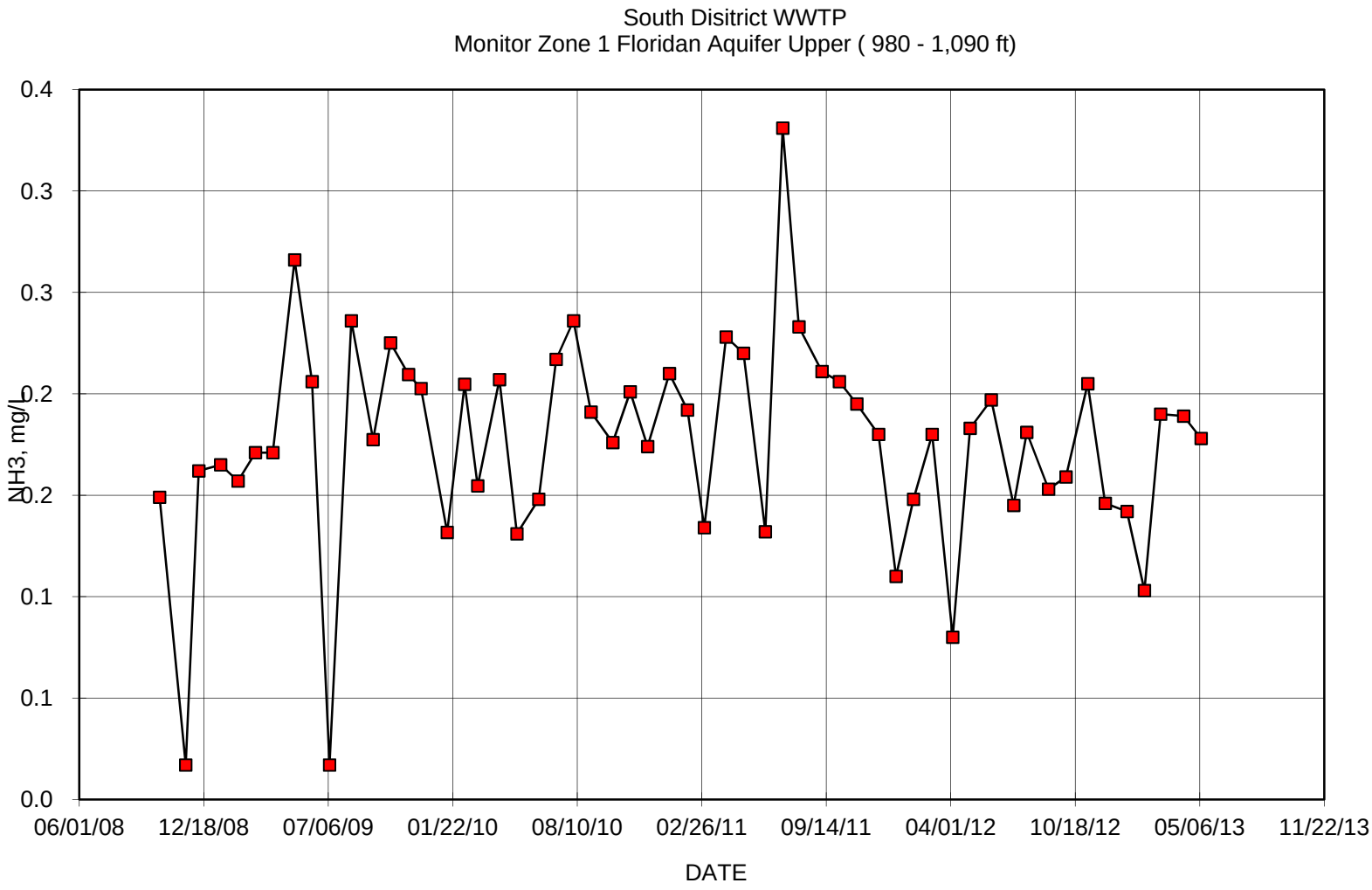
05/04/11	1,920	303	704	0.21	0.22	3,061	23	74	8.1	0.02	0.8	0.00	0.0	498	4.6	2.9	0.9
06/08/11	1,792	304	704	0.38	0.13	3,135	24	75	8.0	0.04	0.7	0.01	0.0	486	11.1	2.7	0.8
07/06/11	1,828	277	639	0.37	0.33	3,040	24	74	7.8	0.02	0.7	0.00	0.0	536	5.4	2.4	0.9
08/01/11	1,860	302	701	0.35	0.23	3,011	25	78	7.9	0.01	0.9	0.01	0.0	498	5.6	1.7	1.0
09/07/11	1,796	304	711	0.42	0.21	3,029	24	75	8.1	0.03	0.3	0.00	0.0	501	12.9	13.4	0.9
10/05/11	1,744	302	708	0.59	0.21	2,934	23	74	8.1	0.02	0.8	0.00	0.0	504	6.7	2.2	101.0
11/02/11	1,792	302	711	0.41	0.20	2,906	24	75	8.2	0.02	0.7	0.00	0.0	496	4.7	1.2	0.8
12/07/11	1,816	306	724	0.36	0.18	3,102	23	73	8.3	0.00	1.2	0.01	0.0	522	6.3	1.9	1.0
01/04/12	1,596	259	750	0.72	0.11	2,596	20	68	8.4	0.09	0.5	0.00	0.0	318	4.4	1.5	0.8
02/01/12	1,904	298	706	0.30	0.15	2,821	24	75	8.2	0.02	0.9	0.00	0.0	501	1.8	2.3	0.9
03/02/12	1,752	306	714	0.35	0.18	2,784	24	74	7.9	0.01	1.5	0.03	0.0	538	4.2	3.1	0.7
04/04/12	1,732	291	681	0.39	0.08	2,926	24	75	7.9	0.02	0.3	0.25	0.3	512	6.4	6.4	0.9
05/02/12	1,872	301	726	0.36	0.18	2,742	24	75	8.0	0.04	1.1	0.00	0.0	533	5.5	1.8	0.8
06/05/12	1,920	303	704	0.36	0.20	3,115	23	74	8.3	0.01	1.2	0.01	0.0	479	6.5	2.3	1.0
07/11/12	1,748	311	721	0.28	0.15	3,113	23	74	8.2	0.03	0.4	0.00	0.0	523	5.3	2.2	0.8
08/01/12	1,824	279	651	0.37	0.18	3,125	24	76	8.2	0.01	0.3	0.00	0.0	540	9.1	3.1	0.8
09/05/12	1,868	278	645	0.47	0.15	3,088	24	75	8.2	0.03	0.3	0.00	0.0	495	6.1	1.1	0.8
10/03/12	1,792	297	702	0.35	0.16	3,016	24	75	8.2	0.03	0.4	0.00	0.0	494	4.4	2.4	0.9
11/07/12	1,676	273	635	0.38	0.21	2,926	23	73	8.1	0.01	0.5	0.01	0.0	517	6.7	2.6	0.8
12/05/12	1,848	374	888	0.40	0.15	3,106	23	74	8.0	0.03	0.1	0.02	0.0	542	9.0	1.9	0.8
01/09/13	1,848	265	622	0.48	0.14	3,157	23	74	8.0	0.16	0.4	0.00	0.0	500	5.5	1.8	0.8
02/06/13	1,836	298	701	0.37	0.10	3,130	23	74	7.9	0.03	0.7	0.00	0.0	469	5.0	2.0	0.9
03/04/13	1,768	296	701	0.37	0.19	3,170	23	73	8.2	0.03	1.9	0.02	0.0	557	5.7	3.6	0.7
04/10/13	1,784	298	699	0.40	0.19	3,155	23	74	7.8	0.01	0.0	0.02	0.0	496	3.6	1.3	0.8
05/08/13	1,948	294	696	0.32	0.18	3,317	24	75	8.0	0.03	0.0	0.01	0.0	527	3.9	1.9	0.8

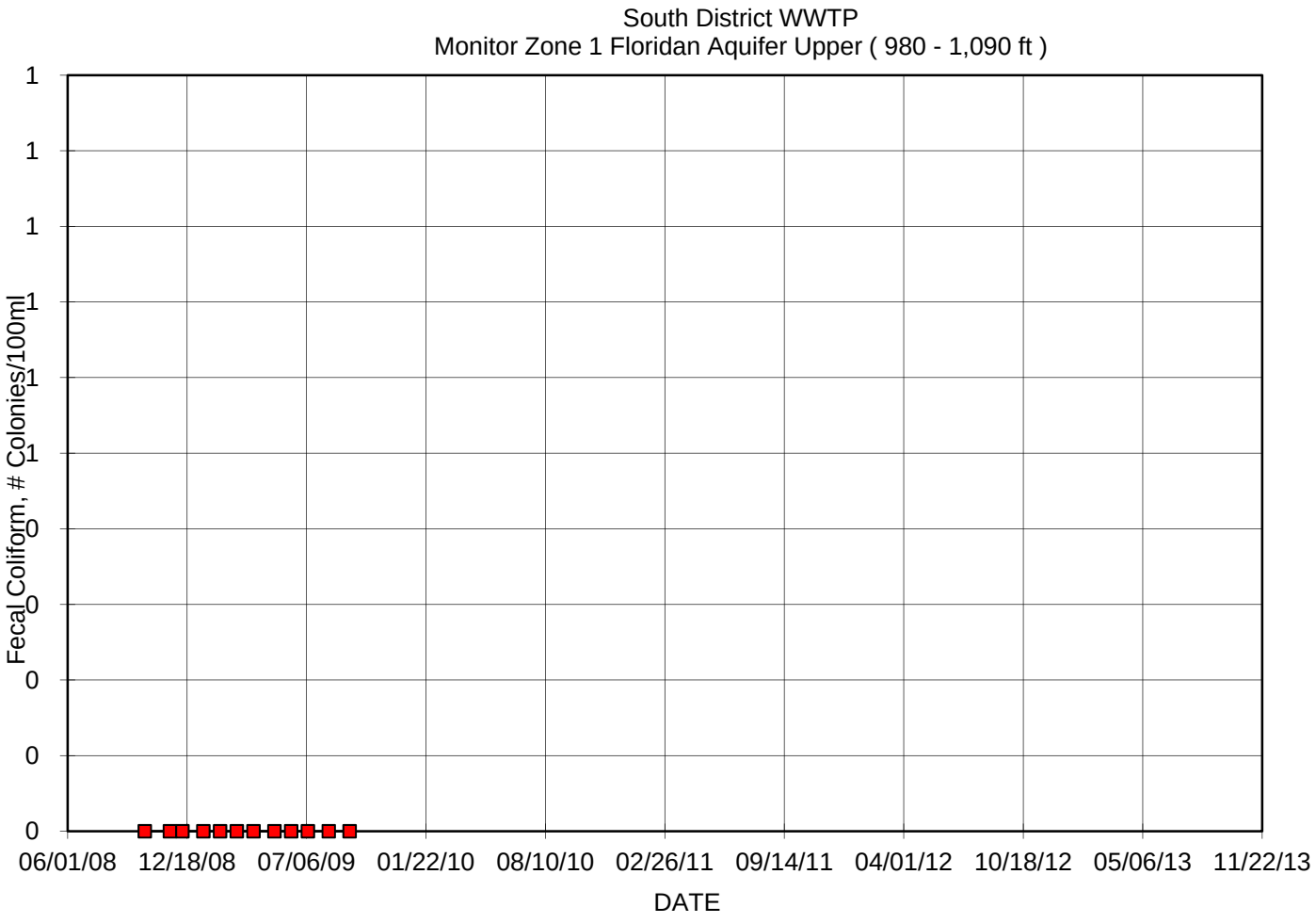

South District WWTP
Monitor Zone 1 Floridan Aquifer Upper (980 - 1,090 ft)
TDS, mg/L
2,500
2,000
1,500
1,000
500
0
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

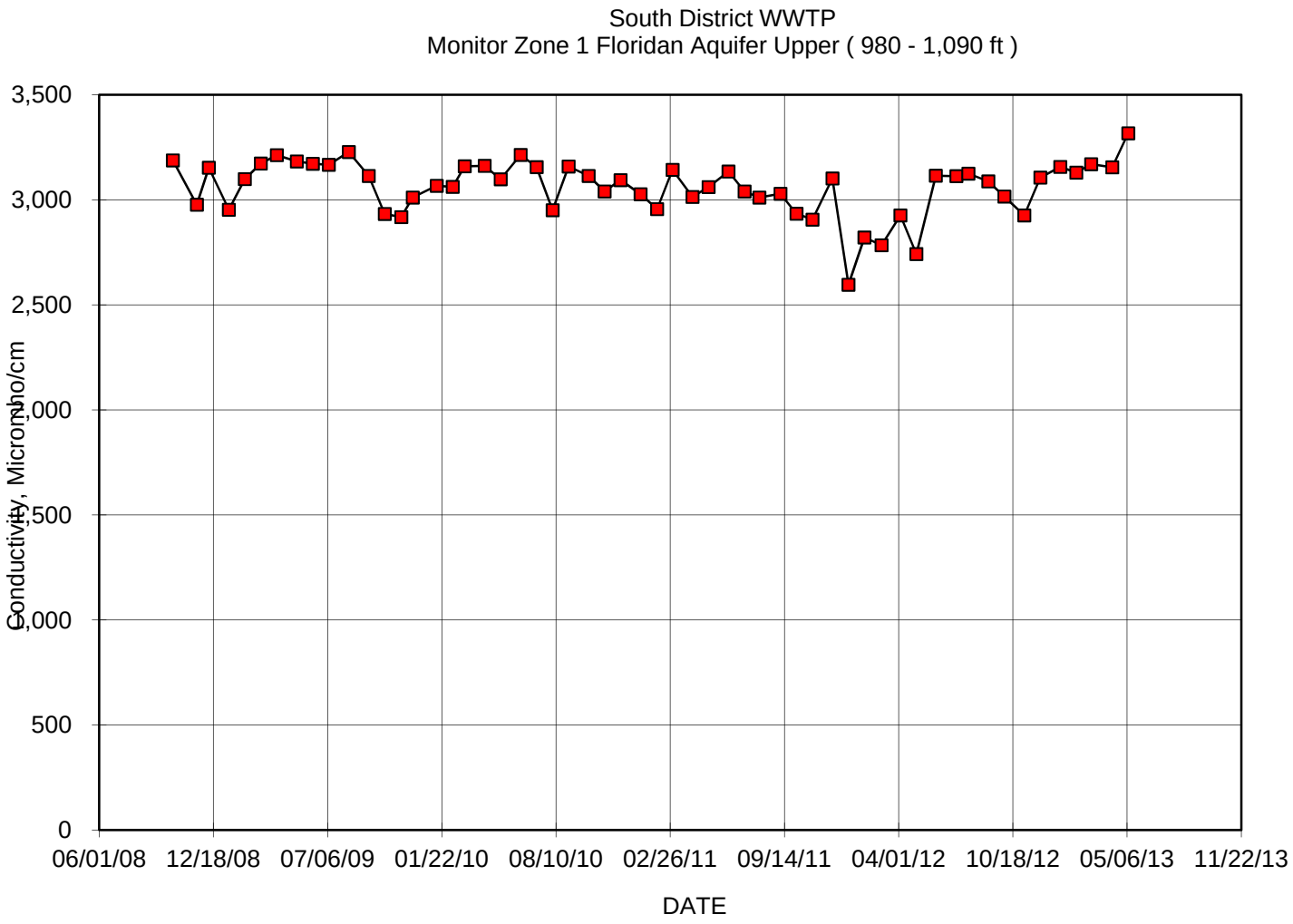

South District WWTP
Monitor Zone 1 Floridan Aquifer Upper (980 - 1,090 ft)
Sulfate, mg/L
400
350
300
250
200
150
100
50
0
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

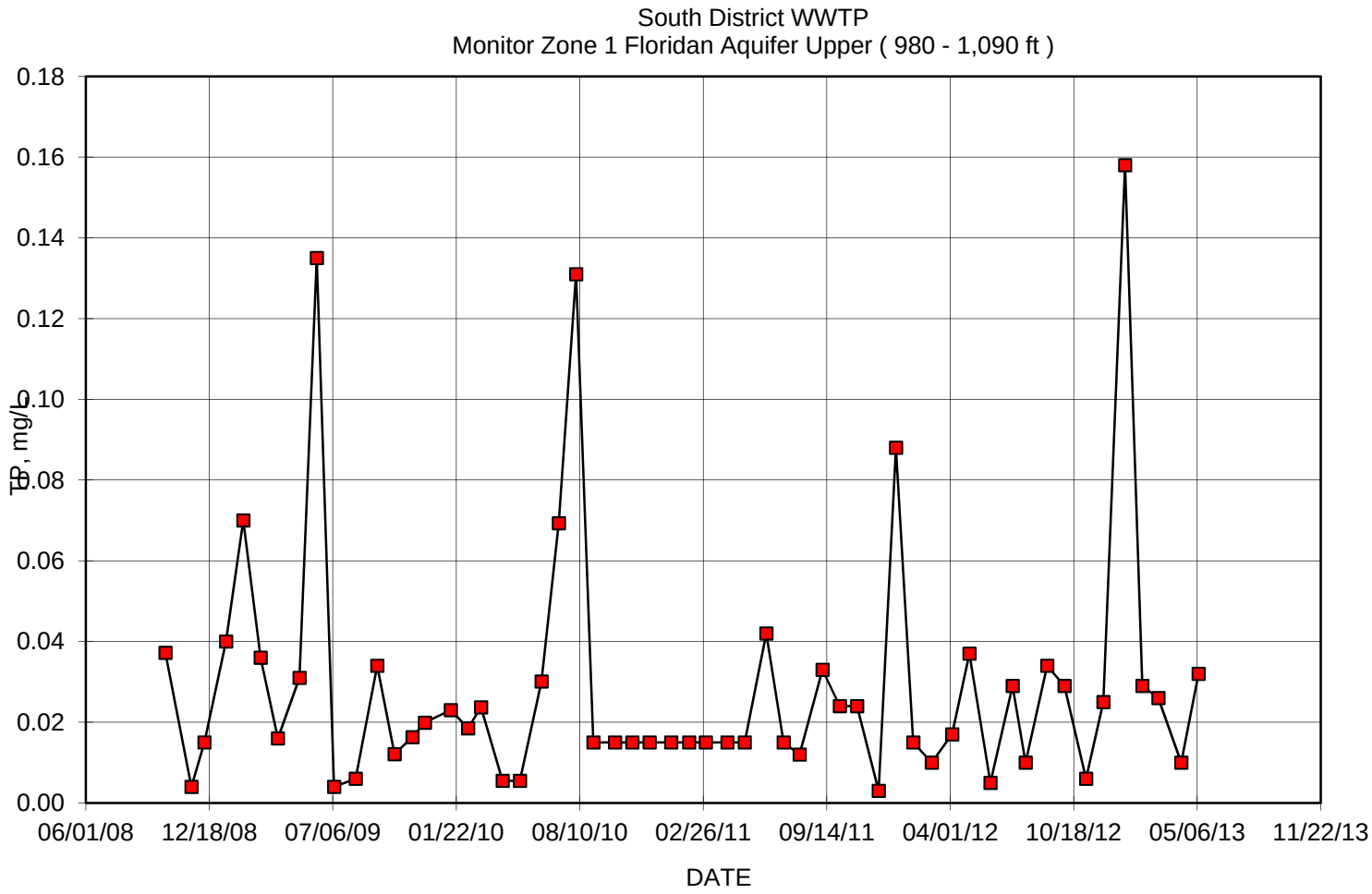

South Dsitrict WWTP
Monitor Zone 1 Floridan Aquifer Upper (980 - 1,090 ft)
Chlorides, mg/L
1,000
900
800
700
600
500
400
300
200
100
0
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

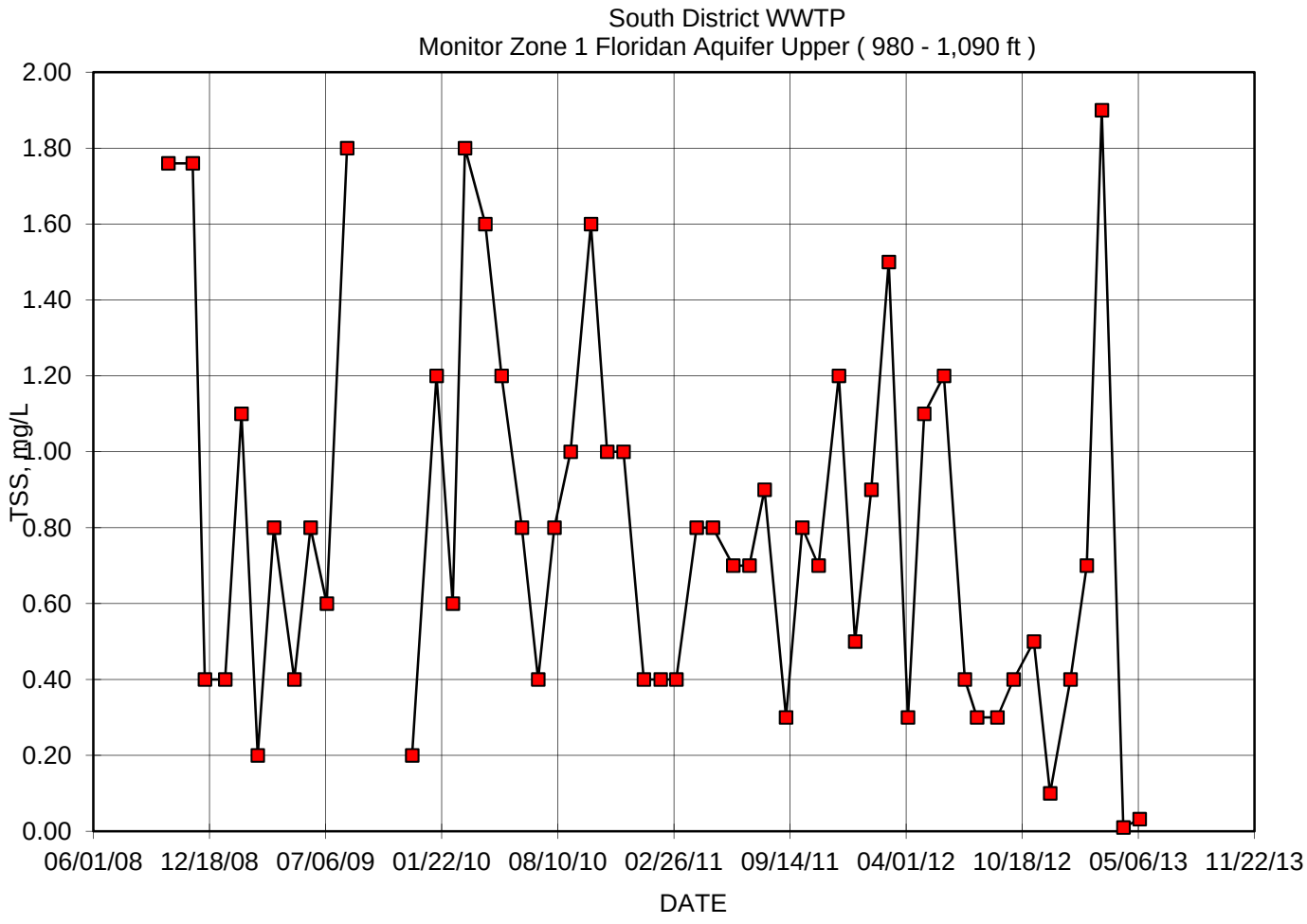

South District WWTP
Monitor Zone 1 Floridan Aquifer Upper (980 - 1,090 ft)
TKN, mg/L
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South Disitrict WWTP
Monitor Zone 1 Floridan Aquifer Upper (980 - 1,090 ft)
0.4
0.3
0.3
0.2
0.2
0.1
0.1
0.0
NH3, mg/L
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 1 Floridan Aquifer Upper (980 - 1,090 ft)
Fecal Coliform, # Colonies/100ml
1
1
1
1
1
1
0
0
0
0
0
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 1 Floridan Aquifer Upper (980 - 1,090 ft)
Conductivity, Micromho/cm
3,500
3,000
2,500
2,000
1,500
1,000
500
0
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

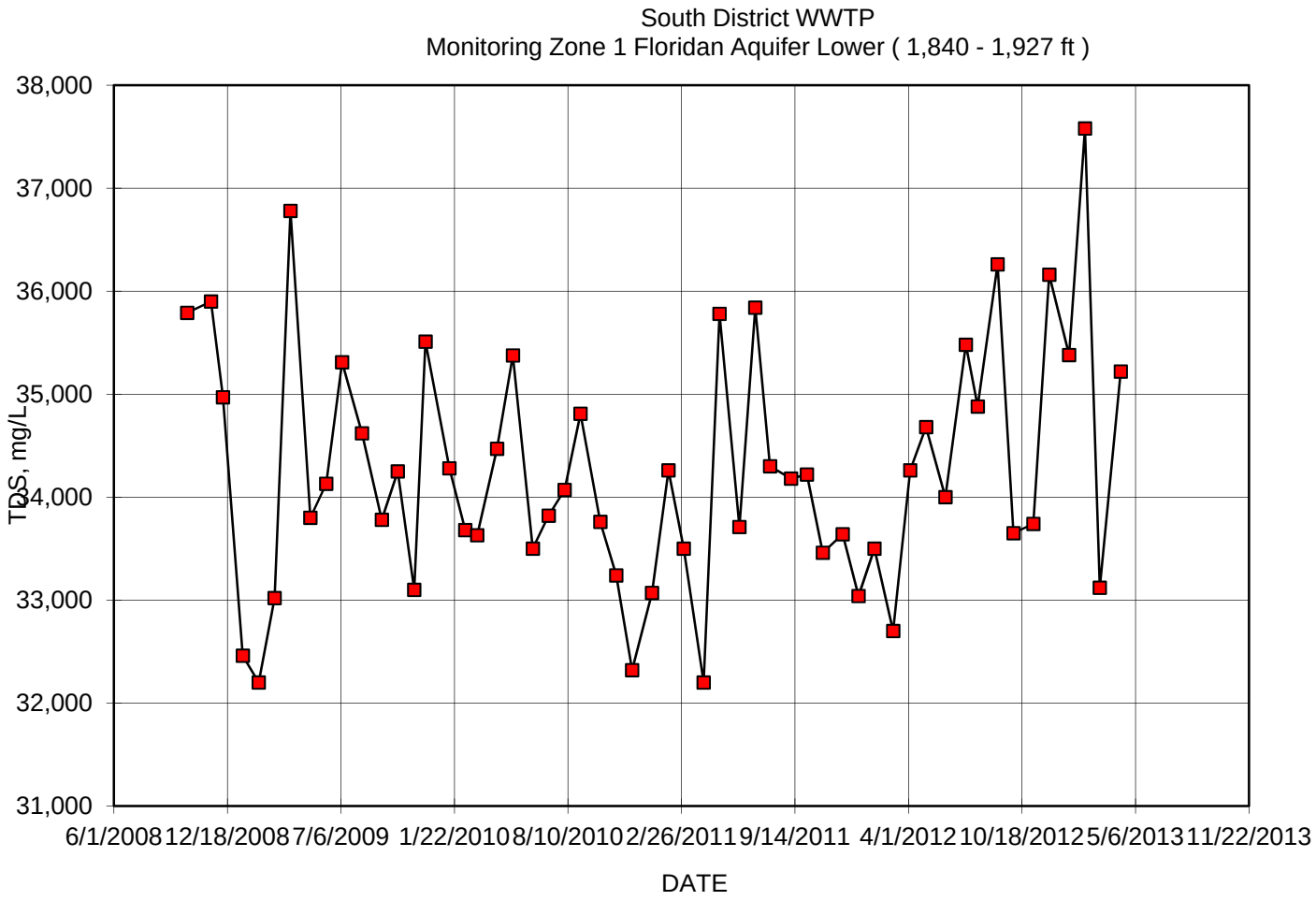

South District WWTP
Monitor Zone 1 Floridan Aquifer Upper (980 - 1,090 ft)
TP, mg/L
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

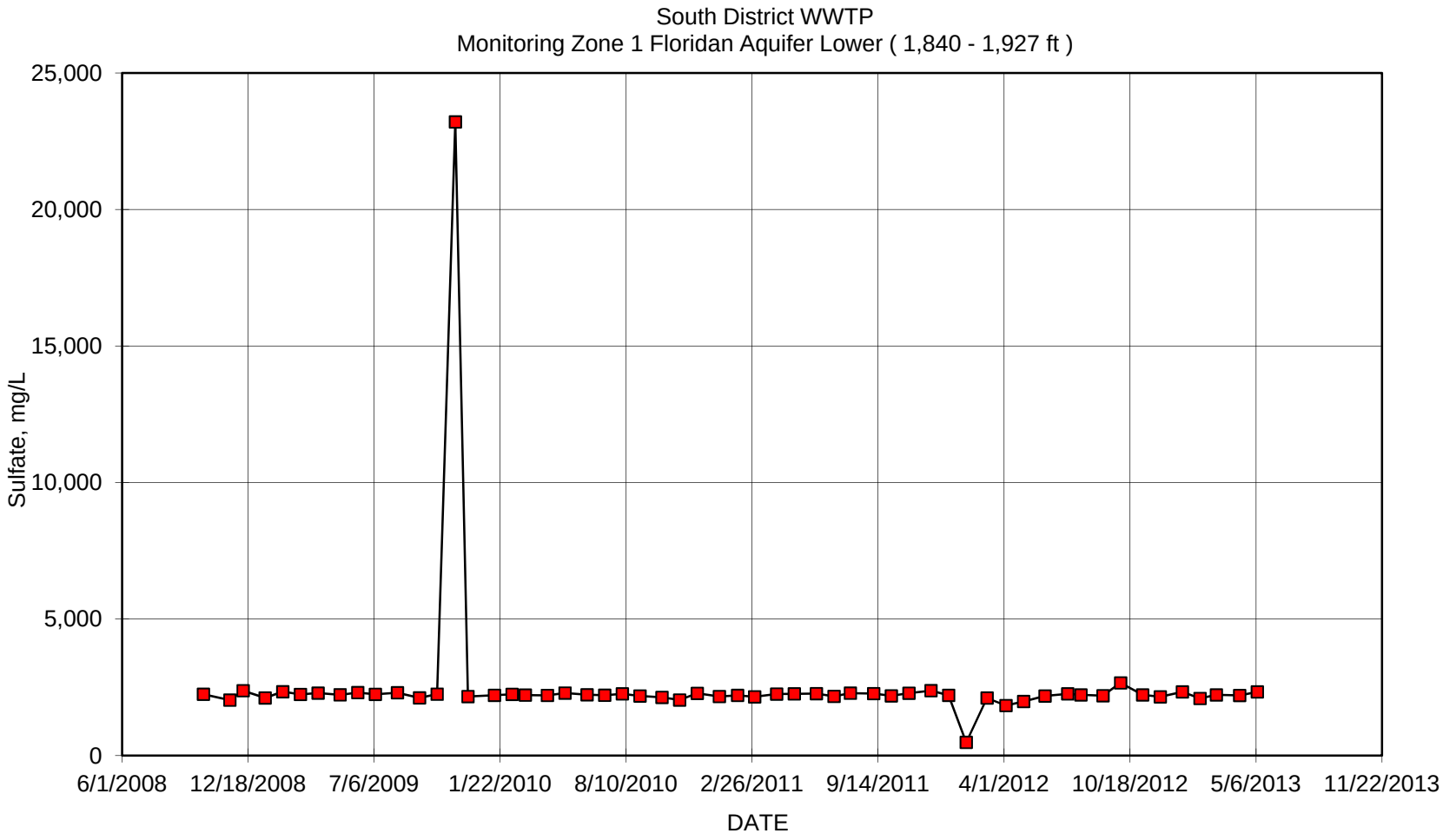

South District WWTP
Monitor Zone 1 Floridan Aquifer Upper (980 - 1,090 ft)
TSS, mg/L
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

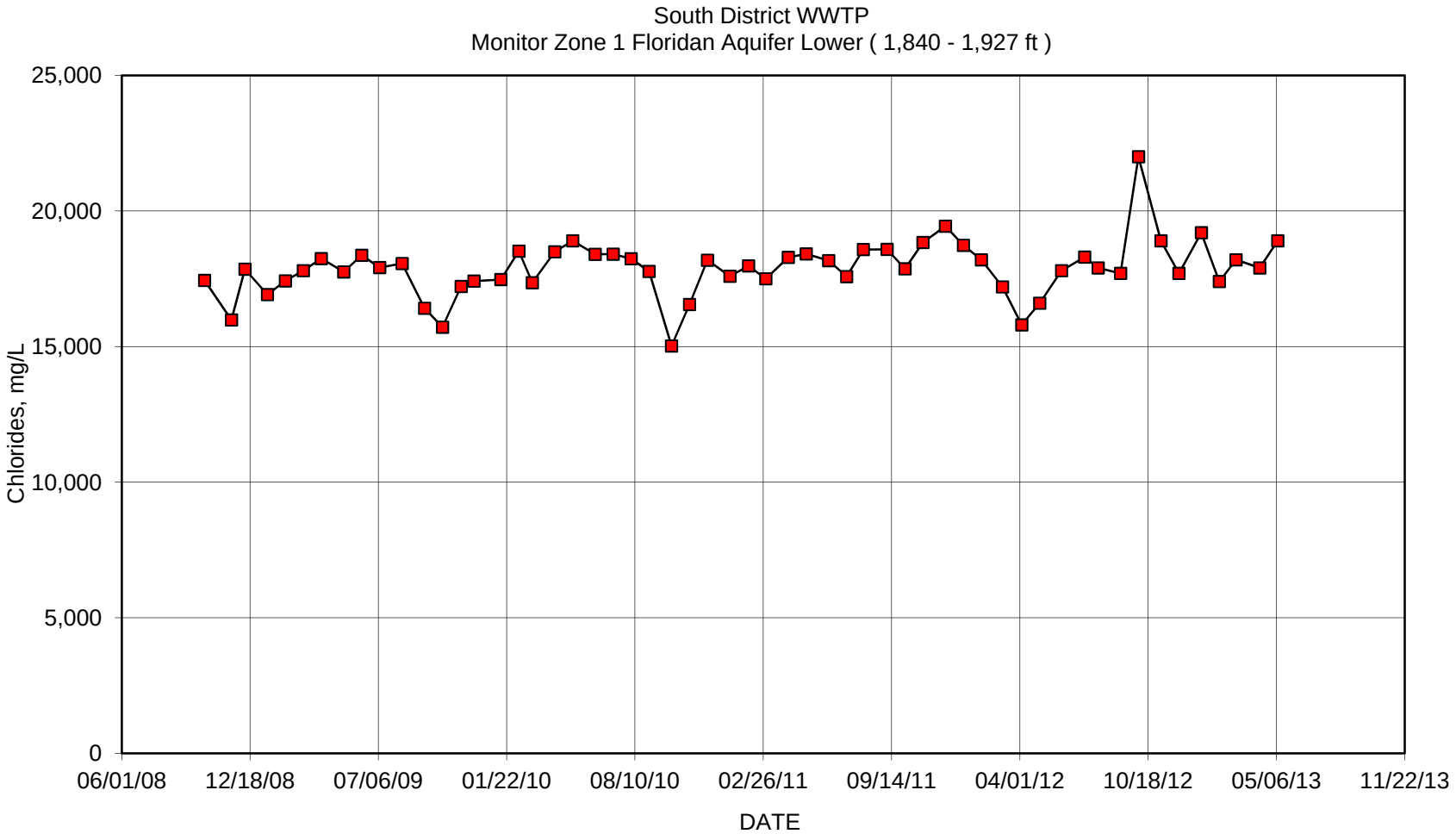
FA-1 Lower Data

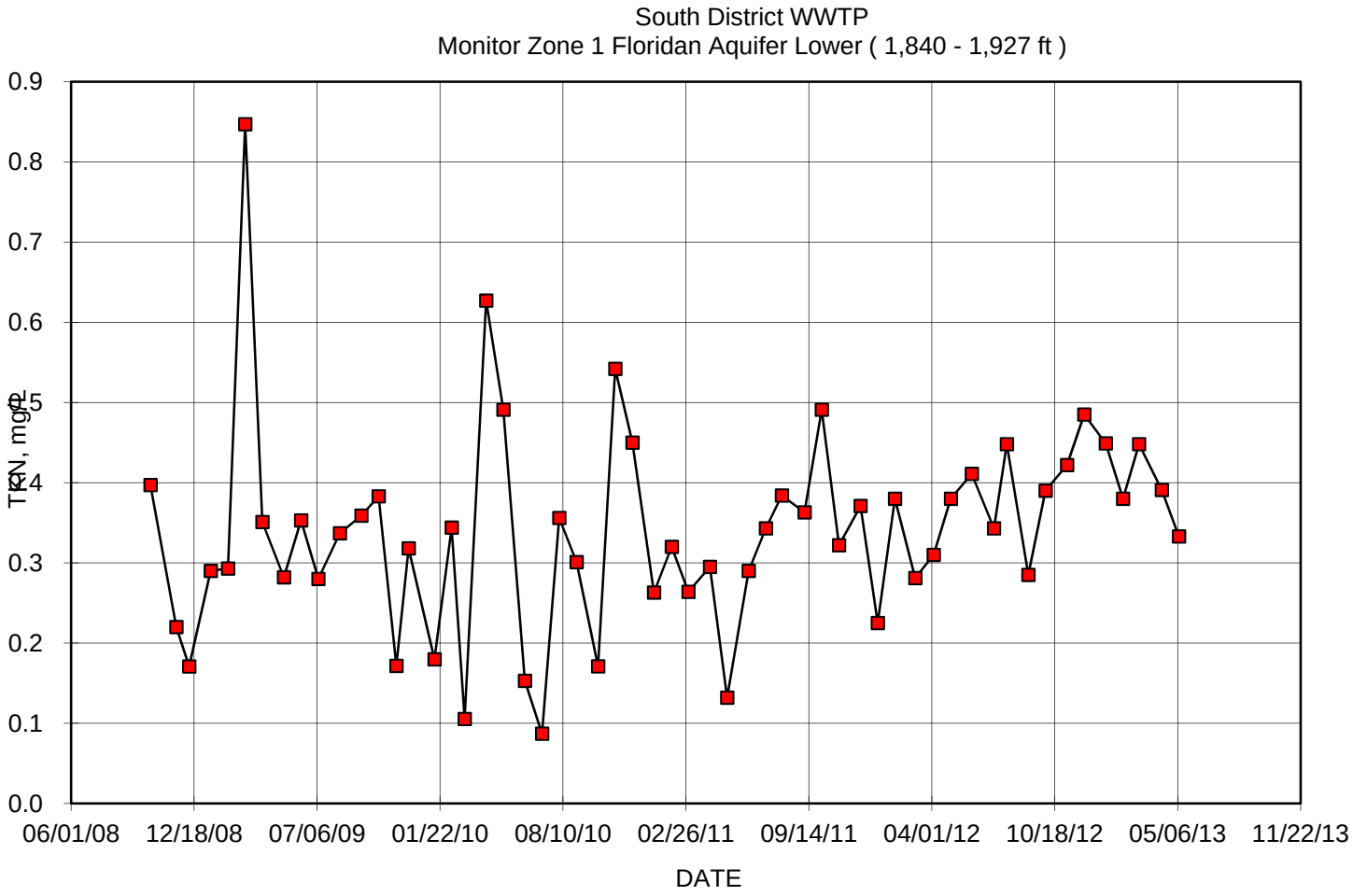
Date	TDS, mg/L	Sulfate, mg/L	Chlorides, mg/L	TKN, mg/L	NH3, mg/L	Fecal Coliform, # Colonies/100ml	Conductivity, Micromho/cm	Temp., C	Temp., F	pH	DO, mg/L	TP, mg/L	TOC, mg/L	TSS, mg/L	NO_3, mg/L	NO_2, mg/L	NO_3 + NO_2, mg/L	N, mg/L	Sodium, mg/L	Gross Alpha pCi/L	Radium 226 pCi/L
10/08/08	35,790	2,245	17,440	0.40	0.06	0	46,500	24	76	7.6		0.03	3.02	32.40	0.03	0.00					
11/19/08	35,900	2,030	15,981	0.22	0.02	0	46,110	22	71	7.4		0.00	0.80	19.40	0.03	0.00					
12/10/08	34,970	2,375	17,855	0.17	0.07	0	49,120	24	75	7.3		0.03	0.73	18.40	0.03	0.00					
01/14/09	32,460	2,109	16,916	0.29	0.06	0	48,010	22	71	6.9		0.05	0.70	22.60	0.06	0.00					
02/11/09	32,200	2,337	17,422	0.29	0.08	0	50,340	23	74	7.5		0.08	1.19	25.70	0.00	0.00					
03/11/09	33,020	2,238	17,800	0.85	0.10	0	50,280	23	73	7.1		0.28	12.50	17.80	0.00	0.00					
04/08/09	36,780	2,286	18,245	0.35	0.09	0	51,520	23	74	7.0		0.09	0.35	23.80	0.00	0.00					
05/13/09	33,800	2,223	17,753	0.28	0.36	0	49,700	25	77	7.4		0.04	6.09	16.60	0.00	0.00					
06/10/09	34,130	2,305	18,367	0.35	0.13	0	52,790	24	76	7.3		0.39	1.60	11.60	0.00	0.00					
07/08/09	35,310	2,241	17,914	0.28	0.14	0	48,700	24	75	7.2		0.02	0.60	19.00	0.00	0.00					
08/12/09	34,620	2,300	18,063	0.34	0.30	0	49,490	23	74	7.5		0.01	0.91	21.20	0.00	0.00					
09/16/09	33,780	2,112	16,412	0.36	0.09		48,230			7.5		0.02			0.05	0.01					
10/14/09	34,250	2,248	15,715	0.38	0.09		48,830			7.5		0.02			0.00	0.00					
11/12/09	33,100	23,208	17,216	0.17	0.13		49,880			8.3		0.03			0.00	0.00					
12/02/09	35,510	2,160	17,415	0.32	0.12		51,940	25	76	7.4		0.03		13.00	0.00	0.00					
01/13/10	34,280	2,205	17,472	0.18	0.10		47,300	21	70	7.2		0.03		11.80	0.00	0.00					
02/10/10	33,680	2,241	18,520	0.34	0.08		47,770	23	74	7.4		0.02		25.80	0.00	0.00					
03/03/10	33,630	2,214	17,357	0.11	0.07		49,030	22	72	7.4		0.02		12.00	0.02	0.11					
04/07/10	34,470	2,202	18,496	0.63	0.14		49,890	24	75	7.3		0.02		13.60	0.00	0.00					
05/05/10	35,376	2,288	18,899	0.49	0.02		48,670	24	76	7.5		0.01		25.20	0.00	0.00					
06/09/10	33,500	2,225	18,403	0.15	0.09		50,350	26	79	7.5		0.22		21.00	0.00	0.00					
07/07/10	33,820	2,209	18,409	0.09	0.13		49,050	25	77	7.4		0.03		18.20	0.02	0.02					
08/04/10	34,070	2,260	18,238	0.36	1.67		47,490	24	75	7.4		0.18		13.80	0.00	0.00					
09/01/10	34,810	2,181	17,772	0.30	1.29		48,840	24	75	7.3		0.02		36.20	0.00	0.00					
10/06/10	33,760	2,129	15,024	0.17	0.87		48,310	23	74	7.5		0.01		18.40	0.00	0.00					
11/03/10	33,240	2,033	16,551	0.54	0.75		48,140	23	74	7.4		0.02		12.60	0.00	0.00					
12/01/10	32,320	2,277	18,185	0.45	0.70		48,170	23	74	7.4		0.02		19.60	0.07	0.00					
01/05/11	33,070	2,161	17,593	0.26	0.61		46,760	23	73	7.4		0.02		14.60	0.02	0.00					

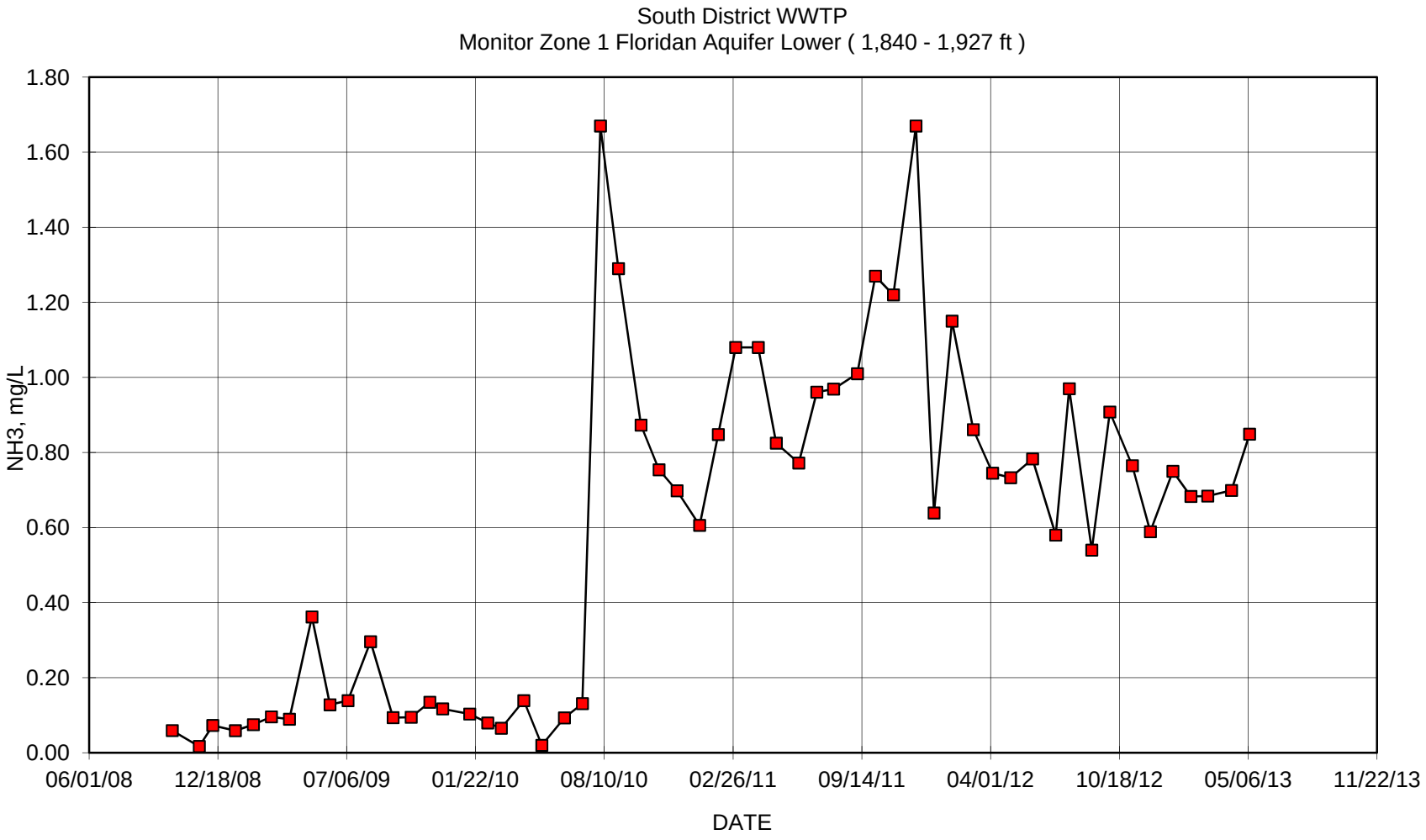
02/03/11	34,260	2,203	17,975	0.32	0.85	46,490	23	73	7.4	0.02	10.00	0.00	0.00
03/02/11	33,500	2,149	17,500	0.26	1.08	48,320	22	72	7.2	0.02	67.80	0.00	0.00
04/06/11	32,200	2,252	18,289	0.30	1.08	47,720	23	73	7.1	0.02	12.60	0.00	0.00
05/04/11	35,780	2,260	18,416	0.13	0.83	50,600	23	73	7.4	0.02	16.60	0.00	0.00
06/08/11	33,710	2,267	18,169	0.29	0.77	48,930	24	75	7.2	0.05	14.60	0.00	0.00
07/06/11	35,840	2,166	17,580	0.34	0.96	49,540	23	74	7.7	0.00	17.00	0.02	0.00
08/01/11	34,300	2,284	18,579	0.38	0.97	46,690	25	77	7.5	0.02	11.10	0.00	0.00
09/07/11	34,180	2,268	18,584	0.36	1.01	48,540	24	75	7.4	0.04	13.10	0.01	0.00
10/05/11	34,220	2,185	17,867	0.49	1.27	47,280	23	73	7.5	0.03	15.10	0.01	0.00
11/02/11	33,460	2,282	18,839	0.32	1.22	47,880	24	74	7.3	0.03	9.90	0.02	0.00
12/07/11	33,640	2,376	19,438	0.37	1.67	46,390	23	74	7.8	0.02	10.10	0.02	0.00
01/04/12	33,040	2,206	18,733	0.23	0.64	45,620	19	66	8.3	0.02	4.10	0.01	0.00
02/01/12	33,500	483	18,200	0.38	1.15	47,551	23	74	7.2	0.02	14.30	0.02	0.00
03/05/12	32,700	2,107	17,200	0.28	0.86	43,690	23	74	7.4	0.02	5.10	0.02	0.00
04/04/12	34,260	1,830	15,800	0.31	0.75	48,900	23	74	7.3	0.04	11.70	0.50	2.50
05/02/12	34,680	1,980	16,600	0.38	0.73	49,550	24	75	7.5	0.05	12.30	0.00	0.00
06/05/12	34,000	2,180	17,800	0.41	0.78	45,420	23	73	7.2	0.01	9.30	0.01	0.00
07/11/12	35,480	2,260	18,300	0.34	0.58	48,780	23	74	7.5	0.03	11.70	0.02	0.00
08/01/12	34,880	2,220	17,900	0.45	0.97	46,550	24	75	8.0	0.04	9.20	0.01	0.00
09/05/12	36,260	2,190	17,700	0.29	0.54	48,740	24	74	7.4	0.03	11.20	0.01	0.00
10/03/12	33,650	2,660	22,000	0.39	0.91	49,622	23	74	7.5	0.03	16.00	0.01	0.00
11/07/12	33,740	2,220	18,900	0.42	0.77	47,862	23	73	7.6	0.03	10.10	0.01	0.00
12/05/12	36,160	2,150	17,700	0.49	0.59	49,220	23	73	7.3	0.05	8.80	0.02	0.01
01/09/13	35,380	2,330	19,200	0.45	0.75	49,050	23	74	7.5	0.15	7.90	0.01	0.01
02/06/13	37,580	2,090	17,400	0.38	0.68	47,012	23	74	7.5	0.03	11.30	0.02	0.01
03/04/13	33,120	2,220	18,200	0.45	0.68	49,232	22	72	7.7	0.04	30.00	0.01	0.01
04/10/13	35,220	2,200	17,900	0.39	0.70	49,449	23	73	7.4	0.02	0.02	0.02	0.02
05/08/13		2,330	18,900	0.33	0.85	50,489	24	74	7.4	0.07	0.07		0.01

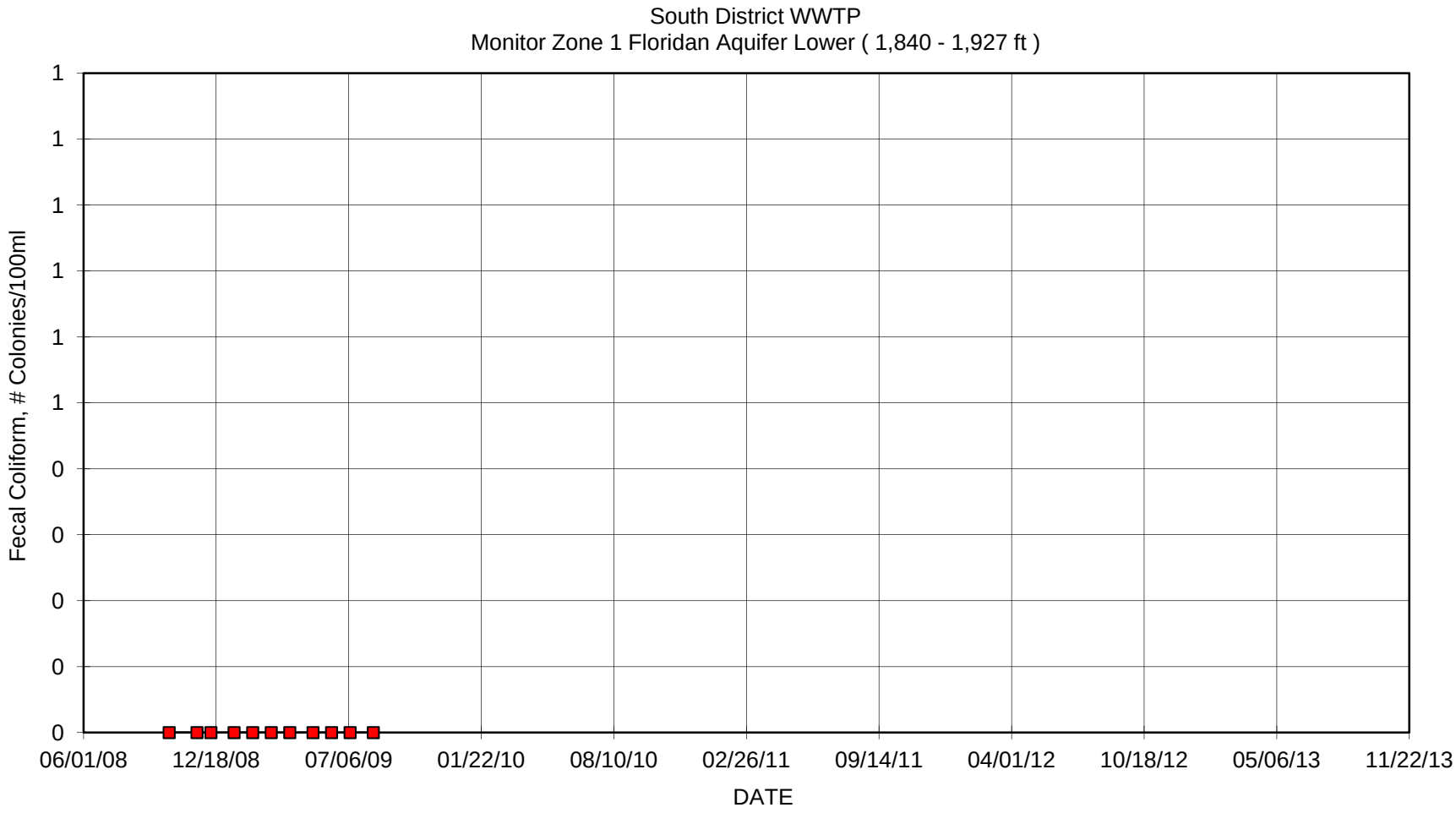

South District WWTP
Monitoring Zone 1 Floridan Aquifer Lower (1,840 - 1,927 ft)
38,000
37,000
36,000
35,000
34,000
33,000
32,000
31,000
TDS, mg/L
6/1/2008
12/18/2008
7/6/2009
1/22/2010
8/10/2010
2/26/2011
9/14/2011
4/1/2012
10/18/2012
5/6/2013
11/22/2013
DATE


South District WWTP
Monitoring Zone 1 Floridan Aquifer Lower (1,840 - 1,927 ft)
Sulfate, mg/L
25,000
20,000
15,000
10,000
5,000
0
6/1/2008
12/18/2008
7/6/2009
1/22/2010
8/10/2010
2/26/2011
9/14/2011
4/1/2012
10/18/2012
5/6/2013
11/22/2013
DATE


South District WWTP
Monitor Zone 1 Floridan Aquifer Lower (1,840 - 1,927 ft)
Chlorides, mg/L
25,000
20,000
15,000
10,000
5,000
0
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 1 Floridan Aquifer Lower (1,840 - 1,927 ft)
TKN, mg/L
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 1 Floridan Aquifer Lower (1,840 - 1,927 ft)
NH3, mg/L
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE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Fecal Coliform, # Colonies/100ml
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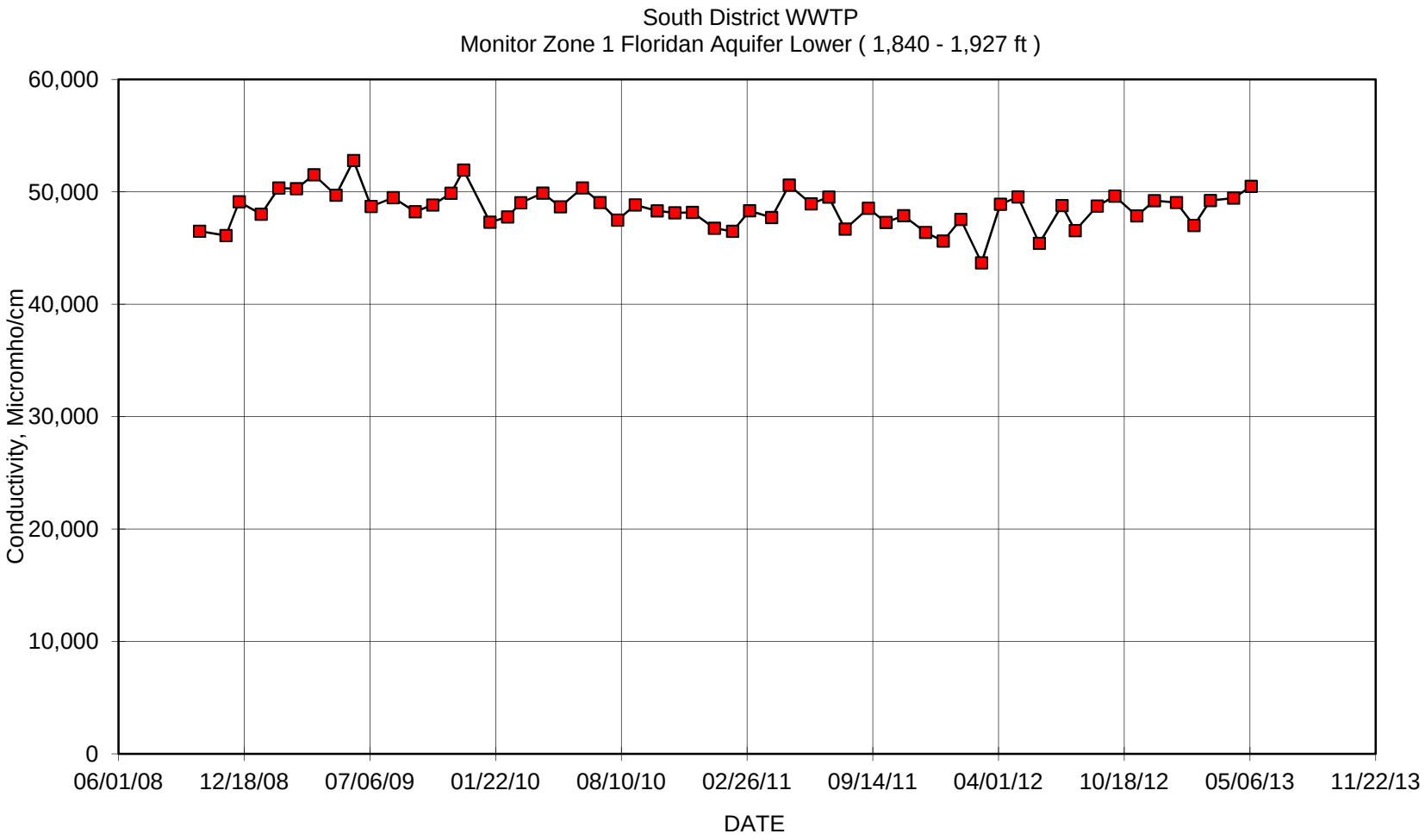
1
1
1
1
1
0
0
0
0
0
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE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Conductivity, Micromho/cm
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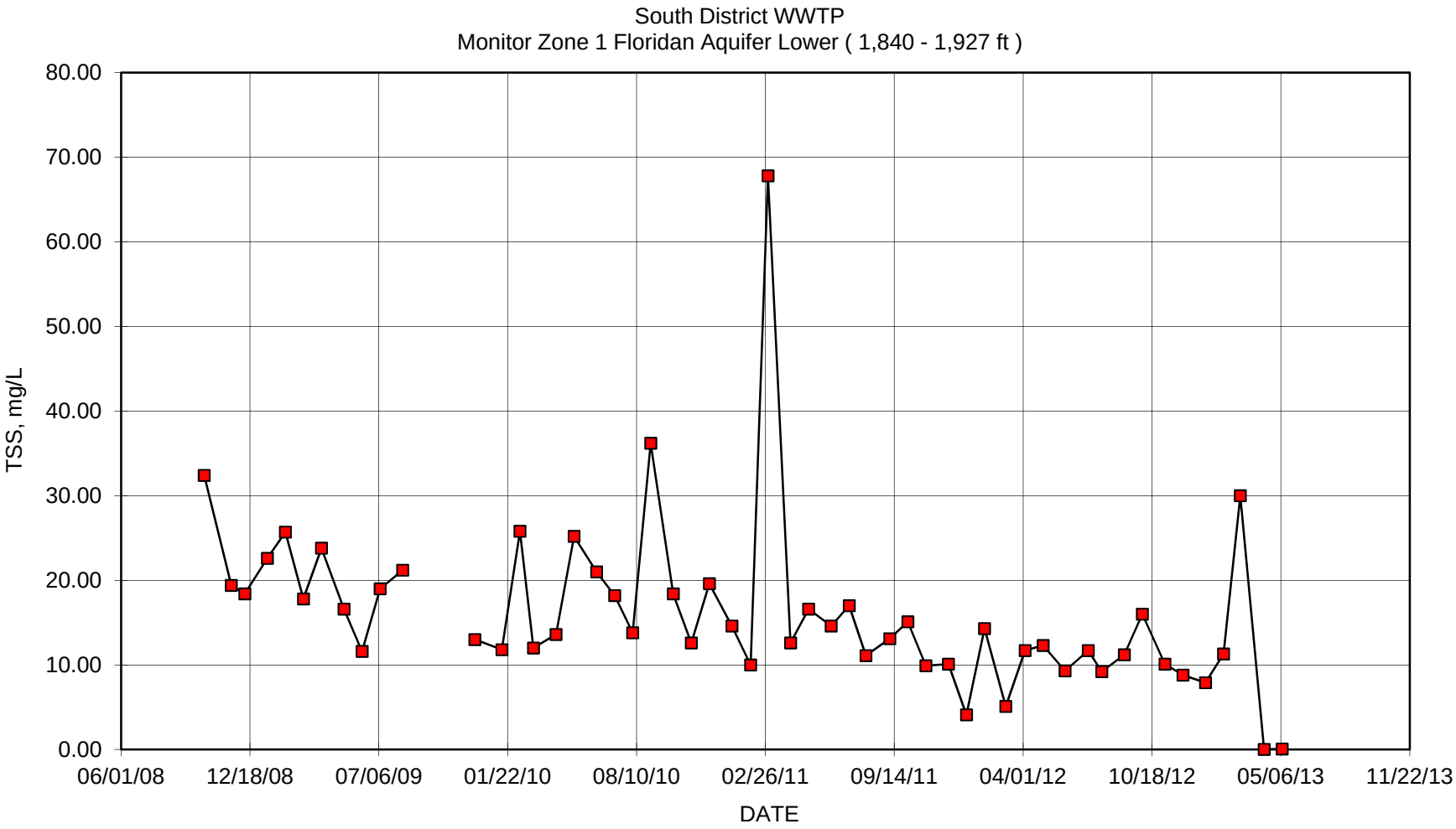
50,000
40,000
30,000
20,000
10,000
0
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE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TSS, mg/L
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70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
06/01/08
12/18/08
07/06/09
01/22/10
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09/14/11
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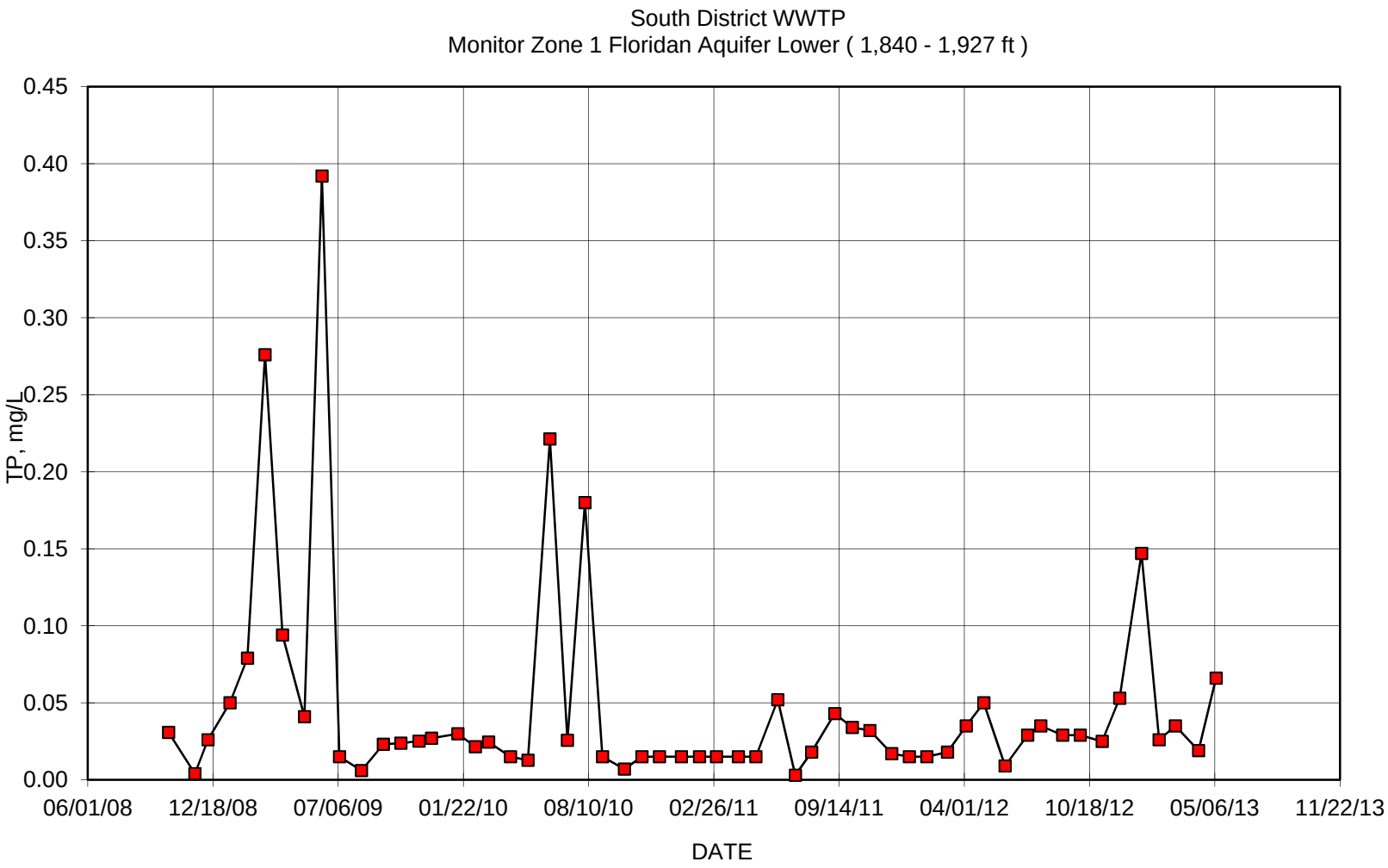
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 1 Floridan Aquifer Lower (1,840 - 1,927 ft)
TP, mg/L
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
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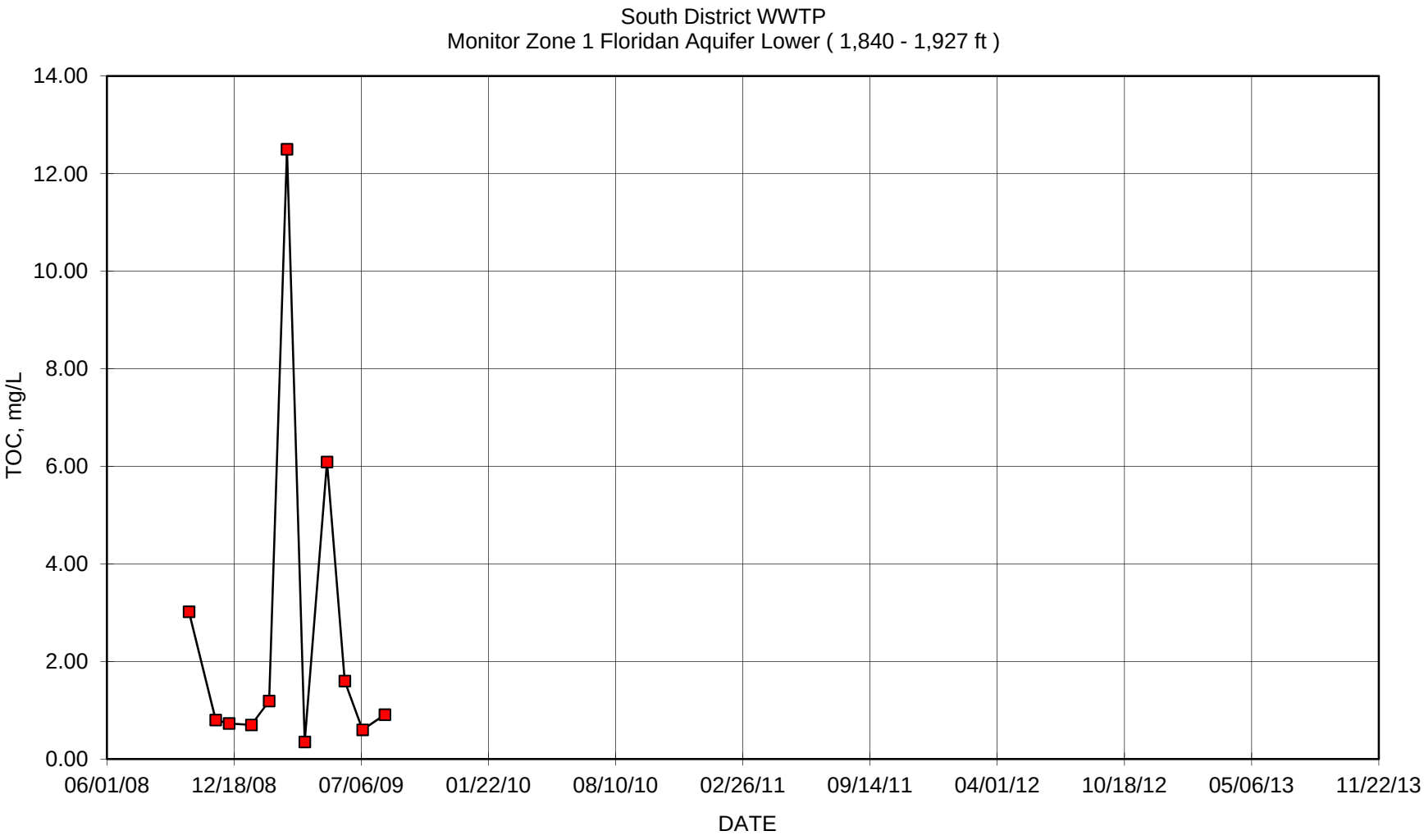
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 1 Floridan Aquifer Lower (1,840 - 1,927 ft)
TOC, mg/L
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12.00
10.00
8.00
6.00
4.00
2.00
0.00
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

MIAMI-DADE COUNTY
miamidade.gov

Water and Sewer
PO Box 330316 • 3071 SW 38 Avenue
Miami, Florida 33233-3016
T 305-665-7471

September 24, 2013

Mr. Joseph R. May, P.G.
Florida Department of Environmental Protection
400 North Congress Avenue, 3rd Floor
West Palm Beach, Florida 33401

CCN: 57713

Reference: Miami-Dade Water and Sewer Department -- Mechanical Integrity Testing (MIT) Report for Deep Injection Well No. IW-9 at the SDWWTP Site.

Dear Mr. May:

Enclosed please find the Certificate of Mechanical Integrity and the MIT Report on the re-testing of Deep Injection Well No. IW-9 at the South District Wastewater Treatment Plant site in Miami-Dade County.

All the tests were conducted in strict adherence to the specifications submitted to and approved by your office. The testing results for the well were good. Both external and internal mechanical integrity were demonstrated. The well casing and the wellhead components are in good condition. All the well head valves and all the well head components are scheduled to be rust-proofed and repainted when all the MITs are completed. Based on the results of the well testing we conclude that the well retains full mechanical integrity and recommend that MDWASD be allowed to continue operating the well in its normal mode.

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

The demonstration of mechanical integrity is being submitted per Chapter 62-528.300(6)(b)2., 62-528.300(6)(c), and 62-528.425(1)(d), F.A.C. and specific condition 3.j. of Permit 0061787-022-UO.

If you have any questions or require additional explanation of any item in the report, please do not hesitate to contact me at [redacted] or Sonia Villamil a[redacted]

[redacted]

Vicente E. Arrebola, P.E.
Assistant Director- Wastewater System Operations

Enclosures: Certificate of Mechanical Integrity
MIT Report Well IW-9 (1 copy)

cc: Joseph Haberfeld, FDEP - Tallahassee

MIAMI-DADE COUNTY
Delivering Excellence Every Day

Mechanical Integrity Test Report
Deep Injection Well No. IW-9
South District Wastewater Treatment Plant

Prepared by:
Miami-Dade Water and Sewer Department
3071 SW 38th Avenue
Miami, Florida 33146

CERTIFICATE OF MECHANICAL INTEGRITY

The **South District WWTP** deep injection well **IW-9** operated by **Miami-Dade Water and Sewer Department** has been tested for mechanical integrity. The tests followed standard engineering practices and used methods presented in the United States Environmental Protection Agency regulations for the purposes of these tests. The external and internal mechanical integrity tests followed Florida Department of Environmental Protection (FDEP) pre-approved testing specifications and all the critical test events were witnessed by representatives of the FDEP, the MDWASD and the contractor.

Having supervised the engineer and geologists that were present during the testing, conducted the examining of the results and the preparation this mechanical integrity report as part of this certification, the undersigned certifies that deep injection well **IW-9** operated by **Miami-Dade Water and Sewer Department** at the **South District Wastewater Treatment Plant Site in Miami-Dade County, Florida** has successfully passed all the test requirements for mechanical integrity under rules of Chapter 62-528 of the Florida Administrative Code and is therefore determined to have mechanical integrity.

Certified on September 24, 2013

[redacted]

Howard J. Fallon Jr., P.E.
Professional Engineer
License Number 24153

MECHANICAL INTEGRITY TEST REPORT
FOR
DEEP INJECTION WELL No. IW-9
AT THE
SOUTH DISTRICT WASTEWATER TREATMENT PLANT

Prepared by:

MIAMI-DADE WATER AND SEWER DEPARTMENT
3071 SW 38th Avenue
Miami, Florida 33146

For Submittal To:

UNDERGROUND INJECTION CONTROL
FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

September 2013

ABSTRACT

The internal mechanical integrity was investigated through a pressure test performed on the injection casing. The pressure test was conducted at 154 pounds per square inch (psi) which is approximately 1.5 times the maximum (100 psi) potential injection pressure and more than 1.7 times the maximum operational pressure that the well will be under when operating at its full permitted injection velocity of 10 feet per second (ft/sec). FDEP permits a 5% loss in pressure during the hour long test in order for the internal mechanical integrity to pass the pressure test.
IW-9 successfully passed the pressure test because the casing only lost 3 psi. The successful results of the pressure test for internal mechanical integrity were reinforced by the results of the second internal mechanical integrity test, the TV survey of the casing. The TV survey confirmed that the casing and the casing joints are in good condition and that the well has internal mechanical integrity down to 2,418 ft bls.

The external mechanical integrity was investigated using two test procedures, a Radioactive Tracer Survey (RTS) and a Temperature Log. Results of the RTS confirmed the integrity of the cement around the casing and the continued competence of its seal with the geologic strata. The temperature test showed that there are no anomalies that would indicate points where injected fluids could escape through the casing and cement into the formation. Similarly there were no temperature anomalies that would indicate injection fluids entering the formations at other than the approved injection depth.

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Section 1

1. INTRODUCTION

1.1 BACKGROUND

On October 12, 2012, (see Appendix A) the Miami-Dade Water and Sewer Department (MDWASD) submitted the County's proposed plan and testing specifications for conducting the mechanical integrity tests (MITs) and repairs on some of the injection wells at the South District Wastewater Treatment Plant (SDWWTP) site (see Figure 1) to the Florida Department of Environmental Protection (FDEP). The plan, represented by the specifications, described the step-by-step procedure to be followed and included the testing schedule required to meet the 5-year MIT re-testing conditions of the FDEP permit for each of the injection wells. After receipt of these documents, the FDEP Staff reviewed the proposed plan and sent an approval on June 5, 2013 (see Appendix B).

The contract documents for conducting the MITs were let out for bids, and the winning bid was submitted on February 28, 2013 by Youngquist Brothers, Inc., a well drilling contractor from Ft. Meyers, Florida. After the contract was approved by the Board of Country Commissioners and signed by the County Manager, the MDWASD issued the notice to proceed on May 17, 2013 and the contractor began mobilizing to the site.

1.2 PURPOSE AND SCOPE

The purpose of this report is to provide FDEP with a document that describes the re-testing procedures for mechanical integrity applied to each of the SDWWTP deep injection wells (see Figure 2). The report also presents the field reports (see Appendix C), and the results of the tests in a single volume for ease of reference. The mechanical integrity re-testing operations involved conducting a pressure test on the well casing to show that there are no leaks in the casing, and conducting a TV survey on the well to reinforce the data from the pressure test. The re-testing includes tracking a radioactive liquid-tracer (iodine isotope I-131) injected down the well to show that there is no fluid movement upward behind the casing, into underground sources of drinking water (USDW). The radioactive test information is reinforced with temperature logs run on the well. Gamma ray logs are used to detect the movement of the radioactive tracer.

Figure 1. South District Wastewater Treatment Plant Site

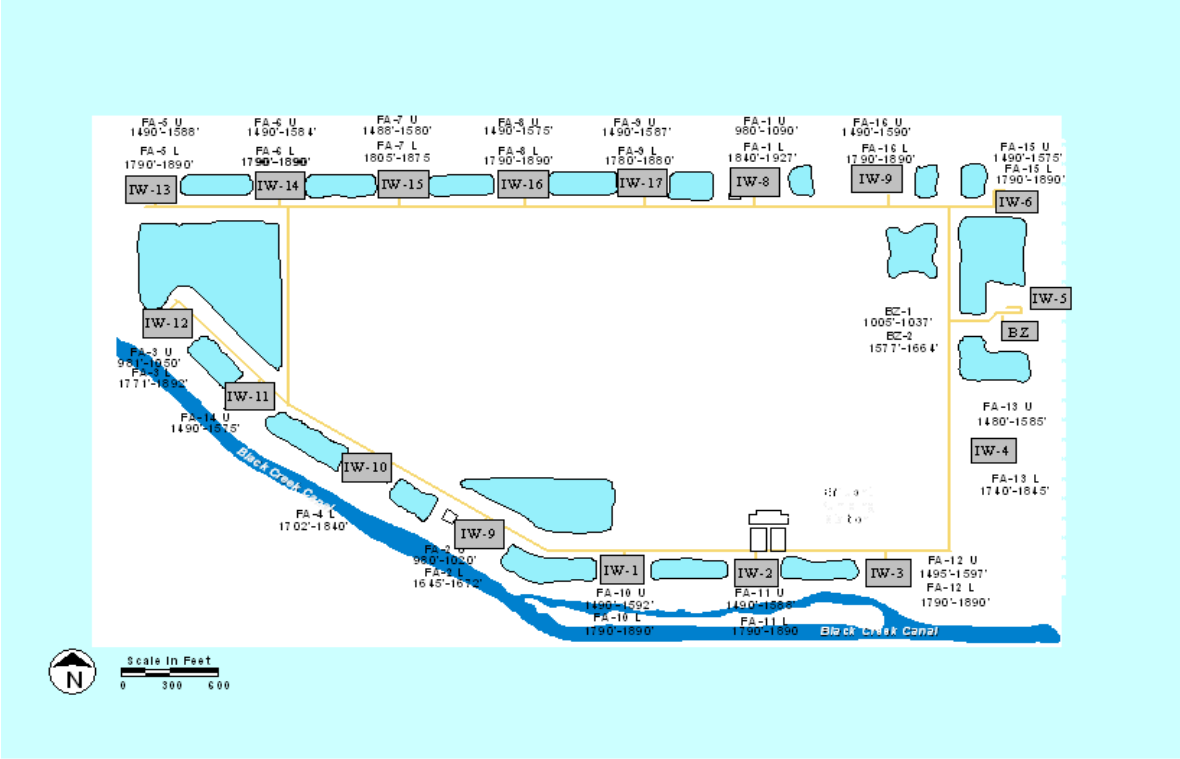

Figure 2. Well Locations Layout

Section 2

2. MECHANICAL INTEGRITY TESTING (MIT)

2.1 METHODS USED

The MIT program is designed to test two elements of the injection well system: 1. Internal integrity and 2. External integrity. The first test element, the internal mechanical integrity test of the well, tests the condition of the injection casing. The second test element, the external mechanical integrity test of the well, tests for leaks outside the casing. This is achieved through a series of field tests including a pressure test and a TV survey for the internal testing, and the temperature log, gamma ray log and RTS survey for the external testing. The first test element, the internal mechanical integrity test, tests for leaks in the injection pipe (casing). The second test element tests for leaks in the annular space outside the casing (cement-filled space between the periphery of the drilled hole and the casing) and in the near-to-the-well geologic strata.

2.2 CASING SCRUBBING

Because the mechanical integrity of injection wells has to be tested every five years, and because a TV inspection of the well is part of the test requirements, MITs provide a timely opportunity to clean the well of deposits that may have formed on the inside of the casing during the intervening years and at the same time provide a cleaner casing for the TV inspection. Cleaning the inside of the well casing is achieved by running a scrubbing brush up and down the casing. However, before the cleaning can be performed, flow out of the well must be controlled. The column of water inside the casing is fresh water and results in a positive hydraulic head inside the well. That head must first be controlled to prevent water from flowing out of the well during the cleaning operation.

2.2.1 Flow Suppression

Suppression of the fresh water head was achieved by first pre-mixing water with salt (NaCl) to form a heavy brine, and then pumping the brine down the well casing, through a 6-inch gate valve on the wellhead. This procedure results in the displacement down the well of the fresh water at the top of the column and replacement of the displaced fresh water with the brine solution. An equal volume of fresh water is displaced out of the well at the bottom of the casing. The procedure is repeated until the pressure head inside the well is suppressed. This method of displacement is used because it achieves flow suppression without first having to open the well to insert a tremie pipe to the bottom of the casing for introduction of the brine. This displacement method also provides a safe way of “killing” the well that at the same time reduces the volume of injected salt solution that would enter the formation at the bottom of the well. One additional advantage is that using this method the brine can be recovered and reused in flow suppression at other wells.

The brine was prepared in 1,000-gallon (gal.) batches by mixing the salt from a 2,000-pound (lbs.) sack in a 1,000 gal. tank of fresh water. The 1,000 gal. solution was then pumped down the well before other similarly mixed batches of salt solution were mixed and pumped down the well (see Figure 3). In the end, the operation was repeated 13 times, and a total of 13 sacks (approximately 26,000 lbs. of salt) were used to suppress the head in the well. This salt concentration represents a theoretical specific gravity of 1.239 for the brine, calculated from the salt solution used in the field of 10.3 lbs per gallon. The 26,000 lbs of salt suppressed the pressure head from approximately 26 feet above the top of the casing to approximately 15 feet below.

Figure 3. Flow Suppression Equipment

2.2.2 Scrubbing Operation

The brush used to clean the casing is made with an old drill rod that has an outside diameter of 7 inches with thick steel wire inserted and secured sticking out of the drill rod. The total diameter of the brush with the steel wire bristles is 24 inches. The brush is attached to the bottom of the packer and inserted into the well (see Figure 4). A 24-inch flange was bolted to the top of the well and pressure fittings installed to be used for packer inflation later on in the process. Then Youngquist lowers the brush and packer by attaching drill rods to the top of the packer and then raising and lowering the brush several times using a 50 ton crane. This process was repeated until the casing was scrubbed and the packer was at the depth required to perform the packer test on the well.

Figure 4. Scrubbing Brush and Hydraulic Packer

2.3 INTERNAL MECHANICAL INTEGRITY (CASING TESTS)

2.3.1 Pressure Test

After the pressure head was suppressed and the casing scrubbed, and the inflatable packer was placed at a depth of 2,394 ft bls. This well is cased to a depth of 2,418 ft bls so the packer is in the bottom 50 feet of the casing. Additional pressure fittings were installed on the flange to pressurize the casing with water. A bleeder valve atop the 24-inch flange allows passage of the drill pipes that support the packer without loss of pressure in the casing (see Figure 5). A pretest was conducted on the casing to determine that the pressure was holding and that all the installed testing equipment was operating properly, then FDEP was informed that the well was ready for their inspection. The next day, June 19, 2013, the pressure test was repeated in the presence of FDEP Staff. The packer had been previously sealed against the casing, at an inflation pressure of 350 pounds per square inch (psi) and at 8:00 AM the casing was pressurized with water to a pressure of 154 psi.

Figure 5. Well-Head and Recorder Set Up for Pressure Test

At 9:05 A.M.. the one-hour pressure test was started in the presence of Joseph May, P.G. representing FDEP and witnessed by Sonia Villamil, Maria Macfarlane, and Michael Ashe representing MDWASD, and by Chris Harp and others representing the drilling contractor. The pressure test ran for the required one-hour period. The pressure deviation (loss) in that time was 3 psi, well below the 7.5 psi deviation allowable under the 5 % criteria in the rules (see Table 2-1). The packer inflation pressure and the pressure in the casing were measured using certified gages (see Appendix C) graduated from 0 to 200 psi in increments of 1 psi. The pressure was read in person and recorded by hand at five minute intervals during the test. The pressure was also recorded on an In-Situ pressure transducer attached to the stand with the pressure gauges (see Figure 5).

Table 2-1 Casing Pressure Readings

Time	Casing Pressure (psi)	Pressure Change (psi)	Packer Pressure (psi)
9:05	154	0.0	350
9:10	154	0.0	350
9:15	154	0.0	350
9:20	154	0.0	350
9:25	153	1.0	350
9:30	153	0.0	340
9:35	153	0.0	340
9:40	153	0.0	340
9:45	153	0.0	340
9:50	152	1.0	340
9:55	152	0.0	340
10:00	152	0.0	340
10:05	151	1.0	340

2.3.2 Bleed-Off Calculations

At the completion of the pressure test the casing pressure was bled-off and the discharged volume from the bleeding was measured (see Table 2-2). Bleeding until the pressure resulted in zero flow produced approximately 30 gallons. This exercise provides a reasonable assurance that the packer is placed at the depth in the well that is within the last 50 feet of the casing.

Table 2-2. Bleeding Volumes versus Pressure

Bled Volume (gallons)	0	5	10	15	20	25	30
Casing Pressure (psi)	151	125	99	74	48	24	0

2.3.3 Television Survey

A closed circuit color television camera, encased in a pressure vessel capable of withstanding the pressures exerted at the depths to be televised, and equipped with a fish-eye lens, was introduced into the well through a pack-off stripper device on a standpipe above the injection well (see Figure 6). The camera is centralized in the casing, and is preceded down the well with a light source attached below the camera. The camera televises a view of the full circumference of the inside of the casing and the image is recorded on video tape. Prior to the video survey, the well was scrubbed and flushed with potable water to provide the best picture possible. The video

survey began at land surface and continued down to 2,915 feet, where the camera runs into an obstruction. At selected intervals of interest, the camera was used to pan the intervals in a horizontal format prior to continuing the normal vertical recording.

A review of the video (see Appendix F) indicates that the casing is in good condition down to 2,418 feet. The video also shows that the scrubbing operation was successful. The scrubber has scrubbed the casing free of all growth down to 2,414 feet and this is confirmed by visible vertical scratches throughout that length of the casing; indicating that the scrubber had brushed the steel casing effectively. All the scratches are superficial, and do not detract from the physical and mechanical integrity of the casing. There are no gouges, grooves, nicks, or other physical damage visible in the casing for its whole length. Below 2,414 feet the casing was not scrubbed to avoid hanging the scrubber with the edge of the bottom of the casing at 2,418 feet. There are some growths and/or deposits visible inside the casing below 2,414 feet.

In summary, the video picture meets the quality standards that are needed for a visual evaluation of the well. This video survey presents a clear view of the casing and of the welded joints of the casing. All the joints are clean and appear to be tight. From the TV survey it is concluded that this casing is in good condition throughout its whole depth from land surface to 2,418 feet.

Figure 6. Television Survey (Standpipe and Logging Truck)

2.4 EXTERNAL MECHANICAL INTEGRITY (CEMENT AND FORMATIONS)

The external mechanical integrity test consisted of two low flow dynamic tests The RTS and temperature survey, conducted on June 25 2013, for the external mechanical integrity portion of the test was witnessed by the representative of FDEP (Joseph May, P.G.), by representatives of MDWASD (Sonia Villamil and Maria Macfarlane) and by representatives of the contractor (Luis Morey).

2.4.1 Radioactive Tracer Survey (RTS)

The radioactive tracer survey uses an isotope of iodine (I-131) as a tracer of water movement inside and outside the casing. Iodine –131 is used because it is a radioactive isotope commonly used in medical practice and therefore it is more easily available and lower in cost than other potential tracers. I-131 also has the advantage of having a half-life of 8 days. That half-life is quite suitable because it is long enough to allow time for transportation to the well site with little decay but also short enough so that it would quickly be reduced if there were any unexpected spills or if there were mechanical failures through which the isotope could travel with the water. The radiation levels of I-131 at the concentration used for RTS testing is in millicurie-range, which if it were considered a waste, would be characterized as a low level waste by the US Atomic Energy Commission.

The I-131 is first loaded into a container located in the logging tool. This container is electronically activated from the logging truck to eject the desired quantity of tracer at the desired depth through an ejection port. In addition to the tracer container, the logging tool is also assembled with three gamma ray detectors. One detector, the top gamma ray detector (GRT), is located 10 feet above the ejector. The other two detectors, the middle one (GRM) and the bottom one (GRB) are located immediately below the ejector at about 3 feet and 12.4 feet below the ejector respectively. The bottom of the logging tool also includes a temperature tool at the very bottom, and a casing collar locator (CCL) 1 foot below the GRM. Figure 7 shows the configuration of the RTS logging tool. The RTS log in the appendix (Appendix D) shows the distances between each of the logging tool components described above.

2.4.1.1 First Low Flow Dynamic Test

Prior to starting the low flow dynamic test, a background gamma ray log was conducted to establish the natural conditions. It was conducted right after the temperature log. Since the temperature log was run downward starting at land surface, the temperature log had ended with the logging tool at the bottom. The background gamma ray log was conducted from the bottom (2,915 feet) up to the surface.

From the surface, the logging tool was again lowered down the well and the casing collar locator (CCL) used to locate the bottom of the casing. The magnetic coils on the CCL give out a magnetic field and detect a change in the mass. If there is growth on the casing it is harder for the CCL to have a clean line. If the growth has some iron on it, it can cause a sort of interference with the CCL making it harder for the CCL to find the end of the casing. The CCL shows that the bottom of the casing is at 2,420 feet bls. After the bottom of the casing was located, the well was ready for the low-flow dynamic RTS test.

The ejector port of the I-131container was set at 2,415 feet and 1 millicurie (mCi) of I-131 was released while the flow down the well was kept at a constant rate of 91 gallons per minute (gpm). The logging tool was kept immobile after the ejection of the I-131 and the three gamma ray detectors continued to record in place. One (1) mCi of I-131 was ejected into the well. The middle detector, located 3 feet below the ejector port, picked up the radioactive tracer 28 seconds after the ejection. The bottom detector, which is located over 12 feet below the ejector, picked up the tracer 2 minute and 20 seconds after the ejection. The middle detector seems to pick up some interference from the ejection motor on the tool when the ejection occurs and this shows up on the log at the same time of ejection. However, this interference is at a much lower level and is dismissed as nothing more than interference from the ejection motor. The test ran for 60 minutes and the top detector did not pick up any tracer.

After the first low flow test ended, the tool was then raised up more than 200 feet, to a depth of 2,200 feet, to log out of position to make sure that the tracer did not migrate up the casing or the formation outside of the casing. No migration was detected.

Once the log out of position was conducted and the tool was placed back to depth, no staining on the casing was found which means no interference for the second RTS. Therefore, with the approval of Joseph May, P.G. from FDEP, the well was not flushed prior to the second RTS test.

Figure 7. RTS Tool and Temperature Probe

2.4.1.2 Second Low Flow Dynamic Test

The tool was placed back to a depth were the ejector was located at 2,415 feet with a flow of 92 gallons per minute set down the well. For this test, 2 milicuries of I-131 were ejected into the casing. The middle detector started picking up the tracer about 22 seconds after it was ejected. The bottom detector, which is located over 12 feet below the ejector, picked up the tracer 1 minutes and 32 seconds after the ejection. Again the middle detector picked up some interference from the ejector motor at the time the I-131 was released. The upper detector did not pick up any tracer for the duration of the test, which lasted 30 minutes.

After the second low flow test ended, the tool was then raised up more than 200 feet, to a depth of 2,200 feet, to log out of position to make sure that the tracer did not migrate up the casing or the formation outside of the casing. No migration was detected.

With the last low flow dynamic test, the mechanical integrity test was concluded, but before bringing the geophysical tools out of the well, the leftover I-131in the container was ejected and the container flushed-clean to insure that any remaining radioactive iodine was well dispersed. The tool was placed at a depth of 2,764 ft bls. The ejector was located at 2,750 ft bls, and the remaining Iodine 131 was ejected and the well was flushed with effluent at a rate of over 4,800 gallons per minute to ensure no staining of the tool. The logging tool was then brought up from the bottom and on the way up a final gamma ray log was made. Then the final gamma ray log was compared to the background gamma ray log, and the comparison showed that there are no noticeable differences in the two except for a residual stain at the bottom of the casing where the I-131 had been repeatedly released during the testing, and just below there, where the tracer exited the casing. Injection of water down the well at a rate of 8,750 gpm continued for the next hour to completely flush out the well.

2.4.2 Temperature Log

Youngquist Brothers Inc. conducted the temperature log on June 25, 2013 starting at about 9:30 A.M. and logging down to 2,914 feet. The temperature probe (Figure 7) was run from the surface downward to minimize the disturbing effect of the movement of the logging tool on the temperature of the water in the well. The temperature log was started more than 24 hours after the well had last been disturbed by outside influences. The TV survey was the last disturbance in the well.

The temperature log (see Appendix H) shows the warmest interval is in the section from 2,350 to 2,450 feet. This is consistent with the higher temperature of the injected water in that interval. The temperature log did not detect any anomalies that would indicate that injection fluids are present outside the casing, and there is no indication of any upward movement of warm injection water either. The similarity of the temperature oscillations in this temperature log (in the interval from land surface down to the bottom of the casing) to those in the temperature logs from previous MITs and to those in the temperature log when the well was constructed, indicates that there has been no apparent change in the cased interval, and no upward movement of the injected water in the last 5 years.

2.5 WELL HEAD REPAIRS AND RE-INSTALLATION

The work associated with the MIT ended when the wellhead was replaced. The air and vacuum release surge check valves were replaced prior to reinstallation of the wellhead. The 6 inch gate valve and air release were replaced. The wellheads are scheduled to be sandblasted, rust proofed and repainted after the MITs on all the other wells are completed. Injection well IW-9 has been placed back on line and flow from the plant's pump station is again discharging to this injection well.

Section 3

3. CONCLUSIONS AND RECOMMENDATIONS

3.1 CONCLUSIONS

The pressure test was conducted successfully and it was concluded from the results that there is internal mechanical integrity. This conclusion is reinforced by the analysis of the TV survey down to the injection level at 2,418 feet. The TV survey indicated that the casing is in good condition and that all the casing joints appear to be tight and in good working order.

The two successful RTS conducted at low flow rates indicate that there is no upward movement of water outside the casing. Therefore, it was concluded that the RTS results show that there is external mechanical integrity. The temperature survey reinforced the results of the RTS by showing that there has been no movement of injected water anywhere except the injection zone.

3.2 RECOMMENDATIONS

The successful completion of all the tests for mechanical integrity confirms that IW-9 retains full mechanical integrity and as such it is appropriate to continue using this injection well. MDWASD also recommends that FDEP review the results of the tests presented in this report and based on those results determine that the well has mechanical integrity and may continue to be used for its intended purpose.

Finally, MDWASD recommends that although the well head will not be painted until all the MIT tests are completed on the other wells, IW-9 should receive mechanical integrity certification.

Appendix A

Mechanical Integrity Testing Procedures Submitted by MDWASD to FDEP
October 12, 2012

Miami-Dade Water and Sewer Department
Mechanical Integrity Testing Procedures

Miami-Dade Water and Sewer Department
Mechanical Integrity Testing and Repair Procedures
October 12, 2012

MECHANICAL INTEGRITY TESTING and REPAIR PLAN (SDWWTP and NDWWTP Injection Wells)

General Information

The Contractor shall carefully coordinate his activities with the Department to minimize interference with any existing operations or the operations of the Department. Department forces will isolate the well and turn over to the Contractor. Existing valves shall only be operated by Department personnel. The Contractor's personnel, under no circumstances, shall operate any such valve.

The Contractor shall provide all barricades and/or flashing warning lights necessary to warn workers and employee of the testing throughout the Project. This shall be done at the Contractor's expense and to the satisfaction of the Engineer. Every effort must be made to reduce inconvenience and nuisances to a minimum.

The Contractor shall at all times, use the assigned entrance to the Plants to bring in materials, equipment etc. required for the Project. Materials and equipment shall be stored in areas designated by the Engineer, and shall not interfere with the daily operations at the site or with other Projects. Suitable platforms shall be used for material storage to prevent damage to the landscaping. The Contractor shall exercise extreme caution when transporting equipment or materials within the Plant area.

The conveying vehicles shall be properly selected, and equipped, to prevent damage to paved areas, landscaping and other existing facilities including wells, well pads, fencing, underground pipelines, pipe chases, etc. If necessary, suitable wooden skids shall be used to distribute loads, and to prevent damage.

If any of the above existing structures, including the wells, or any other parts of the project area, are damaged, the contractor shall make suitable repairs or replacement at his expense, in a manner described by the Engineer, and to his satisfaction.

The Contractor shall also exercise extreme caution to prevent any spillage of sewage effluent. The County may charge t he Contractor for any cost incurred or penalties imposed on the County as a result of such spillage.

The wells to be tested are Injection Wells IW-l through IW-17 at the South District Wastewater Treatment Plant and IW-1N through IW-4N at the North District Wastewater Treatment! Plant

The Injection Wells have a 24-inch outside diameter (OD), 0.500-inch wall thickness injection casing set to total depths of 2,450 to 2,850 feet below land surface (bls), and were constructed with a nominal 22-inch diameter open borehole extending from the bottom of the casing to approximately 3,000 feet bls.
Except IW-5 at the SDWWTP, has a 20-inch outside diameter (OD), and 0.500 inch wall thickness.

The CONTRACTOR will perform internal and external mechanical integrity tests on the casings of twenty one deep injection wells and perform all appurtenant work in accordance with the above

Contract Documents.

The work shall be performed by a competent crew with equipment that is adequate to complete all phases of the testing and instruments of sufficient accuracy and resolution to identify anomalous responses to the tests. If the CONTRACTOR'S equipment is not capable of satisfactorily performing the work provided for in these specifications, the CONTRACTOR at his own expense shall substitute equipment.

The CONTRACTOR shall have not less than 5 years experience in constructing and testing wells and shall have tested not less than 5 wells of similar type and capacity. The CONTRACTOR shall be licensed by the State of Florida and the license number shall be affixed to all correspondence and reports.

All work shall comply with and be in full conformance with this Mechanical Integrity Test Plan submitted to FDEP together with subsequent response letters for the injection wells at the South and North District Wastewater Treatment Plants and with the appropriate sections of Chapter 62-528 FAC.

If remedial work or re-testing is required prior to final acceptance of the work to meet regulatory requirements and the specifications of the Contract Documents due to defective materials, accident, loss of equipment or equipment malfunction, or for any other cause directly attributable to the CONTRACTOR's actions, the CONTRACTOR shall bear the entire cost of the remediation or re-testing, including all additional materials, labor, and equipment required and any necessary additional Engineering costs. In the event of a problem, the ENGINEER shall be notified immediately, and the following shall apply:

1. The CONTRACTOR shall propose a method of correcting the problem, in writing, to The ENGINEER, who shall review the method of corrective action, and accept the plan in writing before work can proceed.

2. All work on the well must be in accordance with all applicable local, state and federal regulations.

The CONTRACTOR shall notify the ENGINEER a minimum of 72 hours prior to conducting the pressure test, geophysical logging and the radioactive tracer survey so that the ENGINEER and regulatory agency staff can be properly notified.

The CONTRACTOR shall provide all facilities, equipment and materials required for the removal of waste fluids from the well site.

The CONTRACTOR shall kill the well using a dense food- grade salt solution. No barite or mud-based additives shall be used in the well.

The CONTRACTOR shall comply with the OSHA regulations contained in 29CFR Section 1910 for General Industry Regulations and 29CFR Section 1926 for Construction Regulations.

Equipment and Procedures

1. Wellhead Assembly: The stripper head assembly used during the video survey, Geophysical logging, and the radioactive survey shall be bolted to the wellhead above the 6-inch gate valve. The stripper head assembly used must be of sufficient length to house the longest of the wire line tools used for the testing between the gate valve and the pack-off mounted at the top of the assembly. The pack-off must be adjusted so that the tools can be moved freely up and down the well with minimal leakage from the well. The assembly shall include a 4-inch valve and tee, which will be used to inject potable water during the surveys. The assembly shall be fitted with a

pressure gauge for use during the tests.

2. Wellhead Hardware: Should the nuts and/or bolts at the wellhead assembly become stripped during the CONTRACTOR's efforts, the CONTRACTOR shall replace them with equivalent hardware.

3. Water Line: The CONTRACTOR shall provide a potable water supply line for use during the video surveys. This line shall be connected to the existing 4-inch valve on the CONTRACTOR's stripper head. It shall be equipped with a check value to prevent the backflow of effluent into the water supply source. It shall also be equipped with a continuous recording digital flow meter and totalizer capable of measuring flows accurately in the range of 0 to 250 gpm.

Mechanical Integrity Testing (MIT)

The mechanical integrity testing under this Contract shall be accomplished using the following methods and general sequence, however the Contractor shall submit a more detailed sequence to the Engineer for approval before he begins work. The Contractor shall use extreme caution to prevent any loss of equipment, tools or other items into the wells and shall be fully responsible for retrieving any such items immediately, at no expense to the Department. All pressure tests must be conducted in the presence of the Engineer or his authorized representative.

MIT Clean and Pressure Test the Casing

1. The Contractor shall set up all equipment required to prepare for suppressing the density differential pressure, cleaning, performing the pressure test and the radioisotope and closed circuit television surveys.

2. The Contractor shall inject sufficient salt solution into the well to balance the differential pressure and disassemble the wellhead. The brine solution shall remain in the well during the cleaning and pressure testing steps, after which time it shall be transferred to another well if clean enough for reuse, or shall otherwise be disposed of by the Contractor. Under no circumstances shall brine solution be spilled or disposed of on the ground surface, however it may be disposed of into the injection well.

3. The Contractor shall clean the casing before proceeding with the pressure test. The entire length of casing shall be cleaned. If the later television survey indicates insufficient cleaning, the well shall be re-cleaned by the Contractor, at his expense, to the satisfaction of the Engineer. If the television survey must be repeated because of insufficient cleaning, in the opinion of the Engineer, it shall also be at the Contractor's expense.

4. The Contractor shall, when requested by the Engineer, place the packer through a stand-pipe with a packoff device to a point near the top of the well (but within the concrete encasement area) and test its integrity. This shall be accomplished as described in Steps 6, 7, and 8 below. If the packer fails the integrity test it shall be replaced with one that will meet the test. The Engineer is aware that packers have limited inflation cycles and will attempt to minimize the verification of packer operation. However, any integrity failure for which the packer operation can not be eliminated must be repeated at the Contractor's cost. It is anticipated that each new packer will be tested at the wellhead to verify its capacity to seat and deflate.

5. The Contractor shall lower and place the packer to a point within the lower 40 feet of the casing, but not the last 10 feet. The CONTRACTOR will be responsible to assure the proper seating of the packer. A preliminary test shall be performed to ensure proper operation of the test set-up. The CONTRACTOR shall notify the ENGINEER at least 24 hours before running the preliminary test. The test will be run following the same test program as the actual pressure test, as described below. IW-2 at SDWWTP will have the packer placed within 40 feet of the tear in the casing.

6. The Contractor shall inflate the packer to a pressure not exceeding 350 psig over the static condition as measured at the wellhead on a calibrated gauge to create a positive seal.

7. The Contractor shall pressurize the casing to 150 psig with no air in the casing or wellhead. The pressure shall be recorded on a chart and signed by the Engineer, the Contractor and any witnesses present. The pressure test gauge shall be calibrated within 6 months of performing the pressure test. The CONTRACTOR must present proof of calibration of the pressure gauge to the ENGINEER and FDEP staff at the time of testing each well. The pressure gauge must be mounted at or near eye level in order to ensure maximum visibility.

8. The test will be considered successful if the pressure does not change more than 5% psi in one hour.

9. If the test fails, the Contractor shall move the packer upwards for approximately 10 feet, and repeat Steps 6, 7 and 8.

10. If the test still fails, additional repositioning of the packer and repeating of Steps 6, 7 and 8 shall be as ordered by the Engineer. If the test still fails, and subsequent radioisotope surveys indicate no casing failure, it will be presumed that the Contractor's packer did not create a positive seal, and the Contractor shall be required to repeat Steps 4 through 8 at his expense. No payments will be made to the Contractor if it is subsequently determined that the test failure was caused by the seating of the packer. If the packer fails during packer operation verification, it will be concluded that the packer was faulty during any previous test that did not demonstrate casing integrity. The Contractor shall repeat this test at his expense.

11. After pressure testing, measure the depressurization bleed down with a 5 gallon bucket upon release of the pressure in the casing. The bleed down fluid will be properly disposed of by the Contractor.

12. The Contractor shall deflate the packer and withdraw it from the casing.

13. The Contractor shall reassemble the wellhead and connecting piping using new gaskets.

14. Prior to geophysical logging, the fluid used to "kill" the well, or for pressure testing the casing shall be flushed from the well and the well will be shut-in for a minimum of 12 hours.

MIT Video Surveys

A Video Survey inside the injection well casing be performed using the following procedures.

.A 6-inch diameter stripper head assembly will be bolted to the wellhead assembly above the existing 6-inch diameter gate valve. The stripper head will be of dimensions that allow the video operator to put his camera between the gate valve and the pack off and close both the valve and the pack off. The lower part of the assembly shall consist of a 4-inch tee and valve through which potable water may be introduced into the well.
.
Prior to performance of the survey and for a period of 24 hours, fresh water from an adjacent fire hydrant will be introduced into the well through a 4-inch diameter valve located on the stripper head assembly. Fresh water shall be pumped into the well to provide clarity for the survey.

3. If, after 24 hours of pumping potable water into the well, the water quality does not permit a clear picture of the inside of the well, the CONTRACTOR may be required to perform additional pumping services to assure a good survey as specified above.

4. The pumping of the potable water will continue at a rate of approximately 0 to 250 gpm during video surveying. If the open hole portion of the well is not clean, or visibility in any part of the well is poor, the CONTRACTOR shall perform additional pumping services to ensure a good video survey before running another or continuing with the survey.

5. During the video survey, the CONTRACTOR shall stop the camera's progress as instructed by the ENGINEER at depths where there may be potential flaws in the casing or other features to allow for thorough examination at those locations.

Upon reaching the total depth of the well with the video camera and obtaining a video survey satisfactory to the ENGINEER, the camera shall be removed from the well, and the well placed back in service.

MIT Radioisotope Tracer Survey and Temperature Survey

A radioisotope tracer survey shall be used to detect any fluid movement outside of the injection casing from the injection zone into the overlaying aquifers. The tool configuration shown below, or approved equal is required. The tool must be capable of ejecting the radioactive tracer and simultaneously monitoring the gamma ray sensors. No time lag between ejection and monitoring is permitted. A casing collar locator (CCL) shall be positioned below the tool as shown below, to precisely locate the bottom of the casing. Two low flow dynamic test runs, shall be performed. Additional low flow dynamic test runs can be done if results warrant additional testing, as determined by the ENGINEER in consultation with FDEP staff.

A temperature survey log shall also be performed from land surface to the total depth of the well. The temperature log shall be performed logging down at a rate of not more than 60 feet per minute. The temperature survey shall be performed after the well has been "shut in" and stabilized for at least 12 hours prior to the dynamic and static tests.

The Contractor shall perform an initial background gamma ray survey extending from the base of the land surface to the total depth of the well. The background gamma ray log shall be taken at a rate of not more than 60 feet per minute.

After the dynamic tests are completed, another background gamma ray survey shall be taken from the base of the casing to the base of the intermediate casing.

If additional radioisotope tracer survey work is ordered by the Engineer, it will be paid for at the hourly price proposed for additional radioisotope tracer surveys.

Radioactive Tracer Survey (RTS)

A RTS will be performed in the injection well. The tool used for testing will be configured according to information to be supplied by the service company performing the logs and as approved by the ENGINEER. Below is an example of a typical RTS tool that will be used for these surveys. The CONTRACTOR will provide a specific tool configuration with the logs.

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)
			CHD-SDSCHD (SDS) Cable Head	1.00	1.50	5.00
GR#3	23.83					
			GR #3 -GR#3 (GR#3_T) GR#3_TOP	9.33	1.69	50.00
			TREJCT-A (RTS) EJECTOR 14.5' FROM TOOL BOTTOM	3.00	1.69	10.00
			GR #2 -GR#2 (GR#2_M) GR#2_MIDDLE	3.58	1.69	25.00
GR#2	11.17					
CCL	9.63		CCL-000 (000001) RTS_CCL	0.75	1.69	5.00
			TRDET-GR#1 (GR#1_B) GR#1_BOTTOM	8.67	1.69	50.00
GR#1	0.58		TEMP-11116Temp (11116HT)	0.58	1.69	5.00
TEMP	0.17		RTS_TEMP			

Dataset: sdiw1.db: field/well/run1/FINBK
Total Length: 26.92 ft
Total Weight: 150.00 lb
O.D. 1.69 in

RTS tool Typical Configuration

The sequence of the tests shall be as follows:

First Low Flow Dynamic: The low flow run of the radioactive tracer survey shall be performed with a pumping-in velocity of 3 to 5 feet per minute. This would require a volume of between 65 gpm and 108 gpm to be injected during the survey. This is for the 24 inch wells, for Well I-5, which has a 20 inch casing this volume is 44 gpm and 73 gpm. Potable water from the same source as used for the video survey would be used as the most appropriate water supply for this portion of the test.

1) After beginning the flow of water into the well, the tool will be placed at a depth of approximately 5 feet above the base of the final casing, and a slug of 2 millicuries radioactive Iodine 131 is ejected. The tool will remain in place for a period of approximately one hour and the three gamma ray detectors in the "time drive" mode will record the movement of the slug. If tracer is detected at the uppermost detector, indicating potential staining of the tool, the tool may be moved upward to an alternate location.

2) After the one hour waiting period, a log out-of-position will be performed between the ejection point and a minimum of 200 feet above the highest point of tracer detection.

3) Upon completion of logging, the casing will be flushed with 3 to 5 casing volumes of effluent.

4) After flushing, the tool will immediately be run to the base of the casing, then the interval between the ejection point and 200 feet above the highest point of tracer detection will be logged.

Second Low Flow Dynamic: The process described above for the low flow dynamic log will be repeated to include a log out-of-position, a casing flush, and an after flush pass. A slug of tracer greater than or equal to 3 millicuries shall be used as determined by the ENGINEER.

If, during testing, no apparent anomalies appear that may indicate a lack of mechanical integrity in the injection well, the RTS will be concluded. If anomalies do occur, the RTS will be altered to track the radioactive tracer material. After RTS is complete, the RTS tool will be discharged in the injection zone and the well shall be flushed with 3 to 5 volumes of effluent. A second background log will be run from the bottom to the top of the well.

MIT Deadlines (sorted by date MIT pressure test due)

SDWWTP MIT Schedule of Completion

Well	Pressure Test	RTS/Video
IW-2	7/13/2013	7/25/2013
IW-1[1]	7/20/2013	7/31/2013
IW-3	7/24/2013	8/7/2013
IW-9[1]	7/30/2013	8/12/2013
IW-10[1]	8/6/2013	8/21/2013
IW-11	8/20/2013	9/3/2013
IW-12	8/25/2013	9/19/2013
IW-14	9/9/2013	9/26/2013
IW-13	9/16/2013	10/6/2013
IW-4	9/25/2013	10/14/2013
IW-6	9/30/2013	10/20/2013
IW-5	10/19/2013	10/27/2013
IW-7[2]	10/26/2013	1/7/2014
IW-8	11/2/2013	11/12/2013
IW-17	11/11/2013	11/19/2013
IW-16	11/18/2013	12/9/2013
IW-15	12/3/2013	12/16/2013

NOTES:
1.The original video was not clear enough and therefore a new video was done at the end of the MITs at SDWWTP.
2.The Computer failed during the RTS, because the Iodine 131 had already been injected, FDEP and DOH required 46 days b/f the RTS could be redone.

NDWWTP MIT Schedule of Completion

Well	Pressure Test	RTS/Video
IW-1N	3/14/2014	3/26/2014
IW-2N	3/25/2014	4/9/2014
IW-3N	4/2/2014	4/17/2014
IW-4N	4/9/2014	4/24/2014

REPAIR PLAN:

The following repair plans apply to wells at SDWWTP and NDWWTP.

1. Kill well and remove 24 inch gate valve and 4 inch bypass valves. Remove 1 inch pressure transmitter line and weld hold closed. Please see drawings included in below.

2. Sand existing casing in concrete pits and coat with Bitumastic. Please see drawings included in below.

3. Chip concrete around outer casing 1 inch deep, in order to embed PVC sleeve. Please see drawings included in below.

4. Install C905 PVC sleeve around casing pipe, embed 1 inch deep and fill annular space with grout, using Type II Neat cement. Slope top edge to create 30 degree watershed and seal at edges with sealant. Please see drawings included in below.

5. Relocate 1 inch pressure transmitter as indicated in drawings. Weld the hole. Please see drawings included in below.

6. At the NDWWTP IW-1N, IW-3N and IW-4N install new magmeters with any necessary spool pieces to be field determined. Please see drawings included in below.

7. Reassemble wellheads including installation of new 24 inch butterfly valve on horizontal part of well. Mega flanges will be used to ensure the layout of the pipe and the vales match. Please see drawings included in below.

8. On IW-4N at NDWWTP, install electric actuator for butterfly valve at base of injection well. Please see drawings included in below.

Appendix B

FDEP Approval of MIT Plan for SDWWTP and NDWWTP

November 26, 2012

Villamil, Sonia (WASD)

From: May, Joseph [redacted]
Sent: Monday, November 26, 2012 2:40 PM
To: Villamil, Sonia (WASD)
Cc: Vandor, Heidi; Silverman, Mark; Walsh, Virginia (WASD); Goldenberg, Bertha M. (WASD); Fallon Jr., Howard J. (WASD); Arrebola, Vicente (WASD); Macfarlane, Maria (WASD); Oakley, Clint (WASD)
Subject: RE: MDWASD MIT and Repair Plan Submittal

Importance: High

Hello all,

The Department approves the plan with the following understandings:

1) Medicinal grade I-131 should be specified since this solution is filtered to reduce precipitate material, as opposed to regular grade I-131, in the vial causing a tool malfunction. It has been our experience that an activity of ~1mCi/ml has been the easiest to work with in the field.
2) Please contact me a minimum of three days prior to mobilization to each site. Due to the travel time from West Palm Beach to the sites close coordination would be appreciated between myself and a designated contact person from the utility so that each pressure and RTS can be witnessed.

Thank you,

Joe

Please take a few minutes to share your comments on the service you received from the department by clicking on this link. DEP Customer Survey.

From: Villamil, Sonia (WASD) [mailto:[redacted]
Sent: Wednesday, October 17, 2012 9:42 AM
To: May, Joseph
Cc: Vandor, Heidi; Silverman, Mark; Walsh, Virginia (WASD); Goldenberg, Bertha M. (WASD); Fallon Jr., Howard J. (WASD); Arrebola, Vicente (WASD); Macfarlane, Maria (WASD); Oakley, Clint (WASD)
Subject: MDWASD MIT and Repair Plan Submittal

Hello Mr. May,

The MDWASD respectfully submits the attached MIT testing and repair plan for your approval. The paper copy is being sent via regular mail as well.

Thank you,

Sonia Villamil
Engineer II
Miami Dade Water and Sewer Department
3071 SW 38th Ave Room 554-8
Miami, FL 33146
[redacted]
fax: 786-552-8640
miamidade.gov

Appendix C

Field Notes from tests including gauge certification and pressure charts.

MIAMI-DADE WATER AND SEWER DEPARTMENT

MECHANICAL INTEGRITY TESTING OF DEEP INJECTION WELLS AND ASSOCIATED SERVICES

BID NO.: RPQ P0086

PRESSURE TEST IW – 9 June 19, 2013

TIME	CASING PRESSURE (psi)	PACKER PRESSURE (psi)
9:05	154⁻	350
9:10	154⁻	350
9:15	154⁻	350⁻
9:20	154⁻	350⁻
9:25	153⁺	350⁻
9:30	153⁺	340⁺
9:35	153	340⁺
9:40	153⁻	340⁺
9:45	153⁻	340⁺
9:50	152⁺	340⁺
9:55	152	340⁺
10:00	152⁻	340⁺
10:05	152⁻	340⁺
10:10	151⁺	340⁺

6-19-13

IW-9

BREAK OFF TEST

GALLONS	CASING PRESSURE (psi)	PACKER PRESSURE (psi)
0	151 +	340 +
5	125 -	340 -
10	99 +	320 +
15	74 -	320 -
20	48	300 +
25	24 -	300 -
30	0	280 +

Top of Packer: 2,394.5 **feet**

Bottom of Casing: 2418 **feet**

MIAMI-DADE WATER AND SEWER DEPARTMENT

MECHANICAL INTEGRITY TESTING OF DEEP INJECTION WELLS AND ASSOCIATED SERVICES

BID NO.: RPQ P0086

PRESSURE TEST IW – 9

WITNESS LIST

June 19, 2013

NAME	SIGNATURE	COMPANY/AGENCY	TELEPHONE
Idia Macfarlane	[redacted]	WASD	[redacted]
Joe May		FDEP	
Justin Taylor		WASD	
CHRIS HARP		YBI	
Michael Ashe		WASD	
Sonia Villamil		WASD	

Pressure Test IW-9

In-Situ Inc. Hermit 3000

Report generated:	6/21/2013	12:09:56
Test defined on:	6/11/2013	15:29:20
Test started on:	6/19/2013	9:05:15
Test stopped on:	6/19/2013	10:29:05
Test extracted on:	6/21/2013	12:05:49

Data gathered using Linear testing
Time between data point Minutes.
Number of data samples 84

TOTAL DATA SAMPLES 84

Channel number [1]

Measurement type:	Pressure
Channel name:	250psi 6488
Linearity:	1.764
Scale:	244.2348
Offset:	-0.4381
Warmup:	50

Channel number [0]

Measurement type:	Barometric Pressure
Channel name:	Barometric
Linearity:	0
Scale:	0
Offset:	0
Warmup:	50

Date	Time	ET (min)	Chan[1] PSI	Chan[0] Inches Hg
	6/19/2013 9:05	0	155.809	30.149
	6/19/2013 9:06	1	155.763	30.112
	6/19/2013 9:07	2	155.655	30.1
	6/19/2013 9:08	3	155.686	30.129
	6/19/2013 9:09	4	155.64	30.159
	6/19/2013 9:10	5	155.563	30.169
	6/19/2013 9:11	6	155.532	30.176
	6/19/2013 9:12	7	155.47	30.18
	6/19/2013 9:13	8	155.424	30.182
	6/19/2013 9:14	9	155.378	30.182
	6/19/2013 9:15	10	155.285	30.182
	6/19/2013 9:16	11	155.224	30.182
	6/19/2013 9:17	12	155.177	30.182
	6/19/2013 9:18	13	155.147	30.18
	6/19/2013 9:19	14	155.085	30.184
	6/19/2013 9:20	15	155.023	30.182

6/19/2013 9:21	16	154.962	30.182
6/19/2013 9:22	17	154.9	30.184
6/19/2013 9:23	18	154.839	30.182
6/19/2013 9:24	19	154.792	30.184
6/19/2013 9:25	20	154.731	30.184
6/19/2013 9:26	21	154.669	30.186
6/19/2013 9:27	22	154.623	30.184
6/19/2013 9:28	23	154.592	30.182
6/19/2013 9:29	24	154.5	30.182
6/19/2013 9:30	25	154.453	30.182
6/19/2013 9:31	26	154.392	30.182
6/19/2013 9:32	27	154.346	30.182
6/19/2013 9:33	28	154.284	30.18
6/19/2013 9:34	29	154.238	30.18
6/19/2013 9:35	30	154.145	30.18
6/19/2013 9:36	31	154.099	30.184
6/19/2013 9:37	32	154.053	30.182
6/19/2013 9:38	33	154.007	30.182
6/19/2013 9:39	34	153.945	30.18
6/19/2013 9:40	35	153.868	30.18
6/19/2013 9:41	36	153.837	30.18
6/19/2013 9:42	37	153.776	30.18
6/19/2013 9:43	38	153.699	30.18
6/19/2013 9:44	39	153.652	30.178
6/19/2013 9:45	40	153.591	30.18
6/19/2013 9:46	41	153.56	30.178
6/19/2013 9:47	42	153.498	30.178
6/19/2013 9:48	43	153.452	30.18
6/19/2013 9:49	44	153.391	30.18
6/19/2013 9:50	45	153.36	30.18
6/19/2013 9:51	46	153.252	30.176
6/19/2013 9:52	47	153.237	30.178
6/19/2013 9:53	48	153.16	30.178
6/19/2013 9:54	49	153.098	30.178
6/19/2013 9:55	50	153.083	30.176
6/19/2013 9:56	51	153.021	30.176
6/19/2013 9:57	52	152.898	30.176
6/19/2013 9:58	53	152.929	30.176
6/19/2013 9:59	54	152.821	30.178
6/19/2013 10:00	55	152.79	30.176
6/19/2013 10:01	56	152.744	30.176
6/19/2013 10:02	57	152.682	30.174
6/19/2013 10:03	58	152.62	30.176
6/19/2013 10:04	59	152.59	30.178
6/19/2013 10:05	60	152.528	30.174
6/19/2013 10:06	61	152.451	30.176
6/19/2013 10:07	62	152.42	30.176
6/19/2013 10:08	63	152.359	30.178
6/19/2013 10:09	64	152.297	30.165
6/19/2013 10:10	65	152.22	30.108
6/19/2013 10:11	66	152.158	30.086
6/19/2013 10:12	67	124.611	30.112

6/19/2013 10:13	68	126.211	30.145
6/19/2013 10:14	69	94.591	30.157
6/19/2013 10:15	70	100.517	30.163
6/19/2013 10:16	71	64.393	30.163
6/19/2013 10:17	72	74.969	30.165
6/19/2013 10:18	73	37.124	30.167
6/19/2013 10:19	74	49.459	30.171
6/19/2013 10:20	75	24.507	30.171
6/19/2013 10:21	76	24.156	30.169
6/19/2013 10:22	77	10.525	30.169
6/19/2013 10:23	78	4.814	30.169
6/19/2013 10:24	79	1.348	30.167
6/19/2013 10:25	80	0.157	30.171
6/19/2013 10:26	81	0.768	30.169
6/19/2013 10:27	82	0.798	30.171
6/19/2013 10:28	83	0.783	30.141

Certificate of Calibration

OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

Ozone Industries, Inc.
Precision Measurement Equipment Division

Purchase Order #

Calibration Performed By:
OZONE INDUSTRIES, INC.
15551 PINE RIDGE RD.
FORT MYERS, FL 33908

For:
YOUNGQUIST BROTHERS, INC.
15465 PINE RIDGE RD.
FORT MYERS, FL 33908

EQUIPMENT INFORMATION:

Description: PRESSURE GAUGE
Manufacter: MCDANIELS
Model Number: 300PSI
Part Number: N/A
Range: 0-300 PSI

Serial Number: 972062-1
Customer I.D.:
Cust. Barcode: N/A
Cust. Location: N/A
Specifications: +/- 0.25% FS

Cal Date: 6/6/2013
Cal. Due Date: 8/5/2013
Cal. Interval 60 DAYS
Received: IN TOLERANCE
Calibration Result: PASS
Environmental Conditions: 74 DEG F / 20% H
Performed By: Daniel McKissick

Procedure: STANDARD

This is to certify that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure at the points tested (unless otherwise noted). It has been Calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration is in accordance with Ozone Industries, Inc Quality Assurance Manual. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

Calibration Remarks:
THIS UNIT WAS FOUND TO BE IN TOLERANCE AT THE TIME OF CALIBRATION.
PERFORMED ROUTINE CALIBRATION / CERTIFICATION

Standards Used to Calibrate Equipment:

Company	I.D.	Description	Last Cal.	Cal. Due Date
OZONE	A1731	EATON UPC5000 PNEUMATIC CALIBRATOR	12/12/2012	12/12/2013

Signatures:

Certified by:
Print: Daniel McKissick
Date: 06/06/13
[redacted]

Approved by:
Print: Daniel McKissick
[redacted]

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ØZONE
INDUSTRIES
CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

PH: 239-433-3400
FAX: 239-489-3877

CONTROL NO: 032509-1

CUSTOMER: YBI15465

CALIBRATION DATA FORM

MFR:	MCDANIELS	**DESCRIPTION**	PRESSURE GAUGE
MODEL NO:	300 PSI .25%	**TECHNICIAN:**	0030
SERIAL NO:	972062-1	**CAL. DATE:**	06/06/13
CUST. ID:	N/A	**DUE DATE:**	08/05/13

* IF NO "AS LEFT" READING IS SHOWN ON THIS CHART, IT MEANS THE UNIT WAS IN TOLERANCE AND THERE WERE NO ADJUSTMENTS MADE TO IT.

RANGE: 0-300 PSI

NOMINAL	AS FOUND	AS LEFT *	LOW LIMIT	HIGH LIMIT
50	50.26		49.25	50.75
100	100.31		99.25	100.75
150	150.38		149.25	150.75
200	200.49		199.25	200.75
300	300.6		299.25	300.75

Certificate of Calibration

OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

Ozone Industries, Inc.
Precision Measurement Equipment Division

Purchase Order #

Calibration Performed By:
OZONE INDUSTRIES, INC.
15551 PINE RIDGE RD.
FORT MYERS, FL 33908

For:
YOUNGQUIST BROTHERS, INC.
15465 PINE RIDGE RD.
FORT MYERS, FL 33908

EQUIPMENT INFORMATION:

Description: PRESSURE GAUGE
Manufacter: McDaniel
Model Number: 300PSI
Part Number: N/A
Range: 0-300 PSI

Serial Number: 972034-2
Customer I.D.:
Cust. Barcode: N/A
Cust. Location: N/A
Specifications: +/- 0.25% FS

Cal Date: 5/17/2013
Cal. Due Date: 11/17/2013
Cal. Interval 6 MONTHS
Received: IN TOLERANCE
Calibration Result: PASS
Environmental Conditions: 74 DEG F / 80% H
Performed By: Daniel McKissick

Procedure: STANDARD

This is to certify that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure at the points tested (unless otherwise noted). It has been Calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration is in accordance with Ozone Industries, Inc Quality Assurance Manual. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

Calibration Remarks:
THIS UNIT WAS FOUND TO BE IN TOLERANCE AT THE TIME OF CALIBRATION.
PERFORMED ROUTINE CALIBRATION / CERTIFICATION

Standards Used to Calibrate Equipment:

Company	I.D.	Description	Last Cal.	Cal. Due Date
OZONE	A1731	EATON UPC5000 PNEUMATIC CALIBRATOR	12/12/2012	12/12/2013

Signatures:

Certified by:
Print: Daniel McKissick
[redacted]

Approved by:
Print: Daniel McKissick
Date: [redacted] 05/17/13
[redacted]

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ØZONE
INDUSTRIES
CORPORATION

15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

PH: 239-433-3400
FAX: 239-489-3877

CONTROL NO: 100809-7

CUSTOMER: YBI15465

CALIBRATION DATA FORM

MFR:	PIC	**DESCRIPTION**	PRESSURE GAUGE
MODEL NO:	300 PSI .25%	**TECHNICIAN:**	0030
SERIAL NO:	972034-2	**CAL. DATE:**	05/17/13
CUST. ID:	N/A	**DUE DATE:**	11/17/13

* IF NO "AS LEFT" READING IS SHOWN ON THIS CHART, IT MEANS THE UNIT WAS IN TOLERANCE AND THERE WERE NO ADJUSTMENTS MADE TO IT.

RANGE: 0-300 PSI

NOMINAL	AS FOUND	AS LEFT *	LOW LIMIT	HIGH LIMIT
50	49.59		49.25	50.75
100	99.47		99.25	100.75
150	149.45		149.25	150.75
200	199.43		199.25	200.75
300	299.4		299.25	300.75

Certificate of Calibration

OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

Ozone Industries, Inc.
Precision Measurement Equipment Division

Purchase Order #

Calibration Performed By:
OZONE INDUSTRIES, INC.
15551 PINE RIDGE RD.
FORT MYERS, FL 33908

For:
YOUNGQUIST BROTHERS, INC.
15465 PINE RIDGE RD.
FORT MYERS, FL 33908

EQUIPMENT INFORMATION:

Description: PRESSURE GAUGE
Manufacter: MCDANIELS
Model Number: 300PSI
Part Number: N/A
Range: 0-300 PSI

Serial Number: AB30128
Customer I.D.:
Cust. Barcode: N/A
Cust. Location: N/A
Specifications: +/- 0.25% FS

Cal Date: 6/17/2013
Cal. Due Date: 12/17/2013
Cal. Interval 6 MONTHS
Received: IN TOLERANCE
Calibration Result: PASS
Environmental Conditions: 73 DEG F / 40% H
Performed By: Daniel McKissick

Procedure: STANDARD

This is to certify that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure at the points tested (unless otherwise noted). It has been Calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration is in accordance with Ozone Industries, Inc Quality Assurance Manual. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

Calibration Remarks:
THIS UNIT WAS FOUND TO BE IN TOLERANCE AT THE TIME OF CALIBRATION.
PERFORMED ROUTINE CALIBRATION / CERTIFICATION

Standards Used to Calibrate Equipment:

Company	I.D.	Description	Last Cal.	Cal. Due Date
OZONE	A1731	EATON UPC5000 PNEUMATIC CALIBRATOR	12/12/2012	12/12/2013

Signatures:

Certified by:
Print: Daniel McKissick
Date: 06/17/13
[redacted]

Approved by:
Print: Daniel McKissick
Date: 06/17/13
[redacted]

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OZONE
INDUSTRIES
CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

PH: 239-433-3400
FAX: 239-489-3877

CONTROL NO: 080709-2

CUSTOMER: YBI15465

CALIBRATION DATA FORM

MFR:	MCDANIELS	**DESCRIPTION**	PRESSURE GAUGE
MODEL NO:	300 PSI .25%	**TECHNICIAN:**	0030
SERIAL NO:	AB30128	**CAL. DATE:**	06/17/13
CUST. ID:	N/A	**DUE DATE:**	12/17/13

* IF NO "AS LEFT" READING IS SHOWN ON THIS CHART, IT MEANS THE UNIT WAS IN TOLERANCE AND THERE WERE NO ADJUSTMENTS MADE TO IT.

RANGE: 0-200 PSI

NOMINAL	AS FOUND	AS LEFT *	LOW LIMIT	HIGH LIMIT
50	50.18		49.25	50.75
100	100.19		99.25	100.75
150	150.22		149.25	150.75
200	200.31		199.25	200.75
250	250.33		249.25	250.75
300	300.39		299.25	300.75

Appendix D

RTS and RTS Tool Configuration

RADIOACTIVE TRACER SURVEY LOG

Company	MIAMI-DADE WATER & SEWER
Well	IW-#9
Field	S.D.W.W.T.P.
County	MIAMI-DADE
State	FL

Company MIAMI-DADE WATER & SEWER
Well IW-#9
Field S.D.W.W.T.P.
County MIAMI-DADE
State FL

Company MIAMI-DADE WATER & SEWER
Well IW-#9
Field S.D.W.W.T.P.
County MIAMI-DADE State FL

Location: API # :

SEC TWP RGE

Other Services

Elevation

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

Date	25-JUN-2013		
Run Number	2013 MIT		
Depth Driller	2920'		
Depth Logger	2920'		
Bottom Logged Interval	2920'		
Top Log Interval	SURFACE		
Open Hole Size	24"		
Type Fluid	WATER		
Density / Viscosity	NA		
Max. Recorded Temp.	NA		
Estimated Cement Top	NA		
Time Well Ready	UPON ARRIVAL		
Time Logger on Bottom	0930		
Equipment Number	102		
Location	FT. MYERS		
Recorded By	MOREY	RIVES	
Witnessed By	S. VILLAMIL	M. MACFARLANE	

Borehole Record				Borehole Record			
Run Number	Bit	From	To	Run No	Bit	From	To

Casing Record	Size	Wgt/Ft	Top	Bottom
Surface String				
Prot. String				
Production String	24"	.500" W.T	SURFACE	2420'
Liner				

<< Fold Here >>>

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

Comments

HIGH RESOLUTION TEMPERATURE

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)

GR#3	24.00				
		GR #3 -RTST (951T)	11.50	1.69	30.00
		TREJCT-A (951)	1.00	1.69	10.00
		GR #2 -RTSM (951M)	3.00	1.69	10.00
GR#2	10.50				
CCL	9.60	CCL-1.68GRRTS (951)	0.75	1.69	10.00
		GR-RTSB (951B)	9.25	1.69	10.00
GR	1.20				

Dataset: sdwwtp-iw9.db: field/well/run1/pass2
Total Length: 25.50 ft
Total Weight: 70.00 lb
O.D. 1.69 in

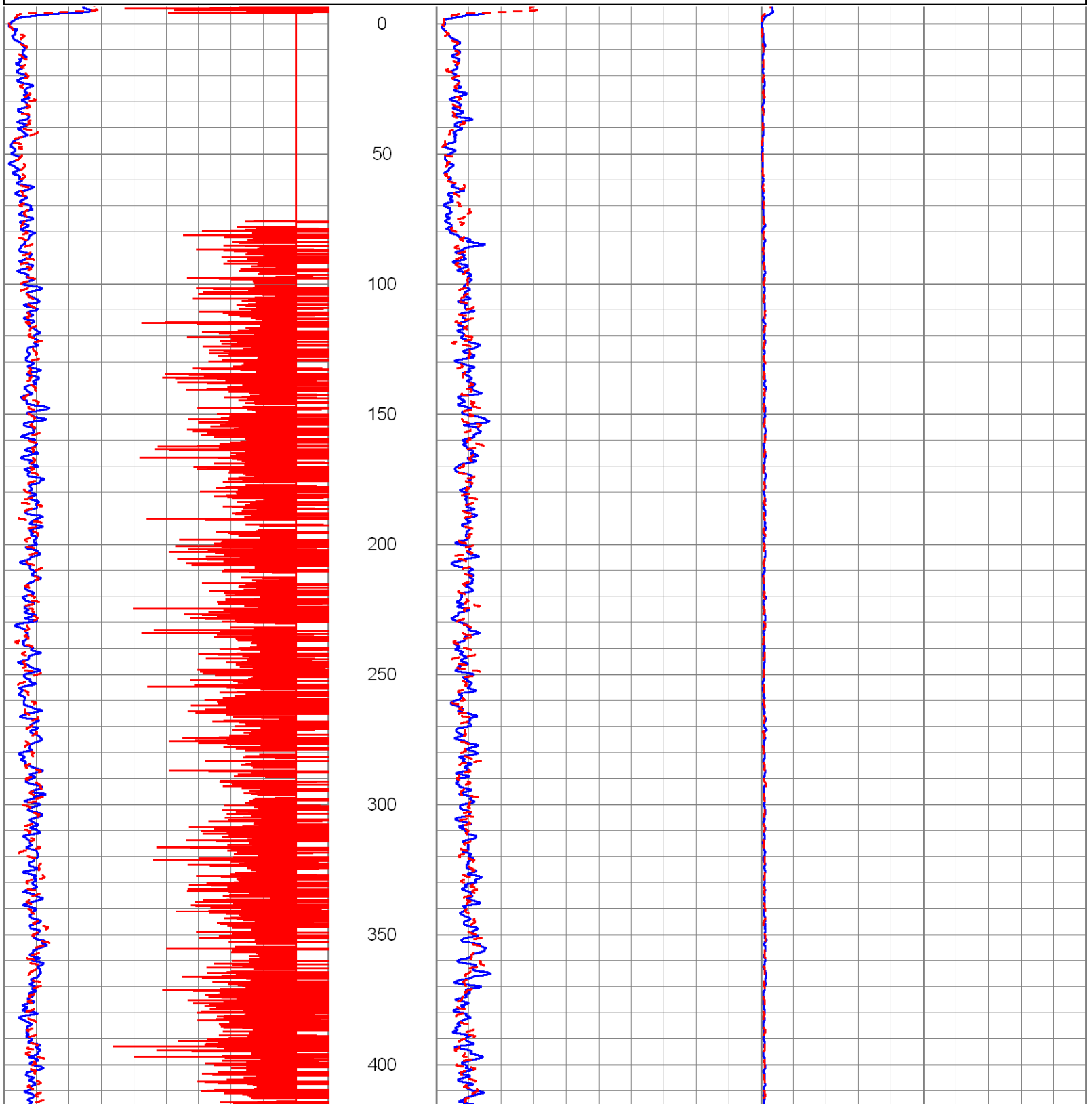
YOUNGQUIST

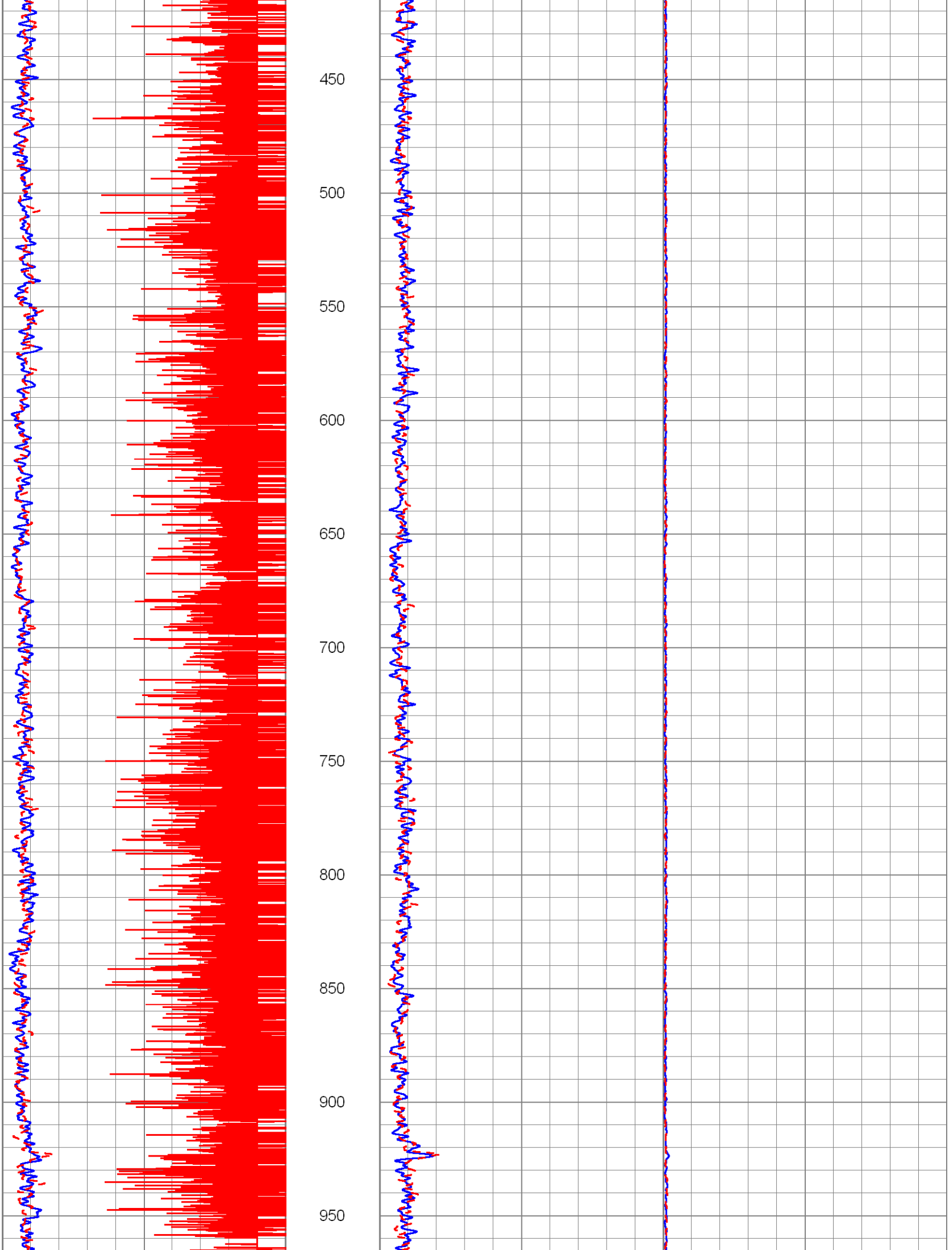
FINAL BACKGROUND

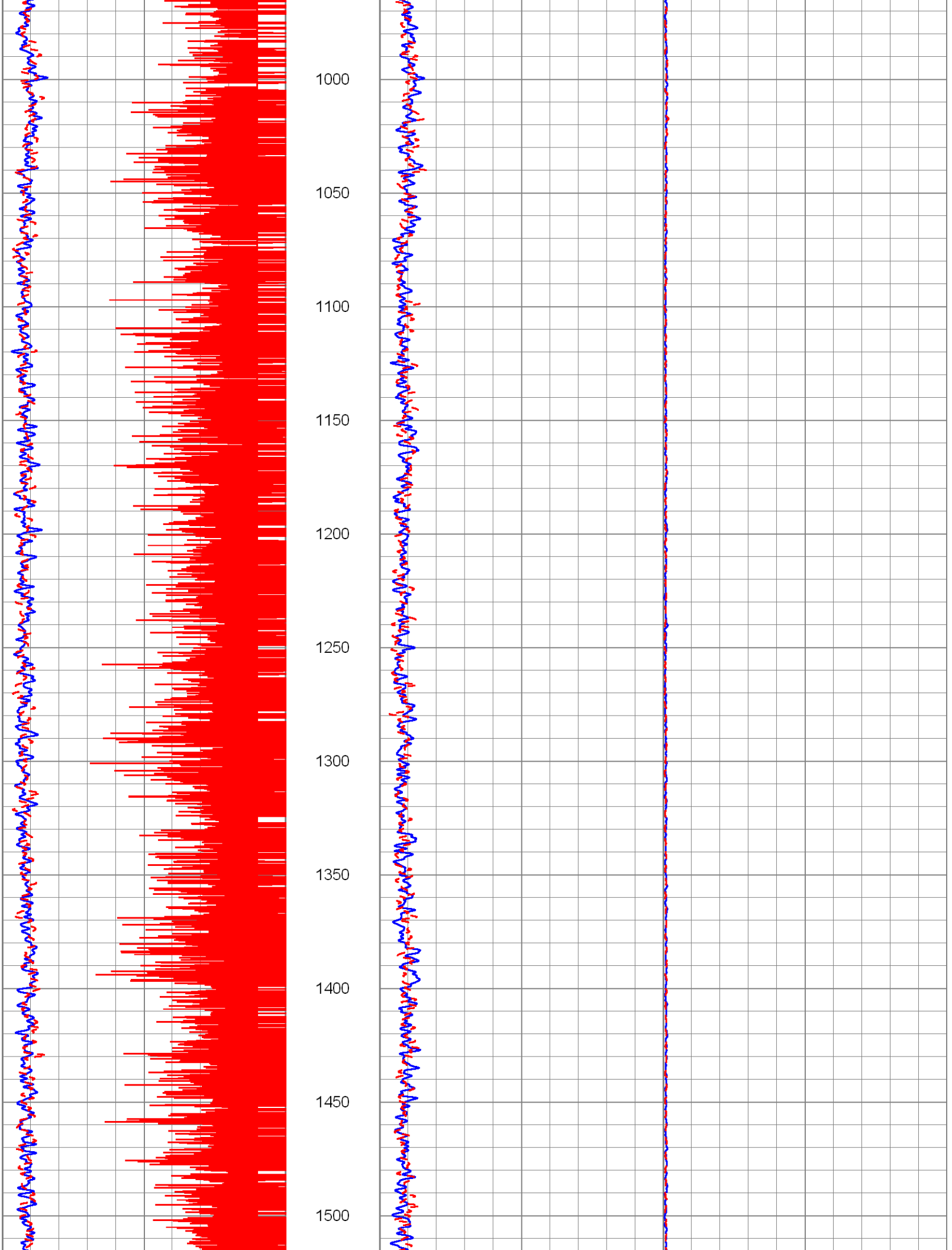
FINAL BACKGROUND

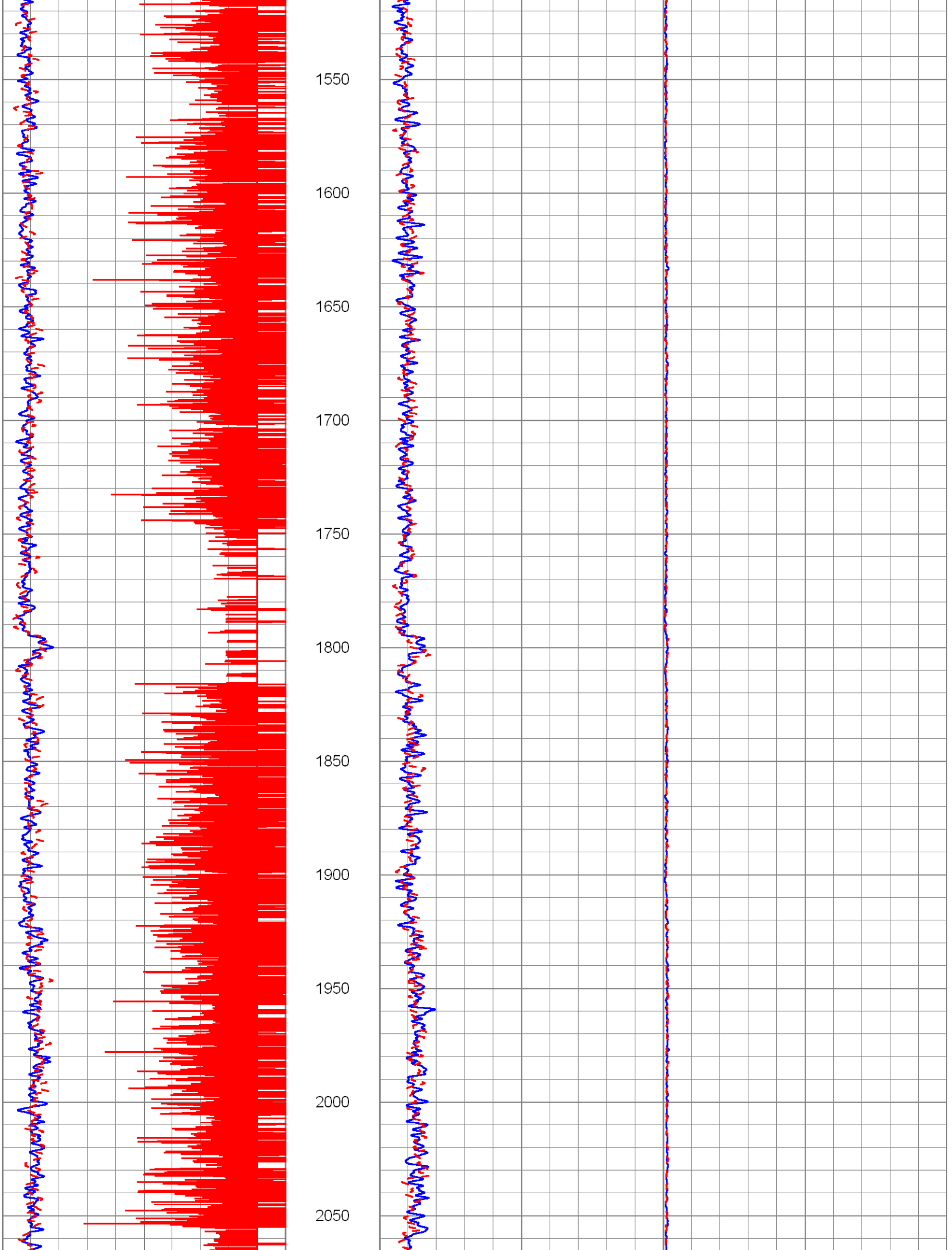
Database File:	sdwwtp-iw9.db
Dataset Pathname:	pass10
Presentation Format:	rts
Dataset Creation:	Tue Jun 25 15:37:38 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:600

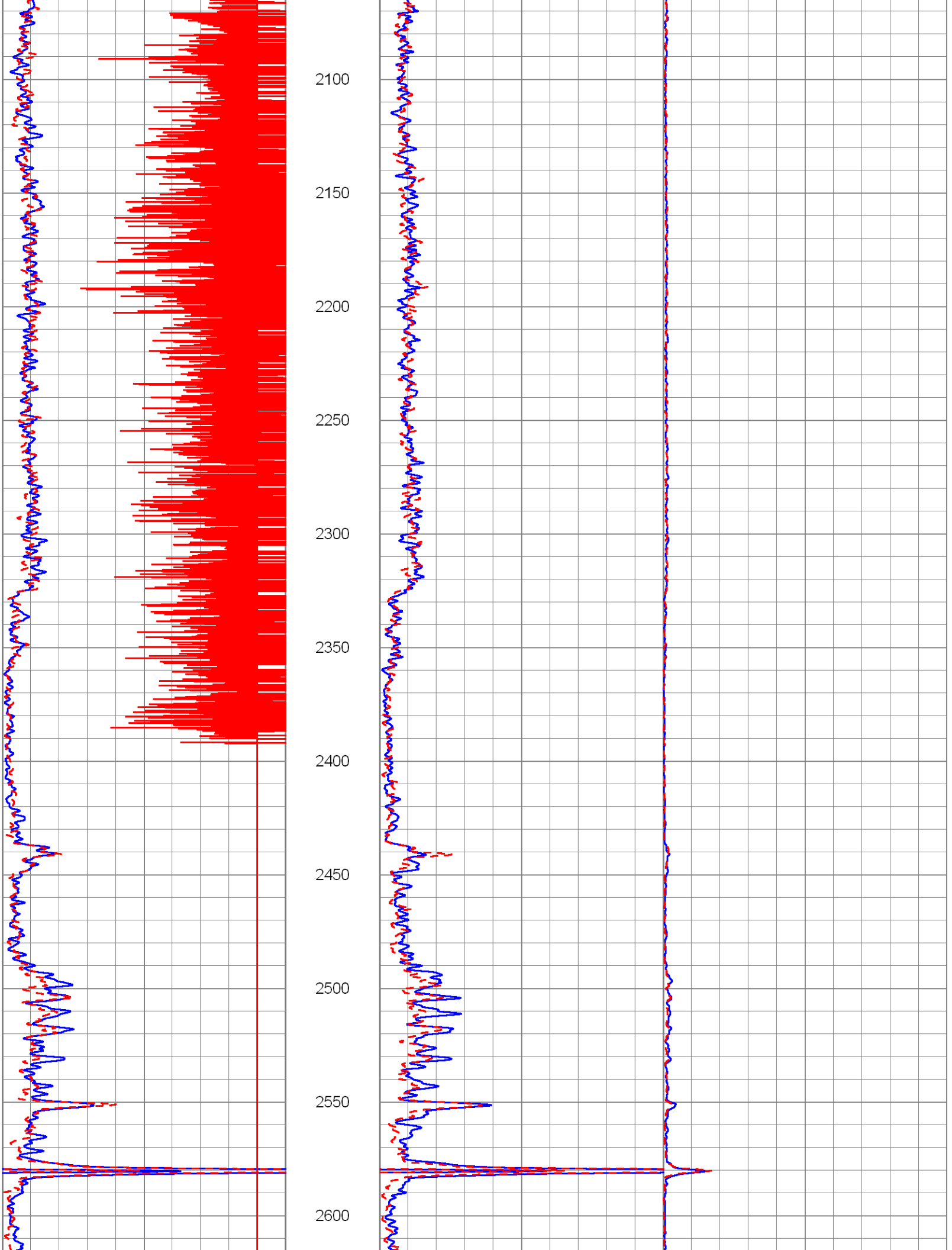
0	GRT (GAPI)	100	0	GRB (GAPI)	100	0	GRM (GAPI) 1000
0	GRT-BACKGRND (GAPI)	100	0	GRB-BACKGRD (GAPI)	100	0	GRM-BACKGRND (GAPI) 1000
0.9	CCL	-0.1					

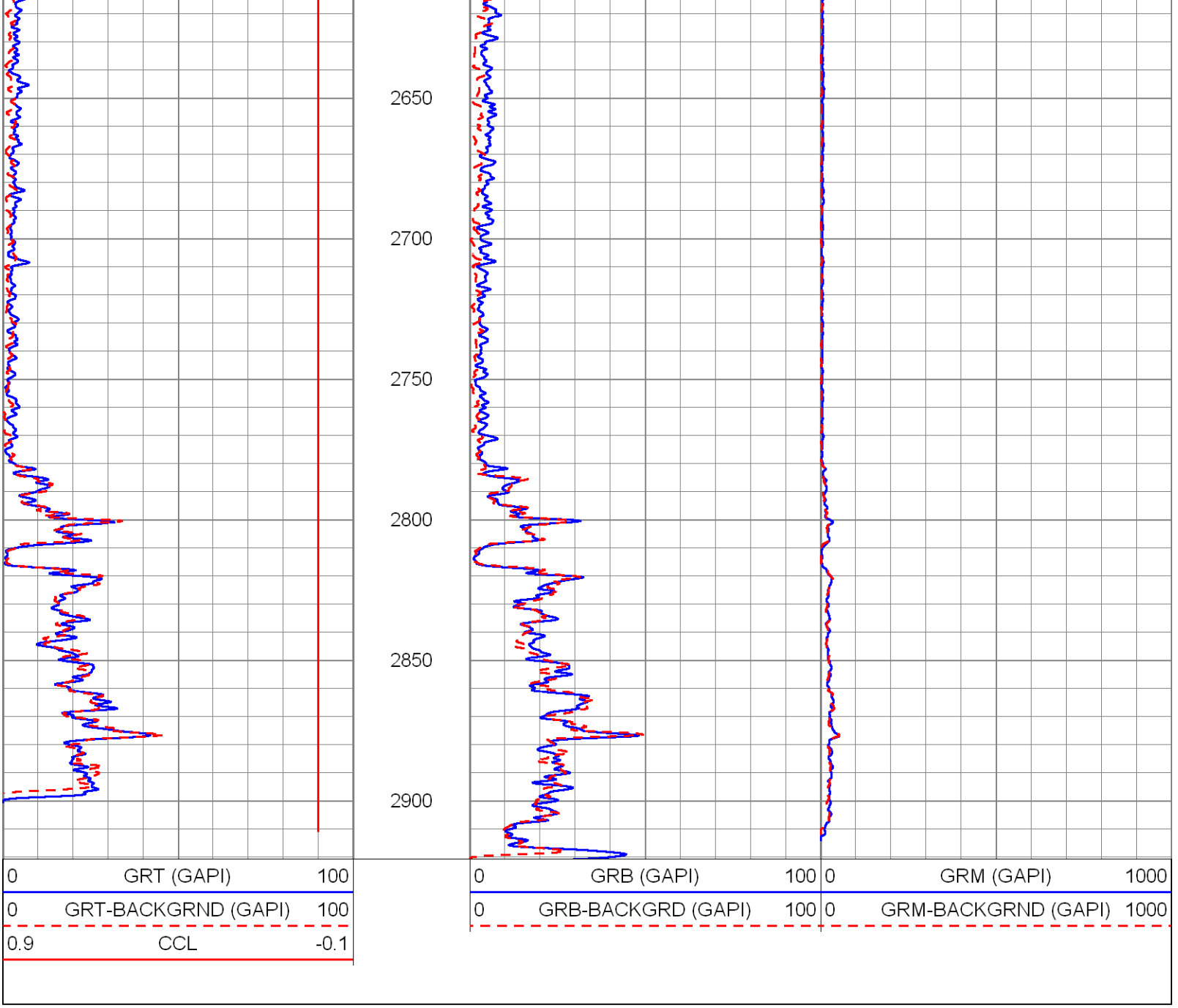



450
500
550
600
650
700
750
800
850
900
950


1000
1050
1100
1150
1200
1250
1300
1350
1400
1450
1500

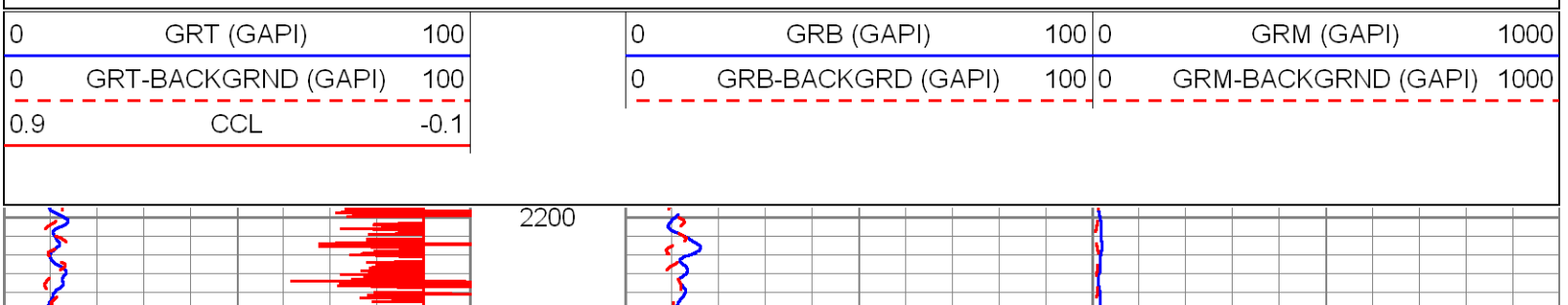

1550
1600
1650
1700
1750
1800
1850
1900
1950
2000
2050

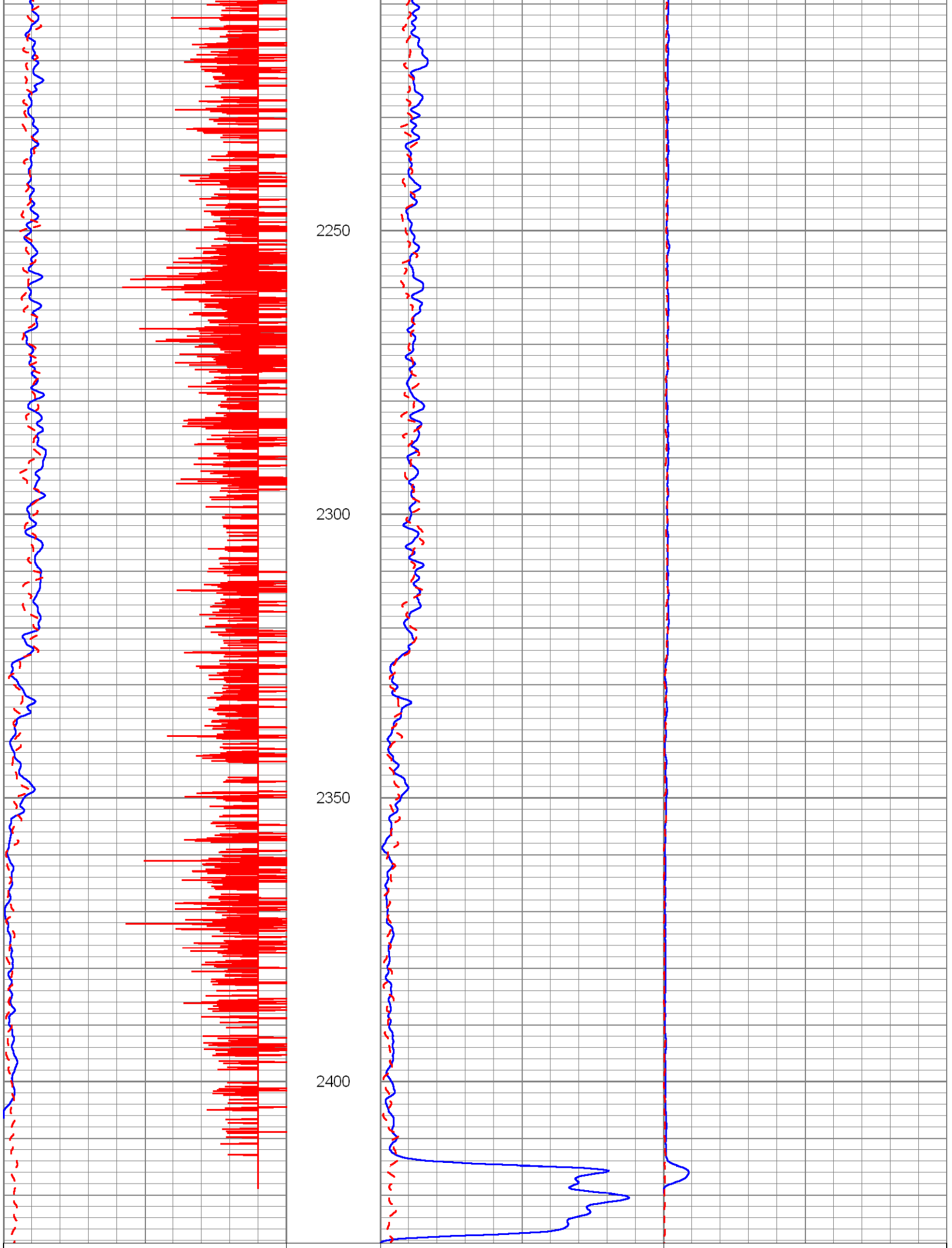

2100
2150
2200
2250
2300
2350
2400
2450
2500
2550
2600



LOP #2

Database File:	sdwwtp-iw9.db
Dataset Pathname:	pass9
Presentation Format:	rts
Dataset Creation:	Tue Jun 25 14:53:49 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:240




2250
2300
2350
2400

0	GRT (GAPI)	100
0	GRT-BACKGRND (GAPI)	100
0.9	CCL	-0.1

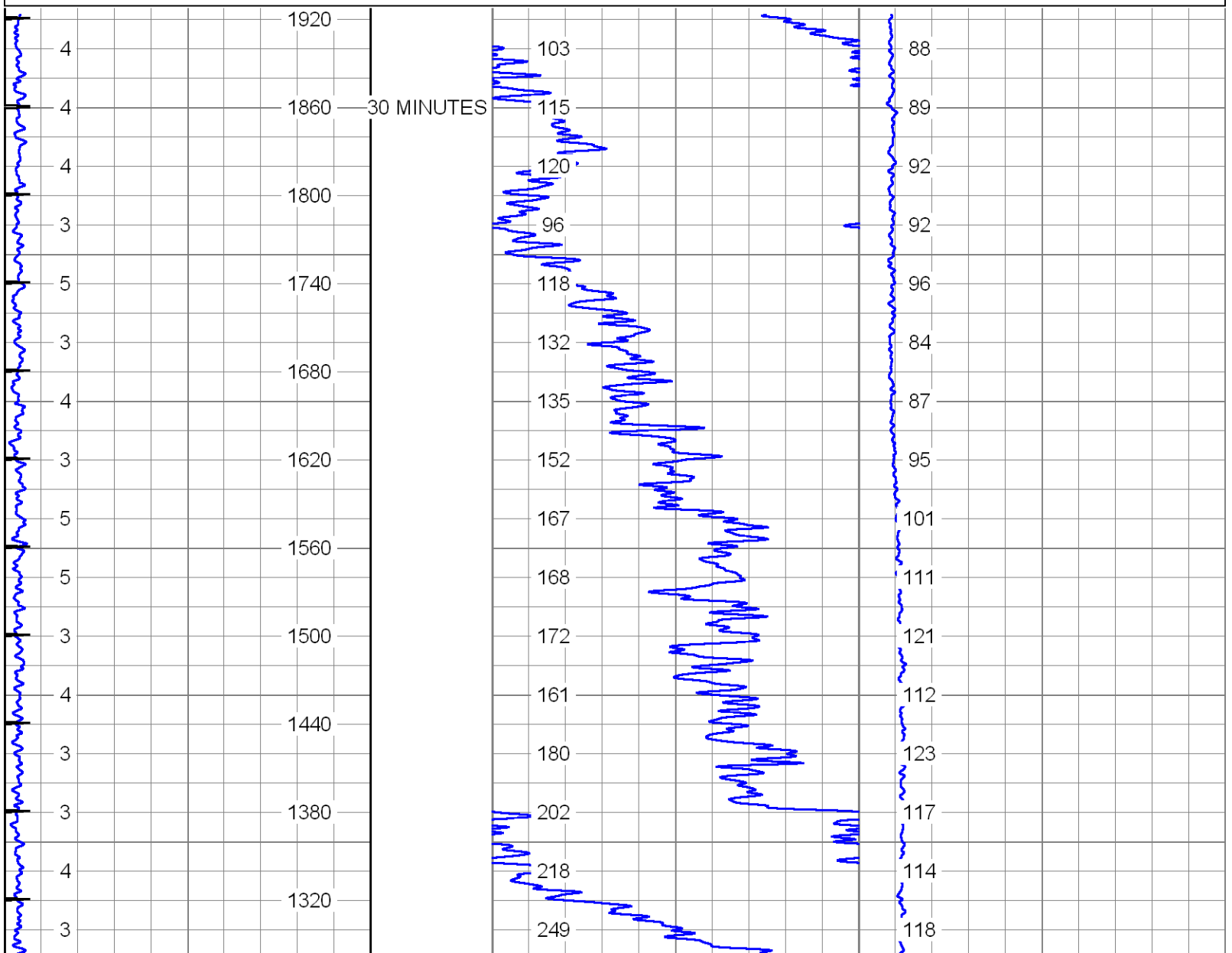
0	GRB (GAPI)	100
0	GRB-BACKGRD (GAPI)	100

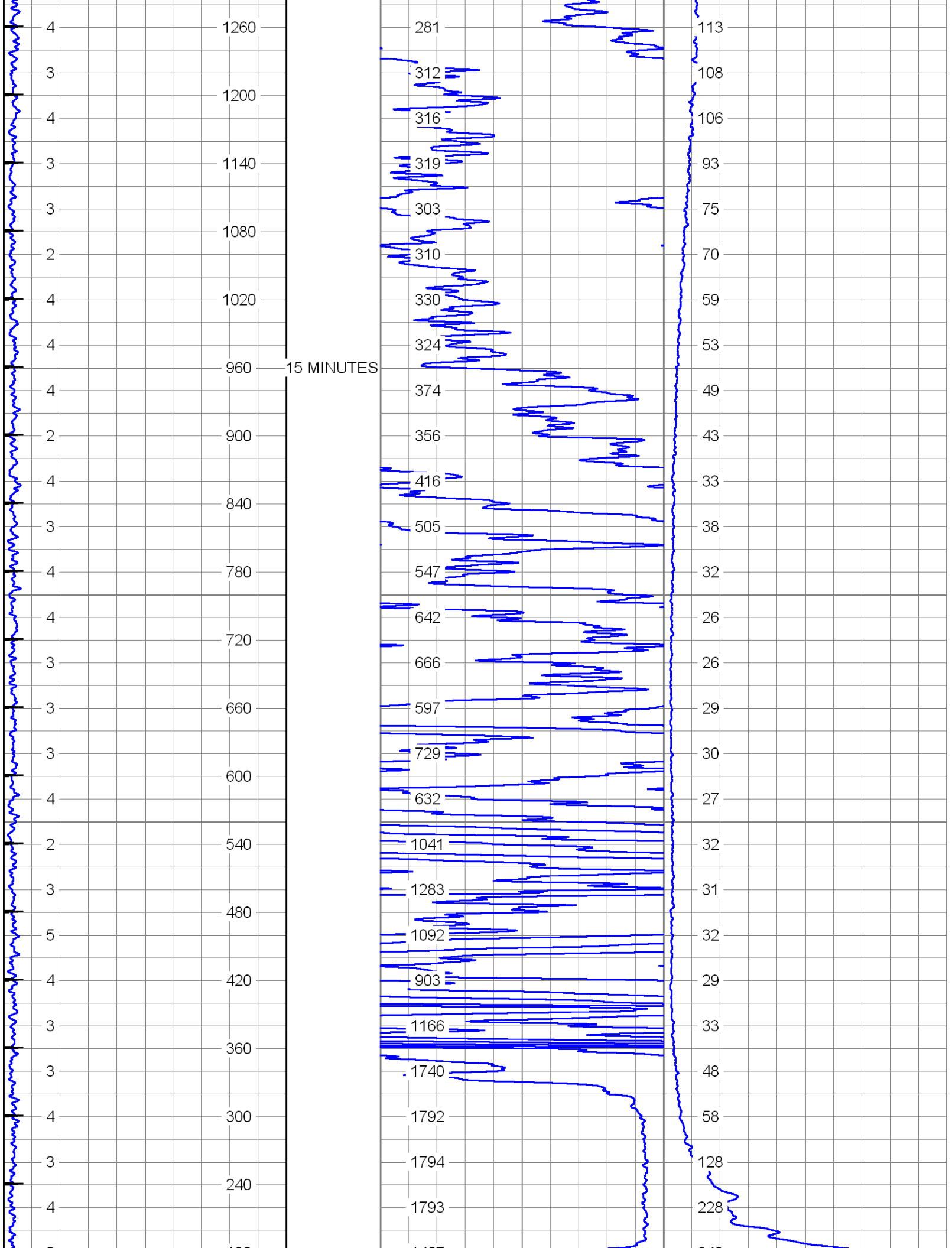
0	GRM (GAPI)	1000
0	GRM-BACKGRND (GAPI)	1000

DYNAMIC TEST #2 (92 GPM)

Database File:	sdwwtp-iw9.db
Dataset Pathname:	pass8
Presentation Format:	rtstime
Dataset Creation:	Tue Jun 25 14:18:31 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:600

0	GRT (GAPI)	100	0 EJECT 2	0	GRB (GAPI)	100	0	GRM (GAPI) 1000
0	MINUTES	15			GRB (GAPI)			GRM (GAPI)
GRT (GAPI)		ELTIM (sec)						





4
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1140
1080
1020
960
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780
720
660
600
540
480
420
360
300
240
15 MINUTES
281
312
316
319
303
310
330
324
374
356
416
505
547
642
666
597
729
632
1041
1283
1092
903
1166
1740
1792
1794
1793
113
108
106
93
75
70
59
53
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26
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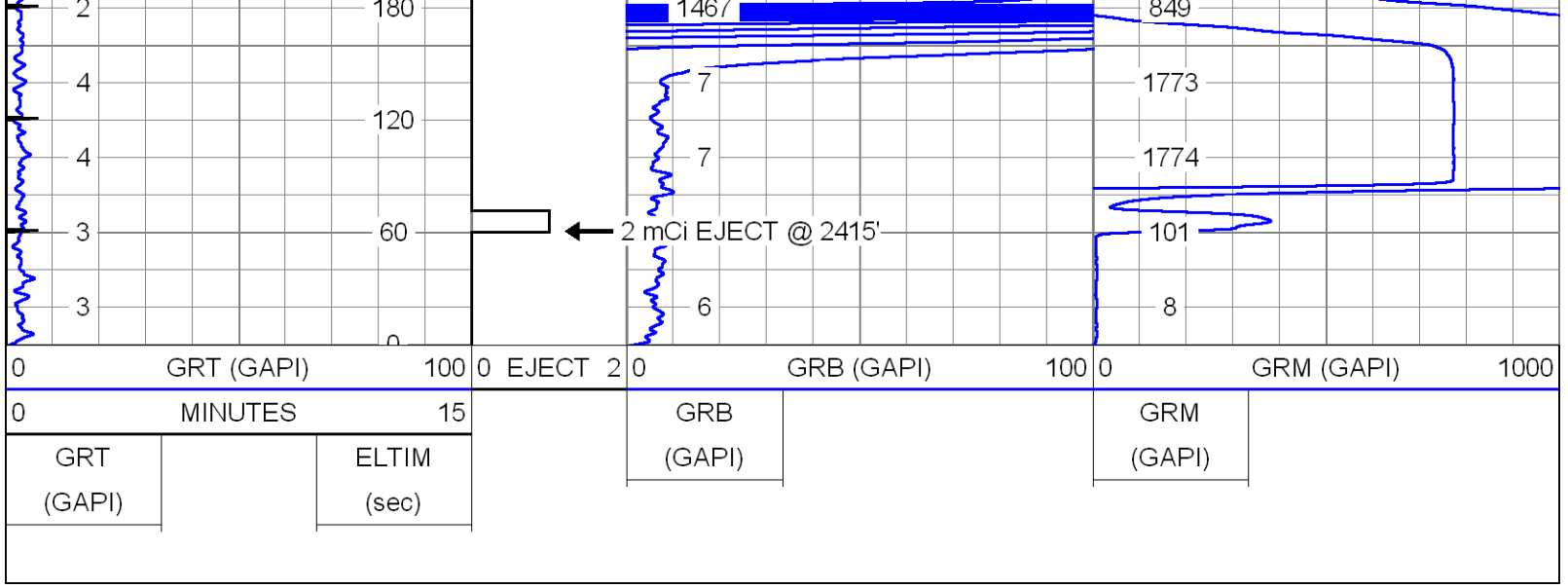
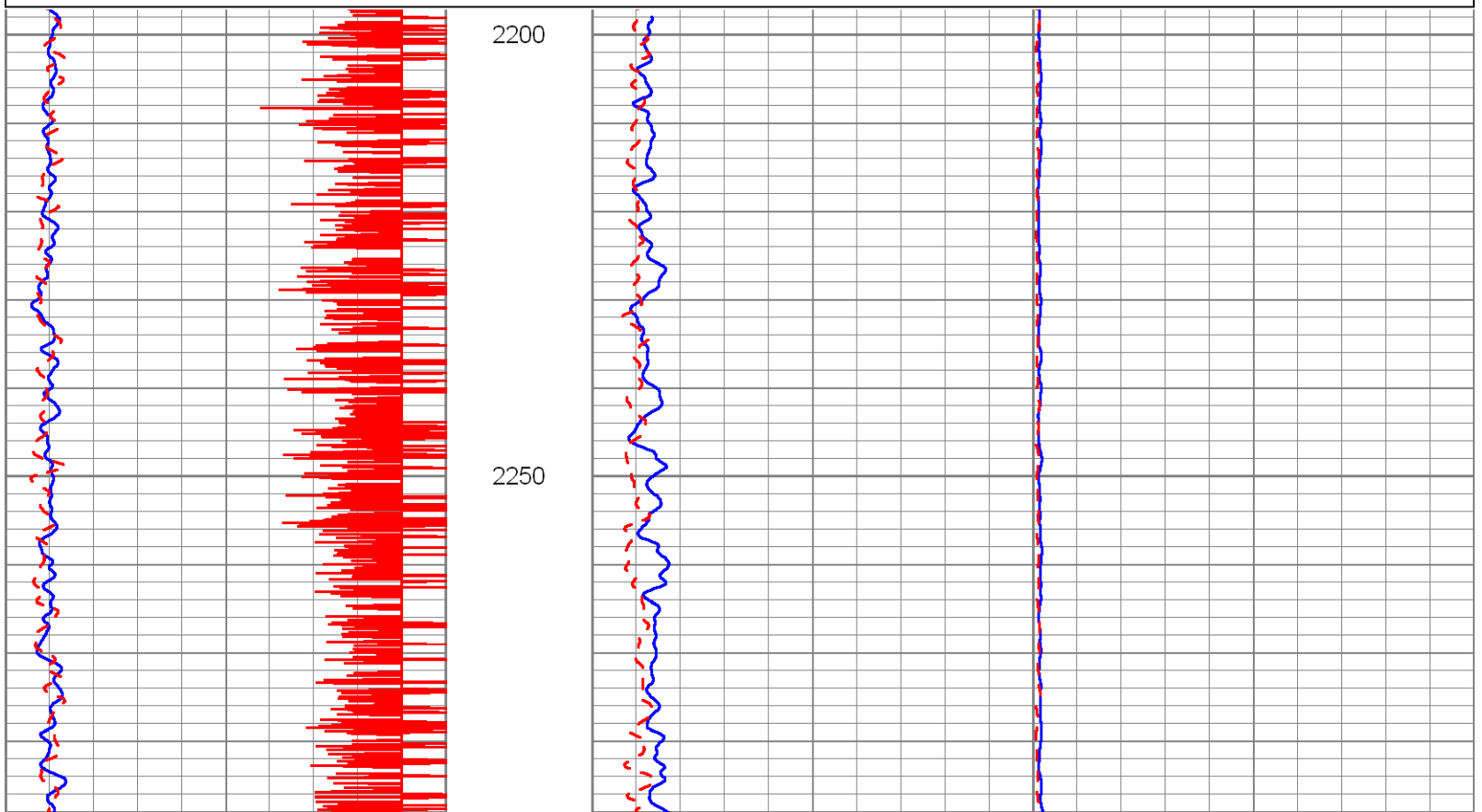
33
48
58
128
228

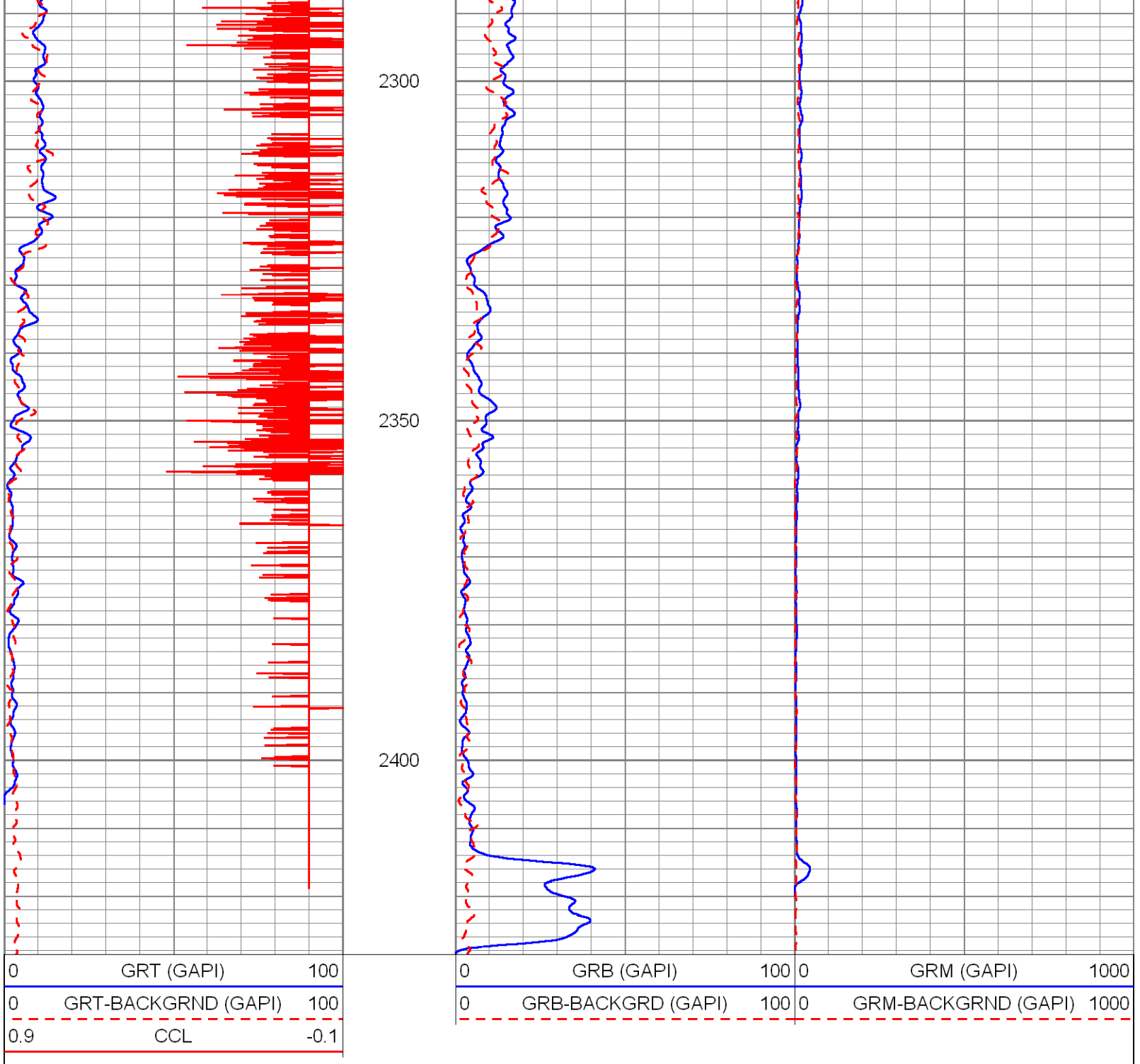


LOP #1

Database File:	sdwwtp-iw9.db
Dataset Pathname:	pass7
Presentation Format:	rts
Dataset Creation:	Tue Jun 25 13:18:17 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:240

0	GRT (GAPI)	100		0	GRB (GAPI)	100	0	GRM (GAPI) 1000
0	GRT-BACKGRND (GAPI)	100		0	GRB-BACKGRD (GAPI)	100	0	GRM-BACKGRND (GAPI) 1000
0.9	CCL	-0.1						

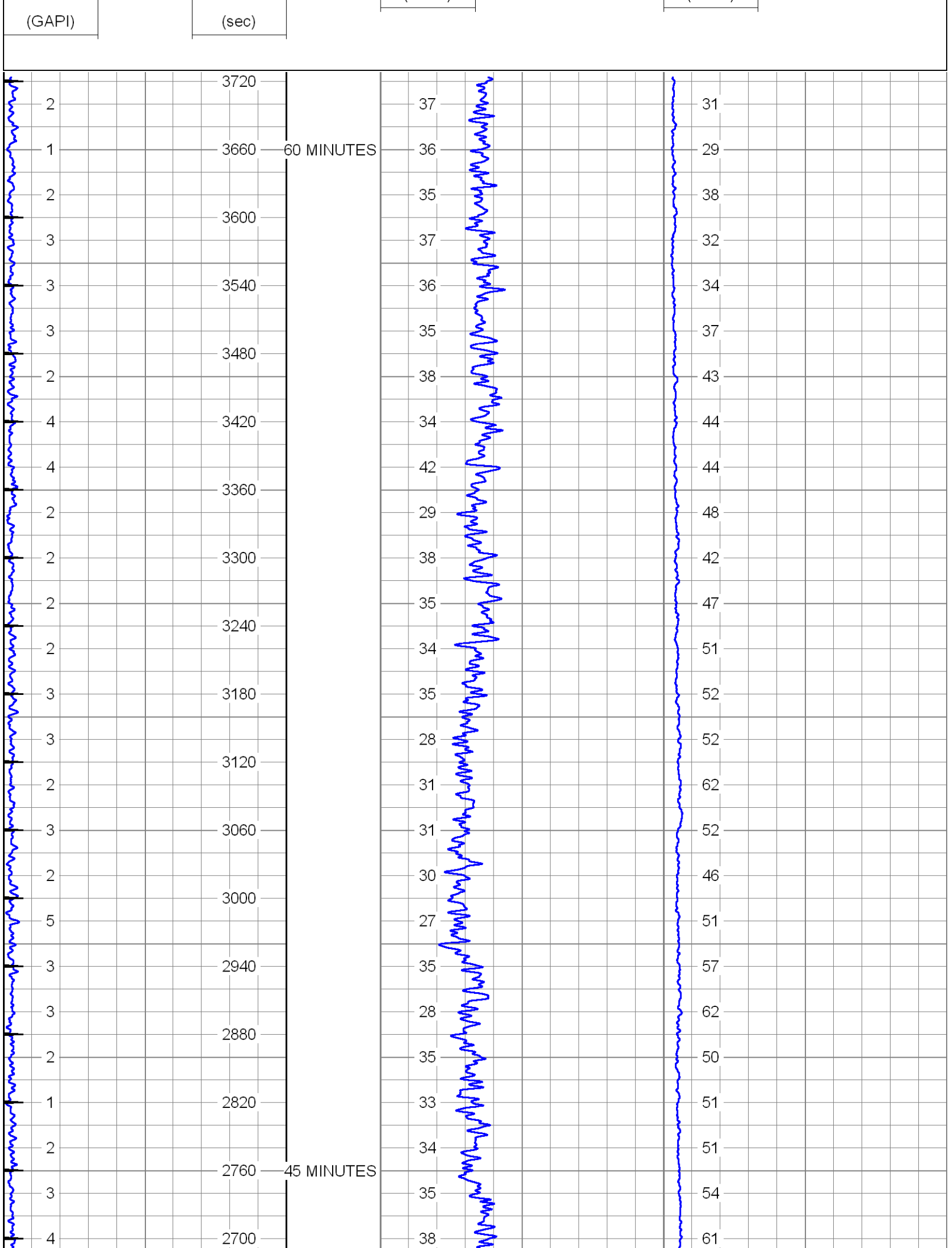


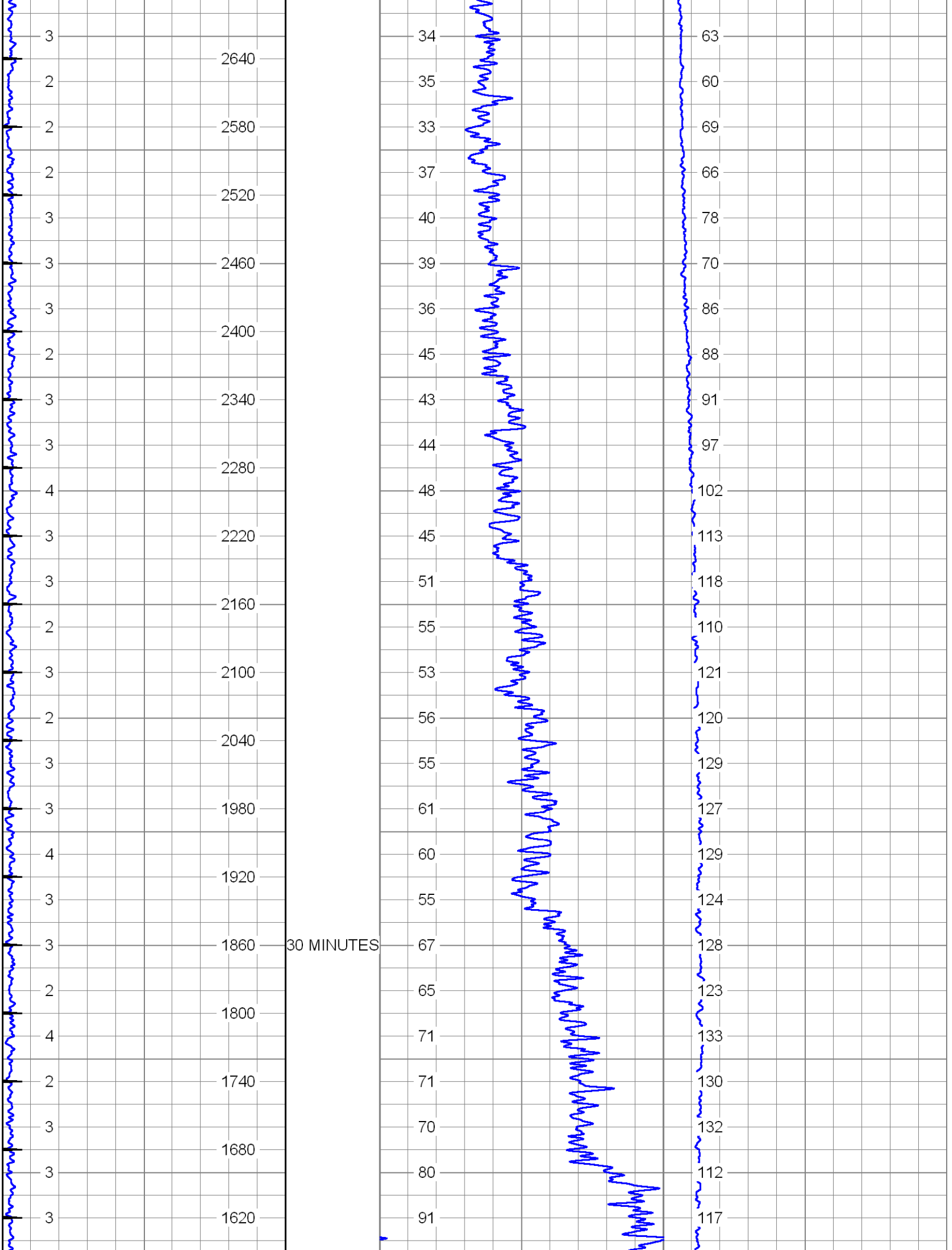


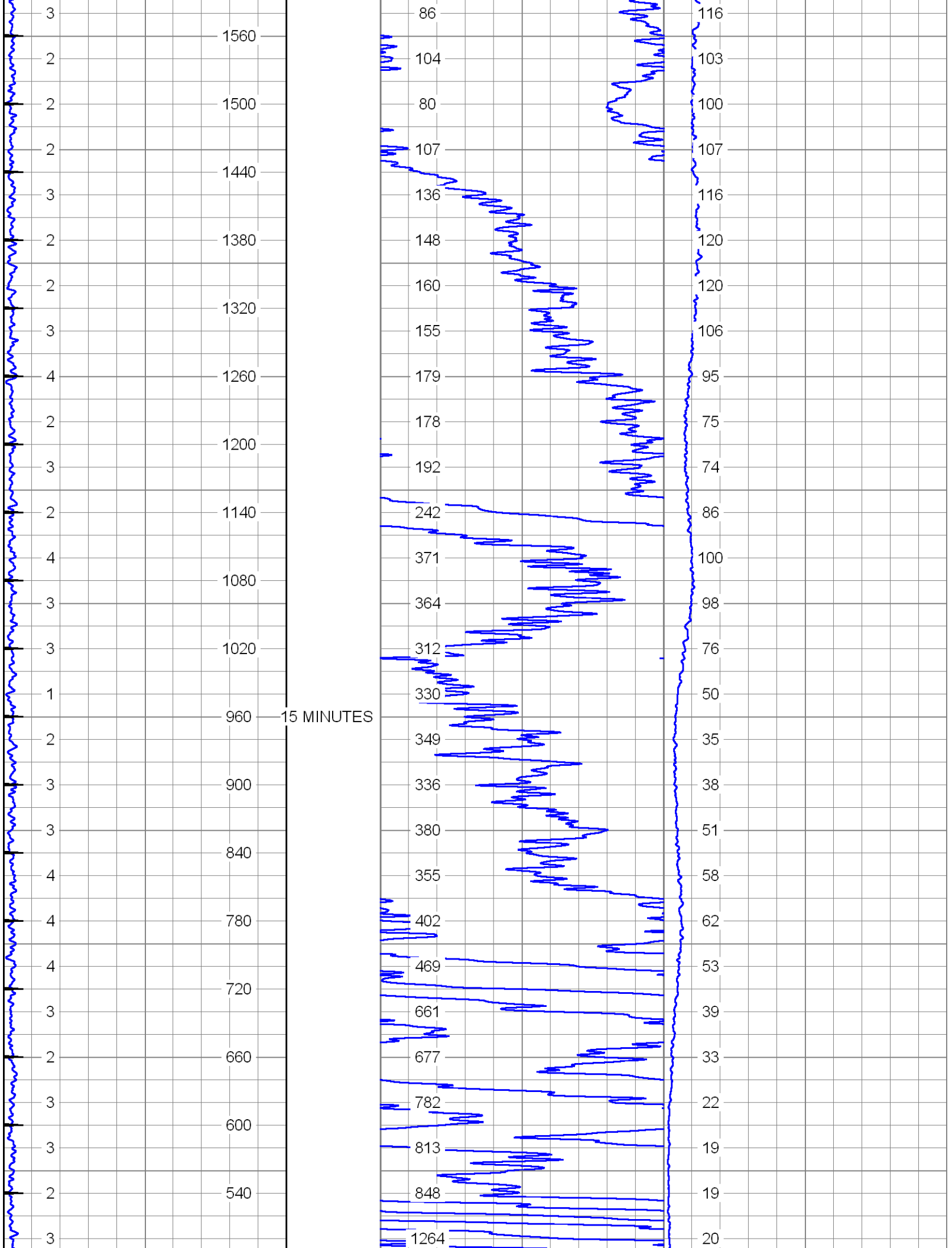
DYNAMIC TEST #1 (93 GPM)

Database File:	sdwwtp-iw9.db
Dataset Pathname:	pass6
Presentation Format:	rtstime
Dataset Creation:	Tue Jun 25 12:14:58 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:600

0	GRT (GAPI)	100	0 EJECT 2	0	GRB (GAPI)	100	0 GRM (GAPI) 1000
0	MINUTES	15			GRB		GRM
GRT		ELTIM			(GAPI)		(GAPI)


(GAPI)
(sec)
3720
3660
60 MINUTES
3600
3540
3480
3420
3360
3300
3240
3180
3120
3060
3000
2940
2880
2820
2760
45 MINUTES
2700


30 MINUTES


3
2
2
2
3
2
2
3
4
2
3
2
4
3
3
1
2
3
3
4
4
4
3
2
3
3
2
3
1560
1500
1440
1380
1320
1260
1200
1140
1080
1020
960
900
840
780
720
660
600
540
15 MINUTES
86
104
80
107
136
148
160
155
179
178
192
242
371
364
312
330
349
336
380
355
402
469
661
677
782
813
848
1264
116
103
100
107
116
120
120
106
95
75
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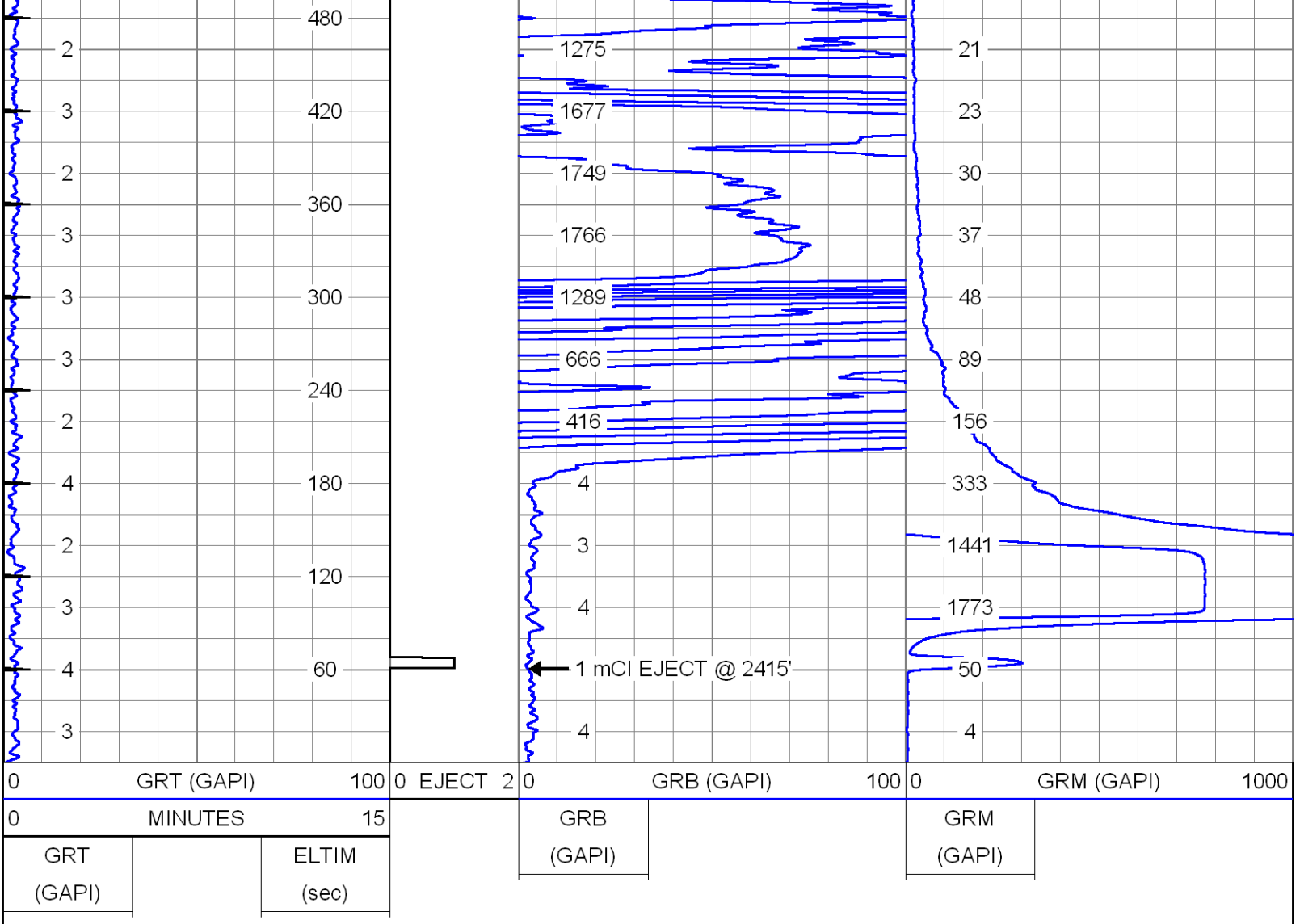
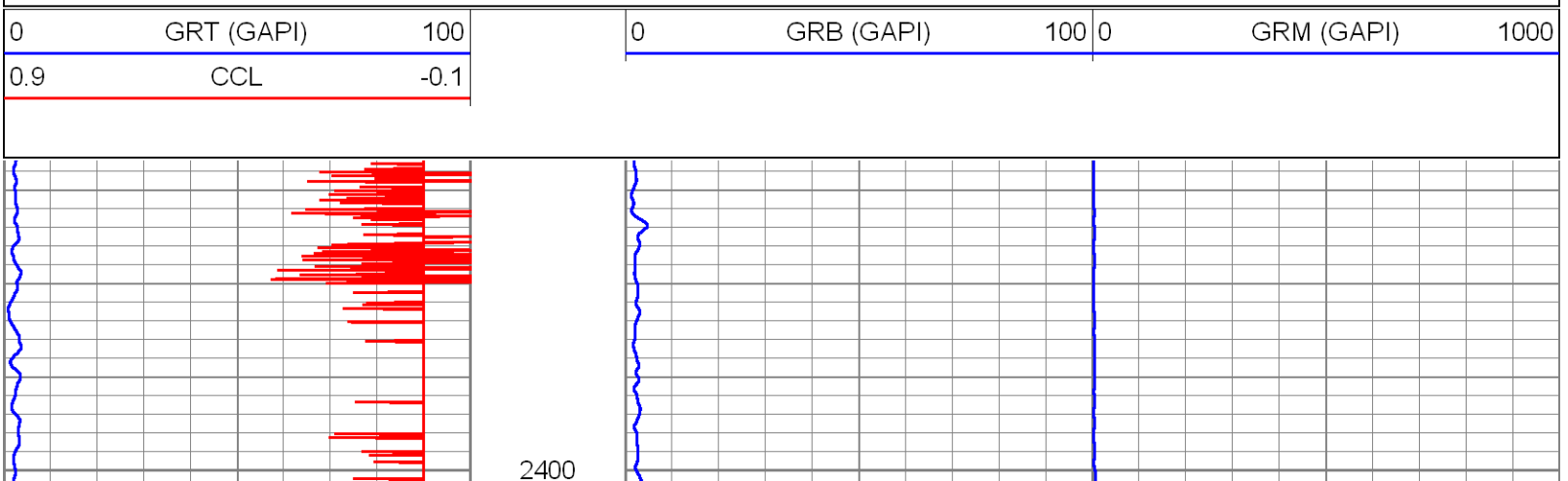
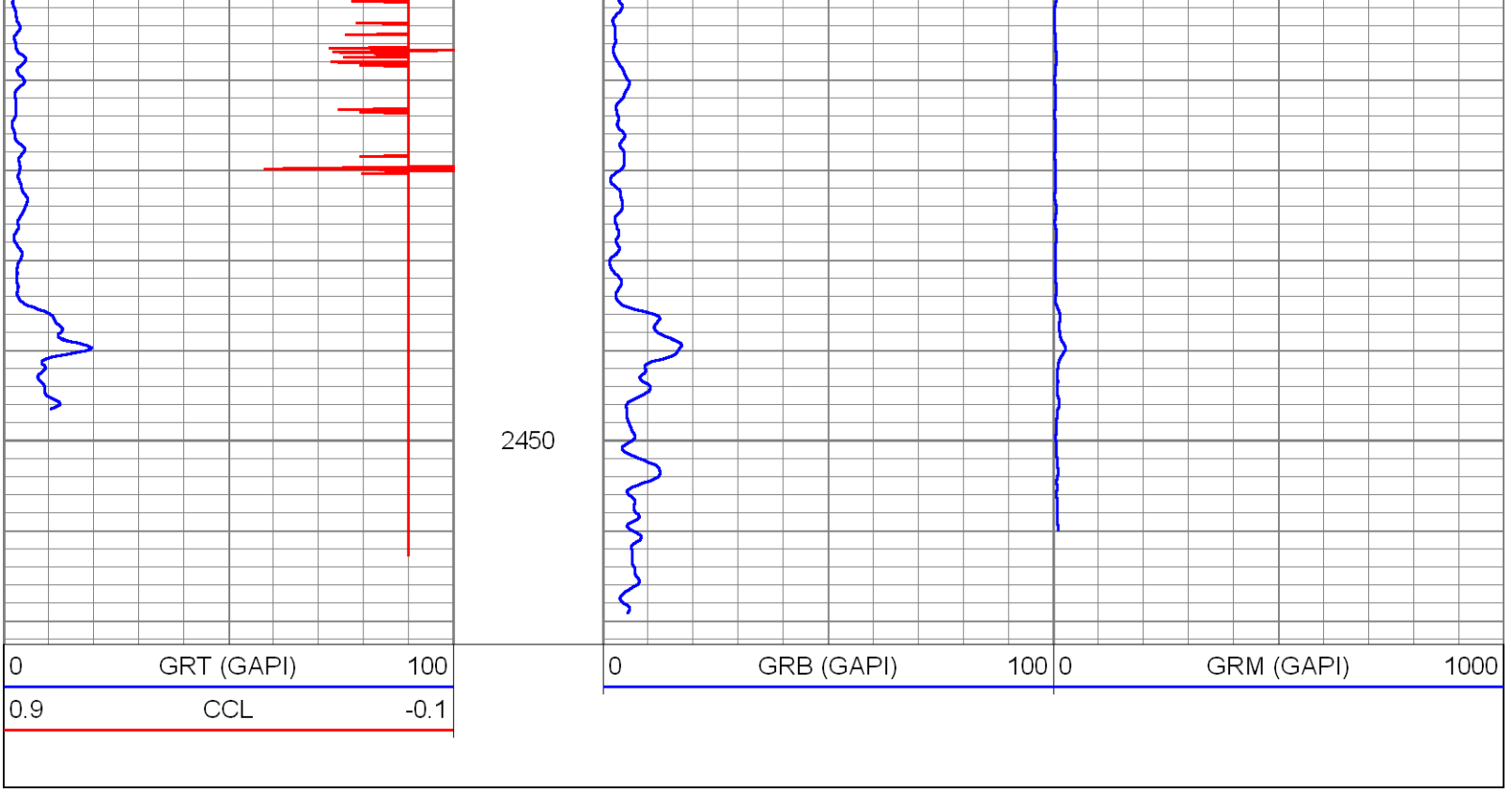
39
33
22
19
19
20



CASING TIE IN

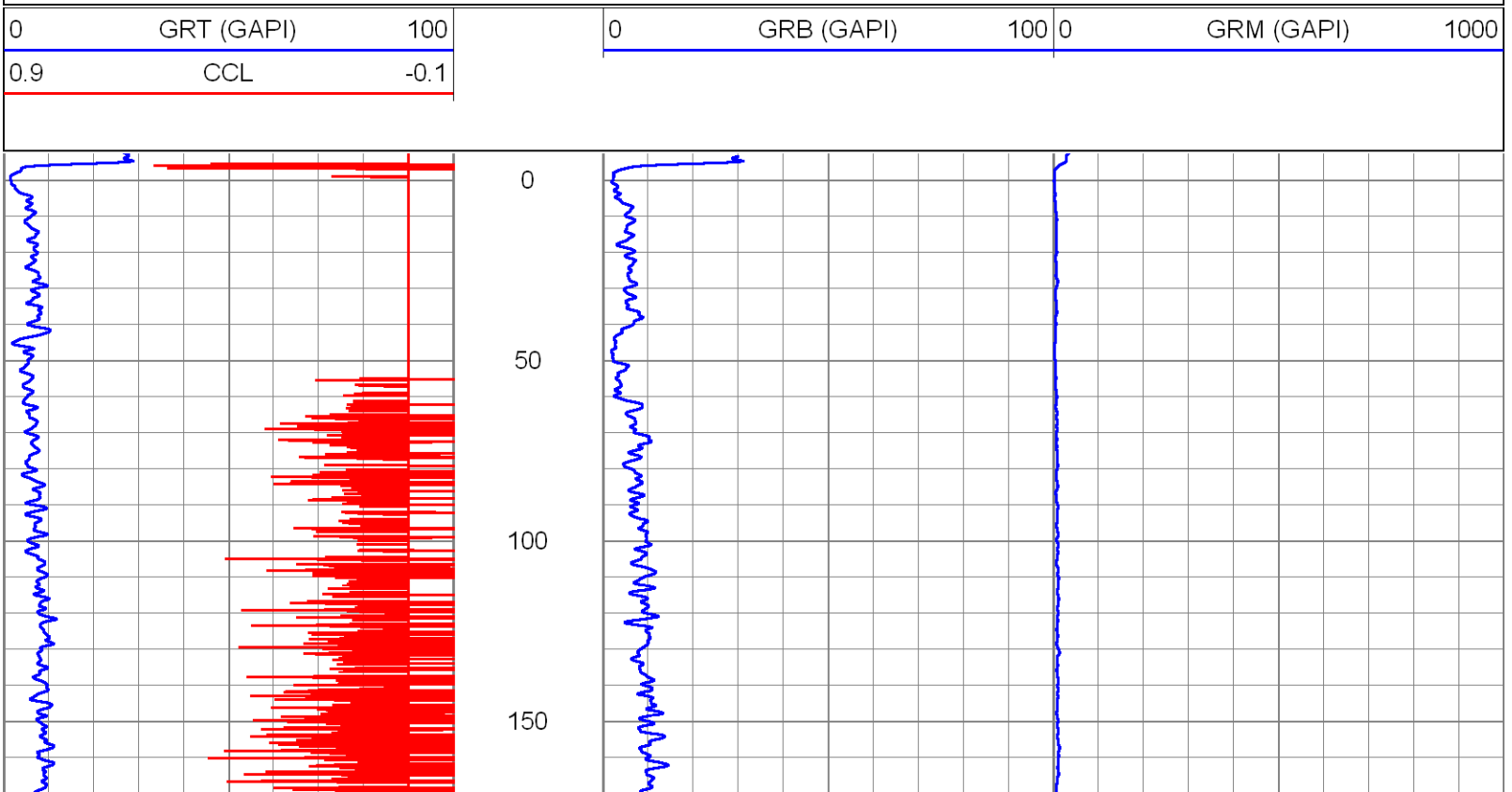
Database File: sdwwtp-iw9.db
Dataset Pathname: pass3
Presentation Format: rts
Dataset Creation: Tue Jun 25 11:54:14 2013 by Log SOC 110722
Charted by: Depth in Feet scaled 1:240

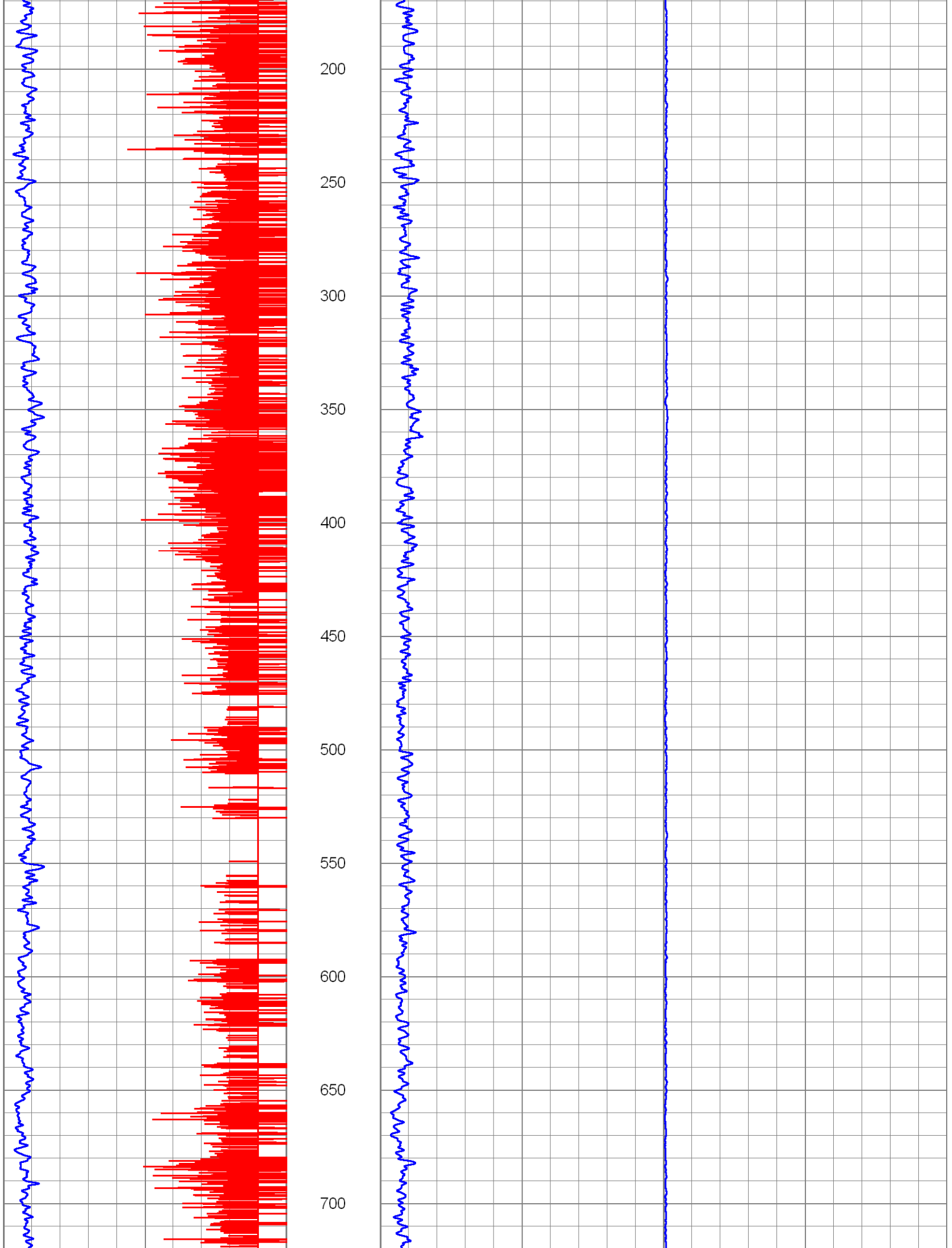


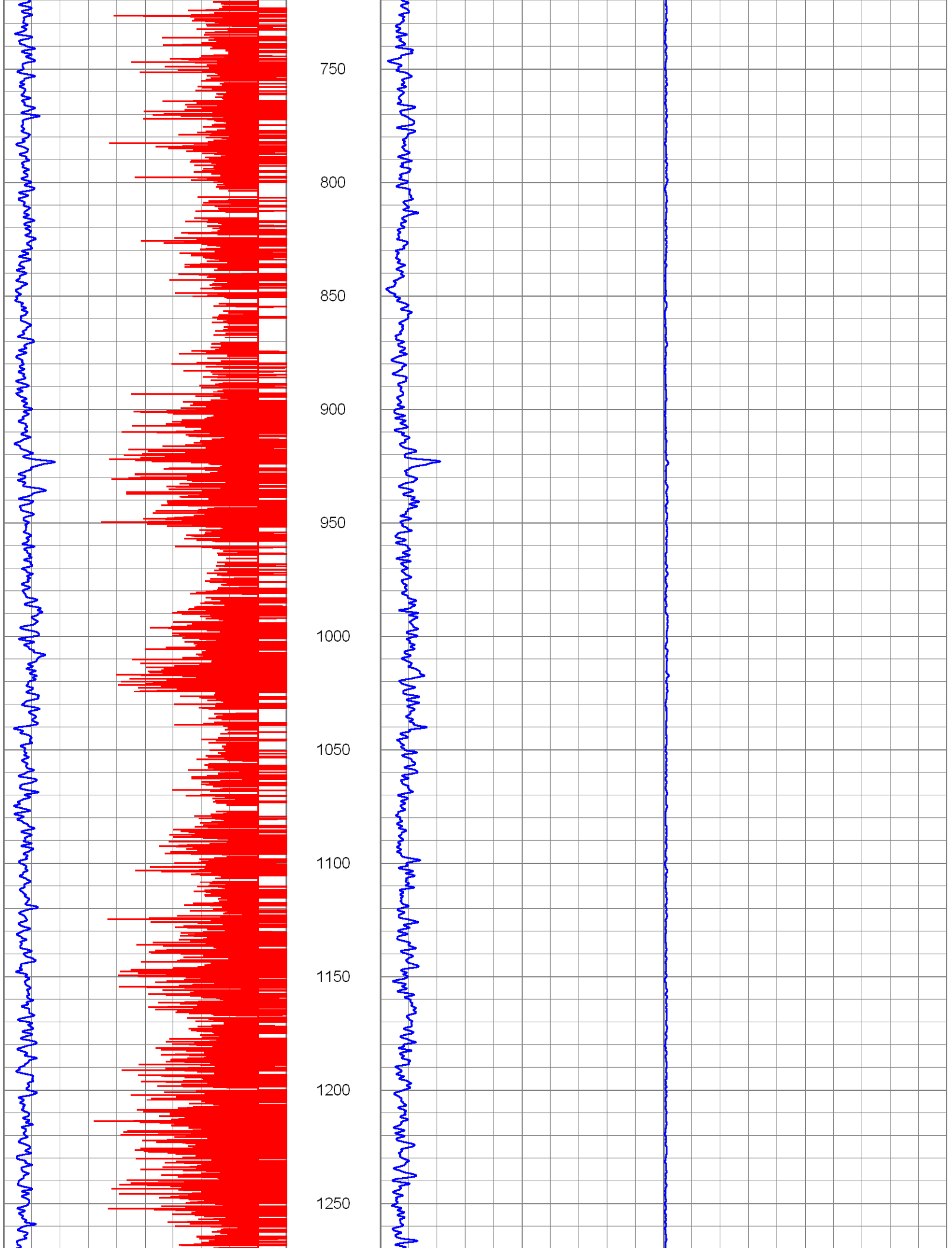


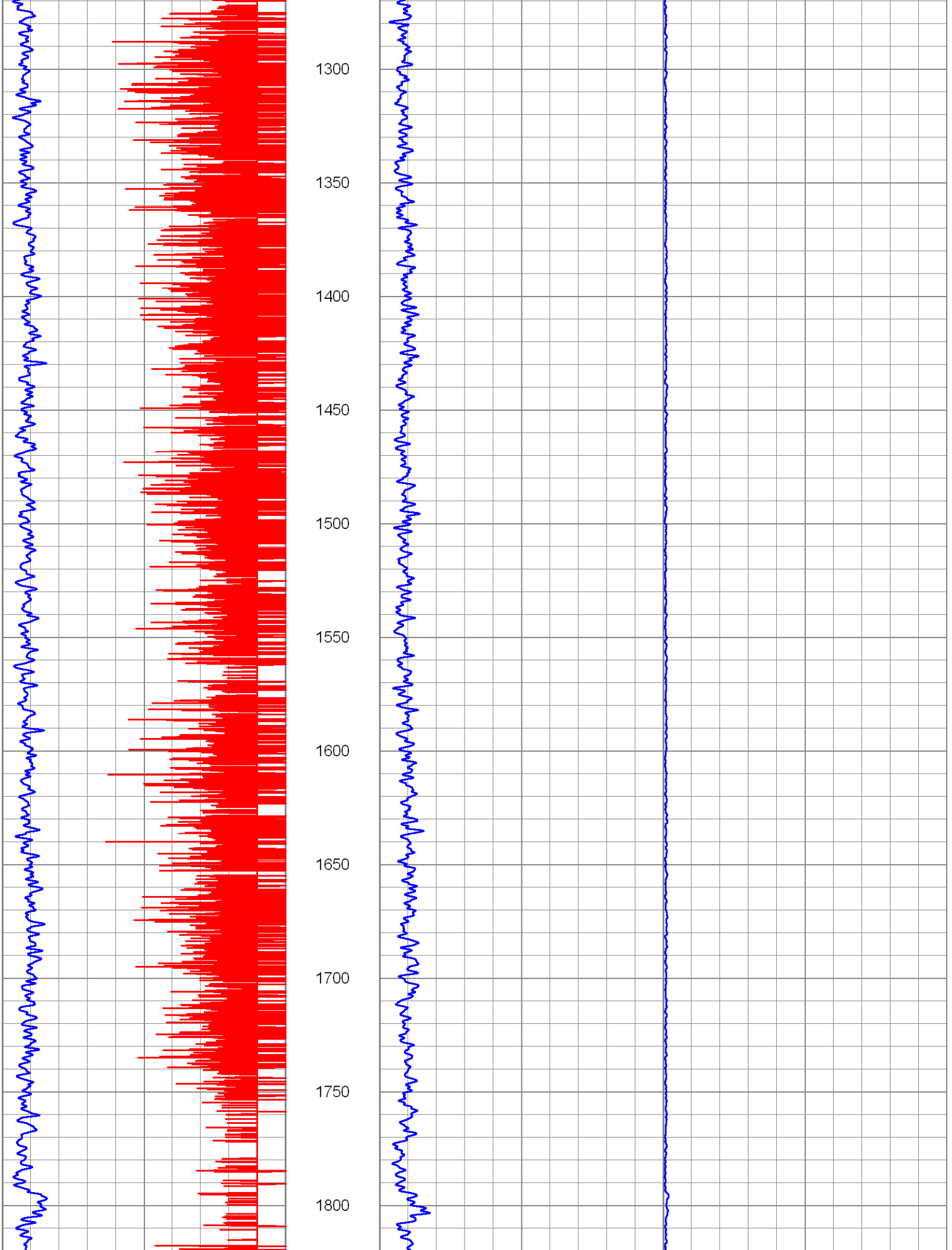
GAMMA-RAY BACKGROUND

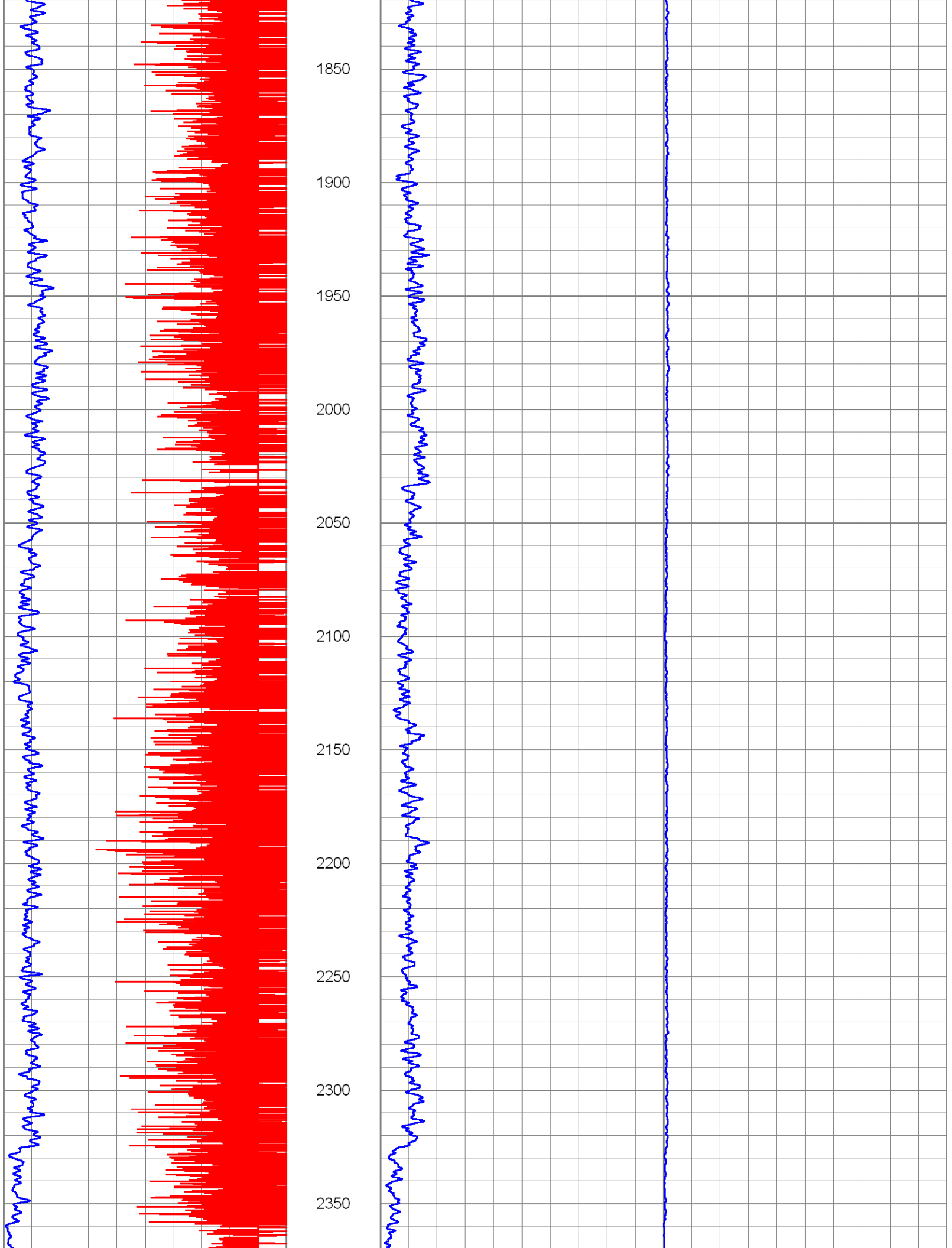
Database File:	sdwwtp-iw9.db
Dataset Pathname:	pass2
Presentation Format:	rts
Dataset Creation:	Tue Jun 25 09:39:02 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:600

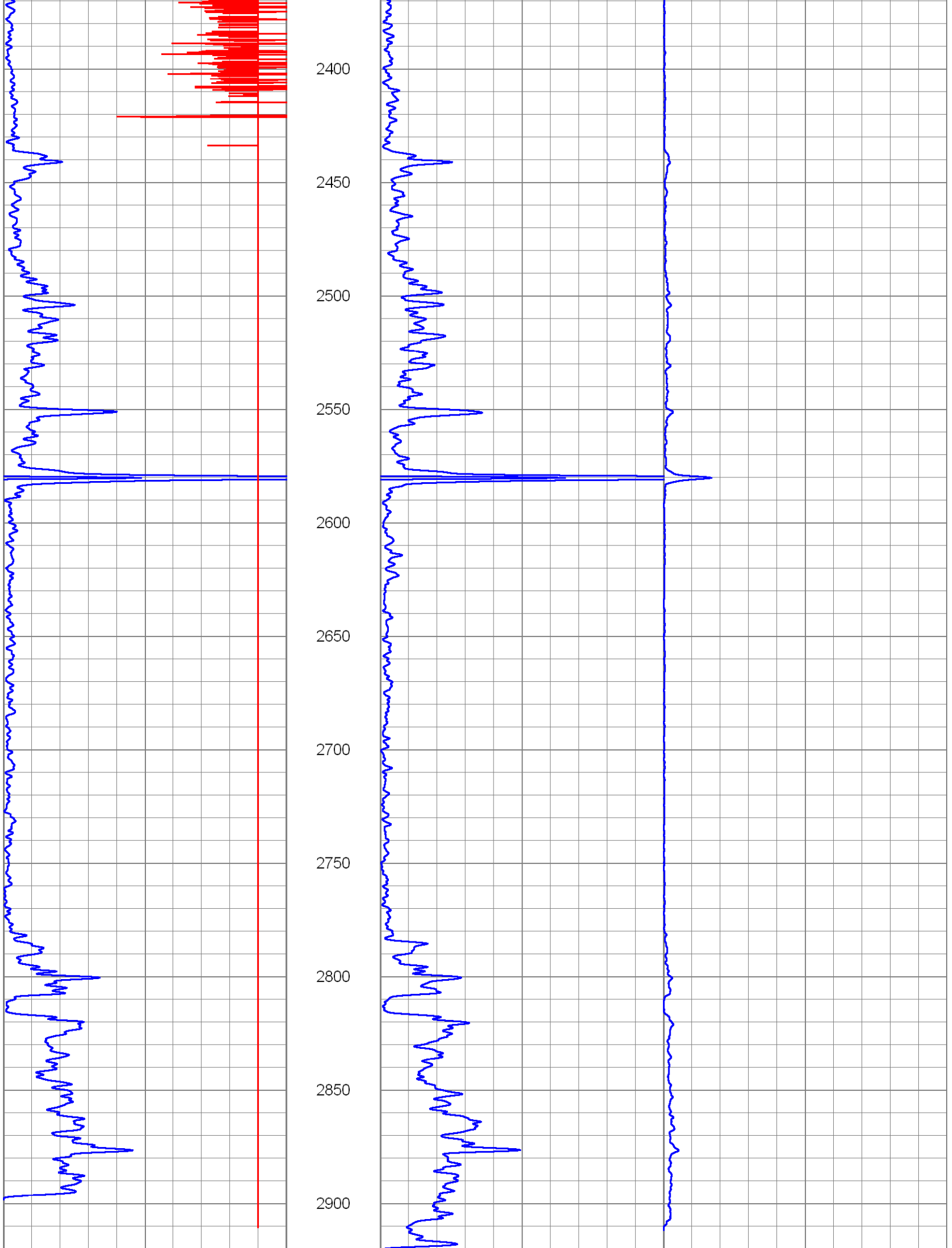



200
250
300
350
400
450
500
550
600
650
700


750
800
850
900
950
1000
1050
1100
1150
1200
1250


1300
1350
1400
1450
1500
1550
1600
1650
1700
1750
1800


1850
1900
1950
2000
2050
2100
2150
2200
2250
2300
2350


2400
2450
2500
2550
2600
2650
2700
2750
2800
2850
2900

0	GRT (GAPI)	100		0	GRB (GAPI)	100	0	GRM (GAPI) 1000
0.9	CCL	-0.1						

Calibration Report

Database File: sdwwtp-iw9.db
Dataset Pathname: pass2
Dataset Creation: Tue Jun 25 09:39:02 2013 by Log SOC 110722

Gamma Ray Calibration Report

Serial Number:	951B	
Tool Model:	RTSB	
Performed:	Tue Jun 25 08:09:32 2013	
Calibrator Value:	90.0	GAPI
Background Reading:	37.1	cps
Calibrator Reading:	198.5	cps
Sensitivity:	0.5578	GAPI/cps

Gamma Ray Calibration Report

Serial Number:	951M	
Tool Model:	RTSM	
Performed:	Tue Jun 25 08:09:44 2013	
Calibrator Value:	90.0	GAPI
Background Reading:	25.3	cps
Calibrator Reading:	188.6	cps
Sensitivity:	0.5511	GAPI/cps

Gamma Ray Calibration Report

Serial Number:	951T	
Tool Model:	RTST	
Performed:	Tue Jun 25 08:09:56 2013	
Calibrator Value:	90.0	GAPI
Background Reading:	22.8	cps
Calibrator Reading:	186.9	cps
Sensitivity:	0.5485	GAPI/cps

Appendix E

Temperature Log

HIGH RESOLUTION TEMPERATURE LOG

Company	MIAMI-DADE WATER & SEWER
Well	IW-#9
Field	S.D.W.W.T.P.
County	MIAMI-DADE
State	FL

Company MIAMI-DADE WATER & SEWER
Well IW-#9
Field S.D.W.W.T.P.
County MIAMI-DADE
State FL

Company MIAMI-DADE WATER & SEWER
Well IW-#9
Field S.D.W.W.T.P.
County MIAMI-DADE State FL

Location: API # :

SEC TWP RGE

Other Services

Elevation

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

Date	25-JUN-2013		
Run Number	2013 MIT		
Depth Driller	2920'		
Depth Logger	2920'		
Bottom Logged Interval	2920'		
Top Log Interval	SURFACE		
Open Hole Size	24"		
Type Fluid	WATER		
Density / Viscosity	NA		
Max. Recorded Temp.	80.9 degF		
Estimated Cement Top	NA		
Time Well Ready	UPON ARRIVAL		
Time Logger on Bottom	0930		
Equipment Number	102		
Location	FT. MYERS		
Recorded By	MOREY	RIVES	
Witnessed By	S. VILLAMIL	M. MACFARLANE	

Borehole Record				Borehole Record			
Run Number	Bit	From	To	Run No	Bit	From	To

Casing Record	Size	Wgt/Ft	Top	Bottom
Surface String				
Prot. String				
Production String	24"	.500" W.T	SURFACE	2420'
Liner				

<< Fold Here >>>

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

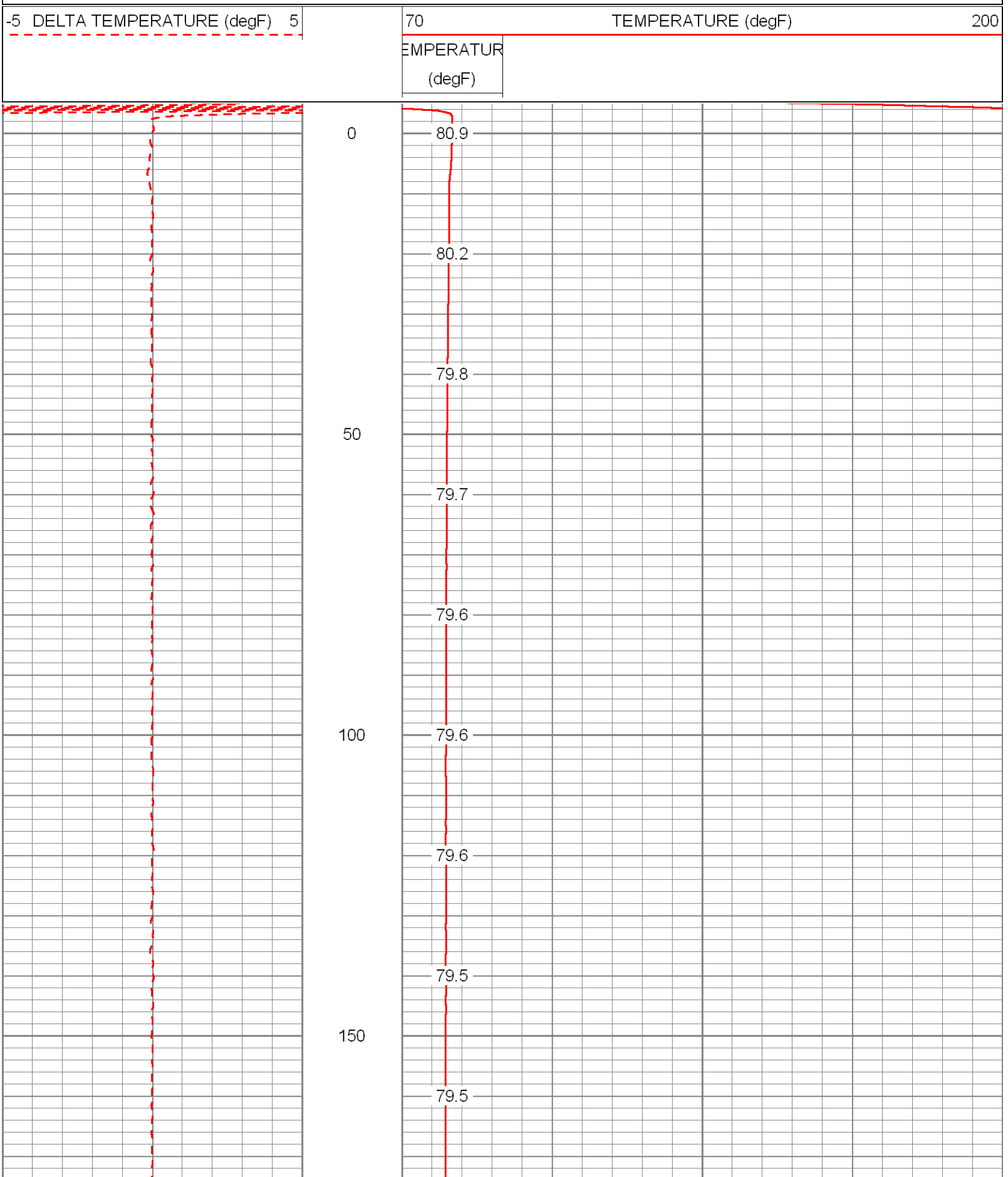
Comments

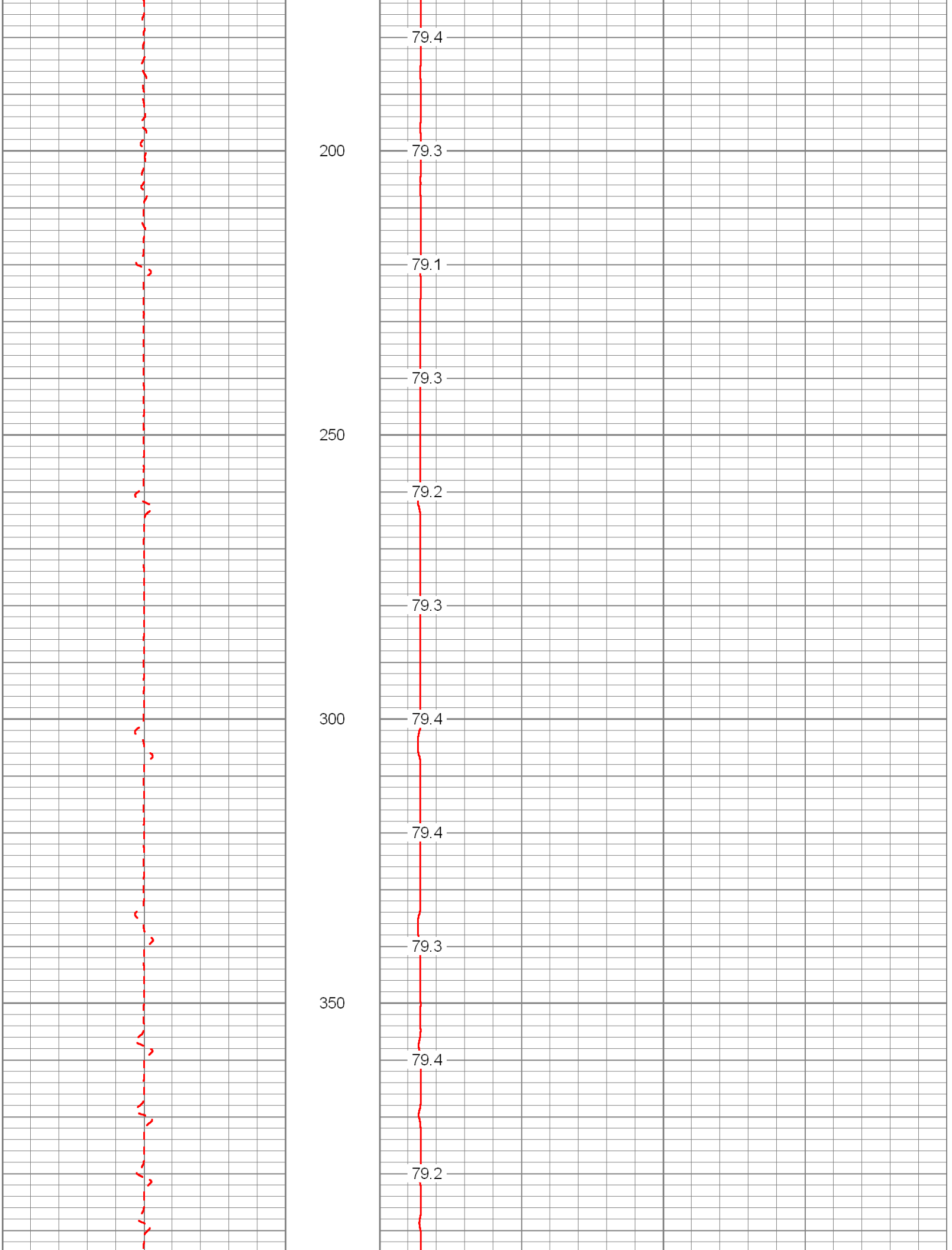
RADIOACTIVE TRACER SURVEY

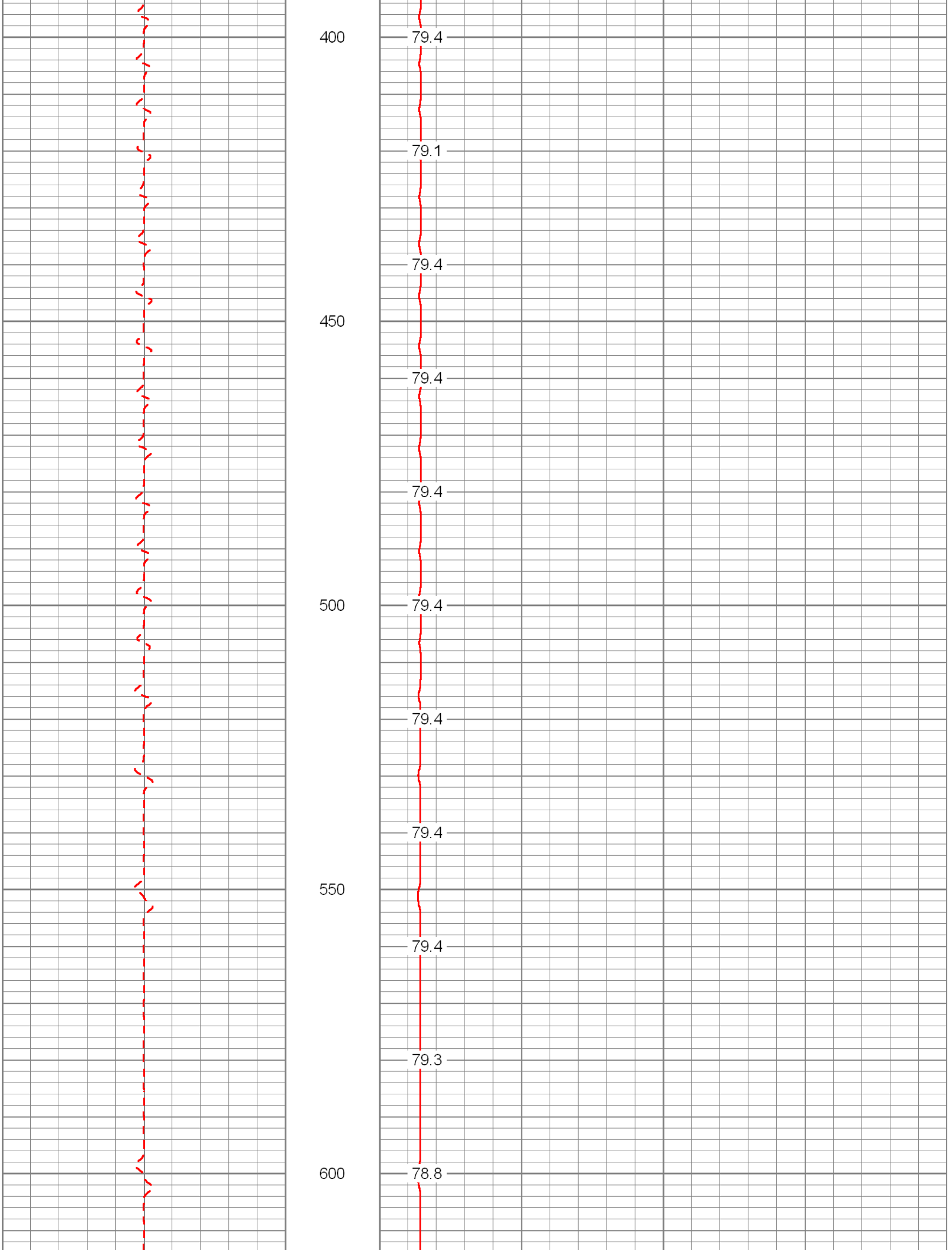
TEMPERATURE

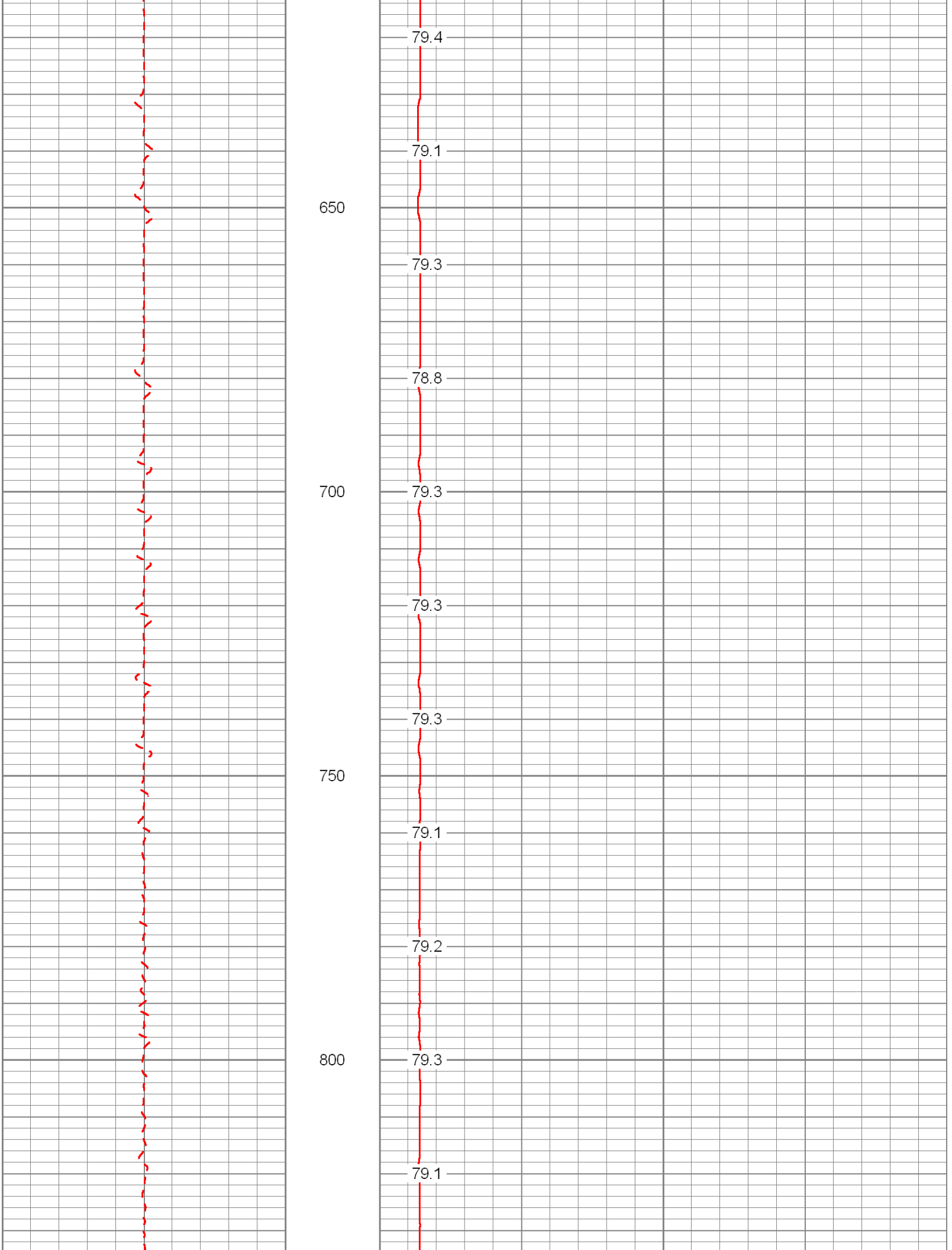
BROTHERS

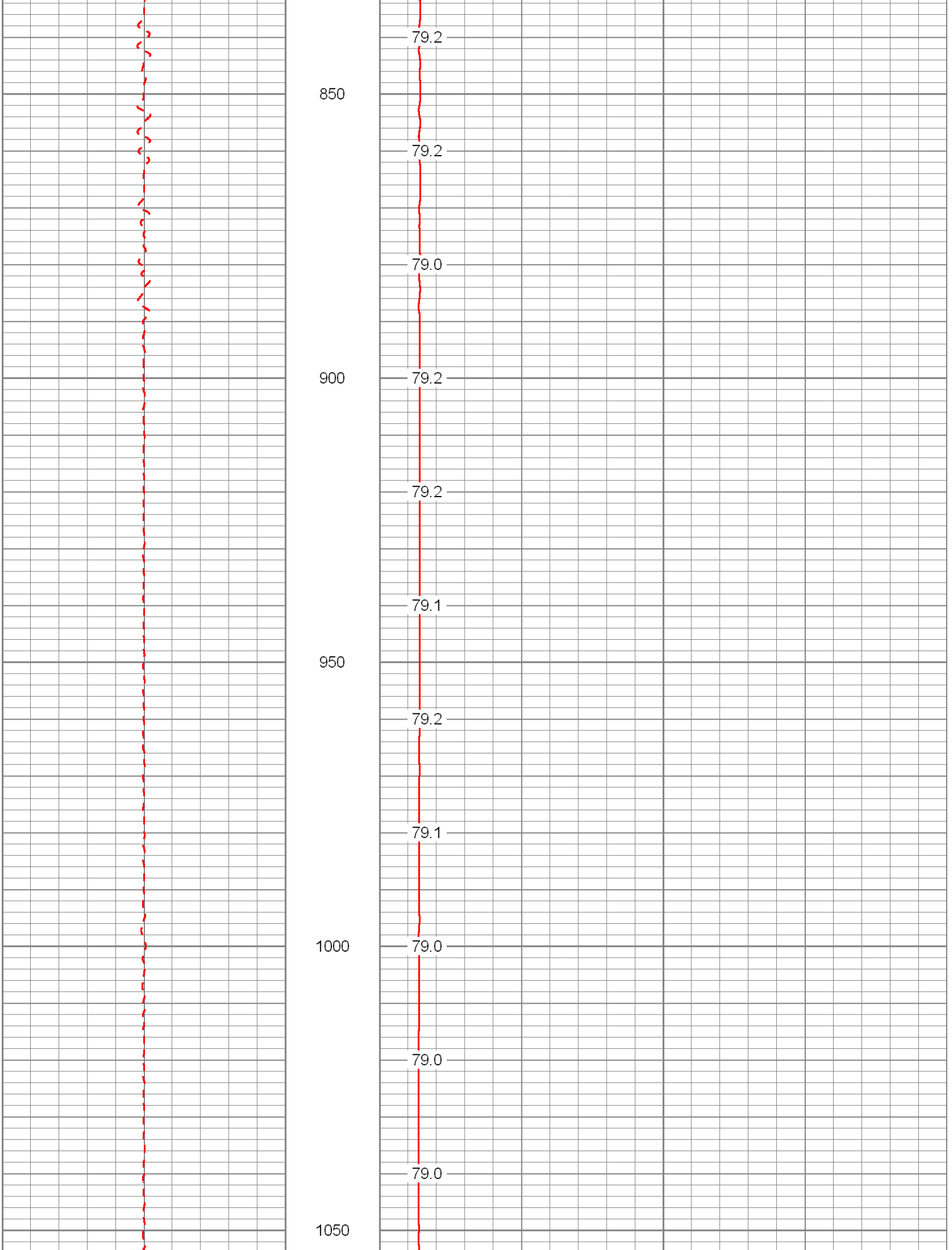
Database File:	sdwwtp-iw9.db
Dataset Pathname:	pass1
Presentation Format:	temp
Dataset Creation:	Tue Jun 25 08:34:03 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:240

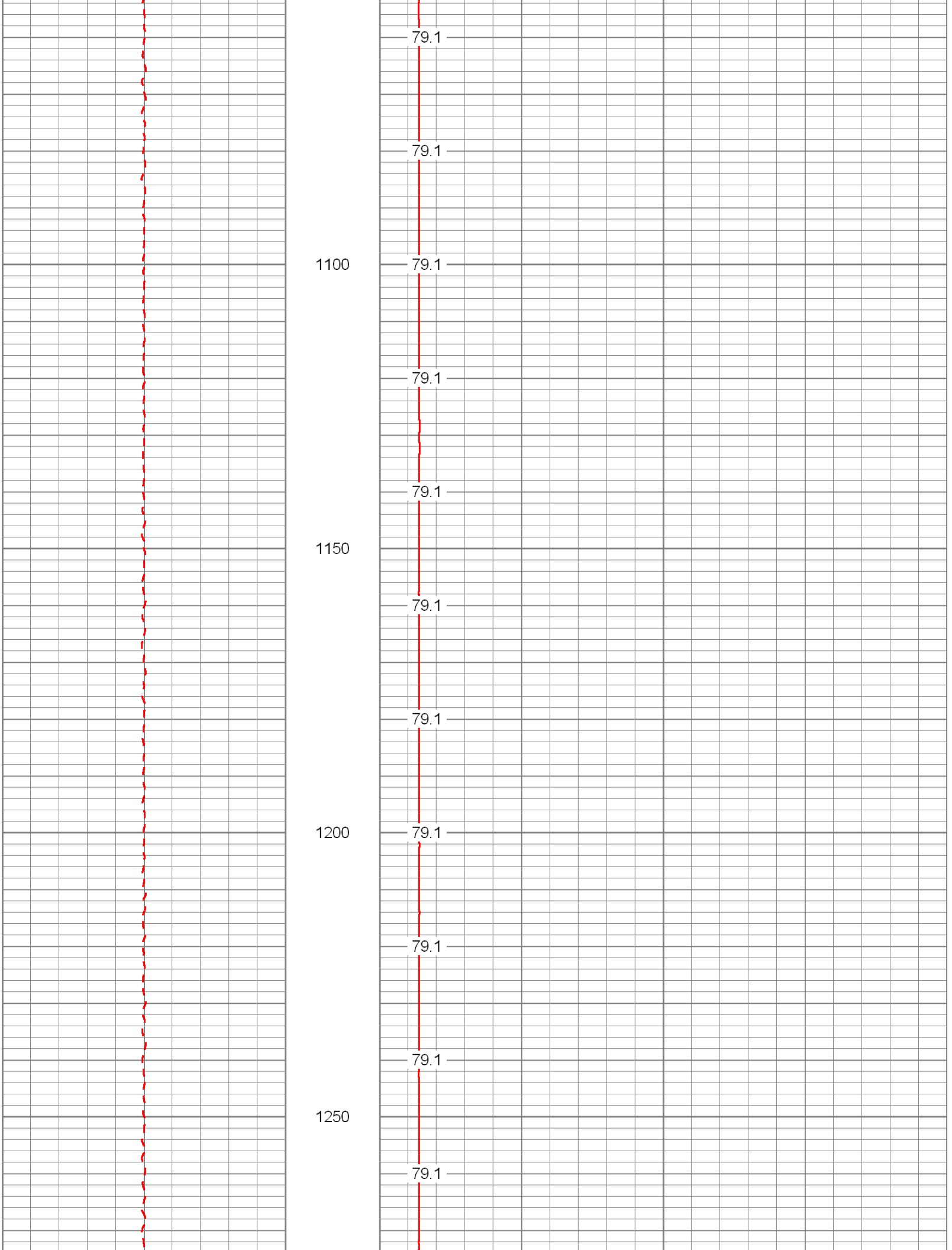


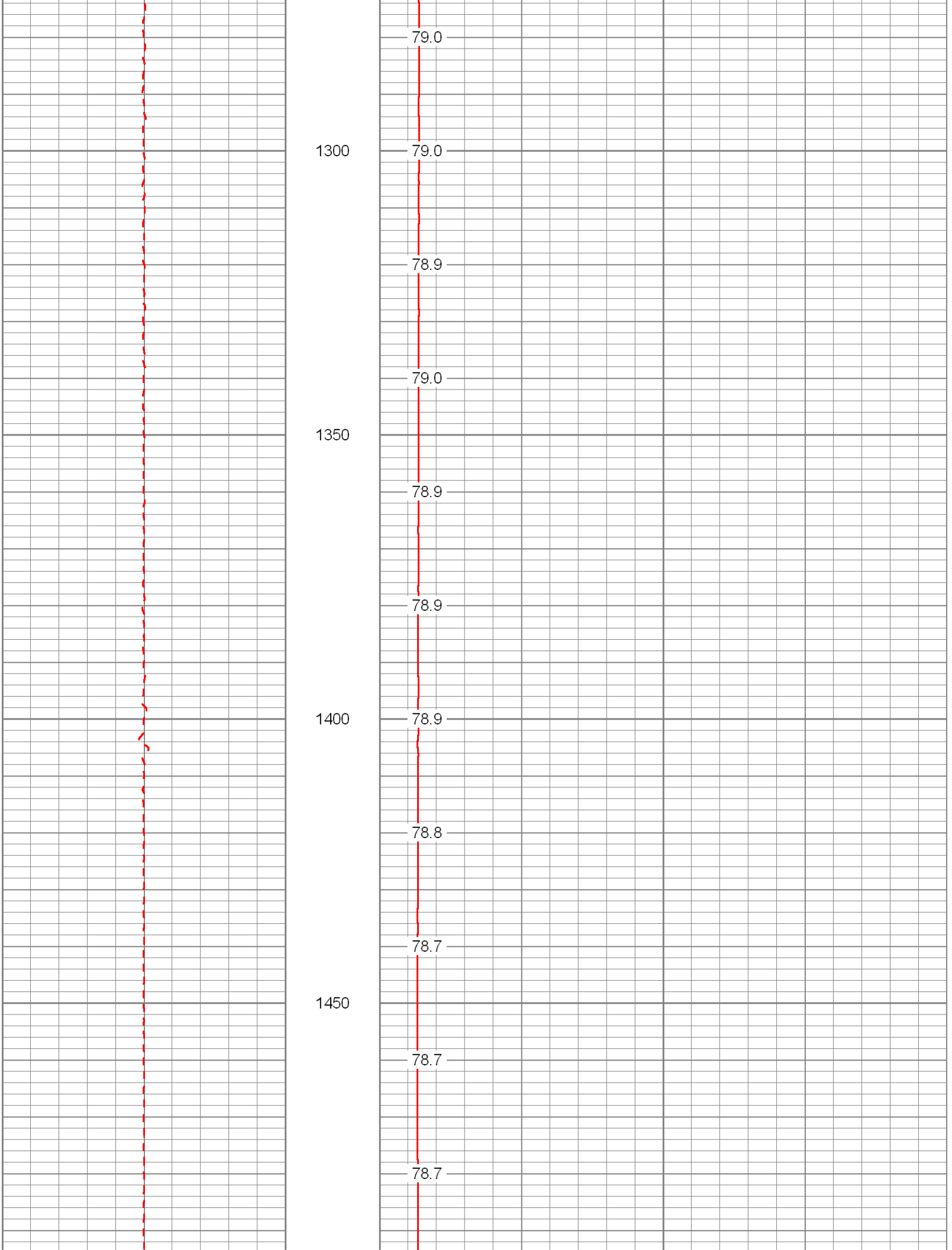

79.4
200
79.3
79.1
79.3
250
79.2
79.3
300
79.4
79.4
79.3
350
79.4
79.2

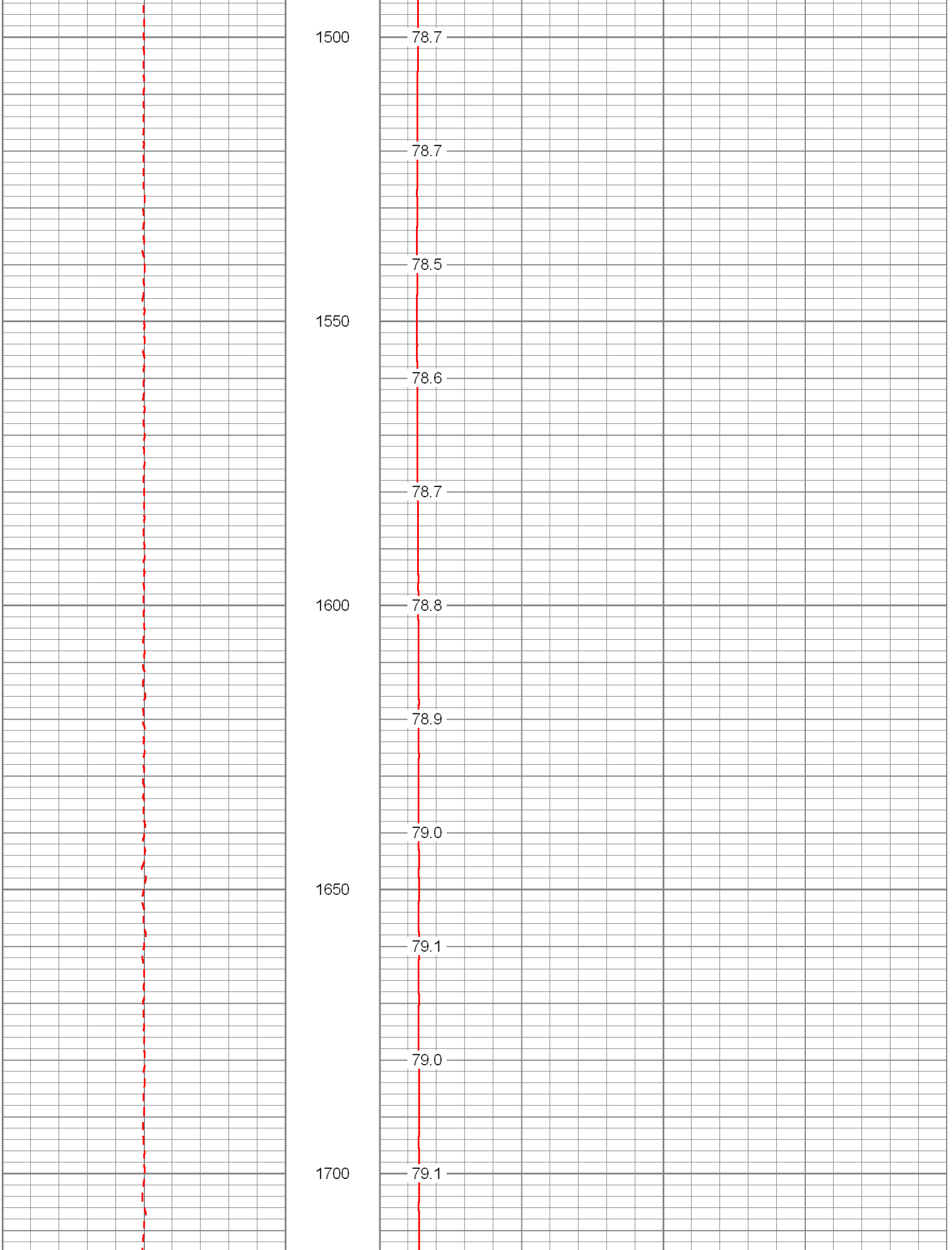

400
79.4
79.1
79.4
450
79.4
79.4
500
79.4
79.4
79.4
550
79.4
79.3
600
78.8


79.4
79.1
650
79.3
78.8
700
79.3
79.3
79.3
750
79.1
79.2
800
79.3
79.1


79.2
850
79.2
79.0
900
79.2
79.2
79.1
950
79.2
79.1
1000
79.0
79.0
79.0
1050


79.1
79.1
1100
79.1
79.1
79.1
1150
79.1
79.1
1200
79.1
79.1
79.1
1250
79.1


79.0
1300
79.0
78.9
79.0
1350
78.9
78.9
1400
78.9
78.8
78.7
1450
78.7
78.7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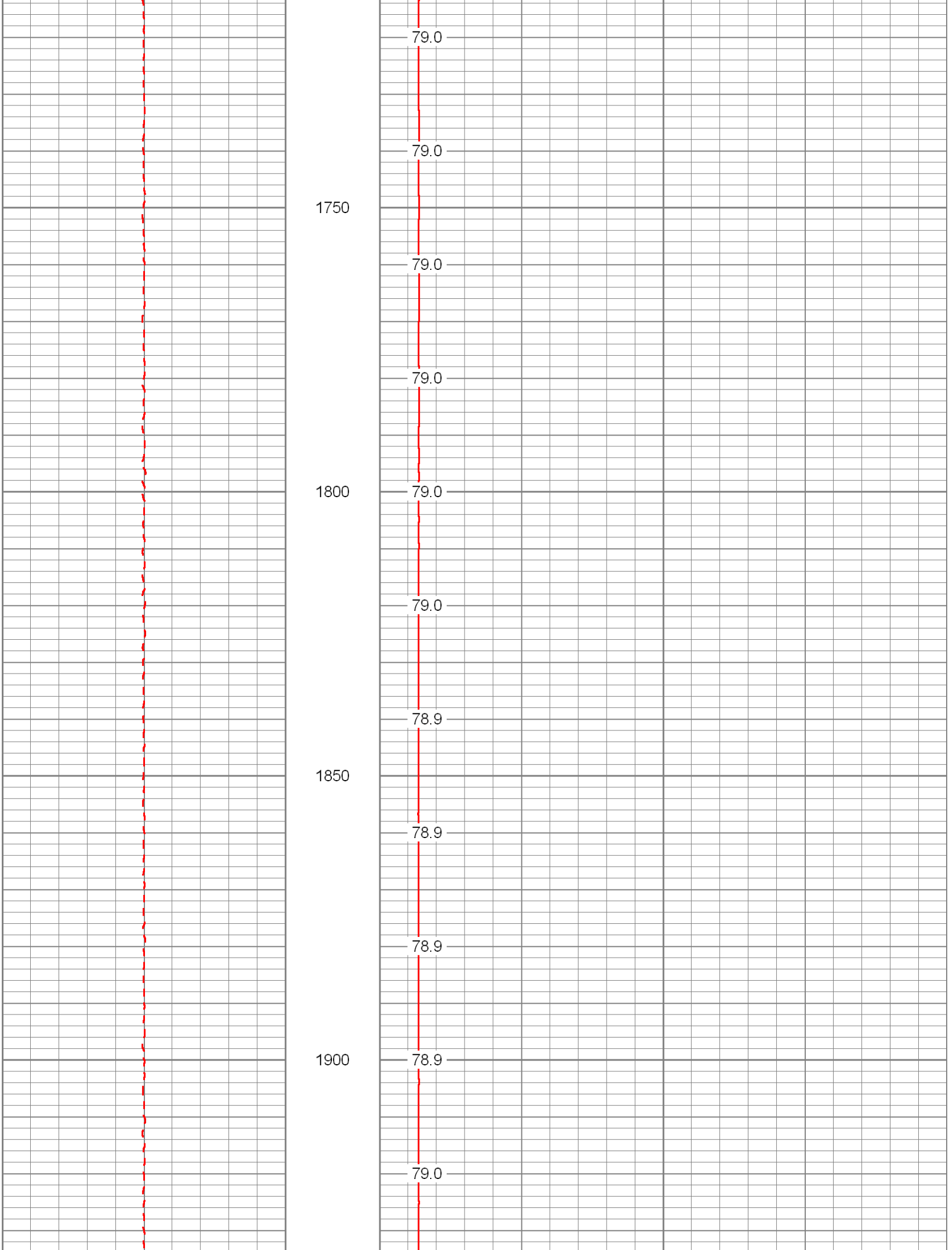
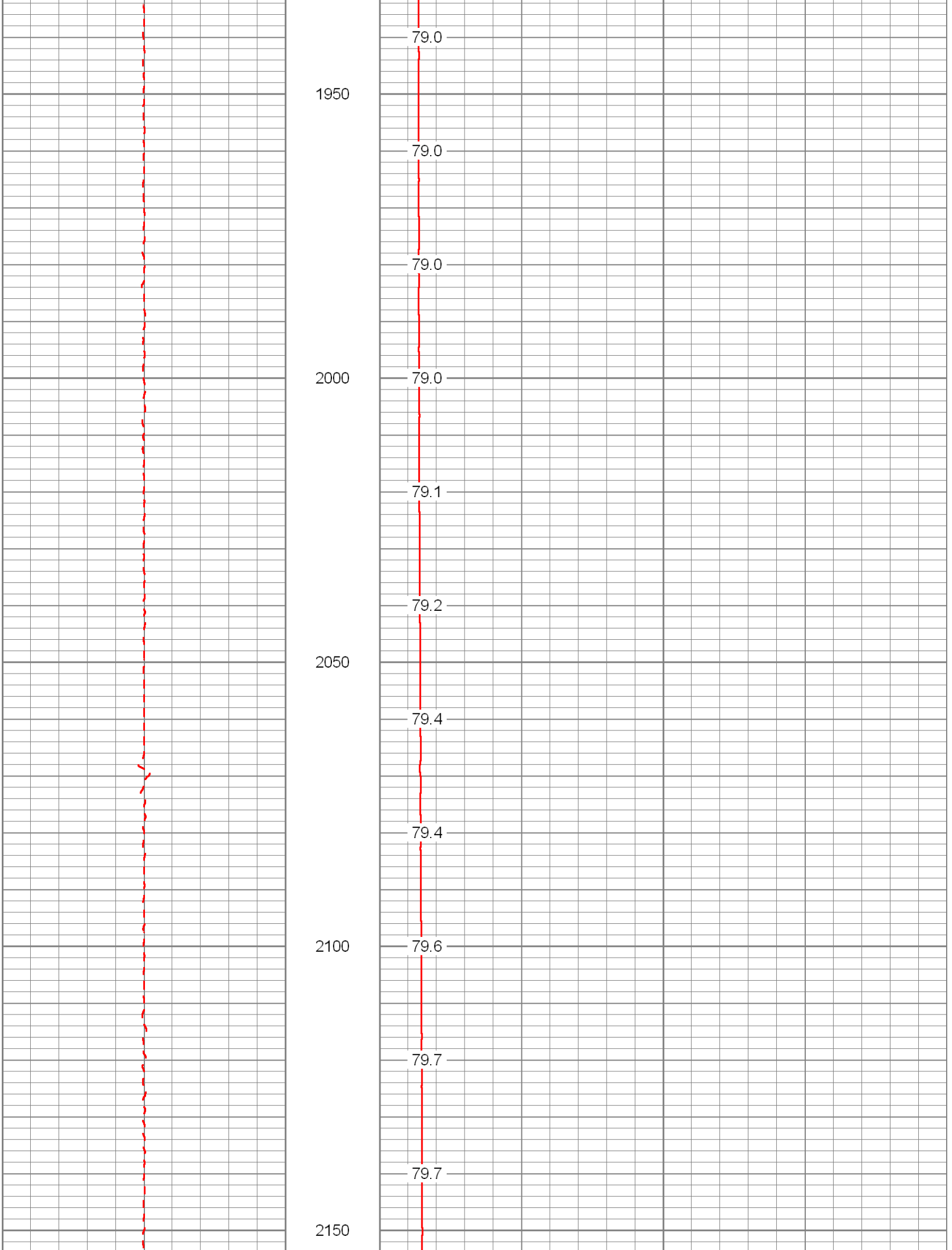
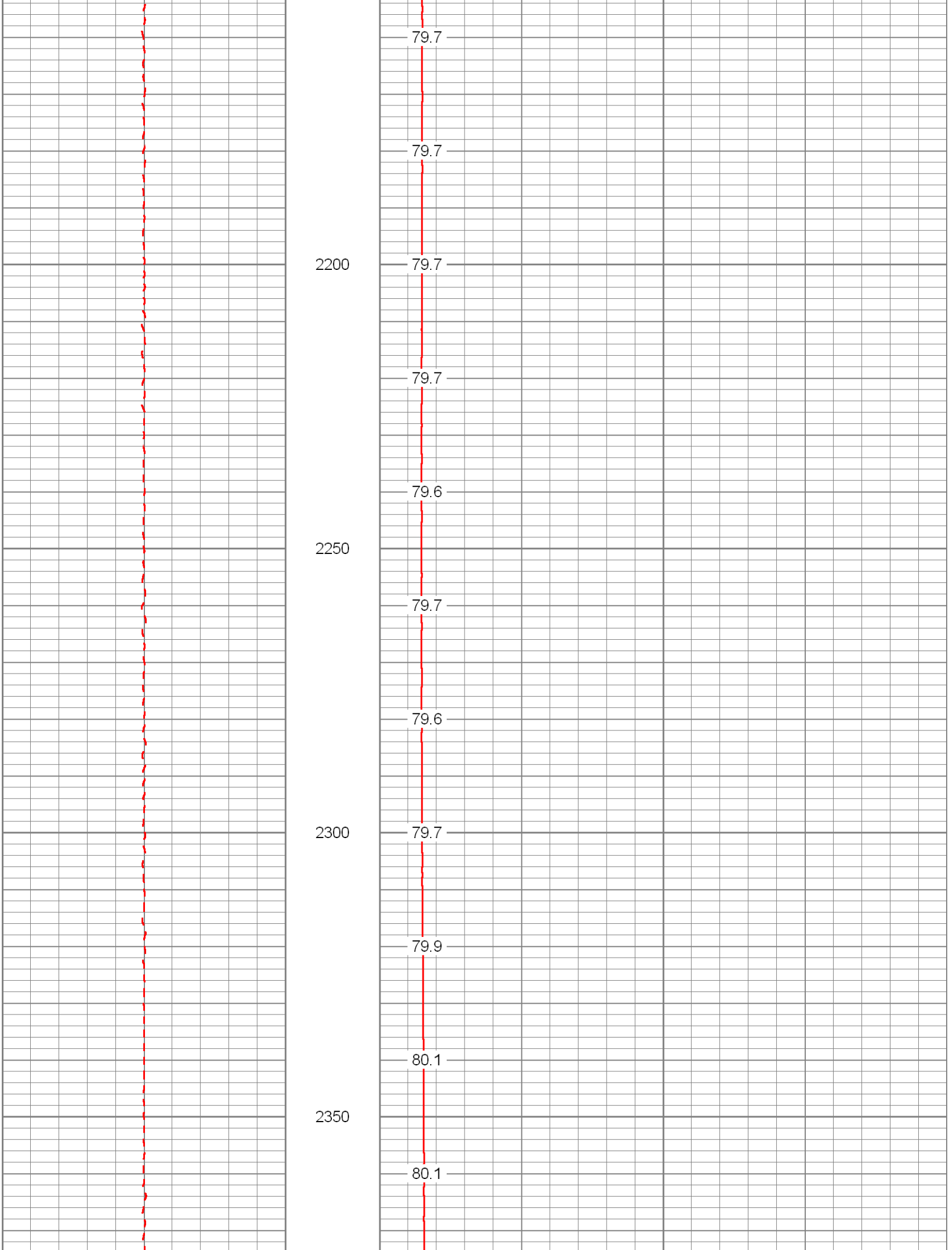
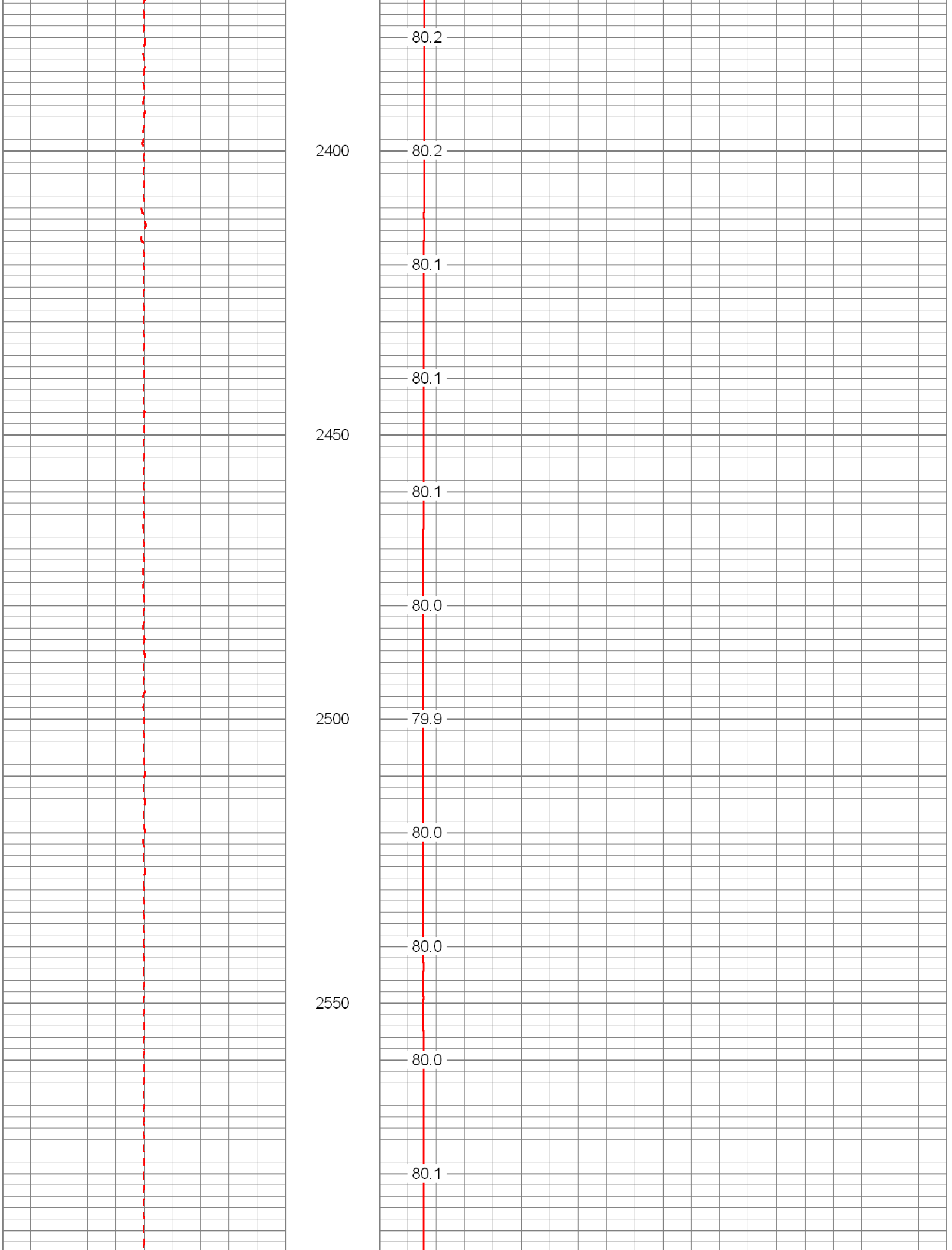
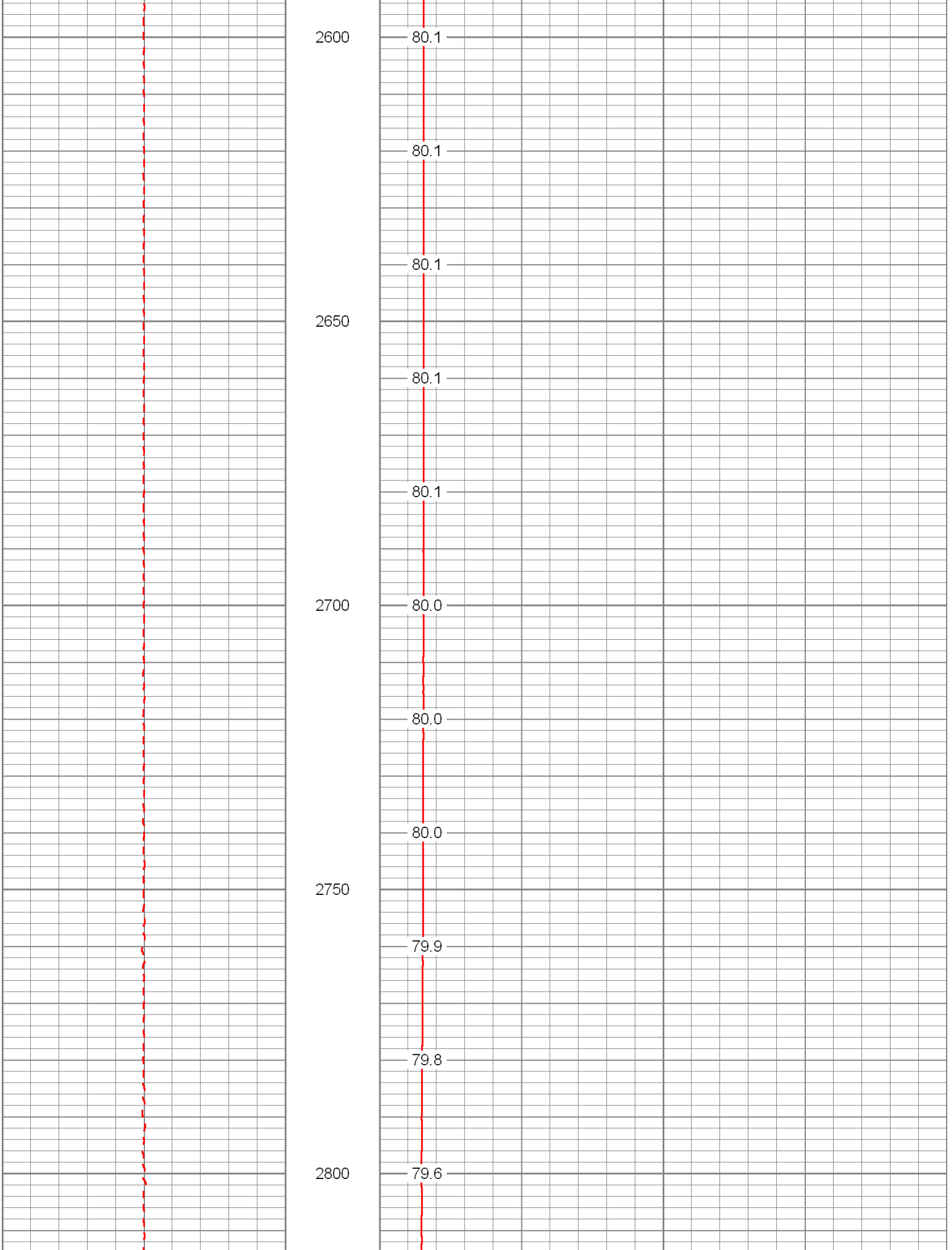
78.7
78.7
78.5
1550
78.6
78.7
1600
78.8
78.9
79.0
1650
79.1
79.0
1700
79.1

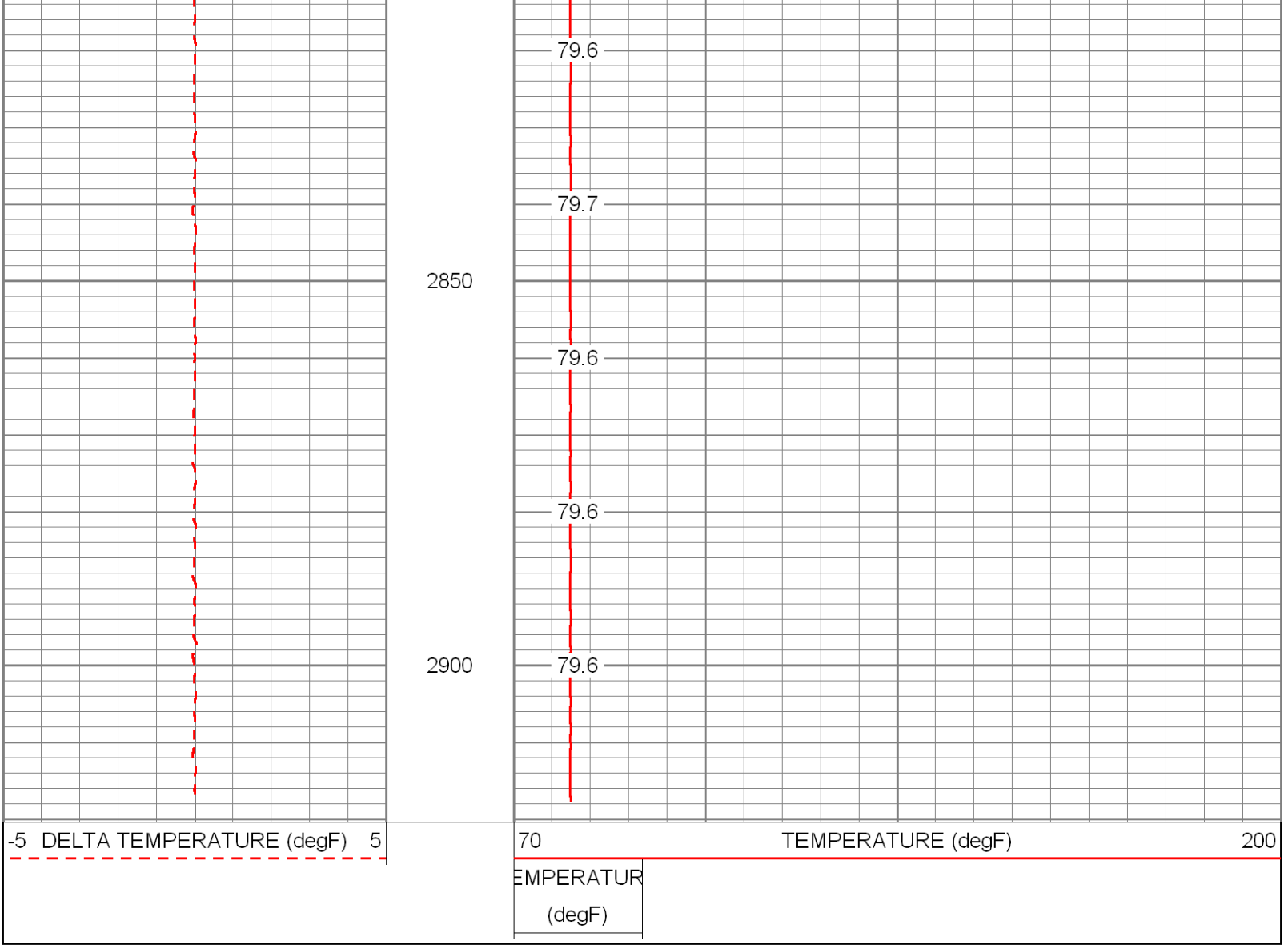

79.0
79.0
1750
79.0
79.0
1800
79.0
79.0
78.9
1850
78.9
78.9
1900
78.9
79.0


79.0
1950
79.0
79.0
2000
79.0
79.1
79.2
2050
79.4
79.4
2100
79.6
79.7
79.7
2150


79.7
79.7
2200
79.7
79.7
79.6
2250
79.7
79.6
2300
79.7
79.9
80.1
2350
80.1


80.2
2400
80.2
80.1
80.1
2450
80.1
80.0
2500
79.9
80.0
80.0
2550
80.0
80.1


2600
80.1
80.1
80.1
2650
80.1
80.1
2700
80.0
80.0
80.0
2750
79.9
79.8
2800
79.6



Calibration Report

Database File: sdwwtp-iw9.db
Dataset Pathname: pass1
Dataset Creation: Tue Jun 25 08:34:03 2013 by Log SOC 110722

Temperature Calibration Report

Serial Number: 951
Tool Model: RTS
Performed: Mon Oct 08 09:35:10 2012

Point #	Reading		Reference	
1	414.44	cps	33.00	degF
2	892.98	cps	85.00	degF
3	1755.38	cps	170.00	degF
4		cps		degF
5		cps		degF
6		cps		degF
7		cps		degF
8		cps		degF
9		cps		degF
10		cps		degF

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)

			TEMP-RTS (951)	25.50	1.69	70.00
TEMP	0.10					

Dataset: sdwwtp-iw9.db: field/well/run1/pass1
Total Length: 25.50 ft
Total Weight: 70.00 lb
O.D. 1.69 in

YOUNGQUIST

GEOPHYSICAL LOGGING DIVISION

Radioactive Tracer Survey Tool Diagram

Date: 6/25/13

Job: SDWWTP-1W9

Internal RTS: ___ External RTS: ✓ YB I Logger: MORLEY

BOTTOM OF CASING: 2420'

-5' IN CASING: 2415'

+13.5' FOR BOTTOM OF TOOL: 2428.5

Eject #1: 1 mCi

Eject #2: 2 mCi

Eject #3: mCi

Eject #4: mCi

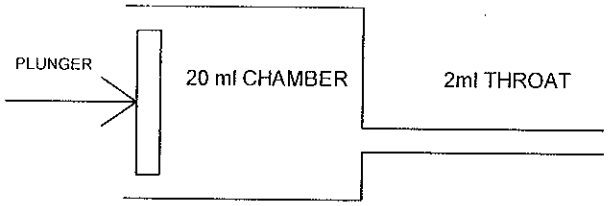
Eject #5: mCi

Eject #6: mCi

Total mCi of I-131 loaded in tool: 5 **1ml =1mCi**

Total volume of Chamber and Throat:22ml

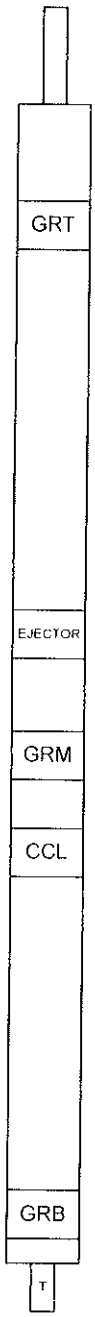
EJECTOR PORT DIAGRAM



Total Eject Cycle Time (22ml): 24 **Sec**

Eject Cycle Time Per ml (Total Time / 22): 1.1 **Sec**

Throat Eject Cycle Time (2*Time Per ml): 2.2 **Sec**



TOP OF TOOL (25ft 2in)

GAMMA RAY TOP DECTOR (23ft 6in)

ALL MEASUREMENTS ARE FROM THE BOTTOM OF THE TOOL.

TOOL DIAMETER IS 1-11/16".

EJECTOR PORT (13ft 6in)

GAMMA RAY MIDDLE DECTOR (10ft 6in)

COLLAR LOCATOR (9ft 6in)

GAMMA RAY BOTTOM DECTOR (1ft 2in)

TEMPERATURE PROBE

TIME PER EJECT

(Total ml of I-131)/(20ml)= mCi per ml in the chamber

(5)/(20)= .25 mCi per ml

mCi = Throat Eject Cycle Time + (ml of Chamber Required)*(Eje ct Cycle Time Per ml)

1 mCi = 2.2 + (4)*(1.1) = 6.6 **seconds**

2 mCi = 2.2 + (8)*(1.1) = 11 **seconds**

3 mCi = + ( )*( ) = **seconds**

4 mCi = + ( )*( ) = **seconds**

Appendix F

Television Survey

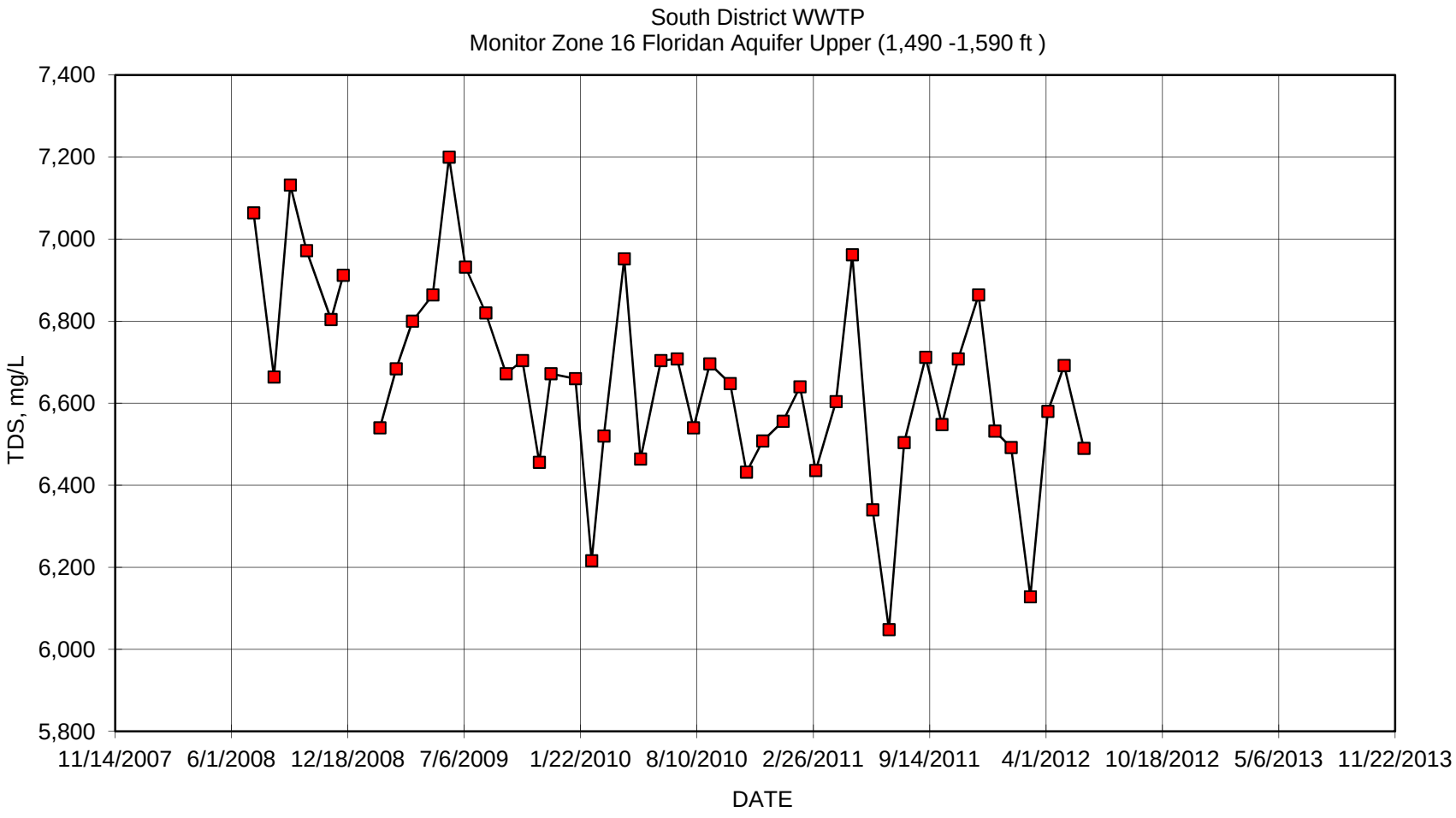
Appendix G

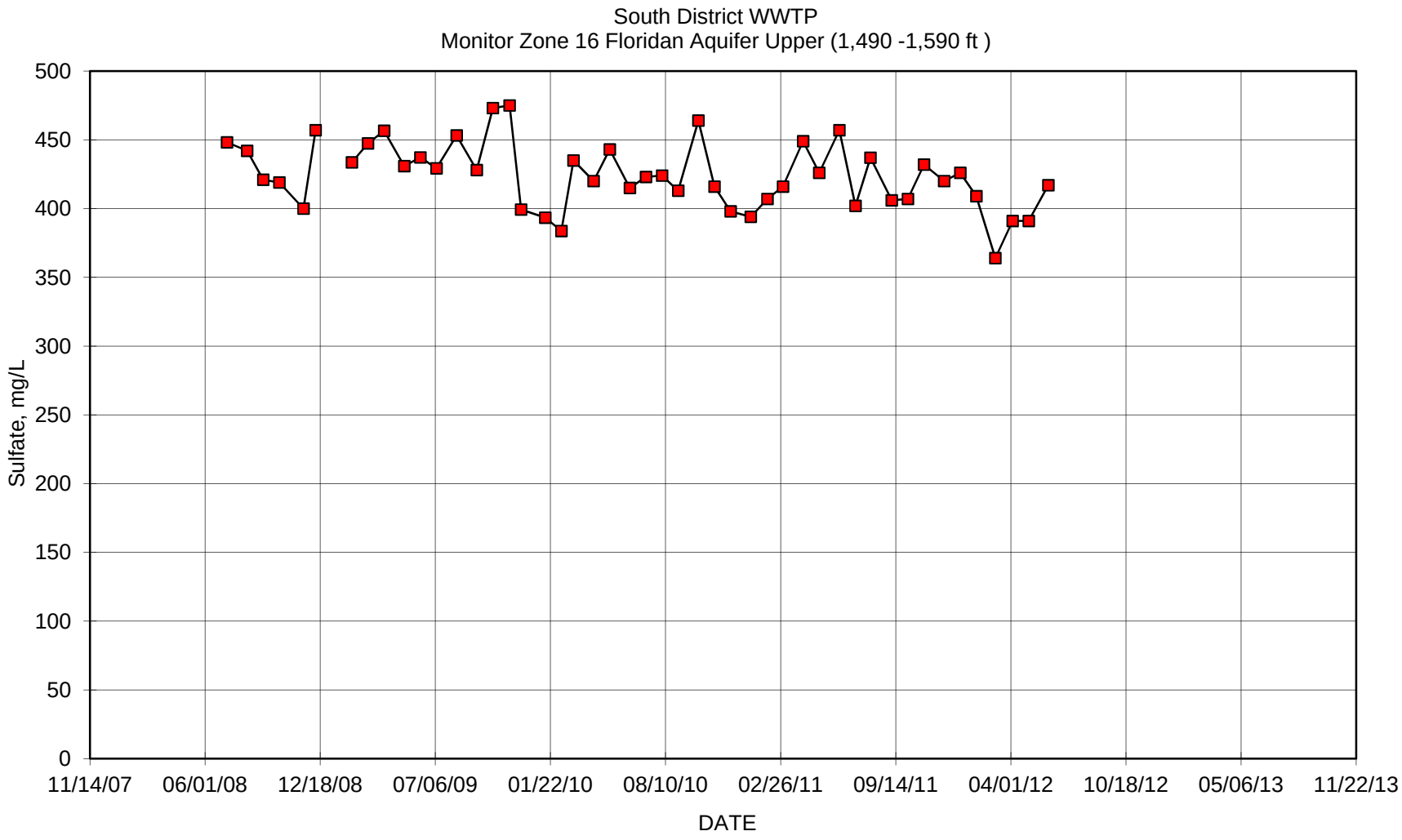
5 year Monitoring Data

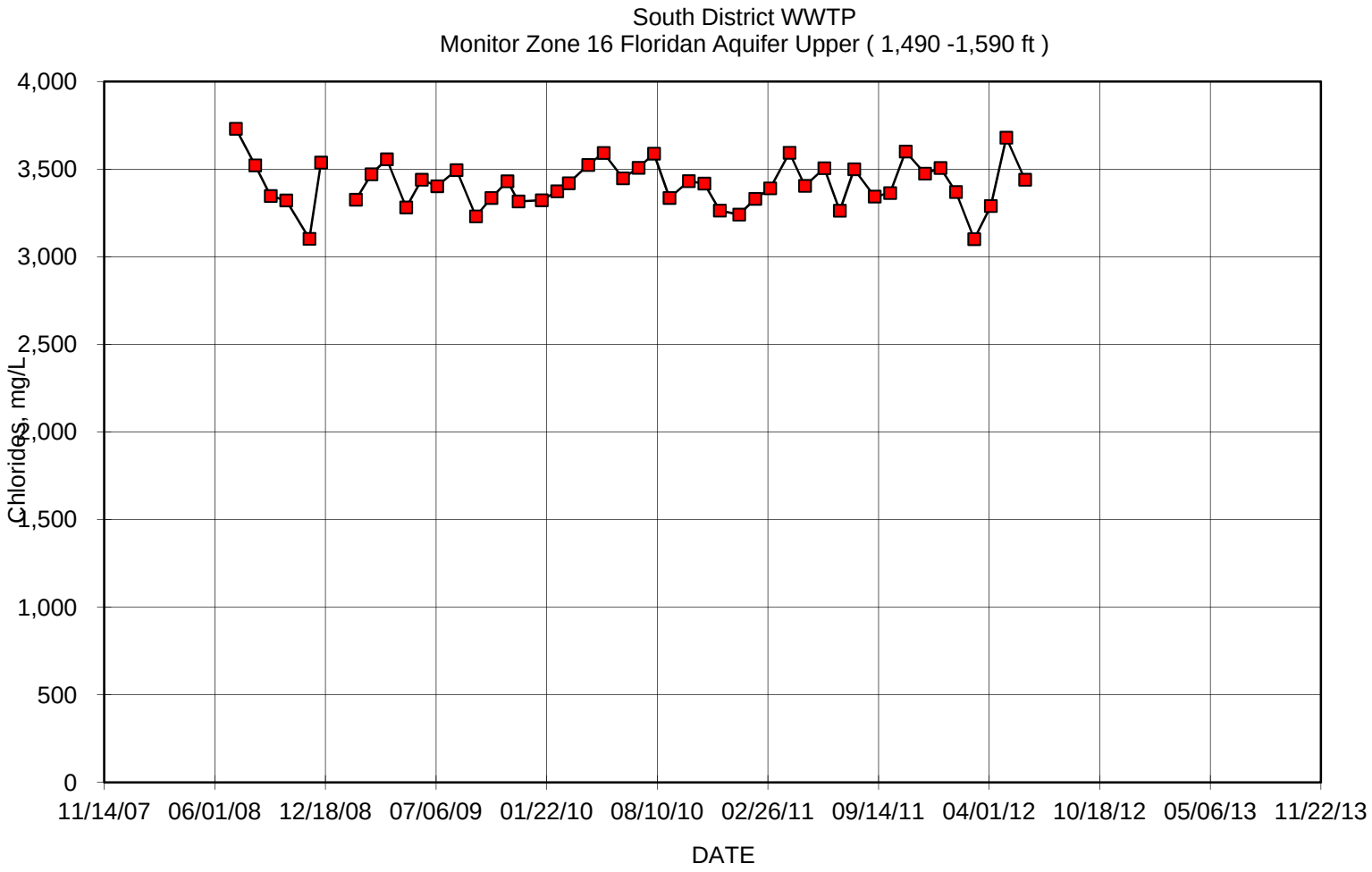
FA-16 Upper

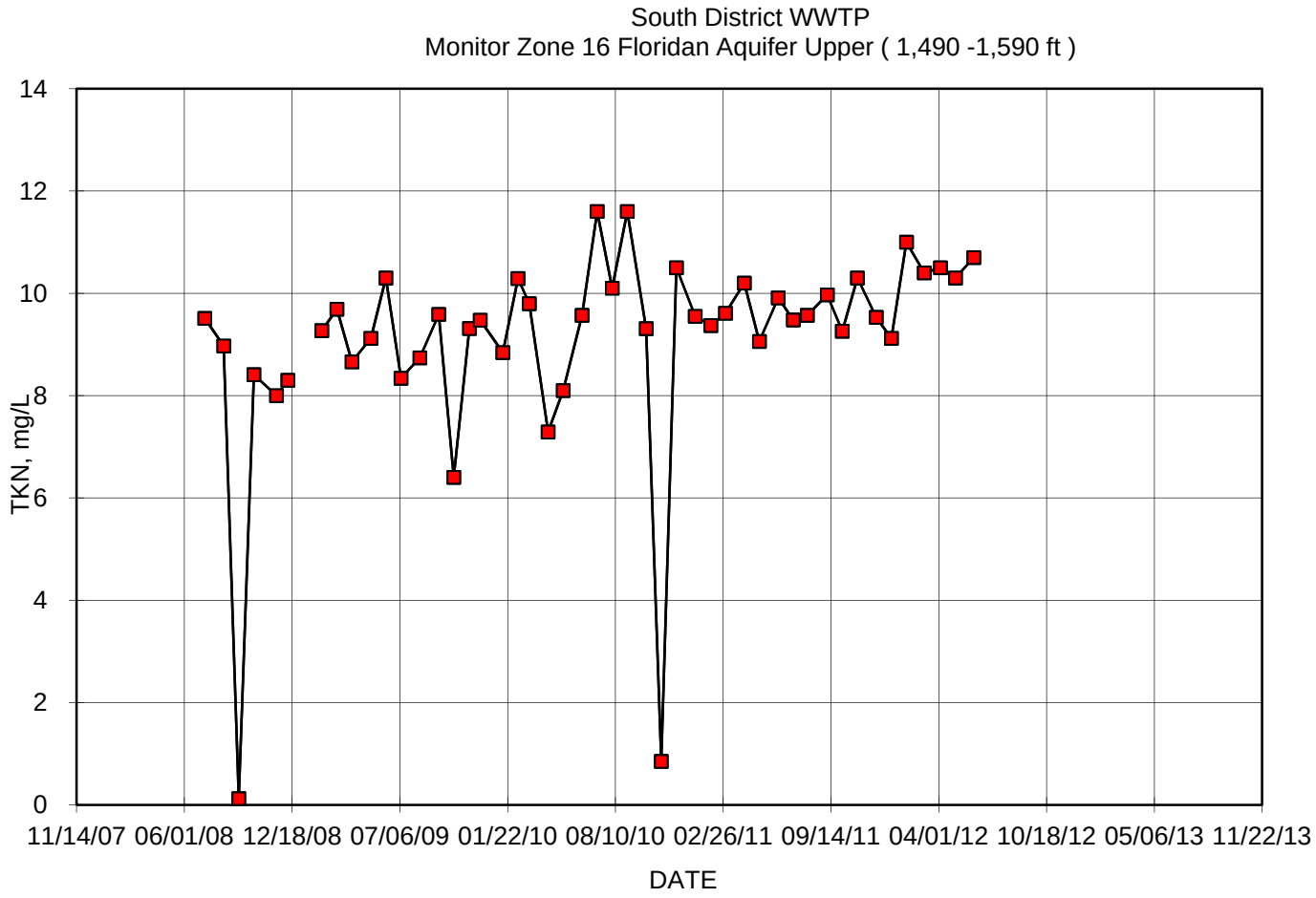
Date	TDS, mg/L	Sulfate, mg/L	Chlorides, mg/L	TKN, mg/L	NH3, mg/L	Conductivity, Micromho/cm	Temp., C	Temp., F	pH	TP, mg/L	TSS mg/L	NO_3 mg/L	NO_2 mg/L	Sodium, mg/L	Gross Alpha, pCi/L	Radium 226, pCi/L	Radium 228, pCi/L
07/09/08	7,064	448	3,731	9.51	6.84	10,950	24	75	7.7	0.00	1.76	0.03	0.00				
08/13/08	6,664	442	3,522	8.97	7.36	10,520	24	75	7.7	0.01	7.40	0.08	0.05				
09/10/08	7,132	421	3,347	0.12	7.94	11,080	25	76	7.6	0.98	8.00	0.08	0.05				
10/08/08	6,972	419	3,322	8.41	7.94	11,270	24	75	7.5	0.03	6.40	0.03	0.00				
11/19/08	6,804	400	3,103	8.00	6.51	10,340	21	71	7.7	0.00	1.76	0.03	0.00				
12/10/08	6,912	457	3,538	8.30	7.07	11,090	23	74	7.5	0.02	7.80	0.03	0.00				
01/14/09																	
02/11/09	6,540	434	3,326	9.27	7.32	11,410	24	74	7.8	0.07	10.90	0.00	0.01				
03/11/09	6,684	447	3,471	9.69	8.75	10,980	23	73	7.3	0.40	5.80	0.00	0.00				
04/08/09	6,800	457	3,557	8.66	9.52	11,230	22	72	7.5	0.04	6.20	0.00	0.00				
05/13/09	6,864	431	3,282	9.12	8.73	11,100	24	76	7.6	0.00	8.80	0.02	0.00				
06/10/09	7,200	437	3,440	10.30	8.96	11,050	24	75	7.6	0.18	7.00	0.00	0.00				
07/08/09	6,932	429	3,403	8.34	7.81	11,120	25	76	7.5	0.03	9.00	0.00	0.00				
08/12/09	6,820	453	3,495	8.74	8.92	11,320	23	74	7.5	0.01	6.20	0.00	0.00				
09/16/09	6,672	428	3,231	9.59	7.75	10,840			7.5	0.01		0.05	0.01	1790	22.5	5.8	0.8
10/14/09	6,704	473	3,336	6.40	8.28	10,270			7.6			0.00	0.00	1730	9.3	5.3	0.8
11/12/09	6,456	475	3,431	9.31	8.62	10,020			7.7			0.00	0.00	1750	14.7	5.4	0.8
12/02/09	6,672	399	3,316	9.48	8.54	10,940	24	75	7.5	0.02	8.00	0.00	0.00	1660	8.6	6.2	0.8
01/13/10	6,660	393	3,323	8.84	8.31	10,740	20	68	7.5	0.02	5.80	0.00	0.00	1470	14.7	6	0.9
02/10/10	6,216	384	3,374	10.29	9.36	10,440	23	73	8.1	0.02	2.40	0.00	0.00	1630	13	5.9	0.8
03/03/10	6,520	435	3,420	9.80	8.57	11,000	22	71	7.5	0.02	6.60	0.00	0.00	1700	10.6	6.4	0.8
04/07/10	6,952	420	3,524	7.29	8.07	10,970	23	74	7.4	0.01	8.00	0.00	0.00	1820	18.8	6.8	0.9
05/05/10	6,464	443	3,593	8.10	8.28	10,710	24	74	7.6	0.01	1.80	0.01	0.00	1830	20.9	6.2	0.8
06/09/10	6,704	415	3,448	9.57	8.02	11,030	26	78	7.7	0.05	6.00	0.01	0.01	1620	17.1	5.9	1.0
07/07/10	6,708	423	3,508	11.60	8.62	10,860	24	75	7.6	0.01	1.40	0.00	0.00	1860	16.5	5.7	0.7
08/04/10	6,540	424	3,589	10.10	10.10	10,220	24	75	7.7	0.11	5.20	0.01	0.00	1740	16.6	6.3	0.8
09/01/10	6,696	413	3,336	11.60	9.48	10,940	24	75	7.7	0.02	14.50	0.01	0.00	1750	22.9	5.7	0.8
10/06/10	6,648	464	3,432	9.31	9.94	10,850	23	73	7.5	0.02	1.70	0.00	0.00	1760	7.6	1.4	0.9
11/03/10	6,432	416	3,418	0.85	9.52	10,520	23	73	7.6	0.02	4.40	0.00	0.85	4830	17.7	6.3	0.9
12/01/10	6,508	398	3,264	10.50	10.10	10,770	23	73	7.8	0.02	9.20	0.00	0.01	1820	17.7	7.4	0.6
01/05/11	6,556	394	3,241	9.55	9.59	10,410	23	74	7.7	0.02	3.30	0.00	0.00	1840	17.4	9.8	0.9
02/03/11	6,640	407	3,331	9.37	8.94	10,150	22	72	7.5	0.10	2.40	0.00	0.01	1730	21.3	7.8	0.7
03/02/11	6,436	416	3,391	9.61	9.03	10,810	22	72	7.6	0.02	9.80	0.00	0.00	1700	23.7	6.8	0.8

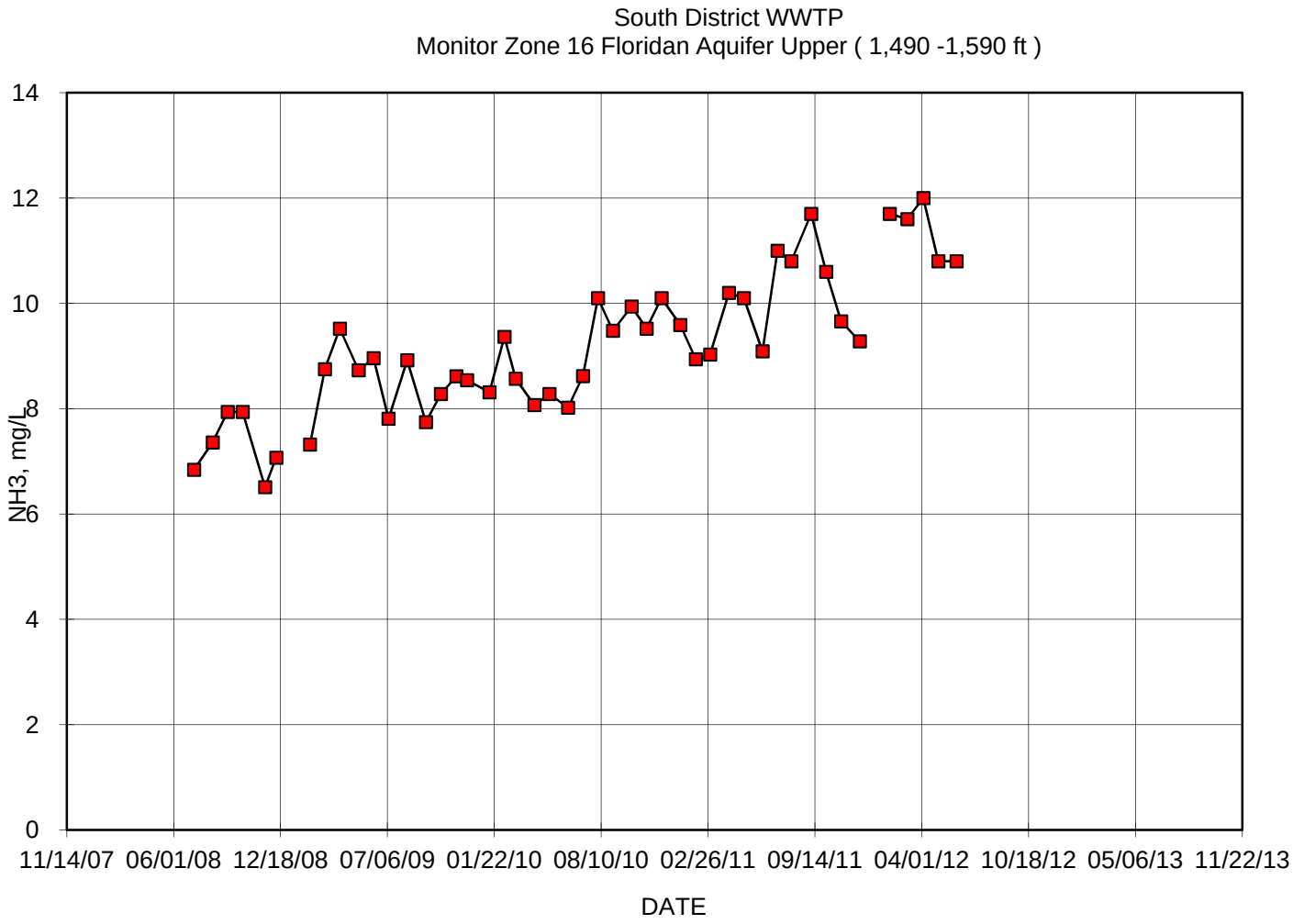
04/06/11	6,604	449	3,594	10.20	10.20	10,370	23	73	7.8	0.02	5.00	0.00	0.00	1660	17.8	6.7	0.7
05/04/11	6,962	426	3,405	9.06	10.10	11,170	23	73	7.8	0.02	3.40	0.00	0.00	1740	10.1	6.6	0.8
06/08/11	6,340	457	3,506	9.91	9.09	10,720	23	74	7.7	0.05	2.00	0.00	0.00	1820	19.7	4.5	0.7
07/06/11	6,048	402	3,263	9.48	11.00	10,460	24	75	7.6	0.02	2.50	0.00	0.00	1670	14	5.5	0.8
08/01/11	6,504	437	3,500	9.57	10.80	10,320	25	76	7.5	0.03	9.50	0.00	0.00	1780	28.1	6.7	0.8
09/07/11	6,712	406	3,344	9.97	11.70	10,310	24	75	7.8	0.06	7.20	0.00	0.00	1760	13.3	7.1	0.8
10/05/11	6,548	407	3,364	9.26	10.60	10,010	23	73	7.7	0.04	7.80	0.00	0.00	1780	24.1	6.5	1.0
11/02/11	6,708	432	3,601	10.30	9.66	9,745	23	74	7.9	0.02	4.30	0.00	0.00	1990	19.3	5.2	0.9
12/07/11	6,864	420	3,475	9.53	9.28	10,534	23	73	6.1	0.03	3.20	0.00	0.00	1900	11.5	6.0	0.9
01/04/12	6,532	426	3,507	9.12		9,452	21	69	7.7	0.02	6.30	0.00	0.00	1900	14.9	5.5	0.7
02/01/12	6,492	409	3,370	11.00	11.70	8,803	23	73	7.6	0.02	2.60	0.00	0.00	1870	18.1	5.6	0.8
03/05/12	6,128	364	3,101	10.40	11.60	9,691	23	74	7.7	0.00	6.00	0.00	0.00	1820	25.4	6.0	0.8
04/04/12	6,580	391	3,290	10.50	12.00	10,094	23	73	7.5	0.03	2.90	0.50	0.50	1750	18	6.7	0.8
05/02/12	6,692	391	3,680	10.30	10.80	9,634	24	74	7.6	0.01	7.50	0.00	0.00	1990	11.9	1.9	1.0
06/05/12	6,490	417	3,440	10.70	10.80	10,690	23	74	8.1	0.02	4.50	0.01	0.00	1760	17	5.6	0.8
07/11/12																	
08/01/12																	
09/05/12																	
10/03/12																	
11/07/12																	
12/05/12																	
01/09/13																	
02/06/13																	
03/04/13																	

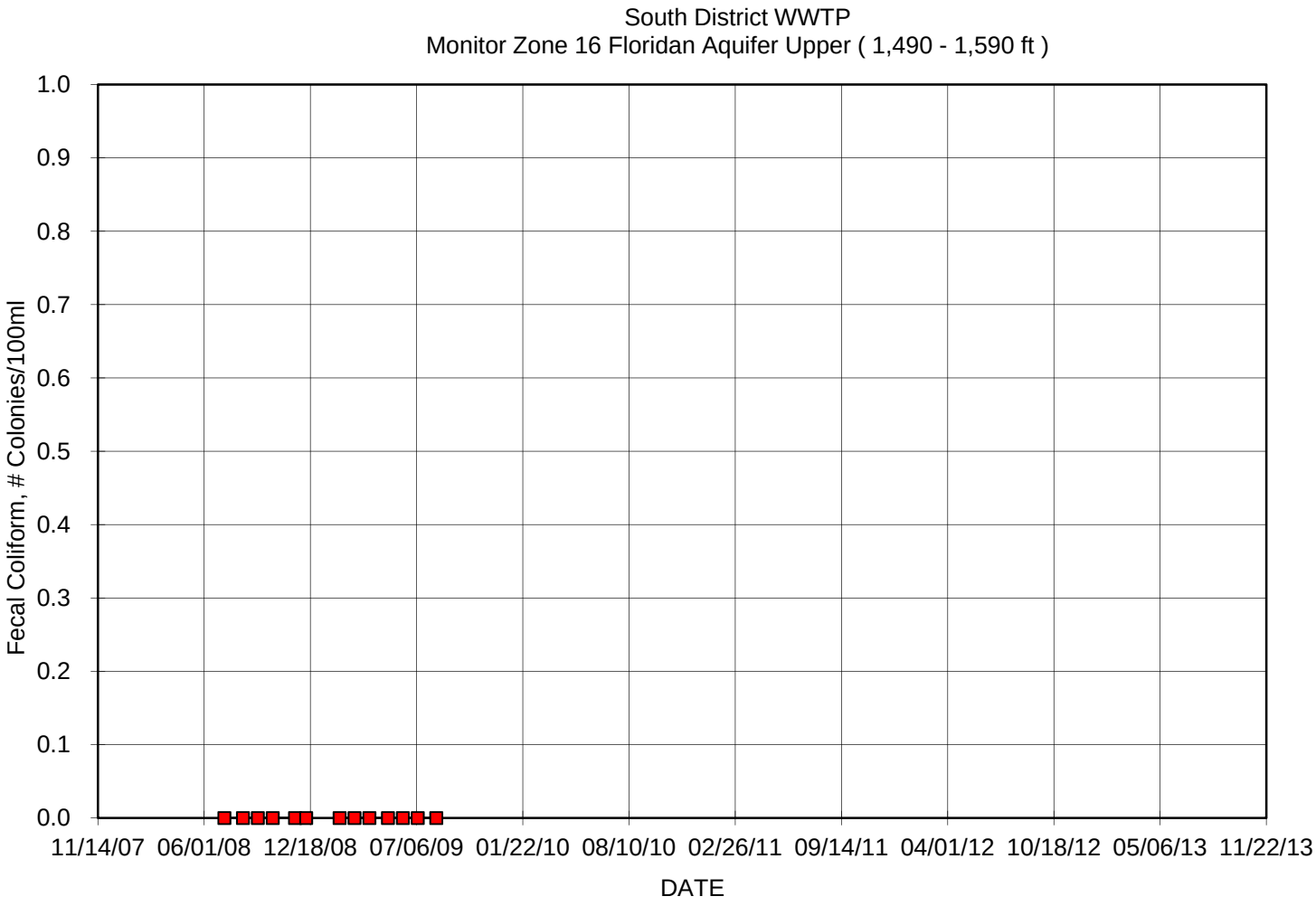

South District WWTP
Monitor Zone 16 Floridan Aquifer Upper (1,490 -1,590 ft)
7,400
7,200
7,000
6,800
6,600
6,400
6,200
6,000
5,800
TDS, mg/L
11/14/2007
6/1/2008
12/18/2008
7/6/2009
1/22/2010
8/10/2010
2/26/2011
9/14/2011
4/1/2012
10/18/2012
5/6/2013
11/22/2013
DATE

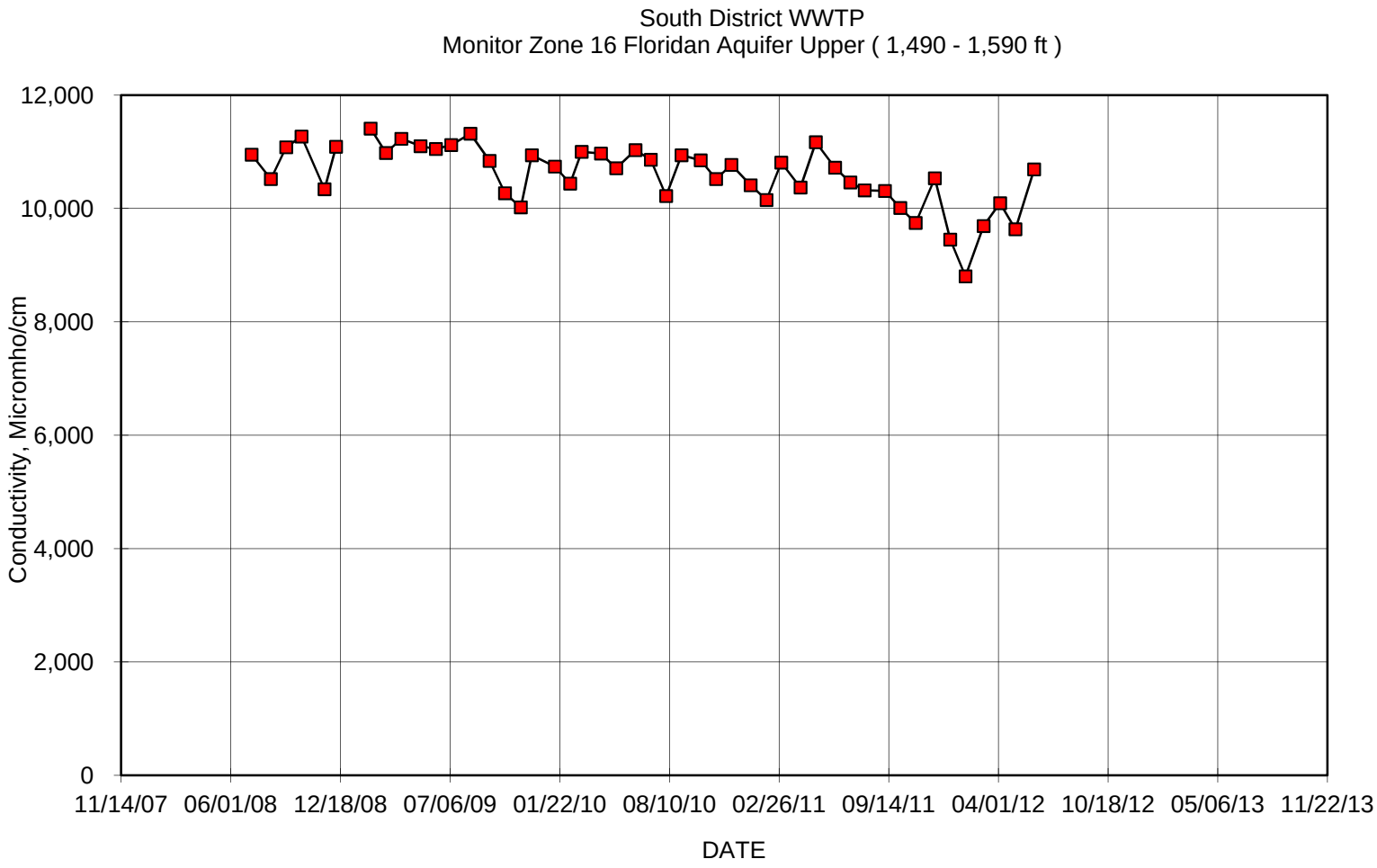

South District WWTP
Monitor Zone 16 Floridan Aquifer Upper (1,490 -1,590 ft)
Sulfate, mg/L
500
450
400
350
300
250
200
150
100
50
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

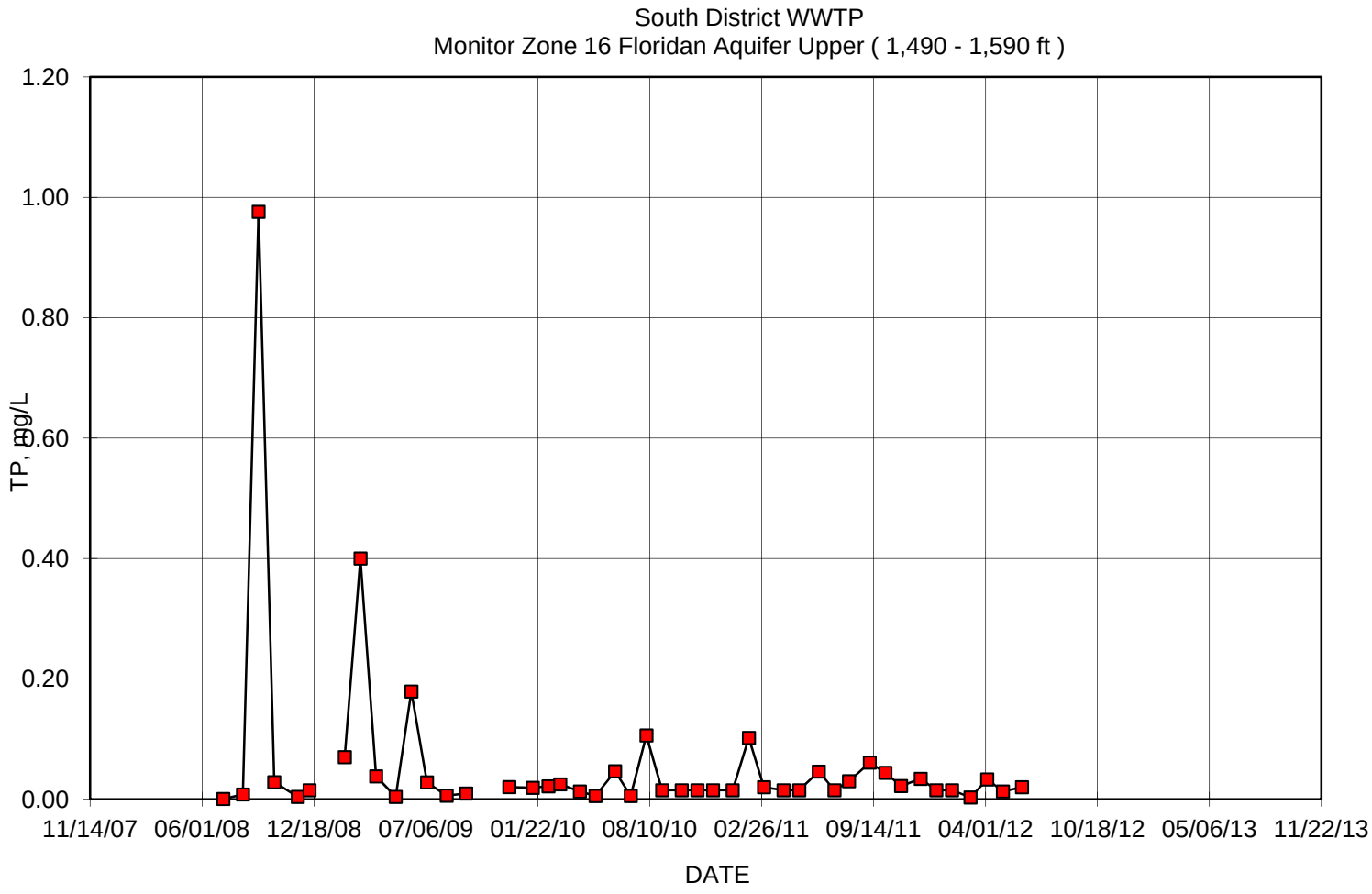

South District WWTP
Monitor Zone 16 Floridan Aquifer Upper (1,490 -1,590 ft)
Chlorides, mg/L
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

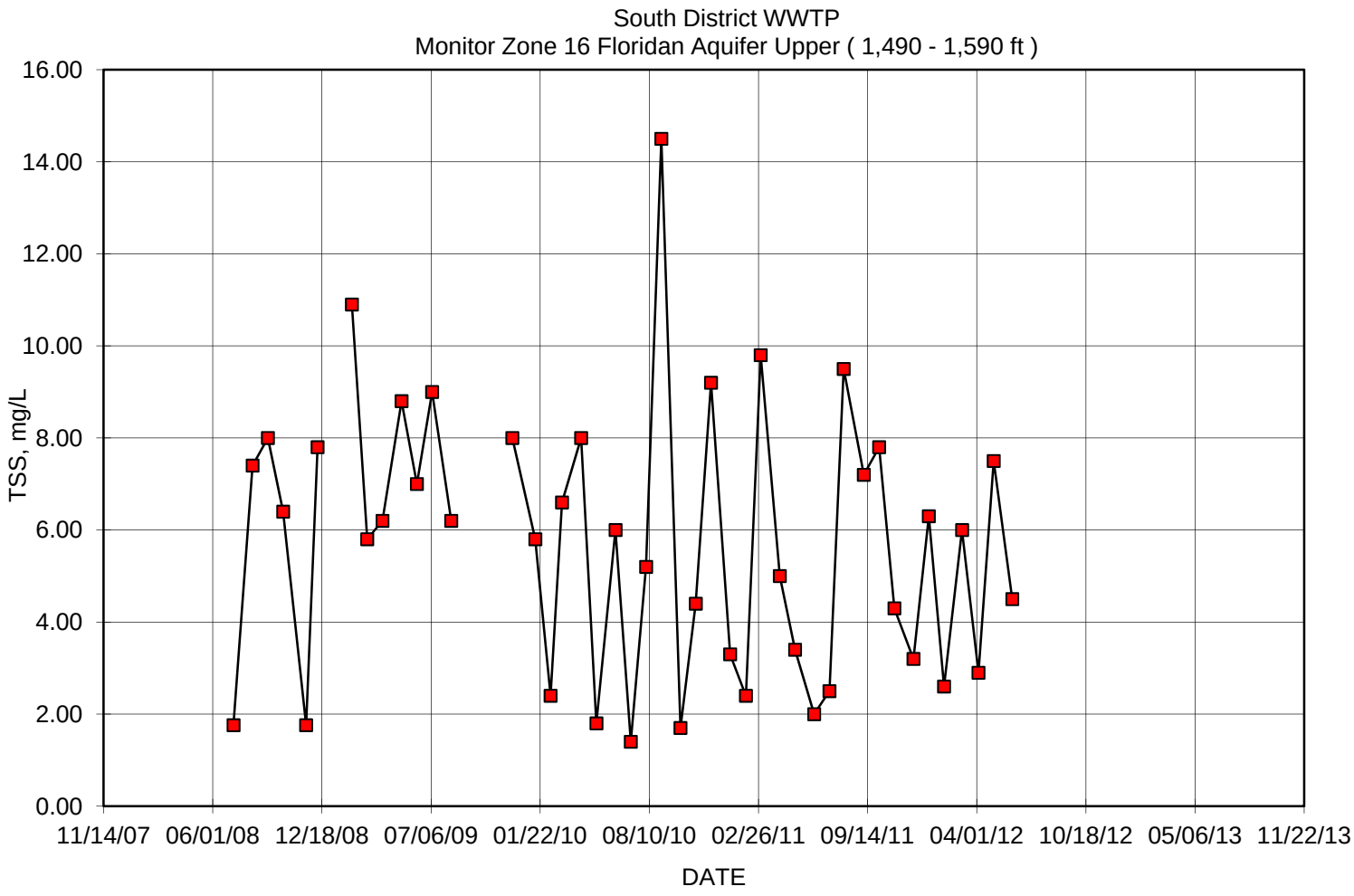

South District WWTP
Monitor Zone 16 Floridan Aquifer Upper (1,490 -1,590 ft)
TKN, mg/L
0
2
4
6
8
10
12
14
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 16 Floridan Aquifer Upper (1,490 -1,590 ft)
NH3, mg/L
0
2
4
6
8
10
12
14
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 16 Floridan Aquifer Upper (1,490 - 1,590 ft)
Fecal Coliform, # Colonies/100ml
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 16 Floridan Aquifer Upper (1,490 - 1,590 ft)
Conductivity, Micromho/cm
12,000
10,000
8,000
6,000
4,000
2,000
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 16 Floridan Aquifer Upper (1,490 - 1,590 ft)
1.20
1.00
0.80
0.60
0.40
0.20
0.00
TP, mg/L
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

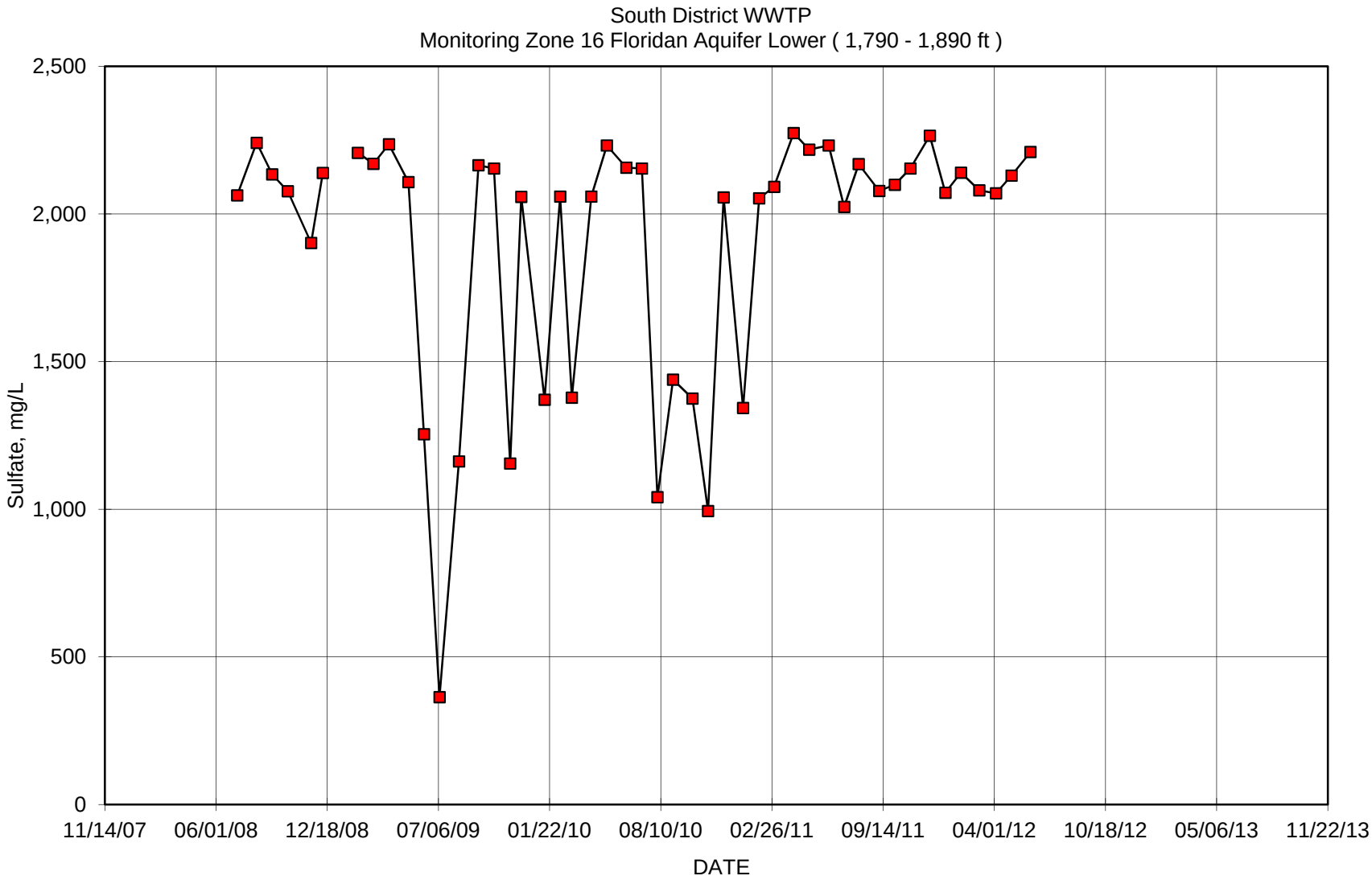

South District WWTP
Monitor Zone 16 Floridan Aquifer Upper (1,490 - 1,590 ft)
TSS, mg/L
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

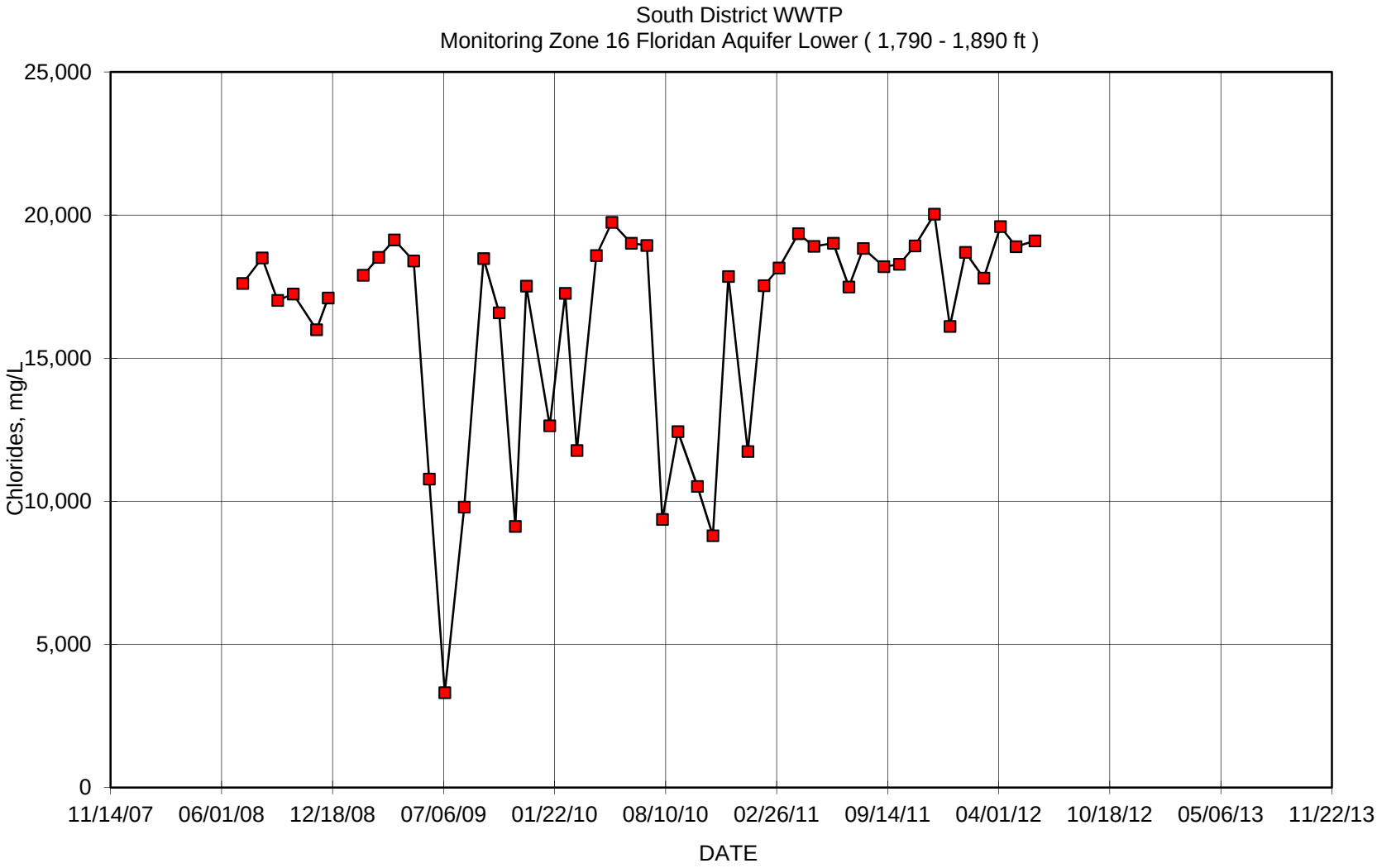
FA-16 Lower Data

Date	TDS, mg/L	Sulfate, mg/L	Chlorides, mg/L	TKN, mg/L	NH3, mg/L	Conductivity, Micromho/cm	Temp., C	Temp., F	pH	TP, mg/L	TSS mg/L	NO_3 mg/L	NO_2 mg/L	Sodium, mg/L	Gross Alpha, pCi/L	Radium 226, pCi/L	Radium 228, pCi/L
07/09/08	35,310	2,063	17,613	0.40	0.01	48,780	24	75	7.5	0.01	17.20	0.03	0.00				
08/13/08	33,330	2,241	18,504	0.12	0.09	50,190	24	75	7.6	0.01	23.20	0.08	0.05				
09/10/08	33,940	2,134	17,021	0.12	0.03	45,730	25	77	7.5	0.06	21.40	0.08	0.05				
10/08/08	36,390	2,077	17,244	0.44	0.07	45,950	24	74	7.6	0.02	24.80	0.03	0.00				
11/19/08	36,330	1,902	15,996	0.22	0.02	45,360	21	71	7.3	0.00	18.60	0.03	0.00				
12/10/08	33,870	2,139	17,107	0.48	0.08	48,360	23	73	7.3	0.03	17.40	0.03	0.00				
01/14/09																	
02/11/09	34,300	2,207	17,899	0.29	0.07	48,420	23	74	7.1	0.07	24.90	0.00	0.00				
03/11/09	32,540	2,170	18,526	0.40	0.14	49,470	22	72	7.4	1.25	13.20	0.00	0.00				
04/08/09	33,950	2,236	19,136	7.13	0.12	50,890	23	73	7.3	0.04	22.40	0.00	0.00				
05/13/09	34,420	2,108	18,398	0.29	0.20	49,150	25	77	7.5	0.01	16.20	0.00	0.00				
06/10/09	34,150	1,254	10,779	0.30	0.16	61,900	24	75	7.4	0.32	13.00	0.00	0.00				
07/08/09	34,940	364	3,313	0.32	0.02	49,160	25	76	7.3	0.01	18.20	0.00	0.00				
08/12/09	34,030	1,162	9,800	0.33	0.14	48,770	23	74	7.6	0.01	17.80	0.00	0.00				
09/16/09	34,240	2,165	18,481	0.35	0.10	47,520			7.5	0.01		0.05	0.01	9560	16.1	12.1	0.9
10/14/09	34,490	2,154	16,589	6.40	0.13	10,270			7.6	0.03		0.00	0.00	1730	9.3	5.3	0.8
11/12/09	33,440	1,155	9,124	0.28	0.11	49,220			8.4	0.03		0.00	0.00	8170	14.0	14.2	1.0
12/02/09	35,370	2,058	17,521	0.39	0.13	50,850	24	74	7.4	0.03	15.80	0.00	0.00	10200	17.2	15.8	0.8
01/13/10	33,840	1,371	12,640	0.22	0.08	46,860	20	68	7.2	0.02	9.60	0.00	0.00	7860	14.0	12.7	1.0
02/10/10	32,960	2,059	17,267	0.38	0.08	47,120	22	72	7.4	0.03	18.20	0.00	0.00	7890	13.7	12.6	1.0
03/03/10	34,250	1,378	11,776	0.27	0.09	48,420	21	69	7.3	0.03	11.00	0.00	0.00	8820	15.3	12.4	0.8
04/07/10	33,740	2,059	18,588	5.87	7.99	49,020	24	75	7.3	0.02	12.00	0.00	0.00	8990	17.4	13.1	0.8
05/05/10	33,772	2,232	19,747	0.43	0.14	48,160	24	75	7.5	0.01	14.40	0.00	0.00	9890	13.1	10.9	0.7
06/09/10	34,880	2,157	19,017	0.34	0.11	49,640	24	76	7.4	0.04	24.80	0.00	0.00	8560	14.4	13.8	0.9
07/07/10	34,430	2,154	18,941	0.09	0.23	48,670	24	75	7.4	0.01	9.80	0.00	0.00	9420	12.4	13.8	0.7
08/04/10	33,750	1,041	9,367	1.02	1.31	46,940	24	75	7.4	0.24	18.40	0.00	0.00	9480	20.0	1.1	0.9
09/01/10	33,760	1,439	12,436	0.65	0.91	48,360	24	75	7.4	0.02	44.60	0.00	0.00	8680	13.4	13.8	0.8
10/06/10	33,790	1,375	10,522	0.18	0.84	47,680	23	73	7.6	0.01	16.40	0.00	0.00	8750	8.8	14.1	0.9
11/03/10	33,070	994	8,798	0.15	0.12	47,450	23	73	7.4	0.00	14.60	0.00	0.00	9910	10.0	10.4	0.8
12/01/10	32,880	2,056	17,856	0.52	0.83	47,570	23	73	7.4	0.02	13.60	0.00	0.00	9720	13.0	13.4	0.7
01/05/11	33,250	1,343	11,742	0.59	0.81	46,160	23	73	7.4	0.02	9.60	0.01	0.02	9400	18.5	16.8	0.7
02/03/11	33,850	2,053	17,535	0.37	0.62	45,900	22	72	7.5	0.07	14.60	0.00	0.00	9210	13.3	10.3	0.7
03/02/11	32,130	2,092	18,153	0.52	1.07	47,690	22	72	7.2	0.14	23.40	0.00	0.00	8980	15.8	14.5	0.7

04/06/11	37,140	2,274	19,353	0.29	1.01	47,030	22	72	7.1	0.02	12.60	0.00	0.00	10400	14.0	13.6	0.8
05/04/11	36,180	2,218	18,910	0.29	1.20	46,570	23	73	7.4	0.02	7.20	0.00	0.00	9480	12.8	12.9	0.9
06/08/11	32,690	2,232	19,017	0.38	0.92	48,260	23	74	7.2	0.09	9.20	0.01	0.00	9840	13.4	12.0	0.8
07/06/11	34,120	2,024	17,490	0.35	1.03	48,920	24	74	7.6	0.02	13.00	0.02	0.00	9090	11.3	14.8	0.8
08/01/11	32,980	2,169	18,836	0.27	0.91	45,950	24	76	7.5	0.04	24.20	0.00	0.00	11200	11.2	11.5	0.8
09/07/11	31,800	2,078	18,199	0.29	0.94	47,940	24	75	7.4	0.05	10.80	0.02	0.00	9420	16.7	16.2	0.9
10/05/11	33,860	2,099	18,283	0.37	1.38	46,650	22	72	7.5	0.06	13.90	0.00	0.00	9550	15.2	14.5	0.9
11/02/11	33,420	2,154	18,927	0.31	1.15	47,240	23	74	7.2	0.05	8.30	0.00	0.00	10300	11.9	10.4	0.9
12/07/11	33,740	2,265	20,035	0.34	1.29	45,460	22	72	7.8	0.05	7.90	0.00	0.00	10000	14.2	13.4	0.9
01/04/12	32,400	2,072	16,113	0.31	1.16	44,820	20	68	7.4	0.02	17.80	0.01	0.00	9850	12.8	12.5	0.7
02/01/12	30,380	2,140	18,700	0.38	1.28	46,977	23	73	7.2	0.02	11.10	0.01	0.00	10400	10.9	9.8	0.7
03/05/12	31,780	2,080	17,800	0.35	0.99	42,460	23	73	7.6	0.02	10.30	0.02	0.00	10900	13.5	13.9	0.8
04/04/12	34,220	2,070	19,600	0.31	0.04	48,250	23	73	7.3	0.03	13.20	2.50	2.50	9890	15.5	14.8	0.9
05/02/12	33,240	2,130	18,900	0.39	0.81	48,900	23	74	7.6	0.03	10.00	0.03	0.00	10400	14.1	13.1	0.8
06/05/12	33,884	2,210	19,100	0.36	0.93	44,935	23	74	7.2	0.03	14.00	0.01	0.00	9650	12.7	13.2	0.9
07/11/12																	
08/01/12																	
09/05/12																	
10/03/12																	
11/07/12																	
12/05/12																	
01/09/13																	
02/06/13																	
03/04/13																	

South District WWTP
Monitoring Zone 16 Floridan Aquifer Lower (1,790 - 1,890 ft)
TDS, mg/L
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitoring Zone 16 Floridan Aquifer Lower (1,790 - 1,890 ft)
Sulfate, mg/L
2,500
2,000
1,500
1,000
500
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE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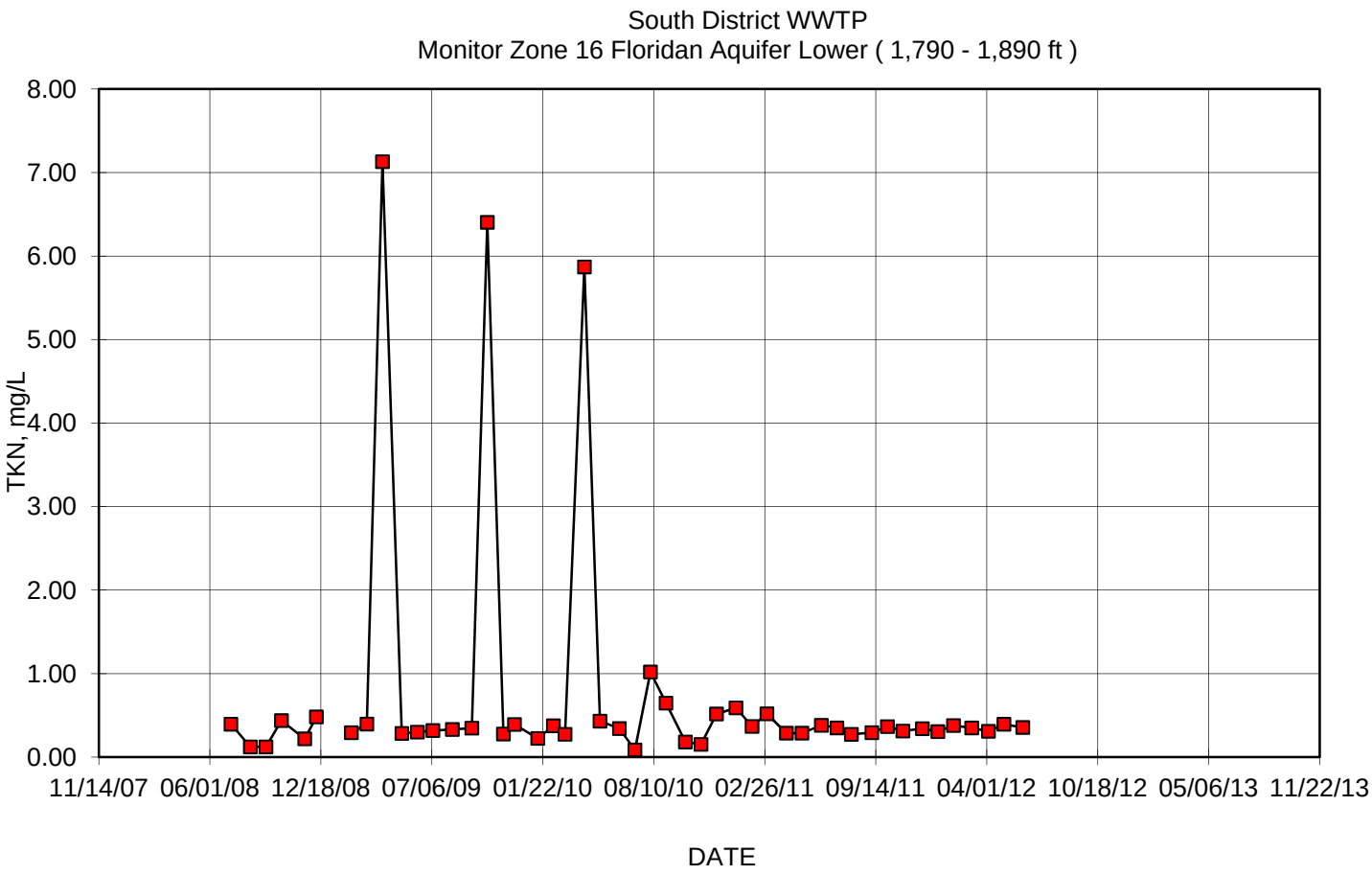
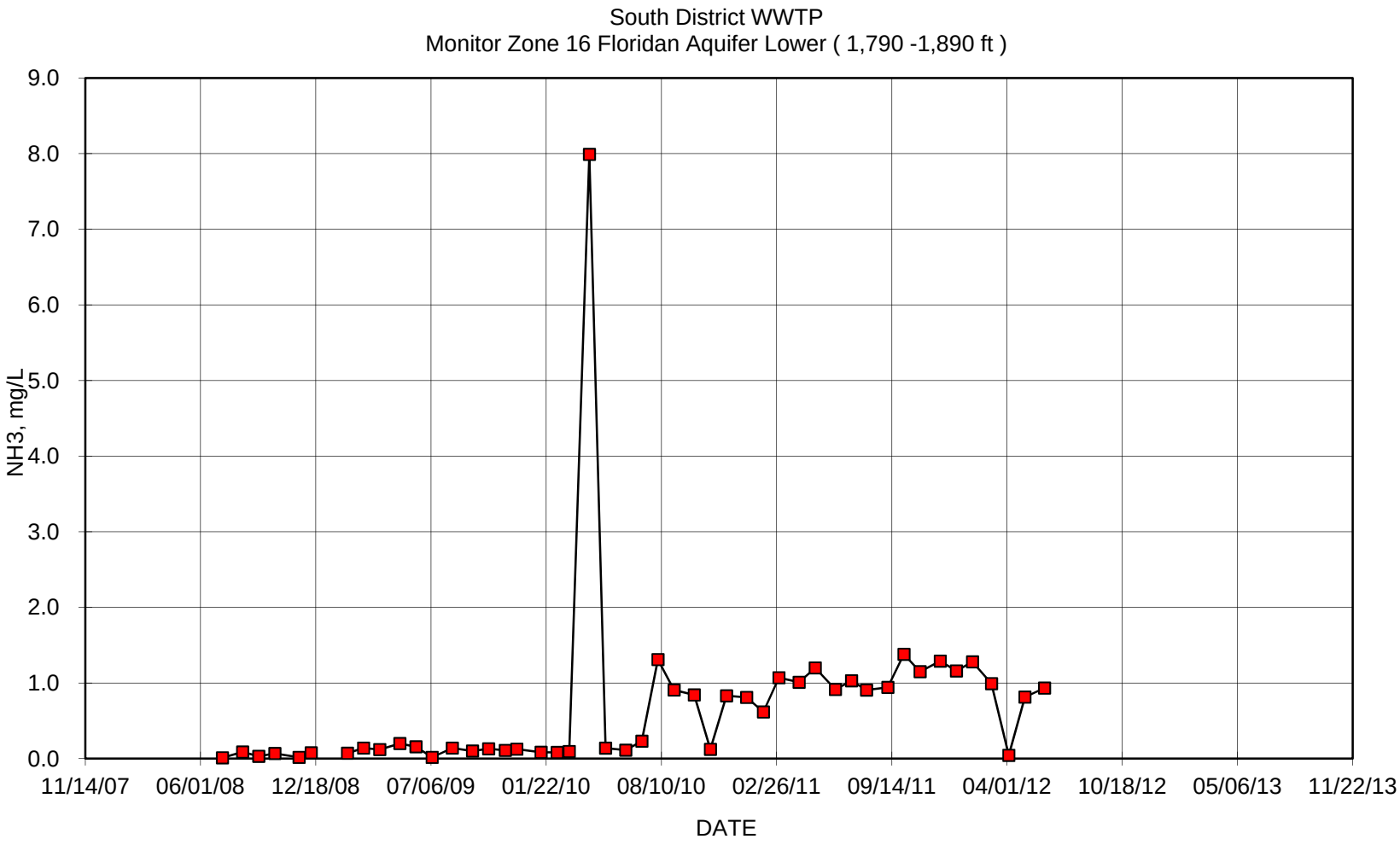
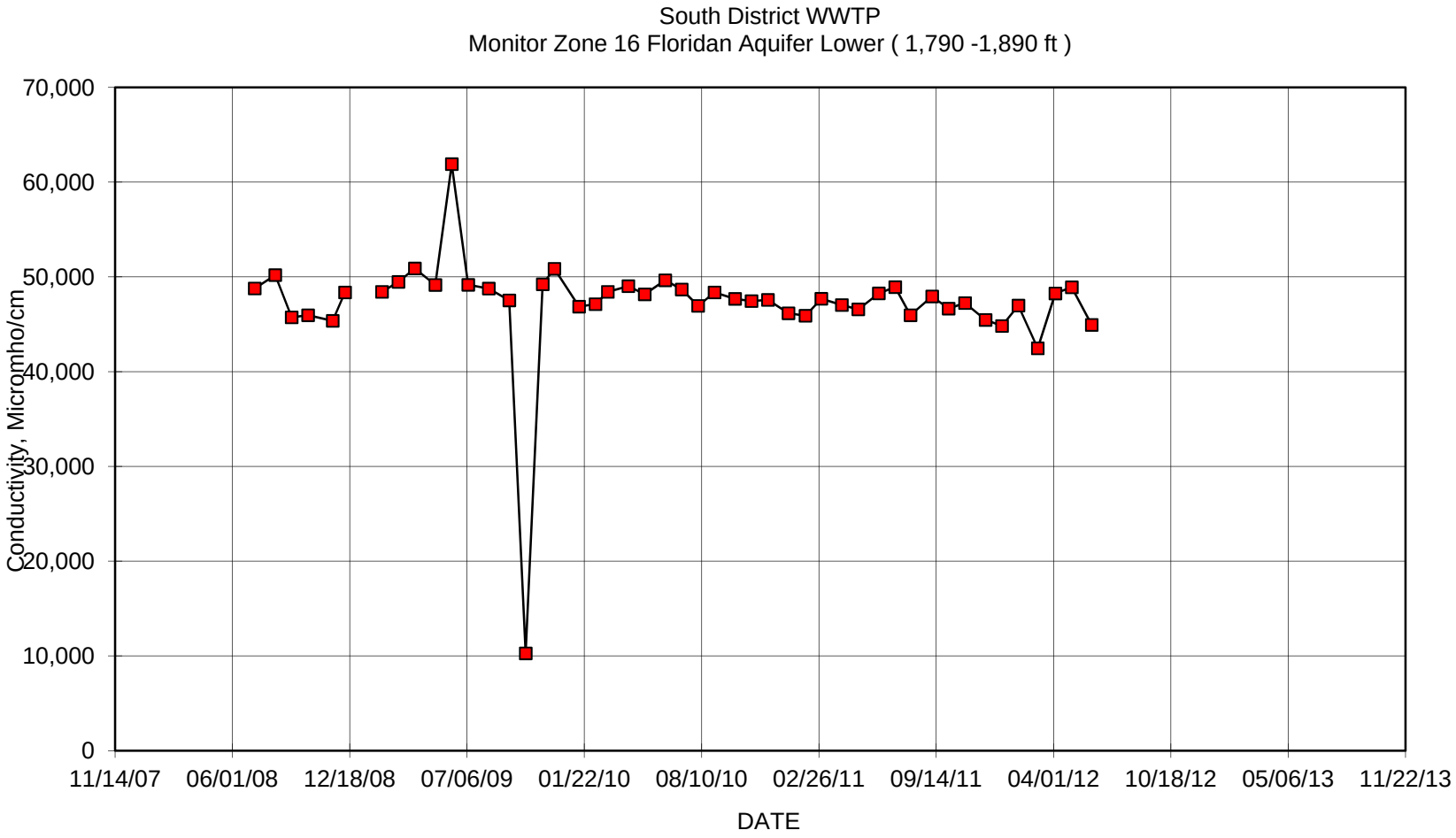
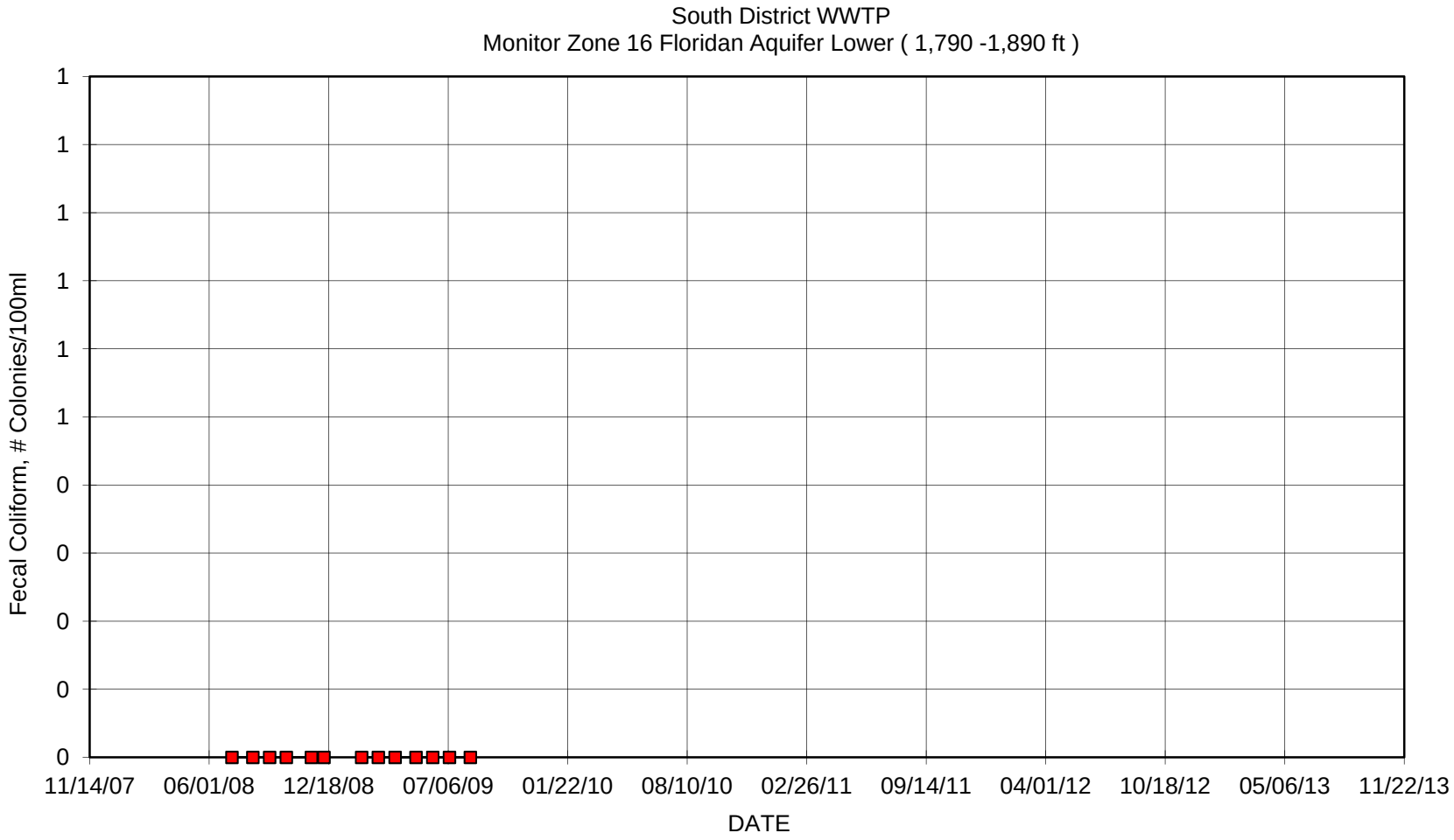
Monitoring Zone 16 Floridan Aquifer Lower (1,790 - 1,890 ft)
Chlorides, mg/L
25,000
20,000
15,000
10,000
5,000
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 16 Floridan Aquifer Lower (1,790 - 1,890 ft)
TKN, mg/L
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 16 Floridan Aquifer Lower (1,790 -1,890 ft)
NH3, mg/L
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 16 Floridan Aquifer Lower (1,790 -1,890 ft)
Conductivity, Micromho/cm
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 16 Floridan Aquifer Lower (1,790 -1,890 ft)
Fecal Coliform, # Colonies/100ml
1
1
1
1
1
1
0
0
0
0
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
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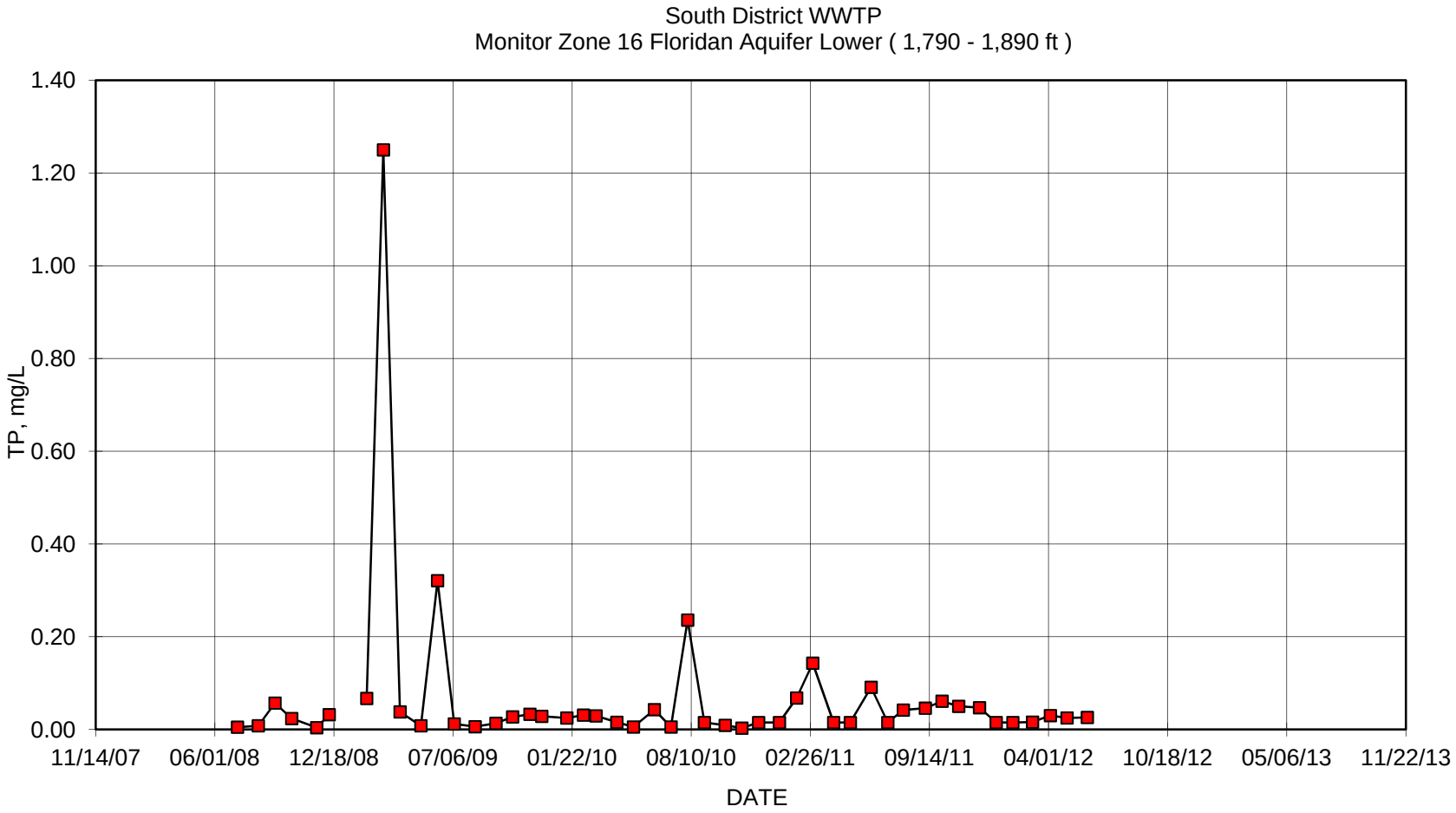
05/06/13
11/22/13
DATE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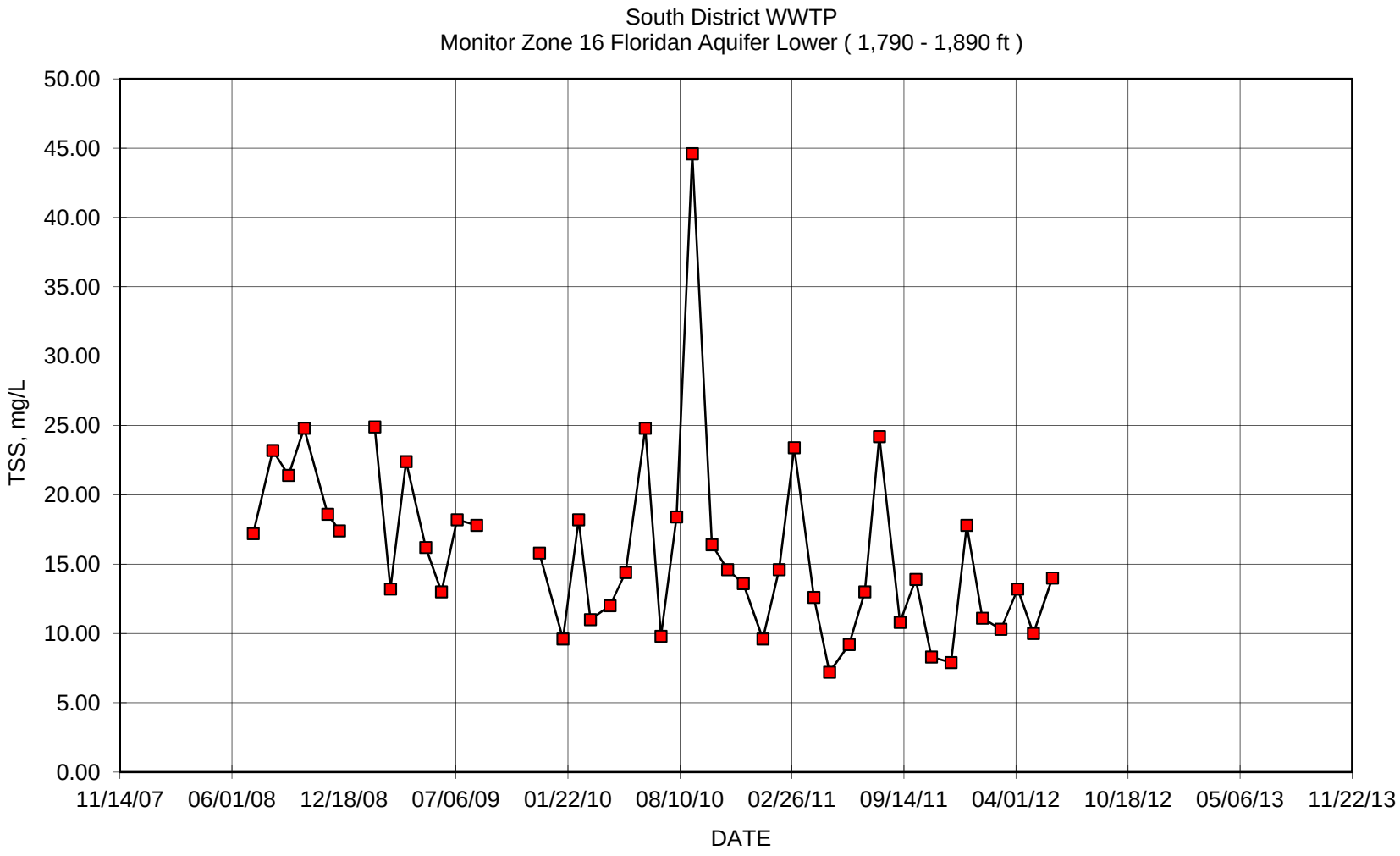
Monitor Zone 16 Floridan Aquifer Lower (1,790 - 1,890 ft)
TP , mg/L
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 16 Floridan Aquifer Lower (1,790 - 1,890 ft)
TSS, mg/L
50.00
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

MIAMI-DADE COUNTY
miamidade.gov

Water and Sewer
PO Box 330316 • 3071 SW 38 Avenue
Miami, Florida 33233-3016
T 305-665-7471

October 1, 2013

Mr. Joseph R. May, P.G.
Florida Department of Environmental Protection
400 North Congress Avenue, 3rd Floor
West Palm Beach, Florida 33401

CCN: 57715

Reference: Miami-Dade Water and Sewer Department -- Mechanical Integrity Testing (MIT) Report for Deep Injection Well No. IW-10 at the SDWWTP Site.

Dear Mr. May:

Enclosed please find the Certificate of Mechanical Integrity and the MIT Report on the re-testing of Deep Injection Well No. IW-10 at the South District Wastewater Treatment Plant site in Miami-Dade County.

All the tests were conducted in strict adherence to the specifications submitted to and approved by your office. The testing results for the well were good. Both external and internal mechanical integrity were demonstrated. The well casing and the wellhead components are in good condition. All the well head valves and all the well head components are scheduled to be rust-proofed and repainted when all the MITs are completed. Based on the results of the well testing we conclude that the well retains full mechanical integrity and recommend that MDWASD be allowed to continue operating the well in its normal mode.

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

The demonstration of mechanical integrity is being submitted per Chapter 62-528.300(6)(b)2., 62-528.300(6)(c), and 62-528.425(1)(d), F.A.C. and specific condition 3.j. of Permit 0061787-022-UO.

If you have any questions or require additional explanation of any item in the report, please do not hesitate to contact me at [redacted] or Sonia Villamil at [redacted].

Sincerely,

[redacted]

Rafael Ferrero, P.E.
Assistant Director- Wastewater Operation Systems

Enclosures: Certificate of Mechanical Integrity
MIT Report Well IW-10 (1 copy)

cc: Joseph Haberfeld, FDEP - Tallahassee

MIAMI-DADE COUNTY
Delivering Excellence Every Day

Mechanical Integrity Test Report
Deep Injection Well No. IW-10
South District Wastewater Treatment Plant

Prepared by:
Miami-Dade Water and Sewer Department
3071 SW 38th Avenue
Miami, Florida 33146

CERTIFICATE OF MECHANICAL INTEGRITY

The **South District WWTP** deep injection well **IW-10** operated by **Miami-Dade Water and Sewer Department** has been tested for mechanical integrity. The tests followed standard engineering practices and used methods presented in the United States Environmental Protection Agency regulations for the purposes of these tests. The external and internal mechanical integrity tests followed Florida Department of Environmental Protection (FDEP) pre-approved testing specifications and all the critical test events were witnessed by representatives of the FDEP, the MDWASD and the contractor.

Having supervised the engineer and geologists that were present during the testing, conducted the examining of the results and the preparation this mechanical integrity report as part of this certification, the undersigned certifies that deep injection well **IW-10** operated by **Miami-Dade Water and Sewer Department** at the **South District Wastewater Treatment Plant Site in Miami-Dade County, Florida** has successfully passed all the test requirements for mechanical integrity under rules of Chapter 62-528 of the Florida Administrative Code and is therefore determined to have mechanical integrity.

Certified on October 1, 2013

[redacted]

Howard J. Fallon Jr., P.E.
Professional Engineer
License Number 24153

MECHANICAL INTEGRITY TEST REPORT
FOR
DEEP INJECTION WELL No. IW-10
AT THE
SOUTH DISTRICT WASTEWATER TREATMENT PLANT

Prepared by:

MIAMI-DADE WATER AND SEWER DEPARTMENT
3071 SW 38th Avenue
Miami, Florida 33146

For Submittal To:

UNDERGROUND INJECTION CONTROL
FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

October 2013

ABSTRACT

The internal mechanical integrity was investigated through a pressure test performed on the injection casing. The pressure test was conducted at 154 pounds per square inch (psi) which is approximately 1.5 times the maximum (100 psi) potential injection pressure and more than 1.7 times the maximum operational pressure that the well will be under when operating at its full permitted injection velocity of 10 feet per second (ft/sec). FDEP permits a 5% loss in pressure during the hour long test in order for the internal mechanical integrity to pass the pressure test.
IW-10 successfully passed the pressure test because the casing only lost 4 psi. The successful results of the pressure test for internal mechanical integrity were reinforced by the results of the second internal mechanical integrity test, the TV survey of the casing. The TV survey confirmed that the casing and the casing joints are in good condition and that the well has internal mechanical integrity down to 2,428 ft bls.

The external mechanical integrity was investigated using two test procedures, a Radioactive Tracer Survey (RTS) and a Temperature Log. Results of the RTS confirmed the integrity of the cement around the casing and the continued competence of its seal with the geologic strata. The temperature test showed that there are no anomalies that would indicate points where injected fluids could escape through the casing and cement into the formation. Similarly there were no temperature anomalies that would indicate injection fluids entering the formations at other than the approved injection depth.

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APPENDIX B – FDEP APPROVAL OF TEST SPECIFICATIONS
APPENDIX C – FIELD NOTES INCLUDING PRESSURE CHART AND GUAGE CERTIFICATION
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Section 1

1. INTRODUCTION

1.1 BACKGROUND

On October 12, 2012, (see Appendix A) the Miami-Dade Water and Sewer Department (MDWASD) submitted the County's proposed plan and testing specifications for conducting the mechanical integrity tests (MITs) and repairs on some of the injection wells at the South District Wastewater Treatment Plant (SDWWTP) site (see Figure 1) to the Florida Department of Environmental Protection (FDEP). The plan, represented by the specifications, described the step-by-step procedure to be followed and included the testing schedule required to meet the 5-year MIT re-testing conditions of the FDEP permit for each of the injection wells. After receipt of these documents, the FDEP Staff reviewed the proposed plan and sent an approval on June 5, 2013 (see Appendix B).

The contract documents for conducting the MITs were let out for bids, and the winning bid was submitted on February 28, 2013 by Youngquist Brothers, Inc., a well drilling contractor from Ft. Meyers, Florida. After the contract was approved by the Board of Country Commissioners and signed by the County Manager, the MDWASD issued the notice to proceed on May 17, 2013 and the contractor began mobilizing to the site.

1.2 PURPOSE AND SCOPE

The purpose of this report is to provide FDEP with a document that describes the re-testing procedures for mechanical integrity applied to each of the SDWWTP deep injection wells (see Figure 2). The report also presents the field reports (see Appendix C), and the results of the tests in a single volume for ease of reference. The mechanical integrity re-testing operations involved conducting a pressure test on the well casing to show that there are no leaks in the casing, and conducting a TV survey on the well to reinforce the data from the pressure test. The re-testing includes tracking a radioactive liquid-tracer (iodine isotope I-131) injected down the well to show that there is no fluid movement upward behind the casing, into underground sources of drinking water (USDW). The radioactive test information is reinforced with temperature logs run on the well. Gamma ray logs are used to detect the movement of the radioactive tracer.

Figure 1. South District Wastewater Treatment Plant Site

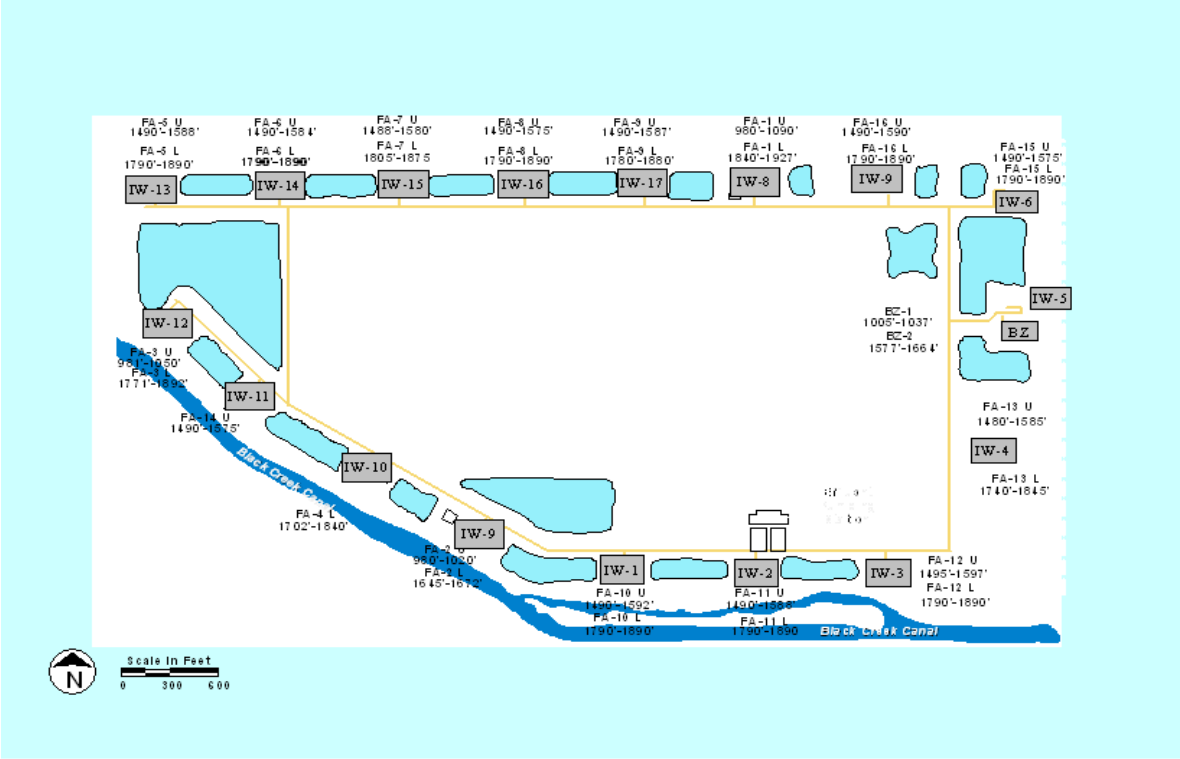


Figure 2. Well Locations Layout

Section 2

2. MECHANICAL INTEGRITY TESTING (MIT)

2.1 METHODS USED

The MIT program is designed to test two elements of the injection well system: 1. Internal integrity and 2. External integrity. The first test element, the internal mechanical integrity test of the well, tests the condition of the injection casing. The second test element, the external mechanical integrity test of the well, tests for leaks outside the casing. This is achieved through a series of field tests including a pressure test and a TV survey for the internal testing, and the temperature log, gamma ray log and RTS survey for the external testing. The first test element, the internal mechanical integrity test, tests for leaks in the injection pipe (casing). The second test element tests for leaks in the annular space outside the casing (cement-filled space between the periphery of the drilled hole and the casing) and in the near-to-the-well geologic strata.

2.2 CASING SCRUBBING

Because the mechanical integrity of injection wells has to be tested every five years, and because a TV inspection of the well is part of the test requirements, MITs provide a timely opportunity to clean the well of deposits that may have formed on the inside of the casing during the intervening years and at the same time provide a cleaner casing for the TV inspection. Cleaning the inside of the well casing is achieved by running a scrubbing brush up and down the casing. However, before the cleaning can be performed, flow out of the well must be controlled. The column of water inside the casing is fresh water and results in a positive hydraulic head inside the well. That head must first be controlled to prevent water from flowing out of the well during the cleaning operation.

2.2.1 Flow Suppression

Suppression of the fresh water head was achieved by first pre-mixing water with salt (NaCl) to form a heavy brine, and then pumping the brine down the well casing, through a 6-inch gate valve on the wellhead. This procedure results in the displacement down the well of the fresh water at the top of the column and replacement of the displaced fresh water with the brine solution. An equal volume of fresh water is displaced out of the well at the bottom of the casing. The procedure is repeated until the pressure head inside the well is suppressed. This method of displacement is used because it achieves flow suppression without first having to open the well to insert a tremie pipe to the bottom of the casing for introduction of the brine. This displacement method also provides a safe way of “killing” the well that at the same time reduces the volume of injected salt solution that would enter the formation at the bottom of the well. One additional advantage is that using this method the brine can be recovered and reused in flow suppression at other wells.

The brine was prepared in 1,000-gallon (gal.) batches by mixing the salt from a 2,000-pound (lbs.) sack in a 1,000 gal. tank of fresh water. The 1,000 gal. solution was then pumped down the well before other similarly mixed batches of salt solution were mixed and pumped down the well (see Figure 3). In the end, the operation was repeated 13 times, and a total of 13 sacks (approximately 26,000 lbs. of salt) were used to suppress the head in the well. This salt concentration represents a theoretical specific gravity of 1.239 for the brine, calculated from the salt solution used in the field of 10.3 lbs per gallon. The 26,000 lbs of salt suppressed the pressure head from approximately 26 feet above the top of the casing to approximately 15 feet below.

Figure 3. Flow Suppression Equipment

2.2.2 Scrubbing Operation

The brush used to clean the casing is made with an old drill rod that has an outside diameter of 7 inches with thick steel wire inserted and secured sticking out of the drill rod. The total diameter of the brush with the steel wire bristles is 24 inches. The brush is attached to the bottom of the packer and inserted into the well (see Figure 4). A 24-inch flange was bolted to the top of the well and pressure fittings installed to be used for packer inflation later on in the process. Then Youngquist lowers the brush and packer by attaching drill rods to the top of the packer and then raising and lowering the brush several times using a 50 ton crane. This process was repeated until the casing was scrubbed and the packer was at the depth required to perform the packer test on the well.

Figure 4. Scrubbing Brush and Hydraulic Packer

2.3 INTERNAL MECHANICAL INTEGRITY (CASING TESTS)

2.3.1 Pressure Test

After the pressure head was suppressed and the casing scrubbed, and the inflatable packer was placed at a depth of 2,402 ft bls. This well is cased to a depth of 2,425 ft bls so the packer is in the bottom 50 feet of the casing. Additional pressure fittings were installed on the flange to pressurize the casing with water. A bleeder valve atop the 24-inch flange allows passage of the drill pipes that support the packer without loss of pressure in the casing (see Figure 5). A pretest was conducted on the casing to determine that the pressure was holding and that all the installed testing equipment was operating properly, then FDEP was informed that the well was ready for their inspection. The next day, June 28, 2013, the pressure test was repeated in the presence of FDEP Staff. The packer had been previously sealed against the casing, at an inflation pressure of 380 pounds per square inch (psi) and at 8:00 AM the casing was pressurized with water to a pressure of 154 psi.

Figure 5. Well-Head and Recorder Set Up for Pressure Test

At 8:47 A.M. the one-hour pressure test was started in the presence of Joseph May, P.G. representing FDEP and witnessed by Sonia Villamil, Maria Macfarlane, and Michael Ashe representing MDWASD, and by Chris Harp and others representing the drilling contractor. The pressure test ran for the required one-hour period. The pressure deviation (loss) in that time was 4 psi, well below the 7.5 psi deviation allowable under the 5 % criteria in the rules (see Table 2-1). The packer inflation pressure and the pressure in the casing were measured using certified gages (see Appendix C) graduated from 0 to 200 psi in increments of 1 psi. The pressure was read in person and recorded by hand at five minute intervals during the test. The pressure was also recorded on an In-Situ pressure transducer attached to the stand with the pressure gauges (see Figure 5).

Table 2-1 Casing Pressure Readings

Time	Casing Pressure (psi)	Pressure Change (psi)	Packer Pressure (psi)
8:47	154	0.0	380
8:52	154	0.0	380
8:57	153	1.0	380
9:02	153	0.0	380
9:07	153	0.0	380
9:12	152.5	0.5	380
9:17	152.5	0.0	380
9:22	152	0.5	380
9:27	152	0.0	380
9:32	151.5	0.5	380
9:37	151	0.5	380
9:42	150	1.0	380
9:47	150	0.0	380

2.3.2 Bleed-Off Calculations

At the completion of the pressure test the casing pressure was bled-off and the discharged volume from the bleeding was measured (see Table 2-2). Bleeding until the pressure resulted in zero flow produced approximately 29 gallons. This exercise provides a reasonable assurance that the packer is placed at the depth in the well that is within the last 50 feet of the casing.

Table 2-2. Bleeding Volumes versus Pressure

Bled Volume (gallons)	0	5	10	15	20	25	29
Casing Pressure (psi)	150	123	91	70	44	18	0

2.3.3 Television Survey

A closed circuit color television camera, encased in a pressure vessel capable of withstanding the pressures exerted at the depths to be televised, and equipped with a fish-eye lens, was introduced into the well through a pack-off stripper device on a standpipe above the injection well (see Figure 6). The camera is centralized in the casing, and is preceded down the well with a light source attached below the camera. The camera televises a view of the full circumference of the inside of the casing and the image is recorded on video tape. Prior to the video survey, the well was scrubbed and flushed with potable water to provide the best picture possible. The video

survey began at land surface and continued down to 2,914 feet, where the camera runs into an obstruction, but the hole below seems open below the partial obstruction where the tool was stuck. At selected intervals of interest, the camera was used to pan the intervals in a horizontal format prior to continuing the normal vertical recording.

A review of the video (see Appendix F) indicates that the casing is in good condition down to 2,428.5 feet. The video also shows that the scrubbing operation was successful. The scrubber has scrubbed the casing free of all growth down to 2,425 feet and this is confirmed by visible vertical scratches throughout that length of the casing; indicating that the scrubber had brushed the steel casing effectively. All the scratches are superficial, and do not detract from the physical and mechanical integrity of the casing. There are no gouges, grooves, nicks, or other physical damage visible in the casing for its whole length. Below 2,425 feet the casing was not scrubbed to avoid hanging the scrubber with the edge of the bottom of the casing at 2,428.5 feet. There are some growths and/or deposits visible inside the casing below 2,425feet.

In summary, the video picture meets the quality standards that are needed for a visual evaluation of the well. This video survey presents a clear view of the casing and of the welded joints of the casing. All the joints are clean and appear to be tight. From the TV survey it is concluded that this casing is in good condition throughout its whole depth from land surface to 2,428.5 feet.

Figure 6. Television Survey (Standpipe and Logging Truck)

2.4 EXTERNAL MECHANICAL INTEGRITY (CEMENT AND FORMATIONS)

The external mechanical integrity test consisted of two low flow dynamic tests The RTS and temperature survey, conducted on July 3 2013, for the external mechanical integrity portion of the test was witnessed by the representative of FDEP (Joseph May, P.G.), by representatives of MDWASD (Sonia Villamil and Maria Macfarlane) and by representatives of the contractor (Luis Morey).

2.4.1 Radioactive Tracer Survey (RTS)

The radioactive tracer survey uses an isotope of iodine (I-131) as a tracer of water movement inside and outside the casing. Iodine –131 is used because it is a radioactive isotope commonly used in medical practice and therefore it is more easily available and lower in cost than other potential tracers. I-131 also has the advantage of having a half-life of 8 days. That half-life is quite suitable because it is long enough to allow time for transportation to the well site with little decay but also short enough so that it would quickly be reduced if there were any unexpected spills or if there were mechanical failures through which the isotope could travel with the water. The radiation levels of I-131 at the concentration used for RTS testing is in millicurie-range, which if it were considered a waste, would be characterized as a low level waste by the US Atomic Energy Commission.

The I-131 is first loaded into a container located in the logging tool. This container is electronically activated from the logging truck to eject the desired quantity of tracer at the desired depth through an ejection port. In addition to the tracer container, the logging tool is also assembled with three gamma ray detectors. One detector, the top gamma ray detector (GRT), is located 10 feet above the ejector. The other two detectors, the middle one (GRM) and the bottom one (GRB) are located immediately below the ejector at about 3 feet and 12.4 feet below the ejector respectively. The bottom of the logging tool also includes a temperature tool at the very bottom, and a casing collar locator (CCL) 1 foot below the GRM. Figure 7 shows the configuration of the RTS logging tool. The RTS log in the appendix (Appendix D) shows the distances between each of the logging tool components described above.

2.4.1.1 First Low Flow Dynamic Test

Prior to starting the low flow dynamic test, a background gamma ray log was conducted to establish the natural conditions. It was conducted right after the temperature log. Since the temperature log was run downward starting at land surface, the temperature log had ended with the logging tool at the bottom. The background gamma ray log was conducted from the bottom (2,914 feet) up to the surface.

From the surface, the logging tool was again lowered down the well and the casing collar locator (CCL) used to locate the bottom of the casing. The magnetic coils on the CCL give out a magnetic field and detect a change in the mass. If there is growth on the casing it is harder for the CCL to have a clean line. If the growth has some iron on it, it can cause a sort of interference with the CCL making it harder for the CCL to find the end of the casing. The CCL shows that the bottom of the casing is at 2,428 feet bls. After the bottom of the casing was located, the well was ready for the low-flow dynamic RTS test.

The ejector port of the I-131container was set at 2,423 feet and 1 millicurie (mCi) of I-131 was released while the flow down the well was kept at a constant rate of 86 gallons per minute (gpm). The logging tool was kept immobile after the ejection of the I-131 and the three gamma ray detectors continued to record in place. One (1) mCi of I-131 was ejected into the well. The middle detector, located 3 feet below the ejector port, picked up the radioactive tracer 20 seconds after the ejection. The bottom detector, which is located over 12 feet below the ejector, picked up the tracer 2 minutes after the ejection. The test ran for 60 minutes and the top detector did not pick up any tracer.

After the first low flow test ended, the tool was then raised up more than 200 feet, to a depth of 2,200 feet, to log out of position to make sure that the tracer did not migrate up the casing or the formation outside of the casing. No migration was detected.

Once the log out of position was conducted and the tool was placed back to depth, no staining on the casing was found which means no interference for the second RTS. Therefore, with the approval of Joseph May, P.G. from FDEP, the well was not flushed prior to the second RTS test.

Figure 7. RTS Tool and Temperature Probe

2.4.1.2 Second Low Flow Dynamic Test

The tool was placed back to a depth were the ejector was located at 2,423 feet with a flow of 87 gallons per minute set down the well. For this test, 2 milicuries of I-131 were ejected into the casing. The middle detector started picking up the tracer about 20 seconds after it was ejected. The bottom detector, which is located over 12 feet below the ejector, picked up the tracer 2 minutes and 20 seconds after the ejection. The upper detector did not pick up any tracer for the duration of the test, which lasted 30 minutes.

After the second low flow test ended, the tool was then raised up more than 200 feet, to a depth of 2,200 feet, to log out of position to make sure that the tracer did not migrate up the casing or the formation outside of the casing. A spike up to approximately 1000 GAP was found at 2,422. The ejection point was at 2,423 so we could not determine if it is a stain on the casing from ejection or if the I-131 is behind the casing. Therefore the well was flushed at 4,600 gpm for about 20 minutes. The log after flush shows that there is I-131 at 2,422 ft bls so this leads us to believe that it is behind the casing. However, the I-131 did not travel up beyond 2,422 ft bls so this can indicate that there is some grout missing behind the end of the casing, but only for 6 feet. This does not affect the external integrity of the well because it is below the confining unit and no I-131 traveled beyond the 2,422 ft bls so there is no pathway for fluid migration.

With the last low flow dynamic test, the mechanical integrity test was concluded, but before bringing the geophysical tools out of the well, the leftover I-131in the container was ejected and the container flushed-clean to insure that any remaining radioactive iodine was well dispersed. The tool was placed at a depth of 2,713.5 ft bls. The ejector was located at 2,700 ft bls, and the remaining Iodine 131 was ejected and the well was flushed with effluent at a rate of over 4,600 gallons per minute to ensure no staining of the tool. The logging tool was then brought up from the bottom and on the way up a final gamma ray log was made. Then the final gamma ray log was compared to the background gamma ray log, and the comparison showed that there are no noticeable differences in the two except for a residual stain at the bottom of the casing where the I-131 had been repeatedly released during the testing, and just below there, where the tracer exited the casing. Injection of water down the well at a rate of 4,600 gpm continued for the next hour to completely flush out the well.

2.4.2 Temperature Log

Youngquist Brothers Inc. conducted the temperature log on July 3, 2013 starting at about 9:10 A.M. and logging down to 2,914 feet. The temperature probe (Figure 7) was run from the surface downward to minimize the disturbing effect of the movement of the logging tool on the temperature of the water in the well. The temperature log was started more than 24 hours after the well had last been disturbed by outside influences. The TV survey was the last disturbance in the well.

The temperature log (see Appendix H) shows the warmest interval is in the section from 2,350 to 2,428 feet. This is consistent with the higher temperature of the injected water in that interval. The temperature log did not detect any anomalies that would indicate that injection fluids are present outside the casing, and there is no indication of any upward movement of warm injection

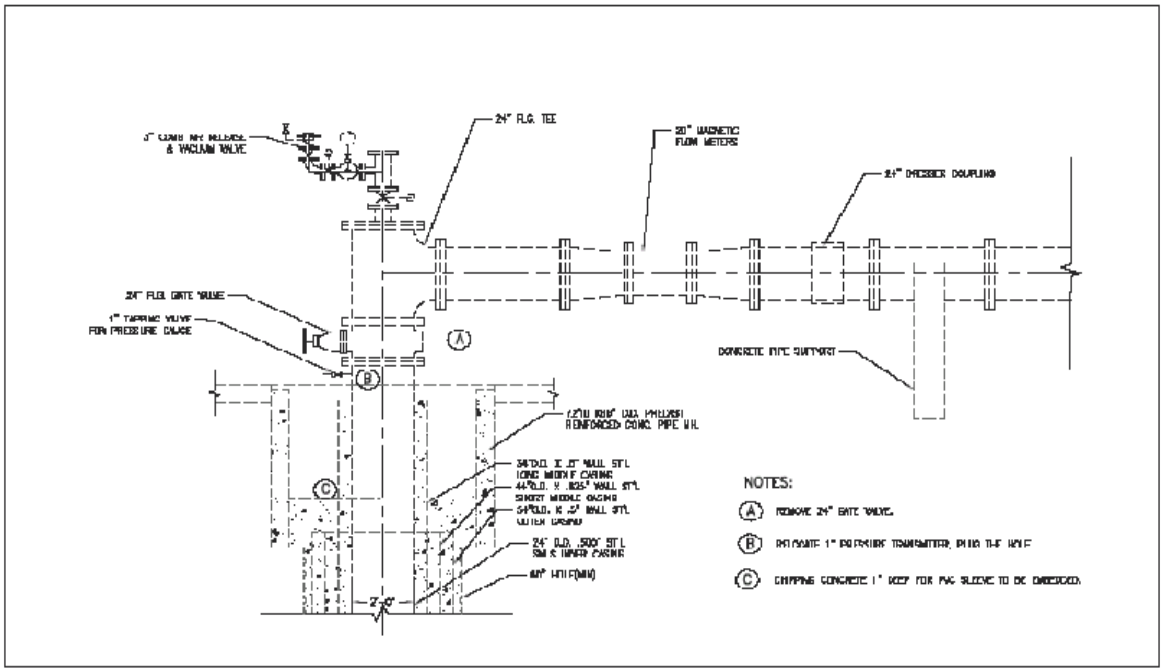
water either. The similarity of the temperature oscillations in this temperature log (in the interval from land surface down to the bottom of the casing) to those in the temperature logs from previous MITs and to those in the temperature log when the well was constructed, indicates that there has been no apparent change in the cased interval, and no upward movement of the injected water in the last 5 years.

2.5 WELL HEAD REPAIRS AND RE-INSTALLATION

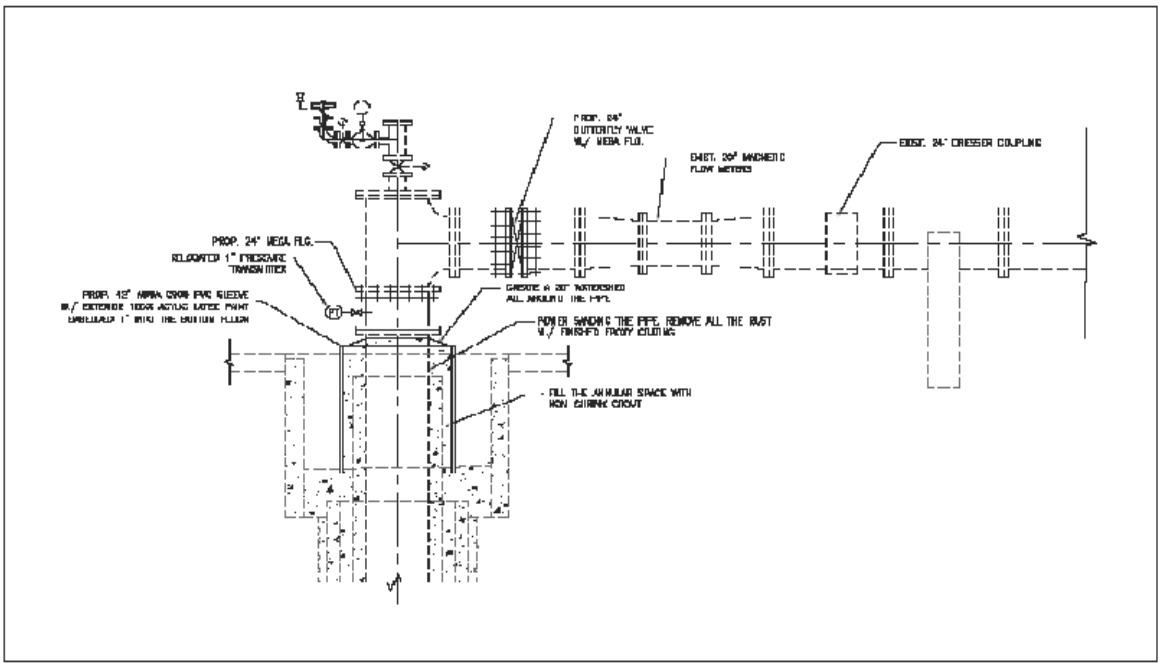
The work associated with the MIT ended when the wellhead was replaced. The air and vacuum release surge check valves were replaced prior to reinstallation of the wellhead. The 6 inch gate valve and air release were replaced. The well had both a butterfly valve on the horizontal pipe from the well head T and a gate valve on the vertical part of the well before the T. The pressure tap for the instrumentation of the well was below the water line when the sump was full of water. Therefore this well was retrofit to remove the redundant gate valve off the well and lift the pressure tap above the water line. A PVC liner was also installed at the base of the sump that protects the 24” OD steel casing from being exposed to FA purge water from the monitoring wells. The PVC was cemented into the bottom of the sump and the annulus was filled with grout to ensure that no water can reach the steel casing. Please see Figure 8 and Figure 9 below.

The wellheads are scheduled to be sandblasted, rust proofed and repainted after the MITs on all the other wells are completed. Injection well IW-10 has been placed back on line and flow from the plant’s pump station is again discharging to this injection well, .

Figure 8 Retrofit Well with PVC liner



REPAIR PLAN FOR I-13 TO I-17



PROPOSAL PLAN FOR I-13 TO I-17

Figure 9 Drawing showing before and after layouts for the Retrofit.

Section 3

3. CONCLUSIONS AND RECOMMENDATIONS

3.1 CONCLUSIONS

The pressure test was conducted successfully and it was concluded from the results that there is internal mechanical integrity. This conclusion is reinforced by the analysis of the TV survey down to the injection level at 2,428 feet. The TV survey indicated that the casing is in good condition and that all the casing joints appear to be tight and in good working order.

The two successful RTS conducted at low flow rates indicate that there is no upward movement of water outside the casing. Therefore, it was concluded that the RTS results show that there is external mechanical integrity. The temperature survey reinforced the results of the RTS by showing that there has been no movement of injected water anywhere except the injection zone.

3.2 RECOMMENDATIONS

The successful completion of all the tests for mechanical integrity confirms that IW-10 retains full mechanical integrity and as such it is appropriate to continue using this injection well. MDWASD also recommends that FDEP review the results of the tests presented in this report and based on those results determine that the well has mechanical integrity and may continue to be used for its intended purpose.

Finally, MDWASD recommends that although the well head will not be painted until all the MIT tests are completed on the other wells, IW-10 should receive mechanical integrity certification.

Appendix A

Mechanical Integrity Testing Procedures Submitted by MDWASD to FDEP
October 12, 2012

Miami-Dade Water and Sewer Department
Mechanical Integrity Testing Procedures

Miami-Dade Water and Sewer Department
Mechanical Integrity Testing and Repair Procedures
October 12, 2012

MECHANICAL INTEGRITY TESTING and REPAIR PLAN (SDWWTP and NDWWTP Injection Wells)

General Information

The Contractor shall carefully coordinate his activities with the Department to minimize interference with any existing operations or the operations of the Department. Department forces will isolate the well and turn over to the Contractor. Existing valves shall only be operated by Department personnel. The Contractor's personnel, under no circumstances, shall operate any such valve.

The Contractor shall provide all barricades and/or flashing warning lights necessary to warn workers and employee of the testing throughout the Project. This shall be done at the Contractor's expense and to the satisfaction of the Engineer. Every effort must be made to reduce inconvenience and nuisances to a minimum.

The Contractor shall at all times, use the assigned entrance to the Plants to bring in materials, equipment etc. required for the Project. Materials and equipment shall be stored in areas designated by the Engineer, and shall not interfere with the daily operations at the site or with other Projects. Suitable platforms shall be used for material storage to prevent damage to the landscaping. The Contractor shall exercise extreme caution when transporting equipment or materials within the Plant area.

The conveying vehicles shall be properly selected, and equipped, to prevent damage to paved areas, landscaping and other existing facilities including wells, well pads, fencing, underground pipelines, pipe chases, etc. If necessary, suitable wooden skids shall be used to distribute loads, and to prevent damage.

If any of the above existing structures, including the wells, or any other parts of the project area, are damaged, the contractor shall make suitable repairs or replacement at his expense, in a manner described by the Engineer, and to his satisfaction.

The Contractor shall also exercise extreme caution to prevent any spillage of sewage effluent. The County may charge t he Contractor for any cost incurred or penalties imposed on the County as a result of such spillage.

The wells to be tested are Injection Wells IW-l through IW-17 at the South District Wastewater Treatment Plant and IW-1N through IW-4N at the North District Wastewater Treatment! Plant

The Injection Wells have a 24-inch outside diameter (OD), 0.500-inch wall thickness injection casing set to total depths of 2,450 to 2,850 feet below land surface (bls), and were constructed with a nominal 22-inch diameter open borehole extending from the bottom of the casing to approximately 3,000 feet bls.
Except IW-5 at the SDWWTP, has a 20-inch outside diameter (OD), and 0.500 inch wall thickness.

The CONTRACTOR will perform internal and external mechanical integrity tests on the casings of twenty one deep injection wells and perform all appurtenant work in accordance with the above

Contract Documents.

The work shall be performed by a competent crew with equipment that is adequate to complete all phases of the testing and instruments of sufficient accuracy and resolution to identify anomalous responses to the tests. If the CONTRACTOR'S equipment is not capable of satisfactorily performing the work provided for in these specifications, the CONTRACTOR at his own expense shall substitute equipment.

The CONTRACTOR shall have not less than 5 years experience in constructing and testing wells and shall have tested not less than 5 wells of similar type and capacity. The CONTRACTOR shall be licensed by the State of Florida and the license number shall be affixed to all correspondence and reports.

All work shall comply with and be in full conformance with this Mechanical Integrity Test Plan submitted to FDEP together with subsequent response letters for the injection wells at the South and North District Wastewater Treatment Plants and with the appropriate sections of Chapter 62-528 FAC.

If remedial work or re-testing is required prior to final acceptance of the work to meet regulatory requirements and the specifications of the Contract Documents due to defective materials, accident, loss of equipment or equipment malfunction, or for any other cause directly attributable to the CONTRACTOR's actions, the CONTRACTOR shall bear the entire cost of the remediation or re-testing, including all additional materials, labor, and equipment required and any necessary additional Engineering costs. In the event of a problem, the ENGINEER shall be notified immediately, and the following shall apply:

1. The CONTRACTOR shall propose a method of correcting the problem, in writing, to The ENGINEER, who shall review the method of corrective action, and accept the plan in writing before work can proceed.

2. All work on the well must be in accordance with all applicable local, state and federal regulations.

The CONTRACTOR shall notify the ENGINEER a minimum of 72 hours prior to conducting the pressure test, geophysical logging and the radioactive tracer survey so that the ENGINEER and regulatory agency staff can be properly notified.

The CONTRACTOR shall provide all facilities, equipment and materials required for the removal of waste fluids from the well site.

The CONTRACTOR shall kill the well using a dense food- grade salt solution. No barite or mud-based additives shall be used in the well.

The CONTRACTOR shall comply with the OSHA regulations contained in 29CFR Section 1910 for General Industry Regulations and 29CFR Section 1926 for Construction Regulations.

Equipment and Procedures

1. Wellhead Assembly: The stripper head assembly used during the video survey, Geophysical logging, and the radioactive survey shall be bolted to the wellhead above the 6-inch gate valve. The stripper head assembly used must be of sufficient length to house the longest of the wire line tools used for the testing between the gate valve and the pack-off mounted at the top of the assembly. The pack-off must be adjusted so that the tools can be moved freely up and down the well with minimal leakage from the well. The assembly shall include a 4-inch valve and tee, which will be used to inject potable water during the surveys. The assembly shall be fitted with a

pressure gauge for use during the tests.

2. Wellhead Hardware: Should the nuts and/or bolts at the wellhead assembly become stripped during the CONTRACTOR's efforts, the CONTRACTOR shall replace them with equivalent hardware.

3. Water Line: The CONTRACTOR shall provide a potable water supply line for use during the video surveys. This line shall be connected to the existing 4-inch valve on the CONTRACTOR's stripper head. It shall be equipped with a check value to prevent the backflow of effluent into the water supply source. It shall also be equipped with a continuous recording digital flow meter and totalizer capable of measuring flows accurately in the range of 0 to 250 gpm.

Mechanical Integrity Testing (MIT)

The mechanical integrity testing under this Contract shall be accomplished using the following methods and general sequence, however the Contractor shall submit a more detailed sequence to the Engineer for approval before he begins work. The Contractor shall use extreme caution to prevent any loss of equipment, tools or other items into the wells and shall be fully responsible for retrieving any such items immediately, at no expense to the Department. All pressure tests must be conducted in the presence of the Engineer or his authorized representative.

MIT Clean and Pressure Test the Casing

1. The Contractor shall set up all equipment required to prepare for suppressing the density differential pressure, cleaning, performing the pressure test and the radioisotope and closed circuit television surveys.

2. The Contractor shall inject sufficient salt solution into the well to balance the differential pressure and disassemble the wellhead. The brine solution shall remain in the well during the cleaning and pressure testing steps, after which time it shall be transferred to another well if clean enough for reuse, or shall otherwise be disposed of by the Contractor. Under no circumstances shall brine solution be spilled or disposed of on the ground surface, however it may be disposed of into the injection well.

3. The Contractor shall clean the casing before proceeding with the pressure test. The entire length of casing shall be cleaned. If the later television survey indicates insufficient cleaning, the well shall be re-cleaned by the Contractor, at his expense, to the satisfaction of the Engineer. If the television survey must be repeated because of insufficient cleaning, in the opinion of the Engineer, it shall also be at the Contractor's expense.

4. The Contractor shall, when requested by the Engineer, place the packer through a stand-pipe with a packoff device to a point near the top of the well (but within the concrete encasement area) and test its integrity. This shall be accomplished as described in Steps 6, 7, and 8 below. If the packer fails the integrity test it shall be replaced with one that will meet the test. The Engineer is aware that packers have limited inflation cycles and will attempt to minimize the verification of packer operation. However, any integrity failure for which the packer operation can not be eliminated must be repeated at the Contractor's cost. It is anticipated that each new packer will be tested at the wellhead to verify its capacity to seat and deflate.

5. The Contractor shall lower and place the packer to a point within the lower 40 feet of the casing, but not the last 10 feet. The CONTRACTOR will be responsible to assure the proper seating of the packer. A preliminary test shall be performed to ensure proper operation of the test set-up. The CONTRACTOR shall notify the ENGINEER at least 24 hours before running the preliminary test. The test will be run following the same test program as the actual pressure test, as described below. IW-2 at SDWWTP will have the packer placed within 40 feet of the tear in the casing.

6. The Contractor shall inflate the packer to a pressure not exceeding 350 psig over the static condition as measured at the wellhead on a calibrated gauge to create a positive seal.

7. The Contractor shall pressurize the casing to 150 psig with no air in the casing or wellhead. The pressure shall be recorded on a chart and signed by the Engineer, the Contractor and any witnesses present. The pressure test gauge shall be calibrated within 6 months of performing the pressure test. The CONTRACTOR must present proof of calibration of the pressure gauge to the ENGINEER and FDEP staff at the time of testing each well. The pressure gauge must be mounted at or near eye level in order to ensure maximum visibility.

8. The test will be considered successful if the pressure does not change more than 5% psi in one hour.

9. If the test fails, the Contractor shall move the packer upwards for approximately 10 feet, and repeat Steps 6, 7 and 8.

10. If the test still fails, additional repositioning of the packer and repeating of Steps 6, 7 and 8 shall be as ordered by the Engineer. If the test still fails, and subsequent radioisotope surveys indicate no casing failure, it will be presumed that the Contractor's packer did not create a positive seal, and the Contractor shall be required to repeat Steps 4 through 8 at his expense. No payments will be made to the Contractor if it is subsequently determined that the test failure was caused by the seating of the packer. If the packer fails during packer operation verification, it will be concluded that the packer was faulty during any previous test that did not demonstrate casing integrity. The Contractor shall repeat this test at his expense.

11. After pressure testing, measure the depressurization bleed down with a 5 gallon bucket upon release of the pressure in the casing. The bleed down fluid will be properly disposed of by the Contractor.

12. The Contractor shall deflate the packer and withdraw it from the casing.

13. The Contractor shall reassemble the wellhead and connecting piping using new gaskets.

14. Prior to geophysical logging, the fluid used to "kill" the well, or for pressure testing the casing shall be flushed from the well and the well will be shut-in for a minimum of 12 hours.

MIT Video Surveys

A Video Survey inside the injection well casing be performed using the following procedures.

.A 6-inch diameter stripper head assembly will be bolted to the wellhead assembly above the existing 6-inch diameter gate valve. The stripper head will be of dimensions that allow the video operator to put his camera between the gate valve and the pack off and close both the valve and the pack off. The lower part of the assembly shall consist of a 4-inch tee and valve through which potable water may be introduced into the well.
.
Prior to performance of the survey and for a period of 24 hours, fresh water from an adjacent fire hydrant will be introduced into the well through a 4-inch diameter valve located on the stripper head assembly. Fresh water shall be pumped into the well to provide clarity for the survey.

3. If, after 24 hours of pumping potable water into the well, the water quality does not permit a clear picture of the inside of the well, the CONTRACTOR may be required to perform additional pumping services to assure a good survey as specified above.

4. The pumping of the potable water will continue at a rate of approximately 0 to 250 gpm during video surveying. If the open hole portion of the well is not clean, or visibility in any part of the well is poor, the CONTRACTOR shall perform additional pumping services to ensure a good video survey before running another or continuing with the survey.

5. During the video survey, the CONTRACTOR shall stop the camera's progress as instructed by the ENGINEER at depths where there may be potential flaws in the casing or other features to allow for thorough examination at those locations.

Upon reaching the total depth of the well with the video camera and obtaining a video survey satisfactory to the ENGINEER, the camera shall be removed from the well, and the well placed back in service.

MIT Radioisotope Tracer Survey and Temperature Survey

A radioisotope tracer survey shall be used to detect any fluid movement outside of the injection casing from the injection zone into the overlaying aquifers. The tool configuration shown below, or approved equal is required. The tool must be capable of ejecting the radioactive tracer and simultaneously monitoring the gamma ray sensors. No time lag between ejection and monitoring is permitted. A casing collar locator (CCL) shall be positioned below the tool as shown below, to precisely locate the bottom of the casing. Two low flow dynamic test runs, shall be performed. Additional low flow dynamic test runs can be done if results warrant additional testing, as determined by the ENGINEER in consultation with FDEP staff.

A temperature survey log shall also be performed from land surface to the total depth of the well. The temperature log shall be performed logging down at a rate of not more than 60 feet per minute. The temperature survey shall be performed after the well has been "shut in" and stabilized for at least 12 hours prior to the dynamic and static tests.

The Contractor shall perform an initial background gamma ray survey extending from the base of the land surface to the total depth of the well. The background gamma ray log shall be taken at a rate of not more than 60 feet per minute.

After the dynamic tests are completed, another background gamma ray survey shall be taken from the base of the casing to the base of the intermediate casing.

If additional radioisotope tracer survey work is ordered by the Engineer, it will be paid for at the hourly price proposed for additional radioisotope tracer surveys.

Radioactive Tracer Survey (RTS)

A RTS will be performed in the injection well. The tool used for testing will be configured according to information to be supplied by the service company performing the logs and as approved by the ENGINEER. Below is an example of a typical RTS tool that will be used for these surveys. The CONTRACTOR will provide a specific tool configuration with the logs.

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)
			CHD-SDSCHD (SDS) Cable Head	1.00	1.50	5.00
GR#3	23.83					
			GR #3 -GR#3 (GR#3_T) GR#3_TOP	9.33	1.69	50.00
			TREJCT-A (RTS) EJECTOR 14.5' FROM TOOL BOTTOM	3.00	1.69	10.00
			GR #2 -GR#2 (GR#2_M) GR#2_MIDDLE	3.58	1.69	25.00
GR#2	11.17					
CCL	9.63		CCL-000 (000001) RTS_CCL	0.75	1.69	5.00
			TRDET-GR#1 (GR#1_B) GR#1_BOTTOM	8.67	1.69	50.00
GR#1	0.58		TEMP-11116Temp (11116HT)	0.58	1.69	5.00
TEMP	0.17		RTS_TEMP			

Dataset: sdiw1.db: field/well/run1/FINBK
Total Length: 26.92 ft
Total Weight: 150.00 lb
O.D. 1.69 in

RTS tool Typical Configuration

The sequence of the tests shall be as follows:

First Low Flow Dynamic: The low flow run of the radioactive tracer survey shall be performed with a pumping-in velocity of 3 to 5 feet per minute. This would require a volume of between 65 gpm and 108 gpm to be injected during the survey. This is for the 24 inch wells, for Well I-5, which has a 20 inch casing this volume is 44 gpm and 73 gpm. Potable water from the same source as used for the video survey would be used as the most appropriate water supply for this portion of the test.

1) After beginning the flow of water into the well, the tool will be placed at a depth of approximately 5 feet above the base of the final casing, and a slug of 2 millicuries radioactive Iodine 131 is ejected. The tool will remain in place for a period of approximately one hour and the three gamma ray detectors in the "time drive" mode will record the movement of the slug. If tracer is detected at the uppermost detector, indicating potential staining of the tool, the tool may be moved upward to an alternate location.

2) After the one hour waiting period, a log out-of-position will be performed between the ejection point and a minimum of 200 feet above the highest point of tracer detection.

3) Upon completion of logging, the casing will be flushed with 3 to 5 casing volumes of effluent.

4) After flushing, the tool will immediately be run to the base of the casing, then the interval between the ejection point and 200 feet above the highest point of tracer detection will be logged.

Second Low Flow Dynamic: The process described above for the low flow dynamic log will be repeated to include a log out-of-position, a casing flush, and an after flush pass. A slug of tracer greater than or equal to 3 millicuries shall be used as determined by the ENGINEER.

If, during testing, no apparent anomalies appear that may indicate a lack of mechanical integrity in the injection well, the RTS will be concluded. If anomalies do occur, the RTS will be altered to track the radioactive tracer material. After RTS is complete, the RTS tool will be discharged in the injection zone and the well shall be flushed with 3 to 5 volumes of effluent. A second background log will be run from the bottom to the top of the well.

MIT Deadlines (sorted by date MIT pressure test due)

SDWWTP MIT Schedule of Completion

Well	Pressure Test	RTS/Video
IW-2	7/13/2013	7/25/2013
IW-1[1]	7/20/2013	7/31/2013
IW-3	7/24/2013	8/7/2013
IW-9[1]	7/30/2013	8/12/2013
IW-10[1]	8/6/2013	8/21/2013
IW-11	8/20/2013	9/3/2013
IW-12	8/25/2013	9/19/2013
IW-14	9/9/2013	9/26/2013
IW-13	9/16/2013	10/6/2013
IW-4	9/25/2013	10/14/2013
IW-6	9/30/2013	10/20/2013
IW-5	10/19/2013	10/27/2013
IW-7[2]	10/26/2013	1/7/2014
IW-8	11/2/2013	11/12/2013
IW-17	11/11/2013	11/19/2013
IW-16	11/18/2013	12/9/2013
IW-15	12/3/2013	12/16/2013

NOTES:
1.The original video was not clear enough and therefore a new video was done at the end of the MITs at SDWWTP.
2.The Computer failed during the RTS, because the Iodine 131 had already been injected, FDEP and DOH required 46 days b/f the RTS could be redone.

NDWWTP MIT Schedule of Completion

Well	Pressure Test	RTS/Video
IW-1N	3/14/2014	3/26/2014
IW-2N	3/25/2014	4/9/2014
IW-3N	4/2/2014	4/17/2014
IW-4N	4/9/2014	4/24/2014

REPAIR PLAN:

The following repair plans apply to wells at SDWWTP and NDWWTP.

1. Kill well and remove 24 inch gate valve and 4 inch bypass valves. Remove 1 inch pressure transmitter line and weld hold closed. Please see drawings included in below.

2. Sand existing casing in concrete pits and coat with Bitumastic. Please see drawings included in below.

3. Chip concrete around outer casing 1 inch deep, in order to embed PVC sleeve. Please see drawings included in below.

4. Install C905 PVC sleeve around casing pipe, embed 1 inch deep and fill annular space with grout, using Type II Neat cement. Slope top edge to create 30 degree watershed and seal at edges with sealant. Please see drawings included in below.

5. Relocate 1 inch pressure transmitter as indicated in drawings. Weld the hole. Please see drawings included in below.

6. At the NDWWTP IW-1N, IW-3N and IW-4N install new magmeters with any necessary spool pieces to be field determined. Please see drawings included in below.

7. Reassemble wellheads including installation of new 24 inch butterfly valve on horizontal part of well. Mega flanges will be used to ensure the layout of the pipe and the vales match. Please see drawings included in below.

8. On IW-4N at NDWWTP, install electric actuator for butterfly valve at base of injection well. Please see drawings included in below.

Appendix B

FDEP Approval of MIT Plan for SDWWTP and NDWWTP

November 26, 2012

Villamil, Sonia (WASD)

From: May, Joseph [redacted]
Sent: Monday, November 26, 2012 2:40 PM
To: Villamil, Sonia (WASD)
Cc: Vandor, Heidi; Silverman, Mark; Walsh, Virginia (WASD); Goldenberg, Bertha M. (WASD); Fallon Jr., Howard J. (WASD); Arrebola, Vicente (WASD); Macfarlane, Maria (WASD); Oakley, Clint (WASD)
Subject: RE: MDWASD MIT and Repair Plan Submittal

Importance: High

Hello all,

The Department approves the plan with the following understandings:

1) Medicinal grade I-131 should be specified since this solution is filtered to reduce precipitate material, as opposed to regular grade I-131, in the vial causing a tool malfunction. It has been our experience that an activity of ~1mCi/ml has been the easiest to work with in the field.
2) Please contact me a minimum of three days prior to mobilization to each site. Due to the travel time from West Palm Beach to the sites close coordination would be appreciated between myself and a designated contact person from the utility so that each pressure and RTS can be witnessed.

Thank you,

Joe

Please take a few minutes to share your comments on the service you received from the department by clicking on this link. DEP Customer Survey.

From: Villamil, Sonia (WASD) [mailto:[redacted]
Sent: Wednesday, October 17, 2012 9:42 AM
To: May, Joseph
Cc: Vandor, Heidi; Silverman, Mark; Walsh, Virginia (WASD); Goldenberg, Bertha M. (WASD); Fallon Jr., Howard J. (WASD); Arrebola, Vicente (WASD); Macfarlane, Maria (WASD); Oakley, Clint (WASD)
Subject: MDWASD MIT and Repair Plan Submittal

Hello Mr. May,

The MDWASD respectfully submits the attached MIT testing and repair plan for your approval. The paper copy is being sent via regular mail as well.

Thank you,

Sonia Villamil
Engineer II
Miami Dade Water and Sewer Department
3071 SW 38th Ave Room 554-8
Miami, FL 33146
[redacted]
fax: 786-552-8640
miamidade.gov

Appendix C

Field Notes from tests including gauge certification and pressure charts.

MIAMI-DADE WATER AND SEWER DEPARTMENT

MECHANICAL INTEGRITY TESTING OF DEEP INJECTION WELLS AND ASSOCIATED SERVICES

BID NO.: RPQ P0086

PRESSURE TEST IW - 10

June 28, 2013

TIME	CASING PRESSURE (psi)	PACKER PRESSURE (psi)
8:47	154	380
8:52	154	380
8:57	153+	380
9:02	153	380
9:07	153	380
9:12	152.5	380
9:17	152.5	380
9:22	152	380
9:27	152	380
9:32	151.5	380
9:37	151	380
9:42	150	380
9:47	150	380

MIAMI-DADE WATER AND SEWER DEPARTMENT

MECHANICAL INTEGRITY TESTING OF DEEP INJECTION WELLS AND ASSOCIATED SERVICES

BID NO.: RPQ P0086

BREAK OFF TEST IW - 10

June 28, 2013

GALLONS	CASING PRESSURE (psi)	PACKER PRESSURE (psi)
0	~~125~~ 150	380
5	~~91~~ 123	~~360~~ 370
10	91	360
15	70	340+
20	~~45~~ 44	320
25	18	315
~~30~~ 29	0	310

Top of Packer: _____ feet

Bottom of Casing: _____ feet

MIAMI-DADE WATER AND SEWER DEPARTMENT

MECHANICAL INTEGRITY TESTING OF DEEP INJECTION WELLS AND ASSOCIATED SERVICES

BID NO.: RPQ P0086

PRESSURE TEST IW - 10

WITNESS LIST

June 28, 2013

NAME	SIGNATURE	COMPANY/AGENCY	[redacted]
Sonia Villamil	[redacted]	WASD	
Maria MacFarlane		WASD	
Joe May		FDEP	
CHRIS PARP		YBI	

Miami Dade South District

Date: 6-26-13 WED

IW# 10

Packer Tally 2412.87

Joint #	Length (ft.)	Total Length (ft)	Joint #	Length (ft.)	Total Length (ft)	Joint #	Length (ft.)	Total Length (ft)
1	31.25	31.25	35	30.78	1071.98	68	30.68	2082.55
2	30.62	61.87	36	30.57	1102.55	69	30.57	2113.12
3	30.55	92.42	37	30.56	1133.11	70	30.6	2143.72
4	30.65	123.07	38	30.8	1163.91	71	30.55	2174.27
5	30.54	153.61	39	30.34	1194.25	72	30.53	2204.8
6	30.55	184.16	40	30.63	1224.88	73	30.8	2235.6
7	30.68	214.84	41	30.53	1255.41	74	30.63	2266.23
8	30.55	245.39	42	30.58	1285.99	75	30.53	2296.76
9	30.57	275.96	43	30.78	1316.77	76	30.6	2327.36
10	30.57	306.53	44	30.64	1347.41	77	30.63	2357.99
11	30.56	337.09	45	30.55	1377.96	78	30.56	2388.55
12	30.6	367.69	46	30.8	1408.76	79	30.56	2419.11
13	30.59	398.28	47	30.71	1439.47	80	30.67	2449.78
14	30.85	429.13	48	30.55	1470.02	81	30.6	2480.38
15	30.57	459.7	49	30.53	1500.55	82	30.71	2511.09
16	30.65	490.35	50	30.64	1531.19	83	30.65	2541.74
17	30.58	520.93	51	30.59	1561.78	84	30.55	2572.29
18	30.6	551.53	52	30.6	1592.38	85	30.55	2602.84
19	30.64	582.17	53	30.6	1622.98	86	30.63	2633.47
20	30.6	612.77	54	30.58	1653.56	87	30.74	2664.21
21	30.53	643.3	55	30.53	1684.09	88	30.82	2695.03
22	30.53	673.83	56	30.7	1714.79	89	30.69	2725.72
23	30.82	704.65	57	30.55	1745.34	90	30.6	2756.32
24	30.65	735.3	58	30.68	1776.02	91	30.6	2786.92
25	30.72	766.02	59	30.55	1806.57	92	30.72	2817.64
26	30.6	796.62	60	30.6	1837.17	93	30.53	2848.17
27	30.72	827.34	61	30.75	1867.92	94	30.74	2878.91
28	30.58	857.92	62	30.6	1898.52	95	30.67	2909.58
29	30.58	888.5	63	30.57	1929.09	96	30.63	2940.21
30	30.63	919.13	64	30.63	1959.72	97	30.57	2970.78
31	30.58	949.71	65	30.8	1990.52	98	30.6	3001.38
32	30.67	980.38	66	30.57	2021.09	99	30.53	3031.91
33	30.25	1010.63	67	30.78	2051.87	100	30.65	3062.56
34	30.57	1041.2						

Certificate of Calibration

OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

Ozone Industries, Inc.
Precision Measurement Equipment Division

Purchase Order #

Calibration Performed By:
OZONE INDUSTRIES, INC.
15551 PINE RIDGE RD.
FORT MYERS, FL 33908

For:
YOUNGQUIST BROTHERS, INC.
15465 PINE RIDGE RD.
FORT MYERS, FL 33908

EQUIPMENT INFORMATION:

Description: PRESSURE GAUGE
Manufacter: MCDANIELS
Model Number: 300PSI
Part Number: N/A
Range: 0-300 PSI

Serial Number: 972062-1
Customer I.D.:
Cust. Barcode: N/A
Cust. Location: N/A
Specifications: +/- 0.25% FS

Cal Date: 6/6/2013
Cal. Due Date: 8/5/2013
Cal. Interval 60 DAYS
Received: IN TOLERANCE
Calibration Result: PASS
Environmental Conditions: 74 DEG F / 20% H
Performed By: Daniel McKissick

Procedure: STANDARD

This is to certify that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure at the points tested (unless otherwise noted). It has been Calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration is in accordance with Ozone Industries, Inc Quality Assurance Manual. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

Calibration Remarks:
THIS UNIT WAS FOUND TO BE IN TOLERANCE AT THE TIME OF CALIBRATION.
PERFORMED ROUTINE CALIBRATION / CERTIFICATION

Standards Used to Calibrate Equipment:

Company	I.D.	Description	Last Cal.	Cal. Due Date
OZONE	A1731	EATON UPC5000 PNEUMATIC CALIBRATOR	12/12/2012	12/12/2013

Signatures:

Certified by:
Print: Daniel McKissick
Date: 06/06/13
[redacted]

Approved by:
Print: Daniel McKissick
[redacted]

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ØZONE
INDUSTRIES
CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

PH: 239-433-3400
FAX: 239-489-3877

CONTROL NO: 032509-1

CUSTOMER: YBI15465

CALIBRATION DATA FORM

MFR:	MCDANIELS	**DESCRIPTION**	PRESSURE GAUGE
MODEL NO:	300 PSI .25%	**TECHNICIAN:**	0030
SERIAL NO:	972062-1	**CAL. DATE:**	06/06/13
CUST. ID:	N/A	**DUE DATE:**	08/05/13

* IF NO "AS LEFT" READING IS SHOWN ON THIS CHART, IT MEANS THE UNIT WAS IN TOLERANCE AND THERE WERE NO ADJUSTMENTS MADE TO IT.

RANGE: 0-300 PSI

NOMINAL	AS FOUND	AS LEFT *	LOW LIMIT	HIGH LIMIT
50	50.26		49.25	50.75
100	100.31		99.25	100.75
150	150.38		149.25	150.75
200	200.49		199.25	200.75
300	300.6		299.25	300.75

Certificate of Calibration

OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

Ozone Industries, Inc.
Precision Measurement Equipment Division

Purchase Order #

Calibration Performed By:
OZONE INDUSTRIES, INC.
15551 PINE RIDGE RD.
FORT MYERS, FL 33908

For:
YOUNGQUIST BROTHERS, INC.
15465 PINE RIDGE RD.
FORT MYERS, FL 33908

EQUIPMENT INFORMATION:

Description: PRESSURE GAUGE
Manufacter: McDaniel
Model Number: 300PSI
Part Number: N/A
Range: 0-300 PSI

Serial Number: 972034-2
Customer I.D.:
Cust. Barcode: N/A
Cust. Location: N/A
Specifications: +/- 0.25% FS

Cal Date: 5/17/2013
Cal. Due Date: 11/17/2013
Cal. Interval 6 MONTHS
Received: IN TOLERANCE
Calibration Result: PASS
Environmental Conditions: 74 DEG F / 80% H
Performed By: Daniel McKissick

Procedure: STANDARD

This is to certify that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure at the points tested (unless otherwise noted). It has been Calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration is in accordance with Ozone Industries, Inc Quality Assurance Manual. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

Calibration Remarks:
THIS UNIT WAS FOUND TO BE IN TOLERANCE AT THE TIME OF CALIBRATION.
PERFORMED ROUTINE CALIBRATION / CERTIFICATION

Standards Used to Calibrate Equipment:

Company	I.D.	Description	Last Cal.	Cal. Due Date
OZONE	A1731	EATON UPC5000 PNEUMATIC CALIBRATOR	12/12/2012	12/12/2013

Signatures:

Certified by:
Print: Daniel McKissick
[redacted]

Approved by:
Print: Daniel McKissick
Date: [redacted] 05/17/13
[redacted]

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ØZONE
INDUSTRIES
CORPORATION

15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

PH: 239-433-3400
FAX: 239-489-3877

CONTROL NO: 100809-7

CUSTOMER: YBI15465

CALIBRATION DATA FORM

MFR:	PIC	**DESCRIPTION**	PRESSURE GAUGE
MODEL NO:	300 PSI .25%	**TECHNICIAN:**	0030
SERIAL NO:	972034-2	**CAL. DATE:**	05/17/13
CUST. ID:	N/A	**DUE DATE:**	11/17/13

* IF NO "AS LEFT" READING IS SHOWN ON THIS CHART, IT MEANS THE UNIT WAS IN TOLERANCE AND THERE WERE NO ADJUSTMENTS MADE TO IT.

RANGE: 0-300 PSI

NOMINAL	AS FOUND	AS LEFT *	LOW LIMIT	HIGH LIMIT
50	49.59		49.25	50.75
100	99.47		99.25	100.75
150	149.45		149.25	150.75
200	199.43		199.25	200.75
300	299.4		299.25	300.75

Certificate of Calibration

OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

Ozone Industries, Inc.
Precision Measurement Equipment Division

Purchase Order #

Calibration Performed By:
OZONE INDUSTRIES, INC.
15551 PINE RIDGE RD.
FORT MYERS, FL 33908

For:
YOUNGQUIST BROTHERS, INC.
15465 PINE RIDGE RD.
FORT MYERS, FL 33908

EQUIPMENT INFORMATION:

Description: PRESSURE GAUGE
Manufacter: MCDANIELS
Model Number: 300PSI
Part Number: N/A
Range: 0-300 PSI

Serial Number: AB30128
Customer I.D.:
Cust. Barcode: N/A
Cust. Location: N/A
Specifications: +/- 0.25% FS

Cal Date: 6/17/2013
Cal. Due Date: 12/17/2013
Cal. Interval 6 MONTHS
Received: IN TOLERANCE
Calibration Result: PASS
Environmental Conditions: 73 DEG F / 40% H
Performed By: Daniel McKissick

Procedure: STANDARD

This is to certify that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure at the points tested (unless otherwise noted). It has been Calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration is in accordance with Ozone Industries, Inc Quality Assurance Manual. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

Calibration Remarks:
THIS UNIT WAS FOUND TO BE IN TOLERANCE AT THE TIME OF CALIBRATION.
PERFORMED ROUTINE CALIBRATION / CERTIFICATION

Standards Used to Calibrate Equipment:

Company	I.D.	Description	Last Cal.	Cal. Due Date
OZONE	A1731	EATON UPC5000 PNEUMATIC CALIBRATOR	12/12/2012	12/12/2013

Signatures:

Certified by:
Print: Daniel McKissick
Date: 06/17/13
[redacted]

Approved by:
Print: Daniel McKissick
Date: 06/17/13
[redacted]

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OZONE
INDUSTRIES
CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

PH: 239-433-3400
FAX: 239-489-3877

CONTROL NO: 080709-2

CUSTOMER: YBI15465

CALIBRATION DATA FORM

MFR:	MCDANIELS	**DESCRIPTION**	PRESSURE GAUGE
MODEL NO:	300 PSI .25%	**TECHNICIAN:**	0030
SERIAL NO:	AB30128	**CAL. DATE:**	06/17/13
CUST. ID:	N/A	**DUE DATE:**	12/17/13

* IF NO "AS LEFT" READING IS SHOWN ON THIS CHART, IT MEANS THE UNIT WAS IN TOLERANCE AND THERE WERE NO ADJUSTMENTS MADE TO IT.

RANGE: 0-200 PSI

NOMINAL	AS FOUND	AS LEFT *	LOW LIMIT	HIGH LIMIT
50	50.18		49.25	50.75
100	100.19		99.25	100.75
150	150.22		149.25	150.75
200	200.31		199.25	200.75
250	250.33		249.25	250.75
300	300.39		299.25	300.75

MIAMI DADE 6-26-13 WED

SOUTH DISTRICT

IW 10 CASING @ 2425'

PACKER	10.32' ℄
78 JT'S	2388.55'
6' PUP JT	6.00'
8' PUP JT	8.00'
	2412.87' ℄ OF PACKER DURING THE TEST.

2421.10' BOTTOM OF BRUSH DURING THE TEST.

2425' EXTENT OF BRUSHING.

IW-10 PT

	Field Cal Date	unknown	unknown
Rec #	**Date/Time**	**Temperature(degF)**	**Pressure(psi)**
1	6/28/2013 8:46:10	83.2	154.903
2	6/28/2013 8:47:10	84.9	154.841
3	6/28/2013 8:48:10	86.2	154.771
4	6/28/2013 8:49:10	87.5	154.712
5	6/28/2013 8:50:10	88.6	154.644
6	6/28/2013 8:51:10	89.4	154.579
7	6/28/2013 8:52:10	90.3	154.512
8	6/28/2013 8:53:10	90.9	154.438
9	6/28/2013 8:54:10	91.6	154.373
10	6/28/2013 8:55:10	92.2	154.309
11	6/28/2013 8:56:10	92.5	154.246
12	6/28/2013 8:57:10	92.6	154.175
13	6/28/2013 8:58:10	92.6	154.104
14	6/28/2013 8:59:10	92.6	154.033
15	6/28/2013 9:00:10	92.7	153.961
16	6/28/2013 9:01:10	92.7	153.901
17	6/28/2013 9:02:10	93.1	153.828
18	6/28/2013 9:03:10	93.4	153.765
19	6/28/2013 9:04:10	93.4	153.705
20	6/28/2013 9:05:10	93.6	153.633
21	6/28/2013 9:06:10	94.1	153.559
22	6/28/2013 9:07:10	94	153.499
23	6/28/2013 9:08:10	93.8	153.429
24	6/28/2013 9:09:10	93.4	153.36
25	6/28/2013 9:10:10	93.3	153.29
26	6/28/2013 9:11:10	93.3	153.229
27	6/28/2013 9:12:10	93.3	153.158
28	6/28/2013 9:13:10	93.3	153.087
29	6/28/2013 9:14:10	93.3	153.017
30	6/28/2013 9:15:10	93.8	152.953
31	6/28/2013 9:16:10	93.8	152.883
32	6/28/2013 9:17:10	93.9	152.821
33	6/28/2013 9:18:10	93.5	152.752
34	6/28/2013 9:19:10	93.3	152.682
35	6/28/2013 9:20:10	93.5	152.62
36	6/28/2013 9:21:10	93.8	152.548
37	6/28/2013 9:22:10	94	152.486
38	6/28/2013 9:23:10	94.1	152.415
39	6/28/2013 9:24:10	94	152.355
Rec #	**Date/Time**	**Temperature(degF)**	**Pressure(psi)**

40	6/28/2013 9:25:10	94.2	152.283
41	6/28/2013 9:26:10	94.1	152.212
42	6/28/2013 9:27:10	93.9	158.813
43	6/28/2013 9:28:10	93.5	152.074
44	6/28/2013 9:29:10	93.6	152.012
45	6/28/2013 9:30:10	93.9	151.95
46	6/28/2013 9:31:10	94.2	151.888
47	6/28/2013 9:32:10	94.8	151.824
48	6/28/2013 9:33:10	94.7	151.754
49	6/28/2013 9:34:10	94.4	151.684
50	6/28/2013 9:35:10	94.5	151.613
51	6/28/2013 9:36:10	94.8	151.541
52	6/28/2013 9:37:10	94.7	151.491
53	6/28/2013 9:38:10	94.7	151.42
54	6/28/2013 9:39:10	94.7	151.359
55	6/28/2013 9:40:10	94.5	151.289
56	6/28/2013 9:41:10	94.5	151.228
57	6/28/2013 9:42:10	94.5	151.1567
58	6/28/2013 9:43:10	94.7	151.096
59	6/28/2013 9:44:10	94.9	151.024
60	6/28/2013 9:45:10	95	150.962
61	6/28/2013 9:46:10	95.1	150.901
62	6/28/2013 9:47:10	95.4	150.839
63	6/28/2013 9:48:10	95.4	150.768
64	6/28/2013 9:49:10	95.7	150.706
65	6/28/2013 9:50:10	95.4	131.995
66	6/28/2013 9:51:10	95.2	123.602
67	6/28/2013 9:52:10	95.1	83.778
68	6/28/2013 9:53:10	95	97.053
69	6/28/2013 9:54:10	94.5	63.903
70	6/28/2013 9:55:10	93.8	70.952
71	6/28/2013 9:56:10	93.6	51.155
72	6/28/2013 9:57:10	93.8	35.824
73	6/28/2013 9:58:10	93.9	23.288
74	6/28/2013 9:59:10	94.1	13.628
75	6/28/2013 10:00:10	94.3	9.982
76	6/28/2013 10:01:10	94.3	4.069
77	6/28/2013 10:02:10	94.2	0.586
78	6/28/2013 10:03:10	94.1	0

Appendix D

RTS and RTS Tool Configuration

RADIOACTIVE TRACER SURVEY LOG

Company	SOUTH DISTRICT W.W.T.P
Well	IW-10
Field	S.D.W.W.T.P
County	MIAMI-DADE
State	FLORIDA

Company SOUTH DISTRICT W.W.T.P
Well IW-10
Field S.D.W.W.T.P
County MIAMI-DADE
State FLORIDA

Location: API # :

Other Services: SEE COMMENTS

	SEC	TWP	RGE	Elevation
Permanent Datum		GL		Elevation
Log Measured From		GL		K.B.
Drilling Measured From		GL		D.F.
				G.L.

Date	03-JUI-2013		
Run Number	MIT2013		
Depth Driller	3028'		
Depth Logger	2714'		
Bottom Logged Interval	2714'		
Top Log Interval	SURFACE		
Open Hole Size	24"		
Type Fluid	WATER		
Density / Viscosity	NA		
Max. Recorded Temp.	NA		
Estimated Cement Top	NA		
Time Well Ready	ON ARRIVAL		
Time Logger on Bottom	0930		
Equipment Number	103		
Location	FT. MYERS		
Recorded By	RIVES	MOREY	
Witnessed By	S. VILLAMIL	J. MAY	M. MACFARLANE

Borehole Record				Borehole Record			
Run Number	Bit	From	To	Run No	Bit	From	To

Casing Record	Size	Wgt/Ft	Top	Bottom
Surface String				
Prot. String				
Production String				
Liner	24"	.500 W.T	SURFACE	2428

<< Fold Here >>>

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

Comments

HIGH RESOLUTION TEMPERATURE LOG

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)

GR#3	24.00				
		GR #3 -RTST (951T)	11.50	1.69	30.00
		TREJCT-A (951)	1.00	1.69	10.00
		GR #2 -RTSM (952M)	3.00	1.69	10.00
GR#2	10.50				
CCL	9.60	CCL-1.68GRRTS (952)	0.75	1.69	10.00
		GR-RTSB (952B)	9.25	1.69	10.00
GR	1.20				

Dataset: sdwwtp-iw-10.db: field/well/run1/pass11
Total Length: 25.50 ft
Total Weight: 70.00 lb
O.D. 1.69 in

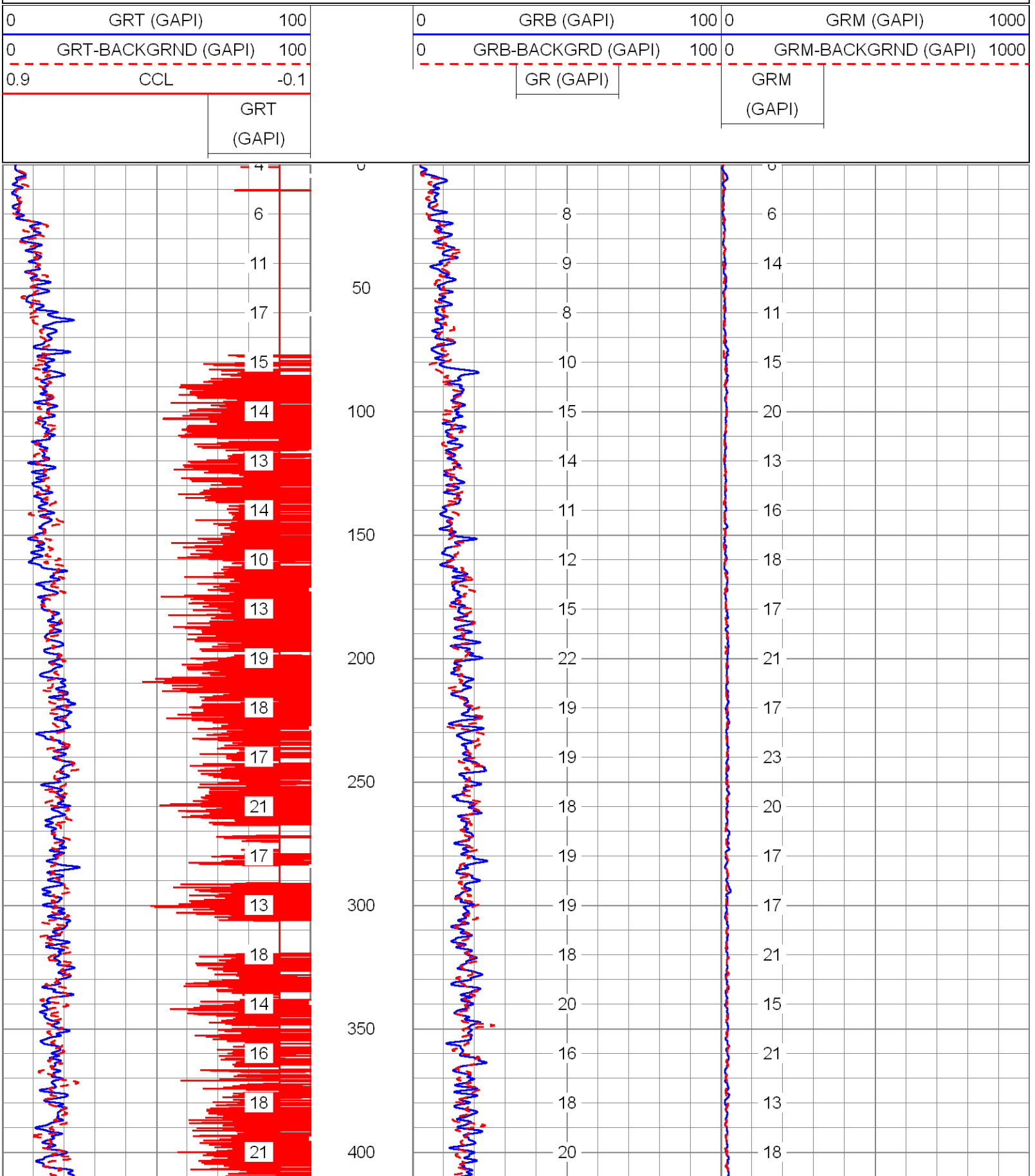
YOUNGQUIST

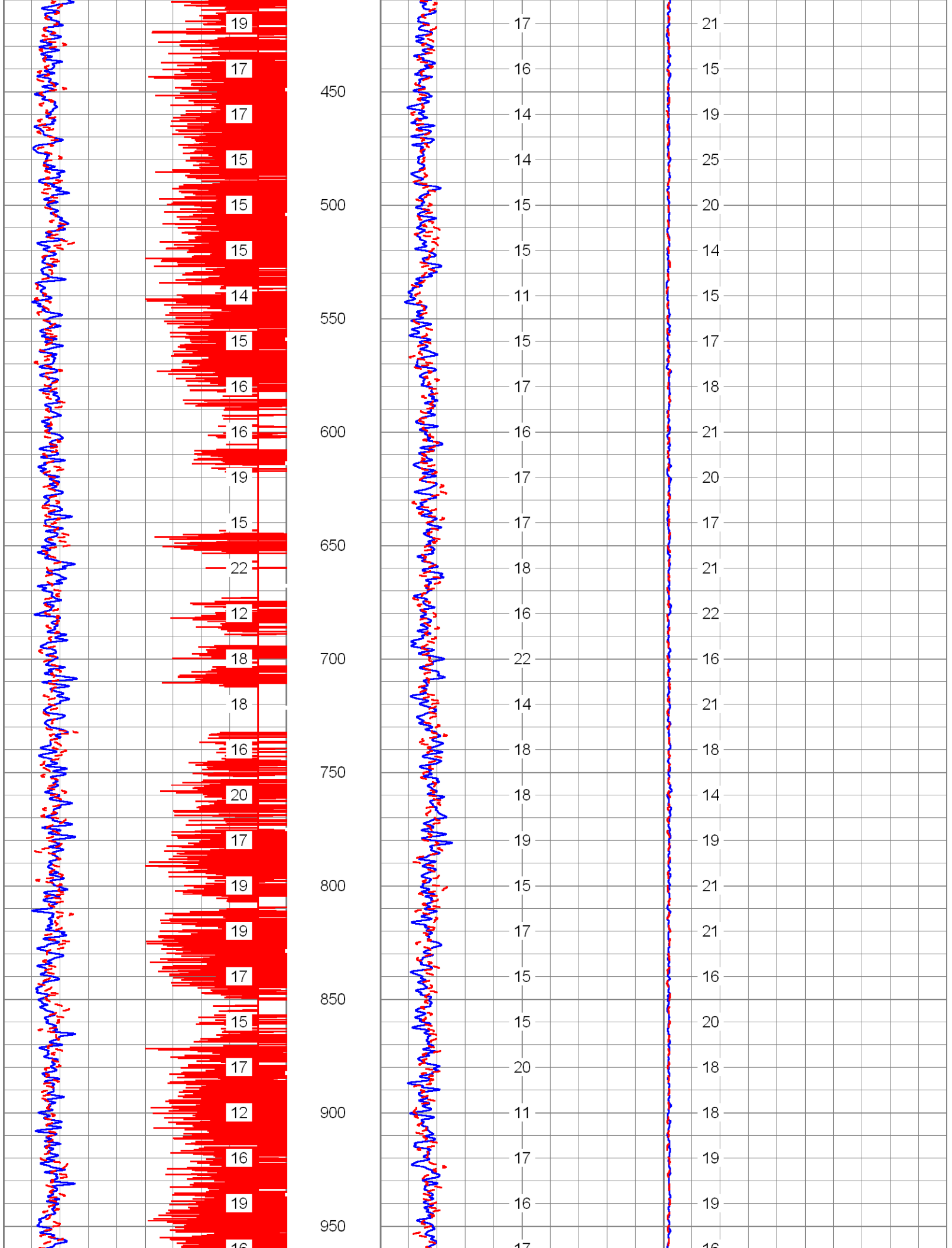
FINAL BACKGROUND

YOUNGQUIST BROTHERS

FINAL BACKGROUND

Database File:	sdwwtp-iw-10.db
Dataset Pathname:	pass18
Presentation Format:	rts
Dataset Creation:	Wed Jul 03 16:14:54 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:600

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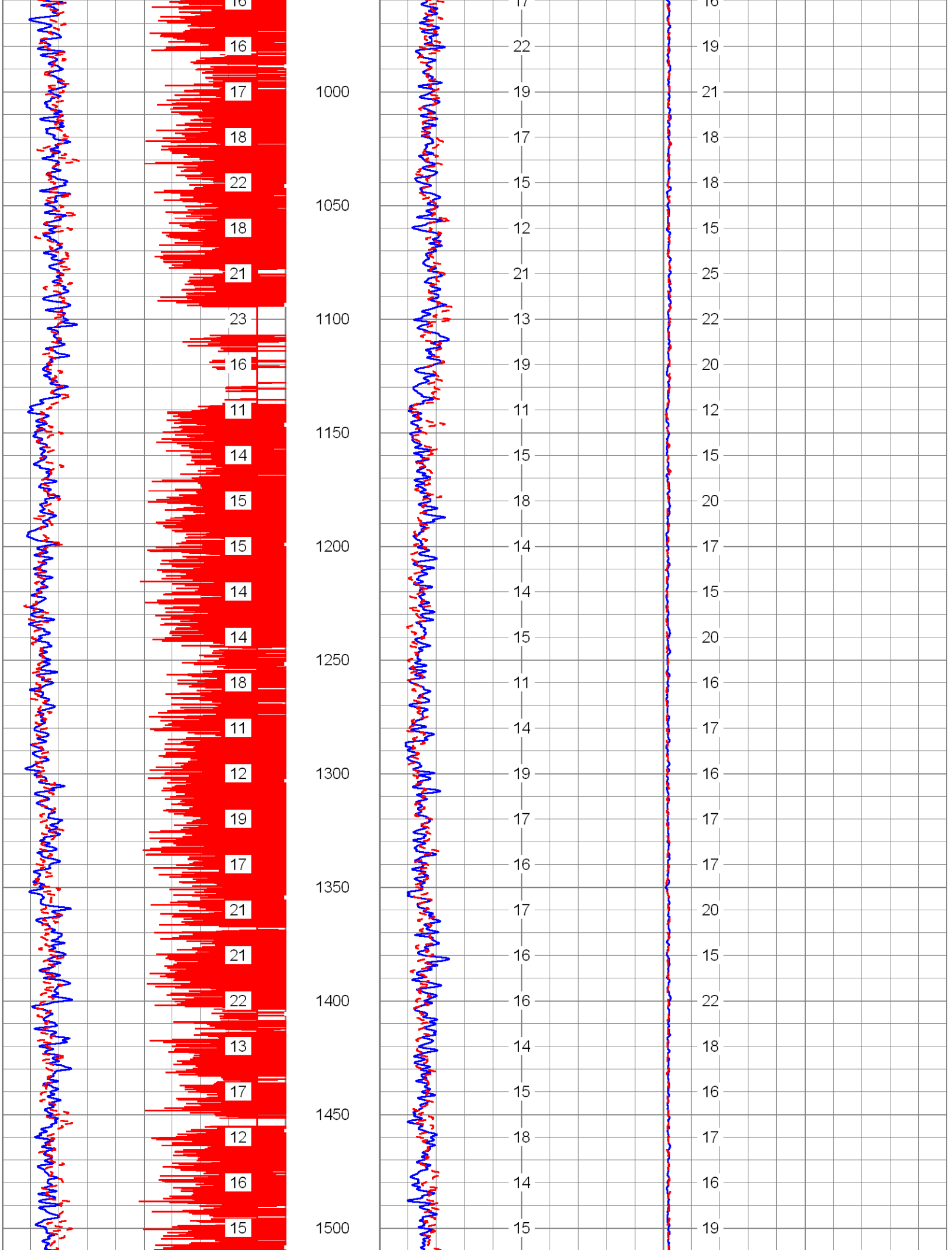
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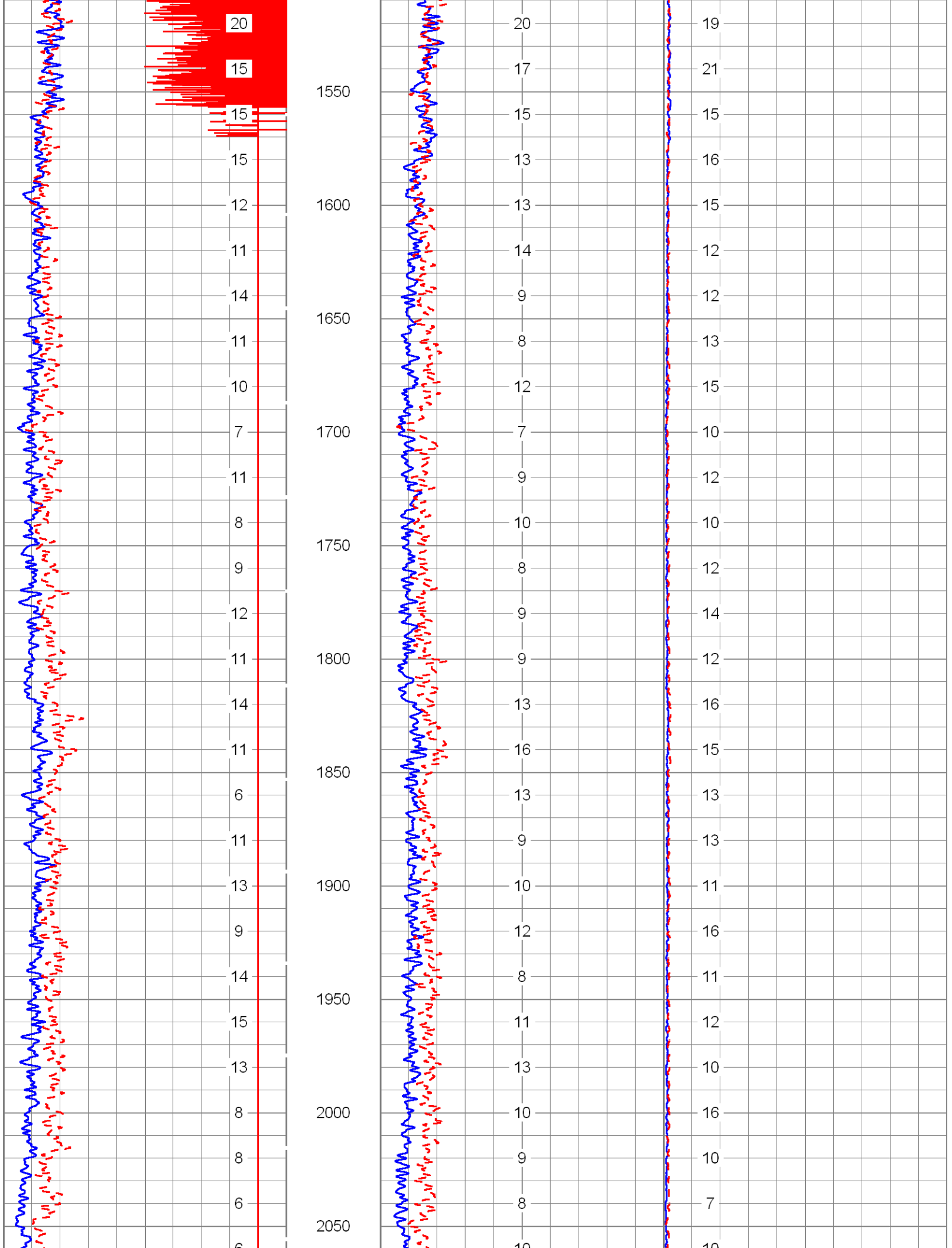
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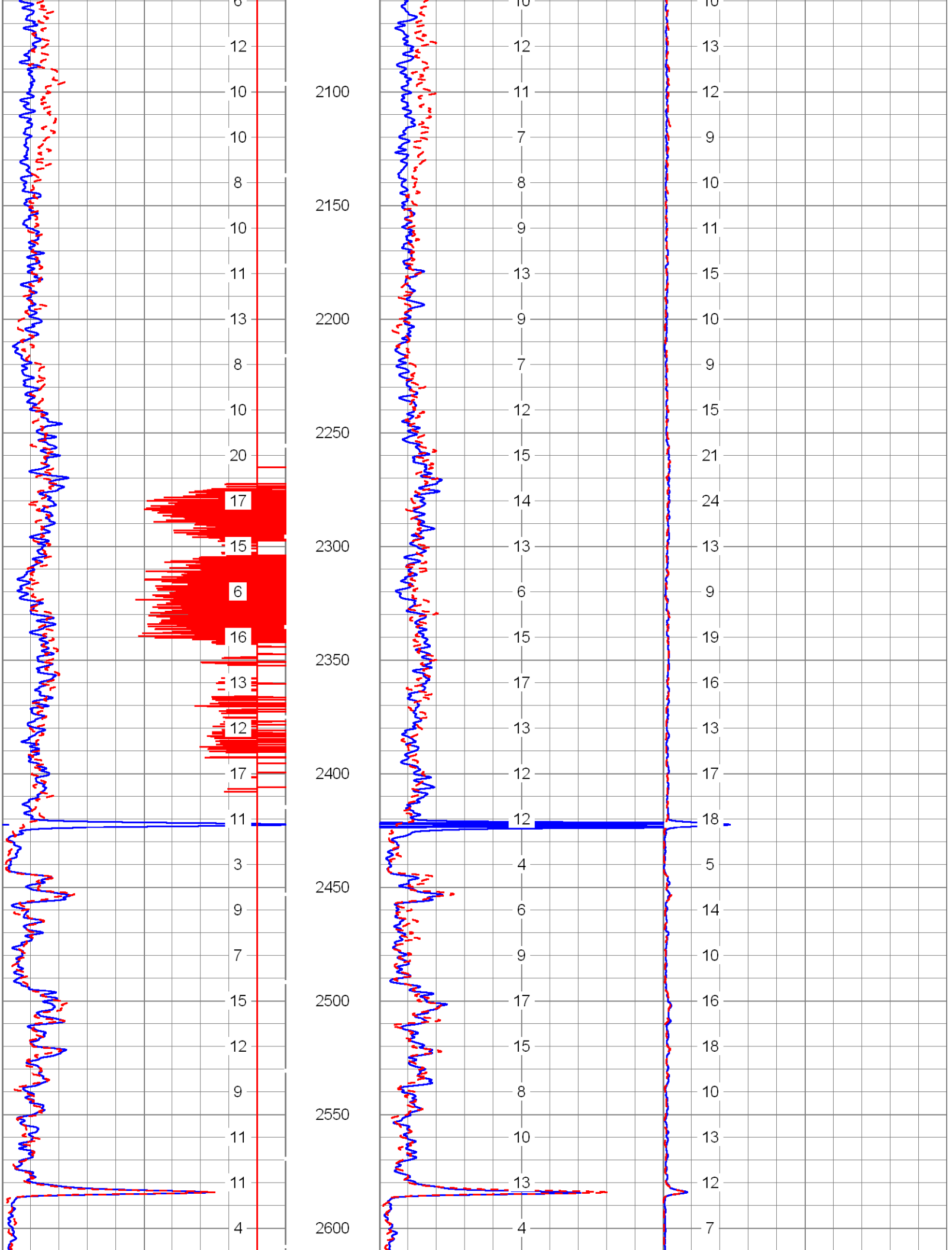
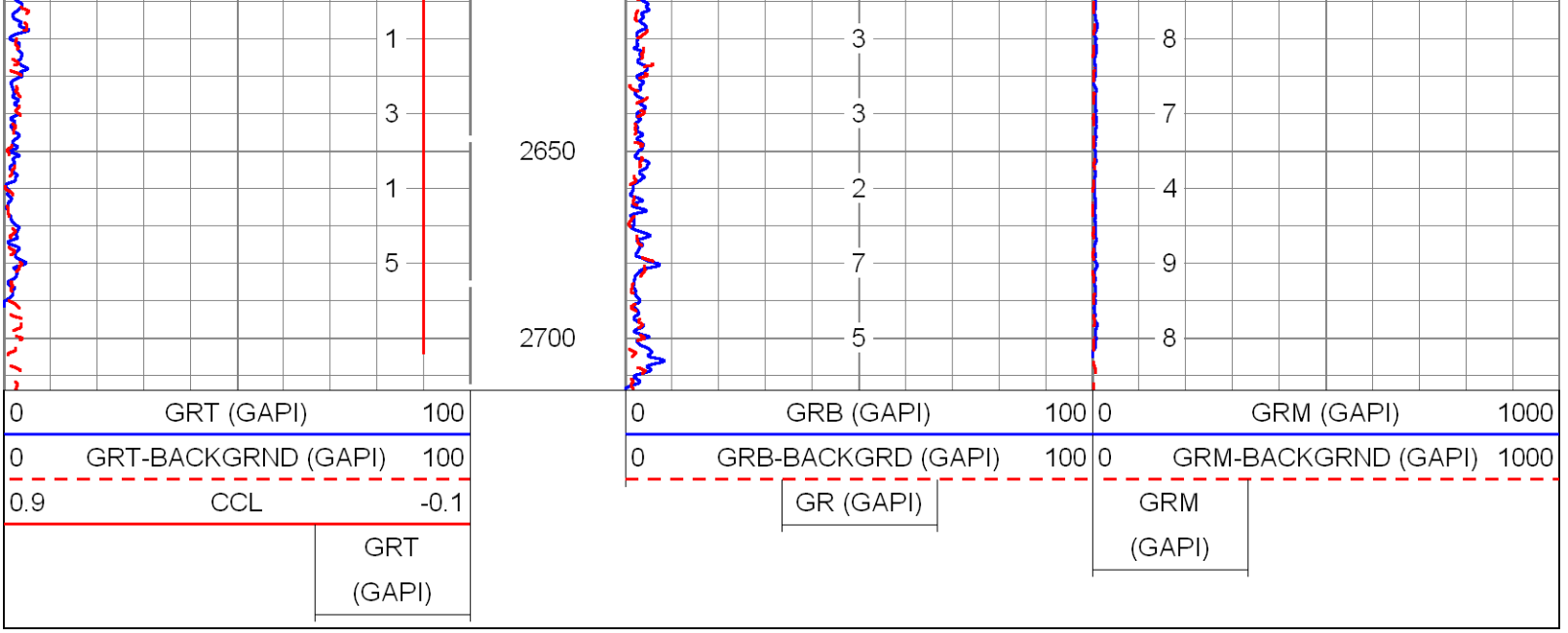
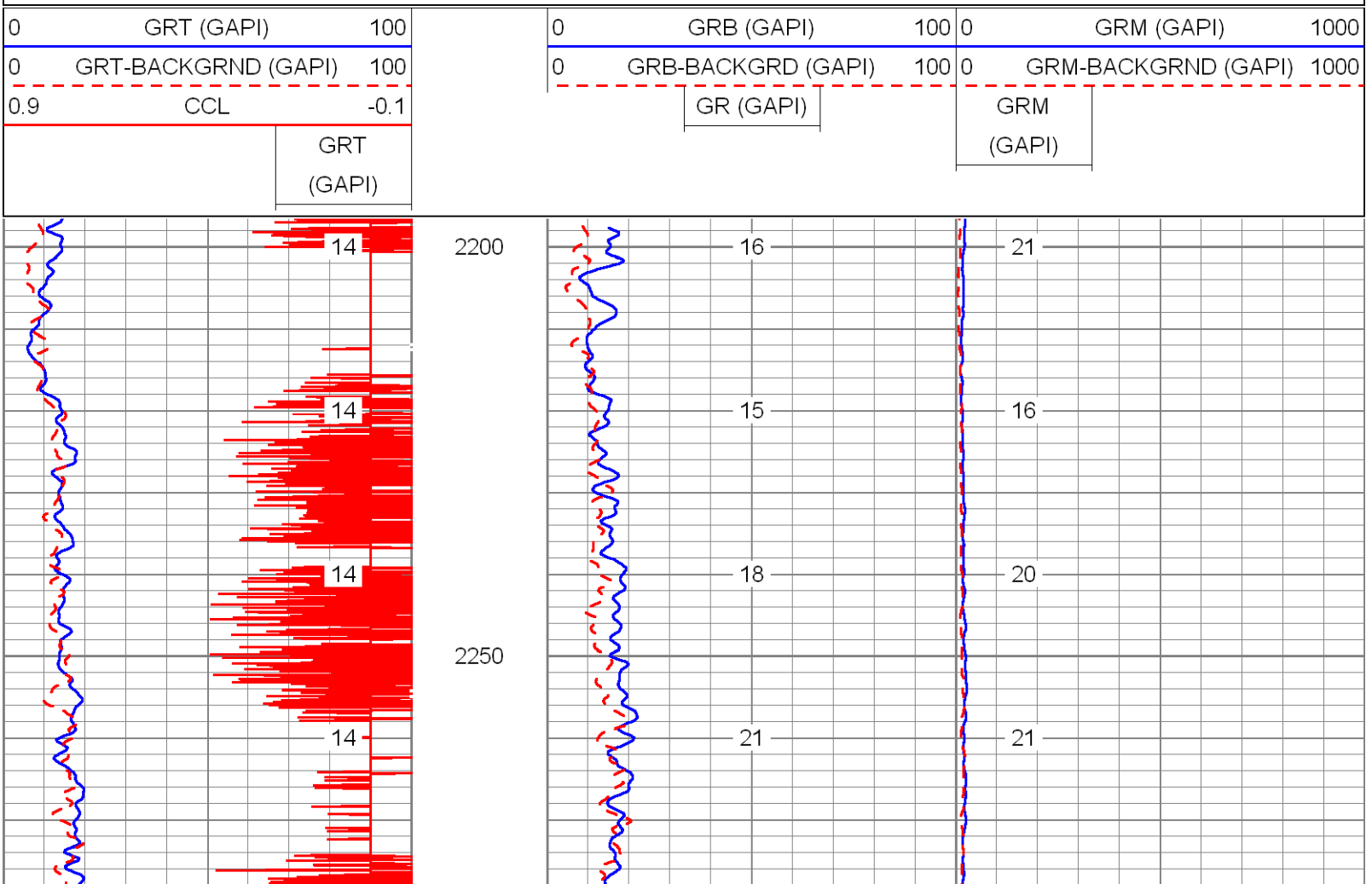
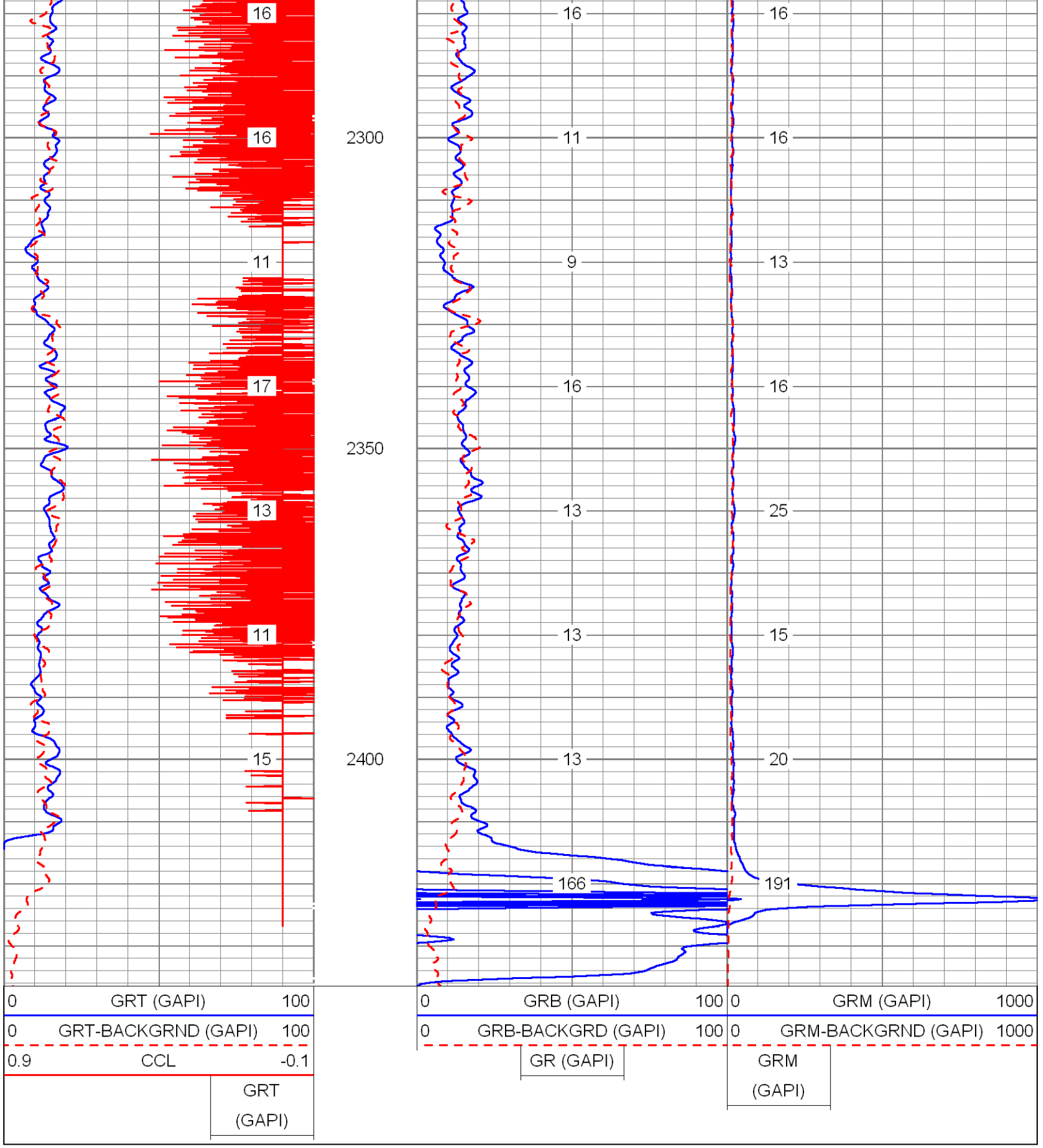

2100
2150
2200
2250
2300
2350
2400
2450
2500
2550
2600



LOP #2

Database File:	sdwwtp-iw-10.db
Dataset Pathname:	pass17
Presentation Format:	rts
Dataset Creation:	Wed Jul 03 15:38:42 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:240

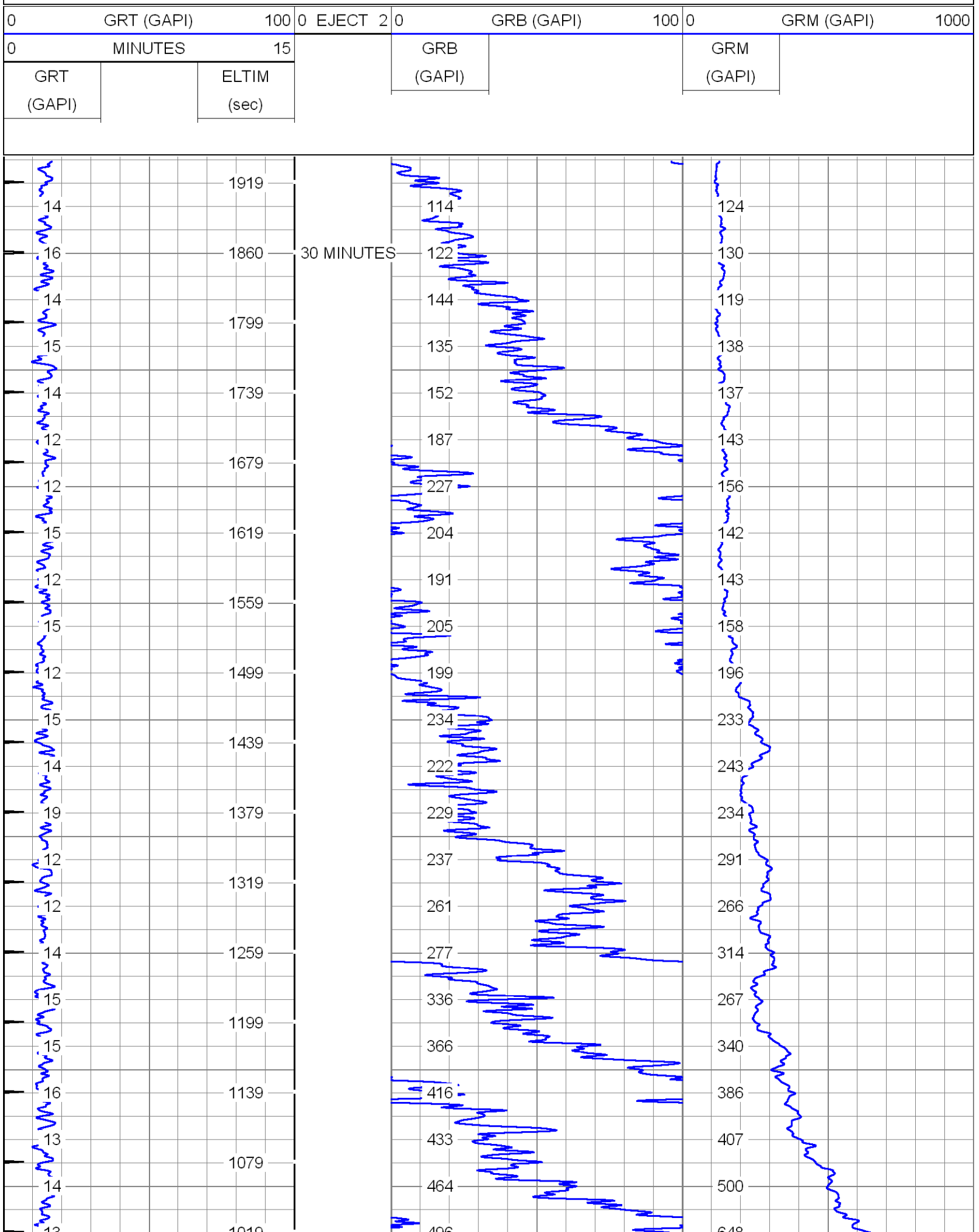


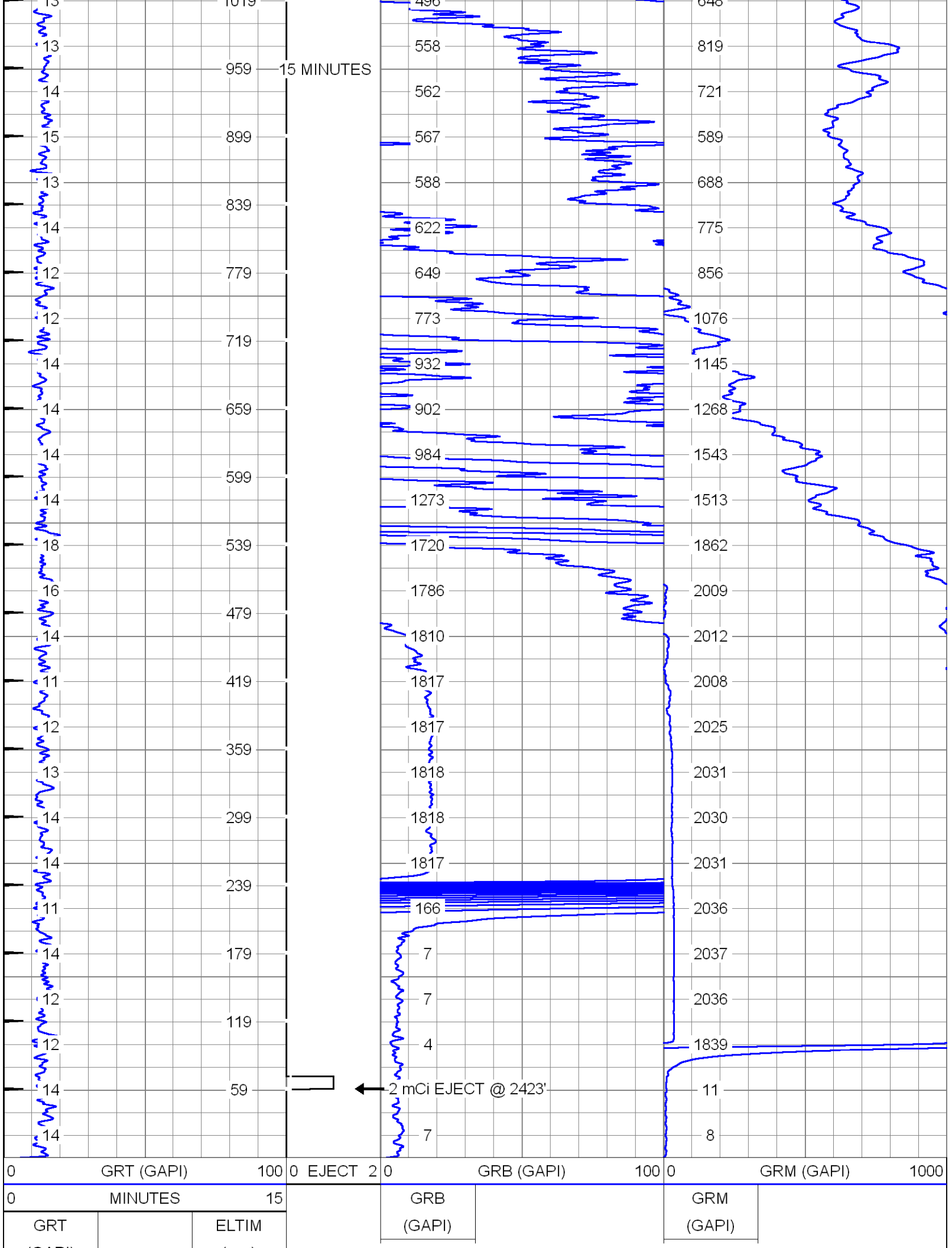


DYNAMIC TEST #2 (87 GPM)

Database File: sdwwtp-iw-10.db
Dataset Pathname: pass16
Presentation Format: rtstime

Presentation Format: rtstime
Dataset Creation: Wed Jul 03 15:04:19 2013 by Log SOC 110722
Charted by: Depth in Feet scaled 1:600



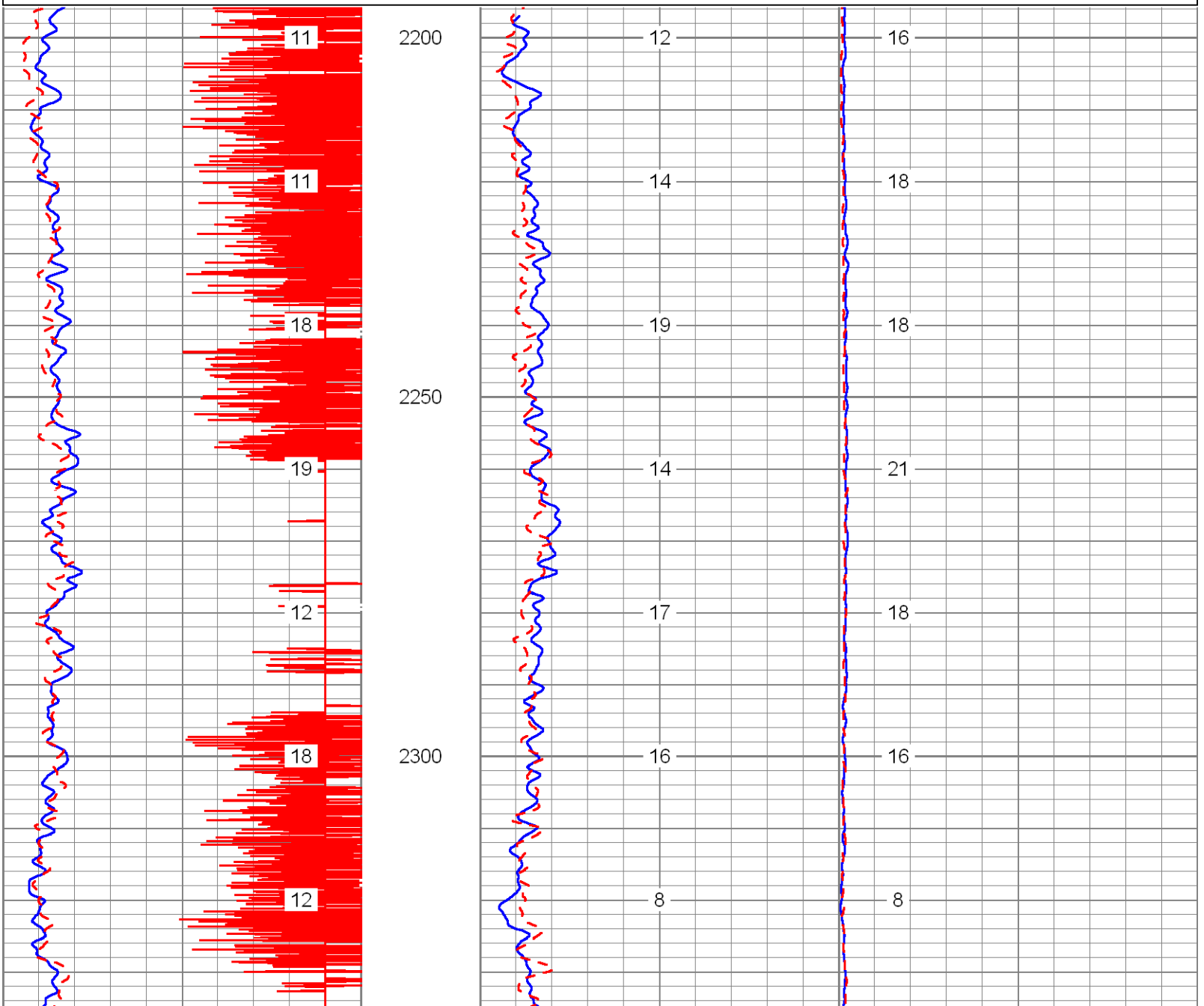

15 MINUTES
2 mCi EJECT @ 2423'
0 GRT (GAPI) 100
0 EJECT 2
0 GRB (GAPI) 100
0 GRM (GAPI) 1000
0 MINUTES 15
GRT (GAPI)
ELTIM
GRB (GAPI)
GRM (GAPI)

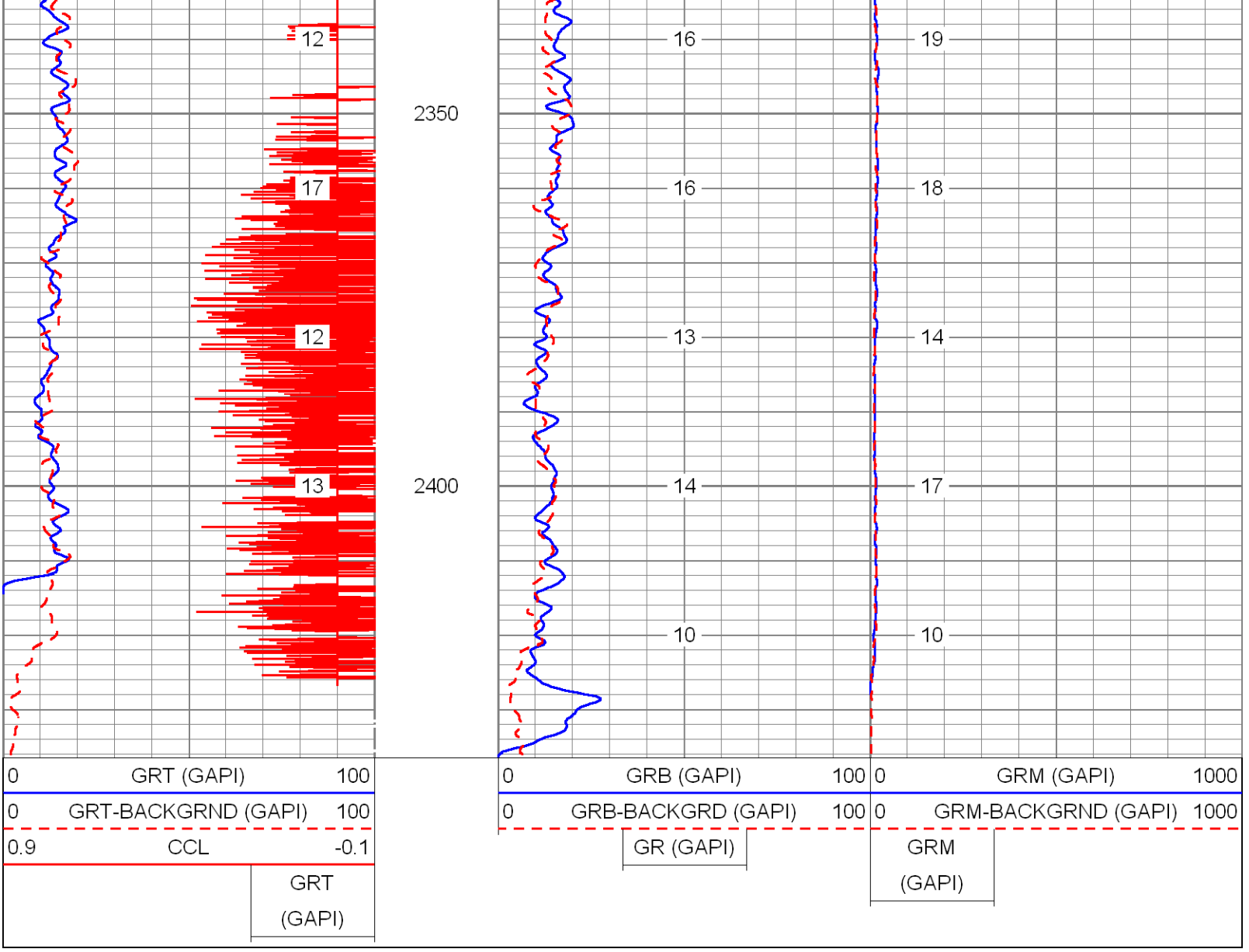
(GAPI) (sec)

LOP #1

Database File:	sdwwtp-iw-10.db
Dataset Pathname:	pass15
Presentation Format:	rts
Dataset Creation:	Wed Jul 03 14:46:00 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:240

0	GRT (GAPI)	100	0	GRB (GAPI)	100	0	GRM (GAPI) 1000
0	GRT-BACKGRND (GAPI)	100	0	GRB-BACKGRD (GAPI)	100	0	GRM-BACKGRND (GAPI) 1000
0.9	CCL	-0.1		GR (GAPI)			GRM (GAPI)
		GRT (GAPI)					

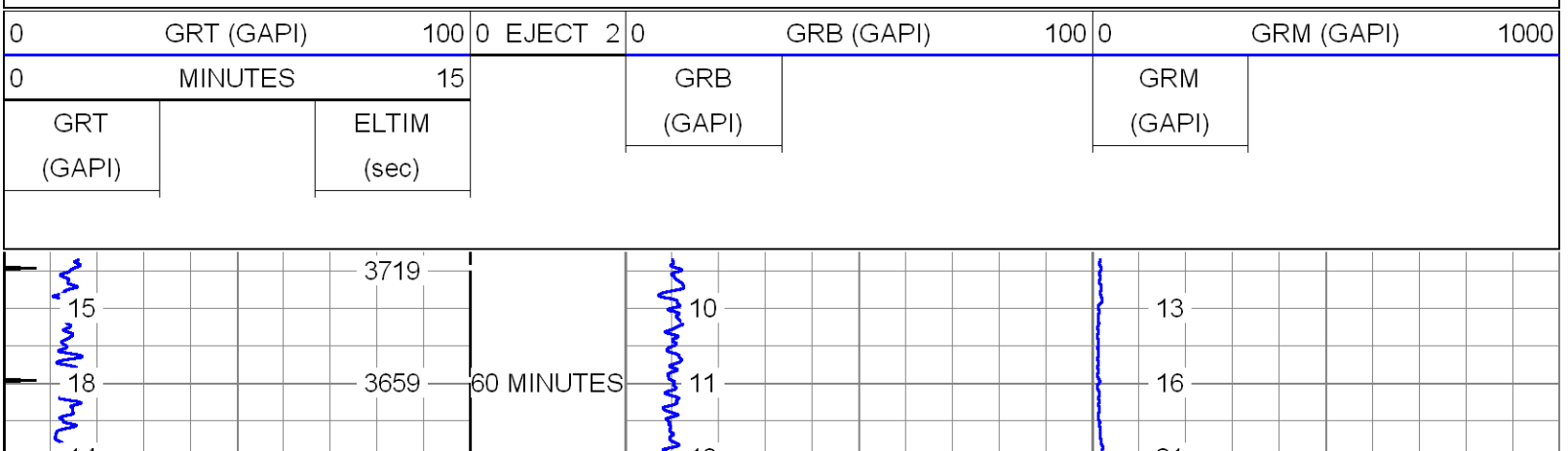


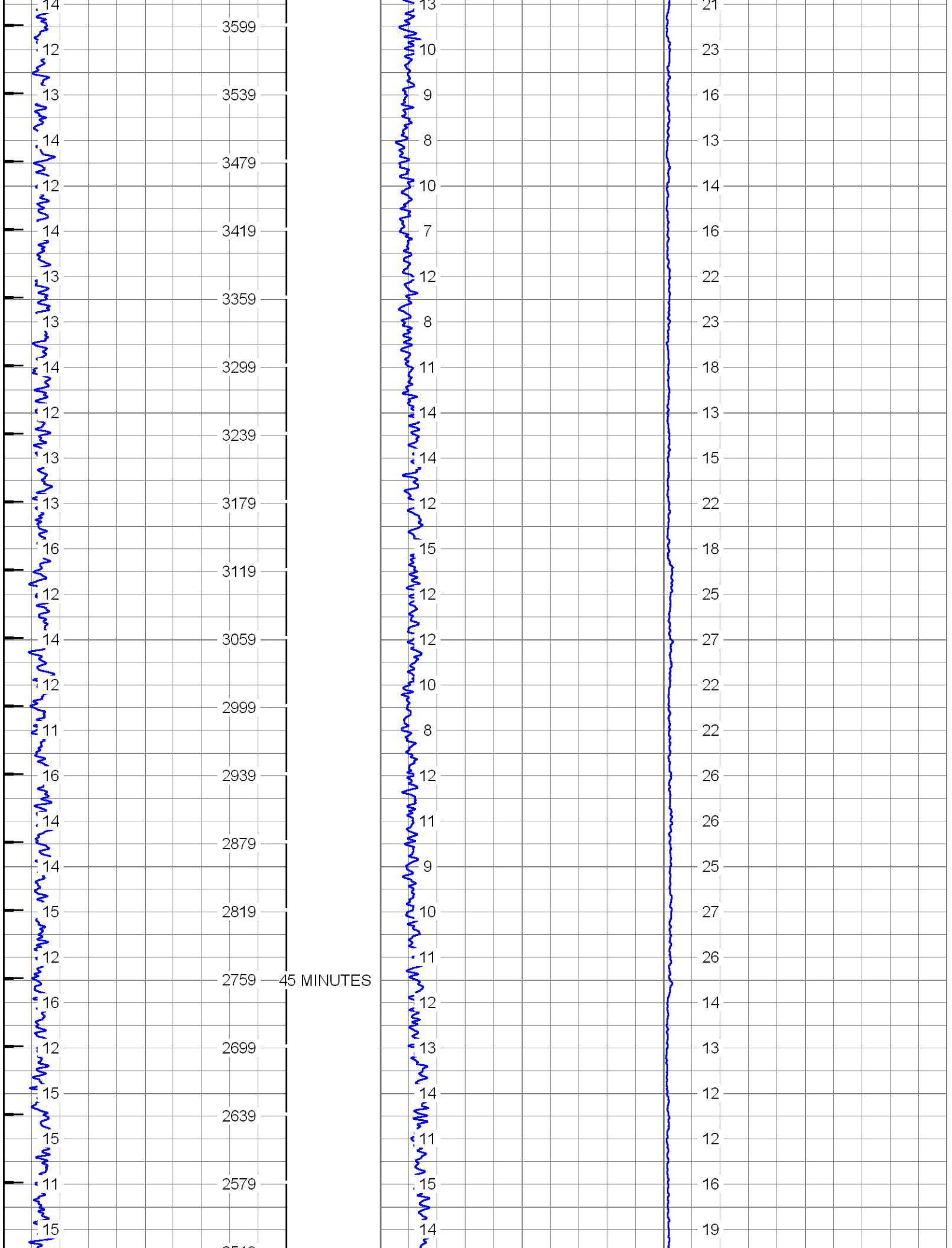


YOUNGQUIST BROTHERS

DYNAMIC TEST #1 (87 GPM)

Database File:	sdwwtp-iw-10.db
Dataset Pathname:	pass14
Presentation Format:	rtstime
Dataset Creation:	Wed Jul 03 13:41:27 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:600




3599
3539
3479
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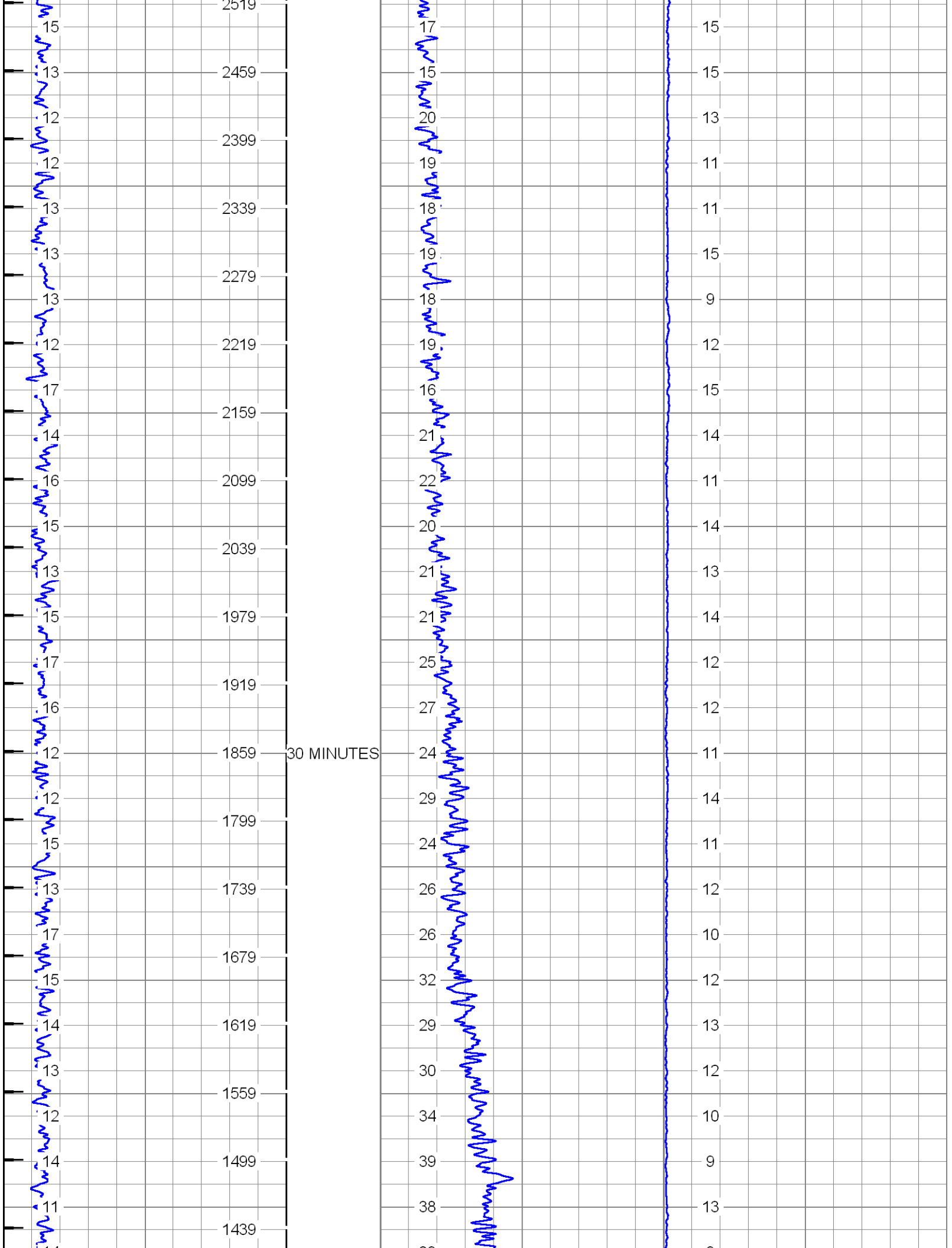
3359
3299
3239
3179
3119
3059
2999
2939
2879
2819
2759
45 MINUTES
2699
2639
2579


2519
2459
2399
2339
2279
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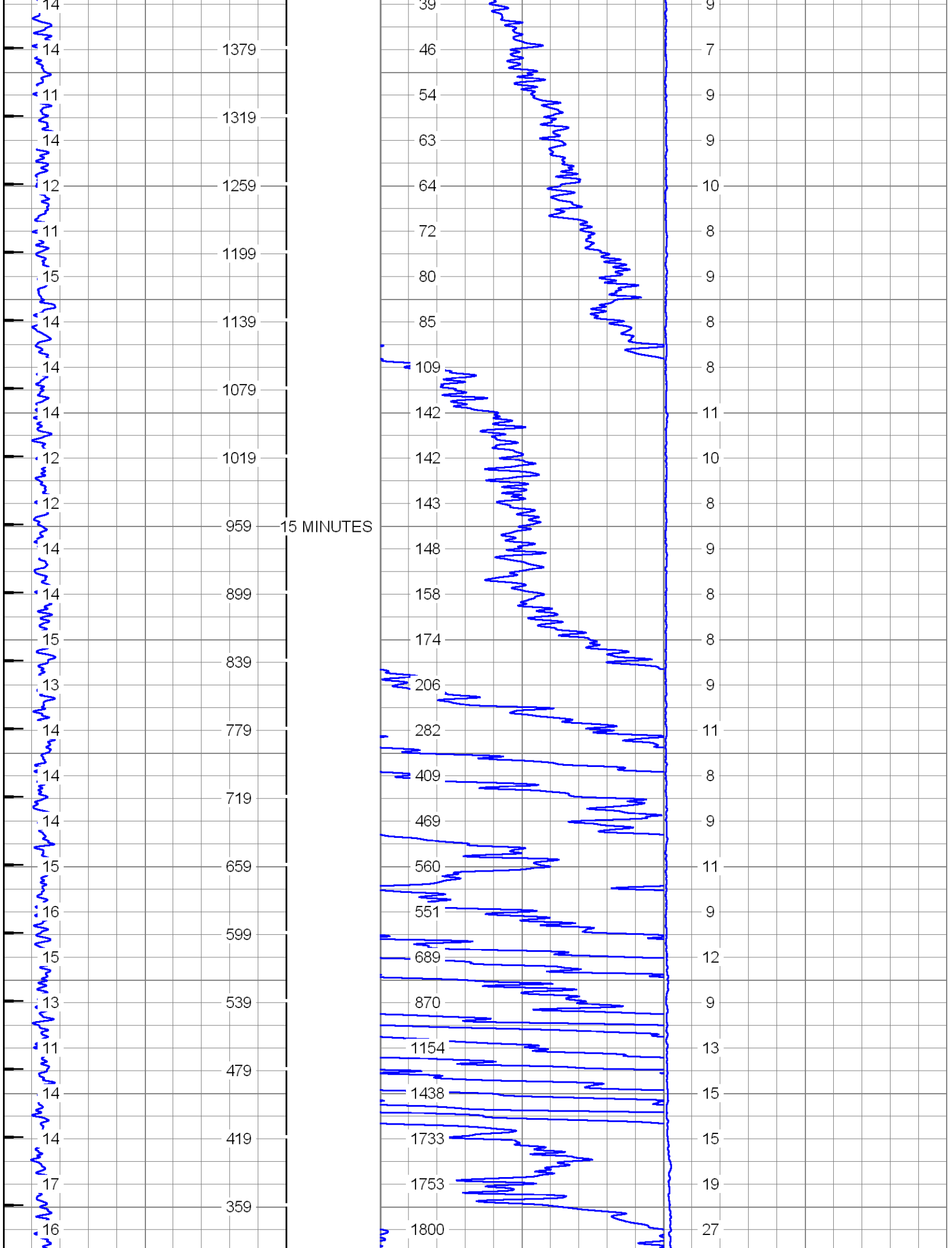
2159
2099
2039
1979
1919
1859
1799
1739
1679
1619
1559
1499
1439
30 MINUTES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1259
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1139
1079
1019
959
15 MINUTES
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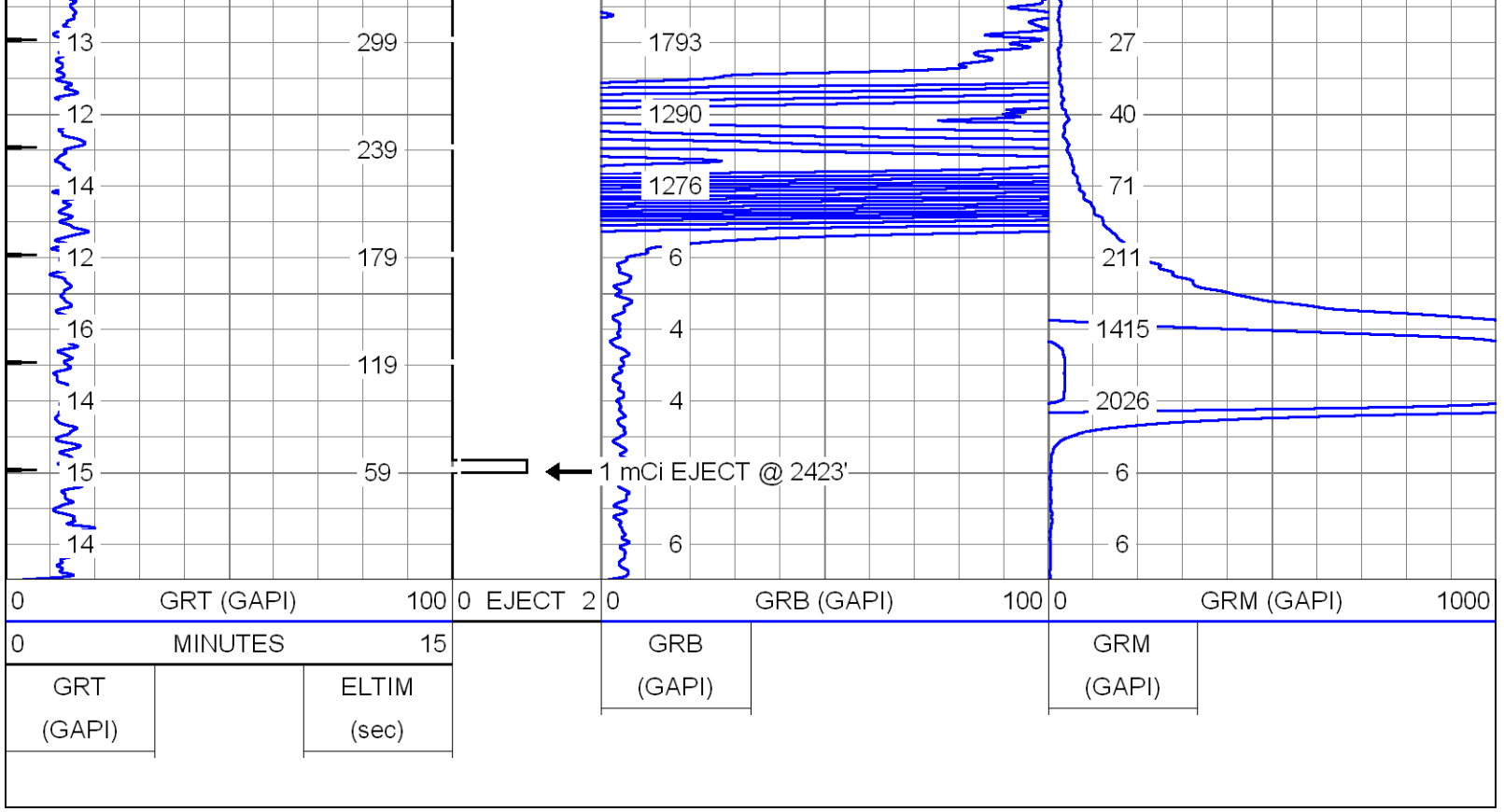
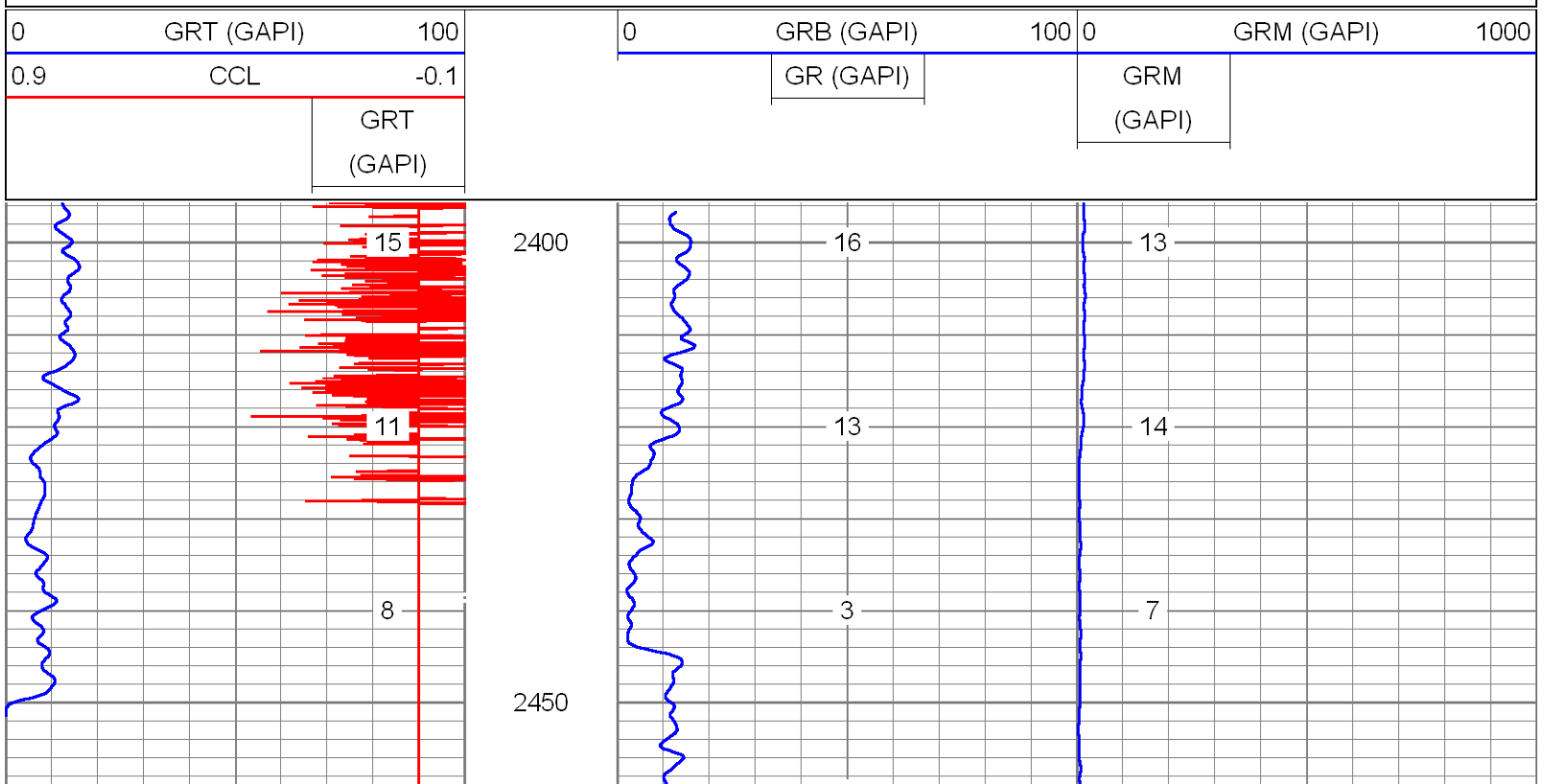
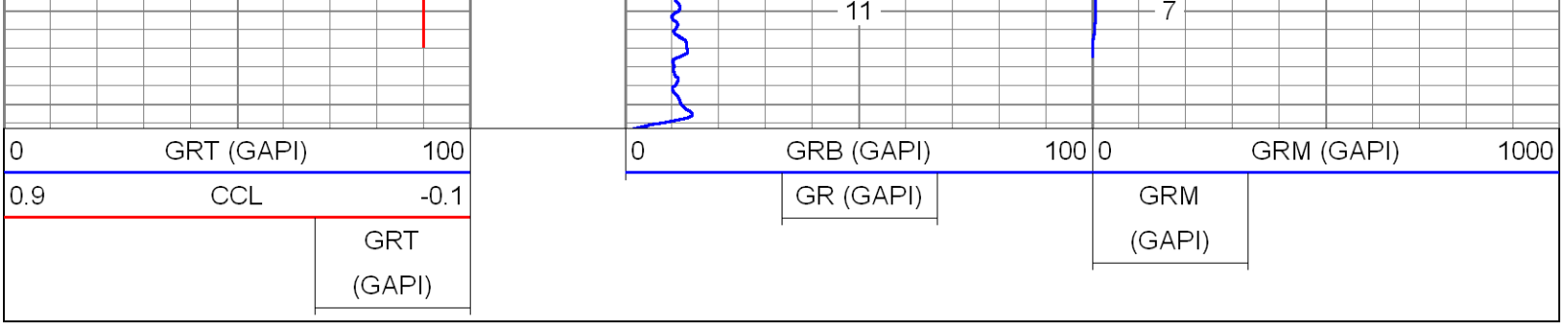


CASING TIE-IN

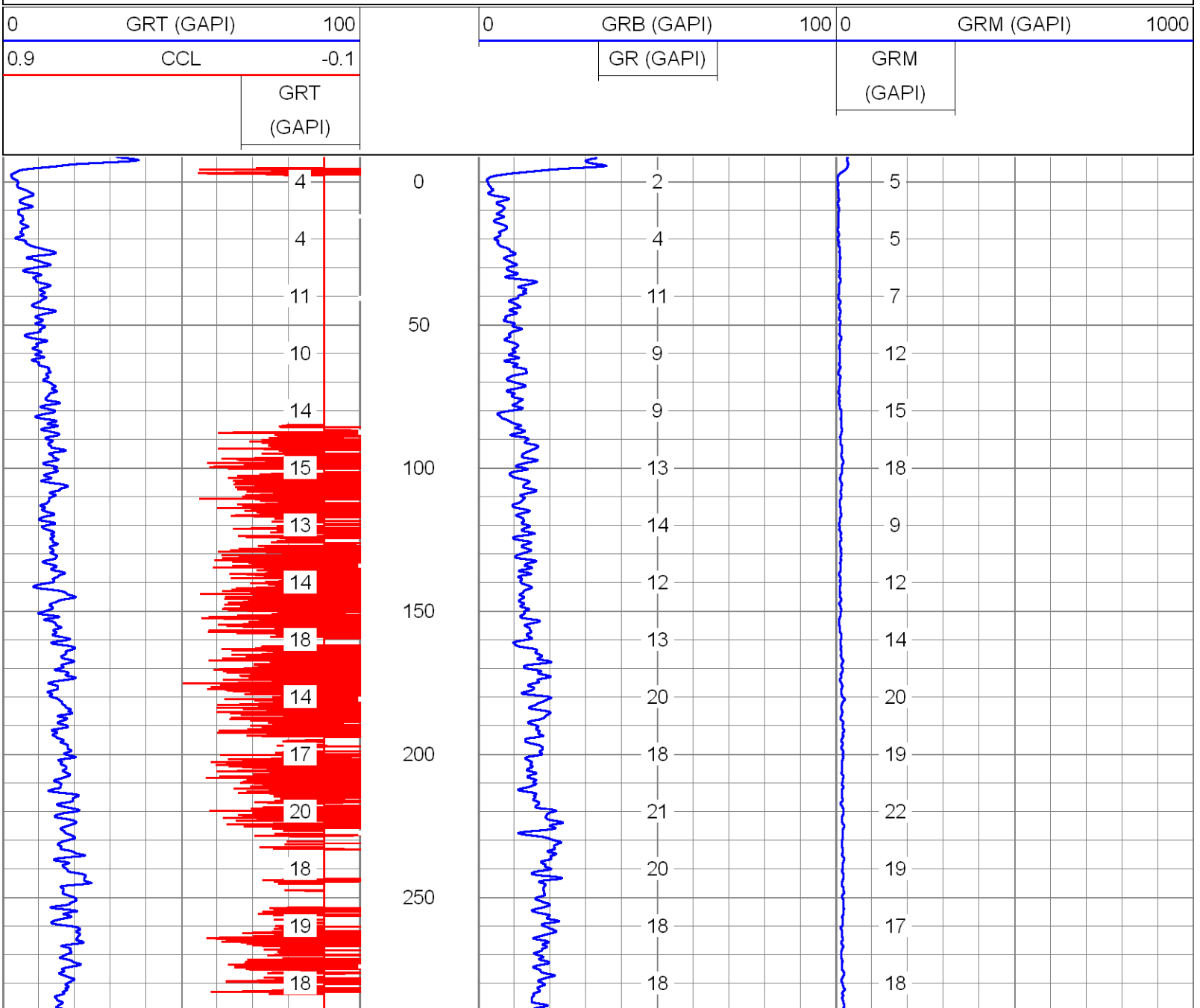
Database File:	sdwwtp-iw-10.db
Dataset Pathname:	pass13
Presentation Format:	rts
Dataset Creation:	Wed Jul 03 13:27:34 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:240

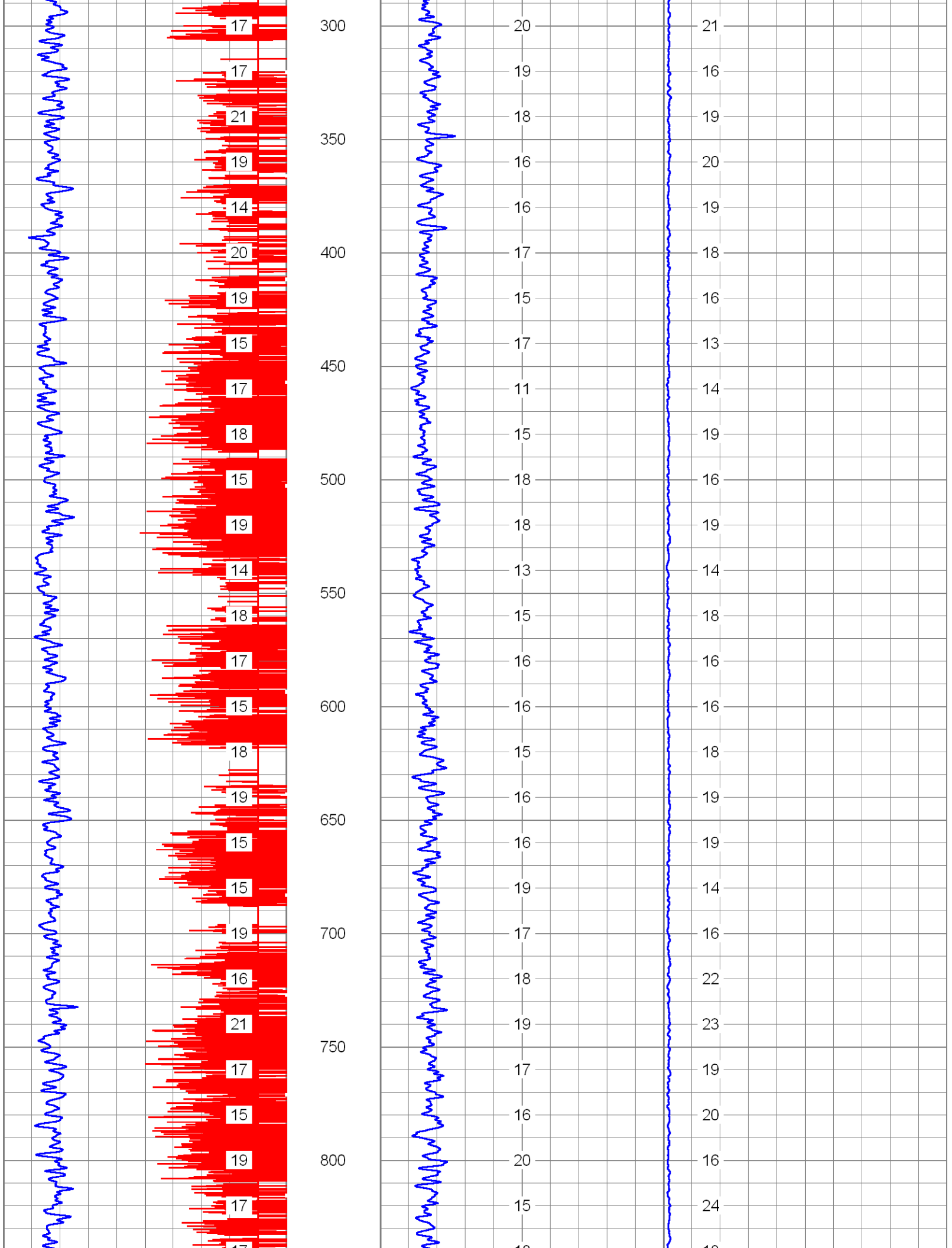




GAMMA-RAY BACKGROUND

Database File:	sdwwtp-iw-10.db
Dataset Pathname:	pass11
Presentation Format:	rts
Dataset Creation:	Wed Jul 03 11:20:49 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:600





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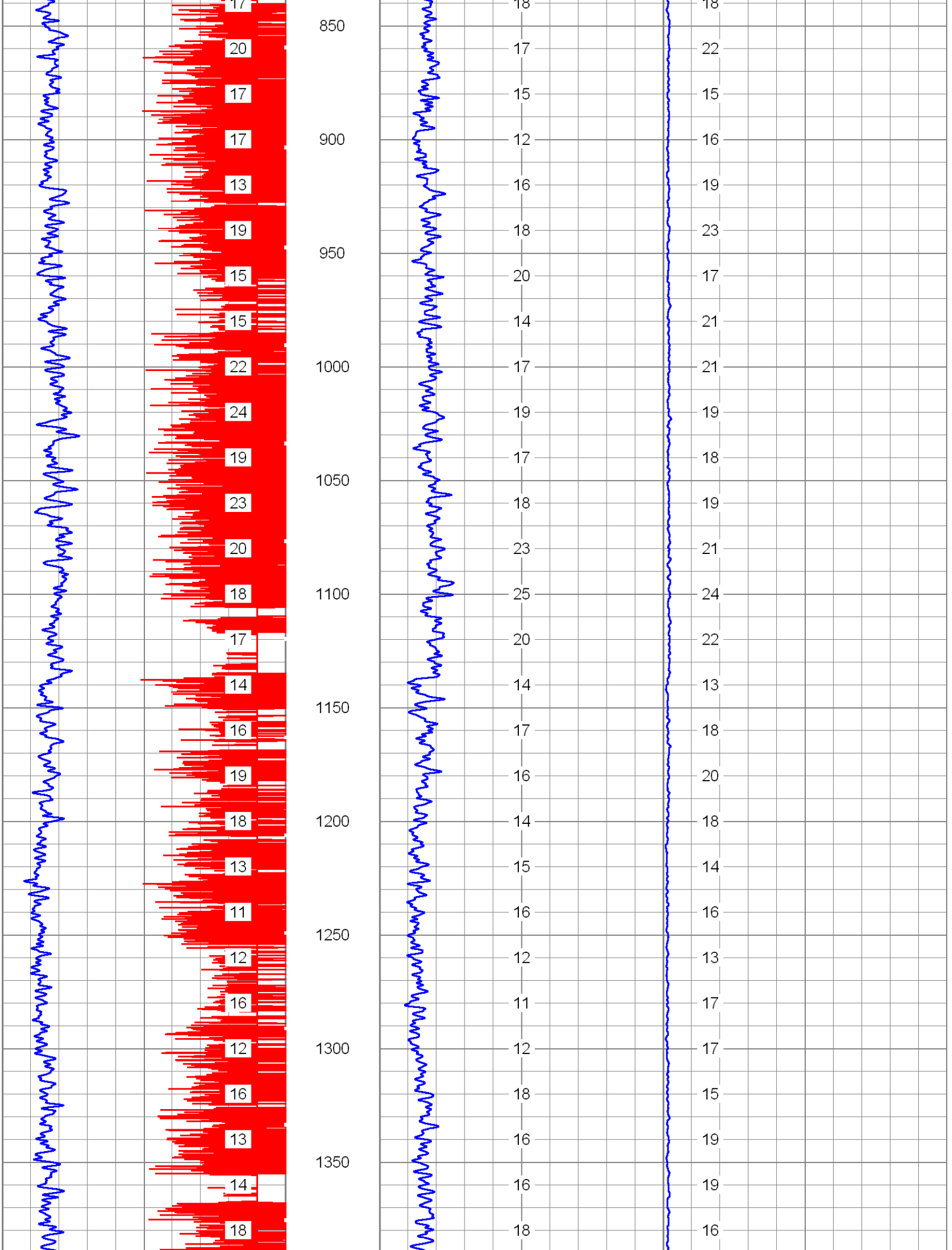
850
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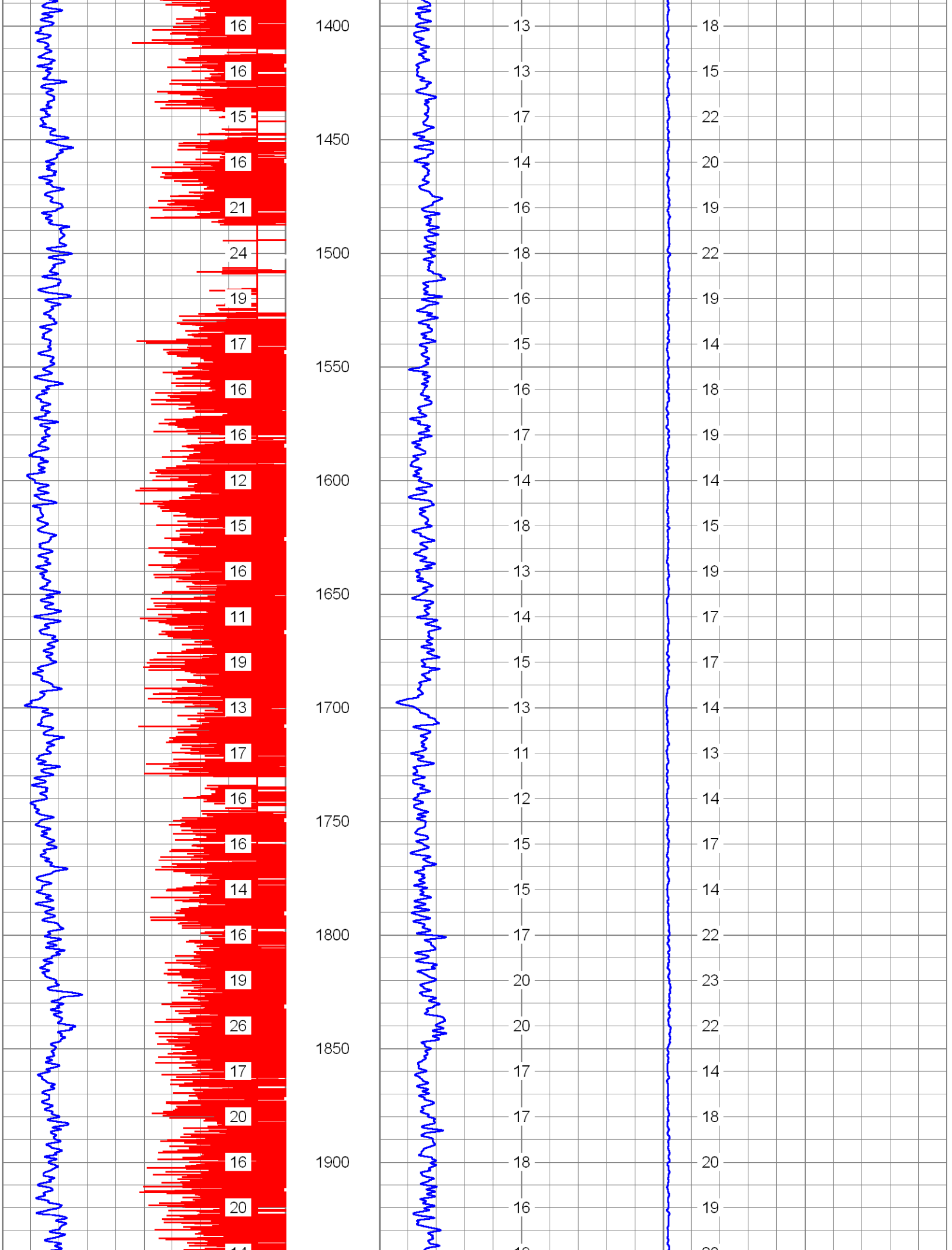
1300
1350


1400
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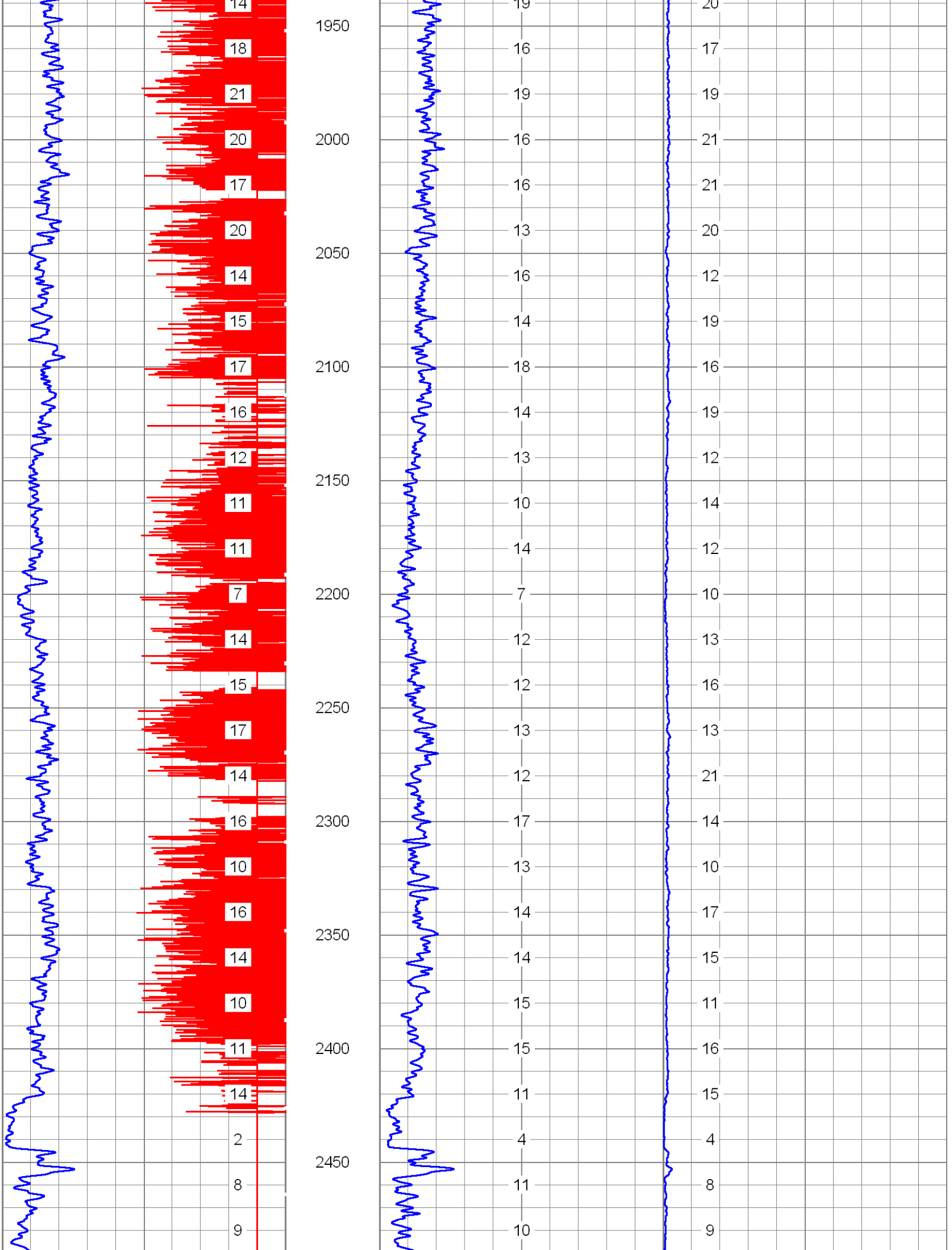
13 13 17 14 16 18 16 15 16 17 14 18 13 14 15 13 11 12 15 15 17 20 20 17 17 18 16
18 15 22 20 19 22 19 14 18 19 14 15 19 17 17 14 13 14 17 14 22 23 22 14 18 20 19


1950
2000
2050
2100
2150
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2300
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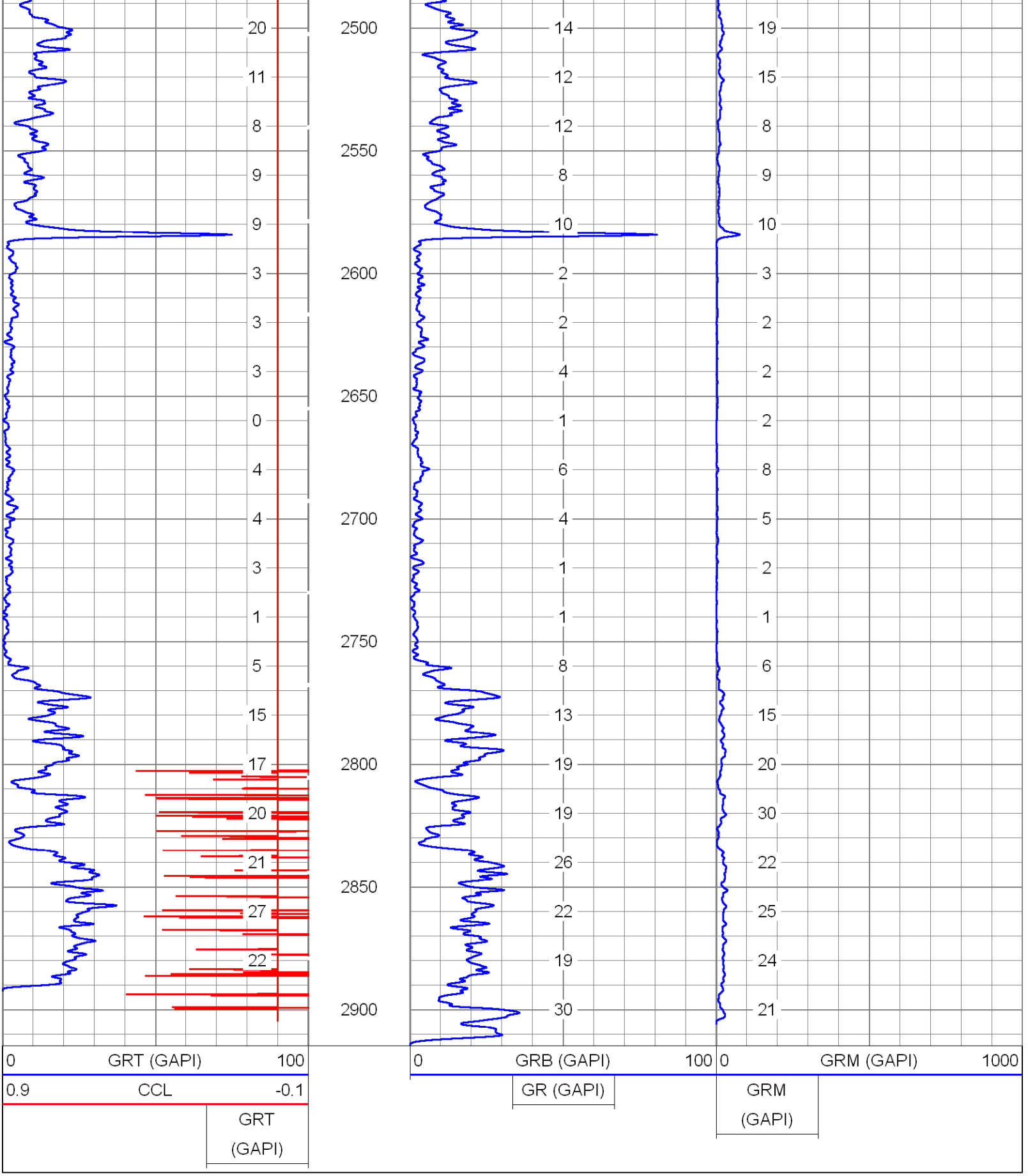
2400
2450



Calibration Report

Database File: sdwwtp-iw-10.db
Dataset Pathname: pass11
Dataset Creation: Wed Jul 03 11:20:49 2013 by Log SOC 110722

Gamma Ray Calibration Report

Serial Number:	952B	
Tool Model:	RTSB	
Performed:	Wed Jul 03 10:45:44 2013	
Calibrator Value:	90.0	GAPI
Background Reading:	30.7	cps
Calibrator Reading:	189.6	cps
Sensitivity:	0.5664	GAPI/cps

Gamma Ray Calibration Report

Serial Number:	952M	
Tool Model:	RTSM	
Performed:	Wed Jul 03 10:45:56 2013	
Calibrator Value:	90.0	GAPI
Background Reading:	32.0	cps
Calibrator Reading:	174.2	cps
Sensitivity:	0.6329	GAPI/cps

Gamma Ray Calibration Report

Serial Number:	951T	
Tool Model:	RTST	
Performed:	Wed Jul 03 08:02:09 2013	
Calibrator Value:	90.0	GAPI
Background Reading:	85.7	cps
Calibrator Reading:	235.7	cps
Sensitivity:	0.5998	GAPI/cps

YOUNGQUIST ENGINEERING

GEOPHYSICAL LOGGING DIVISION

Radioactive Tracer Survey Tool Diagram

Date: 7/3/13 Job: SDWWTP IW-10

Internal RTS: ___ External RTS: ✓ YB I Logger: MOREY

BOTTOM OF CASING: _____

-5' IN CASING: _____

+13.5' FOR BOTTOM OF TOOL: _____

Eject #1: 1 mCi Eject #2: 2 mCi

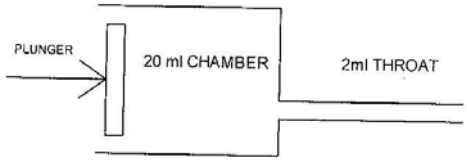
Eject #3: mCi Eject #4: mCi

Eject #5: mCi Eject #6: mCi

Total mCi of I-131 loaded in tool: 5 **1ml =1mCi**

Total volume of Chamber and Throat:22ml

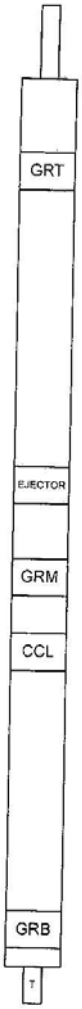
EJECTOR PORT DIAGRAM



Total Eject Cycle Time (22ml): 24 **Sec**

Eject Cycle Time Per ml (Total Time / 22): 1.1 **Sec**

Throat Eject Cycle Time (2*Time Per ml): 2.2 **Sec**



TOP OF TOOL (25ft 2in)

GAMMA RAY TOP DECTOR (23ft 6in)

ALL MEASUREMENTS ARE FROM THE BOTTOM OF THE TOOL.

TOOL DIAMETER IS 1-11/16".

EJECTOR PORT (13ft 6in)

GAMMA RAY MIDDLE DECTOR (10ft 6in)

COLLAR LOCATOR (9ft 6in)

GAMMA RAY BOTTOM DECTOR (1ft 2in)

TEMPERATURE PROBE

TIME PER EJECT

(Total ml of I-131)/(20ml)= mCi per ml in the chamber

(_____)/(20)= _____ mCi per ml

mCi = Throat Eject Cycle Time + (ml of Chamber Required)*(Eject Cycle Time Per ml)

1 mCi = 2.2+(4)*(1.1) = 6.6 **seconds**

2 mCi = 2.2+(8)*(1.1) = 11 **seconds**

3 mCi = + ( )*( ) = **seconds**

4 mCi = + ( )*( ) = **seconds**

Appendix E

Temperature Log

HIGH RESOLUTION TEMPERATURE LOG

Company SOUTH DISTRICT W.W.T.P
Well IW-10
Field S.D.W.W.T.P
County MIAMI-DADE
State FLORIDA

Company SOUTH DISTRICT W.W.T.P
Well IW-10
Field S.D.W.W.T.P
County MIAMI-DADE
State FLORIDA

Location: API # :

SEC TWP RGE

Other Services
SEE COMMENTS

Permanent Datum	GL	Elevation
Log Measured From	GL	
Drilling Measured From	GL	

Elevation
K.B.
D.F.
G.L.

Date	03-JUI-2013		
Run Number	MIT2013		
Depth Driller	3028'		
Depth Logger	2914'		
Bottom Logged Interval	2914'		
Top Log Interval	SURFACE		
Open Hole Size	24"		
Type Fluid	WATER		
Density / Viscosity	NA		
Max. Recorded Temp.	83.2 degF		
Estimated Cement Top	NA		
Time Well Ready	ON ARRIVAL		
Time Logger on Bottom	0930		
Equipment Number	103		
Location	FT. MYERS		
Recorded By	RIVES	MOREY	
Witnessed By	S. VILLAMIL	J. MAY	M. MACFARLANE

Borehole Record				Borehole Record			
Run Number	Bit	From	To	Run No	Bit	From	To

Casing Record	Size	Wgt/Ft	Top	Bottom
Surface String				
Prot. String				
Production String				
Liner	24"	.500 W.T	SURFACE	2428'

<< Fold Here >>>

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

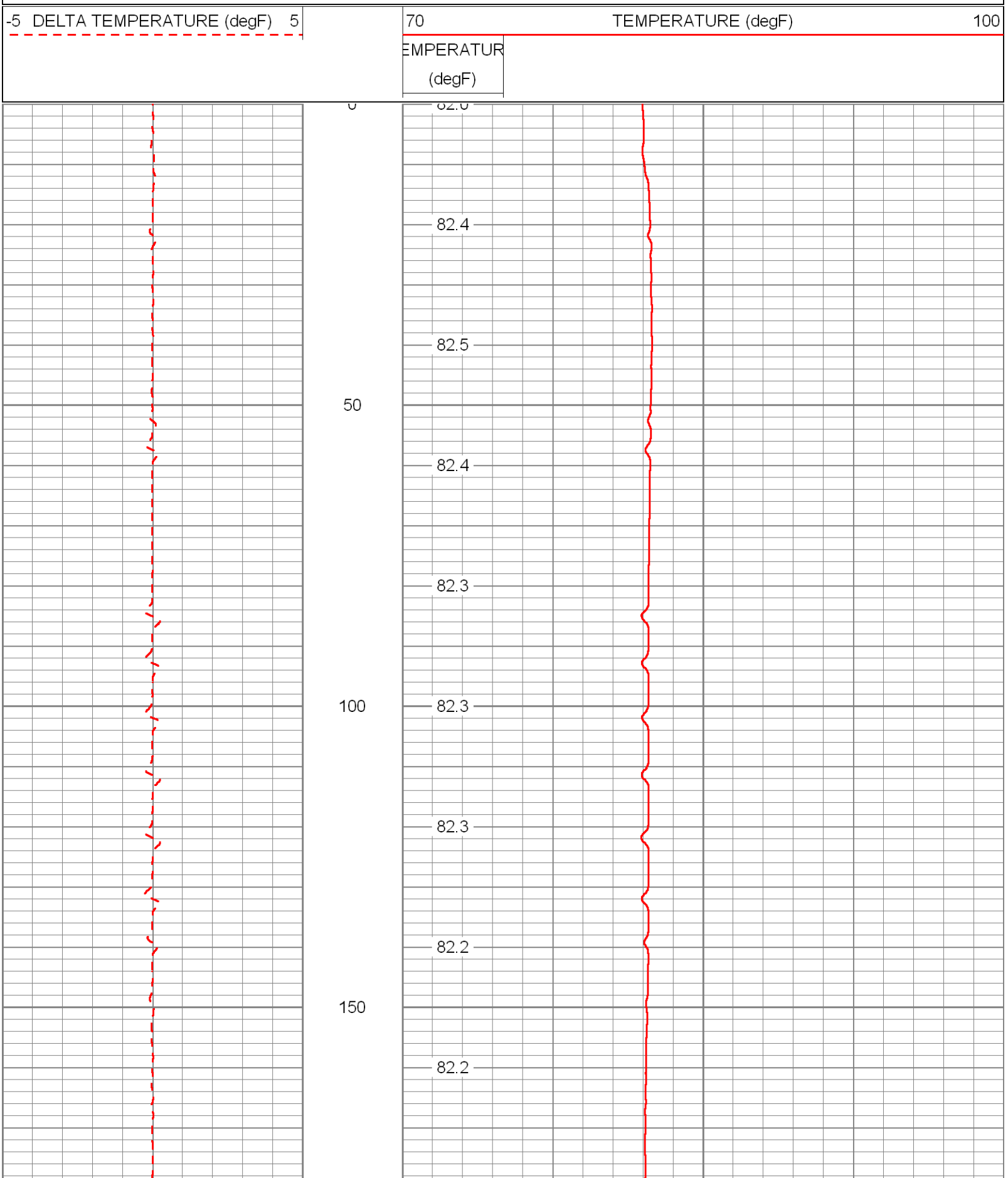
Comments

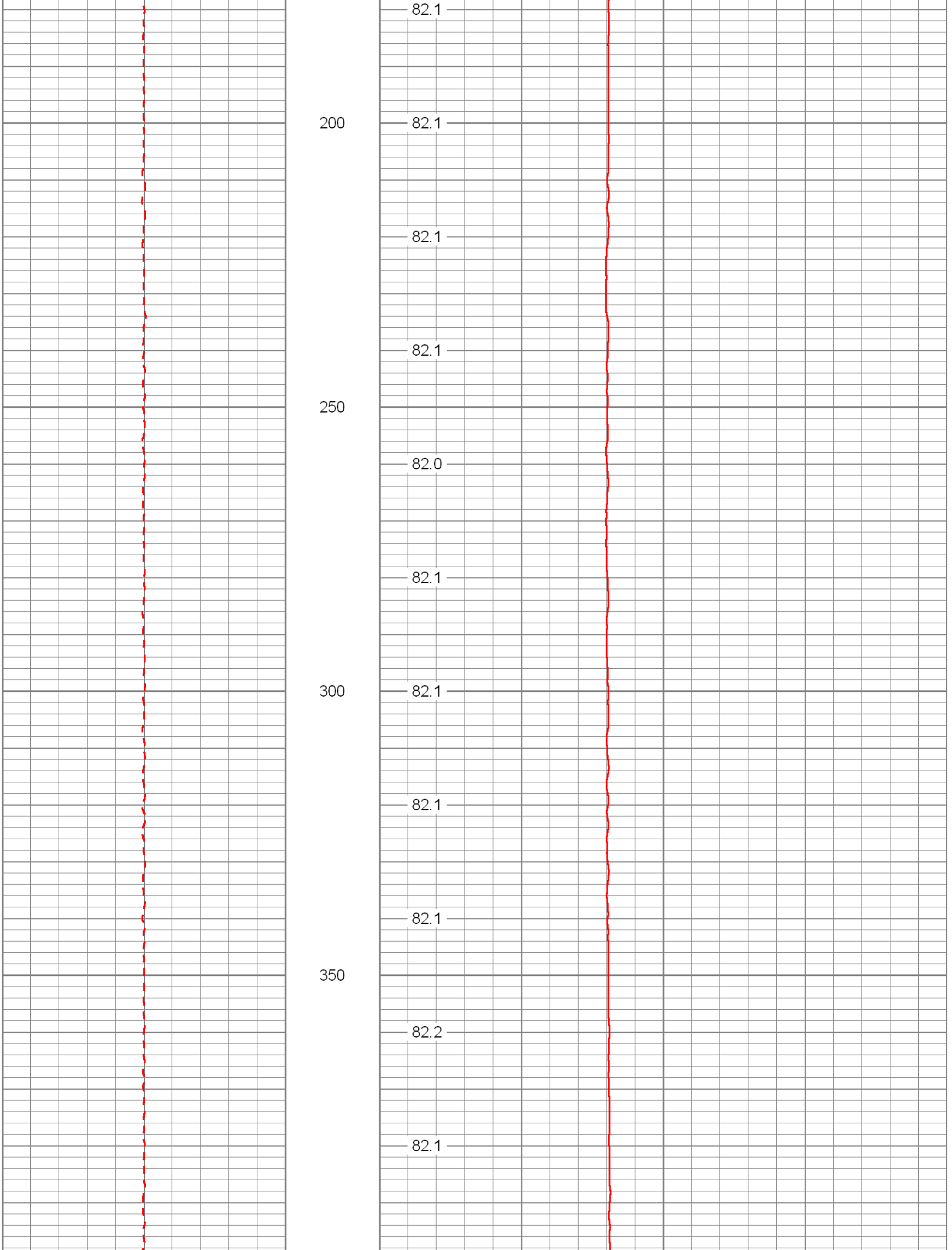
RADIOACTIVETRACER SURVEY

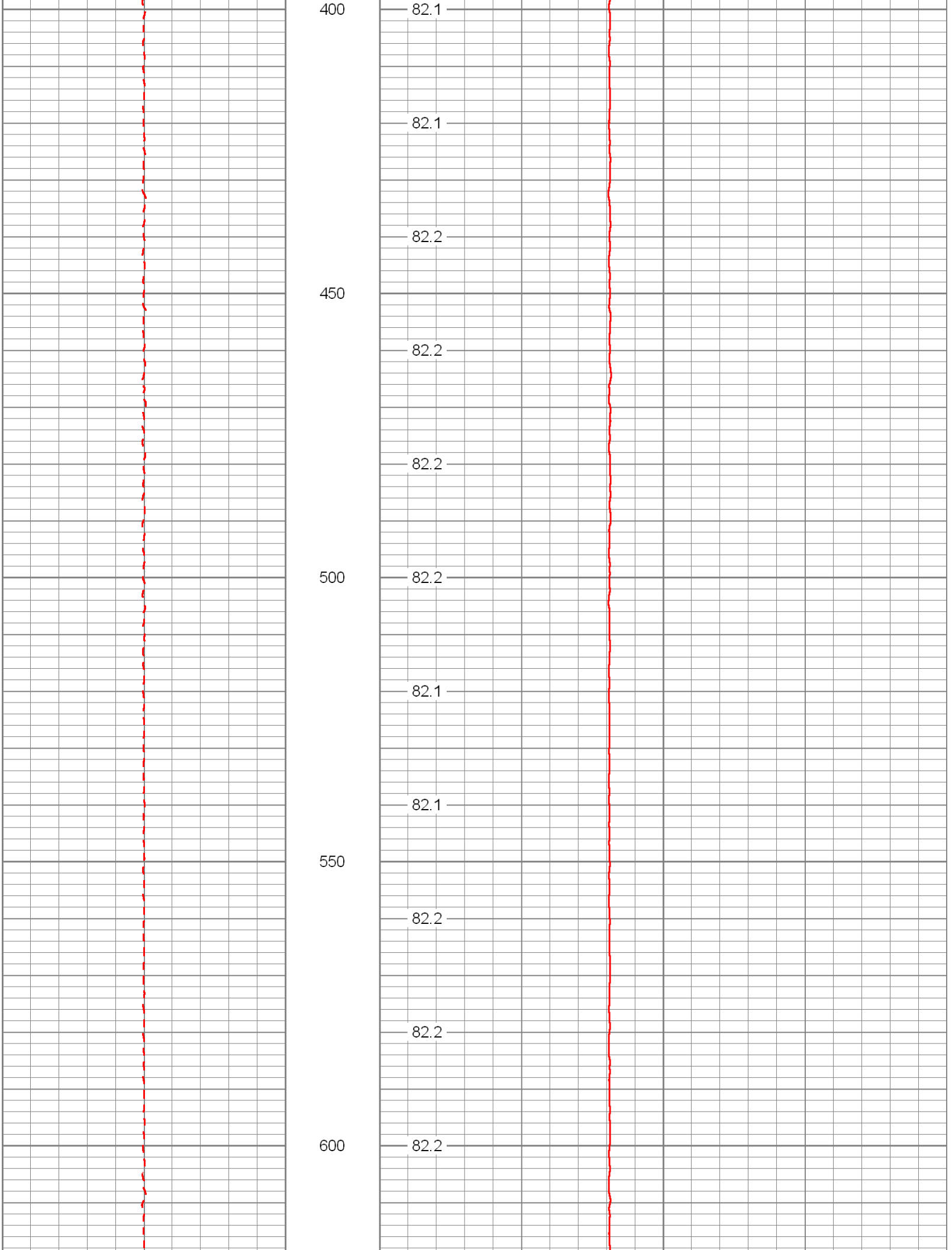
TEMPERATURE

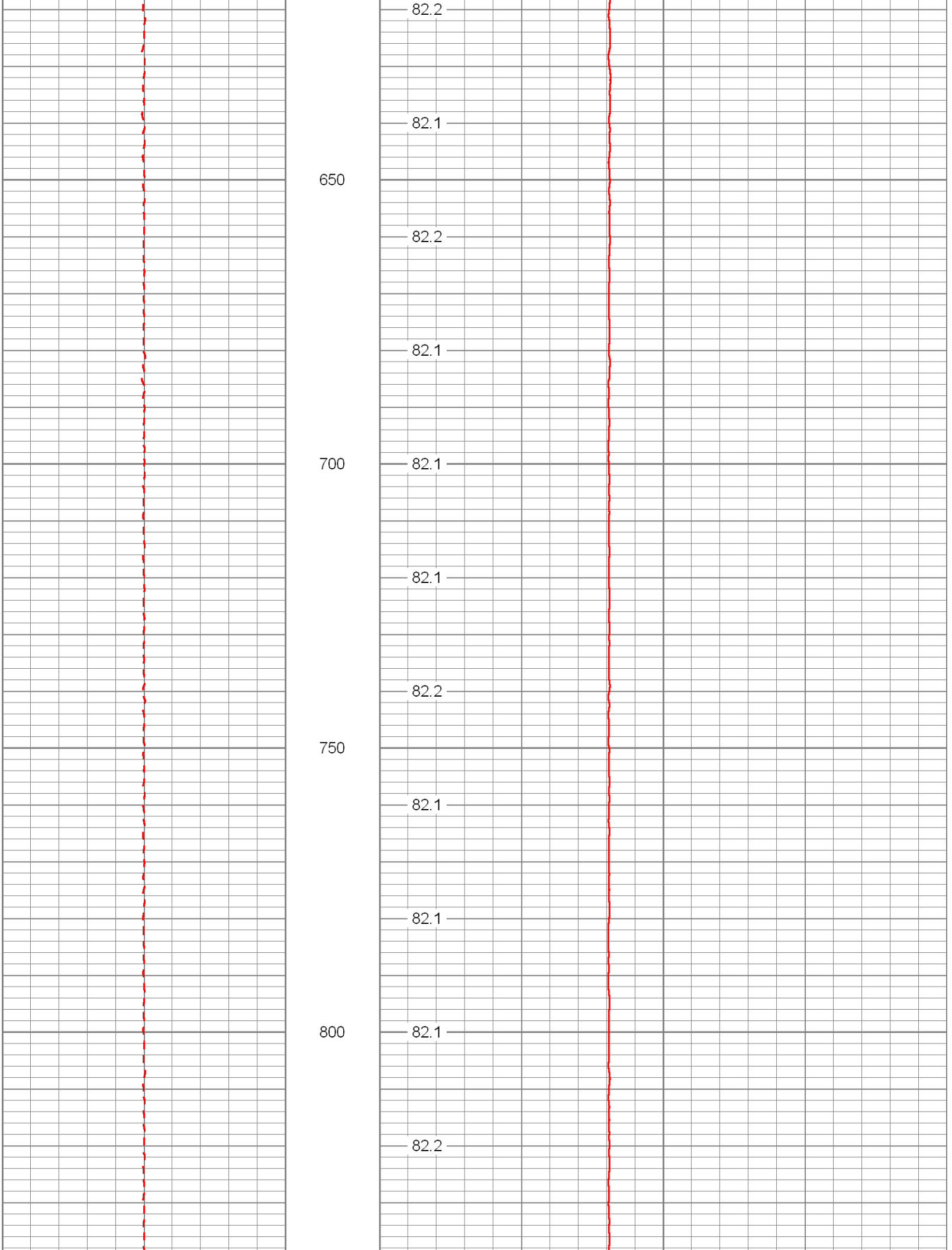
BROTHERS

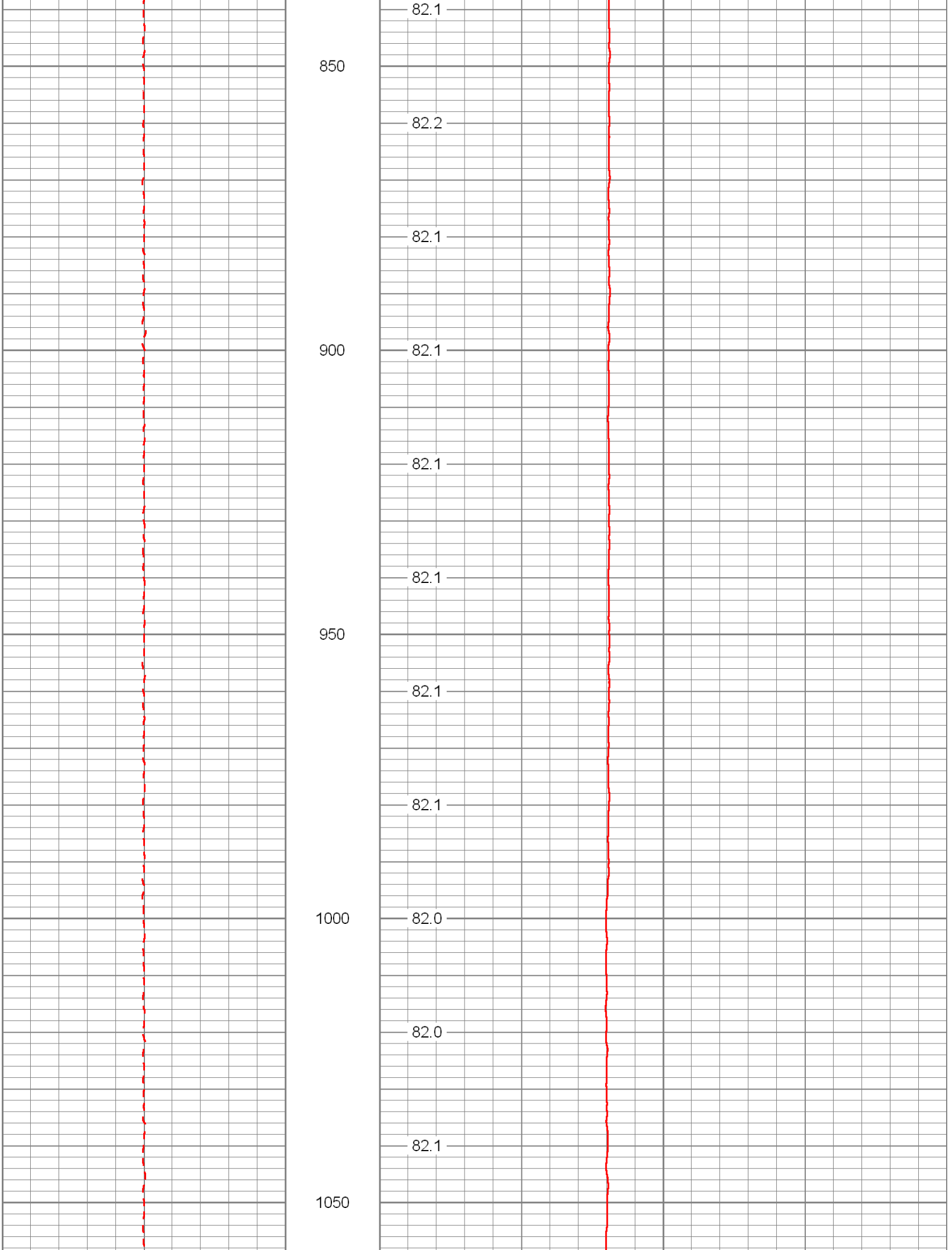
Database File:	sdwwtp-iw-10.db
Dataset Pathname:	pass4
Presentation Format:	temp
Dataset Creation:	Wed Jul 03 08:21:45 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:240

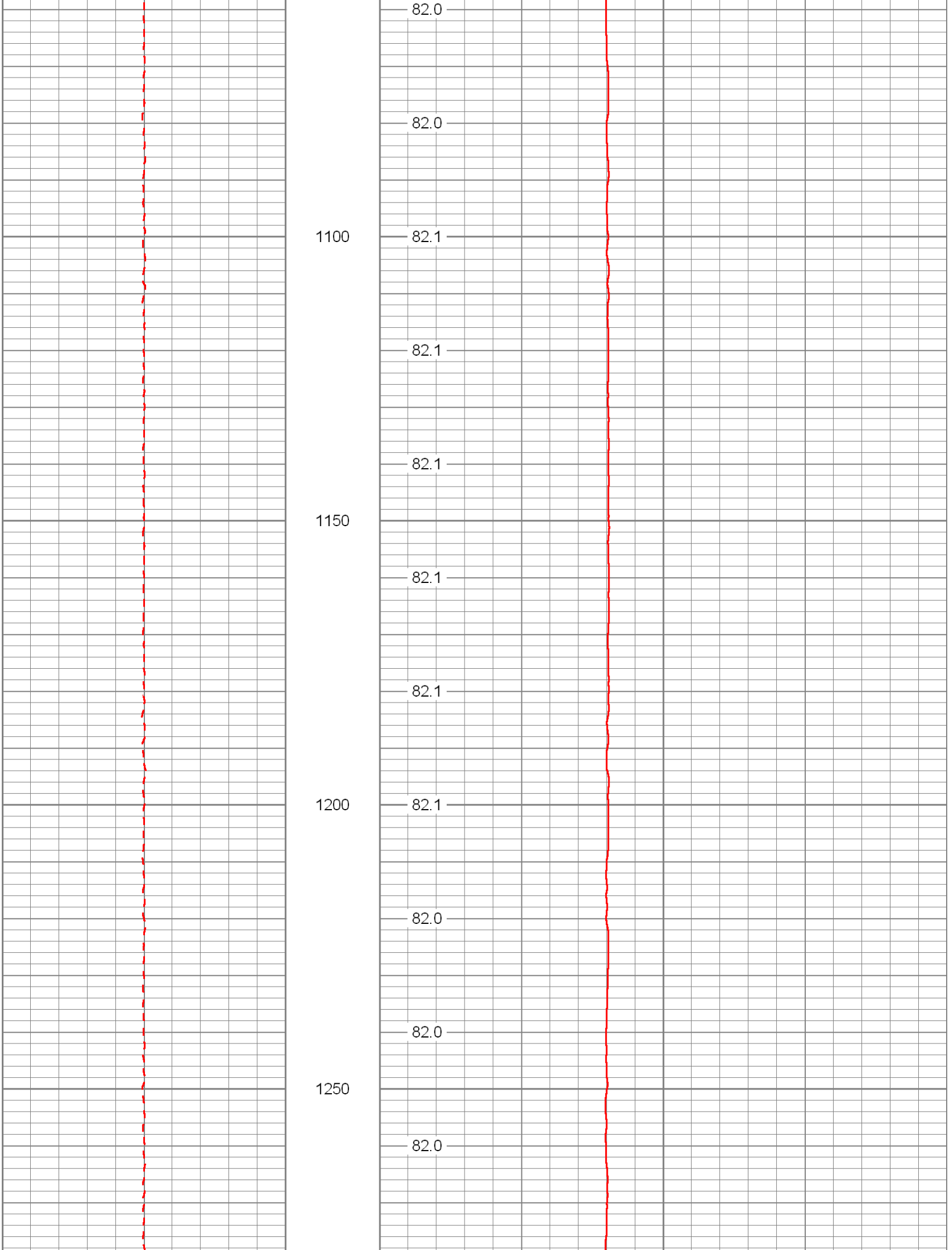


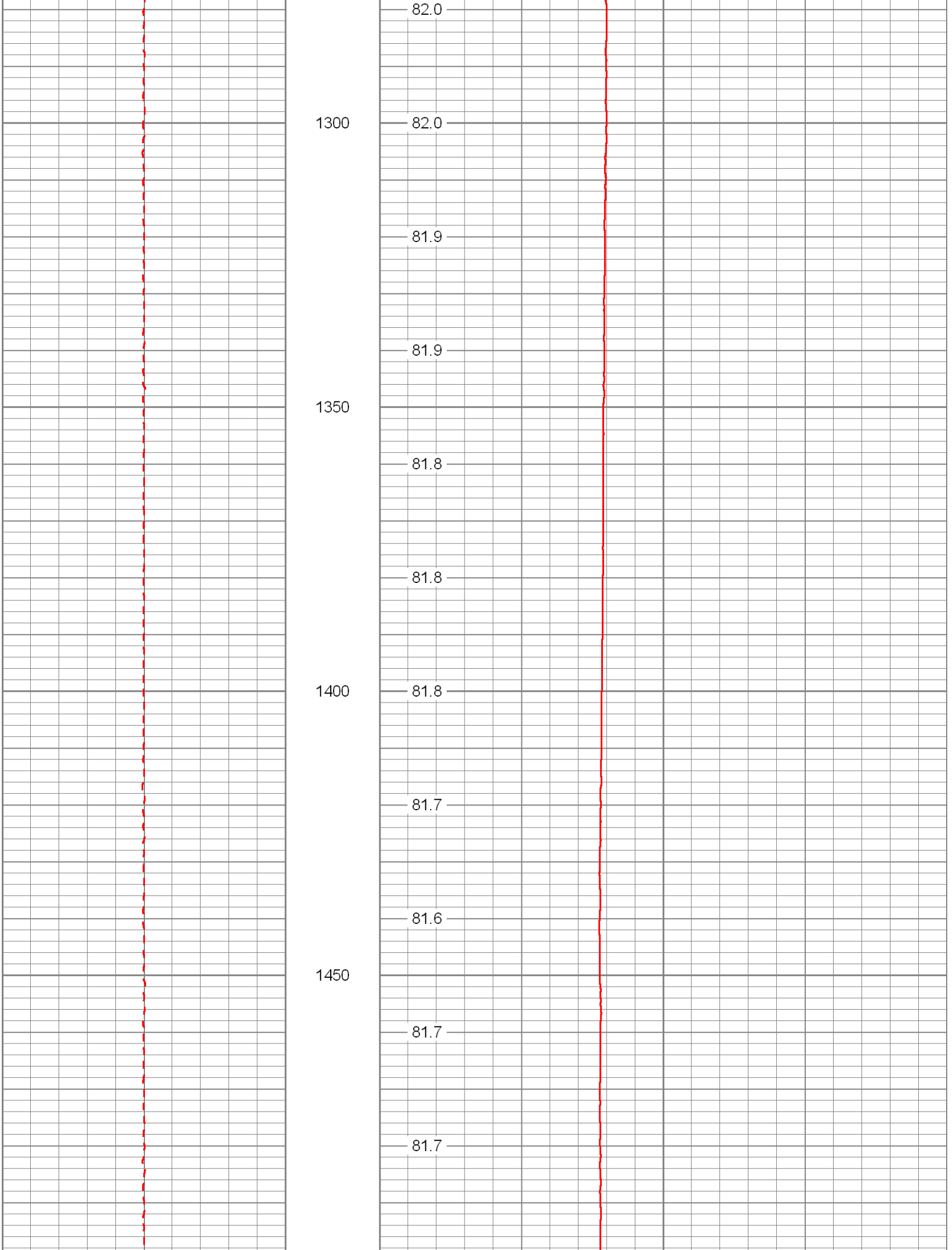

82.1
200
82.1
82.1
82.1
250
82.0
82.1
300
82.1
82.1
82.1
350
82.2
82.1

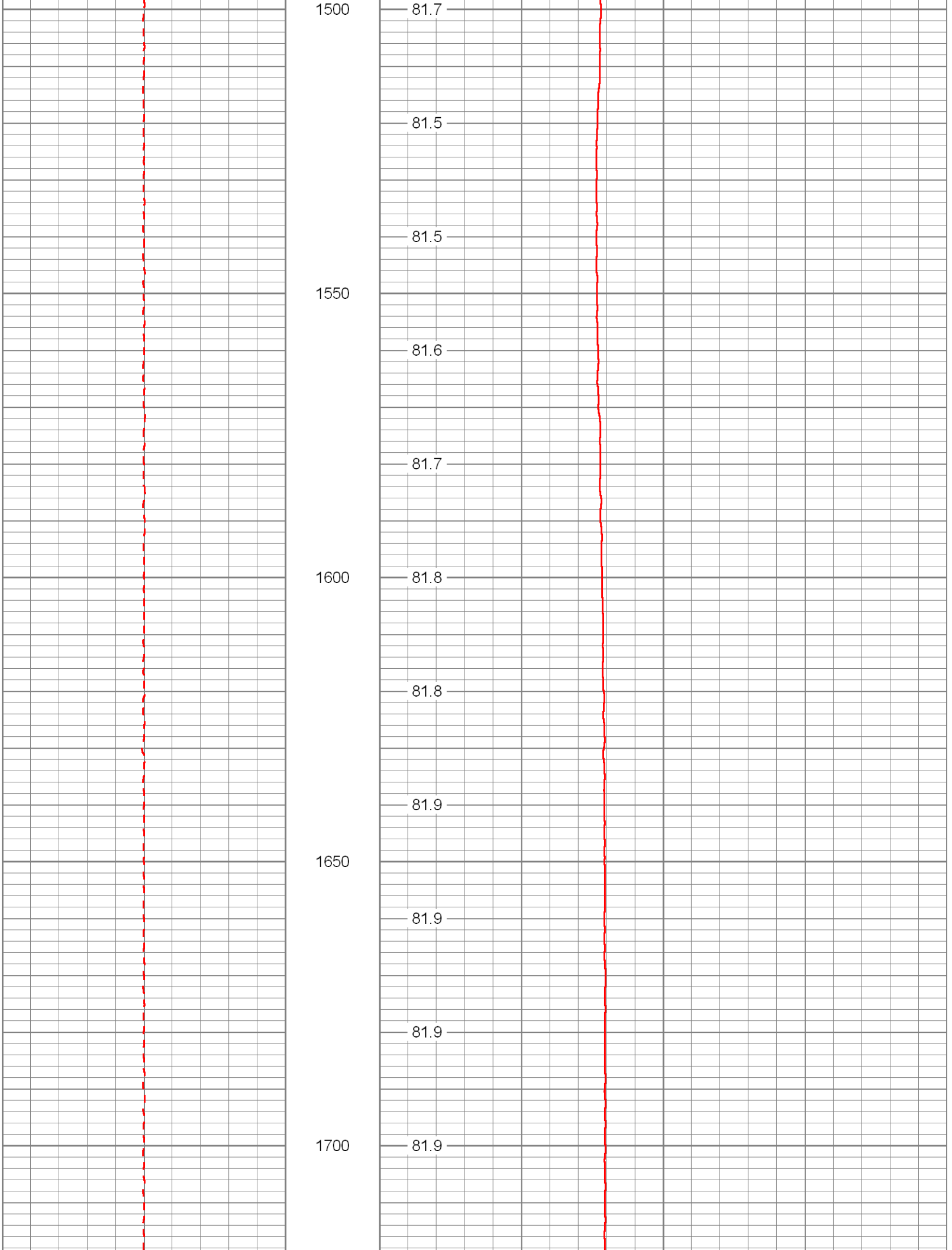

400
450
500
550
600
82.1
82.1
82.2
82.2
82.2
82.2
82.1
82.1
82.2
82.2
82.2


82.2
82.1
650
82.2
82.1
700
82.1
82.1
82.2
750
82.1
82.1
800
82.1
82.2


850
900
950
1000
1050
82.1
82.2
82.1
82.1
82.1
82.1
82.1
82.1
82.1
82.0
82.0
82.1


82.0
82.0
1100
82.1
82.1
82.1
1150
82.1
82.1
1200
82.1
82.0
82.0
1250
82.0


82.0
1300
82.0
81.9
81.9
1350
81.8
81.8
1400
81.8
81.7
81.6
1450
81.7
81.7


1500
81.7
81.5
81.5
1550
81.6
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1600
81.8
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1650
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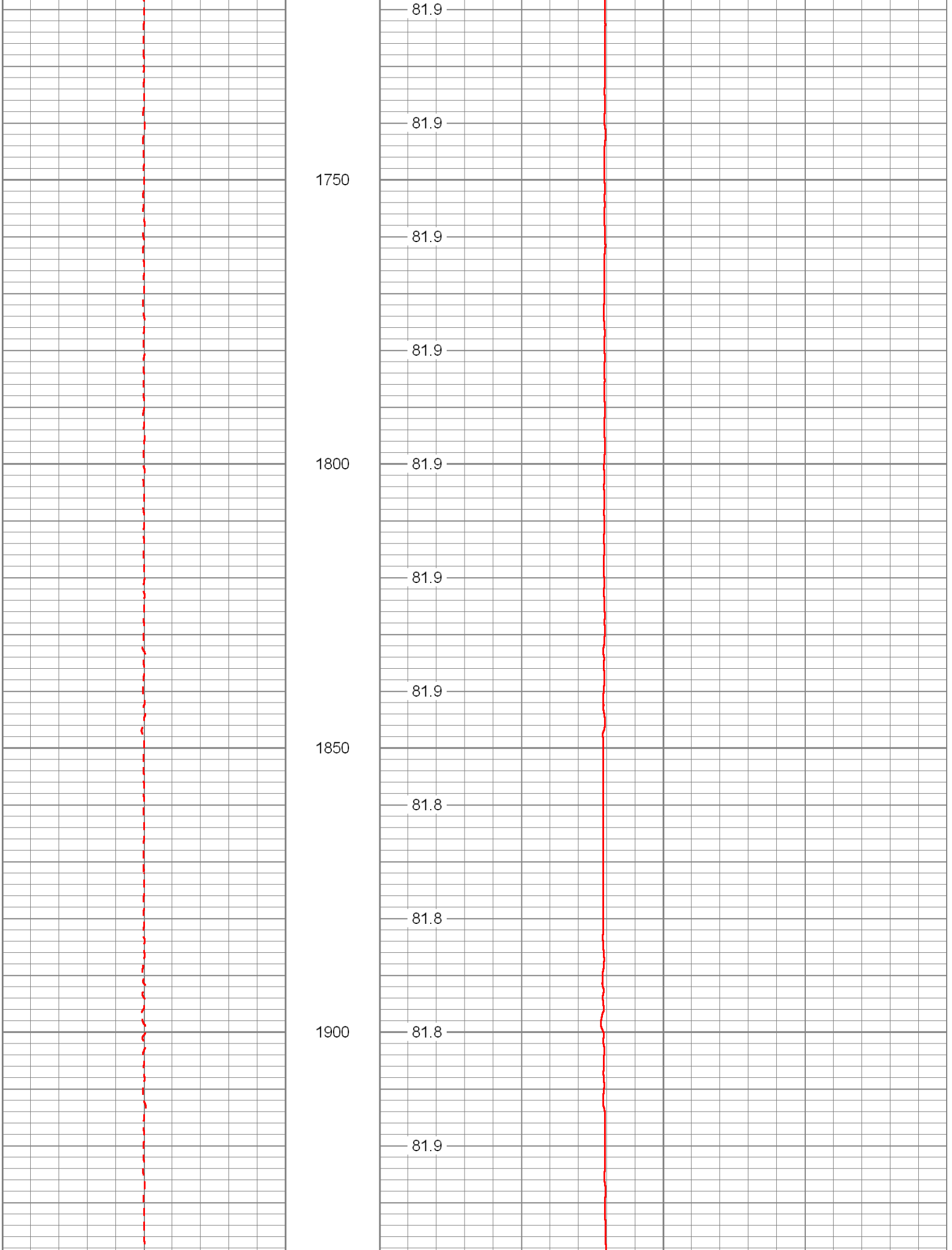
81.9
1700
81.9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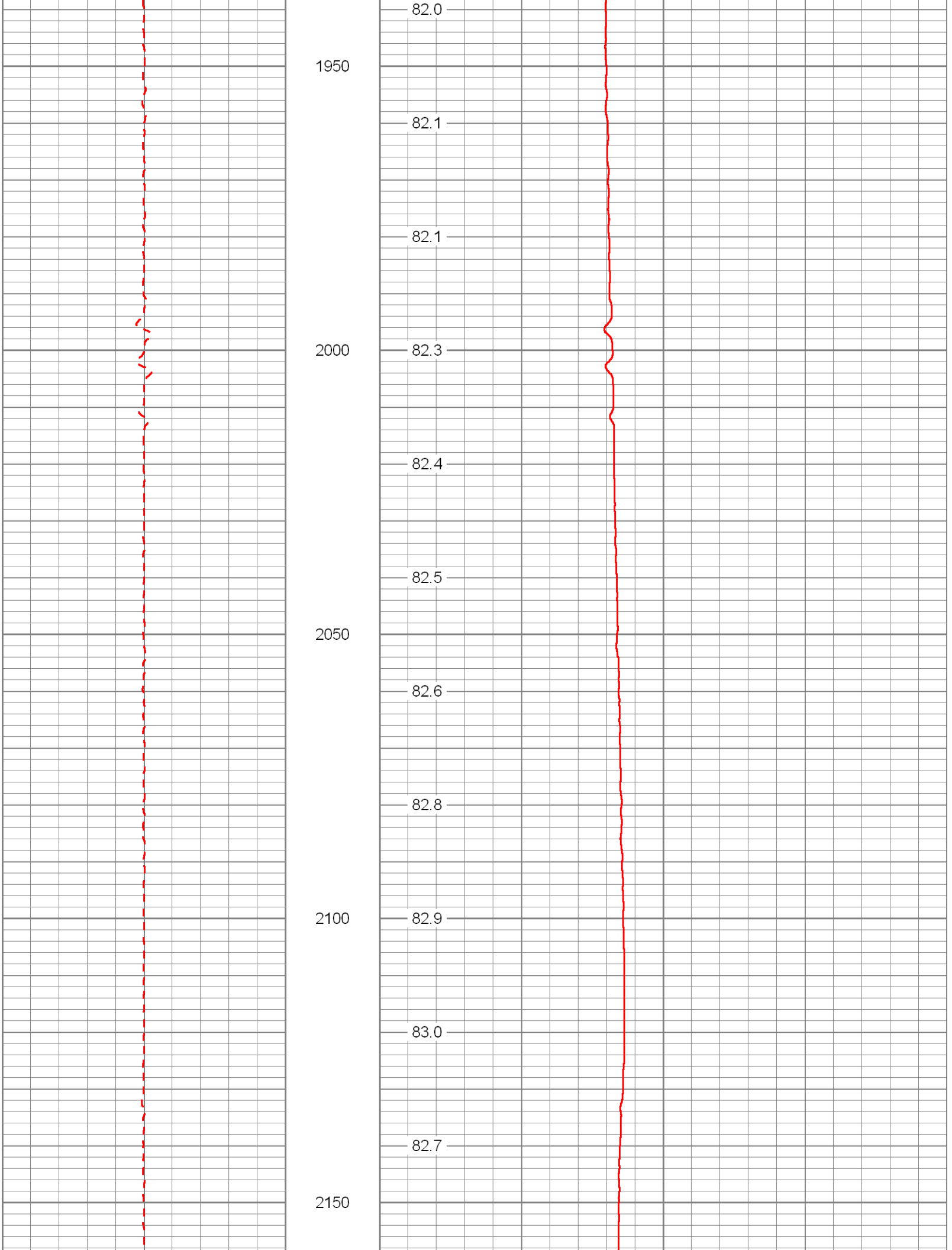
81.9
81.9
1800
81.9
81.9
81.9
1850
81.8
81.8
1900
81.8
81.9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2000
2050
2100
2150
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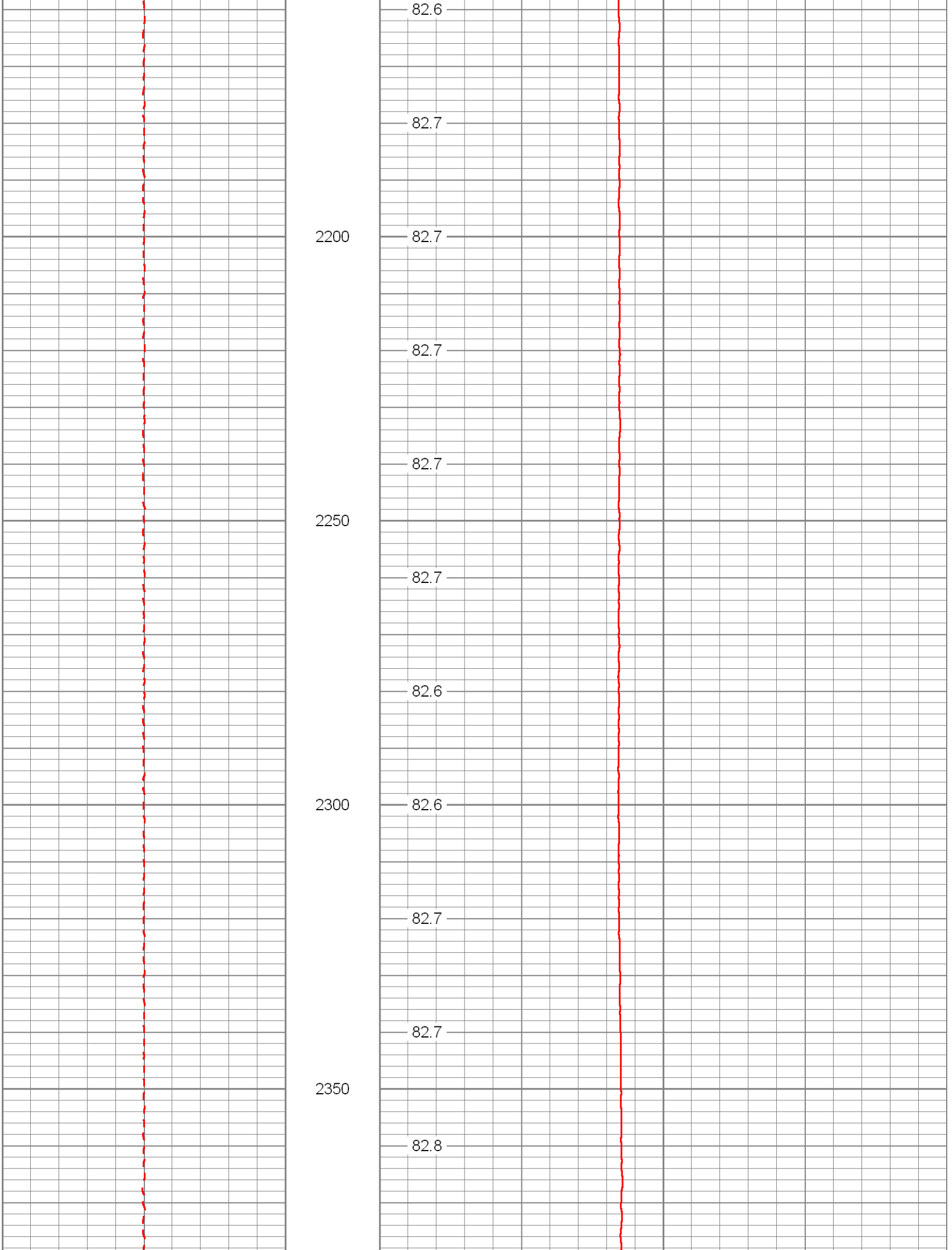
82.1
82.1
82.3
82.4
82.5
82.6
82.8
82.9
83.0
82.7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82.7
2200
82.7
82.7
82.7
2250
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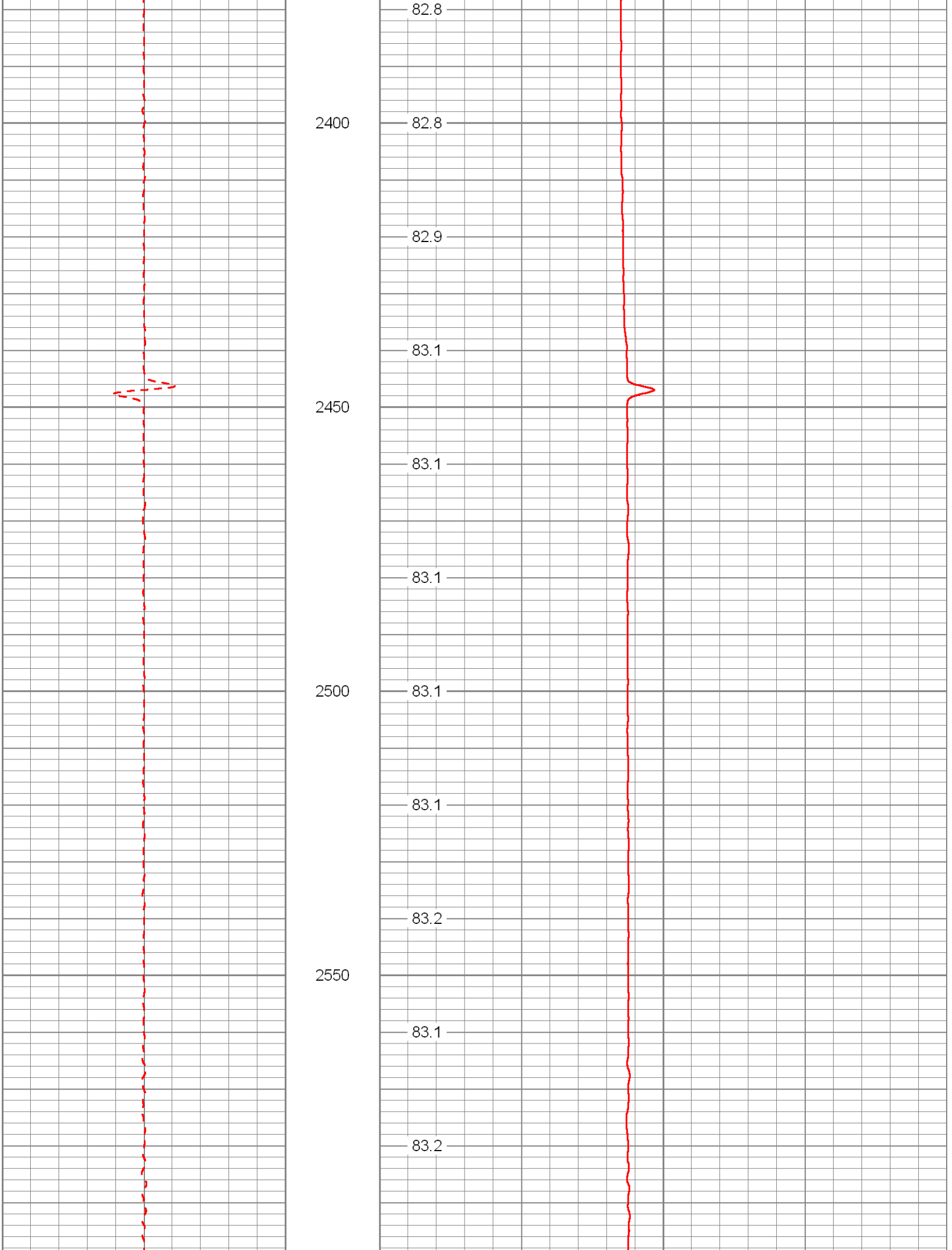
82.6
2300
82.6
82.7
82.7
2350
82.8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2400
82.8
82.9
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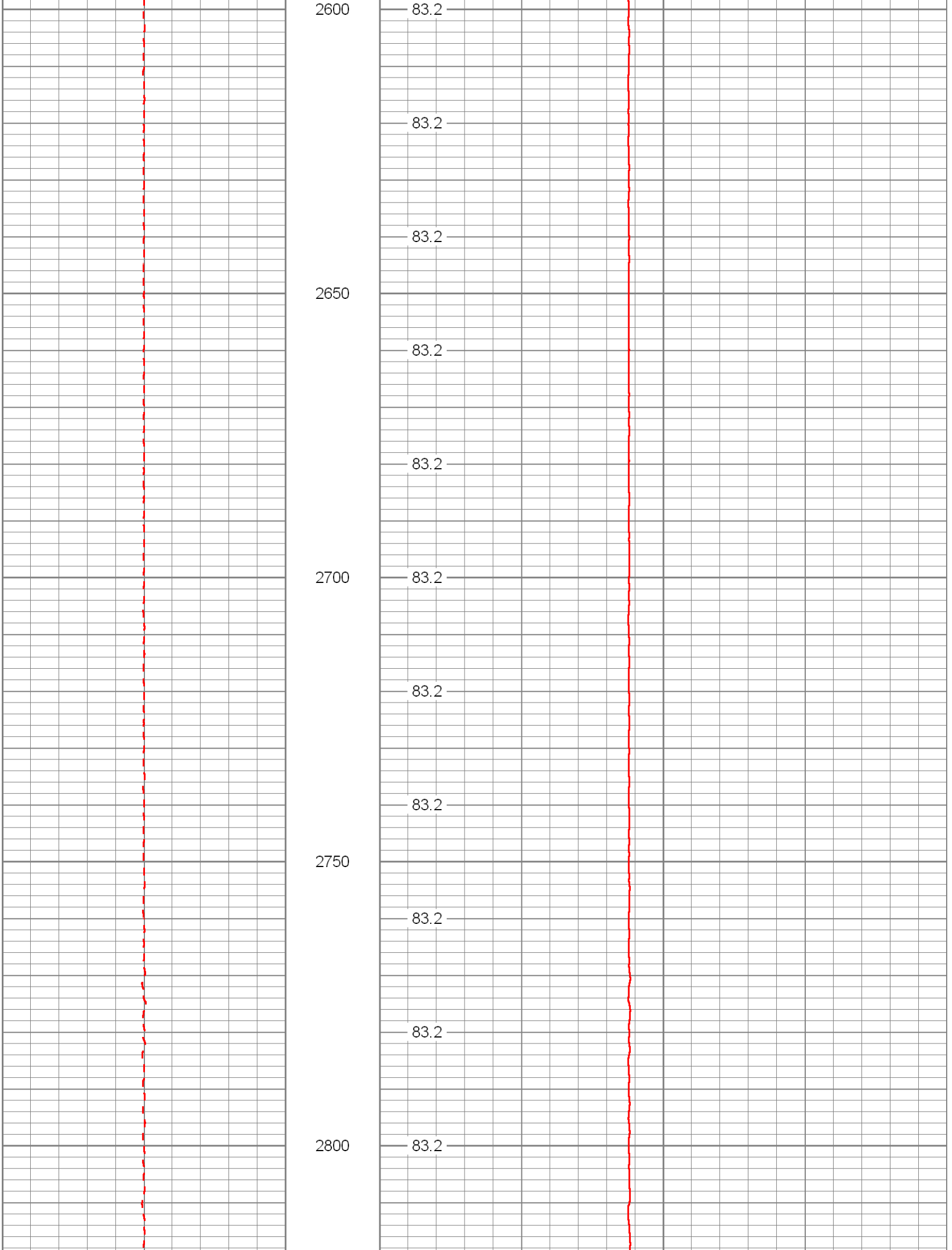
2450
83.1
83.1
2500
83.1
83.1
83.2
2550
83.1
83.2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83.2
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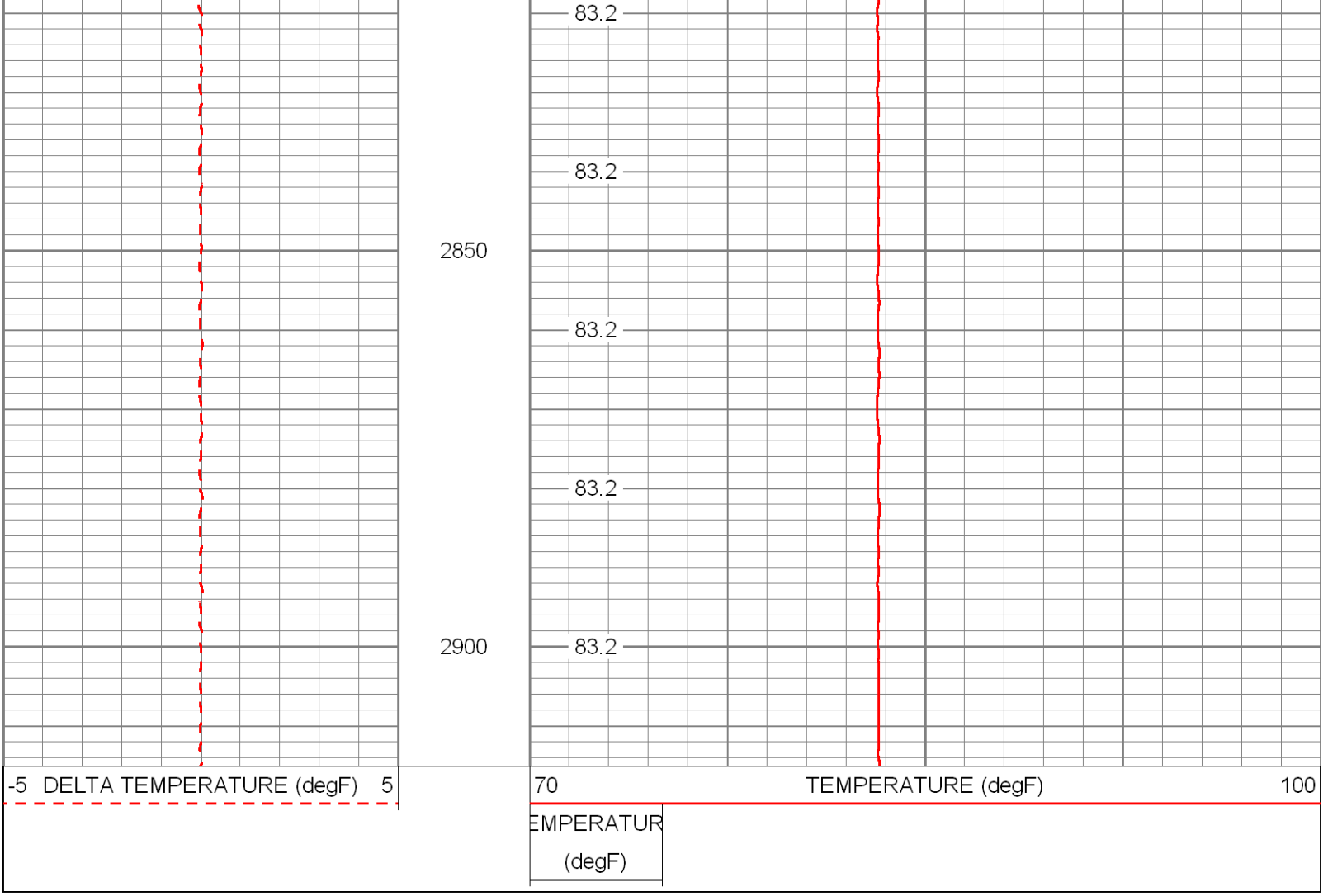
2650
83.2
83.2
2700
83.2
83.2
83.2
2750
83.2
83.2
2800
83.2



Calibration Report

Database File: sdwwtp-iw-10.db
Dataset Pathname: pass4
Dataset Creation: Wed Jul 03 08:21:45 2013 by Log SOC 110722

Temperature Calibration Report

Serial Number: 951
Tool Model: RTS
Performed: Mon Nov 26 07:28:07 2012

Point #	Reading		Reference	
1	332.37	cps	33.00	degF
2	858.20	cps	84.00	degF
3	2127.17	cps	212.00	degF
4		cps		degF
5		cps		degF
6		cps		degF
7		cps		degF
8		cps		degF
9		cps		degF
10		cps		degF

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)

			TEMP-RTS (951)	25.50	1.69	70.00
TEMP	0.10					

Dataset: sdwwtp-iw-10.db: field/well/run1/pass4
Total Length: 25.50 ft
Total Weight: 70.00 lb
O.D. 1.69 in

Appendix F

Television Survey

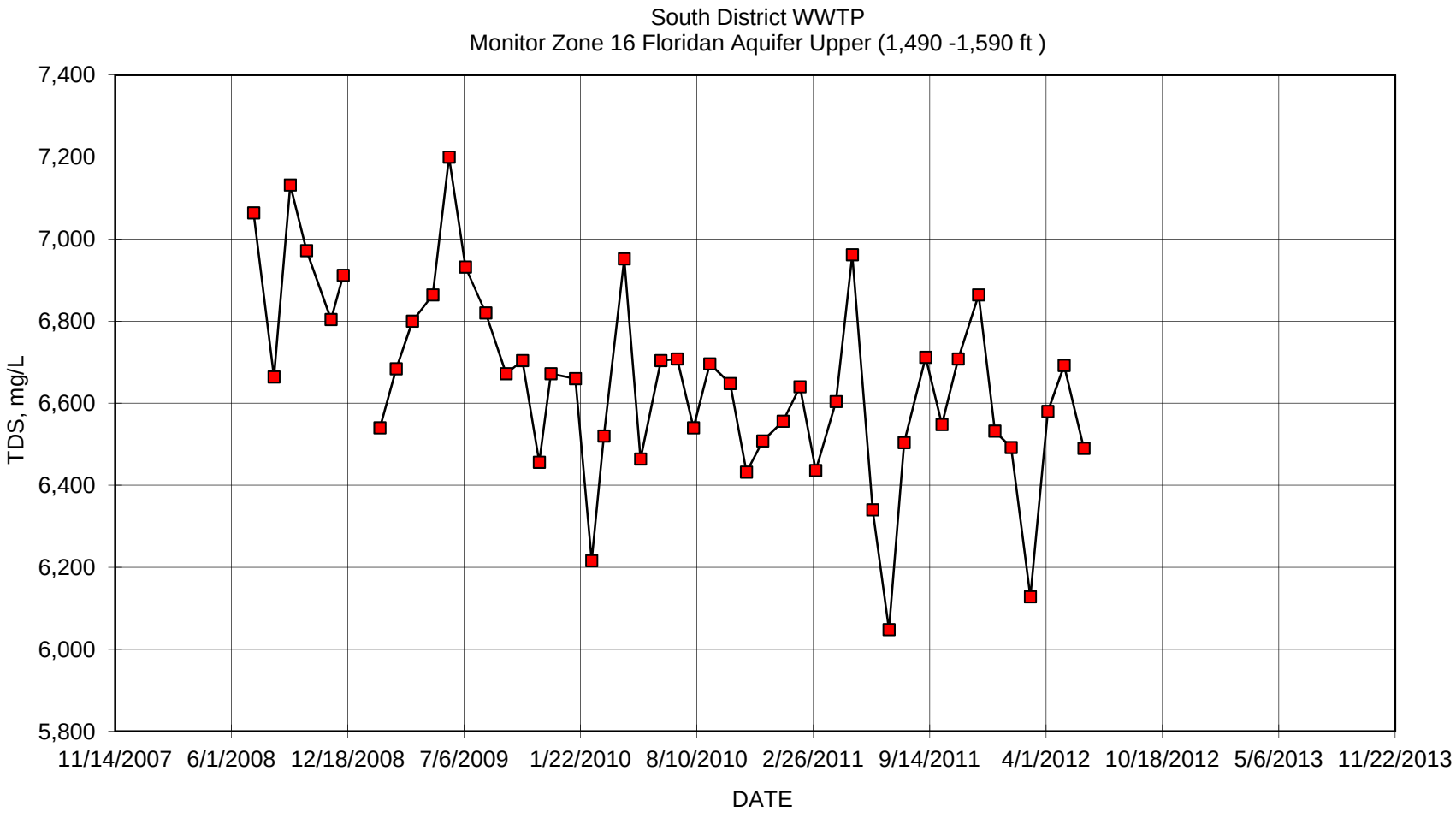
Appendix G

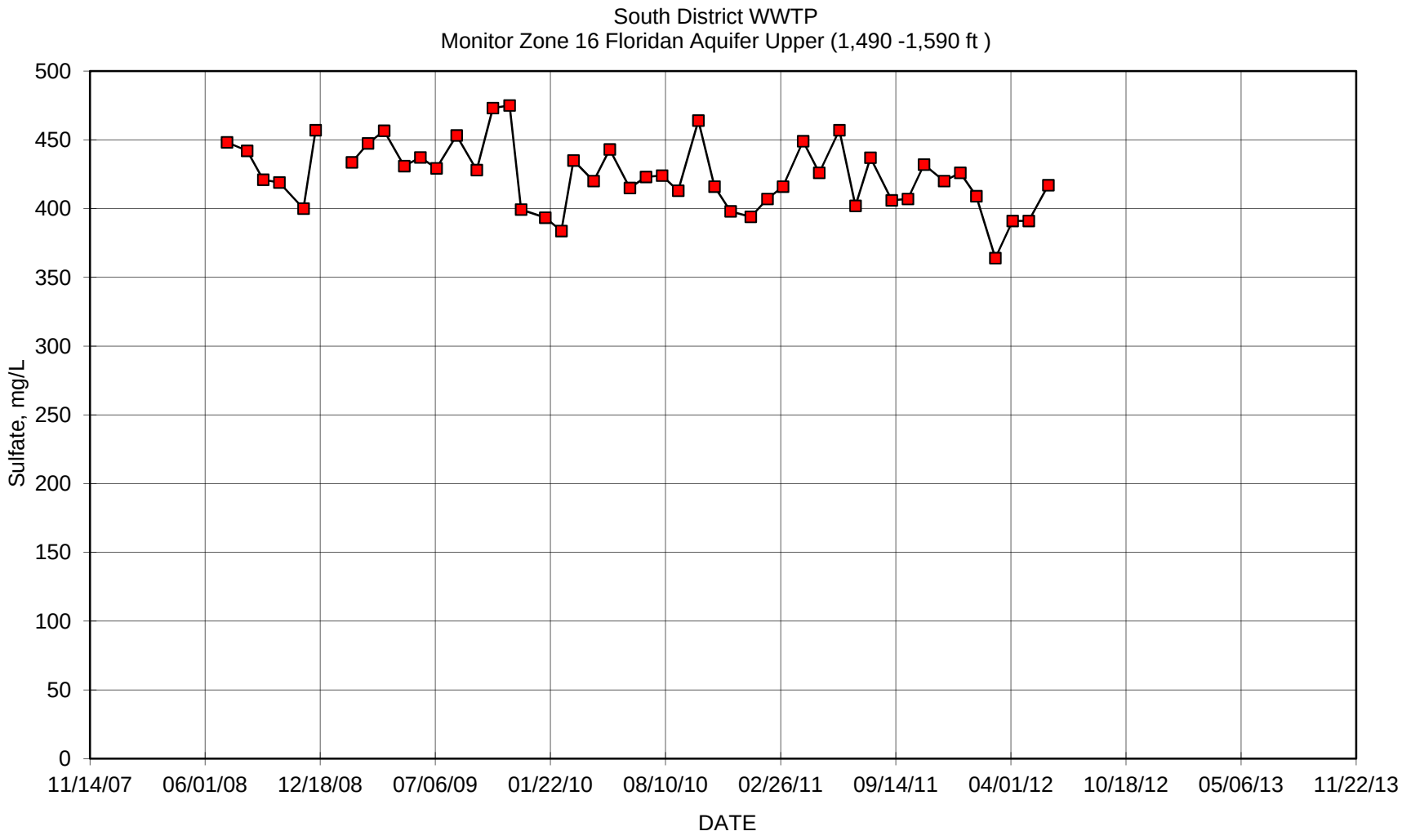
5 year Monitoring Data

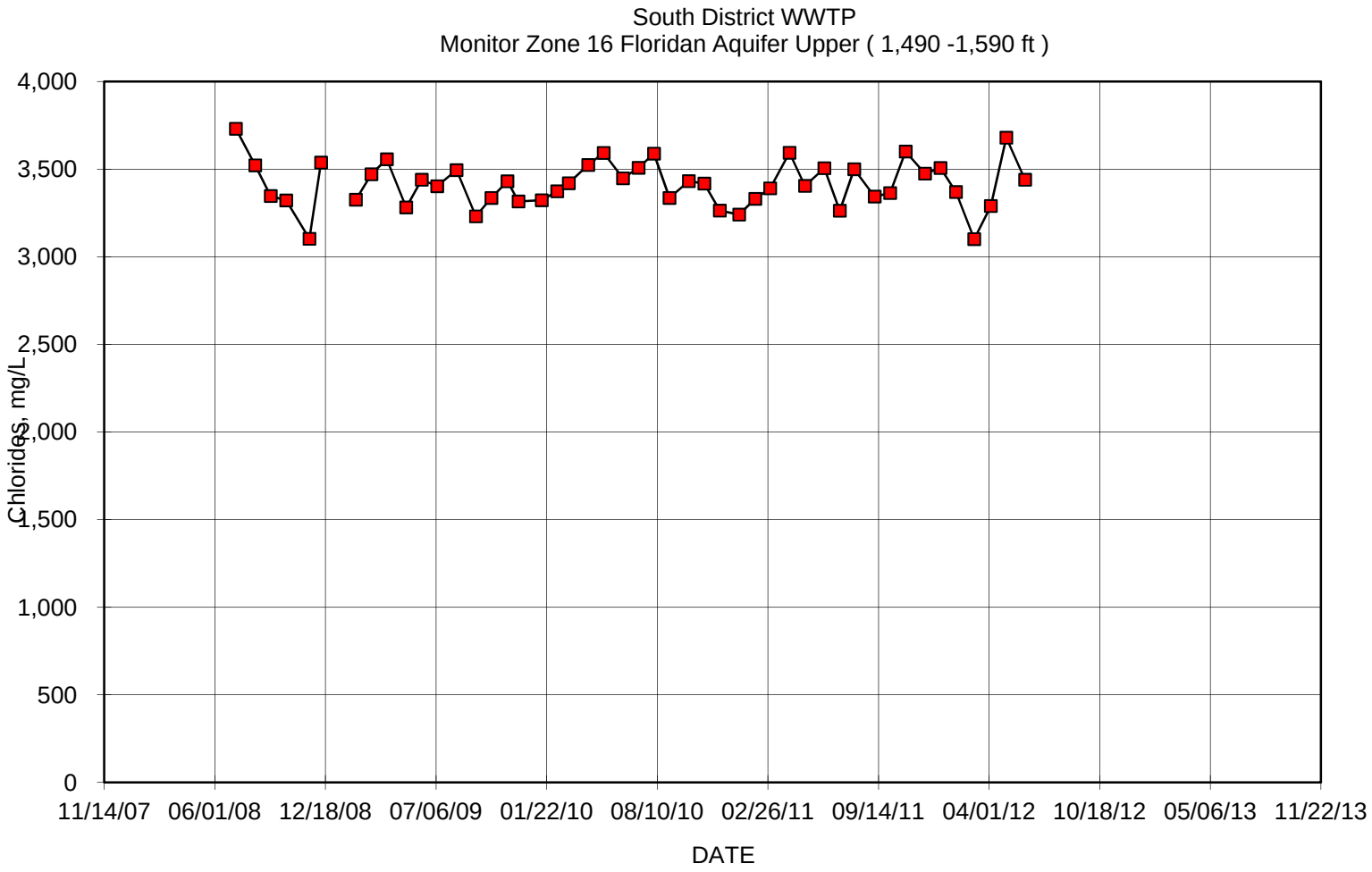
FA-16 Upper

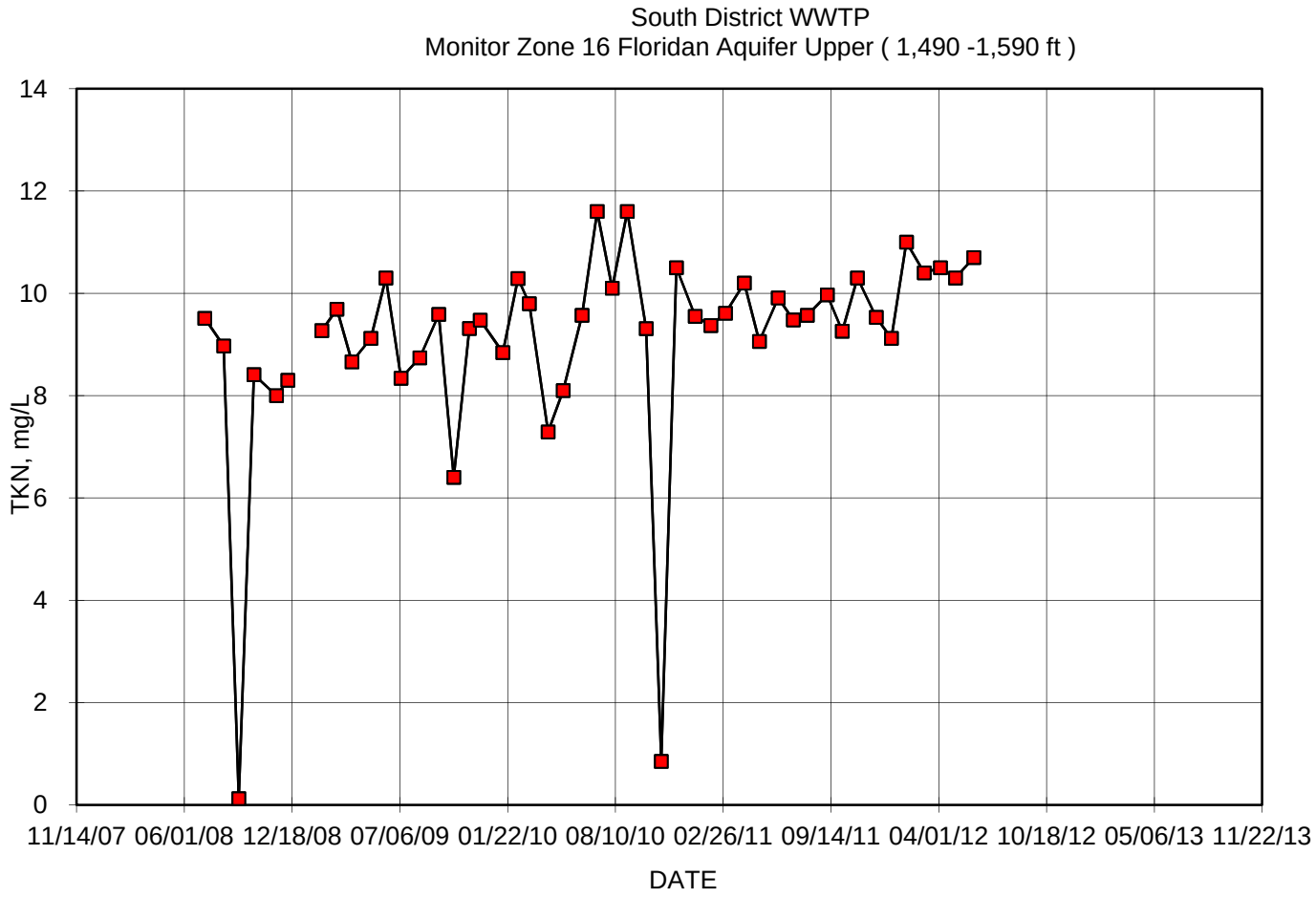
Date	TDS, mg/L	Sulfate, mg/L	Chlorides, mg/L	TKN, mg/L	NH3, mg/L	Conductivity, Micromho/cm	Temp., C	Temp., F	pH	TP, mg/L	TSS mg/L	NO_3 mg/L	NO_2 mg/L	Sodium, mg/L	Gross Alpha, pCi/L	Radium 226, pCi/L	Radium 228, pCi/L
07/09/08	7,064	448	3,731	9.51	6.84	10,950	24	75	7.7	0.00	1.76	0.03	0.00				
08/13/08	6,664	442	3,522	8.97	7.36	10,520	24	75	7.7	0.01	7.40	0.08	0.05				
09/10/08	7,132	421	3,347	0.12	7.94	11,080	25	76	7.6	0.98	8.00	0.08	0.05				
10/08/08	6,972	419	3,322	8.41	7.94	11,270	24	75	7.5	0.03	6.40	0.03	0.00				
11/19/08	6,804	400	3,103	8.00	6.51	10,340	21	71	7.7	0.00	1.76	0.03	0.00				
12/10/08	6,912	457	3,538	8.30	7.07	11,090	23	74	7.5	0.02	7.80	0.03	0.00				
01/14/09																	
02/11/09	6,540	434	3,326	9.27	7.32	11,410	24	74	7.8	0.07	10.90	0.00	0.01				
03/11/09	6,684	447	3,471	9.69	8.75	10,980	23	73	7.3	0.40	5.80	0.00	0.00				
04/08/09	6,800	457	3,557	8.66	9.52	11,230	22	72	7.5	0.04	6.20	0.00	0.00				
05/13/09	6,864	431	3,282	9.12	8.73	11,100	24	76	7.6	0.00	8.80	0.02	0.00				
06/10/09	7,200	437	3,440	10.30	8.96	11,050	24	75	7.6	0.18	7.00	0.00	0.00				
07/08/09	6,932	429	3,403	8.34	7.81	11,120	25	76	7.5	0.03	9.00	0.00	0.00				
08/12/09	6,820	453	3,495	8.74	8.92	11,320	23	74	7.5	0.01	6.20	0.00	0.00				
09/16/09	6,672	428	3,231	9.59	7.75	10,840			7.5	0.01		0.05	0.01	1790	22.5	5.8	0.8
10/14/09	6,704	473	3,336	6.40	8.28	10,270			7.6			0.00	0.00	1730	9.3	5.3	0.8
11/12/09	6,456	475	3,431	9.31	8.62	10,020			7.7			0.00	0.00	1750	14.7	5.4	0.8
12/02/09	6,672	399	3,316	9.48	8.54	10,940	24	75	7.5	0.02	8.00	0.00	0.00	1660	8.6	6.2	0.8
01/13/10	6,660	393	3,323	8.84	8.31	10,740	20	68	7.5	0.02	5.80	0.00	0.00	1470	14.7	6	0.9
02/10/10	6,216	384	3,374	10.29	9.36	10,440	23	73	8.1	0.02	2.40	0.00	0.00	1630	13	5.9	0.8
03/03/10	6,520	435	3,420	9.80	8.57	11,000	22	71	7.5	0.02	6.60	0.00	0.00	1700	10.6	6.4	0.8
04/07/10	6,952	420	3,524	7.29	8.07	10,970	23	74	7.4	0.01	8.00	0.00	0.00	1820	18.8	6.8	0.9
05/05/10	6,464	443	3,593	8.10	8.28	10,710	24	74	7.6	0.01	1.80	0.01	0.00	1830	20.9	6.2	0.8
06/09/10	6,704	415	3,448	9.57	8.02	11,030	26	78	7.7	0.05	6.00	0.01	0.01	1620	17.1	5.9	1.0
07/07/10	6,708	423	3,508	11.60	8.62	10,860	24	75	7.6	0.01	1.40	0.00	0.00	1860	16.5	5.7	0.7
08/04/10	6,540	424	3,589	10.10	10.10	10,220	24	75	7.7	0.11	5.20	0.01	0.00	1740	16.6	6.3	0.8
09/01/10	6,696	413	3,336	11.60	9.48	10,940	24	75	7.7	0.02	14.50	0.01	0.00	1750	22.9	5.7	0.8
10/06/10	6,648	464	3,432	9.31	9.94	10,850	23	73	7.5	0.02	1.70	0.00	0.00	1760	7.6	1.4	0.9
11/03/10	6,432	416	3,418	0.85	9.52	10,520	23	73	7.6	0.02	4.40	0.00	0.85	4830	17.7	6.3	0.9
12/01/10	6,508	398	3,264	10.50	10.10	10,770	23	73	7.8	0.02	9.20	0.00	0.01	1820	17.7	7.4	0.6
01/05/11	6,556	394	3,241	9.55	9.59	10,410	23	74	7.7	0.02	3.30	0.00	0.00	1840	17.4	9.8	0.9
02/03/11	6,640	407	3,331	9.37	8.94	10,150	22	72	7.5	0.10	2.40	0.00	0.01	1730	21.3	7.8	0.7
03/02/11	6,436	416	3,391	9.61	9.03	10,810	22	72	7.6	0.02	9.80	0.00	0.00	1700	23.7	6.8	0.8

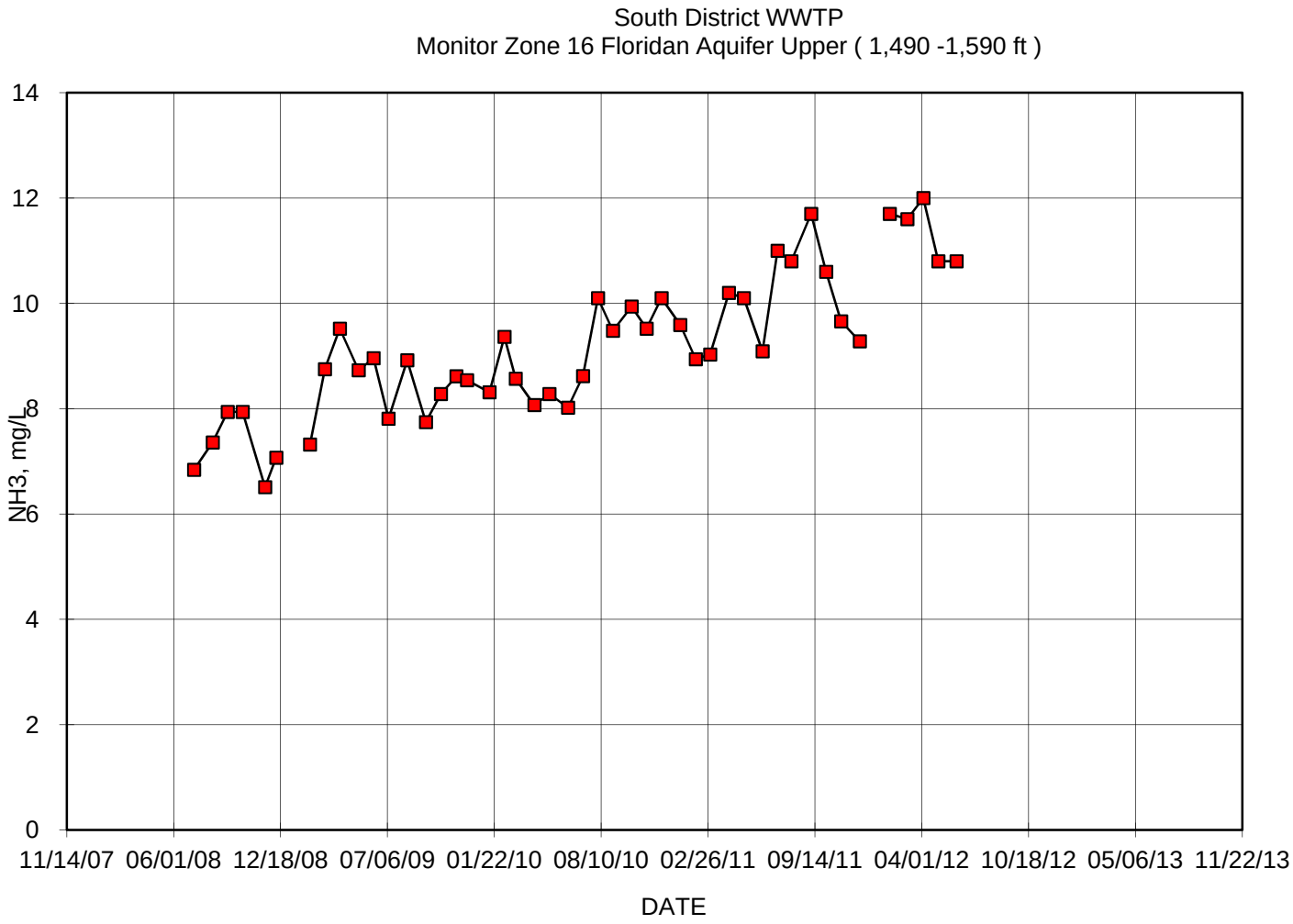
04/06/11	6,604	449	3,594	10.20	10.20	10,370	23	73	7.8	0.02	5.00	0.00	0.00	1660	17.8	6.7	0.7
05/04/11	6,962	426	3,405	9.06	10.10	11,170	23	73	7.8	0.02	3.40	0.00	0.00	1740	10.1	6.6	0.8
06/08/11	6,340	457	3,506	9.91	9.09	10,720	23	74	7.7	0.05	2.00	0.00	0.00	1820	19.7	4.5	0.7
07/06/11	6,048	402	3,263	9.48	11.00	10,460	24	75	7.6	0.02	2.50	0.00	0.00	1670	14	5.5	0.8
08/01/11	6,504	437	3,500	9.57	10.80	10,320	25	76	7.5	0.03	9.50	0.00	0.00	1780	28.1	6.7	0.8
09/07/11	6,712	406	3,344	9.97	11.70	10,310	24	75	7.8	0.06	7.20	0.00	0.00	1760	13.3	7.1	0.8
10/05/11	6,548	407	3,364	9.26	10.60	10,010	23	73	7.7	0.04	7.80	0.00	0.00	1780	24.1	6.5	1.0
11/02/11	6,708	432	3,601	10.30	9.66	9,745	23	74	7.9	0.02	4.30	0.00	0.00	1990	19.3	5.2	0.9
12/07/11	6,864	420	3,475	9.53	9.28	10,534	23	73	6.1	0.03	3.20	0.00	0.00	1900	11.5	6.0	0.9
01/04/12	6,532	426	3,507	9.12		9,452	21	69	7.7	0.02	6.30	0.00	0.00	1900	14.9	5.5	0.7
02/01/12	6,492	409	3,370	11.00	11.70	8,803	23	73	7.6	0.02	2.60	0.00	0.00	1870	18.1	5.6	0.8
03/05/12	6,128	364	3,101	10.40	11.60	9,691	23	74	7.7	0.00	6.00	0.00	0.00	1820	25.4	6.0	0.8
04/04/12	6,580	391	3,290	10.50	12.00	10,094	23	73	7.5	0.03	2.90	0.50	0.50	1750	18	6.7	0.8
05/02/12	6,692	391	3,680	10.30	10.80	9,634	24	74	7.6	0.01	7.50	0.00	0.00	1990	11.9	1.9	1.0
06/05/12	6,490	417	3,440	10.70	10.80	10,690	23	74	8.1	0.02	4.50	0.01	0.00	1760	17	5.6	0.8
07/11/12																	
08/01/12																	
09/05/12																	
10/03/12																	
11/07/12																	
12/05/12																	
01/09/13																	
02/06/13																	
03/04/13																	

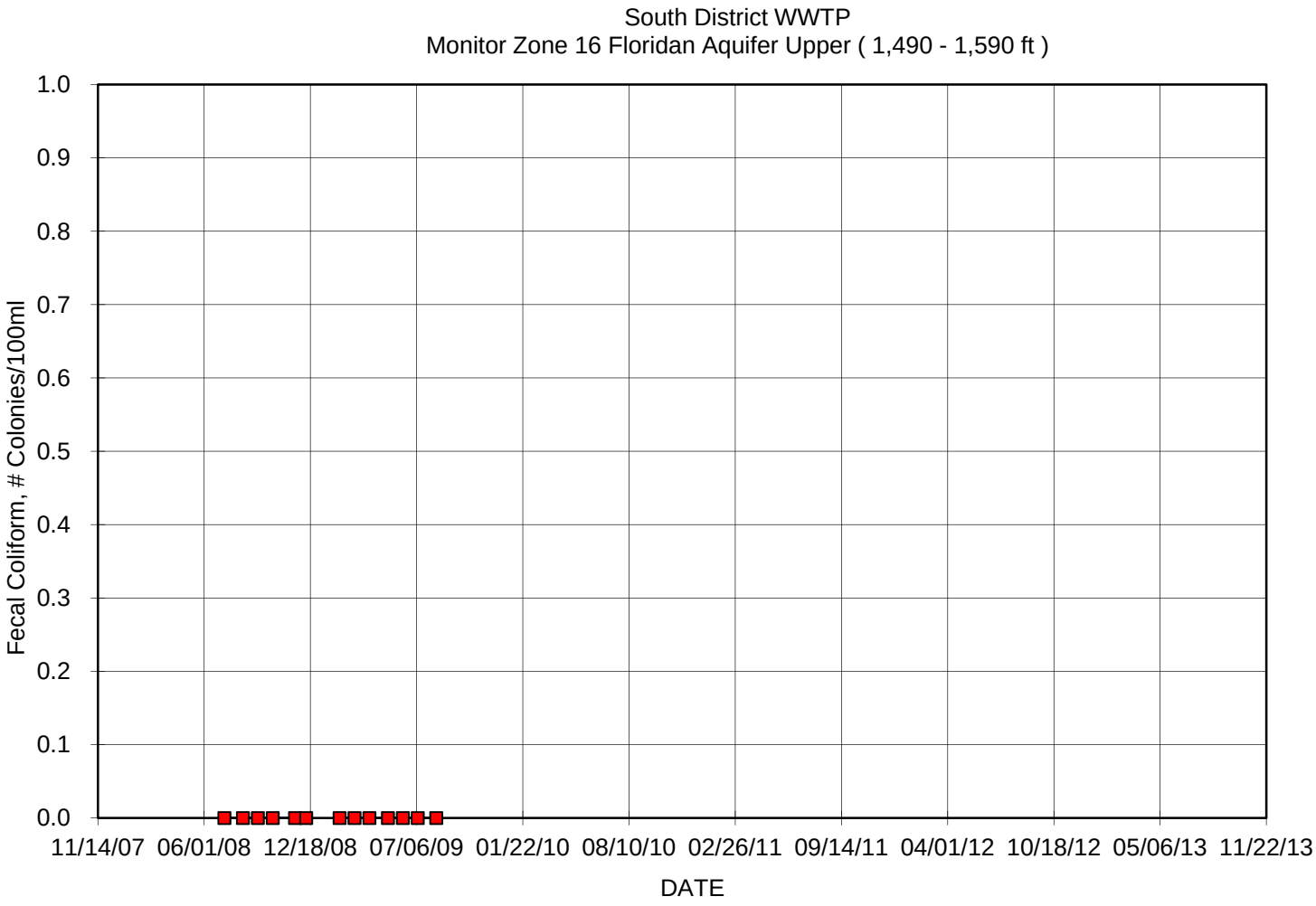

South District WWTP
Monitor Zone 16 Floridan Aquifer Upper (1,490 -1,590 ft)
7,400
7,200
7,000
6,800
6,600
6,400
6,200
6,000
5,800
TDS, mg/L
11/14/2007
6/1/2008
12/18/2008
7/6/2009
1/22/2010
8/10/2010
2/26/2011
9/14/2011
4/1/2012
10/18/2012
5/6/2013
11/22/2013
DATE

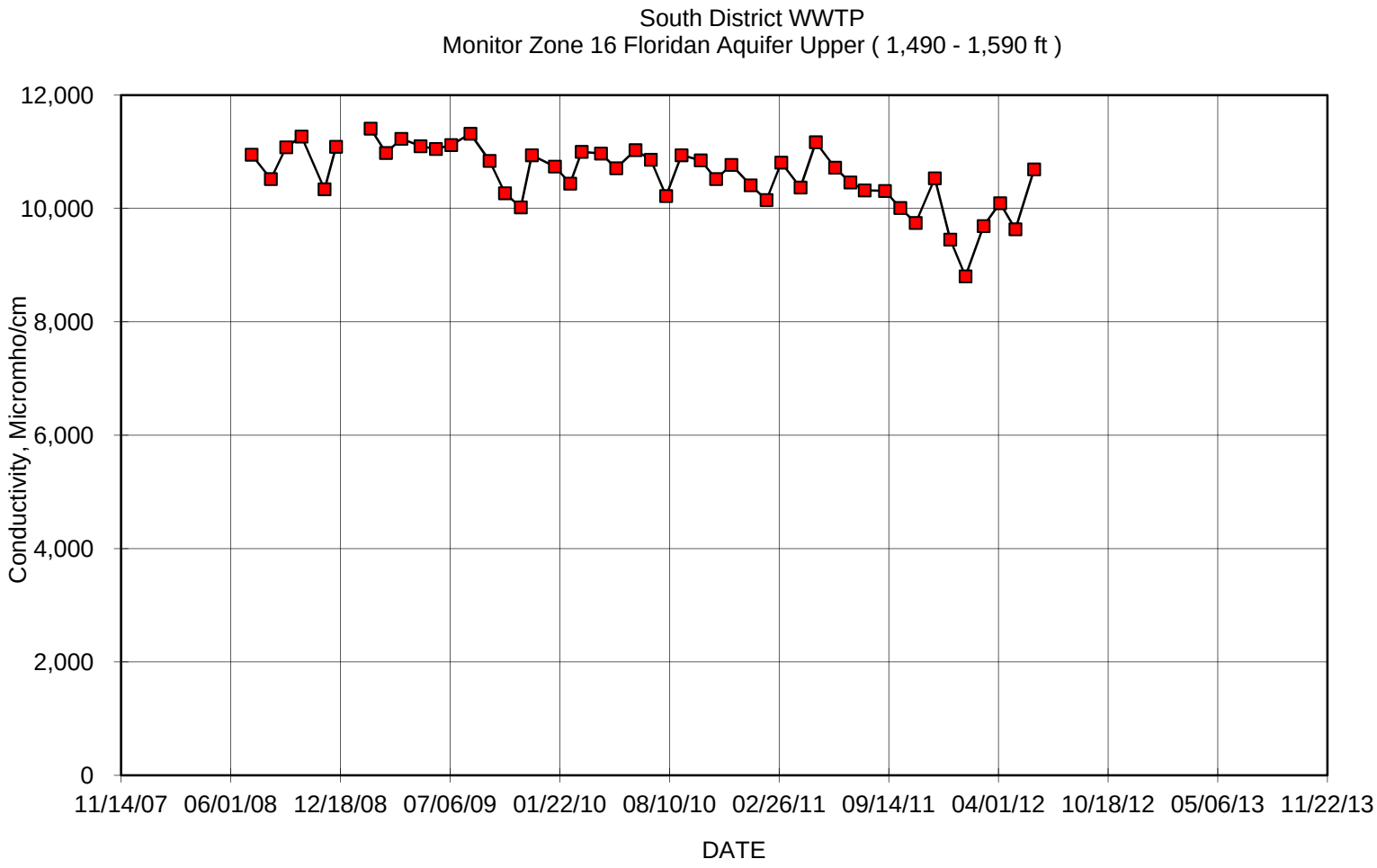

South District WWTP
Monitor Zone 16 Floridan Aquifer Upper (1,490 -1,590 ft)
Sulfate, mg/L
500
450
400
350
300
250
200
150
100
50
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

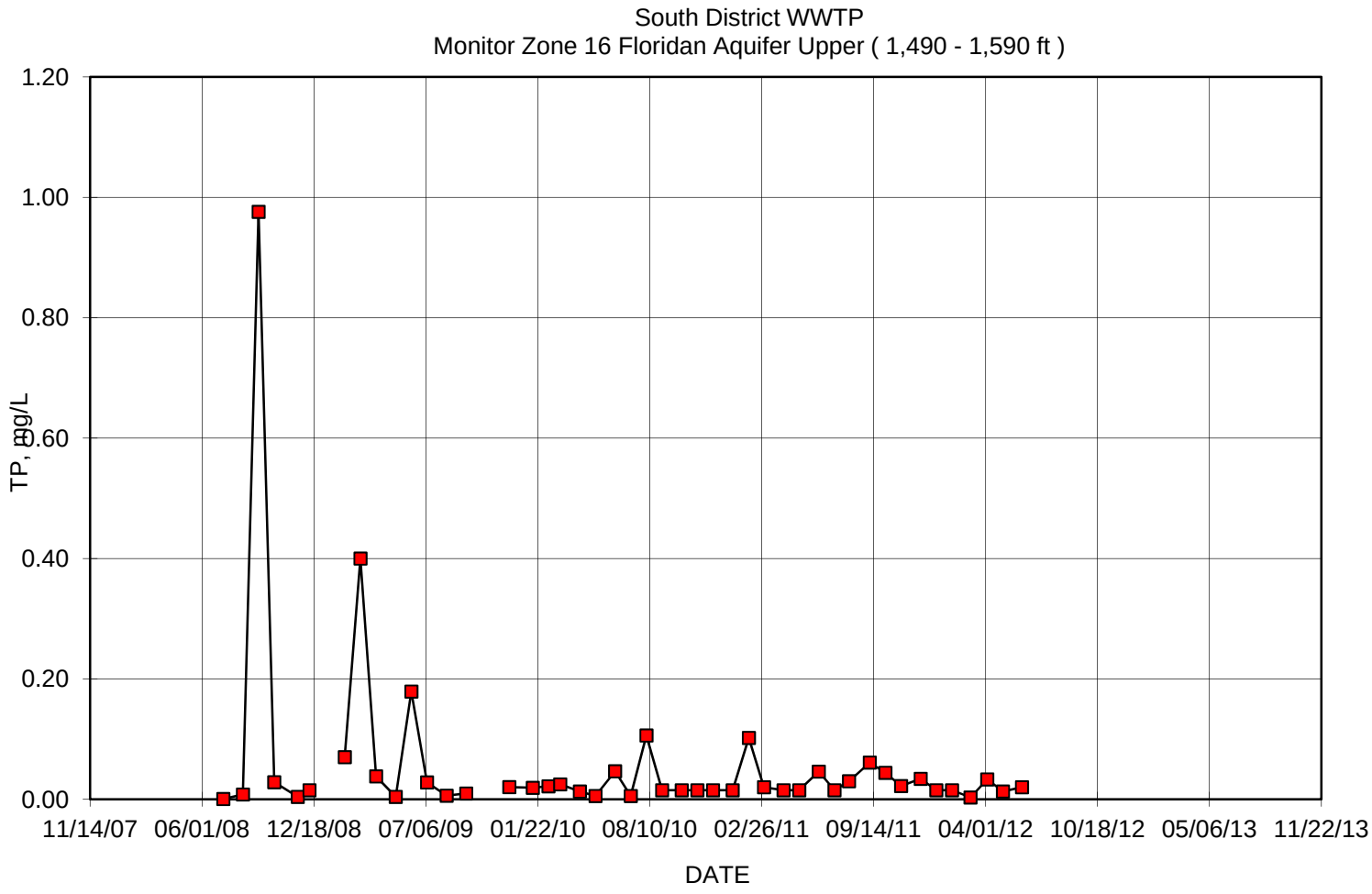

South District WWTP
Monitor Zone 16 Floridan Aquifer Upper (1,490 -1,590 ft)
Chlorides, mg/L
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

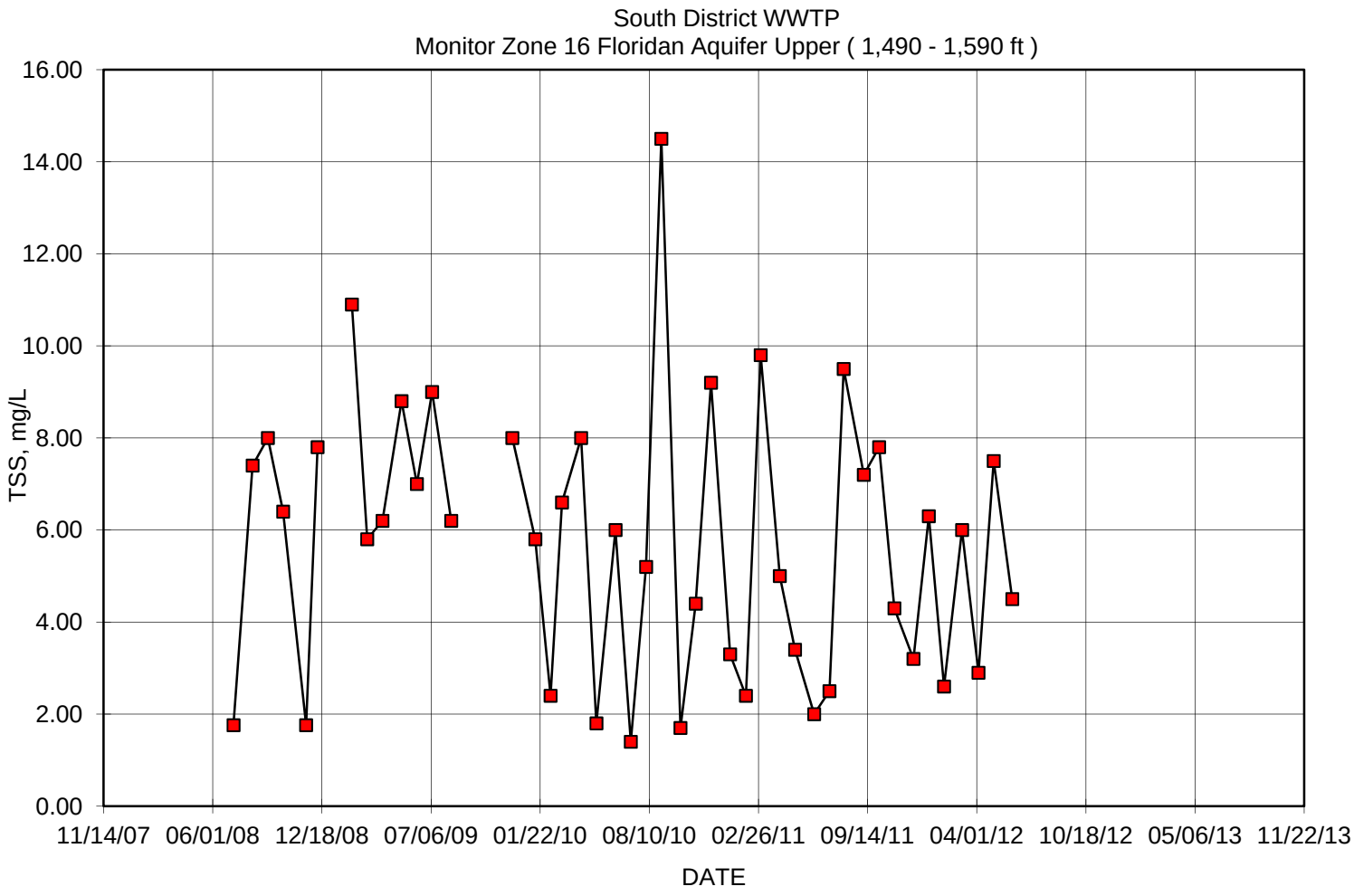

South District WWTP
Monitor Zone 16 Floridan Aquifer Upper (1,490 -1,590 ft)
TKN, mg/L
0
2
4
6
8
10
12
14
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 16 Floridan Aquifer Upper (1,490 -1,590 ft)
NH3, mg/L
0
2
4
6
8
10
12
14
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 16 Floridan Aquifer Upper (1,490 - 1,590 ft)
Fecal Coliform, # Colonies/100ml
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 16 Floridan Aquifer Upper (1,490 - 1,590 ft)
Conductivity, Micromho/cm
12,000
10,000
8,000
6,000
4,000
2,000
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 16 Floridan Aquifer Upper (1,490 - 1,590 ft)
1.20
1.00
0.80
0.60
0.40
0.20
0.00
TP, mg/L
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

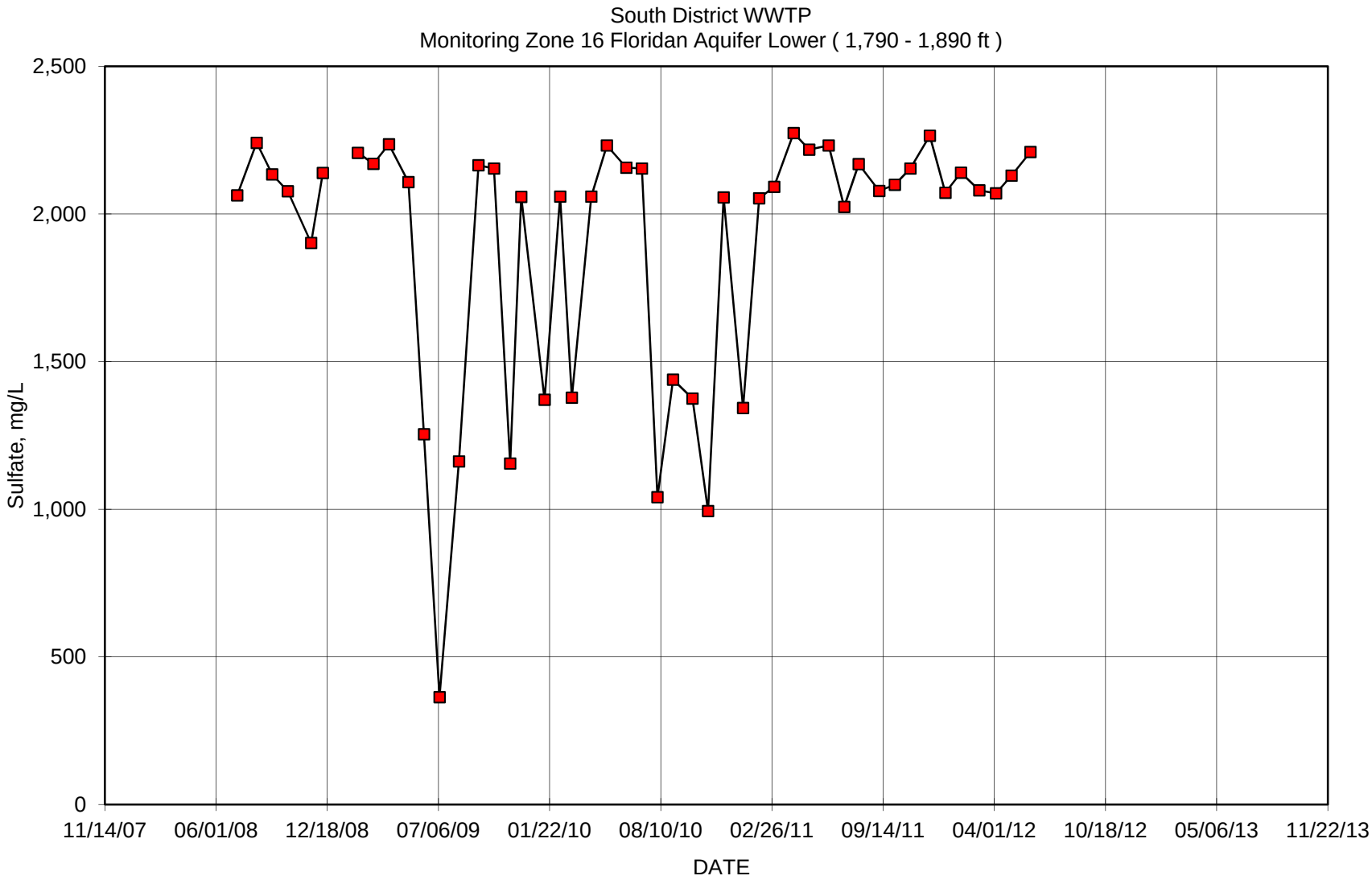

South District WWTP
Monitor Zone 16 Floridan Aquifer Upper (1,490 - 1,590 ft)
TSS, mg/L
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

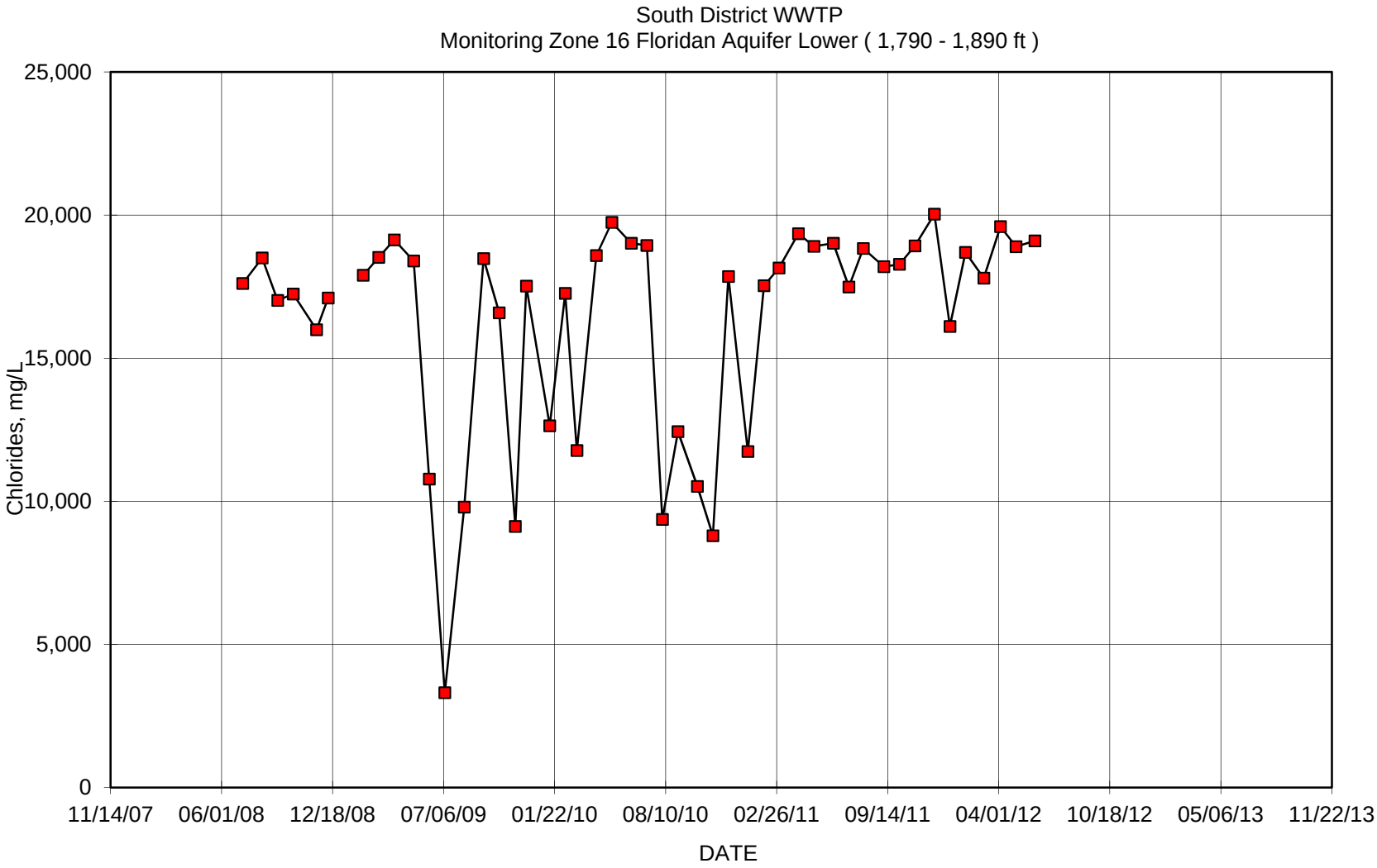
FA-16 Lower Data

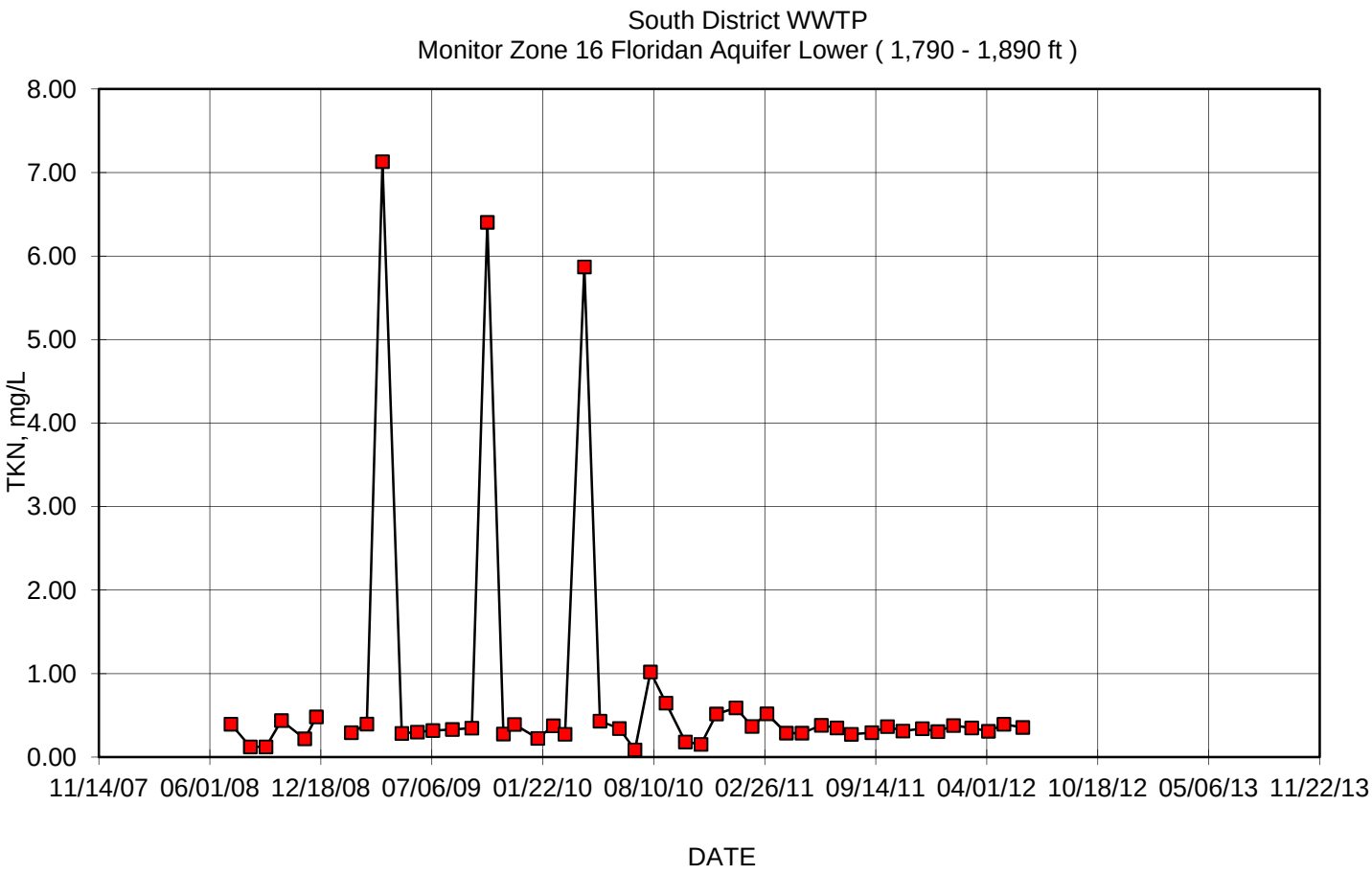
Date	TDS, mg/L	Sulfate, mg/L	Chlorides, mg/L	TKN, mg/L	NH3, mg/L	Conductivity, Micromho/cm	Temp., C	Temp., F	pH	TP, mg/L	TSS mg/L	NO_3 mg/L	NO_2 mg/L	Sodium, mg/L	Gross Alpha, pCi/L	Radium 226, pCi/L	Radium 228, pCi/L
07/09/08	35,310	2,063	17,613	0.40	0.01	48,780	24	75	7.5	0.01	17.20	0.03	0.00				
08/13/08	33,330	2,241	18,504	0.12	0.09	50,190	24	75	7.6	0.01	23.20	0.08	0.05				
09/10/08	33,940	2,134	17,021	0.12	0.03	45,730	25	77	7.5	0.06	21.40	0.08	0.05				
10/08/08	36,390	2,077	17,244	0.44	0.07	45,950	24	74	7.6	0.02	24.80	0.03	0.00				
11/19/08	36,330	1,902	15,996	0.22	0.02	45,360	21	71	7.3	0.00	18.60	0.03	0.00				
12/10/08	33,870	2,139	17,107	0.48	0.08	48,360	23	73	7.3	0.03	17.40	0.03	0.00				
01/14/09																	
02/11/09	34,300	2,207	17,899	0.29	0.07	48,420	23	74	7.1	0.07	24.90	0.00	0.00				
03/11/09	32,540	2,170	18,526	0.40	0.14	49,470	22	72	7.4	1.25	13.20	0.00	0.00				
04/08/09	33,950	2,236	19,136	7.13	0.12	50,890	23	73	7.3	0.04	22.40	0.00	0.00				
05/13/09	34,420	2,108	18,398	0.29	0.20	49,150	25	77	7.5	0.01	16.20	0.00	0.00				
06/10/09	34,150	1,254	10,779	0.30	0.16	61,900	24	75	7.4	0.32	13.00	0.00	0.00				
07/08/09	34,940	364	3,313	0.32	0.02	49,160	25	76	7.3	0.01	18.20	0.00	0.00				
08/12/09	34,030	1,162	9,800	0.33	0.14	48,770	23	74	7.6	0.01	17.80	0.00	0.00				
09/16/09	34,240	2,165	18,481	0.35	0.10	47,520			7.5	0.01		0.05	0.01	9560	16.1	12.1	0.9
10/14/09	34,490	2,154	16,589	6.40	0.13	10,270			7.6	0.03		0.00	0.00	1730	9.3	5.3	0.8
11/12/09	33,440	1,155	9,124	0.28	0.11	49,220			8.4	0.03		0.00	0.00	8170	14.0	14.2	1.0
12/02/09	35,370	2,058	17,521	0.39	0.13	50,850	24	74	7.4	0.03	15.80	0.00	0.00	10200	17.2	15.8	0.8
01/13/10	33,840	1,371	12,640	0.22	0.08	46,860	20	68	7.2	0.02	9.60	0.00	0.00	7860	14.0	12.7	1.0
02/10/10	32,960	2,059	17,267	0.38	0.08	47,120	22	72	7.4	0.03	18.20	0.00	0.00	7890	13.7	12.6	1.0
03/03/10	34,250	1,378	11,776	0.27	0.09	48,420	21	69	7.3	0.03	11.00	0.00	0.00	8820	15.3	12.4	0.8
04/07/10	33,740	2,059	18,588	5.87	7.99	49,020	24	75	7.3	0.02	12.00	0.00	0.00	8990	17.4	13.1	0.8
05/05/10	33,772	2,232	19,747	0.43	0.14	48,160	24	75	7.5	0.01	14.40	0.00	0.00	9890	13.1	10.9	0.7
06/09/10	34,880	2,157	19,017	0.34	0.11	49,640	24	76	7.4	0.04	24.80	0.00	0.00	8560	14.4	13.8	0.9
07/07/10	34,430	2,154	18,941	0.09	0.23	48,670	24	75	7.4	0.01	9.80	0.00	0.00	9420	12.4	13.8	0.7
08/04/10	33,750	1,041	9,367	1.02	1.31	46,940	24	75	7.4	0.24	18.40	0.00	0.00	9480	20.0	1.1	0.9
09/01/10	33,760	1,439	12,436	0.65	0.91	48,360	24	75	7.4	0.02	44.60	0.00	0.00	8680	13.4	13.8	0.8
10/06/10	33,790	1,375	10,522	0.18	0.84	47,680	23	73	7.6	0.01	16.40	0.00	0.00	8750	8.8	14.1	0.9
11/03/10	33,070	994	8,798	0.15	0.12	47,450	23	73	7.4	0.00	14.60	0.00	0.00	9910	10.0	10.4	0.8
12/01/10	32,880	2,056	17,856	0.52	0.83	47,570	23	73	7.4	0.02	13.60	0.00	0.00	9720	13.0	13.4	0.7
01/05/11	33,250	1,343	11,742	0.59	0.81	46,160	23	73	7.4	0.02	9.60	0.01	0.02	9400	18.5	16.8	0.7
02/03/11	33,850	2,053	17,535	0.37	0.62	45,900	22	72	7.5	0.07	14.60	0.00	0.00	9210	13.3	10.3	0.7
03/02/11	32,130	2,092	18,153	0.52	1.07	47,690	22	72	7.2	0.14	23.40	0.00	0.00	8980	15.8	14.5	0.7

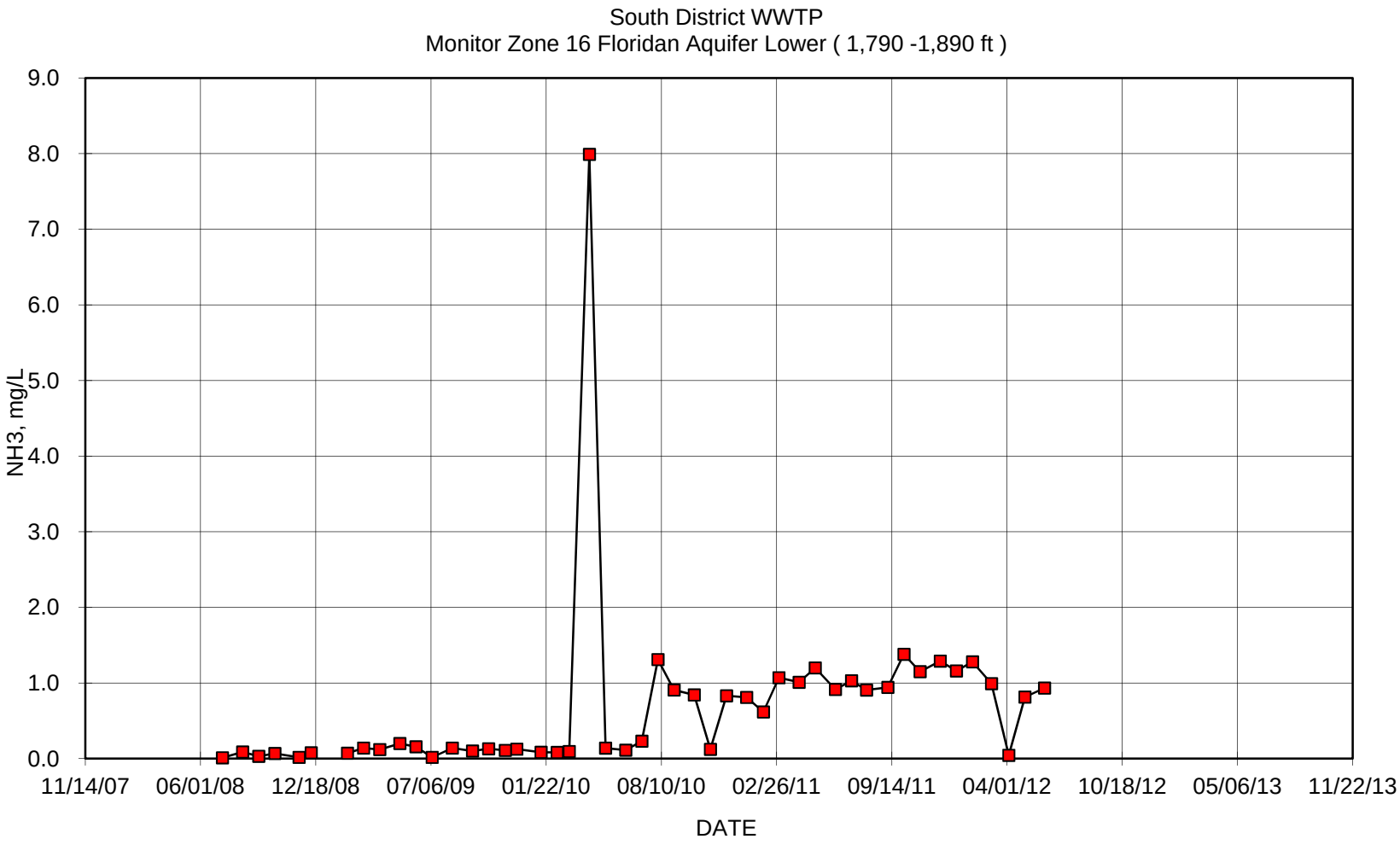
04/06/11	37,140	2,274	19,353	0.29	1.01	47,030	22	72	7.1	0.02	12.60	0.00	0.00	10400	14.0	13.6	0.8
05/04/11	36,180	2,218	18,910	0.29	1.20	46,570	23	73	7.4	0.02	7.20	0.00	0.00	9480	12.8	12.9	0.9
06/08/11	32,690	2,232	19,017	0.38	0.92	48,260	23	74	7.2	0.09	9.20	0.01	0.00	9840	13.4	12.0	0.8
07/06/11	34,120	2,024	17,490	0.35	1.03	48,920	24	74	7.6	0.02	13.00	0.02	0.00	9090	11.3	14.8	0.8
08/01/11	32,980	2,169	18,836	0.27	0.91	45,950	24	76	7.5	0.04	24.20	0.00	0.00	11200	11.2	11.5	0.8
09/07/11	31,800	2,078	18,199	0.29	0.94	47,940	24	75	7.4	0.05	10.80	0.02	0.00	9420	16.7	16.2	0.9
10/05/11	33,860	2,099	18,283	0.37	1.38	46,650	22	72	7.5	0.06	13.90	0.00	0.00	9550	15.2	14.5	0.9
11/02/11	33,420	2,154	18,927	0.31	1.15	47,240	23	74	7.2	0.05	8.30	0.00	0.00	10300	11.9	10.4	0.9
12/07/11	33,740	2,265	20,035	0.34	1.29	45,460	22	72	7.8	0.05	7.90	0.00	0.00	10000	14.2	13.4	0.9
01/04/12	32,400	2,072	16,113	0.31	1.16	44,820	20	68	7.4	0.02	17.80	0.01	0.00	9850	12.8	12.5	0.7
02/01/12	30,380	2,140	18,700	0.38	1.28	46,977	23	73	7.2	0.02	11.10	0.01	0.00	10400	10.9	9.8	0.7
03/05/12	31,780	2,080	17,800	0.35	0.99	42,460	23	73	7.6	0.02	10.30	0.02	0.00	10900	13.5	13.9	0.8
04/04/12	34,220	2,070	19,600	0.31	0.04	48,250	23	73	7.3	0.03	13.20	2.50	2.50	9890	15.5	14.8	0.9
05/02/12	33,240	2,130	18,900	0.39	0.81	48,900	23	74	7.6	0.03	10.00	0.03	0.00	10400	14.1	13.1	0.8
06/05/12	33,884	2,210	19,100	0.36	0.93	44,935	23	74	7.2	0.03	14.00	0.01	0.00	9650	12.7	13.2	0.9
07/11/12																	
08/01/12																	
09/05/12																	
10/03/12																	
11/07/12																	
12/05/12																	
01/09/13																	
02/06/13																	
03/04/13																	

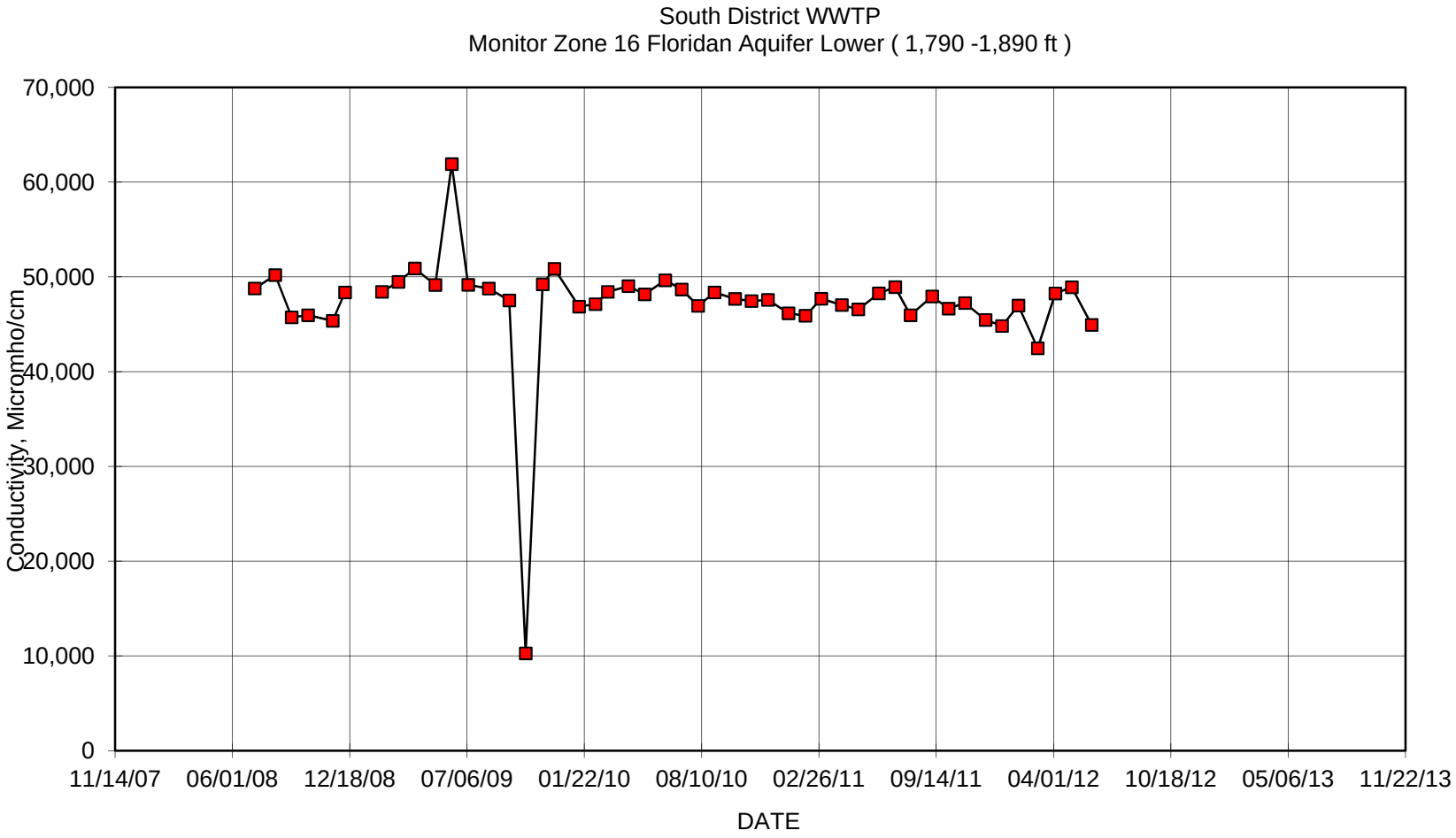
South District WWTP
Monitoring Zone 16 Floridan Aquifer Lower (1,790 - 1,890 ft)
TDS, mg/L
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

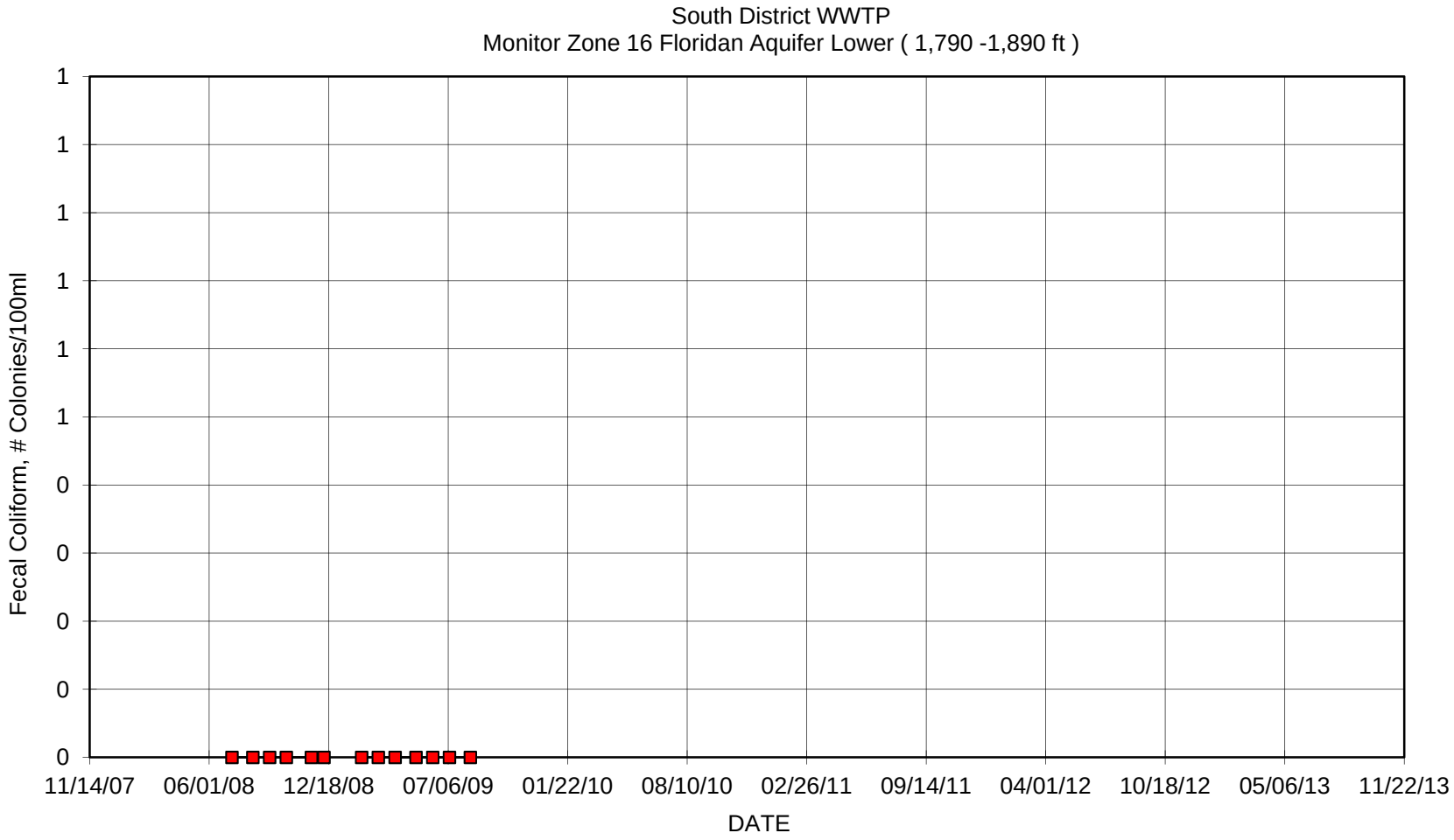

South District WWTP
Monitoring Zone 16 Floridan Aquifer Lower (1,790 - 1,890 ft)
Sulfate, mg/L
2,500
2,000
1,500
1,000
500
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

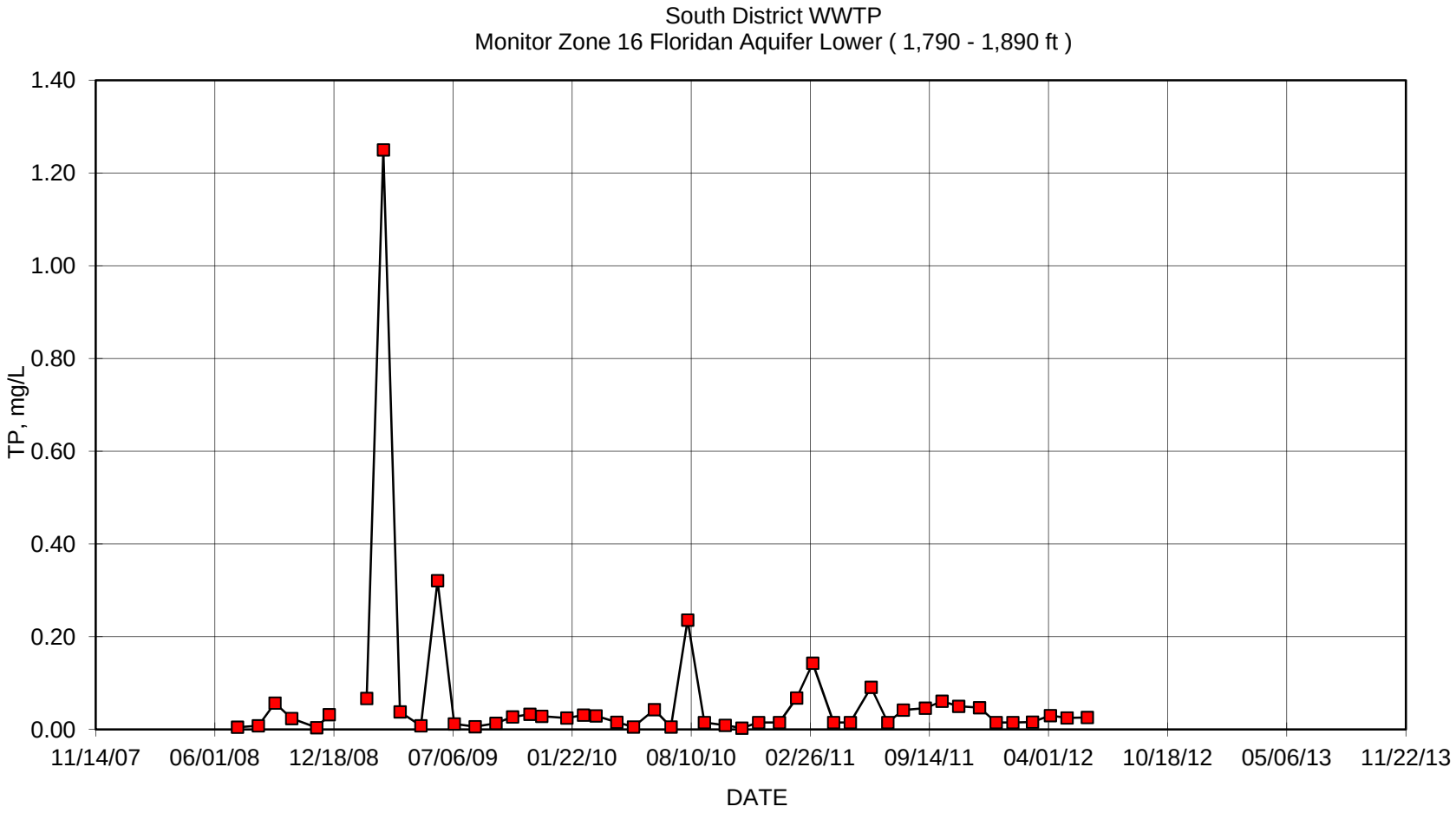

South District WWTP
Monitoring Zone 16 Floridan Aquifer Lower (1,790 - 1,890 ft)
Chlorides, mg/L
25,000
20,000
15,000
10,000
5,000
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

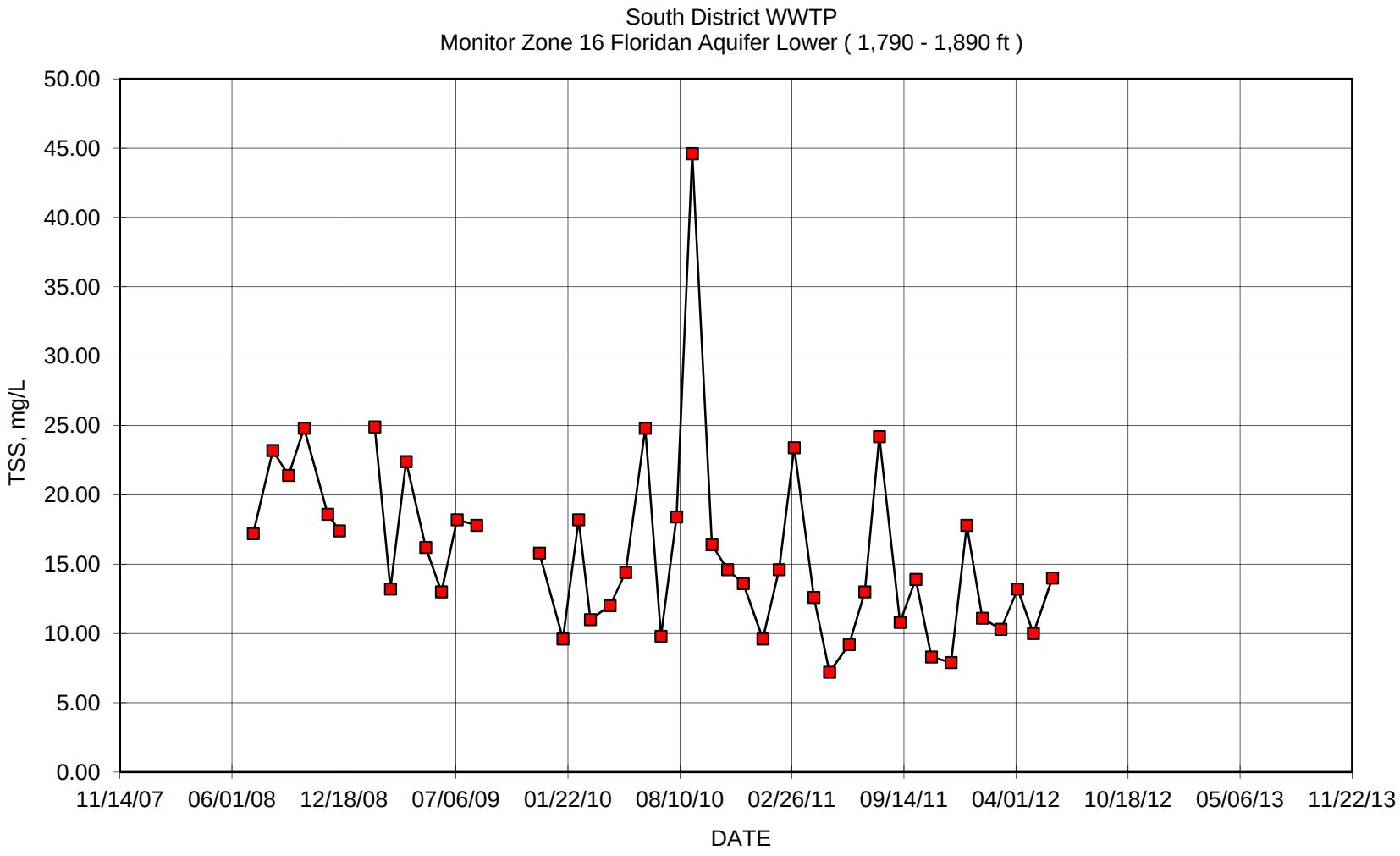

South District WWTP
Monitor Zone 16 Floridan Aquifer Lower (1,790 - 1,890 ft)
TKN, mg/L
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 16 Floridan Aquifer Lower (1,790 -1,890 ft)
NH3, mg/L
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 16 Floridan Aquifer Lower (1,790 -1,890 ft)
Conductivity, Micromho/cm
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 16 Floridan Aquifer Lower (1,790 -1,890 ft)
Fecal Coliform, # Colonies/100ml
1
1
1
1
1
1
0
0
0
0
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 16 Floridan Aquifer Lower (1,790 - 1,890 ft)
TP , mg/L
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 16 Floridan Aquifer Lower (1,790 - 1,890 ft)
TSS, mg/L
50.00
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

MIAMI-DADE COUNTY
miamidade.gov

Water and Sewer
PO Box 330316 • 3071 SW 38 Avenue
Miami, Florida 33233-3016
T 305-665-7471

October 24, 2013

Mr. Joseph R. May, P.G.
Florida Department of Environmental Protection
400 North Congress Avenue, 3rd Floor
West Palm Beach, Florida 33401

CCN: 57717

Reference: Miami-Dade Water and Sewer Department -- Mechanical Integrity Testing (MIT) Report for Deep Injection Well No. IW-11 at the SDWWTP Site.

Dear Mr. May:

Enclosed please find the Certificate of Mechanical Integrity and the MIT Report on the re-testing of Deep Injection Well No. IW-11 at the South District Wastewater Treatment Plant site in Miami-Dade County.

All the tests were conducted in strict adherence to the specifications submitted to and approved by your office. The testing results for the well were good. Both external and internal mechanical integrity were demonstrated. The well casing and the wellhead components are in good condition. All the well head valves and all the well head components are scheduled to be rust-proofed and repainted when all the MITs are completed. Based on the results of the well testing we conclude that the well retains full mechanical integrity and recommend that MDWASD be allowed to continue operating the well in its normal mode.

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

The demonstration of mechanical integrity is being submitted per Chapter 62-528.300(6)(b)2., 62-528.300(6)(c), and 62-528.425(1)(d), F.A.C. and specific condition 3.j. of Permit 0061787-022-UO.

If you have any questions or require additional explanation of any item in the report, please do not hesitate to contact me at [redacted] or Sonia Villamil at [redacted]

[redacted]

Assistant Director- Wastewater Operation Systems

Enclosures: Certificate of Mechanical Integrity
MIT Report Well IW-11 (1 copy)

cc: Joseph Haberfeld, FDEP - Tallahassee

MIAMI-DADE COUNTY
Delivering Excellence Every Day

Mechanical Integrity Test Report
Deep Injection Well No. IW-11
South District Wastewater Treatment Plant

Prepared by:
Miami-Dade Water and Sewer Department
3071 SW 38th Avenue
Miami, Florida 33146

CERTIFICATE OF MECHANICAL INTEGRITY

The **South District WWTP** deep injection well **IW-11** operated by **Miami-Dade Water and Sewer Department** has been tested for mechanical integrity. The tests followed standard engineering practices and used methods presented in the United States Environmental Protection Agency regulations for the purposes of these tests. The external and internal mechanical integrity tests followed Florida Department of Environmental Protection (FDEP) pre-approved testing specifications and all the critical test events were witnessed by representatives of the FDEP, the MDWASD and the contractor.

Having supervised the engineer and geologists that were present during the testing, conducted the examining of the results and the preparation this mechanical integrity report as part of this certification, the undersigned certifies that deep injection well **IW-11** operated by **Miami-Dade Water and Sewer Department** at the **South District Wastewater Treatment Plant Site in Miami-Dade County, Florida** has successfully passed all the test requirements for mechanical integrity under rules of Chapter 62-528 of the Florida Administrative Code and is therefore determined to have mechanical integrity.

Certified on October 24, 2013

[redacted]

Howard J. Fallon Jr., P.E.
Professional Engineer
License Number 24153

MECHANICAL INTEGRITY TEST REPORT
FOR
DEEP INJECTION WELL No. IW-11
AT THE
SOUTH DISTRICT WASTEWATER TREATMENT PLANT

Prepared by:

MIAMI-DADE WATER AND SEWER DEPARTMENT
3071 SW 38th Avenue
Miami, Florida 33146

For Submittal To:

UNDERGROUND INJECTION CONTROL
FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

October 2013

ABSTRACT

The internal mechanical integrity was investigated through a pressure test performed on the injection casing. The pressure test was conducted at 154 pounds per square inch (psi) which is approximately 1.5 times the maximum (100 psi) potential injection pressure and more than 1.7 times the maximum operational pressure that the well will be under when operating at its full permitted injection velocity of 10 feet per second (ft/sec). FDEP permits a 5% loss in pressure during the hour long test in order for the internal mechanical integrity to pass the pressure test.
IW-11 successfully passed the pressure test because the casing only lost 2 psi. The successful results of the pressure test for internal mechanical integrity were reinforced by the results of the second internal mechanical integrity test, the TV survey of the casing. The TV survey confirmed that the casing and the casing joints are in good condition and that the well has internal mechanical integrity down to 2,436 ft bls.

The external mechanical integrity was investigated using two test procedures, a Radioactive Tracer Survey (RTS) and a Temperature Log. Results of the RTS confirmed the integrity of the cement around the casing and the continued competence of its seal with the geologic strata. The temperature test showed that there are no anomalies that would indicate points where injected fluids could escape through the casing and cement into the formation. Similarly there were no temperature anomalies that would indicate injection fluids entering the formations at other than the approved injection depth.

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Section 1

1. INTRODUCTION

1.1 BACKGROUND

On October 12, 2012, (see Appendix A) the Miami-Dade Water and Sewer Department (MDWASD) submitted the County's proposed plan and testing specifications for conducting the mechanical integrity tests (MITs) and repairs on some of the injection wells at the South District Wastewater Treatment Plant (SDWWTP) site (see Figure 1) to the Florida Department of Environmental Protection (FDEP). The plan, represented by the specifications, described the step-by-step procedure to be followed and included the testing schedule required to meet the 5-year MIT re-testing conditions of the FDEP permit for each of the injection wells. After receipt of these documents, the FDEP Staff reviewed the proposed plan and sent an approval on June 5, 2013 (see Appendix B).

The contract documents for conducting the MITs were let out for bids, and the winning bid was submitted on February 28, 2013 by Youngquist Brothers, Inc., a well drilling contractor from Ft. Meyers, Florida. After the contract was approved by the Board of Country Commissioners and signed by the County Manager, the MDWASD issued the notice to proceed on May 17, 2013 and the contractor began mobilizing to the site.

1.2 PURPOSE AND SCOPE

The purpose of this report is to provide FDEP with a document that describes the re-testing procedures for mechanical integrity applied to each of the SDWWTP deep injection wells (see Figure 2). The report also presents the field reports (see Appendix C), and the results of the tests in a single volume for ease of reference. The mechanical integrity re-testing operations involved conducting a pressure test on the well casing to show that there are no leaks in the casing, and conducting a TV survey on the well to reinforce the data from the pressure test. The re-testing includes tracking a radioactive liquid-tracer (iodine isotope I-131) injected down the well to show that there is no fluid movement upward behind the casing, into underground sources of drinking water (USDW). The radioactive test information is reinforced with temperature logs run on the well. Gamma ray logs are used to detect the movement of the radioactive tracer.

Figure 1. South District Wastewater Treatment Plant Site

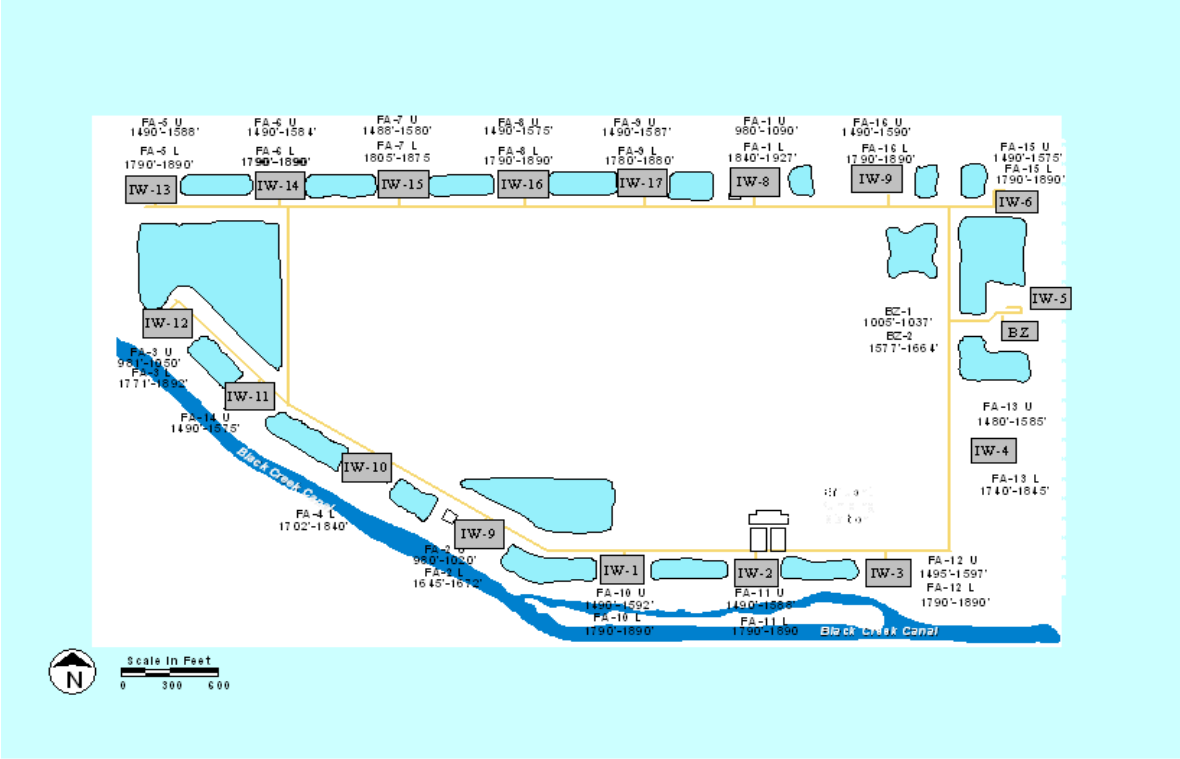


Figure 2. Well Locations Layout

Section 2

2. MECHANICAL INTEGRITY TESTING (MIT)

2.1 METHODS USED

The MIT program is designed to test two elements of the injection well system: 1. Internal integrity and 2. External integrity. The first test element, the internal mechanical integrity test of the well, tests the condition of the injection casing. The second test element, the external mechanical integrity test of the well, tests for leaks outside the casing. This is achieved through a series of field tests including a pressure test and a TV survey for the internal testing, and the temperature log, gamma ray log and RTS survey for the external testing. The first test element, the internal mechanical integrity test, tests for leaks in the injection pipe (casing). The second test element tests for leaks in the annular space outside the casing (cement-filled space between the periphery of the drilled hole and the casing) and in the near-to-the-well geologic strata.

2.2 CASING SCRUBBING

Because the mechanical integrity of injection wells has to be tested every five years, and because a TV inspection of the well is part of the test requirements, MITs provide a timely opportunity to clean the well of deposits that may have formed on the inside of the casing during the intervening years and at the same time provide a cleaner casing for the TV inspection. Cleaning the inside of the well casing is achieved by running a scrubbing brush up and down the casing. However, before the cleaning can be performed, flow out of the well must be controlled. The column of water inside the casing is fresh water and results in a positive hydraulic head inside the well. That head must first be controlled to prevent water from flowing out of the well during the cleaning operation.

2.2.1 Flow Suppression

Suppression of the fresh water head was achieved by first pre-mixing water with salt (NaCl) to form a heavy brine, and then pumping the brine down the well casing, through a 6-inch gate valve on the wellhead. This procedure results in the displacement down the well of the fresh water at the top of the column and replacement of the displaced fresh water with the brine solution. An equal volume of fresh water is displaced out of the well at the bottom of the casing. The procedure is repeated until the pressure head inside the well is suppressed. This method of displacement is used because it achieves flow suppression without first having to open the well to insert a tremie pipe to the bottom of the casing for introduction of the brine. This displacement method also provides a safe way of “killing” the well that at the same time reduces the volume of injected salt solution that would enter the formation at the bottom of the well. One additional advantage is that using this method the brine can be recovered and reused in flow suppression at other wells.

The brine was prepared in 1,000-gallon (gal.) batches by mixing the salt from a 2,000-pound (lbs.) sack in a 1,000 gal. tank of fresh water. The 1,000 gal. solution was then pumped down the well before other similarly mixed batches of salt solution were mixed and pumped down the well (see Figure 3). In the end, the operation was repeated 13 times, and a total of 13 sacks (approximately 26,000 lbs. of salt) were used to suppress the head in the well. This salt concentration represents a theoretical specific gravity of 1.239 for the brine, calculated from the salt solution used in the field of 10.3 lbs per gallon. The 26,000 lbs of salt suppressed the pressure head from approximately 26 feet above the top of the casing to approximately 15 feet below.

Figure 3. Flow Suppression Equipment

2.2.2 Scrubbing Operation

The brush used to clean the casing is made with an old drill rod that has an outside diameter of 7 inches with thick steel wire inserted and secured sticking out of the drill rod. The total diameter of the brush with the steel wire bristles is 24 inches. The brush is attached to the bottom of the packer and inserted into the well (see Figure 4). A 24-inch flange was bolted to the top of the well and pressure fittings installed to be used for packer inflation later on in the process. Then Youngquist lowers the brush and packer by attaching drill rods to the top of the packer and then raising and lowering the brush several times using a 50 ton crane. This process was repeated until the casing was scrubbed and the packer was at the depth required to perform the packer test on the well.

Figure 4. Scrubbing Brush and Hydraulic Packer

2.3 INTERNAL MECHANICAL INTEGRITY (CASING TESTS)

2.3.1 Pressure Test

After the pressure head was suppressed and the casing scrubbed, and the inflatable packer was placed at a depth of 2,381 ft bls. This well is cased to a depth of 2,428 ft bls so the packer is in the bottom 50 feet of the casing. Additional pressure fittings were installed on the flange to pressurize the casing with water. A bleeder valve atop the 24-inch flange allows passage of the drill pipes that support the packer without loss of pressure in the casing (see Figure 5). A pretest was conducted on the casing to determine that the pressure was holding and that all the installed testing equipment was operating properly, then FDEP was informed that the well was ready for their inspection. The next day, July 22, 2013, the pressure test was repeated in the presence of FDEP Staff. The packer had been previously sealed against the casing, at an inflation pressure of 380 pounds per square inch (psi) and at 10:00 AM the casing was pressurized with water to a pressure of 154 psi.

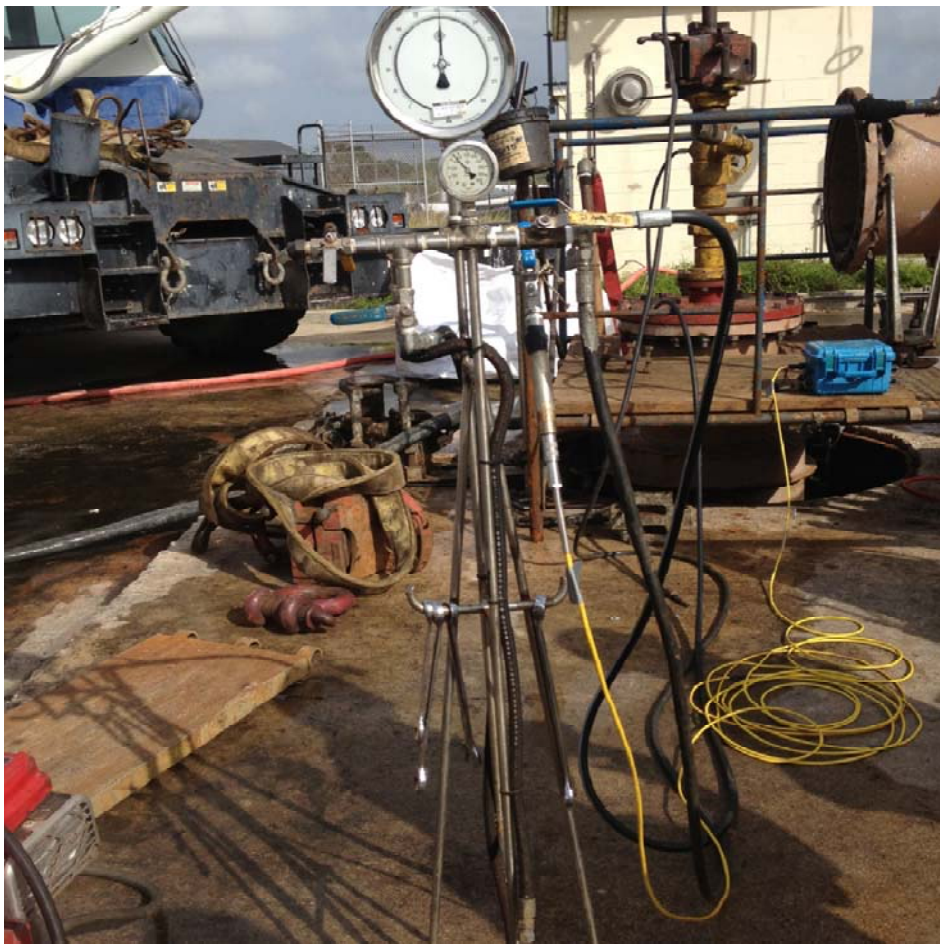


Figure 5. Well-Head and Recorder Set Up for Pressure Test

At 10:55 A.M. the one-hour pressure test was started in the presence of Joseph May, P.G. representing FDEP and witnessed by Sonia Villamil, and Michael Ashe representing MDWASD, and by Chris Harp and others representing the drilling contractor. The pressure test ran for the required one-hour period. The pressure deviation (loss) in that time was 2 psi, well below the 7.5 psi deviation allowable under the 5 % criteria in the rules (see Table 2-1). The packer inflation pressure and the pressure in the casing were measured using certified gages (see Appendix C) graduated from 0 to 200 psi in increments of 1 psi. The pressure was read in person and recorded by hand at five minute intervals during the test. The pressure was also recorded on an In-Situ pressure transducer attached to the stand with the pressure gauges (see Figure 5).

Table 2-1 Casing Pressure Readings

Time	Casing Pressure (psi)	Pressure Change (psi)	Packer Pressure (psi)
10:55	154	0.0	380
11:00	154	0.0	380
11:05	153.5	0.5	380
11:10	153.5	0.0	380

11:15	153.5	0.0	380
11:20	153	0.5	380
11:25	153	0.0	380
11:30	153	0.0	380
11:35	152.5	0.5	370
11:40	152.5	0.0	370
11:50	152	0.5	370
11:55	152	0.0	370

2.3.2 Bleed-Off Calculations

At the completion of the pressure test the casing pressure was bled-off and the discharged volume from the bleeding was measured (see Table 2-2). Bleeding until the pressure resulted in zero flow produced approximately 29.5 gallons. This exercise provides a reasonable assurance that the packer is placed at the depth in the well that is within the last 50 feet of the casing.

Table 2-2. Bleeding Volumes versus Pressure

Bled Volume (gallons)	0	5	10	15	20	25	29.5
Casing Pressure (psi)	152	124	91	70	48	17	0

2.3.3 Television Survey

A closed circuit color television camera, encased in a pressure vessel capable of withstanding the pressures exerted at the depths to be televised, and equipped with a fish-eye lens, was introduced into the well through a pack-off stripper device on a standpipe above the injection well (see Figure 6). The camera is centralized in the casing, and is preceded down the well with a light source attached below the camera. The camera televises a view of the full circumference of the inside of the casing and the image is recorded on video tape. Prior to the video survey, the well was scrubbed and flushed with potable water to provide the best picture possible. The video survey began at land surface and continued down to 2,941 feet, where the camera runs into an obstruction, but the hole below seems open below the partial obstruction where the tool was stuck. At selected intervals of interest, the camera was used to pan the intervals in a horizontal format prior to continuing the normal vertical recording.

A review of the video (see Appendix F) indicates that the casing is in good condition down to 2,436 feet. The video also shows that the scrubbing operation was successful. The scrubber has scrubbed the casing free of all growth down to 2,414 feet and this is confirmed by visible vertical scratches throughout that length of the casing; indicating that the scrubber had brushed the steel casing effectively. All the scratches are superficial, and do not detract from the physical and

mechanical integrity of the casing. There are no gouges, grooves, nicks, or other physical damage visible in the casing for its whole length. Below 2,414 feet the casing was not scrubbed to avoid hanging the scrubber with the edge of the bottom of the casing at 2,436 feet. There are some growths and/or deposits visible inside the casing below 2,414feet.

In summary, the video picture meets the quality standards that are needed for a visual evaluation of the well. This video survey presents a clear view of the casing and of the welded joints of the casing. All the joints are clean and appear to be tight. From the TV survey it is concluded that this casing is in good condition throughout its whole depth from land surface to 2,436 feet.

Figure 6. Television Survey (Standpipe and Logging Truck)

2.4 EXTERNAL MECHANICAL INTEGRITY (CEMENT AND FORMATIONS)

The external mechanical integrity test consisted of two low flow dynamic tests The RTS and temperature survey, conducted on July 29 2013, for the external mechanical integrity portion of the test was witnessed by the representative of FDEP (Joseph May, P.G.), by representatives of MDWASD (Sonia Villamil) and by representatives of the contractor (Luis Morey).

2.4.1 Radioactive Tracer Survey (RTS)

The radioactive tracer survey uses an isotope of iodine (I-131) as a tracer of water movement

inside and outside the casing. Iodine –131 is used because it is a radioactive isotope commonly used in medical practice and therefore it is more easily available and lower in cost than other potential tracers. I-131 also has the advantage of having a half-life of 8 days. That half-life is quite suitable because it is long enough to allow time for transportation to the well site with little decay but also short enough so that it would quickly be reduced if there were any unexpected spills or if there were mechanical failures through which the isotope could travel with the water. The radiation levels of I-131 at the concentration used for RTS testing is in millicurie-range, which if it were considered a waste, would be characterized as a low level waste by the US Atomic Energy Commission.

The I-131 is first loaded into a container located in the logging tool. This container is electronically activated from the logging truck to eject the desired quantity of tracer at the desired depth through an ejection port. In addition to the tracer container, the logging tool is also assembled with three gamma ray detectors. One detector, the top gamma ray detector (GRT), is located 10 feet above the ejector. The other two detectors, the middle one (GRM) and the bottom one (GRB) are located immediately below the ejector at about 3 feet and 12.4 feet below the ejector respectively. The bottom of the logging tool also includes a temperature tool at the very bottom, and a casing collar locator (CCL) 1 foot below the GRM. Figure 7 shows the configuration of the RTS logging tool. The RTS log in the appendix (Appendix D) shows the distances between each of the logging tool components described above.

2.4.1.1 First Low Flow Dynamic Test

Prior to starting the low flow dynamic test, a background gamma ray log was conducted to establish the natural conditions. It was conducted right after the temperature log. Since the temperature log was run downward starting at land surface, the temperature log had ended with the logging tool at the bottom. The background gamma ray log was conducted from the bottom (2,941 feet) up to the surface.

From the surface, the logging tool was again lowered down the well and the casing collar locator (CCL) used to locate the bottom of the casing. The magnetic coils on the CCL give out a magnetic field and detect a change in the mass. If there is growth on the casing it is harder for the CCL to have a clean line. If the growth has some iron on it, it can cause a sort of interference with the CCL making it harder for the CCL to find the end of the casing. The CCL shows that the bottom of the casing is at 2,432 feet bls. After the bottom of the casing was located, the well was ready for the low-flow dynamic RTS test.

The ejector port of the I-131container was set at 2,427 feet and 1 millicurie (mCi) of I-131 was released while the flow down the well was kept at a constant rate of 91 gallons per minute (gpm). The logging tool was kept immobile after the ejection of the I-131 and the three gamma ray detectors continued to record in place. One (1) mCi of I-131 was ejected into the well. The middle detector, located 3 feet below the ejector port, picked up the radioactive tracer 24 seconds after the ejection. The bottom detector, which is located over 12 feet below the ejector, picked up the tracer 2 minutes and 8 seconds after the ejection. The test ran for 60 minutes and the top detector did not pick up any tracer.

After the first low flow test ended, the tool was then raised up more than 200 feet, to a depth of 2,200 feet, to log out of position to make sure that the tracer did not migrate up the casing or the

formation outside of the casing. No migration was detected.

Once the log out of position was conducted and the tool was placed back to depth, no staining on the casing was found which means no interference for the second RTS. Therefore, with the approval of Joseph May, P.G. from FDEP, the well was not flushed prior to the second RTS test.

Figure 7. RTS Tool and Temperature Probe

2.4.1.2 Second Low Flow Dynamic Test

The tool was placed back to a depth were the ejector was located at 2,427 feet with a flow of 90 gallons per minute set down the well. For this test, 2 milicuries of I-131 were ejected into the casing. The middle detector started picking up the tracer about 24 seconds after it was ejected. The bottom detector, which is located over 12 feet below the ejector, picked up the tracer 2 minutes and 24 seconds after the ejection. The upper detector did not pick up any tracer for the duration of the test, which lasted 30 minutes.

After the second low flow test ended, the tool was then raised up more than 200 feet, to a depth of 2,200 feet, to log out of position to make sure that the tracer did not migrate up the casing or the formation outside of the casing. Minor stain was observed at the ejection point but since it was minimum and no I-131 traveled beyond the 2,427.ft bls, flushing was not needed and no pathway for fluid migration was observed.

With the last low flow dynamic test, the mechanical integrity test was concluded, but before bringing the geophysical tools out of the well, the leftover I-131in the container was ejected and the container flushed-clean to insure that any remaining radioactive iodine was well dispersed. The tool was placed at a depth of 2,838.5 ft bls. The ejector was located at 2,825 ft bls, and the remaining Iodine 131 was ejected and the well was flushed with effluent at a rate of over 5,000 gallons per minute to ensure no staining of the tool. The logging tool was then brought up from the bottom and on the way up a final gamma ray log was made. Then the final gamma ray log was compared to the background gamma ray log, and the comparison showed that there are no noticeable differences in the two except for a residual stain at the bottom of the casing where the I-131 had been repeatedly released during the testing, and just below there, where the tracer exited the casing. Injection of water down the well at a rate of 5000 gpm continued for the next hour to completely flush out the well.

2.4.2 Temperature Log

Youngquist Brothers Inc. conducted the temperature log on July 29, 2013 starting at about 9:30 A.M. and logging down to 2,914 feet. The temperature probe (Figure 7) was run from the surface downward to minimize the disturbing effect of the movement of the logging tool on the temperature of the water in the well. The temperature log was started more than 24 hours after the well had last been disturbed by outside influences. The TV survey was the last disturbance in the well.

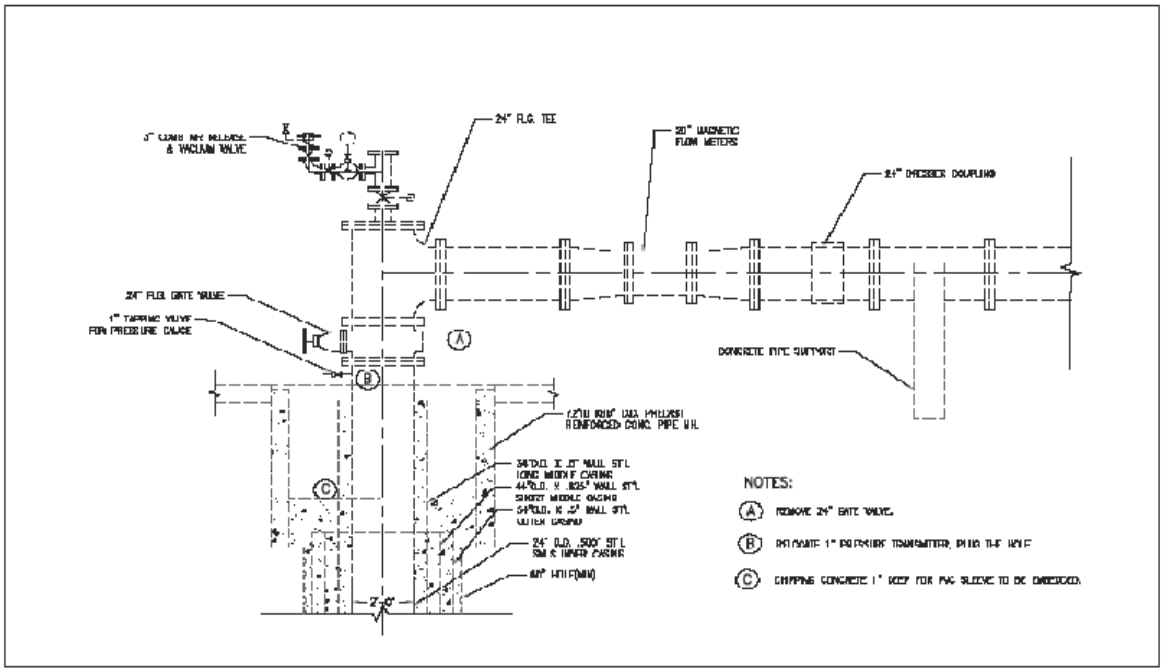
The temperature log (see Appendix H) shows the warmest interval is in the section from 2,500 to 2,930 feet. This is consistent with the higher temperature of the injected water in that interval. The temperature log did not detect any anomalies that would indicate that injection fluids are present outside the casing, and there is no indication of any upward movement of warm injection water either. The similarity of the temperature oscillations in this temperature log (in the interval from land surface down to the bottom of the casing) to those in the temperature logs from previous MITs and to those in the temperature log when the well was constructed, indicates that there has been no apparent change in the cased interval, and no upward movement of the injected water in the last 5 years.

2.5 WELL HEAD REPAIRS AND RE-INSTALLATION

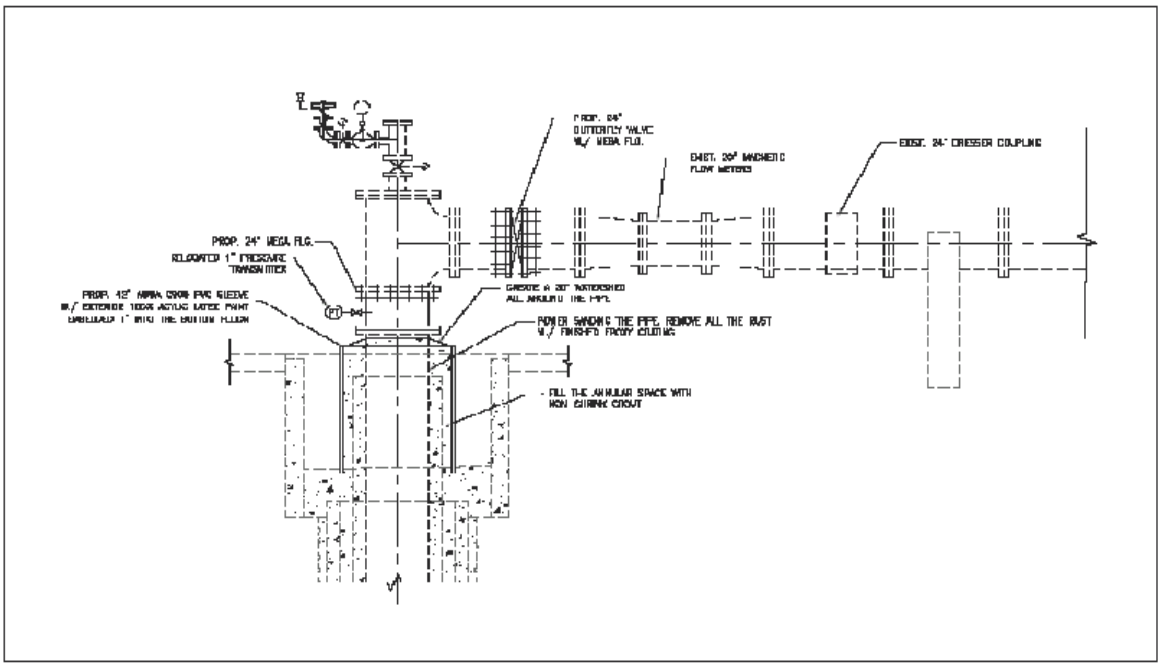
The work associated with the MIT ended when the wellhead was replaced. The air and vacuum release surge check valves were replaced prior to reinstallation of the wellhead. The 6 inch gate valve and air release were replaced. The pressure tap for the instrumentation of the well was below the water line when the sump was full of water. Therefore this well was retrofit to remove the redundant gate valve off the well and lift the pressure tap above the water line. A PVC liner was also installed at the base of the sump that protects the 24" OD steel casing from being exposed to FA purge water from the monitoring wells. The PVC was cemented into the bottom of the sump and the annulus was filled with grout to ensure that no water can reach the steel casing. Please see Figure 8 and Figure 9 below.

The wellheads are scheduled to be sandblasted, rust proofed and repainted after the MITs on all the other wells are completed. Injection well IW-11 has been placed back on line and flow from the plant's pump station is again discharging to this injection well, .

Figure 8 Retrofit Well with PVC liner



REPAIR PLAN FOR I-13 TO I-17



PROPOSAL PLAN FOR I-13 TO I-17

Figure 9 Drawing showing before and after layouts for the Retrofit.

Section 3

3. CONCLUSIONS AND RECOMMENDATIONS

3.1 CONCLUSIONS

The pressure test was conducted successfully and it was concluded from the results that there is internal mechanical integrity. This conclusion is reinforced by the analysis of the TV survey down to the injection level at 2,436 feet. The TV survey indicated that the casing is in good condition and that all the casing joints appear to be tight and in good working order.

The two successful RTS conducted at low flow rates indicate that there is no upward movement of water outside the casing. Therefore, it was concluded that the RTS results show that there is external mechanical integrity. The temperature survey reinforced the results of the RTS by showing that there has been no movement of injected water anywhere except the injection zone.

3.2 RECOMMENDATIONS

The successful completion of all the tests for mechanical integrity confirms that IW-11 retains full mechanical integrity and as such it is appropriate to continue using this injection well. MDWASD also recommends that FDEP review the results of the tests presented in this report and based on those results determine that the well has mechanical integrity and may continue to be used for its intended purpose.

Finally, MDWASD recommends that although the well head will not be painted until all the MIT tests are completed on the other wells, IW-11 should receive mechanical integrity certification.

Appendix A

Mechanical Integrity Testing Procedures Submitted by MDWASD to FDEP
October 12, 2012

Miami-Dade Water and Sewer Department
Mechanical Integrity Testing Procedures

Miami-Dade Water and Sewer Department
Mechanical Integrity Testing and Repair Procedures
October 12, 2012

MECHANICAL INTEGRITY TESTING and REPAIR PLAN (SDWWTP and NDWWTP Injection Wells)

General Information

The Contractor shall carefully coordinate his activities with the Department to minimize interference with any existing operations or the operations of the Department. Department forces will isolate the well and turn over to the Contractor. Existing valves shall only be operated by Department personnel. The Contractor's personnel, under no circumstances, shall operate any such valve.

The Contractor shall provide all barricades and/or flashing warning lights necessary to warn workers and employee of the testing throughout the Project. This shall be done at the Contractor's expense and to the satisfaction of the Engineer. Every effort must be made to reduce inconvenience and nuisances to a minimum.

The Contractor shall at all times, use the assigned entrance to the Plants to bring in materials, equipment etc. required for the Project. Materials and equipment shall be stored in areas designated by the Engineer, and shall not interfere with the daily operations at the site or with other Projects. Suitable platforms shall be used for material storage to prevent damage to the landscaping. The Contractor shall exercise extreme caution when transporting equipment or materials within the Plant area.

The conveying vehicles shall be properly selected, and equipped, to prevent damage to paved areas, landscaping and other existing facilities including wells, well pads, fencing, underground pipelines, pipe chases, etc. If necessary, suitable wooden skids shall be used to distribute loads, and to prevent damage.

If any of the above existing structures, including the wells, or any other parts of the project area, are damaged, the contractor shall make suitable repairs or replacement at his expense, in a manner described by the Engineer, and to his satisfaction.

The Contractor shall also exercise extreme caution to prevent any spillage of sewage effluent. The County may charge t he Contractor for any cost incurred or penalties imposed on the County as a result of such spillage.

The wells to be tested are Injection Wells IW-l through IW-17 at the South District Wastewater Treatment Plant and IW-1N through IW-4N at the North District Wastewater Treatment! Plant

The Injection Wells have a 24-inch outside diameter (OD), 0.500-inch wall thickness injection casing set to total depths of 2,450 to 2,850 feet below land surface (bls), and were constructed with a nominal 22-inch diameter open borehole extending from the bottom of the casing to approximately 3,000 feet bls.
Except IW-5 at the SDWWTP, has a 20-inch outside diameter (OD), and 0.500 inch wall thickness.

The CONTRACTOR will perform internal and external mechanical integrity tests on the casings of twenty one deep injection wells and perform all appurtenant work in accordance with the above

Contract Documents.

The work shall be performed by a competent crew with equipment that is adequate to complete all phases of the testing and instruments of sufficient accuracy and resolution to identify anomalous responses to the tests. If the CONTRACTOR'S equipment is not capable of satisfactorily performing the work provided for in these specifications, the CONTRACTOR at his own expense shall substitute equipment.

The CONTRACTOR shall have not less than 5 years experience in constructing and testing wells and shall have tested not less than 5 wells of similar type and capacity. The CONTRACTOR shall be licensed by the State of Florida and the license number shall be affixed to all correspondence and reports.

All work shall comply with and be in full conformance with this Mechanical Integrity Test Plan submitted to FDEP together with subsequent response letters for the injection wells at the South and North District Wastewater Treatment Plants and with the appropriate sections of Chapter 62-528 FAC.

If remedial work or re-testing is required prior to final acceptance of the work to meet regulatory requirements and the specifications of the Contract Documents due to defective materials, accident, loss of equipment or equipment malfunction, or for any other cause directly attributable to the CONTRACTOR's actions, the CONTRACTOR shall bear the entire cost of the remediation or re-testing, including all additional materials, labor, and equipment required and any necessary additional Engineering costs. In the event of a problem, the ENGINEER shall be notified immediately, and the following shall apply:

1. The CONTRACTOR shall propose a method of correcting the problem, in writing, to The ENGINEER, who shall review the method of corrective action, and accept the plan in writing before work can proceed.

2. All work on the well must be in accordance with all applicable local, state and federal regulations.

The CONTRACTOR shall notify the ENGINEER a minimum of 72 hours prior to conducting the pressure test, geophysical logging and the radioactive tracer survey so that the ENGINEER and regulatory agency staff can be properly notified.

The CONTRACTOR shall provide all facilities, equipment and materials required for the removal of waste fluids from the well site.

The CONTRACTOR shall kill the well using a dense food- grade salt solution. No barite or mud-based additives shall be used in the well.

The CONTRACTOR shall comply with the OSHA regulations contained in 29CFR Section 1910 for General Industry Regulations and 29CFR Section 1926 for Construction Regulations.

Equipment and Procedures

1. Wellhead Assembly: The stripper head assembly used during the video survey, Geophysical logging, and the radioactive survey shall be bolted to the wellhead above the 6-inch gate valve. The stripper head assembly used must be of sufficient length to house the longest of the wire line tools used for the testing between the gate valve and the pack-off mounted at the top of the assembly. The pack-off must be adjusted so that the tools can be moved freely up and down the well with minimal leakage from the well. The assembly shall include a 4-inch valve and tee, which will be used to inject potable water during the surveys. The assembly shall be fitted with a

pressure gauge for use during the tests.

2. Wellhead Hardware: Should the nuts and/or bolts at the wellhead assembly become stripped during the CONTRACTOR's efforts, the CONTRACTOR shall replace them with equivalent hardware.

3. Water Line: The CONTRACTOR shall provide a potable water supply line for use during the video surveys. This line shall be connected to the existing 4-inch valve on the CONTRACTOR's stripper head. It shall be equipped with a check value to prevent the backflow of effluent into the water supply source. It shall also be equipped with a continuous recording digital flow meter and totalizer capable of measuring flows accurately in the range of 0 to 250 gpm.

Mechanical Integrity Testing (MIT)

The mechanical integrity testing under this Contract shall be accomplished using the following methods and general sequence, however the Contractor shall submit a more detailed sequence to the Engineer for approval before he begins work. The Contractor shall use extreme caution to prevent any loss of equipment, tools or other items into the wells and shall be fully responsible for retrieving any such items immediately, at no expense to the Department. All pressure tests must be conducted in the presence of the Engineer or his authorized representative.

MIT Clean and Pressure Test the Casing

1. The Contractor shall set up all equipment required to prepare for suppressing the density differential pressure, cleaning, performing the pressure test and the radioisotope and closed circuit television surveys.

2. The Contractor shall inject sufficient salt solution into the well to balance the differential pressure and disassemble the wellhead. The brine solution shall remain in the well during the cleaning and pressure testing steps, after which time it shall be transferred to another well if clean enough for reuse, or shall otherwise be disposed of by the Contractor. Under no circumstances shall brine solution be spilled or disposed of on the ground surface, however it may be disposed of into the injection well.

3. The Contractor shall clean the casing before proceeding with the pressure test. The entire length of casing shall be cleaned. If the later television survey indicates insufficient cleaning, the well shall be re-cleaned by the Contractor, at his expense, to the satisfaction of the Engineer. If the television survey must be repeated because of insufficient cleaning, in the opinion of the Engineer, it shall also be at the Contractor's expense.

4. The Contractor shall, when requested by the Engineer, place the packer through a stand-pipe with a packoff device to a point near the top of the well (but within the concrete encasement area) and test its integrity. This shall be accomplished as described in Steps 6, 7, and 8 below. If the packer fails the integrity test it shall be replaced with one that will meet the test. The Engineer is aware that packers have limited inflation cycles and will attempt to minimize the verification of packer operation. However, any integrity failure for which the packer operation can not be eliminated must be repeated at the Contractor's cost. It is anticipated that each new packer will be tested at the wellhead to verify its capacity to seat and deflate.

5. The Contractor shall lower and place the packer to a point within the lower 40 feet of the casing, but not the last 10 feet. The CONTRACTOR will be responsible to assure the proper seating of the packer. A preliminary test shall be performed to ensure proper operation of the test set-up. The CONTRACTOR shall notify the ENGINEER at least 24 hours before running the preliminary test. The test will be run following the same test program as the actual pressure test, as described below. IW-2 at SDWWTP will have the packer placed within 40 feet of the tear in the casing.

6. The Contractor shall inflate the packer to a pressure not exceeding 350 psig over the static condition as measured at the wellhead on a calibrated gauge to create a positive seal.

7. The Contractor shall pressurize the casing to 150 psig with no air in the casing or wellhead. The pressure shall be recorded on a chart and signed by the Engineer, the Contractor and any witnesses present. The pressure test gauge shall be calibrated within 6 months of performing the pressure test. The CONTRACTOR must present proof of calibration of the pressure gauge to the ENGINEER and FDEP staff at the time of testing each well. The pressure gauge must be mounted at or near eye level in order to ensure maximum visibility.

8. The test will be considered successful if the pressure does not change more than 5% psi in one hour.

9. If the test fails, the Contractor shall move the packer upwards for approximately 10 feet, and repeat Steps 6, 7 and 8.

10. If the test still fails, additional repositioning of the packer and repeating of Steps 6, 7 and 8 shall be as ordered by the Engineer. If the test still fails, and subsequent radioisotope surveys indicate no casing failure, it will be presumed that the Contractor's packer did not create a positive seal, and the Contractor shall be required to repeat Steps 4 through 8 at his expense. No payments will be made to the Contractor if it is subsequently determined that the test failure was caused by the seating of the packer. If the packer fails during packer operation verification, it will be concluded that the packer was faulty during any previous test that did not demonstrate casing integrity. The Contractor shall repeat this test at his expense.

11. After pressure testing, measure the depressurization bleed down with a 5 gallon bucket upon release of the pressure in the casing. The bleed down fluid will be properly disposed of by the Contractor.

12. The Contractor shall deflate the packer and withdraw it from the casing.

13. The Contractor shall reassemble the wellhead and connecting piping using new gaskets.

14. Prior to geophysical logging, the fluid used to "kill" the well, or for pressure testing the casing shall be flushed from the well and the well will be shut-in for a minimum of 12 hours.

MIT Video Surveys

A Video Survey inside the injection well casing be performed using the following procedures.

.A 6-inch diameter stripper head assembly will be bolted to the wellhead assembly above the existing 6-inch diameter gate valve. The stripper head will be of dimensions that allow the video operator to put his camera between the gate valve and the pack off and close both the valve and the pack off. The lower part of the assembly shall consist of a 4-inch tee and valve through which potable water may be introduced into the well.
.
Prior to performance of the survey and for a period of 24 hours, fresh water from an adjacent fire hydrant will be introduced into the well through a 4-inch diameter valve located on the stripper head assembly. Fresh water shall be pumped into the well to provide clarity for the survey.

3. If, after 24 hours of pumping potable water into the well, the water quality does not permit a clear picture of the inside of the well, the CONTRACTOR may be required to perform additional pumping services to assure a good survey as specified above.

4. The pumping of the potable water will continue at a rate of approximately 0 to 250 gpm during video surveying. If the open hole portion of the well is not clean, or visibility in any part of the well is poor, the CONTRACTOR shall perform additional pumping services to ensure a good video survey before running another or continuing with the survey.

5. During the video survey, the CONTRACTOR shall stop the camera's progress as instructed by the ENGINEER at depths where there may be potential flaws in the casing or other features to allow for thorough examination at those locations.

Upon reaching the total depth of the well with the video camera and obtaining a video survey satisfactory to the ENGINEER, the camera shall be removed from the well, and the well placed back in service.

MIT Radioisotope Tracer Survey and Temperature Survey

A radioisotope tracer survey shall be used to detect any fluid movement outside of the injection casing from the injection zone into the overlaying aquifers. The tool configuration shown below, or approved equal is required. The tool must be capable of ejecting the radioactive tracer and simultaneously monitoring the gamma ray sensors. No time lag between ejection and monitoring is permitted. A casing collar locator (CCL) shall be positioned below the tool as shown below, to precisely locate the bottom of the casing. Two low flow dynamic test runs, shall be performed. Additional low flow dynamic test runs can be done if results warrant additional testing, as determined by the ENGINEER in consultation with FDEP staff.

A temperature survey log shall also be performed from land surface to the total depth of the well. The temperature log shall be performed logging down at a rate of not more than 60 feet per minute. The temperature survey shall be performed after the well has been "shut in" and stabilized for at least 12 hours prior to the dynamic and static tests.

The Contractor shall perform an initial background gamma ray survey extending from the base of the land surface to the total depth of the well. The background gamma ray log shall be taken at a rate of not more than 60 feet per minute.

After the dynamic tests are completed, another background gamma ray survey shall be taken from the base of the casing to the base of the intermediate casing.

If additional radioisotope tracer survey work is ordered by the Engineer, it will be paid for at the hourly price proposed for additional radioisotope tracer surveys.

Radioactive Tracer Survey (RTS)

A RTS will be performed in the injection well. The tool used for testing will be configured according to information to be supplied by the service company performing the logs and as approved by the ENGINEER. Below is an example of a typical RTS tool that will be used for these surveys. The CONTRACTOR will provide a specific tool configuration with the logs.

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)
			CHD-SDSCHD (SDS) Cable Head	1.00	1.50	5.00
GR#3	23.83					
			GR #3 -GR#3 (GR#3_T) GR#3_TOP	9.33	1.69	50.00
			TREJCT-A (RTS) EJECTOR 14.5' FROM TOOL BOTTOM	3.00	1.69	10.00
			GR #2 -GR#2 (GR#2_M) GR#2_MIDDLE	3.58	1.69	25.00
GR#2	11.17					
CCL	9.63		CCL-000 (000001) RTS_CCL	0.75	1.69	5.00
			TRDET-GR#1 (GR#1_B) GR#1_BOTTOM	8.67	1.69	50.00
GR#1	0.58		TEMP-11116Temp (11116HT)	0.58	1.69	5.00
TEMP	0.17		RTS_TEMP			

Dataset: sdiw1.db: field/well/run1/FINBK
Total Length: 26.92 ft
Total Weight: 150.00 lb
O.D. 1.69 in

RTS tool Typical Configuration

The sequence of the tests shall be as follows:

First Low Flow Dynamic: The low flow run of the radioactive tracer survey shall be performed with a pumping-in velocity of 3 to 5 feet per minute. This would require a volume of between 65 gpm and 108 gpm to be injected during the survey. This is for the 24 inch wells, for Well I-5, which has a 20 inch casing this volume is 44 gpm and 73 gpm. Potable water from the same source as used for the video survey would be used as the most appropriate water supply for this portion of the test.

1) After beginning the flow of water into the well, the tool will be placed at a depth of approximately 5 feet above the base of the final casing, and a slug of 2 millicuries radioactive Iodine 131 is ejected. The tool will remain in place for a period of approximately one hour and the three gamma ray detectors in the "time drive" mode will record the movement of the slug. If tracer is detected at the uppermost detector, indicating potential staining of the tool, the tool may be moved upward to an alternate location.

2) After the one hour waiting period, a log out-of-position will be performed between the ejection point and a minimum of 200 feet above the highest point of tracer detection.

3) Upon completion of logging, the casing will be flushed with 3 to 5 casing volumes of effluent.

4) After flushing, the tool will immediately be run to the base of the casing, then the interval between the ejection point and 200 feet above the highest point of tracer detection will be logged.

Second Low Flow Dynamic: The process described above for the low flow dynamic log will be repeated to include a log out-of-position, a casing flush, and an after flush pass. A slug of tracer greater than or equal to 3 millicuries shall be used as determined by the ENGINEER.

If, during testing, no apparent anomalies appear that may indicate a lack of mechanical integrity in the injection well, the RTS will be concluded. If anomalies do occur, the RTS will be altered to track the radioactive tracer material. After RTS is complete, the RTS tool will be discharged in the injection zone and the well shall be flushed with 3 to 5 volumes of effluent. A second background log will be run from the bottom to the top of the well.

MIT Deadlines (sorted by date MIT pressure test due)

SDWWTP MIT Schedule of Completion

Well	Pressure Test	RTS/Video
IW-2	7/13/2013	7/25/2013
IW-1[1]	7/20/2013	7/31/2013
IW-3	7/24/2013	8/7/2013
IW-9[1]	7/30/2013	8/12/2013
IW-10[1]	8/6/2013	8/21/2013
IW-11	8/20/2013	9/3/2013
IW-12	8/25/2013	9/19/2013
IW-14	9/9/2013	9/26/2013
IW-13	9/16/2013	10/6/2013
IW-4	9/25/2013	10/14/2013
IW-6	9/30/2013	10/20/2013
IW-5	10/19/2013	10/27/2013
IW-7[2]	10/26/2013	1/7/2014
IW-8	11/2/2013	11/12/2013
IW-17	11/11/2013	11/19/2013
IW-16	11/18/2013	12/9/2013
IW-15	12/3/2013	12/16/2013

NOTES:
1.The original video was not clear enough and therefore a new video was done at the end of the MITs at SDWWTP.
2.The Computer failed during the RTS, because the Iodine 131 had already been injected, FDEP and DOH required 46 days b/f the RTS could be redone.

NDWWTP MIT Schedule of Completion

Well	Pressure Test	RTS/Video
IW-1N	3/14/2014	3/26/2014
IW-2N	3/25/2014	4/9/2014
IW-3N	4/2/2014	4/17/2014
IW-4N	4/9/2014	4/24/2014

REPAIR PLAN:

The following repair plans apply to wells at SDWWTP and NDWWTP.

1. Kill well and remove 24 inch gate valve and 4 inch bypass valves. Remove 1 inch pressure transmitter line and weld hold closed. Please see drawings included in below.

2. Sand existing casing in concrete pits and coat with Bitumastic. Please see drawings included in below.

3. Chip concrete around outer casing 1 inch deep, in order to embed PVC sleeve. Please see drawings included in below.

4. Install C905 PVC sleeve around casing pipe, embed 1 inch deep and fill annular space with grout, using Type II Neat cement. Slope top edge to create 30 degree watershed and seal at edges with sealant. Please see drawings included in below.

5. Relocate 1 inch pressure transmitter as indicated in drawings. Weld the hole. Please see drawings included in below.

6. At the NDWWTP IW-1N, IW-3N and IW-4N install new magmeters with any necessary spool pieces to be field determined. Please see drawings included in below.

7. Reassemble wellheads including installation of new 24 inch butterfly valve on horizontal part of well. Mega flanges will be used to ensure the layout of the pipe and the vales match. Please see drawings included in below.

8. On IW-4N at NDWWTP, install electric actuator for butterfly valve at base of injection well. Please see drawings included in below.

Appendix B

FDEP Approval of MIT Plan for SDWWTP and NDWWTP

November 26, 2012

Villamil, Sonia (WASD)

From: May, Joseph [redacted]
Sent: Monday, November 26, 2012 2:40 PM
To: Villamil, Sonia (WASD)
Cc: Vandor, Heidi; Silverman, Mark; Walsh, Virginia (WASD); Goldenberg, Bertha M. (WASD); Fallon Jr., Howard J. (WASD); Arrebola, Vicente (WASD); Macfarlane, Maria (WASD); Oakley, Clint (WASD)
Subject: RE: MDWASD MIT and Repair Plan Submittal

Importance: High

Hello all,

The Department approves the plan with the following understandings:

1) Medicinal grade I-131 should be specified since this solution is filtered to reduce precipitate material, as opposed to regular grade I-131, in the vial causing a tool malfunction. It has been our experience that an activity of ~1mCi/ml has been the easiest to work with in the field.
2) Please contact me a minimum of three days prior to mobilization to each site. Due to the travel time from West Palm Beach to the sites close coordination would be appreciated between myself and a designated contact person from the utility so that each pressure and RTS can be witnessed.

Thank you,

Joe

Please take a few minutes to share your comments on the service you received from the department by clicking on this link. DEP Customer Survey.

From: Villamil, Sonia (WASD) [mailto:[redacted]
Sent: Wednesday, October 17, 2012 9:42 AM
To: May, Joseph
Cc: Vandor, Heidi; Silverman, Mark; Walsh, Virginia (WASD); Goldenberg, Bertha M. (WASD); Fallon Jr., Howard J. (WASD); Arrebola, Vicente (WASD); Macfarlane, Maria (WASD); Oakley, Clint (WASD)
Subject: MDWASD MIT and Repair Plan Submittal

Hello Mr. May,

The MDWASD respectfully submits the attached MIT testing and repair plan for your approval. The paper copy is being sent via regular mail as well.

Thank you,

Sonia Villamil
Engineer II
Miami Dade Water and Sewer Department
3071 SW 38th Ave Room 554-8
Miami, FL 33146
[redacted]
fax: 786-552-8640
miamidade.gov

Appendix C

Field Notes from tests including gauge certification and pressure charts.

MIAMI-DADE WATER AND SEWER DEPARTMENT

MECHANICAL INTEGRITY TESTING OF DEEP INJECTION WELLS AND ASSOCIATED SERVICES

BID NO.: RPQ P0086

PRESSURE TEST IW - 11

July 22, 2013

TIME	CASING PRESSURE (psi)	PACKER PRESSURE (psi)
10:55	154	380
11:00	154	380
11:05	153.5	380
11:10	153.5	380
11:15	153.5	380
11:20	153	380
11:25	153	380
11:30	153	380
11:35	152.5	370
11:40	152.5	370
11:50	152	370
11:55	152	370

MIAMI-DADE WATER AND SEWER DEPARTMENT

MECHANICAL INTEGRITY TESTING OF DEEP INJECTION WELLS AND ASSOCIATED SERVICES

BID NO.: RPQ P0086

BREAK OFF TEST IW - 11

July 22, 2013

GALLONS	CASING PRESSURE (psi)	PACKER PRESSURE (psi)
0	152	365
5	124	360
10	91	340+
15	70	340
20	48	320+
25	17	320+
~~30~~ 29.5	0	310

Top of Packer: 2381.6 feet

Bottom of Casing: 2428 feet

MIAMI-DADE WATER AND SEWER DEPARTMENT

MECHANICAL INTEGRITY TESTING OF DEEP INJECTION WELLS AND ASSOCIATED SERVICES

BID NO.: RPQ P0086

PRESSURE TEST IW - 11

WITNESS LIST

July 22, 2013

NAME	SIGNATURE	COMPANY/AGENCY	TELEPHONE
Joe May	[redacted]	FDEP	[redacted]
Sonia Villar		WASD	
Michael A		WASD	
CHRIS HARF		YBI	

Miami Dade South District

Date: 7-18-13 THU

IW# 11

Packer Tally 2398.87' ℄ of PACKER

Joint #	Length (ft.)	Total Length (ft)	Joint #	Length (ft.)	Total Length (ft)	Joint #	Length (ft.)	Total Length (ft)
1	31.25	31.25	35	30.78	1071.98	68	30.68	2082.55
2	30.62	61.87	36	30.57	1102.55	69	30.57	2113.12
3	30.55	92.42	37	30.56	1133.11	70	30.6	2143.72
4	30.65	123.07	38	30.8	1163.91	71	30.55	2174.27
5	30.54	153.61	39	30.34	1194.25	72	30.53	2204.8
6	30.55	184.16	40	30.63	1224.88	73	30.8	2235.6
7	30.68	214.84	41	30.53	1255.41	74	30.63	2266.23
8	30.55	245.39	42	30.58	1285.99	75	30.53	2296.76
9	30.57	275.96	43	30.78	1316.77	76	30.6	2327.36
10	30.57	306.53	44	30.64	1347.41	77	30.63	2357.99
11	30.56	337.09	45	30.55	1377.96	78	30.56	2388.55
12	30.6	367.69	46	30.8	1408.76	79	30.56	2419.11
13	30.59	398.28	47	30.71	1439.47	80	30.67	2449.78
14	30.85	429.13	48	30.55	1470.02	81	30.6	2480.38
15	30.57	459.7	49	30.53	1500.55	82	30.71	2511.09
16	30.65	490.35	50	30.64	1531.19	83	30.65	2541.74
17	30.58	520.93	51	30.59	1561.78	84	30.55	2572.29
18	30.6	551.53	52	30.6	1592.38	85	30.55	2602.84
19	30.64	582.17	53	30.6	1622.98	86	30.63	2633.47
20	30.6	612.77	54	30.58	1653.56	87	30.74	2664.21
21	30.53	643.3	55	30.53	1684.09	88	30.82	2695.03
22	30.53	673.83	56	30.7	1714.79	89	30.69	2725.72
23	30.82	704.65	57	30.55	1745.34	90	30.6	2756.32
24	30.65	735.3	58	30.68	1776.02	91	30.6	2786.92
25	30.72	766.02	59	30.55	1806.57	92	30.72	2817.64
26	30.6	796.62	60	30.6	1837.17	93	30.53	2848.17
27	30.72	827.34	61	30.75	1867.92	94	30.74	2878.91
28	30.58	857.92	62	30.6	1898.52	95	30.67	2909.58
29	30.58	888.5	63	30.57	1929.09	96	30.63	2940.21
30	30.63	919.13	64	30.63	1959.72	97	30.57	2970.78
31	30.58	949.71	65	30.8	1990.52	98	30.6	3001.38
32	30.67	980.38	66	30.57	2021.09	99	30.53	3031.91
33	30.25	1010.63	67	30.78	2051.87	100	30.65	3062.56
34	30.57	1041.2						

MIAMI DADE.
SOUTH DISTRICT IW #11

THUR.
7-18-13

PACKER 10.32
78 JT'S 2388.55
2398.87
LESS STICKUP - 7.00
2391.87 ℄ OF PACKER.

2381.56

EXTENT OF BRUSHING WILL BE 2414.10
BOTTOM OF BRUSH DURING THE TEST WILL BE @ 2407.10

IW-11 PT

Field Cal Date	unknown	unknown	
Rec #	Date/Time	Temperature(degF)	Pressure(psi)
1	7/22/2013 10:54	89.7	154.5
2	7/22/2013 10:55	90	154.5
3	7/22/2013 10:56	90.6	154.4
4	7/22/2013 10:57	91.3	154.4
5	7/22/2013 10:58	91.6	154.4
6	7/22/2013 10:59	91.5	154.3
7	7/22/2013 11:00	91.3	154.3
8	7/22/2013 11:01	91.2	154.2
9	7/22/2013 11:02	91.3	154.2
10	7/22/2013 11:03	91.4	154.1
11	7/22/2013 11:04	91.3	154.1
12	7/22/2013 11:05	91.5	154.1
13	7/22/2013 11:06	91.4	154.0
14	7/22/2013 11:07	91.5	154.0
15	7/22/2013 11:08	91.4	153.9
16	7/22/2013 11:09	91.1	153.9
17	7/22/2013 11:10	91.1	153.8
18	7/22/2013 11:11	91.3	153.8
19	7/22/2013 11:12	91.8	153.8
20	7/22/2013 11:13	92.2	153.7
21	7/22/2013 11:14	92.3	153.7
22	7/22/2013 11:15	92.3	153.6
23	7/22/2013 11:16	92.2	153.6
24	7/22/2013 11:17	92.4	153.5
25	7/22/2013 11:18	92.5	153.5
26	7/22/2013 11:19	92.3	153.5
27	7/22/2013 11:20	92.3	153.4
28	7/22/2013 11:21	92.6	153.4
29	7/22/2013 11:22	92.5	153.3
30	7/22/2013 11:23	92.4	153.3
31	7/22/2013 11:24	92.2	153.3
32	7/22/2013 11:25	92.2	153.2
33	7/22/2013 11:26	92.2	153.2
34	7/22/2013 11:27	91.8	153.2
35	7/22/2013 11:28	92	153.1
36	7/22/2013 11:29	92.1	153.1
37	7/22/2013 11:30	92.1	153.0
38	7/22/2013 11:31	92.1	153.0
39	7/22/2013 11:32	92.1	153.0
40	7/22/2013 11:33	92.1	152.9
Rec #	Date/Time	Temperature(degF)	Pressure(psi)

41	7/22/2013 11:34	91.8	152.9
42	7/22/2013 11:35	92	152.8
43	7/22/2013 11:36	91.5	152.8
44	7/22/2013 11:37	91.2	152.7
45	7/22/2013 11:38	91.1	152.7
46	7/22/2013 11:39	91.2	152.7
47	7/22/2013 11:40	90.7	152.6
48	7/22/2013 11:41	90.3	152.6
49	7/22/2013 11:42	90.3	152.6
50	7/22/2013 11:43	90.5	152.5
51	7/22/2013 11:44	90.9	152.5
52	7/22/2013 11:45	91.3	152.4
53	7/22/2013 11:46	91.6	152.4
54	7/22/2013 11:47	91.7	152.4
55	7/22/2013 11:48	91.7	152.3
56	7/22/2013 11:49	91.7	152.3
57	7/22/2013 11:50	91.7	152.3
58	7/22/2013 11:51	91.5	152.2
59	7/22/2013 11:52	91.3	152.2
60	7/22/2013 11:53	91.1	152.1
61	7/22/2013 11:54	90.8	152.1
62	7/22/2013 11:55	90.8	152.1
63	7/22/2013 11:56	90.8	152.0
64	7/22/2013 11:57	90.7	152.0
65	7/22/2013 11:58	90.7	142.6
66	7/22/2013 11:59	90.7	142.9
67	7/22/2013 12:00	90.5	124.1
68	7/22/2013 12:01	90.3	95.4
69	7/22/2013 12:02	90.3	78.1
70	7/22/2013 12:03	90.4	61.7
71	7/22/2013 12:04	90.4	69.6
72	7/22/2013 12:05	90.5	57.6
73	7/22/2013 12:06	90.5	45.1
74	7/22/2013 12:07	90.3	35.5
75	7/22/2013 12:08	90.2	20.5
76	7/22/2013 12:09	89.9	12.4
77	7/22/2013 12:10	89.6	16.7
78	7/22/2013 12:11	89.5	4.0
79	7/22/2013 12:12	89.4	0.0

Certificate of Calibration

OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

Ozone Industries, Inc.
Precision Measurement Equipment Division

Purchase Order #

Calibration Performed By:
OZONE INDUSTRIES, INC.
15551 PINE RIDGE RD.
FORT MYERS, FL 33908

For:
YOUNGQUIST BROTHERS, INC.
15465 PINE RIDGE RD.
FORT MYERS, FL 33908

EQUIPMENT INFORMATION:

Description: PRESSURE GAUGE
Manufacter: MCDANIELS
Model Number: 300PSI
Part Number: N/A
Range: 0-300 PSI

Serial Number: 972062-1
Customer I.D.:
Cust. Barcode: N/A
Cust. Location: N/A
Specifications: +/- 0.25% FS

Cal Date: 6/6/2013
Cal. Due Date: 8/5/2013
Cal. Interval 60 DAYS
Received: IN TOLERANCE
Calibration Result: PASS
Environmental Conditions: 74 DEG F / 20% H
Performed By: Daniel McKissick

Procedure: STANDARD

This is to certify that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure at the points tested (unless otherwise noted). It has been Calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration is in accordance with Ozone Industries, Inc Quality Assurance Manual. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

Calibration Remarks:
THIS UNIT WAS FOUND TO BE IN TOLERANCE AT THE TIME OF CALIBRATION.
PERFORMED ROUTINE CALIBRATION / CERTIFICATION

Standards Used to Calibrate Equipment:

Company	I.D.	Description	Last Cal.	Cal. Due Date
OZONE	A1731	EATON UPC5000 PNEUMATIC CALIBRATOR	12/12/2012	12/12/2013

Signatures:

Certified by:
Print: Daniel McKissick
Date: 06/06/13
[redacted]

Approved by:
Print: Daniel McKissick
[redacted]

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ØZONE
INDUSTRIES
CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

PH: 239-433-3400
FAX: 239-489-3877

CONTROL NO: 032509-1

CUSTOMER: YBI15465

CALIBRATION DATA FORM

MFR:	MCDANIELS	**DESCRIPTION**	PRESSURE GAUGE
MODEL NO:	300 PSI .25%	**TECHNICIAN:**	0030
SERIAL NO:	972062-1	**CAL. DATE:**	06/06/13
CUST. ID:	N/A	**DUE DATE:**	08/05/13

* IF NO "AS LEFT" READING IS SHOWN ON THIS CHART, IT MEANS THE UNIT WAS IN TOLERANCE AND THERE WERE NO ADJUSTMENTS MADE TO IT.

RANGE: 0-300 PSI

NOMINAL	AS FOUND	AS LEFT *	LOW LIMIT	HIGH LIMIT
50	50.26		49.25	50.75
100	100.31		99.25	100.75
150	150.38		149.25	150.75
200	200.49		199.25	200.75
300	300.6		299.25	300.75

Certificate of Calibration

OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

Ozone Industries, Inc.
Precision Measurement Equipment Division

Purchase Order #

Calibration Performed By:
OZONE INDUSTRIES, INC.
15551 PINE RIDGE RD.
FORT MYERS, FL 33908

For:
YOUNGQUIST BROTHERS, INC.
15465 PINE RIDGE RD.
FORT MYERS, FL 33908

EQUIPMENT INFORMATION:

Description: PRESSURE GAUGE
Manufacter: McDaniel
Model Number: 300PSI
Part Number: N/A
Range: 0-300 PSI

Serial Number: 972034-2
Customer I.D.:
Cust. Barcode: N/A
Cust. Location: N/A
Specifications: +/- 0.25% FS

Cal Date: 5/17/2013
Cal. Due Date: 11/17/2013
Cal. Interval 6 MONTHS
Received: IN TOLERANCE
Calibration Result: PASS
Environmental Conditions: 74 DEG F / 80% H
Performed By: Daniel McKissick

Procedure: STANDARD

This is to certify that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure at the points tested (unless otherwise noted). It has been Calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration is in accordance with Ozone Industries, Inc Quality Assurance Manual. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

Calibration Remarks:
THIS UNIT WAS FOUND TO BE IN TOLERANCE AT THE TIME OF CALIBRATION.
PERFORMED ROUTINE CALIBRATION / CERTIFICATION

Standards Used to Calibrate Equipment:

Company	I.D.	Description	Last Cal.	Cal. Due Date
OZONE	A1731	EATON UPC5000 PNEUMATIC CALIBRATOR	12/12/2012	12/12/2013

Signatures:

Certified by:
Print: Daniel McKissick
[redacted]

Approved by:
Print: Daniel McKissick
Date: [redacted] 05/17/13
[redacted]

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ØZONE
INDUSTRIES
CORPORATION

15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

PH: 239-433-3400
FAX: 239-489-3877

CONTROL NO: 100809-7

CUSTOMER: YBI15465

CALIBRATION DATA FORM

MFR:	PIC	**DESCRIPTION**	PRESSURE GAUGE
MODEL NO:	300 PSI .25%	**TECHNICIAN:**	0030
SERIAL NO:	972034-2	**CAL. DATE:**	05/17/13
CUST. ID:	N/A	**DUE DATE:**	11/17/13

* IF NO "AS LEFT" READING IS SHOWN ON THIS CHART, IT MEANS THE UNIT WAS IN TOLERANCE AND THERE WERE NO ADJUSTMENTS MADE TO IT.

RANGE: 0-300 PSI

NOMINAL	AS FOUND	AS LEFT *	LOW LIMIT	HIGH LIMIT
50	49.59		49.25	50.75
100	99.47		99.25	100.75
150	149.45		149.25	150.75
200	199.43		199.25	200.75
300	299.4		299.25	300.75

Certificate of Calibration

OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

Ozone Industries, Inc.
Precision Measurement Equipment Division

Purchase Order #

Calibration Performed By:
OZONE INDUSTRIES, INC.
15551 PINE RIDGE RD.
FORT MYERS, FL 33908

For:
YOUNGQUIST BROTHERS, INC.
15465 PINE RIDGE RD.
FORT MYERS, FL 33908

EQUIPMENT INFORMATION:

Description: PRESSURE GAUGE
Manufacter: MCDANIELS
Model Number: 300PSI
Part Number: N/A
Range: 0-300 PSI

Serial Number: AB30128
Customer I.D.:
Cust. Barcode: N/A
Cust. Location: N/A
Specifications: +/- 0.25% FS

Cal Date: 6/17/2013
Cal. Due Date: 12/17/2013
Cal. Interval 6 MONTHS
Received: IN TOLERANCE
Calibration Result: PASS
Environmental Conditions: 73 DEG F / 40% H
Performed By: Daniel McKissick

Procedure: STANDARD

This is to certify that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure at the points tested (unless otherwise noted). It has been Calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration is in accordance with Ozone Industries, Inc Quality Assurance Manual. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

Calibration Remarks:
THIS UNIT WAS FOUND TO BE IN TOLERANCE AT THE TIME OF CALIBRATION.
PERFORMED ROUTINE CALIBRATION / CERTIFICATION

Standards Used to Calibrate Equipment:

Company	I.D.	Description	Last Cal.	Cal. Due Date
OZONE	A1731	EATON UPC5000 PNEUMATIC CALIBRATOR	12/12/2012	12/12/2013

Signatures:

Certified by:
Print: Daniel McKissick
Date: 06/17/13
[redacted]

Approved by:
Print: Daniel McKissick
Date: 06/17/13
[redacted]

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OZONE
INDUSTRIES
CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

PH: 239-433-3400
FAX: 239-489-3877

CONTROL NO: 080709-2

CUSTOMER: YBI15465

CALIBRATION DATA FORM

MFR:	MCDANIELS	**DESCRIPTION**	PRESSURE GAUGE
MODEL NO:	300 PSI .25%	**TECHNICIAN:**	0030
SERIAL NO:	AB30128	**CAL. DATE:**	06/17/13
CUST. ID:	N/A	**DUE DATE:**	12/17/13

* IF NO "AS LEFT" READING IS SHOWN ON THIS CHART, IT MEANS THE UNIT WAS IN TOLERANCE AND THERE WERE NO ADJUSTMENTS MADE TO IT.

RANGE: 0-200 PSI

NOMINAL	AS FOUND	AS LEFT *	LOW LIMIT	HIGH LIMIT
50	50.18		49.25	50.75
100	100.19		99.25	100.75
150	150.22		149.25	150.75
200	200.31		199.25	200.75
250	250.33		249.25	250.75
300	300.39		299.25	300.75

Appendix D

RTS and RTS Tool Configuration

YOUNGQUIST

GEOPHYSICAL LOGGING DIVISION

Radioactive Tracer Survey Tool Diagram

Date: 07/29/13 Job: SDWWTP - IW-11

Internal RTS:___ External RTS:___ YB I Logger: [illegible]

BOTTOM OF CASING: 2432'

-5' IN CASING: 2427'

+13.5' FOR BOTTOM OF TOOL: 2440.5

Eject #1: 1 mCi Eject #2: 2 mCi

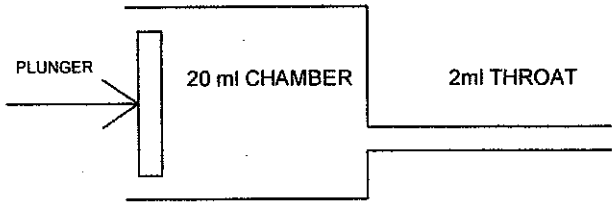
Eject #3: mCi Eject #4: mCi

Eject #5: mCi Eject #6: mCi

Total mCi of I-131 loaded in tool: 5 **1ml =1mCi**

Total volume of Chamber and Throat:22ml

EJECTOR PORT DIAGRAM



Total Eject Cycle Time (22ml): 24 **Sec**

Eject Cycle Time Per ml (Total Time / 22): 1.1 **Sec**

Throat Eject Cycle Time (2*Time Per ml): 2.2 **Sec**

TIME PER EJECT

(Total ml of I-131)/(20ml)= mCi per ml in the chamber

(5)/(20)= .25 mCi per ml

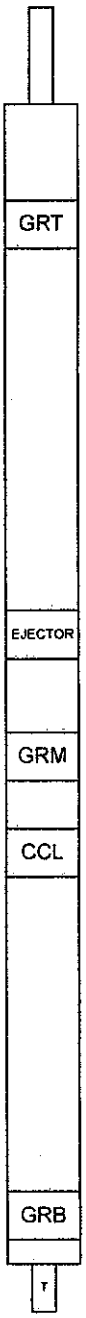
mCi = Throat Eject Cycle Time + (ml of Chamber Required)*(Eject Cycle Time Per ml)

1 mCi = 2.2 + (4)*(1.1) = 6.6 **seconds**

2 mCi = 2.2 + (8)*(1.1) = 11 **seconds**

3 mCi = + ( )*( ) = **seconds**

4 mCi = + ( )*( ) = **seconds**



TOP OF TOOL (25ft 2in)

GAMMA RAY TOP DECTOR (23ft 6in)

ALL MEASUREMENTS ARE FROM THE BOTTOM OF THE TOOL.

TOOL DIAMETER IS 1-11/16".

EJECTOR PORT (13ft 6in)

GAMMA RAY MIDDLE DECTOR (10ft 6in)

COLLAR LOCATOR (9ft 6in)

GAMMA RAY BOTTOM DECTOR (1ft 2in)

TEMPERATURE PROBE

Appendix E

Temperature Log

Appendix F

Television Survey

Appendix G

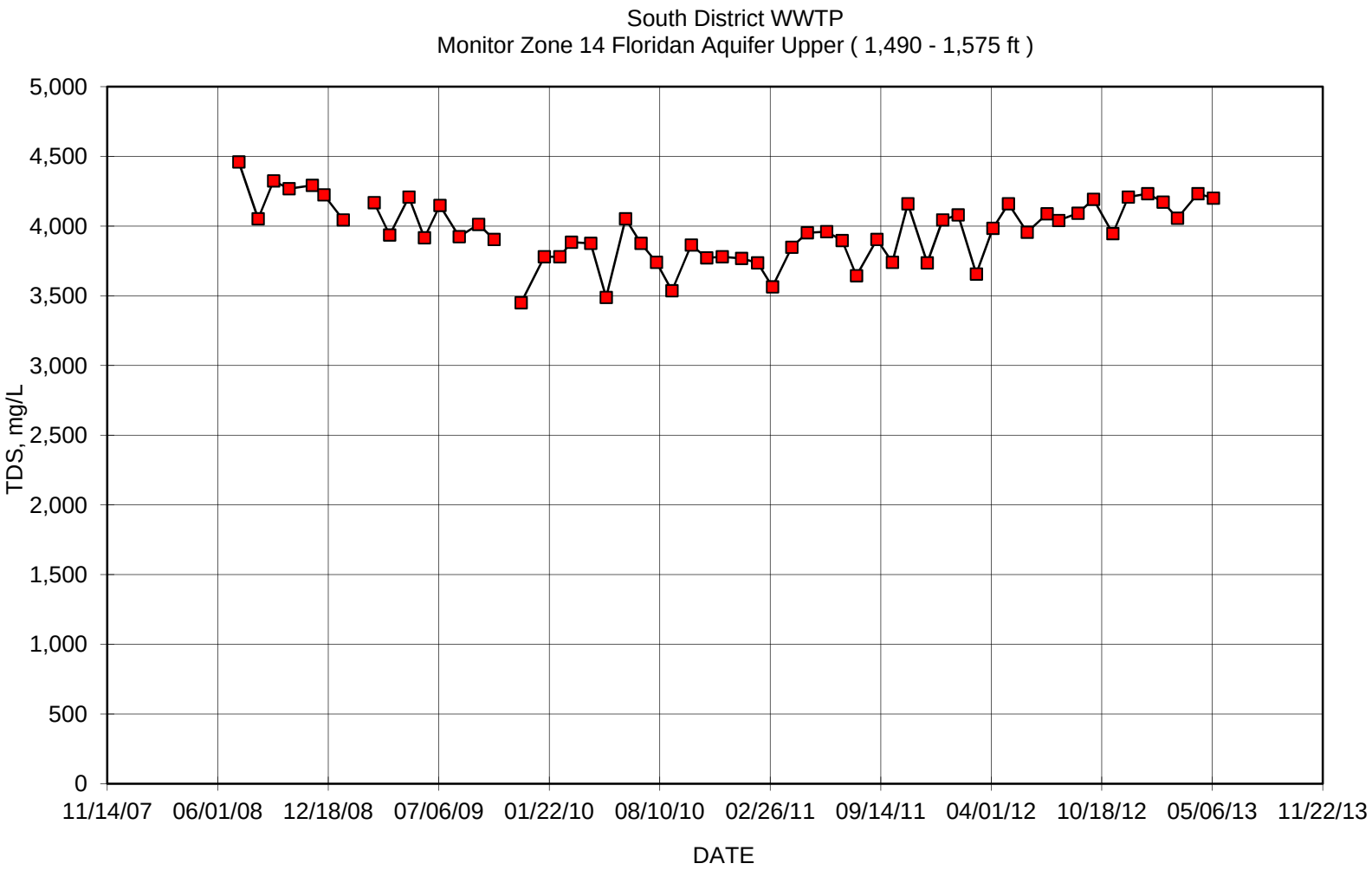
5 year Monitoring Data

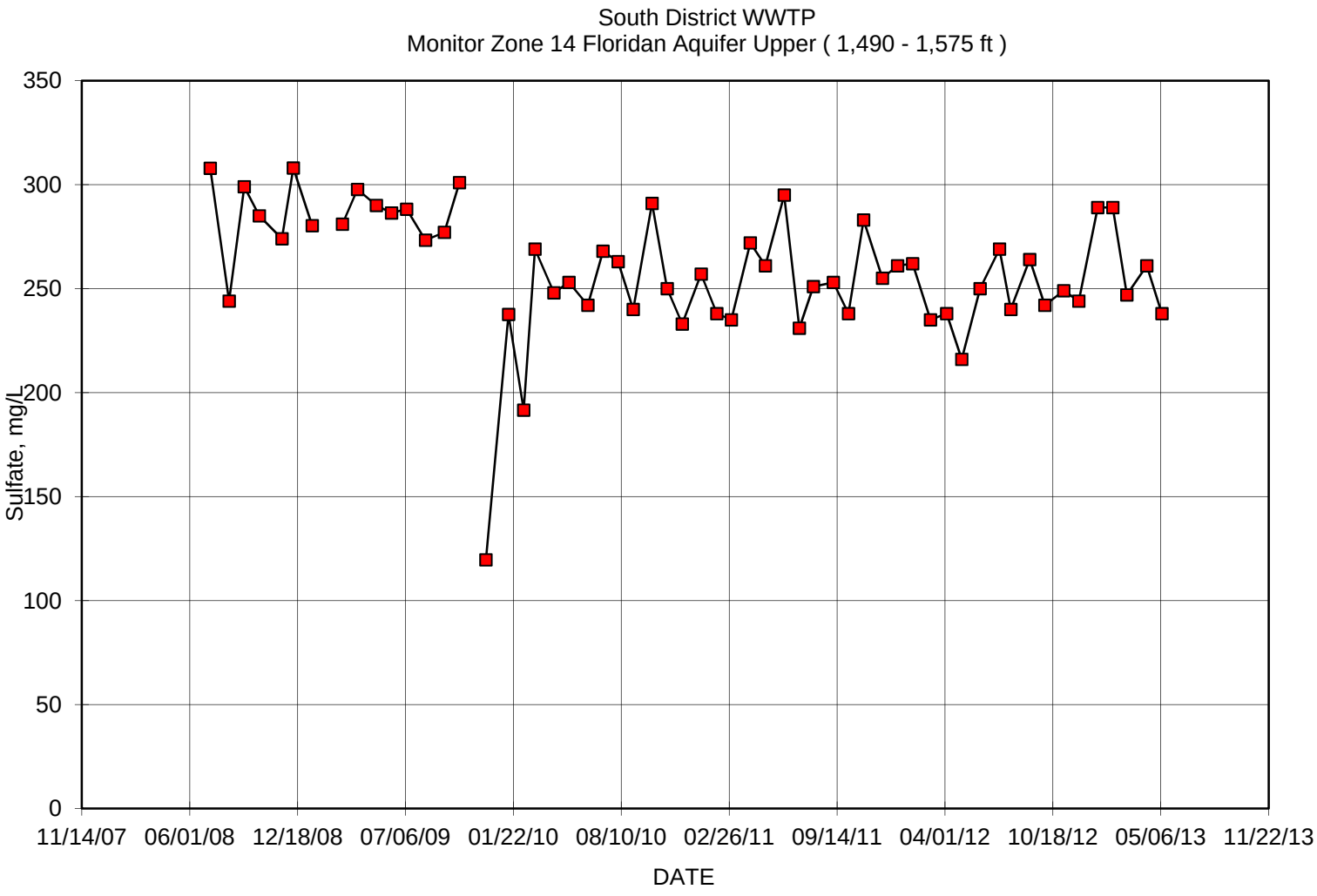
FA-14 Upper

Date	TDS, mg/L	Sulfate mg/L	Chlorides, mg/L	TKN, mg/L	NH3, mg/L	Conductivity, Micromho/cm	Temp., C	Temp., F	pH	TP, mg/L	TSS mg/L	NO_3 mg/L	NO_2 mg/L	Sodium, pCi/L	Gross Alpha, pCi/L	Radium 226, pCi/L	Radium 228, pCi/L
07/09/08	4,460	308	2,285	9.62	7.62	7,218	24	75	7.39	0.01	1.76	0.03	0.00				
08/13/08	4,052	244	2,175	9.84	8.42	6,535	25	77	7.82	0.01	1.76	0.08	0.05				
09/10/08	4,324	299	2,049	10.10	8.36	7,165	25	76	7.40	0.02	1.76	0.08	0.05				
10/08/08	4,268	285	1,926	9.44	6.36	7,218	24	74	7.30	0.08	1.76	0.03	0.00				
11/19/08	4,292	274	1,974	1.40	1.47	7,166	23	74	7.33	0.00	1.76	0.03	0.00				
12/10/08	4,224	308	2,107	9.60	7.62	7,049	23	74	7.28	0.02	0.20	0.03	0.01				
01/14/09	4,044	280	1,934	9.78	7.80	6,780	22	72	7.28	0.04	2.20	0.03	0.01				
02/11/09																	
03/11/09	4,168	281	1,973	9.44	9.83	7,214	23	73	7.37	0.25	2.00	0.00	0.00				
04/08/09	3,936	298	2,069	9.10	10.90	6,794	22	71	7.28	0.04	2.20	0.00	0.01				
05/13/09	4,208	290	1,915	9.39	9.49	6,785	24	75	7.36	0.01	3.60	0.00	0.01				
06/10/09	3,916	286	2,000	8.40	9.90	6,795	24	74	7.37	0.16	4.20	0.00	0.00				
07/08/09	4,148	288	1,997	9.82	8.30	6,865	25	76	7.33	0.01	2.80	0.01	0.01				
08/12/09	3,924	273	1,895	9.64	10.20	6,829	25	77	7.47	0.01	4.40	0.00	0.01				
09/16/09	4,012	277	1,838	10.95	8.93	6,803			7.29	0.01		0.05	0.01	1050	9.2	4.2	0.9
10/14/09	3,904	301	1,851	5.17	9.52	6,398			7.37	0.03		0.00	0.01	1000	9.4	4.6	0.9
11/12/09																	
12/02/09	3,450	120	1,389	11.15	9.76	6,067	25	77	8.07	0.01	30.00	0.00	0.01	873	10.0	3.2	0.9
01/13/10	3,780	238	1,772	11.03	9.46	6,289	22	72	7.38	0.02	1.40	0.01	0.01	860	11.4	3.9	0.7
02/10/10	3,780	192	1,497	10.66	9.76	6,393	23	73	7.32	0.02	2.40	0.00	0.02	945	7.9	3.9	0.9
03/03/10	3,884	269	1,907	10.85	9.23	6,749	22	71	7.32	0.05	1.00	0.00	0.00	1050	9.4	5.0	0.7
04/07/10	3,876	248	1,857	5.36	9.33	6,541	25	77	7.29	0.02	3.00	0.00	0.00	961	13.1	4.1	0.8
05/05/10	3,488	253	1,823	12.00	8.97	6,368	25	77	7.26	0.01	4.00	0.00	0.00	1080	12.0	3.1	0.8
06/09/10	4,052	242	1,733	10.80	8.41	6,602	24	75	7.26	0.05	4.60	0.00	0.00	939	8.6	4.5	0.7
07/07/10	3,876	268	1,948	8.64	8.89	6,561	24	76	7.31	0.04	2.20	0.00	0.00	998	7.7	4.2	0.7
08/04/10	3,740	263	1,963	11.60	10.80	6,035	24	76	7.30	0.18	2.00	0.00	0.00	991	16.2	5.2	0.9
09/01/10	3,536	240	1,720	14.40	8.15	6,255	24	76	7.33	0.02	5.40	0.00	0.00	920	8.4	4.9	0.8
10/06/10	3,864	291	1,973	10.60	10.60	6,576	24	76	7.10	0.02	2.40	0.03	0.01	948	9.7	3.5	0.8
11/03/10	3,772	250	1,852	11.60	10.10	6,377	25	77	7.41	0.02	1.80	0.00	0.00	1020	11.2	3.7	0.6
12/01/10	3,780	233	1,724	11.40	10.90	6,264	24	75	7.36	0.02	1.40	0.00	0.01	902	8.8	4.2	0.7
01/05/11	3,768	257	1,804	10.30	10.20	6,308	24	75	7.39	0.02	2.10	0.00	0.01	1010	10.8	4.0	0.8
02/03/11	3,736	238	1,786	10.90	10.30	6,090	24	76	7.32	0.20	2.30	0.00	0.00	954	10.4	4.5	0.8
03/02/11	3,564	235	1,791	10.80	10.00	6,355	23	74	7.44	0.02	4.50	0.00	0.00	994	12.1	4.5	0.8

04/06/11	3,848	272	1,955	11.60	10.80	6,304	23	74	7.27	0.02	3.30	0.00	0.00	974	13.1	4.9	0.7
05/04/11	3,952	261	1,880	10.90	10.70	6,394	24	75	7.26	0.02	2.00	0.00	0.00	1050	8.0	4.4	1.0
06/08/11	3,960	295	1,967	10.20	9.86	6,589	25	77	7.28	0.03	3.10	0.00	0.01	1030	9.3	4.9	0.7
07/06/11	3,896	231	1,736	11.40	12.10	6,434	24	76	7.21	0.02	0.90	0.00	0.00	957	6.9	4.3	0.7
08/01/11	3,644	251	1,888	11.20	12.70	6,085	26	78	7.18	0.02	4.70	0.00	0.00	902	14.3	3.9	0.9
09/07/11	3,904	253	1,865	11.00	12.30	6,247	24	75	7.71	0.04	4.80	0.00	0.00	1000	7.9	3.9	0.9
10/05/11	3,740	238	1,909	11.10	12.70	6,286	24	76	7.34	0.04	3.90	0.00	0.00	1010	9.8	5.6	0.9
11/02/11	4,160	283	2,156	11.10	11.20	6,667	25	76	7.34	0.03	3.50	0.00	0.00	1120	10.9	2.9	0.9
12/07/11	3,736	255	1,980	11.60	11.30	5,527	25	76	7.54	0.04	1.50	0.00	0.00	1060	9.0	4.2	0.8
01/04/12	4,044	261	2,058	10.50	14.00	6,155	22	72	7.42	0.02	3.30	0.00	0.00	1110	9.0	5.1	0.8
02/01/12	4,080	262	2,030	11.50	13.70	5,722	24	76	7.19	0.02	1.30	0.00	0.00	1110	10.2	4.1	0.9
03/05/12	3,656	235	1,877	13.20	13.80	6,081	24	76	7.31	0.01	13.10	0.00	0.00	1070	8.9	4.7	0.8
04/04/12	3,984	238	2,020	13.00	12.20	6,476	24	76	7.46	0.03	4.70	0.50	0.50	949	6.8	4.9	0.7
05/02/12	4,160	216	2,090	12.40	12.60	6,184	24	76	7.46	0.01	19.10	0.01	0.01	1120	11.5	4.9	0.8
06/05/12	3,956	250	2,040	13.20	12.70	6,755	25	76	7.5	0.02	1.90	0.00	0.00	1030	11.0	4.4	0.7
07/11/12	4,088	269	2,000	12.80	10.40	6,667	24	75	7.28	0.01	3.30	0.01	0.01	1060	17.6	4.4	0.8
08/01/12	4,040	240	1,970	13.30	13.80	6,701	24	76	7.31	0.02	6.70	0.01	0.00	1100	8.7	3.6	0.8
09/05/12	4,092	264	2,140	13.20	11.80	7,125	25	77	7.34	0.04	6.70	0.01	0.00	1070	12.8	3.6	0.8
10/03/12	4,192	242	2,140	13.30	13.10	6,865	24	76	7.3	0.03	2.40	0.00	0.00	1090	19.2	4.8	0.8
11/07/12	3,946	249	1,950	11.00	12.70	6,433	24	75	7.27	0.01	2.60	0.01	0.00	1170	14.7	4.9	0.9
12/05/12	4,208	244	1,960	14.10	13.80	6,846	24	75	7.26	0.01	2.10	0.02	0.01	1090	11.2	2.8	0.9
01/09/13	4,232	289	2,170	14.20	13.70	7,248	24	75	7.28	0.06	3.70	0.02	0.00	1190	9.4	2.0	0.9
02/06/13	4,172	289	2,050	13.60	15.10	7,135	24	76	7.37	0.03	12.70	0.00	0.00	1170	10.4	5.1	0.9
03/04/13	4,056	247	2,037	12.60	13.10	7,156	23	74	7.26	0.04	5.50	0.00	0.00	1230	25.6	3.8	1.3
04/10/13	4,232	261	2,070	12.60	12.60	7,225	24	75	7.07	0.01	0.01	0.00	0.00	1130	9.4	1.5	0.7
05/08/13	4,200	238	1,910	12.90	12.30	7,459	25	76	7.34	0.04	0.04	0.01	0.01	1190	11.1	5.4	0.8

AVG	3,965	259	1,936	10.90	10.61	6,600		75	7.4	0.04	3.96	0.02	0.01
MAX	4,460	308	2,285	14.40	15.10	7,459		78	8.1	0.25	30.00	0.50	0.50
MIN	3,450	#####	1,389	1.40	1.47	5,527		71	7.1	0.00	0.01	0.00	0.00


South District WWTP
Monitor Zone 14 Floridan Aquifer Upper (1,490 - 1,575 ft)
TDS, mg/L
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE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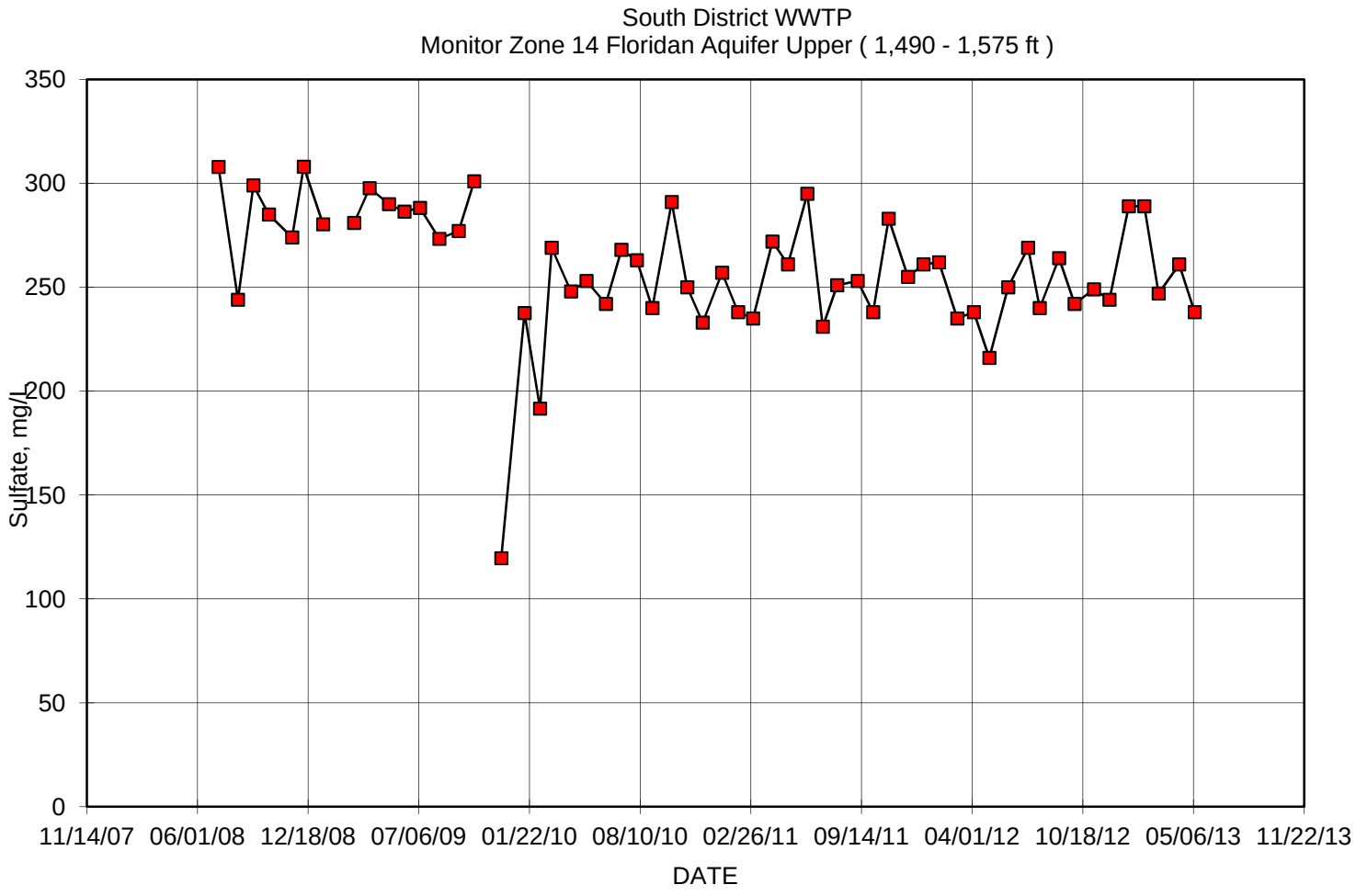
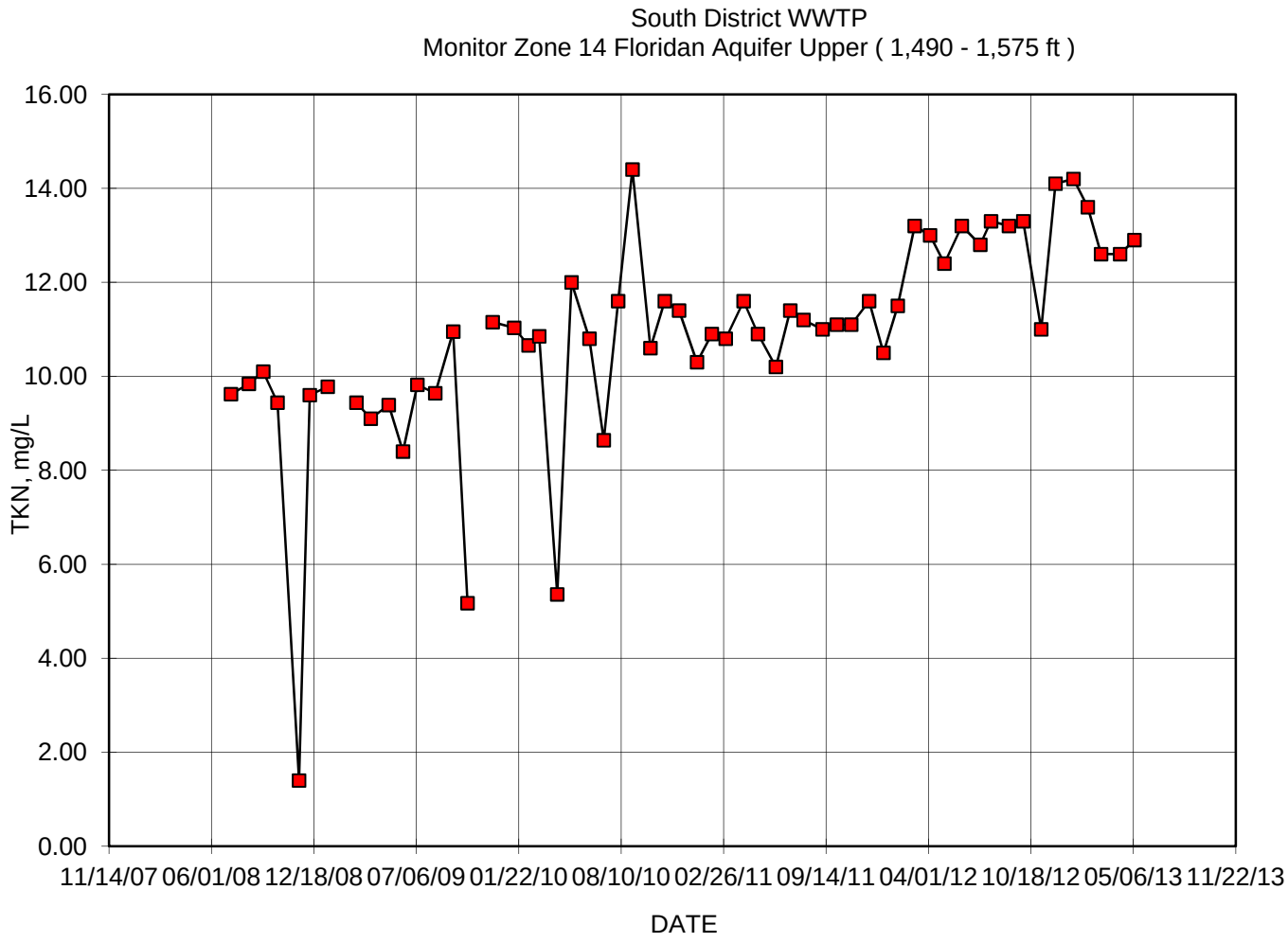
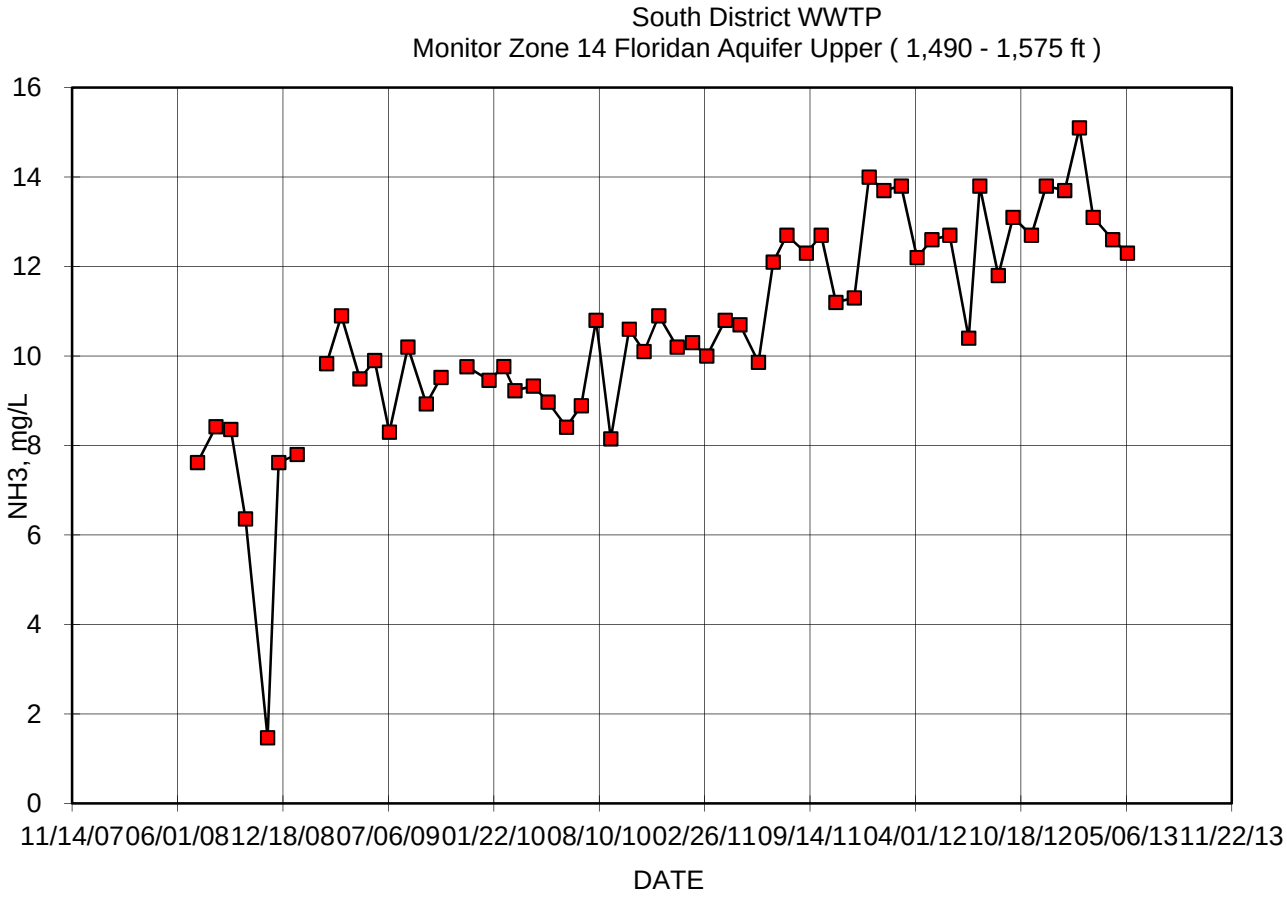
Monitor Zone 14 Floridan Aquifer Upper (1,490 - 1,575 ft)
Sulfate, mg/L
350
300
250
200
150
100
50
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 14 Floridan Aquifer Upper (1,490 - 1,575 ft)
Sulfate, mg/L
350
300
250
200
150
100
50
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 14 Floridan Aquifer Upper (1,490 - 1,575 ft)
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
TKN, mg/L
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 14 Floridan Aquifer Upper (1,490 - 1,575 ft)
NH3, mg/L
0
2
4
6
8
10
12
14
16
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
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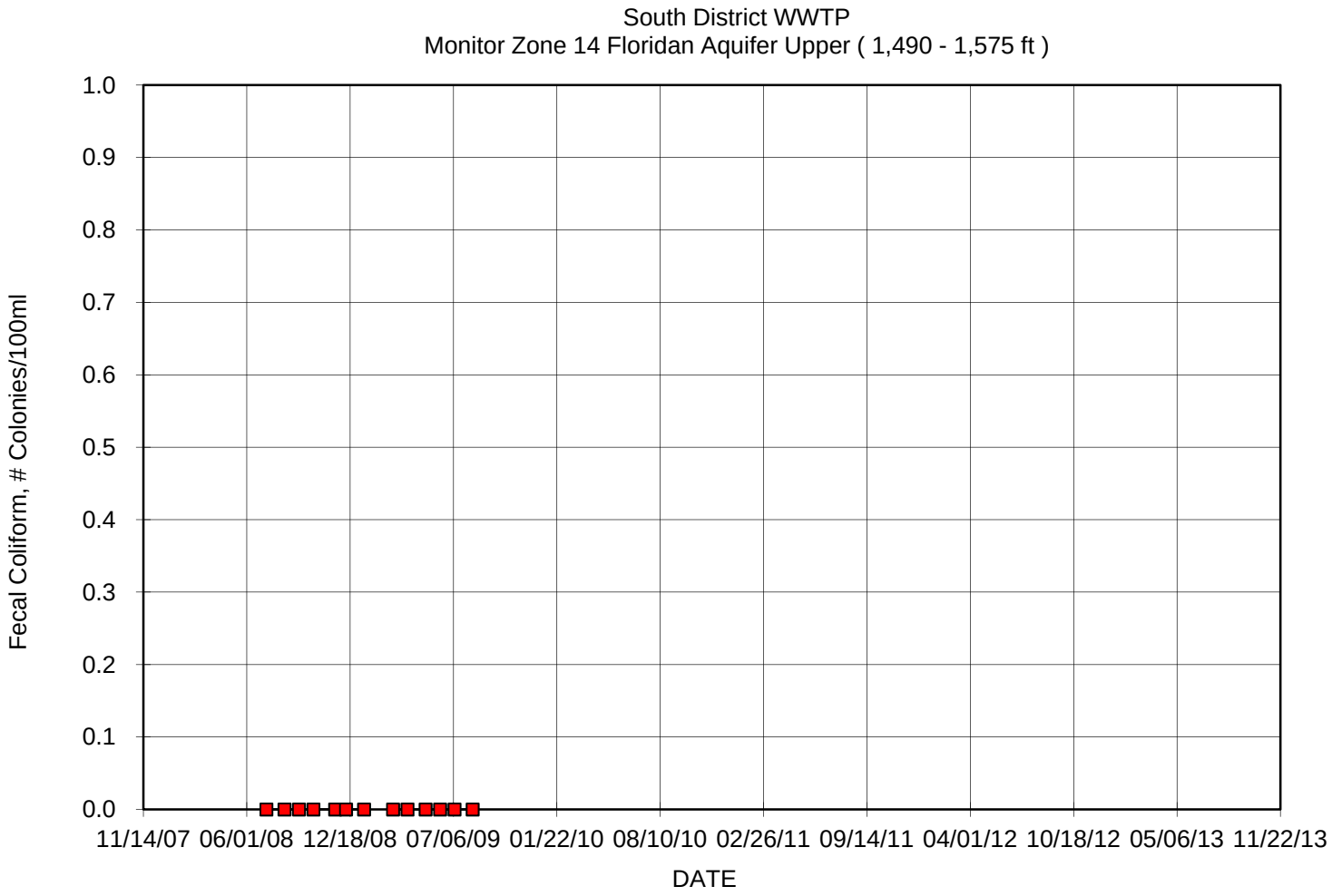
South District WWTP
Monitor Zone 14 Floridan Aquifer Upper (1,490 - 1,575 ft)
Fecal Coliform, # Colonies/100ml
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
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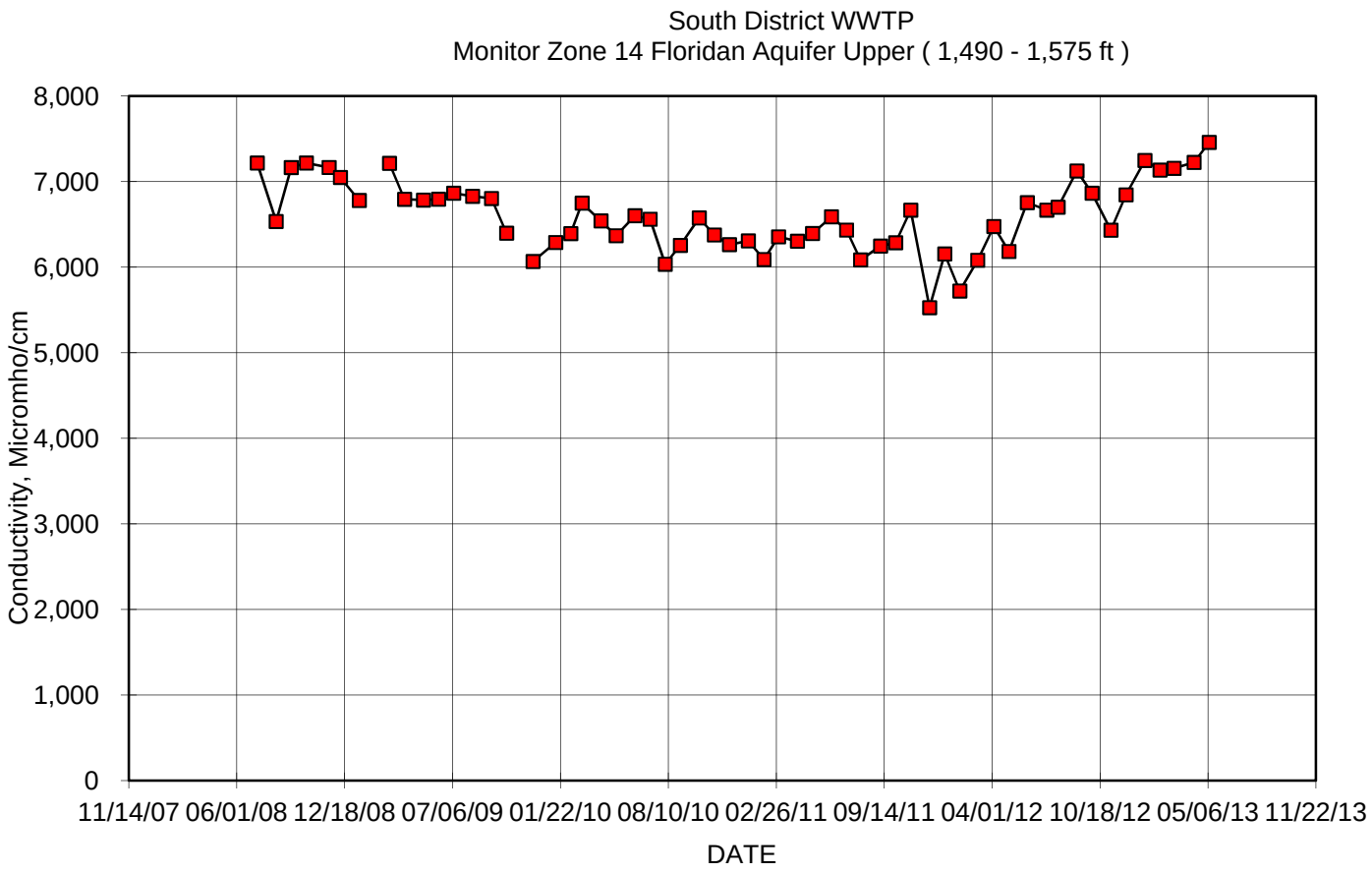
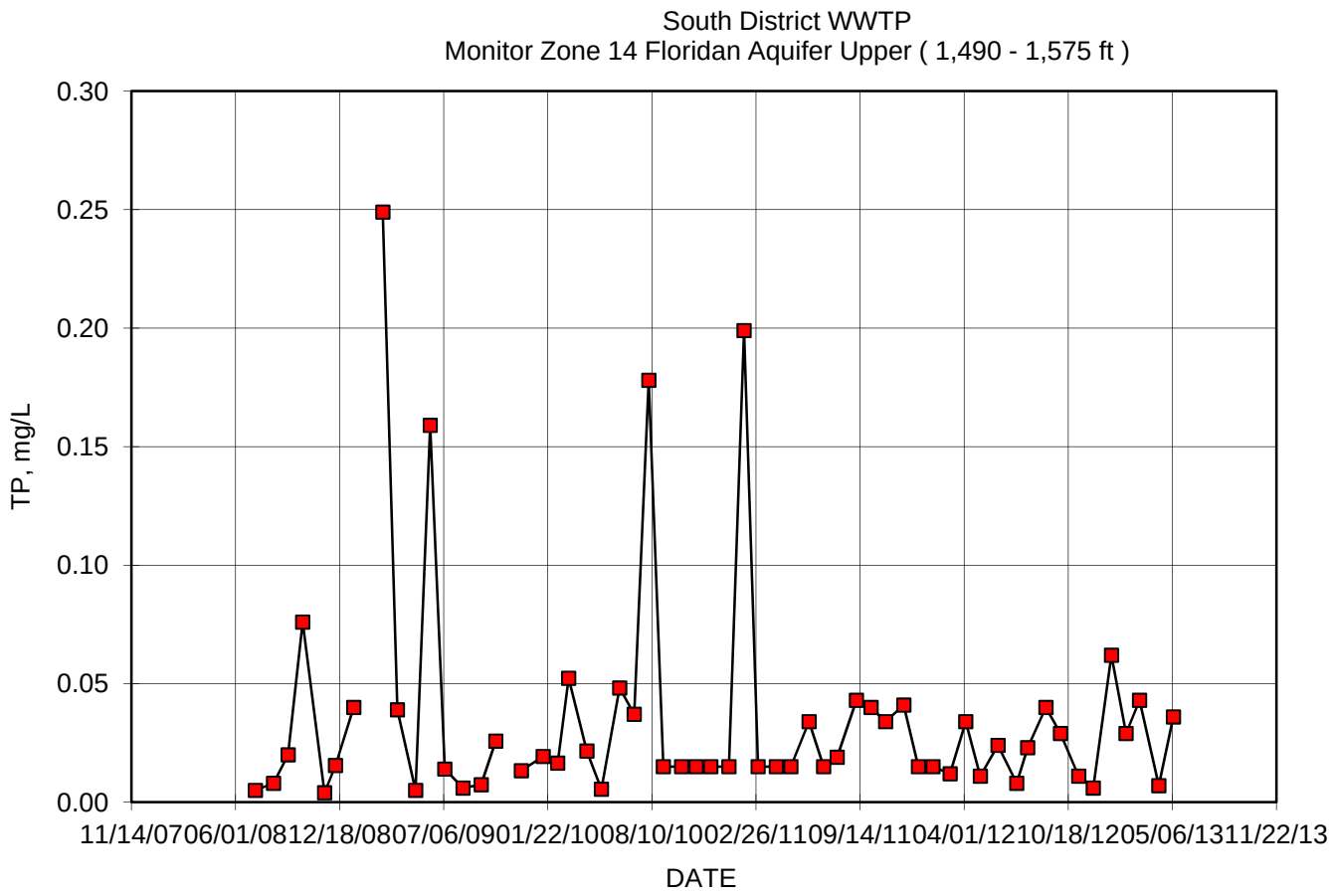
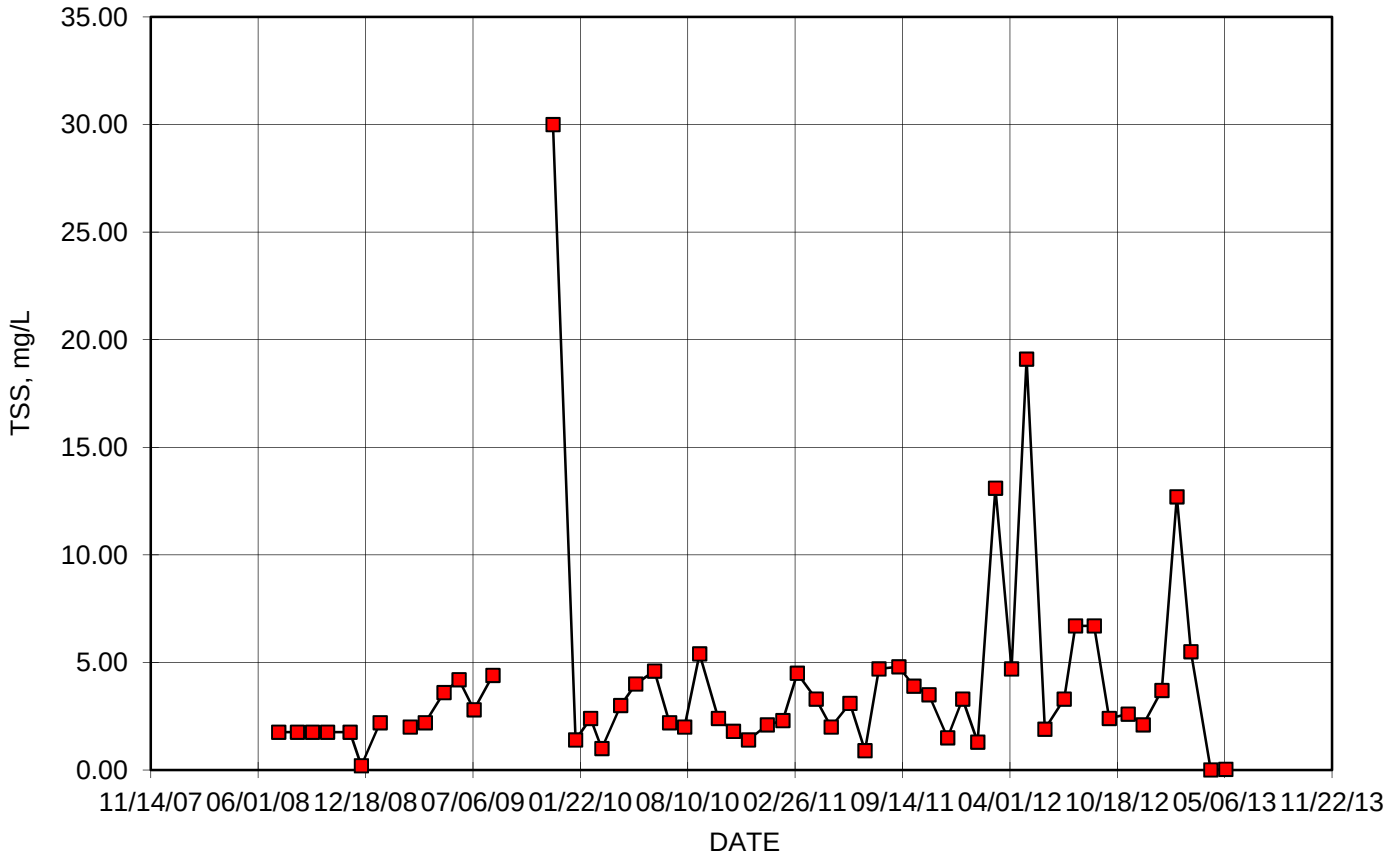
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 14 Floridan Aquifer Upper (1,490 - 1,575 ft)
Conductivity, Micromho/cm
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 14 Floridan Aquifer Upper (1,490 - 1,575 ft)
TP, mg/L
0.30
0.25
0.20
0.15
0.10
0.05
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

South District WWTP
Monitor Zone 14 Floridan Aquifer Upper (1,490 - 1,575 ft)



MIAMI-DADE COUNTY
miamidade.gov

Water and Sewer
PO Box 330316 • 3071 SW 38 Avenue
Miami, Florida 33233-3016
T 305-665-7471

October 24, 2013

Mr. Joseph R. May, P.G.
Florida Department of Environmental Protection
400 North Congress Avenue, 3rd Floor
West Palm Beach, Florida 33401

CCN: 57718

Reference: Miami-Dade Water and Sewer Department -- Mechanical Integrity Testing (MIT) Report for Deep Injection Well No. IW-12 at the SDWWTP Site.

Dear Mr. May:

Enclosed please find the Certificate of Mechanical Integrity and the MIT Report on the re-testing of Deep Injection Well No. IW-12 at the South District Wastewater Treatment Plant site in Miami-Dade County.

All the tests were conducted in strict adherence to the specifications submitted to and approved by your office. The testing results for the well were good. Both external and internal mechanical integrity were demonstrated. The well casing and the wellhead components are in good condition. All the well head valves and all the well head components are scheduled to be rust-proofed and repainted when all the MITs are completed. Based on the results of the well testing we conclude that the well retains full mechanical integrity and recommend that MDWASD be allowed to continue operating the well in its normal mode.

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

The demonstration of mechanical integrity is being submitted per Chapter 62-528.300(6)(b)2., 62-528.300(6)(c), and 62-528.425(1)(d), F.A.C. and specific condition 3.j. of Permit 0061787-022-UO.

If you have any questions or require additional explanation of any item in the report, please do not hesitate to contact me at [redacted] or Sonia Villamil at [redacted].

[redacted]

Assistant Director- Wastewater Operation Systems

Enclosures: Certificate of Mechanical Integrity
MIT Report Well IW-12 (1 copy)

cc: Joseph Haberfeld, FDEP - Tallahassee

MIAMI-DADE COUNTY
Delivering Excellence Every Day

Mechanical Integrity Test Report
Deep Injection Well No. IW-12
South District Wastewater Treatment Plant

Prepared by:
Miami-Dade Water and Sewer Department
3071 SW 38th Avenue
Miami, Florida 33146

CERTIFICATE OF MECHANICAL INTEGRITY

The **South District WWTP** deep injection well **IW-12** operated by **Miami-Dade Water and Sewer Department** has been tested for mechanical integrity. The tests followed standard engineering practices and used methods presented in the United States Environmental Protection Agency regulations for the purposes of these tests. The external and internal mechanical integrity tests followed Florida Department of Environmental Protection (FDEP) pre-approved testing specifications and all the critical test events were witnessed by representatives of the FDEP, the MDWASD and the contractor.

Having supervised the engineer and geologists that were present during the testing, conducted the examining of the results and the preparation this mechanical integrity report as part of this certification, the undersigned certifies that deep injection well **IW-12** operated by **Miami-Dade Water and Sewer Department** at the **South District Wastewater Treatment Plant Site in Miami-Dade County, Florida** has successfully passed all the test requirements for mechanical integrity under rules of Chapter 62-528 of the Florida Administrative Code and is therefore determined to have mechanical integrity.

Certified on October 24, 2013

[redacted]

Howard J. Fallon Jr., P.E.
Professional Engineer
License Number 24153

MECHANICAL INTEGRITY TEST REPORT
FOR
DEEP INJECTION WELL No. IW-12
AT THE
SOUTH DISTRICT WASTEWATER TREATMENT PLANT

Prepared by:

MIAMI-DADE WATER AND SEWER DEPARTMENT
3071 SW 38th Avenue
Miami, Florida 33146

For Submittal To:

UNDERGROUND INJECTION CONTROL
FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

October 2013

ABSTRACT

The internal mechanical integrity was investigated through a pressure test performed on the injection casing. The pressure test was conducted at 154 pounds per square inch (psi) which is approximately 1.5 times the maximum (100 psi) potential injection pressure and more than 1.7 times the maximum operational pressure that the well will be under when operating at its full permitted injection velocity of 10 feet per second (ft/sec). FDEP permits a 5% loss in pressure during the hour long test in order for the internal mechanical integrity to pass the pressure test.
IW-12 successfully passed the pressure test because the casing only lost 1.5 psi. The successful results of the pressure test for internal mechanical integrity were reinforced by the results of the second internal mechanical integrity test, the TV survey of the casing. The TV survey confirmed that the casing and the casing joints are in good condition and that the well has internal mechanical integrity down to 2,394 ft bls.

The external mechanical integrity was investigated using two test procedures, a Radioactive Tracer Survey (RTS) and a Temperature Log. Results of the RTS confirmed the integrity of the cement around the casing and the continued competence of its seal with the geologic strata. The temperature test showed that there are no anomalies that would indicate points where injected fluids could escape through the casing and cement into the formation. Similarly there were no temperature anomalies that would indicate injection fluids entering the formations at other than the approved injection depth.

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Section 1

1. INTRODUCTION

1.1 BACKGROUND

On October 12, 2012, (see Appendix A) the Miami-Dade Water and Sewer Department (MDWASD) submitted the County's proposed plan and testing specifications for conducting the mechanical integrity tests (MITs) and repairs on some of the injection wells at the South District Wastewater Treatment Plant (SDWWTP) site (see Figure 1) to the Florida Department of Environmental Protection (FDEP). The plan, represented by the specifications, described the step-by-step procedure to be followed and included the testing schedule required to meet the 5-year MIT re-testing conditions of the FDEP permit for each of the injection wells. After receipt of these documents, the FDEP Staff reviewed the proposed plan and sent an approval on June 5, 2013 (see Appendix B).

The contract documents for conducting the MITs were let out for bids, and the winning bid was submitted on February 28, 2013 by Youngquist Brothers, Inc., a well drilling contractor from Ft. Meyers, Florida. After the contract was approved by the Board of Country Commissioners and signed by the County Manager, the MDWASD issued the notice to proceed on May 17, 2013 and the contractor began mobilizing to the site.

1.2 PURPOSE AND SCOPE

The purpose of this report is to provide FDEP with a document that describes the re-testing procedures for mechanical integrity applied to each of the SDWWTP deep injection wells (see Figure 2). The report also presents the field reports (see Appendix C), and the results of the tests in a single volume for ease of reference. The mechanical integrity re-testing operations involved conducting a pressure test on the well casing to show that there are no leaks in the casing, and conducting a TV survey on the well to reinforce the data from the pressure test. The re-testing includes tracking a radioactive liquid-tracer (iodine isotope I-131) injected down the well to show that there is no fluid movement upward behind the casing, into underground sources of drinking water (USDW). The radioactive test information is reinforced with temperature logs run on the well. Gamma ray logs are used to detect the movement of the radioactive tracer.

Figure 1. South District Wastewater Treatment Plant Site

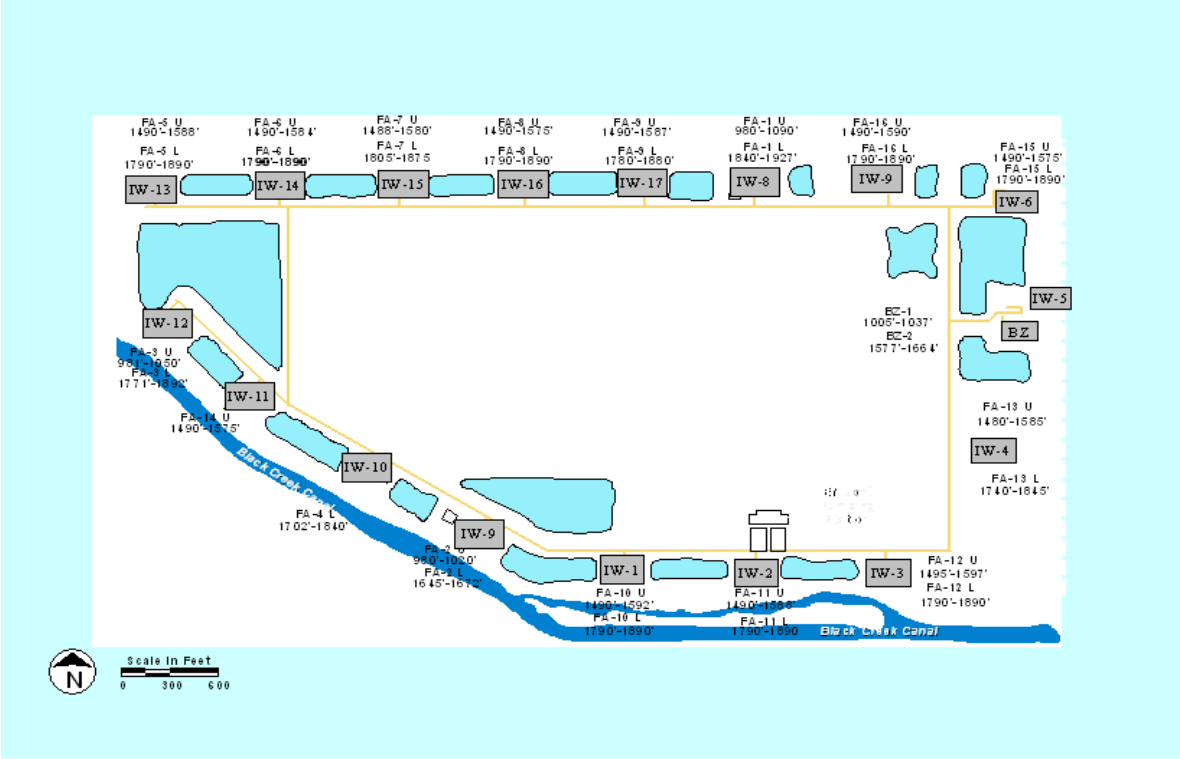


Figure 2. Well Locations Layout

Section 2

2. MECHANICAL INTEGRITY TESTING (MIT)

2.1 METHODS USED

The MIT program is designed to test two elements of the injection well system: 1. Internal integrity and 2. External integrity. The first test element, the internal mechanical integrity test of the well, tests the condition of the injection casing. The second test element, the external mechanical integrity test of the well, tests for leaks outside the casing. This is achieved through a series of field tests including a pressure test and a TV survey for the internal testing, and the temperature log, gamma ray log and RTS survey for the external testing. The first test element, the internal mechanical integrity test, tests for leaks in the injection pipe (casing). The second test element tests for leaks in the annular space outside the casing (cement-filled space between the periphery of the drilled hole and the casing) and in the near-to-the-well geologic strata.

2.2 CASING SCRUBBING

Because the mechanical integrity of injection wells has to be tested every five years, and because a TV inspection of the well is part of the test requirements, MITs provide a timely opportunity to clean the well of deposits that may have formed on the inside of the casing during the intervening years and at the same time provide a cleaner casing for the TV inspection. Cleaning the inside of the well casing is achieved by running a scrubbing brush up and down the casing. However, before the cleaning can be performed, flow out of the well must be controlled. The column of water inside the casing is fresh water and results in a positive hydraulic head inside the well. That head must first be controlled to prevent water from flowing out of the well during the cleaning operation.

2.2.1 Flow Suppression

Suppression of the fresh water head was achieved by first pre-mixing water with salt (NaCl) to form a heavy brine, and then pumping the brine down the well casing, through a 6-inch gate valve on the wellhead. This procedure results in the displacement down the well of the fresh water at the top of the column and replacement of the displaced fresh water with the brine solution. An equal volume of fresh water is displaced out of the well at the bottom of the casing. The procedure is repeated until the pressure head inside the well is suppressed. This method of displacement is used because it achieves flow suppression without first having to open the well to insert a tremie pipe to the bottom of the casing for introduction of the brine. This displacement method also provides a safe way of “killing” the well that at the same time reduces the volume of injected salt solution that would enter the formation at the bottom of the well. One additional advantage is that using this method the brine can be recovered and reused in flow suppression at other wells.

The brine was prepared in 1,000-gallon (gal.) batches by mixing the salt from a 2,000-pound (lbs.) sack in a 1,000 gal. tank of fresh water. The 1,000 gal. solution was then pumped down the well before other similarly mixed batches of salt solution were mixed and pumped down the well (see Figure 3). In the end, the operation was repeated 13 times, and a total of 13 sacks (approximately 26,000 lbs. of salt) were used to suppress the head in the well. This salt concentration represents a theoretical specific gravity of 1.239 for the brine, calculated from the salt solution used in the field of 10.3 lbs per gallon. The 26,000 lbs of salt suppressed the pressure head from approximately 26 feet above the top of the casing to approximately 15 feet below.

Figure 3. Flow Suppression Equipment

2.2.2 Scrubbing Operation

The brush used to clean the casing is made with an old drill rod that has an outside diameter of 7 inches with thick steel wire inserted and secured sticking out of the drill rod. The total diameter of the brush with the steel wire bristles is 24 inches. The brush is attached to the bottom of the packer and inserted into the well (see Figure 4). A 24-inch flange was bolted to the top of the well and pressure fittings installed to be used for packer inflation later on in the process. Then Youngquist lowers the brush and packer by attaching drill rods to the top of the packer and then raising and lowering the brush several times using a 50 ton crane. This process was repeated until the casing was scrubbed and the packer was at the depth required to perform the packer test on the well.

Figure 4. Scrubbing Brush and Hydraulic Packer

2.3 INTERNAL MECHANICAL INTEGRITY (CASING TESTS)

2.3.1 Pressure Test

After the pressure head was suppressed and the casing scrubbed, and the inflatable packer was placed at a depth of 2,359 ft bls. This well is cased to a depth of 2,394 ft bls so the packer is in the bottom 50 feet of the casing. Additional pressure fittings were installed on the flange to pressurize the casing with water. A bleeder valve atop the 24-inch flange allows passage of the drill pipes that support the packer without loss of pressure in the casing (see Figure 5). A pretest was conducted on the casing to determine that the pressure was holding and that all the installed testing equipment was operating properly, then FDEP was informed that the well was ready for their inspection. The next day, July 26, 2013, the pressure test was repeated in the presence of FDEP Staff. The packer had been previously sealed against the casing, at an inflation pressure of 360 pounds per square inch (psi) and at 8:00 AM the casing was pressurized with water to a pressure of 153.5 psi.

Figure 5. Well-Head and Recorder Set Up for Pressure Test

At 10:35 A.M. the one-hour pressure test was started in the presence of Joseph May, P.G. representing FDEP and witnessed by Sonia Villamil and Michael Ashe representing MDWASD, and by Chris Harp and others representing the drilling contractor. The pressure test ran for the required one-hour period. The pressure deviation (loss) in that time was 1.5 psi, well below the 7.5 psi deviation allowable under the 5 % criteria in the rules (see Table 2-1). During the pressure test, the gauge must have had some small issue because the pressure rose 1 psi during the test (from 10:50 to 10:55). The pressure gauge increased from 153 psi to 154 psi. This increase was witnessed by FDEP and WASD representatives. After reviewing the data collected by the pressure transducer, there is no increase in the data recorded to match what was witnessed from the pressure gauge. Therefore, although the table shows the manually recorded values

including the increase, the pressure test is still considered valid and a total loss of 2.5 psi was recorded by the pressure transducer. The packer inflation pressure and the pressure in the casing were measured using certified gages (see Appendix C) graduated from 0 to 200 psi in increments of 1 psi. The pressure was read in person and recorded by hand at five minute intervals during the test. The pressure was also recorded on an In-Situ pressure transducer attached to the stand with the pressure gauges (see Figure 5).

Table 2-1 Casing Pressure Readings

Time	Casing Pressure (psi)	Pressure Change (psi)	Packer Pressure (psi)
10:35	153.5	0.0	360
10:40	153	0.5	360
10:45	153	0.0	360
10:50	153	0.0	360
10:55	154	+1.0	360
11:00	153.5	0.5	360
11:05	153	0.5	360
11:10	153	0.0	360
11:15	153	0.0	360
11:20	153	0.0	360
11:25	152.5	0.5	360
11:30	152	0.5	360
11:35	152	0.0	360

2.3.2 Bleed-Off Calculations

At the completion of the pressure test the casing pressure was bled-off and the discharged volume from the bleeding was measured (see Table 2-2). Bleeding until the pressure resulted in zero flow produced approximately 29 gallons. This exercise provides a reasonable assurance that the packer is placed at the depth in the well that is within the last 50 feet of the casing.

Table 2-2. Bleeding Volumes versus Pressure

Bled Volume (gallons)	0	5	10	15	20	25	29
Casing Pressure (psi)	152	124	96	69	42	15	0

2.3.3 Television Survey

A closed circuit color television camera, encased in a pressure vessel capable of withstanding the pressures exerted at the depths to be televised, and equipped with a fish-eye lens, was introduced into the well through a pack-off stripper device on a standpipe above the injection well (see Figure 6). The camera is centralized in the casing, and is preceded down the well with a light source attached below the camera. The camera televises a view of the full circumference of the inside of the casing and the image is recorded on video tape. Prior to the video survey, the well was scrubbed and flushed with potable water to provide the best picture possible. The video survey began at land surface and continued down to 2,914 feet, where the camera runs into an obstruction, but the hole below seems open below the partial obstruction where the tool was stuck. At selected intervals of interest, the camera was used to pan the intervals in a horizontal format prior to continuing the normal vertical recording.

A review of the video (see Appendix F) indicates that the casing is in good condition down to 2,394 feet. The video also shows that the scrubbing operation was successful. The scrubber has scrubbed the casing free of all growth down to 2,391 feet and this is confirmed by visible vertical scratches throughout that length of the casing; indicating that the scrubber had brushed the steel casing effectively. All the scratches are superficial, and do not detract from the physical and mechanical integrity of the casing. There are no gouges, grooves, nicks, or other physical damage visible in the casing for its whole length. Below 2,391 feet the casing was not scrubbed to avoid hanging the scrubber with the edge of the bottom of the casing at 2,394 feet. There are some growths and/or deposits visible inside the casing below 2,391feet.

In summary, the video picture meets the quality standards that are needed for a visual evaluation of the well. This video survey presents a clear view of the casing and of the welded joints of the casing. All the joints are clean and appear to be tight. From the TV survey it is concluded that this casing is in good condition throughout its whole depth from land surface to 2,394 feet.

Figure 6. Television Survey (Standpipe and Logging Truck)

2.4 EXTERNAL MECHANICAL INTEGRITY (CEMENT AND FORMATIONS)

The external mechanical integrity test consisted of two low flow dynamic tests The RTS and temperature survey, conducted on August 5, 2013, for the external mechanical integrity portion of the test was witnessed by the representative of FDEP (Joseph May, P.G.), by representatives of MDWASD (Sonia Villamil and Maria Macfarlane) and by representatives of the contractor (Luis Morey).

2.4.1 Radioactive Tracer Survey (RTS)

The radioactive tracer survey uses an isotope of iodine (I-131) as a tracer of water movement inside and outside the casing. Iodine –131 is used because it is a radioactive isotope commonly used in medical practice and therefore it is more easily available and lower in cost than other potential tracers. I-131 also has the advantage of having a half-life of 8 days. That half-life is quite suitable because it is long enough to allow time for transportation to the well site with little decay but also short enough so that it would quickly be reduced if there were any unexpected spills or if there were mechanical failures through which the isotope could travel with the water. The radiation levels of I-131 at the concentration used for RTS testing is in millicurie-range, which if it were considered a waste, would be characterized as a low level waste by the US Atomic Energy Commission.

The I-131 is first loaded into a container located in the logging tool. This container is electronically activated from the logging truck to eject the desired quantity of tracer at the desired depth through an ejection port. In addition to the tracer container, the logging tool is also assembled with three gamma ray detectors. One detector, the top gamma ray detector (GRT), is located 10 feet above the ejector. The other two detectors, the middle one (GRM) and the bottom one (GRB) are located immediately below the ejector at about 3 feet and 12.4 feet below the ejector respectively. The bottom of the logging tool also includes a temperature tool at the very bottom, and a casing collar locator (CCL) 1 foot below the GRM. Figure 7 shows the configuration of the RTS logging tool. The RTS log in the appendix (Appendix D) shows the distances between each of the logging tool components described above.

2.4.1.1 First Low Flow Dynamic Test

Prior to starting the low flow dynamic test, a background gamma ray log was conducted to establish the natural conditions. It was conducted right after the temperature log. Since the temperature log was run downward starting at land surface, the temperature log had ended with the logging tool at the bottom. The background gamma ray log was conducted from the bottom (2,976 feet) up to the surface.

From the surface, the logging tool was again lowered down the well and the casing collar locator (CCL) used to locate the bottom of the casing. The magnetic coils on the CCL give out a magnetic field and detect a change in the mass. If there is growth on the casing it is harder for the CCL to have a clean line. If the growth has some iron on it, it can cause a sort of interference with the CCL making it harder for the CCL to find the end of the casing. The CCL shows that the bottom of the casing is at 2,395 feet bls. After the bottom of the casing was located, the well was ready for the low-flow dynamic RTS test.

The ejector port of the I-131container was set at 2,390 feet and 1 millicurie (mCi) of I-131 was released while the flow down the well was kept at a constant rate of 90 gallons per minute (gpm). The logging tool was kept immobile after the ejection of the I-131 and the three gamma ray detectors continued to record in place. One (1) mCi of I-131 was ejected into the well. The middle detector, located 3 feet below the ejector port, picked up the radioactive tracer 12 seconds after the ejection. The bottom detector, which is located over 12 feet below the ejector, picked up the tracer 1 minute and 36 seconds after the ejection. The flow was double checked after the bottom detector picked up the tracer and confirmed to be at 90 gpm. The test ran for 60 minutes and the top detector did not pick up any tracer.

After the first low flow test ended, the tool was then raised up more than 200 feet, to a depth of 2,200 feet, to log out of position to make sure that the tracer did not migrate up the casing or the formation outside of the casing. No migration was detected.

Once the log out of position was conducted and the tool was placed back to depth, no staining on the casing was found which means no interference for the second RTS. Therefore, with the approval of Joseph May, P.G. from FDEP, the well was not flushed prior to the second RTS test.

Figure 7. RTS Tool and Temperature Probe

2.4.1.2 Second Low Flow Dynamic Test

The tool was placed back to a depth were the ejector was located at 2,390 feet with a flow of 90 gallons per minute set down the well. For this test, 2 milicuries of I-131 were ejected into the casing. The middle detector started picking up the tracer about 20 seconds after it was ejected. The bottom detector, which is located over 12 feet below the ejector, picked up the tracer 2 minutes and 40 seconds after the ejection. The upper detector did not pick up any tracer for the duration of the test, which lasted 30 minutes.

After the second low flow test ended, the tool was then raised up more than 200 feet, to a depth of 2,200 feet, to log out of position to make sure that the tracer did not migrate up the casing or the formation outside of the casing. A spike up to approximately 100 GAP was found at 2,386.. However, the I-131 did not travel up beyond 2,386 ft bls so this can indicate that there is some grout missing behind the end of the casing, but only for 9 feet. This does not affect the external integrity of the well because it is below the confining unit and no I-131 traveled beyond the 2,386 ft bls so there is no pathway for fluid migration.

With the last low flow dynamic test, the mechanical integrity test was concluded, but before bringing the geophysical tools out of the well, the leftover I-131in the container was ejected and the container flushed-clean to insure that any remaining radioactive iodine was well dispersed. The tool was placed at a depth of 2,914 ft bls. The ejector was located at 2,900 ft bls, and the remaining Iodine 131 was ejected and the well was flushed with effluent at a rate of over 4,400 gallons per minute to ensure no staining of the tool. The logging tool was then brought up from the bottom and on the way up a final gamma ray log was made. Then the final gamma ray log was compared to the background gamma ray log, and the comparison showed that there are no noticeable differences in the two except for a residual stain at the bottom of the casing where the I-131 had been repeatedly released during the testing, and just below there, where the tracer

exited the casing. Injection of water down the well at a rate of 4,400 gpm continued for the next hour to completely flush out the well.

2.4.2 Temperature Log

Youngquist Brothers Inc. conducted the temperature log on August 5, 2013 starting at about 8:00 A.M. and logging down to 2,976 feet. The temperature probe (Figure 7) was run from the surface downward to minimize the disturbing effect of the movement of the logging tool on the temperature of the water in the well. The temperature log was started more than 24 hours after the well had last been disturbed by outside influences. The TV survey was the last disturbance in the well.

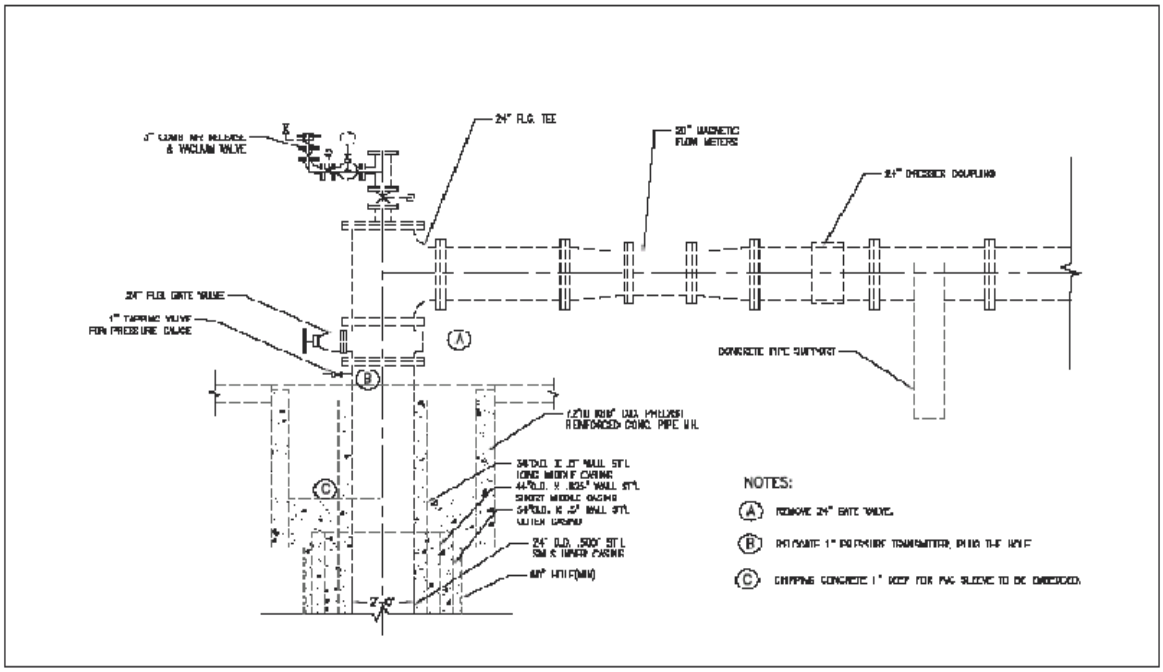
The temperature log (see Appendix H) shows the warmest interval is in the section from 2,350 to 2,394 feet. This is consistent with the higher temperature of the injected water in that interval. The temperature log did not detect any anomalies that would indicate that injection fluids are present outside the casing, and there is no indication of any upward movement of warm injection water either. The similarity of the temperature oscillations in this temperature log (in the interval from land surface down to the bottom of the casing) to those in the temperature logs from previous MITs and to those in the temperature log when the well was constructed, indicates that there has been no apparent change in the cased interval, and no upward movement of the injected water in the last 5 years.

2.5 WELL HEAD REPAIRS AND RE-INSTALLATION

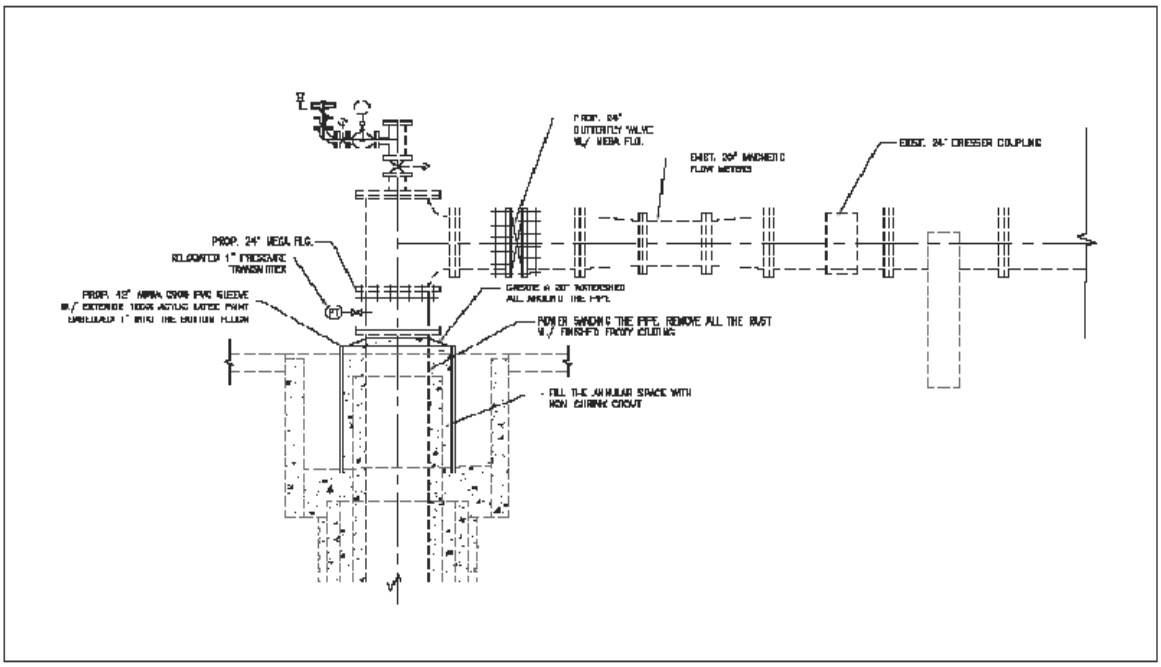
The work associated with the MIT ended when the wellhead was replaced. The air and vacuum release surge check valves were replaced prior to reinstallation of the wellhead. The 6 inch gate valve and air release were replaced. The well had both a butterfly valve on the horizontal pipe from the well head T and a gate valve on the vertical part of the well before the T. The pressure tap for the instrumentation of the well was below the water line when the sump was full of water. Therefore this well was retrofit to remove the redundant gate valve off the well and lift the pressure tap above the water line. A PVC liner was also installed at the base of the sump that protects the 24” OD steel casing from being exposed to FA purge water from the monitoring wells. The PVC was cemented into the bottom of the sump and the annulus was filled with grout to ensure that no water can reach the steel casing. Please see Figure 8 and Figure 9 below.

The wellheads are scheduled to be sandblasted, rust proofed and repainted after the MITs on all the other wells are completed. Injection well IW-12 has been placed back on line and flow from the plant’s pump station is again discharging to this injection well, .

Figure 8 Retrofit Well with PVC liner



REPAIR PLAN FOR I-13 TO I-17



PROPOSAL PLAN FOR I-13 TO I-17

Figure 9 Drawing showing before and after layouts for the Retrofit.

Section 3

3. CONCLUSIONS AND RECOMMENDATIONS

3.1 CONCLUSIONS

The pressure test was conducted successfully and it was concluded from the results that there is internal mechanical integrity. This conclusion is reinforced by the analysis of the TV survey down to the injection level at 2,394 feet. The TV survey indicated that the casing is in good condition and that all the casing joints appear to be tight and in good working order.

The two successful RTS conducted at low flow rates indicate that there is no upward movement of water outside the casing. Therefore, it was concluded that the RTS results show that there is external mechanical integrity. The temperature survey reinforced the results of the RTS by showing that there has been no movement of injected water anywhere except the injection zone.

3.2 RECOMMENDATIONS

The successful completion of all the tests for mechanical integrity confirms that IW-12 retains full mechanical integrity and as such it is appropriate to continue using this injection well. MDWASD also recommends that FDEP review the results of the tests presented in this report and based on those results determine that the well has mechanical integrity and may continue to be used for its intended purpose.

Finally, MDWASD recommends that although the well head will not be painted until all the MIT tests are completed on the other wells, IW-12 should receive mechanical integrity certification.

Appendix A

Mechanical Integrity Testing Procedures Submitted by MDWASD to FDEP
October 12, 2012

Miami-Dade Water and Sewer Department
Mechanical Integrity Testing Procedures

Miami-Dade Water and Sewer Department
Mechanical Integrity Testing and Repair Procedures
October 12, 2012

MECHANICAL INTEGRITY TESTING and REPAIR PLAN (SDWWTP and NDWWTP Injection Wells)

General Information

The Contractor shall carefully coordinate his activities with the Department to minimize interference with any existing operations or the operations of the Department. Department forces will isolate the well and turn over to the Contractor. Existing valves shall only be operated by Department personnel. The Contractor's personnel, under no circumstances, shall operate any such valve.

The Contractor shall provide all barricades and/or flashing warning lights necessary to warn workers and employee of the testing throughout the Project. This shall be done at the Contractor's expense and to the satisfaction of the Engineer. Every effort must be made to reduce inconvenience and nuisances to a minimum.

The Contractor shall at all times, use the assigned entrance to the Plants to bring in materials, equipment etc. required for the Project. Materials and equipment shall be stored in areas designated by the Engineer, and shall not interfere with the daily operations at the site or with other Projects. Suitable platforms shall be used for material storage to prevent damage to the landscaping. The Contractor shall exercise extreme caution when transporting equipment or materials within the Plant area.

The conveying vehicles shall be properly selected, and equipped, to prevent damage to paved areas, landscaping and other existing facilities including wells, well pads, fencing, underground pipelines, pipe chases, etc. If necessary, suitable wooden skids shall be used to distribute loads, and to prevent damage.

If any of the above existing structures, including the wells, or any other parts of the project area, are damaged, the contractor shall make suitable repairs or replacement at his expense, in a manner described by the Engineer, and to his satisfaction.

The Contractor shall also exercise extreme caution to prevent any spillage of sewage effluent. The County may charge t he Contractor for any cost incurred or penalties imposed on the County as a result of such spillage.

The wells to be tested are Injection Wells IW-l through IW-17 at the South District Wastewater Treatment Plant and IW-1N through IW-4N at the North District Wastewater Treatment! Plant

The Injection Wells have a 24-inch outside diameter (OD), 0.500-inch wall thickness injection casing set to total depths of 2,450 to 2,850 feet below land surface (bls), and were constructed with a nominal 22-inch diameter open borehole extending from the bottom of the casing to approximately 3,000 feet bls.
Except IW-5 at the SDWWTP, has a 20-inch outside diameter (OD), and 0.500 inch wall thickness.

The CONTRACTOR will perform internal and external mechanical integrity tests on the casings of twenty one deep injection wells and perform all appurtenant work in accordance with the above

Contract Documents.

The work shall be performed by a competent crew with equipment that is adequate to complete all phases of the testing and instruments of sufficient accuracy and resolution to identify anomalous responses to the tests. If the CONTRACTOR'S equipment is not capable of satisfactorily performing the work provided for in these specifications, the CONTRACTOR at his own expense shall substitute equipment.

The CONTRACTOR shall have not less than 5 years experience in constructing and testing wells and shall have tested not less than 5 wells of similar type and capacity. The CONTRACTOR shall be licensed by the State of Florida and the license number shall be affixed to all correspondence and reports.

All work shall comply with and be in full conformance with this Mechanical Integrity Test Plan submitted to FDEP together with subsequent response letters for the injection wells at the South and North District Wastewater Treatment Plants and with the appropriate sections of Chapter 62-528 FAC.

If remedial work or re-testing is required prior to final acceptance of the work to meet regulatory requirements and the specifications of the Contract Documents due to defective materials, accident, loss of equipment or equipment malfunction, or for any other cause directly attributable to the CONTRACTOR's actions, the CONTRACTOR shall bear the entire cost of the remediation or re-testing, including all additional materials, labor, and equipment required and any necessary additional Engineering costs. In the event of a problem, the ENGINEER shall be notified immediately, and the following shall apply:

1. The CONTRACTOR shall propose a method of correcting the problem, in writing, to The ENGINEER, who shall review the method of corrective action, and accept the plan in writing before work can proceed.

2. All work on the well must be in accordance with all applicable local, state and federal regulations.

The CONTRACTOR shall notify the ENGINEER a minimum of 72 hours prior to conducting the pressure test, geophysical logging and the radioactive tracer survey so that the ENGINEER and regulatory agency staff can be properly notified.

The CONTRACTOR shall provide all facilities, equipment and materials required for the removal of waste fluids from the well site.

The CONTRACTOR shall kill the well using a dense food- grade salt solution. No barite or mud-based additives shall be used in the well.

The CONTRACTOR shall comply with the OSHA regulations contained in 29CFR Section 1910 for General Industry Regulations and 29CFR Section 1926 for Construction Regulations.

Equipment and Procedures

1. Wellhead Assembly: The stripper head assembly used during the video survey, Geophysical logging, and the radioactive survey shall be bolted to the wellhead above the 6-inch gate valve. The stripper head assembly used must be of sufficient length to house the longest of the wire line tools used for the testing between the gate valve and the pack-off mounted at the top of the assembly. The pack-off must be adjusted so that the tools can be moved freely up and down the well with minimal leakage from the well. The assembly shall include a 4-inch valve and tee, which will be used to inject potable water during the surveys. The assembly shall be fitted with a

pressure gauge for use during the tests.

2. Wellhead Hardware: Should the nuts and/or bolts at the wellhead assembly become stripped during the CONTRACTOR's efforts, the CONTRACTOR shall replace them with equivalent hardware.

3. Water Line: The CONTRACTOR shall provide a potable water supply line for use during the video surveys. This line shall be connected to the existing 4-inch valve on the CONTRACTOR's stripper head. It shall be equipped with a check value to prevent the backflow of effluent into the water supply source. It shall also be equipped with a continuous recording digital flow meter and totalizer capable of measuring flows accurately in the range of 0 to 250 gpm.

Mechanical Integrity Testing (MIT)

The mechanical integrity testing under this Contract shall be accomplished using the following methods and general sequence, however the Contractor shall submit a more detailed sequence to the Engineer for approval before he begins work. The Contractor shall use extreme caution to prevent any loss of equipment, tools or other items into the wells and shall be fully responsible for retrieving any such items immediately, at no expense to the Department. All pressure tests must be conducted in the presence of the Engineer or his authorized representative.

MIT Clean and Pressure Test the Casing

1. The Contractor shall set up all equipment required to prepare for suppressing the density differential pressure, cleaning, performing the pressure test and the radioisotope and closed circuit television surveys.

2. The Contractor shall inject sufficient salt solution into the well to balance the differential pressure and disassemble the wellhead. The brine solution shall remain in the well during the cleaning and pressure testing steps, after which time it shall be transferred to another well if clean enough for reuse, or shall otherwise be disposed of by the Contractor. Under no circumstances shall brine solution be spilled or disposed of on the ground surface, however it may be disposed of into the injection well.

3. The Contractor shall clean the casing before proceeding with the pressure test. The entire length of casing shall be cleaned. If the later television survey indicates insufficient cleaning, the well shall be re-cleaned by the Contractor, at his expense, to the satisfaction of the Engineer. If the television survey must be repeated because of insufficient cleaning, in the opinion of the Engineer, it shall also be at the Contractor's expense.

4. The Contractor shall, when requested by the Engineer, place the packer through a stand-pipe with a packoff device to a point near the top of the well (but within the concrete encasement area) and test its integrity. This shall be accomplished as described in Steps 6, 7, and 8 below. If the packer fails the integrity test it shall be replaced with one that will meet the test. The Engineer is aware that packers have limited inflation cycles and will attempt to minimize the verification of packer operation. However, any integrity failure for which the packer operation can not be eliminated must be repeated at the Contractor's cost. It is anticipated that each new packer will be tested at the wellhead to verify its capacity to seat and deflate.

5. The Contractor shall lower and place the packer to a point within the lower 40 feet of the casing, but not the last 10 feet. The CONTRACTOR will be responsible to assure the proper seating of the packer. A preliminary test shall be performed to ensure proper operation of the test set-up. The CONTRACTOR shall notify the ENGINEER at least 24 hours before running the preliminary test. The test will be run following the same test program as the actual pressure test, as described below. IW-2 at SDWWTP will have the packer placed within 40 feet of the tear in the casing.

6. The Contractor shall inflate the packer to a pressure not exceeding 350 psig over the static condition as measured at the wellhead on a calibrated gauge to create a positive seal.

7. The Contractor shall pressurize the casing to 150 psig with no air in the casing or wellhead. The pressure shall be recorded on a chart and signed by the Engineer, the Contractor and any witnesses present. The pressure test gauge shall be calibrated within 6 months of performing the pressure test. The CONTRACTOR must present proof of calibration of the pressure gauge to the ENGINEER and FDEP staff at the time of testing each well. The pressure gauge must be mounted at or near eye level in order to ensure maximum visibility.

8. The test will be considered successful if the pressure does not change more than 5% psi in one hour.

9. If the test fails, the Contractor shall move the packer upwards for approximately 10 feet, and repeat Steps 6, 7 and 8.

10. If the test still fails, additional repositioning of the packer and repeating of Steps 6, 7 and 8 shall be as ordered by the Engineer. If the test still fails, and subsequent radioisotope surveys indicate no casing failure, it will be presumed that the Contractor's packer did not create a positive seal, and the Contractor shall be required to repeat Steps 4 through 8 at his expense. No payments will be made to the Contractor if it is subsequently determined that the test failure was caused by the seating of the packer. If the packer fails during packer operation verification, it will be concluded that the packer was faulty during any previous test that did not demonstrate casing integrity. The Contractor shall repeat this test at his expense.

11. After pressure testing, measure the depressurization bleed down with a 5 gallon bucket upon release of the pressure in the casing. The bleed down fluid will be properly disposed of by the Contractor.

12. The Contractor shall deflate the packer and withdraw it from the casing.

13. The Contractor shall reassemble the wellhead and connecting piping using new gaskets.

14. Prior to geophysical logging, the fluid used to "kill" the well, or for pressure testing the casing shall be flushed from the well and the well will be shut-in for a minimum of 12 hours.

MIT Video Surveys

A Video Survey inside the injection well casing be performed using the following procedures.

.A 6-inch diameter stripper head assembly will be bolted to the wellhead assembly above the existing 6-inch diameter gate valve. The stripper head will be of dimensions that allow the video operator to put his camera between the gate valve and the pack off and close both the valve and the pack off. The lower part of the assembly shall consist of a 4-inch tee and valve through which potable water may be introduced into the well.
.
Prior to performance of the survey and for a period of 24 hours, fresh water from an adjacent fire hydrant will be introduced into the well through a 4-inch diameter valve located on the stripper head assembly. Fresh water shall be pumped into the well to provide clarity for the survey.

3. If, after 24 hours of pumping potable water into the well, the water quality does not permit a clear picture of the inside of the well, the CONTRACTOR may be required to perform additional pumping services to assure a good survey as specified above.

4. The pumping of the potable water will continue at a rate of approximately 0 to 250 gpm during video surveying. If the open hole portion of the well is not clean, or visibility in any part of the well is poor, the CONTRACTOR shall perform additional pumping services to ensure a good video survey before running another or continuing with the survey.

5. During the video survey, the CONTRACTOR shall stop the camera's progress as instructed by the ENGINEER at depths where there may be potential flaws in the casing or other features to allow for thorough examination at those locations.

Upon reaching the total depth of the well with the video camera and obtaining a video survey satisfactory to the ENGINEER, the camera shall be removed from the well, and the well placed back in service.

MIT Radioisotope Tracer Survey and Temperature Survey

A radioisotope tracer survey shall be used to detect any fluid movement outside of the injection casing from the injection zone into the overlaying aquifers. The tool configuration shown below, or approved equal is required. The tool must be capable of ejecting the radioactive tracer and simultaneously monitoring the gamma ray sensors. No time lag between ejection and monitoring is permitted. A casing collar locator (CCL) shall be positioned below the tool as shown below, to precisely locate the bottom of the casing. Two low flow dynamic test runs, shall be performed. Additional low flow dynamic test runs can be done if results warrant additional testing, as determined by the ENGINEER in consultation with FDEP staff.

A temperature survey log shall also be performed from land surface to the total depth of the well. The temperature log shall be performed logging down at a rate of not more than 60 feet per minute. The temperature survey shall be performed after the well has been "shut in" and stabilized for at least 12 hours prior to the dynamic and static tests.

The Contractor shall perform an initial background gamma ray survey extending from the base of the land surface to the total depth of the well. The background gamma ray log shall be taken at a rate of not more than 60 feet per minute.

After the dynamic tests are completed, another background gamma ray survey shall be taken from the base of the casing to the base of the intermediate casing.

If additional radioisotope tracer survey work is ordered by the Engineer, it will be paid for at the hourly price proposed for additional radioisotope tracer surveys.

Radioactive Tracer Survey (RTS)

A RTS will be performed in the injection well. The tool used for testing will be configured according to information to be supplied by the service company performing the logs and as approved by the ENGINEER. Below is an example of a typical RTS tool that will be used for these surveys. The CONTRACTOR will provide a specific tool configuration with the logs.

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)
			CHD-SDSCHD (SDS) Cable Head	1.00	1.50	5.00
GR#3	23.83					
			GR #3 -GR#3 (GR#3_T) GR#3_TOP	9.33	1.69	50.00
			TREJCT-A (RTS) EJECTOR 14.5' FROM TOOL BOTTOM	3.00	1.69	10.00
			GR #2 -GR#2 (GR#2_M) GR#2_MIDDLE	3.58	1.69	25.00
GR#2	11.17					
CCL	9.63		CCL-000 (000001) RTS_CCL	0.75	1.69	5.00
			TRDET-GR#1 (GR#1_B) GR#1_BOTTOM	8.67	1.69	50.00
GR#1	0.58		TEMP-11116Temp (11116HT)	0.58	1.69	5.00
TEMP	0.17		RTS_TEMP			

Dataset: sdiw1.db: field/well/run1/FINBK
Total Length: 26.92 ft
Total Weight: 150.00 lb
O.D. 1.69 in

RTS tool Typical Configuration

The sequence of the tests shall be as follows:

First Low Flow Dynamic: The low flow run of the radioactive tracer survey shall be performed with a pumping-in velocity of 3 to 5 feet per minute. This would require a volume of between 65 gpm and 108 gpm to be injected during the survey. This is for the 24 inch wells, for Well I-5, which has a 20 inch casing this volume is 44 gpm and 73 gpm. Potable water from the same source as used for the video survey would be used as the most appropriate water supply for this portion of the test.

1) After beginning the flow of water into the well, the tool will be placed at a depth of approximately 5 feet above the base of the final casing, and a slug of 2 millicuries radioactive Iodine 131 is ejected. The tool will remain in place for a period of approximately one hour and the three gamma ray detectors in the "time drive" mode will record the movement of the slug. If tracer is detected at the uppermost detector, indicating potential staining of the tool, the tool may be moved upward to an alternate location.

2) After the one hour waiting period, a log out-of-position will be performed between the ejection point and a minimum of 200 feet above the highest point of tracer detection.

3) Upon completion of logging, the casing will be flushed with 3 to 5 casing volumes of effluent.

4) After flushing, the tool will immediately be run to the base of the casing, then the interval between the ejection point and 200 feet above the highest point of tracer detection will be logged.

Second Low Flow Dynamic: The process described above for the low flow dynamic log will be repeated to include a log out-of-position, a casing flush, and an after flush pass. A slug of tracer greater than or equal to 3 millicuries shall be used as determined by the ENGINEER.

If, during testing, no apparent anomalies appear that may indicate a lack of mechanical integrity in the injection well, the RTS will be concluded. If anomalies do occur, the RTS will be altered to track the radioactive tracer material. After RTS is complete, the RTS tool will be discharged in the injection zone and the well shall be flushed with 3 to 5 volumes of effluent. A second background log will be run from the bottom to the top of the well.

MIT Deadlines (sorted by date MIT pressure test due)

SDWWTP MIT Schedule of Completion

Well	Pressure Test	RTS/Video
IW-2	7/13/2013	7/25/2013
IW-1[1]	7/20/2013	7/31/2013
IW-3	7/24/2013	8/7/2013
IW-9[1]	7/30/2013	8/12/2013
IW-10[1]	8/6/2013	8/21/2013
IW-11	8/20/2013	9/3/2013
IW-12	8/25/2013	9/19/2013
IW-14	9/9/2013	9/26/2013
IW-13	9/16/2013	10/6/2013
IW-4	9/25/2013	10/14/2013
IW-6	9/30/2013	10/20/2013
IW-5	10/19/2013	10/27/2013
IW-7[2]	10/26/2013	1/7/2014
IW-8	11/2/2013	11/12/2013
IW-17	11/11/2013	11/19/2013
IW-16	11/18/2013	12/9/2013
IW-15	12/3/2013	12/16/2013

NOTES:
1.The original video was not clear enough and therefore a new video was done at the end of the MITs at SDWWTP.
2.The Computer failed during the RTS, because the Iodine 131 had already been injected, FDEP and DOH required 46 days b/f the RTS could be redone.

NDWWTP MIT Schedule of Completion

Well	Pressure Test	RTS/Video
IW-1N	3/14/2014	3/26/2014
IW-2N	3/25/2014	4/9/2014
IW-3N	4/2/2014	4/17/2014
IW-4N	4/9/2014	4/24/2014

REPAIR PLAN:

The following repair plans apply to wells at SDWWTP and NDWWTP.

1. Kill well and remove 24 inch gate valve and 4 inch bypass valves. Remove 1 inch pressure transmitter line and weld hold closed. Please see drawings included in below.

2. Sand existing casing in concrete pits and coat with Bitumastic. Please see drawings included in below.

3. Chip concrete around outer casing 1 inch deep, in order to embed PVC sleeve. Please see drawings included in below.

4. Install C905 PVC sleeve around casing pipe, embed 1 inch deep and fill annular space with grout, using Type II Neat cement. Slope top edge to create 30 degree watershed and seal at edges with sealant. Please see drawings included in below.

5. Relocate 1 inch pressure transmitter as indicated in drawings. Weld the hole. Please see drawings included in below.

6. At the NDWWTP IW-1N, IW-3N and IW-4N install new magmeters with any necessary spool pieces to be field determined. Please see drawings included in below.

7. Reassemble wellheads including installation of new 24 inch butterfly valve on horizontal part of well. Mega flanges will be used to ensure the layout of the pipe and the vales match. Please see drawings included in below.

8. On IW-4N at NDWWTP, install electric actuator for butterfly valve at base of injection well. Please see drawings included in below.

Appendix B

FDEP Approval of MIT Plan for SDWWTP and NDWWTP

November 26, 2012

Villamil, Sonia (WASD)

From: May, Joseph [redacted]
Sent: Monday, November 26, 2012 2:40 PM
To: Villamil, Sonia (WASD)
Cc: Vandor, Heidi; Silverman, Mark; Walsh, Virginia (WASD); Goldenberg, Bertha M. (WASD); Fallon Jr., Howard J. (WASD); Arrebola, Vicente (WASD); Macfarlane, Maria (WASD); Oakley, Clint (WASD)
Subject: RE: MDWASD MIT and Repair Plan Submittal

Importance: High

Hello all,

The Department approves the plan with the following understandings:

1) Medicinal grade I-131 should be specified since this solution is filtered to reduce precipitate material, as opposed to regular grade I-131, in the vial causing a tool malfunction. It has been our experience that an activity of ~1mCi/ml has been the easiest to work with in the field.
2) Please contact me a minimum of three days prior to mobilization to each site. Due to the travel time from West Palm Beach to the sites close coordination would be appreciated between myself and a designated contact person from the utility so that each pressure and RTS can be witnessed.

Thank you,

Joe

Please take a few minutes to share your comments on the service you received from the department by clicking on this link. DEP Customer Survey.

From: Villamil, Sonia (WASD) [mailto:[redacted]
Sent: Wednesday, October 17, 2012 9:42 AM
To: May, Joseph
Cc: Vandor, Heidi; Silverman, Mark; Walsh, Virginia (WASD); Goldenberg, Bertha M. (WASD); Fallon Jr., Howard J. (WASD); Arrebola, Vicente (WASD); Macfarlane, Maria (WASD); Oakley, Clint (WASD)
Subject: MDWASD MIT and Repair Plan Submittal

Hello Mr. May,

The MDWASD respectfully submits the attached MIT testing and repair plan for your approval. The paper copy is being sent via regular mail as well.

Thank you,

Sonia Villamil
Engineer II
Miami Dade Water and Sewer Department
3071 SW 38th Ave Room 554-8
Miami, FL 33146
[redacted]
fax: 786-552-8640
miamidade.gov

Appendix C

Field Notes from tests including gauge certification and pressure charts.

MIAMI-DADE WATER AND SEWER DEPARTMENT

MECHANICAL INTEGRITY TESTING OF DEEP INJECTION WELLS AND ASSOCIATED SERVICES

BID NO.: RPQ P0086

* get color info on paint for wells.

PRESSURE TEST IW - 12

July 26, 2013

TIME	CASING PRESSURE (psi)	PACKER PRESSURE (psi)
10:35	153.5	360+
10:40	153+	360+
10:45	153	360+
10:50	153	360+
10:55	154	360+
11:00	153.5	360+
11:05	153	360+
11:10	153	360+
11:15	153	360+
11:20	153	360+
11:25	152.5	360
11:30	152	360
11:35	152	360

MIAMI-DADE WATER AND SEWER DEPARTMENT

MECHANICAL INTEGRITY TESTING OF DEEP INJECTION WELLS AND ASSOCIATED SERVICES

BID NO.: RPQ P0086

BREAK OFF TEST IW - 12

July 26, 2013

GALLONS	CASING PRESSURE (psi)	PACKER PRESSURE (psi)
0	152	360
5	124	350
10	96	340
15	69	340-
20	42	320
25	15	320-
~~30~~ 29	0	300+

Top of Packer: 2359 feet

Bottom of Casing: 2392 feet

MIAMI-DADE WATER AND SEWER DEPARTMENT

MECHANICAL INTEGRITY TESTING OF DEEP INJECTION WELLS AND ASSOCIATED SERVICES

BID NO.: RPQ P0086

PRESSURE TEST IW - 12

WITNESS LIST

July 26, 2013

NAME	SIGNATURE	COMPANY/AGENCY	TELEPHONE
Joe May	[redacted]	FDEP	[redacted]
Chris Harp		YBI	
Sonia Villa		WASD	

Certificate of Calibration

OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

Ozone Industries, Inc.
Precision Measurement Equipment Division

Purchase Order #

Calibration Performed By:
OZONE INDUSTRIES, INC.
15551 PINE RIDGE RD.
FORT MYERS, FL 33908

For:
YOUNGQUIST BROTHERS, INC.
15465 PINE RIDGE RD.
FORT MYERS, FL 33908

EQUIPMENT INFORMATION:

Description: PRESSURE GAUGE
Manufacter: MCDANIELS
Model Number: 300PSI
Part Number: N/A
Range: 0-300 PSI

Serial Number: 972062-1
Customer I.D.:
Cust. Barcode: N/A
Cust. Location: N/A
Specifications: +/- 0.25% FS

Cal Date: 6/6/2013
Cal. Due Date: 8/5/2013
Cal. Interval 60 DAYS
Received: IN TOLERANCE
Calibration Result: PASS
Environmental Conditions: 74 DEG F / 20% H
Performed By: Daniel McKissick

Procedure: STANDARD

This is to certify that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure at the points tested (unless otherwise noted). It has been Calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration is in accordance with Ozone Industries, Inc Quality Assurance Manual. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

Calibration Remarks:
THIS UNIT WAS FOUND TO BE IN TOLERANCE AT THE TIME OF CALIBRATION.
PERFORMED ROUTINE CALIBRATION / CERTIFICATION

Standards Used to Calibrate Equipment:

Company	I.D.	Description	Last Cal.	Cal. Due Date
OZONE	A1731	EATON UPC5000 PNEUMATIC CALIBRATOR	12/12/2012	12/12/2013

Signatures:

Certified by:
Print: Daniel McKissick
Date: 06/06/13
[redacted]

Approved by:
Print: Daniel McKissick
[redacted]

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ØZONE
INDUSTRIES
CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

PH: 239-433-3400
FAX: 239-489-3877

CONTROL NO: 032509-1

CUSTOMER: YBI15465

CALIBRATION DATA FORM

MFR:	MCDANIELS	**DESCRIPTION**	PRESSURE GAUGE
MODEL NO:	300 PSI .25%	**TECHNICIAN:**	0030
SERIAL NO:	972062-1	**CAL. DATE:**	06/06/13
CUST. ID:	N/A	**DUE DATE:**	08/05/13

* IF NO "AS LEFT" READING IS SHOWN ON THIS CHART, IT MEANS THE UNIT WAS IN TOLERANCE AND THERE WERE NO ADJUSTMENTS MADE TO IT.

RANGE: 0-300 PSI

NOMINAL	AS FOUND	AS LEFT *	LOW LIMIT	HIGH LIMIT
50	50.26		49.25	50.75
100	100.31		99.25	100.75
150	150.38		149.25	150.75
200	200.49		199.25	200.75
300	300.6		299.25	300.75

Certificate of Calibration

OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

Ozone Industries, Inc.
Precision Measurement Equipment Division

Purchase Order #

Calibration Performed By:
OZONE INDUSTRIES, INC.
15551 PINE RIDGE RD.
FORT MYERS, FL 33908

For:
YOUNGQUIST BROTHERS, INC.
15465 PINE RIDGE RD.
FORT MYERS, FL 33908

EQUIPMENT INFORMATION:

Description: PRESSURE GAUGE
Manufacter: McDaniel
Model Number: 300PSI
Part Number: N/A
Range: 0-300 PSI

Serial Number: 972034-2
Customer I.D.:
Cust. Barcode: N/A
Cust. Location: N/A
Specifications: +/- 0.25% FS

Cal Date: 5/17/2013
Cal. Due Date: 11/17/2013
Cal. Interval 6 MONTHS
Received: IN TOLERANCE
Calibration Result: PASS
Environmental Conditions: 74 DEG F / 80% H
Performed By: Daniel McKissick

Procedure: STANDARD

This is to certify that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure at the points tested (unless otherwise noted). It has been Calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration is in accordance with Ozone Industries, Inc Quality Assurance Manual. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

Calibration Remarks:
THIS UNIT WAS FOUND TO BE IN TOLERANCE AT THE TIME OF CALIBRATION.
PERFORMED ROUTINE CALIBRATION / CERTIFICATION

Standards Used to Calibrate Equipment:

Company	I.D.	Description	Last Cal.	Cal. Due Date
OZONE	A1731	EATON UPC5000 PNEUMATIC CALIBRATOR	12/12/2012	12/12/2013

Signatures:

Certified by:
Print: Daniel McKissick
[redacted]

Approved by:
Print: Daniel McKissick
Date: [redacted] 05/17/13
[redacted]

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ØZONE
INDUSTRIES
CORPORATION

15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

PH: 239-433-3400
FAX: 239-489-3877

CONTROL NO: 100809-7

CUSTOMER: YBI15465

CALIBRATION DATA FORM

MFR:	PIC	**DESCRIPTION**	PRESSURE GAUGE
MODEL NO:	300 PSI .25%	**TECHNICIAN:**	0030
SERIAL NO:	972034-2	**CAL. DATE:**	05/17/13
CUST. ID:	N/A	**DUE DATE:**	11/17/13

* IF NO "AS LEFT" READING IS SHOWN ON THIS CHART, IT MEANS THE UNIT WAS IN TOLERANCE AND THERE WERE NO ADJUSTMENTS MADE TO IT.

RANGE: 0-300 PSI

NOMINAL	AS FOUND	AS LEFT *	LOW LIMIT	HIGH LIMIT
50	49.59		49.25	50.75
100	99.47		99.25	100.75
150	149.45		149.25	150.75
200	199.43		199.25	200.75
300	299.4		299.25	300.75

Certificate of Calibration

OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

Ozone Industries, Inc.
Precision Measurement Equipment Division

Purchase Order #

Calibration Performed By:
OZONE INDUSTRIES, INC.
15551 PINE RIDGE RD.
FORT MYERS, FL 33908

For:
YOUNGQUIST BROTHERS, INC.
15465 PINE RIDGE RD.
FORT MYERS, FL 33908

EQUIPMENT INFORMATION:

Description: PRESSURE GAUGE
Manufacter: MCDANIELS
Model Number: 300PSI
Part Number: N/A
Range: 0-300 PSI

Serial Number: AB30128
Customer I.D.:
Cust. Barcode: N/A
Cust. Location: N/A
Specifications: +/- 0.25% FS

Cal Date: 6/17/2013
Cal. Due Date: 12/17/2013
Cal. Interval 6 MONTHS
Received: IN TOLERANCE
Calibration Result: PASS
Environmental Conditions: 73 DEG F / 40% H
Performed By: Daniel McKissick

Procedure: STANDARD

This is to certify that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure at the points tested (unless otherwise noted). It has been Calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration is in accordance with Ozone Industries, Inc Quality Assurance Manual. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

Calibration Remarks:
THIS UNIT WAS FOUND TO BE IN TOLERANCE AT THE TIME OF CALIBRATION.
PERFORMED ROUTINE CALIBRATION / CERTIFICATION

Standards Used to Calibrate Equipment:

Company	I.D.	Description	Last Cal.	Cal. Due Date
OZONE	A1731	EATON UPC5000 PNEUMATIC CALIBRATOR	12/12/2012	12/12/2013

Signatures:

Certified by:
Print: Daniel McKissick
Date: 06/17/13
[redacted]

Approved by:
Print: Daniel McKissick
Date: 06/17/13
[redacted]

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OZONE
INDUSTRIES
CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

PH: 239-433-3400
FAX: 239-489-3877

CONTROL NO: 080709-2

CUSTOMER: YBI15465

CALIBRATION DATA FORM

MFR:	MCDANIELS	**DESCRIPTION**	PRESSURE GAUGE
MODEL NO:	300 PSI .25%	**TECHNICIAN:**	0030
SERIAL NO:	AB30128	**CAL. DATE:**	06/17/13
CUST. ID:	N/A	**DUE DATE:**	12/17/13

* IF NO "AS LEFT" READING IS SHOWN ON THIS CHART, IT MEANS THE UNIT WAS IN TOLERANCE AND THERE WERE NO ADJUSTMENTS MADE TO IT.

RANGE: 0-200 PSI

NOMINAL	AS FOUND	AS LEFT *	LOW LIMIT	HIGH LIMIT
50	50.18		49.25	50.75
100	100.19		99.25	100.75
150	150.22		149.25	150.75
200	200.31		199.25	200.75
250	250.33		249.25	250.75
300	300.39		299.25	300.75

Miami Dade South District

Date: 7-24-13

IW# 12

Packer Tally 2369 31' ℄ of PACKER.

Joint #	Length (ft.)	Total Length (ft)	Joint #	Length (ft.)	Total Length (ft)	Joint #	Length (ft.)	Total Length (ft)
1	31.25	31.25	35	30.78	1071.98	68	30.68	2082.55
2	30.62	61.87	36	30.57	1102.55	69	30.57	2113.12
3	30.55	92.42	37	30.56	1133.11	70	30.6	2143.72
4	30.65	123.07	38	30.8	1163.91	71	30.55	2174.27
5	30.54	153.61	39	30.34	1194.25	72	30.53	2204.8
6	30.55	184.16	40	30.63	1224.88	73	30.8	2235.6
7	30.68	214.84	41	30.53	1255.41	74	30.63	2266.23
8	30.55	245.39	42	30.58	1285.99	75	30.53	2296.76
9	30.57	275.96	43	30.78	1316.77	76	30.6	2327.36
10	30.57	306.53	44	30.64	1347.41	77	30.63	2357.99
11	30.56	337.09	45	30.55	1377.96	78	30.56	2388.55
12	30.6	367.69	46	30.8	1408.76	79	30.56	2419.11
13	30.59	398.28	47	30.71	1439.47	80	30.67	2449.78
14	30.85	429.13	48	30.55	1470.02	81	30.6	2480.38
15	30.57	459.7	49	30.53	1500.55	82	30.71	2511.09
16	30.65	490.35	50	30.64	1531.19	83	30.65	2541.74
17	30.58	520.93	51	30.59	1561.78	84	30.55	2572.29
18	30.6	551.53	52	30.6	1592.38	85	30.55	2602.84
19	30.64	582.17	53	30.6	1622.98	86	30.63	2633.47
20	30.6	612.77	54	30.58	1653.56	87	30.74	2664.21
21	30.53	643.3	55	30.53	1684.09	88	30.82	2695.03
22	30.53	673.83	56	30.7	1714.79	89	30.69	2725.72
23	30.82	704.65	57	30.55	1745.34	90	30.6	2756.32
24	30.65	735.3	58	30.68	1776.02	91	30.6	2786.92
25	30.72	766.02	59	30.55	1806.57	92	30.72	2817.64
26	30.6	796.62	60	30.6	1837.17	93	30.53	2848.17
27	30.72	827.34	61	30.75	1867.92	94	30.74	2878.91
28	30.58	857.92	62	30.6	1898.52	95	30.67	2909.58
29	30.58	888.5	63	30.57	1929.09	96	30.63	2940.21
30	30.63	919.13	64	30.63	1959.72	97	30.57	2970.78
31	30.58	949.71	65	30.8	1990.52	98	30.6	3001.38
32	30.67	980.38	66	30.57	2021.09	99	30.53	3031.91
33	30.25	1010.63	67	30.78	2051.87	100	30.65	3062.56
34	30.57	1041.2						

Appendix D

RTS and RTS Tool Configuration

YOUNGQUIST

GEOPHYSICAL LOGGING DIVISION

Radioactive Tracer Survey Tool Diagram

Date: 8/5/13 Job: SDWWTP - IW-12

Internal RTS: ___ External RTS: ✓ YB I Logger: MOREY

BOTTOM OF CASING: 2395'

-5' IN CASING: 2390'

+13.5' FOR BOTTOM OF TOOL: 2403.5

Eject #1: 1 mCi Eject #2: 2 mCi

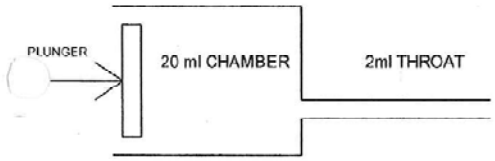
Eject #3: ___ mCi Eject #4: ___ mCi

Eject #5: ___ mCi Eject #6: ___ mCi

Total mCi of I-131 loaded in tool: 5 **1ml =1mCi**

Total volume of Chamber and Throat:22ml

EJECTOR PORT DIAGRAM



Total Eject Cycle Time (22ml): 13 **Sec**

Eject Cycle Time Per ml (Total Time / 22): 0.6 **Sec**

Throat Eject Cycle Time (2*Time Per ml): 1.2 **Sec**

TIME PER EJECT

(Total ml of I-131)/(20ml)= mCi per ml in the chamber

(5)/(20)= 0.25 mCi per ml

mCi = Throat Eject Cycle Time + (ml of Chamber Required)*(Eject Cycle Time Per ml)

1 mCi = 1.2 + (4)*(0.6) = 3.6 **seconds**

2 mCi = 1.2 + (8)*(0.6) = 6 **seconds**

3 mCi = + ( )*( ) = **seconds**

4 mCi = + ( )*( ) = **seconds**

TOP OF TOOL (25ft 2in)

GAMMA RAY TOP DECTOR (23ft 6in)

ALL MEASUREMENTS ARE FROM THE BOTTOM OF THE TOOL.

TOOL DIAMETER IS 1-11/16".

EJECTOR PORT (13ft 6in)

GAMMA RAY MIDDLE DECTOR (10ft 6in)

COLLAR LOCATOR (9ft 6in)

GAMMA RAY BOTTOM DECTOR (1ft 2in)

TEMPERATURE PROBE

Appendix E

Temperature Log

Appendix F

Television Survey

Appendix G

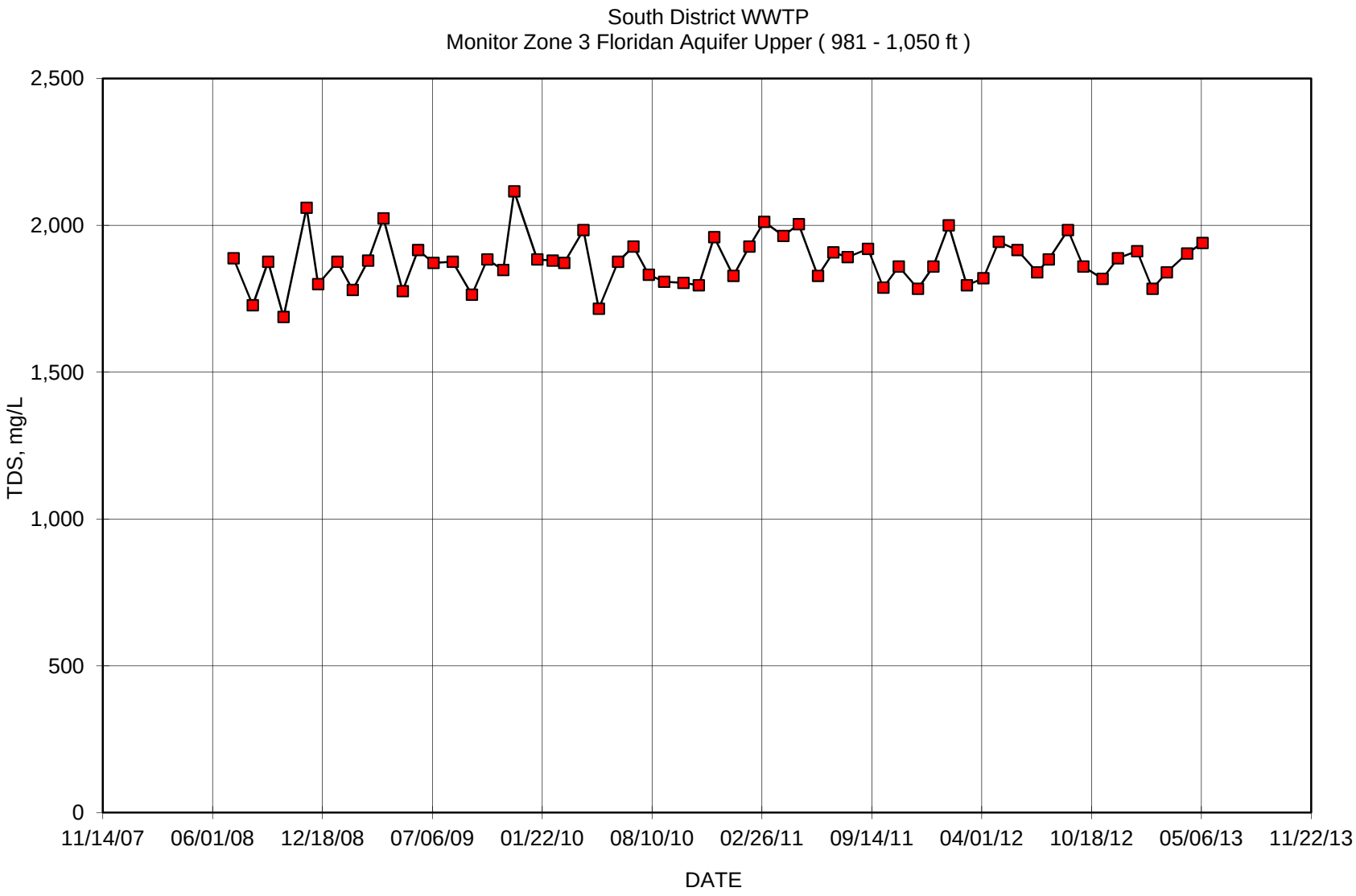
5 year Monitoring Data

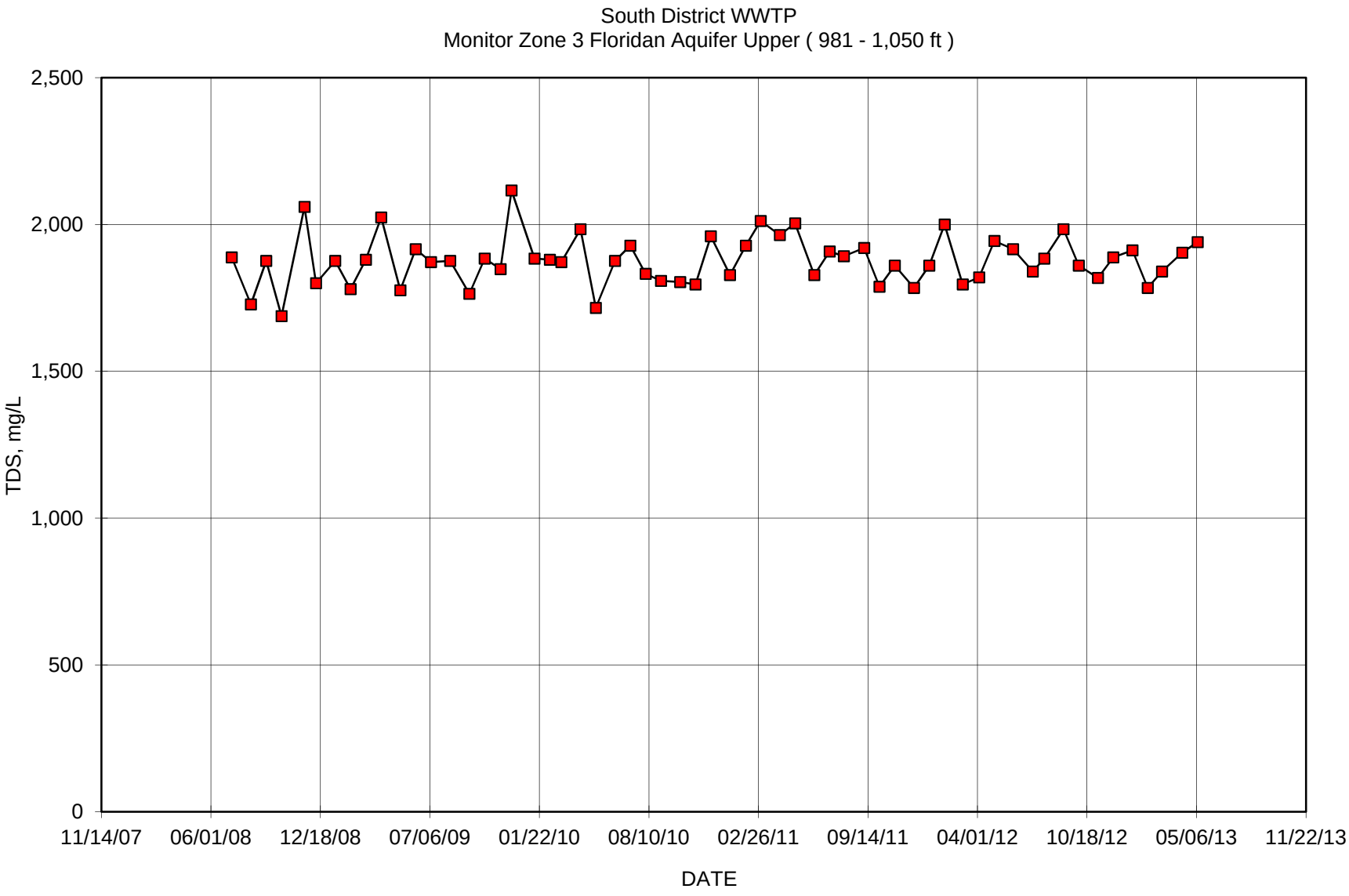
FA-3 Upper

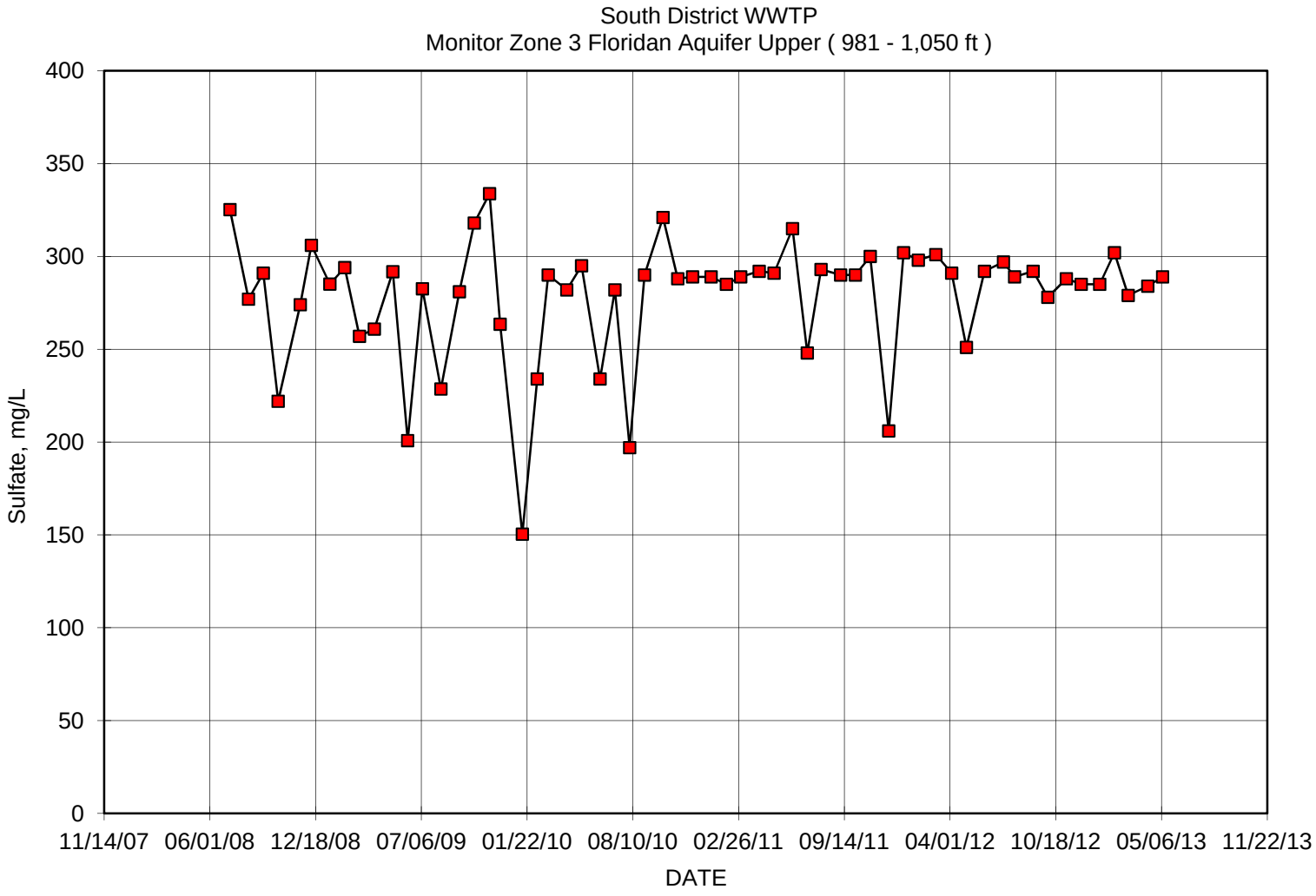
Date	TDS, mg/L	Sulfate, mg/L	Chlorides, mg/L	TKN, mg/L	NH3, mg/L	Conductivity, Micromho/cm	Temp., C	Temp., F	pH	TP, mg/L	TSS, mg/L	Sodium, mg/L	Gross Alpha, pCi/L	Radium 226, pCi/L	Radium 228, pCi/L
07/09/08	1,888	325	872	0.25	0.01	3,214	24	75	7.9	0.01	1.76				
08/13/08	1,728	277	763	0.80	0.15	3,088	24	76	7.6	0.80	1.76				
09/10/08	1,876	291	730	0.49	0.09	3,261	28	82	7.8	0.49	1.76				
10/08/08	1,688	222	681	0.56	0.14	3,156	26	80	8.5	0.02	1.76				
11/19/08	2,060	274	723	0.22	0.02	3,273	23	74	7.8	0.00	1.76				
12/10/08	1,800	306	764	0.60	0.15	3,205	23	74	7.4	0.09	1.00				
01/14/09	1,876	285	715	0.46	0.15	3,139	22	72	7.7	0.04	0.20				
02/11/09	1,780	294	721	0.25	0.19	3,464	23	73	7.8	0.22	1.20				
03/11/09	1,880	257	655	0.46	0.06	3,327	22	72	7.4	0.01	0.20				
04/08/09	2,024	261	675	0.22	0.21	3,312	22	71	7.6	0.04	1.00				
05/13/09	1,776	292	696	0.22	0.02	3,194	24	74	7.9	0.02	2.40				
06/10/09	1,916	201	516	0.70	0.18	3,291	23	74	7.9	0.20	0.80				
07/08/09	1,872	283	719	0.23	0.18	3,291	24	75	7.8	0.00	1.80				
08/12/09	1,876	229	574	0.23	0.46	3,409	25	76	7.7	0.01	0.20				
09/16/09	1,764	281	669	0.62	0.17	3,274			7.7	0.00		502			
10/14/09	1,884	318	747	0.50	0.16	3,162			7.6	0.01		505			
11/12/09	1,848	334	845	0.63	0.19	2,929			8.1	0.03		489			
12/02/09	2,116	264	711	0.47	0.22	3,215	24	75	7.9	0.02	0.20	551			
01/13/10	1,884	150	380	0.64	0.20	3,212	22	71	7.8	0.03	0.80	679			
02/10/10	1,880	234	644	0.49	0.17	3,196	22	72	7.9	0.02	0.80	503			
03/03/10	1,872	290	722	0.53	0.15	3,322	22	72	7.8	0.02	2.20	503	10.4	6.8	0.9
04/07/10	1,984	282	746	0.53	0.16	3,355	25	76	7.7	0.01	1.40	628	8.2	9.8	0.9
05/05/10	1,716	295	765	0.37	0.14	3,261	25	77	7.9	0.04	0.80	549	11.30	6.30	0.70
06/09/10	1,876	234	613	0.35	0.13	3,387	24	75	7.6	0.02	0.60	500	11.80	6.30	0.80
07/07/10	1,928	282	745	0.25	0.20	3,291	24	75	7.8	0.04	0.20	521	12.80	5.80	0.70
08/04/10	1,832	197	553	0.33	0.20	3,093	24	75	7.8	0.18	1.40	513	8.00	5.60	1.00

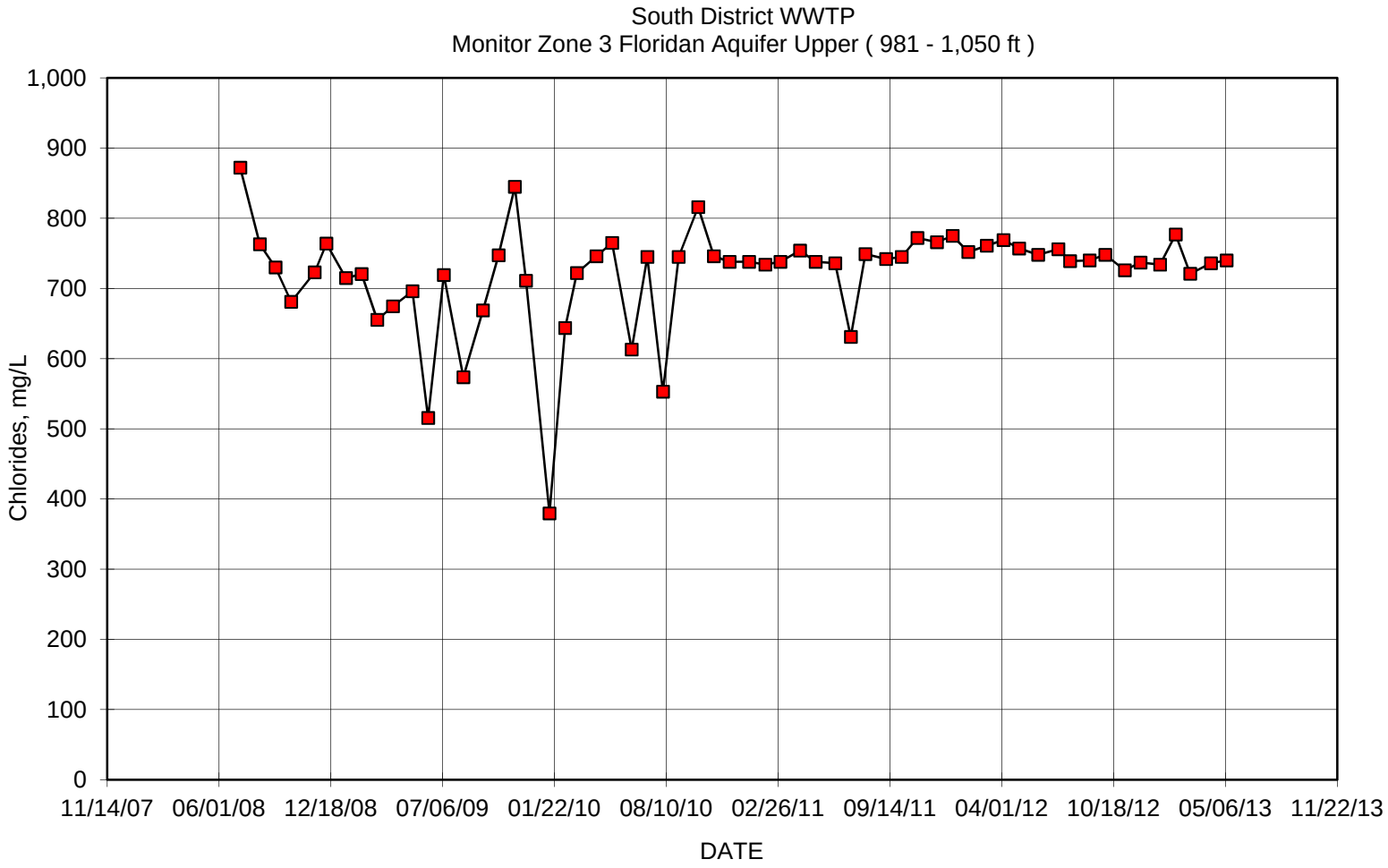
09/01/10	1,808	290	745	0.41	0.19	3,331	25	77	7.8	0.02	2.60	508	7.90	6.30	0.70
10/06/10	1,804	321	816	0.23	0.18	3,287	25	77	7.5	0.02	1.80	535	10.10	5.20	0.90
11/03/10	1,796	288	746	0.34	0.18	3,187	23	74	7.7	0.00	0.20	521	6.70	4.50	0.70
12/01/10	1,960	289	738	0.38	0.20	3,259	24	76	7.8	0.02	0.80	505	12.60	5.40	0.60
01/05/11	1,828	289	738	0.47	0.17	3,177	24	76	7.8	0.02	1.00	537	16.00	6.40	0.90
02/03/11	1,928	285	734	0.33	0.19	3,112	24	75	7.7	0.02	0.40	514	18.70	5.00	0.70
03/02/11	2,012	289	738	0.28	0.16	3,299	23	74	7.8	0.02	4.70	510	10.30	5.30	0.70
04/06/11	1,964	292	754	0.30	0.16	3,172	24	75	7.9	0.02	0.30	509	7.20	5.80	1.00
05/04/11	2,004	291	738	0.37	0.18	3,225	24	76	7.8	0.02	0.90	457	16.50	6.80	0.70
06/08/11	1,828	315	736	0.41	0.15	3,287	24	76	7.8	0.05	0.80	527	19.70	5.60	0.60
07/06/11	1,908	248	631	0.34	0.30	3,200	24	76	7.8	0.02	0.90	564	9.70	6.40	0.90
08/01/11	1,892	293	749	0.40	0.21	3,168	25	77	7.7	0.00	1.30	509	14.30	6.30	0.90
09/07/11	1,920	290	742	0.40	0.20	3,179	25	77	8.0	0.03	1.20	521	17.50	7.00	0.70
10/05/11	1,788	290	745	0.43	0.20	3,130	24	76	7.9	0.02	1.50	528	11.20	2.70	0.70
11/02/11	1,860	300	772	0.37	0.16	3,223	24	76	7.5	0.02	0.30	507	12.50	6.00	9.00
12/07/11	1,784	206	766	0.40	0.17	3,272	24	76	8.1	0.02	0.30	549	9.70	6.50	0.80
01/04/12	1,860	302	775	0.38	0.14	2,912	22	71	7.8	0.02	0.30	539	7.90	6.30	0.80
02/01/12	2,000	298	752	0.29	0.16	2,909	24	75	7.8	0.02	0.00	535	10.00	4.50	0.90
03/05/12	1,796	301	761	0.36	0.16	3,016	24	75	7.8	0.01	0.80	551	8.30	4.90	0.90
04/04/12	1,820	291	769	0.35	0.11	3,179	24	75	8.0	0.03	0.40	531	6.10	6.40	1.00
05/02/12	1,944	251	757	0.32	0.18	2,983	25	76	7.9	0.03	1.90	562	14.10	5.50	0.80
06/05/12	1,916	292	748	0.47	0.18	3,288	24	76	8.1	0.01	0.90	554	10.50	5.40	0.90
07/11/12	1,840	297	756	0.26	0.13	3,266	24	75	7.9	0.03	0.10	543	8.40	5.50	0.70
08/01/12	1,884	289	739	0.42	0.17	3,282	25	77	7.8	0.02	0.10	558	6.90	5.40	0.90
09/05/12	1,984	292	740	0.38	0.14	3,266	24	75	7.9	0.03	0.50	498	14.20	4.00	0.80
10/03/12	1,860	278	748	0.35	0.14	3,168	24	75	7.7	0.03	0.80	503	9.20	5.20	1.00
11/07/12	1,818	288	726	0.45	0.19	3,081	24	75	7.8	0.00	0.30	552	7.50	4.90	0.80
12/05/12	1,888	285	737	0.38	0.13	3,285	23	74	7.8	0.02	1.10	568	9.90	4.70	0.90
01/09/13	1,912	285	734	0.51	0.14	3,305	24	75	7.8	0.01	0.10	547	5.30	5.30	0.90
02/06/13	1,784	302	777	0.79	0.17	3,294	24	75	7.7	0.02	1.50	610	11.70	6.30	0.90
03/04/13	1,840	279	721	0.34	0.13	3,309	23	73	7.9	0.02	0.80	566	6.70	6.50	0.70

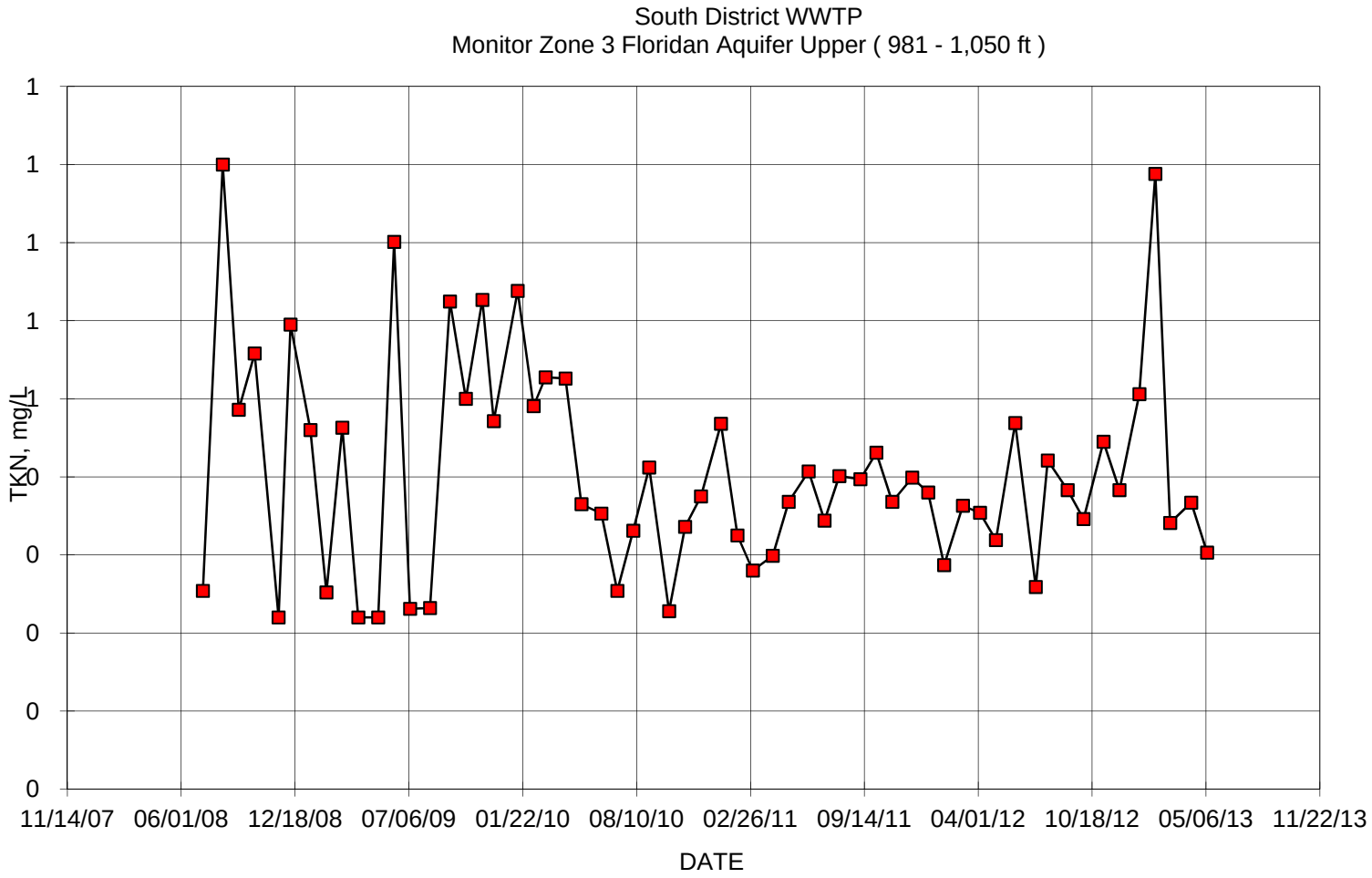
04/10/13	1,904	284	736	0.37	0.18	3,308	24	74	7.7	0.01	0.01	538	10.40	6.00	0.90
05/08/13	1,940	289	740	0.30	0.17	3,412	25	76	7.7	0.01	0.01	543	8.70	3.50	0.90

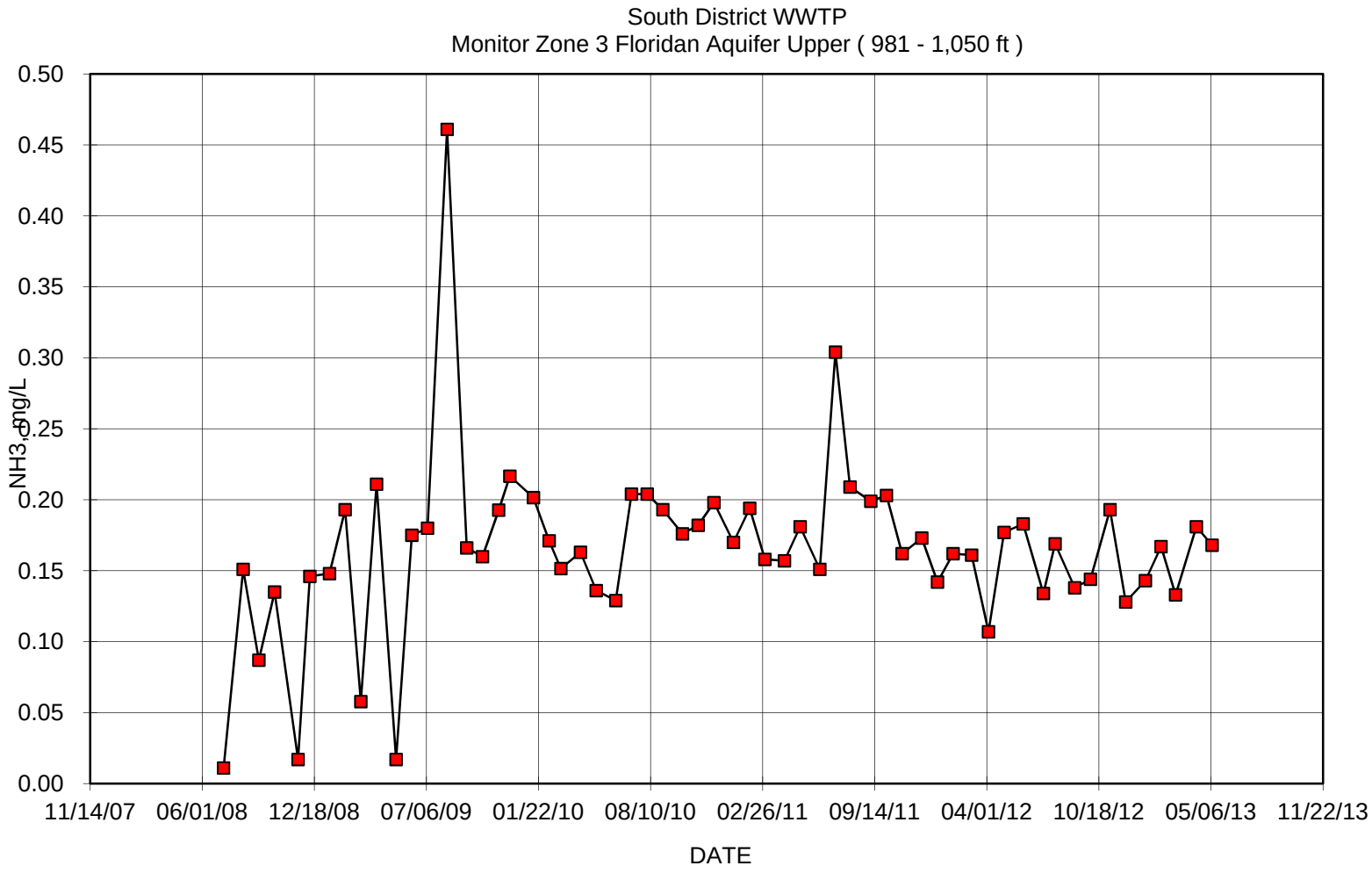

South District WWTP
Monitor Zone 3 Floridan Aquifer Upper (981 - 1,050 ft)
TDS, mg/L
2,500
2,000
1,500
1,000
500
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

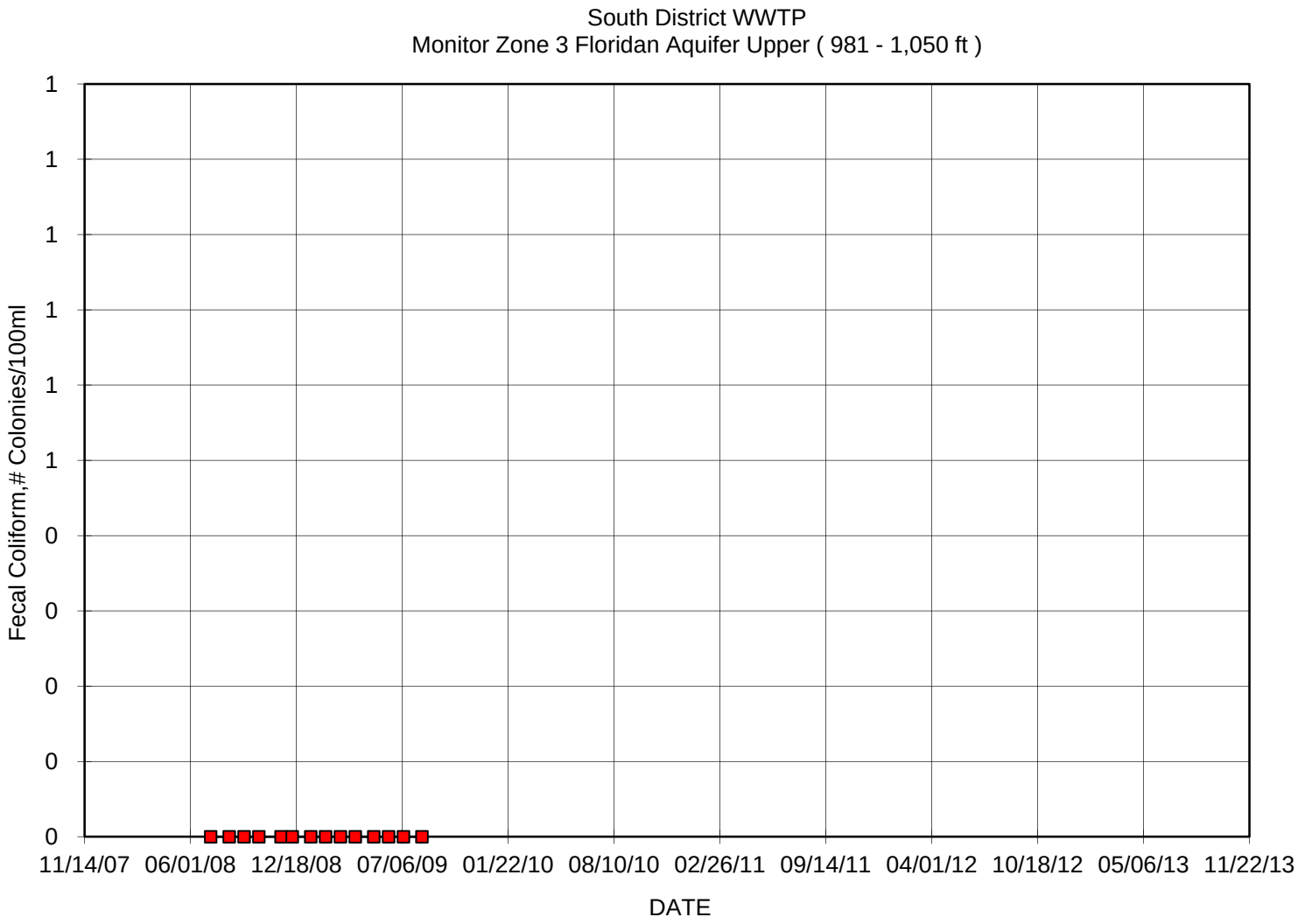

South District WWTP
Monitor Zone 3 Floridan Aquifer Upper (981 - 1,050 ft)
TDS, mg/L
2,500
2,000
1,500
1,000
500
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

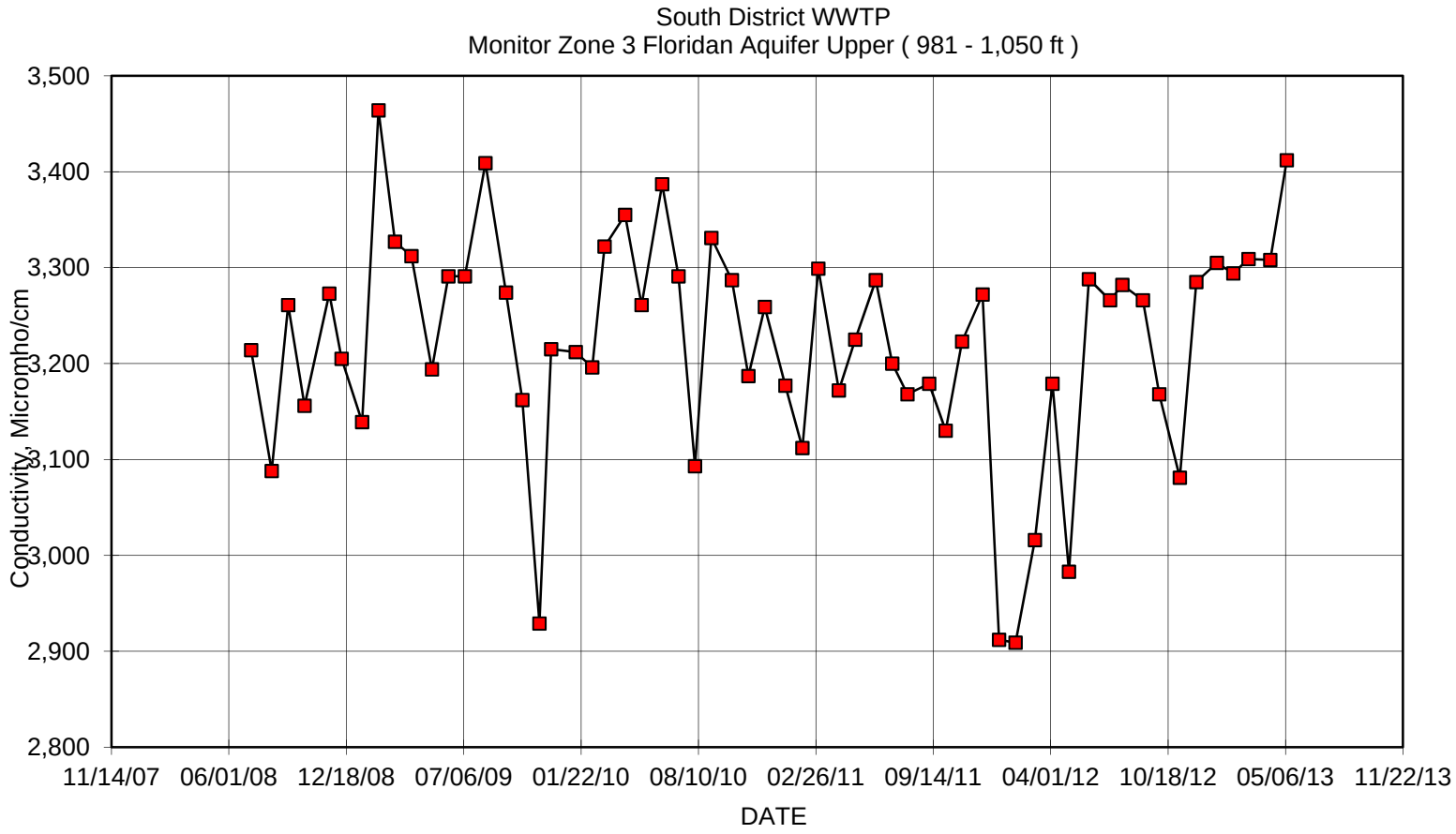

South District WWTP
Monitor Zone 3 Floridan Aquifer Upper (981 - 1,050 ft)
Sulfate, mg/L
400
350
300
250
200
150
100
50
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

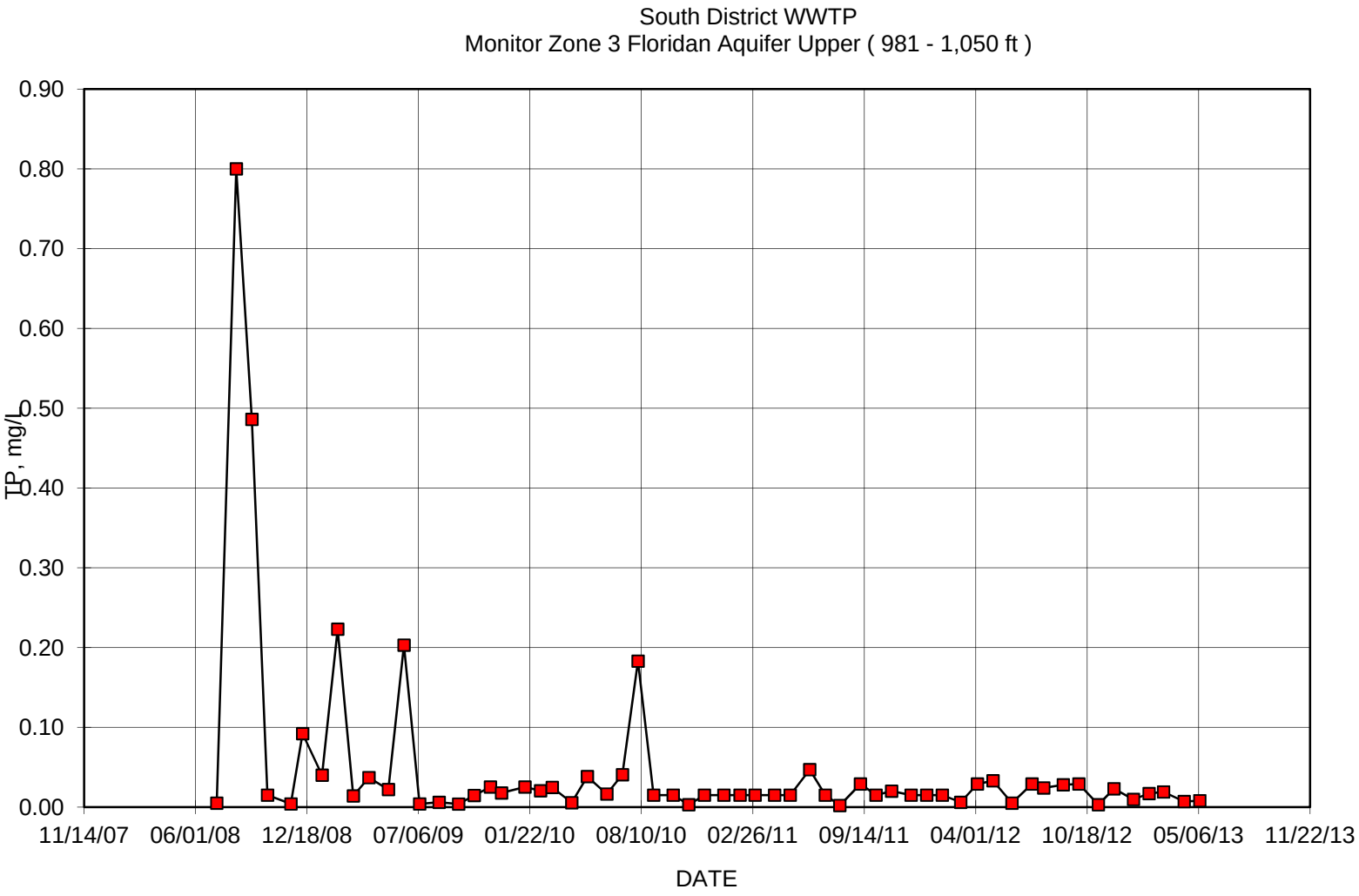

South District WWTP
Monitor Zone 3 Floridan Aquifer Upper (981 - 1,050 ft)
Chlorides, mg/L
1,000
900
800
700
600
500
400
300
200
100
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

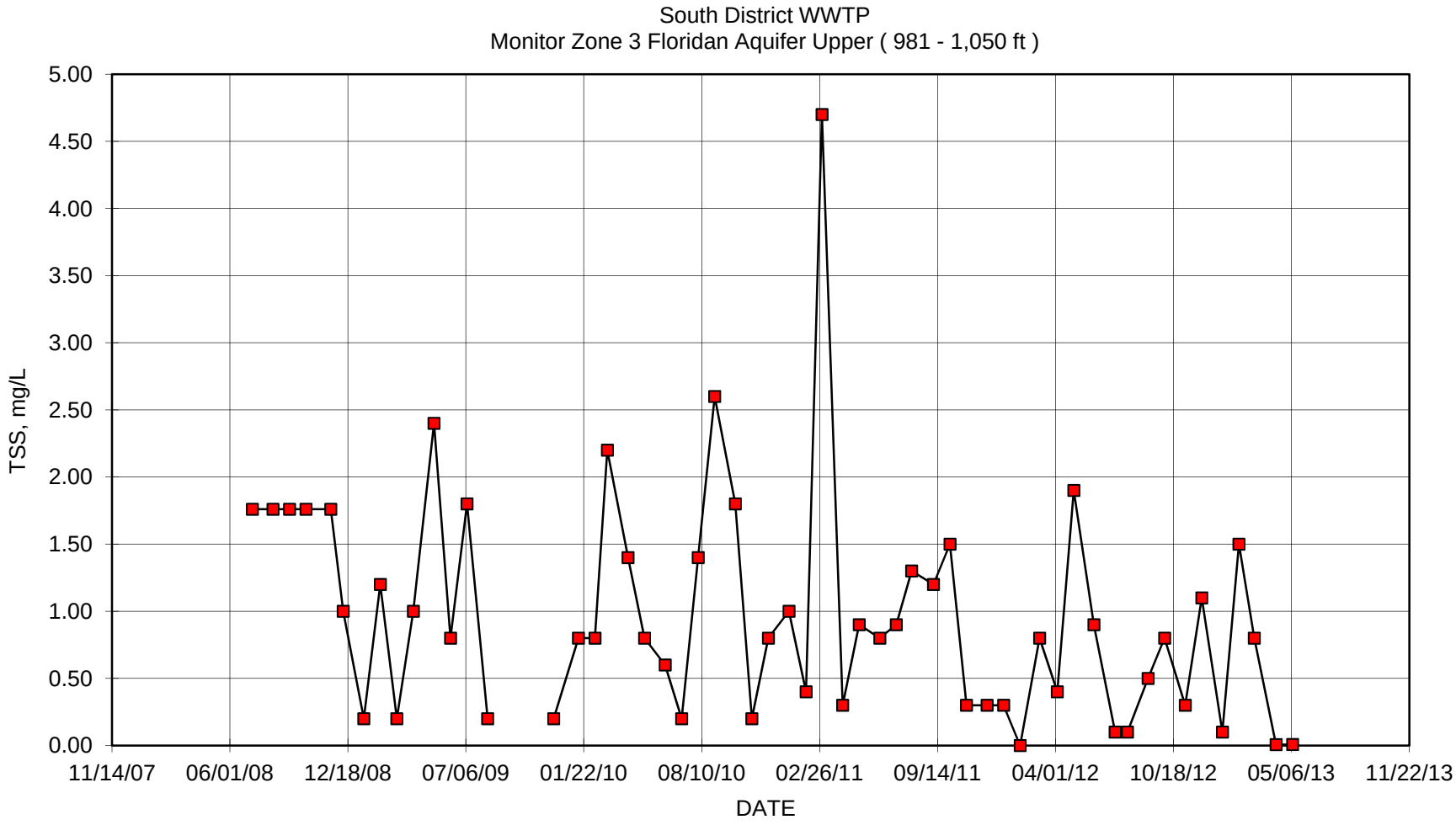

South District WWTP
Monitor Zone 3 Floridan Aquifer Upper (981 - 1,050 ft)
TKN, mg/L
1
1
1
1
1
0
0
0
0
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 3 Floridan Aquifer Upper (981 - 1,050 ft)
NH3, mg/L
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 3 Floridan Aquifer Upper (981 - 1,050 ft)
Fecal Coliform,# Colonies/100ml
1
1
1
1
1
1
0
0
0
0
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 3 Floridan Aquifer Upper (981 - 1,050 ft)
Conductivity, Micromho/cm
3,500
3,400
3,300
3,200
3,100
3,000
2,900
2,800
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 3 Floridan Aquifer Upper (981 - 1,050 ft)
TP, mg/L
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

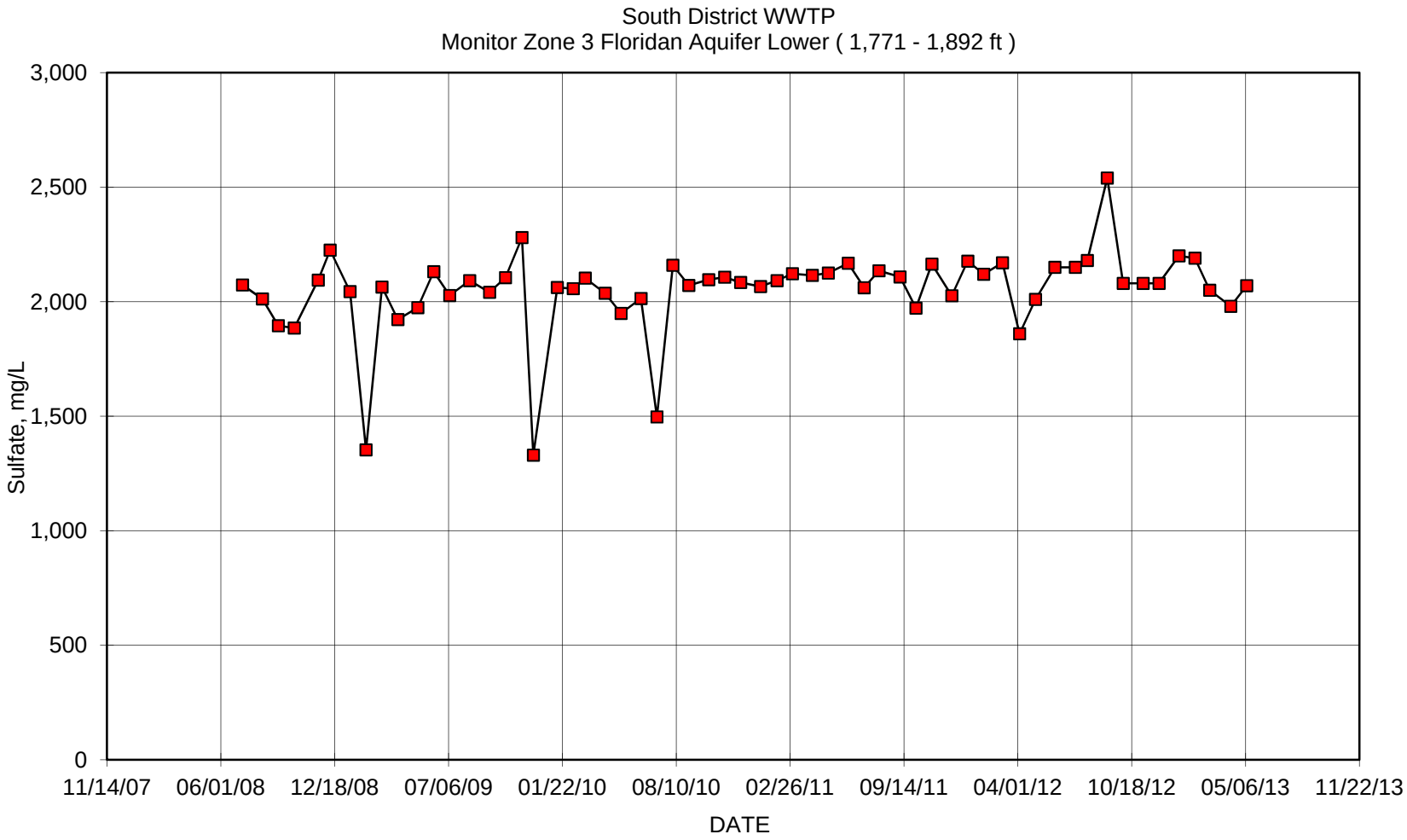

South District WWTP
Monitor Zone 3 Floridan Aquifer Upper (981 - 1,050 ft)
TSS, mg/L
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

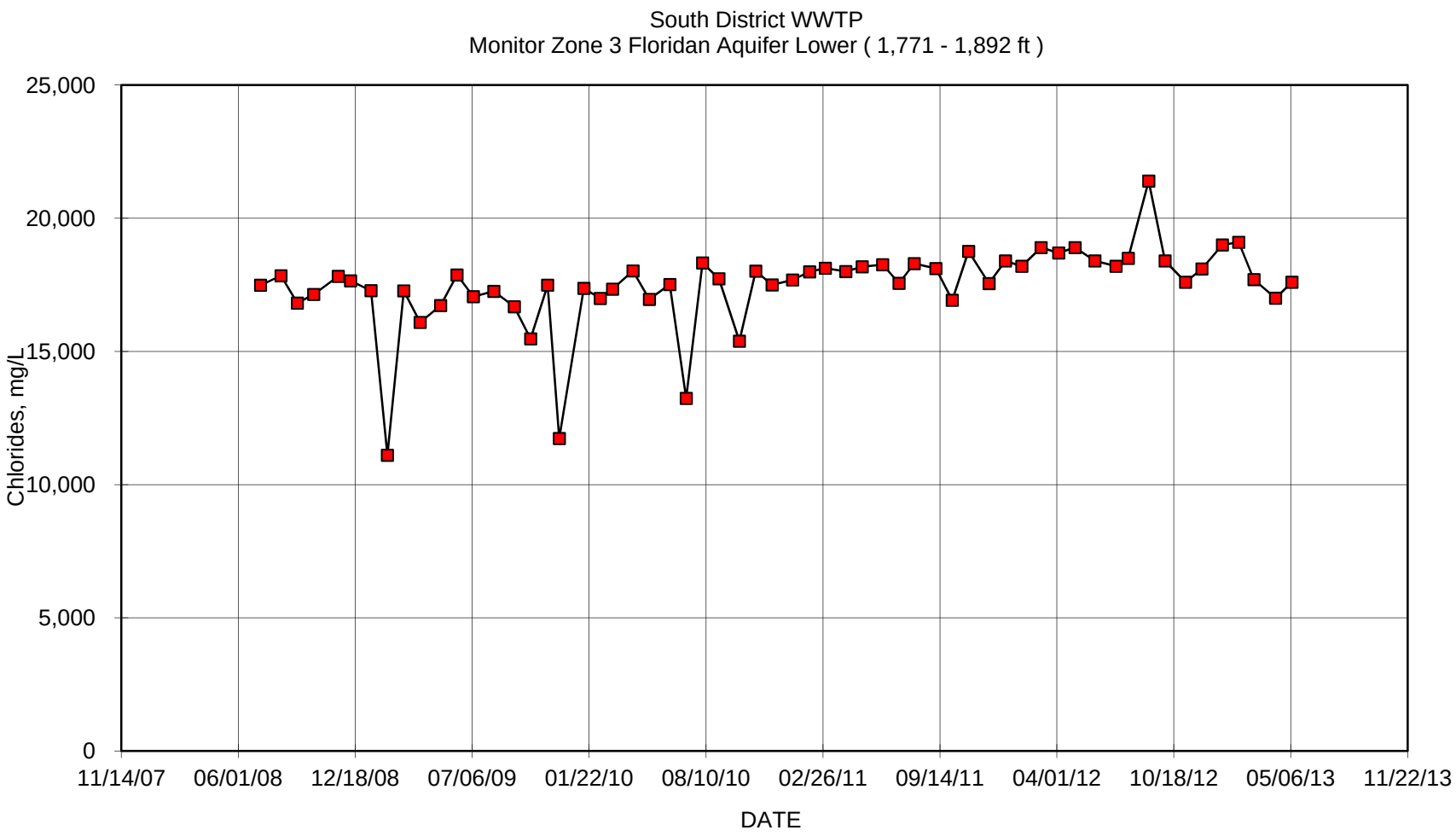
FA-3 Lower Data

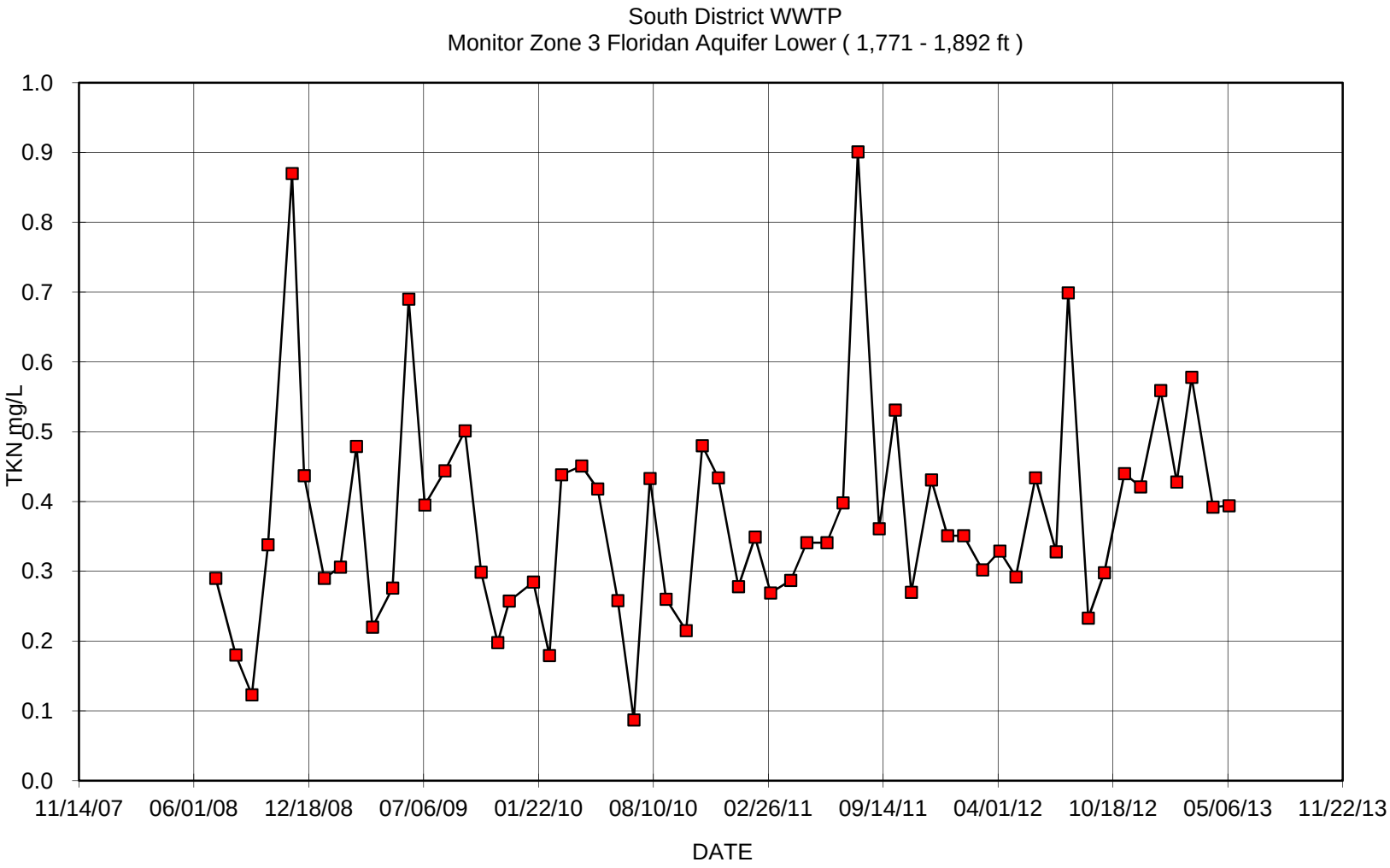
Date	TDS, mg/L	Sulfate, mg/L	Chlorides, mg/L	TKN, mg/L	NH3, mg/L	Conductivity, Micromho/cm	Temp., C	Temp., F	pH	TP, mg/L	TSS, mg/L	NO_3, mg/L	NO_2, mg/L	Sodium, mg/L	Gross Alpha, pCi/L	Radium 226, pCi/L	Radium 228, pCi/L
07/09/08	34,770	2,073	17,487	0.29	0.01	48,340	24	75	7.5	0.01	16.00	0.03	0.00				
08/13/08	32,000	2,012	17,844	0.18	0.04	46,660	24	76	7.7	0.01	19.40	0.08	0.05				
09/10/08	33,590	1,895	16,816	0.12	0.00	45,180	28	82	7.1	0.01	13.00	0.08	0.05				
10/08/08	35,580	1,885	17,143	0.34	0.00	45,260	27	80	7.4	0.02	20.60	0.03	0.00				
11/19/08	35,590	2,094	17,821	0.87	0.02	47,830	23	74	7.3	0.00	19.00	0.03	0.00				
12/10/08	33,640	2,225	17,651	0.44	0.10	47,640	23	73	7.0	0.02	14.60	0.03	0.00				
01/14/09	29,740	2,044	17,282	0.29	0.09	47,220	21	70	7.1	0.05	18.40	0.03	0.00				
02/11/09	33,490	1,353	11,105	0.31	0.15	49,380	23	73	7.4	1.25	18.40	0.00	0.00				
03/11/09	32,240	2,064	17,276	0.48	0.07	49,120	22	72	7.0	0.05	19.80	0.00	0.00				
04/08/09	35,700	1,922	16,092	0.22	0.19	49,770	21	69	6.8	0.03	21.80	0.00	0.00				
05/13/09	35,650	1,974	16,724	0.28	0.28	48,020	24	74	7.3	0.02	18.20	0.00	0.00				
06/10/09	34,230	2,131	17,873	0.69	0.17	47,730	23	74	7.1	0.34	13.60	0.00	0.00				
07/08/09	34,520	2,027	17,057	0.40	0.19	47,560	24	75	7.1	0.40	18.40	0.00	0.00				
08/12/09	35,050	2,092	17,258	0.44	0.62	48,850	25	77	7.5	0.01	12.60	0.00	0.00				
09/16/09	32,760	2,041	16,681	0.50	0.14	47,490			7.5	0.02		0.05	0.01	9060	10.3	8.1	0.7
10/14/09	34,530	2,105	15,474	0.30	0.11	48,440			7.2	0.02		0.00	0.00	9110	11.3	10.5	0.9
11/12/09	32,550	2,280	17,491	0.20	0.14	41,820			7.2	0.02		0.00	0.00	8700	9.9	8.8	1.0
12/02/09	34,930	1,330	11,733	0.26	0.14	50,730	25	76	7.4	0.02	16.60	0.00	0.00	10200	13.4	10.8	0.8
01/13/10	33,570	2,062	17,371	0.28	0.12	46,430	21	70	7.2	0.02	11.20	0.00	0.00	448	10.6	9.1	0.8
02/10/10	32,860	2,057	16,993	0.18	0.11	46,690	22	71	7.4	0.02	13.20	0.00	0.00	9270	10.2	9.5	0.9
03/03/10	33,100	2,103	17,341	0.44	0.08	48,240	22	71	7.2	0.03	9.20	0.00	0.00	8910	10.9	8.7	0.7
04/07/10	33,660	2,037	18,024	0.45	0.27	48,960	25	78	7.2	0.11	10.00	0.00	0.00	9230	15.7	7.4	0.8
05/05/10	33,056	1,949	16,957	0.42	0.09	48,190	25	78	7.4	0.01	10.40	0.00	0.00	9550	10.2	10.7	0.9
06/09/10	32,510	2,014	17,514	0.26	0.12	48,480	24	75	7.2	0.05	6.80	0.02	0.00	9030	11.2	9.3	0.8
07/07/10	33,130	1,497	13,240	0.09	0.16	47,740	24	75	7.3	0.04	10.80	0.00	0.00	9540	9.6	7.9	0.8
08/04/10	33,360	2,159	18,326	0.43	1.22	46,560	24	75	7.4	0.24	11.00	0.00	0.00	9490	9.2	9.9	0.7
09/01/10	32,620	2,071	17,731	0.26	0.97	48,150	25	77	7.3	0.02	38.80	0.02	0.00	8910	10.0	9.3	0.7
10/06/10	33,020	2,096	15,387	0.22	0.86	47,530	25	77	7.5	0.00	9.00	0.00	0.22	9560	10.9	9.6	0.8
11/03/10	32,580	2,107	18,016	0.48	0.71	47,190	23	74	7.4	0.02	7.20	0.00	0.00	8970	10.6	9.7	0.6
12/01/10	32,600	2,084	17,499	0.43	0.87	47,370	24	76	7.4	0.02	11.80	0.01	0.00	8930	11.2	10.2	0.8

01/05/11	33,240	2,066	17,686	0.28	0.78	46,010	24	75	7.4	0.02	10.20	0.02	0.00	9610	10.8	9.7	0.9
02/03/11	32,750	2,092	17,991	0.35	0.61	46,170	24	75	7.4	0.02	4.60	0.03	0.00	9250	11.0	9.6	0.8
03/02/11	33,370	2,122	18,127	0.27	1.06	47,700	23	74	7.2	0.02	39.40	0.00	0.00	9220	13.2	10.8	0.6
04/06/11	32,000	2,115	18,003	0.29	0.99	46,760	23	74	7.1	0.02	6.80	0.00	0.00	11000	9.2	7.4	0.8
05/04/11	35,400	2,125	18,179	0.34	1.28	49,850	24	75	7.5	0.02	13.20	0.00	0.00	7560	12.0	10.1	0.7
06/08/11	36,460	2,168	18,258	0.34	0.97	48,100	24	76	7.3	0.05	6.80	0.01	0.00	10200	8.4	8.7	0.9
07/06/11	36,640	2,061	17,559	0.40	0.97	49,100	24	76	7.7	0.02	20.60	0.02	0.00	10200	8.4	7.7	0.8
08/01/11	34,060	2,135	18,300	0.90	0.90	47,060	25	77	7.7	0.00	13.50	0.00	0.00	9580	9.5	8.2	1.0
09/07/11	33,360	2,108	18,114	0.36	1.04	48,300	25	77	7.4	0.04	7.90	0.01	0.00	9560	11.4	10.0	0.8
10/05/11	33,000	1,972	16,923	0.53	1.46	46,220	24	75	7.5	0.02	11.50	0.00	0.00	9760	12.8	11.5	0.9
11/02/11	32,780	2,164	18,758	0.27	1.21	46,720	24	76	7.6	0.04	6.40	0.00	0.00	8000	9.2	8.7	0.9
12/07/11	33,860	2,026	17,550	0.43	1.21	45,660	23	73	7.7	0.01	8.70	0.02	0.00	10200	10.3	9.3	1.0
01/04/12	32,880	2,177	18,399	0.35	1.10	44,420	21	70	7.4	0.02	9.70	0.02	0.00	9410	5.5	4.4	0.8
02/01/12	32,980	2,120	18,200	0.35	1.19	40,081	24	75	7.4	0.02	6.50	0.02	0.00	2050	10.1	9.3	0.7
03/05/12	31,680	2,170	18,900	0.30	0.89	43,540	24	75	7.5	0.02	8.10	0.01	0.00	9610	8.8	8.7	0.6
04/04/12	32,420	1,860	18,700	0.33	0.73	45,120	23	74	7.3	0.02	17.90	0.50	2.50	9660	7.8	7.1	1.0
05/02/12	33,900	2,010	18,900	0.29	0.91	48,620	25	76	7.7	0.05	10.90	0.01	0.00	10300	12.5	11.1	0.8
06/05/12	33,580	2,150	18,400	0.43	0.84	45,672	21	70	7.4	0.01	5.60	0.01	0.00	10400	6.3	7.0	0.9
07/11/12	33,860	2,150	18,200	0.33	0.79	47,870	23	74	7.4	0.03	8.30	0.08	0.00	9800	9.6	8.6	0.9
08/01/12	33,890	2,180	18,500	0.70	0.76	45,790	25	76	8.1	0.09	5.60	0.01	0.00	10500	9.2	8.4	0.7
09/05/12	35,760	2,540	21,400	0.23	0.67	48,040	24	75	7.6	0.04	11.90	0.00	0.23	8970	10.0	8.6	0.8
10/03/12	33,120	2,080	18,400	0.30	0.99	48,932	24	75	7.6	0.03	14.90	0.01	0.00	9500	9.3	10.0	0.9
11/07/12	32,840	2,080	17,600	0.44	0.71	46,986	23	74	7.5	0.02	13.70		0.00	10000	8.3	7.9	0.9
12/05/12	34,800	2,080	18,100	0.42	0.61	48,530	23	74	7.4	0.04	6.50	0.02	0.01	10900	8.5	8.1	0.9
01/09/13	35,640	2,200	19,000	0.56	0.69	48,570	23	74	7.5	0.11	8.90	0.01	0.01	11300	10.3	9.9	0.7
02/06/13	32,160	2,190	19,100	0.43	0.72	46,228	24	75	7.5	0.02	8.90	0.01	0.01	9020	10.5	9.8	0.8
03/04/13	33,780	2,050	17,700	0.58	0.78	48,581	23	73	7.4	0.04	24.40	0.01	0.02	9740	18.1	13.8	0.7
04/10/13	34,180	1,980	17,000	0.39	0.72	48,527	23	74	7.5	0.03	0.03	0.02	0.02	9820	9.2	9.7	0.8
05/08/13	33,040	2,070	17,600	0.39	0.80	49,595	24	76	7.2	0.04	0.04	0.00	0.01	10400	8.4	7.9	0.7

South District WWTP
Monitor Zone 3 Floridan Aquifer Lower (1,771 - 1,892 ft)
TDS, mg/L
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 3 Floridan Aquifer Lower (1,771 - 1,892 ft)
Sulfate, mg/L
3,000
2,500
2,000
1,500
1,000
500
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 3 Floridan Aquifer Lower (1,771 - 1,892 ft)
25,000
20,000
15,000
10,000
5,000
0
Chlorides, mg/L
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 3 Floridan Aquifer Lower (1,771 - 1,892 ft)
TKN mg/L
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
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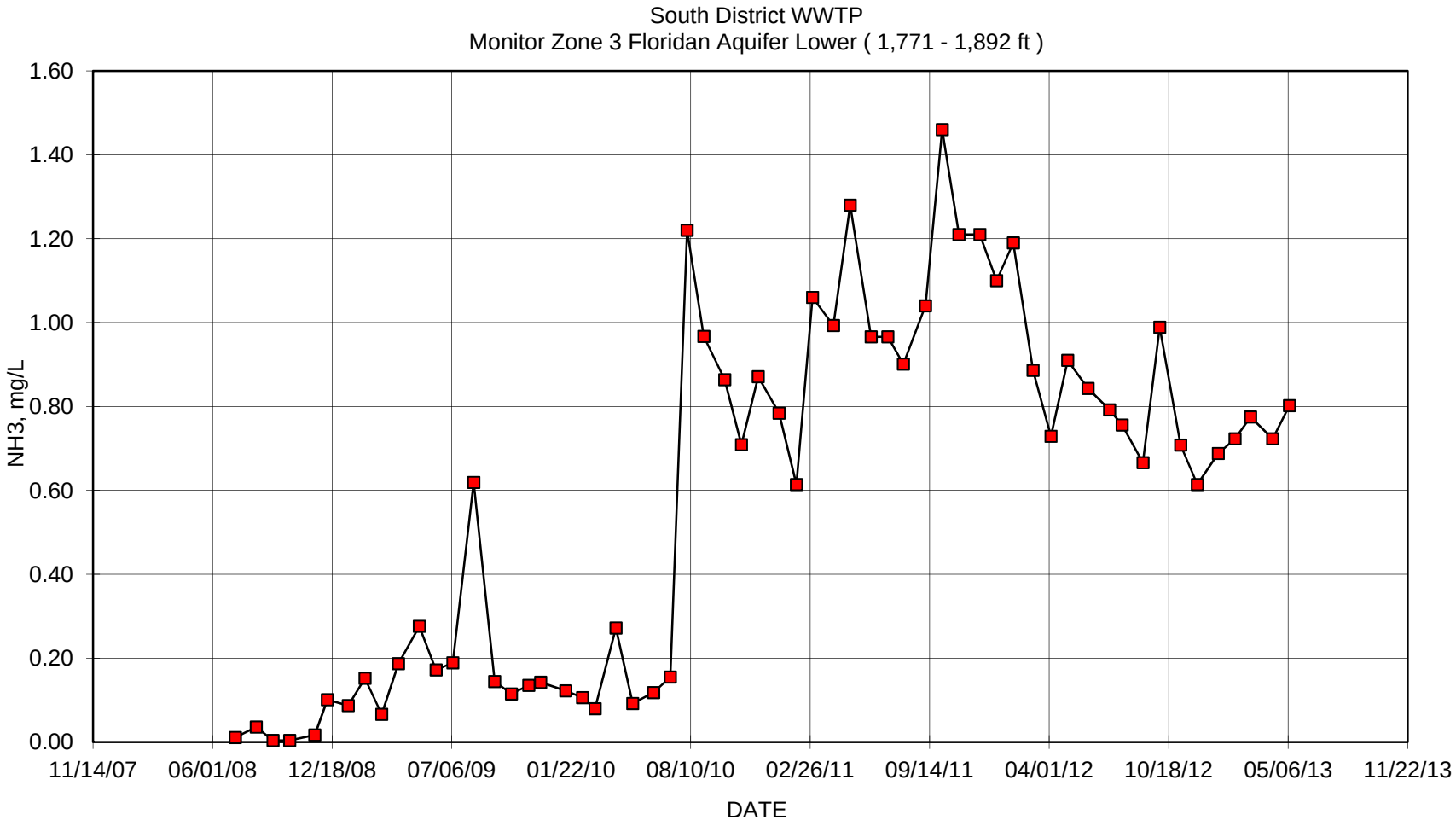
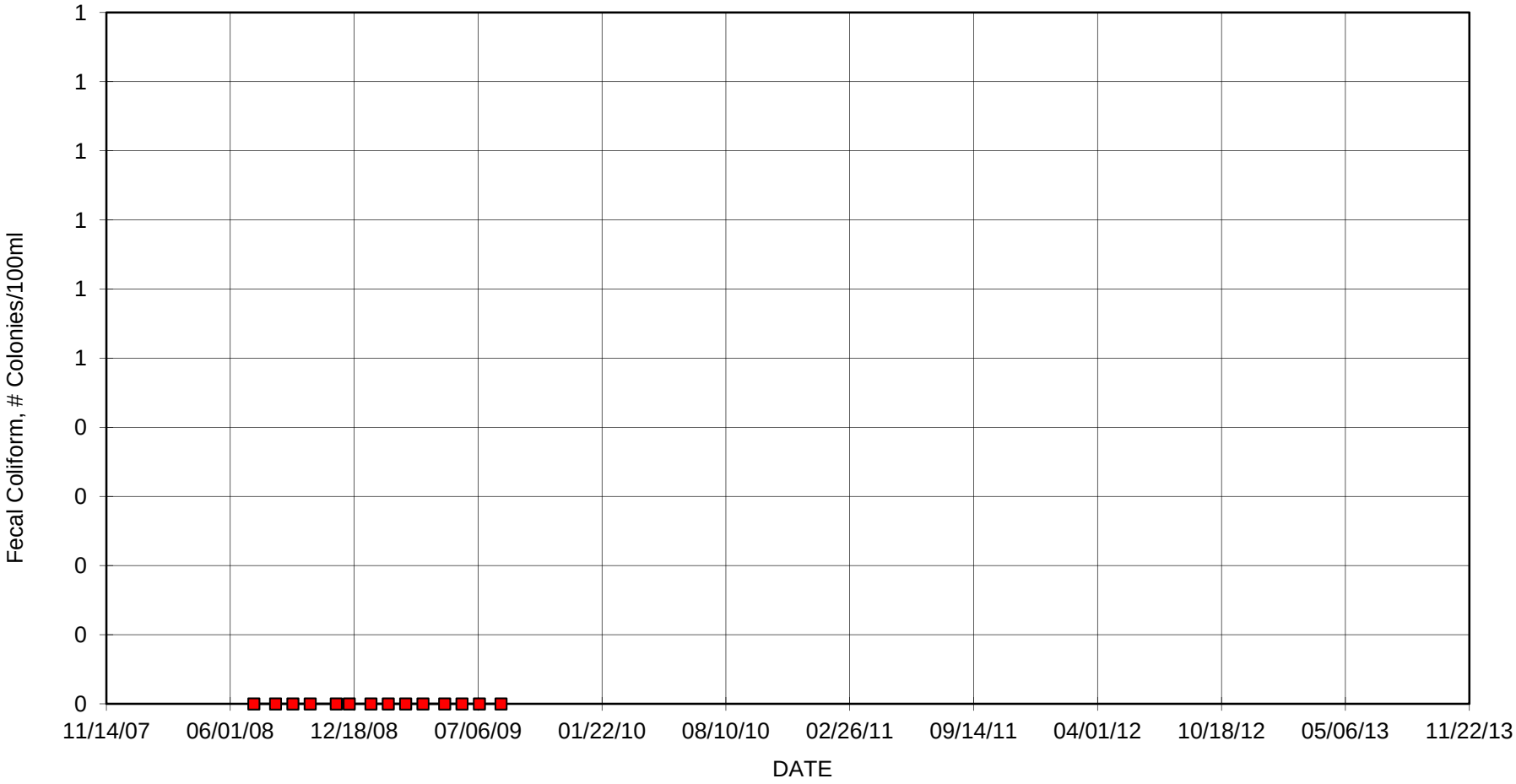
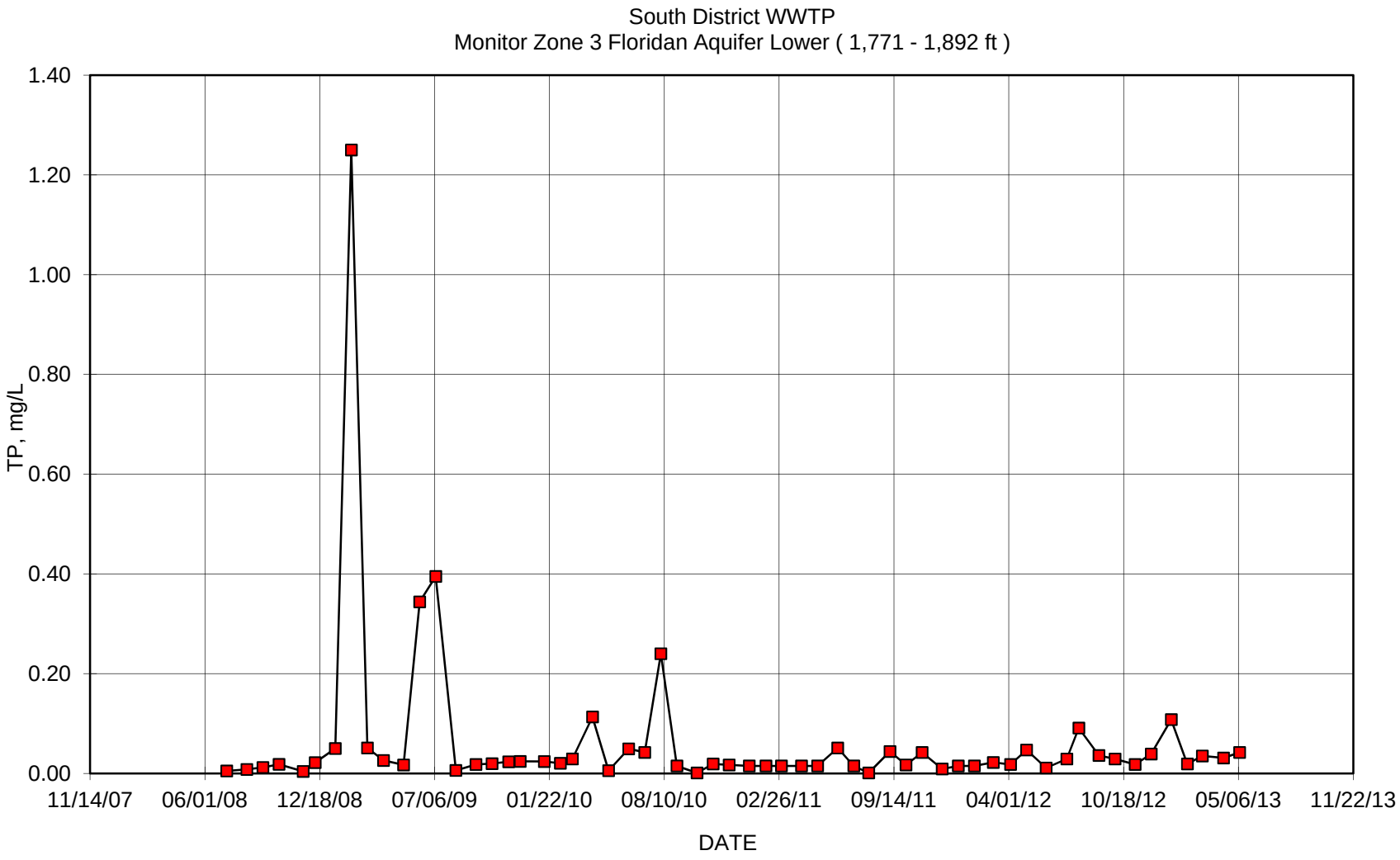
05/06/13
11/22/13
DATE

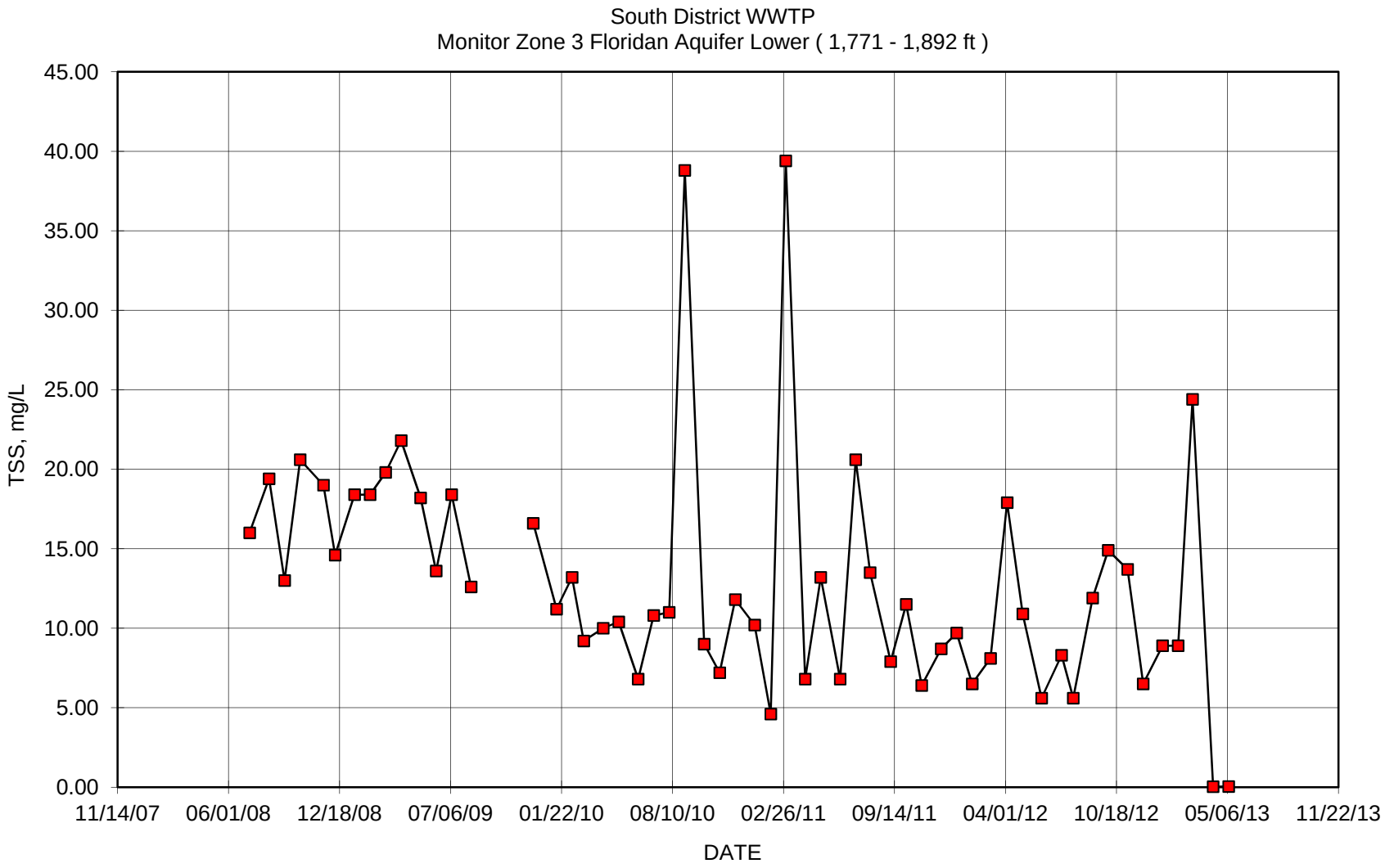

South District WWTP
Monitor Zone 3 Floridan Aquifer Lower (1,771 - 1,892 ft)
NH3, mg/L
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

South District WWTP
Monitor Zone 3 Floridan Aquifer Lower (1,771 - 1,892 ft)



South District WWTP
Monitor Zone 3 Floridan Aquifer Lower (1,771 - 1,892 ft)
Conductivity, Micromho/c
60,000
50,000
40,000
30,000
20,000
10,000
0
11/14/2007
6/1/2008
12/18/2008
7/6/2009
1/22/2010
8/10/2010
2/26/2011
9/14/2011
4/1/2012
10/18/2012
5/6/2013
11/22/2013
DATE


South District WWTP
Monitor Zone 3 Floridan Aquifer Lower (1,771 - 1,892 ft)
TP, mg/L
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 3 Floridan Aquifer Lower (1,771 - 1,892 ft)
TSS, mg/L
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

MIAMI-DADE COUNTY
miamidade.gov

Water and Sewer
PO Box 330316 • 3071 SW 38 Avenue
Miami, Florida 33233-3016
T 305-665-7471

November 1, 2013

Mr. Joseph R. May, P.G.
Florida Department of Environmental Protection
400 North Congress Avenue, 3rd Floor
West Palm Beach, Florida 33401

CCN: 57718

Reference: Miami-Dade Water and Sewer Department -- Mechanical Integrity Testing (MIT) Report for Deep Injection Well No. IW-13 at the SDWWTP Site.

Dear Mr. May:

Enclosed please find the Certificate of Mechanical Integrity and the MIT Report on the re-testing of Deep Injection Well No. IW-13 at the South District Wastewater Treatment Plant site in Miami-Dade County.

All the tests were conducted in strict adherence to the specifications submitted to and approved by your office. The testing results for the well were good. Both external and internal mechanical integrity were demonstrated. The well casing and the wellhead components are in good condition. All the well head valves and all the well head components are scheduled to be rust-proofed and repainted when all the MITs are completed. Based on the results of the well testing we conclude that the well retains full mechanical integrity and recommend that MDWASD be allowed to continue operating the well in its normal mode.

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

The demonstration of mechanical integrity is being submitted per Chapter 62-528.300(6)(b)2., 62-528.300(6)(c), and 62-528.425(1)(d), F.A.C. and specific condition 3.j. of Permit 0061787-022-UO.

If you have any questions or require additional explanation of any item in the report, please do not hesitate to contact me at [redacted] or Sonia Villamil at [redacted]

Sincerely,

[redacted]

Rafael A. Terrero, P.E.
Assistant Director- Wastewater Operation Systems

Enclosures: Certificate of Mechanical Integrity
MIT Report Well IW-13 (1 copy)

cc: Joseph Haberfeld, FDEP - Tallahassee

MIAMI-DADE COUNTY
Delivering Excellence Every Day

Mechanical Integrity Test Report
Deep Injection Well No. IW-13
South District Wastewater Treatment Plant

Prepared by:
Miami-Dade Water and Sewer Department
3071 SW 38th Avenue
Miami, Florida 33146

CERTIFICATE OF MECHANICAL INTEGRITY

The **South District WWTP** deep injection well **IW-13** operated by **Miami-Dade Water and Sewer Department** has been tested for mechanical integrity. The tests followed standard engineering practices and used methods presented in the United States Environmental Protection Agency regulations for the purposes of these tests. The external and internal mechanical integrity tests followed Florida Department of Environmental Protection (FDEP) pre-approved testing specifications and all the critical test events were witnessed by representatives of the FDEP, the MDWASD and the contractor.

Having supervised the engineer and geologists that were present during the testing, conducted the examining of the results and the preparation this mechanical integrity report as part of this certification, the undersigned certifies that deep injection well **IW-13** operated by **Miami-Dade Water and Sewer Department** at the **South District Wastewater Treatment Plant Site in Miami-Dade County, Florida** has successfully passed all the test requirements for mechanical integrity under rules of Chapter 62-528 of the Florida Administrative Code and is therefore determined to have mechanical integrity.

Certified on October 31, 2013

[redacted]

Howard J. Fallon Jr., P.E.
Professional Engineer
License Number 24153

MECHANICAL INTEGRITY TEST REPORT
FOR
DEEP INJECTION WELL No. IW-13
AT THE
SOUTH DISTRICT WASTEWATER TREATMENT PLANT

Prepared by:

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For Submittal To:

UNDERGROUND INJECTION CONTROL
FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

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ABSTRACT

The internal mechanical integrity was investigated through a pressure test performed on the injection casing. The pressure test was conducted at 155 pounds per square inch (psi) which is approximately 1.5 times the maximum (100 psi) potential injection pressure and more than 1.7 times the maximum operational pressure that the well will be under when operating at its full permitted injection velocity of 10 feet per second (ft/sec). FDEP permits a 5% loss in pressure during the hour long test in order for the internal mechanical integrity to pass the pressure test.
IW-13 successfully passed the pressure test because the casing only lost 2 psi. The successful results of the pressure test for internal mechanical integrity were reinforced by the results of the second internal mechanical integrity test, the TV survey of the casing. The TV survey confirmed that the casing and the casing joints are in good condition and that the well has internal mechanical integrity down to 2,400 ft bls.

The external mechanical integrity was investigated using two test procedures, a Radioactive Tracer Survey (RTS) and a Temperature Log. Results of the RTS confirmed the integrity of the cement around the casing and the continued competence of its seal with the geologic strata. The temperature test showed that there are no anomalies that would indicate points where injected fluids could escape through the casing and cement into the formation. Similarly there were no temperature anomalies that would indicate injection fluids entering the formations at other than the approved injection depth.

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Section 1

1. INTRODUCTION

1.1 BACKGROUND

On October 12, 2012, (see Appendix A) the Miami-Dade Water and Sewer Department (MDWASD) submitted the County's proposed plan and testing specifications for conducting the mechanical integrity tests (MITs) and repairs on some of the injection wells at the South District Wastewater Treatment Plant (SDWWTP) site (see Figure 1) to the Florida Department of Environmental Protection (FDEP). The plan, represented by the specifications, described the step-by-step procedure to be followed and included the testing schedule required to meet the 5-year MIT re-testing conditions of the FDEP permit for each of the injection wells. After receipt of these documents, the FDEP Staff reviewed the proposed plan and sent an approval on June 5, 2013 (see Appendix B).

The contract documents for conducting the MITs were let out for bids, and the winning bid was submitted on February 28, 2013 by Youngquist Brothers, Inc., a well drilling contractor from Ft. Meyers, Florida. After the contract was approved by the Board of Country Commissioners and signed by the County Manager, the MDWASD issued the notice to proceed on May 17, 2013 and the contractor began mobilizing to the site.

1.2 PURPOSE AND SCOPE

The purpose of this report is to provide FDEP with a document that describes the re-testing procedures for mechanical integrity applied to each of the SDWWTP deep injection wells (see Figure 2). The report also presents the field reports (see Appendix C), and the results of the tests in a single volume for ease of reference. The mechanical integrity re-testing operations involved conducting a pressure test on the well casing to show that there are no leaks in the casing, and conducting a TV survey on the well to reinforce the data from the pressure test. The re-testing includes tracking a radioactive liquid-tracer (iodine isotope I-131) injected down the well to show that there is no fluid movement upward behind the casing, into underground sources of drinking water (USDW). The radioactive test information is reinforced with temperature logs run on the well. Gamma ray logs are used to detect the movement of the radioactive tracer.

Figure 1. South District Wastewater Treatment Plant Site

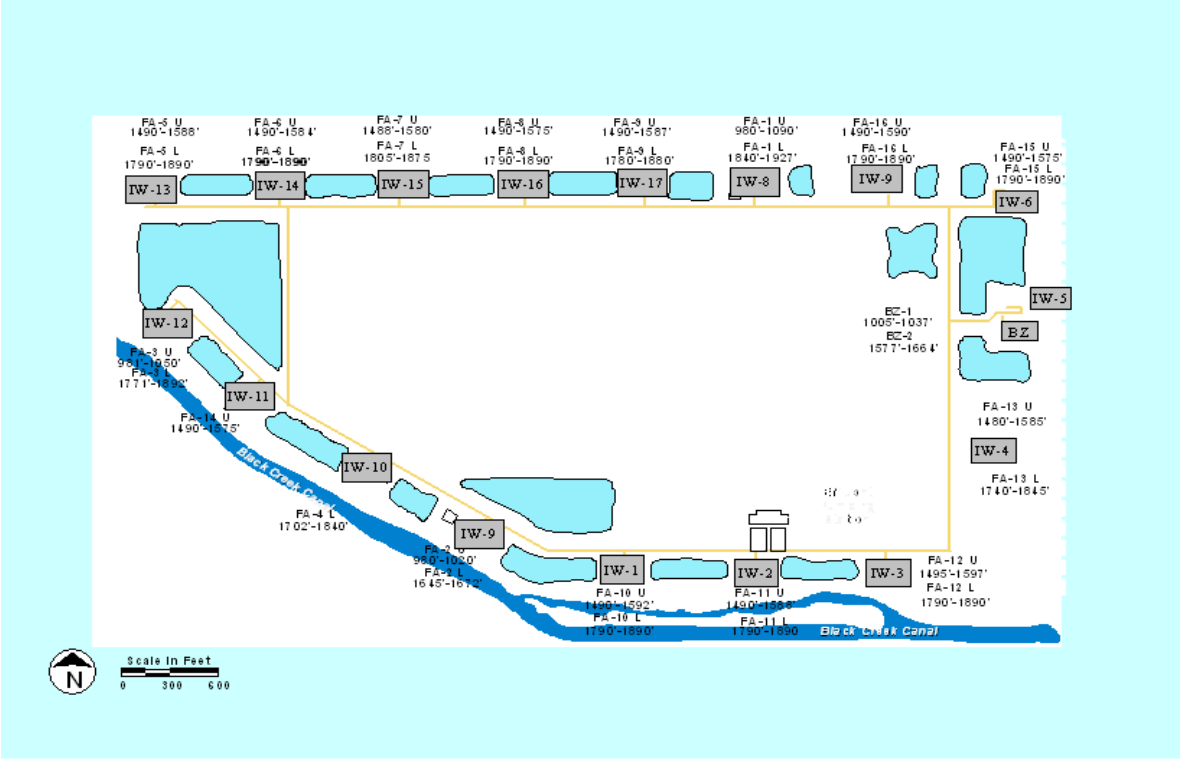


Figure 2. Well Locations Layout

Section 2

2. MECHANICAL INTEGRITY TESTING (MIT)

2.1 METHODS USED

The MIT program is designed to test two elements of the injection well system: 1. Internal integrity and 2. External integrity. The first test element, the internal mechanical integrity test of the well, tests the condition of the injection casing. The second test element, the external mechanical integrity test of the well, tests for leaks outside the casing. This is achieved through a series of field tests including a pressure test and a TV survey for the internal testing, and the temperature log, gamma ray log and RTS survey for the external testing. The first test element, the internal mechanical integrity test, tests for leaks in the injection pipe (casing). The second test element tests for leaks in the annular space outside the casing (cement-filled space between the periphery of the drilled hole and the casing) and in the near-to-the-well geologic strata.

2.2 CASING SCRUBBING

Because the mechanical integrity of injection wells has to be tested every five years, and because a TV inspection of the well is part of the test requirements, MITs provide a timely opportunity to clean the well of deposits that may have formed on the inside of the casing during the intervening years and at the same time provide a cleaner casing for the TV inspection. Cleaning the inside of the well casing is achieved by running a scrubbing brush up and down the casing. However, before the cleaning can be performed, flow out of the well must be controlled. The column of water inside the casing is fresh water and results in a positive hydraulic head inside the well. That head must first be controlled to prevent water from flowing out of the well during the cleaning operation.

2.2.1 Flow Suppression

Suppression of the fresh water head was achieved by first pre-mixing water with salt (NaCl) to form a heavy brine, and then pumping the brine down the well casing, through a 6-inch gate valve on the wellhead. This procedure results in the displacement down the well of the fresh water at the top of the column and replacement of the displaced fresh water with the brine solution. An equal volume of fresh water is displaced out of the well at the bottom of the casing. The procedure is repeated until the pressure head inside the well is suppressed. This method of displacement is used because it achieves flow suppression without first having to open the well to insert a tremie pipe to the bottom of the casing for introduction of the brine. This displacement method also provides a safe way of “killing” the well that at the same time reduces the volume of injected salt solution that would enter the formation at the bottom of the well. One additional advantage is that using this method the brine can be recovered and reused in flow suppression at other wells.

The brine was prepared in 1,000-gallon (gal.) batches by mixing the salt from a 2,000-pound (lbs.) sack in a 1,000 gal. tank of fresh water. The 1,000 gal. solution was then pumped down the well before other similarly mixed batches of salt solution were mixed and pumped down the well (see Figure 3). In the end, the operation was repeated 13 times, and a total of 13 sacks (approximately 26,000 lbs. of salt) were used to suppress the head in the well. This salt concentration represents a theoretical specific gravity of 1.239 for the brine, calculated from the salt solution used in the field of 10.3 lbs per gallon. The 26,000 lbs of salt suppressed the pressure head from approximately 26 feet above the top of the casing to approximately 15 feet below.

Figure 3. Flow Suppression Equipment

2.2.2 Scrubbing Operation

The brush used to clean the casing is made with an old drill rod that has an outside diameter of 7 inches with thick steel wire inserted and secured sticking out of the drill rod. The total diameter of the brush with the steel wire bristles is 24 inches. The brush is attached to the bottom of the packer and inserted into the well (see Figure 4). A 24-inch flange was bolted to the top of the well and pressure fittings installed to be used for packer inflation later on in the process. Then Youngquist lowers the brush and packer by attaching drill rods to the top of the packer and then raising and lowering the brush several times using a 50 ton crane. This process was repeated until the casing was scrubbed and the packer was at the depth required to perform the packer test on the well.

Figure 4. Scrubbing Brush and Hydraulic Packer

2.3 INTERNAL MECHANICAL INTEGRITY (CASING TESTS)

2.3.1 Pressure Test

After the pressure head was suppressed and the casing scrubbed, and the top of the inflatable packer was placed at a depth of 2,351 ft bls. This well is cased to a depth of 2,400 ft bls so the packer is in the bottom 50 feet of the casing. Additional pressure fittings were installed on the flange to pressurize the casing with water. A bleeder valve atop the 24-inch flange allows passage of the drill pipes that support the packer without loss of pressure in the casing (see Figure 5). A pretest was conducted on the casing to determine that the pressure was holding and that all the installed testing equipment was operating properly, then FDEP was informed that the well was ready for their inspection. The next day, August 1, 2013, the pressure test was repeated in the presence of FDEP Staff. The packer had been previously sealed against the casing, at an inflation pressure of 380 pounds per square inch (psi) and at 7:00 AM the casing was pressurized with water to a pressure of 155 psi.

Figure 5. Well-Head and Recorder Set Up for Pressure Test

At 8:10 A.M. the one-hour pressure test was started in the presence of Joseph May, P.G. representing FDEP and witnessed by Sonia Villamil, Maria Macfarlane, and Michael Ashe representing MDWASD, and by Chris Harp and others representing the drilling contractor. The pressure test ran for the required one-hour period. The pressure deviation (loss) in that time was 2 psi, well below the 7.5 psi deviation allowable under the 5 % criteria in the rules (see Table 2-1). The packer inflation pressure and the pressure in the casing were measured using certified gages (see Appendix C) graduated from 0 to 200 psi in increments of 1 psi. The pressure was read in person and recorded by hand at five minute intervals during the test. The pressure was also recorded on an In-Situ pressure transducer attached to the stand with the pressure gauges (see Figure 5).

Table 2-1 Casing Pressure Readings

Time	Casing Pressure (psi)	Pressure Change (psi)	Packer Pressure (psi)
8:10	155	0.0	380
8:15	155	0.0	380
8:20	155	0.0	380
8:25	154.5	0.5	380
8:30	154.5	0.0	380
8:35	154.5	0.0	380
8:40	154	0.5	380
8:45	153.5	0.5	380
8:50	153.5	0.0	380
8:55	153.5	0.0	380
9:00	153	0.0	380
9:05	153	0.0	380
9:10	153	0.0	380

2.3.2 Bleed-Off Calculations

At the completion of the pressure test the casing pressure was bled-off and the discharged volume from the bleeding was measured (see Table 2-2). Bleeding until the pressure resulted in zero flow produced approximately 29 gallons. This exercise provides a reasonable assurance that the packer is placed at the depth in the well that is within the last 50 feet of the casing.

Table 2-2. Bleeding Volumes versus Pressure

Bled Volume (gallons)	0	5	10	15	20	25	29
Casing Pressure (psi)	153	125	98	72	50	18	0

2.3.3 Television Survey

A closed circuit color television camera, encased in a pressure vessel capable of withstanding the pressures exerted at the depths to be televised, and equipped with a fish-eye lens, was introduced into the well through a pack-off stripper device on a standpipe above the injection well (see Figure 6). The camera is centralized in the casing, and is preceded down the well with a light source attached below the camera. The camera televises a view of the full circumference of the inside of the casing and the image is recorded on video tape. Prior to the video survey, the well was scrubbed and flushed with potable water to provide the best picture possible. The video

survey began at land surface and continued down to 2,931.5 feet, where the camera runs into an obstruction, but the hole below seems open below the partial obstruction where the tool was stuck. At selected intervals of interest, the camera was used to pan the intervals in a horizontal format prior to continuing the normal vertical recording.

A review of the video (see Appendix F) indicates that the casing is in good condition down to 2,405 feet. The video also shows that the scrubbing operation was successful. The scrubber has scrubbed the casing free of all growth down to 2,389 feet and this is confirmed by visible vertical scratches throughout that length of the casing; indicating that the scrubber had brushed the steel casing effectively. All the scratches are superficial, and do not detract from the physical and mechanical integrity of the casing. There are no gouges, grooves, nicks, or other physical damage visible in the casing for its whole length. Below 2,384 feet the casing was not scrubbed to avoid hanging the scrubber with the edge of the bottom of the casing at 2,405 feet.

In summary, the video picture meets the quality standards that are needed for a visual evaluation of the well. This video survey presents a clear view of the casing and of the welded joints of the casing. All the joints are clean and appear to be tight. From the TV survey it is concluded that this casing is in good condition throughout its whole depth from land surface to 2,405 feet.

Figure 6. Television Survey (Standpipe and Logging Truck)

2.4 EXTERNAL MECHANICAL INTEGRITY (CEMENT AND FORMATIONS)

The external mechanical integrity test consisted of two low flow dynamic tests The RTS and temperature survey, conducted on August 9, 2013, for the external mechanical integrity portion of the test was witnessed by the representative of FDEP (Joseph May, P.G.), by representatives of MDWASD (Sonia Villamil and Maria Macfarlane) and by representatives of the contractor (Luis Morey).

2.4.1 Radioactive Tracer Survey (RTS)

The radioactive tracer survey uses an isotope of iodine (I-131) as a tracer of water movement inside and outside the casing. Iodine –131 is used because it is a radioactive isotope commonly used in medical practice and therefore it is more easily available and lower in cost than other potential tracers. I-131 also has the advantage of having a half-life of 8 days. That half-life is quite suitable because it is long enough to allow time for transportation to the well site with little decay but also short enough so that it would quickly be reduced if there were any unexpected spills or if there were mechanical failures through which the isotope could travel with the water. The radiation levels of I-131 at the concentration used for RTS testing is in millicurie-range, which if it were considered a waste, would be characterized as a low level waste by the US Atomic Energy Commission.

The I-131 is first loaded into a container located in the logging tool. This container is electronically activated from the logging truck to eject the desired quantity of tracer at the desired depth through an ejection port. In addition to the tracer container, the logging tool is also assembled with three gamma ray detectors. One detector, the top gamma ray detector (GRT), is located 10 feet above the ejector. The other two detectors, the middle one (GRM) and the bottom one (GRB) are located immediately below the ejector at about 3 feet and 12.4 feet below the ejector respectively. The bottom of the logging tool also includes a temperature tool at the very bottom, and a casing collar locator (CCL) 1 foot below the GRM. Figure 7 shows the configuration of the RTS logging tool. The RTS log in the appendix (Appendix D) shows the distances between each of the logging tool components described above.

2.4.1.1 First Low Flow Dynamic Test

Prior to starting the low flow dynamic test, a background gamma ray log was conducted to establish the natural conditions. It was conducted right after the temperature log. Since the temperature log was run downward starting at land surface, the temperature log had ended with the logging tool at the bottom. The background gamma ray log was conducted from the bottom (2,426 feet) up to the surface. Although the camera was able to go down to 2,931 feet the logging tool used for the RTS and temperature log could not go down below 2,426 feet bls. It is possible that because the tool is not centered, it got stuck on a ledge or an uneven part of the formation outside of the casing. Because the tool was able to get to the depth needed to eject, the RTS continued.

From the surface, the logging tool was again lowered down the well and the casing collar locator (CCL) used to locate the bottom of the casing. The magnetic coils on the CCL give out a magnetic field and detect a change in the mass. If there is growth on the casing it is harder for the CCL to have a clean line. If the growth has some iron on it, it can cause a sort of interference

with the CCL making it harder for the CCL to find the end of the casing. The CCL shows that the bottom of the casing is at 2,404 feet bls. After the bottom of the casing was located, the well was ready for the low-flow dynamic RTS test.

The ejector port of the I-131container was set at 2,399 feet and 1 millicurie (mCi) of I-131 was released while the flow down the well was kept at a constant rate of 89 gallons per minute (gpm). The logging tool was kept immobile after the ejection of the I-131 and the three gamma ray detectors continued to record in place. One (1) mCi of I-131 was ejected into the well. The middle detector, located 3 feet below the ejector port, picked up the radioactive tracer 32 seconds after the ejection. The bottom detector, which is located over 12 feet below the ejector, picked up the tracer 2 minutes after the ejection. The test ran for 60 minutes and the top detector did not pick up any tracer.

After the first low flow test ended, the tool was then raised up more than 200 feet, to a depth of 2,200 feet, to log out of position to make sure that the tracer did not migrate up the casing or the formation outside of the casing. No migration was detected.

Once the log out of position was conducted and the tool was placed back to depth, no staining on the casing was found which means no interference for the second RTS. Therefore, with the approval of Joseph May, P.G. from FDEP, the well was not flushed prior to the second RTS test.

Figure 7. RTS Tool and Temperature Probe

2.4.1.2 Second Low Flow Dynamic Test

The tool was placed back to a depth were the ejector was located at 2,399 feet with a flow of 95 gallons per minute set down the well. For this test, 2 milicuries of I-131 were ejected into the casing. The middle detector started picking up the tracer about 30 seconds after it was ejected. The bottom detector, which is located over 12 feet below the ejector, picked up the tracer 2 minutes and 8 seconds after the ejection. The upper detector did not pick up any tracer for the duration of the test, which lasted 30 minutes.

After the second low flow test ended, the tool was then raised up more than 200 feet, to a depth of 2,200 feet, to log out of position to make sure that the tracer did not migrate up the casing or the formation outside of the casing. No upward migration was detected.

With the last low flow dynamic test, the mechanical integrity test was concluded, but before bringing the geophysical tools out of the well, the leftover I-131in the container was ejected and the container flushed-clean to insure that any remaining radioactive iodine was well dispersed. The tool was placed at a depth of 2,426 ft bls. The ejector was located at 2,412.5 ft bls, and the remaining Iodine 131 was ejected and the well was flushed with effluent at a rate of over 4,500 gallons per minute to ensure no staining of the tool. The logging tool was then brought up from the bottom and on the way up a final gamma ray log was made. Then the final gamma ray log was compared to the background gamma ray log, and the comparison showed that there are no noticeable differences in the two except for a residual stain at the bottom of the casing where the I-131 had been repeatedly released during the testing, and just below there, where the tracer exited the casing. Injection of water down the well at a rate of 4,500 gpm continued for the next hour to completely flush out the well.

2.4.2 Temperature Log

Youngquist Brothers Inc. conducted the temperature log on August 9, 2013 starting at about 8:10 A.M. and logging down to 2,426 feet. The temperature probe (Figure 7) was run from the surface downward to minimize the disturbing effect of the movement of the logging tool on the temperature of the water in the well. The temperature log was started more than 24 hours after the well had last been disturbed by outside influences. The TV survey was the last disturbance in the well.

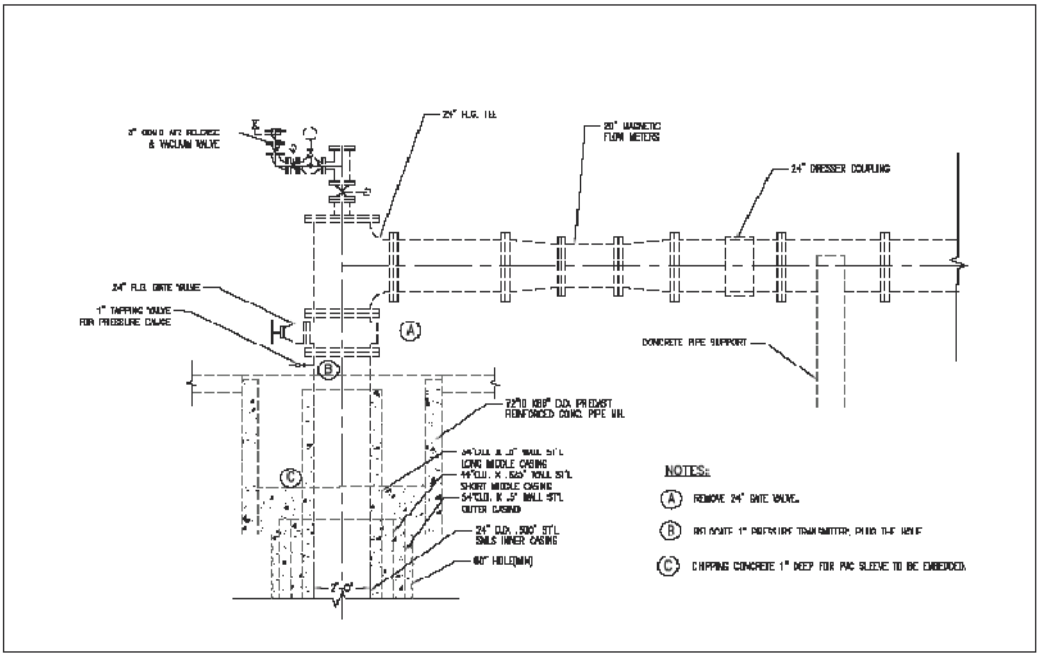
The temperature log (see Appendix H) shows the warmest interval is in the section from 2,350 to 2,400 feet. This is consistent with the higher temperature of the injected water in that interval. The temperature log did not detect any anomalies that would indicate that injection fluids are present outside the casing, and there is no indication of any upward movement of warm injection water either. The similarity of the temperature oscillations in this temperature log (in the interval from land surface down to the bottom of the casing) to those in the temperature logs from previous MITs and to those in the temperature log when the well was constructed, indicates that there has been no apparent change in the cased interval, and no upward movement of the injected water in the last 5 years.

2.5 WELL HEAD REPAIRS AND RE-INSTALLATION

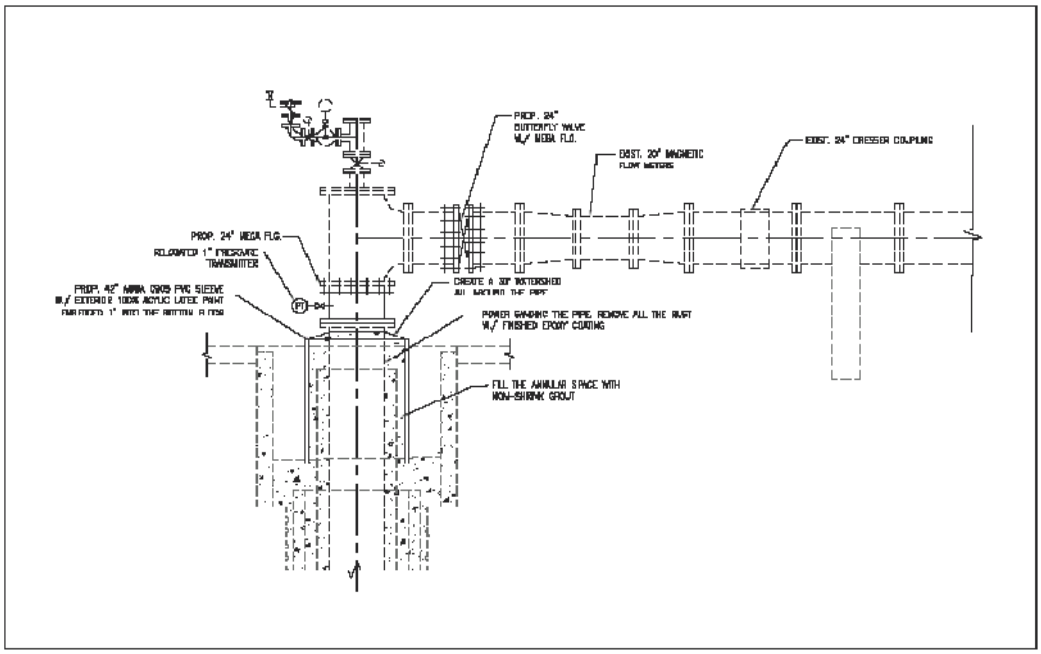
The work associated with the MIT ended when the wellhead was replaced. The air and vacuum release surge check valves were replaced prior to reinstallation of the wellhead. The 6 inch gate valve and air release were replaced. The well had a gate valve on the vertical part of the well before the T. The pressure tap for the instrumentation of the well was below the water line when the sump was full of water. Therefore this well was retrofit to replace the gate valve with a 24" butterfly valve installed on the horizontal pipe coming off the T the well and lift the pressure tap above the water line. A PVC liner was also installed at the base of the sump that protects the 24" OD steel casing from being exposed to FA purge water from the monitoring wells. The PVC was cemented into the bottom of the sump and the annulus was filled with grout to ensure that no water can reach the steel casing. Please see drawings of the retrofit below, Figure 8 and 9.

The wellheads are scheduled to be sandblasted, rust proofed and repainted after the MITs on all the other wells are completed. Injection well IW-13 has been placed back on line and flow from the plant's pump station is again discharging to this injection well, .

Figure 8 Retrofit Well with PVC liner



REPAIR PLAN FOR I-13 TO I-17



PROPOSAL PLAN FOR I-13 TO I-17

Figure 9 Drawing showing before and after layouts for the Retrofit.

Section 3

3. CONCLUSIONS AND RECOMMENDATIONS

3.1 CONCLUSIONS

The pressure test was conducted successfully and it was concluded from the results that there is internal mechanical integrity. This conclusion is reinforced by the analysis of the TV survey down to the injection level at 2,405 feet. The TV survey indicated that the casing is in good condition and that all the casing joints appear to be tight and in good working order.

The two successful RTS conducted at low flow rates indicate that there is no upward movement of water outside the casing. Therefore, it was concluded that the RTS results show that there is external mechanical integrity. The temperature survey reinforced the results of the RTS by showing that there has been no movement of injected water anywhere except the injection zone.

3.2 RECOMMENDATIONS

The successful completion of all the tests for mechanical integrity confirms that IW-13 retains full mechanical integrity and as such it is appropriate to continue using this injection well. MDWASD also recommends that FDEP review the results of the tests presented in this report and based on those results determine that the well has mechanical integrity and may continue to be used for its intended purpose.

Finally, MDWASD recommends that although the well head will not be painted until all the MIT tests are completed on the other wells, IW-13 should receive mechanical integrity certification.

Appendix A

Mechanical Integrity Testing Procedures Submitted by MDWASD to FDEP
October 12, 2012

Miami-Dade Water and Sewer Department
Mechanical Integrity Testing Procedures

Miami-Dade Water and Sewer Department
Mechanical Integrity Testing and Repair Procedures
October 12, 2012

MECHANICAL INTEGRITY TESTING and REPAIR PLAN (SDWWTP and NDWWTP Injection Wells)

General Information

The Contractor shall carefully coordinate his activities with the Department to minimize interference with any existing operations or the operations of the Department. Department forces will isolate the well and turn over to the Contractor. Existing valves shall only be operated by Department personnel. The Contractor's personnel, under no circumstances, shall operate any such valve.

The Contractor shall provide all barricades and/or flashing warning lights necessary to warn workers and employee of the testing throughout the Project. This shall be done at the Contractor's expense and to the satisfaction of the Engineer. Every effort must be made to reduce inconvenience and nuisances to a minimum.

The Contractor shall at all times, use the assigned entrance to the Plants to bring in materials, equipment etc. required for the Project. Materials and equipment shall be stored in areas designated by the Engineer, and shall not interfere with the daily operations at the site or with other Projects. Suitable platforms shall be used for material storage to prevent damage to the landscaping. The Contractor shall exercise extreme caution when transporting equipment or materials within the Plant area.

The conveying vehicles shall be properly selected, and equipped, to prevent damage to paved areas, landscaping and other existing facilities including wells, well pads, fencing, underground pipelines, pipe chases, etc. If necessary, suitable wooden skids shall be used to distribute loads, and to prevent damage.

If any of the above existing structures, including the wells, or any other parts of the project area, are damaged, the contractor shall make suitable repairs or replacement at his expense, in a manner described by the Engineer, and to his satisfaction.

The Contractor shall also exercise extreme caution to prevent any spillage of sewage effluent. The County may charge t he Contractor for any cost incurred or penalties imposed on the County as a result of such spillage.

The wells to be tested are Injection Wells IW-l through IW-13 at the South District Wastewater Treatment Plant and IW-1N through IW-4N at the North District Wastewater Treatment! Plant

The Injection Wells have a 24-inch outside diameter (OD), 0.500-inch wall thickness injection casing set to total depths of 2,450 to 2,850 feet below land surface (bls), and were constructed with a nominal 22-inch diameter open borehole extending from the bottom of the casing to approximately 3,000 feet bls.
Except IW-5 at the SDWWTP, has a 20-inch outside diameter (OD), and 0.500 inch wall thickness.

The CONTRACTOR will perform internal and external mechanical integrity tests on the casings of twenty one deep injection wells and perform all appurtenant work in accordance with the above

Contract Documents.

The work shall be performed by a competent crew with equipment that is adequate to complete all phases of the testing and instruments of sufficient accuracy and resolution to identify anomalous responses to the tests. If the CONTRACTOR'S equipment is not capable of satisfactorily performing the work provided for in these specifications, the CONTRACTOR at his own expense shall substitute equipment.

The CONTRACTOR shall have not less than 5 years experience in constructing and testing wells and shall have tested not less than 5 wells of similar type and capacity. The CONTRACTOR shall be licensed by the State of Florida and the license number shall be affixed to all correspondence and reports.

All work shall comply with and be in full conformance with this Mechanical Integrity Test Plan submitted to FDEP together with subsequent response letters for the injection wells at the South and North District Wastewater Treatment Plants and with the appropriate sections of Chapter 62-528 FAC.

If remedial work or re-testing is required prior to final acceptance of the work to meet regulatory requirements and the specifications of the Contract Documents due to defective materials, accident, loss of equipment or equipment malfunction, or for any other cause directly attributable to the CONTRACTOR's actions, the CONTRACTOR shall bear the entire cost of the remediation or re-testing, including all additional materials, labor, and equipment required and any necessary additional Engineering costs. In the event of a problem, the ENGINEER shall be notified immediately, and the following shall apply:

1. The CONTRACTOR shall propose a method of correcting the problem, in writing, to The ENGINEER, who shall review the method of corrective action, and accept the plan in writing before work can proceed.

2. All work on the well must be in accordance with all applicable local, state and federal regulations.

The CONTRACTOR shall notify the ENGINEER a minimum of 72 hours prior to conducting the pressure test, geophysical logging and the radioactive tracer survey so that the ENGINEER and regulatory agency staff can be properly notified.

The CONTRACTOR shall provide all facilities, equipment and materials required for the removal of waste fluids from the well site.

The CONTRACTOR shall kill the well using a dense food- grade salt solution. No barite or mud-based additives shall be used in the well.

The CONTRACTOR shall comply with the OSHA regulations contained in 29CFR Section 1910 for General Industry Regulations and 29CFR Section 1926 for Construction Regulations.

Equipment and Procedures

1. Wellhead Assembly: The stripper head assembly used during the video survey, Geophysical logging, and the radioactive survey shall be bolted to the wellhead above the 6-inch gate valve. The stripper head assembly used must be of sufficient length to house the longest of the wire line tools used for the testing between the gate valve and the pack-off mounted at the top of the assembly. The pack-off must be adjusted so that the tools can be moved freely up and down the well with minimal leakage from the well. The assembly shall include a 4-inch valve and tee, which will be used to inject potable water during the surveys. The assembly shall be fitted with a

pressure gauge for use during the tests.

2. Wellhead Hardware: Should the nuts and/or bolts at the wellhead assembly become stripped during the CONTRACTOR's efforts, the CONTRACTOR shall replace them with equivalent hardware.

3. Water Line: The CONTRACTOR shall provide a potable water supply line for use during the video surveys. This line shall be connected to the existing 4-inch valve on the CONTRACTOR's stripper head. It shall be equipped with a check value to prevent the backflow of effluent into the water supply source. It shall also be equipped with a continuous recording digital flow meter and totalizer capable of measuring flows accurately in the range of 0 to 250 gpm.

Mechanical Integrity Testing (MIT)

The mechanical integrity testing under this Contract shall be accomplished using the following methods and general sequence, however the Contractor shall submit a more detailed sequence to the Engineer for approval before he begins work. The Contractor shall use extreme caution to prevent any loss of equipment, tools or other items into the wells and shall be fully responsible for retrieving any such items immediately, at no expense to the Department. All pressure tests must be conducted in the presence of the Engineer or his authorized representative.

MIT Clean and Pressure Test the Casing

1. The Contractor shall set up all equipment required to prepare for suppressing the density differential pressure, cleaning, performing the pressure test and the radioisotope and closed circuit television surveys.

2. The Contractor shall inject sufficient salt solution into the well to balance the differential pressure and disassemble the wellhead. The brine solution shall remain in the well during the cleaning and pressure testing steps, after which time it shall be transferred to another well if clean enough for reuse, or shall otherwise be disposed of by the Contractor. Under no circumstances shall brine solution be spilled or disposed of on the ground surface, however it may be disposed of into the injection well.

3. The Contractor shall clean the casing before proceeding with the pressure test. The entire length of casing shall be cleaned. If the later television survey indicates insufficient cleaning, the well shall be re-cleaned by the Contractor, at his expense, to the satisfaction of the Engineer. If the television survey must be repeated because of insufficient cleaning, in the opinion of the Engineer, it shall also be at the Contractor's expense.

4. The Contractor shall, when requested by the Engineer, place the packer through a stand-pipe with a packoff device to a point near the top of the well (but within the concrete encasement area) and test its integrity. This shall be accomplished as described in Steps 6, 7, and 8 below. If the packer fails the integrity test it shall be replaced with one that will meet the test. The Engineer is aware that packers have limited inflation cycles and will attempt to minimize the verification of packer operation. However, any integrity failure for which the packer operation can not be eliminated must be repeated at the Contractor's cost. It is anticipated that each new packer will be tested at the wellhead to verify its capacity to seat and deflate.

5. The Contractor shall lower and place the packer to a point within the lower 40 feet of the casing, but not the last 10 feet. The CONTRACTOR will be responsible to assure the proper seating of the packer. A preliminary test shall be performed to ensure proper operation of the test set-up. The CONTRACTOR shall notify the ENGINEER at least 24 hours before running the preliminary test. The test will be run following the same test program as the actual pressure test, as described below. IW-2 at SDWWTP will have the packer placed within 40 feet of the tear in the casing.

6. The Contractor shall inflate the packer to a pressure not exceeding 350 psig over the static condition as measured at the wellhead on a calibrated gauge to create a positive seal.

7. The Contractor shall pressurize the casing to 150 psig with no air in the casing or wellhead. The pressure shall be recorded on a chart and signed by the Engineer, the Contractor and any witnesses present. The pressure test gauge shall be calibrated within 6 months of performing the pressure test. The CONTRACTOR must present proof of calibration of the pressure gauge to the ENGINEER and FDEP staff at the time of testing each well. The pressure gauge must be mounted at or near eye level in order to ensure maximum visibility.

8. The test will be considered successful if the pressure does not change more than 5% psi in one hour.

9. If the test fails, the Contractor shall move the packer upwards for approximately 10 feet, and repeat Steps 6, 7 and 8.

10. If the test still fails, additional repositioning of the packer and repeating of Steps 6, 7 and 8 shall be as ordered by the Engineer. If the test still fails, and subsequent radioisotope surveys indicate no casing failure, it will be presumed that the Contractor's packer did not create a positive seal, and the Contractor shall be required to repeat Steps 4 through 8 at his expense. No payments will be made to the Contractor if it is subsequently determined that the test failure was caused by the seating of the packer. If the packer fails during packer operation verification, it will be concluded that the packer was faulty during any previous test that did not demonstrate casing integrity. The Contractor shall repeat this test at his expense.

11. After pressure testing, measure the depressurization bleed down with a 5 gallon bucket upon release of the pressure in the casing. The bleed down fluid will be properly disposed of by the Contractor.

12. The Contractor shall deflate the packer and withdraw it from the casing.

13. The Contractor shall reassemble the wellhead and connecting piping using new gaskets.

14. Prior to geophysical logging, the fluid used to "kill" the well, or for pressure testing the casing shall be flushed from the well and the well will be shut-in for a minimum of 12 hours.

MIT Video Surveys

A Video Survey inside the injection well casing be performed using the following procedures.

.A 6-inch diameter stripper head assembly will be bolted to the wellhead assembly above the existing 6-inch diameter gate valve. The stripper head will be of dimensions that allow the video operator to put his camera between the gate valve and the pack off and close both the valve and the pack off. The lower part of the assembly shall consist of a 4-inch tee and valve through which potable water may be introduced into the well.
.
Prior to performance of the survey and for a period of 24 hours, fresh water from an adjacent fire hydrant will be introduced into the well through a 4-inch diameter valve located on the stripper head assembly. Fresh water shall be pumped into the well to provide clarity for the survey.

3. If, after 24 hours of pumping potable water into the well, the water quality does not permit a clear picture of the inside of the well, the CONTRACTOR may be required to perform additional pumping services to assure a good survey as specified above.

4. The pumping of the potable water will continue at a rate of approximately 0 to 250 gpm during video surveying. If the open hole portion of the well is not clean, or visibility in any part of the well is poor, the CONTRACTOR shall perform additional pumping services to ensure a good video survey before running another or continuing with the survey.

5. During the video survey, the CONTRACTOR shall stop the camera's progress as instructed by the ENGINEER at depths where there may be potential flaws in the casing or other features to allow for thorough examination at those locations.

Upon reaching the total depth of the well with the video camera and obtaining a video survey satisfactory to the ENGINEER, the camera shall be removed from the well, and the well placed back in service.

MIT Radioisotope Tracer Survey and Temperature Survey

A radioisotope tracer survey shall be used to detect any fluid movement outside of the injection casing from the injection zone into the overlaying aquifers. The tool configuration shown below, or approved equal is required. The tool must be capable of ejecting the radioactive tracer and simultaneously monitoring the gamma ray sensors. No time lag between ejection and monitoring is permitted. A casing collar locator (CCL) shall be positioned below the tool as shown below, to precisely locate the bottom of the casing. Two low flow dynamic test runs, shall be performed. Additional low flow dynamic test runs can be done if results warrant additional testing, as determined by the ENGINEER in consultation with FDEP staff.

A temperature survey log shall also be performed from land surface to the total depth of the well. The temperature log shall be performed logging down at a rate of not more than 60 feet per minute. The temperature survey shall be performed after the well has been "shut in" and stabilized for at least 12 hours prior to the dynamic and static tests.

The Contractor shall perform an initial background gamma ray survey extending from the base of the land surface to the total depth of the well. The background gamma ray log shall be taken at a rate of not more than 60 feet per minute.

After the dynamic tests are completed, another background gamma ray survey shall be taken from the base of the casing to the base of the intermediate casing.

If additional radioisotope tracer survey work is ordered by the Engineer, it will be paid for at the hourly price proposed for additional radioisotope tracer surveys.

Radioactive Tracer Survey (RTS)

A RTS will be performed in the injection well. The tool used for testing will be configured according to information to be supplied by the service company performing the logs and as approved by the ENGINEER. Below is an example of a typical RTS tool that will be used for these surveys. The CONTRACTOR will provide a specific tool configuration with the logs.

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)
			CHD-SDSCHD (SDS) Cable Head	1.00	1.50	5.00
GR#3	23.83					
			GR #3 -GR#3 (GR#3_T) GR#3_TOP	9.33	1.69	50.00
			TREJCT-A (RTS) EJECTOR 14.5' FROM TOOL BOTTOM	3.00	1.69	10.00
			GR #2 -GR#2 (GR#2_M) GR#2_MIDDLE	3.58	1.69	25.00
GR#2	11.17					
CCL	9.63		CCL-000 (000001) RTS_CCL	0.75	1.69	5.00
			TRDET-GR#1 (GR#1_B) GR#1_BOTTOM	8.67	1.69	50.00
GR#1	0.58		TEMP-11116Temp (11116HT)	0.58	1.69	5.00
TEMP	0.17		RTS_TEMP			

Dataset: sdiw1.db: field/well/run1/FINBK
Total Length: 26.92 ft
Total Weight: 150.00 lb
O.D. 1.69 in

RTS tool Typical Configuration

The sequence of the tests shall be as follows:

First Low Flow Dynamic: The low flow run of the radioactive tracer survey shall be performed with a pumping-in velocity of 3 to 5 feet per minute. This would require a volume of between 65 gpm and 108 gpm to be injected during the survey. This is for the 24 inch wells, for Well I-5, which has a 20 inch casing this volume is 44 gpm and 73 gpm. Potable water from the same source as used for the video survey would be used as the most appropriate water supply for this portion of the test.

1) After beginning the flow of water into the well, the tool will be placed at a depth of approximately 5 feet above the base of the final casing, and a slug of 2 millicuries radioactive Iodine 131 is ejected. The tool will remain in place for a period of approximately one hour and the three gamma ray detectors in the "time drive" mode will record the movement of the slug. If tracer is detected at the uppermost detector, indicating potential staining of the tool, the tool may be moved upward to an alternate location.

2) After the one hour waiting period, a log out-of-position will be performed between the ejection point and a minimum of 200 feet above the highest point of tracer detection.

3) Upon completion of logging, the casing will be flushed with 3 to 5 casing volumes of effluent.

4) After flushing, the tool will immediately be run to the base of the casing, then the interval between the ejection point and 200 feet above the highest point of tracer detection will be logged.

Second Low Flow Dynamic: The process described above for the low flow dynamic log will be repeated to include a log out-of-position, a casing flush, and an after flush pass. A slug of tracer greater than or equal to 3 millicuries shall be used as determined by the ENGINEER.

If, during testing, no apparent anomalies appear that may indicate a lack of mechanical integrity in the injection well, the RTS will be concluded. If anomalies do occur, the RTS will be altered to track the radioactive tracer material. After RTS is complete, the RTS tool will be discharged in the injection zone and the well shall be flushed with 3 to 5 volumes of effluent. A second background log will be run from the bottom to the top of the well.

MIT Deadlines (sorted by date MIT pressure test due)

SDWWTP MIT Schedule of Completion

Well	Pressure Test	RTS/Video
IW-2	7/13/2013	7/25/2013
IW-1[1]	7/20/2013	7/31/2013
IW-3	7/24/2013	8/7/2013
IW-9[1]	7/30/2013	8/12/2013
IW-10[1]	8/6/2013	8/21/2013
IW-11	8/20/2013	9/3/2013
IW-12	8/25/2013	9/19/2013
IW-14	9/9/2013	9/26/2013
IW-13	9/16/2013	10/6/2013
IW-4	9/25/2013	10/14/2013
IW-6	9/30/2013	10/20/2013
IW-5	10/19/2013	10/27/2013
IW-7[2]	10/26/2013	1/7/2014
IW-8	11/2/2013	11/12/2013
IW-17	11/11/2013	11/19/2013
IW-16	11/18/2013	12/9/2013
IW-15	12/3/2013	12/16/2013

NOTES:
1.The original video was not clear enough and therefore a new video was done at the end of the MITs at SDWWTP.
2.The Computer failed during the RTS, because the Iodine 131 had already been injected, FDEP and DOH required 46 days b/f the RTS could be redone.

NDWWTP MIT Schedule of Completion

Well	Pressure Test	RTS/Video
IW-1N	3/14/2014	3/26/2014
IW-2N	3/25/2014	4/9/2014
IW-3N	4/2/2014	4/17/2014
IW-4N	4/9/2014	4/24/2014

REPAIR PLAN:

The following repair plans apply to wells at SDWWTP and NDWWTP.

1. Kill well and remove 24 inch gate valve and 4 inch bypass valves. Remove 1 inch pressure transmitter line and weld hold closed. Please see drawings included in below.

2. Sand existing casing in concrete pits and coat with Bitumastic. Please see drawings included in below.

3. Chip concrete around outer casing 1 inch deep, in order to embed PVC sleeve. Please see drawings included in below.

4. Install C905 PVC sleeve around casing pipe, embed 1 inch deep and fill annular space with grout, using Type II Neat cement. Slope top edge to create 30 degree watershed and seal at edges with sealant. Please see drawings included in below.

5. Relocate 1 inch pressure transmitter as indicated in drawings. Weld the hole. Please see drawings included in below.

6. At the NDWWTP IW-1N, IW-3N and IW-4N install new magmeters with any necessary spool pieces to be field determined. Please see drawings included in below.

7. Reassemble wellheads including installation of new 24 inch butterfly valve on horizontal part of well. Mega flanges will be used to ensure the layout of the pipe and the vales match. Please see drawings included in below.

8. On IW-4N at NDWWTP, install electric actuator for butterfly valve at base of injection well. Please see drawings included in below.

Appendix B

FDEP Approval of MIT Plan for SDWWTP and NDWWTP

November 26, 2012

Villamil, Sonia (WASD)

From: May, Joseph [redacted]
Sent: Monday, November 26, 2012 2:40 PM
To: Villamil, Sonia (WASD)
Cc: Vandor, Heidi; Silverman, Mark; Walsh, Virginia (WASD); Goldenberg, Bertha M. (WASD); Fallon Jr., Howard J. (WASD); Arrebola, Vicente (WASD); Macfarlane, Maria (WASD); Oakley, Clint (WASD)
Subject: RE: MDWASD MIT and Repair Plan Submittal

Importance: High

Hello all,

The Department approves the plan with the following understandings:

1) Medicinal grade I-131 should be specified since this solution is filtered to reduce precipitate material, as opposed to regular grade I-131, in the vial causing a tool malfunction. It has been our experience that an activity of ~1mCi/ml has been the easiest to work with in the field.
2) Please contact me a minimum of three days prior to mobilization to each site. Due to the travel time from West Palm Beach to the sites close coordination would be appreciated between myself and a designated contact person from the utility so that each pressure and RTS can be witnessed.

Thank you,

Joe

Please take a few minutes to share your comments on the service you received from the department by clicking on this link. DEP Customer Survey.

From: Villamil, Sonia (WASD) [mailto:[redacted]
Sent: Wednesday, October 17, 2012 9:42 AM
To: May, Joseph
Cc: Vandor, Heidi; Silverman, Mark; Walsh, Virginia (WASD); Goldenberg, Bertha M. (WASD); Fallon Jr., Howard J. (WASD); Arrebola, Vicente (WASD); Macfarlane, Maria (WASD); Oakley, Clint (WASD)
Subject: MDWASD MIT and Repair Plan Submittal

Hello Mr. May,

The MDWASD respectfully submits the attached MIT testing and repair plan for your approval. The paper copy is being sent via regular mail as well.

Thank you,

Sonia Villamil
Engineer II
Miami Dade Water and Sewer Department
3071 SW 38th Ave Room 554-8
Miami, FL 33146
[redacted]
fax: 786-552-8640
miamidade.gov

Appendix C

Field Notes from tests including gauge certification and pressure charts.

MIAMI-DADE WATER AND SEWER DEPARTMENT

MECHANICAL INTEGRITY TESTING OF DEEP INJECTION WELLS AND ASSOCIATED SERVICES

BID NO.: RPQ P0086

PRESSURE TEST IW - 13

August 1, 2013

TIME	CASING PRESSURE (psi)	PACKER PRESSURE (psi)
8:10	155	380
8:15	155	380
8:20	155	380
8:25	154.5	380
8:30	154.5	380
8:35	154	380
8:40	154	380
8:45	153.5	380
8:50	153.5	380
8:55	153.5	380
9:00	153	380
9:05	153	380
9:10	153	380

MIAMI-DADE WATER AND SEWER DEPARTMENT

MECHANICAL INTEGRITY TESTING OF DEEP INJECTION WELLS AND ASSOCIATED SERVICES

BID NO.: RPQ P0086

BREAK OFF TEST IW - 13

August 1, 2013

GALLONS	CASING PRESSURE (psi)	PACKER PRESSURE (psi)
0	153	380
5	125	370
10	98	360
15	72	350
20	50	340
25	18	330
~~30~~ 29	0	320

Top of Packer: _____ feet

Bottom of Casing: 2400 feet

MIAMI-DADE WATER AND SEWER DEPARTMENT

MECHANICAL INTEGRITY TESTING OF DEEP INJECTION WELLS AND ASSOCIATED SERVICES

BID NO.: RPQ P0086

PRESSURE TEST IW - 13

WITNESS LIST

August 1, 2013

NAME	SIGNATURE	COMPANY/AGENCY	TELEPHONE
Joe May	[redacted]	FDEP	[redacted]
Michael Asha		WASD	
CHRIS HALP		YBI	
[illegible]		WASD	

MIAMI DADE B.O.C 2400
SOUTH DISTRICT IW13 TALLY 7-30-13

PACKAR 10.32' ℄
77 JTS 2357.99'
2368.31'
- STICK UP. - 7.00'
2361.31' ℄ OF PACKER.

EXTENT OF BRUSHING WILL BE 2383.54'
BOTTOM OF BRUSH WILL BE @ 2376.54 DURING
THE TEST.

2351.00' Center of packer

Miami Dade South District

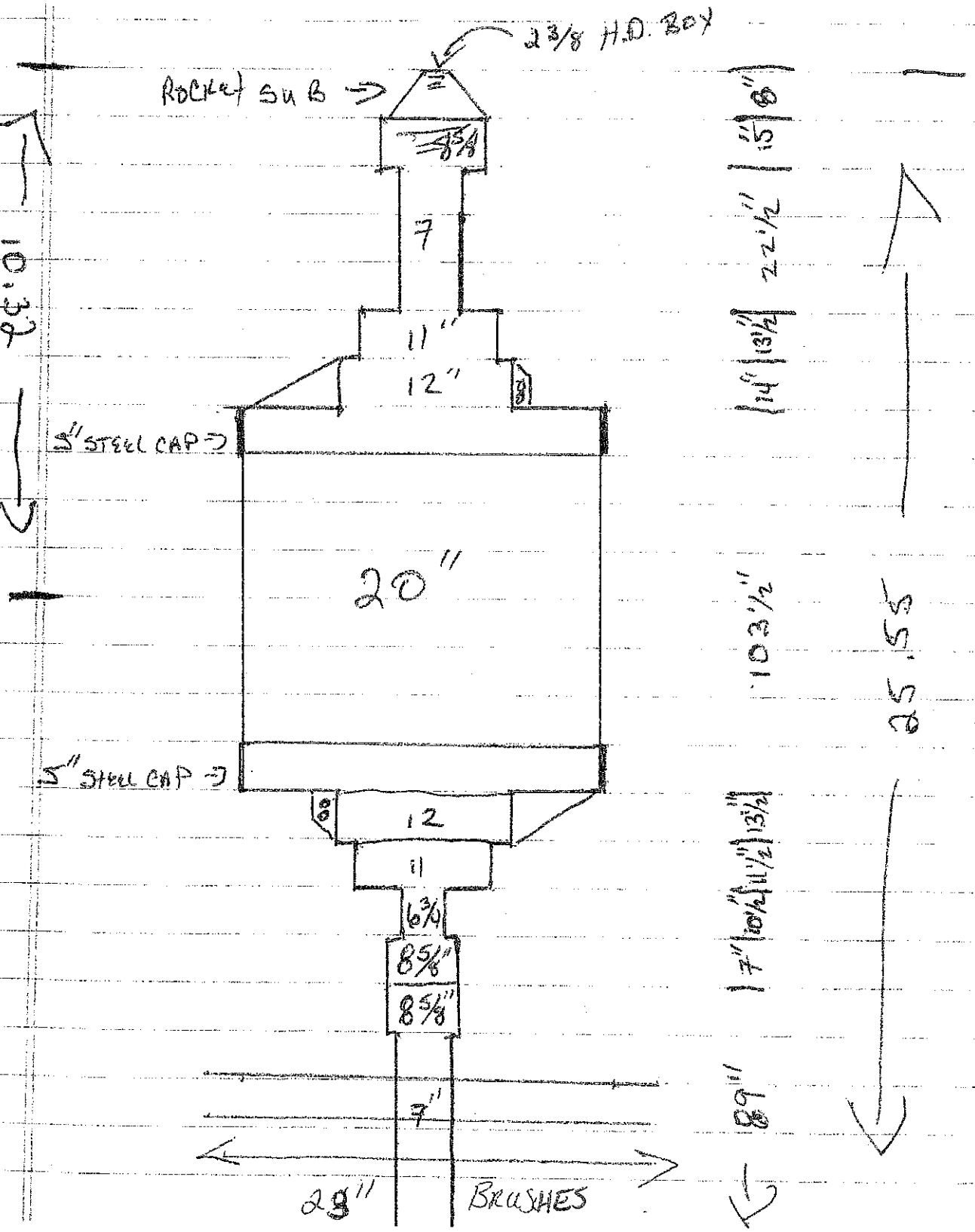
Date: 7-30-13

IW# 13

Packer Tally 236131

Joint #	Length (ft.)	Total Length (ft)	Joint #	Length (ft.)	Total Length (ft)	Joint #	Length (ft.)	Total Length (ft)
1	31.25	31.25	35	30.78	1071.98	68	30.68	2082.55
2	30.62	61.87	36	30.57	1102.55	69	30.57	2113.12
3	30.55	92.42	37	30.56	1133.11	70	30.6	2143.72
4	30.65	123.07	38	30.8	1163.91	71	30.55	2174.27
5	30.54	153.61	39	30.34	1194.25	72	30.53	2204.8
6	30.55	184.16	40	30.63	1224.88	73	30.8	2235.6
7	30.68	214.84	41	30.53	1255.41	74	30.63	2266.23
8	30.55	245.39	42	30.58	1285.99	75	30.53	2296.76
9	30.57	275.96	43	30.78	1316.77	76	30.6	2327.36
10	30.57	306.53	44	30.64	1347.41	77	30.63	2357.99
11	30.56	337.09	45	30.55	1377.96	78	30.56	2388.55
12	30.6	367.69	46	30.8	1408.76	79	30.56	2419.11
13	30.59	398.28	47	30.71	1439.47	80	30.67	2449.78
14	30.85	429.13	48	30.55	1470.02	81	30.6	2480.38
15	30.57	459.7	49	30.53	1500.55	82	30.71	2511.09
16	30.65	490.35	50	30.64	1531.19	83	30.65	2541.74
17	30.58	520.93	51	30.59	1561.78	84	30.55	2572.29
18	30.6	551.53	52	30.6	1592.38	85	30.55	2602.84
19	30.64	582.17	53	30.6	1622.98	86	30.63	2633.47
20	30.6	612.77	54	30.58	1653.56	87	30.74	2664.21
21	30.53	643.3	55	30.53	1684.09	88	30.82	2695.03
22	30.53	673.83	56	30.7	1714.79	89	30.69	2725.72
23	30.82	704.65	57	30.55	1745.34	90	30.6	2756.32
24	30.65	735.3	58	30.68	1776.02	91	30.6	2786.92
25	30.72	766.02	59	30.55	1806.57	92	30.72	2817.64
26	30.6	796.62	60	30.6	1837.17	93	30.53	2848.17
27	30.72	827.34	61	30.75	1867.92	94	30.74	2878.91
28	30.58	857.92	62	30.6	1898.52	95	30.67	2909.58
29	30.58	888.5	63	30.57	1929.09	96	30.63	2940.21
30	30.63	919.13	64	30.63	1959.72	97	30.57	2970.78
31	30.58	949.71	65	30.8	1990.52	98	30.6	3001.38
32	30.67	980.38	66	30.57	2021.09	99	30.53	3031.91
33	30.25	1010.63	67	30.78	2051.87	100	30.65	3062.56
34	30.57	1041.2						

20" PACKER W/ 24" BRUSH. 5-20-13
10.32 ¢ OF PACKER ELEMENT



IW-13

Sensor/Session information

SensorSN	21325011	Modbus Addr.	2
Sensor Type	PT2X	Initialized w/fw R 2. 9	
Sensor Name	INW Smart Sensor	Uploaded	Aqua4Plus 1.9.3
Session Name	1MIN	Exported	Aqua4Plus 1.9.3
# Records	180		
Statistical Data		Temperature(degF)	Pressure(psi)
	Sensor Range	-40 - +125 degC	300 psia

Rec #	Date/Time	Temperature(degF)	Pressure(psi)
1	8/5/2013 8:09	82.1	155.491
2	8/5/2013 8:10	83.3	155.451
3	8/5/2013 8:11	84	155.416
4	8/5/2013 8:12	84.5	155.371
5	8/5/2013 8:13	85.5	155.344
6	8/5/2013 8:14	86.1	155.3
7	8/5/2013 8:15	86.1	155.259
8	8/5/2013 8:16	86	155.22
9	8/5/2013 8:17	86.3	155.187
10	8/5/2013 8:18	87.2	155.151
11	8/5/2013 8:19	87.7	155.117
12	8/5/2013 8:20	88.5	155.072
13	8/5/2013 8:21	89.3	155.036
14	8/5/2013 8:22	89.8	155.003
15	8/5/2013 8:23	90.5	154.968
16	8/5/2013 8:24	90.4	154.928
17	8/5/2013 8:25	90	154.89
18	8/5/2013 8:26	90.6	154.846
19	8/5/2013 8:27	91.3	154.812
20	8/5/2013 8:28	92	154.777
21	8/5/2013 8:29	92	154.737
22	8/5/2013 8:30	92.4	154.704
23	8/5/2013 8:31	93.1	154.67
24	8/5/2013 8:32	93.6	154.636
25	8/5/2013 8:33	93.8	154.605
26	8/5/2013 8:34	93.5	154.556
27	8/5/2013 8:35	93.2	154.517
28	8/5/2013 8:36	93.1	154.488
29	8/5/2013 8:37	93.4	154.445
30	8/5/2013 8:38	93.9	154.412
31	8/5/2013 8:39	93.5	154.374
32	8/5/2013 8:40	93.6	154.333
33	8/5/2013 8:41	93.9	154.301
34	8/5/2013 8:42	94.1	154.259
35	8/5/2013 8:43	94.3	154.228

Rec #	Date/Time	Temperature(degF)	Pressure(psi)
36	8/5/2013 8:44	94.3	154.187
37	8/5/2013 8:45	94.2	154.157
38	8/5/2013 8:46	94.2	154.117
39	8/5/2013 8:47	94.2	154.076
40	8/5/2013 8:48	94	154.057
41	8/5/2013 8:49	94.1	154.016
42	8/5/2013 8:50	94.3	153.975
43	8/5/2013 8:51	94.4	153.944
44	8/5/2013 8:52	94.3	153.914
45	8/5/2013 8:53	94.1	153.875
46	8/5/2013 8:54	93.9	153.835
47	8/5/2013 8:55	93.9	153.805
48	8/5/2013 8:56	94.3	153.772
49	8/5/2013 8:57	94.9	153.739
50	8/5/2013 8:58	95.6	153.705
51	8/5/2013 8:59	95.6	153.675
52	8/5/2013 9:00	95.8	153.633
53	8/5/2013 9:01	96	153.601
54	8/5/2013 9:02	96.1	153.571
55	8/5/2013 9:03	96	153.541
56	8/5/2013 9:04	95.8	153.491
57	8/5/2013 9:05	95.8	153.471
58	8/5/2013 9:06	95.8	153.43
59	8/5/2013 9:07	95.8	153.4
60	8/5/2013 9:08	95.7	153.37
61	8/5/2013 9:09	95.3	153.331
62	8/5/2013 9:10	95.3	153.301
63	8/5/2013 9:11	95.2	149.829
64	8/5/2013 9:12	95	132.049
65	8/5/2013 9:13	95	113.185
66	8/5/2013 9:14	94.3	110.413
67	8/5/2013 9:15	94.1	92.48
68	8/5/2013 9:16	94	93.615
69	8/5/2013 9:17	94.3	68.522
70	8/5/2013 9:18	94.8	72.308
71	8/5/2013 9:19	95.1	59.002
72	8/5/2013 9:20	95.4	49.342
73	8/5/2013 9:21	95.7	45.575
74	8/5/2013 9:22	95.7	28.22
75	8/5/2013 9:23	95.7	16.981
76	8/5/2013 9:24	95.9	14.804
77	8/5/2013 9:25	96.1	6.511
78	8/5/2013 9:26	96.7	2.259
79	8/5/2013 9:27	97.5	0

Certificate of Calibration

OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

Ozone Industries, Inc.
Precision Measurement Equipment Division

Purchase Order #

Calibration Performed By:
OZONE INDUSTRIES, INC.
15551 PINE RIDGE RD.
FORT MYERS, FL 33908

For:
YOUNGQUIST BROTHERS, INC.
15465 PINE RIDGE RD.
FORT MYERS, FL 33908

EQUIPMENT INFORMATION:

Description: PRESSURE GAUGE
Manufacter: MCDANIELS
Model Number: 300PSI
Part Number: N/A
Range: 0-300 PSI

Serial Number: 972062-1
Customer I.D.:
Cust. Barcode: N/A
Cust. Location: N/A
Specifications: +/- 0.25% FS

Cal Date: 6/6/2013
Cal. Due Date: 8/5/2013
Cal. Interval 60 DAYS
Received: IN TOLERANCE
Calibration Result: PASS
Environmental Conditions: 74 DEG F / 20% H
Performed By: Daniel McKissick

Procedure: STANDARD

This is to certify that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure at the points tested (unless otherwise noted). It has been Calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration is in accordance with Ozone Industries, Inc Quality Assurance Manual. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

Calibration Remarks:
THIS UNIT WAS FOUND TO BE IN TOLERANCE AT THE TIME OF CALIBRATION.
PERFORMED ROUTINE CALIBRATION / CERTIFICATION

Standards Used to Calibrate Equipment:

Company	I.D.	Description	Last Cal.	Cal. Due Date
OZONE	A1731	EATON UPC5000 PNEUMATIC CALIBRATOR	12/12/2012	12/12/2013

Signatures:

Certified by:
Print: Daniel McKissick
Date: 06/06/13
[redacted]

Approved by:
Print: Daniel McKissick
[redacted]

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ØZONE
INDUSTRIES
CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

PH: 239-433-3400
FAX: 239-489-3877

CONTROL NO: 032509-1

CUSTOMER: YBI15465

CALIBRATION DATA FORM

MFR:	MCDANIELS	**DESCRIPTION**	PRESSURE GAUGE
MODEL NO:	300 PSI .25%	**TECHNICIAN:**	0030
SERIAL NO:	972062-1	**CAL. DATE:**	06/06/13
CUST. ID:	N/A	**DUE DATE:**	08/05/13

* IF NO "AS LEFT" READING IS SHOWN ON THIS CHART, IT MEANS THE UNIT WAS IN TOLERANCE AND THERE WERE NO ADJUSTMENTS MADE TO IT.

RANGE: 0-300 PSI

NOMINAL	AS FOUND	AS LEFT *	LOW LIMIT	HIGH LIMIT
50	50.26		49.25	50.75
100	100.31		99.25	100.75
150	150.38		149.25	150.75
200	200.49		199.25	200.75
300	300.6		299.25	300.75

Certificate of Calibration

OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

Ozone Industries, Inc.
Precision Measurement Equipment Division

Purchase Order #

Calibration Performed By:
OZONE INDUSTRIES, INC.
15551 PINE RIDGE RD.
FORT MYERS, FL 33908

For:
YOUNGQUIST BROTHERS, INC.
15465 PINE RIDGE RD.
FORT MYERS, FL 33908

EQUIPMENT INFORMATION:

Description: PRESSURE GAUGE
Manufacter: McDaniel
Model Number: 300PSI
Part Number: N/A
Range: 0-300 PSI

Serial Number: 972034-2
Customer I.D.:
Cust. Barcode: N/A
Cust. Location: N/A
Specifications: +/- 0.25% FS

Cal Date: 5/17/2013
Cal. Due Date: 11/17/2013
Cal. Interval 6 MONTHS
Received: IN TOLERANCE
Calibration Result: PASS
Environmental Conditions: 74 DEG F / 80% H
Performed By: Daniel McKissick

Procedure: STANDARD

This is to certify that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure at the points tested (unless otherwise noted). It has been Calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration is in accordance with Ozone Industries, Inc Quality Assurance Manual. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

Calibration Remarks:
THIS UNIT WAS FOUND TO BE IN TOLERANCE AT THE TIME OF CALIBRATION.
PERFORMED ROUTINE CALIBRATION / CERTIFICATION

Standards Used to Calibrate Equipment:

Company	I.D.	Description	Last Cal.	Cal. Due Date
OZONE	A1731	EATON UPC5000 PNEUMATIC CALIBRATOR	12/12/2012	12/12/2013

Signatures:

Certified by:
Print: Daniel McKissick
[redacted]

Approved by:
Print: Daniel McKissick
Date: [redacted] 05/17/13
[redacted]

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ØZONE
INDUSTRIES
CORPORATION

15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

PH: 239-433-3400
FAX: 239-489-3877

CONTROL NO: 100809-7

CUSTOMER: YBI15465

CALIBRATION DATA FORM

MFR:	PIC	**DESCRIPTION**	PRESSURE GAUGE
MODEL NO:	300 PSI .25%	**TECHNICIAN:**	0030
SERIAL NO:	972034-2	**CAL. DATE:**	05/17/13
CUST. ID:	N/A	**DUE DATE:**	11/17/13

* IF NO "AS LEFT" READING IS SHOWN ON THIS CHART, IT MEANS THE UNIT WAS IN TOLERANCE AND THERE WERE NO ADJUSTMENTS MADE TO IT.

RANGE: 0-300 PSI

NOMINAL	AS FOUND	AS LEFT *	LOW LIMIT	HIGH LIMIT
50	49.59		49.25	50.75
100	99.47		99.25	100.75
150	149.45		149.25	150.75
200	199.43		199.25	200.75
300	299.4		299.25	300.75

Certificate of Calibration

OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

Ozone Industries, Inc.
Precision Measurement Equipment Division

Purchase Order #

Calibration Performed By:
OZONE INDUSTRIES, INC.
15551 PINE RIDGE RD.
FORT MYERS, FL 33908

For:
YOUNGQUIST BROTHERS, INC.
15465 PINE RIDGE RD.
FORT MYERS, FL 33908

EQUIPMENT INFORMATION:

Description: PRESSURE GAUGE
Manufacter: MCDANIELS
Model Number: 300PSI
Part Number: N/A
Range: 0-300 PSI

Serial Number: AB30128
Customer I.D.:
Cust. Barcode: N/A
Cust. Location: N/A
Specifications: +/- 0.25% FS

Cal Date: 6/17/2013
Cal. Due Date: 12/17/2013
Cal. Interval 6 MONTHS
Received: IN TOLERANCE
Calibration Result: PASS
Environmental Conditions: 73 DEG F / 40% H
Performed By: Daniel McKissick

Procedure: STANDARD

This is to certify that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure at the points tested (unless otherwise noted). It has been Calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration is in accordance with Ozone Industries, Inc Quality Assurance Manual. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

Calibration Remarks:
THIS UNIT WAS FOUND TO BE IN TOLERANCE AT THE TIME OF CALIBRATION.
PERFORMED ROUTINE CALIBRATION / CERTIFICATION

Standards Used to Calibrate Equipment:

Company	I.D.	Description	Last Cal.	Cal. Due Date
OZONE	A1731	EATON UPC5000 PNEUMATIC CALIBRATOR	12/12/2012	12/12/2013

Signatures:

Certified by:
Print: Daniel McKissick
Date: 06/17/13
[redacted]

Approved by:
Print: Daniel McKissick
Date: 06/17/13
[redacted]

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OZONE
INDUSTRIES
CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

PH: 239-433-3400
FAX: 239-489-3877

CONTROL NO: 080709-2

CUSTOMER: YBI15465

CALIBRATION DATA FORM

MFR:	MCDANIELS	**DESCRIPTION**	PRESSURE GAUGE
MODEL NO:	300 PSI .25%	**TECHNICIAN:**	0030
SERIAL NO:	AB30128	**CAL. DATE:**	06/17/13
CUST. ID:	N/A	**DUE DATE:**	12/17/13

* IF NO "AS LEFT" READING IS SHOWN ON THIS CHART, IT MEANS THE UNIT WAS IN TOLERANCE AND THERE WERE NO ADJUSTMENTS MADE TO IT.

RANGE: 0-200 PSI

NOMINAL	AS FOUND	AS LEFT *	LOW LIMIT	HIGH LIMIT
50	50.18		49.25	50.75
100	100.19		99.25	100.75
150	150.22		149.25	150.75
200	200.31		199.25	200.75
250	250.33		249.25	250.75
300	300.39		299.25	300.75

Appendix D

RTS and RTS Tool Configuration

RADIOACTIVE TRACER SURVEY LOG

Company SOUTH MIAMI-DADE W.W.T.P.
Well IW-12
Field S.D.W.W.T.P.
County MIAMI-DADE
State FLORIDA

Company SOUTH MIAMI-DADE W.W.T.P.
Well IW-12
Field S.D.W.W.T.P.
County MIAMI-DADE State FLORIDA

Location: API # :

SEC TWP RGE

Other Services

Elevation

Permanent Datum	PAD	Elevation	PAD
Log Measured From	PAD		
Drilling Measured From	PAD		

K.B.
D.F.
G.L.

Date	09-AUG-2013		
Run Number	2013 MIT		
Depth Driller	2426'		
Depth Logger	2426'		
Bottom Logged Interval	2426'		
Top Log Interval	SURFACE		
Open Hole Size	22"		
Type Fluid	WATER		
Density / Viscosity	NA		
Max. Recorded Temp.	NA		
Estimated Cement Top	NA		
Time Well Ready	ON ARRIVAL		
Time Logger on Bottom	ON ARRIVAL		
Equipment Number	102		
Location	FT MYERS		
Recorded By	MOREY	RIVES	
Witnessed By	S. VILLAMIL		

Borehole Record				Borehole Record			
Run Number	Bit	From	To	Run No	Bit	From	To

Casing Record	Size	Wgt/Ft	Top	Bottom
Surface String				
Prot. String				
Production String	24"	.500" W.T.	SURFACE	2404'
Liner				

<< Fold Here >>>

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

Comments

HIGH RESOLUTION TEMPERATURE

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)

GR#3	24.00					
			GR #3 -RTST (952T)	11.50	1.69	30.00
			TREJCT-A (952)	1.00	1.69	10.00
			GR #2 -RTSM (952M)	3.00	1.69	10.00
GR#2	10.50					
CCL	9.60		CCL-1.68GRRTS (952)	0.75	1.69	10.00
			GR-RTSB (952B)	9.25	1.69	10.00
GR	1.20					

Dataset: sdwwtp-iw-13.db: field/well/run1/pass3
Total Length: 25.50 ft
Total Weight: 70.00 lb
O.D. 1.69 in

YOUNGQUIST

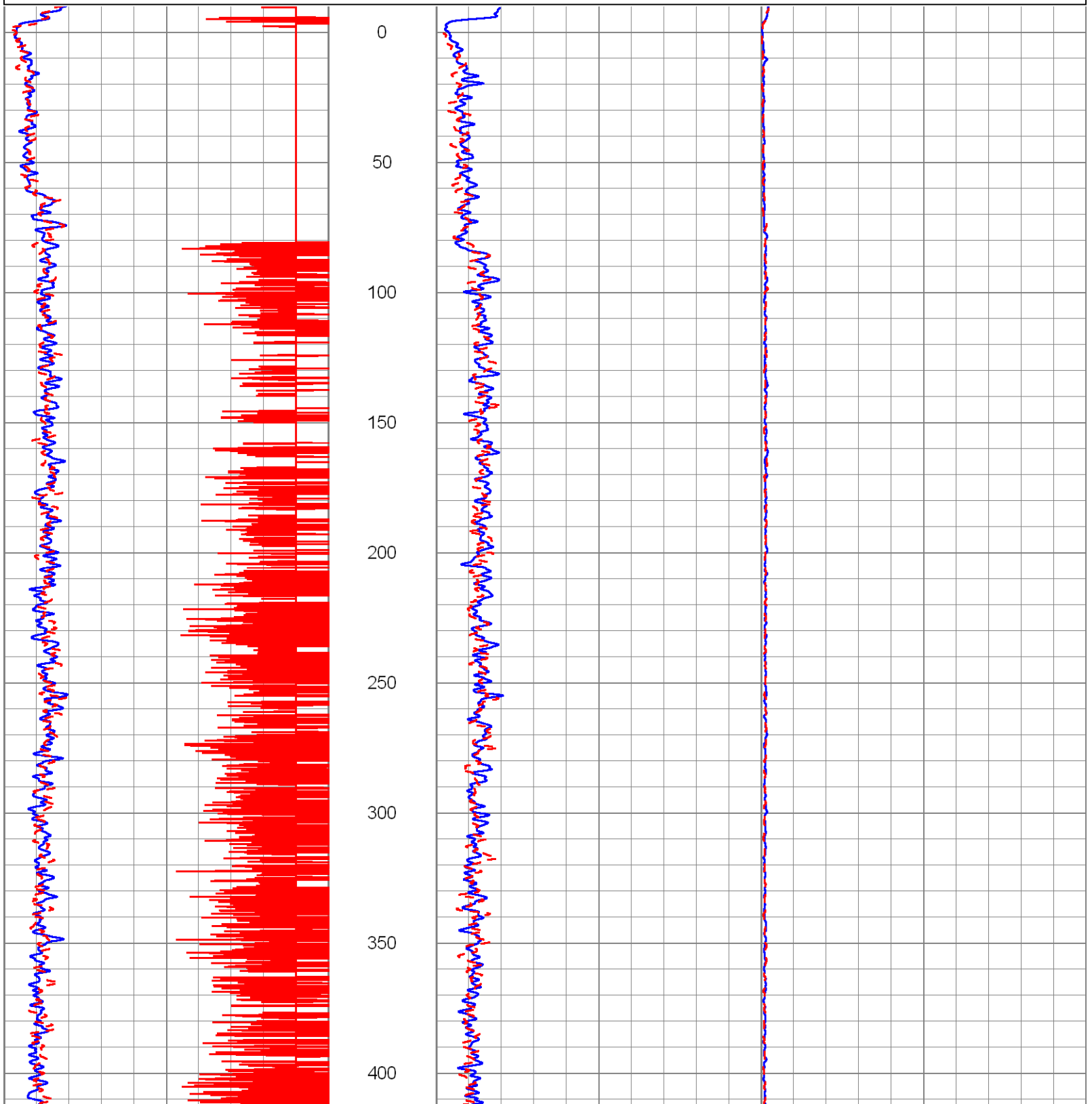
FINAL BACKGROUND

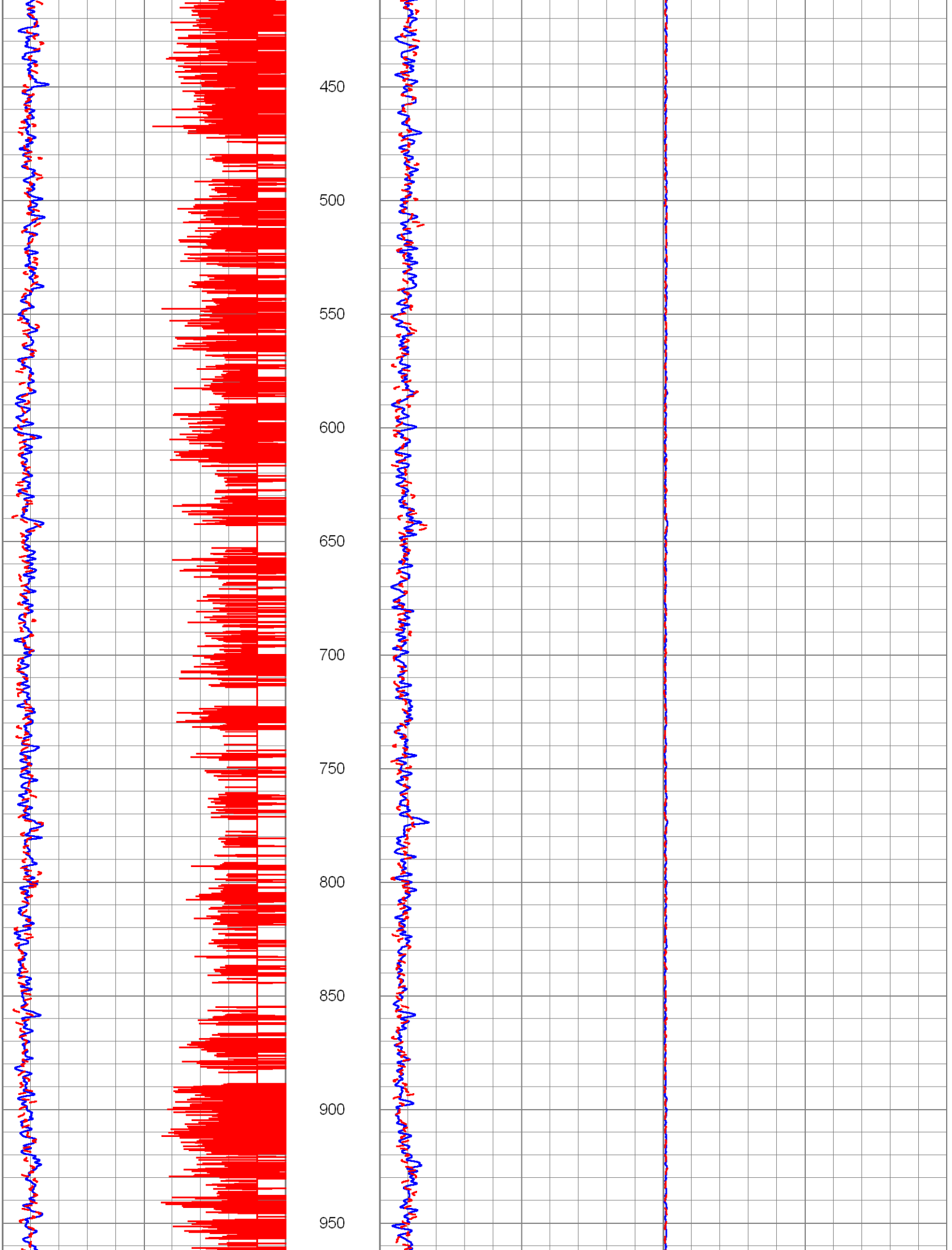
YOUNGQUIST BROTHERS

FINAL BACKGROUND

Database File:	c:\warrior\data\2013\mit\south dade\data base\sdwwtp-iw-13.db
Dataset Pathname:	pass12
Presentation Format:	rts
Dataset Creation:	Fri Aug 09 13:30:24 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:600

0	GRT (GAPI)	100		0	GRB (GAPI)	100	0 GRM (GAPI) 1000
0	GRT-BACKGRND (GAPI)	100		0	GRB-BACKGRD (GAPI)	100	0 GRM-BACKGRND (GAPI) 1000
0.9	CCL	-0.1					

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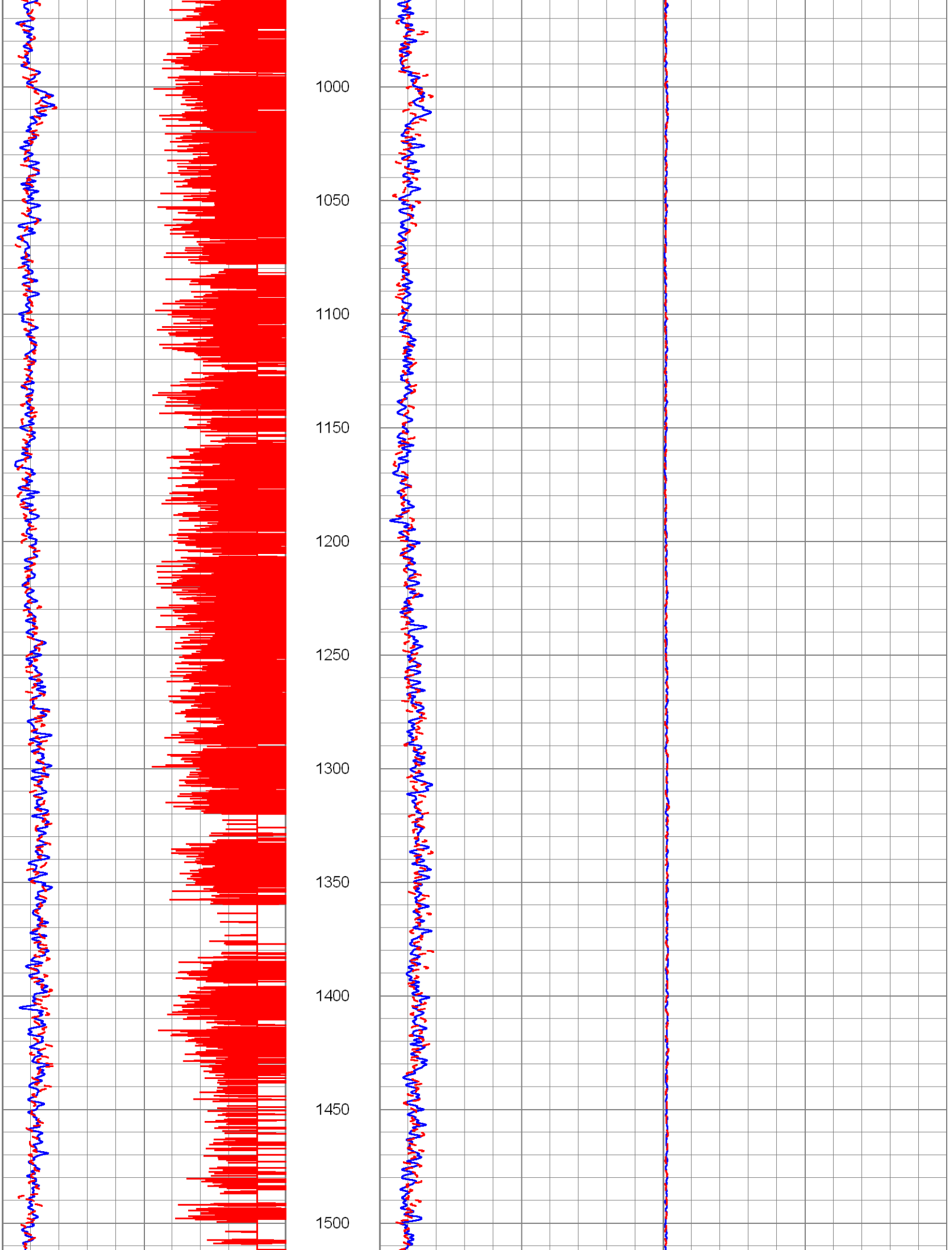
700
750
800
850
900
950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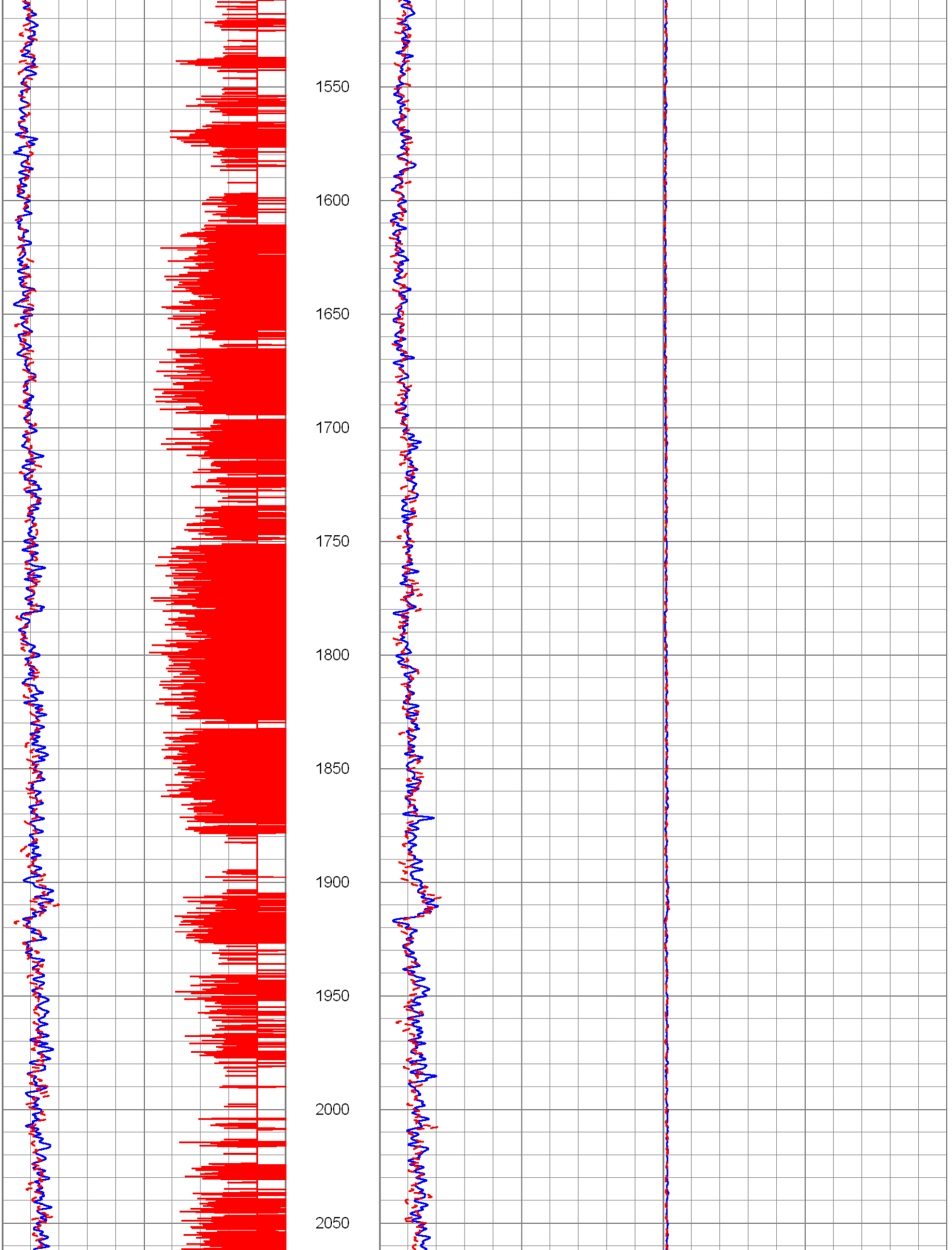
1050
1100
1150
1200
1250
1300
1350
1400
1450
1500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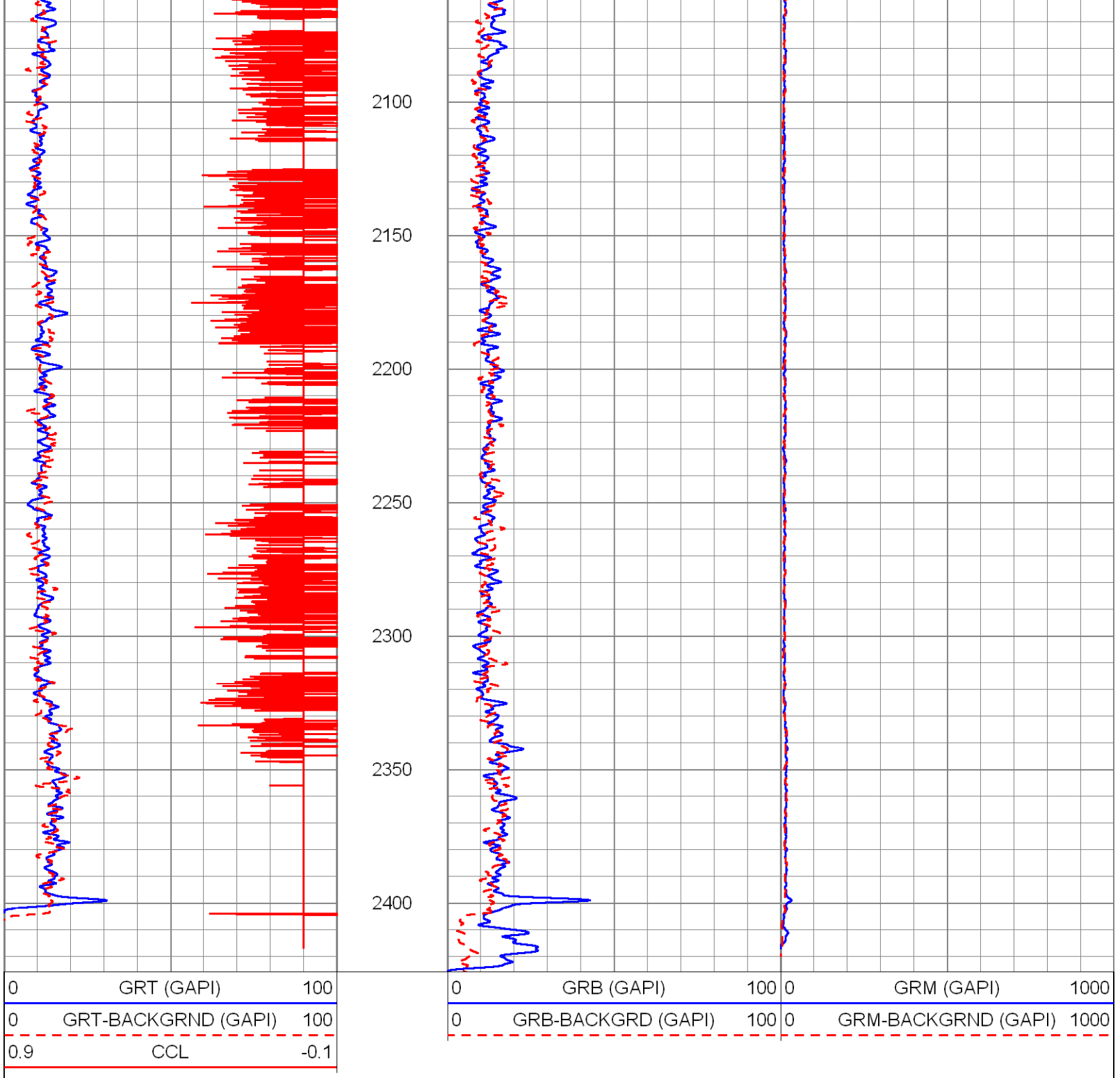
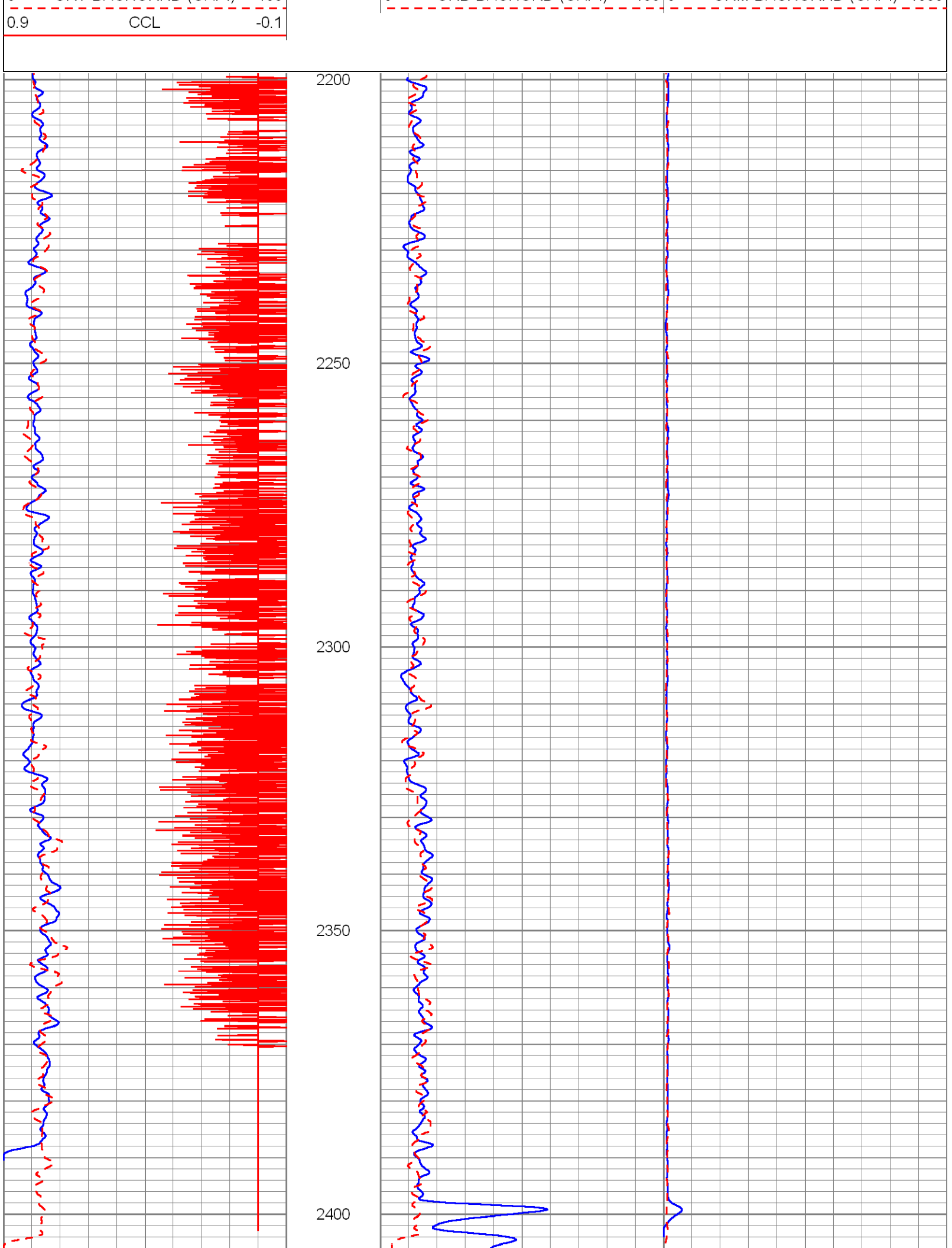
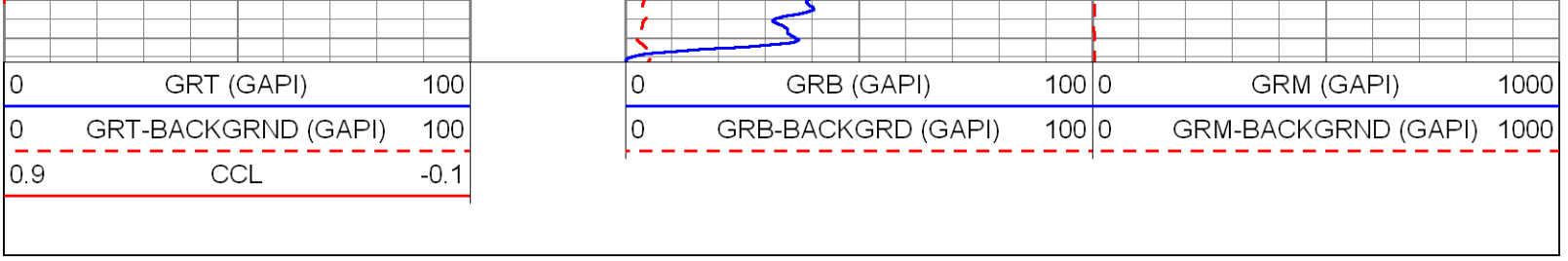
1600
1650
1700
1750
1800
1850
1900
1950
2000
2050



LOP# 2

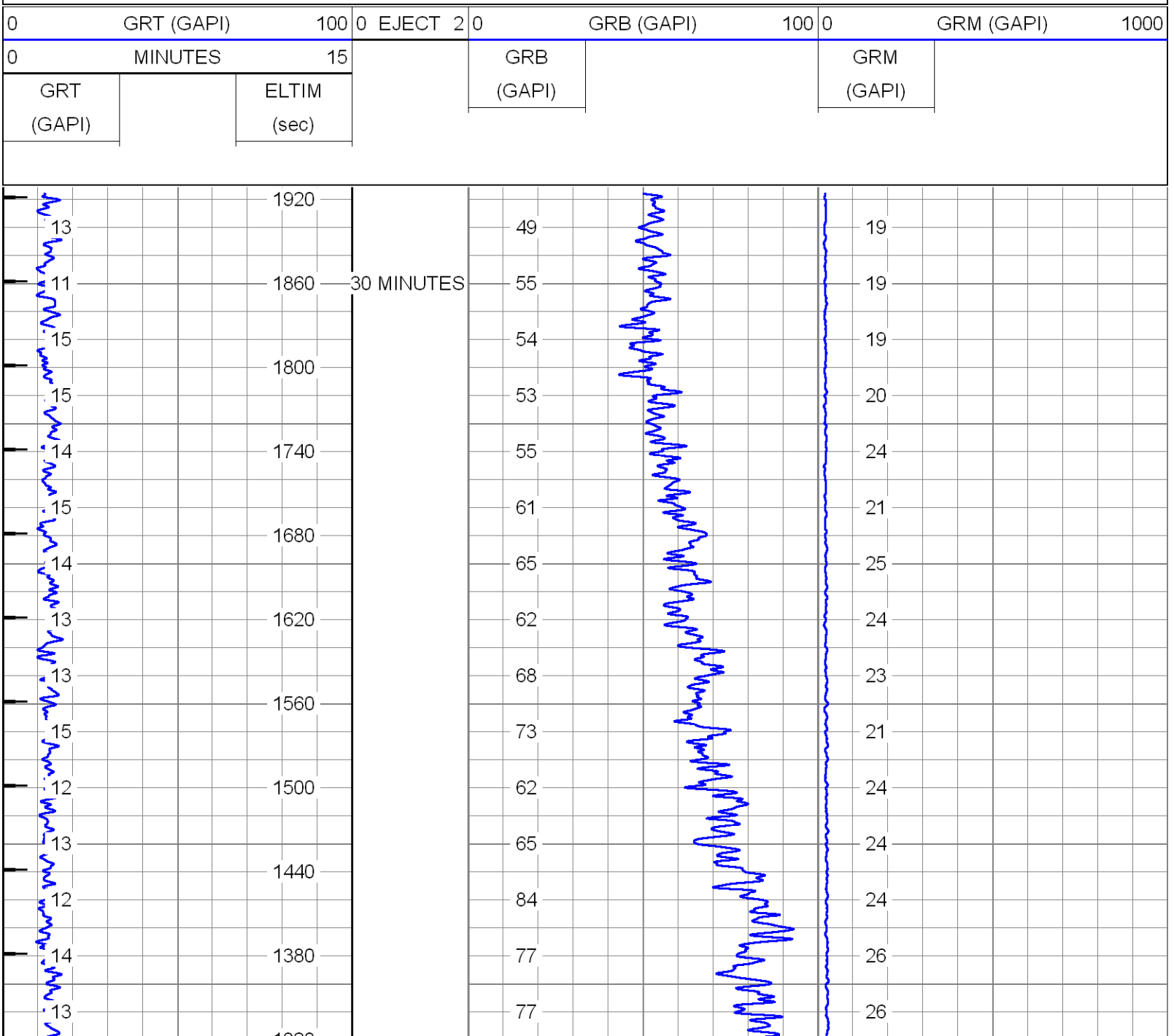
Database File:	c:\warrior\data\2013\mit\south dade\data base\sdwwtp-iw-13.db
Dataset Pathname:	pass11
Presentation Format:	rts
Dataset Creation:	Fri Aug 09 13:07:05 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:240

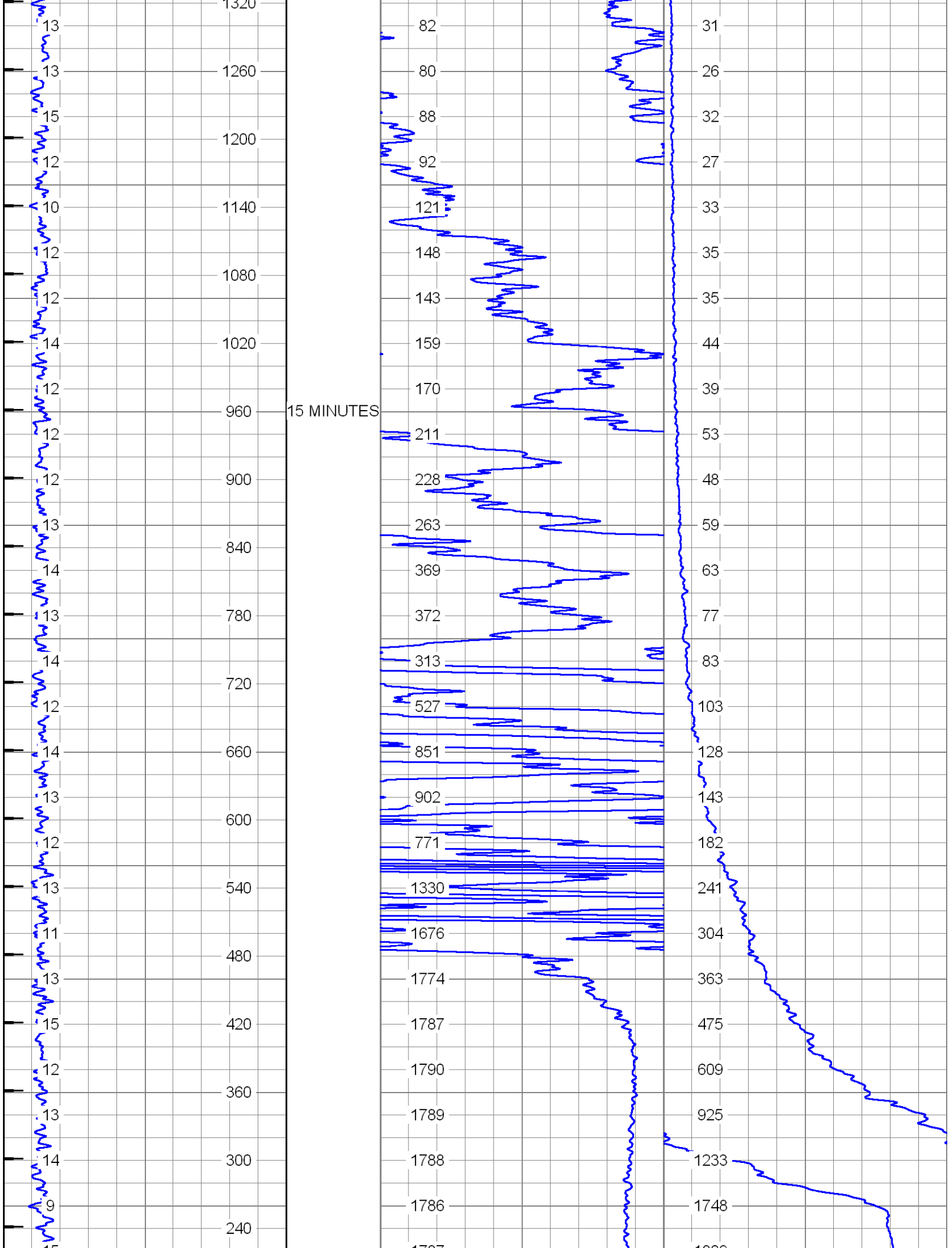

0.9
CCL
-0.1
2200
2250
2300
2350
2400



DYNAMIC TEST# 2 (90 GPM)

Database File: c:\warrior\data\2013\mit\south dade\data base\sdwwtp-iw-13.db
Dataset Pathname: pass9
Presentation Format: rtstime
Dataset Creation: Fri Aug 09 12:32:57 2013 by Log SOC 110722
Charted by: Depth in Feet scaled 1:600

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1260
1200
1140
1080
1020
960
900
840
780
720
660
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480
420
360
300
240
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228
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369
372
313
527
851
902
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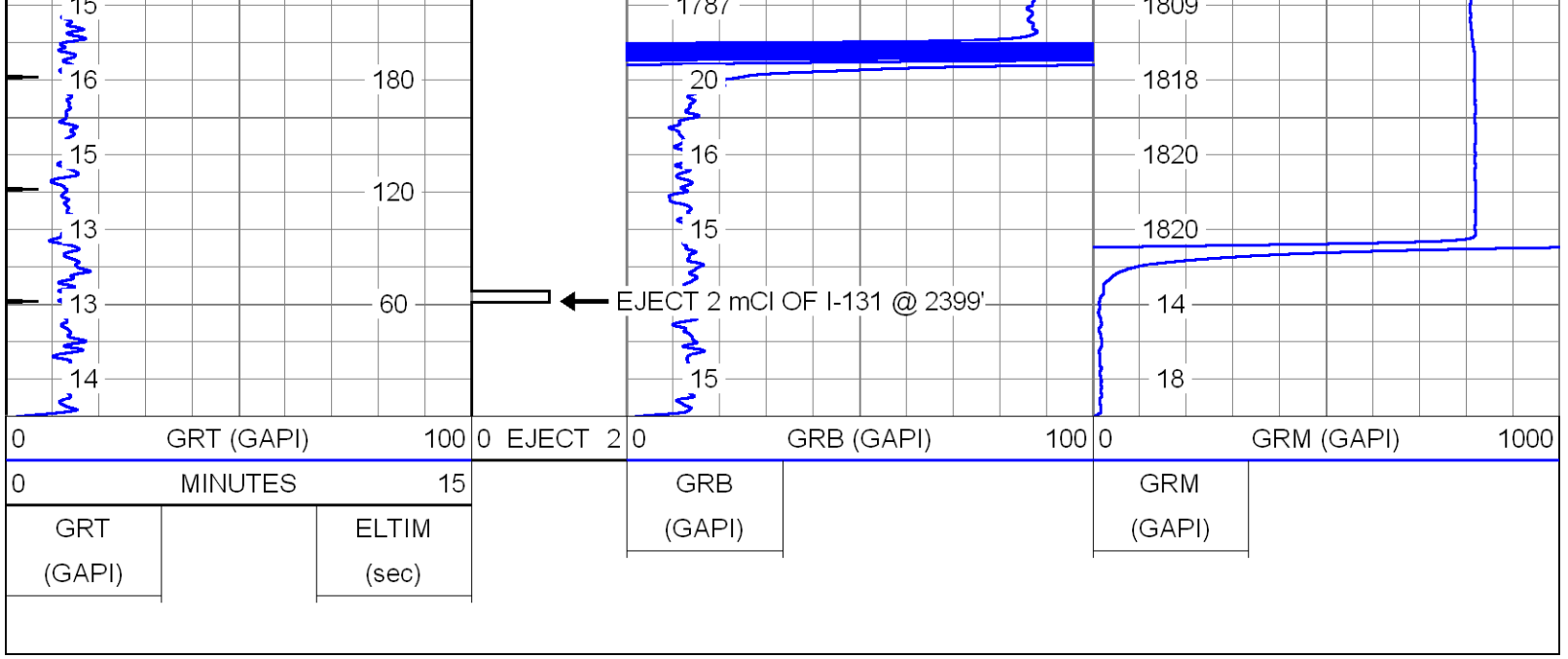
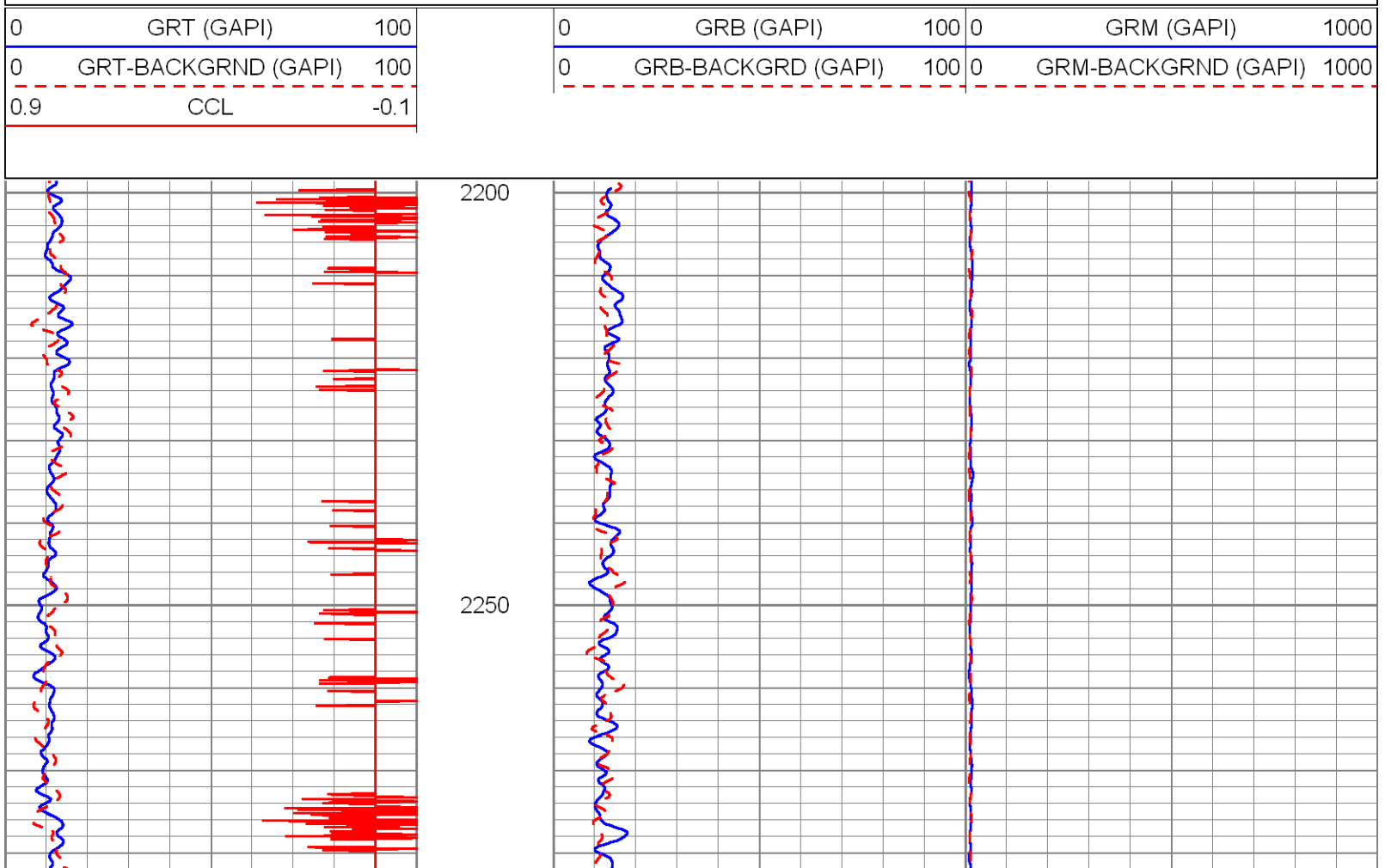
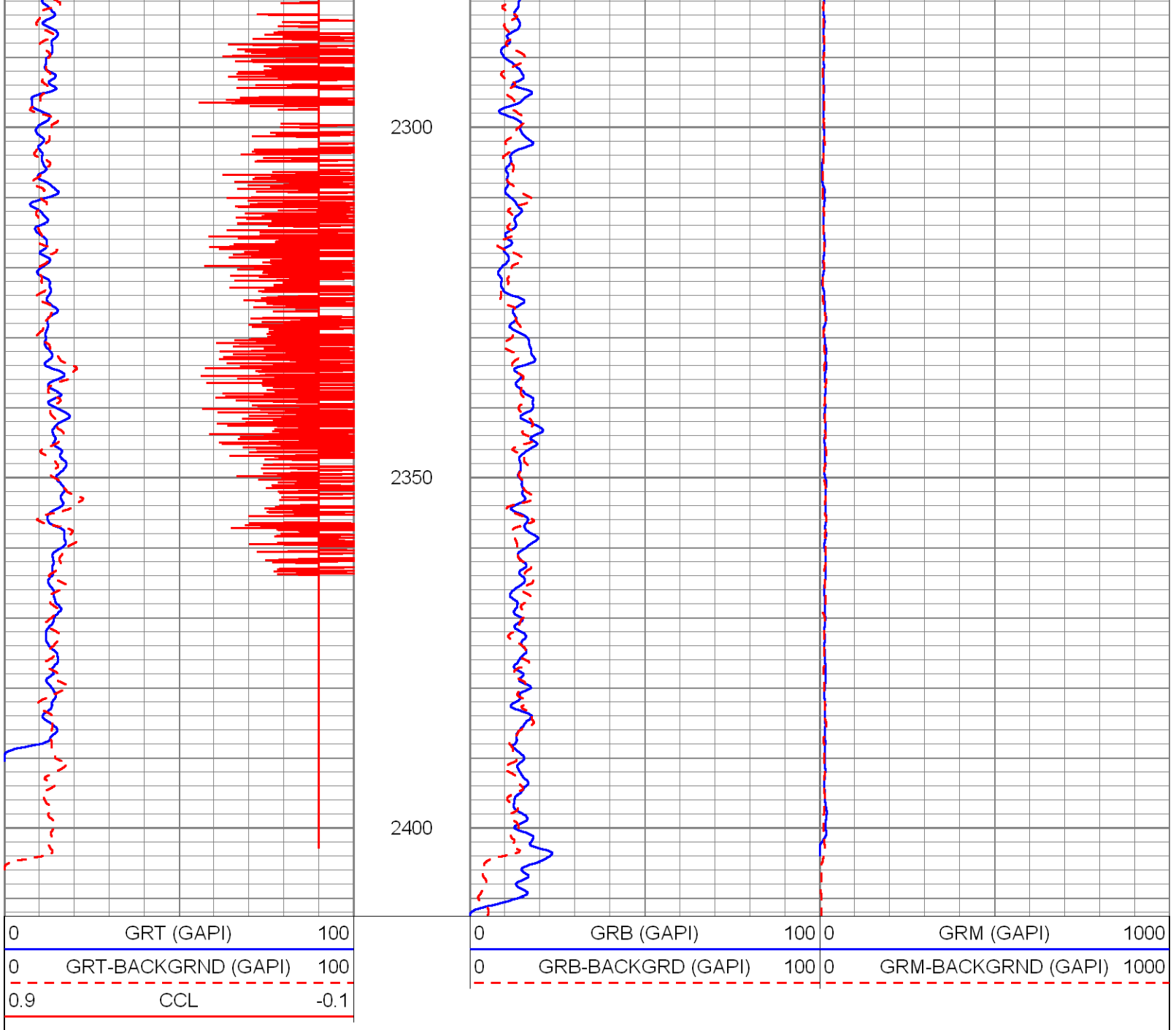
609
925
1233
1748



LOP #1

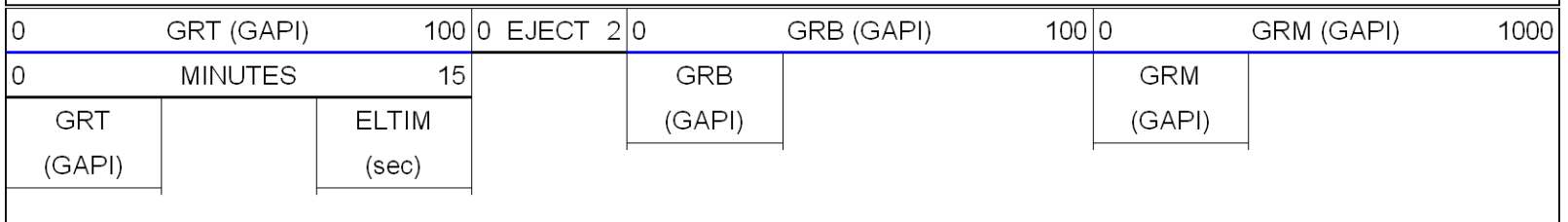
Database File:	c:\warrior\data\2013\mit\south dade\data base\sdwwtp-iw-13.db
Dataset Pathname:	pass7
Presentation Format:	rts
Dataset Creation:	Fri Aug 09 12:10:46 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:240

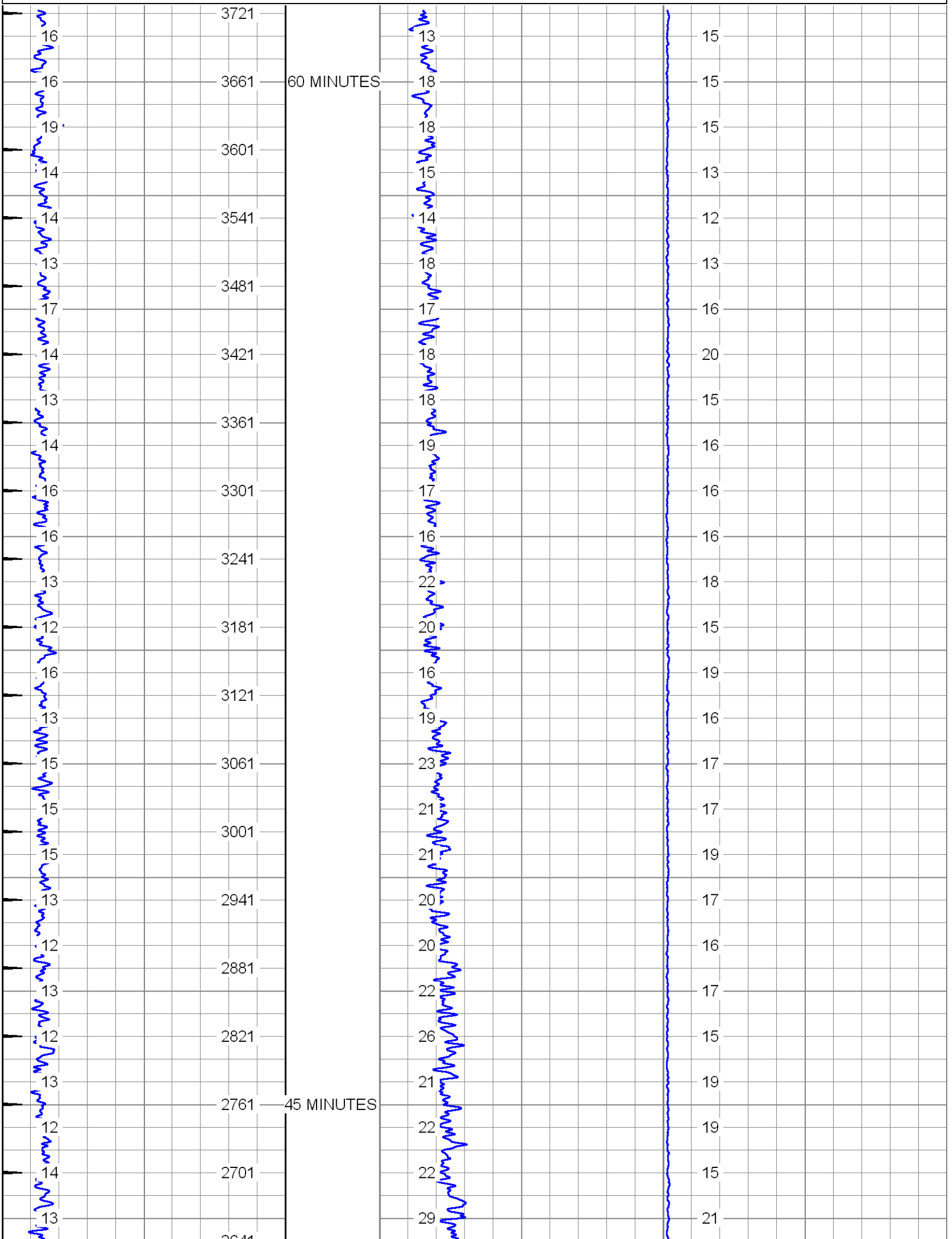




DYNAMIC TEST# 1 (89 GPM)

Database File:	c:\warrior\data\2013\mit\south dade\data base\sdwwtp-iw-13.db
Dataset Pathname:	pass6
Presentation Format:	rtstime
Dataset Creation:	Fri Aug 09 11:07:30 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:600

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3661
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3541
3481
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3181
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3061
3001
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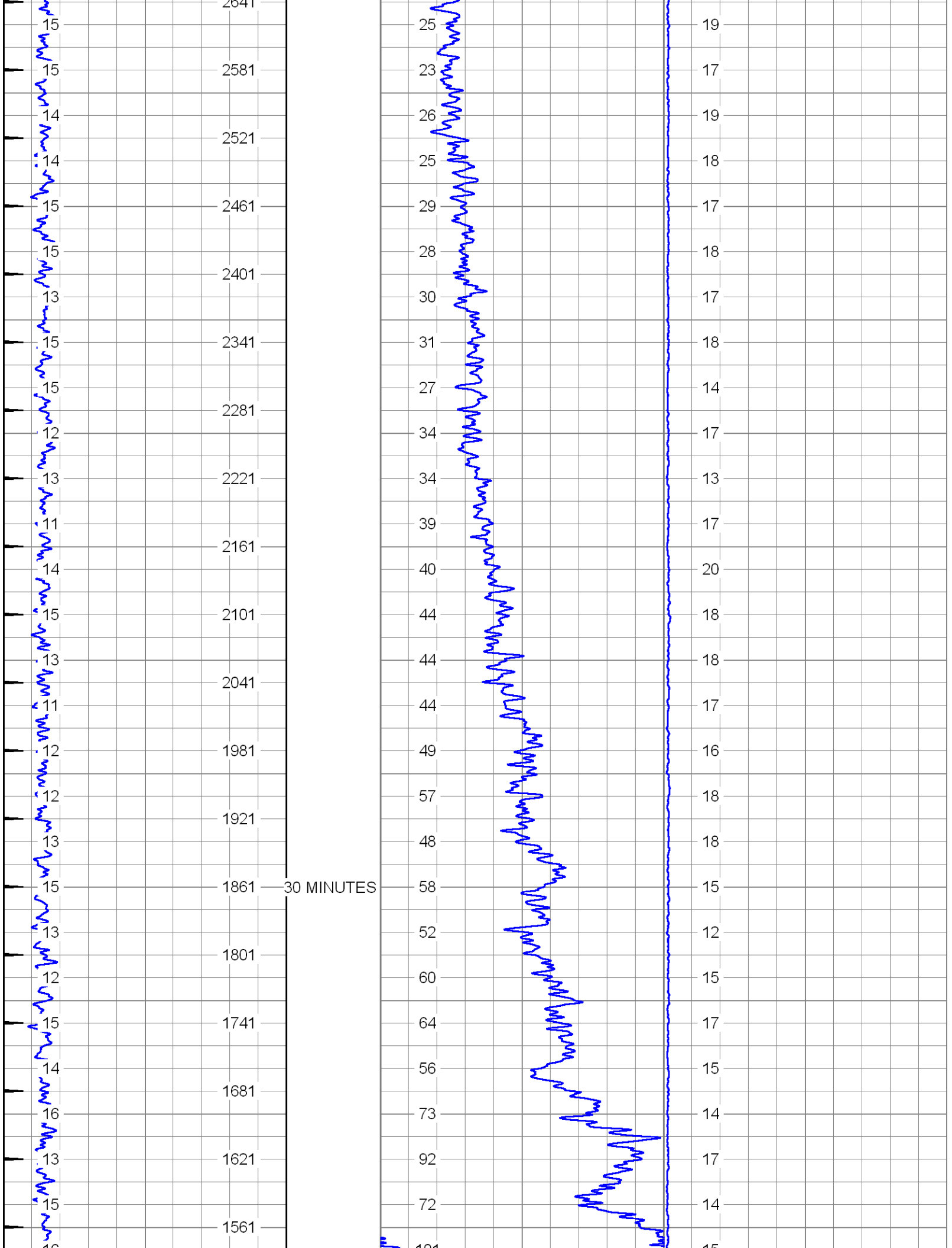
2761
45 MINUTES
2701
2641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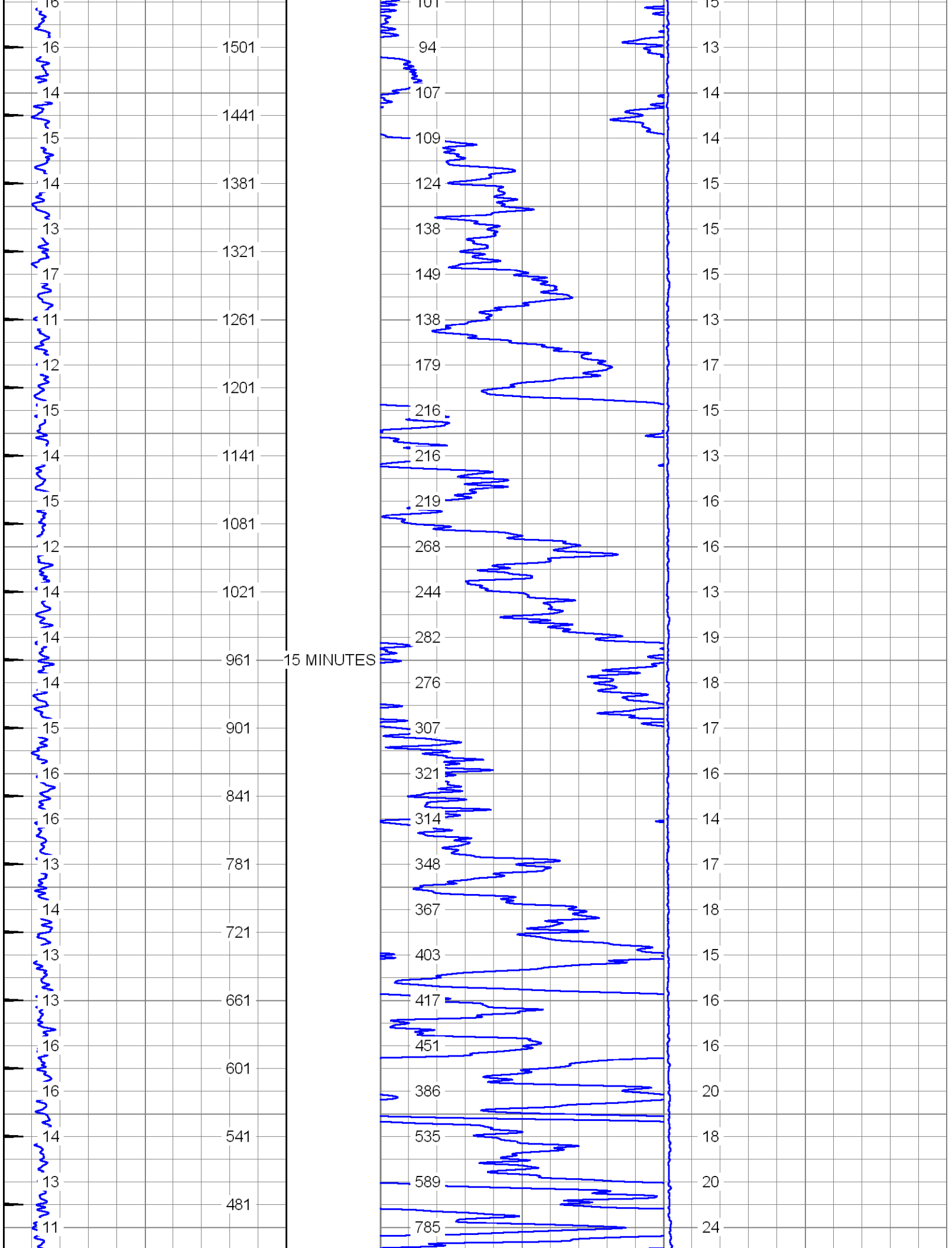

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1381
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1321
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1261
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1201
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1141
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1081
12
14
1021
14
961
15 MINUTES
14
15
901
16
841
16
13
781
14
721
13
13
661
16
601
16
14
541
13
481
11
101
94
107
109
124
138
149
138
179
216
216
219
268
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307
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785
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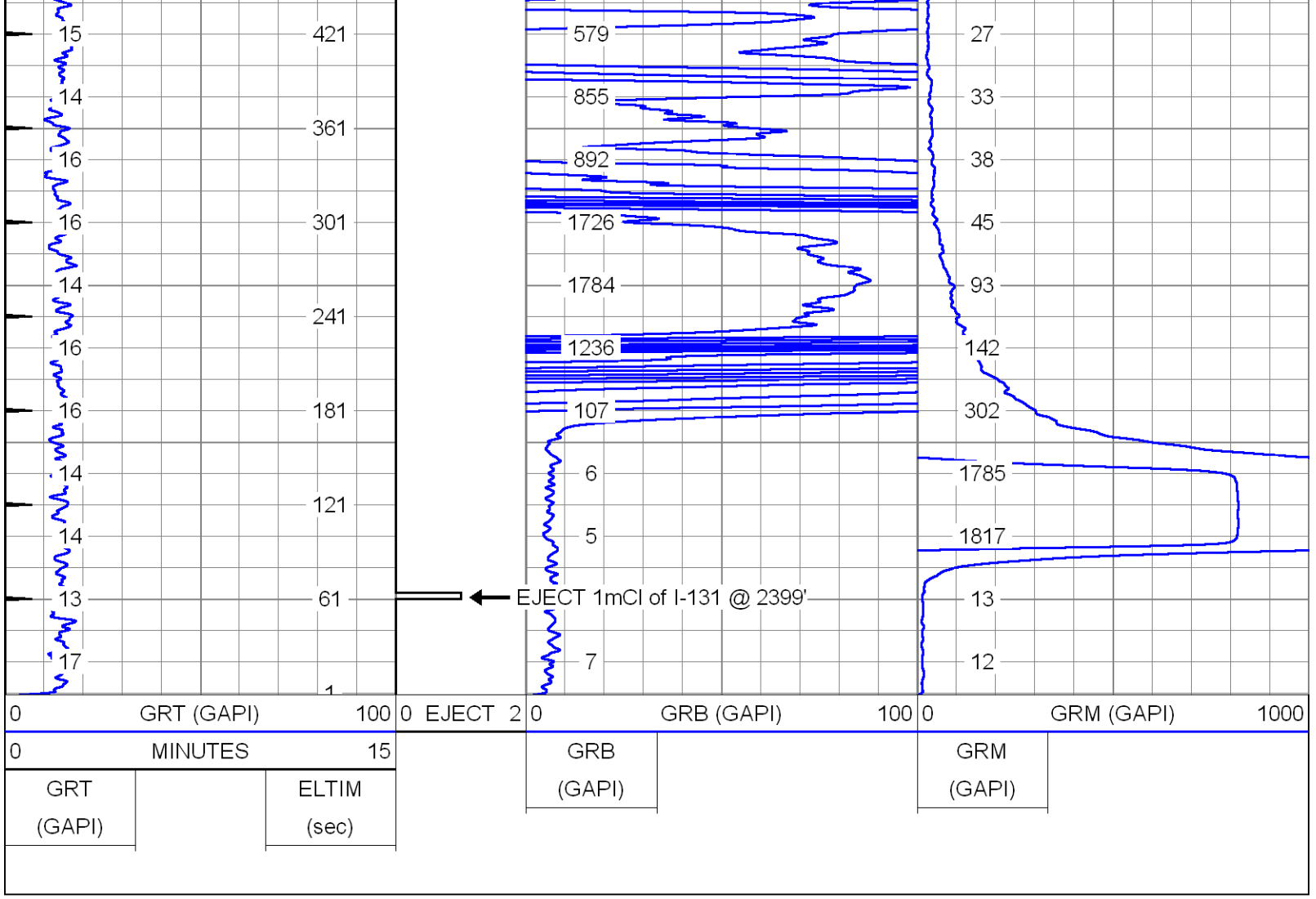
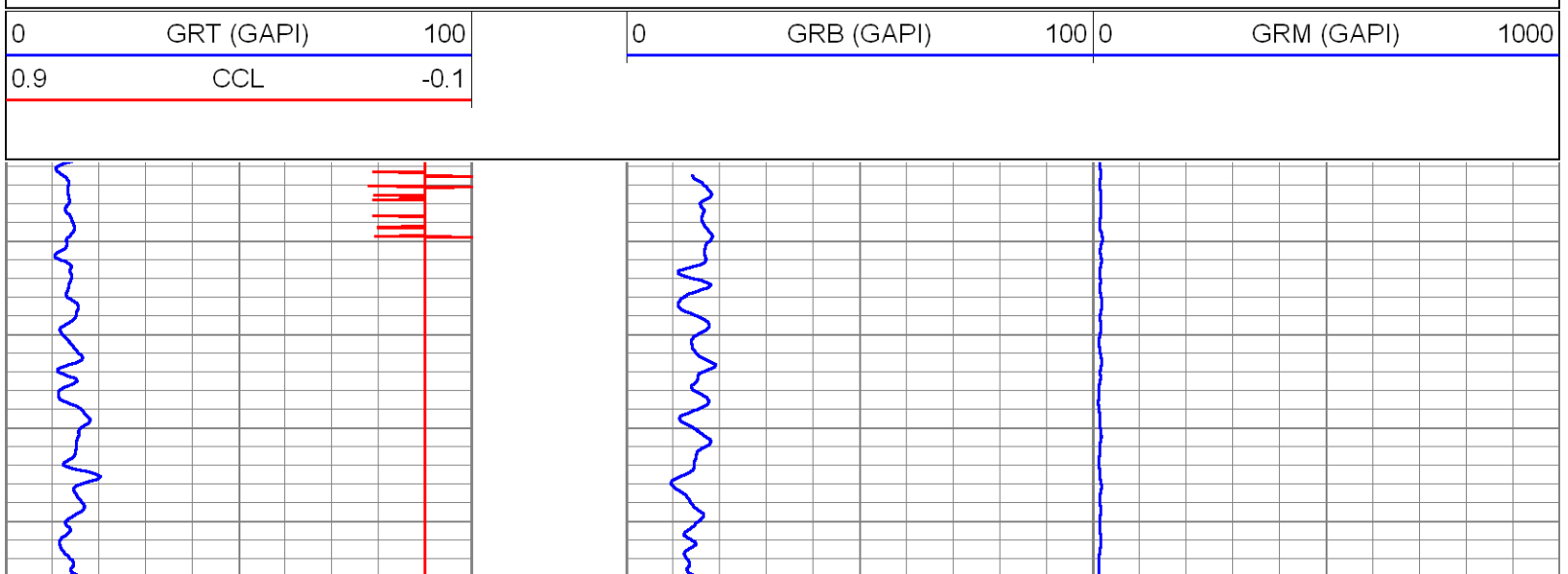
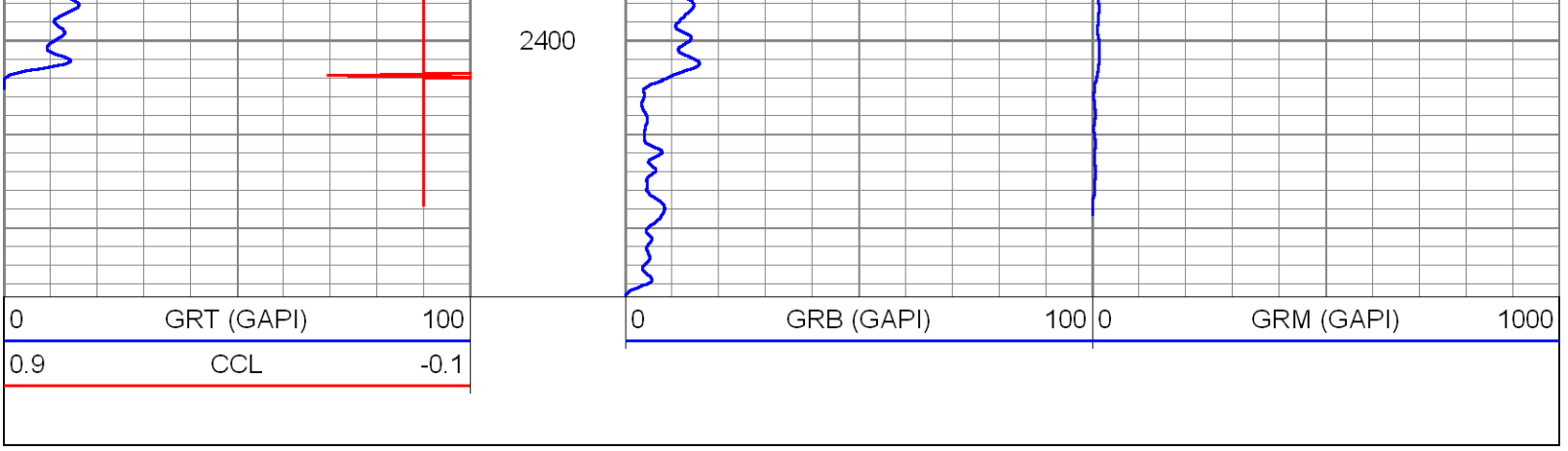


CASING TIE-IN

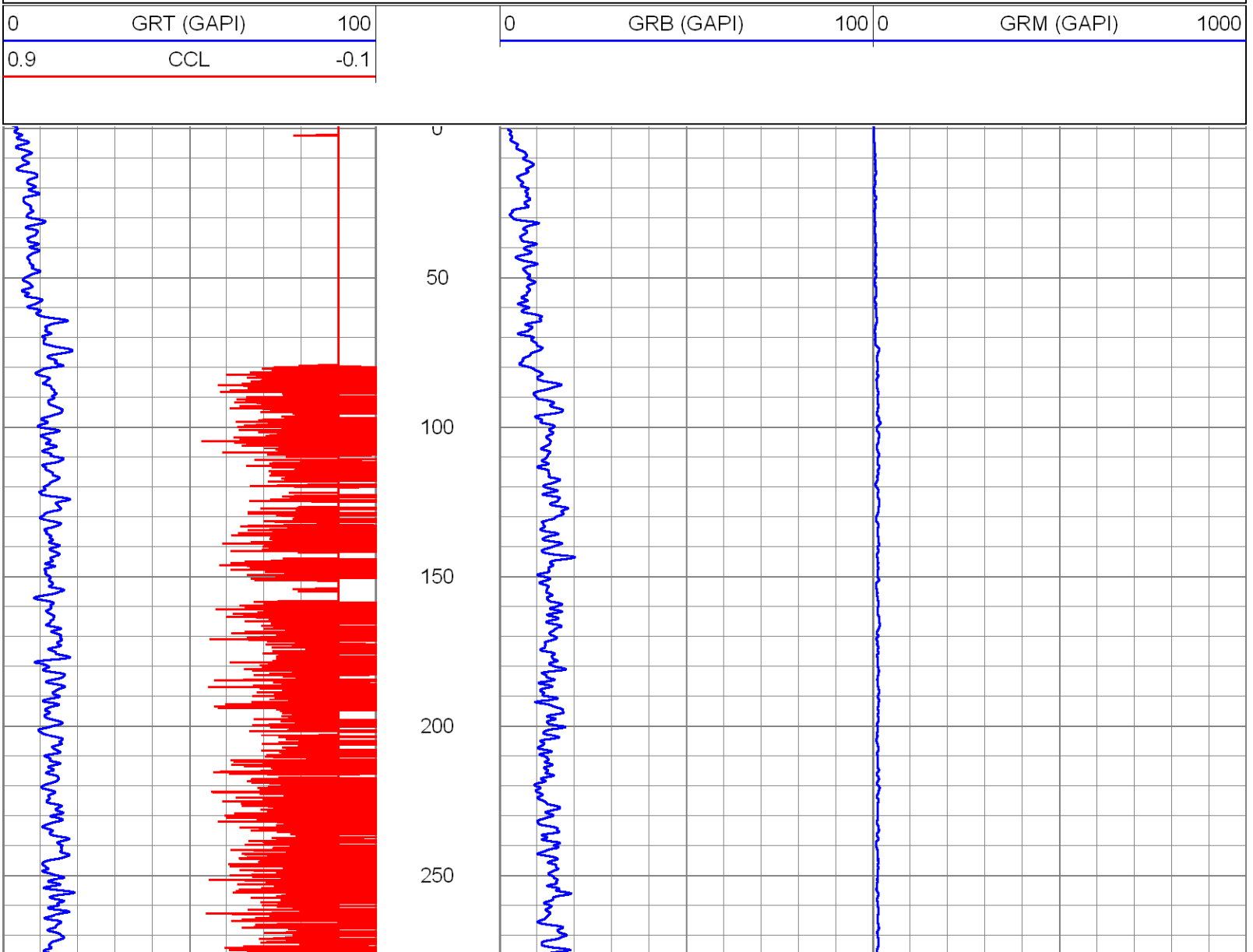
Database File:	c:\warrior\data\2013\mit\south dade\data base\sdwwtp-iw-13.db
Dataset Pathname:	pass5
Presentation Format:	rts
Dataset Creation:	Fri Aug 09 10:41:46 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:240

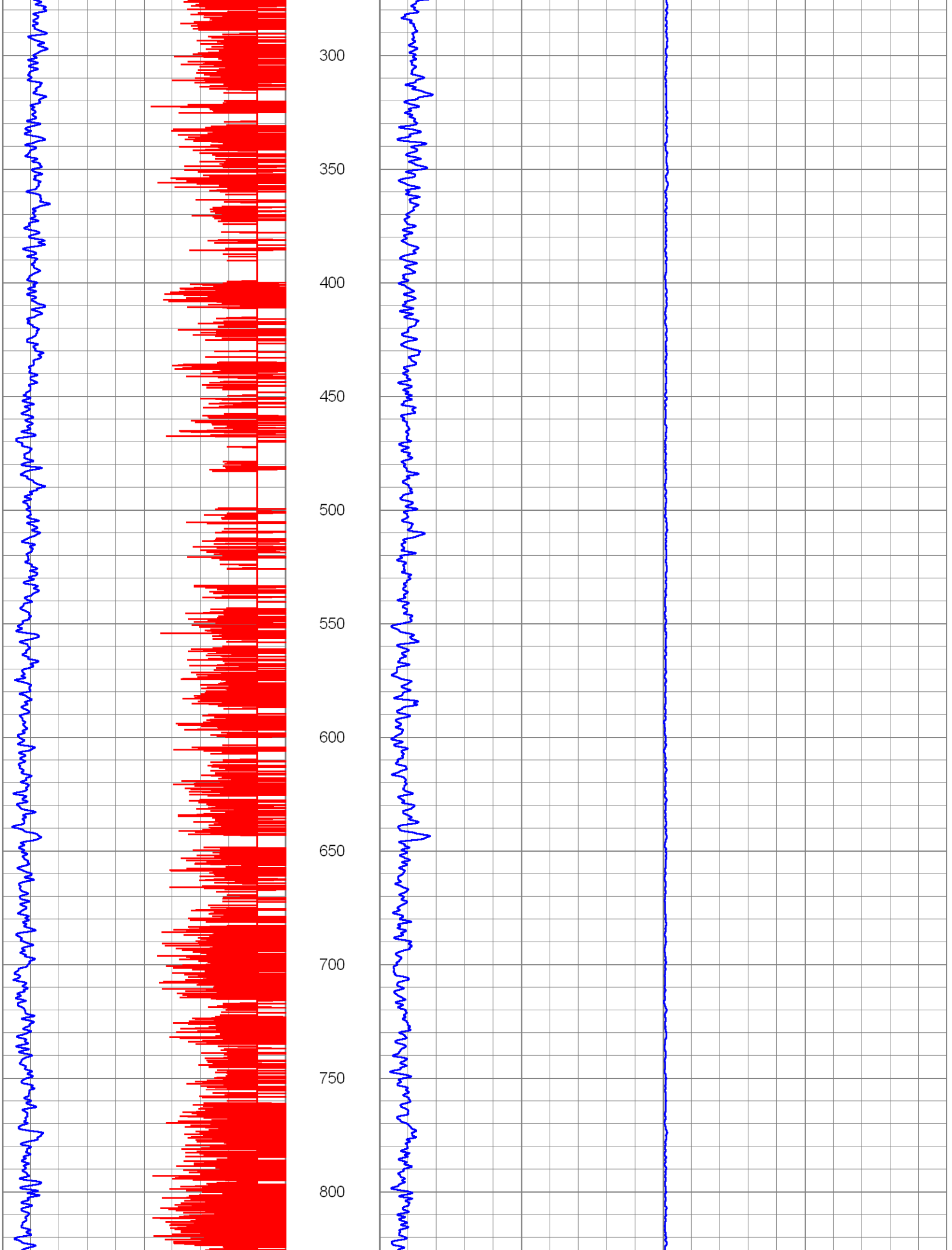


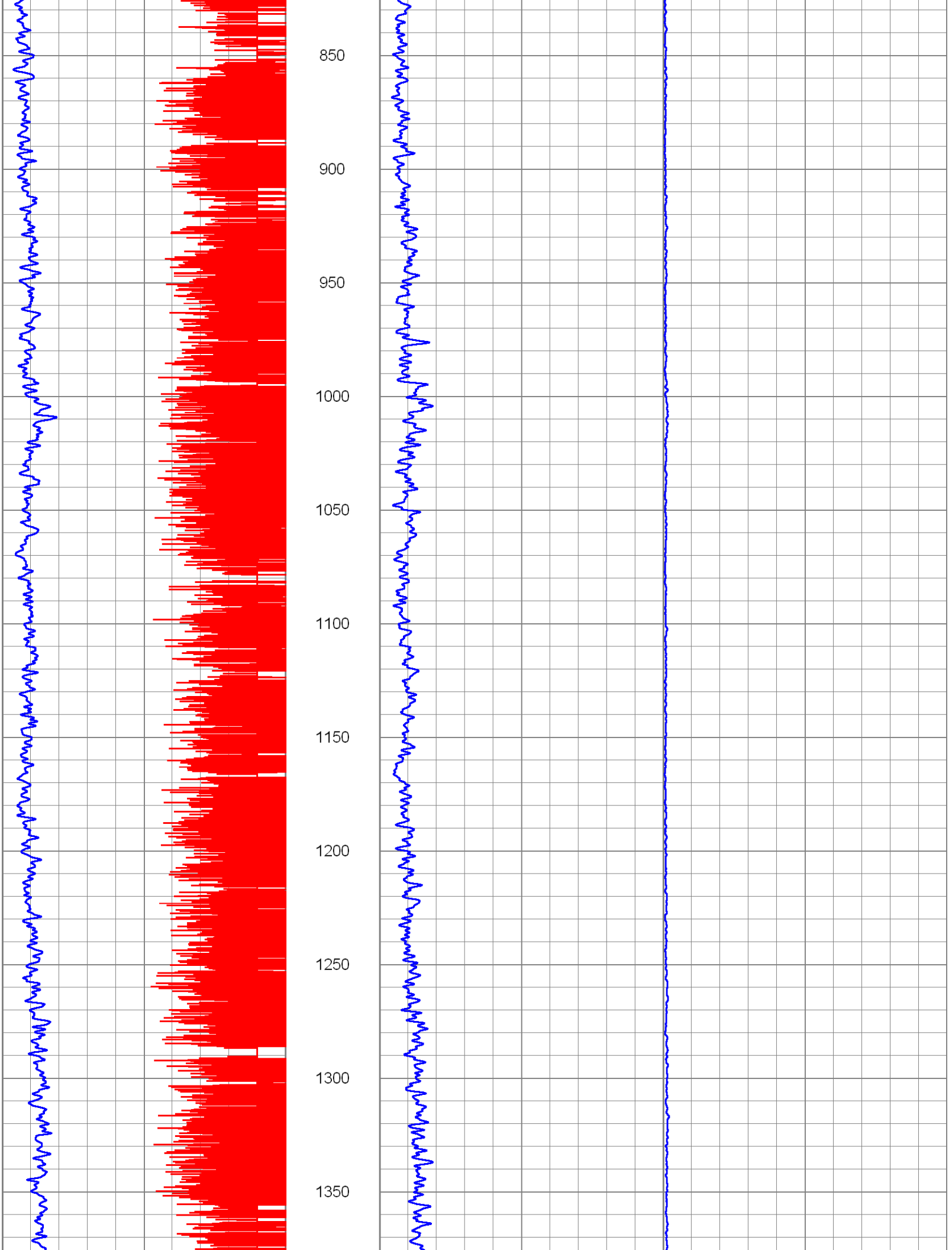


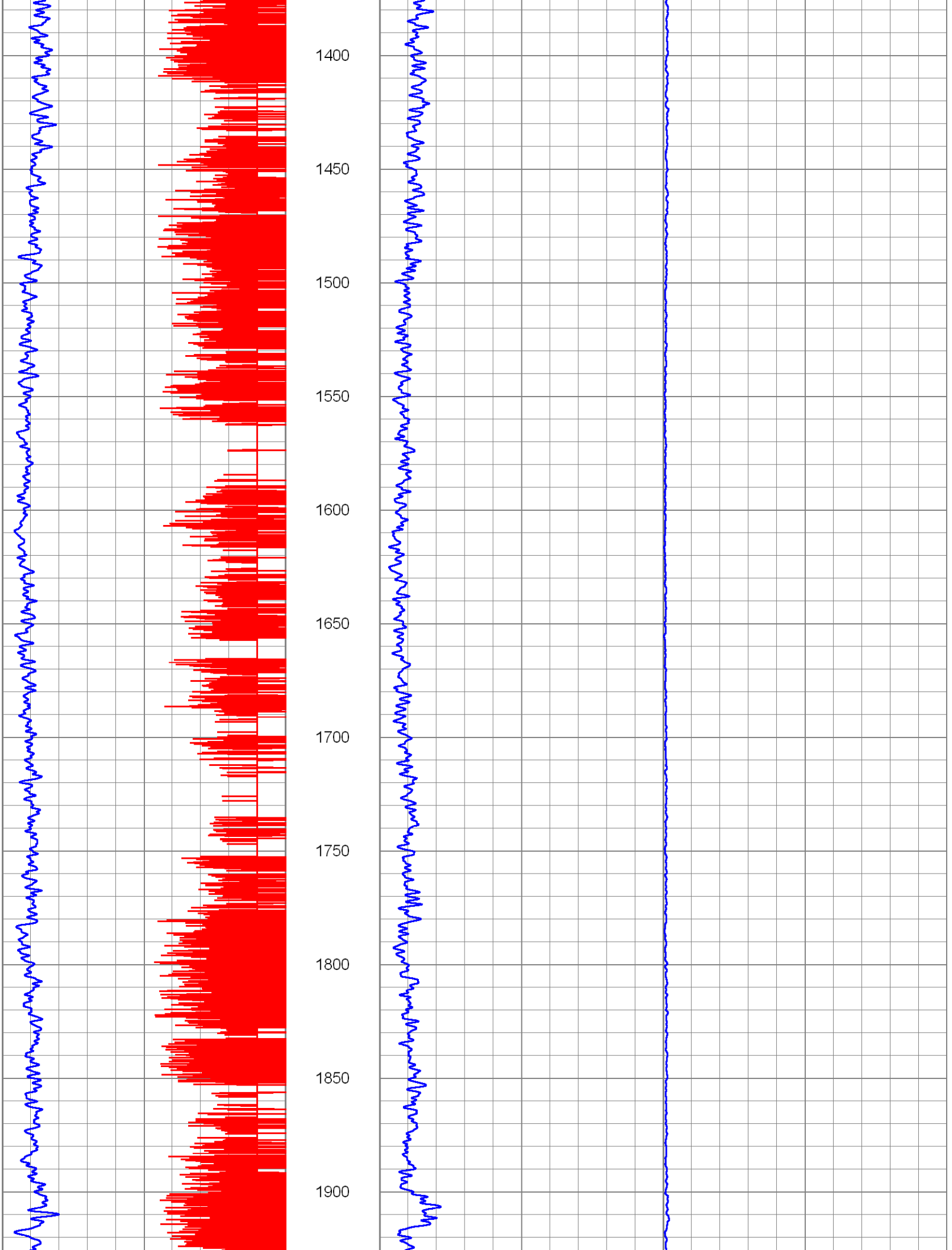
GAMMA-RAY BACKGROUND

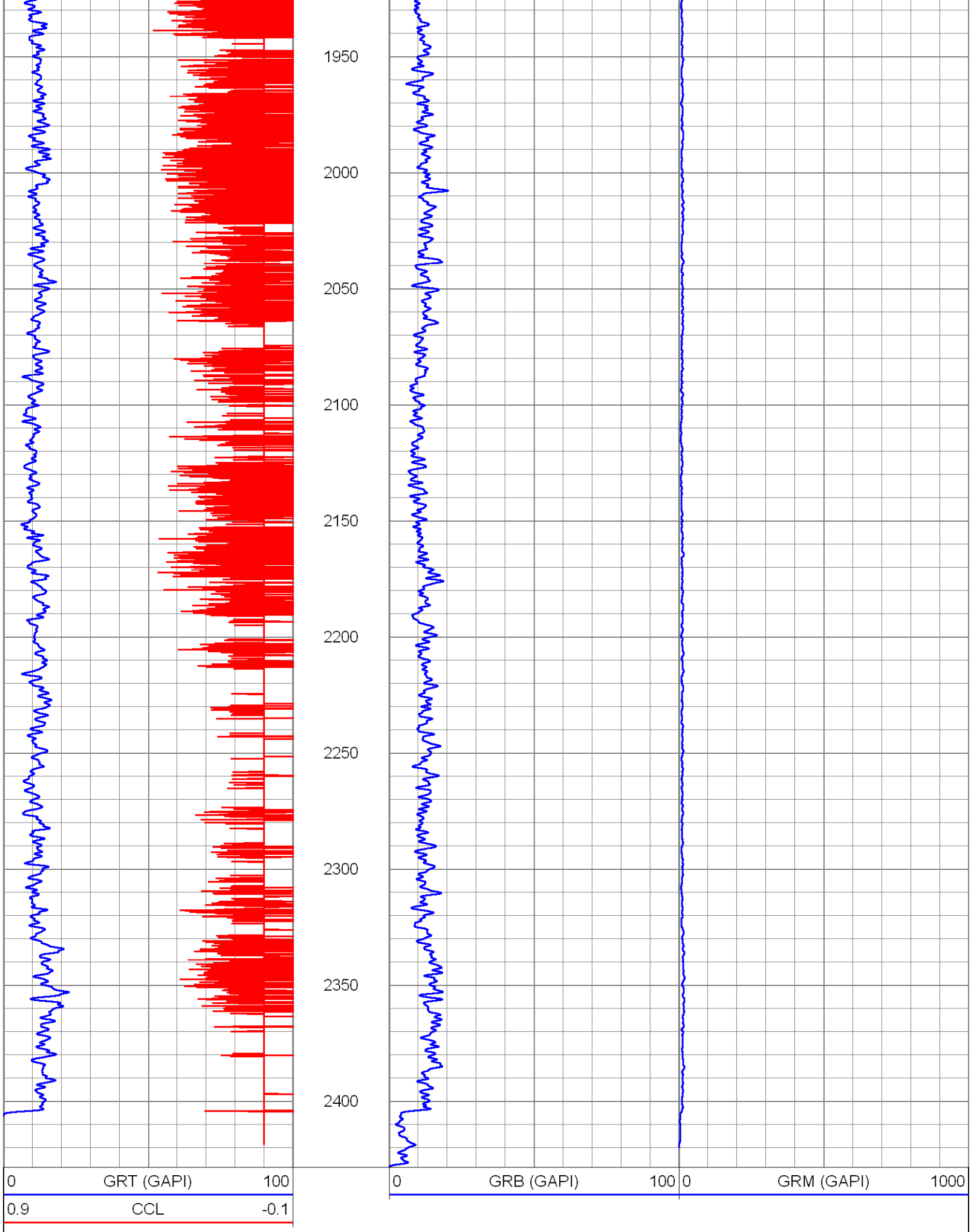
Database File:	c:\warrior\data\2013\mit\south dade\data base\sdwwtp-iw-13.db
Dataset Pathname:	pass3
Presentation Format:	rts
Dataset Creation:	Fri Aug 09 08:52:23 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:600




300
350
400
450
500
550
600
650
700
750
800


850
900
950
1000
1050
1100
1150
1200
1250
1300
1350


1400
1450
1500
1550
1600
1650
1700
1750
1800
1850
1900


1950
2000
2050
2100
2150
2200
2250
2300
2350
2400
0
GRT (GAPI)
100
0.9
CCL
-0.1
0
GRB (GAPI)
100
0
GRM (GAPI)
1000

Calibration Report

Database File: C:\Warrior\Data\2013\MIT\SOUTH DADE\data base\sdwwtp-iw-13.db
Dataset Pathname: pass3
Dataset Creation: Fri Aug 09 08:52:23 2013 by Log SOC 110722

Gamma Ray Calibration Report

Serial Number:	952B	
Tool Model:	RTSB	
Performed:	Fri Aug 09 07:38:45 2013	
Calibrator Value:	90.0	GAPI
Background Reading:	84.6	cps
Calibrator Reading:	246.2	cps
Sensitivity:	0.5568	GAPI/cps

Gamma Ray Calibration Report

Serial Number:	952M	
Tool Model:	RTSM	
Performed:	Fri Aug 09 07:38:57 2013	
Calibrator Value:	90.0	GAPI
Background Reading:	168.9	cps
Calibrator Reading:	328.1	cps
Sensitivity:	0.5655	GAPI/cps

Gamma Ray Calibration Report

Serial Number:	952T	
Tool Model:	RTST	
Performed:	Fri Aug 09 07:39:06 2013	
Calibrator Value:	90.0	GAPI
Background Reading:	101.1	cps
Calibrator Reading:	270.2	cps
Sensitivity:	0.5322	GAPI/cps

YOUNGQUIST

GEOPHYSICAL LOGGING DIVISION

Radioactive Tracer Survey Tool Diagram

Date: 8/8/13 Job: SDWWTP IW-13

Internal RTS: ___ External RTS: ✓ YB I Logger: MDREY

BOTTOM OF CASING: 2404

-5' IN CASING: 2399

+13.5' FOR BOTTOM OF TOOL: 2412.5

Eject #1: 1 mCi Eject #2: 2 mCi

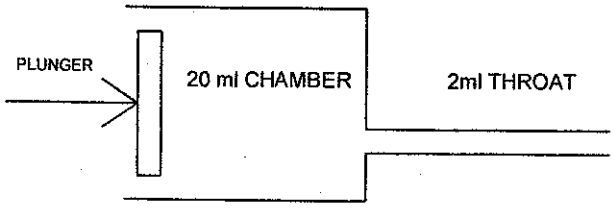
Eject #3: ___ mCi Eject #4: ___ mCi

Eject #5: ___ mCi Eject #6: ___ mCi

Total mCi of I-131 loaded in tool: 5 **1ml =1mCi**

Total volume of Chamber and Throat:22ml

EJECTOR PORT DIAGRAM



Total Eject Cycle Time (22ml): 13 **Sec**

Eject Cycle Time Per ml (Total Time / 22): 0.6 **Sec**

Throat Eject Cycle Time (2*Time Per ml): 1.2 **Sec**

TIME PER EJECT

(Total ml of I-131)/(20ml)= mCi per ml in the chamber

(5)/(20)= .25 mCi per ml

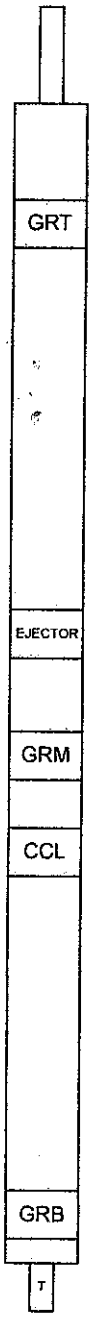
mCi = Throat Eject Cycle Time + (ml of Chamber Required)*(Eject Cycle Time Per ml)

1 mCi = 1.2+(4)*(0.6) = 3.6 **seconds**

2 mCi = 1.2 + (8)*(0.6) = 6 **seconds**

3 mCi = + ( )*( ) = **seconds**

4 mCi = + ( )*( ) = **seconds**



TOP OF TOOL (25ft 2in)

GAMMA RAY TOP DECTOR (23ft 6in)

ALL MEASUREMENTS ARE FROM THE BOTTOM OF THE TOOL.

TOOL DIAMETER IS 1-11/16".

EJECTOR PORT (13ft 6in)

GAMMA RAY MIDDLE DECTOR (10ft 6in)

COLLAR LOCATOR (9ft 6in)

GAMMA RAY BOTTOM DECTOR (1ft 2in)

TEMPERATURE PROBE

Appendix E

Temperature Log

HIGH RESOLUTION TEMPERATURE LOG

Company	SOUTH MIAMI-DADE W.W.T.P.
Well	IW-12
Field	S.D.W.W.T.P.
County	MIAMI-DADE
State	FLORIDA

Location: API # :

SEC TWP RGE

Other Services

Permanent Datum	PAD	Elevation	PAD
Log Measured From	PAD		
Drilling Measured From	PAD		

Elevation
K.B.
D.F.
G.L.

Date	09-AUG-2013		
Run Number	2013 MIT		
Depth Driller	2426'		
Depth Logger	2426'		
Bottom Logged Interval	2426'		
Top Log Interval	SURFACE		
Open Hole Size	22"		
Type Fluid	WATER		
Density / Viscosity	NA		
Max. Recorded Temp.	80.1 degF		
Estimated Cement Top	NA		
Time Well Ready	ON ARRIVAL		
Time Logger on Bottom	ON ARRIVAL		
Equipment Number	102		
Location	FT MYERS		
Recorded By	MOREY	RIVES	
Witnessed By	S. VILLAMIL		

Borehole Record				Borehole Record			
Run Number	Bit	From	To	Run No	Bit	From	To

Casing Record	Size	Wgt/Ft	Top	Bottom
Surface String				
Prot. String				
Production String	24"	.500" W.T.	SURFACE	2404'
Liner				

<< Fold Here >>>

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

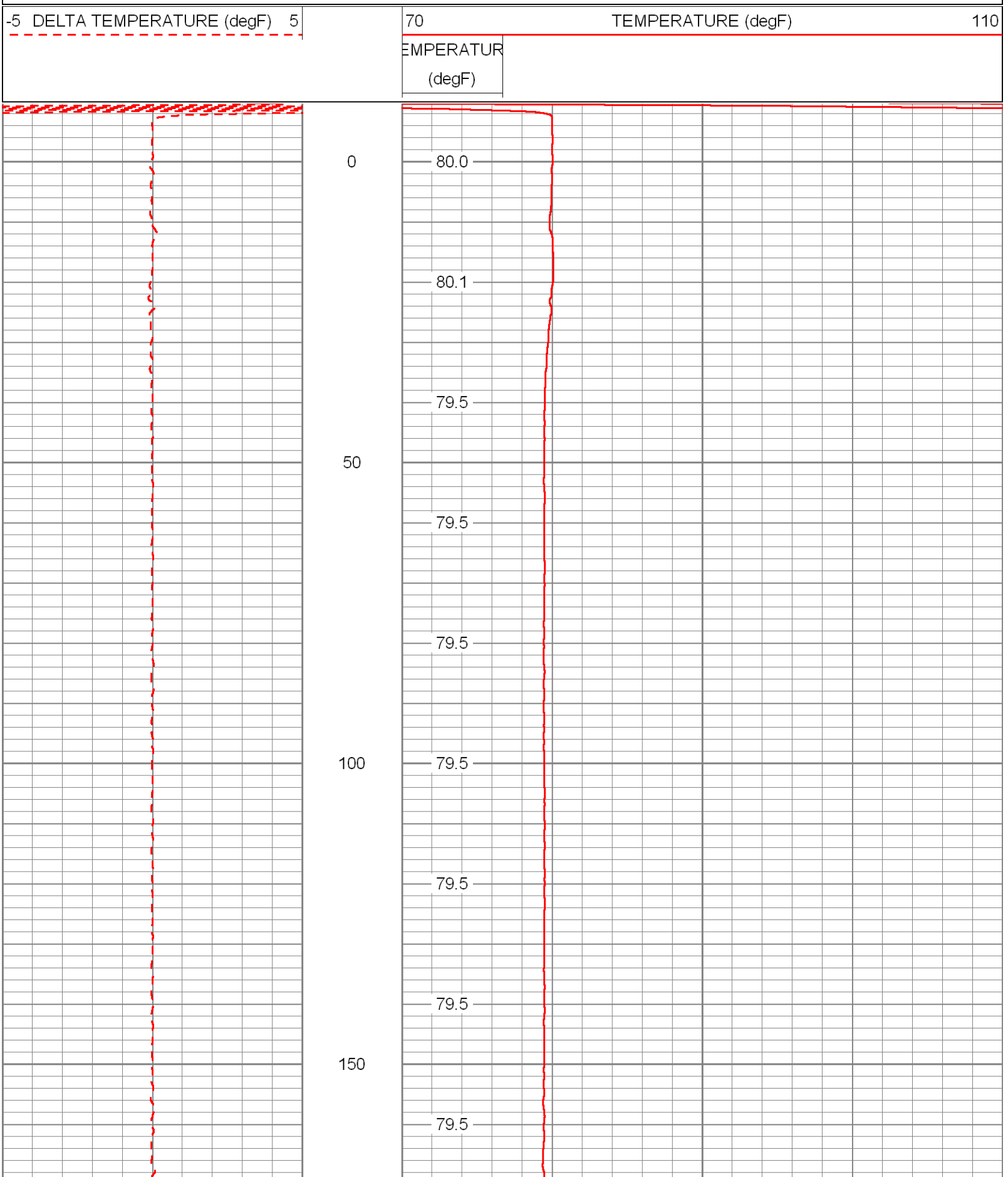
Comments

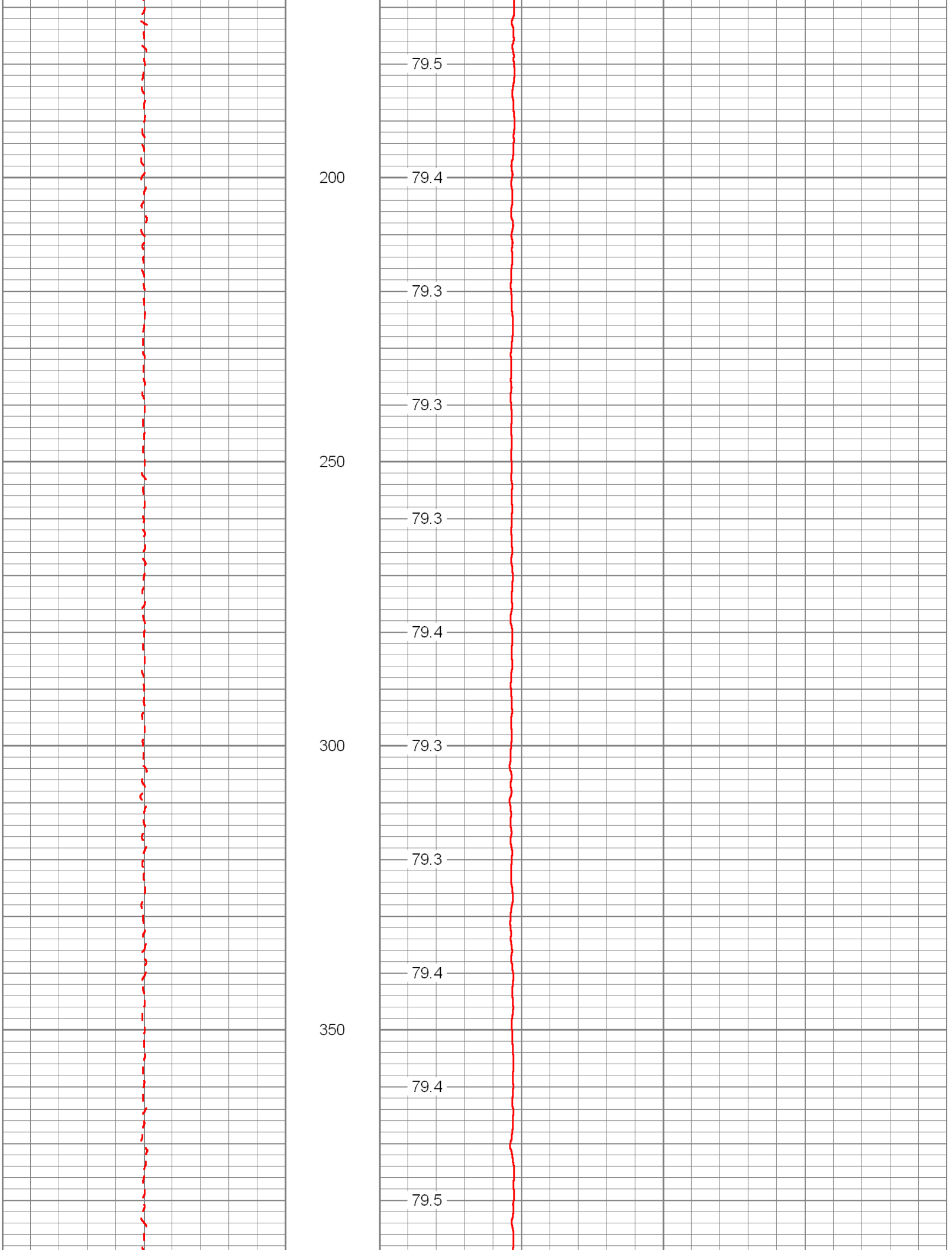
RADIOACTIVE TRACER SURVEY

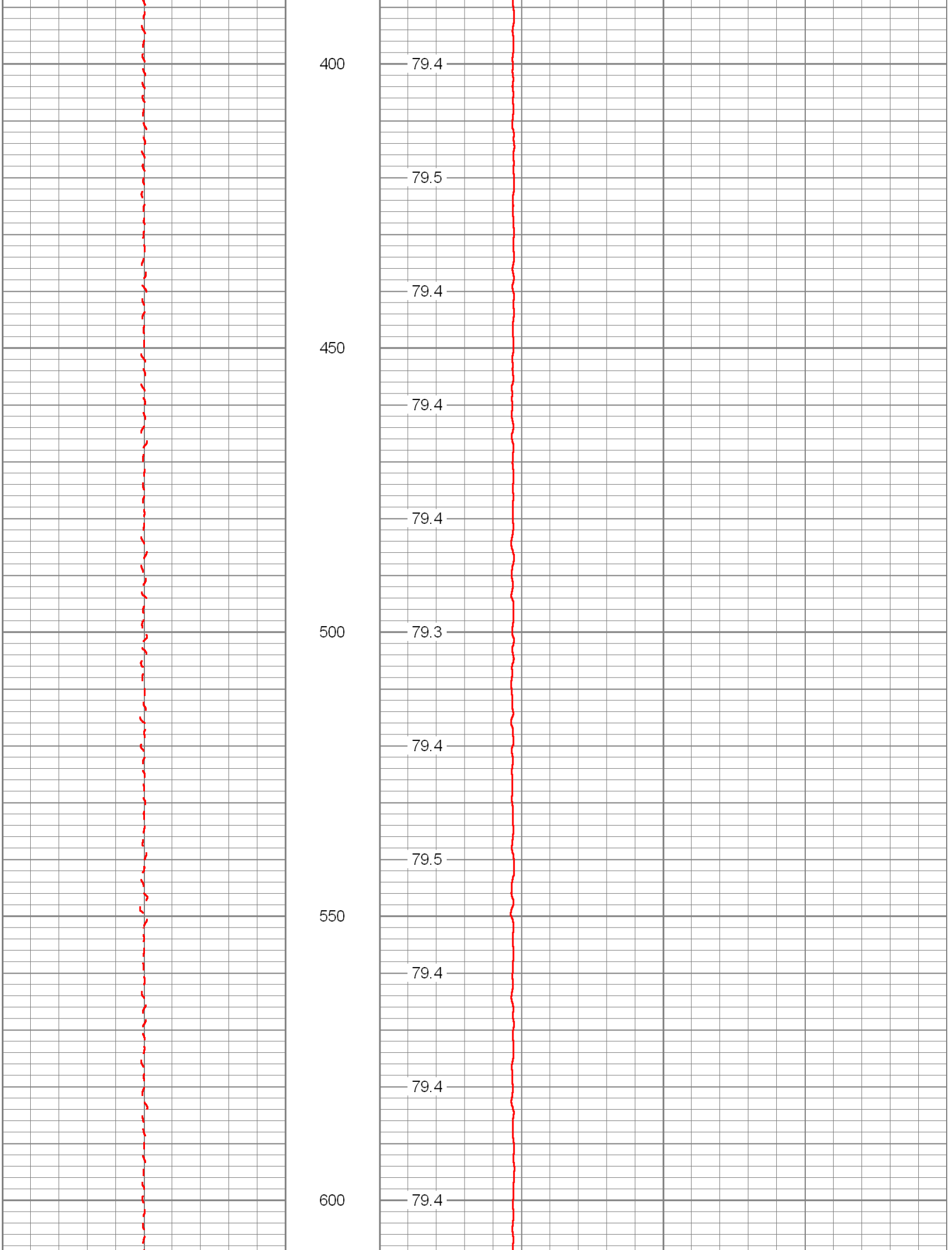
TEMPERATURE

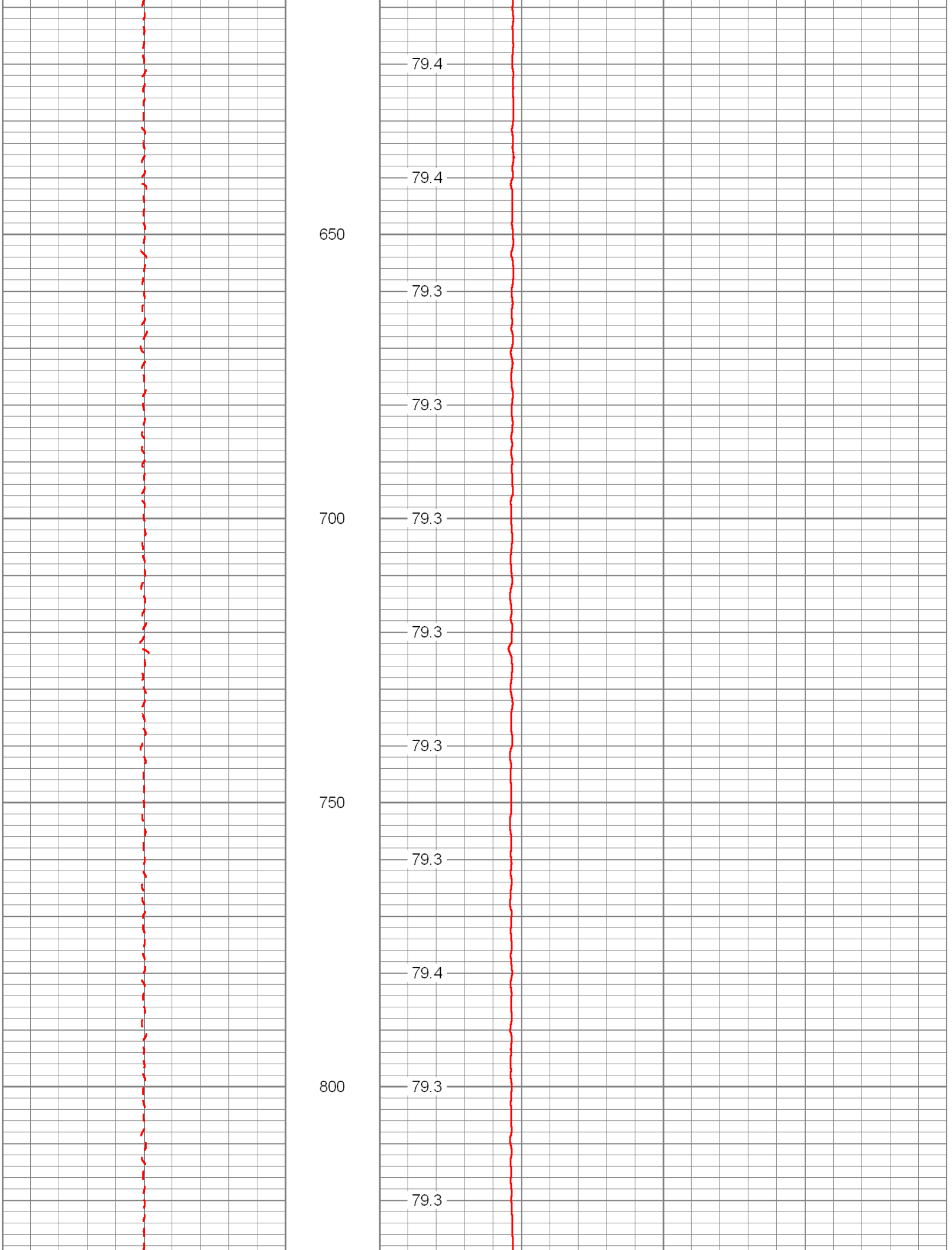
BROTHERS

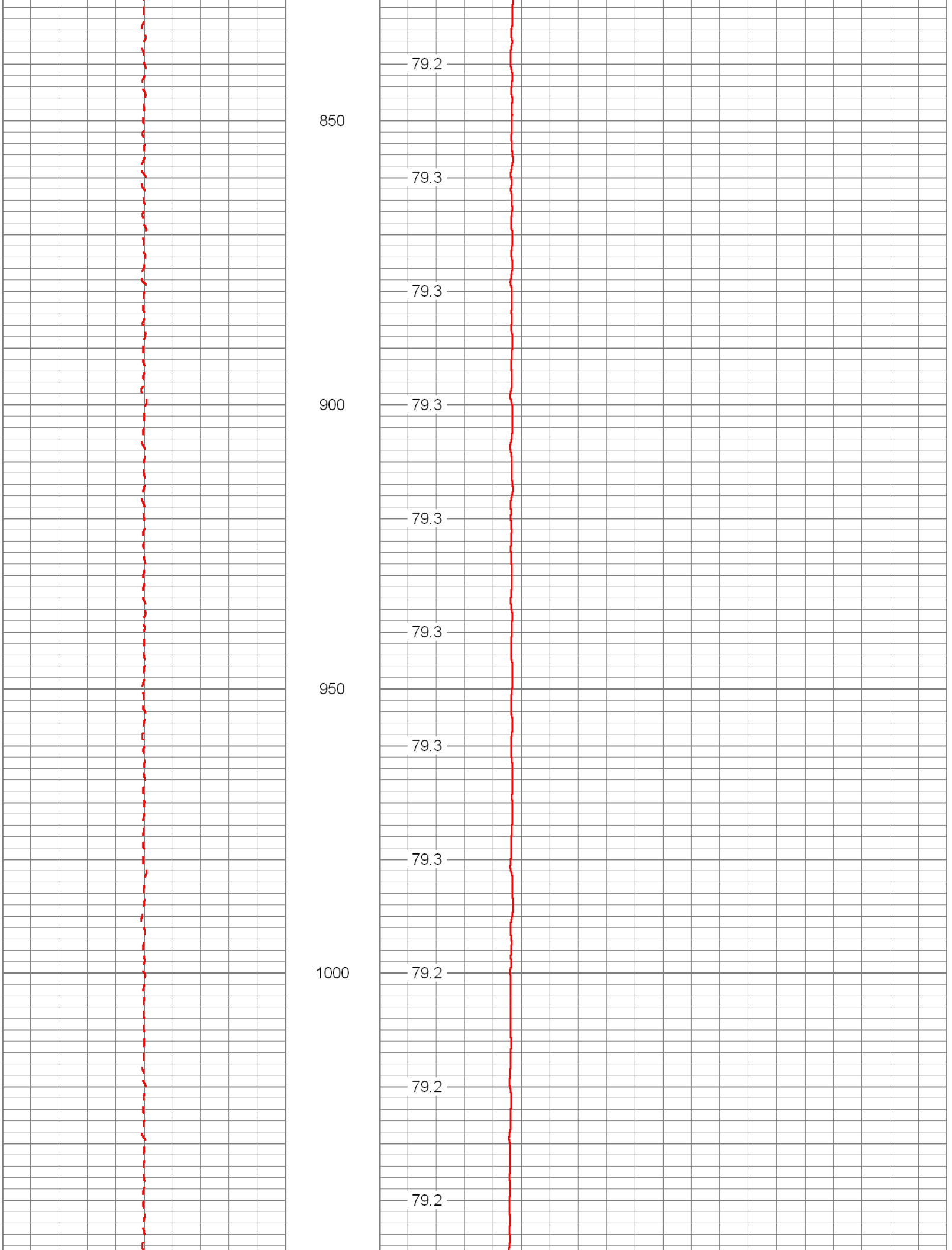
Database File:	c:\warrior\data\2013\mit\south dade\data base\sdwwtp-iw-13.db
Dataset Pathname:	pass2
Presentation Format:	temp
Dataset Creation:	Fri Aug 09 07:52:11 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:240

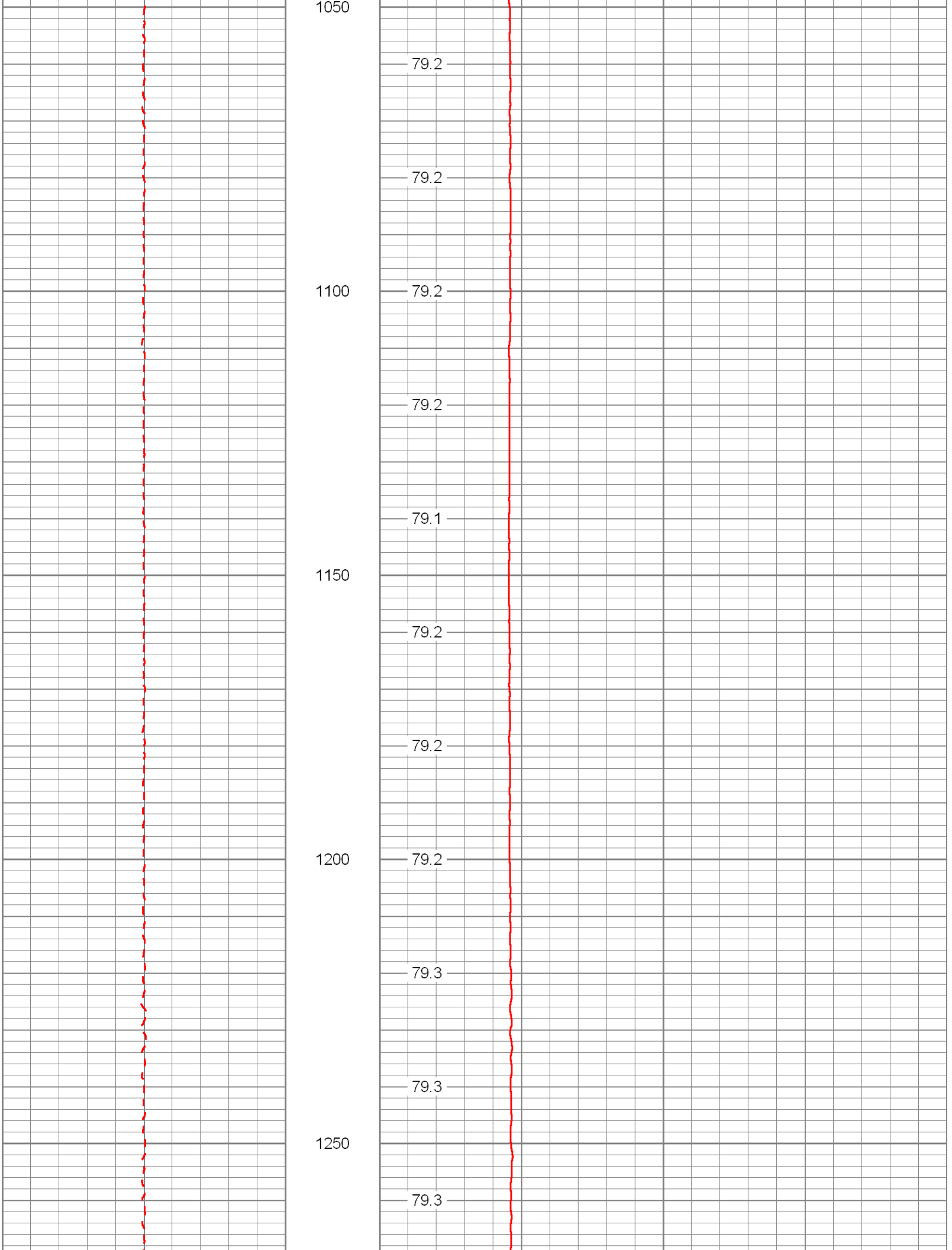


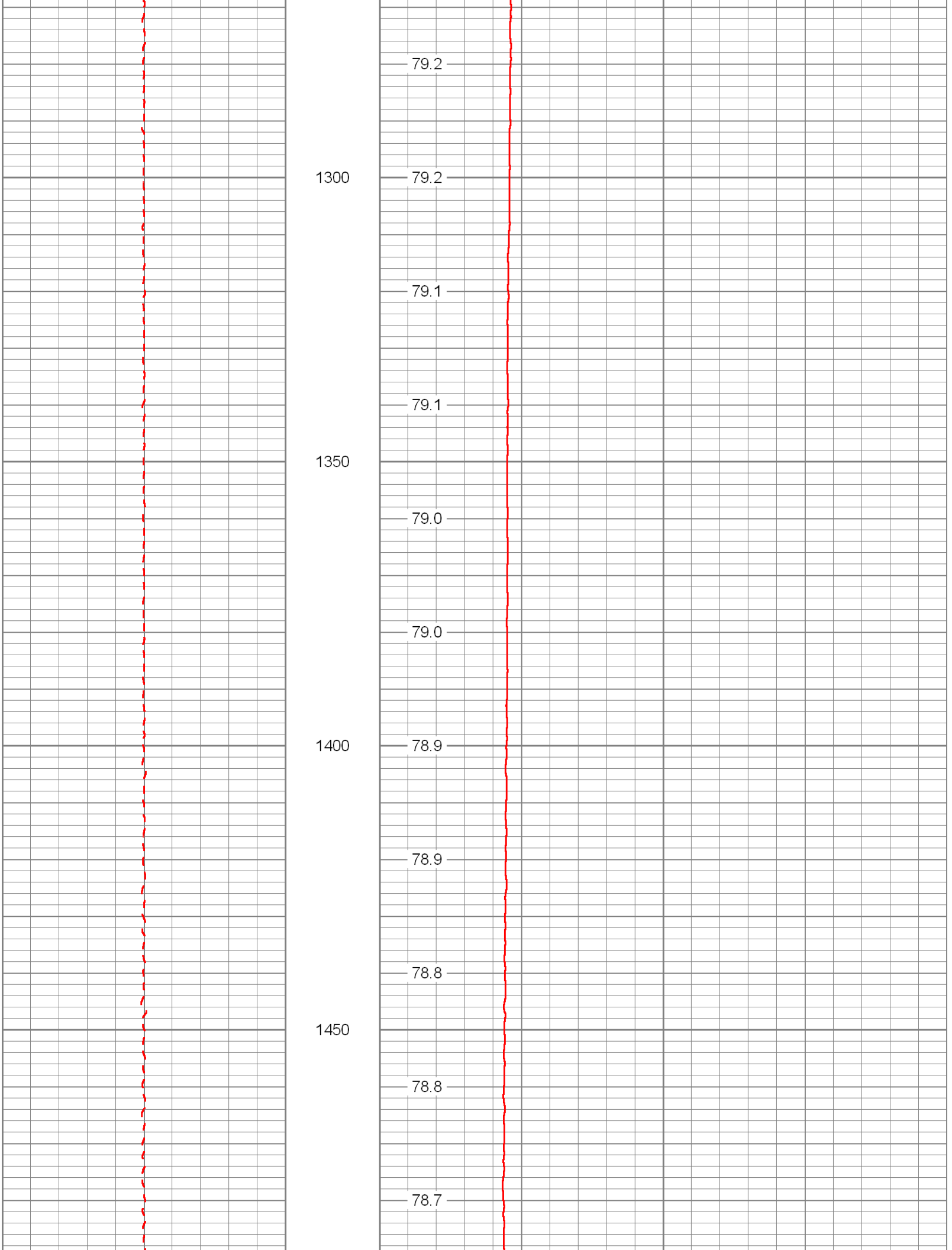

79.5
200
79.4
79.3
79.3
250
79.3
79.4
300
79.3
79.3
79.4
350
79.4
79.5

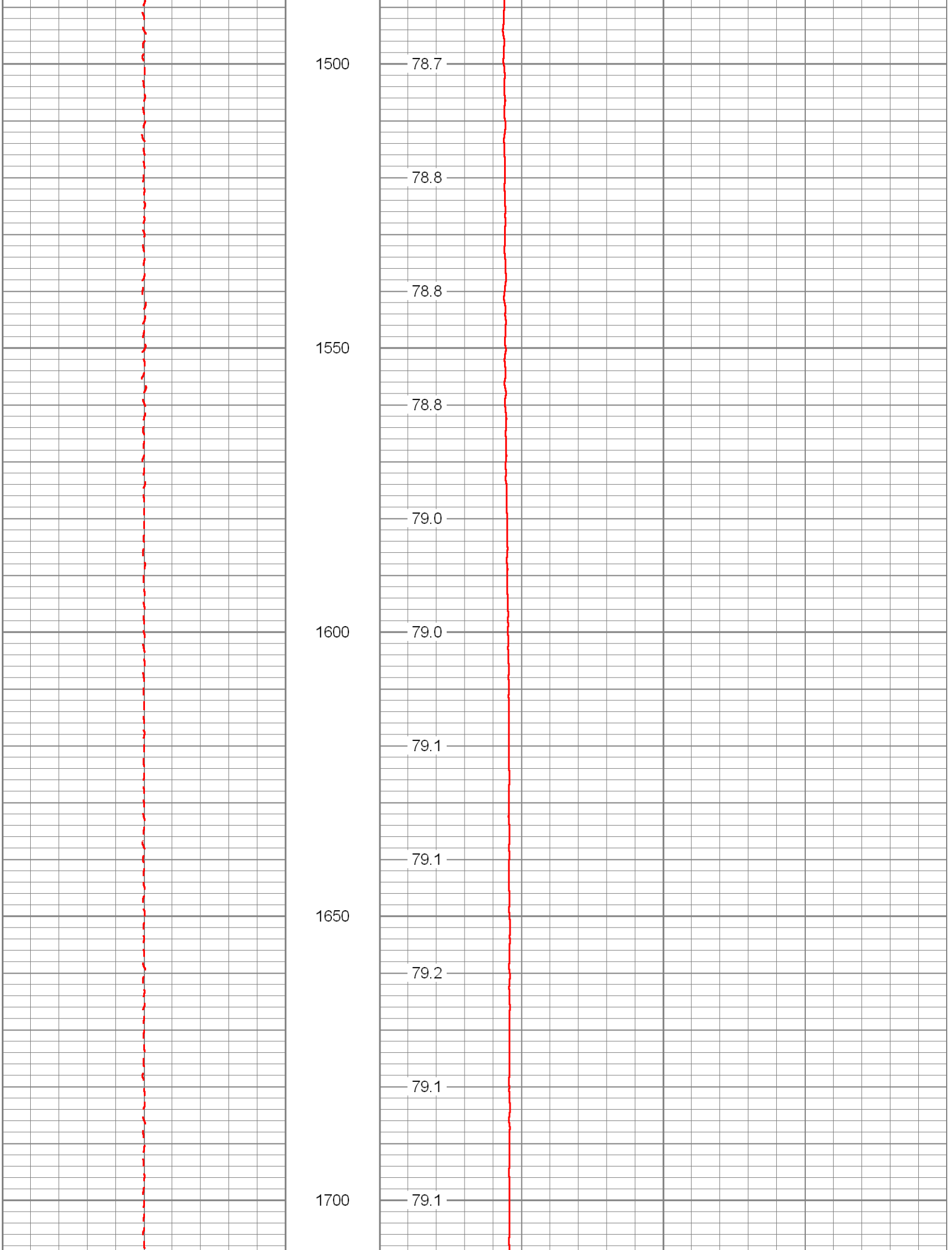

400
79.4
79.5
79.4
450
79.4
79.4
500
79.3
79.4
79.5
550
79.4
79.4
600
79.4

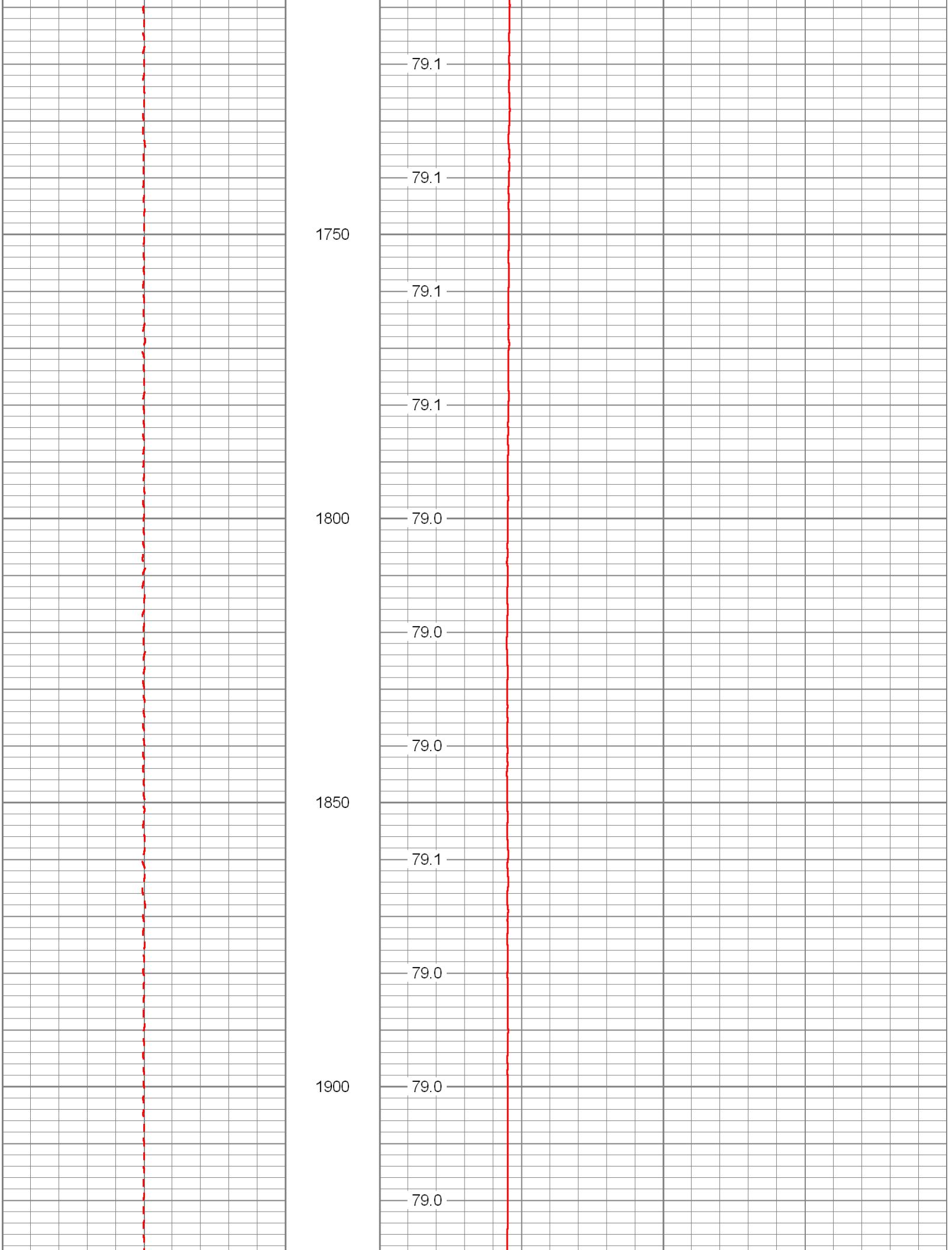

79.4
79.4
650
79.3
79.3
700
79.3
79.3
79.3
750
79.3
79.4
800
79.3
79.3

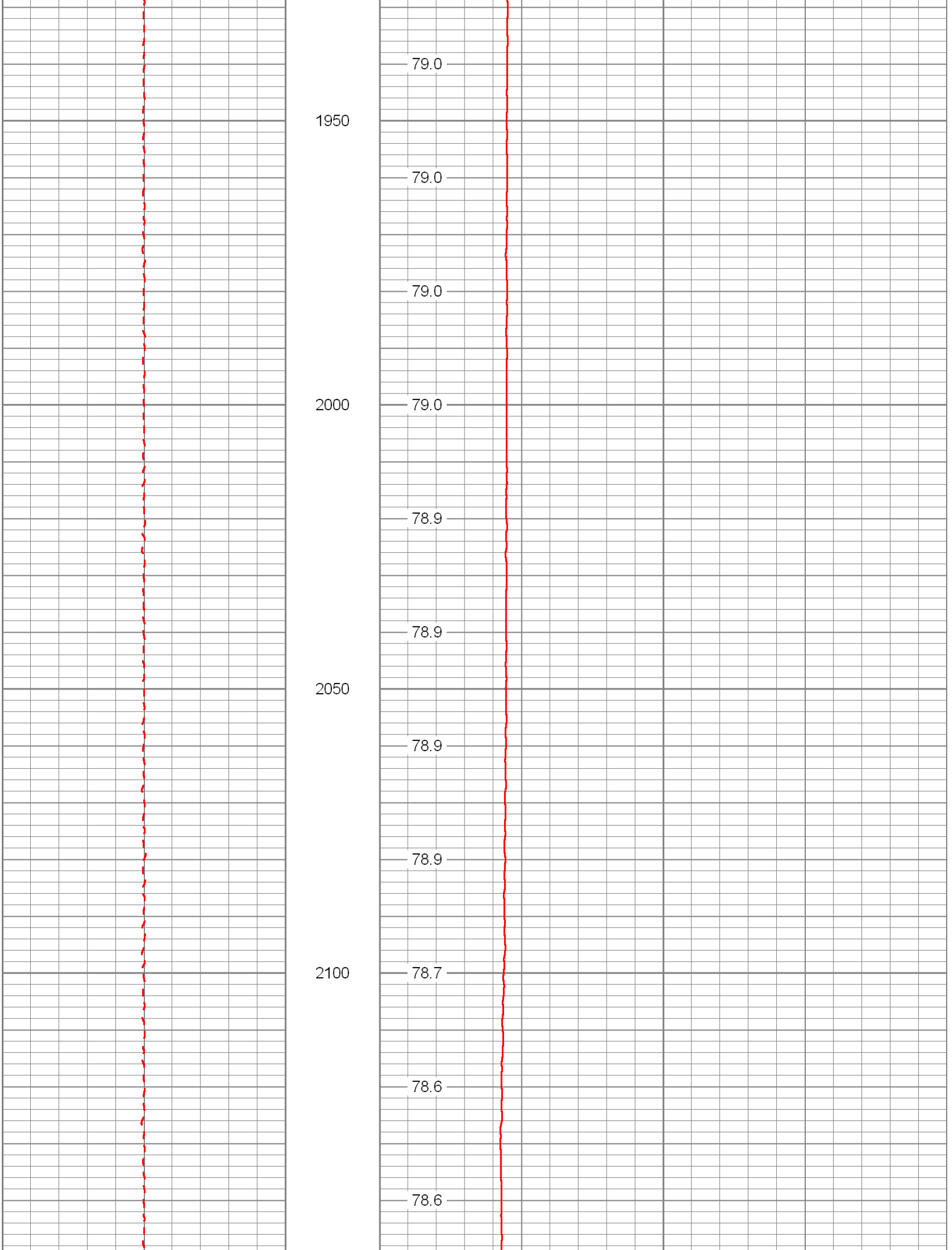

79.2
850
79.3
79.3
900
79.3
79.3
79.3
950
79.3
79.3
1000
79.2
79.2
79.2

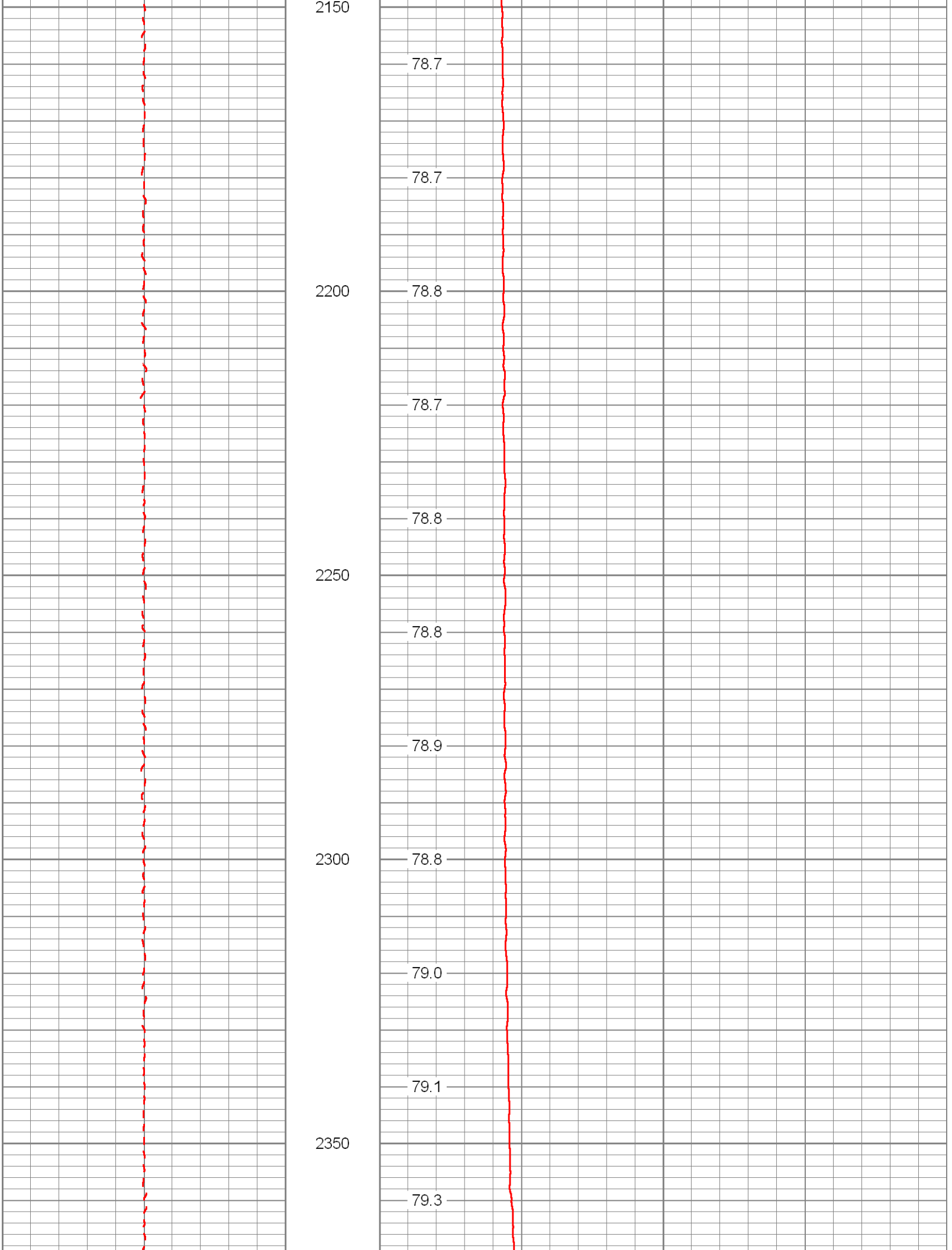

1050
79.2
79.2
1100
79.2
79.2
79.1
1150
79.2
79.2
1200
79.2
79.3
79.3
1250
79.3

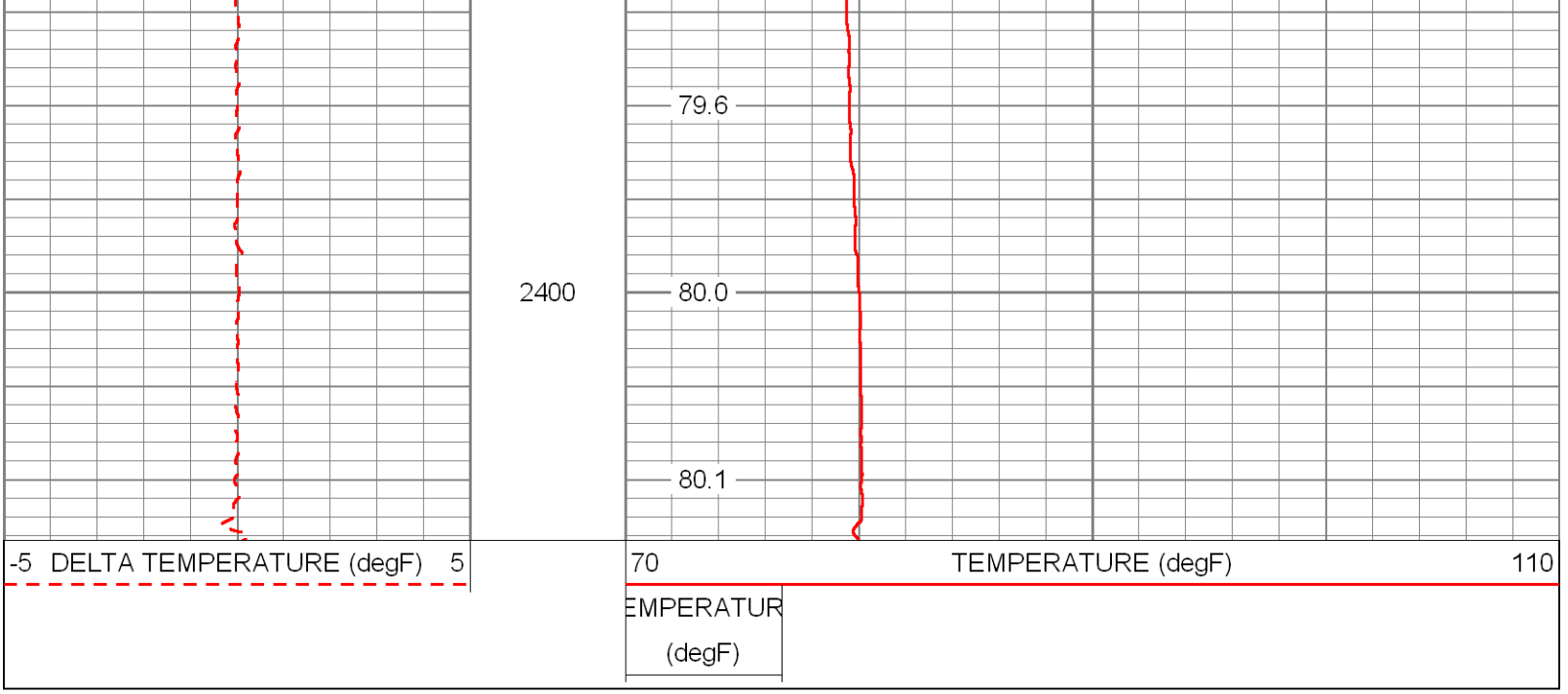

79.2
1300
79.2
79.1
79.1
1350
79.0
79.0
1400
78.9
78.9
78.8
1450
78.8
78.7


1500
78.7
78.8
78.8
1550
78.8
79.0
1600
79.0
79.1
79.1
1650
79.2
79.1
1700
79.1


79.1
79.1
1750
79.1
79.1
1800
79.0
79.0
79.0
1850
79.1
79.0
1900
79.0
79.0


79.0
1950
79.0
79.0
2000
79.0
78.9
78.9
2050
78.9
78.9
2100
78.7
78.6
78.6


2150
78.7
78.7
2200
78.8
78.7
78.8
2250
78.8
78.9
2300
78.8
79.0
79.1
2350
79.3



Calibration Report

Database File: C:\Warrior\Data\2013\MIT\SOUTH DADE\data base\sdwwtp-iw-13.db
Dataset Pathname: pass2
Dataset Creation: Fri Aug 09 07:52:11 2013 by Log SOC 110722

Temperature Calibration Report

Serial Number: 952
Tool Model: RTS
Performed: Wed Jun 19 08:20:23 2013

Point #	Reading		Reference	
1	439.20	cps	33.00	degF
2	912.13	cps	85.00	degF
3	1637.63	cps	155.00	degF
4		cps		degF
5		cps		degF
6		cps		degF
7		cps		degF
8		cps		degF
9		cps		degF
10		cps		degF

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)

			TEMP-RTS (952)	25.50	1.69	70.00
TEMP	0.10					

Dataset: sdwwtp-iw-13.db: field/well/run1/pass2
Total Length: 25.50 ft
Total Weight: 70.00 lb
O.D. 1.69 in

Appendix F

Television Survey

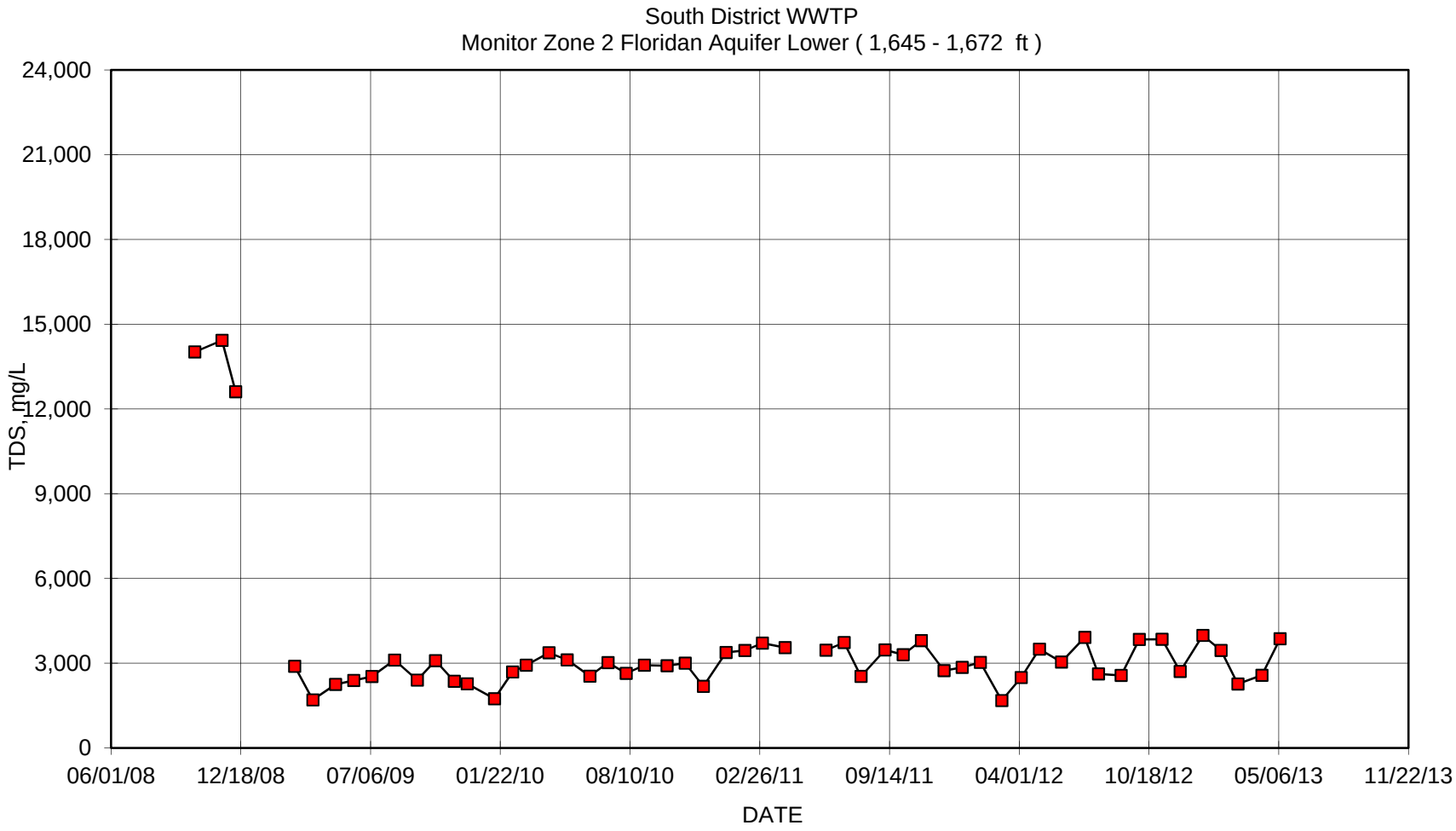
Appendix G

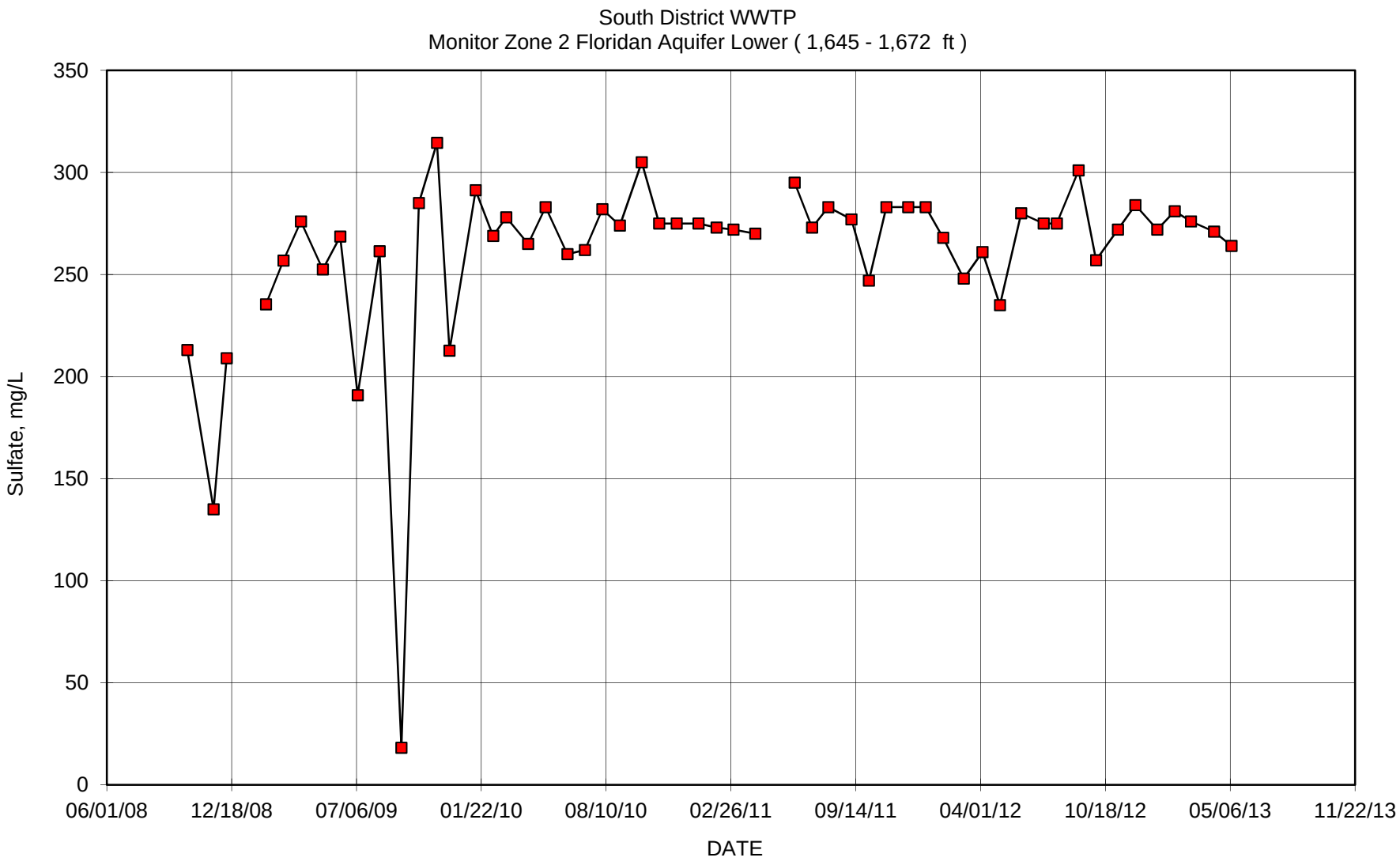
5 year Monitoring Data

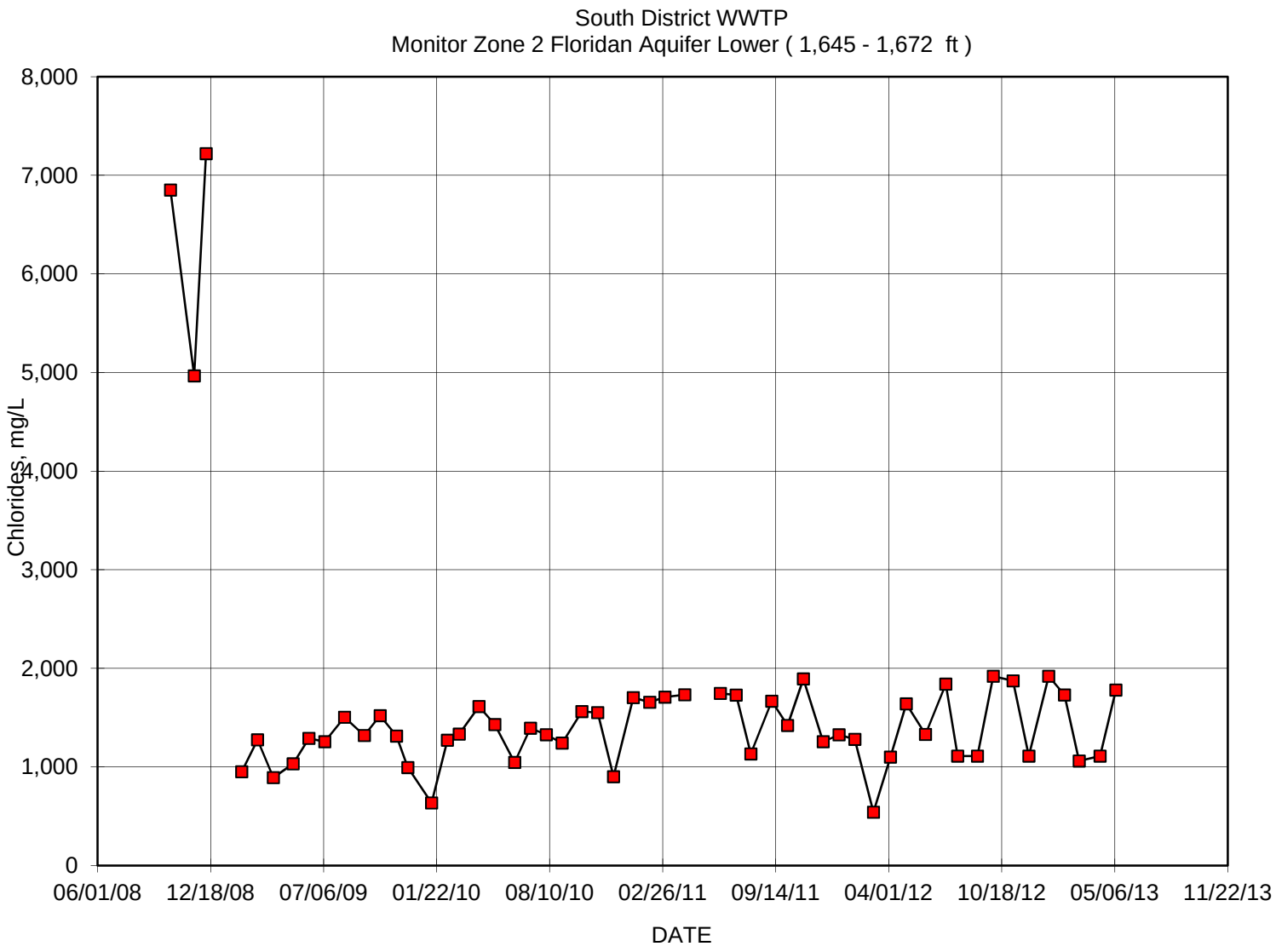
FA-2 Upper

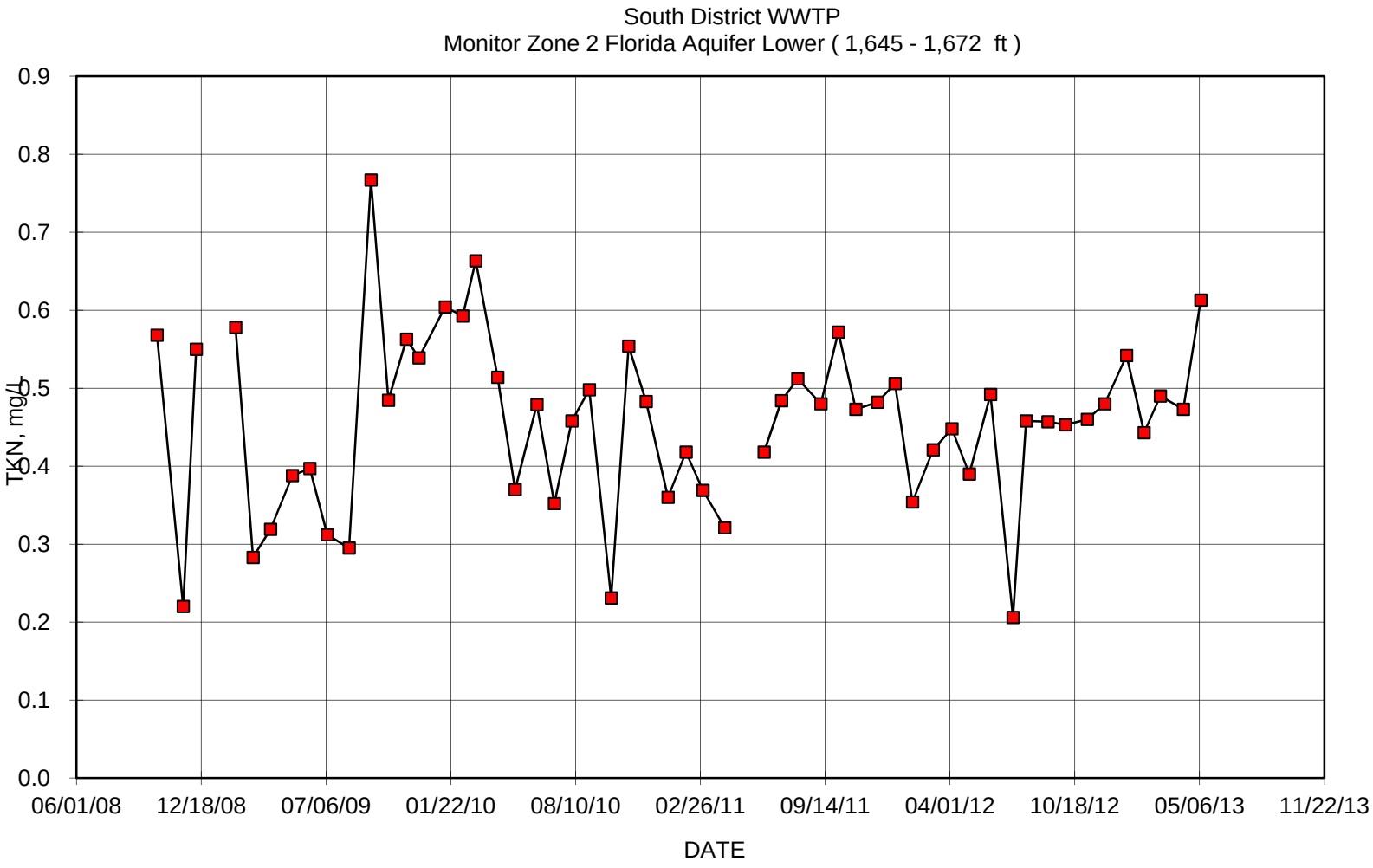
Date	TDS, mg/L	Sulfate, mg/L	Chlorides, mg/L	TKN, mg/L	NH3, mg/L	Conductivity, Micromho/cm	Temp, C	Temp, F	pH	TP, mg/L	TSS, mg/L	NO_3, mg/L	NO_2, mg/L	Sodium, mg/L	Gros Alpha, pCi/L	Radium 226, pCi/L	Radium 228, pCi/L
10/08/08	14,020	213	6,851	0.57	0.19	18,490	24	75	7.6	0.03	12.80	0.03	0.00				
11/19/08	14,430	135	4,966	0.22	0.02	19,750	24	75	7.6	0.00	14.00	0.03	0.00				
12/10/08	12,610	209	7,220	0.55	0.19	19,680	23	74	7.4	0.02	8.60	0.03	0.00				
01/14/09																	
02/11/09		235	951	0.58	0.20	4,007	26	78	8.1	0.07	3.30	0.00	0.00				
03/11/09	2,890	257	1,275	0.28	0.22	4,849	24	75	7.6	0.15	4.00	0.00	0.00				
04/08/09	1,700	276	892	0.32	0.23	3,675	23	73	7.7	0.01	1.20	0.00	0.01				
05/13/09	2,250	253	1,032	0.39	0.28	4,557	24	76	8.0	0.01	2.00	0.00	0.01				
06/10/09	2,390	269	1,290	0.40	0.26	5,275	24	75	7.7	0.13	5.80	0.01	0.00				
07/08/09	2,530	191	1,256	0.31	0.19	4,456	26	80	8.3	0.00	8.80	0.01	0.01				
08/12/09	3,110	261	1,504	0.30	0.44	5,685	25	76	7.8	0.01	1.20	0.00	0.00				
09/16/09	2,400	18	1,319	0.77	0.22	4,869			8.5	0.01		0.05	0.01	583	4.5	1.3	0.8
10/14/09	3,090	285	1,520	0.48	0.24	5,558			7.8	0.01		0.00	0.00	865	5.7	2.4	1.0
11/12/09	2,360	315	1,313	0.56	0.24	3,924			7.1	0.02		0.00	0.00	688	5.3	1.7	0.8
12/02/09	2,270	213	994	0.54	0.27	3,974	24	76	8.2	0.01	4.00	0.00	0.01	623	5.4	2.8	0.8
01/13/10	1,740	291	635	0.60	0.26	2,973	24	75	7.8	0.02	0.80	0.00	0.01	8440	4.4	1.3	0.7
02/10/10	2,690	269	1,271	0.59	0.25	4,591	22	71	7.9	0.01	4.80	0.01	0.01	783	6.7	2	0.8
03/03/10	2,930	278	1,333	0.66	0.25	4,868	24	75	7.7	0.03	1.60	0.01	0.00	798	6.1	3.5	0.8
04/07/10	3,370	265	1,613	0.51	0.24	5,740	25	76	7.6	0.01	1.20	0.00	0.00	902	11.8	2.6	0.7
05/05/10	3,116	283	1,430	0.37	0.13	5,117	25	78	7.8	0.01	14.20	0.00	0.00	885	6.5	2.1	0.7
06/09/10	2,540	260	1,046	0.48	0.16	4,129	25	77	8.0	0.03	4.60	0.00	0.00	640	3.7	1.6	0.8
07/07/10	3,020	262	1,393	0.35	0.27	5,115	24	75	7.8	0.02	1.00	0.00	0.00	822	7.8	3	1.0
08/04/10	2,640	282	1,327	0.46	0.32	4,476	25	76	7.8	0.20	16.60	0.00	0.00	735	6.8	6.1	0.7
09/01/10	2,930	274	1,242	0.50	0.23	4,783	24	76	7.8	0.02	18.40	0.00	0.00	740	8.4	2.5	0.7
10/06/10	2,910	305	1,562	0.23	0.25	5,304	24	75	7.9	0.02	1.60	0.00	0.00	858	9.7	2.5	0.7
11/03/10	3,000	275	1,551	0.55	0.26	5,461	24	75	7.7	0.01	1.00	0.00	0.00	881	4.1	2.9	0.8
12/01/10	2,180	275	901	0.48	0.26	3,683	24	76	7.8	0.02	2.60	0.00	0.01	573	404	1.8	0.7
01/05/11	3,380	275	1,703	0.36	0.26	5,780	24	76	7.7	0.02	1.30	0.00	0.01	928	10	3.1	0.8
02/03/11	3,450	273	1,656	0.42	0.21	5,752	24	76	7.6	0.02	1.20	0.00	0.00	963	6.2	3	0.8
03/02/11	3,710	272	1,708	0.37	0.21	6,015	24	75	7.6	0.02	2.50	0.00	0.00	1000	10.7	3.2	0.6
04/06/11	3,550	270	1,732	0.32	0.24	5,838	24	76	7.5	0.02	0.40	0.00	0.00	1000	7.4	3.3	0.8
05/04/11																	
06/08/11	3,460	295	1,746	0.42	0.23	6,213	24	76	7.8	0.05	1.20	0.01	0.00	1040	9.3	3.2	0.9

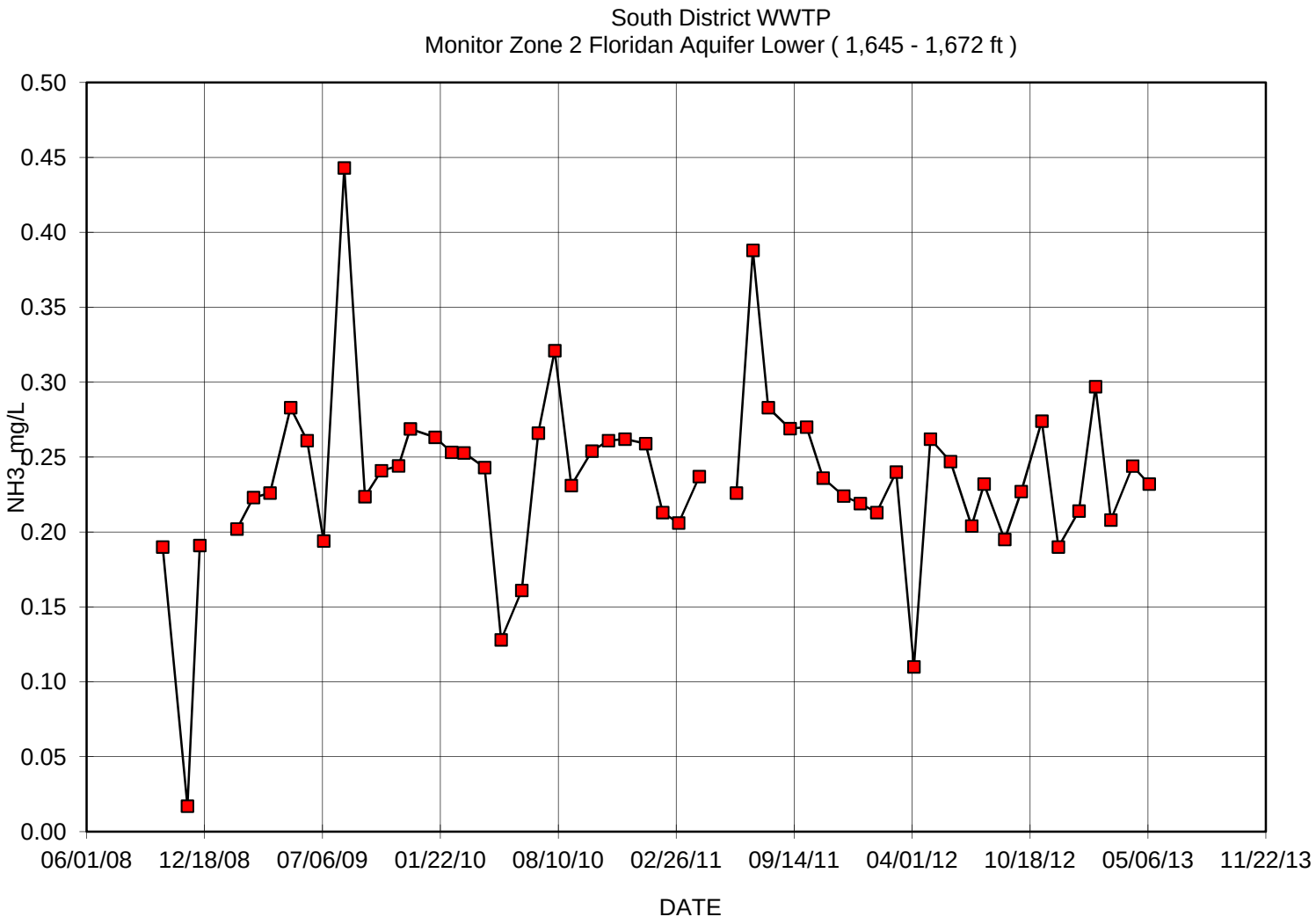
07/06/11	3,732	273	1,729	0.48	0.39	6,092	24	75	8.0	0.02	1.90	0.00	0.00	1100	11.8	3.2	0.8
08/01/11	2,532	283	1,132	0.51	0.28	4,120	25	78	8.0	0.00	6.10	0.00	0.00	666	6.2	1.9	0.9
09/07/11	3,468	277	1,667	0.48	0.27	5,919	25	77	7.9	0.04	1.20	0.01	0.00	915	11.5	2.5	0.8
10/05/11	3,300	247	1,421	0.57	0.27	5,435	24	75	7.8	0.02	3.30	0.00	0.00	906	5.5	2.9	1.0
11/02/11	3,800	283	1,893	0.47	0.24	5,832	24	76	7.8	0.02	1.20	0.00	0.00	1040	9.9	3.3	0.9
12/07/11	2,736	283	1,256	0.48	0.22	4,278	24	75	7.6	0.02	8.40	0.03	0.00	760	7.1	2.1	0.9
01/04/12	2,852	283	1,326	0.51	0.22	4,403	24	74	7.9	0.02	4.50	0.00	0.00	784	9.9	4	0.8
02/01/12	3,028	268	1,280	0.35	0.21	4,874	24	76	7.7	0.02	5.10	0.00	0.00	768	6.2	2.6	0.9
03/05/12	1,676	248	541	0.42	0.24	2,769	25	76	7.5	0.01	11.30	0.01	0.00	506	4.7	0.8	0.7
04/04/12	2,492	261	1,100	0.45	0.11	3,791	25	77	7.4	0.02	12.30	0.50	0.50	728	7.7	1.9	0.9
05/02/12	3,496	235	1,640	0.39	0.26	5,826	24	76	7.8	0.04	1.90	0.00	0.00	982	8.4	2.4	0.8
06/05/12	3,040	280	1,330	0.49	0.25	4,209	25	76	7.8	0.03	2.90	0.00	0.00	829	8.6	2.4	0.8
07/11/12	3,912	275	1,840	0.21	0.20	6,257	24	75	7.8	0.03	0.00	0.03	0.00	1060	9.9	3.3	0.9
08/01/12	2,620	275	1,110	0.46	0.23	4,202	25	77	8.4	0.00	2.10	0.00	0.00	768	14.3	1.5	0.8
09/05/12	2,568	301	1,110	0.46	0.20	4,164	24	76	7.9	0.05	6.00	0.00	0.00	629	6.3	1.3	0.8
10/03/12	3,840	257	1,920	0.45	0.23	6,701	24	76	7.9	0.03	0.90	0.00	0.00	1010	11.7	3.1	0.8
11/07/12	3,848	272	1,873	0.46	0.27	6,444	24	76	7.8	0.23	1.20	0.00	0.00	1110	6.6	3.6	0.8
12/05/12	2,708	284	1,110	0.48	0.19	4,215	24	75	7.8	0.12	5.10	0.08	0.01	702	5.2	1.1	0.8
01/09/13	3,984	272	1,920	0.54	0.21	6,546	24	76	7.7	0.14	0.40	0.01	0.01	1070	11.9	2.8	0.8
02/06/13	3,452	281	1,730	0.44	0.30	5,560	25	77	7.8	0.00	3.70	0.00	0.01	840	8	0.5	0.9
03/04/13	2,264	276	1,060	0.49	0.21	4,153	24	75	7.8	0.03	2.40	0.00	0.00	742	5.1	2.4	0.8
04/10/13	2,572	271	1,110	0.47	0.24	4,403	24	76	8.0	0.00	0.00	0.02	0.01	656	5.7	1.6	0.8
05/08/13	3,864	264	1,780	0.61	0.23	6,527	24	76	7.8	0.03	0.03	0.01	0.00	1080	7.1	2.9	0.7

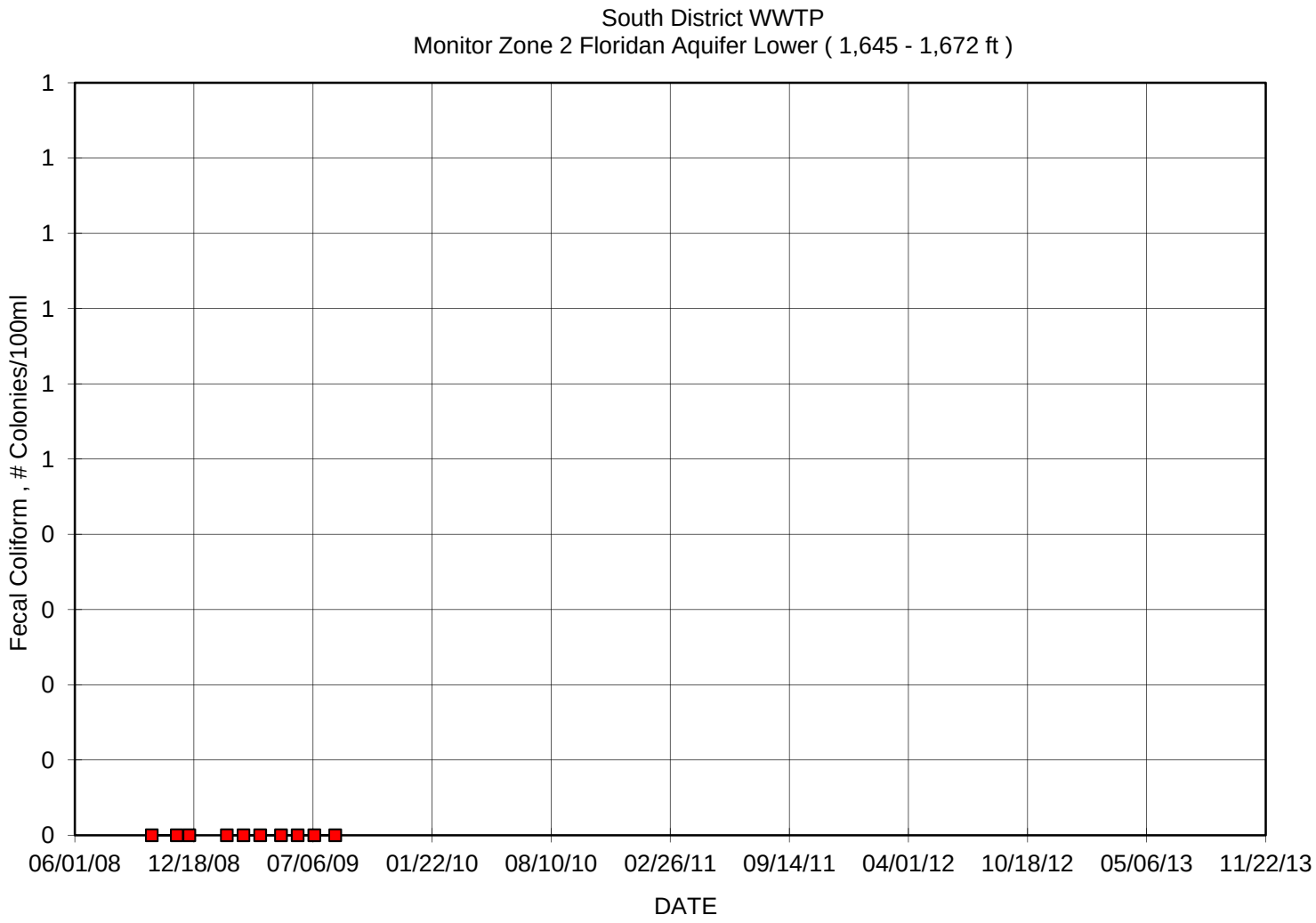

South District WWTP
Monitor Zone 2 Floridan Aquifer Lower (1,645 - 1,672 ft)
24,000
21,000
18,000
15,000
12,000
9,000
6,000
3,000
0
TDS, mg/L
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

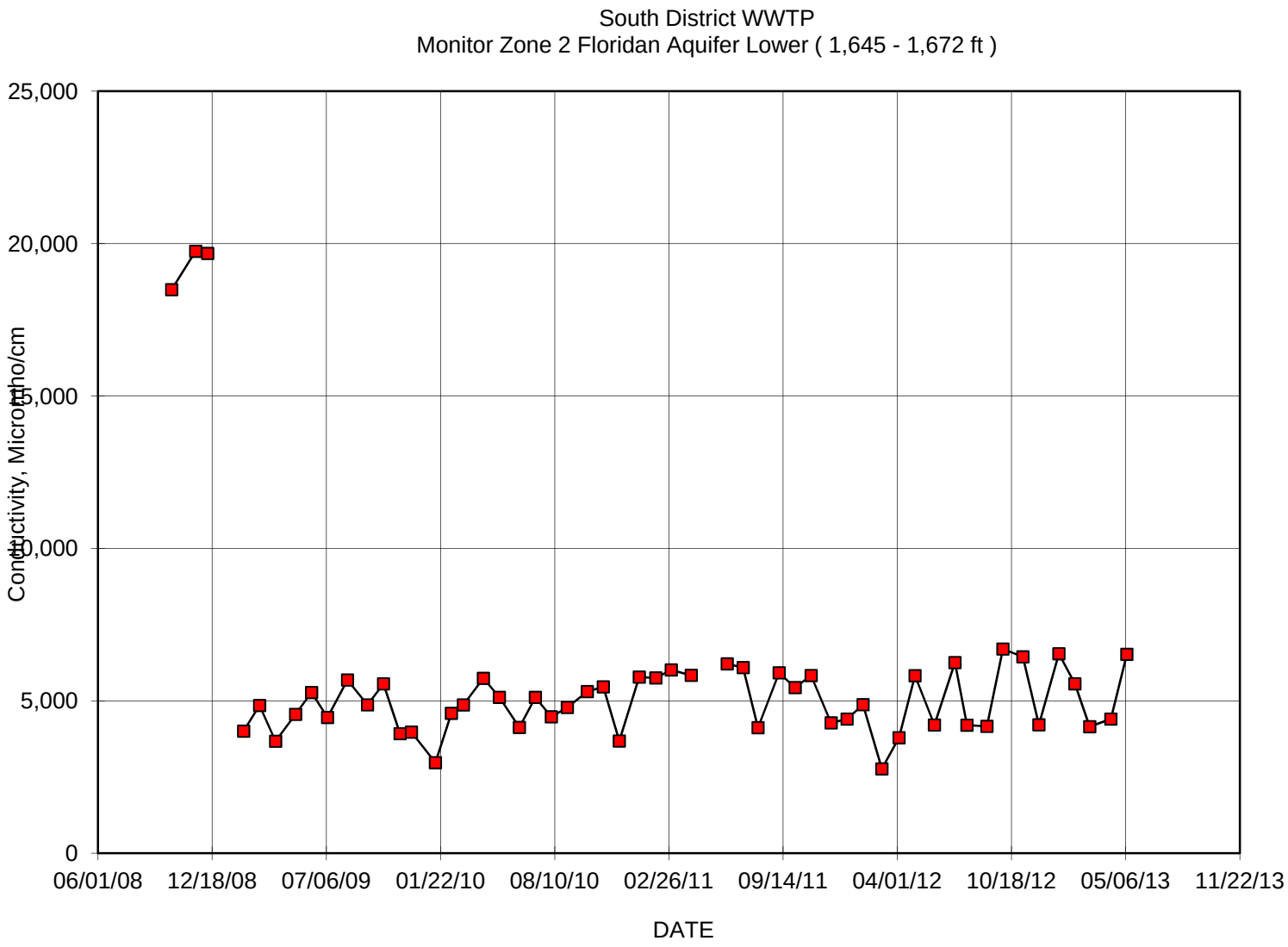

South District WWTP
Monitor Zone 2 Floridan Aquifer Lower (1,645 - 1,672 ft)
Sulfate, mg/L
350
300
250
200
150
100
50
0
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

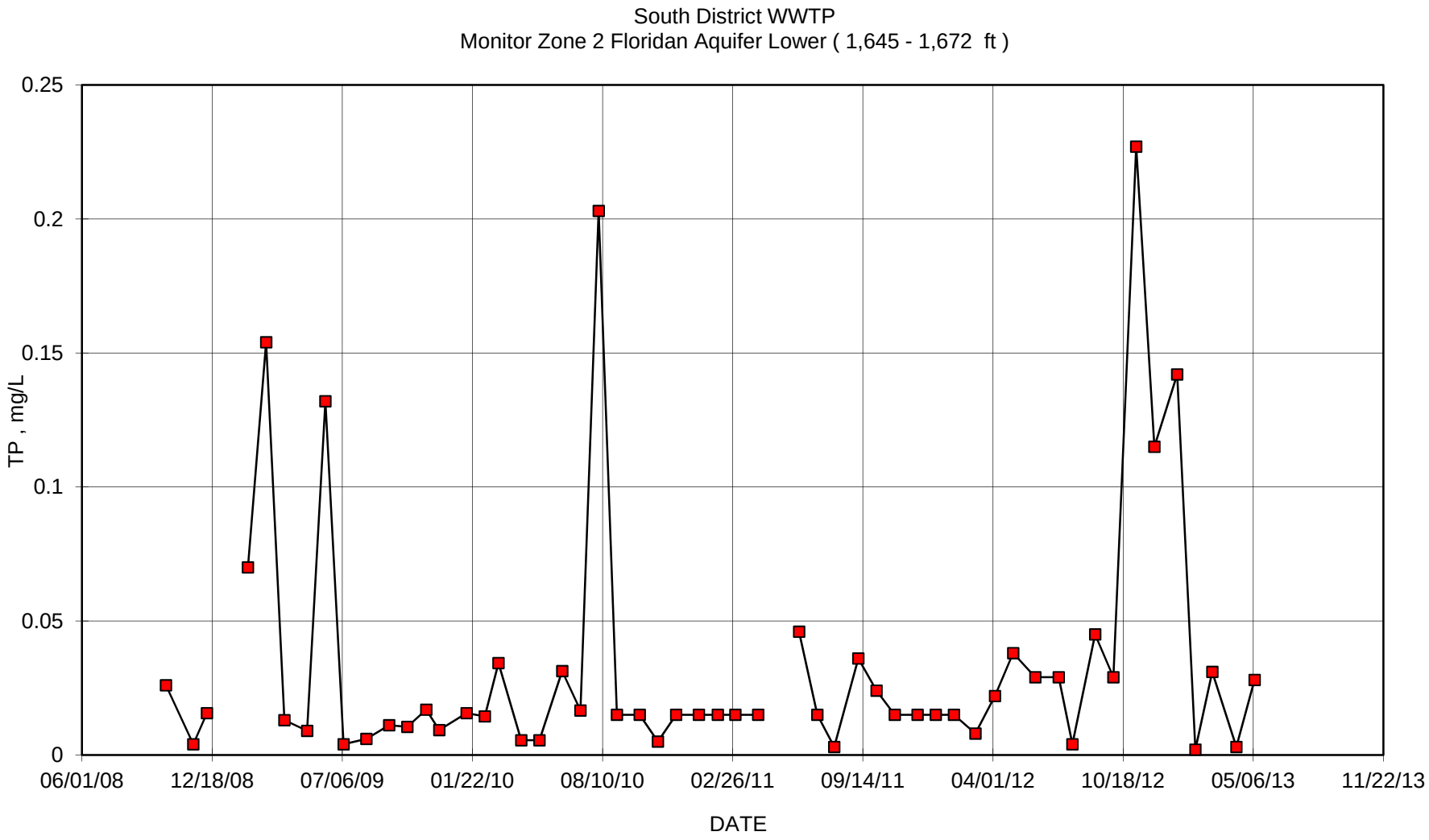

South District WWTP
Monitor Zone 2 Floridan Aquifer Lower (1,645 - 1,672 ft)
Chlorides, mg/L
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

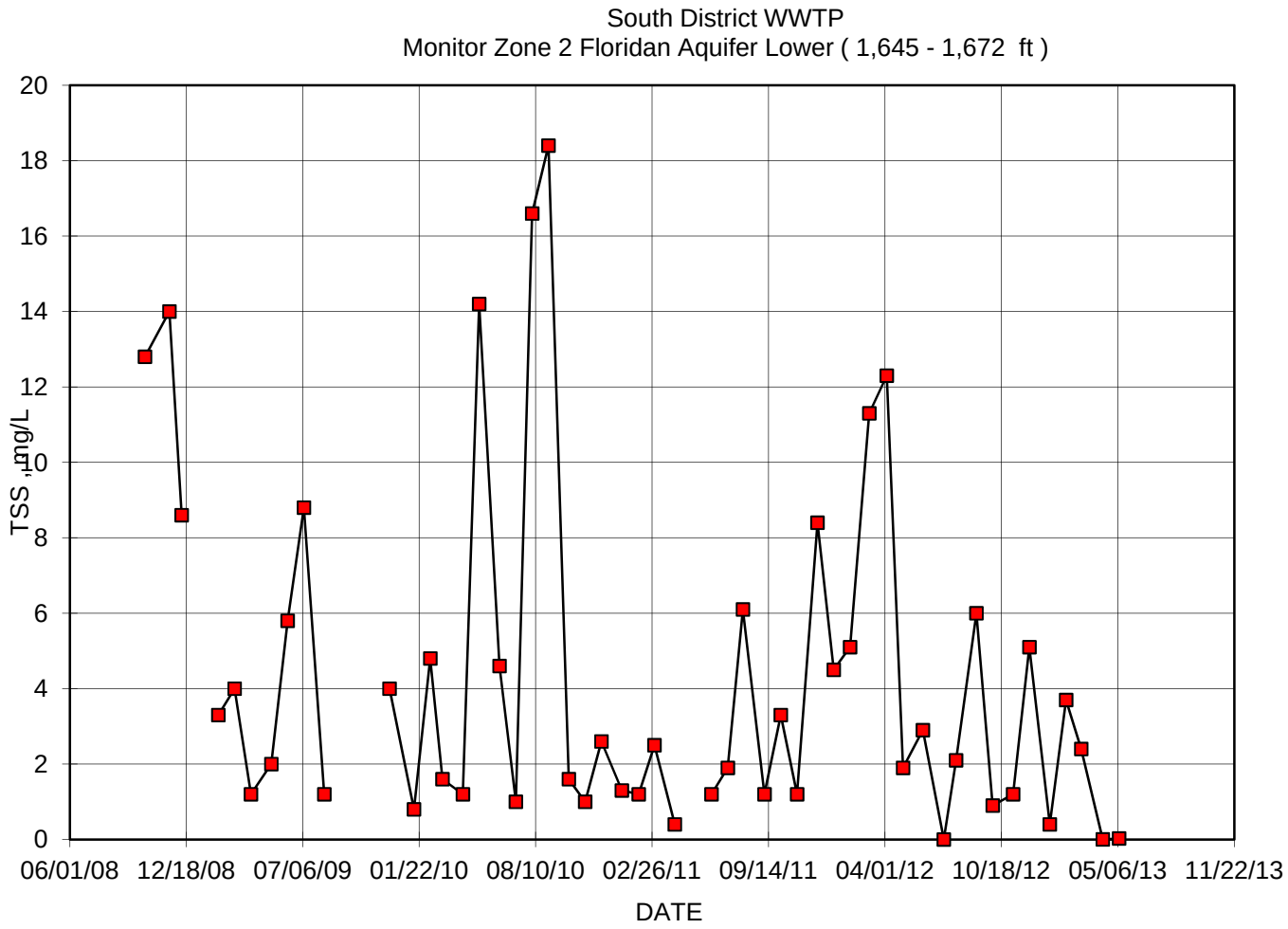

South District WWTP
Monitor Zone 2 Florida Aquifer Lower (1,645 - 1,672 ft)
TKN, mg/L
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 2 Floridan Aquifer Lower (1,645 - 1,672 ft)
NH3 mg/L
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 2 Floridan Aquifer Lower (1,645 - 1,672 ft)
Fecal Coliform , # Colonies/100ml
1
1
1
1
1
1
0
0
0
0
0
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 2 Floridan Aquifer Lower (1,645 - 1,672 ft)
25,000
20,000
15,000
10,000
5,000
0
Conductivity, Micromho/cm
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

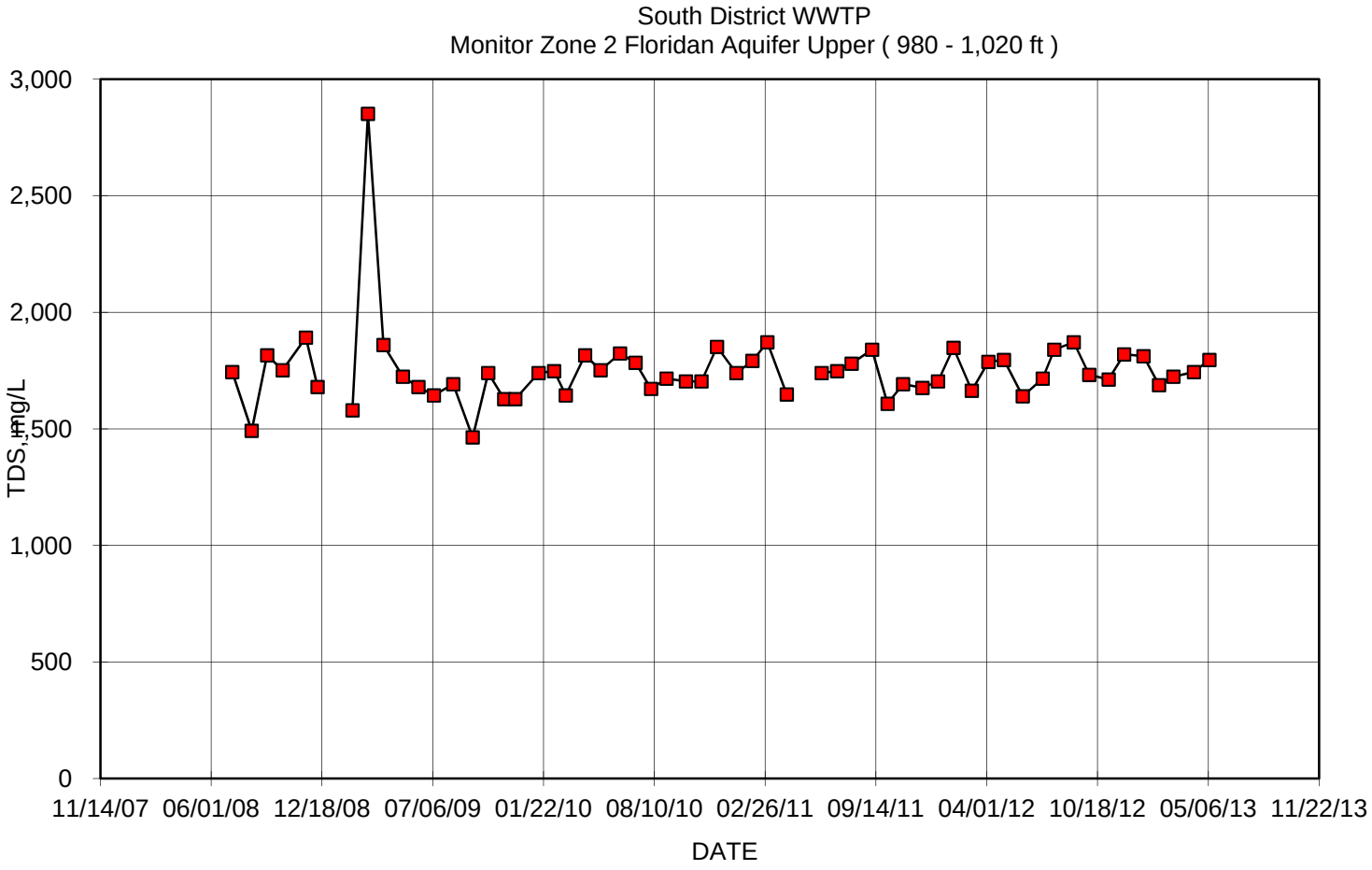

South District WWTP
Monitor Zone 2 Floridan Aquifer Lower (1,645 - 1,672 ft)
TP , mg/L
0.25
0.2
0.15
0.1
0.05
0
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

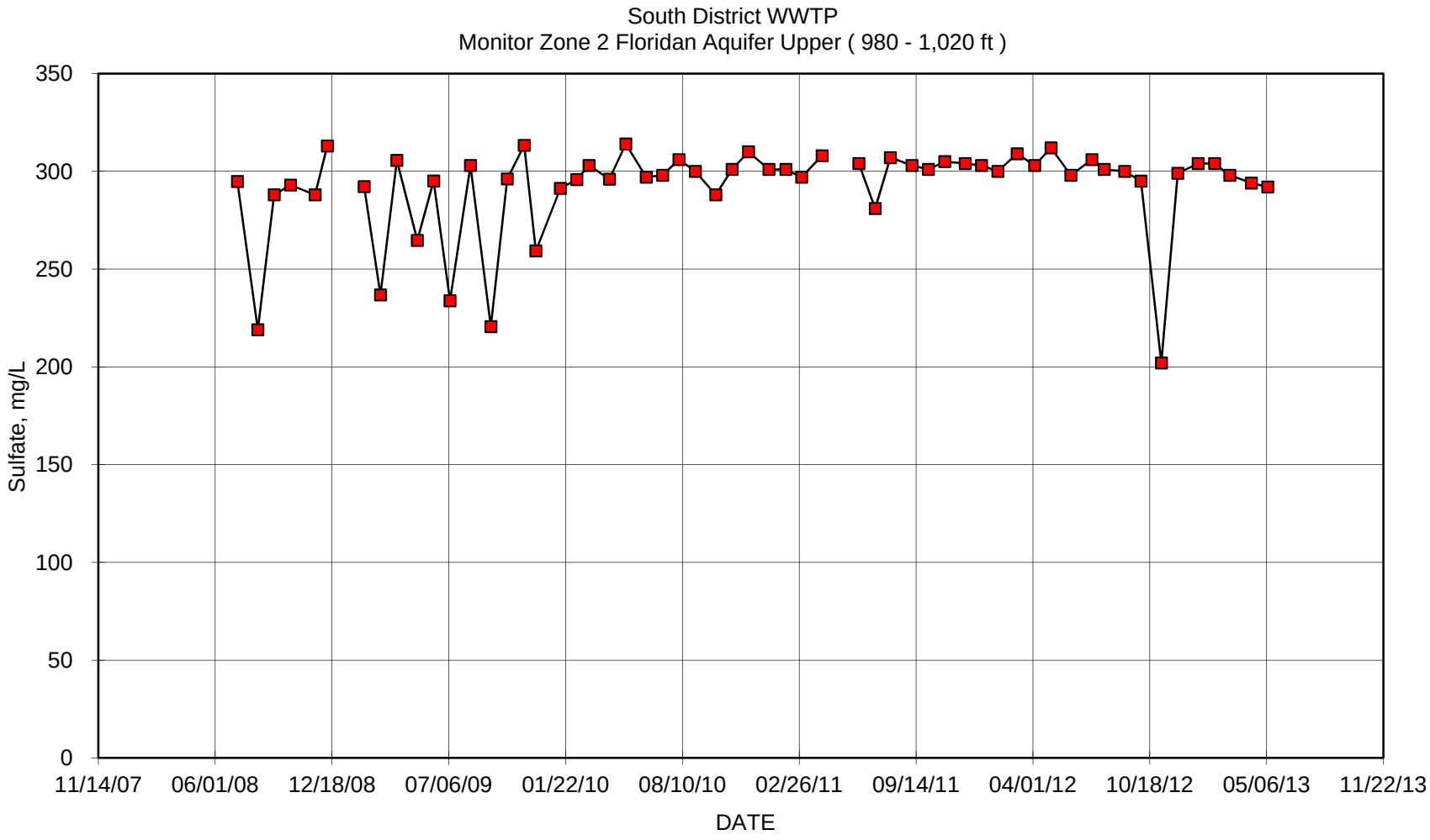

South District WWTP
Monitor Zone 2 Floridan Aquifer Lower (1,645 - 1,672 ft)
TSS , mg/L
20
18
16
14
12
10
8
6
4
2
0
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

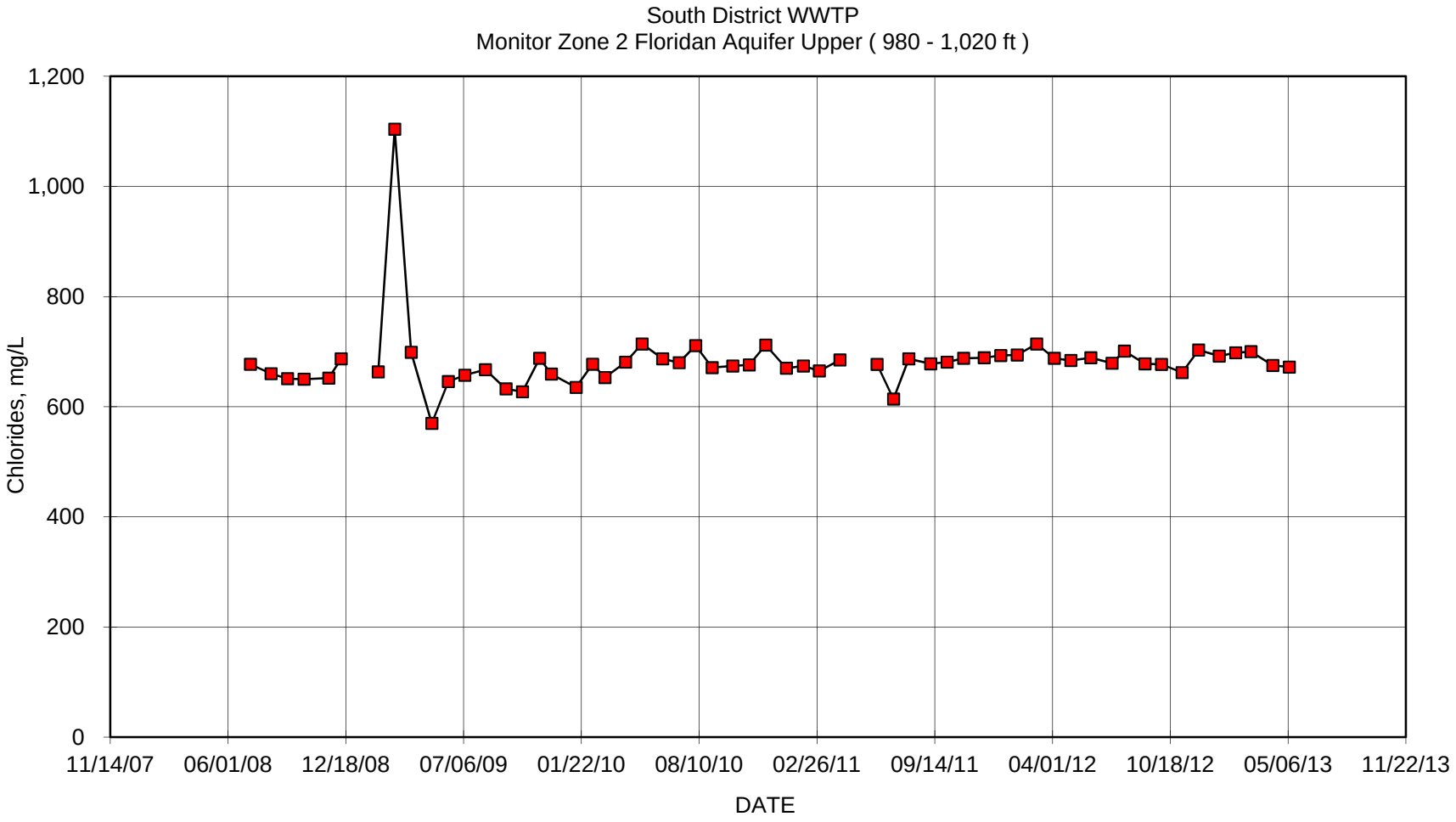
FA-2 Lower Data

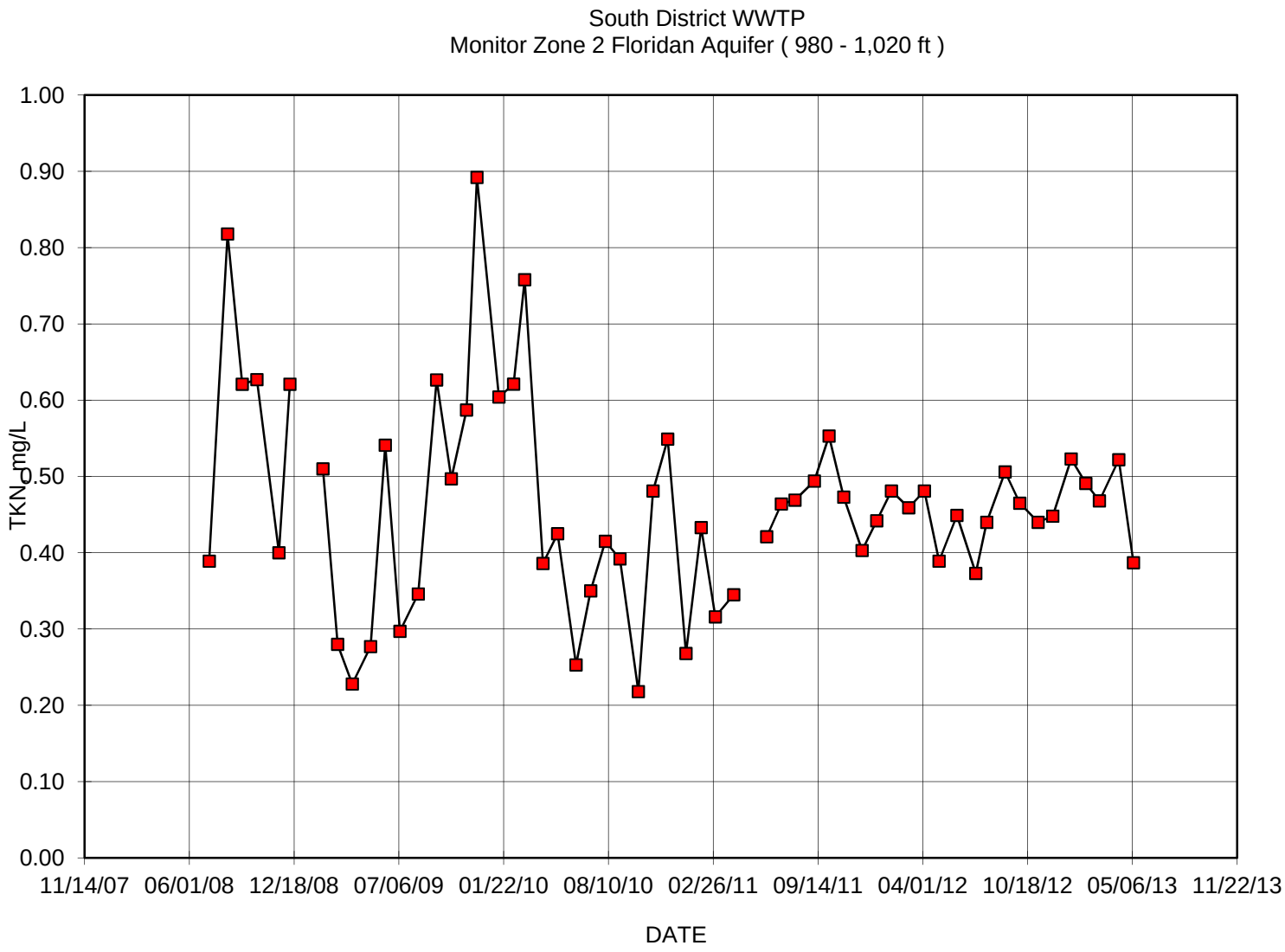
Date	TDS, mg/L	Sulfate, mg/L	Chlorides, mg/L	TKN, mg/L	NH3, mg/L	Conductivity, Micromho/cm	Temp., C	Temp., F	pH	TP, mg/L	TSS, mg/L	NO_3, mg/L	NO_2, mg/L	Sodium, mg/L	Gross Alpha pCi/L	Radium 226 pCi/L	Radium 228 pCi/L
07/09/08	1,744	295	677	0.39	0.04	2,987	24	76	8.1	0.01	1.8	0.03	0.00				
08/13/08	1,492	219	660	0.82	0.23	2,757	26	79	8.8	0.01	1.8	0.08	0.05				
09/10/08	1,816	288	651	0.62	0.15	3,032	25	77	8.0	0.01	1.8	0.08	0.05				
10/08/08	1,752	293	650	0.63	0.19	3,101	24	75	7.9	0.02	1.8	0.03	0.00				
11/19/08	1,892	288	652	0.40	0.02	3,037	24	75	8.1	0.00	1.8	0.03	0.00				
12/10/08	1,680	313	687	0.62	0.23	2,982	24	75	7.8	0.02	0.4	0.03	0.00				
01/14/09																	
02/11/09	1,580	292	663	0.51	0.23	2,994	25	77	8.0	0.03	1.0	0.00	0.00				
03/11/09	2,852	237	1,104	0.28	0.24	5,010	24	75	7.6	0.16	1.8	0.00	0.00				
04/08/09	1,860	306	699	0.23	0.24	3,126	24	74	7.9	0.02	0.6	0.00	0.01				
05/13/09	1,724	265	570	0.28	0.32	2,987	25	76	8.0	0.01	0.6	0.00	0.01				
06/10/09	1,680	295	646	0.54	0.24	3,054	24	76	8.0	0.13	0.2	0.01	0.00				
07/08/09	1,644	234	657	0.30	0.27	2,844	29	84	8.6	0.00	0.6	0.00	0.01				
08/12/09	1,692	303	667	0.35	0.52	3,171	25	77	7.8	0.01	1.4	0.00	0.00				
09/16/09	1,464	221	632	0.63	0.25	2,830			8.4	0.00		0.05	0.01	455	6.9	0.8	0.8
10/14/09	1,740	296	627	0.50	0.25	2,905			7.7	0.01		0.00	0.00	465	5.6	1.3	0.9
11/12/09	1,628	313	688	0.59	0.28	2,725			7.9	0.02		0.00	0.00	460	4.4	0.7	0.7
12/02/09	1,628	259	659	0.89	0.26	2,949	25	77	8.4	0.01	1.6	0.00	0.01	485	3.7	1.3	0.9
01/13/10	1,740	291	635	0.60	0.26	2,973	24	75	7.8	0.02	0.8	0.00	0.01	8440	4.4	1.3	0.7
02/10/10	1,748	296	677	0.62	0.31	2,882	23	74	8.0	0.01	0.2	0.00	0.01	492	4.2	1.1	0.9
03/03/10	1,644	303	653	0.76	0.23	3,068	24	75	7.9	0.03	0.2	0.01	0.00	489	5.4	1.3	0.8
04/07/10	1,816	296	681	0.39	0.07	3,098	25	76	7.8	0.01	0.2	0.00	0.00	466	6.4	1.7	0.7
05/05/10	1,752	314	714	0.43	0.24	3,012	25	76	7.8	0.02	1.0	0.00	0.00	516	5.8	1.2	0.7
06/09/10	1,824	297	687	0.25	0.21	3,112	25	76	8.0	0.13	1.4	0.00	0.00	479	8.7	1.2	0.7
07/07/10	1,784	298	680	0.35	0.20	3,039	24	76	7.9	0.01	1.0	0.00	0.00	491	4.8	1.2	1.0
08/04/10	1,672	306	711	0.42	0.30	2,877	25	76	7.9	0.19	0.4	0.00	0.00	483	4.4	1.3	0.8
09/01/10	1,716	300	671	0.39	0.27	3,072	24	76	7.9	0.02	1.0	0.00	0.00	470	7.2	1.8	0.8
10/06/10	1,704	288	674	0.22	0.26	3,035	24	75	7.6	0.02	1.6	0.00	0.00	484	5.2	1.5	0.8
11/03/10	1,704	301	676	0.48	0.26	2,953	24	75	7.8	0.02	0.4	0.00	0.00	464	4.6	1.6	0.7
12/01/10	1,852	310	712	0.55	0.25	3,050	24	76	7.9	0.02	0.6	0.00	0.01	459	3.9	1.8	0.6
01/05/11	1,740	301	670	0.27	0.24	2,939	24	76	7.8	0.02	0.3	0.00	0.01	485	5.0	2.0	0.9
02/03/11	1,792	301	674	0.43	0.23	2,887	24	75	7.7	0.02	0.1	0.00	0.00	459	6.0	2.0	0.8

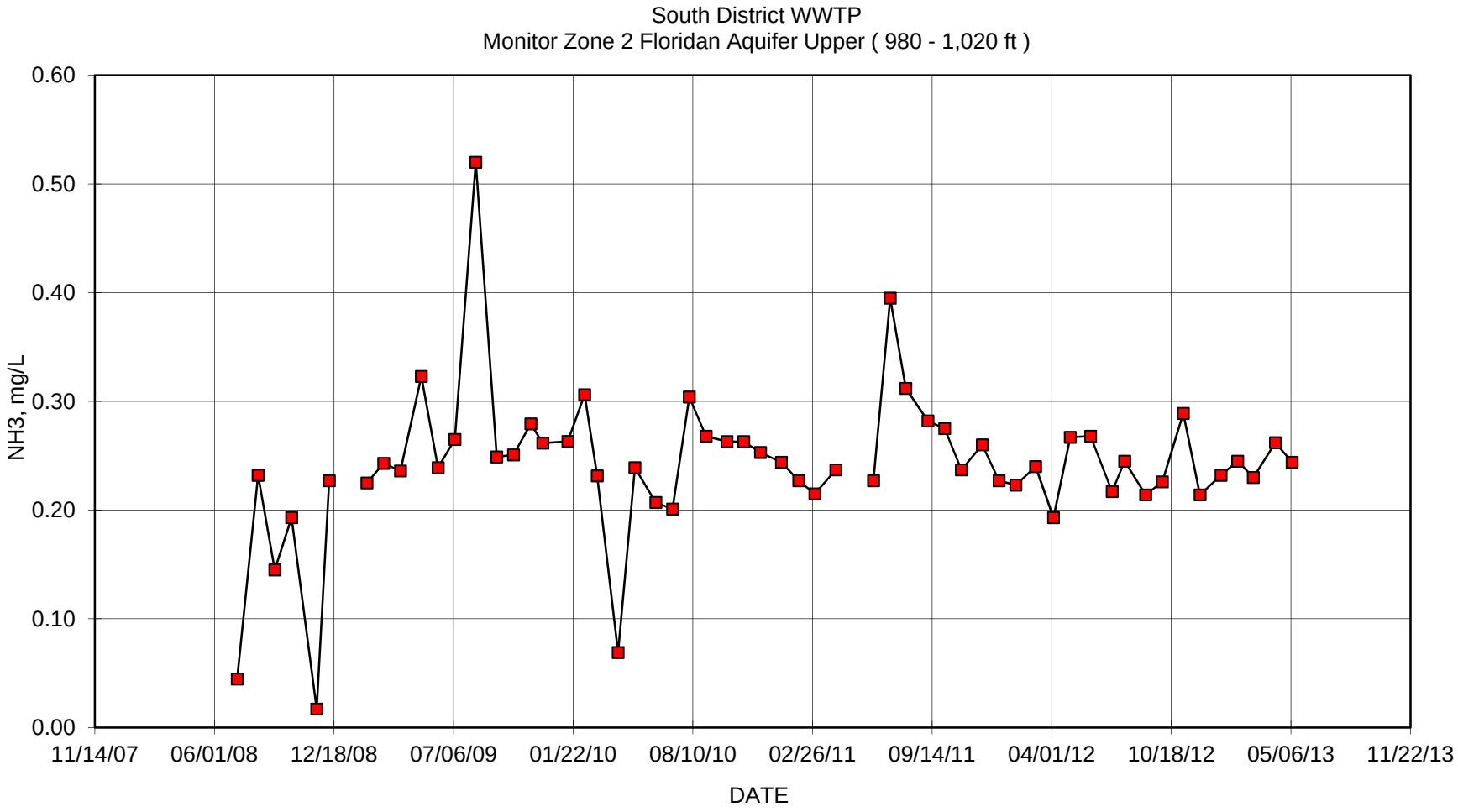
03/02/11	1,872	297	665	0.32	0.22	3,038	24	75	7.8	0.02	0.8	0.00	0.00	478	4.1	1.9	0.7
04/06/11	1,648	308	685	0.35	0.24	2,933	24	76	7.9	0.02	0.1	0.00	0.00	496	5.4	1.5	0.7
05/04/11																	
06/08/11	1,740	304	677	0.42	0.23	3,047	24	76	7.8	0.06	1.5	0.00	0.00	486	5.9	1.3	0.8
07/06/11	1,748	281	614	0.46	0.40	2,958	24	75	7.8	0.02	1.2	0.00	0.00	459	5.3	1.4	0.9
08/01/11	1,780	307	687	0.47	0.31	2,943	26	78	7.7	0.00	0.8	0.00	0.00	480	5.6	1.0	0.9
09/07/11	1,840	303	678	0.49	0.28	2,940	25	76	8.0	0.03	0.7	0.00	0.00	488	4.6	1.8	0.9
10/05/11	1,608	301	681	0.55	0.28	2,888	24	76	7.9	0.01	0.7	0.00	0.00	477	5.6	1.8	1.0
11/02/11	1,692	305	688	0.47	0.24	2,961	24	76	7.9	0.02	1.1	0.00	0.00	495	5.1	1.3	0.8
12/07/11	1,676	304	689	0.40	0.26	3,679	24	76	8.2	0.01	1.2	0.01	0.00	503	5.9	1.4	1.0
01/04/12	1,704	303	693	0.44	0.23	2,705	23	74	7.8	0.02	0.3	0.01	0.00	493	6.6	1.6	0.8
02/01/12	1,848	300	694	0.48	0.22	2,674	24	76	7.8	0.02	0.0	0.00	0.00	474	5.1	1.5	0.8
03/05/12	1,664	309	714	0.46	0.24	2,899	25	77	7.8	0.01	0.7	0.02	0.00	517	3.7	2.0	0.8
04/04/12	1,788	303	688	0.48	0.19	2,512	24	76	7.9	0.01	0.3	0.25	0.25	479	10.7	1.7	0.8
05/02/12	1,796	312	684	0.39	0.27	2,950	24	76	8.0	0.04	0.9	0.00	0.00	490	5.1	1.2	0.8
06/05/12	1,640	298	689	0.45	0.27	3,073	25	76	8.1	0.01	0.6	0.01	0.00	470	5.5	1.1	1.0
07/11/12	1,716	306	679	0.37	0.22	3,013	24	75	8.0	0.03	0.5	0.00	0.00	501	4.8	1.3	0.9
08/01/12	1,840	301	701	0.44	0.25	3,101	25	77	8.0	0.00	0.1	0.00	0.00	524	4.6	1.4	0.7
09/05/12	1,872	300	678	0.51	0.21	3,039	25	76	8.1	0.05	0.3	0.00	0.00	457	6.5	1.6	0.9
10/03/12	1,732	295	677	0.47	0.23	2,928	24	76	7.9	0.03	0.9	0.00	0.00	469	6.8	1.3	0.8
11/07/12	1,712	202	662	0.44	0.29	2,858	24	75	7.8	0.01	1.3	0.01	0.00	505	9.3	2.6	0.8
12/05/12	1,820	299	703	0.45	0.21	3,079	24	76	7.9	0.02	0.4	0.01	0.00	519	5.4	1.2	0.8
01/09/13	1,812	304	692	0.52	0.23	3,064	24	76	8.0	0.13	0.8	0.00	0.00	495	6.4	1.5	0.8
02/06/13	1,688	304	698	0.49	0.25	3,083	24	76	7.8	0.01	0.7	0.01	0.00	442	5.7	2.0	0.8
03/04/13	1,724	298	700	0.47	0.23	3,127	24	75	7.9	0.04	1.6	0.00	0.01	550	5.8	1.7	0.8
04/10/13	1,744	294	675	0.52	0.26	3,085	24	76	7.7	0.01	0.0	0.00	0.01	485	4.1	2.7	0.9
05/08/13	1,796	292	672	0.39	0.24	3,282	25	77	7.9	0.02	0.0	0.01	0.01	482	4.3	1.4	0.7

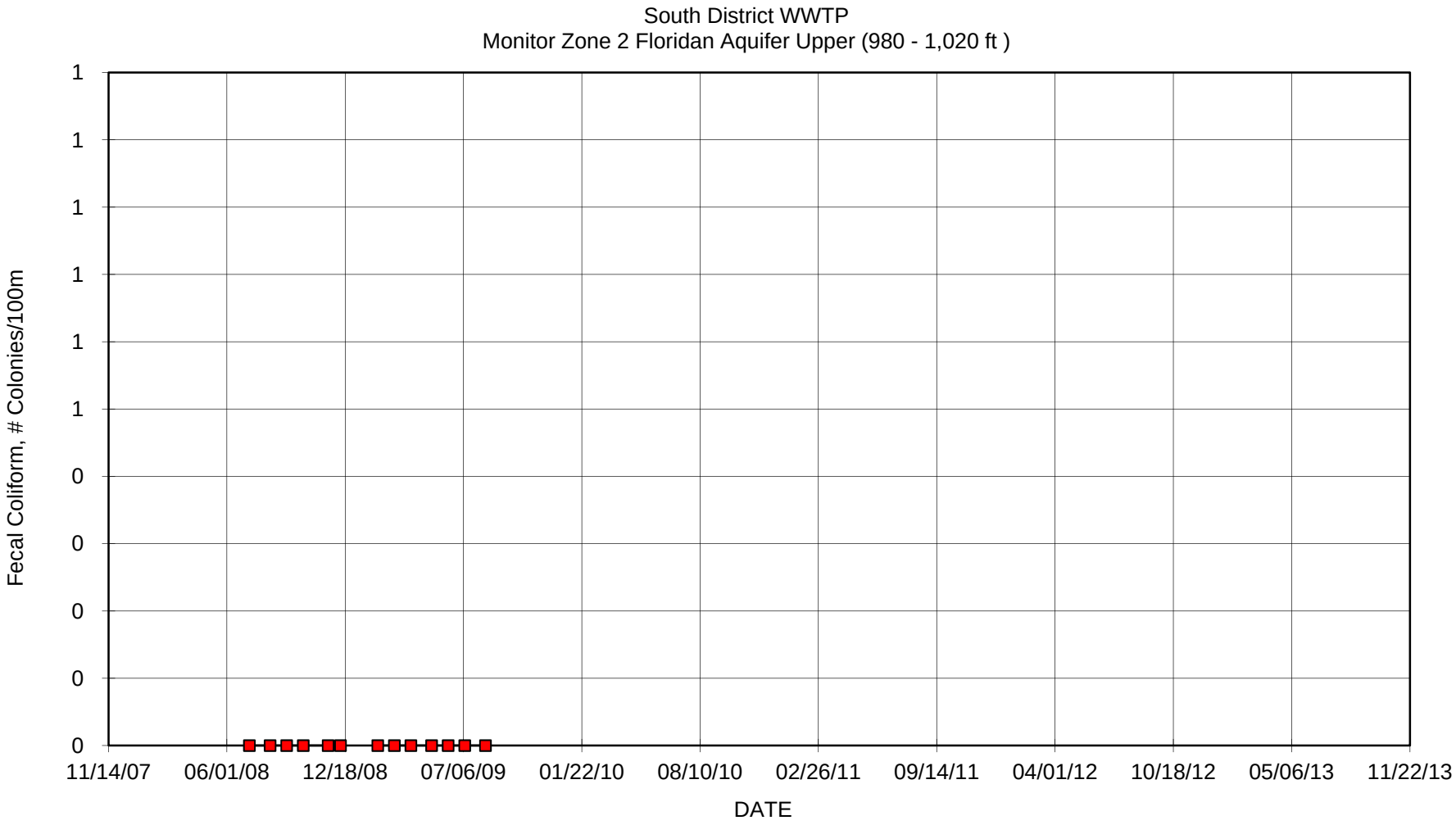

South District WWTP
Monitor Zone 2 Floridan Aquifer Upper (980 - 1,020 ft)
3,000
2,500
2,000
1,500
1,000
500
0
TDS, mg/L
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

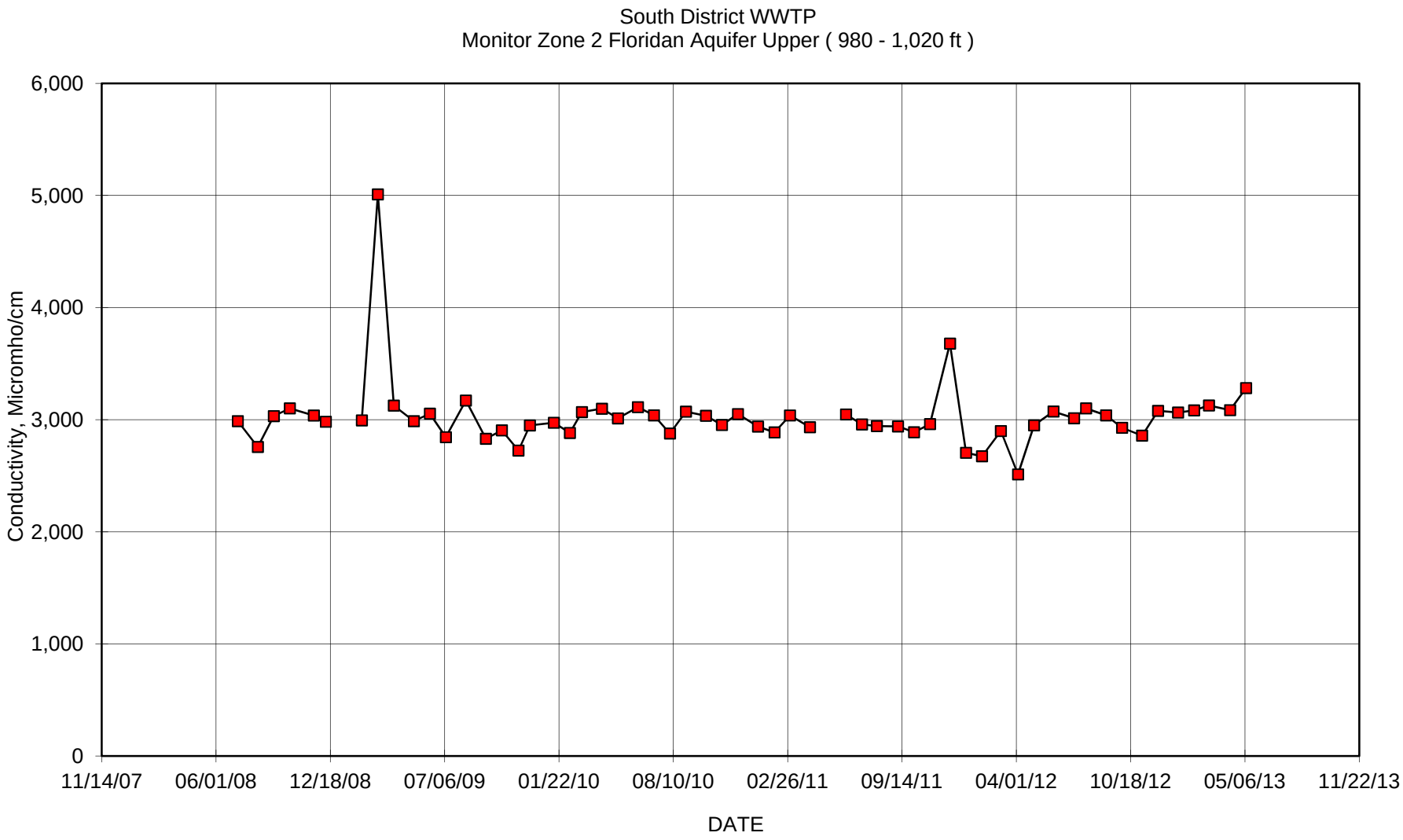

South District WWTP
Monitor Zone 2 Floridan Aquifer Upper (980 - 1,020 ft)
Sulfate, mg/L
350
300
250
200
150
100
50
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

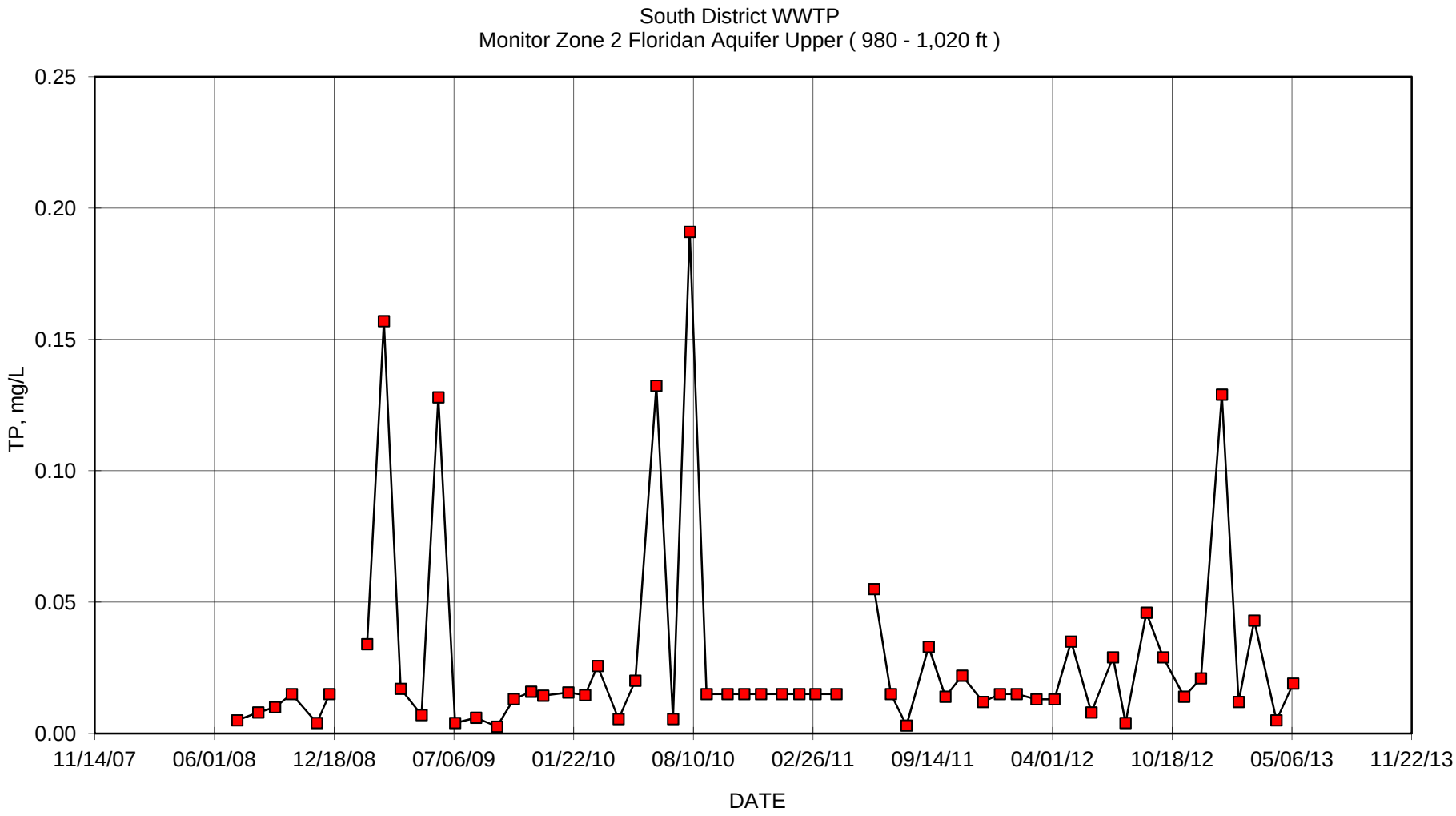

South District WWTP
Monitor Zone 2 Floridan Aquifer Upper (980 - 1,020 ft)
Chlorides, mg/L
1,200
1,000
800
600
400
200
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

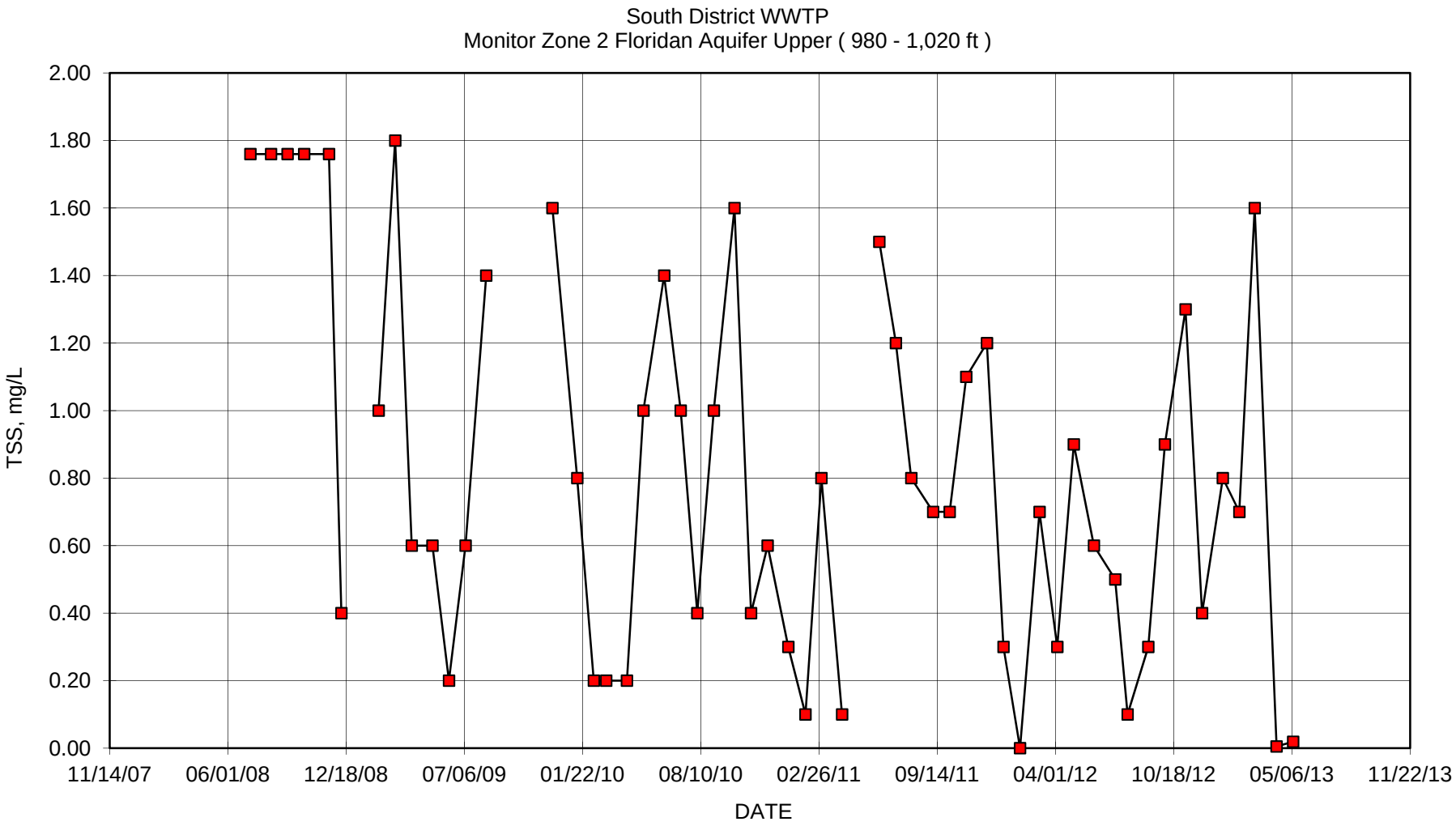

South District WWTP
Monitor Zone 2 Floridan Aquifer (980 - 1,020 ft)
TKN mg/L
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 2 Floridan Aquifer Upper (980 - 1,020 ft)
NH3, mg/L
0.60
0.50
0.40
0.30
0.20
0.10
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 2 Floridan Aquifer Upper (980 - 1,020 ft)
Fecal Coliform, # Colonies/100m
1
1
1
1
1
1
0
0
0
0
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 2 Floridan Aquifer Upper (980 - 1,020 ft)
Conductivity, Micromho/cm
6,000
5,000
4,000
3,000
2,000
1,000
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 2 Floridan Aquifer Upper (980 - 1,020 ft)
TP, mg/L
0.25
0.20
0.15
0.10
0.05
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 2 Floridan Aquifer Upper (980 - 1,020 ft)
TSS, mg/L
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

MIAMI-DADE COUNTY
miamidade.gov

Water and Sewer
PO Box 330316 • 3071 SW 38 Avenue
Miami, Florida 33233-3016
T 305-665-7471

November 25, 2013

Mr. Joseph R. May, P.G.
Florida Department of Environmental Protection
400 North Congress Avenue, 3rd Floor
West Palm Beach, Florida 33401

CCN: 57822

Reference: Miami-Dade Water and Sewer Department -- Mechanical Integrity Testing (MIT) Report for Deep Injection Well No. IW-14 at the SDWWTP Site.

Dear Mr. May:

Enclosed please find the Certificate of Mechanical Integrity and the MIT Report on the re-testing of Deep Injection Well No. IW-14 at the South District Wastewater Treatment Plant site in Miami-Dade County.

All the tests were conducted in strict adherence to the specifications submitted to and approved by your office. The testing results for the well were good. Both external and internal mechanical integrity were demonstrated. The well casing and the wellhead components are in good condition. All the well head valves and all the well head components are scheduled to be rust-proofed and repainted when all the MITs are completed. Based on the results of the well testing we conclude that the well retains full mechanical integrity and recommend that MDWASD be allowed to continue operating the well in its normal mode.

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

The demonstration of mechanical integrity is being submitted per Chapter 62-528.300(6)(b)2., 62-528.300(6)(c), and 62-528.425(1)(d), F.A.C. and specific condition 3.j. of Permit 0061787-022-UO.

If you have any questions or require additional explanation of any item in the report, please do not hesitate to contact me at [redacted] or Sonia Villamil at [redacted].

Sincerely,

[redacted]

for Rafael A. Terrero, P.E.
Assistant Director- Wastewater Operation Systems

Enclosures: Certificate of Mechanical Integrity
MIT Report Well IW-14 (1 copy)

cc: Joseph Haberfeld, FDEP - Tallahassee

MIAMI-DADE COUNTY
Delivering Excellence Every Day

Mechanical Integrity Test Report
Deep Injection Well No. IW-14
South District Wastewater Treatment Plant

Prepared by:
Miami-Dade Water and Sewer Department
3071 SW 38th Avenue
Miami, Florida 33146

CERTIFICATE OF MECHANICAL INTEGRITY

The **South District WWTP** deep injection well **IW-14** operated by **Miami-Dade Water and Sewer Department** has been tested for mechanical integrity. The tests followed standard engineering practices and used methods presented in the United States Environmental Protection Agency regulations for the purposes of these tests. The external and internal mechanical integrity tests followed Florida Department of Environmental Protection (FDEP) pre-approved testing specifications and all the critical test events were witnessed by representatives of the FDEP, the MDWASD and the contractor.

Having supervised the engineer and geologists that were present during the testing, conducted the examining of the results and the preparation this mechanical integrity report as part of this certification, the undersigned certifies that deep injection well **IW-14** operated by **Miami-Dade Water and Sewer Department** at the **South District Wastewater Treatment Plant Site in Miami-Dade County, Florida** has successfully passed all the test requirements for mechanical integrity under rules of Chapter 62-528 of the Florida Administrative Code and is therefore determined to have mechanical integrity.

Certified on November 25, 2013

[redacted]

Howard J. Fallon Jr., P.E.
Professional Engineer
License Number 24153

MECHANICAL INTEGRITY TEST REPORT
FOR
DEEP INJECTION WELL No. IW-14
AT THE
SOUTH DISTRICT WASTEWATER TREATMENT PLANT

Prepared by:

MIAMI-DADE WATER AND SEWER DEPARTMENT
3071 SW 38th Avenue
Miami, Florida 33146

For Submittal To:

UNDERGROUND INJECTION CONTROL
FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

November 2013

ABSTRACT

The internal mechanical integrity was investigated through a pressure test performed on the injection casing. The pressure test was conducted at 154 pounds per square inch (psi) which is approximately 1.5 times the maximum (100 psi) potential injection pressure and more than 1.7 times the maximum operational pressure that the well will be under when operating at its full permitted injection velocity of 10 feet per second (ft/sec). FDEP permits a 5% loss in pressure during the hour long test in order for the internal mechanical integrity to pass the pressure test.
IW-14 successfully passed the pressure test because the casing only lost 2.5 psi. The successful results of the pressure test for internal mechanical integrity were reinforced by the results of the second internal mechanical integrity test, the TV survey of the casing. The TV survey confirmed that the casing and the casing joints are in good condition and that the well has internal mechanical integrity down to 2,404 ft bls.

The external mechanical integrity was investigated using two test procedures, a Radioactive Tracer Survey (RTS) and a Temperature Log. Results of the RTS confirmed the integrity of the cement around the casing and the continued competence of its seal with the geologic strata. The temperature test showed that there are no anomalies that would indicate points where injected fluids could escape through the casing and cement into the formation. Similarly there were no temperature anomalies that would indicate injection fluids entering the formations at other than the approved injection depth.

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Section 1

1. INTRODUCTION

1.1 BACKGROUND

On October 12, 2012, (see Appendix A) the Miami-Dade Water and Sewer Department (MDWASD) submitted the County's proposed plan and testing specifications for conducting the mechanical integrity tests (MITs) and repairs on some of the injection wells at the South District Wastewater Treatment Plant (SDWWTP) site (see Figure 1) to the Florida Department of Environmental Protection (FDEP). The plan, represented by the specifications, described the step-by-step procedure to be followed and included the testing schedule required to meet the 5-year MIT re-testing conditions of the FDEP permit for each of the injection wells. After receipt of these documents, the FDEP Staff reviewed the proposed plan and sent an approval on June 5, 2013 (see Appendix B).

The contract documents for conducting the MITs were let out for bids, and the winning bid was submitted on February 28, 2013 by Youngquist Brothers, Inc., a well drilling contractor from Ft. Meyers, Florida. After the contract was approved by the Board of Country Commissioners and signed by the County Manager, the MDWASD issued the notice to proceed on May 17, 2013 and the contractor began mobilizing to the site.

1.2 PURPOSE AND SCOPE

The purpose of this report is to provide FDEP with a document that describes the re-testing procedures for mechanical integrity applied to each of the SDWWTP deep injection wells (see Figure 2). The report also presents the field reports (see Appendix C), and the results of the tests in a single volume for ease of reference. The mechanical integrity re-testing operations involved conducting a pressure test on the well casing to show that there are no leaks in the casing, and conducting a TV survey on the well to reinforce the data from the pressure test. The re-testing includes tracking a radioactive liquid-tracer (iodine isotope I-131) injected down the well to show that there is no fluid movement upward behind the casing, into underground sources of drinking water (USDW). The radioactive test information is reinforced with temperature logs run on the well. Gamma ray logs are used to detect the movement of the radioactive tracer.

Figure 1. South District Wastewater Treatment Plant Site

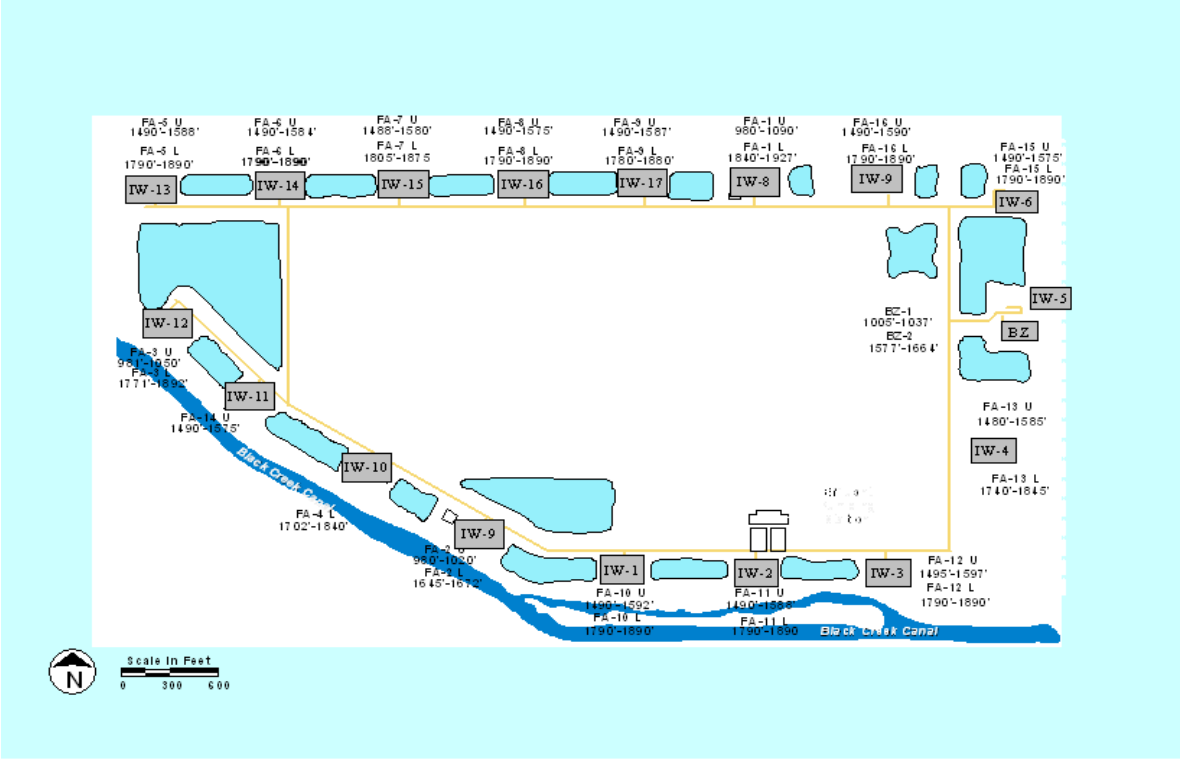


Figure 2. Well Locations Layout

Section 2

2. MECHANICAL INTEGRITY TESTING (MIT)

2.1 METHODS USED

The MIT program is designed to test two elements of the injection well system: 1. Internal integrity and 2. External integrity. The first test element, the internal mechanical integrity test of the well, tests the condition of the injection casing. The second test element, the external mechanical integrity test of the well, tests for leaks outside the casing. This is achieved through a series of field tests including a pressure test and a TV survey for the internal testing, and the temperature log, gamma ray log and RTS survey for the external testing. The first test element, the internal mechanical integrity test, tests for leaks in the injection pipe (casing). The second test element tests for leaks in the annular space outside the casing (cement-filled space between the periphery of the drilled hole and the casing) and in the near-to-the-well geologic strata.

2.2 CASING SCRUBBING

Because the mechanical integrity of injection wells has to be tested every five years, and because a TV inspection of the well is part of the test requirements, MITs provide a timely opportunity to clean the well of deposits that may have formed on the inside of the casing during the intervening years and at the same time provide a cleaner casing for the TV inspection. Cleaning the inside of the well casing is achieved by running a scrubbing brush up and down the casing. However, before the cleaning can be performed, flow out of the well must be controlled. The column of water inside the casing is fresh water and results in a positive hydraulic head inside the well. That head must first be controlled to prevent water from flowing out of the well during the cleaning operation.

2.2.1 Flow Suppression

Suppression of the fresh water head was achieved by first pre-mixing water with salt (NaCl) to form a heavy brine, and then pumping the brine down the well casing, through a 6-inch gate valve on the wellhead. This procedure results in the displacement down the well of the fresh water at the top of the column and replacement of the displaced fresh water with the brine solution. An equal volume of fresh water is displaced out of the well at the bottom of the casing. The procedure is repeated until the pressure head inside the well is suppressed. This method of displacement is used because it achieves flow suppression without first having to open the well to insert a tremie pipe to the bottom of the casing for introduction of the brine. This displacement method also provides a safe way of “killing” the well that at the same time reduces the volume of injected salt solution that would enter the formation at the bottom of the well. One additional advantage is that using this method the brine can be recovered and reused in flow suppression at other wells.

The brine was prepared in 1,000-gallon (gal.) batches by mixing the salt from a 2,000-pound (lbs.) sack in a 1,000 gal. tank of fresh water. The 1,000 gal. solution was then pumped down the well before other similarly mixed batches of salt solution were mixed and pumped down the well (see Figure 3). In the end, the operation was repeated 13 times, and a total of 13 sacks (approximately 26,000 lbs. of salt) were used to suppress the head in the well. This salt concentration represents a theoretical specific gravity of 1.239 for the brine, calculated from the salt solution used in the field of 10.3 lbs per gallon. The 26,000 lbs of salt suppressed the pressure head from approximately 26 feet above the top of the casing to approximately 15 feet below.

Figure 3. Flow Suppression Equipment

2.2.2 Scrubbing Operation

The brush used to clean the casing is made with an old drill rod that has an outside diameter of 7 inches with thick steel wire inserted and secured sticking out of the drill rod. The total diameter of the brush with the steel wire bristles is 24 inches. The brush is attached to the bottom of the packer and inserted into the well (see Figure 4). A 24-inch flange was bolted to the top of the well and pressure fittings installed to be used for packer inflation later on in the process. Then Youngquist lowers the brush and packer by attaching drill rods to the top of the packer and then raising and lowering the brush several times using a 50 ton crane. This process was repeated until the casing was scrubbed and the packer was at the depth required to perform the packer test on the well.

Figure 4. Scrubbing Brush and Hydraulic Packer

2.3 INTERNAL MECHANICAL INTEGRITY (CASING TESTS)

2.3.1 Pressure Test

After the pressure head was suppressed and the casing scrubbed, and the top of the inflatable packer was placed at a depth of 2,369 ft bls. This well is cased to a depth of 2,404 ft bls so the packer is in the bottom 50 feet of the casing. Additional pressure fittings were installed on the flange to pressurize the casing with water. A bleeder valve atop the 24-inch flange allows passage of the drill pipes that support the packer without loss of pressure in the casing (see Figure 5). A pretest was conducted on the casing to determine that the pressure was holding and that all the installed testing equipment was operating properly, then FDEP was informed that the well was ready for their inspection. The next day, August 23, 2013, the pressure test was repeated in the presence of FDEP Staff. The packer had been previously sealed against the casing, at an inflation pressure of 380 pounds per square inch (psi) and at 8:00 AM the casing was pressurized with water to a pressure of 154 psi.

Figure 5. Well-Head and Recorder Set Up for Pressure Test

At 8:40 A.M. the one-hour pressure test was started in the presence of Joseph May, P.G. representing FDEP and witnessed by Sonia Villamil, Maria Macfarlane, and Michael Ashe representing MDWASD, and by Chris Harp and others representing the drilling contractor. The pressure test ran for the required one-hour period. The pressure deviation (loss) in that time was 2.5 psi, well below the 7.5 psi deviation allowable under the 5 % criteria in the rules (see Table 2-1). The packer inflation pressure and the pressure in the casing were measured using certified gages (see Appendix C) graduated from 0 to 200 psi in increments of 1 psi. The pressure was read in person and recorded by hand at five minute intervals during the test. The pressure was also recorded on an In-Situ pressure transducer attached to the stand with the pressure gauges (see Figure 5).

Table 2-1 Casing Pressure Readings

Time	Casing Pressure (psi)	Pressure Change (psi)	Packer Pressure (psi)
8:40	154	0.0	380
8:45	154	0.0	380
8:50	154	0.0	380
8:55	153.5	0.5	380
9:00	153.5	0.0	380
9:05	153	0.5	380
9:10	153	0.0	380
9:15	152.5	0.5	380
9:20	152.5	0.0	380
9:25	152.5	0.0	380
9:30	152	0.5	380
9:35	152	0.0	380
9:40	151.5	0.0	380

2.3.2 Bleed-Off Calculations

At the completion of the pressure test the casing pressure was bled-off and the discharged volume from the bleeding was measured (see Table 2-2). Bleeding until the pressure resulted in zero flow produced approximately 28 gallons. This exercise provides a reasonable assurance that the packer is placed at the depth in the well that is within the last 50 feet of the casing.

Table 2-2. Bleeding Volumes versus Pressure

Bled Volume (gallons)	0	5	10	15	20	25	28
Casing Pressure (psi)	151.5	128	96	68	41	15	0

2.3.3 Television Survey

A closed circuit color television camera, encased in a pressure vessel capable of withstanding the pressures exerted at the depths to be televised, and equipped with a fish-eye lens, was introduced into the well through a pack-off stripper device on a standpipe above the injection well (see Figure 6). The camera is centralized in the casing, and is preceded down the well with a light source attached below the camera. The camera televises a view of the full circumference of the inside of the casing and the image is recorded on video tape. Prior to the video survey, the well was scrubbed and flushed with potable water to provide the best picture possible. The video

survey began at land surface and continued down to 2,602 feet, where the camera runs into an obstruction, but the hole below seems open below the partial obstruction where the tool was stuck. At selected intervals of interest, the camera was used to pan the intervals in a horizontal format prior to continuing the normal vertical recording.

A review of the video (see Appendix F) indicates that the casing is in good condition down to 2,403 feet. The video also shows that the scrubbing operation was successful. The scrubber has scrubbed the casing free of all growth down to 2,395 feet and this is confirmed by visible vertical scratches throughout that length of the casing; indicating that the scrubber had brushed the steel casing effectively. All the scratches are superficial, and do not detract from the physical and mechanical integrity of the casing. There are no gouges, grooves, nicks, or other physical damage visible in the casing for its whole length. Below 2,395 feet the casing was not scrubbed to avoid hanging the scrubber with the edge of the bottom of the casing at 2,403 feet.

In summary, the video picture meets the quality standards that are needed for a visual evaluation of the well. This video survey presents a clear view of the casing and of the welded joints of the casing. All the joints are clean and appear to be tight. From the TV survey it is concluded that this casing is in good condition throughout its whole depth from land surface to 2,403 feet.

Figure 6. Television Survey (Standpipe and Logging Truck)

2.4 EXTERNAL MECHANICAL INTEGRITY (CEMENT AND FORMATIONS)

The external mechanical integrity test consisted of two low flow dynamic tests The RTS was

conducted on August 30, 2013, for the external mechanical integrity portion of the test was witnessed by the representative of FDEP (Joseph May, P.G.), by representatives of MDWASD (Sonia Villamil and Maria Macfarlane) and by representatives of the contractor (Luis Morey).

2.4.1 Radioactive Tracer Survey (RTS)

The radioactive tracer survey uses an isotope of iodine (I-131) as a tracer of water movement inside and outside the casing. Iodine –131 is used because it is a radioactive isotope commonly used in medical practice and therefore it is more easily available and lower in cost than other potential tracers. I-131 also has the advantage of having a half-life of 8 days. That half-life is quite suitable because it is long enough to allow time for transportation to the well site with little decay but also short enough so that it would quickly be reduced if there were any unexpected spills or if there were mechanical failures through which the isotope could travel with the water. The radiation levels of I-131 at the concentration used for RTS testing is in millicurie-range, which if it were considered a waste, would be characterized as a low level waste by the US Atomic Energy Commission.

The I-131 is first loaded into a container located in the logging tool. This container is electronically activated from the logging truck to eject the desired quantity of tracer at the desired depth through an ejection port. In addition to the tracer container, the logging tool is also assembled with three gamma ray detectors. One detector, the top gamma ray detector (GRT), is located 10 feet above the ejector. The other two detectors, the middle one (GRM) and the bottom one (GRB) are located immediately below the ejector at about 3 feet and 12.4 feet below the ejector respectively. The bottom of the logging tool also includes a temperature tool at the very bottom, and a casing collar locator (CCL) 1 foot below the GRM. Figure 7 shows the configuration of the RTS logging tool. The RTS log in the appendix (Appendix D) shows the distances between each of the logging tool components described above.

2.4.1.1 First Low Flow Dynamic Test

Prior to starting the low flow dynamic test, a background gamma ray log was conducted to establish the natural conditions. It was conducted right after the temperature log. Since the temperature log was run downward starting at land surface, the temperature log had ended with the logging tool at the bottom. The background gamma ray log was conducted from the bottom (2,602 feet) up to the surface.

From the surface, the logging tool was again lowered down the well and the casing collar locator (CCL) used to locate the bottom of the casing. The magnetic coils on the CCL give out a magnetic field and detect a change in the mass. If there is growth on the casing it is harder for the CCL to have a clean line. If the growth has some iron on it, it can cause a sort of interference with the CCL making it harder for the CCL to find the end of the casing. The CCL shows that the bottom of the casing is at 2,403 feet bls. After the bottom of the casing was located, the well was ready for the low-flow dynamic RTS test.

The ejector port of the I-131container was set at 2,399 feet and 1 millicurie (mCi) of I-131 was released while the flow down the well was kept at a constant rate of 88 gallons per minute (gpm). The logging tool was kept immobile after the ejection of the I-131 and the three gamma ray detectors continued to record in place. One (1) mCi of I-131 was ejected into the well. The

middle detector, located 3 feet below the ejector port, picked up the radioactive tracer 22 seconds after the ejection. The bottom detector, which is located over 12 feet below the ejector, picked up the tracer 2 minute and 40 seconds after the ejection. The test ran for 60 minutes and the top detector did not pick up any tracer.

After the first low flow test ended, the tool was then raised up more than 200 feet, to a depth of 2,200 feet, to log out of position to make sure that the tracer did not migrate up the casing or the formation outside of the casing. No migration was detected.

Once the log out of position was conducted and the tool was placed back to depth, no staining on the casing was found which means no interference for the second RTS. Therefore, with the approval of Joseph May, P.G. from FDEP, the well was not flushed prior to the second RTS test.

Figure 7. RTS Tool and Temperature Probe

2.4.1.2 Second Low Flow Dynamic Test

The tool was placed back to a depth were the ejector was located at 2,399 feet with a flow of 93 gallons per minute set down the well. For this test, 2 milicuries of I-131 were ejected into the casing. The middle detector started picking up the tracer about 24 seconds after it was ejected. The bottom detector, which is located over 12 feet below the ejector, picked up the tracer 3 minutes after the ejection. The upper detector did not pick up any tracer for the duration of the test, which lasted 30 minutes.

After the second low flow test ended, the tool was then raised up more than 200 feet, to a depth of 2,200 feet, to log out of position to make sure that the tracer did not migrate up the casing or the formation outside of the casing. A small spike was detected at the ejection point and at 2,399 ft bls. The stain on the casing from the ejection is not a problem there. It does not indicate any migration. The spike at 2,399 ft bls is below the casing and did not migrate up any further in the well, so there is no need to further investigate this small spike.

With the last low flow dynamic test, the mechanical integrity test was concluded, but before bringing the geophysical tools out of the well, the leftover I-131in the container was ejected and the container flushed-clean to insure that any remaining radioactive iodine was well dispersed. The tool was placed at a depth of 2,550 ft bls. The ejector was located at 2,550 ft bls, and the remaining Iodine 131 was ejected and the well was flushed with effluent at a rate of over 4,600 gallons per minute to ensure no staining of the tool. The logging tool was then brought up from the bottom and on the way up a final gamma ray log was made. Then the final gamma ray log was compared to the background gamma ray log, and the comparison showed that there are no noticeable differences in the two except for a residual stain at the bottom of the casing where the I-131 had been repeatedly released during the testing, and just below there, where the tracer exited the casing. Injection of water down the well at a rate of 4,600 gpm continued for the next hour to completely flush out the well.

2.4.2 Temperature Log

Youngquist Brothers Inc. conducted the temperature log on August 28, 2013 starting at about 8:50 A.M. and logging down to 2,603 feet. The temperature probe (Figure 7) was run from the surface downward to minimize the disturbing effect of the movement of the logging tool on the temperature of the water in the well. The temperature log was started more than 24 hours after the well had last been disturbed by outside influences. The TV survey was the last disturbance in the well.

The temperature log (see Appendix H) shows the warmest interval is in the section from 2,350 to 2,403 feet. This is consistent with the higher temperature of the injected water in that interval. The temperature log did not detect any anomalies that would indicate that injection fluids are present outside the casing, and there is no indication of any upward movement of warm injection water either. The similarity of the temperature oscillations in this temperature log (in the interval from land surface down to the bottom of the casing) to those in the temperature logs from previous MITs and to those in the temperature log when the well was constructed, indicates that there has been no apparent change in the cased interval, and no upward movement of the injected

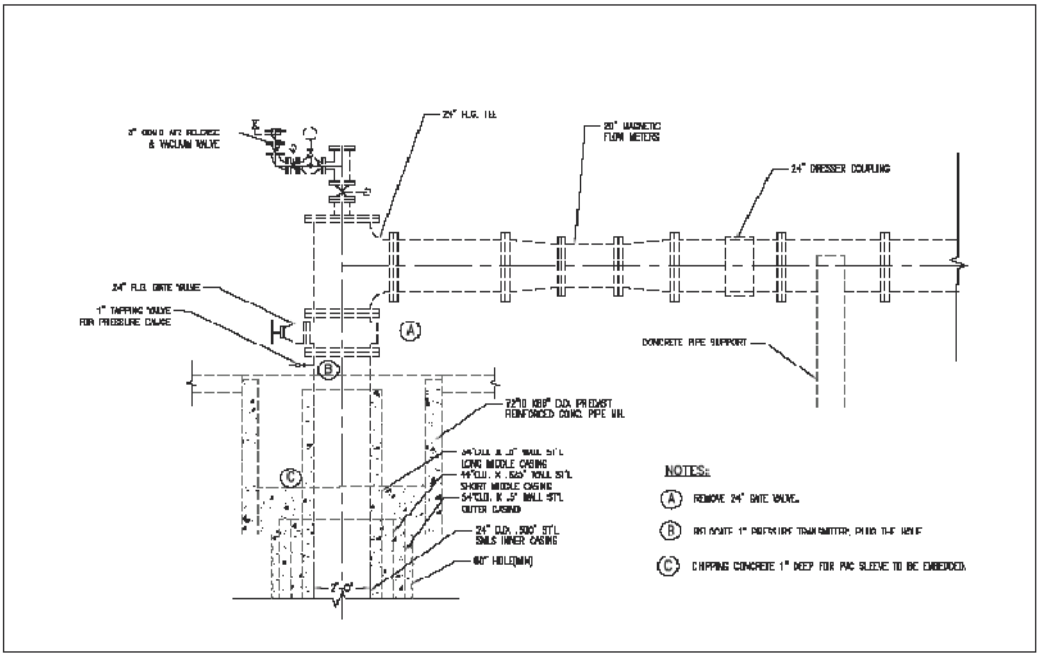
water in the last 5 years.

2.5 WELL HEAD REPAIRS AND RE-INSTALLATION

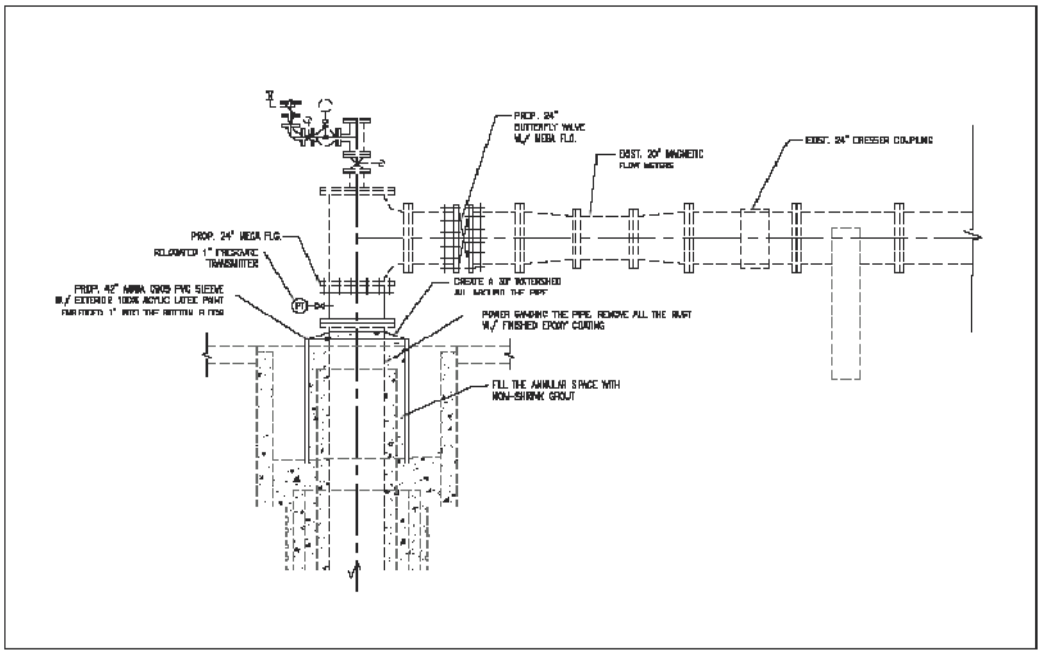
The work associated with the MIT ended when the wellhead was replaced. The air and vacuum release surge check valves were replaced prior to reinstallation of the wellhead. The 6 inch gate valve and air release were replaced. The well had a gate valve on the vertical part of the well before the T. The pressure tap for the instrumentation of the well was below the water line when the sump was full of water. Therefore this well was retrofit to replace the gate valve with a 24" butterfly valve installed on the horizontal pipe coming off the T the well and lift the pressure tap above the water line. A PVC liner was also installed at the base of the sump that protects the 24" OD steel casing from being exposed to FA purge water from the monitoring wells. The PVC was cemented into the bottom of the sump and the annulus was filled with grout to ensure that no water can reach the steel casing. Please see drawings of the retrofit below, Figure 8 and 9.

The wellheads are scheduled to be sandblasted, rust proofed and repainted after the MITs on all the other wells are completed. Injection well IW-14 has been placed back on line and flow from the plant's pump station is again discharging to this injection well, .

Figure 8 Retrofit Well with PVC liner



REPAIR PLAN FOR I-13 TO I-17



PROPOSAL PLAN FOR I-13 TO I-17

Figure 9 Drawing showing before and after layouts for the Retrofit.

Section 3

3. CONCLUSIONS AND RECOMMENDATIONS

3.1 CONCLUSIONS

The pressure test was conducted successfully and it was concluded from the results that there is internal mechanical integrity. This conclusion is reinforced by the analysis of the TV survey down to the injection level at 2,403 feet. The TV survey indicated that the casing is in good condition and that all the casing joints appear to be tight and in good working order.

The two successful RTS conducted at low flow rates indicate that there is no upward movement of water outside the casing. Therefore, it was concluded that the RTS results show that there is external mechanical integrity. The temperature survey reinforced the results of the RTS by showing that there has been no movement of injected water anywhere except the injection zone.

3.2 RECOMMENDATIONS

The successful completion of all the tests for mechanical integrity confirms that IW-14 retains full mechanical integrity and as such it is appropriate to continue using this injection well. MDWASD also recommends that FDEP review the results of the tests presented in this report and based on those results determine that the well has mechanical integrity and may continue to be used for its intended purpose.

Finally, MDWASD recommends that although the well head will not be painted until all the MIT tests are completed on the other wells, IW-14 should receive mechanical integrity certification.

Appendix A

Mechanical Integrity Testing Procedures Submitted by MDWASD to FDEP
October 12, 2012

Miami-Dade Water and Sewer Department
Mechanical Integrity Testing Procedures

Miami-Dade Water and Sewer Department
Mechanical Integrity Testing and Repair Procedures
October 12, 2012

MECHANICAL INTEGRITY TESTING and REPAIR PLAN (SDWWTP and NDWWTP Injection Wells)

General Information

The Contractor shall carefully coordinate his activities with the Department to minimize interference with any existing operations or the operations of the Department. Department forces will isolate the well and turn over to the Contractor. Existing valves shall only be operated by Department personnel. The Contractor's personnel, under no circumstances, shall operate any such valve.

The Contractor shall provide all barricades and/or flashing warning lights necessary to warn workers and employee of the testing throughout the Project. This shall be done at the Contractor's expense and to the satisfaction of the Engineer. Every effort must be made to reduce inconvenience and nuisances to a minimum.

The Contractor shall at all times, use the assigned entrance to the Plants to bring in materials, equipment etc. required for the Project. Materials and equipment shall be stored in areas designated by the Engineer, and shall not interfere with the daily operations at the site or with other Projects. Suitable platforms shall be used for material storage to prevent damage to the landscaping. The Contractor shall exercise extreme caution when transporting equipment or materials within the Plant area.

The conveying vehicles shall be properly selected, and equipped, to prevent damage to paved areas, landscaping and other existing facilities including wells, well pads, fencing, underground pipelines, pipe chases, etc. If necessary, suitable wooden skids shall be used to distribute loads, and to prevent damage.

If any of the above existing structures, including the wells, or any other parts of the project area, are damaged, the contractor shall make suitable repairs or replacement at his expense, in a manner described by the Engineer, and to his satisfaction.

The Contractor shall also exercise extreme caution to prevent any spillage of sewage effluent. The County may charge t he Contractor for any cost incurred or penalties imposed on the County as a result of such spillage.

The wells to be tested are Injection Wells IW-l through IW-17 at the South District Wastewater Treatment Plant and IW-1N through IW-4N at the North District Wastewater Treatment! Plant

The Injection Wells have a 24-inch outside diameter (OD), 0.500-inch wall thickness injection casing set to total depths of 2,450 to 2,850 feet below land surface (bls), and were constructed with a nominal 22-inch diameter open borehole extending from the bottom of the casing to approximately 3,000 feet bls.
Except IW-5 at the SDWWTP, has a 20-inch outside diameter (OD), and 0.500 inch wall thickness.

The CONTRACTOR will perform internal and external mechanical integrity tests on the casings of twenty one deep injection wells and perform all appurtenant work in accordance with the above

Contract Documents.

The work shall be performed by a competent crew with equipment that is adequate to complete all phases of the testing and instruments of sufficient accuracy and resolution to identify anomalous responses to the tests. If the CONTRACTOR'S equipment is not capable of satisfactorily performing the work provided for in these specifications, the CONTRACTOR at his own expense shall substitute equipment.

The CONTRACTOR shall have not less than 5 years experience in constructing and testing wells and shall have tested not less than 5 wells of similar type and capacity. The CONTRACTOR shall be licensed by the State of Florida and the license number shall be affixed to all correspondence and reports.

All work shall comply with and be in full conformance with this Mechanical Integrity Test Plan submitted to FDEP together with subsequent response letters for the injection wells at the South and North District Wastewater Treatment Plants and with the appropriate sections of Chapter 62-528 FAC.

If remedial work or re-testing is required prior to final acceptance of the work to meet regulatory requirements and the specifications of the Contract Documents due to defective materials, accident, loss of equipment or equipment malfunction, or for any other cause directly attributable to the CONTRACTOR's actions, the CONTRACTOR shall bear the entire cost of the remediation or re-testing, including all additional materials, labor, and equipment required and any necessary additional Engineering costs. In the event of a problem, the ENGINEER shall be notified immediately, and the following shall apply:

1. The CONTRACTOR shall propose a method of correcting the problem, in writing, to The ENGINEER, who shall review the method of corrective action, and accept the plan in writing before work can proceed.

2. All work on the well must be in accordance with all applicable local, state and federal regulations.

The CONTRACTOR shall notify the ENGINEER a minimum of 72 hours prior to conducting the pressure test, geophysical logging and the radioactive tracer survey so that the ENGINEER and regulatory agency staff can be properly notified.

The CONTRACTOR shall provide all facilities, equipment and materials required for the removal of waste fluids from the well site.

The CONTRACTOR shall kill the well using a dense food- grade salt solution. No barite or mud-based additives shall be used in the well.

The CONTRACTOR shall comply with the OSHA regulations contained in 29CFR Section 1910 for General Industry Regulations and 29CFR Section 1926 for Construction Regulations.

Equipment and Procedures

1. Wellhead Assembly: The stripper head assembly used during the video survey, Geophysical logging, and the radioactive survey shall be bolted to the wellhead above the 6-inch gate valve. The stripper head assembly used must be of sufficient length to house the longest of the wire line tools used for the testing between the gate valve and the pack-off mounted at the top of the assembly. The pack-off must be adjusted so that the tools can be moved freely up and down the well with minimal leakage from the well. The assembly shall include a 4-inch valve and tee, which will be used to inject potable water during the surveys. The assembly shall be fitted with a

pressure gauge for use during the tests.

2. Wellhead Hardware: Should the nuts and/or bolts at the wellhead assembly become stripped during the CONTRACTOR's efforts, the CONTRACTOR shall replace them with equivalent hardware.

3. Water Line: The CONTRACTOR shall provide a potable water supply line for use during the video surveys. This line shall be connected to the existing 4-inch valve on the CONTRACTOR's stripper head. It shall be equipped with a check value to prevent the backflow of effluent into the water supply source. It shall also be equipped with a continuous recording digital flow meter and totalizer capable of measuring flows accurately in the range of 0 to 250 gpm.

Mechanical Integrity Testing (MIT)

The mechanical integrity testing under this Contract shall be accomplished using the following methods and general sequence, however the Contractor shall submit a more detailed sequence to the Engineer for approval before he begins work. The Contractor shall use extreme caution to prevent any loss of equipment, tools or other items into the wells and shall be fully responsible for retrieving any such items immediately, at no expense to the Department. All pressure tests must be conducted in the presence of the Engineer or his authorized representative.

MIT Clean and Pressure Test the Casing

1. The Contractor shall set up all equipment required to prepare for suppressing the density differential pressure, cleaning, performing the pressure test and the radioisotope and closed circuit television surveys.

2. The Contractor shall inject sufficient salt solution into the well to balance the differential pressure and disassemble the wellhead. The brine solution shall remain in the well during the cleaning and pressure testing steps, after which time it shall be transferred to another well if clean enough for reuse, or shall otherwise be disposed of by the Contractor. Under no circumstances shall brine solution be spilled or disposed of on the ground surface, however it may be disposed of into the injection well.

3. The Contractor shall clean the casing before proceeding with the pressure test. The entire length of casing shall be cleaned. If the later television survey indicates insufficient cleaning, the well shall be re-cleaned by the Contractor, at his expense, to the satisfaction of the Engineer. If the television survey must be repeated because of insufficient cleaning, in the opinion of the Engineer, it shall also be at the Contractor's expense.

4. The Contractor shall, when requested by the Engineer, place the packer through a stand-pipe with a packoff device to a point near the top of the well (but within the concrete encasement area) and test its integrity. This shall be accomplished as described in Steps 6, 7, and 8 below. If the packer fails the integrity test it shall be replaced with one that will meet the test. The Engineer is aware that packers have limited inflation cycles and will attempt to minimize the verification of packer operation. However, any integrity failure for which the packer operation can not be eliminated must be repeated at the Contractor's cost. It is anticipated that each new packer will be tested at the wellhead to verify its capacity to seat and deflate.

5. The Contractor shall lower and place the packer to a point within the lower 40 feet of the casing, but not the last 10 feet. The CONTRACTOR will be responsible to assure the proper seating of the packer. A preliminary test shall be performed to ensure proper operation of the test set-up. The CONTRACTOR shall notify the ENGINEER at least 24 hours before running the preliminary test. The test will be run following the same test program as the actual pressure test, as described below. IW-2 at SDWWTP will have the packer placed within 40 feet of the tear in the casing.

6. The Contractor shall inflate the packer to a pressure not exceeding 350 psig over the static condition as measured at the wellhead on a calibrated gauge to create a positive seal.

7. The Contractor shall pressurize the casing to 150 psig with no air in the casing or wellhead. The pressure shall be recorded on a chart and signed by the Engineer, the Contractor and any witnesses present. The pressure test gauge shall be calibrated within 6 months of performing the pressure test. The CONTRACTOR must present proof of calibration of the pressure gauge to the ENGINEER and FDEP staff at the time of testing each well. The pressure gauge must be mounted at or near eye level in order to ensure maximum visibility.

8. The test will be considered successful if the pressure does not change more than 5% psi in one hour.

9. If the test fails, the Contractor shall move the packer upwards for approximately 10 feet, and repeat Steps 6, 7 and 8.

10. If the test still fails, additional repositioning of the packer and repeating of Steps 6, 7 and 8 shall be as ordered by the Engineer. If the test still fails, and subsequent radioisotope surveys indicate no casing failure, it will be presumed that the Contractor's packer did not create a positive seal, and the Contractor shall be required to repeat Steps 4 through 8 at his expense. No payments will be made to the Contractor if it is subsequently determined that the test failure was caused by the seating of the packer. If the packer fails during packer operation verification, it will be concluded that the packer was faulty during any previous test that did not demonstrate casing integrity. The Contractor shall repeat this test at his expense.

11. After pressure testing, measure the depressurization bleed down with a 5 gallon bucket upon release of the pressure in the casing. The bleed down fluid will be properly disposed of by the Contractor.

12. The Contractor shall deflate the packer and withdraw it from the casing.

13. The Contractor shall reassemble the wellhead and connecting piping using new gaskets.

14. Prior to geophysical logging, the fluid used to "kill" the well, or for pressure testing the casing shall be flushed from the well and the well will be shut-in for a minimum of 12 hours.

MIT Video Surveys

A Video Survey inside the injection well casing be performed using the following procedures.

.A 6-inch diameter stripper head assembly will be bolted to the wellhead assembly above the existing 6-inch diameter gate valve. The stripper head will be of dimensions that allow the video operator to put his camera between the gate valve and the pack off and close both the valve and the pack off. The lower part of the assembly shall consist of a 4-inch tee and valve through which potable water may be introduced into the well.
.
Prior to performance of the survey and for a period of 24 hours, fresh water from an adjacent fire hydrant will be introduced into the well through a 4-inch diameter valve located on the stripper head assembly. Fresh water shall be pumped into the well to provide clarity for the survey.

3. If, after 24 hours of pumping potable water into the well, the water quality does not permit a clear picture of the inside of the well, the CONTRACTOR may be required to perform additional pumping services to assure a good survey as specified above.

4. The pumping of the potable water will continue at a rate of approximately 0 to 250 gpm during video surveying. If the open hole portion of the well is not clean, or visibility in any part of the well is poor, the CONTRACTOR shall perform additional pumping services to ensure a good video survey before running another or continuing with the survey.

5. During the video survey, the CONTRACTOR shall stop the camera's progress as instructed by the ENGINEER at depths where there may be potential flaws in the casing or other features to allow for thorough examination at those locations.

Upon reaching the total depth of the well with the video camera and obtaining a video survey satisfactory to the ENGINEER, the camera shall be removed from the well, and the well placed back in service.

MIT Radioisotope Tracer Survey and Temperature Survey

A radioisotope tracer survey shall be used to detect any fluid movement outside of the injection casing from the injection zone into the overlaying aquifers. The tool configuration shown below, or approved equal is required. The tool must be capable of ejecting the radioactive tracer and simultaneously monitoring the gamma ray sensors. No time lag between ejection and monitoring is permitted. A casing collar locator (CCL) shall be positioned below the tool as shown below, to precisely locate the bottom of the casing. Two low flow dynamic test runs, shall be performed. Additional low flow dynamic test runs can be done if results warrant additional testing, as determined by the ENGINEER in consultation with FDEP staff.

A temperature survey log shall also be performed from land surface to the total depth of the well. The temperature log shall be performed logging down at a rate of not more than 60 feet per minute. The temperature survey shall be performed after the well has been "shut in" and stabilized for at least 12 hours prior to the dynamic and static tests.

The Contractor shall perform an initial background gamma ray survey extending from the base of the land surface to the total depth of the well. The background gamma ray log shall be taken at a rate of not more than 60 feet per minute.

After the dynamic tests are completed, another background gamma ray survey shall be taken from the base of the casing to the base of the intermediate casing.

If additional radioisotope tracer survey work is ordered by the Engineer, it will be paid for at the hourly price proposed for additional radioisotope tracer surveys.

Radioactive Tracer Survey (RTS)

A RTS will be performed in the injection well. The tool used for testing will be configured according to information to be supplied by the service company performing the logs and as approved by the ENGINEER. Below is an example of a typical RTS tool that will be used for these surveys. The CONTRACTOR will provide a specific tool configuration with the logs.

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)
			CHD-SDSCHD (SDS) Cable Head	1.00	1.50	5.00
GR#3	23.83					
			GR #3 -GR#3 (GR#3_T) GR#3_TOP	9.33	1.69	50.00
			TREJCT-A (RTS) EJECTOR 14.5' FROM TOOL BOTTOM	3.00	1.69	10.00
			GR #2 -GR#2 (GR#2_M) GR#2_MIDDLE	3.58	1.69	25.00
GR#2	11.17					
CCL	9.63		CCL-000 (000001) RTS_CCL	0.75	1.69	5.00
			TRDET-GR#1 (GR#1_B) GR#1_BOTTOM	8.67	1.69	50.00
GR#1	0.58		TEMP-11116Temp (11116HT)	0.58	1.69	5.00
TEMP	0.17		RTS_TEMP			

Dataset: sdiw1.db: field/well/run1/FINBK
Total Length: 26.92 ft
Total Weight: 150.00 lb
O.D. 1.69 in

RTS tool Typical Configuration

The sequence of the tests shall be as follows:

First Low Flow Dynamic: The low flow run of the radioactive tracer survey shall be performed with a pumping-in velocity of 3 to 5 feet per minute. This would require a volume of between 65 gpm and 108 gpm to be injected during the survey. This is for the 24 inch wells, for Well I-5, which has a 20 inch casing this volume is 44 gpm and 73 gpm. Potable water from the same source as used for the video survey would be used as the most appropriate water supply for this portion of the test.

1) After beginning the flow of water into the well, the tool will be placed at a depth of approximately 5 feet above the base of the final casing, and a slug of 2 millicuries radioactive Iodine 131 is ejected. The tool will remain in place for a period of approximately one hour and the three gamma ray detectors in the "time drive" mode will record the movement of the slug. If tracer is detected at the uppermost detector, indicating potential staining of the tool, the tool may be moved upward to an alternate location.

2) After the one hour waiting period, a log out-of-position will be performed between the ejection point and a minimum of 200 feet above the highest point of tracer detection.

3) Upon completion of logging, the casing will be flushed with 3 to 5 casing volumes of effluent.

4) After flushing, the tool will immediately be run to the base of the casing, then the interval between the ejection point and 200 feet above the highest point of tracer detection will be logged.

Second Low Flow Dynamic: The process described above for the low flow dynamic log will be repeated to include a log out-of-position, a casing flush, and an after flush pass. A slug of tracer greater than or equal to 3 millicuries shall be used as determined by the ENGINEER.

If, during testing, no apparent anomalies appear that may indicate a lack of mechanical integrity in the injection well, the RTS will be concluded. If anomalies do occur, the RTS will be altered to track the radioactive tracer material. After RTS is complete, the RTS tool will be discharged in the injection zone and the well shall be flushed with 3 to 5 volumes of effluent. A second background log will be run from the bottom to the top of the well.

MIT Deadlines (sorted by date MIT pressure test due)

SDWWTP MIT Schedule of Completion

Well	Pressure Test	RTS/Video
IW-2	7/13/2013	7/25/2013
IW-1[1]	7/20/2013	7/31/2013
IW-3	7/24/2013	8/7/2013
IW-9[1]	7/30/2013	8/12/2013
IW-10[1]	8/6/2013	8/21/2013
IW-11	8/20/2013	9/3/2013
IW-12	8/25/2013	9/19/2013
IW-14	9/9/2013	9/26/2013
IW-13	9/16/2013	10/6/2013
IW-4	9/25/2013	10/14/2013
IW-6	9/30/2013	10/20/2013
IW-5	10/19/2013	10/27/2013
IW-7[2]	10/26/2013	1/7/2014
IW-8	11/2/2013	11/12/2013
IW-17	11/11/2013	11/19/2013
IW-16	11/18/2013	12/9/2013
IW-15	12/3/2013	12/16/2013

NOTES:
1.The original video was not clear enough and therefore a new video was done at the end of the MITs at SDWWTP.
2.The Computer failed during the RTS, because the Iodine 131 had already been injected, FDEP and DOH required 46 days b/f the RTS could be redone.

NDWWTP MIT Schedule of Completion

Well	Pressure Test	RTS/Video
IW-1N	3/14/2014	3/26/2014
IW-2N	3/25/2014	4/9/2014
IW-3N	4/2/2014	4/17/2014
IW-4N	4/9/2014	4/24/2014

REPAIR PLAN:

The following repair plans apply to wells at SDWWTP and NDWWTP.

1. Kill well and remove 24 inch gate valve and 4 inch bypass valves. Remove 1 inch pressure transmitter line and weld hold closed. Please see drawings included in below.

2. Sand existing casing in concrete pits and coat with Bitumastic. Please see drawings included in below.

3. Chip concrete around outer casing 1 inch deep, in order to embed PVC sleeve. Please see drawings included in below.

4. Install C905 PVC sleeve around casing pipe, embed 1 inch deep and fill annular space with grout, using Type II Neat cement. Slope top edge to create 30 degree watershed and seal at edges with sealant. Please see drawings included in below.

5. Relocate 1 inch pressure transmitter as indicated in drawings. Weld the hole. Please see drawings included in below.

6. At the NDWWTP IW-1N, IW-3N and IW-4N install new magmeters with any necessary spool pieces to be field determined. Please see drawings included in below.

7. Reassemble wellheads including installation of new 24 inch butterfly valve on horizontal part of well. Mega flanges will be used to ensure the layout of the pipe and the vales match. Please see drawings included in below.

8. On IW-4N at NDWWTP, install electric actuator for butterfly valve at base of injection well. Please see drawings included in below.

Appendix B

FDEP Approval of MIT Plan for SDWWTP and NDWWTP

November 26, 2012

Villamil, Sonia (WASD)

From: May, Joseph [redacted]
Sent: Monday, November 26, 2012 2:40 PM
To: Villamil, Sonia (WASD)
Cc: Vandor, Heidi; Silverman, Mark; Walsh, Virginia (WASD); Goldenberg, Bertha M. (WASD); Fallon Jr., Howard J. (WASD); Arrebola, Vicente (WASD); Macfarlane, Maria (WASD); Oakley, Clint (WASD)
Subject: RE: MDWASD MIT and Repair Plan Submittal

Importance: High

Hello all,

The Department approves the plan with the following understandings:

1) Medicinal grade I-131 should be specified since this solution is filtered to reduce precipitate material, as opposed to regular grade I-131, in the vial causing a tool malfunction. It has been our experience that an activity of ~1mCi/ml has been the easiest to work with in the field.
2) Please contact me a minimum of three days prior to mobilization to each site. Due to the travel time from West Palm Beach to the sites close coordination would be appreciated between myself and a designated contact person from the utility so that each pressure and RTS can be witnessed.

Thank you,

Joe

Please take a few minutes to share your comments on the service you received from the department by clicking on this link. DEP Customer Survey.

From: Villamil, Sonia (WASD) [mailto:[redacted]
Sent: Wednesday, October 17, 2012 9:42 AM
To: May, Joseph
Cc: Vandor, Heidi; Silverman, Mark; Walsh, Virginia (WASD); Goldenberg, Bertha M. (WASD); Fallon Jr., Howard J. (WASD); Arrebola, Vicente (WASD); Macfarlane, Maria (WASD); Oakley, Clint (WASD)
Subject: MDWASD MIT and Repair Plan Submittal

Hello Mr. May,

The MDWASD respectfully submits the attached MIT testing and repair plan for your approval. The paper copy is being sent via regular mail as well.

Thank you,

Sonia Villamil
Engineer II
Miami Dade Water and Sewer Department
3071 SW 38th Ave Room 554-8
Miami, FL 33146
[redacted]
fax: 786-552-8640
miamidade.gov

Appendix C

Field Notes from tests including gauge certification and pressure charts.

MIAMI-DADE WATER AND SEWER DEPARTMENT

MECHANICAL INTEGRITY TESTING OF DEEP INJECTION WELLS AND ASSOCIATED SERVICES

BID NO.: RPQ P0086

PRESSURE TEST IW - 14

August 23, 2013

TIME	CASING PRESSURE (psi)	PACKER PRESSURE (psi)
8:40	154	380
8:45	154	380
8:50	154	380
8:55	153.5	380
9:00	153.5	380
9:05	153	380
9:10	153	380
9:15	152.5	380
9:20	152.5	380
9:25	152.5	380
9:30	152	380
9:35	152	380
9:40	151.5	380

MIAMI-DADE WATER AND SEWER DEPARTMENT

MECHANICAL INTEGRITY TESTING OF DEEP INJECTION WELLS AND ASSOCIATED SERVICES

BID NO.: RPQ P0086

BREAK OFF TEST IW - 14

August 23, 2013

GALLONS	CASING PRESSURE (psi)	PACKER PRESSURE (psi)
0	1525	380
5	128	360
10	96	360
15	68	340
20	41	340
25	15	320
~~30~~ 28	0	320

Top of Packer: _____ **feet**

Bottom of Casing: 2403 **feet**

MIAMI-DADE WATER AND SEWER DEPARTMENT

MECHANICAL INTEGRITY TESTING OF DEEP INJECTION WELLS AND ASSOCIATED SERVICES

BID NO.: RPQ P0086

PRESSURE TEST IW - 14

WITNESS LIST

August 23, 2013

NAME	SIGNATURE	COMPANY/AGENCY	TELEPHONE
Howard Fallon	[redacted]	WASD	[redacted]
CHRIS HARP		YBI	
Joe MAY		DEP	
Sonia Williams		WASD	

IW-14 PT

Sensor/Session information

SensorSN	21325011	Modbus Ac	2
Sensor Type	PT2X	Initialized v	2. 9
Sensor Name	INW Smart Sensor	Uploaded	Aqua4Plus 1.9.3
Session Nam	1MIN	Exported	Aqua4Plus 1.9.3
# Records	128		

Statistical Data	Temperature(	Pressure(psi)
Sensor Range	-40 - +125 deg	300 psia
Minimum	73.2	0
Maximum	95.1	154.031
Mean	88.8	104.582

Rec #	Date/Time	Temperature(	Pressure(psi)
1	8/23/2013 8:39	154.031	
2	8/23/2013 8:40	153.983	
3	8/23/2013 8:41	153.937	
4	8/23/2013 8:42	153.895	
5	8/23/2013 8:43	153.85	
6	8/23/2013 8:44	153.814	
7	8/23/2013 8:45	153.771	
8	8/23/2013 8:46	153.721	
9	8/23/2013 8:47	153.676	
10	8/23/2013 8:48	153.641	
11	8/23/2013 8:49	153.586	
12	8/23/2013 8:50	153.551	
13	8/23/2013 8:51	153.501	
14	8/23/2013 8:52	153.46	
15	8/23/2013 8:53	153.406	
16	8/23/2013 8:54	153.366	
17	8/23/2013 8:55	153.317	
18	8/23/2013 8:56	153.265	
19	8/23/2013 8:57	153.225	
20	8/23/2013 8:58	153.184	
21	8/23/2013 8:59	153.134	
22	8/23/2013 9:00	153.084	
23	8/23/2013 9:01	153.041	
24	8/23/2013 9:02	152.997	
25	8/23/2013 9:03	152.955	
26	8/23/2013 9:04	152.914	
27	8/23/2013 9:05	152.862	
28	8/23/2013 9:06	152.82	
29	8/23/2013 9:07	152.778	

30	8/23/2013 9:08	152.737
31	8/23/2013 9:09	152.689
32	8/23/2013 9:10	152.633
33	8/23/2013 9:11	152.587
34	8/23/2013 9:12	152.546
35	8/23/2013 9:13	152.502
36	8/23/2013 9:14	152.45
37	8/23/2013 9:15	152.408
38	8/23/2013 9:16	152.367
39	8/23/2013 9:17	152.31
40	8/23/2013 9:18	152.263
41	8/23/2013 9:19	152.225
42	8/23/2013 9:20	152.182
43	8/23/2013 9:21	152.147
44	8/23/2013 9:22	152.095
45	8/23/2013 9:23	152.056
46	8/23/2013 9:24	152.007
47	8/23/2013 9:25	151.967
48	8/23/2013 9:26	151.926
49	8/23/2013 9:27	151.875
50	8/23/2013 9:28	151.825
51	8/23/2013 9:29	151.788
52	8/23/2013 9:30	151.74
53	8/23/2013 9:31	151.692
54	8/23/2013 9:32	151.652
55	8/23/2013 9:33	151.608
56	8/23/2013 9:34	151.571
57	8/23/2013 9:35	151.526
58	8/23/2013 9:36	151.482
59	8/23/2013 9:37	151.438
60	8/23/2013 9:38	151.395
61	8/23/2013 9:39	151.355
62	8/23/2013 9:40	151.303
63	8/23/2013 9:41	151.263
64	8/23/2013 9:42	151.221
65	8/23/2013 9:43	151.179
66	8/23/2013 9:44	151.128
67	8/23/2013 9:45	151.088
68	8/23/2013 9:46	151.048
69	8/23/2013 9:47	143.646
70	8/23/2013 9:48	130.159
71	8/23/2013 9:49	118.586
72	8/23/2013 9:50	115.711
73	8/23/2013 9:51	95.043
74	8/23/2013 9:52	95.428
75	8/23/2013 9:53	82.771
76	8/23/2013 9:54	68.625

77	8/23/2013 9:55	67.349
78	8/23/2013 9:56	40.727
79	8/23/2013 9:57	40.889
80	8/23/2013 9:58	23.654
81	8/23/2013 9:59	12.637
82	8/23/2013 10:00	14.409
83	8/23/2013 10:01	3.139
84	8/23/2013 10:02	0

Certificate of Calibration

OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

Ozone Industries, Inc.
Precision Measurement Equipment Division

Purchase Order #

Calibration Performed By:
OZONE INDUSTRIES, INC.
15551 PINE RIDGE RD.
FORT MYERS, FL 33908

For:
YOUNGQUIST BROTHERS, INC.
15465 PINE RIDGE RD.
FORT MYERS, FL 33908

EQUIPMENT INFORMATION:

Description: PRESSURE GAUGE
Manufacter: MCDANIELS
Model Number: 300PSI
Part Number: N/A
Range: 0-300 PSI

Serial Number: 972062-1
Customer I.D.:
Cust. Barcode: N/A
Cust. Location: N/A
Specifications: +/- 0.25% FS

Cal Date: 6/6/2013
Cal. Due Date: 8/5/2013
Cal. Interval 60 DAYS
Received: IN TOLERANCE
Calibration Result: PASS
Environmental Conditions: 74 DEG F / 20% H
Performed By: Daniel McKissick

Procedure: STANDARD

This is to certify that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure at the points tested (unless otherwise noted). It has been Calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration is in accordance with Ozone Industries, Inc Quality Assurance Manual. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

Calibration Remarks:
THIS UNIT WAS FOUND TO BE IN TOLERANCE AT THE TIME OF CALIBRATION.
PERFORMED ROUTINE CALIBRATION / CERTIFICATION

Standards Used to Calibrate Equipment:

Company	I.D.	Description	Last Cal.	Cal. Due Date
OZONE	A1731	EATON UPC5000 PNEUMATIC CALIBRATOR	12/12/2012	12/12/2013

Signatures:

Certified by:
Print: Daniel McKissick
Date: 06/06/13
[redacted]

Approved by:
Print: Daniel McKissick
[redacted]

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ØZONE
INDUSTRIES
CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

PH: 239-433-3400
FAX: 239-489-3877

CONTROL NO: 032509-1

CUSTOMER: YBI15465

CALIBRATION DATA FORM

MFR:	MCDANIELS	**DESCRIPTION**	PRESSURE GAUGE
MODEL NO:	300 PSI .25%	**TECHNICIAN:**	0030
SERIAL NO:	972062-1	**CAL. DATE:**	06/06/13
CUST. ID:	N/A	**DUE DATE:**	08/05/13

* IF NO "AS LEFT" READING IS SHOWN ON THIS CHART, IT MEANS THE UNIT WAS IN TOLERANCE AND THERE WERE NO ADJUSTMENTS MADE TO IT.

RANGE: 0-300 PSI

NOMINAL	AS FOUND	AS LEFT *	LOW LIMIT	HIGH LIMIT
50	50.26		49.25	50.75
100	100.31		99.25	100.75
150	150.38		149.25	150.75
200	200.49		199.25	200.75
300	300.6		299.25	300.75

Certificate of Calibration

OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

Ozone Industries, Inc.
Precision Measurement Equipment Division

Purchase Order #

Calibration Performed By:
OZONE INDUSTRIES, INC.
15551 PINE RIDGE RD.
FORT MYERS, FL 33908

For:
YOUNGQUIST BROTHERS, INC.
15465 PINE RIDGE RD.
FORT MYERS, FL 33908

EQUIPMENT INFORMATION:

Description: PRESSURE GAUGE
Manufacter: McDaniel
Model Number: 300PSI
Part Number: N/A
Range: 0-300 PSI

Serial Number: 972034-2
Customer I.D.:
Cust. Barcode: N/A
Cust. Location: N/A
Specifications: +/- 0.25% FS

Cal Date: 5/17/2013
Cal. Due Date: 11/17/2013
Cal. Interval 6 MONTHS
Received: IN TOLERANCE
Calibration Result: PASS
Environmental Conditions: 74 DEG F / 80% H
Performed By: Daniel McKissick

Procedure: STANDARD

This is to certify that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure at the points tested (unless otherwise noted). It has been Calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration is in accordance with Ozone Industries, Inc Quality Assurance Manual. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

Calibration Remarks:
THIS UNIT WAS FOUND TO BE IN TOLERANCE AT THE TIME OF CALIBRATION.
PERFORMED ROUTINE CALIBRATION / CERTIFICATION

Standards Used to Calibrate Equipment:

Company	I.D.	Description	Last Cal.	Cal. Due Date
OZONE	A1731	EATON UPC5000 PNEUMATIC CALIBRATOR	12/12/2012	12/12/2013

Signatures:

Certified by:
Print: Daniel McKissick
[redacted]

Approved by:
Print: Daniel McKissick
Date: [redacted] 05/17/13
[redacted]

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ØZONE
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CORPORATION

15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

PH: 239-433-3400
FAX: 239-489-3877

CONTROL NO: 100809-7

CUSTOMER: YBI15465

CALIBRATION DATA FORM

MFR:	PIC	**DESCRIPTION**	PRESSURE GAUGE
MODEL NO:	300 PSI .25%	**TECHNICIAN:**	0030
SERIAL NO:	972034-2	**CAL. DATE:**	05/17/13
CUST. ID:	N/A	**DUE DATE:**	11/17/13

* IF NO "AS LEFT" READING IS SHOWN ON THIS CHART, IT MEANS THE UNIT WAS IN TOLERANCE AND THERE WERE NO ADJUSTMENTS MADE TO IT.

RANGE: 0-300 PSI

NOMINAL	AS FOUND	AS LEFT *	LOW LIMIT	HIGH LIMIT
50	49.59		49.25	50.75
100	99.47		99.25	100.75
150	149.45		149.25	150.75
200	199.43		199.25	200.75
300	299.4		299.25	300.75

Certificate of Calibration

OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

Ozone Industries, Inc.
Precision Measurement Equipment Division

Purchase Order #

Calibration Performed By:
OZONE INDUSTRIES, INC.
15551 PINE RIDGE RD.
FORT MYERS, FL 33908

For:
YOUNGQUIST BROTHERS, INC.
15465 PINE RIDGE RD.
FORT MYERS, FL 33908

EQUIPMENT INFORMATION:

Description: PRESSURE GAUGE
Manufacter: MCDANIELS
Model Number: 300PSI
Part Number: N/A
Range: 0-300 PSI

Serial Number: AB30128
Customer I.D.:
Cust. Barcode: N/A
Cust. Location: N/A
Specifications: +/- 0.25% FS

Cal Date: 6/17/2013
Cal. Due Date: 12/17/2013
Cal. Interval 6 MONTHS
Received: IN TOLERANCE
Calibration Result: PASS
Environmental Conditions: 73 DEG F / 40% H
Performed By: Daniel McKissick

Procedure: STANDARD

This is to certify that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure at the points tested (unless otherwise noted). It has been Calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration is in accordance with Ozone Industries, Inc Quality Assurance Manual. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

Calibration Remarks:
THIS UNIT WAS FOUND TO BE IN TOLERANCE AT THE TIME OF CALIBRATION.
PERFORMED ROUTINE CALIBRATION / CERTIFICATION

Standards Used to Calibrate Equipment:

Company	I.D.	Description	Last Cal.	Cal. Due Date
OZONE	A1731	EATON UPC5000 PNEUMATIC CALIBRATOR	12/12/2012	12/12/2013

Signatures:

Certified by:
Print: Daniel McKissick
Date: 06/17/13
[redacted]

Approved by:
Print: Daniel McKissick
Date: 06/17/13
[redacted]

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OZONE
INDUSTRIES
CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

PH: 239-433-3400
FAX: 239-489-3877

CONTROL NO: 080709-2

CUSTOMER: YBI15465

CALIBRATION DATA FORM

MFR:	MCDANIELS	**DESCRIPTION**	PRESSURE GAUGE
MODEL NO:	300 PSI .25%	**TECHNICIAN:**	0030
SERIAL NO:	AB30128	**CAL. DATE:**	06/17/13
CUST. ID:	N/A	**DUE DATE:**	12/17/13

* IF NO "AS LEFT" READING IS SHOWN ON THIS CHART, IT MEANS THE UNIT WAS IN TOLERANCE AND THERE WERE NO ADJUSTMENTS MADE TO IT.

RANGE: 0-200 PSI

NOMINAL	AS FOUND	AS LEFT *	LOW LIMIT	HIGH LIMIT
50	50.18		49.25	50.75
100	100.19		99.25	100.75
150	150.22		149.25	150.75
200	200.31		199.25	200.75
250	250.33		249.25	250.75
300	300.39		299.25	300.75

Appendix D

RTS and RTS Tool Configuration

RADIOACTIVE TRACER SURVEY LOG

Company	SOUTH MIAMI-DADE W.W.T.P.
Well	IW-14
Field	S.D.W.W.T.P.
County	MIAMI-DADE
State	FLORIDA

Location: API # :

SEC TWP RGE

Other Services

Permanent Datum	PAD	Elevation	PAD
Log Measured From	PAD		
Drilling Measured From	PAD		

Elevation
K.B.
D.F.
G.L.

Date	29-AUG-2013		
Run Number	2013 MIT		
Depth Driller	3060'		
Depth Logger	2603'		
Bottom Logged Interval	2603'		
Top Log Interval	SURFACE		
Open Hole Size	22"		
Type Fluid	WATER		
Density / Viscosity	NA		
Max. Recorded Temp.	NA		
Estimated Cement Top	NA		
Time Well Ready	ON ARRIVAL		
Time Logger on Bottom	ON ARRIVAL		
Equipment Number	102		
Location	FT MYERS		
Recorded By	RIVES	R.GARCIA	A.GARCIA
Witnessed By	S. VILLAMIL		

Borehole Record				Borehole Record			
Run Number	Bit	From	To	Run No	Bit	From	To

Casing Record	Size	Wgt/Ft	Top	Bottom
Surface String				
Prot. String				
Production String	24"	.500" W.T.	SURFACE	2404'
Liner				

<< Fold Here >>>

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

Comments

HIGH RESOLUTION TEMPERATURE

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)

GR#3	24.00	GR #3 -RTST (951T)	11.50	1.69	30.00
		TREJCT-A (951)	1.00	1.69	10.00
		GR #2 -RTSM (951M)	3.00	1.69	10.00
GR#2	10.50				
CCL	9.60	CCL-1.68GRRTS (951)	0.75	1.69	10.00
		GR-RTSB (951B)	9.25	1.69	10.00
GR	1.20				

Dataset: sdwwtp-iw14.db: field/well/run1/pass3
Total Length: 25.50 ft
Total Weight: 70.00 lb
O.D. 1.69 in

YOUNGQUIST

FINAL BACKGROUND

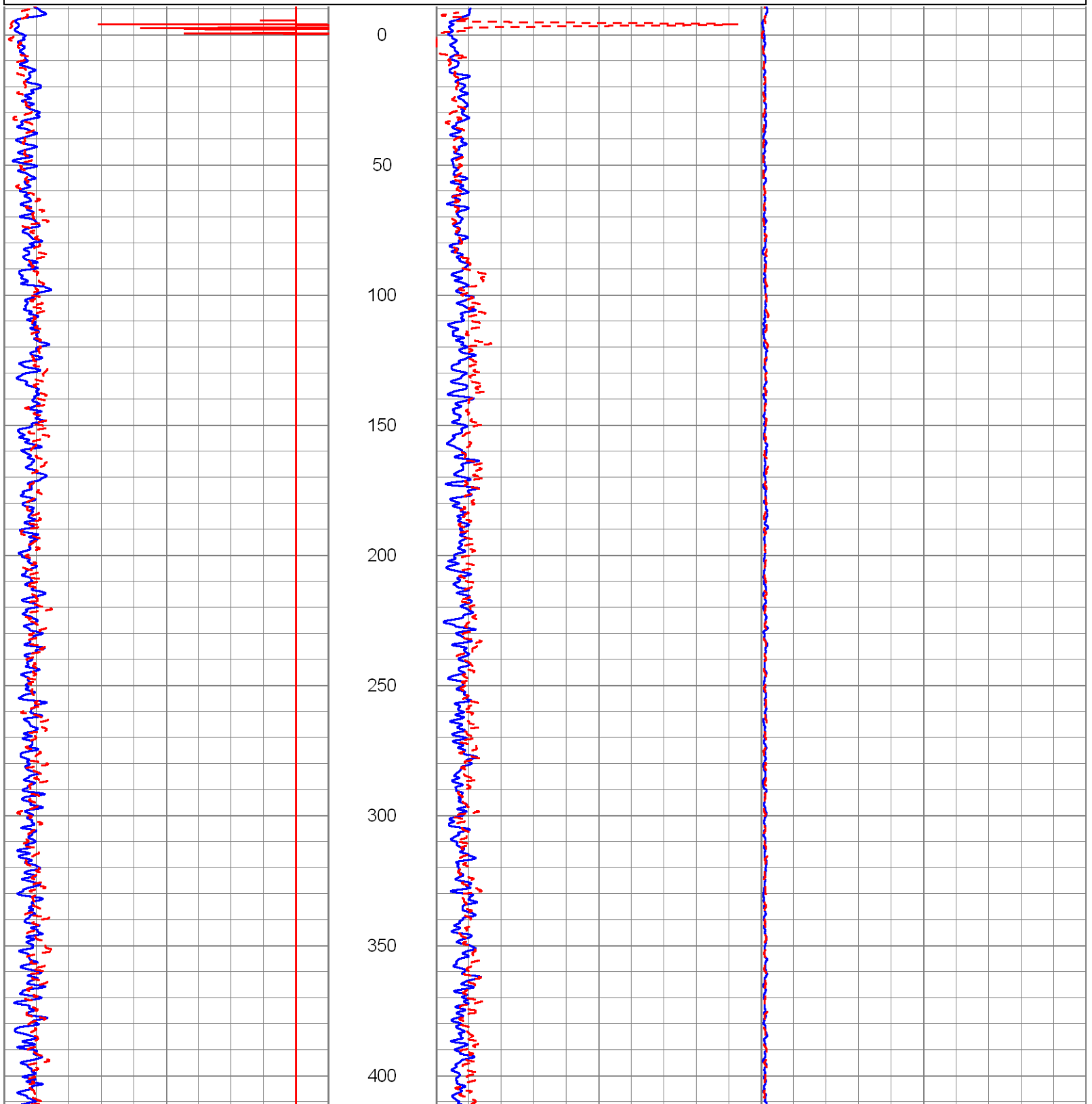
FINAL BACKGROUND

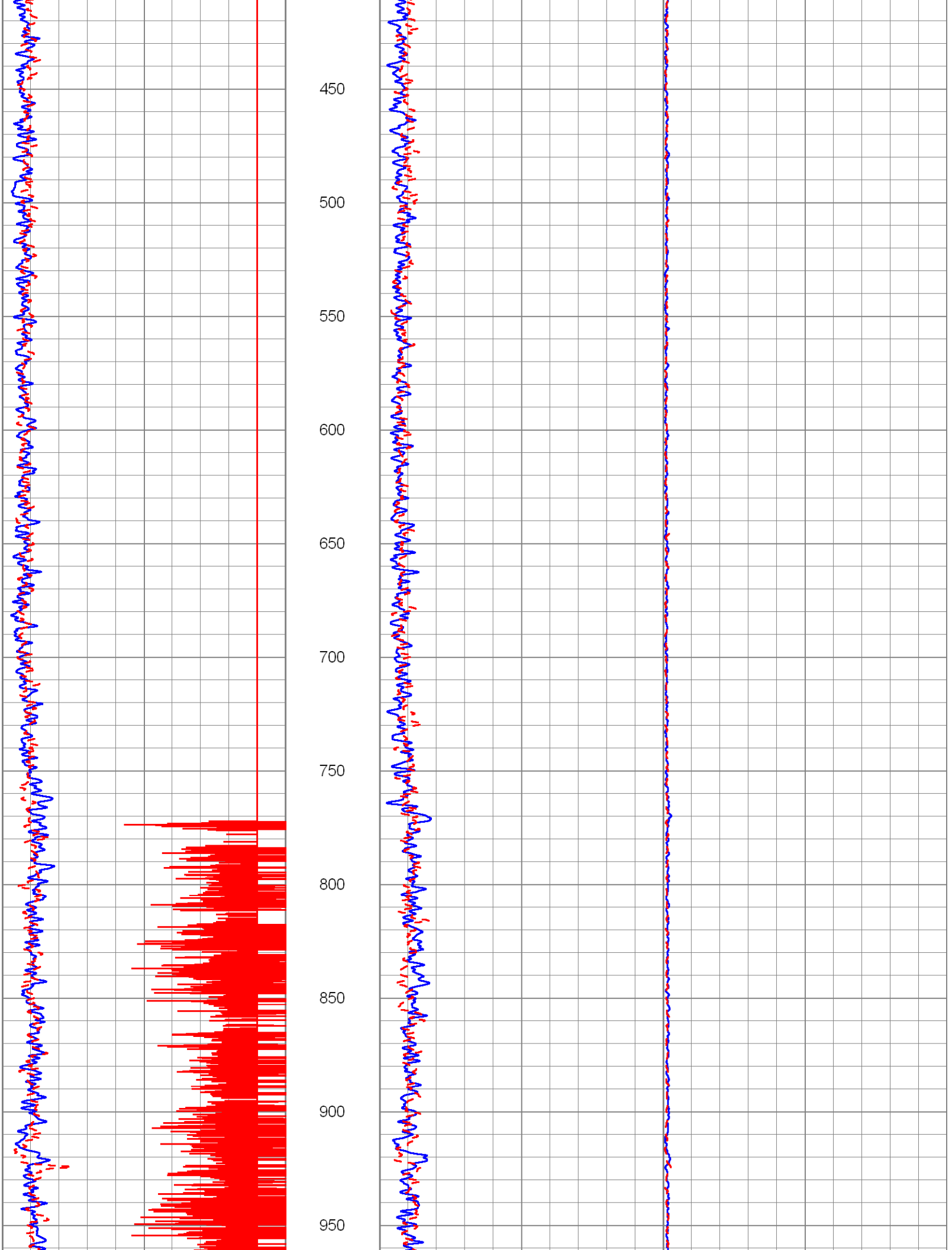
Database File:	sdwwtp-iw14.db
Dataset Pathname:	pass15
Presentation Format:	rts
Dataset Creation:	Fri Aug 30 12:32:59 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:600

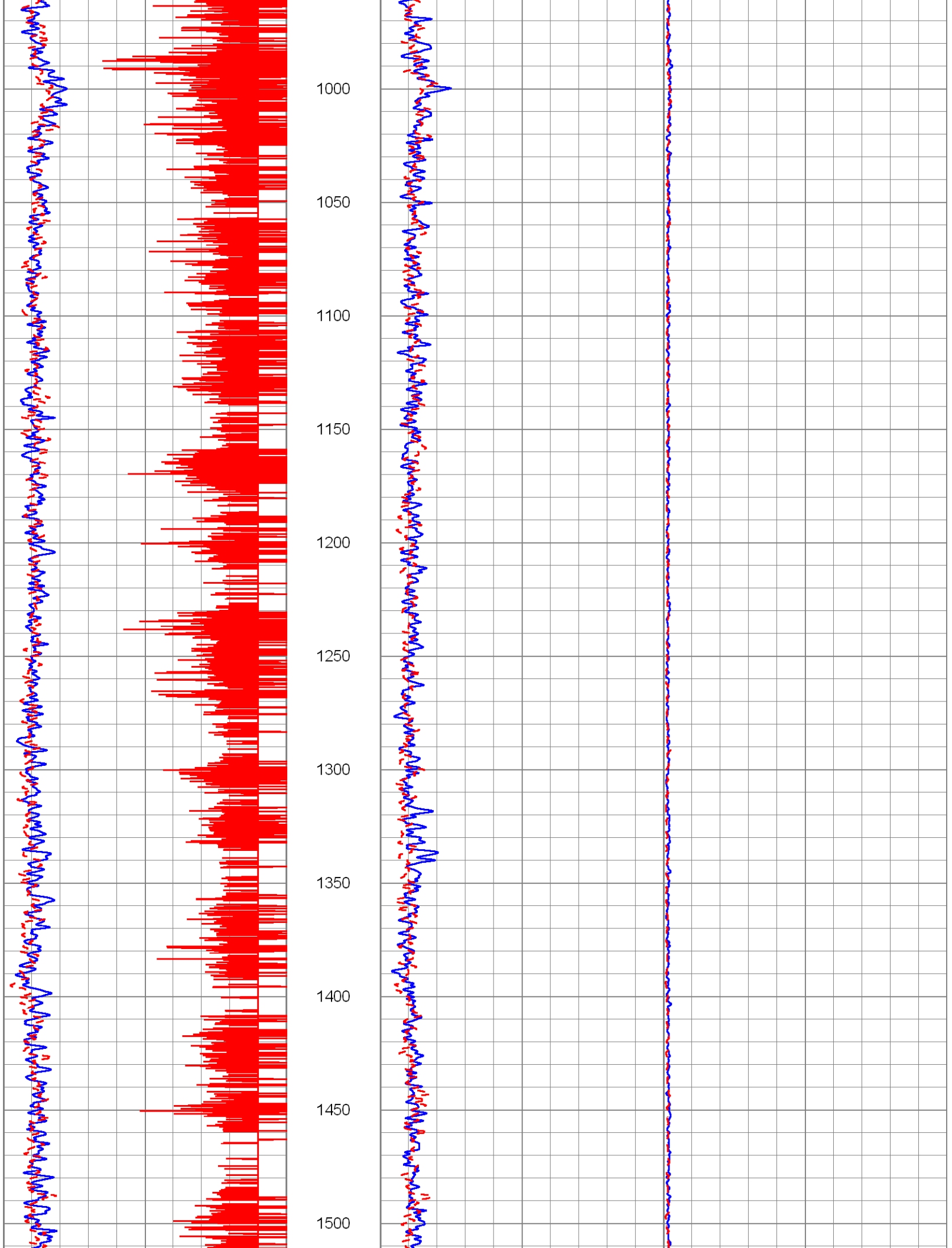
0	GRT (GAPI)	100
0	GRT-BACKGRND (GAPI)	100
0.9	CCL	-0.1

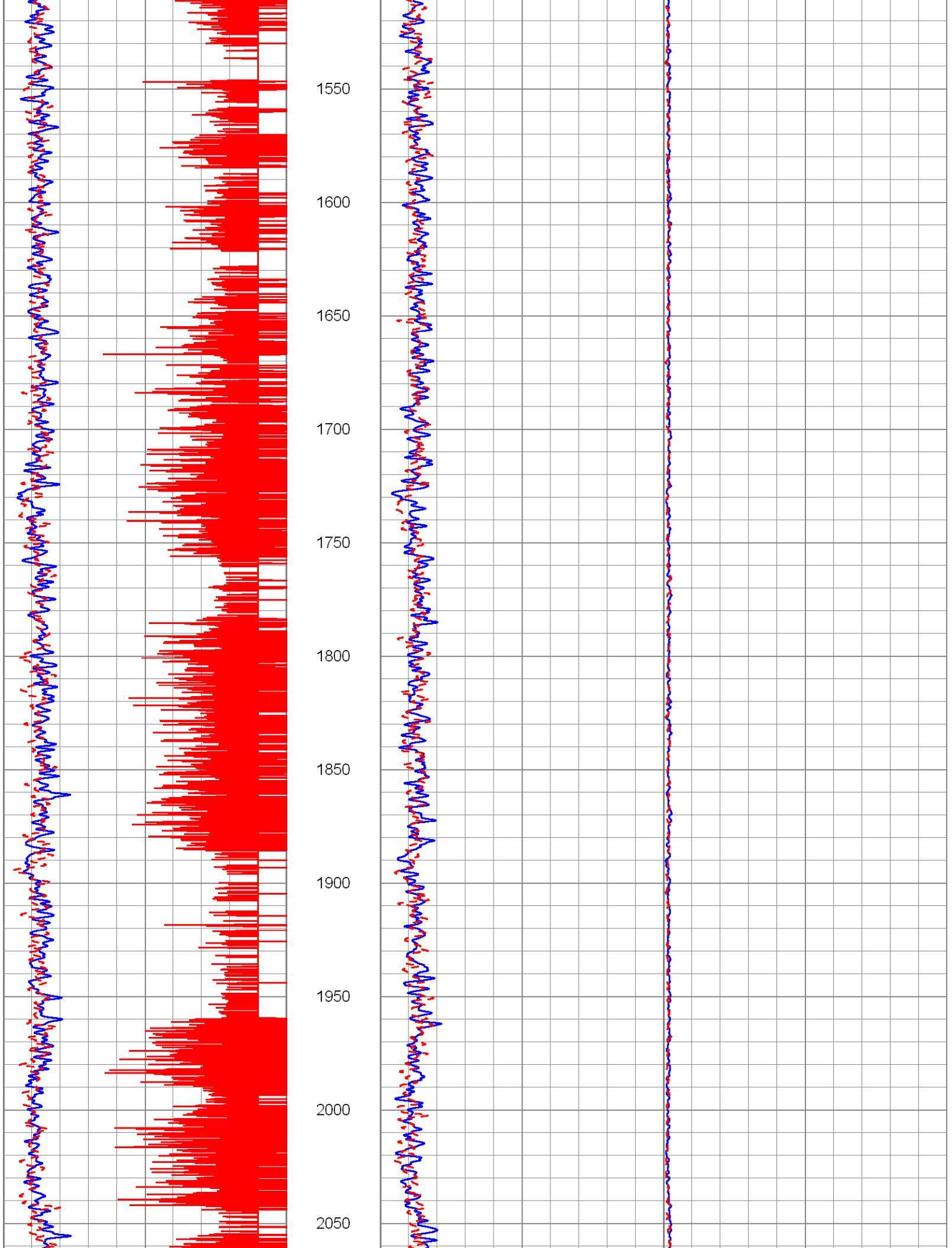
0	GRB (GAPI)	100
0	GRB-BACKGRD (GAPI)	100

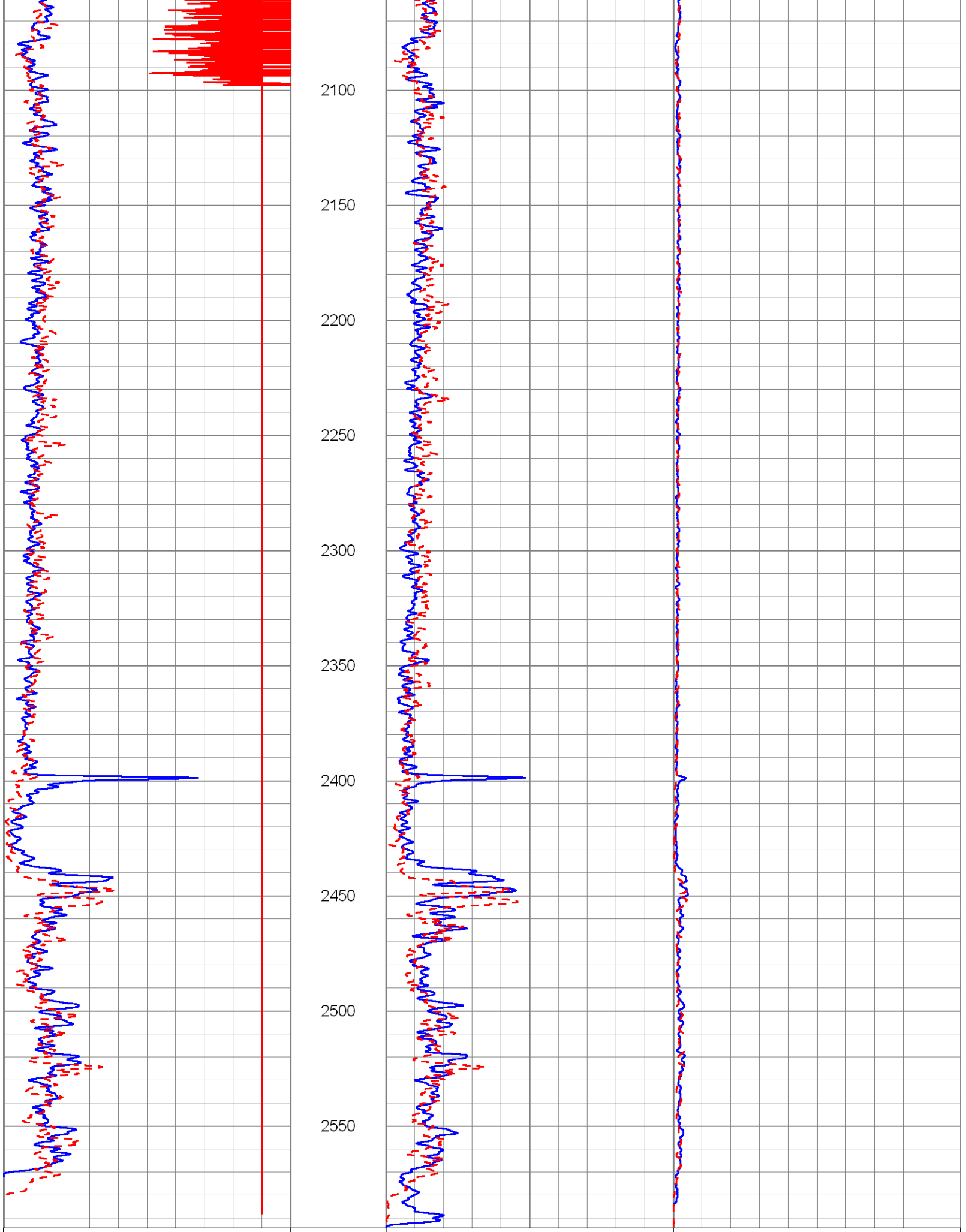
0	GRM (GAPI)	1000
0	GRM-BACKGRND (GAPI)	1000




450
500
550
600
650
700
750
800
850
900
950


1000
1050
1100
1150
1200
1250
1300
1350
1400
1450
1500


1550
1600
1650
1700
1750
1800
1850
1900
1950
2000
2050


2100
2150
2200
2250
2300
2350
2400
2450
2500
2550
0
GRT (GAPI)
100
0
GRB (GAPI)
100
0
GRM (GAPI)
1000

0	GRT-BACKGRND (GAPI)	100
0.9	CCL	-0.1

0	GRB-BACKGRD (GAPI)	100

0	GRM-BACKGRND (GAPI)	1000

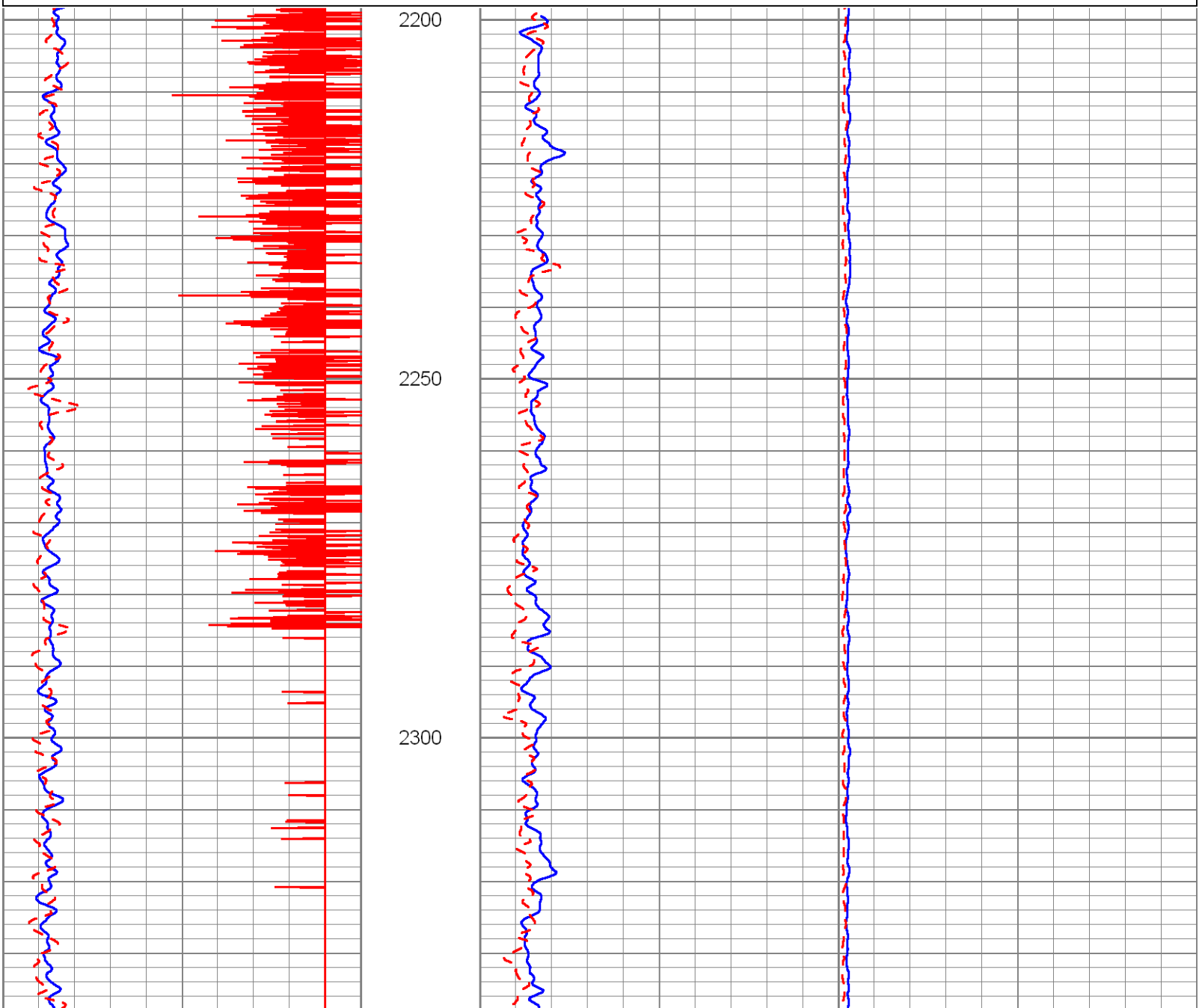
LOP #2

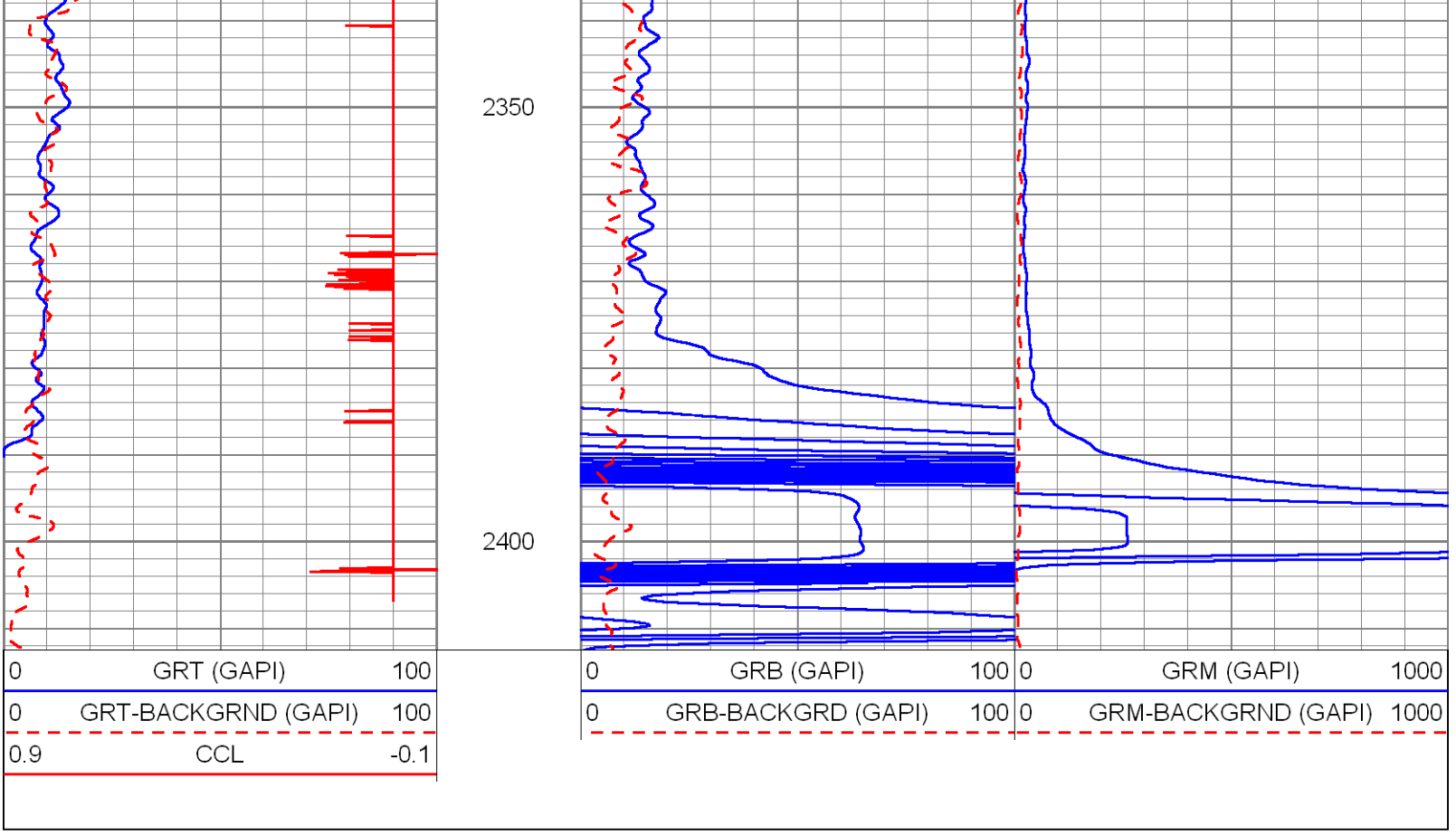
Database File:	sdwwtp-iw14.db
Dataset Pathname:	pass13
Presentation Format:	rts
Dataset Creation:	Fri Aug 30 11:52:41 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:240

0	GRT (GAPI)	100
0	GRT-BACKGRND (GAPI)	100
0.9	CCL	-0.1

0	GRB (GAPI)	100
0	GRB-BACKGRD (GAPI)	100

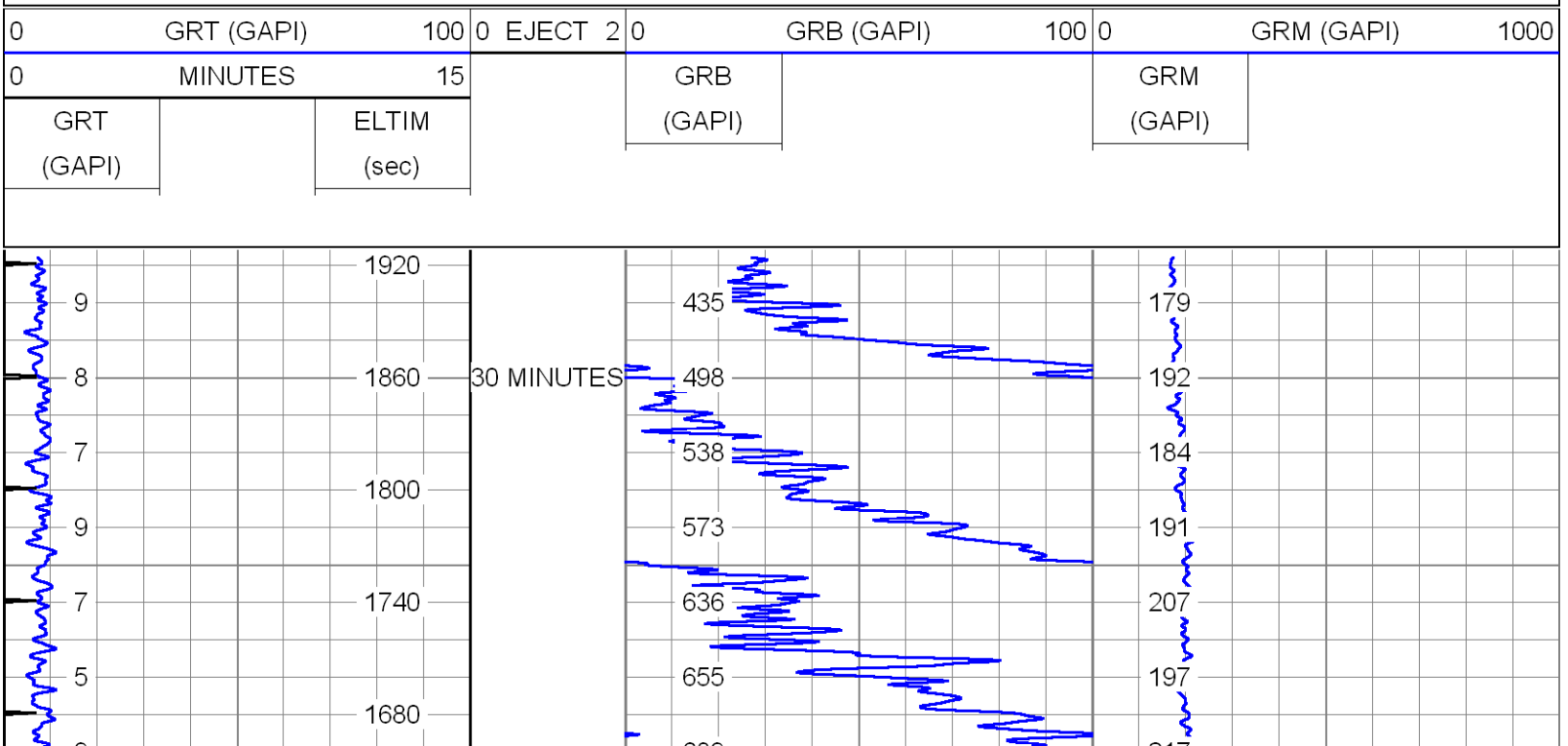
0	GRM (GAPI)	1000
0	GRM-BACKGRND (GAPI)	1000

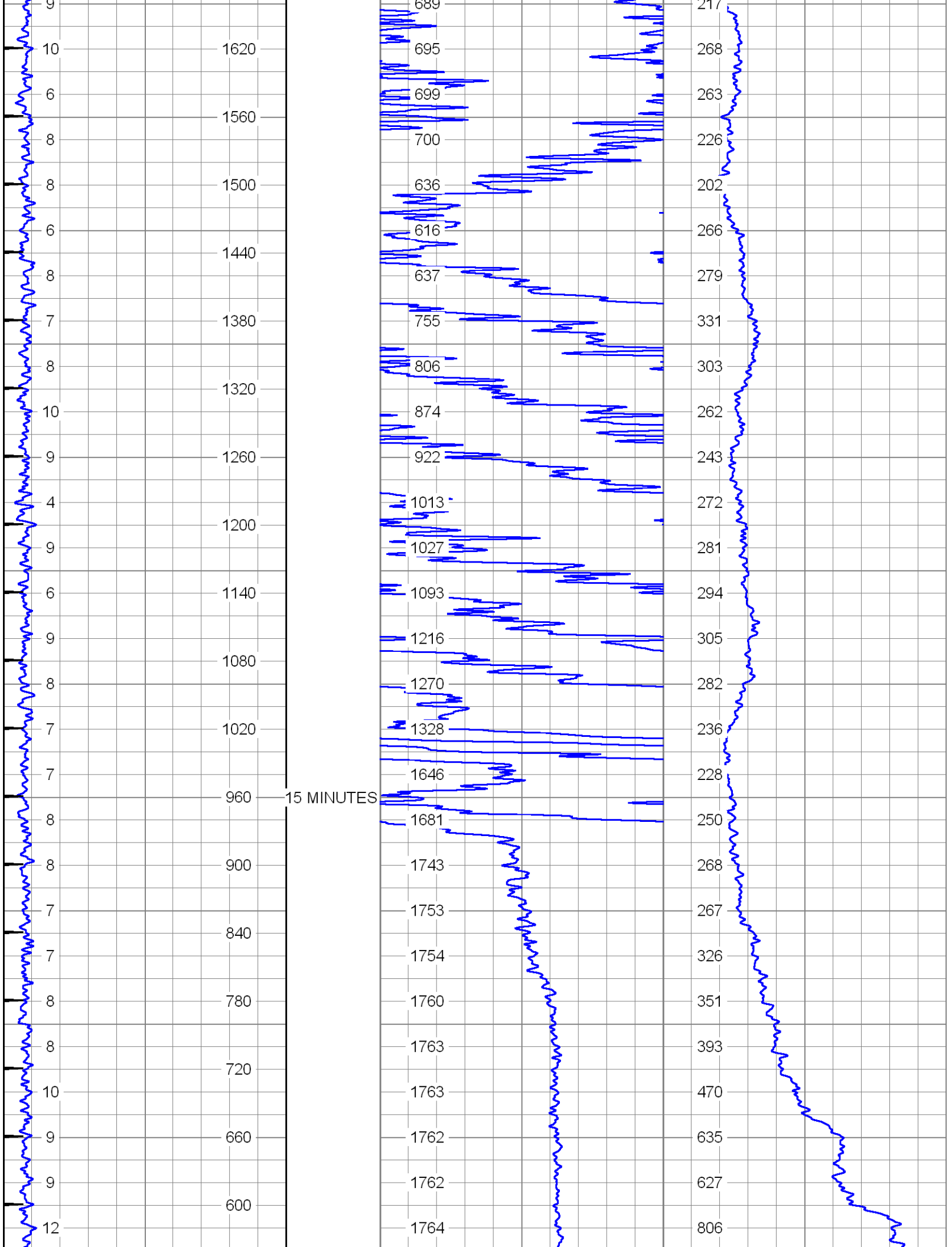




DYNAMIC TEST #2 (93 GPM)

Database File:	sdwwtp-iw14.db
Dataset Pathname:	pass12
Presentation Format:	rtstime
Dataset Creation:	Fri Aug 30 11:17:52 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:600




9
10
6
8
8
6
8
7
8
10
9
4
9
6
9
8
7
7
8
8
7
7
8
8
10
9
9
12
1620
1560
1500
1440
1380
1320
1260
1200
1140
1080
1020
960
900
840
780
720
660
600
15 MINUTES
689
695
699
700
636
616
637
755
806
874
922
1013
1027
1093
1216
1270
1328
1646
1681
1743
1753
1754
1760
1763
1763
1762
1762
1764
217
268
263
226
202
266
279
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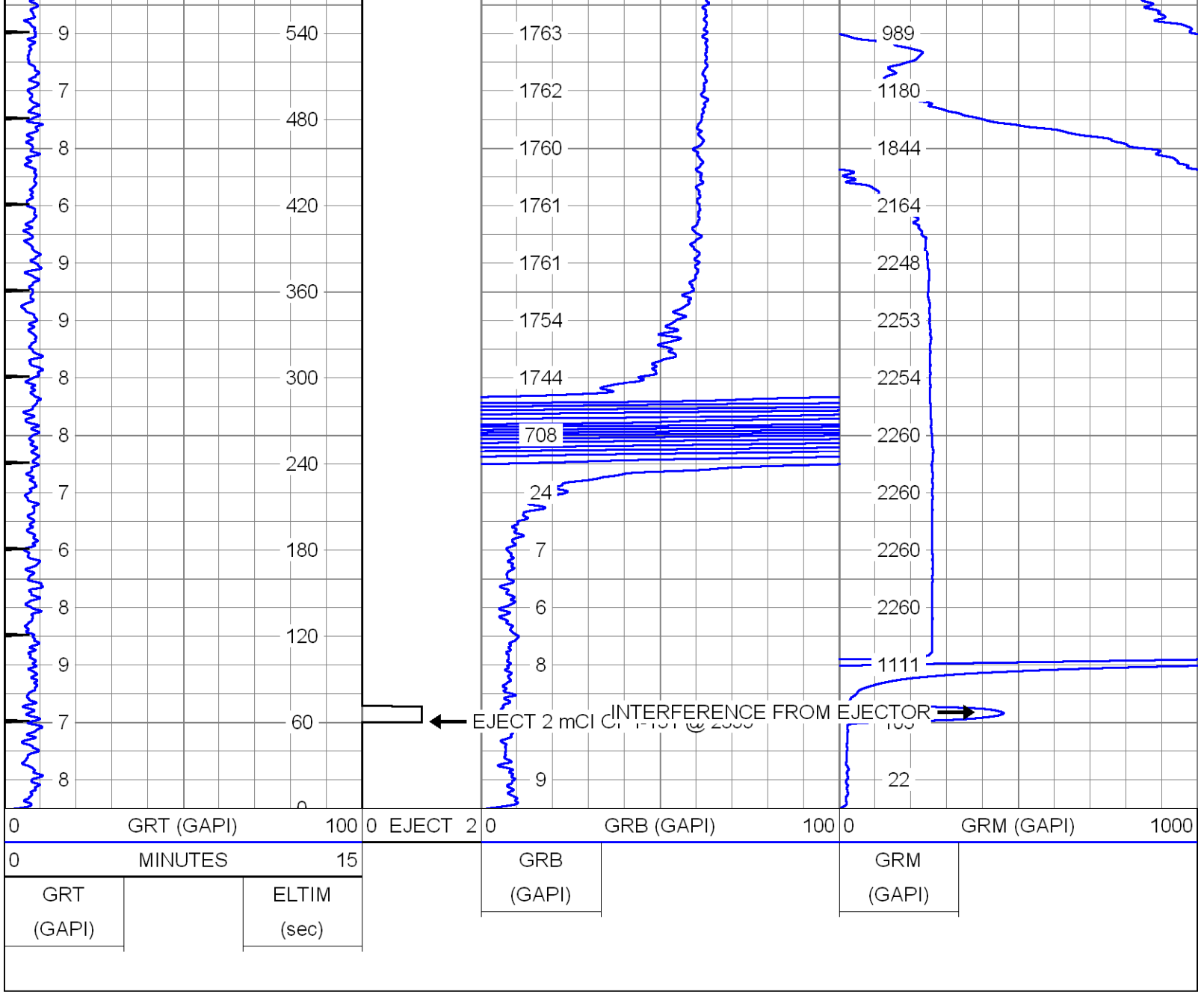
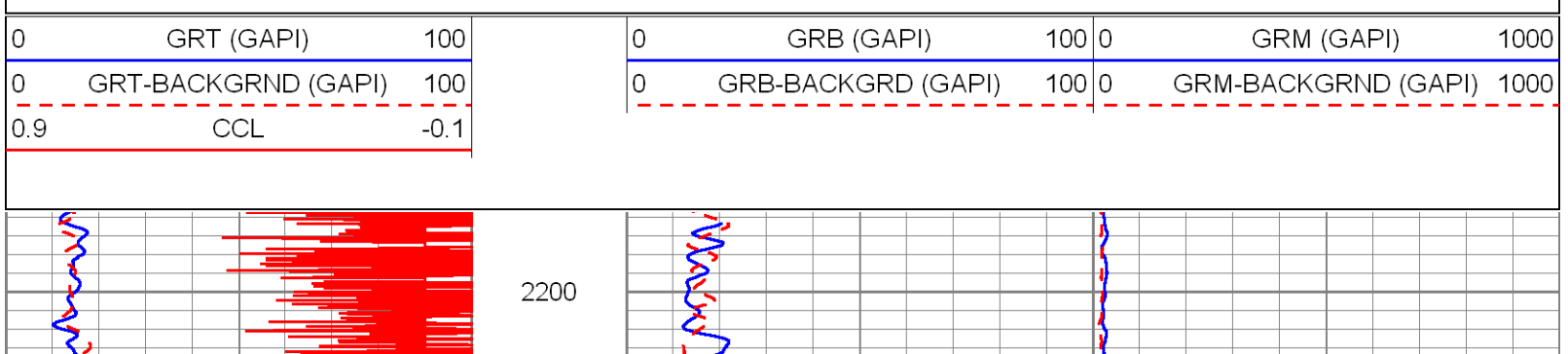
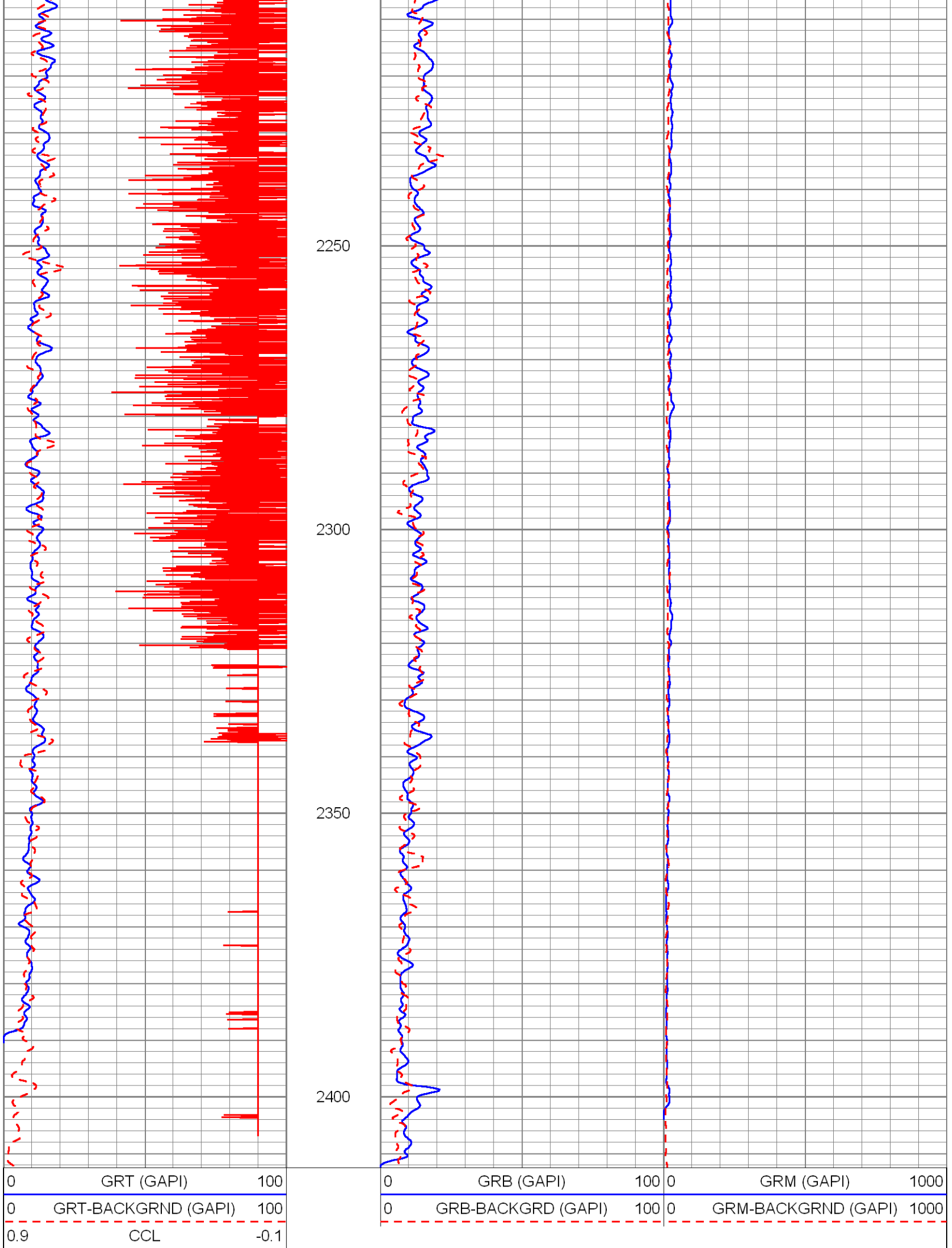
351
393
470
635
627
806



LOP #1

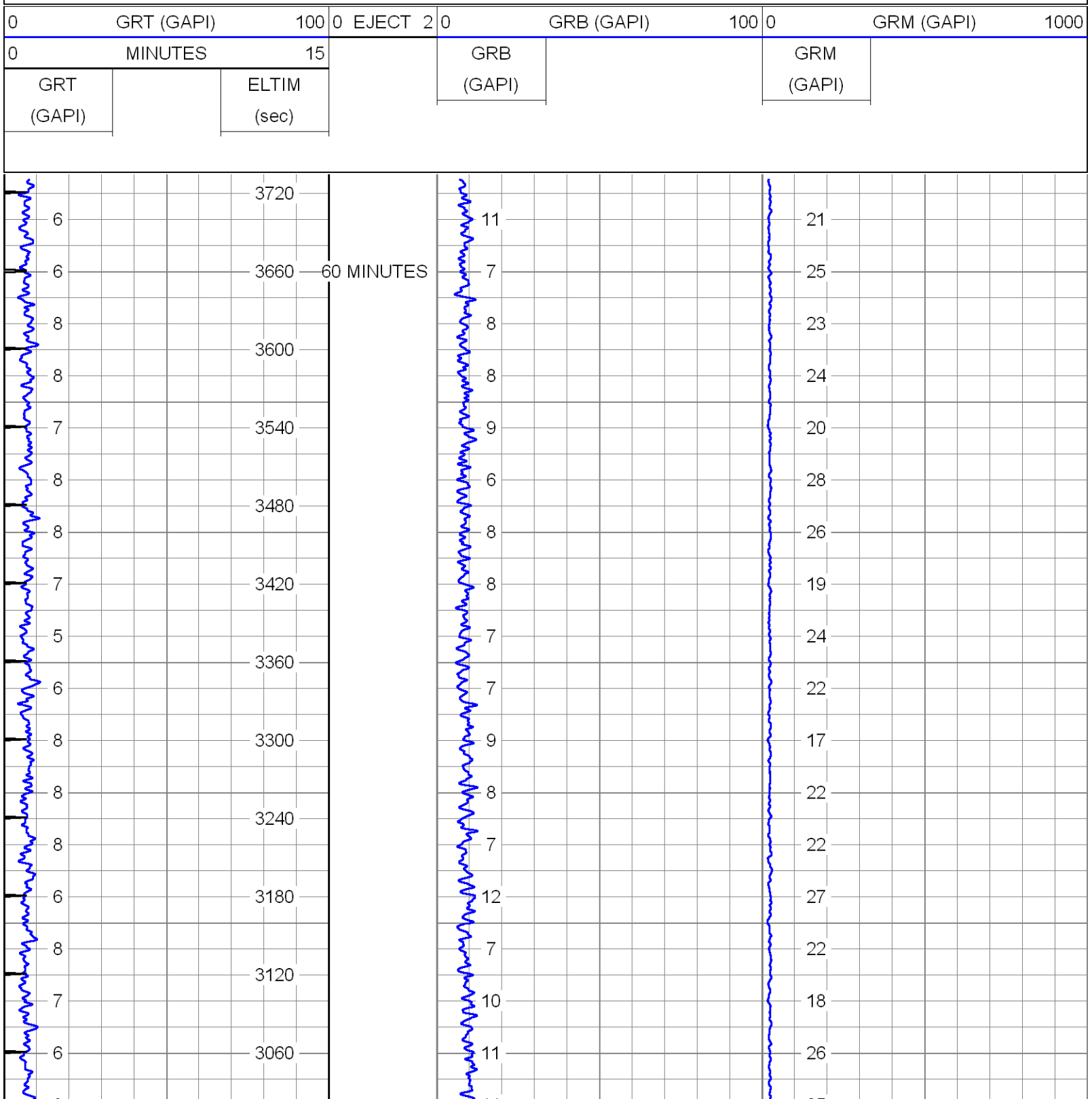
Database File:	sdwwtp-iw14.db
Dataset Pathname:	pass11
Presentation Format:	rts
Dataset Creation:	Fri Aug 30 11:02:19 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:240

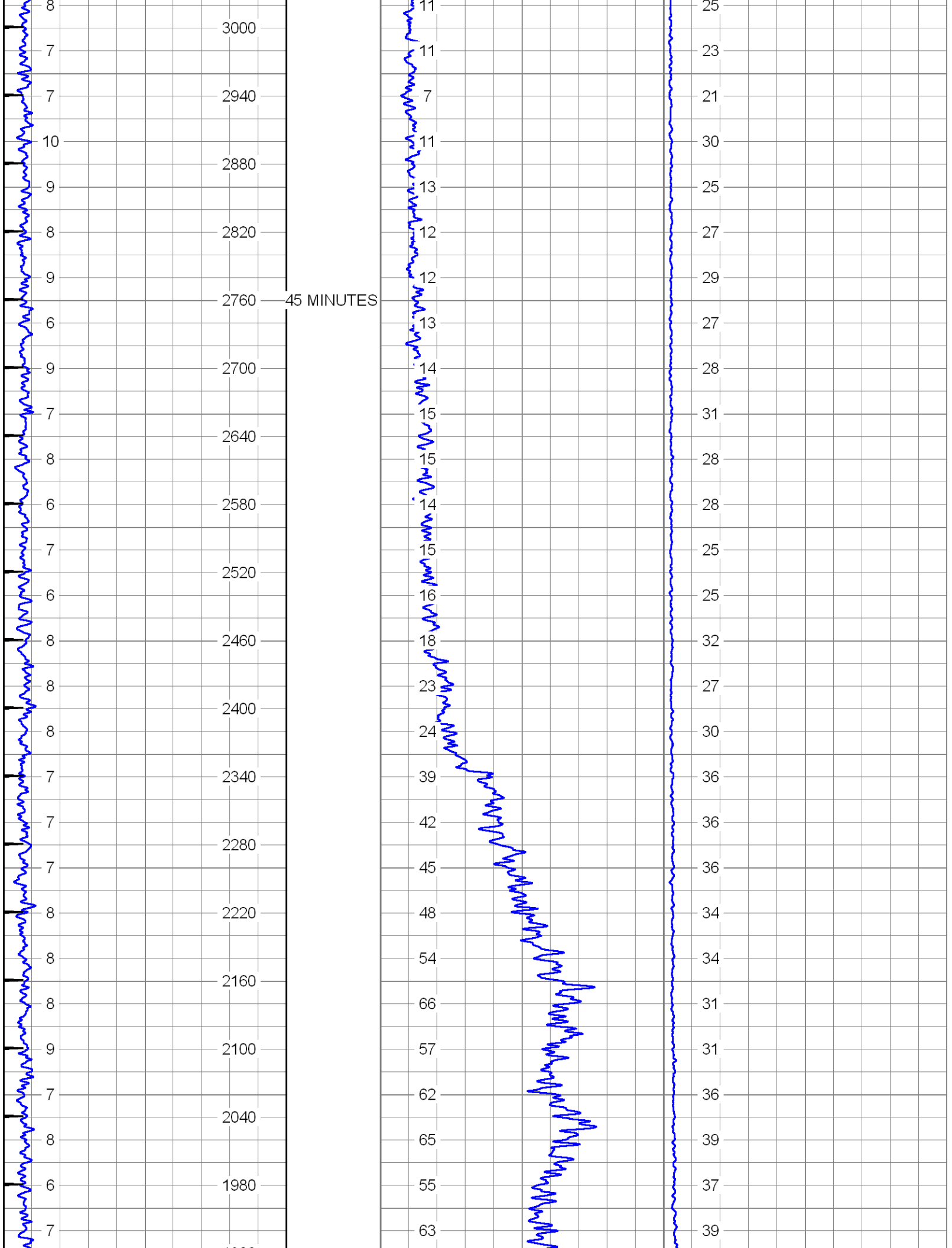


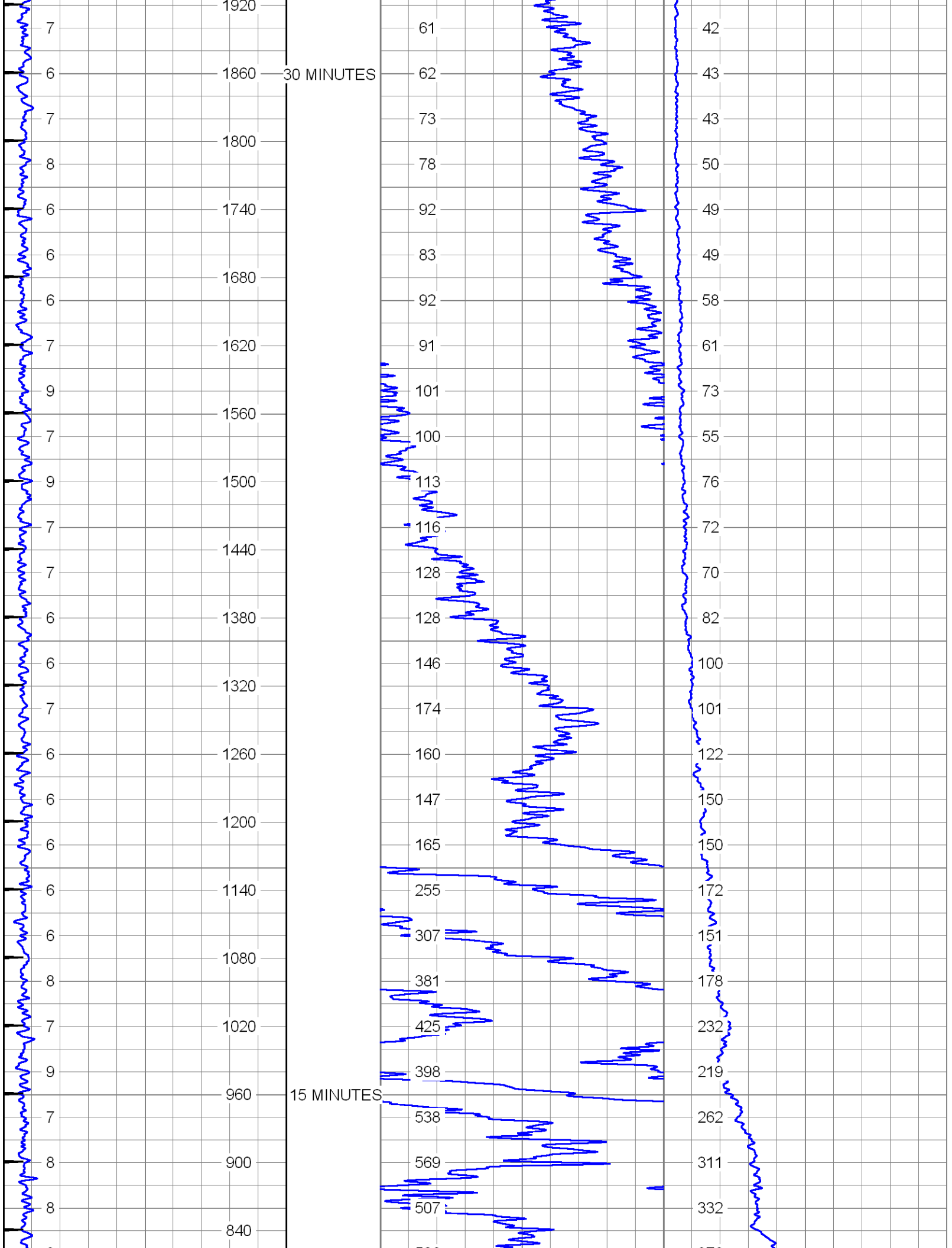

2250
2300
2350
2400
0 GRT (GAPI) 100
0 GRT-BACKGRND (GAPI) 100
0.9 CCL -0.1
0 GRB (GAPI) 100
0 GRB-BACKGRD (GAPI) 100
0 GRM (GAPI) 1000
0 GRM-BACKGRND (GAPI) 1000

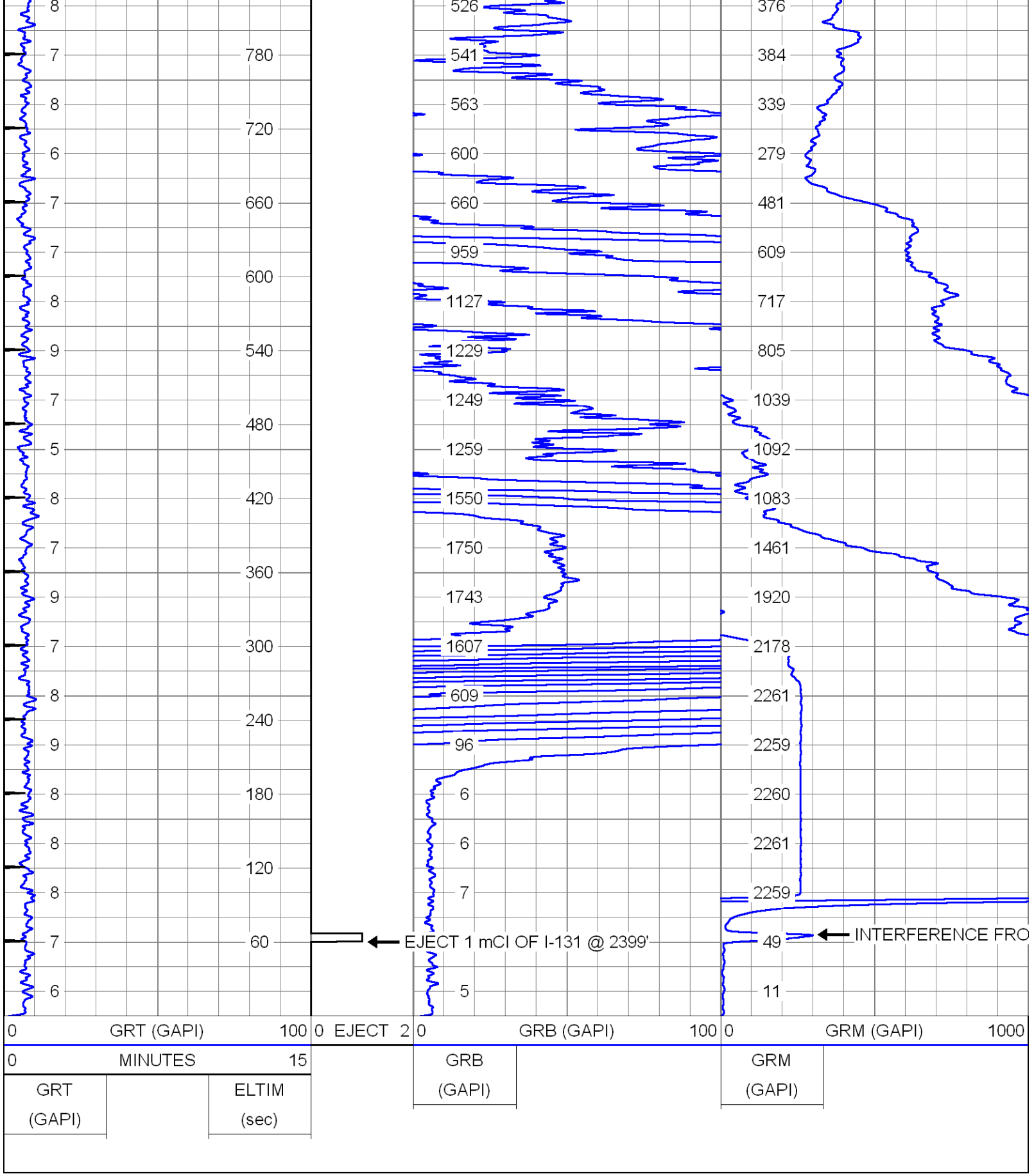
DYNAMIC TEST #1 (88 GPM)

Database File:	sdwwtp-iw14.db
Dataset Pathname:	pass10
Presentation Format:	rtstime
Dataset Creation:	Fri Aug 30 09:57:22 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:600




45 MINUTES
3000
2940
2880
2820
2760
2700
2640
2580
2520
2460
2400
2340
2280
2220
2160
2100
2040
1980

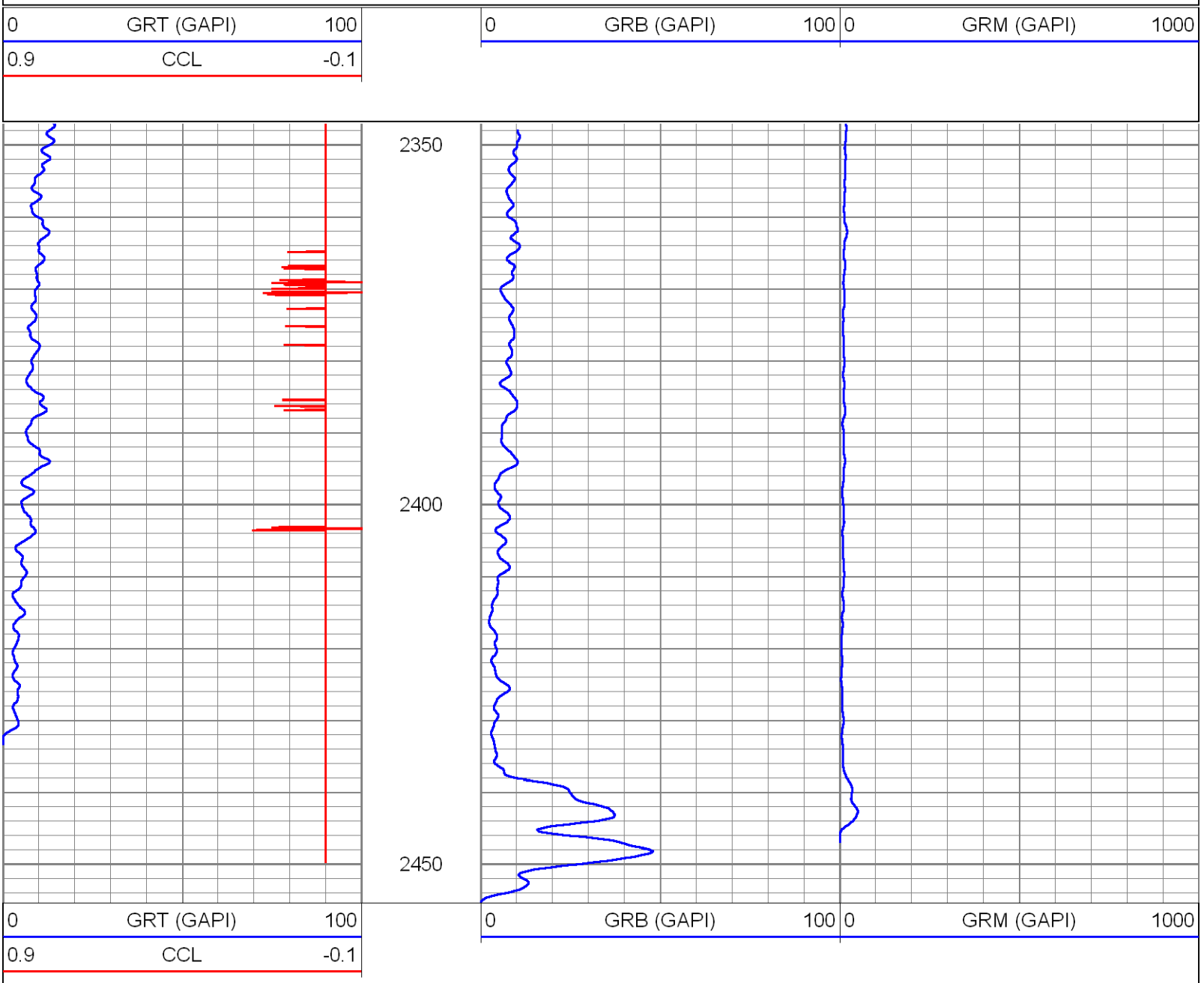

30 MINUTES
15 MINUTES



CASINGTIE-IN

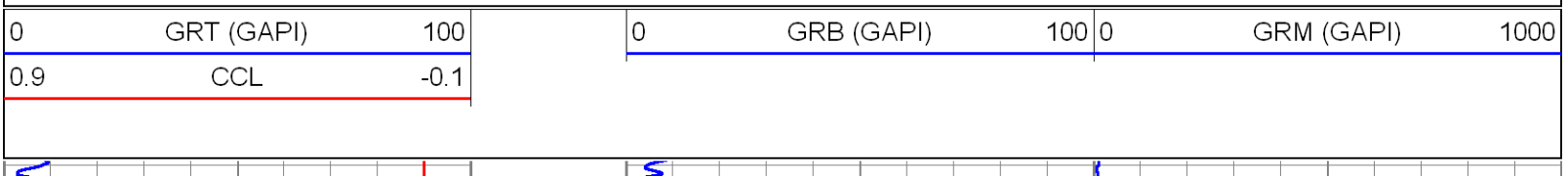
Database File: sdwwtp-jw14.db

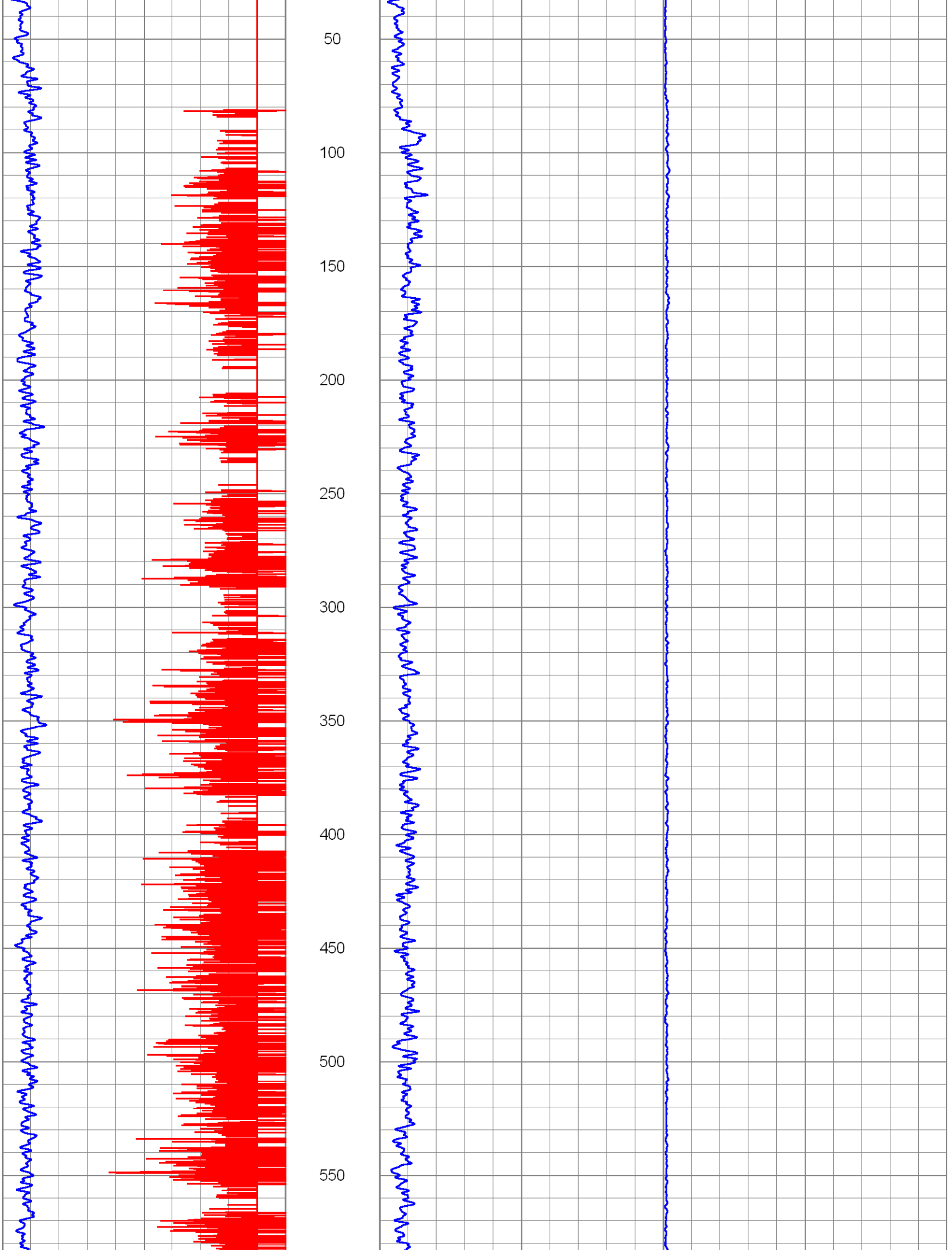
Database File: sdwwtp-iw14.db
Dataset Pathname: pass7
Presentation Format: rts
Dataset Creation: Fri Aug 30 09:32:03 2013 by Log SOC 110722
Charted by: Depth in Feet scaled 1:240

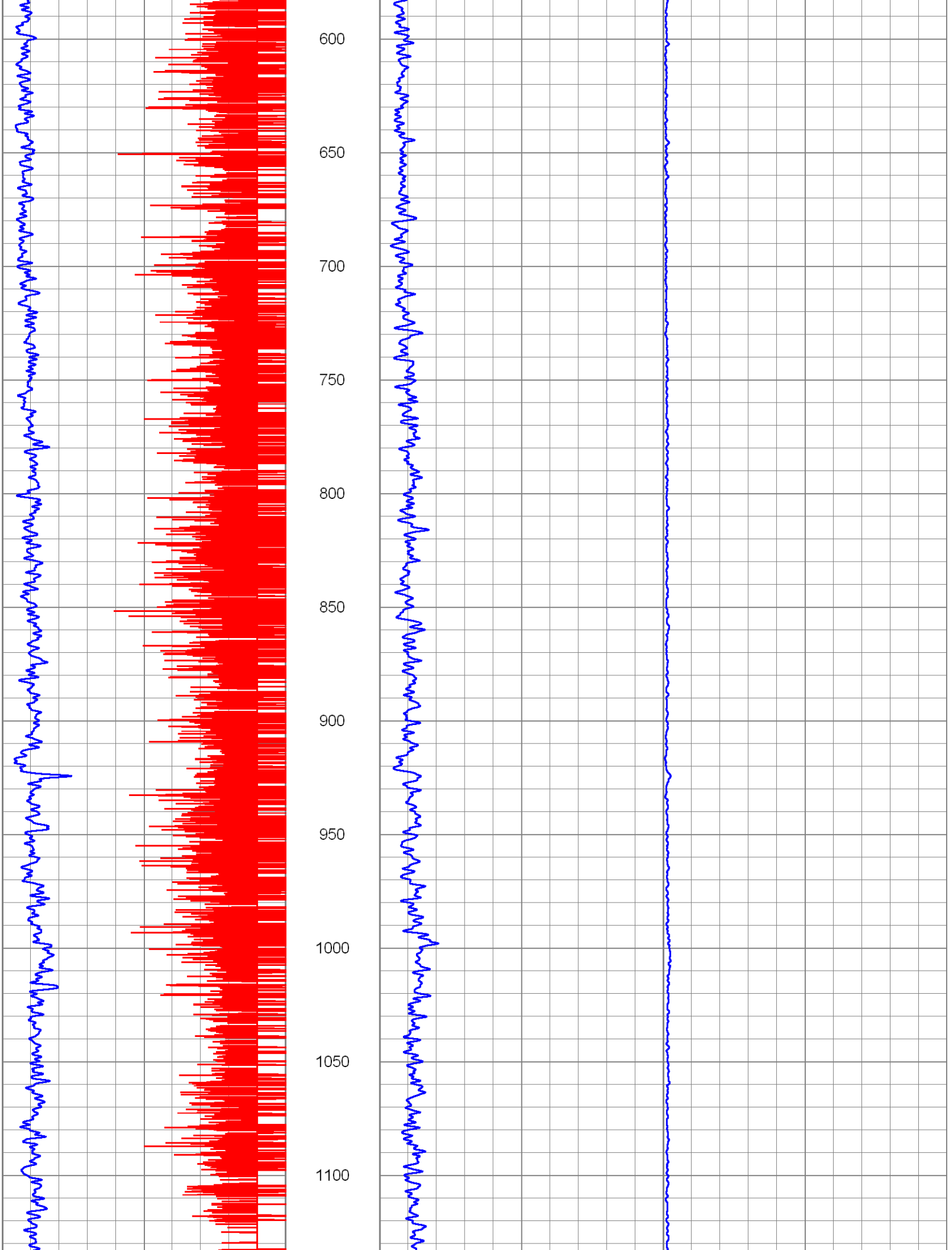


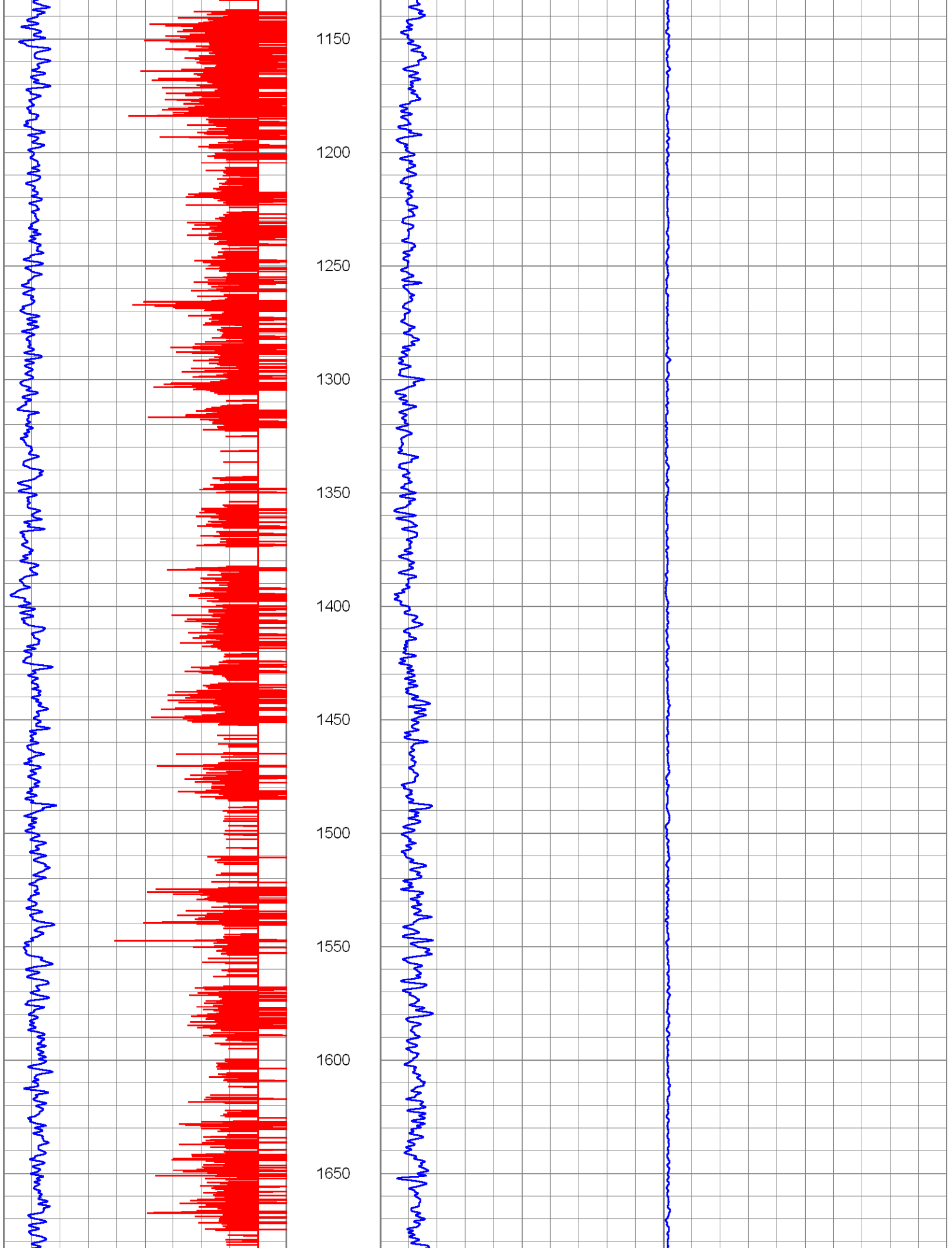
BACKGROUND GAMMA-RAY

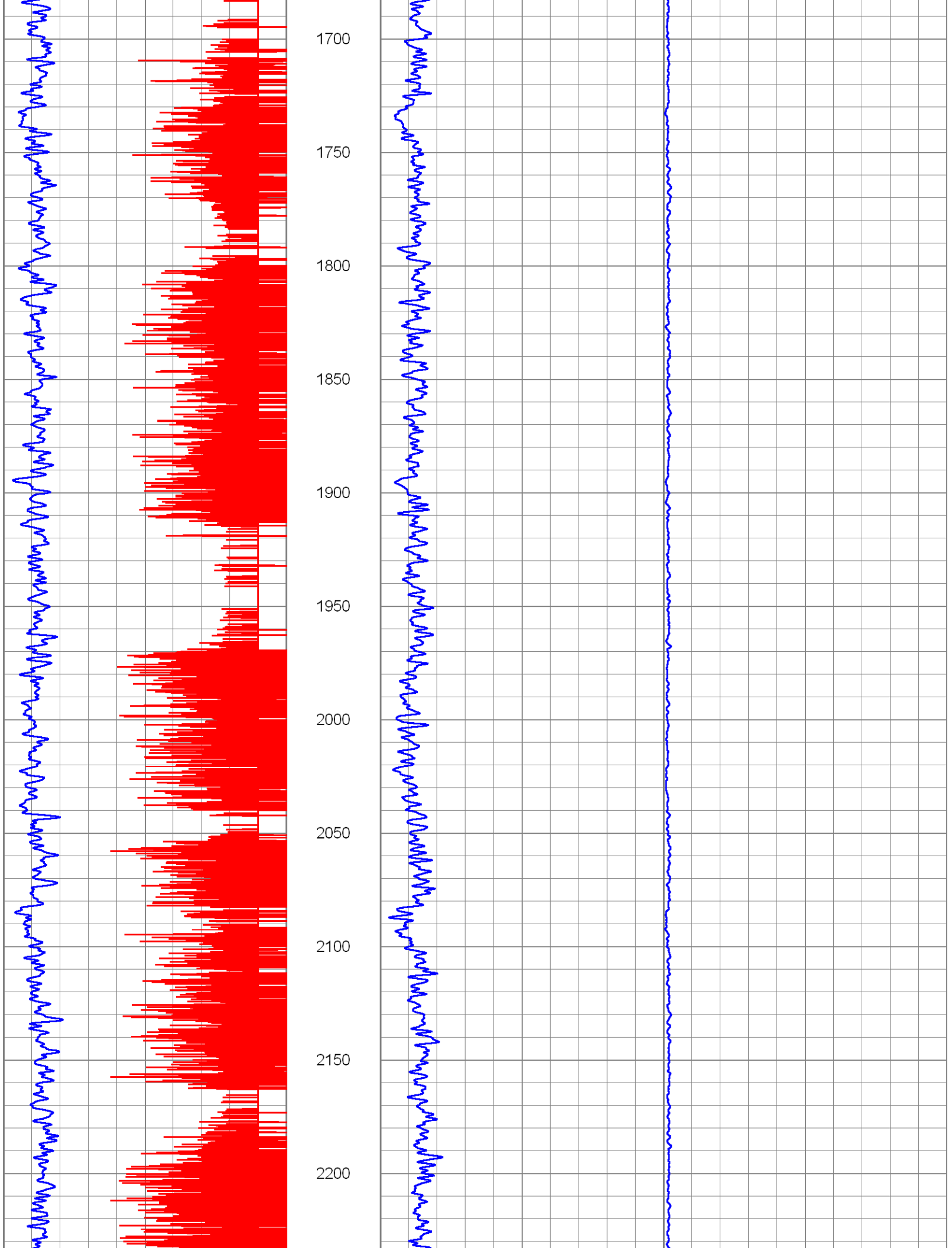
Database File: sdwwtp-iw14.db
Dataset Pathname: pass3
Presentation Format: rts
Dataset Creation: Thu Aug 29 14:27:50 2013 by Log SOC 110722
Charted by: Depth in Feet scaled 1:600

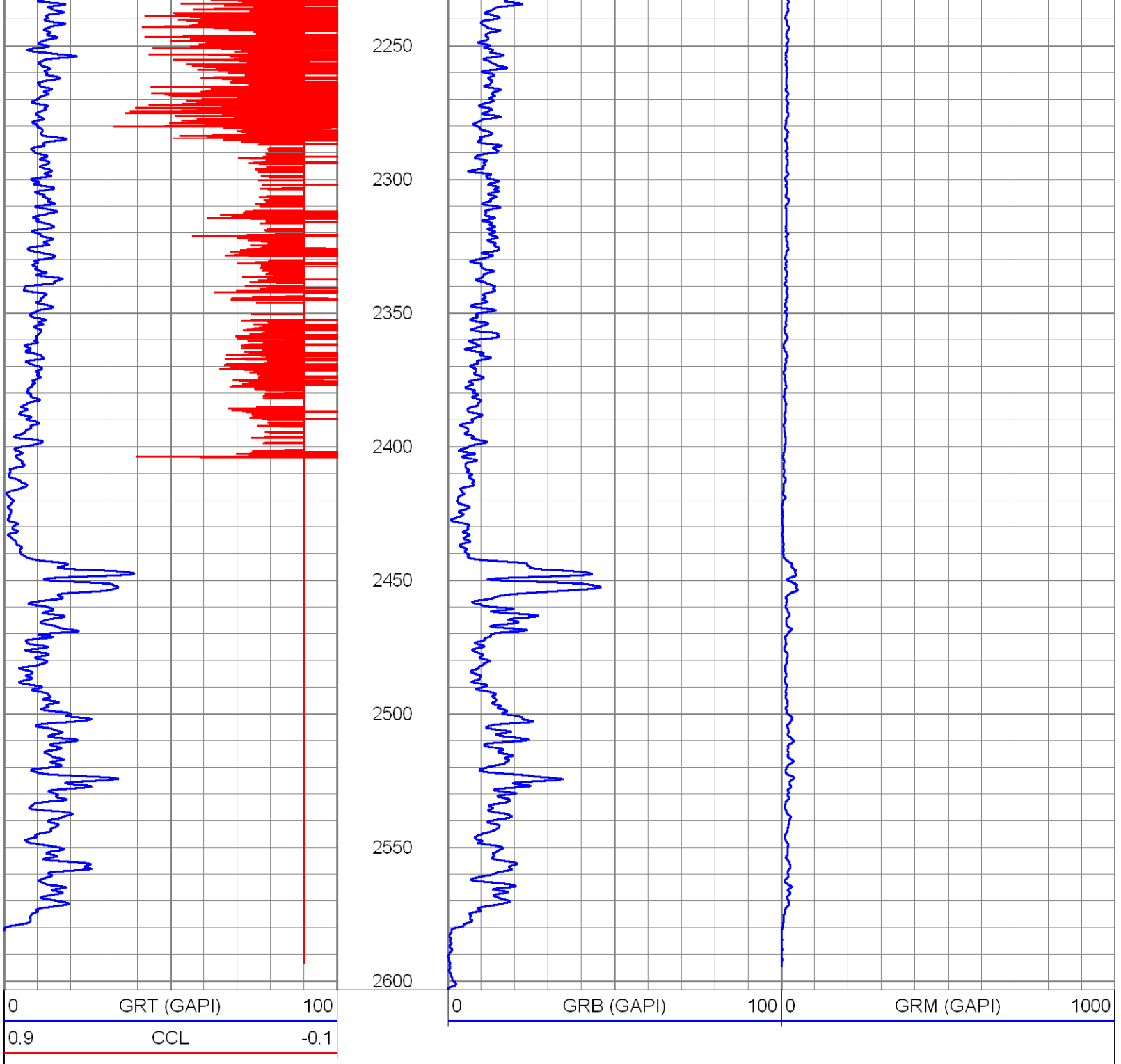



50
100
150
200
250
300
350
400
450
500
550


600
650
700
750
800
850
900
950
1000
1050
1100


1150
1200
1250
1300
1350
1400
1450
1500
1550
1600
1650


1700
1750
1800
1850
1900
1950
2000
2050
2100
2150
2200



Calibration Report

Database File: sdwwtp-iw14.db
Dataset Pathname: pass3
Dataset Creation: Thu Aug 29 14:27:50 2013 by Log SOC 110722

Gamma Ray Calibration Report

Serial Number:	951B	
Tool Model:	RTSB	
Performed:	Thu Aug 29 13:55:08 2013	
Calibrator Value:	90.0	GAPI
Background Reading:	34.7	cps
Calibrator Reading:	198.8	cps

Sensitivity:	0.5487	GAPI/cps

Gamma Ray Calibration Report

Serial Number:	951M	
Tool Model:	RTSM	
Performed:	Thu Aug 29 13:56:55 2013	
Calibrator Value:	90.0	GAPI
Background Reading:	194.5	cps
Calibrator Reading:	322.6	cps
Sensitivity:	0.7024	GAPI/cps

Gamma Ray Calibration Report

Serial Number:	951T	
Tool Model:	RTST	
Performed:	Thu Aug 29 13:58:36 2013	
Calibrator Value:	90.0	GAPI
Background Reading:	28.6	cps
Calibrator Reading:	183.7	cps
Sensitivity:	0.5802	GAPI/cps

Appendix E

Temperature Log

HIGH RESOLUTION TEMPERATURE LOG

YOUNGQUIST BROTHERS

Company	SOUTH MIAMI-DADE W.W.T.P.
Well	IW-14
Field	S.D.W.W.T.P.
County	MIAMI-DADE
State	FLORIDA

Location: API # :

SEC TWP RGE

Other Services

Elevation

K.B.
D.F.
G.L.

Permanent Datum	PAD	Elevation	PAD
Log Measured From	PAD		
Drilling Measured From	PAD		

Date	29-AUG-2013		
Run Number	2013 MIT		
Depth Driller	3060'		
Depth Logger	2603'		
Bottom Logged Interval	2603'		
Top Log Interval	SURFACE		
Open Hole Size	22"		
Type Fluid	WATER		
Density / Viscosity	NA		
Max. Recorded Temp.	81.2 degF		
Estimated Cement Top	NA		
Time Well Ready	ON ARRIVAL		
Time Logger on Bottom	ON ARRIVAL		
Equipment Number	102		
Location	FT MYERS		
Recorded By	RIVES	R.GARCIA	A.GARCIA
Witnessed By	S. VILLAMIL		

Borehole Record				Borehole Record			
Run Number	Bit	From	To	Run No	Bit	From	To

Casing Record	Size	Wgt/Ft	Top	Bottom
Surface String				
Prot. String				
Production String	24"	.500" W.T.	SURFACE	2404'
Liner				

<< Fold Here >>>

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

Comments

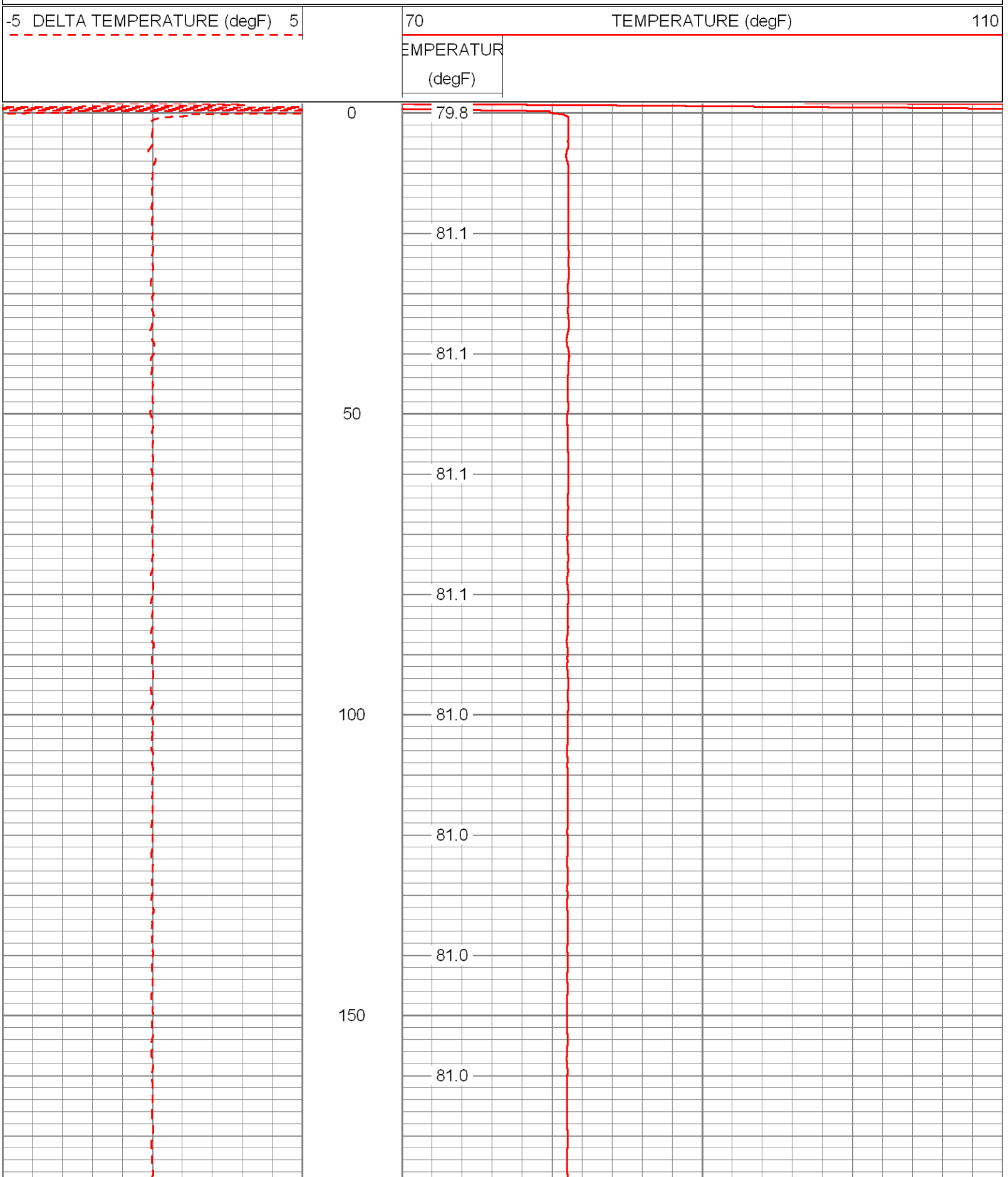
RADIOACTIVE TRACER SURVEY

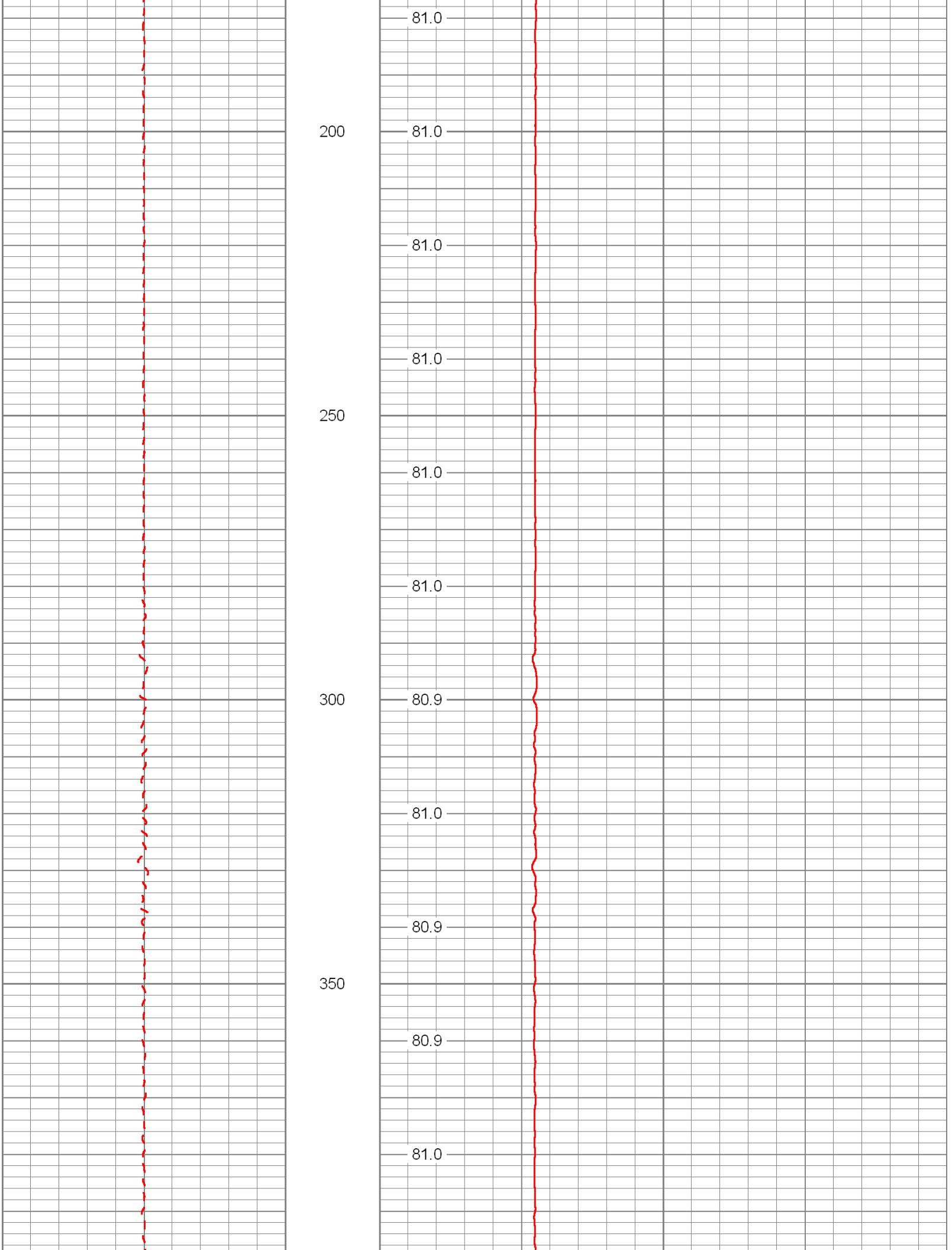
TEMPERATURE

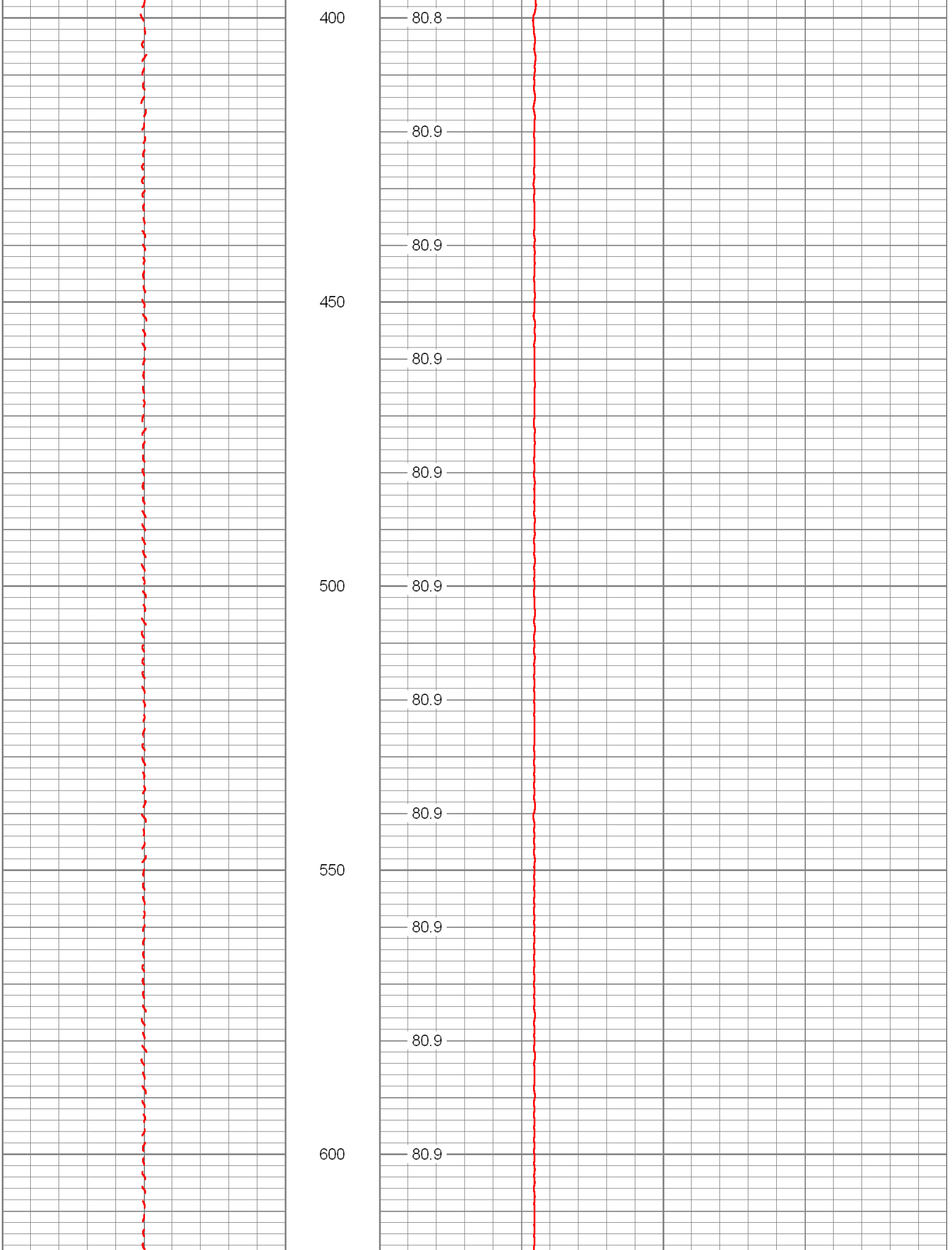
YOUNGQUIST

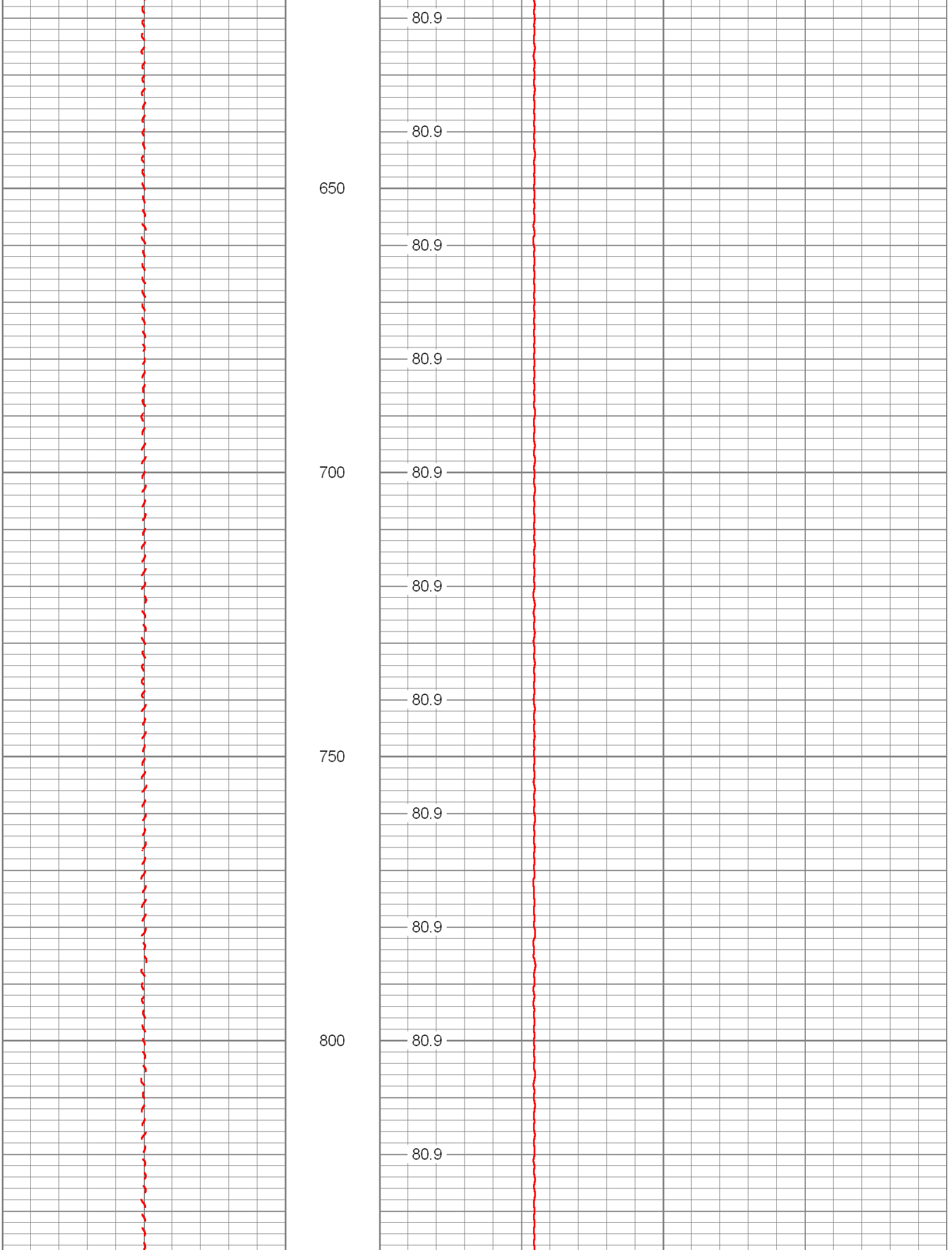
BROTHERS

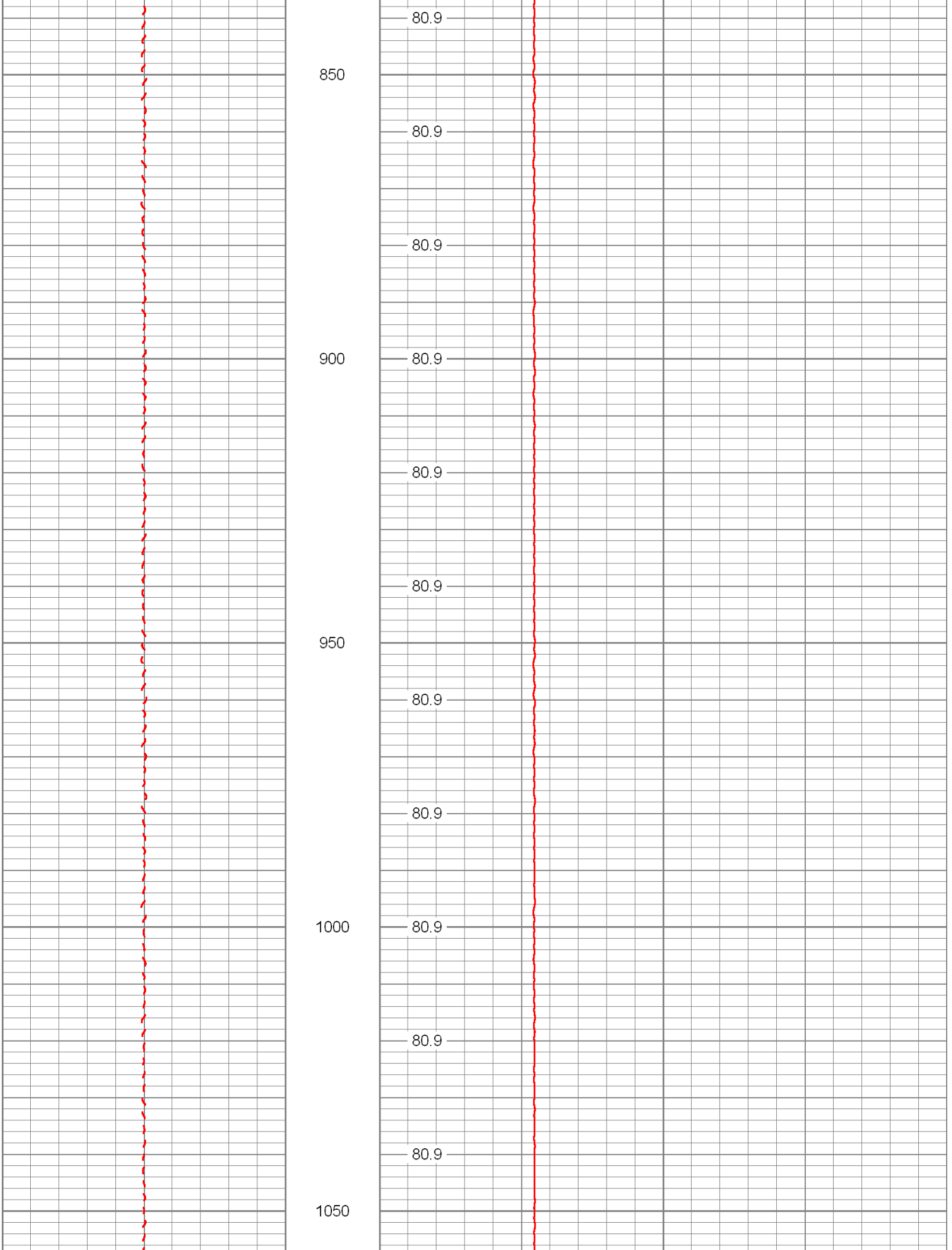
Database File:	sdwwtp-iw14.db
Dataset Pathname:	pass1
Presentation Format:	temp
Dataset Creation:	Thu Aug 29 08:50:06 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:240

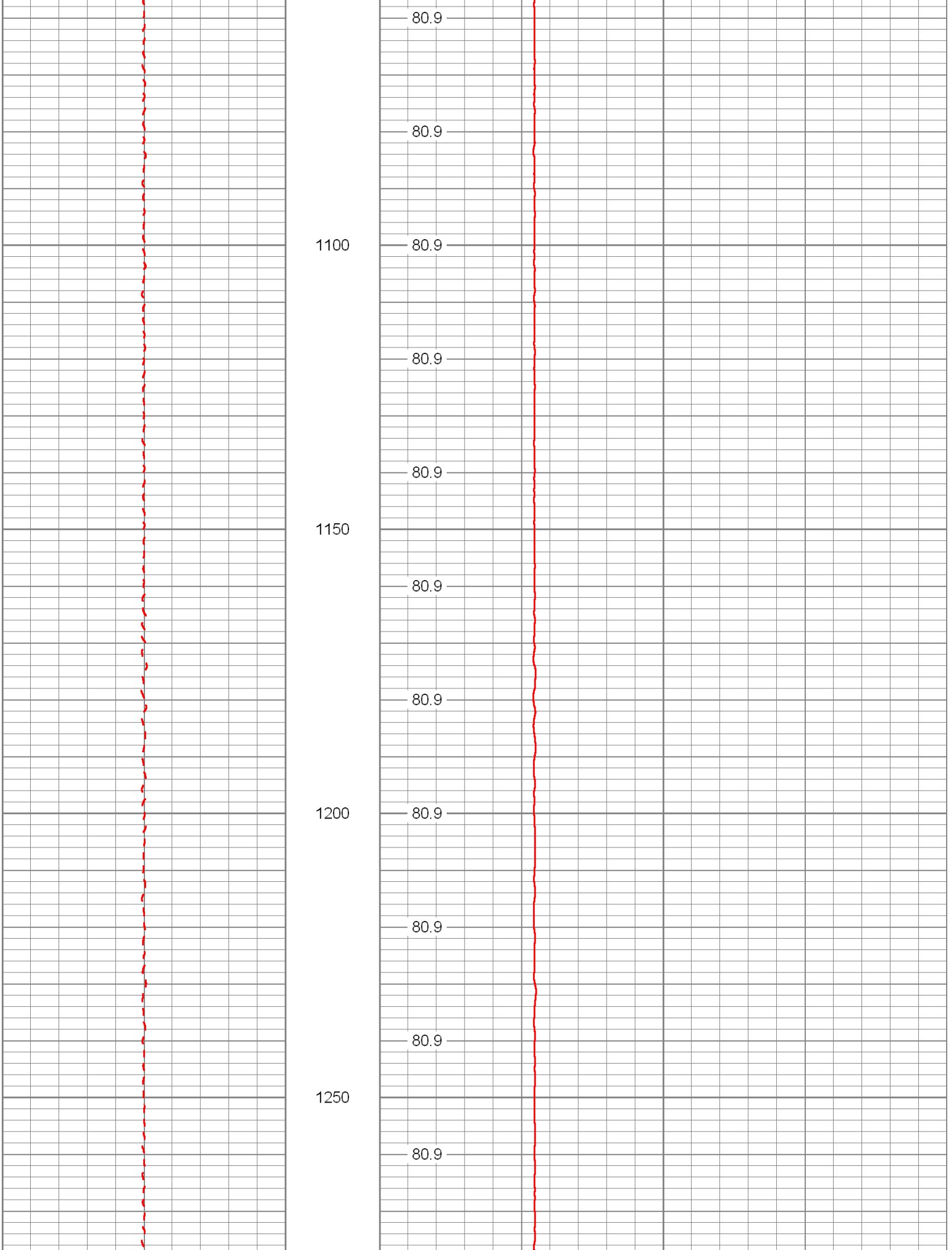


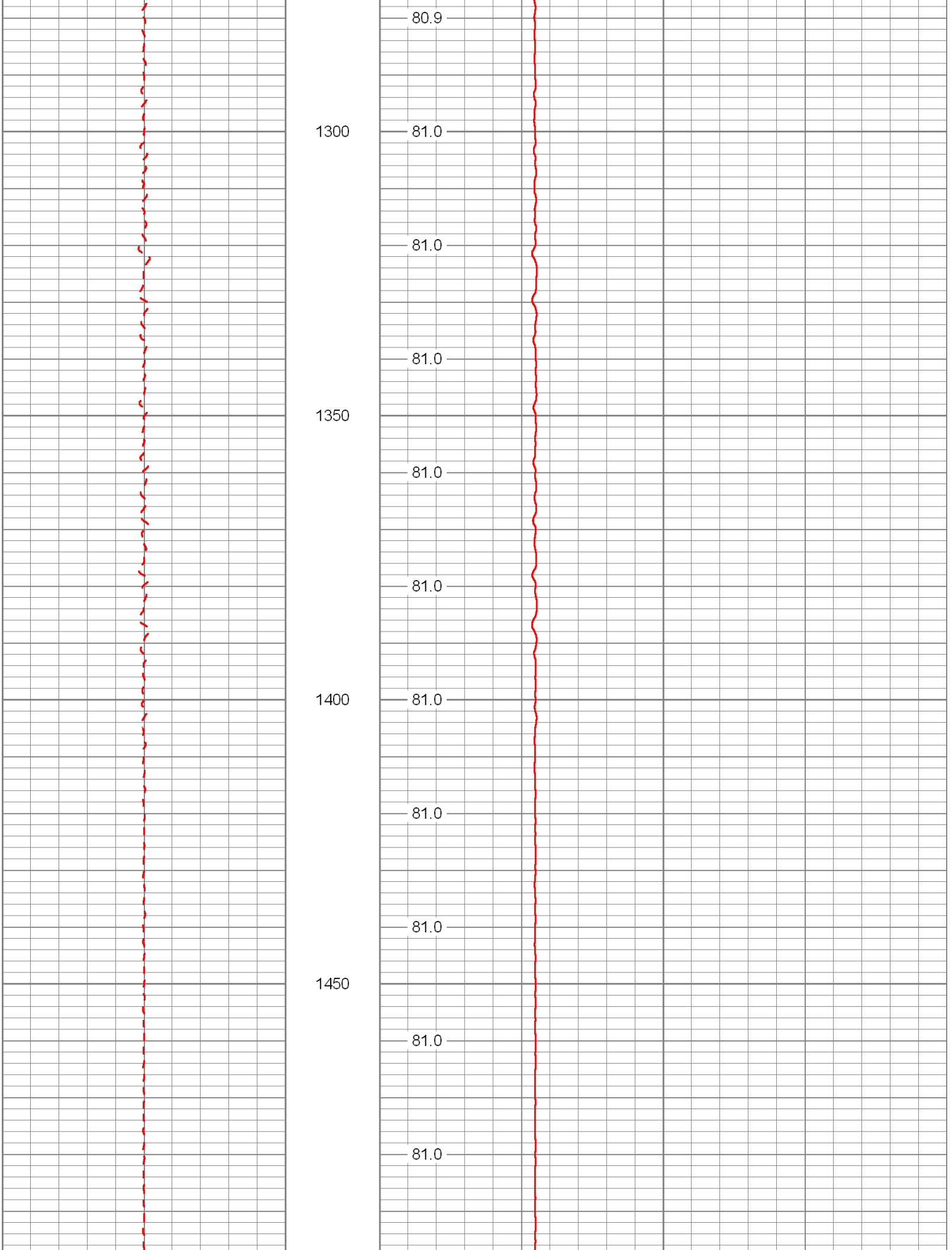

81.0
200
81.0
81.0
81.0
250
81.0
81.0
300
80.9
81.0
80.9
350
80.9
81.0

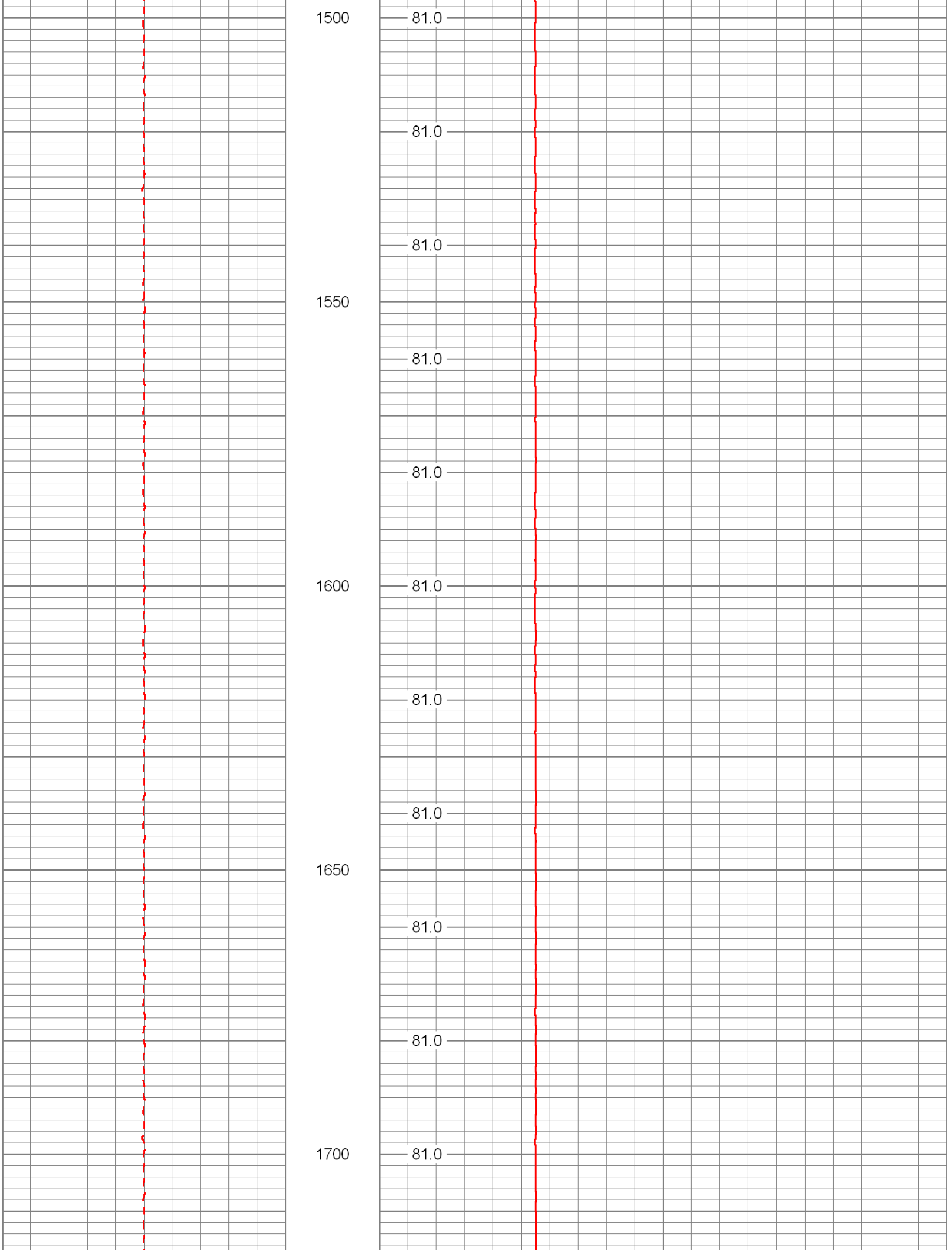

400
450
500
550
600
80.8
80.9
80.9
80.9
80.9
80.9
80.9
80.9
80.9
80.9
80.9

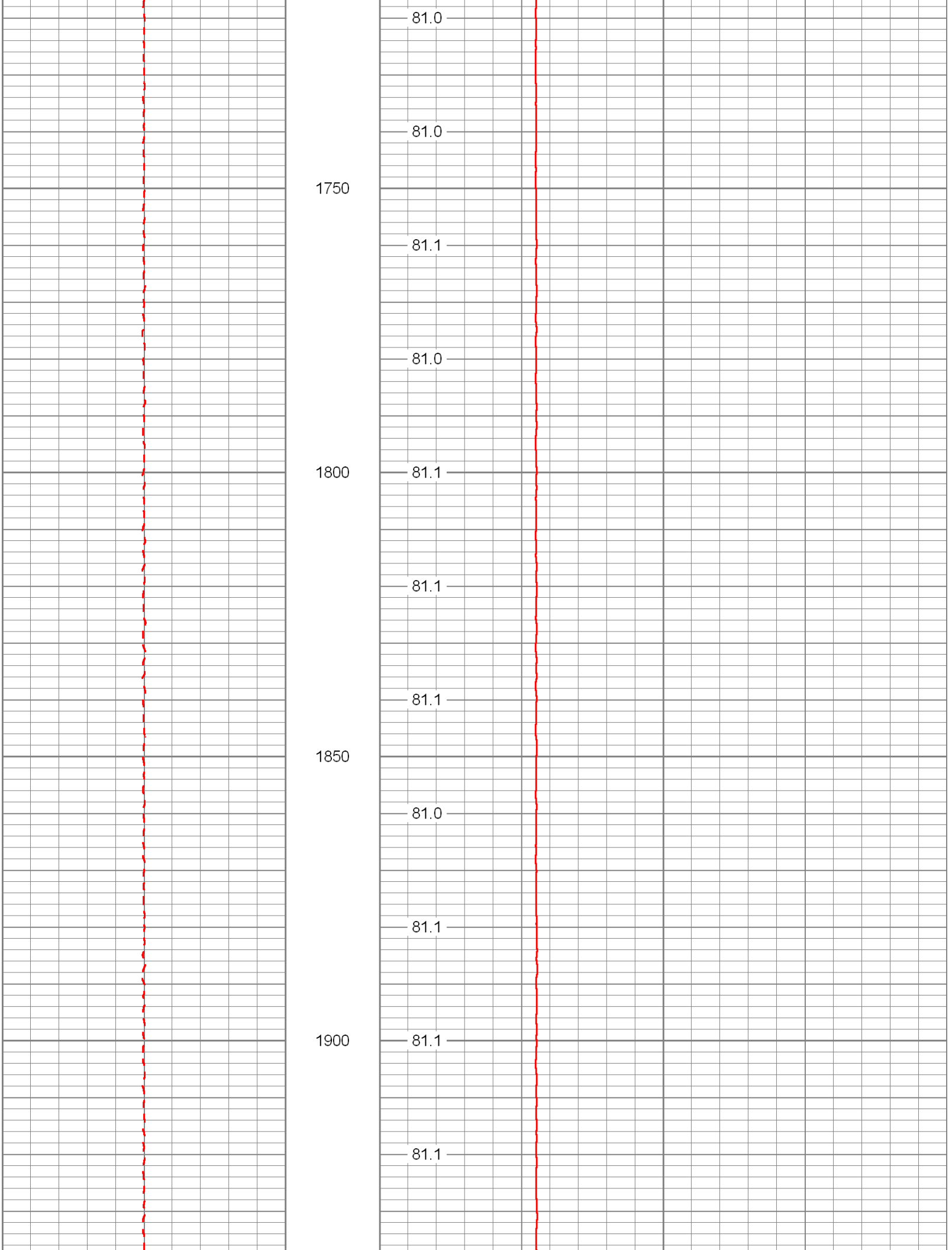

80.9
80.9
650
80.9
80.9
700
80.9
80.9
80.9
750
80.9
80.9
800
80.9
80.9

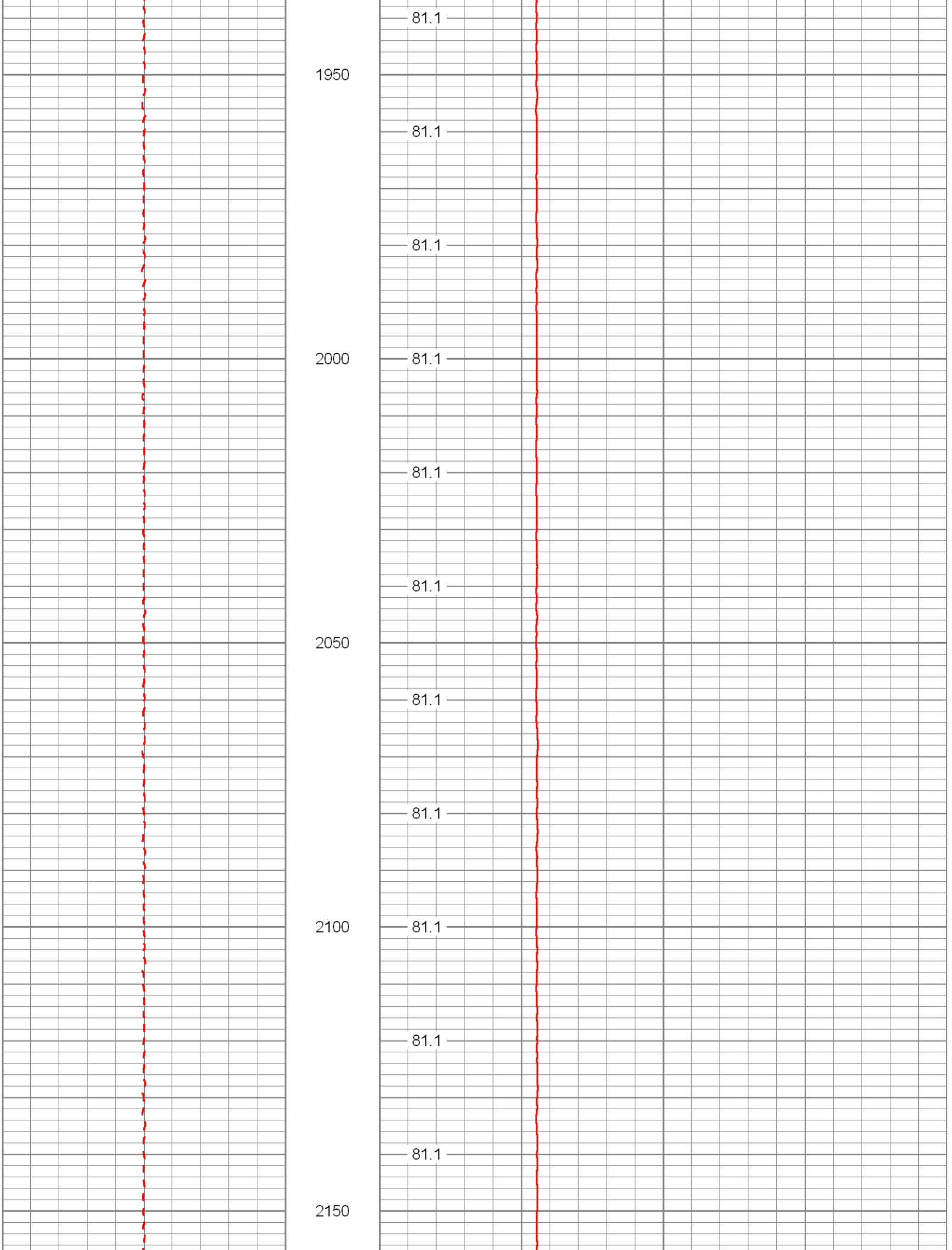

80.9
850
80.9
80.9
900
80.9
80.9
80.9
950
80.9
80.9
1000
80.9
80.9
80.9
1050

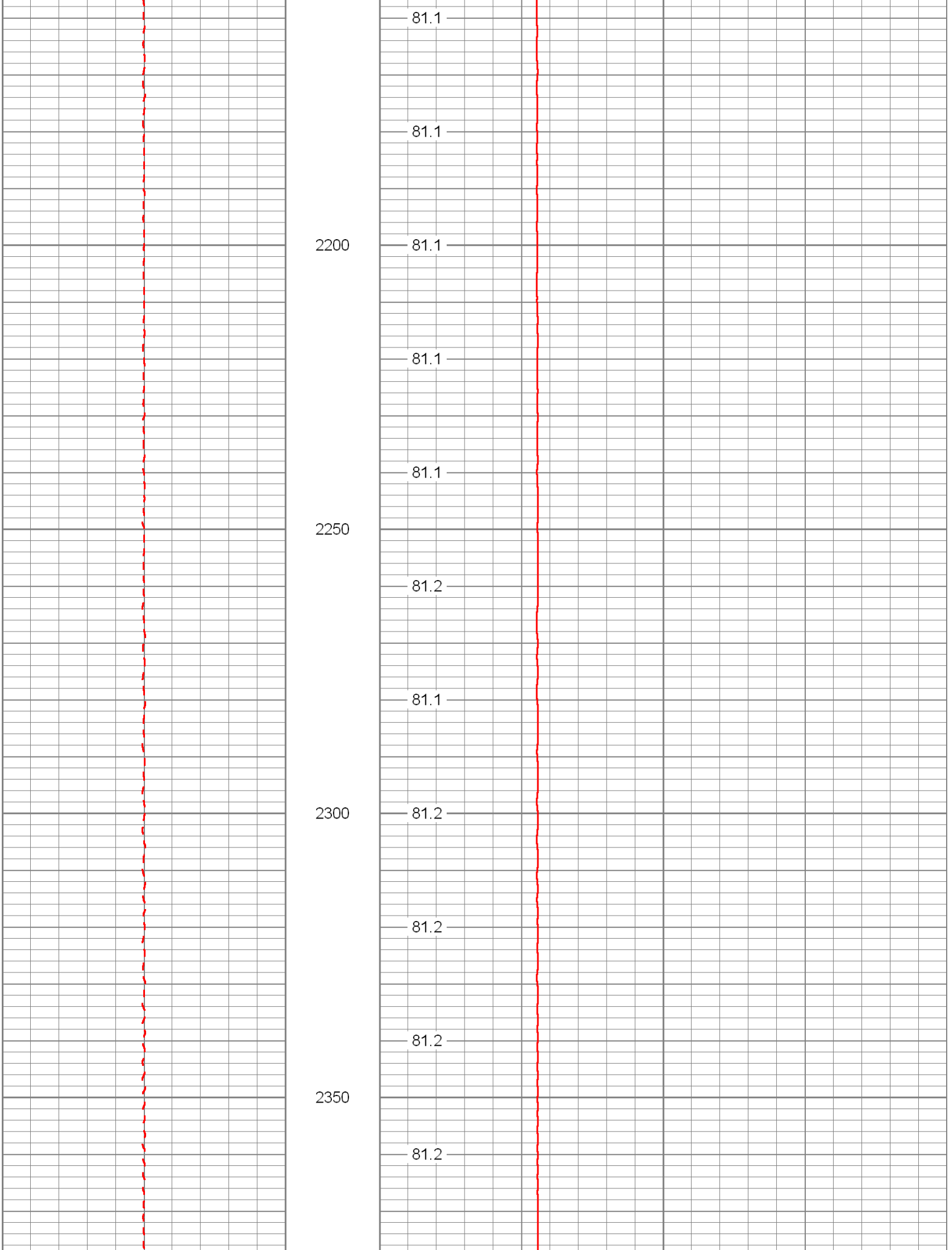

80.9
80.9
1100
80.9
80.9
80.9
1150
80.9
80.9
1200
80.9
80.9
80.9
1250
80.9

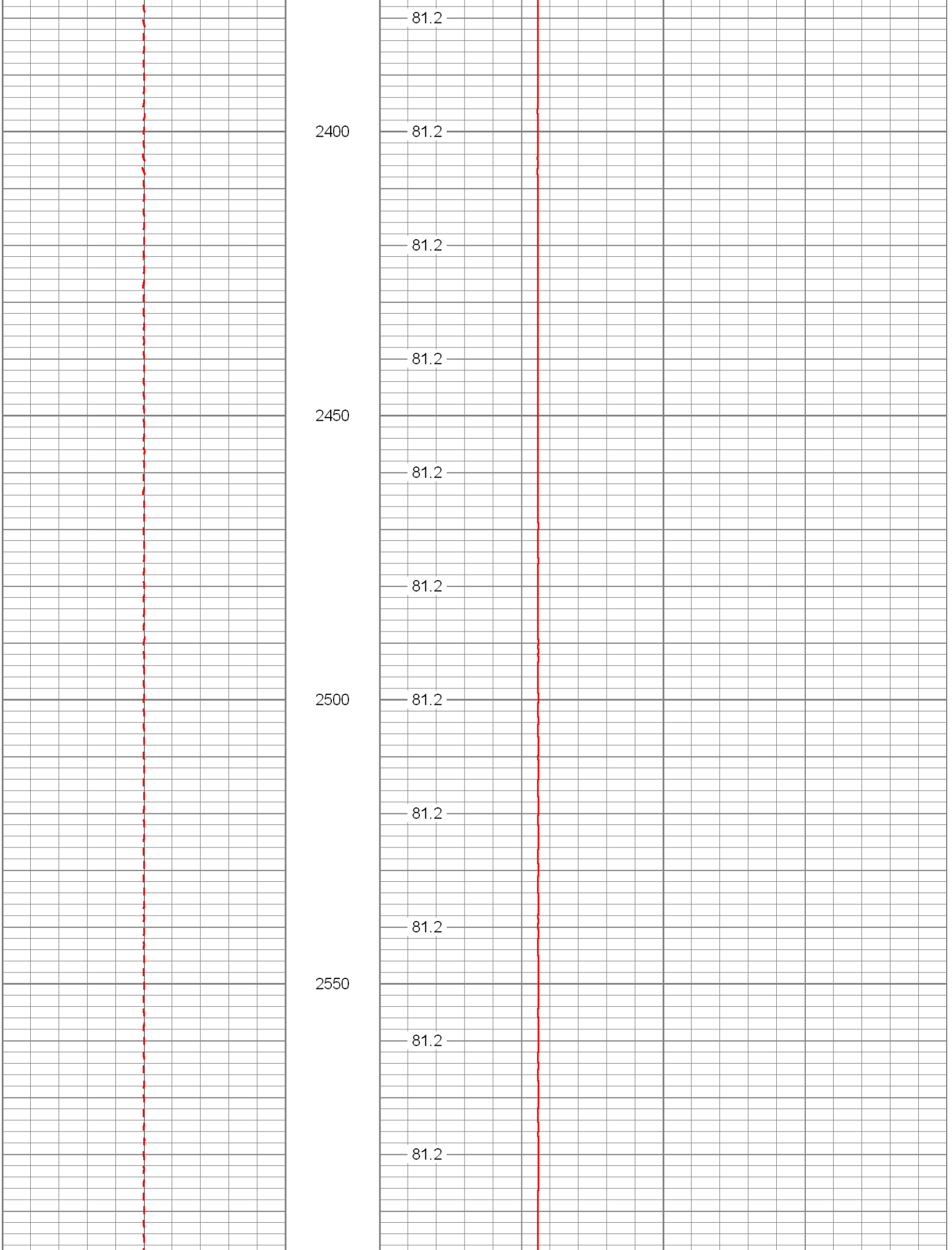

80.9
1300
81.0
81.0
81.0
1350
81.0
81.0
1400
81.0
81.0
81.0
1450
81.0
81.0

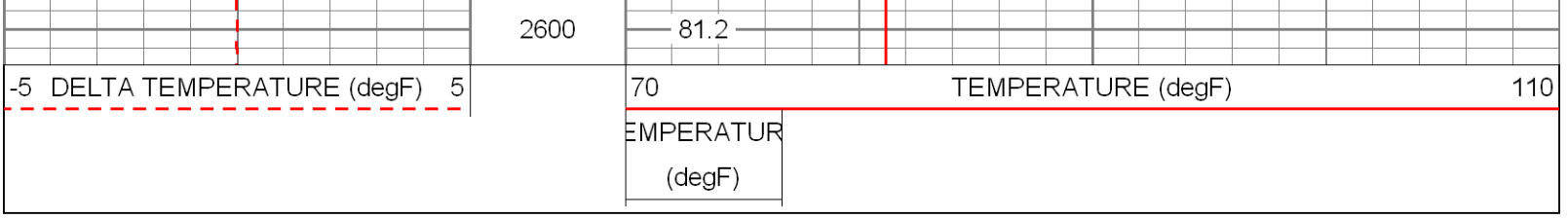

1500
81.0
81.0
81.0
1550
81.0
81.0
1600
81.0
81.0
81.0
1650
81.0
81.0
1700
81.0


81.0
81.0
1750
81.1
81.0
1800
81.1
81.1
81.1
1850
81.0
81.1
1900
81.1
81.1


81.1
1950
81.1
81.1
2000
81.1
81.1
81.1
2050
81.1
81.1
2100
81.1
81.1
81.1
2150


81.1
81.1
2200
81.1
81.1
81.1
2250
81.2
81.1
2300
81.2
81.2
81.2
2350
81.2


81.2
2400
81.2
81.2
81.2
2450
81.2
81.2
2500
81.2
81.2
81.2
2550
81.2
81.2



Calibration Report

Database File: sdwwtp-iw14.db
Dataset Pathname: pass1
Dataset Creation: Thu Aug 29 08:50:06 2013 by Log SOC 110722

Temperature Calibration Report

Serial Number: 951
Tool Model: RTS
Performed: Mon Oct 08 09:35:10 2012

Point #	Reading		Reference	
1	414.44	cps	33.00	degF
2	892.98	cps	85.00	degF
3	1755.38	cps	170.00	degF
4		cps		degF
5		cps		degF
6		cps		degF
7		cps		degF
8		cps		degF
9		cps		degF
10		cps		degF

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)
			TEMP-RTS (951)	25.50	1.69	70.00

TEMP	0.10						

Dataset: sdwwtp-iw14.db: field/well/run1/pass1
Total Length: 25.50 ft
Total Weight: 70.00 lb
O.D. 1.69 in

Appendix F

Television Survey

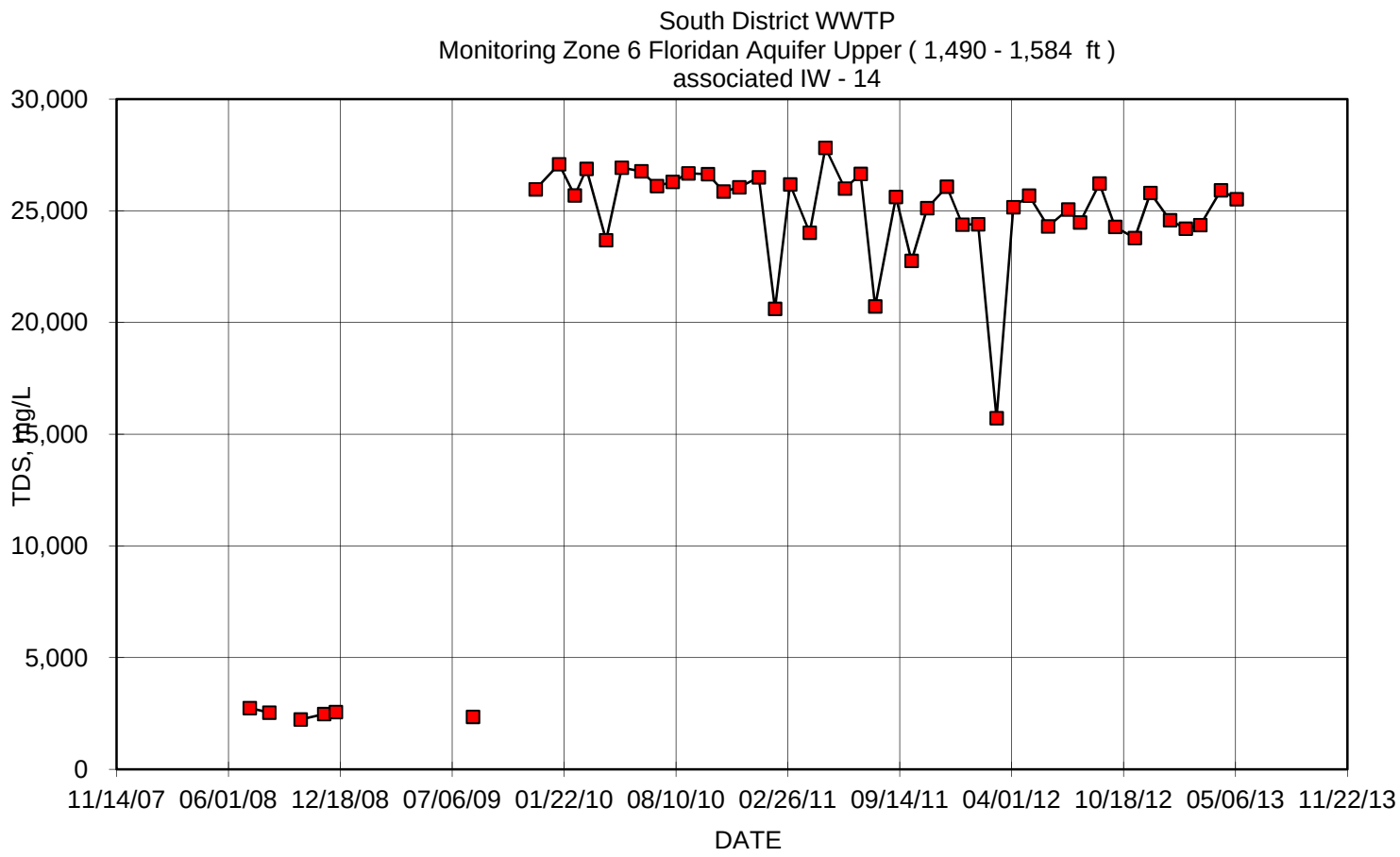
Appendix G

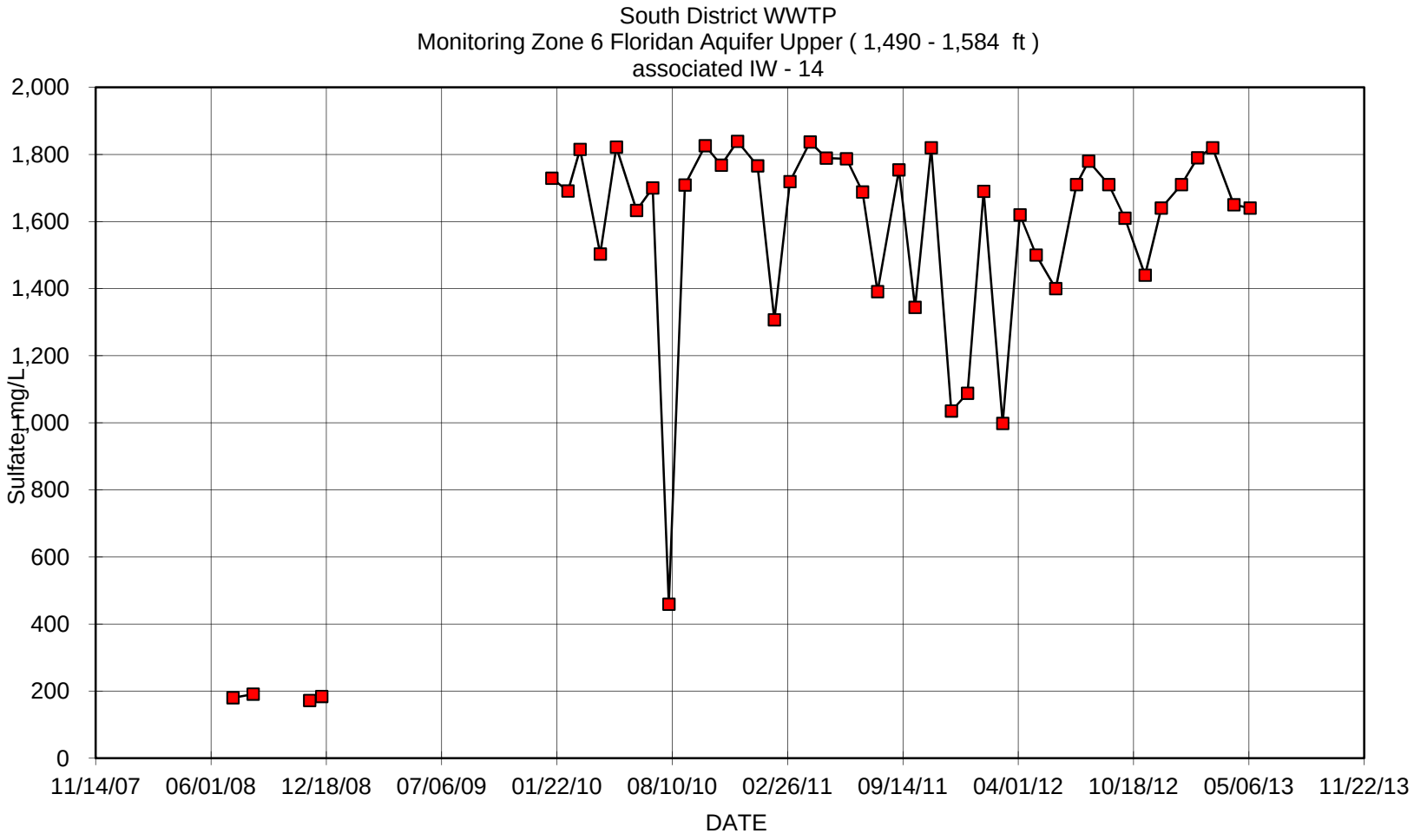
5 year Monitoring Data

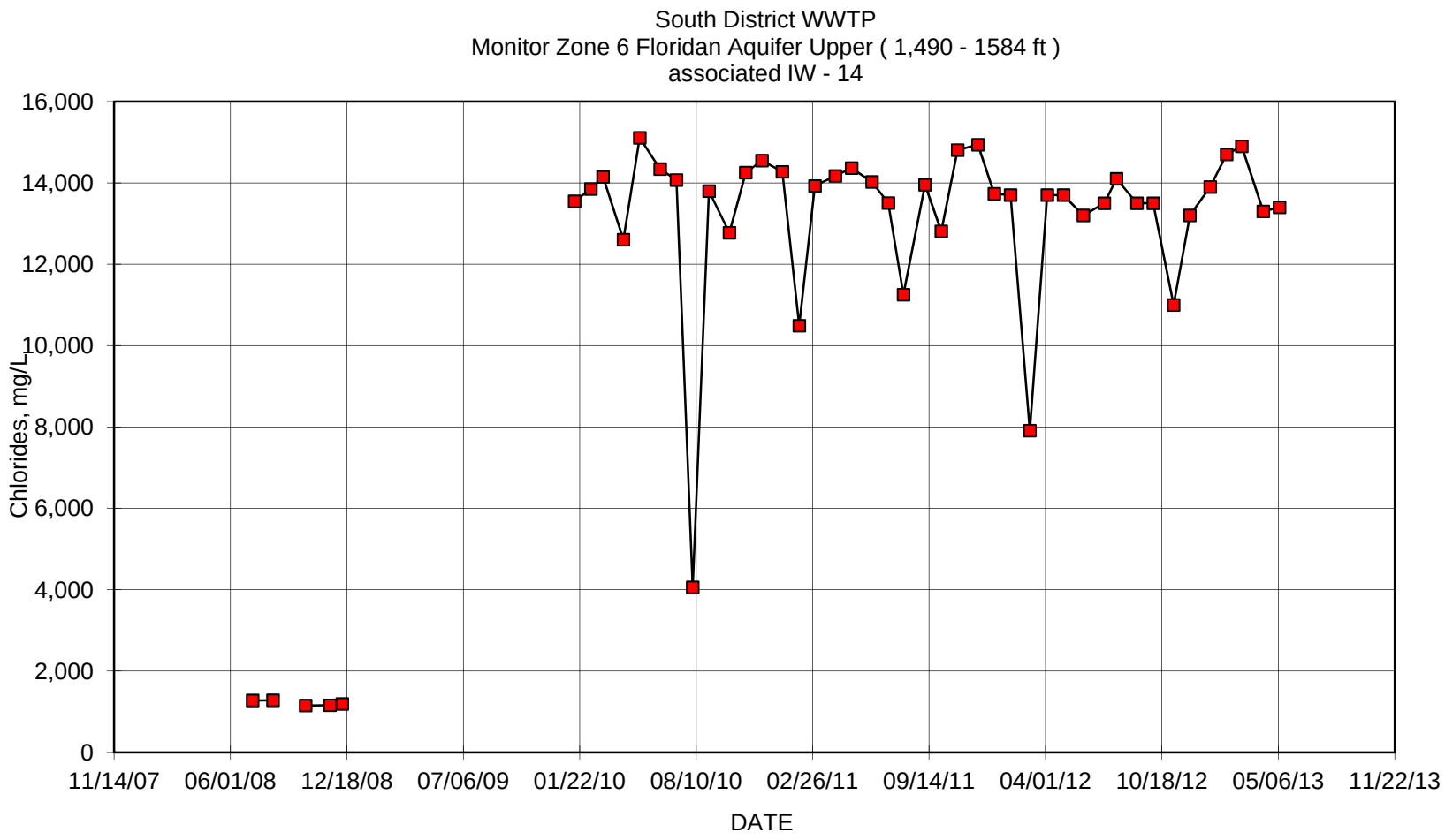
FA-6 Upper

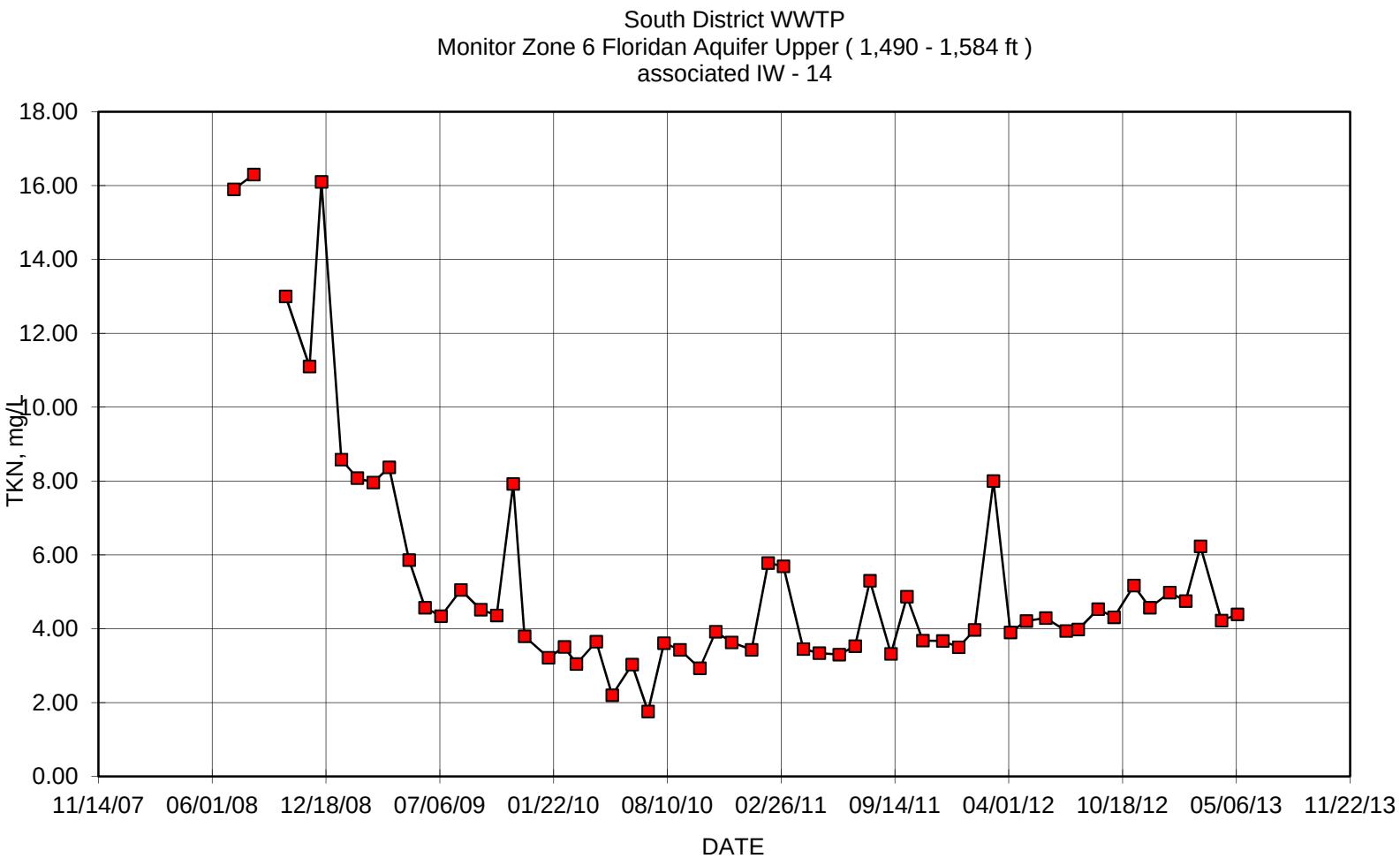
Date	TDS, mg/L	Sulfate, mg/L	Chlorides, mg/L	TKN, mg/L	NH3, mg/L	Conductivity, Micromho/cm	Temp., C	Temp., F	pH	TP, mg/L	NO3 mg/L	TSS mg/L	Sodium, mg/L	Gross Alpha, pCi/L	Radium 226, pCi/L	Radium 228, pCi/L
07/09/08	2,744	180	1,278	15.90	12.90	4,566	26	78	7.3	0.01	0.03	.1.76				
08/13/08	2,540	191	1,282	16.30	16.90	4,612	26	79	7.4	0.01	0.08	1.76				
09/10/08																
10/08/08	2,232		1,153	13.00	12.80	3,967	30	86	8.1	0.10	0.03	1.76				
11/19/08	2,476	172	1,159	11.10	15.20	4,599	24	75	7.3	0.02	0.03	1.76				
12/10/08	2,568	184	1,192	16.10	15.70	4,490	25	77	7.3	0.08	0.03	1.20				
01/14/09				8.58	7.70		20	69	7.5	0.03	0.03	8.40				
02/11/09				8.08	7.36		23	74	7.5		0.00	12.20				
03/11/09				7.96	7.42		24	75	7.3	0.36	0.00	23.60				
04/08/09				8.37	7.53		23	73	7.3	0.02	0.00	26.80				
05/13/09				5.86	6.06	3,100	25	77	7.5	0.00	0.00	28.00				
06/10/09				4.57	4.98		25	76	7.4	0.34	0.00	37.00				
07/08/09				4.34	4.66		25	76	7.3	0.04	0.00	36.20				
08/12/09	2,350			5.05	7.76		24	76	7.4	0.01	0.02	32.20				
09/16/09				4.52	3.79				7.2	0.01	0.01		6900	14.2	7.9	0.9
10/14/09				4.36	3.89				7.5	0.02	0.00		6770	15.1	13.7	0.9
11/12/09				7.92	6.98				8.5	0.02			6450	12.2	10.0	0.9
12/02/09	25,960			3.80	3.75	3,877	25	77	7.5	0.00		37.00	5820	12.1	8.5	0.9
01/13/10	27,084	1,729.0	13,548	3.22	2.99	38,550	21	69	7.4	0.05	0.00	0.00	2050	14.7	11.3	1.1
02/10/10	25,688	1,691.0	13,850	3.51	3.40	37,400	23	73	7.6	0.02	0.00	25.80	7160	9.7	9.5	0.8
03/03/10	26,876	1,815.0	14,149	3.05	2.92	39,790	21	70	7.3	0.02	0.01	26.20	7220	12.7	9.8	0.7
04/07/10	23,684	1,503.0	12,605	3.65	3.83	35,590	27	80	7.1	0.01	0.00	0.00	6720	9.9	7.2	0.9
05/05/10	26,928	1,822.0	15,109	2.20	2.78	39,710	27	81	7.3	0.01	0.00	0.00	7670	14.9	10.1	0.8
06/09/10	26,768	1,633.0	14,341	3.03	2.89	39,920	28	82	7.1	0.01	0.02	26.20	7250	9.1	9.1	0.7
07/07/10	26,108	1,700.0	14,071	1.76	3.12	38,920	26	78	7.7	0.03	0.02	29.40	6840	8.1	11.7	0.8
08/04/10	26,296	459.0	4,057	3.61	3.67	36,380	24	75	7.6	0.17	0.00	30.00	6940	11.8	9.6	0.8
09/01/10	26,676	1,709.0	13,799	3.43	3.24	39,240	24	75	7.4	0.02	0.00	0.00	6630	10.8	9.1	0.8
10/06/10	26,640	1,826.0	12,773	2.93	3.41	39,140	24	75	7.4	0.00	0.00	0.01	6870	12.2	10.6	0.7
11/03/10	25,864	1,768.0	14,253	3.92	3.45	37,480	23	73	7.5	0.02	0.00	0.00	7670	9.8	8.3	0.6
12/01/10	26,052	1,839.0	14,550	3.63	3.44	38,790	23	73	7.7	0.02	0.00	0.01	7170	11.4	9.7	0.8
01/05/11	26,500	1,766.0	14,273	3.43	3.34	37,730	24	76	7.3	0.02	0.00	0.01	7170	13.1	12.4	1.0
02/03/11	20,612	1,307.0	10,490	5.78	4.92	29,110	23	73	7.1	0.02	0.00	31.00	5490	13.8	9.0	0.8

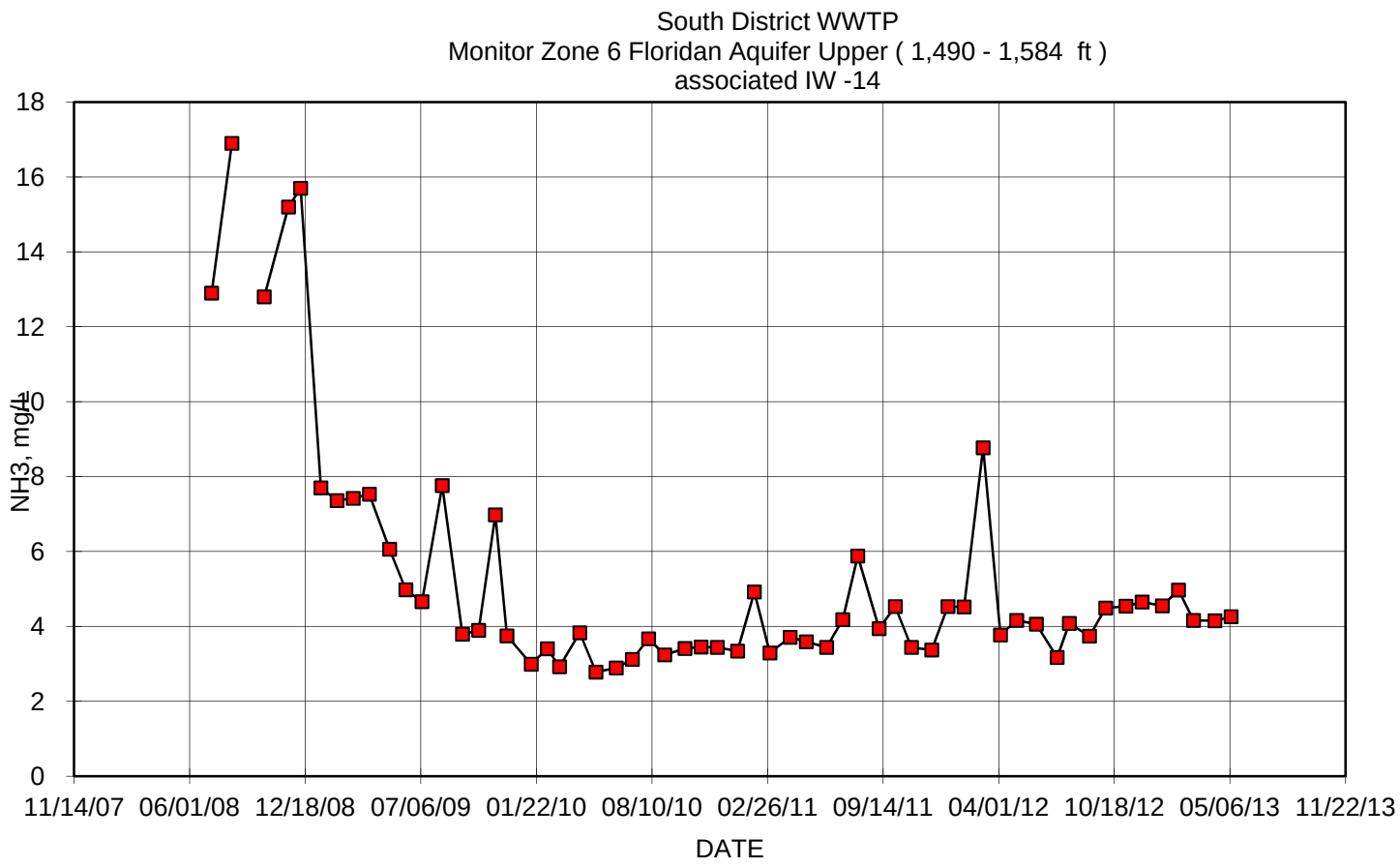
03/02/11	26,180	1,719.0	13,924	5.69	3.29	38,650	23	73	7.2	0.02	0.00	0.00	7070	11.8	10.1	1.0
04/06/11	24,020	1,837.0	14,172	3.45	3.71	37,300	23	74	7.7	0.02	0.01	0.00	9050	11.7	10.9	0.9
05/04/11	27,820	1,789.0	14,364	3.34	3.59	37,350	24	74	7.4	0.02	0.00	0.00	5010	10.1	9.2	0.7
06/08/11	25,996	1,787.0	14,024	3.30	3.44	38,580	25	77	7.5	0.05	0.00	0.00	7390	9.5	8.5	0.9
07/06/11	26,652	1,688.0	13,505	3.53	4.18	37,640	25	76	7.6	0.02	0.01	0.00	6630	10.0	8.9	0.7
08/01/11	20,720	1,391.0	11,253	5.30	5.88	30,140	28	82	7.6	0.01	0.00	0.00	31822	8.7	8.4	0.8
09/07/11	25,620	1,754.0	13,955	3.32	3.94	37,000	26	79	7.3	0.04	0.00	0.00	7400	5.3	2.7	0.9
10/05/11	22,760	1,344.0	12,809	4.87	4.53	33,380	25	77	7.8	0.03	0.00	0.00	6760	8.4	7.5	0.9
11/02/11	25,120	1,820.0	14,807	3.68	3.44	36,850	24	76	7.8	0.04	0.02	0.00	6260	10.3	8.3	0.9
12/07/11	26,080	1,035.0	14,939	3.67	3.37	37,871	24	76	8.1	0.00	0.01	0.00	730	9.2	8.7	0.7
01/04/12	24,380	1,088.0	13,733	3.50	4.53	35,898	20	68	7.6	0.02	0.01	0.00	7600	8.8	8.1	0.6
02/01/12	24,400	1,690.0	13,700	3.97	4.52	32,940	23	74	7.5	0.02	0.01	24.50	7600	10.4	9.8	0.8
03/05/12	15,720	998.0	7,910	8.00	8.77	25,437	24	75	7.5	0.01	0.01	19.80	5140	7.3	6.7	0.9
04/04/12	25,160	1,620.0	13,700	3.90	3.77	38,596	25	77	7.9	0.03	2.50	2.50	6730	9.5	9.0	0.8
05/02/12	25,680	1,500.0	13,700	4.21	4.16	37,323	25	78	7.9	0.05	0.01	0.00	7580	10.4	9.7	0.8
06/05/12	24,300	1,400.0	13,200	4.29	4.06	36,280	26	78	8.8	0.00	0.01	12.30	7450	5.1	5.7	0.9
07/11/12	25,060	1,710.0	13,500	3.94	3.17	37,120	24	75	7.8	0.03	0.01	37.00	7290	8.1	9.9	0.9
08/01/12	24,480	1,780.0	14,100	3.98	4.08	37,111	25	78	7.9	0.01	0.02	0.00	7710	10.1	10.7	0.8
09/05/12	26,220	1,710.0	13,500	4.53	3.74	36,750	24	74	7.9	0.03	0.01	0.00	7030	9.2	8.1	0.8
10/03/12	24,280	1,610.0	13,500	4.31	4.49	35,570	25	76	8.0	0.03	0.01	0.00	7060	11.4	8.7	0.8
11/07/12	23,780	1,440.0	11,000	5.17	4.54	34,010	22	72	8.0	0.01	0.01	24.30	7510	9.8	8.9	0.9
12/05/12	25,800	1,640.0	13,200	4.57	4.65	36,516	24	74	8.0	0.03	0.01	0.01	7520	10.3	9.3	0.8
01/09/13	24,580	1,710.0	13,900	4.98	4.55	37,165	25	76	7.9	0.10	0.03	8.20	7590	9.7	9.2	0.7
02/06/13	24,200	1,790.0	14,700	4.75	4.97	37,476	25	77	8.0	0.03	4.97	10.70	6680	11.8	11.6	0.8
03/04/13	24,360	1,820.0	14,900	6.23	4.16	37,552	21	70	7.9	0.03	4.16	26.00	8720	10.3	9.5	0.8
04/10/13	25,920	1,650.0	13,300	4.22	4.15	37,479	24	75	7.8	0.01	0.01	0.01	7280	10.3	9.2	0.8
05/08/13	25,520	1,640.0	13,400	4.39	4.26	38,366	24	76	7.7	0.03	0.01	0.03	7850	11.6	10.1	0.9

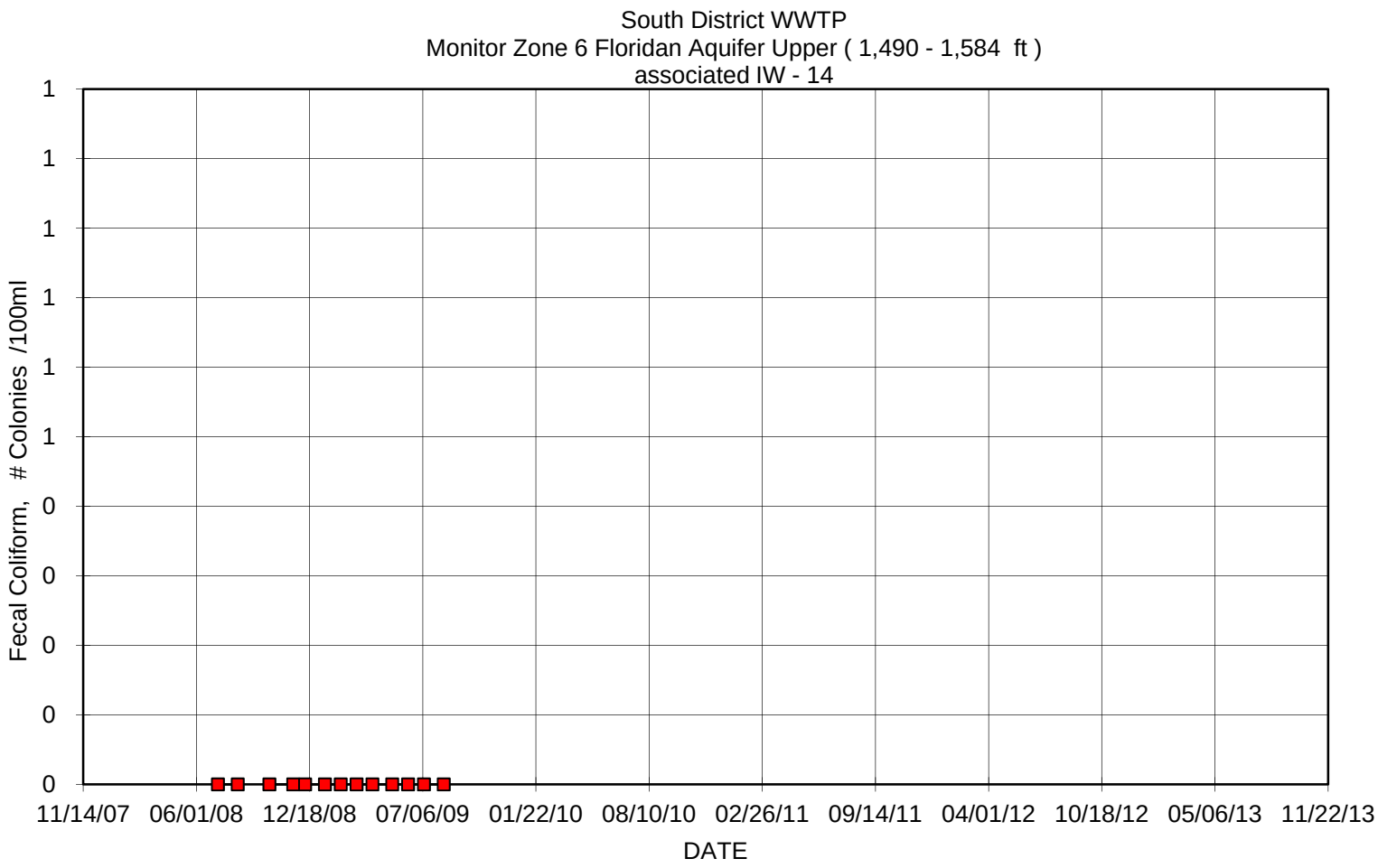

South District WWTP
Monitoring Zone 6 Floridan Aquifer Upper (1,490 - 1,584 ft)
associated IW - 14
30,000
25,000
20,000
15,000
10,000
5,000
0
TDS, mg/L
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

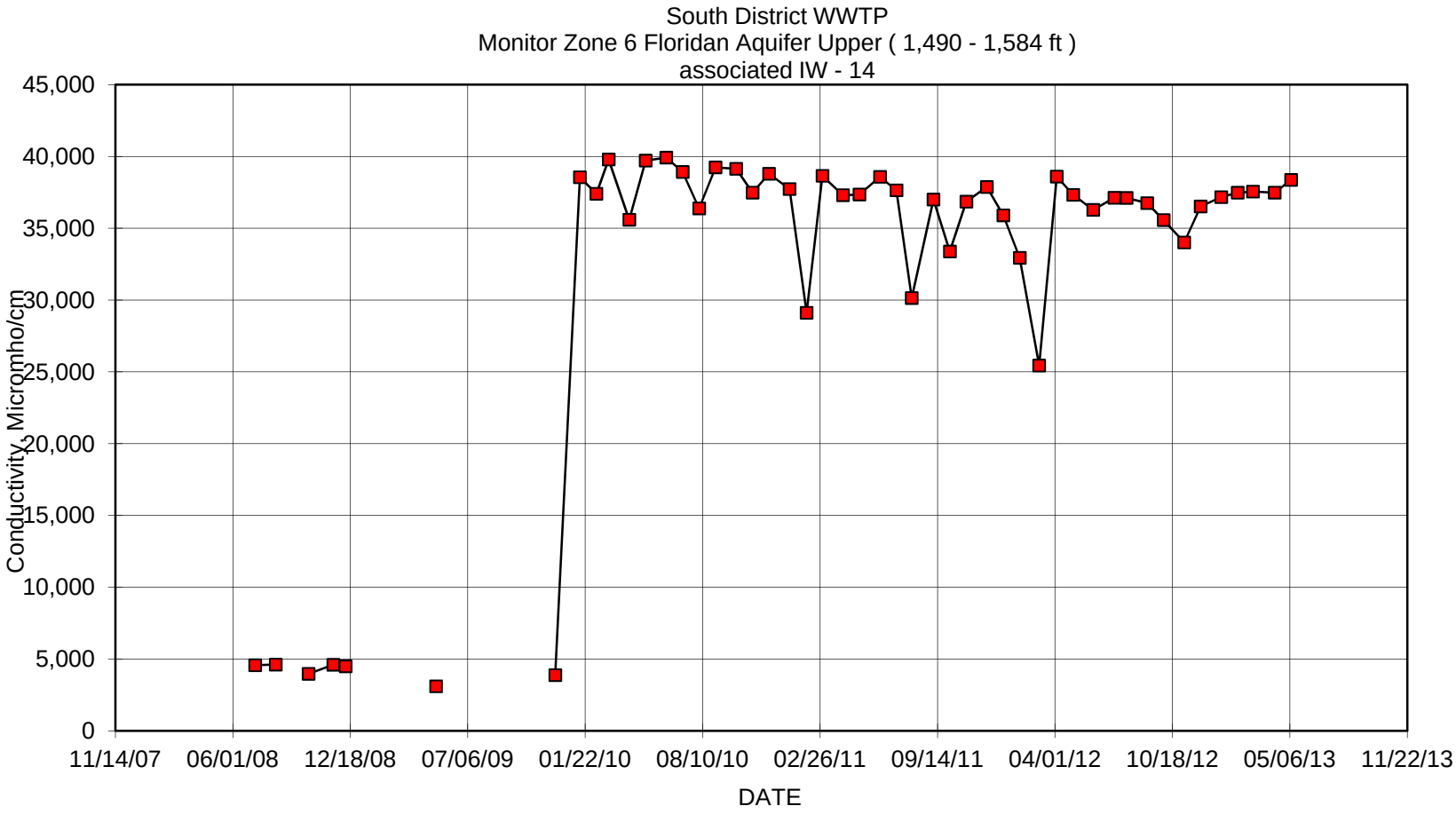

South District WWTP
Monitoring Zone 6 Floridan Aquifer Upper (1,490 - 1,584 ft)
associated IW - 14
Sulfate, mg/L
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

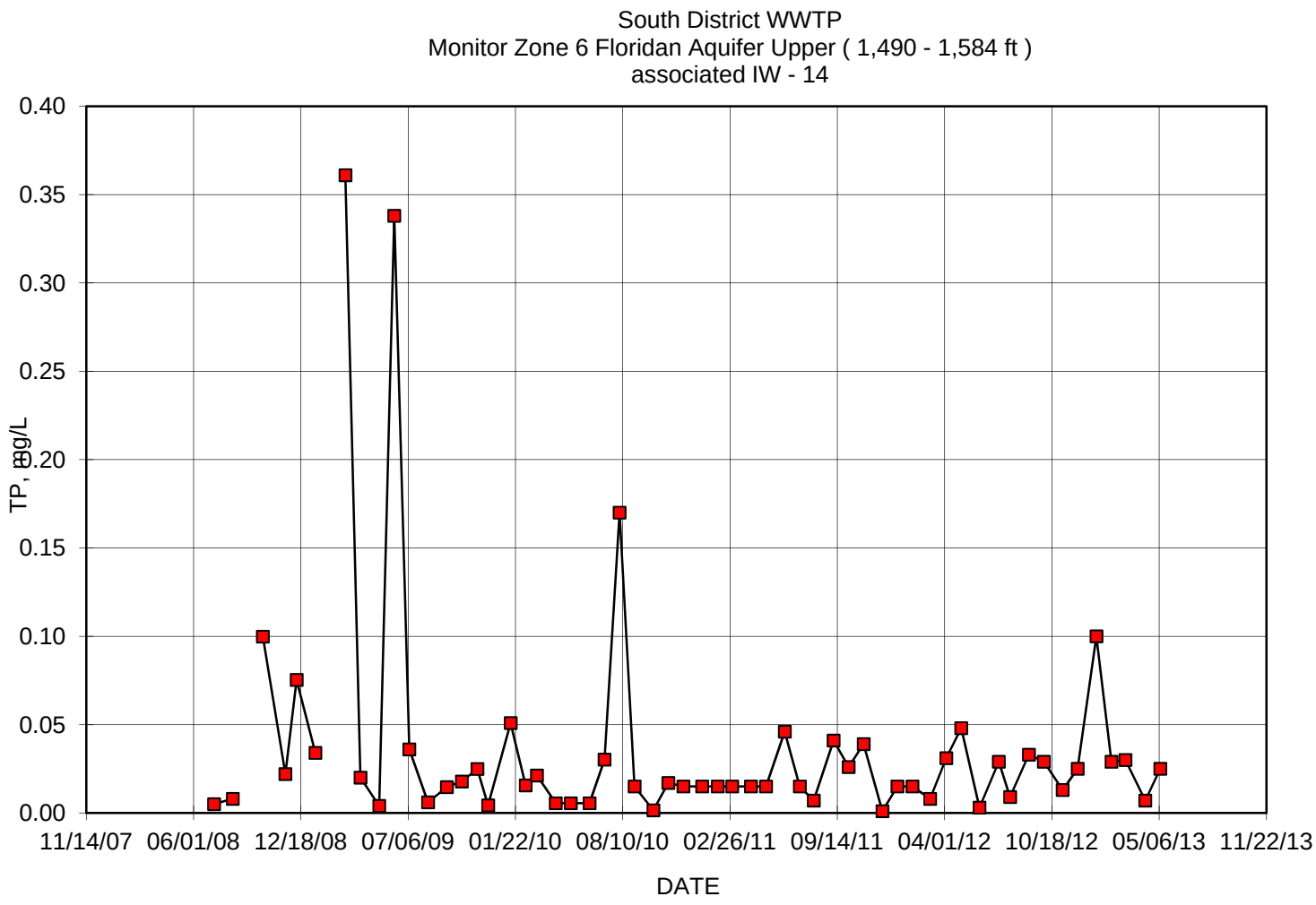

South District WWTP
Monitor Zone 6 Floridan Aquifer Upper (1,490 - 1584 ft)
associated IW - 14
Chlorides, mg/L
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

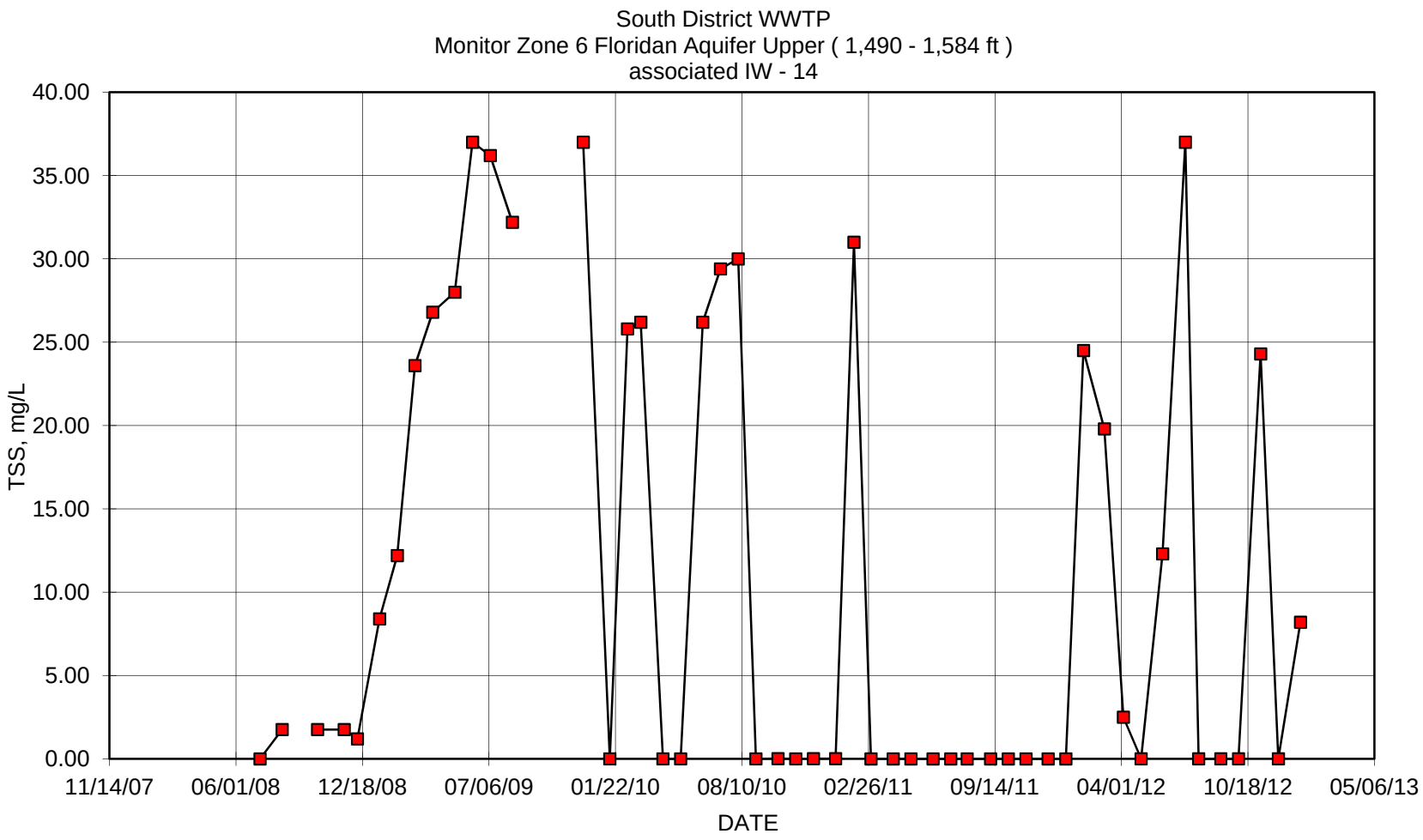

South District WWTP
Monitor Zone 6 Floridan Aquifer Upper (1,490 - 1,584 ft)
associated IW - 14
TKN, mg/L
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 6 Floridan Aquifer Upper (1,490 - 1,584 ft)
associated IW -14
NH3, mg/L
0
2
4
6
8
10
12
14
16
18
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 6 Floridan Aquifer Upper (1,490 - 1,584 ft)
associated IW - 14
Fecal Coliform, # Colonies /100ml
1
1
1
1
1
1
0
0
0
0
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 6 Floridan Aquifer Upper (1,490 - 1,584 ft)
associated IW - 14
Conductivity, Micromho/cm
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 6 Floridan Aquifer Upper (1,490 - 1,584 ft)
associated IW - 14
TP, mg/L
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 6 Floridan Aquifer Upper (1,490 - 1,584 ft)
associated IW - 14
TSS, mg/L
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
DATE

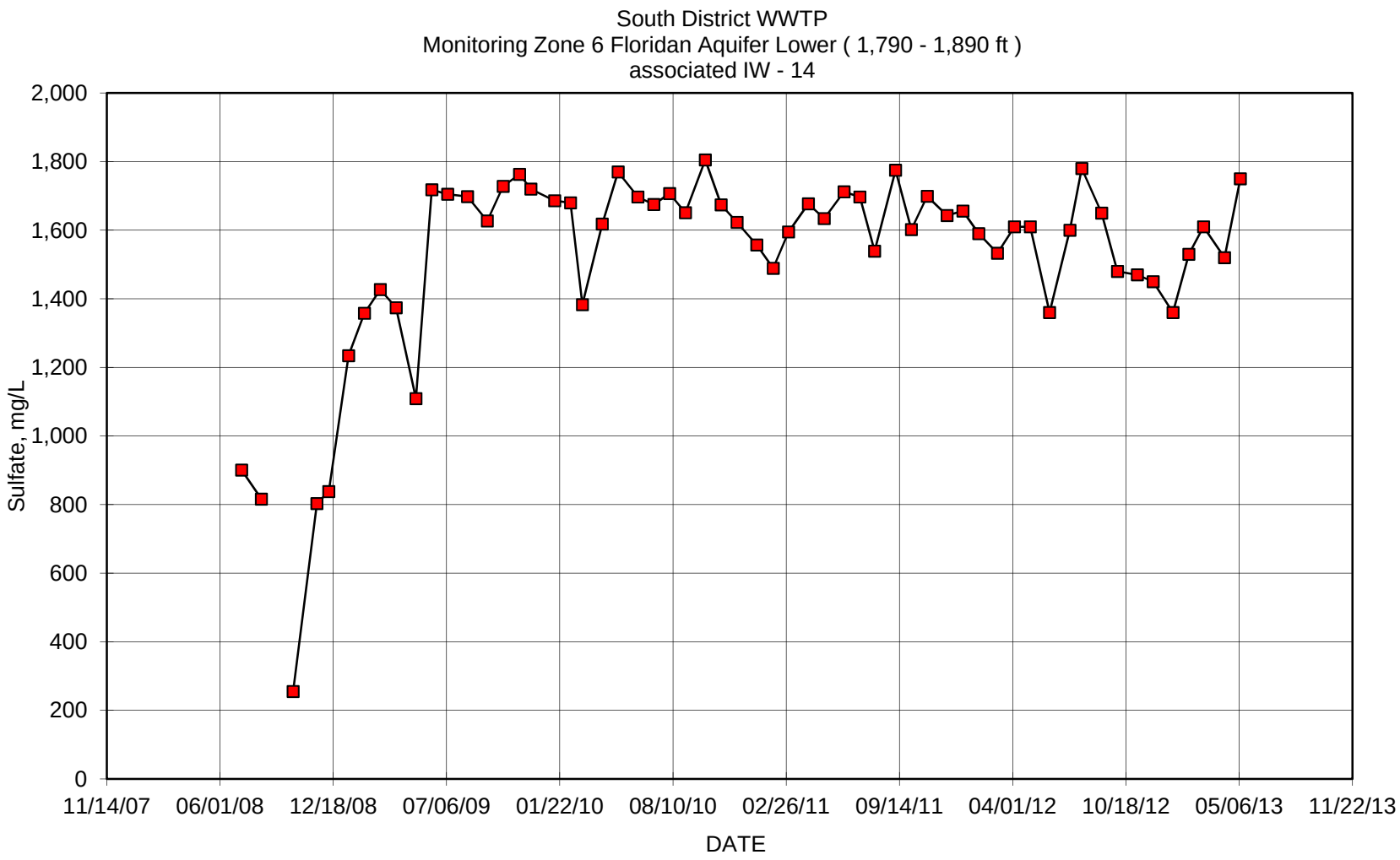
FA-6 Lower Data

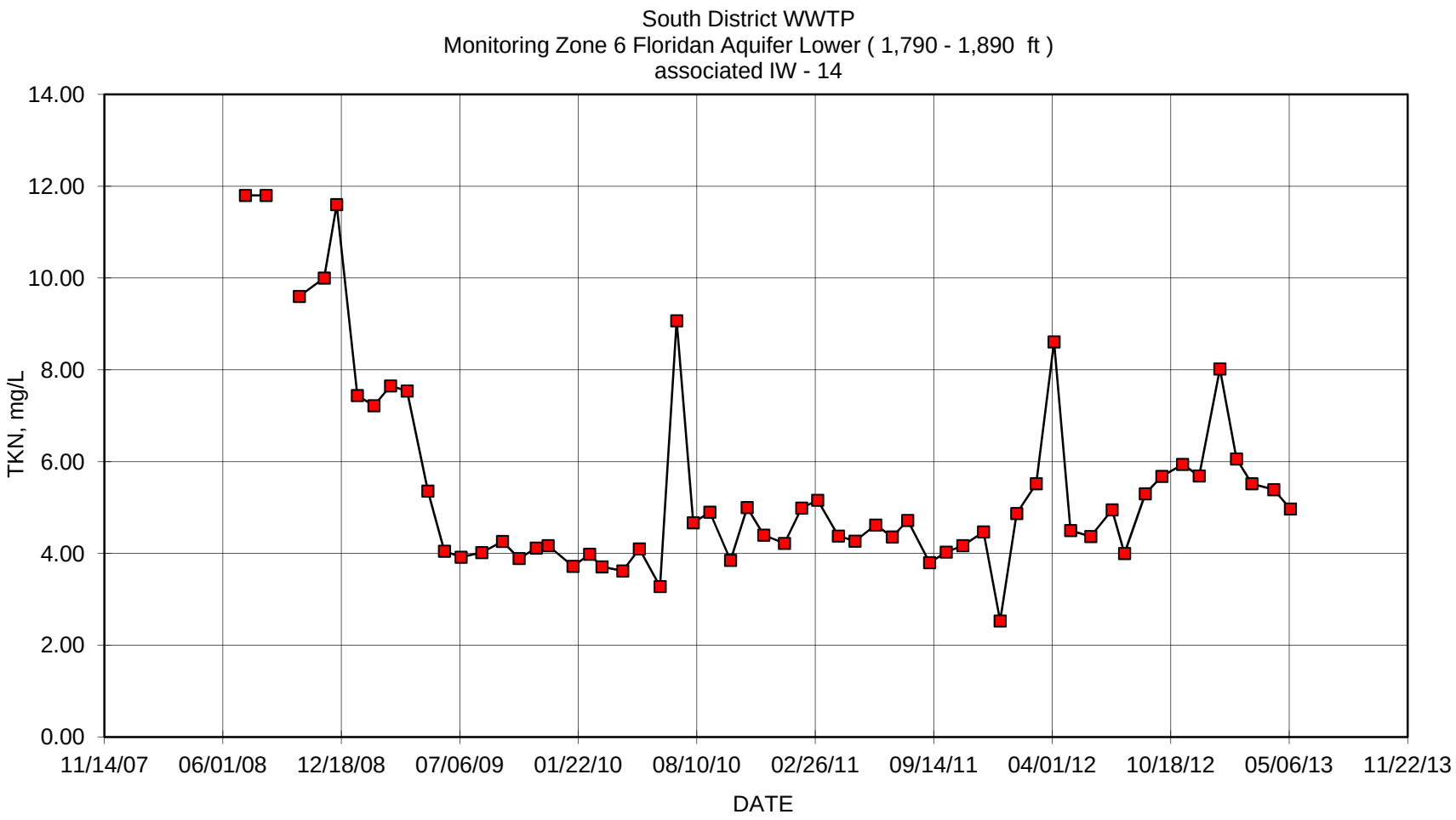
Date	TDS, mg/L	Sulfate, mg/L	Chlorides, mg/L	TKN, mg/L	NH3, mg/L	Conductivity, Micromho/cm	Temp., C	Temp., F	pH	TP, mg/L	NO3 mg/L	TSS mg/L	Sodium, mg/L	Gross Alpha, pCi/L	Radium 226, pCi/L	Radium 228, pCi/L
07/09/08	12,020	901	6,954	11.80	9.26	18,380	25	77	7.3	0.01	0.03	1.76				
08/13/08	11,250	816	6,063	11.80	10.70	18,450	25	78	7.3	0.01	0.12	6.40				
09/10/08																
10/08/08	9,860	255	5,078	9.60	9.38	15,050	28	82	8.5	0.04	0.03	9.20				
11/19/08	12,060	803	6,087	10.00	9.90	19,530	24	74	7.2	0.02	0.03	10.60				
12/10/08	11,910	838	6,192	11.60	8.90	18,730	24	75	7.1	0.04	0.03	7.60				
01/14/09	18,770	1,234	9,424	7.44	6.89	27,080	21	69	7.4	0.04	0.03	11.20				
02/11/09	20,430	1,358	10,188	7.22	6.61	31,570	23	74	7.4	1.32	0.00	10.40				
03/11/09	19,310	1,427	10,946	7.65	6.45	31,350	23	74	7.3	0.09	0.00	0.00				
04/08/09	21,660	1,374	10,574	7.54	6.60	32,380	23	73	6.9	0.03	0.00	18.40				
05/13/09	23,420	1,109	8,585	5.36	5.16	33,520	25	76	7.4	0.01	0.00	11.20				
06/10/09	23,220	1,718	13,157	4.05	4.60	38,710	23	74	7.2	0.36	0.00	15.00				
07/08/09	26,250	1,705	13,072	3.92	4.21	36,530	24	74	7.3	0.05	0.00	22.00				
08/12/09	24,790	1,698	12,937	4.02	6.44	36,760	23	74	7.6	0.01	0.00	14.60				
09/16/09	25,150	1,627	12,347	4.26	3.46	37,200			7.6	0.01	0.05		7300	11.5	8.8	0.8
10/14/09	25,030	1,728	11,612	3.89	3.63	37,390			7.4	0.02	0.00		7160	13.1	11.6	0.8
11/12/09	24,890	1,763	12,522	4.12	3.79	37,900			7.6	0.02	0.00		6440	11.1	9.6	0.9
12/02/09	26,490	1,720	12,985	4.17	3.92	39,050	23	74	7.5	0.02	0.00	12.60	8340	14.3	10.7	1.0
01/13/10	26,010	1,686	13,693	3.72	3.36	37,100	22	71	7.3	0.02	0.00	37.00	6540	12.4	10.8	1.0
02/10/10	24,920	1,680	13,467	3.98	3.73	36,500	22	72	7.5	0.03	0.00	18.80	6830	13.2	8.0	0.8
03/03/10	24,860	1,383	10,696	3.71	3.40	38,420	22	71	7.4	0.03	0.01	13.00	6840	12.6	9.3	0.7
04/07/10	24,550	1,618	13,330	3.62	4.07	35,880	23	74	7.3	0.01	0.00	0.00	6850	12.4	7.2	0.8
05/05/10	24,964	1,770	14,242	4.10	3.38	36,720	24	76	7.5	0.01	0.00	6.20	7120	11.8	9.9	0.7
06/09/10	25,590	1,697	13,684	3.28	3.15	38,470	24	75	7.4	0.02	0.01	14.60	6980	10.5	9.7	0.7
07/07/10	24,670	1,675	13,642	9.07	3.56	37,000	24	76	7.5	0.03	0.02	7.40	7090	12.0	10.9	0.8

08/04/10	24,890	1,707	13,534	4.67	4.02	36,230	23	73	7.5	0.21	0.00	0.00	7080	10.9	10.4	0.7
09/01/10	24,510	1,651	13,124	4.90	4.09	36,790	23	74	7.4	0.02	0.00	0.00	6980	8.8	9.1	0.7
10/06/10	24,500	1,805	12,432	3.85	4.33	36,340	23	74	7.6	0.02	0.01	16.20	7040	13.1	10.3	0.9
11/03/10	23,520	1,674	13,270	5.00	4.35	35,700	23	73	7.4	0.01	0.00	7.80	7520	12.4	10.0	0.7
12/01/10	23,270	1,623	12,699	4.40	4.25	36,040	22	72	7.4	0.02	0.01	15.40	7250	12.8	10.7	0.7
01/05/11	23,690	1,557	12,394	4.22	4.12	34,890	23	74	7.4	0.02	4.12	14.00	7330	12.4	11.2	0.9
02/03/11	22,510	1,489	11,852	4.99	4.69	31,890	23	73	7.4	0.04	0.00	8.40	5920	10.4	10.6	0.8
03/02/11	24,250	1,595	12,669	5.16	3.95	35,650	22	72	7.3	0.02	0.00	44.80	6530	13.9	10.6	0.9
04/06/11	22,680	1,677	13,250	4.38	4.49	35,270	23	73	7.2	0.02	0.00	16.40	7220	10.8	11.1	0.8
05/04/11	31,100	1,634	12,701	4.27	4.43	37,240	23	73	7.6	0.02	0.01	11.60	5710	11.1	11.6	0.9
06/08/11	25,360	1,712	13,124	4.62	4.35	35,490	24	74	7.3	0.06	0.01	10.60	7170	9.5	8.8	0.9
07/06/11	24,480	1,697	13,602	4.36	4.91	36,000	23	74	7.7	0.02	0.01	12.80	7430	9.7	8.7	0.9
08/01/11	22,320	1,539	12,214	4.72	5.15	32,220	25	78	7.8	0.01	0.00	9.20	6820	9.6	9.7	0.8
09/07/11	24,980	1,775	13,910	3.80	4.15	36,840	24	76	7.6	0.04	0.00	13.60	7150	11.8	10.6	1.0
10/05/11	23,960	1,602	12,787	4.03	4.64	34,760	23	74	7.6	0.03	0.01	13.10	7260	11.5	10.2	1.0
11/02/11	23,660	1,699	13,637	4.17	4.39	34,740	23	73	7.4	0.03	0.00	8.00	6780	8.6	7.6	1.0
12/07/11	24,540	1,643	13,169	4.47	4.14	33,156	23	74	7.8	0.03	0.01	8.80		10.3	8.9	0.8
01/04/12	22,620	1,656	13,229	2.53	5.55	32,330	21	69	7.5	0.02	0.01	6.70	6820	9.4	8.2	7.0
02/01/12	23,540	1,590	12,700	4.87	5.48	34,416	23	74	7.4	0.02	0.01	17.50	6900	10.4	9.6	0.8
03/05/12	20,520	1,533	12,180	5.52	6.23	28,550	23	73	7.5	0.01	0.01	0.00	6530	9.3	8.0	0.8
04/04/12	25,340	1,610	13,400	8.61	3.79	37,080	24	75	7.5	0.03	2.50	2.50	6960	10.6	10.1	0.9
05/02/12	25,100	1,610	14,100	4.50	4.49	37,350	24	75	7.7	0.03	0.02	0.00	7950	11.3	10.1	0.8
06/05/12	23,460	1,360	13,300	4.37	4.75	34,231	26	79	7.8	0.00	0.01	8.70	7320	8.2	7.4	0.7
07/11/12	22,540	1,600	12,500	4.95	3.94	34,690	23	74	7.6	0.03	0.03	6.90	6860	6.0	5.5	0.9
08/01/12	26,060	1,780	14,000	4.00	3.83	36,000	24	75	8.2	0.02	0.01	0.00	8090	8.2	7.7	0.8
09/05/12	23,540	1,650	12,900	5.30	4.68	33,960	23	73	7.5	0.04	0.01	0.00	6290	10.1	9.1	0.7
10/03/12	22,140	1,480	12,400	5.68	5.57	34,207	23	74	7.6	0.03	0.01	0.00	6480	10.4	9.7	0.9
11/07/12	21,940	1,470	11,500	5.94	5.42	32,570	22	72	7.6	0.01	0.01	6.00	6860	10.5	9.7	0.9
12/05/12	22,540	1,450	11,600	5.69	5.92	32,960	23	73	7.5	0.03	0.01	6.80	6670	10.1	9.2	0.8
01/09/13	19,080	1,360	10,900	8.02	7.96	29,860	23	74	7.5	0.12	0.02	5.30	5830	7.5	7.8	0.8
02/06/13	22,340	1,530	12,400	6.06	8.35	32,914	23	74	7.6	0.02	0.35	0.80	6040	9.7	7.1	0.9

03/04/13	22,800	1,610	12,900	5.52	5.49	34,985	22	72	7.5	0.15	0.02	24.90	8020	12.3	10.9	0.9
04/10/13	23,960	1,520	12,100	5.39	4.96	35,594	23	74	7.6	0.03	0.00	0.03	7120	11.2	9.1	0.7
05/08/13	23,720	1,750	13,800	4.97	4.96	35,275	24	74	7.5	0.04	0.01	0.04	7130	10.3	10.5	0.8

South District WWTP
Monitoring Zone 6 Floridan Aquifer Lower (1,790 - 1,890 ft)
associated IW - 14
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
TDS, mg/L
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitoring Zone 6 Floridan Aquifer Lower (1,790 - 1,890 ft)
associated IW - 14
Sulfate, mg/L
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE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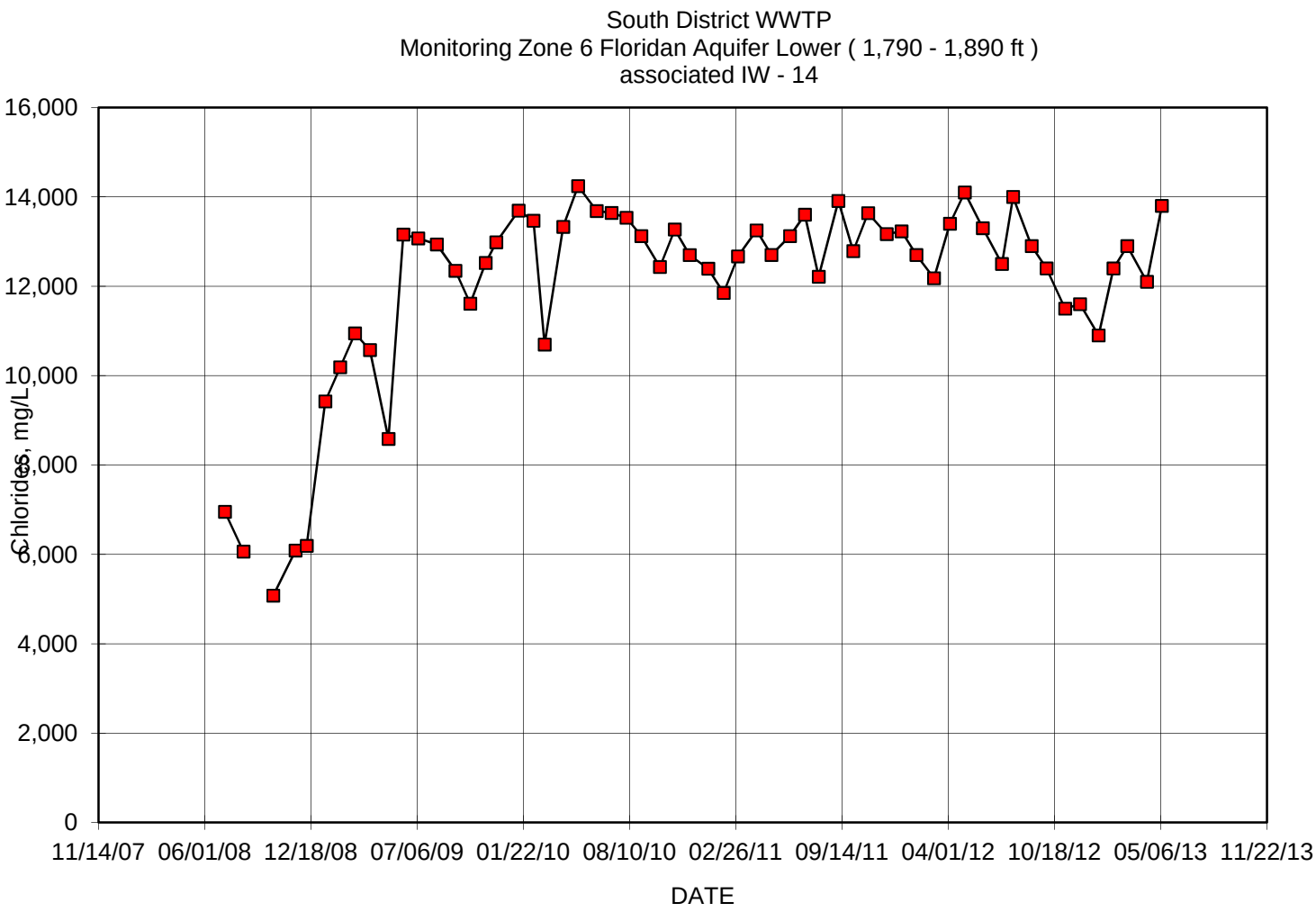
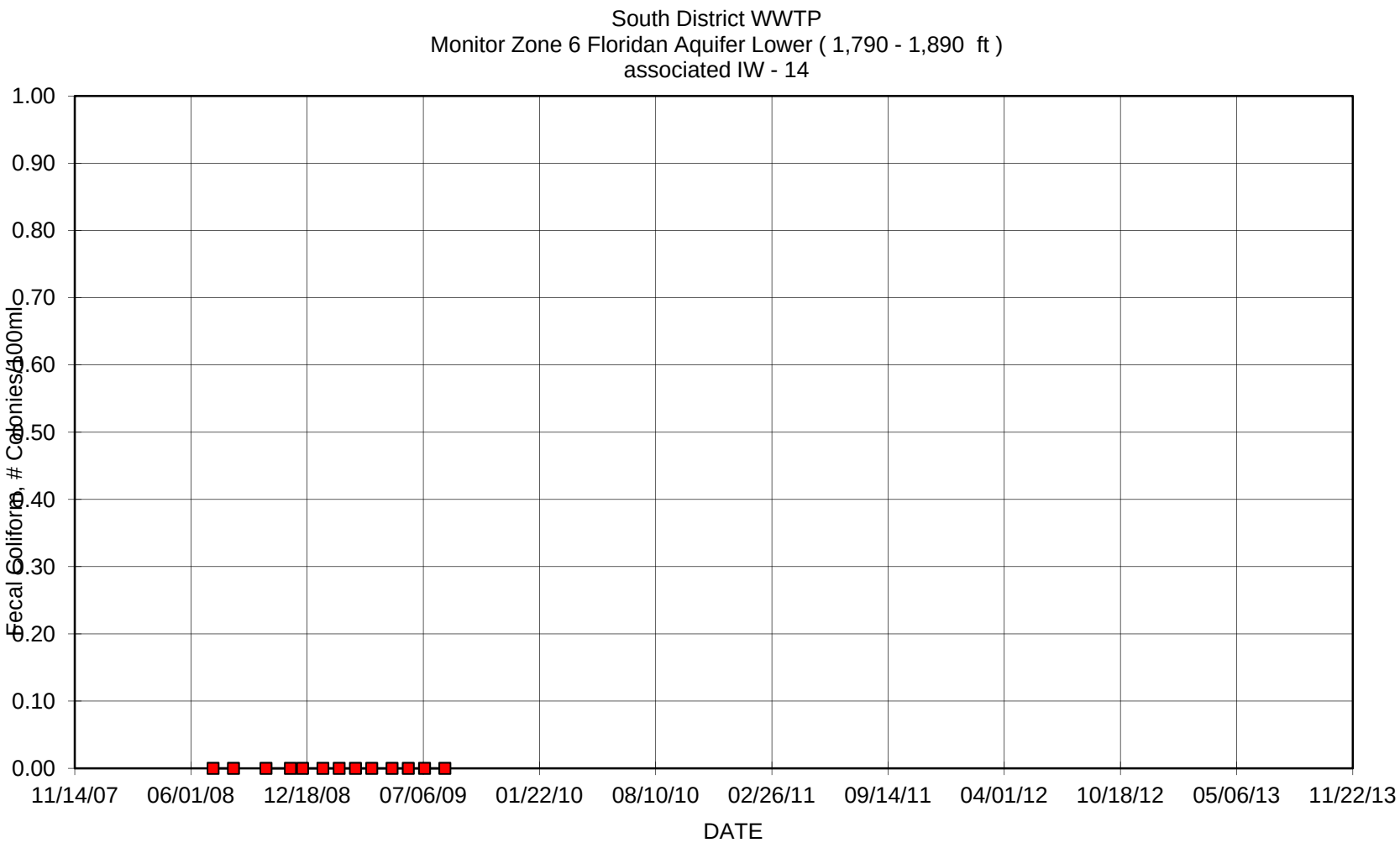
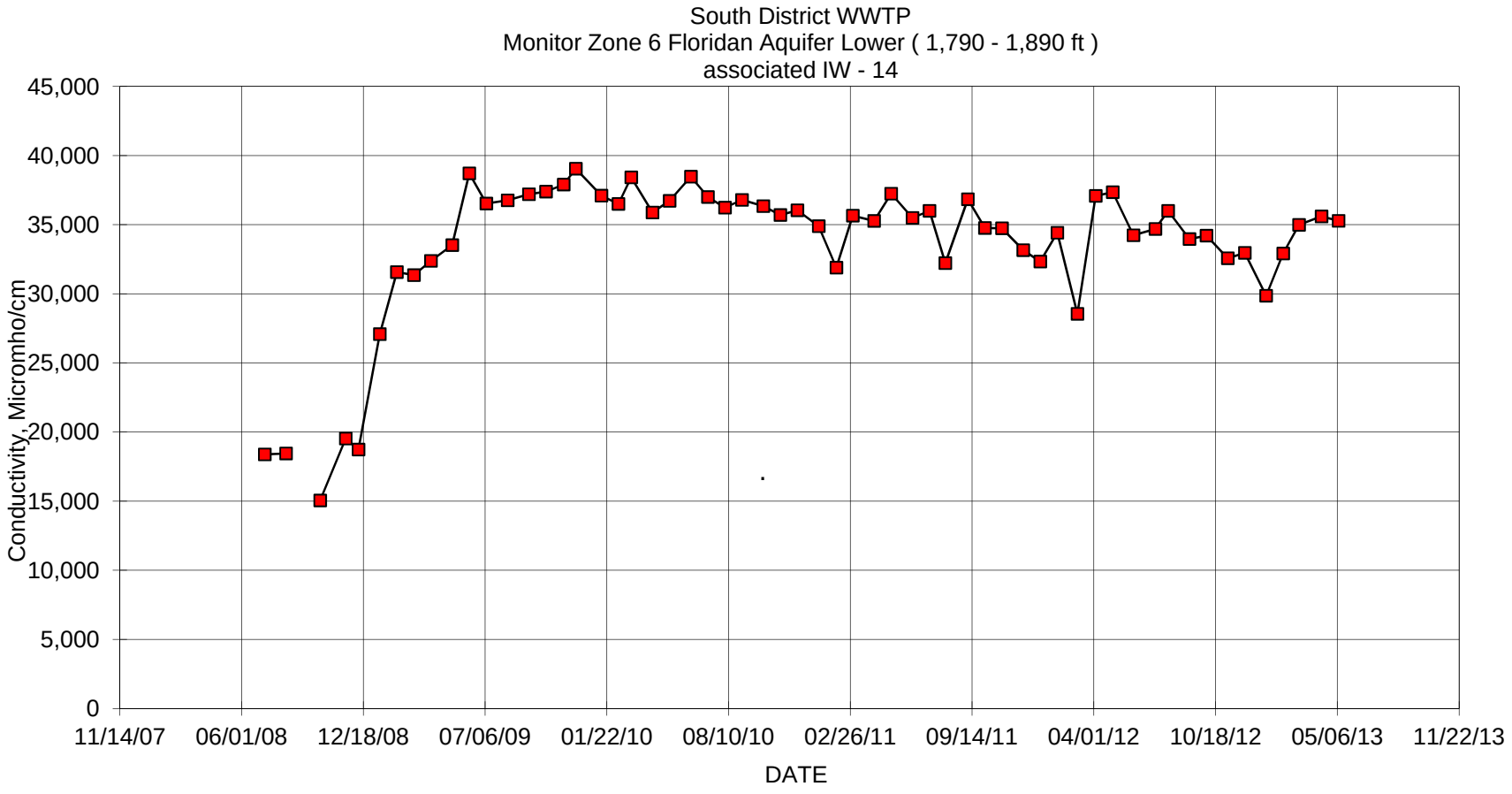
Monitoring Zone 6 Floridan Aquifer Lower (1,790 - 1,890 ft)
associated IW - 14
TKN, mg/L
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitoring Zone 6 Floridan Aquifer Lower (1,790 - 1,890 ft)
associated IW - 14
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
Chlorides, mg/L
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

South District WWTP
Monitor Zone 6 Floridan Aquifer Lower (1,790 - 1,890 ft)
associated IW - 14
NH3, mg/L
12.00
10.00
8.00
6.00
4.00
2.00
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 6 Floridan Aquifer Lower (1,790 - 1,890 ft)
associated IW - 14
Fecal Coliform, # Colonies/100ml
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 6 Floridan Aquifer Lower (1,790 - 1,890 ft)
associated IW - 14
Conductivity, Micromho/cm
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
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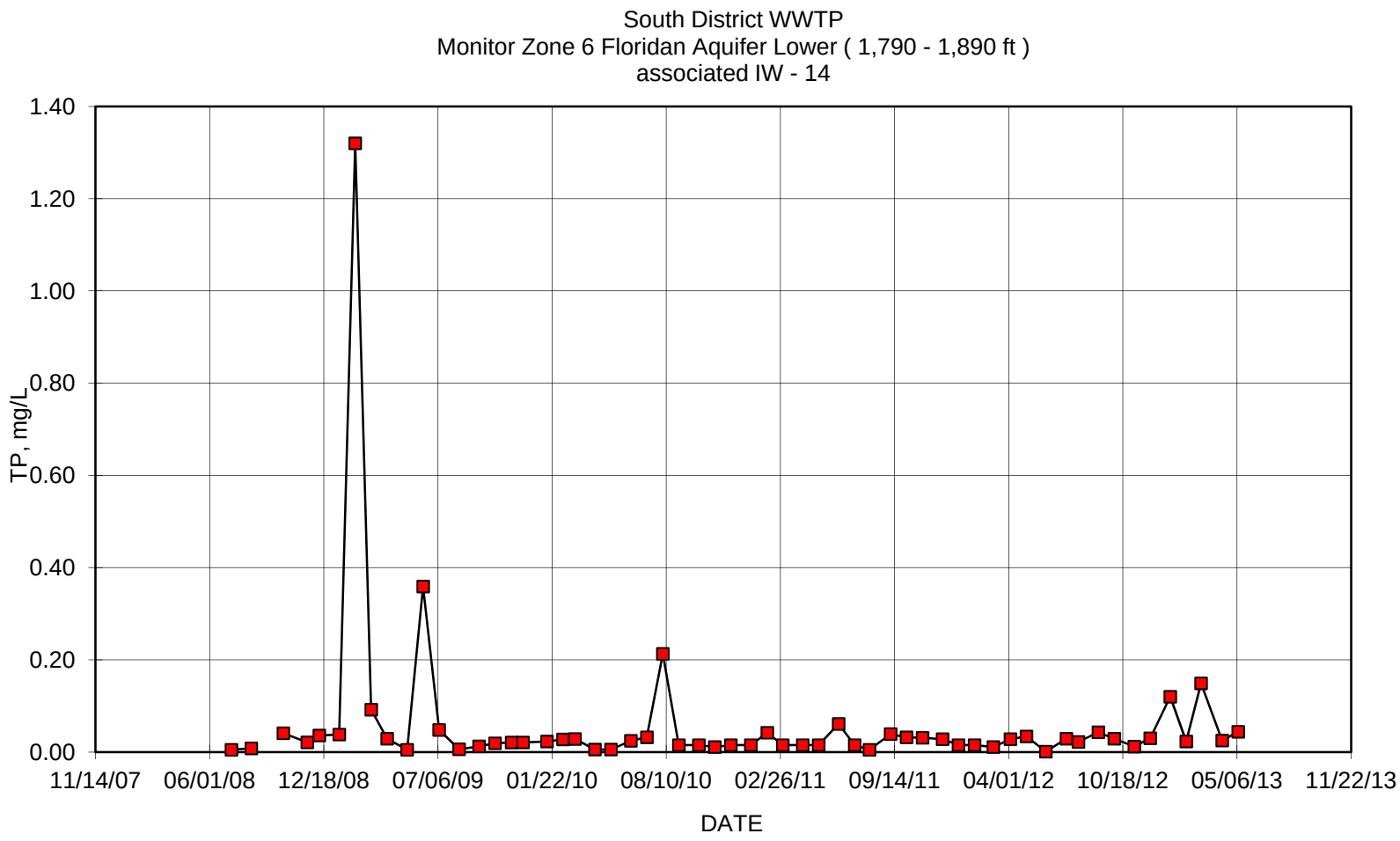
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 6 Floridan Aquifer Lower (1,790 - 1,890 ft)
associated IW - 14
TP, mg/L
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
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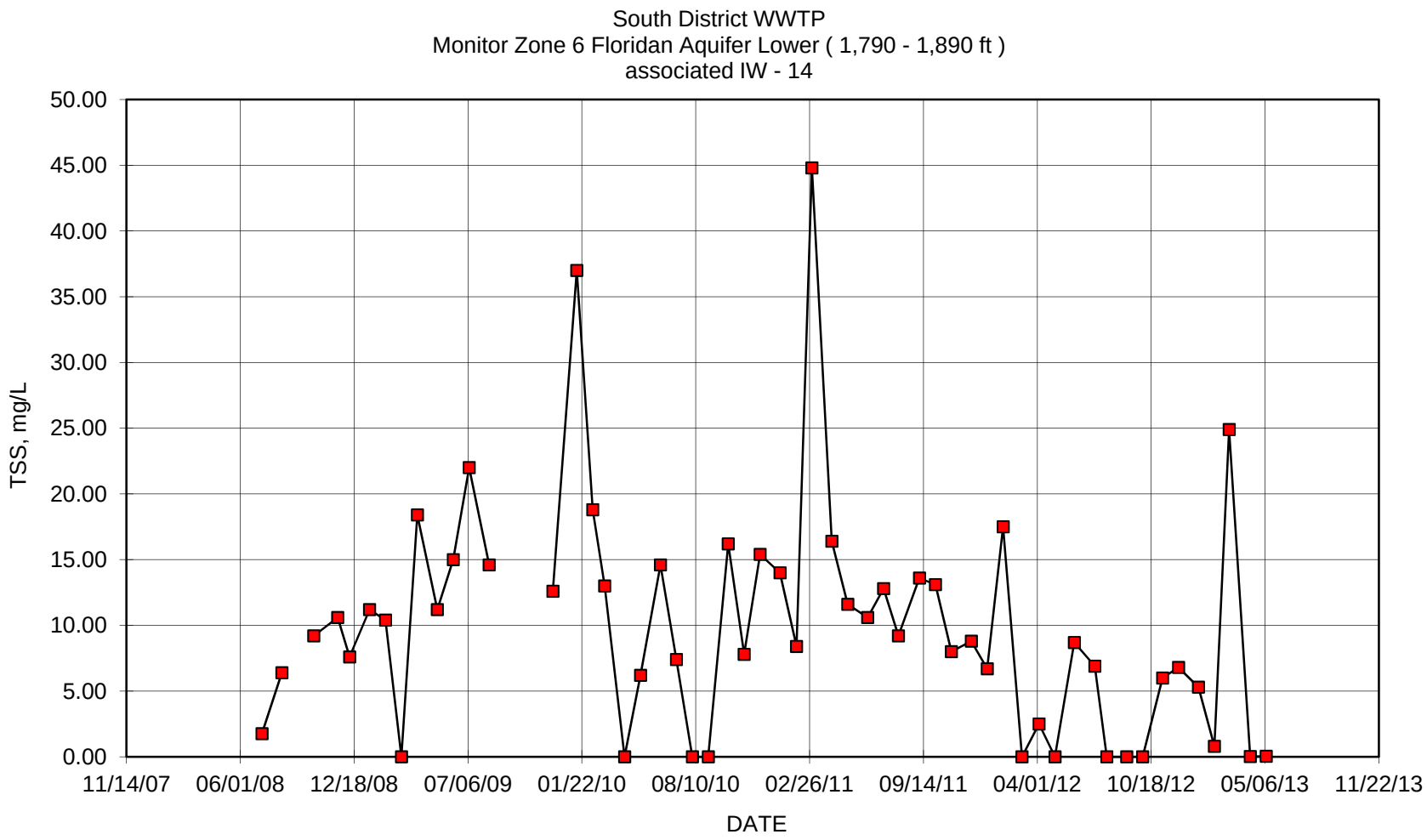
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 6 Floridan Aquifer Lower (1,790 - 1,890 ft)
associated IW - 14
TSS, mg/L
50.00
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

MIAMI-DADE COUNTY
miamidade.gov

Water and Sewer
PO Box 330316 • 3071 SW 38 Avenue
Miami, Florida 33233-3016
T 305-665-7471

December 5, 2013

Mr. Joseph R. May, P.G.
Florida Department of Environmental Protection
400 North Congress Avenue, 3rd Floor
West Palm Beach, Florida 33401

CCN: 57718

Reference: Miami-Dade Water and Sewer Department -- Mechanical Integrity Testing (MIT) Report for Deep Injection Well No. IW-15 at the SDWWTP Site.

Dear Mr. May:

Enclosed please find the Certificate of Mechanical Integrity and the MIT Report on the re-testing of Deep Injection Well No. IW-15 at the South District Wastewater Treatment Plant site in Miami-Dade County.

All the tests were conducted in strict adherence to the specifications submitted to and approved by your office. The testing results for the well were good. Both external and internal mechanical integrity were demonstrated. The well casing and the wellhead components are in good condition. All the well head valves and all the well head components are scheduled to be rust-proofed and repainted when all the MITs are completed. Based on the results of the well testing we conclude that the well retains full mechanical integrity and recommend that MDWASD be allowed to continue operating the well in its normal mode.

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

The demonstration of mechanical integrity is being submitted per Chapter 62-528.300(6)(b)2., 62-528.300(6)(c), and 62-528.425(1)(d), F.A.C. and specific condition 3.j. of Permit 0061787-022-UO.

If you have any questions or require additional explanation of any item in the report, please do not hesitate to contact me at [redacted] or Sonia Villamil at [redacted].

Sincerely,

[redacted]

Assistant Director- Wastewater Operation Systems

Enclosures: Certificate of Mechanical Integrity
MIT Report Well IW-15 (1 copy)

cc: Joseph Haberfeld, FDEP - Tallahassee

MIAMI-DADE COUNTY
Delivering Excellence Every Day

Mechanical Integrity Test Report
Deep Injection Well No. IW-15
South District Wastewater Treatment Plant

Prepared by:
Miami-Dade Water and Sewer Department
3071 SW 38th Avenue
Miami, Florida 33146

CERTIFICATE OF MECHANICAL INTEGRITY

The **South District WWTP** deep injection well **IW-15** operated by **Miami-Dade Water and Sewer Department** has been tested for mechanical integrity. The tests followed standard engineering practices and used methods presented in the United States Environmental Protection Agency regulations for the purposes of these tests. The external and internal mechanical integrity tests followed Florida Department of Environmental Protection (FDEP) pre-approved testing specifications and all the critical test events were witnessed by representatives of the FDEP, the MDWASD and the contractor.

Having supervised the engineer and geologists that were present during the testing, conducted the examining of the results and the preparation this mechanical integrity report as part of this certification, the undersigned certifies that deep injection well **IW-15** operated by **Miami-Dade Water and Sewer Department** at the **South District Wastewater Treatment Plant Site in Miami-Dade County, Florida** has successfully passed all the test requirements for mechanical integrity under rules of Chapter 62-528 of the Florida Administrative Code and is therefore determined to have mechanical integrity.

Certified on December 5, 2013

[redacted]

Howard J. Fallon Jr., P.E.
Professional Engineer
License Number 24153

MECHANICAL INTEGRITY TEST REPORT
FOR
DEEP INJECTION WELL No. IW-15
AT THE
SOUTH DISTRICT WASTEWATER TREATMENT PLANT

Prepared by:

MIAMI-DADE WATER AND SEWER DEPARTMENT
3071 SW 38th Avenue
Miami, Florida 33146

For Submittal To:

UNDERGROUND INJECTION CONTROL
FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

December 2013

ABSTRACT

The internal mechanical integrity was investigated through a pressure test performed on the injection casing. The pressure test was conducted at 153 pounds per square inch (psi) which is approximately 1.5 times the maximum (100 psi) potential injection pressure and more than 1.7 times the maximum operational pressure that the well will be under when operating at its full permitted injection velocity of 10 feet per second (ft/sec). FDEP permits a 5% loss in pressure during the hour long test in order for the internal mechanical integrity to pass the pressure test.
IW-15 successfully passed the pressure test because the casing only lost 4.5 psi. This pressure test was a bit different because there was some minor issue with the packer. Usually the packer pressure holds steady or loses only about 10 psi. However for this test, the packer lost about 50 psi, so some of the loss in the casing could be due to the loss of packer pressure. However, this well passed the FDEP requirements. The successful results of the pressure test for internal mechanical integrity were reinforced by the results of the second internal mechanical integrity test, the TV survey of the casing. The TV survey confirmed that the casing and the casing joints are in good condition and that the well has internal mechanical integrity down to 2,410 ft bls.

The external mechanical integrity was investigated using two test procedures, a Radioactive Tracer Survey (RTS) and a Temperature Log. Results of the RTS confirmed the integrity of the cement around the casing and the continued competence of its seal with the geologic strata. The temperature test showed that there are no anomalies that would indicate points where injected fluids could escape through the casing and cement into the formation. Similarly there were no temperature anomalies that would indicate injection fluids entering the formations at other than the approved injection depth.

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Section 1

1. INTRODUCTION

1.1 BACKGROUND

On October 12, 2012, (see Appendix A) the Miami-Dade Water and Sewer Department (MDWASD) submitted the County's proposed plan and testing specifications for conducting the mechanical integrity tests (MITs) and repairs on some of the injection wells at the South District Wastewater Treatment Plant (SDWWTP) site (see Figure 1) to the Florida Department of Environmental Protection (FDEP). The plan, represented by the specifications, described the step-by-step procedure to be followed and included the testing schedule required to meet the 5-year MIT re-testing conditions of the FDEP permit for each of the injection wells. After receipt of these documents, the FDEP Staff reviewed the proposed plan and sent an approval on June 5, 2013 (see Appendix B).

The contract documents for conducting the MITs were let out for bids, and the winning bid was submitted on February 28, 2013 by Youngquist Brothers, Inc., a well drilling contractor from Ft. Meyers, Florida. After the contract was approved by the Board of Country Commissioners and signed by the County Manager, the MDWASD issued the notice to proceed on May 17, 2013 and the contractor began mobilizing to the site.

1.2 PURPOSE AND SCOPE

The purpose of this report is to provide FDEP with a document that describes the re-testing procedures for mechanical integrity applied to each of the SDWWTP deep injection wells (see Figure 2). The report also presents the field reports (see Appendix C), and the results of the tests in a single volume for ease of reference. The mechanical integrity re-testing operations involved conducting a pressure test on the well casing to show that there are no leaks in the casing, and conducting a TV survey on the well to reinforce the data from the pressure test. The re-testing includes tracking a radioactive liquid-tracer (iodine isotope I-131) injected down the well to show that there is no fluid movement upward behind the casing, into underground sources of drinking water (USDW). The radioactive test information is reinforced with temperature logs run on the well. Gamma ray logs are used to detect the movement of the radioactive tracer.

Figure 1. South District Wastewater Treatment Plant Site

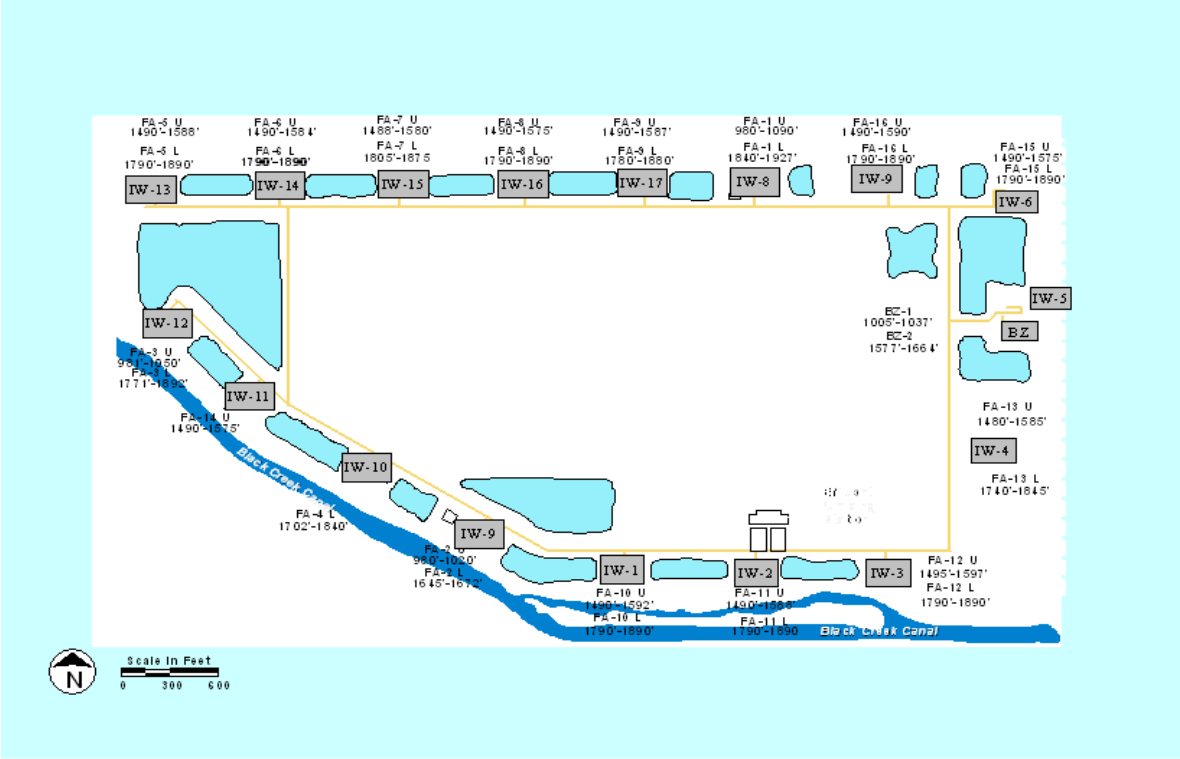


Figure 2. Well Locations Layout

Section 2

2. MECHANICAL INTEGRITY TESTING (MIT)

2.1 METHODS USED

The MIT program is designed to test two elements of the injection well system: 1. Internal integrity and 2. External integrity. The first test element, the internal mechanical integrity test of the well, tests the condition of the injection casing. The second test element, the external mechanical integrity test of the well, tests for leaks outside the casing. This is achieved through a series of field tests including a pressure test and a TV survey for the internal testing, and the temperature log, gamma ray log and RTS survey for the external testing. The first test element, the internal mechanical integrity test, tests for leaks in the injection pipe (casing). The second test element tests for leaks in the annular space outside the casing (cement-filled space between the periphery of the drilled hole and the casing) and in the near-to-the-well geologic strata.

2.2 CASING SCRUBBING

Because the mechanical integrity of injection wells has to be tested every five years, and because a TV inspection of the well is part of the test requirements, MITs provide a timely opportunity to clean the well of deposits that may have formed on the inside of the casing during the intervening years and at the same time provide a cleaner casing for the TV inspection. Cleaning the inside of the well casing is achieved by running a scrubbing brush up and down the casing. However, before the cleaning can be performed, flow out of the well must be controlled. The column of water inside the casing is fresh water and results in a positive hydraulic head inside the well. That head must first be controlled to prevent water from flowing out of the well during the cleaning operation.

2.2.1 Flow Suppression

Suppression of the fresh water head was achieved by first pre-mixing water with salt (NaCl) to form a heavy brine, and then pumping the brine down the well casing, through a 6-inch gate valve on the wellhead. This procedure results in the displacement down the well of the fresh water at the top of the column and replacement of the displaced fresh water with the brine solution. An equal volume of fresh water is displaced out of the well at the bottom of the casing. The procedure is repeated until the pressure head inside the well is suppressed. This method of displacement is used because it achieves flow suppression without first having to open the well to insert a tremie pipe to the bottom of the casing for introduction of the brine. This displacement method also provides a safe way of “killing” the well that at the same time reduces the volume of injected salt solution that would enter the formation at the bottom of the well. One additional advantage is that using this method the brine can be recovered and reused in flow suppression at other wells.

The brine was prepared in 1,000-gallon (gal.) batches by mixing the salt from a 2,000-pound (lbs.) sack in a 1,000 gal. tank of fresh water. The 1,000 gal. solution was then pumped down the well before other similarly mixed batches of salt solution were mixed and pumped down the well (see Figure 3). In the end, the operation was repeated 13 times, and a total of 13 sacks (approximately 26,000 lbs. of salt) were used to suppress the head in the well. This salt concentration represents a theoretical specific gravity of 1.239 for the brine, calculated from the salt solution used in the field of 10.3 lbs per gallon. The 26,000 lbs of salt suppressed the pressure head from approximately 26 feet above the top of the casing to approximately 15 feet below.

Figure 3. Flow Suppression Equipment

2.2.2 Scrubbing Operation

The brush used to clean the casing is made with an old drill rod that has an outside diameter of 7 inches with thick steel wire inserted and secured sticking out of the drill rod. The total diameter of the brush with the steel wire bristles is 24 inches. The brush is attached to the bottom of the packer and inserted into the well (see Figure 4). A 24-inch flange was bolted to the top of the well and pressure fittings installed to be used for packer inflation later on in the process. Then Youngquist lowers the brush and packer by attaching drill rods to the top of the packer and then raising and lowering the brush several times using a 50 ton crane. This process was repeated until the casing was scrubbed and the packer was at the depth required to perform the packer test on the well.

Figure 4. Scrubbing Brush and Hydraulic Packer

2.3 INTERNAL MECHANICAL INTEGRITY (CASING TESTS)

2.3.1 Pressure Test

After the pressure head was suppressed and the casing scrubbed, and the top of the inflatable packer was placed at a depth of 2,381 ft bls. This well is cased to a depth of 2,410 ft bls so the packer is in the bottom 50 feet of the casing. Additional pressure fittings were installed on the flange to pressurize the casing with water. A bleeder valve atop the 24-inch flange allows passage of the drill pipes that support the packer without loss of pressure in the casing (see Figure 5). A pretest was conducted on the casing to determine that the pressure was holding and that all the installed testing equipment was operating properly, then FDEP was informed that the well was ready for their inspection. The next day, August 29, 2013, the pressure test was repeated in the presence of FDEP Staff. The packer had been previously sealed against the casing, at an inflation pressure of 360 pounds per square inch (psi) and at 8:00 AM the casing was pressurized with water to a pressure of 153 psi.

Figure 5. Well-Head and Recorder Set Up for Pressure Test

At 10:00 A.M. the one-hour pressure test was started in the presence of Joseph May, P.G. representing FDEP and witnessed by Sonia Villamil, Maria Macfarlane, and Michael Ashe representing MDWASD, and by Chris Harp and others representing the drilling contractor. The pressure test ran for the required one-hour period. The pressure deviation (loss) in that time was 4.5 psi, well below the 7.5 psi deviation allowable under the 5 % criteria in the rules (see Table 2-1). The packer inflation pressure and the pressure in the casing were measured using certified gages (see Appendix C) graduated from 0 to 200 psi in increments of 1 psi. The pressure was read in person and recorded by hand at five minute intervals during the test. The pressure was also recorded on an In-Situ pressure transducer attached to the stand with the pressure gauges (see Figure 5).

Table 2-1 Casing Pressure Readings

Time	Casing Pressure (psi)	Pressure Change (psi)	Packer Pressure (psi)
10:00	153	0.0	360
10:05	152.5	0.5	360
10:10	152	0.5	350
10:15	152	0.0	340
10:20	151.5	0.5	340
10:25	151	0.5	340
10:30	151	0.0	330
10:35	150.5	0.5	320
10:40	150	0.5	320
10:45	150	0.0	320
10:50	149.5	0.5	310
10:55	149	0.5	310
11:00	148.5	0.5	310

2.3.2 Bleed-Off Calculations

At the completion of the pressure test the casing pressure was bled-off and the discharged volume from the bleeding was measured (see Table 2-2). Bleeding until the pressure resulted in zero flow produced approximately 28.5 gallons. This exercise provides a reasonable assurance that the packer is placed at the depth in the well that is within the last 50 feet of the casing.

Table 2-2. Bleeding Volumes versus Pressure

Bled Volume (gallons)	0	5	10	15	20	25	28.5
Casing Pressure (psi)	148.5	121	95	64	43	18	0

2.3.3 Television Survey

A closed circuit color television camera, encased in a pressure vessel capable of withstanding the pressures exerted at the depths to be televised, and equipped with a fish-eye lens, was introduced into the well through a pack-off stripper device on a standpipe above the injection well (see Figure 6). The camera is centralized in the casing, and is preceded down the well with a light source attached below the camera. The camera televises a view of the full circumference of the inside of the casing and the image is recorded on video tape. Prior to the video survey, the well was scrubbed and flushed with potable water to provide the best picture possible. The video

survey began at land surface and continued down to 2,930 feet, where the camera runs into an obstruction, but the hole below seems open below the partial obstruction where the tool was stuck. At selected intervals of interest, the camera was used to pan the intervals in a horizontal format prior to continuing the normal vertical recording.

A review of the video (see Appendix F) indicates that the casing is in good condition down to 2,416 feet. The video also shows that the scrubbing operation was successful. The scrubber has scrubbed the casing free of all growth down to 2,412 feet and this is confirmed by visible vertical scratches throughout that length of the casing; indicating that the scrubber had brushed the steel casing effectively. All the scratches are superficial, and do not detract from the physical and mechanical integrity of the casing. There are no gouges, grooves, nicks, or other physical damage visible in the casing for its whole length. Below 2,412 feet the casing was not scrubbed to avoid hanging the scrubber with the edge of the bottom of the casing at 2,416 feet.

In summary, the video picture meets the quality standards that are needed for a visual evaluation of the well. This video survey presents a clear view of the casing and of the welded joints of the casing. All the joints are clean and appear to be tight. From the TV survey it is concluded that this casing is in good condition throughout its whole depth from land surface to 2,416 feet.

Figure 6. Television Survey (Standpipe and Logging Truck)

2.4 EXTERNAL MECHANICAL INTEGRITY (CEMENT AND FORMATIONS)

The external mechanical integrity test consisted of two low flow dynamic tests The RTS was conducted on September 6, 2013, for the external mechanical integrity portion of the test was witnessed by the representative of FDEP (Joseph May, P.G.), by representatives of MDWASD (Sonia Villamil and Maria Macfarlane) and by representatives of the contractor (Luis Morey).

2.4.1 Radioactive Tracer Survey (RTS)

The radioactive tracer survey uses an isotope of iodine (I-131) as a tracer of water movement inside and outside the casing. Iodine –131 is used because it is a radioactive isotope commonly used in medical practice and therefore it is more easily available and lower in cost than other potential tracers. I-131 also has the advantage of having a half-life of 8 days. That half-life is quite suitable because it is long enough to allow time for transportation to the well site with little decay but also short enough so that it would quickly be reduced if there were any unexpected spills or if there were mechanical failures through which the isotope could travel with the water. The radiation levels of I-131 at the concentration used for RTS testing is in millicurie-range, which if it were considered a waste, would be characterized as a low level waste by the US Atomic Energy Commission.

The I-131 is first loaded into a container located in the logging tool. This container is electronically activated from the logging truck to eject the desired quantity of tracer at the desired depth through an ejection port. In addition to the tracer container, the logging tool is also assembled with three gamma ray detectors. One detector, the top gamma ray detector (GRT), is located 10 feet above the ejector. The other two detectors, the middle one (GRM) and the bottom one (GRB) are located immediately below the ejector at about 3 feet and 12.4 feet below the ejector respectively. The bottom of the logging tool also includes a temperature tool at the very bottom, and a casing collar locator (CCL) 1 foot below the GRM. Figure 7 shows the configuration of the RTS logging tool. The RTS log in the appendix (Appendix D) shows the distances between each of the logging tool components described above.

2.4.1.1 First Low Flow Dynamic Test

Prior to starting the low flow dynamic test, a background gamma ray log was conducted to establish the natural conditions. It was conducted right after the temperature log. Since the temperature log was run downward starting at land surface, the temperature log had ended with the logging tool at the bottom. The background gamma ray log was conducted from the bottom (2,936 feet) up to the surface.

From the surface, the logging tool was again lowered down the well and the casing collar locator (CCL) used to locate the bottom of the casing. The magnetic coils on the CCL give out a magnetic field and detect a change in the mass. If there is growth on the casing it is harder for the CCL to have a clean line. If the growth has some iron on it, it can cause a sort of interference with the CCL making it harder for the CCL to find the end of the casing. The CCL shows that the bottom of the casing is at 2,416 feet bls. After the bottom of the casing was located, the well was ready for the low-flow dynamic RTS test.

The ejector port of the I-131container was set at 2,411 feet and 1 millicurie (mCi) of I-131 was released while the flow down the well was kept at a constant rate of 84 gallons per minute (gpm). The logging tool was kept immobile after the ejection of the I-131 and the three gamma ray detectors continued to record in place. One (1) mCi of I-131 was ejected into the well. The middle detector, located 3 feet below the ejector port, picked up the radioactive tracer 24 seconds after the ejection. The bottom detector, which is located over 12 feet below the ejector, picked up the tracer 2 minute and 40 seconds after the ejection. The test ran for 60 minutes and the top detector did not pick up any tracer.

After the first low flow test ended, the tool was then raised up more than 200 feet, to a depth of 2,200 feet, to log out of position to make sure that the tracer did not migrate up the casing or the formation outside of the casing. No migration was detected.

Once the log out of position was conducted and the tool was placed back to depth, no staining on the casing was found which means no interference for the second RTS. Therefore, with the approval of Joseph May, P.G. from FDEP, the well was not flushed prior to the second RTS test.

Figure 7. RTS Tool and Temperature Probe

2.4.1.2 Second Low Flow Dynamic Test

The tool was placed back to a depth were the ejector was located at 2,411 feet with a flow of 82 gallons per minute set down the well. For this test, 2 milicuries of I-131 were ejected into the casing. The middle detector started picking up the tracer about 21 seconds after it was ejected. The bottom detector, which is located over 12 feet below the ejector, picked up the tracer 2 minutes and 48 seconds after the ejection. The upper detector did not pick up any tracer for the duration of the test, which lasted 30 minutes.

After the second low flow test ended, the tool was then raised up more than 200 feet, to a depth of 2,200 feet, to log out of position to make sure that the tracer did not migrate up the casing or the formation outside of the casing. A small spike was detected at the ejection point and at 2,411 ft bls. The stain on the casing from the ejection is not a problem there. It does not indicate any migration.

With the last low flow dynamic test, the mechanical integrity test was concluded, but before bringing the geophysical tools out of the well, the leftover I-131in the container was ejected and the container flushed-clean to insure that any remaining radioactive iodine was well dispersed. The tool was placed at a depth of 2,803.5 ft bls. The ejector was located at 2,790 ft bls, and the remaining Iodine 131 was ejected and the well was flushed with effluent at a rate of over 5,576 gallons per minute to ensure no staining of the tool. The logging tool was then brought up from the bottom and on the way up a final gamma ray log was made. Then the final gamma ray log was compared to the background gamma ray log, and the comparison showed that there are no noticeable differences in the two except for a residual stain at the bottom of the casing where the I-131 had been repeatedly released during the testing, and just below there, where the tracer exited the casing. Injection of water down the well at a rate of 5,576 gpm continued for the next hour to completely flush out the well.

2.4.2 Temperature Log

Youngquist Brothers Inc. conducted the temperature log on September 6, 2013 starting at about 8:15 A.M. and logging down to 2,936 feet. The temperature probe (Figure 7) was run from the surface downward to minimize the disturbing effect of the movement of the logging tool on the temperature of the water in the well. Usually, the temperature log is done more than 24 hours after the well had last been disturbed by outside influences. However, for this well, the well was only shut in for about 4 hours prior to the temperature log being conducted. This was discussed with Mr. Joseph May, P.G. of the FDEP and it was determined that the temperature log be conducted and checked with the one from 5 years ago and with temperature logs of the surrounding wells. Because the temperature of the effluent injected in the wells is around 80 degrees, if the casing had a problem, the temperature log would still be useful without having the well shut in because the formation water is much cooler and so the temperature log would show a cooling.

The temperature log (see Appendix H) shows the warmest interval is in the section from 2,350 to 2,416 feet. This is consistent with the higher temperature of the injected water in that interval. The temperature log did not detect any anomalies that would indicate that injection fluids are

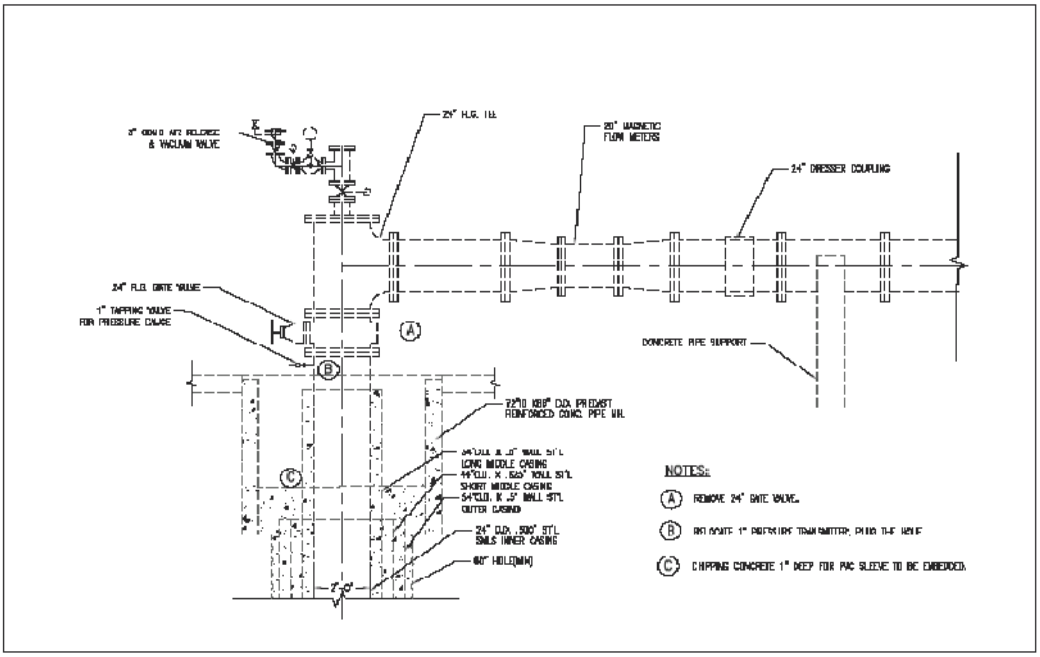
present outside the casing, and there is no indication of any upward movement of warm injection water either. The similarity of the temperature oscillations in this temperature log (in the interval from land surface down to the bottom of the casing) to those in the temperature logs from previous MITs and to those in the temperature log when the well was constructed, indicates that there has been no apparent change in the cased interval, and no upward movement of the injected water in the last 5 years.

2.5 WELL HEAD REPAIRS AND RE-INSTALLATION

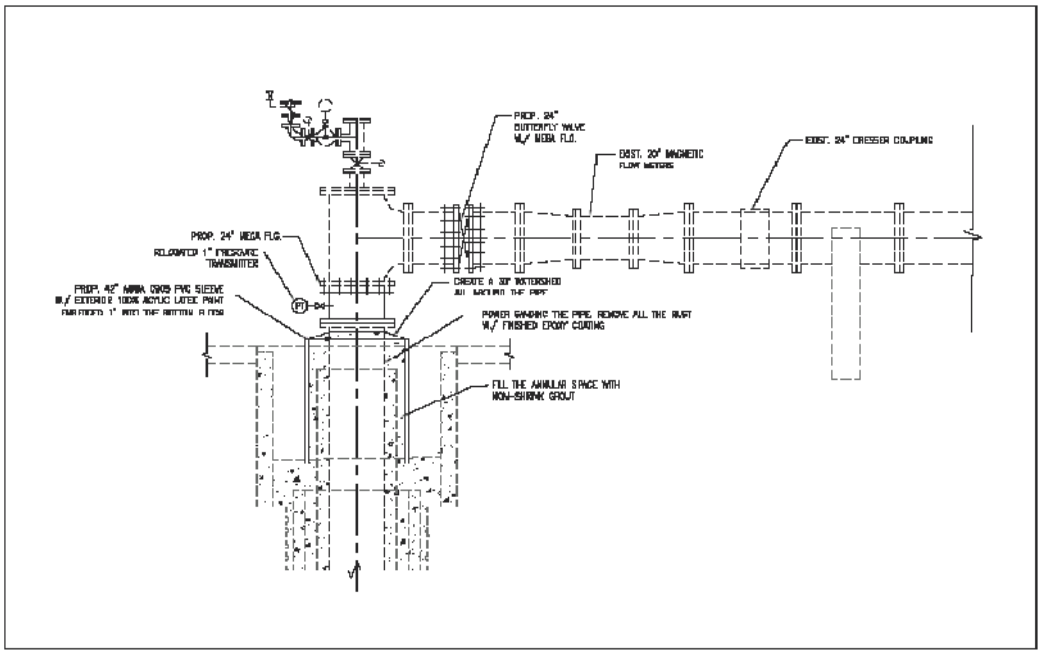
The work associated with the MIT ended when the wellhead was replaced. The air and vacuum release surge check valves were replaced prior to reinstallation of the wellhead. The 6 inch gate valve and air release were replaced. The well had a gate valve on the vertical part of the well before the T. The pressure tap for the instrumentation of the well was below the water line when the sump was full of water. Therefore this well was retrofit to replace the gate valve with a 24" butterfly valve installed on the horizontal pipe coming off the T the well and lift the pressure tap above the water line. A PVC liner was also installed at the base of the sump that protects the 24" OD steel casing from being exposed to FA purge water from the monitoring wells. The PVC was cemented into the bottom of the sump and the annulus was filled with grout to ensure that no water can reach the steel casing. Please see drawings of the retrofit below, Figure 8 and 9.

The wellheads are scheduled to be sandblasted, rust proofed and repainted after the MITs on all the other wells are completed. Injection well IW-15 has been placed back on line and flow from the plant's pump station is again discharging to this injection well, .

Figure 8 Retrofit Well with PVC liner



REPAIR PLAN FOR I-13 TO I-17



PROPOSAL PLAN FOR I-13 TO I-17

Figure 9 Drawing showing before and after layouts for the Retrofit.

Section 3

3. CONCLUSIONS AND RECOMMENDATIONS

3.1 CONCLUSIONS

The pressure test was conducted successfully and it was concluded from the results that there is internal mechanical integrity. This conclusion is reinforced by the analysis of the TV survey down to the injection level at 2,416 feet. The TV survey indicated that the casing is in good condition and that all the casing joints appear to be tight and in good working order.

The two successful RTS conducted at low flow rates indicate that there is no upward movement of water outside the casing. Therefore, it was concluded that the RTS results show that there is external mechanical integrity. The temperature survey reinforced the results of the RTS by showing that there has been no movement of injected water anywhere except the injection zone.

3.2 RECOMMENDATIONS

The successful completion of all the tests for mechanical integrity confirms that IW-15 retains full mechanical integrity and as such it is appropriate to continue using this injection well. MDWASD also recommends that FDEP review the results of the tests presented in this report and based on those results determine that the well has mechanical integrity and may continue to be used for its intended purpose.

Finally, MDWASD recommends that although the well head will not be painted until all the MIT tests are completed on the other wells, IW-15 should receive mechanical integrity certification.

Appendix A

Mechanical Integrity Testing Procedures Submitted by MDWASD to FDEP
October 12, 2012

Miami-Dade Water and Sewer Department
Mechanical Integrity Testing Procedures

Miami-Dade Water and Sewer Department
Mechanical Integrity Testing and Repair Procedures
October 12, 2012

MECHANICAL INTEGRITY TESTING and REPAIR PLAN (SDWWTP and NDWWTP Injection Wells)

General Information

The Contractor shall carefully coordinate his activities with the Department to minimize interference with any existing operations or the operations of the Department. Department forces will isolate the well and turn over to the Contractor. Existing valves shall only be operated by Department personnel. The Contractor's personnel, under no circumstances, shall operate any such valve.

The Contractor shall provide all barricades and/or flashing warning lights necessary to warn workers and employee of the testing throughout the Project. This shall be done at the Contractor's expense and to the satisfaction of the Engineer. Every effort must be made to reduce inconvenience and nuisances to a minimum.

The Contractor shall at all times, use the assigned entrance to the Plants to bring in materials, equipment etc. required for the Project. Materials and equipment shall be stored in areas designated by the Engineer, and shall not interfere with the daily operations at the site or with other Projects. Suitable platforms shall be used for material storage to prevent damage to the landscaping. The Contractor shall exercise extreme caution when transporting equipment or materials within the Plant area.

The conveying vehicles shall be properly selected, and equipped, to prevent damage to paved areas, landscaping and other existing facilities including wells, well pads, fencing, underground pipelines, pipe chases, etc. If necessary, suitable wooden skids shall be used to distribute loads, and to prevent damage.

If any of the above existing structures, including the wells, or any other parts of the project area, are damaged, the contractor shall make suitable repairs or replacement at his expense, in a manner described by the Engineer, and to his satisfaction.

The Contractor shall also exercise extreme caution to prevent any spillage of sewage effluent. The County may charge t he Contractor for any cost incurred or penalties imposed on the County as a result of such spillage.

The wells to be tested are Injection Wells IW-l through IW-17 at the South District Wastewater Treatment Plant and IW-1N through IW-4N at the North District Wastewater Treatment! Plant

The Injection Wells have a 24-inch outside diameter (OD), 0.500-inch wall thickness injection casing set to total depths of 2,450 to 2,850 feet below land surface (bls), and were constructed with a nominal 22-inch diameter open borehole extending from the bottom of the casing to approximately 3,000 feet bls.
Except IW-5 at the SDWWTP, has a 20-inch outside diameter (OD), and 0.500 inch wall thickness.

The CONTRACTOR will perform internal and external mechanical integrity tests on the casings of twenty one deep injection wells and perform all appurtenant work in accordance with the above

Contract Documents.

The work shall be performed by a competent crew with equipment that is adequate to complete all phases of the testing and instruments of sufficient accuracy and resolution to identify anomalous responses to the tests. If the CONTRACTOR'S equipment is not capable of satisfactorily performing the work provided for in these specifications, the CONTRACTOR at his own expense shall substitute equipment.

The CONTRACTOR shall have not less than 5 years experience in constructing and testing wells and shall have tested not less than 5 wells of similar type and capacity. The CONTRACTOR shall be licensed by the State of Florida and the license number shall be affixed to all correspondence and reports.

All work shall comply with and be in full conformance with this Mechanical Integrity Test Plan submitted to FDEP together with subsequent response letters for the injection wells at the South and North District Wastewater Treatment Plants and with the appropriate sections of Chapter 62-528 FAC.

If remedial work or re-testing is required prior to final acceptance of the work to meet regulatory requirements and the specifications of the Contract Documents due to defective materials, accident, loss of equipment or equipment malfunction, or for any other cause directly attributable to the CONTRACTOR's actions, the CONTRACTOR shall bear the entire cost of the remediation or re-testing, including all additional materials, labor, and equipment required and any necessary additional Engineering costs. In the event of a problem, the ENGINEER shall be notified immediately, and the following shall apply:

1. The CONTRACTOR shall propose a method of correcting the problem, in writing, to The ENGINEER, who shall review the method of corrective action, and accept the plan in writing before work can proceed.

2. All work on the well must be in accordance with all applicable local, state and federal regulations.

The CONTRACTOR shall notify the ENGINEER a minimum of 72 hours prior to conducting the pressure test, geophysical logging and the radioactive tracer survey so that the ENGINEER and regulatory agency staff can be properly notified.

The CONTRACTOR shall provide all facilities, equipment and materials required for the removal of waste fluids from the well site.

The CONTRACTOR shall kill the well using a dense food- grade salt solution. No barite or mud-based additives shall be used in the well.

The CONTRACTOR shall comply with the OSHA regulations contained in 29CFR Section 1910 for General Industry Regulations and 29CFR Section 1926 for Construction Regulations.

Equipment and Procedures

1. Wellhead Assembly: The stripper head assembly used during the video survey, Geophysical logging, and the radioactive survey shall be bolted to the wellhead above the 6-inch gate valve. The stripper head assembly used must be of sufficient length to house the longest of the wire line tools used for the testing between the gate valve and the pack-off mounted at the top of the assembly. The pack-off must be adjusted so that the tools can be moved freely up and down the well with minimal leakage from the well. The assembly shall include a 4-inch valve and tee, which will be used to inject potable water during the surveys. The assembly shall be fitted with a

pressure gauge for use during the tests.

2. Wellhead Hardware: Should the nuts and/or bolts at the wellhead assembly become stripped during the CONTRACTOR's efforts, the CONTRACTOR shall replace them with equivalent hardware.

3. Water Line: The CONTRACTOR shall provide a potable water supply line for use during the video surveys. This line shall be connected to the existing 4-inch valve on the CONTRACTOR's stripper head. It shall be equipped with a check value to prevent the backflow of effluent into the water supply source. It shall also be equipped with a continuous recording digital flow meter and totalizer capable of measuring flows accurately in the range of 0 to 250 gpm.

Mechanical Integrity Testing (MIT)

The mechanical integrity testing under this Contract shall be accomplished using the following methods and general sequence, however the Contractor shall submit a more detailed sequence to the Engineer for approval before he begins work. The Contractor shall use extreme caution to prevent any loss of equipment, tools or other items into the wells and shall be fully responsible for retrieving any such items immediately, at no expense to the Department. All pressure tests must be conducted in the presence of the Engineer or his authorized representative.

MIT Clean and Pressure Test the Casing

1. The Contractor shall set up all equipment required to prepare for suppressing the density differential pressure, cleaning, performing the pressure test and the radioisotope and closed circuit television surveys.

2. The Contractor shall inject sufficient salt solution into the well to balance the differential pressure and disassemble the wellhead. The brine solution shall remain in the well during the cleaning and pressure testing steps, after which time it shall be transferred to another well if clean enough for reuse, or shall otherwise be disposed of by the Contractor. Under no circumstances shall brine solution be spilled or disposed of on the ground surface, however it may be disposed of into the injection well.

3. The Contractor shall clean the casing before proceeding with the pressure test. The entire length of casing shall be cleaned. If the later television survey indicates insufficient cleaning, the well shall be re-cleaned by the Contractor, at his expense, to the satisfaction of the Engineer. If the television survey must be repeated because of insufficient cleaning, in the opinion of the Engineer, it shall also be at the Contractor's expense.

4. The Contractor shall, when requested by the Engineer, place the packer through a stand-pipe with a packoff device to a point near the top of the well (but within the concrete encasement area) and test its integrity. This shall be accomplished as described in Steps 6, 7, and 8 below. If the packer fails the integrity test it shall be replaced with one that will meet the test. The Engineer is aware that packers have limited inflation cycles and will attempt to minimize the verification of packer operation. However, any integrity failure for which the packer operation can not be eliminated must be repeated at the Contractor's cost. It is anticipated that each new packer will be tested at the wellhead to verify its capacity to seat and deflate.

5. The Contractor shall lower and place the packer to a point within the lower 40 feet of the casing, but not the last 10 feet. The CONTRACTOR will be responsible to assure the proper seating of the packer. A preliminary test shall be performed to ensure proper operation of the test set-up. The CONTRACTOR shall notify the ENGINEER at least 24 hours before running the preliminary test. The test will be run following the same test program as the actual pressure test, as described below. IW-2 at SDWWTP will have the packer placed within 40 feet of the tear in the casing.

6. The Contractor shall inflate the packer to a pressure not exceeding 350 psig over the static condition as measured at the wellhead on a calibrated gauge to create a positive seal.

7. The Contractor shall pressurize the casing to 150 psig with no air in the casing or wellhead. The pressure shall be recorded on a chart and signed by the Engineer, the Contractor and any witnesses present. The pressure test gauge shall be calibrated within 6 months of performing the pressure test. The CONTRACTOR must present proof of calibration of the pressure gauge to the ENGINEER and FDEP staff at the time of testing each well. The pressure gauge must be mounted at or near eye level in order to ensure maximum visibility.

8. The test will be considered successful if the pressure does not change more than 5% psi in one hour.

9. If the test fails, the Contractor shall move the packer upwards for approximately 10 feet, and repeat Steps 6, 7 and 8.

10. If the test still fails, additional repositioning of the packer and repeating of Steps 6, 7 and 8 shall be as ordered by the Engineer. If the test still fails, and subsequent radioisotope surveys indicate no casing failure, it will be presumed that the Contractor's packer did not create a positive seal, and the Contractor shall be required to repeat Steps 4 through 8 at his expense. No payments will be made to the Contractor if it is subsequently determined that the test failure was caused by the seating of the packer. If the packer fails during packer operation verification, it will be concluded that the packer was faulty during any previous test that did not demonstrate casing integrity. The Contractor shall repeat this test at his expense.

11. After pressure testing, measure the depressurization bleed down with a 5 gallon bucket upon release of the pressure in the casing. The bleed down fluid will be properly disposed of by the Contractor.

12. The Contractor shall deflate the packer and withdraw it from the casing.

13. The Contractor shall reassemble the wellhead and connecting piping using new gaskets.

14. Prior to geophysical logging, the fluid used to "kill" the well, or for pressure testing the casing shall be flushed from the well and the well will be shut-in for a minimum of 12 hours.

MIT Video Surveys

A Video Survey inside the injection well casing be performed using the following procedures.

.A 6-inch diameter stripper head assembly will be bolted to the wellhead assembly above the existing 6-inch diameter gate valve. The stripper head will be of dimensions that allow the video operator to put his camera between the gate valve and the pack off and close both the valve and the pack off. The lower part of the assembly shall consist of a 4-inch tee and valve through which potable water may be introduced into the well.
.
Prior to performance of the survey and for a period of 24 hours, fresh water from an adjacent fire hydrant will be introduced into the well through a 4-inch diameter valve located on the stripper head assembly. Fresh water shall be pumped into the well to provide clarity for the survey.

3. If, after 24 hours of pumping potable water into the well, the water quality does not permit a clear picture of the inside of the well, the CONTRACTOR may be required to perform additional pumping services to assure a good survey as specified above.

4. The pumping of the potable water will continue at a rate of approximately 0 to 250 gpm during video surveying. If the open hole portion of the well is not clean, or visibility in any part of the well is poor, the CONTRACTOR shall perform additional pumping services to ensure a good video survey before running another or continuing with the survey.

5. During the video survey, the CONTRACTOR shall stop the camera's progress as instructed by the ENGINEER at depths where there may be potential flaws in the casing or other features to allow for thorough examination at those locations.

Upon reaching the total depth of the well with the video camera and obtaining a video survey satisfactory to the ENGINEER, the camera shall be removed from the well, and the well placed back in service.

MIT Radioisotope Tracer Survey and Temperature Survey

A radioisotope tracer survey shall be used to detect any fluid movement outside of the injection casing from the injection zone into the overlaying aquifers. The tool configuration shown below, or approved equal is required. The tool must be capable of ejecting the radioactive tracer and simultaneously monitoring the gamma ray sensors. No time lag between ejection and monitoring is permitted. A casing collar locator (CCL) shall be positioned below the tool as shown below, to precisely locate the bottom of the casing. Two low flow dynamic test runs, shall be performed. Additional low flow dynamic test runs can be done if results warrant additional testing, as determined by the ENGINEER in consultation with FDEP staff.

A temperature survey log shall also be performed from land surface to the total depth of the well. The temperature log shall be performed logging down at a rate of not more than 60 feet per minute. The temperature survey shall be performed after the well has been "shut in" and stabilized for at least 12 hours prior to the dynamic and static tests.

The Contractor shall perform an initial background gamma ray survey extending from the base of the land surface to the total depth of the well. The background gamma ray log shall be taken at a rate of not more than 60 feet per minute.

After the dynamic tests are completed, another background gamma ray survey shall be taken from the base of the casing to the base of the intermediate casing.

If additional radioisotope tracer survey work is ordered by the Engineer, it will be paid for at the hourly price proposed for additional radioisotope tracer surveys.

Radioactive Tracer Survey (RTS)

A RTS will be performed in the injection well. The tool used for testing will be configured according to information to be supplied by the service company performing the logs and as approved by the ENGINEER. Below is an example of a typical RTS tool that will be used for these surveys. The CONTRACTOR will provide a specific tool configuration with the logs.

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)
			CHD-SDSCHD (SDS) Cable Head	1.00	1.50	5.00
GR#3	23.83					
			GR #3 -GR#3 (GR#3_T) GR#3_TOP	9.33	1.69	50.00
			TREJCT-A (RTS) EJECTOR 14.5' FROM TOOL BOTTOM	3.00	1.69	10.00
			GR #2 -GR#2 (GR#2_M) GR#2_MIDDLE	3.58	1.69	25.00
GR#2	11.17					
CCL	9.63		CCL-000 (000001) RTS_CCL	0.75	1.69	5.00
			TRDET-GR#1 (GR#1_B) GR#1_BOTTOM	8.67	1.69	50.00
GR#1	0.58		TEMP-11116Temp (11116HT)	0.58	1.69	5.00
TEMP	0.17		RTS_TEMP			

Dataset: sdiw1.db: field/well/run1/FINBK
Total Length: 26.92 ft
Total Weight: 150.00 lb
O.D. 1.69 in

RTS tool Typical Configuration

The sequence of the tests shall be as follows:

First Low Flow Dynamic: The low flow run of the radioactive tracer survey shall be performed with a pumping-in velocity of 3 to 5 feet per minute. This would require a volume of between 65 gpm and 108 gpm to be injected during the survey. This is for the 24 inch wells, for Well I-5, which has a 20 inch casing this volume is 44 gpm and 73 gpm. Potable water from the same source as used for the video survey would be used as the most appropriate water supply for this portion of the test.

1) After beginning the flow of water into the well, the tool will be placed at a depth of approximately 5 feet above the base of the final casing, and a slug of 2 millicuries radioactive Iodine 131 is ejected. The tool will remain in place for a period of approximately one hour and the three gamma ray detectors in the "time drive" mode will record the movement of the slug. If tracer is detected at the uppermost detector, indicating potential staining of the tool, the tool may be moved upward to an alternate location.

2) After the one hour waiting period, a log out-of-position will be performed between the ejection point and a minimum of 200 feet above the highest point of tracer detection.

3) Upon completion of logging, the casing will be flushed with 3 to 5 casing volumes of effluent.

4) After flushing, the tool will immediately be run to the base of the casing, then the interval between the ejection point and 200 feet above the highest point of tracer detection will be logged.

Second Low Flow Dynamic: The process described above for the low flow dynamic log will be repeated to include a log out-of-position, a casing flush, and an after flush pass. A slug of tracer greater than or equal to 3 millicuries shall be used as determined by the ENGINEER.

If, during testing, no apparent anomalies appear that may indicate a lack of mechanical integrity in the injection well, the RTS will be concluded. If anomalies do occur, the RTS will be altered to track the radioactive tracer material. After RTS is complete, the RTS tool will be discharged in the injection zone and the well shall be flushed with 3 to 5 volumes of effluent. A second background log will be run from the bottom to the top of the well.

MIT Deadlines (sorted by date MIT pressure test due)

SDWWTP MIT Schedule of Completion

Well	Pressure Test	RTS/Video
IW-2	7/13/2013	7/25/2013
IW-1[1]	7/20/2013	7/31/2013
IW-3	7/24/2013	8/7/2013
IW-9[1]	7/30/2013	8/12/2013
IW-10[1]	8/6/2013	8/21/2013
IW-11	8/20/2013	9/3/2013
IW-12	8/25/2013	9/19/2013
IW-14	9/9/2013	9/26/2013
IW-13	9/16/2013	10/6/2013
IW-4	9/25/2013	10/14/2013
IW-6	9/30/2013	10/20/2013
IW-5	10/19/2013	10/27/2013
IW-7[2]	10/26/2013	1/7/2014
IW-8	11/2/2013	11/12/2013
IW-17	11/11/2013	11/19/2013
IW-16	11/18/2013	12/9/2013
IW-15	12/3/2013	12/16/2013

NOTES:
1.The original video was not clear enough and therefore a new video was done at the end of the MITs at SDWWTP.
2.The Computer failed during the RTS, because the Iodine 131 had already been injected, FDEP and DOH required 46 days b/f the RTS could be redone.

NDWWTP MIT Schedule of Completion

Well	Pressure Test	RTS/Video
IW-1N	3/14/2014	3/26/2014
IW-2N	3/25/2014	4/9/2014
IW-3N	4/2/2014	4/17/2014
IW-4N	4/9/2014	4/24/2014

REPAIR PLAN:

The following repair plans apply to wells at SDWWTP and NDWWTP.

1. Kill well and remove 24 inch gate valve and 4 inch bypass valves. Remove 1 inch pressure transmitter line and weld hold closed. Please see drawings included in below.

2. Sand existing casing in concrete pits and coat with Bitumastic. Please see drawings included in below.

3. Chip concrete around outer casing 1 inch deep, in order to embed PVC sleeve. Please see drawings included in below.

4. Install C905 PVC sleeve around casing pipe, embed 1 inch deep and fill annular space with grout, using Type II Neat cement. Slope top edge to create 30 degree watershed and seal at edges with sealant. Please see drawings included in below.

5. Relocate 1 inch pressure transmitter as indicated in drawings. Weld the hole. Please see drawings included in below.

6. At the NDWWTP IW-1N, IW-3N and IW-4N install new magmeters with any necessary spool pieces to be field determined. Please see drawings included in below.

7. Reassemble wellheads including installation of new 24 inch butterfly valve on horizontal part of well. Mega flanges will be used to ensure the layout of the pipe and the vales match. Please see drawings included in below.

8. On IW-4N at NDWWTP, install electric actuator for butterfly valve at base of injection well. Please see drawings included in below.

Appendix B

FDEP Approval of MIT Plan for SDWWTP and NDWWTP

November 26, 2012

Villamil, Sonia (WASD)

From: May, Joseph [redacted]
Sent: Monday, November 26, 2012 2:40 PM
To: Villamil, Sonia (WASD)
Cc: Vandor, Heidi; Silverman, Mark; Walsh, Virginia (WASD); Goldenberg, Bertha M. (WASD); Fallon Jr., Howard J. (WASD); Arrebola, Vicente (WASD); Macfarlane, Maria (WASD); Oakley, Clint (WASD)
Subject: RE: MDWASD MIT and Repair Plan Submittal

Importance: High

Hello all,

The Department approves the plan with the following understandings:

1) Medicinal grade I-131 should be specified since this solution is filtered to reduce precipitate material, as opposed to regular grade I-131, in the vial causing a tool malfunction. It has been our experience that an activity of ~1mCi/ml has been the easiest to work with in the field.
2) Please contact me a minimum of three days prior to mobilization to each site. Due to the travel time from West Palm Beach to the sites close coordination would be appreciated between myself and a designated contact person from the utility so that each pressure and RTS can be witnessed.

Thank you,

Joe

Please take a few minutes to share your comments on the service you received from the department by clicking on this link. DEP Customer Survey.

From: Villamil, Sonia (WASD) [mailto:[redacted]
Sent: Wednesday, October 17, 2012 9:42 AM
To: May, Joseph
Cc: Vandor, Heidi; Silverman, Mark; Walsh, Virginia (WASD); Goldenberg, Bertha M. (WASD); Fallon Jr., Howard J. (WASD); Arrebola, Vicente (WASD); Macfarlane, Maria (WASD); Oakley, Clint (WASD)
Subject: MDWASD MIT and Repair Plan Submittal

Hello Mr. May,

The MDWASD respectfully submits the attached MIT testing and repair plan for your approval. The paper copy is being sent via regular mail as well.

Thank you,

Sonia Villamil
Engineer II
Miami Dade Water and Sewer Department
3071 SW 38th Ave Room 554-8
Miami, FL 33146
[redacted]
fax: 786-552-8640
miamidade.gov

Appendix C

Field Notes from tests including gauge certification and pressure charts.

MIAMI-DADE WATER AND SEWER DEPARTMENT

MECHANICAL INTEGRITY TESTING OF DEEP INJECTION WELLS AND ASSOCIATED SERVICES

BID NO.: RPQ P0086

PRESSURE TEST IW - 15

August 29, 2013

TIME	CASING PRESSURE (psi)	PACKER PRESSURE (psi)
10:00	153	360
10:05	152.5	360⁻
10:10	152	~~340~~ ± 350 SV
10:15	152	340
10:20	151.5	340
10:25	151	340⁻
10:30	151	330
10:35	150.5	320
10:40	150	320⁻
10:45	150	320
10:50	149.5	310
10:55	149	310
11:00	148.5	310⁻

MIAMI-DADE WATER AND SEWER DEPARTMENT

MECHANICAL INTEGRITY TESTING OF DEEP INJECTION WELLS AND ASSOCIATED SERVICES

BID NO.: RPQ P0086

BREAK OFF TEST IW - 15

August 29, 2013

GALLONS	CASING PRESSURE (psi)	PACKER PRESSURE (psi)
0	148.5	310
5	121	300
10	95	280
15	64	270
20	43	260
25	18	240
~~30~~ 28.5 (14L)	0	230

2,381

Top of Packer: ~~2,402~~ SV feet

Bottom of Casing: 2,410 feet

MIAMI-DADE WATER AND SEWER DEPARTMENT

MECHANICAL INTEGRITY TESTING OF DEEP INJECTION WELLS AND ASSOCIATED SERVICES

BID NO.: RPQ P0086

PRESSURE TEST IW - 15

WITNESS LIST

August 29, 2013

NAME	SIGNATURE	COMPANY/AGENCY	TELEPHONE
Joe May	[redacted]	FDEP	[redacted]
M. MacFarlane		WASD	
S Villamil		WASD	

IW-15 PT
8/29/2013

Statistical Data		Temperatu	Pressure(psi)
	Sensor Range	-40 - +125 (	300 psia
	Minimum	76.1	0
	Maximum	100.4	153.2
	Field Cal Date	unknown	unknown
Rec #	Date/Time	Temperatu	Pressure(psi)
1	8/29/2013 9:57	85.5	153.2
2	8/29/2013 9:58	87.7	153.2
3	8/29/2013 9:59	89.1	153.1
4	8/29/2013 10:00	90.4	153.0
5	8/29/2013 10:01	91.4	152.9
6	8/29/2013 10:02	92.3	152.9
7	8/29/2013 10:03	92.7	152.8
8	8/29/2013 10:04	93.4	152.7
9	8/29/2013 10:05	94	152.6
10	8/29/2013 10:06	94.5	152.6
11	8/29/2013 10:07	94.8	152.5
12	8/29/2013 10:08	95.1	152.4
13	8/29/2013 10:09	95.4	152.3
14	8/29/2013 10:10	95.7	152.3
15	8/29/2013 10:11	95.8	152.2
16	8/29/2013 10:12	96.1	152.1
17	8/29/2013 10:13	96.1	152.0
18	8/29/2013 10:14	96.3	152.0
19	8/29/2013 10:15	96.7	151.9
20	8/29/2013 10:16	97.5	151.8
21	8/29/2013 10:17	97.5	151.7
22	8/29/2013 10:18	97.5	151.7
23	8/29/2013 10:19	97.5	151.6
24	8/29/2013 10:20	97.9	151.5
25	8/29/2013 10:21	97.9	151.4
26	8/29/2013 10:22	98.3	151.4
27	8/29/2013 10:23	98.6	151.3
28	8/29/2013 10:24	98.9	151.2
29	8/29/2013 10:25	98.6	151.1
30	8/29/2013 10:26	98.3	151.1
31	8/29/2013 10:27	98.1	151.0
32	8/29/2013 10:28	98.7	150.9
33	8/29/2013 10:29	99	150.8
34	8/29/2013 10:30	99.6	150.8
35	8/29/2013 10:31	99.8	150.7
36	8/29/2013 10:32	100.2	150.6
37	8/29/2013 10:33	100.1	150.5
38	8/29/2013 10:34	99.9	150.5

39	8/29/2013 10:35	100.2	150.4
40	8/29/2013 10:36	100.4	150.3
41	8/29/2013 10:37	100.2	150.2
42	8/29/2013 10:38	99.6	150.2
43	8/29/2013 10:39	99.3	150.1
44	8/29/2013 10:40	99.3	150.0
45	8/29/2013 10:41	99.3	149.9
46	8/29/2013 10:42	99.5	149.9
47	8/29/2013 10:43	99.5	149.8
48	8/29/2013 10:44	99.4	149.7
49	8/29/2013 10:45	99.4	149.7
50	8/29/2013 10:46	98.5	149.6
51	8/29/2013 10:47	98	149.5
52	8/29/2013 10:48	98.3	149.4
53	8/29/2013 10:49	98.6	149.4
54	8/29/2013 10:50	98.1	149.3
55	8/29/2013 10:51	97.5	149.2
56	8/29/2013 10:52	97.1	149.1
57	8/29/2013 10:53	96.8	149.1
58	8/29/2013 10:54	96.7	149.0
59	8/29/2013 10:55	97.5	148.9
60	8/29/2013 10:56	98.1	148.8
61	8/29/2013 10:57	98.1	140.8
62	8/29/2013 10:58	98.3	101.7
63	8/29/2013 10:59	98.1	109.6
64	8/29/2013 11:00	98	74.1
65	8/29/2013 11:01	97.5	71.8
66	8/29/2013 11:02	96.8	48.0
67	8/29/2013 11:03	95.7	39.1
68	8/29/2013 11:04	95	34.1
69	8/29/2013 11:05	94.9	20.3
70	8/29/2013 11:06	94.7	12.5
71	8/29/2013 11:07	94	9.7
72	8/29/2013 11:08	93.8	5.0
73	8/29/2013 11:09	93.8	2.1
74	8/29/2013 11:10	93.8	0.0

Certificate of Calibration

OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

Ozone Industries, Inc.
Precision Measurement Equipment Division

Purchase Order #

Calibration Performed By:
OZONE INDUSTRIES, INC.
15551 PINE RIDGE RD.
FORT MYERS, FL 33908

For:
YOUNGQUIST BROTHERS, INC.
15465 PINE RIDGE RD.
FORT MYERS, FL 33908

EQUIPMENT INFORMATION:

Description: PRESSURE GAUGE
Manufacter: MCDANIELS
Model Number: 300PSI
Part Number: N/A
Range: 0-300 PSI

Serial Number: 972062-1
Customer I.D.:
Cust. Barcode: N/A
Cust. Location: N/A
Specifications: +/- 0.25% FS

Cal Date: 6/6/2013
Cal. Due Date: 8/5/2013
Cal. Interval 60 DAYS
Received: IN TOLERANCE
Calibration Result: PASS
Environmental Conditions: 74 DEG F / 20% H
Performed By: Daniel McKissick

Procedure: STANDARD

This is to certify that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure at the points tested (unless otherwise noted). It has been Calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration is in accordance with Ozone Industries, Inc Quality Assurance Manual. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

Calibration Remarks:
THIS UNIT WAS FOUND TO BE IN TOLERANCE AT THE TIME OF CALIBRATION.
PERFORMED ROUTINE CALIBRATION / CERTIFICATION

Standards Used to Calibrate Equipment:

Company	I.D.	Description	Last Cal.	Cal. Due Date
OZONE	A1731	EATON UPC5000 PNEUMATIC CALIBRATOR	12/12/2012	12/12/2013

Signatures:

Certified by:
Print: Daniel McKissick
Date: 06/06/13
[redacted]

Approved by:
Print: Daniel McKissick
[redacted]

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ØZONE
INDUSTRIES
CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

PH: 239-433-3400
FAX: 239-489-3877

CONTROL NO: 032509-1

CUSTOMER: YBI15465

CALIBRATION DATA FORM

MFR:	MCDANIELS	**DESCRIPTION**	PRESSURE GAUGE
MODEL NO:	300 PSI .25%	**TECHNICIAN:**	0030
SERIAL NO:	972062-1	**CAL. DATE:**	06/06/13
CUST. ID:	N/A	**DUE DATE:**	08/05/13

* IF NO "AS LEFT" READING IS SHOWN ON THIS CHART, IT MEANS THE UNIT WAS IN TOLERANCE AND THERE WERE NO ADJUSTMENTS MADE TO IT.

RANGE: 0-300 PSI

NOMINAL	AS FOUND	AS LEFT *	LOW LIMIT	HIGH LIMIT
50	50.26		49.25	50.75
100	100.31		99.25	100.75
150	150.38		149.25	150.75
200	200.49		199.25	200.75
300	300.6		299.25	300.75

Certificate of Calibration

OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

Ozone Industries, Inc.
Precision Measurement Equipment Division

Purchase Order #

Calibration Performed By:
OZONE INDUSTRIES, INC.
15551 PINE RIDGE RD.
FORT MYERS, FL 33908

For:
YOUNGQUIST BROTHERS, INC.
15465 PINE RIDGE RD.
FORT MYERS, FL 33908

EQUIPMENT INFORMATION:

Description: PRESSURE GAUGE
Manufacter: McDaniel
Model Number: 300PSI
Part Number: N/A
Range: 0-300 PSI

Serial Number: 972034-2
Customer I.D.:
Cust. Barcode: N/A
Cust. Location: N/A
Specifications: +/- 0.25% FS

Cal Date: 5/17/2013
Cal. Due Date: 11/17/2013
Cal. Interval 6 MONTHS
Received: IN TOLERANCE
Calibration Result: PASS
Environmental Conditions: 74 DEG F / 80% H
Performed By: Daniel McKissick

Procedure: STANDARD

This is to certify that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure at the points tested (unless otherwise noted). It has been Calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration is in accordance with Ozone Industries, Inc Quality Assurance Manual. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

Calibration Remarks:
THIS UNIT WAS FOUND TO BE IN TOLERANCE AT THE TIME OF CALIBRATION.
PERFORMED ROUTINE CALIBRATION / CERTIFICATION

Standards Used to Calibrate Equipment:

Company	I.D.	Description	Last Cal.	Cal. Due Date
OZONE	A1731	EATON UPC5000 PNEUMATIC CALIBRATOR	12/12/2012	12/12/2013

Signatures:

Certified by:
Print: Daniel McKissick
[redacted]

Approved by:
Print: Daniel McKissick
Date: [redacted] 05/17/13
[redacted]

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15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

PH: 239-433-3400
FAX: 239-489-3877

CONTROL NO: 100809-7

CUSTOMER: YBI15465

CALIBRATION DATA FORM

MFR:	PIC	**DESCRIPTION**	PRESSURE GAUGE
MODEL NO:	300 PSI .25%	**TECHNICIAN:**	0030
SERIAL NO:	972034-2	**CAL. DATE:**	05/17/13
CUST. ID:	N/A	**DUE DATE:**	11/17/13

* IF NO "AS LEFT" READING IS SHOWN ON THIS CHART, IT MEANS THE UNIT WAS IN TOLERANCE AND THERE WERE NO ADJUSTMENTS MADE TO IT.

RANGE: 0-300 PSI

NOMINAL	AS FOUND	AS LEFT *	LOW LIMIT	HIGH LIMIT
50	49.59		49.25	50.75
100	99.47		99.25	100.75
150	149.45		149.25	150.75
200	199.43		199.25	200.75
300	299.4		299.25	300.75

Certificate of Calibration

OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

Ozone Industries, Inc.
Precision Measurement Equipment Division

Purchase Order #

Calibration Performed By:
OZONE INDUSTRIES, INC.
15551 PINE RIDGE RD.
FORT MYERS, FL 33908

For:
YOUNGQUIST BROTHERS, INC.
15465 PINE RIDGE RD.
FORT MYERS, FL 33908

EQUIPMENT INFORMATION:

Description: PRESSURE GAUGE
Manufacter: MCDANIELS
Model Number: 300PSI
Part Number: N/A
Range: 0-300 PSI

Serial Number: AB30128
Customer I.D.:
Cust. Barcode: N/A
Cust. Location: N/A
Specifications: +/- 0.25% FS

Cal Date: 6/17/2013
Cal. Due Date: 12/17/2013
Cal. Interval 6 MONTHS
Received: IN TOLERANCE
Calibration Result: PASS
Environmental Conditions: 73 DEG F / 40% H
Performed By: Daniel McKissick

Procedure: STANDARD

This is to certify that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure at the points tested (unless otherwise noted). It has been Calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration is in accordance with Ozone Industries, Inc Quality Assurance Manual. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

Calibration Remarks:
THIS UNIT WAS FOUND TO BE IN TOLERANCE AT THE TIME OF CALIBRATION.
PERFORMED ROUTINE CALIBRATION / CERTIFICATION

Standards Used to Calibrate Equipment:

Company	I.D.	Description	Last Cal.	Cal. Due Date
OZONE	A1731	EATON UPC5000 PNEUMATIC CALIBRATOR	12/12/2012	12/12/2013

Signatures:

Certified by:
Print: Daniel McKissick
Date: 06/17/13
[redacted]

Approved by:
Print: Daniel McKissick
Date: 06/17/13
[redacted]

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OZONE
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15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

PH: 239-433-3400
FAX: 239-489-3877

CONTROL NO: 080709-2

CUSTOMER: YBI15465

CALIBRATION DATA FORM

MFR:	MCDANIELS	**DESCRIPTION**	PRESSURE GAUGE
MODEL NO:	300 PSI .25%	**TECHNICIAN:**	0030
SERIAL NO:	AB30128	**CAL. DATE:**	06/17/13
CUST. ID:	N/A	**DUE DATE:**	12/17/13

* IF NO "AS LEFT" READING IS SHOWN ON THIS CHART, IT MEANS THE UNIT WAS IN TOLERANCE AND THERE WERE NO ADJUSTMENTS MADE TO IT.

RANGE: 0-200 PSI

NOMINAL	AS FOUND	AS LEFT *	LOW LIMIT	HIGH LIMIT
50	50.18		49.25	50.75
100	100.19		99.25	100.75
150	150.22		149.25	150.75
200	200.31		199.25	200.75
250	250.33		249.25	250.75
300	300.39		299.25	300.75

Appendix D

RTS and RTS Tool Configuration

HIGH RESOLUTION TEMPERATURE LOG

Company	SOUTH MIAMI-DADE W.W.T.P.
Well	IW-15
Field	S.D.W.W.T.P.
County	MIAMI-DADE
State	FLORIDA

Company SOUTH MIAMI-DADE W.W.T.P.
Well IW-15
Field S.D.W.W.T.P.
County MIAMI-DADE
State FLORIDA

Location: API # :

SEC TWP RGE

Other Services

Permanent Datum	PAD	Elevation	PAD
Log Measured From	PAD		
Drilling Measured From	PAD		

Elevation
K.B.
D.F.
G.L.

Date	06-SEP-2013		
Run Number	2013 MIT		
Depth Driller	2944'		
Depth Logger	2944'		
Bottom Logged Interval	2944'		
Top Log Interval	SURFACE		
Open Hole Size	22"		
Type Fluid	WATER		
Density / Viscosity	NA		
Max. Recorded Temp.	80.3 degF		
Estimated Cement Top	NA		
Time Well Ready	ON ARRIVAL		
Time Logger on Bottom	ON ARRIVAL		
Equipment Number	102		
Location	FT MYERS		
Recorded By	MOREY	RIVES	
Witnessed By	S. VILLAMIL		

Borehole Record				Borehole Record			
Run Number	Bit	From	To	Run No	Bit	From	To

Casing Record	Size	Wgt/Ft	Top	Bottom
Surface String				
Prot. String				
Production String	24"	.500" W.T.	SURFACE	2416'
Liner				

<< Fold Here >>>

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

Comments

RADIOACTIVE TRACER SURVEY

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)

GR#3	24.00				
		GR #3 -RTST (952T)	11.50	1.69	30.00
		TREJCT-A (952)	1.00	1.69	10.00
		GR #2 -RTSM (952M)	3.00	1.69	10.00
GR#2	10.50				
CCL	9.60	CCL-1.68GRRTS (952)	0.75	1.69	10.00
		GR-RTSB (952B)	9.25	1.69	10.00
GR	1.20				

Dataset: sdwwtp-iw15.db: field/well/run1/pass2
Total Length: 25.50 ft
Total Weight: 70.00 lb
O.D. 1.69 in

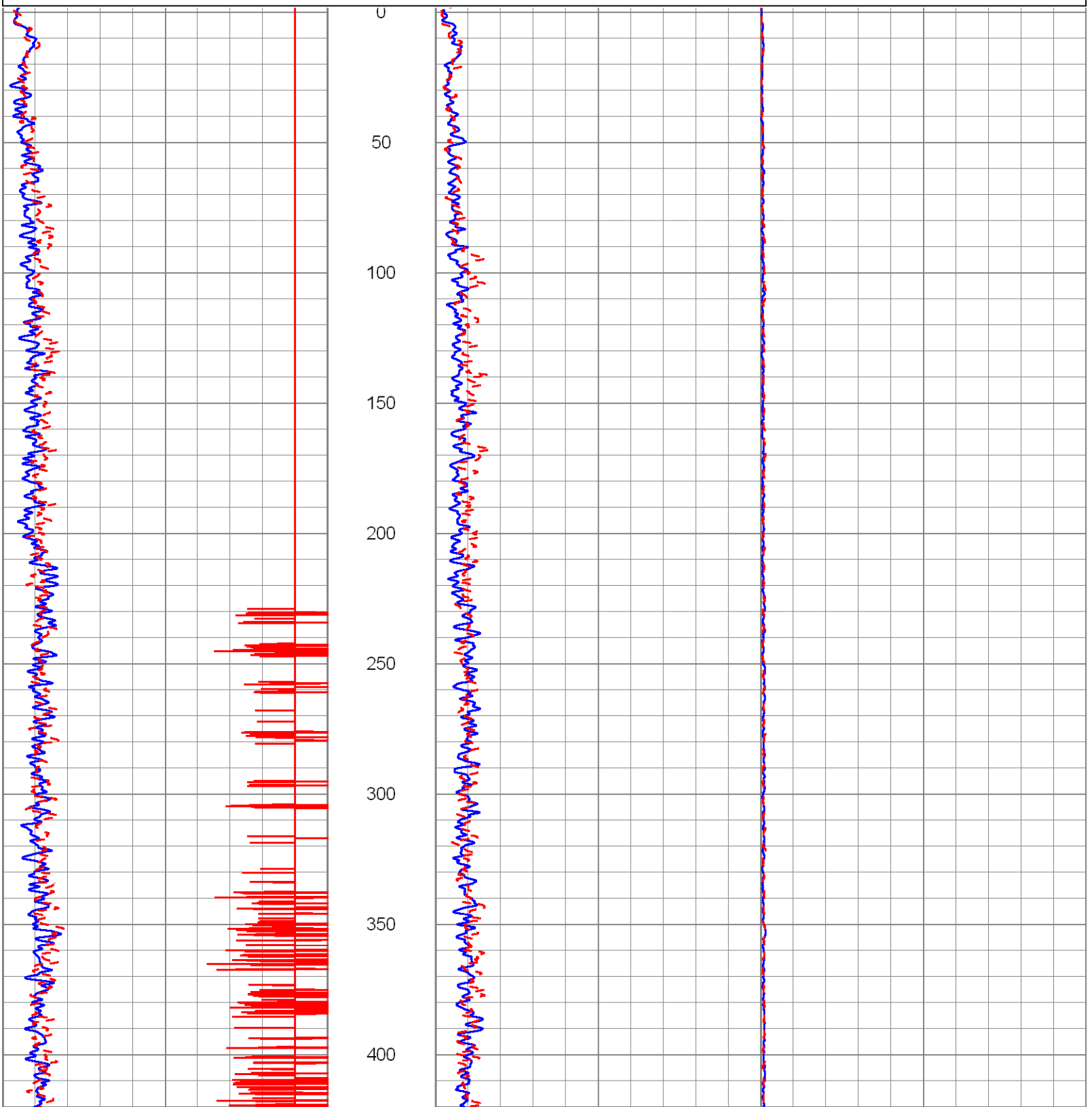
YOUNGQUIST

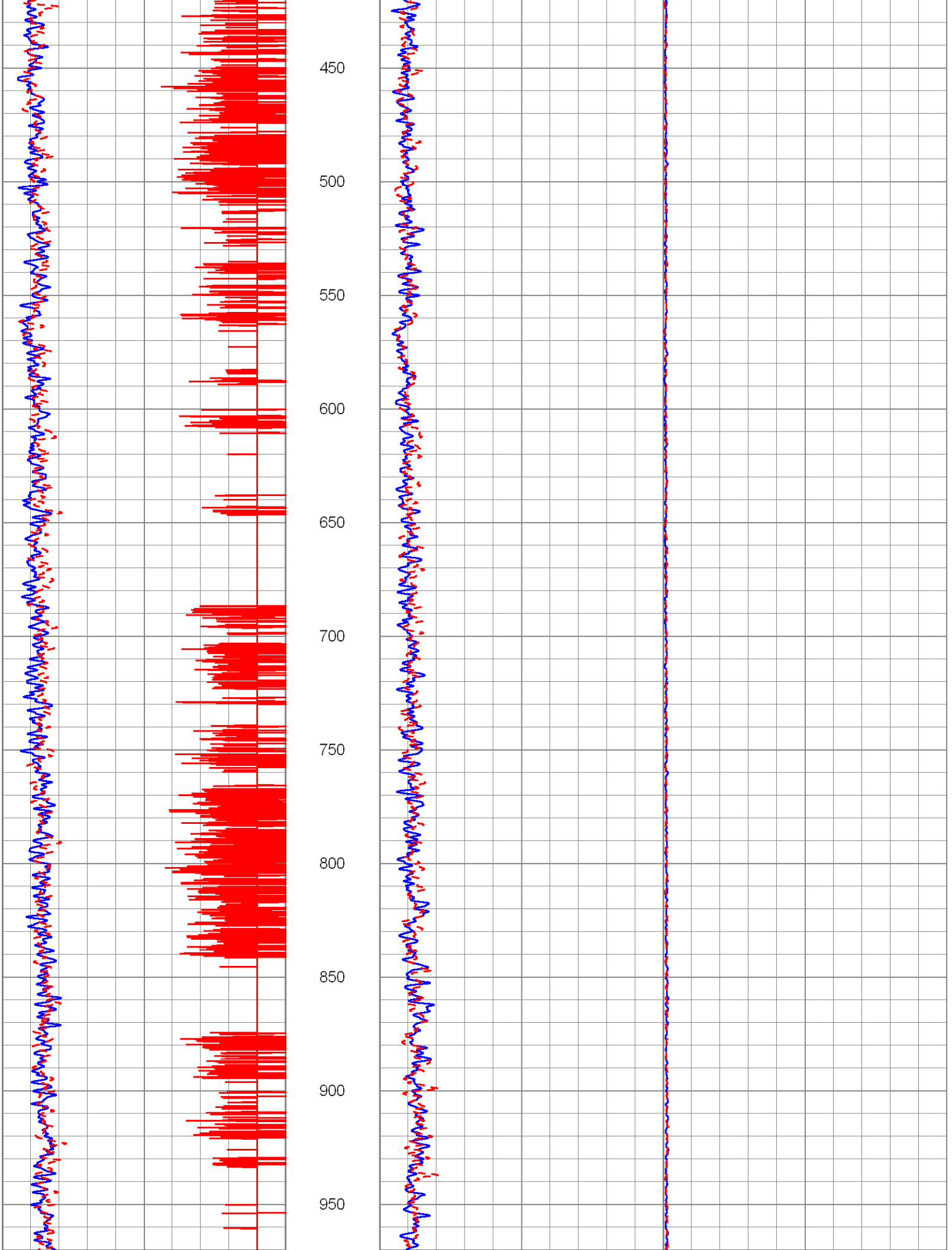
FINAL BACKGROUND

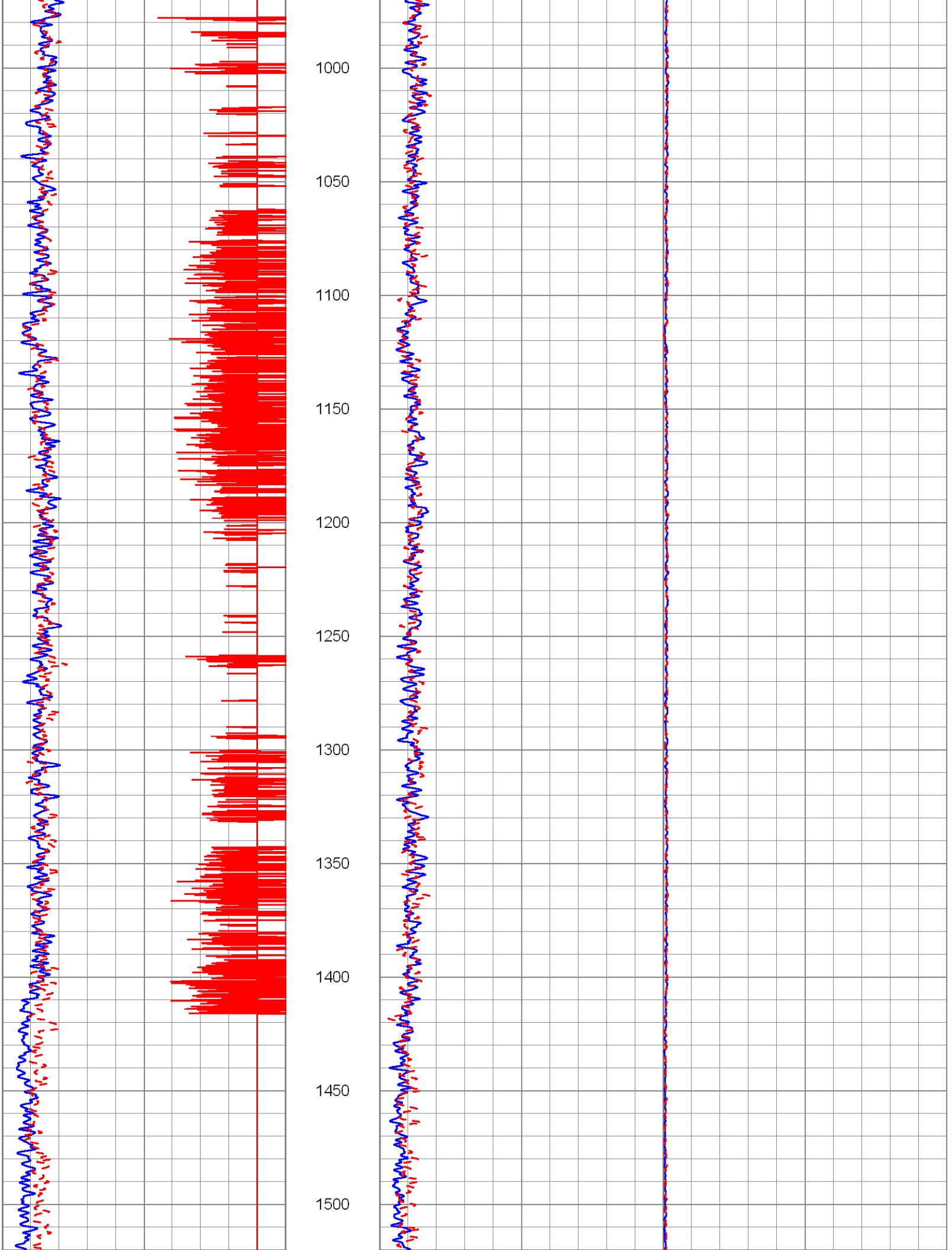
FINAL BACKGROUND

Database File:	sdwwtp-iw15.db
Dataset Pathname:	pass11
Presentation Format:	rts
Dataset Creation:	Fri Sep 06 14:48:09 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:600

0	GRT (GAPI)	100	0	GRB (GAPI)	100	0	GRM (GAPI) 1000
0	GRT-BACKGRND (GAPI)	100	0	GRB-BACKGRD (GAPI)	100	0	GRM-BACKGRND (GAPI) 1000
0.9	CCL	-0.1					




450
500
550
600
650
700
750
800
850
900
950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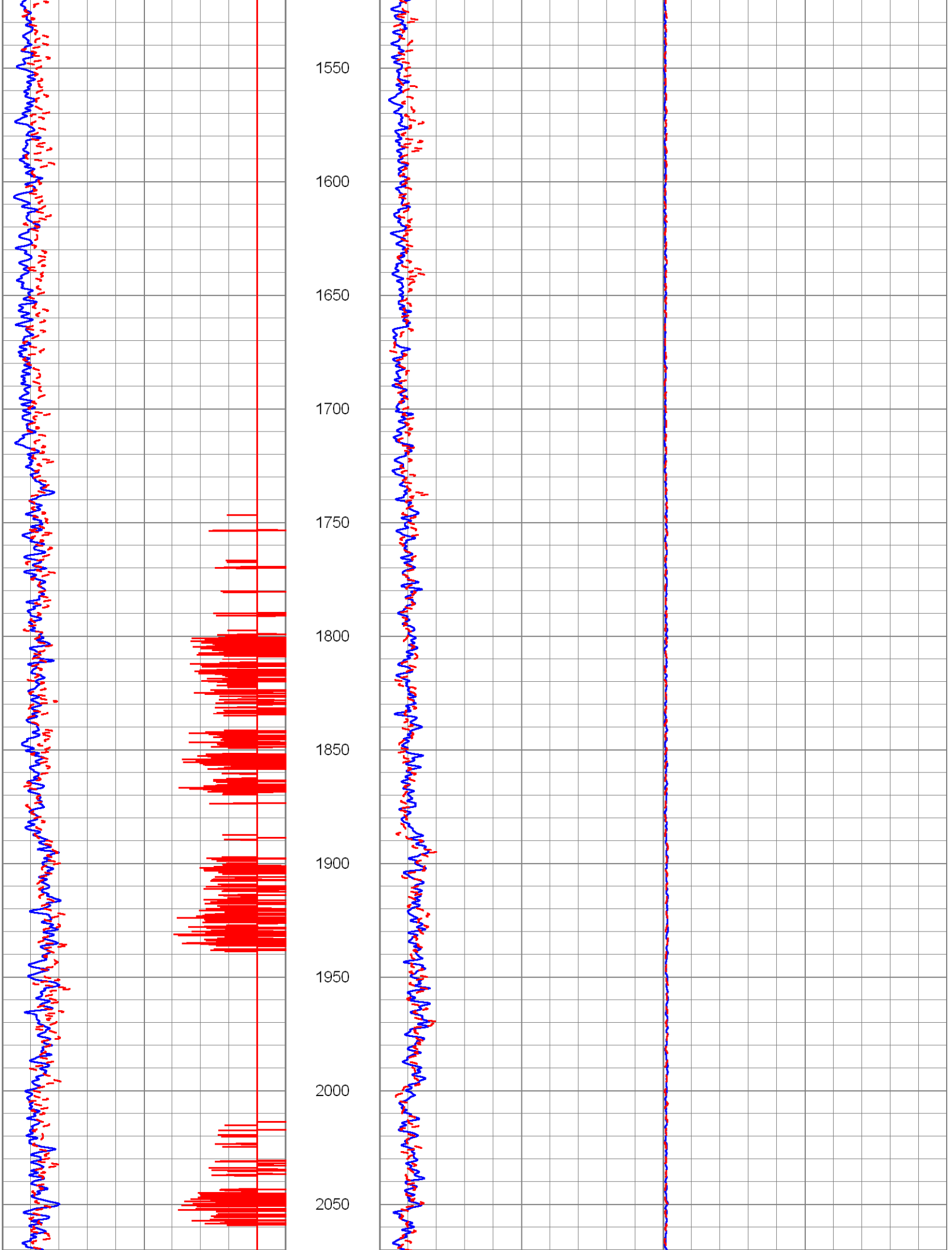
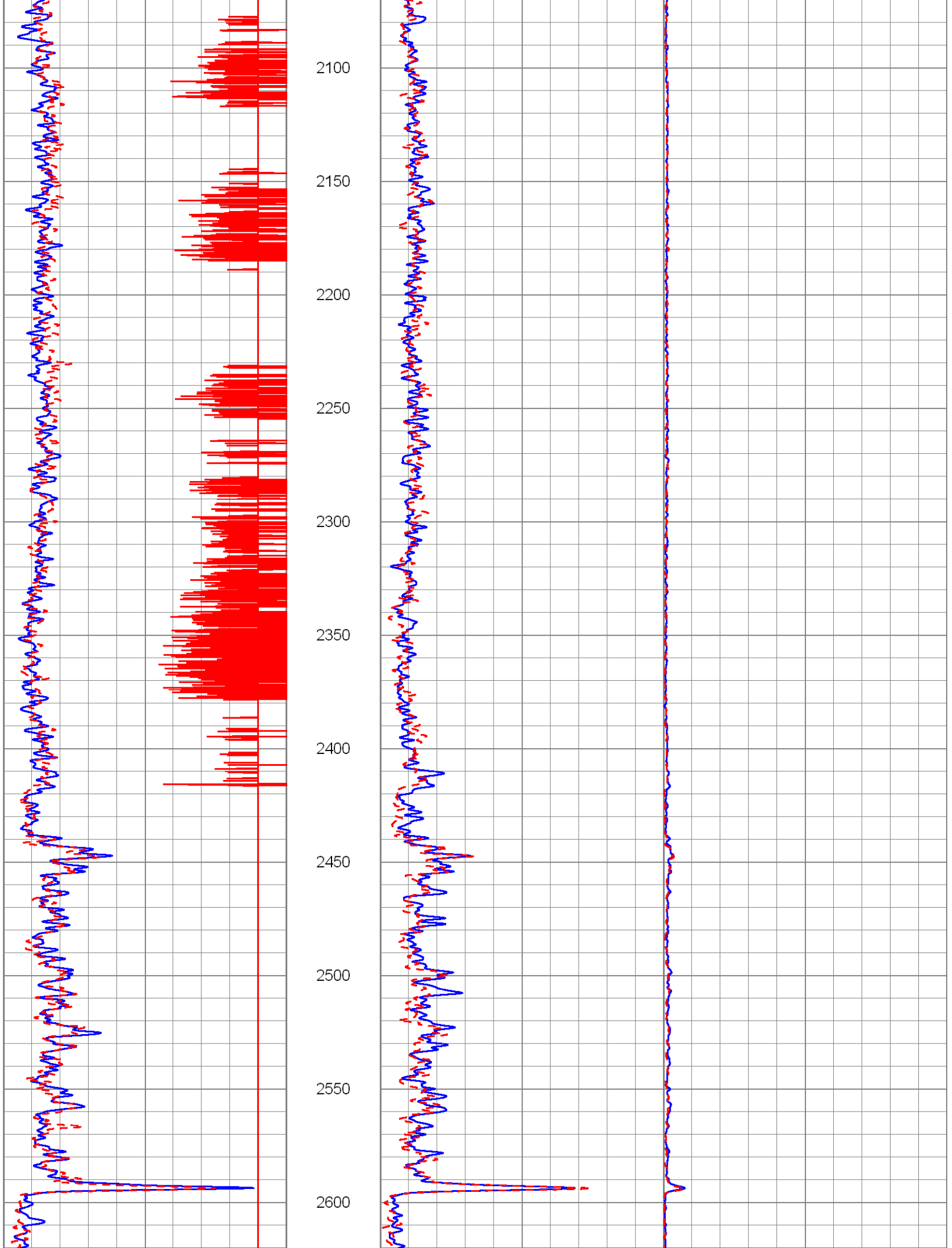
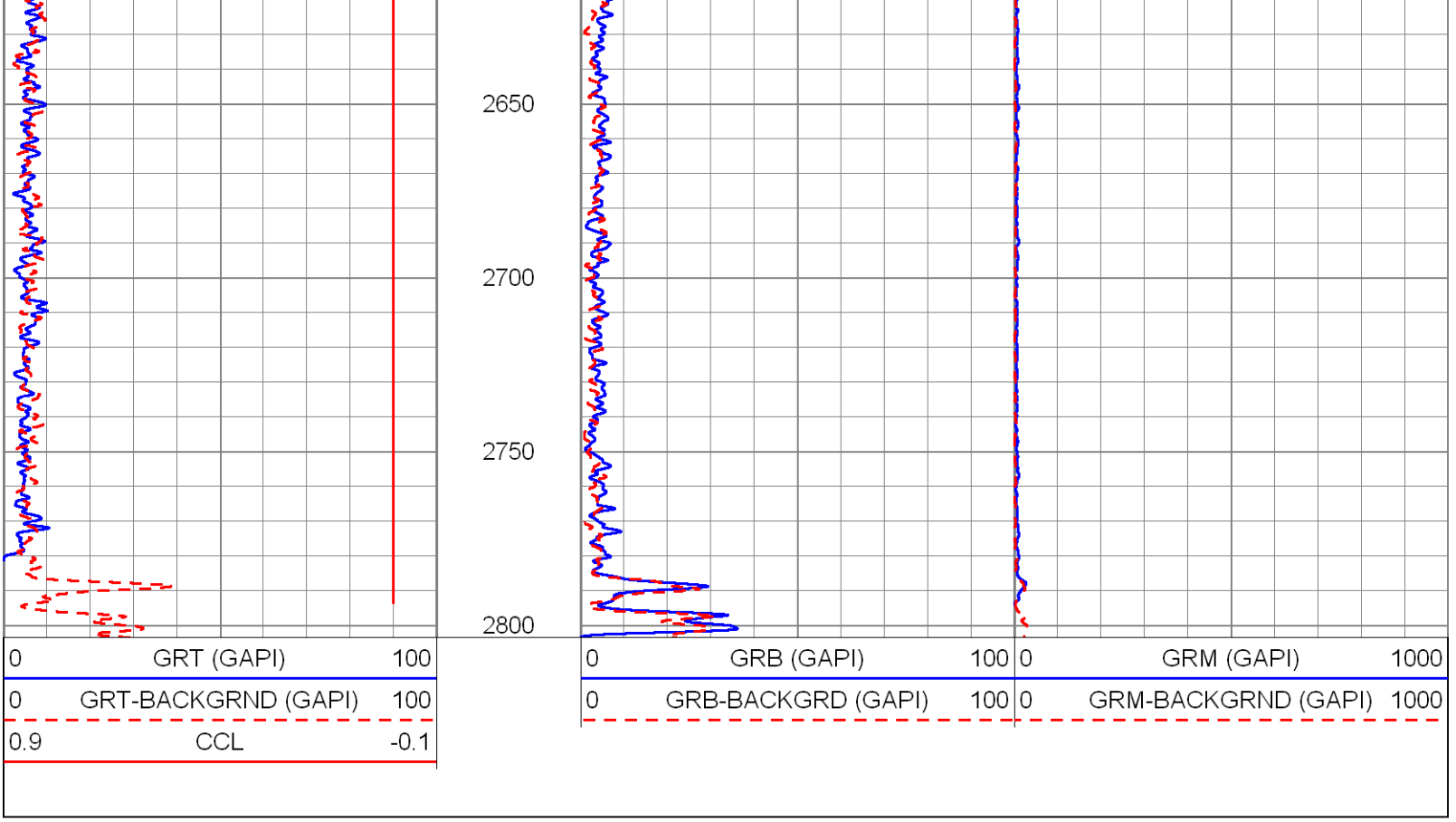
1050
1100
1150
1200
1250
1300
1350
1400
1450
1500

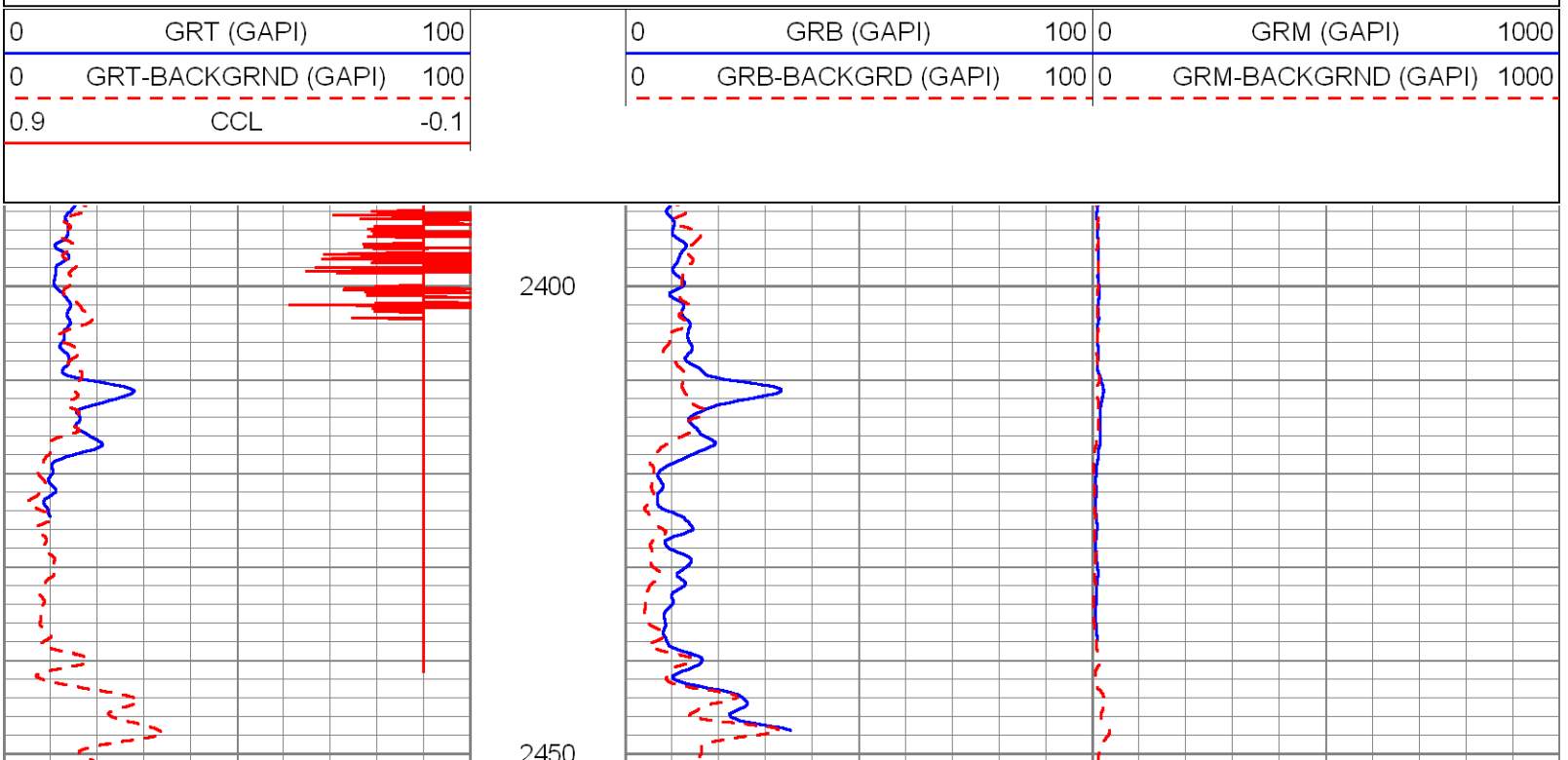

1550
1600
1650
1700
1750
1800
1850
1900
1950
2000
2050


2100
2150
2200
2250
2300
2350
2400
2450
2500
2550
2600



LAF #2

Database File:	sdwwtp-iw15.db
Dataset Pathname:	pass10
Presentation Format:	rts
Dataset Creation:	Fri Sep 06 14:33:12 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:240

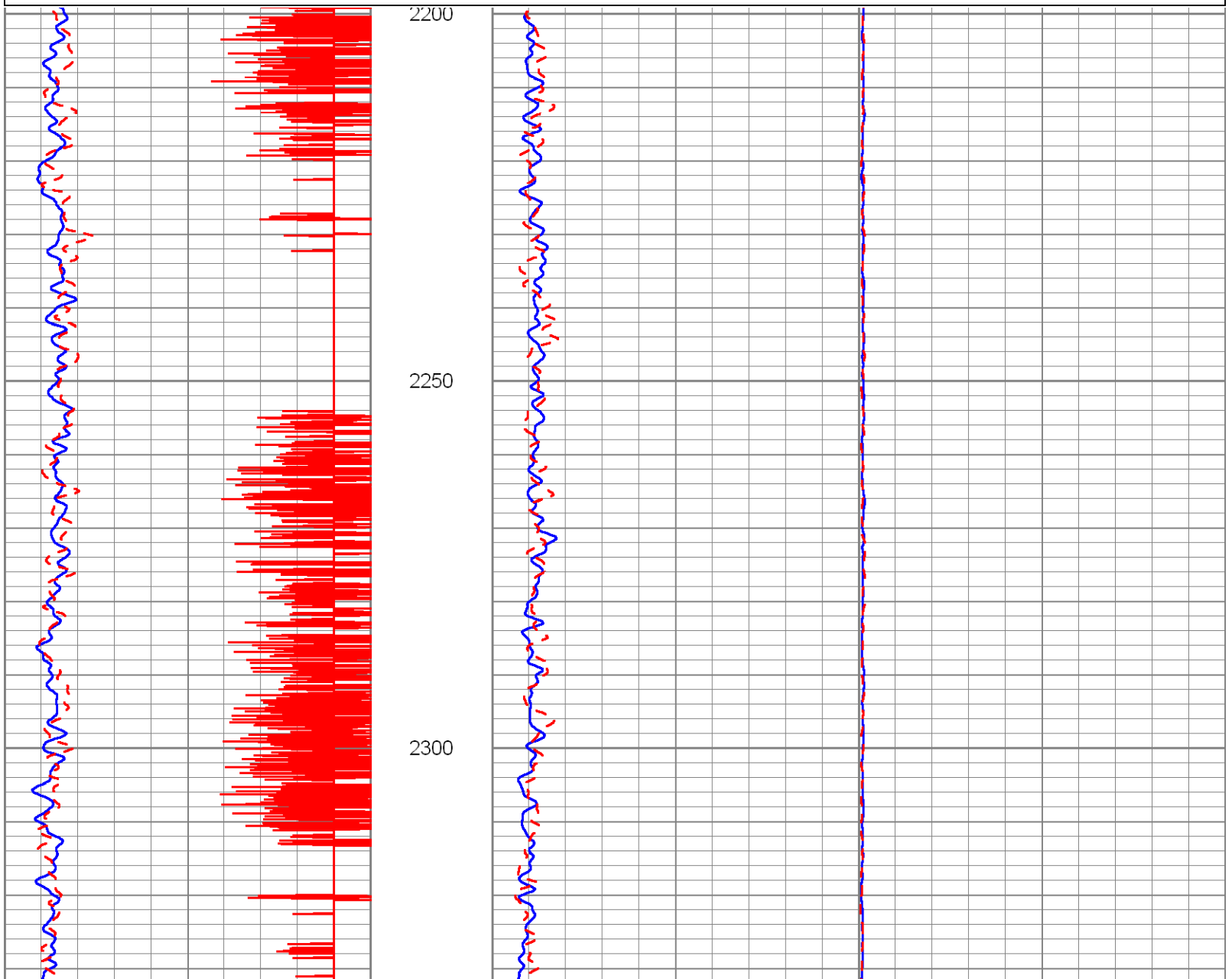


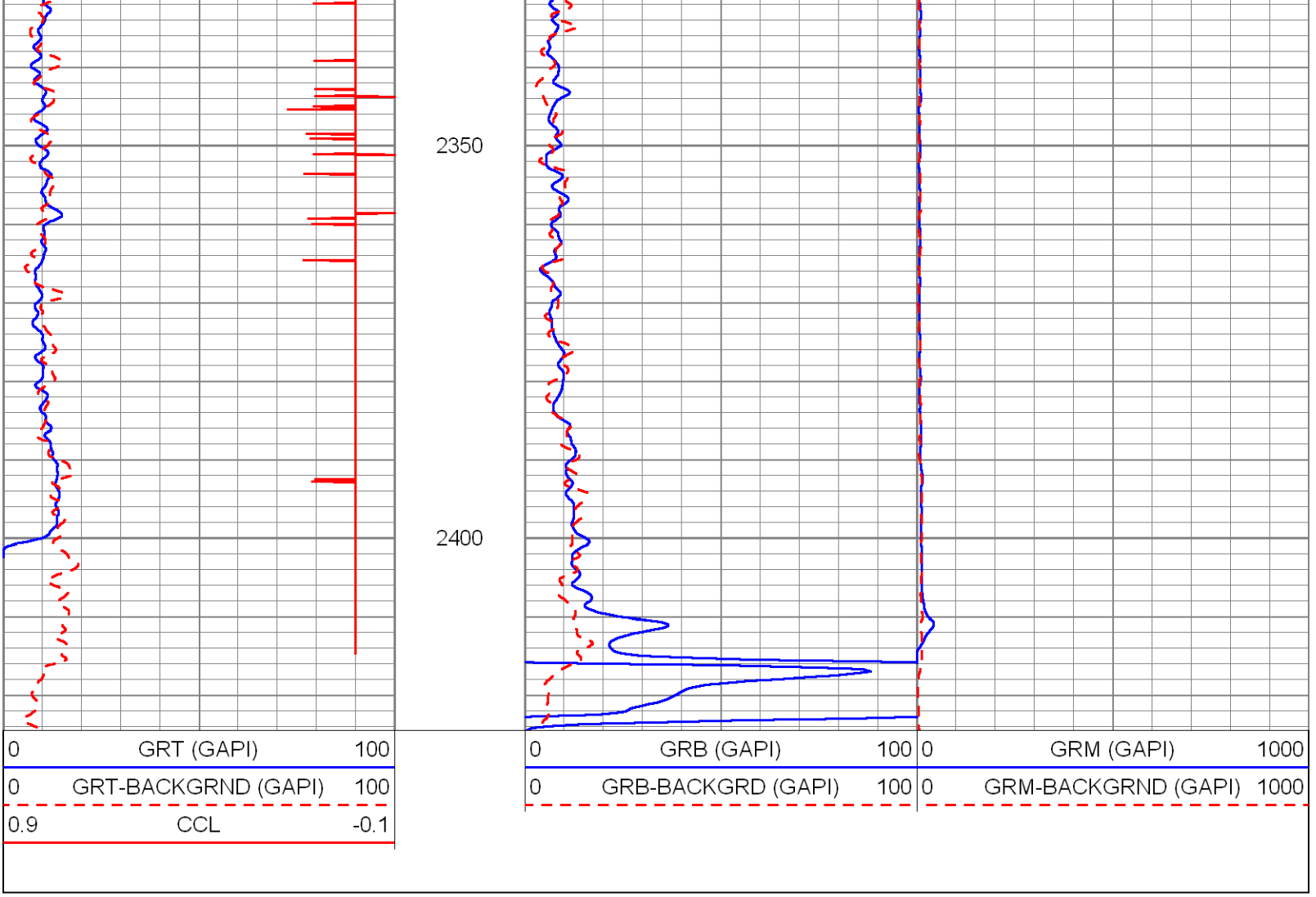
0	GRT (GAPI)	100		0	GRB (GAPI)	100	0	GRM (GAPI) 1000
0	GRT-BACKGRND (GAPI)	100		0	GRB-BACKGRD (GAPI)	100	0	GRM-BACKGRND (GAPI) 1000
0.9	CCL	-0.1						

LOP #2

Database File:	sdwwtp-iw15.db
Dataset Pathname:	pass9
Presentation Format:	rts
Dataset Creation:	Fri Sep 06 14:17:14 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:240

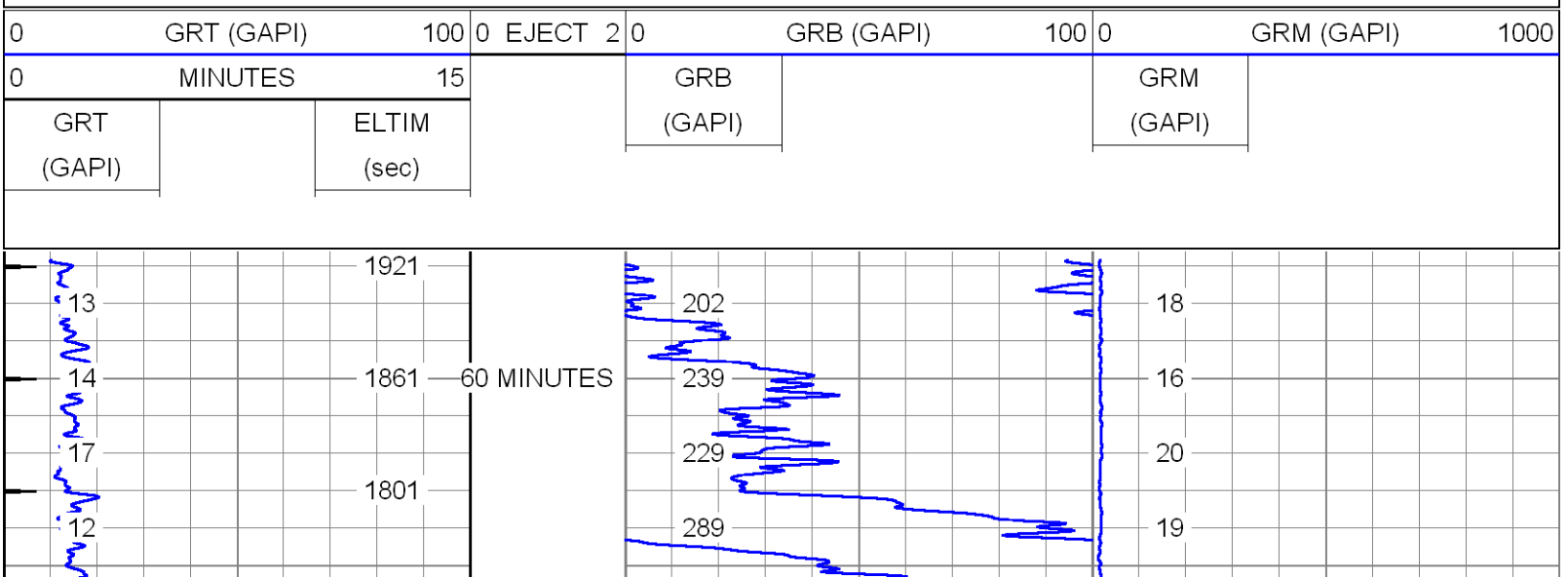
0	GRT (GAPI)	100		0	GRB (GAPI)	100	0	GRM (GAPI) 1000
0	GRT-BACKGRND (GAPI)	100		0	GRB-BACKGRD (GAPI)	100	0	GRM-BACKGRND (GAPI) 1000
0.9	CCL	-0.1						

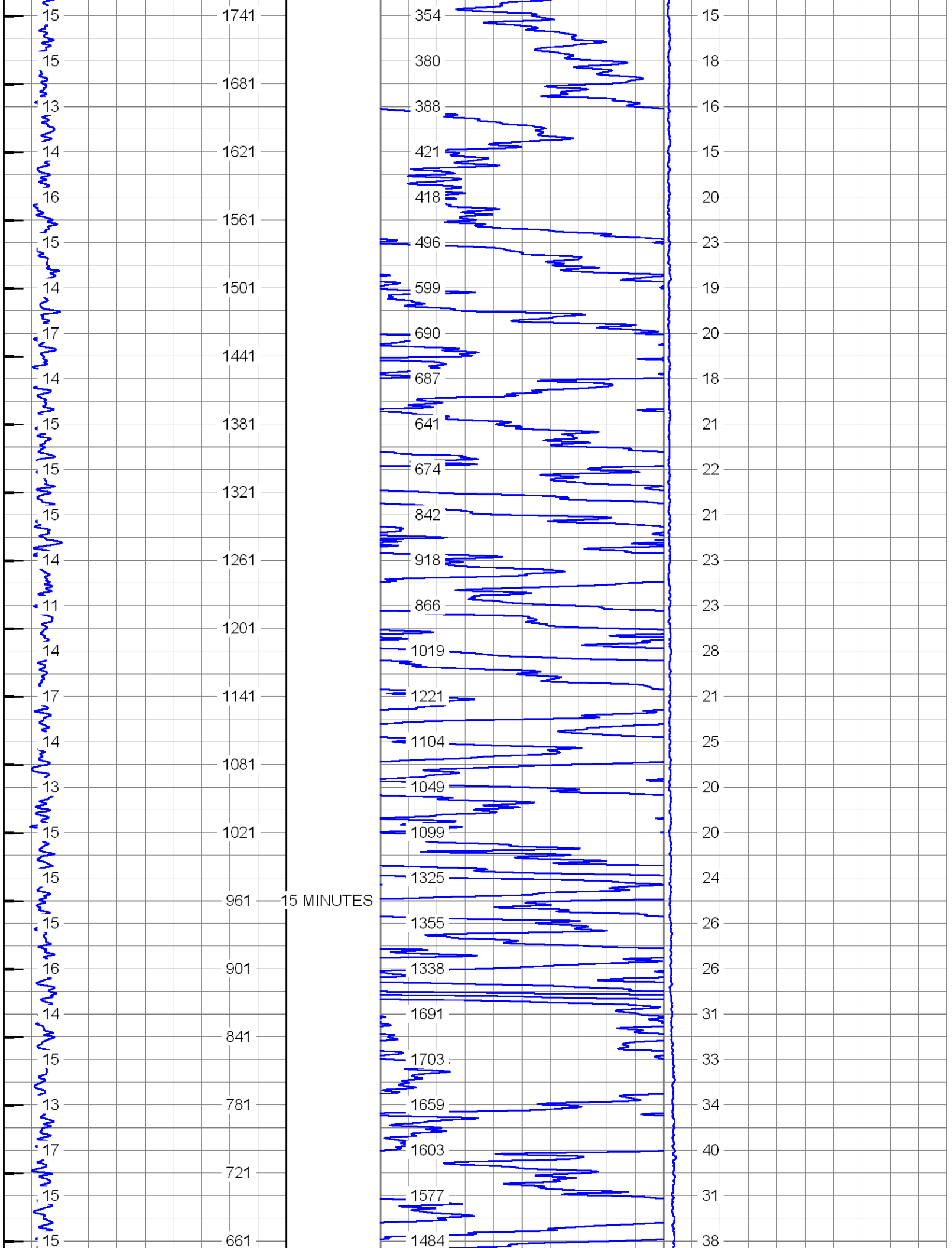


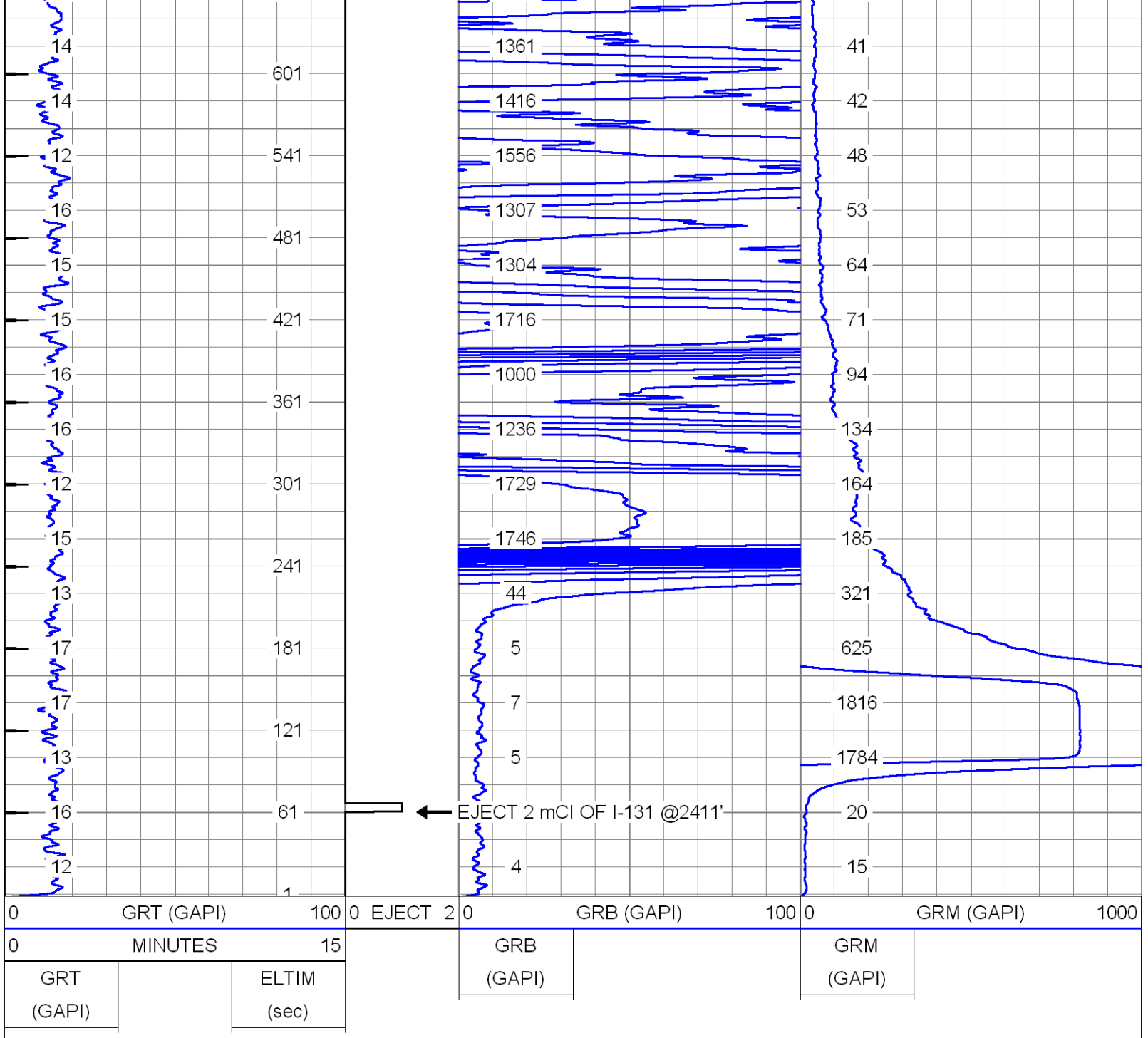


DYNAMIC TEST #2 (82 GPM)

Database File:	sdwwtp-iw15.db
Dataset Pathname:	pass8
Presentation Format:	rtstime
Dataset Creation:	Fri Sep 06 13:42:31 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:600



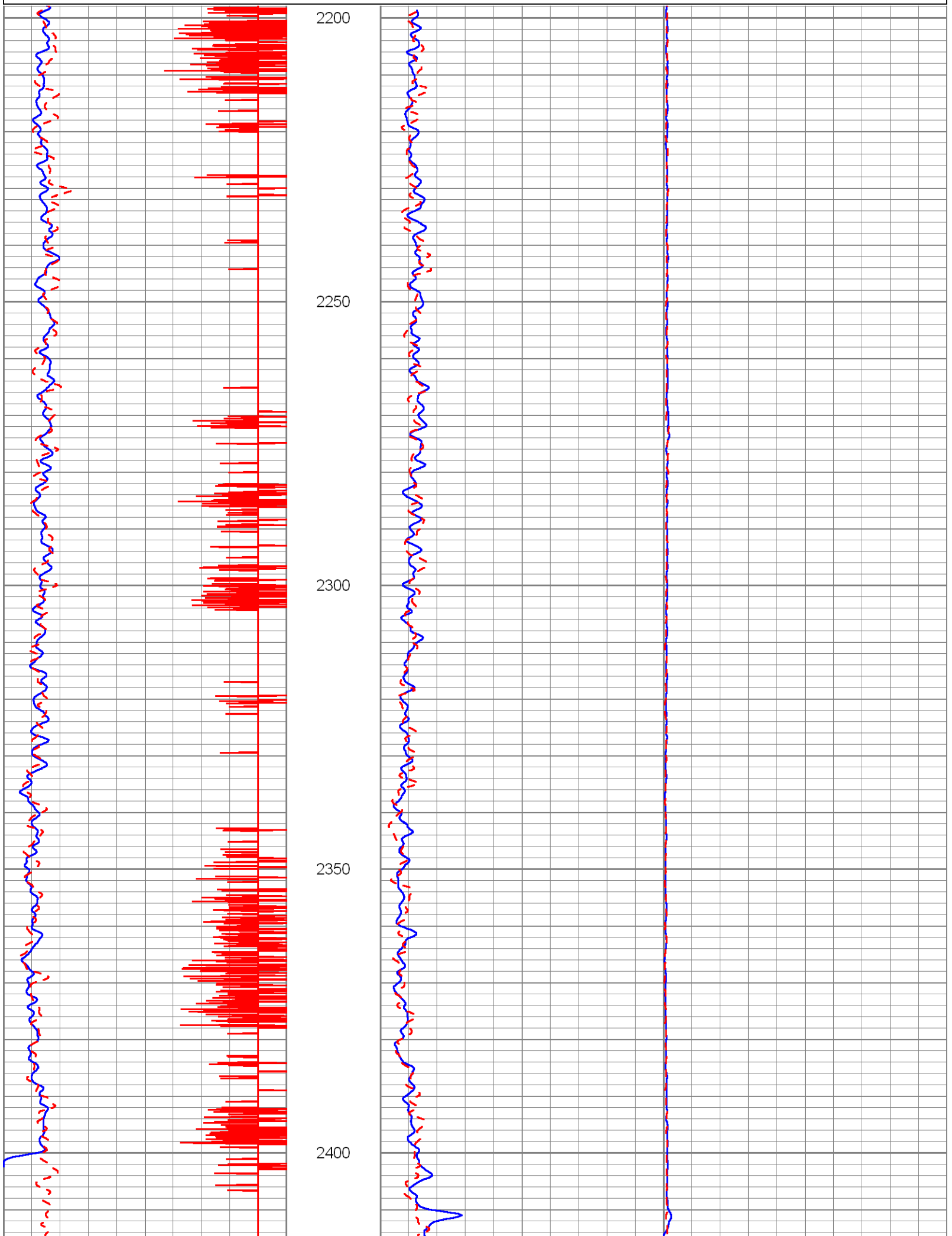

15 MINUTES

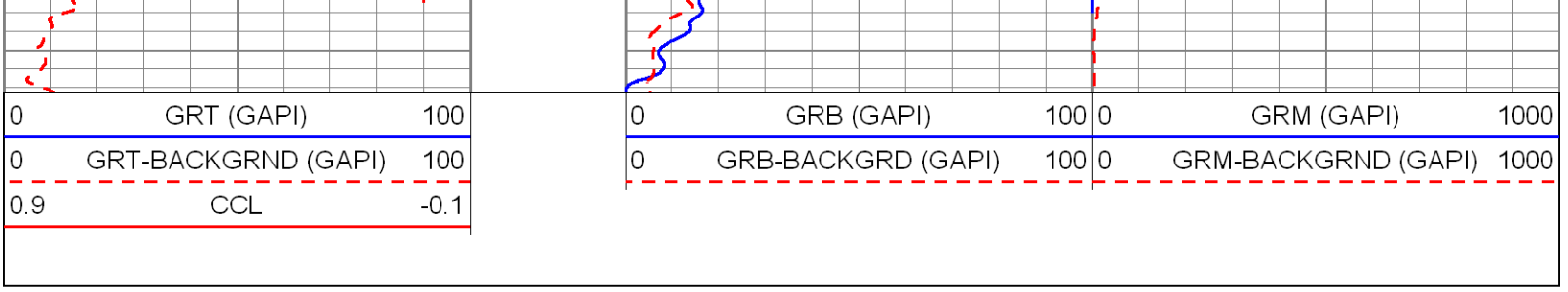


LOP #1

Database File:	sdwwtp-iw15.db
Dataset Pathname:	pass7
Presentation Format:	rts
Dataset Creation:	Fri Sep 06 13:22:55 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:240

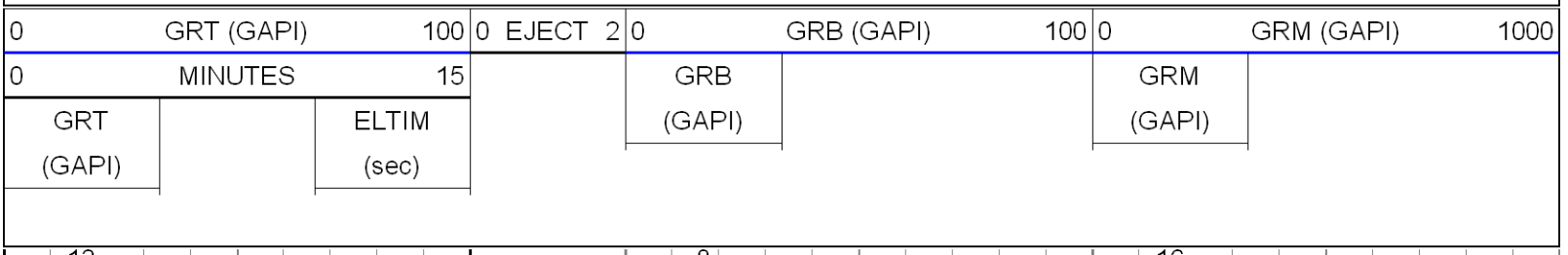
0	GRT (GAPI)	100		0	GRB (GAPI)	100	0	GRM (GAPI) 1000
0	GRT-BACKGRND (GAPI)	100		0	GRB-BACKGRD (GAPI)	100	0	GRM-BACKGRND (GAPI) 1000
0.9	CCL	-0.1						

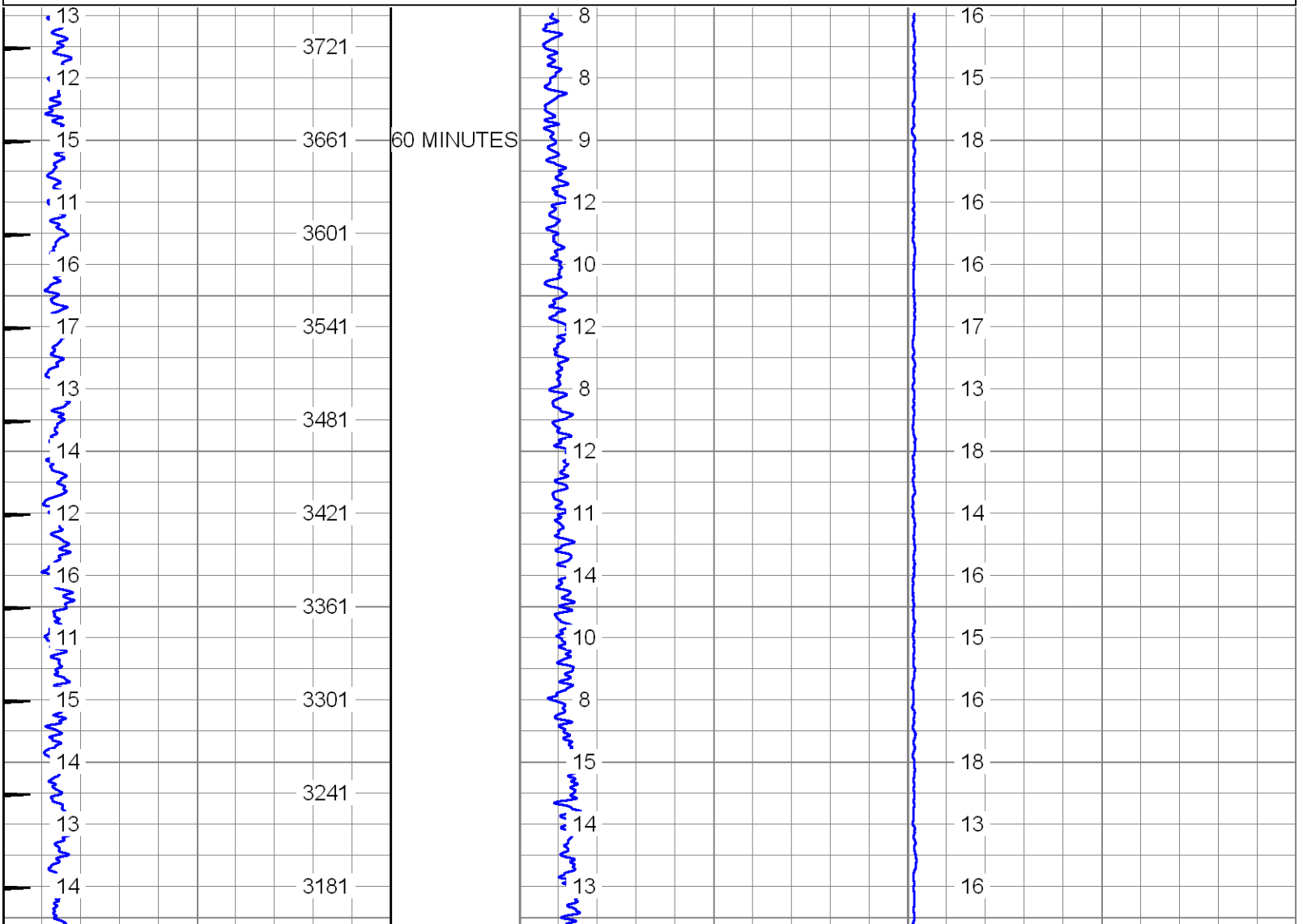

2200
2250
2300
2350
2400

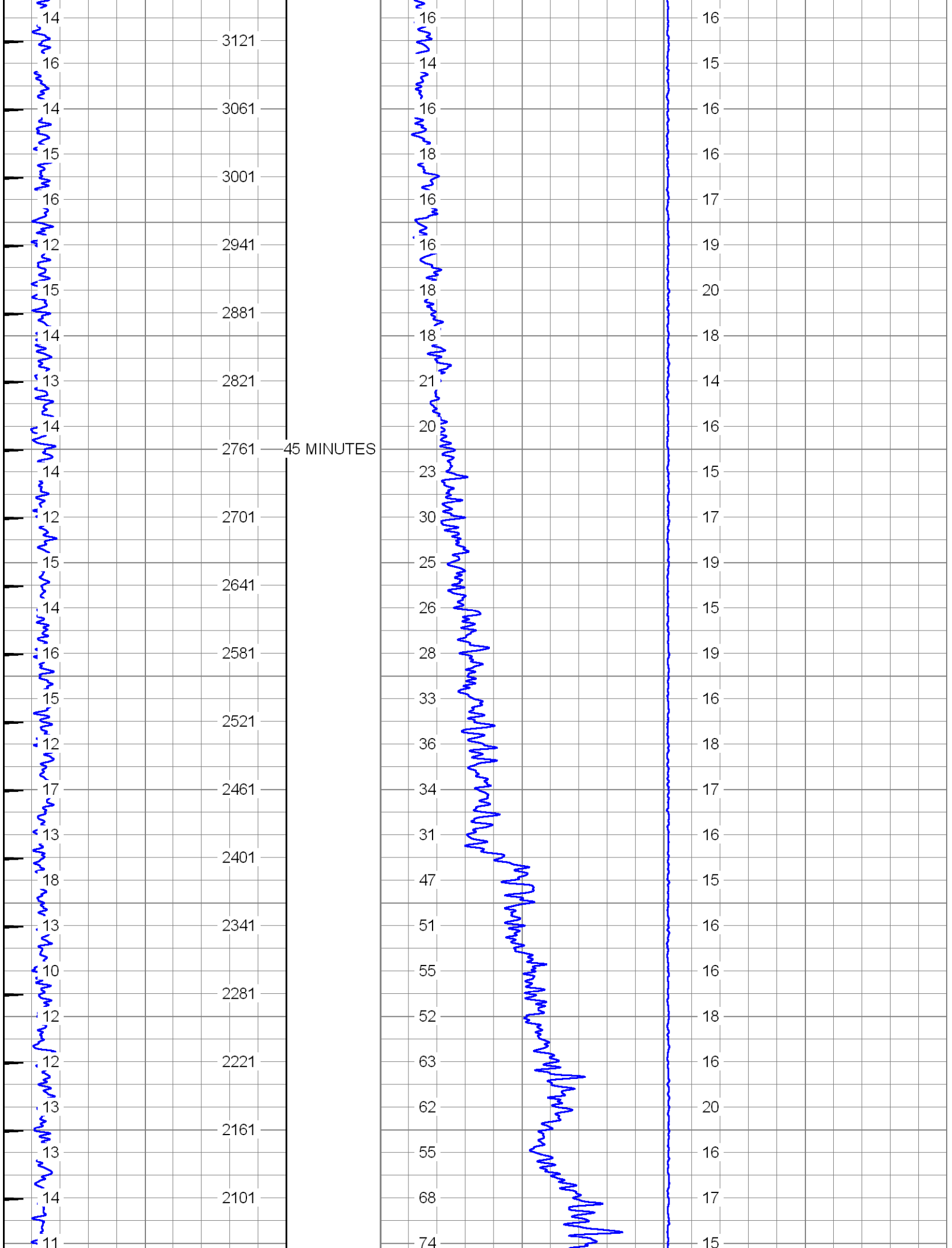


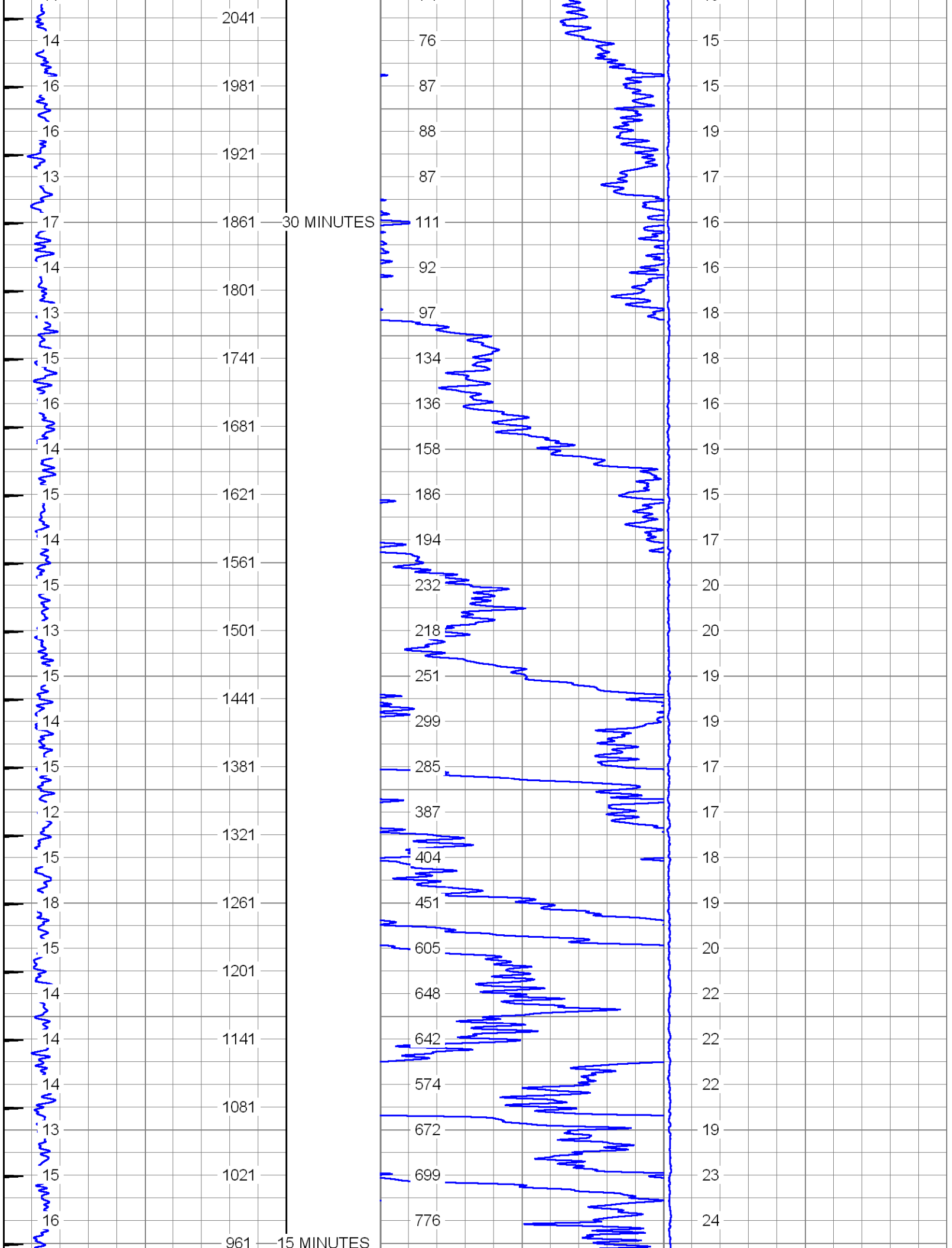
DYNAMIC TEST #1 (84 GPM)

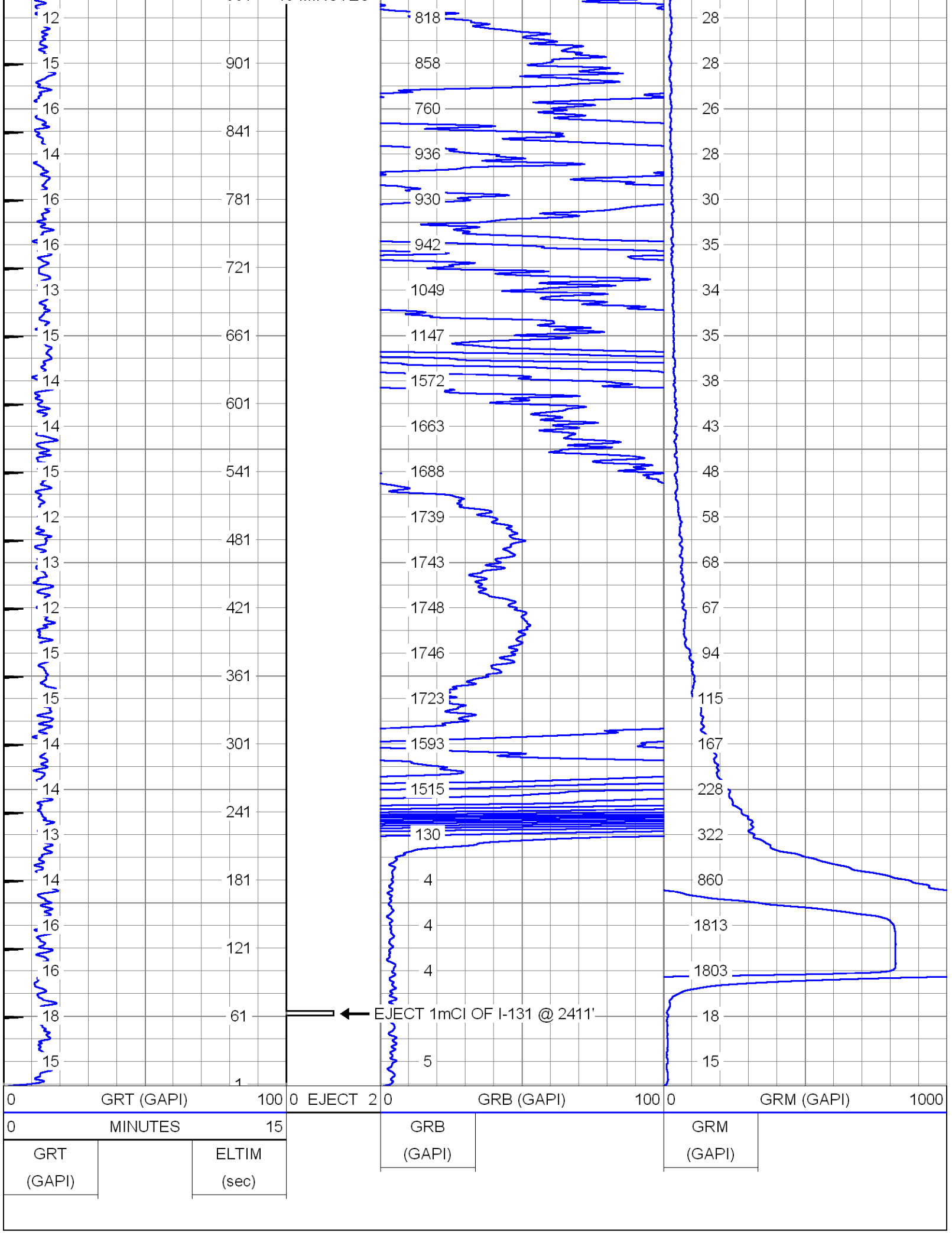
Database File:	sdwwtp-iw15.db
Dataset Pathname:	pass5
Presentation Format:	rtstime
Dataset Creation:	Fri Sep 06 12:17:16 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:600





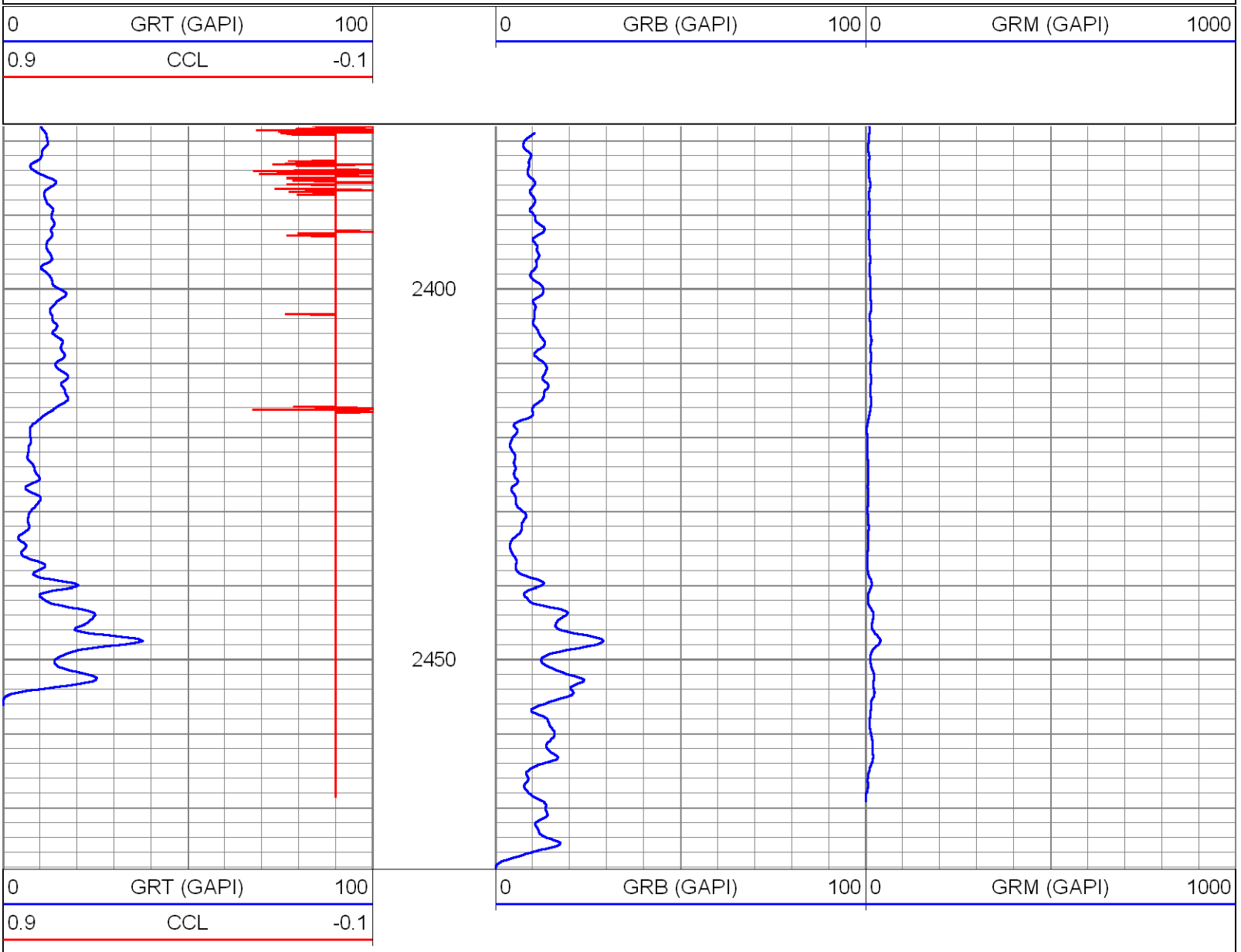

45 MINUTES
3121
3061
3001
2941
2881
2821
2761
2701
2641
2581
2521
2461
2401
2341
2281
2221
2161
2101


2041
1981
1921
1861
30 MINUTES
1801
1741
1681
1621
1561
1501
1441
1381
1321
1261
1201
1141
1081
1021
961
15 MINUTES
14
16
16
13
17
14
13
15
16
14
15
14
15
13
15
14
15
12
15
18
15
14
14
14
13
15
16
76
87
88
87
111
92
97
134
136
158
186
194
232
218
251
299
285
387
404
451
605
648
642
574
672
699
776
15
15
19
17
16
16
18
18
16
19
15
17
20
20
19
19
17
17
18
19
20
22
22
22
19
23
24


EJECT 1mCI OF I-131 @ 2411'
0 GRT (GAPI) 100
0 EJECT 2
0 GRB (GAPI) 100
0 GRM (GAPI) 1000
0 MINUTES 15
GRT (GAPI)
ELTIM (sec)
GRB (GAPI)
GRM (GAPI)

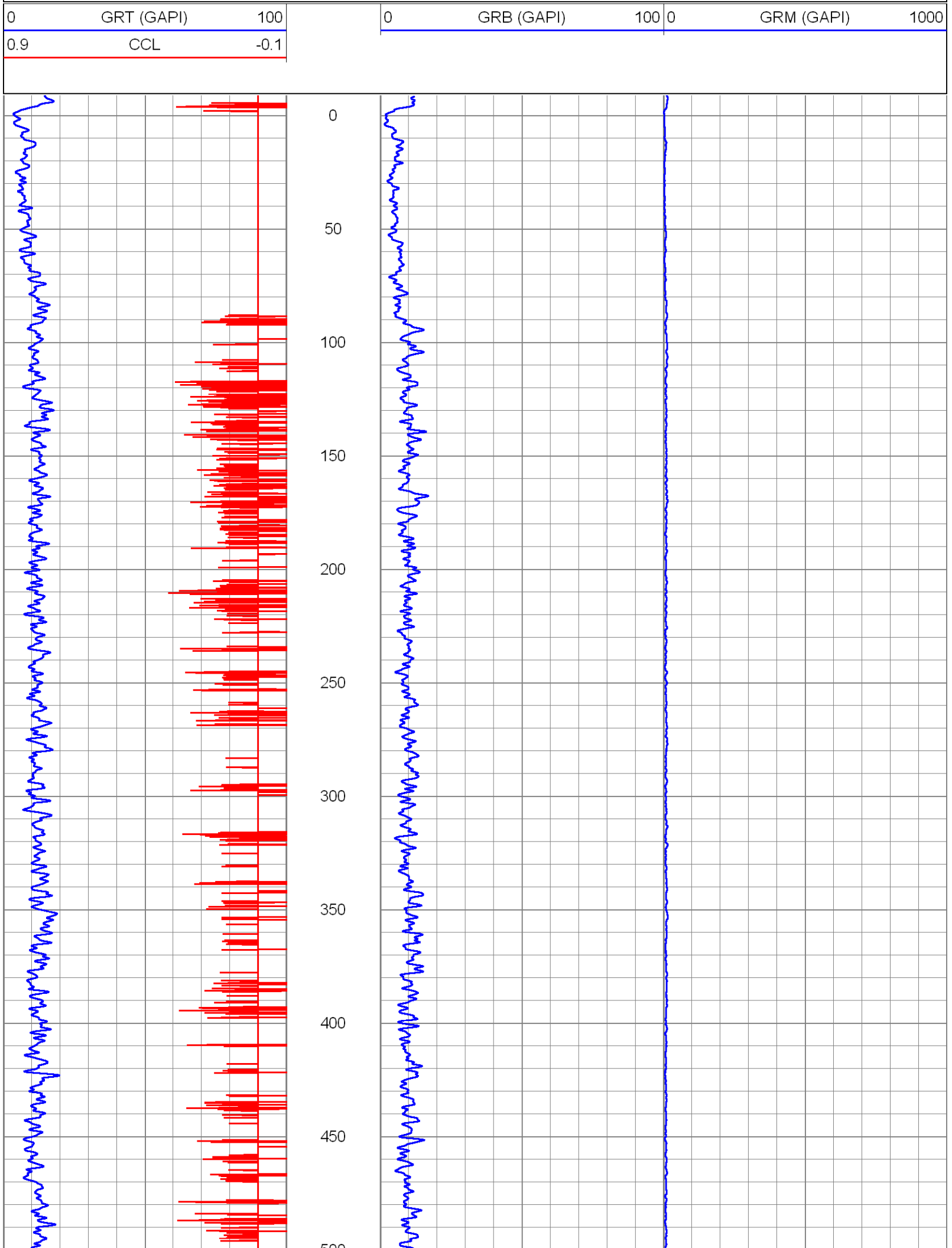
CASING TIE-IN

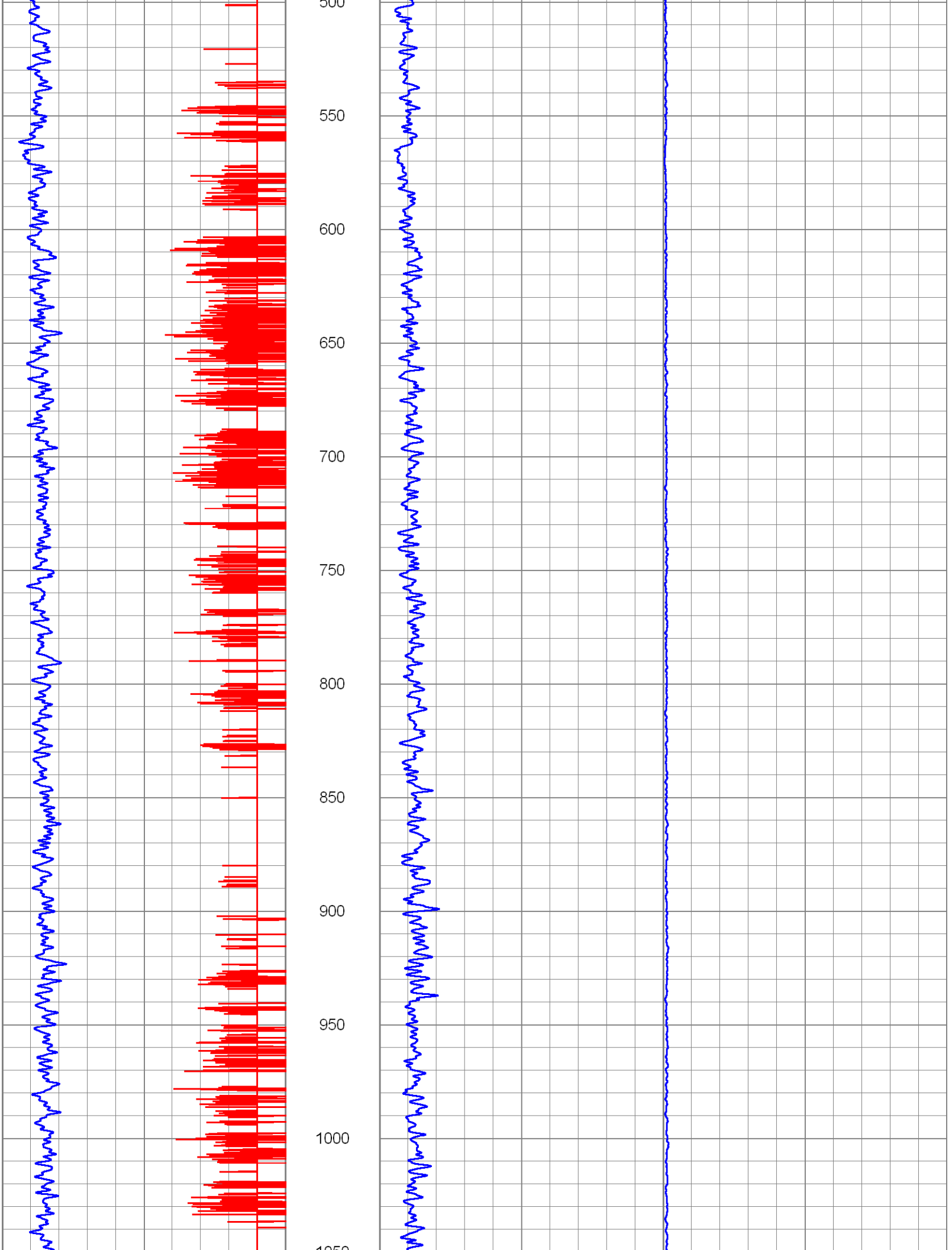
Database File: sdwwtp-iw15.db
Dataset Pathname: pass4
Presentation Format: rts
Dataset Creation: Fri Sep 06 11:34:38 2013 by Log SOC 110722
Charted by: Depth in Feet scaled 1:240

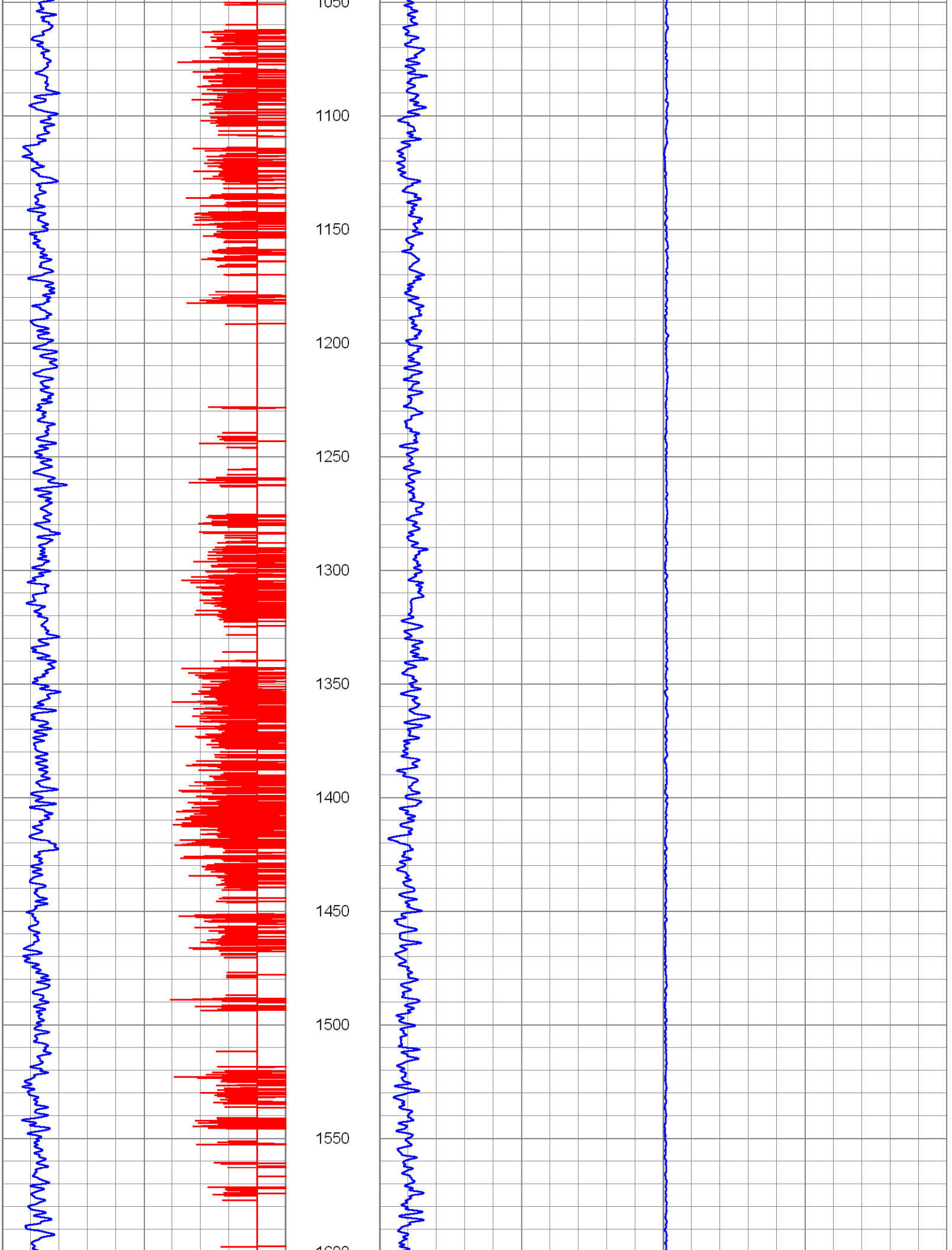


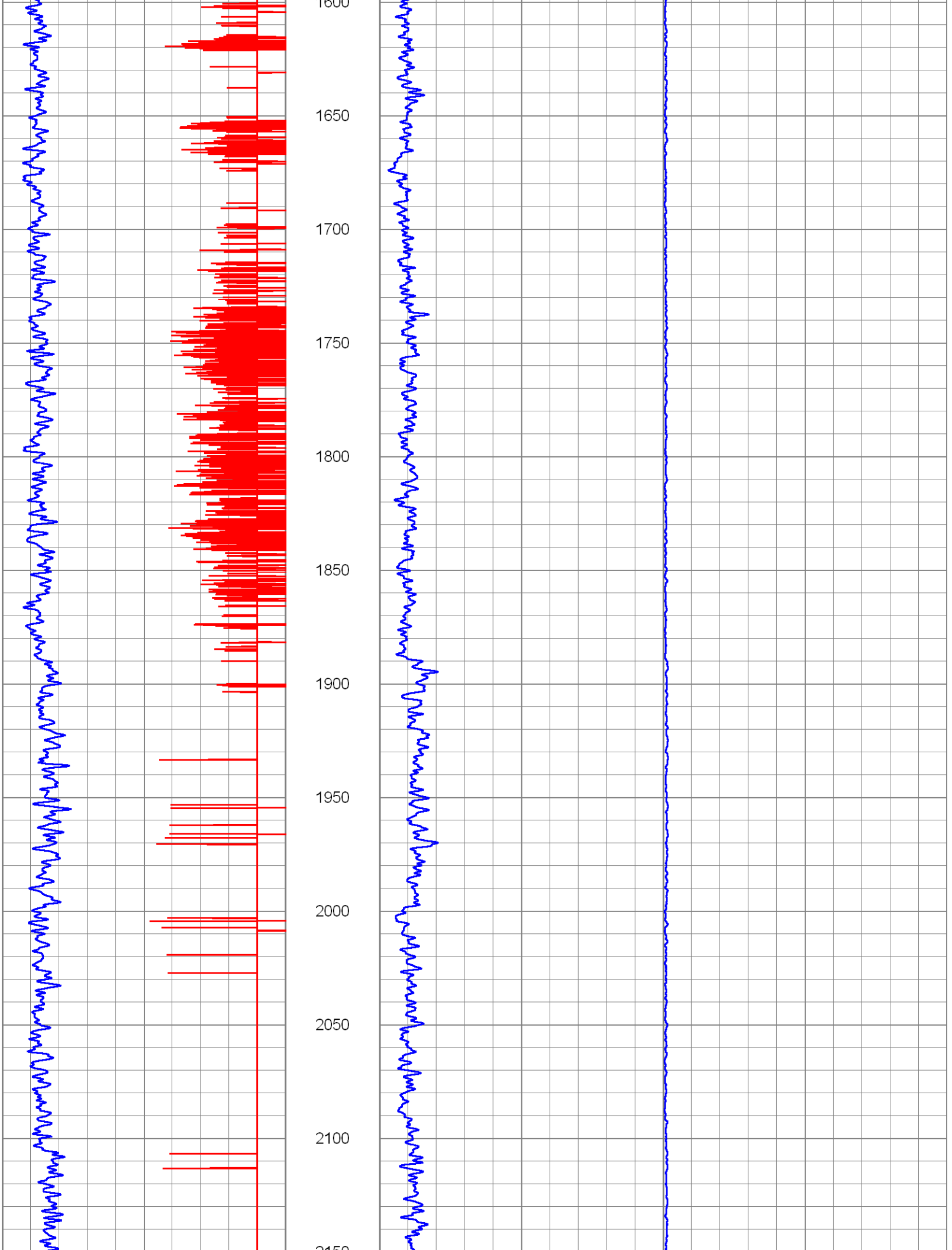
BACKGROUND GAMMA-RAY

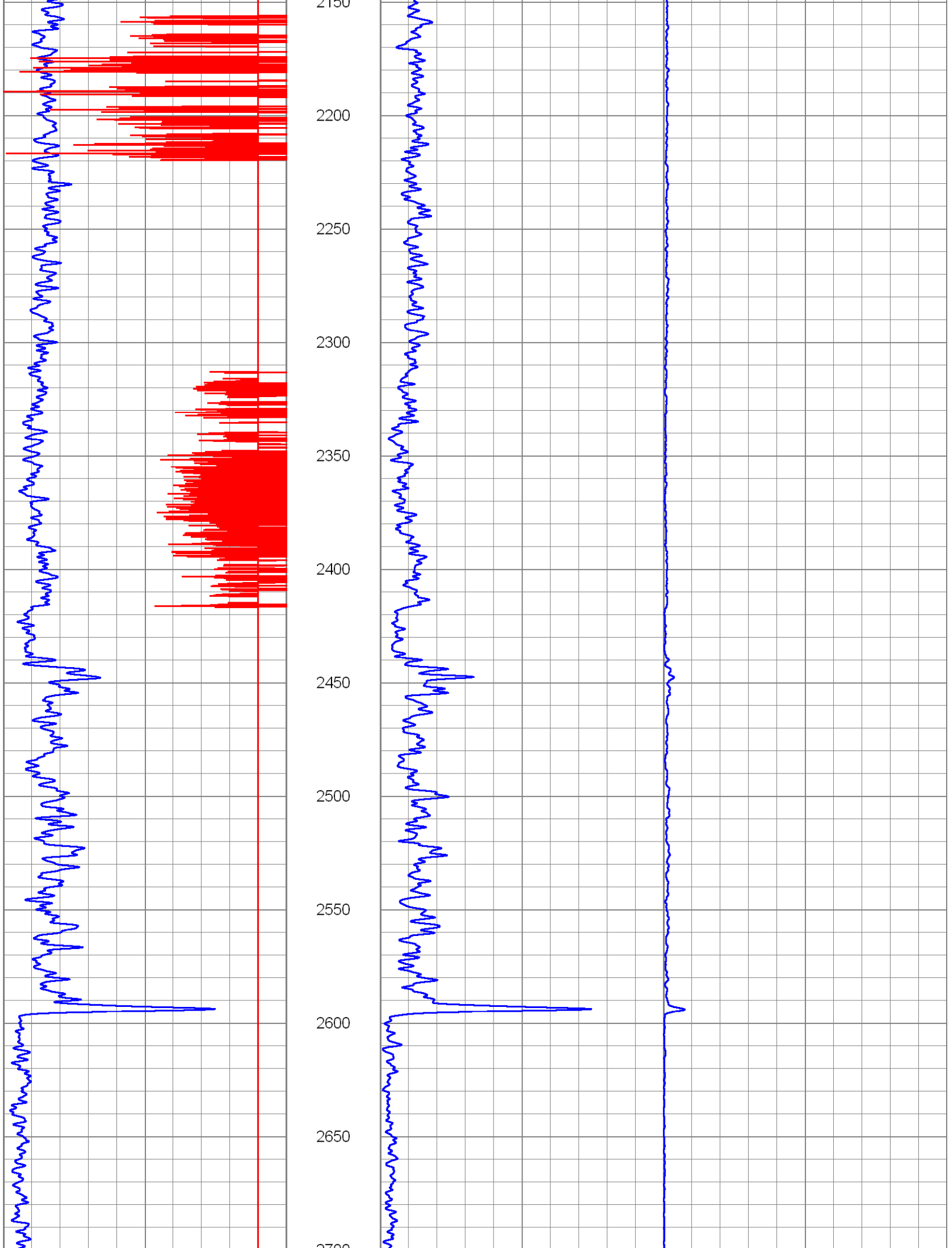
Database File: sdwwtp-iw15.db
Dataset Pathname: pass2
Presentation Format: rts
Dataset Creation: Fri Sep 06 09:24:20 2013 by Log SOC 110722
Charted by: Depth in Feet scaled 1:600

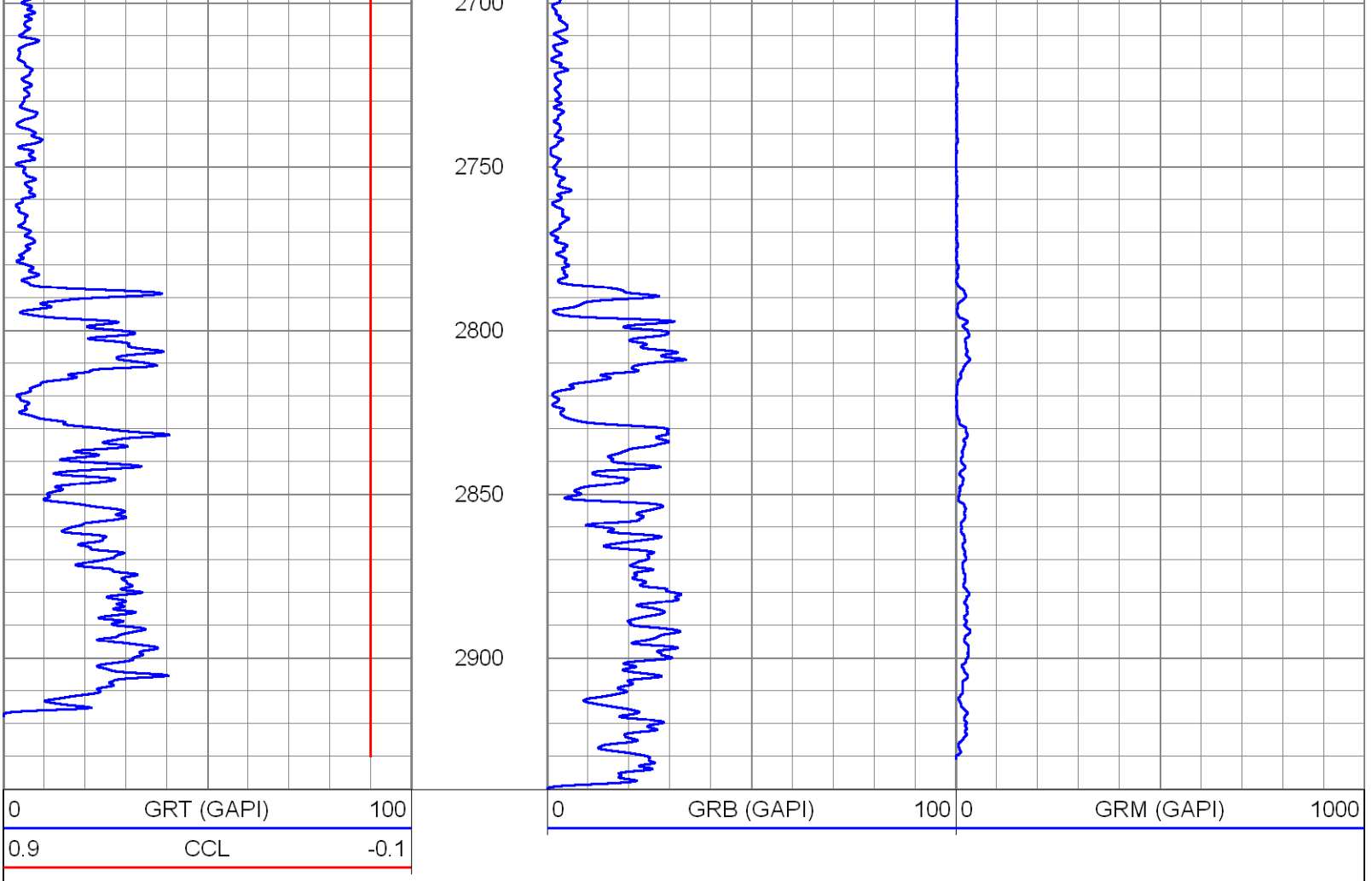

0
GRT (GAPI)
100
0.9
CCL
-0.1
0
GRB (GAPI)
100
0
GRM (GAPI)
1000
0
50
100
150
200
250
300
350
400
450


500
550
600
650
700
750
800
850
900
950
1000


1050
1100
1150
1200
1250
1300
1350
1400
1450
1500
1550


1600
1650
1700
1750
1800
1850
1900
1950
2000
2050
2100
2150


2150
2200
2250
2300
2350
2400
2450
2500
2550
2600
2650



Calibration Report

Database File: sdwwtp-iw15.db
Dataset Pathname: pass2
Dataset Creation: Fri Sep 06 09:24:20 2013 by Log SOC 110722

Gamma Ray Calibration Report

Serial Number:	952B	
Tool Model:	RTSB	
Performed:	Fri Sep 06 07:58:51 2013	
Calibrator Value:	90.0	GAPI
Background Reading:	36.2	cps
Calibrator Reading:	200.9	cps
Sensitivity:	0.5462	GAPI/cps

Gamma Ray Calibration Report

Serial Number:	952M	
Tool Model:	RTSM	
Performed:	Fri Sep 06 07:57:23 2013	
Calibrator Value:	90.0	GAPI
Background Reading:	168.9	cps
Calibrator Reading:	328.1	cps
Sensitivity:	0.5654	GAPI/cps

Gamma Ray Calibration Report

Serial Number:	952T	
Tool Model:	RTST	
Performed:	Fri Sep 06 08:00:26 2013	
Calibrator Value:	90.0	GAPI
Background Reading:	79.8	cps
Calibrator Reading:	233.2	cps
Sensitivity:	0.5870	GAPI/cps

Appendix E

Temperature Log

HIGH RESOLUTION TEMPERATURE LOG

Company	SOUTH MIAMI-DADE W.W.T.P.
Well	IW-15
Field	S.D.W.W.T.P.
County	MIAMI-DADE
State	FLORIDA

Location: API # :

SEC TWP RGE

Other Services

Permanent Datum	PAD	Elevation	PAD
Log Measured From	PAD		
Drilling Measured From	PAD		

Elevation
K.B.
D.F.
G.L.

Date	06-SEP-2013		
Run Number	2013 MIT		
Depth Driller	2944'		
Depth Logger	2944'		
Bottom Logged Interval	2944'		
Top Log Interval	SURFACE		
Open Hole Size	22"		
Type Fluid	WATER		
Density / Viscosity	NA		
Max. Recorded Temp.	80.3 degF		
Estimated Cement Top	NA		
Time Well Ready	ON ARRIVAL		
Time Logger on Bottom	ON ARRIVAL		
Equipment Number	102		
Location	FT MYERS		
Recorded By	MOREY	RIVES	
Witnessed By	S. VILLAMIL		

Borehole Record				Borehole Record			
Run Number	Bit	From	To	Run No	Bit	From	To

Casing Record	Size	Wgt/Ft	Top	Bottom
Surface String				
Prot. String				
Production String	24"	.500" W.T.	SURFACE	2416'
Liner				

<< Fold Here >>>

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

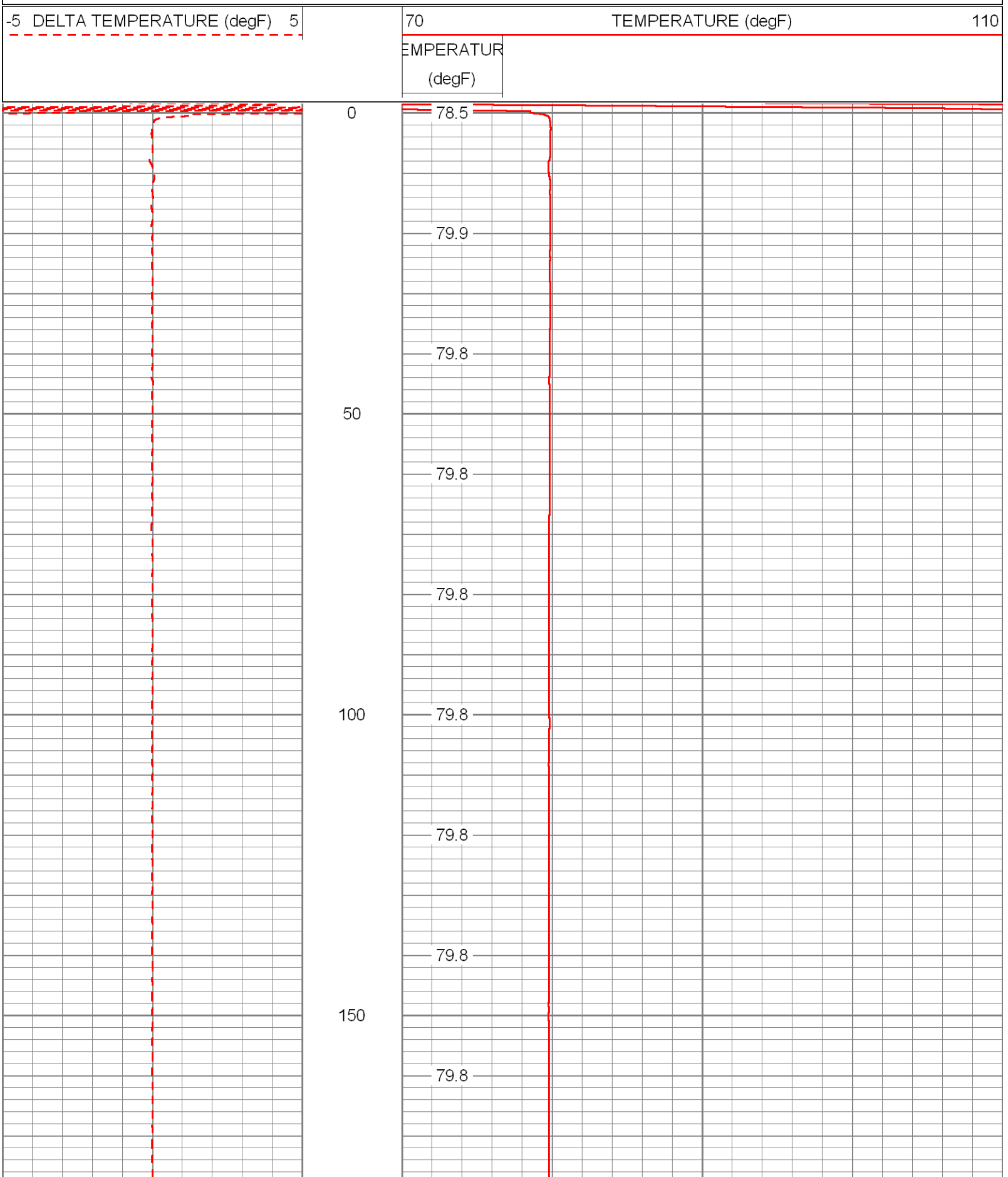
Comments

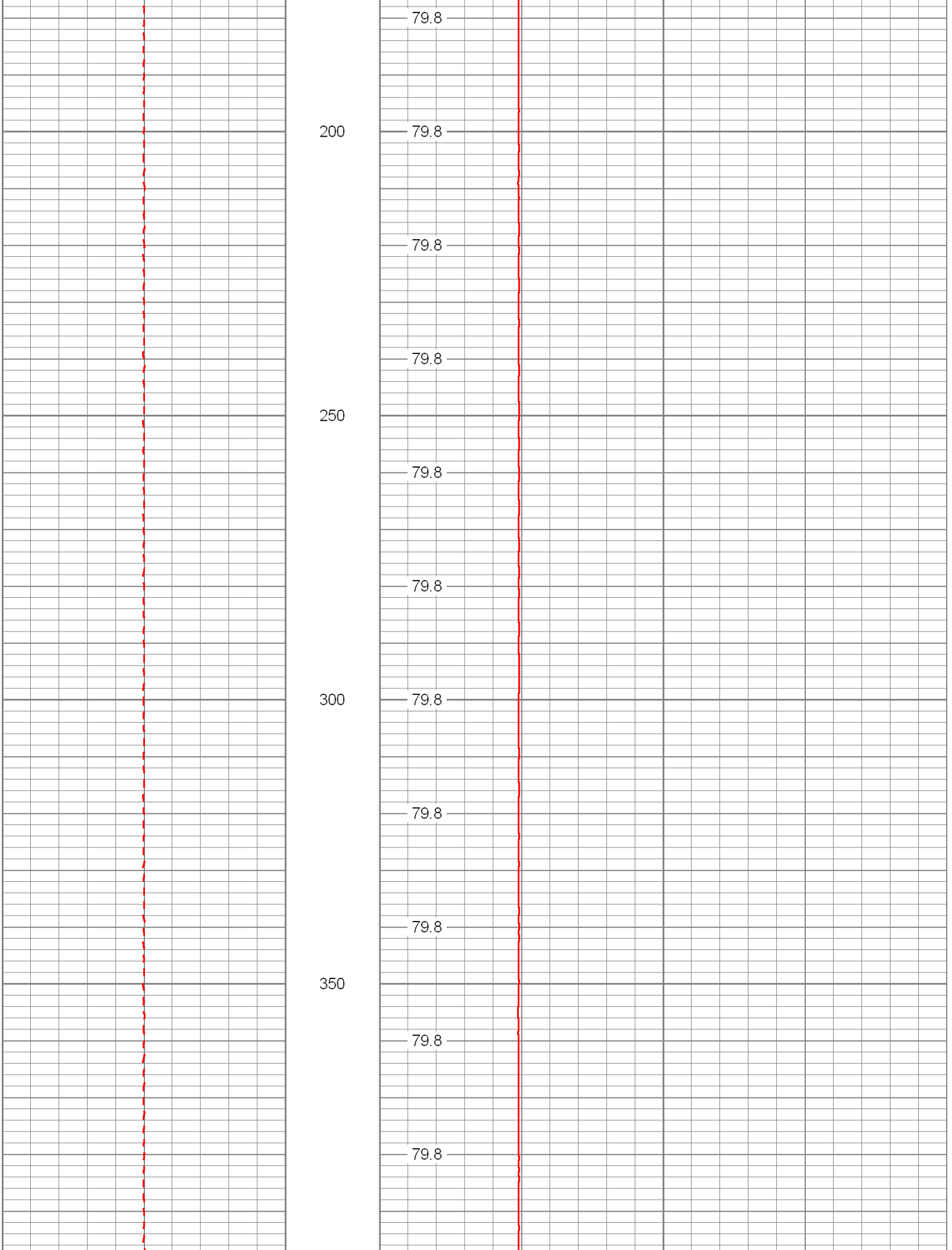
RADIOACTIVE TRACER SURVEY

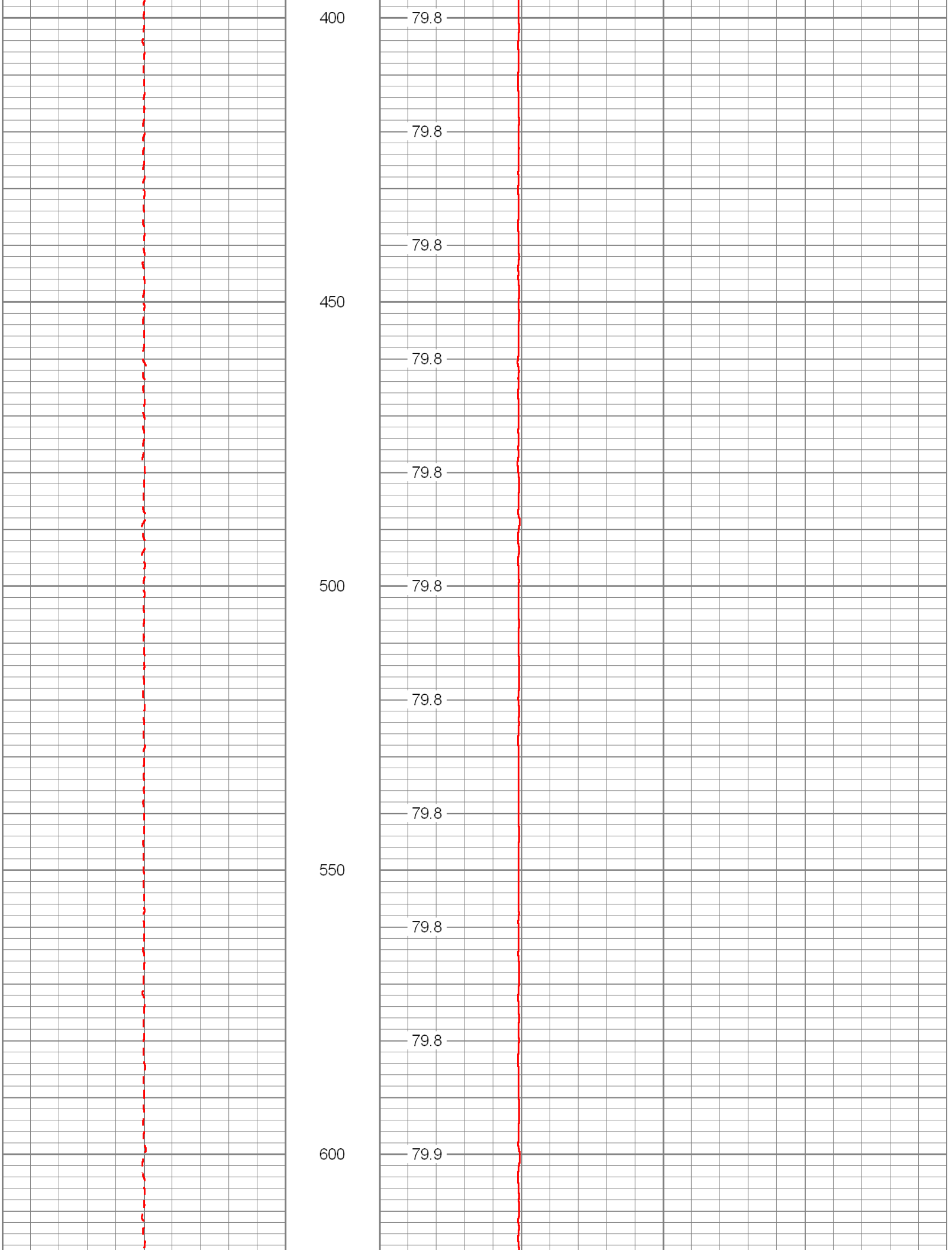
TEMPERATURE

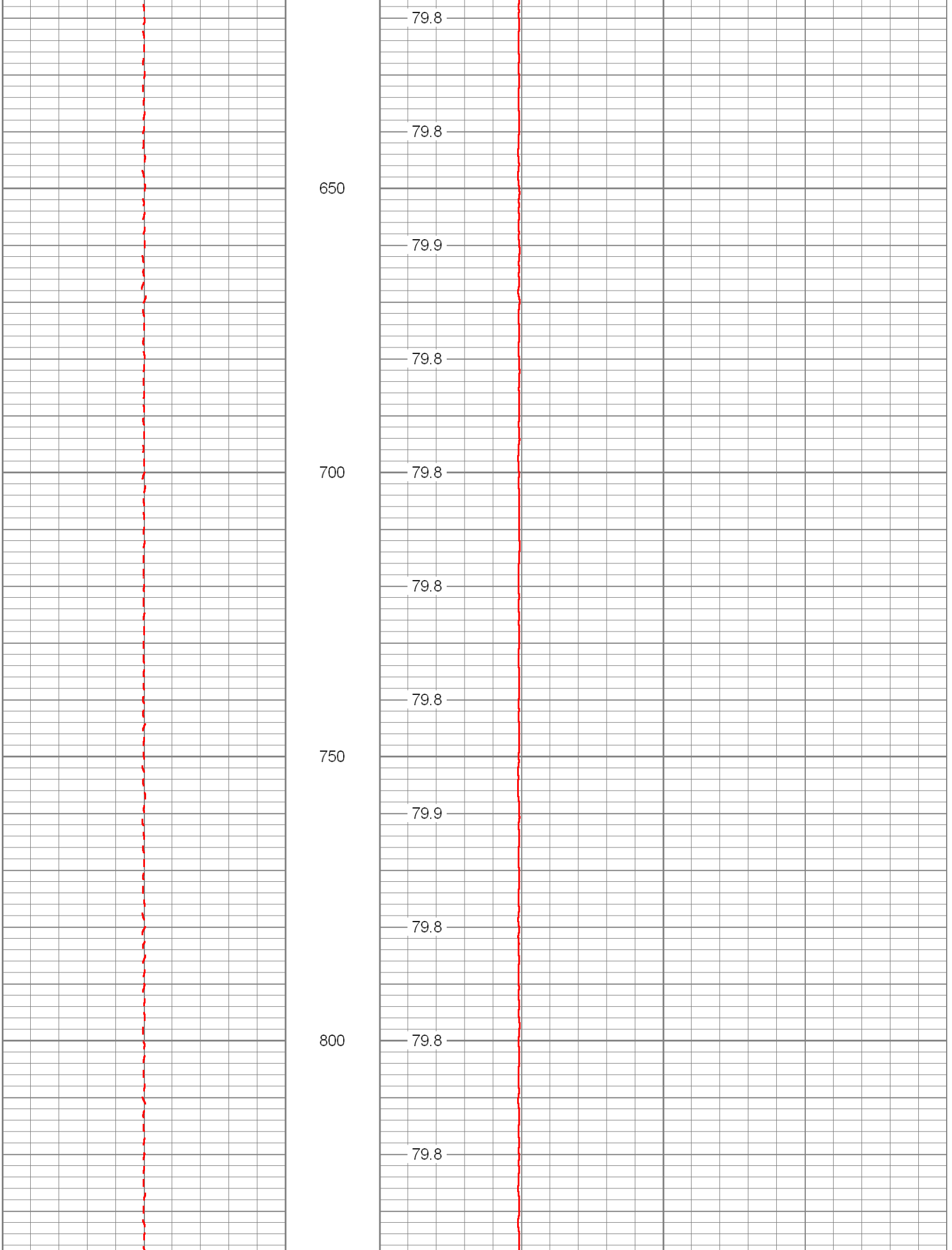
BROTHERS

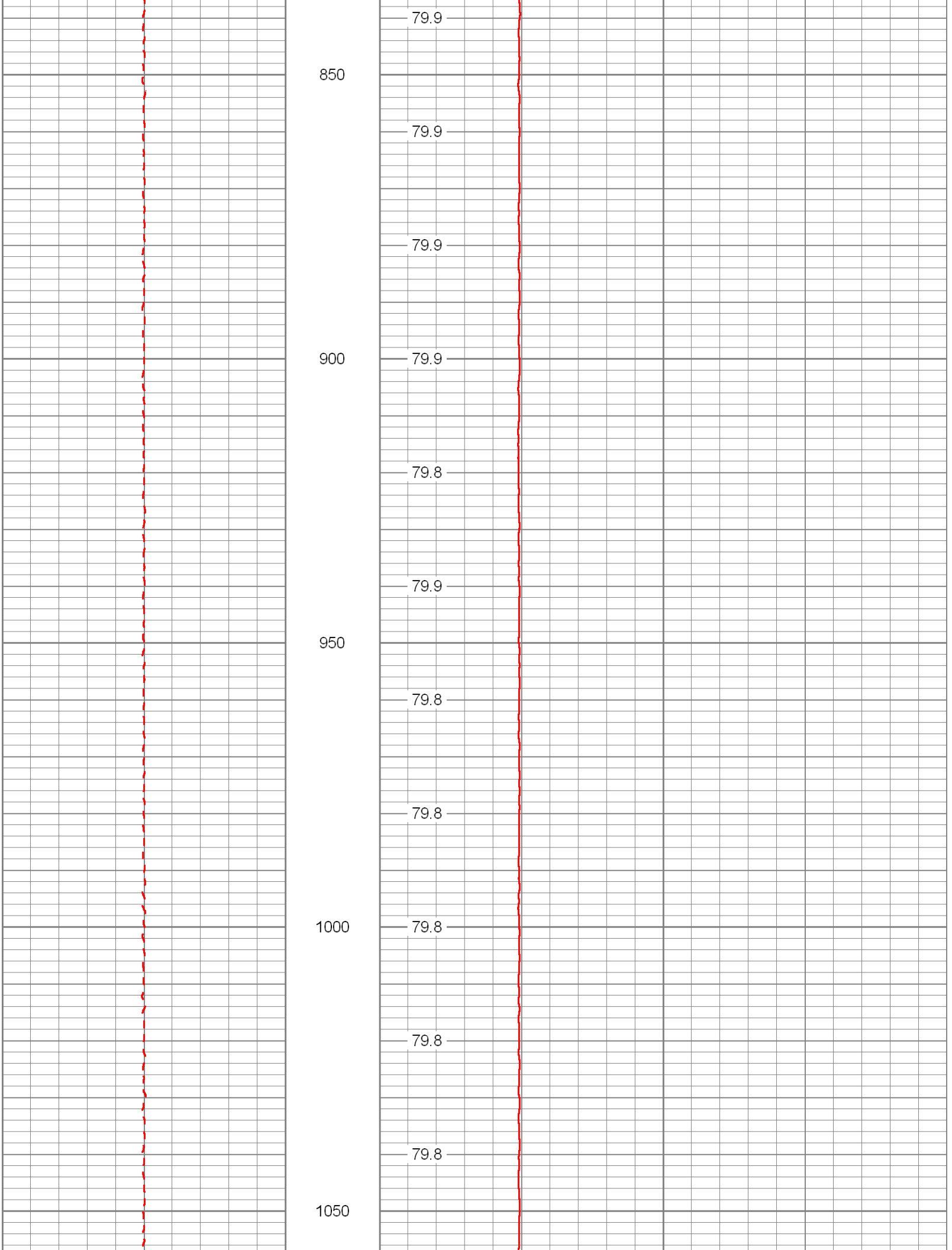
Database File:	sdwwtp-iw15.db
Dataset Pathname:	pass1
Presentation Format:	temp
Dataset Creation:	Fri Sep 06 08:20:09 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:240

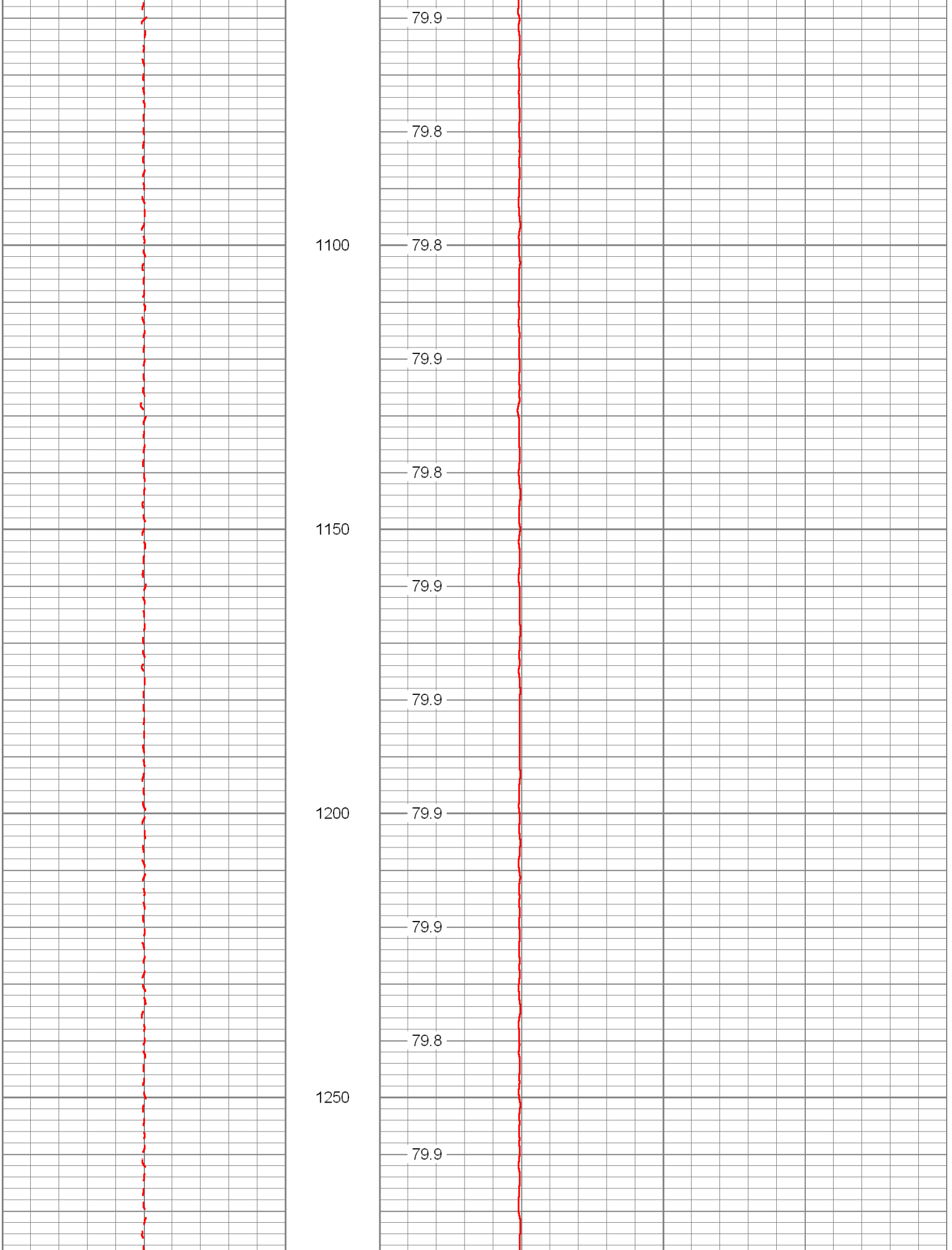


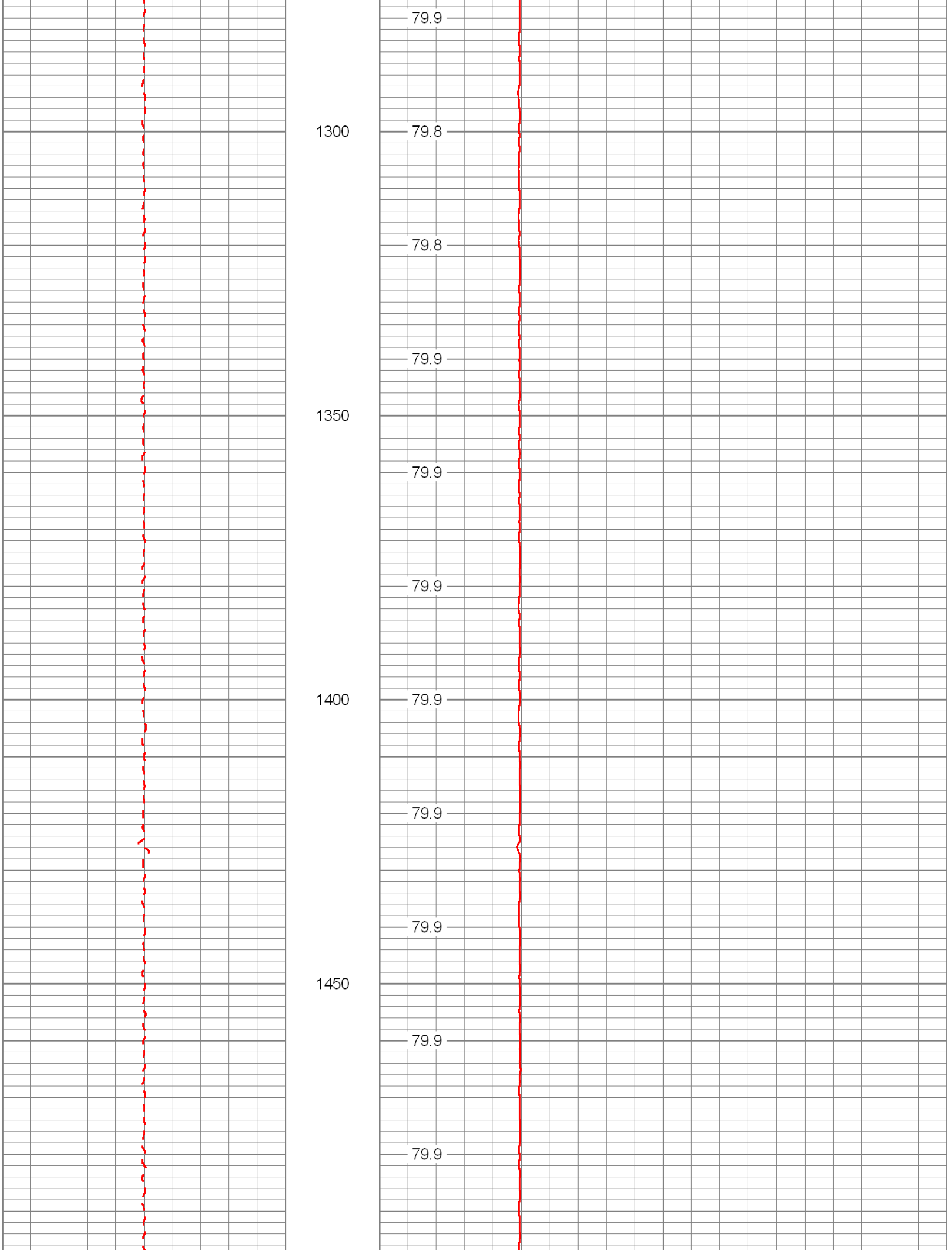

79.8
200
79.8
79.8
79.8
250
79.8
79.8
300
79.8
79.8
79.8
350
79.8
79.8

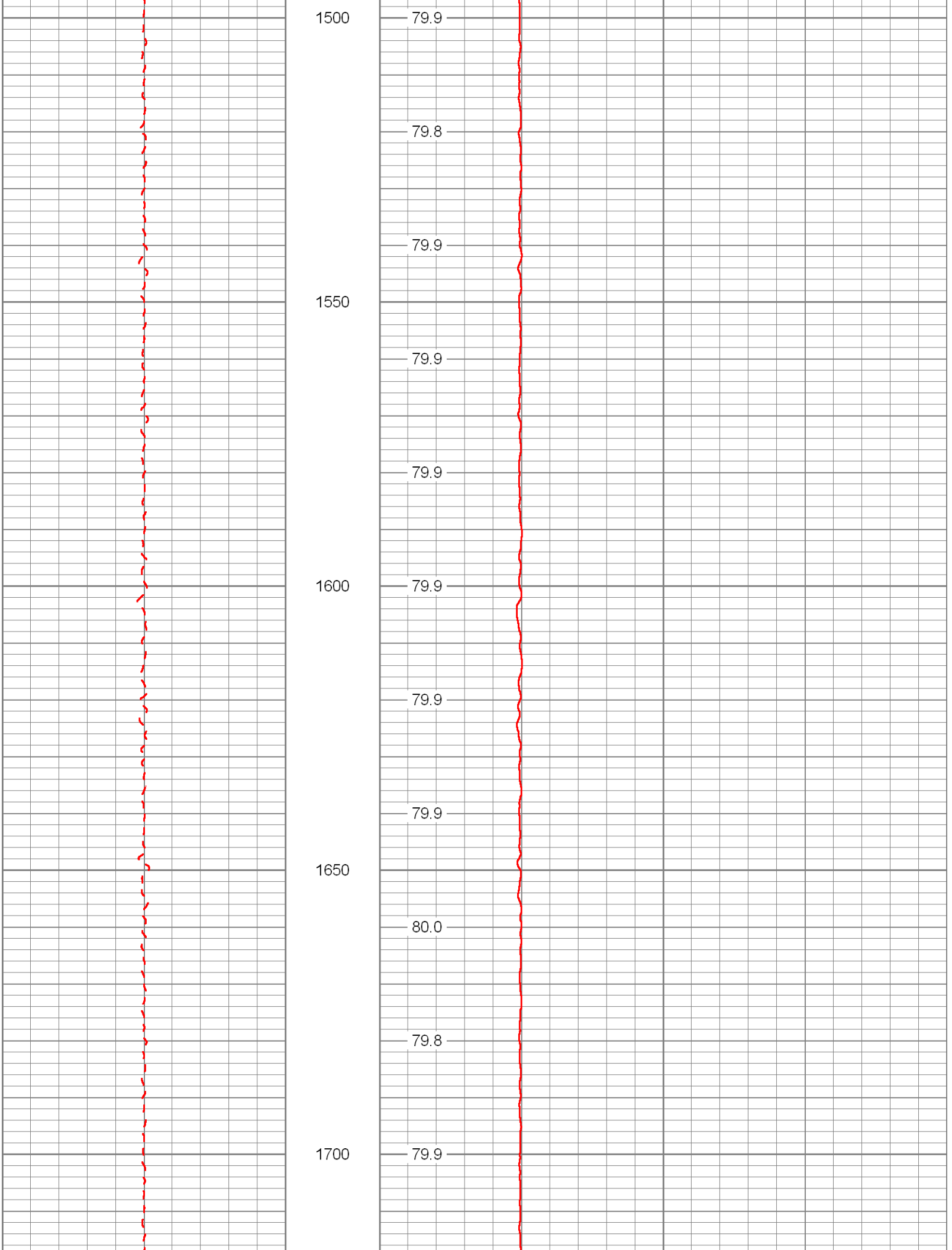

400
79.8
79.8
79.8
450
79.8
79.8
500
79.8
79.8
79.8
550
79.8
79.8
600
79.9

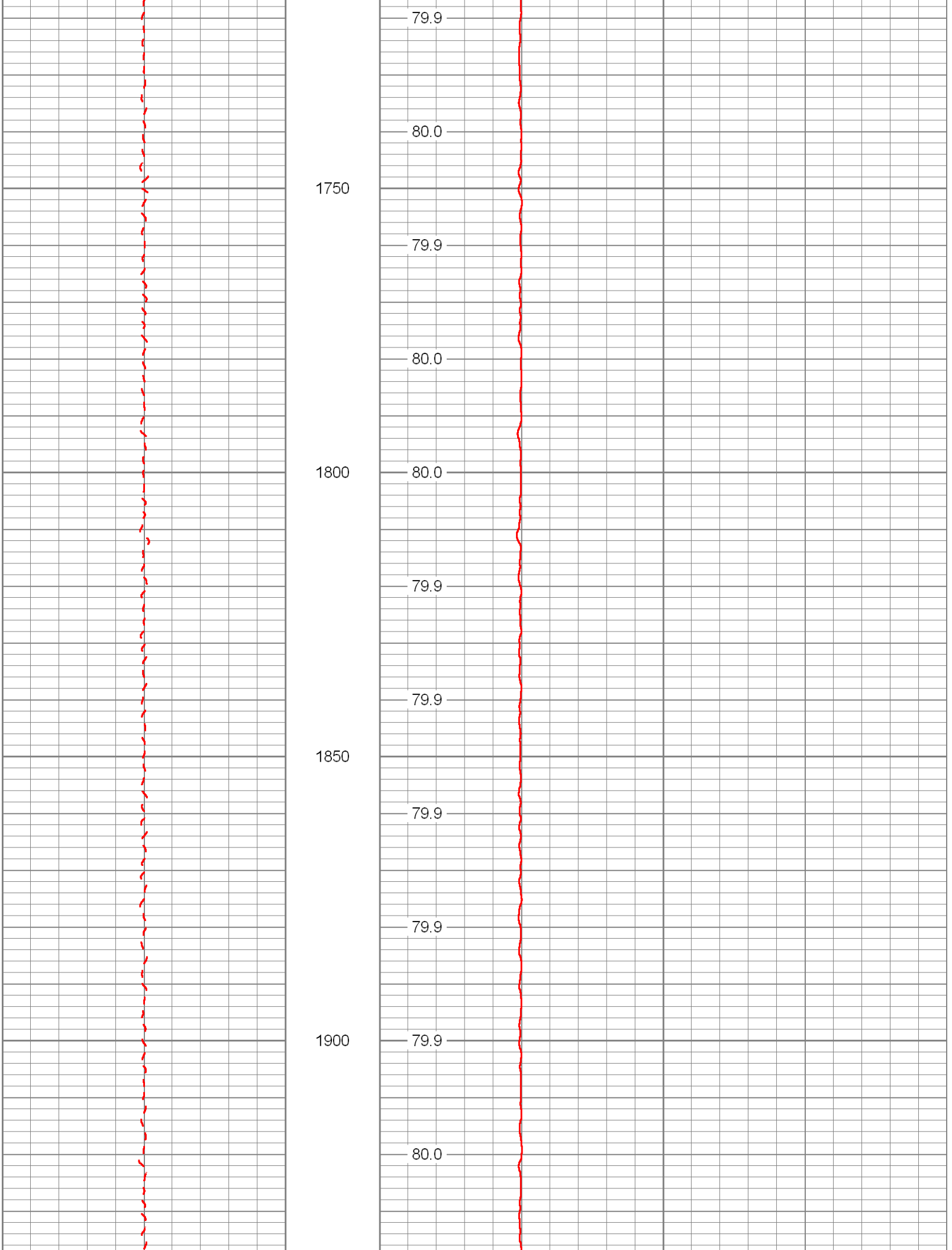

79.8
79.8
650
79.9
79.8
700
79.8
79.8
79.8
750
79.9
79.8
800
79.8
79.8

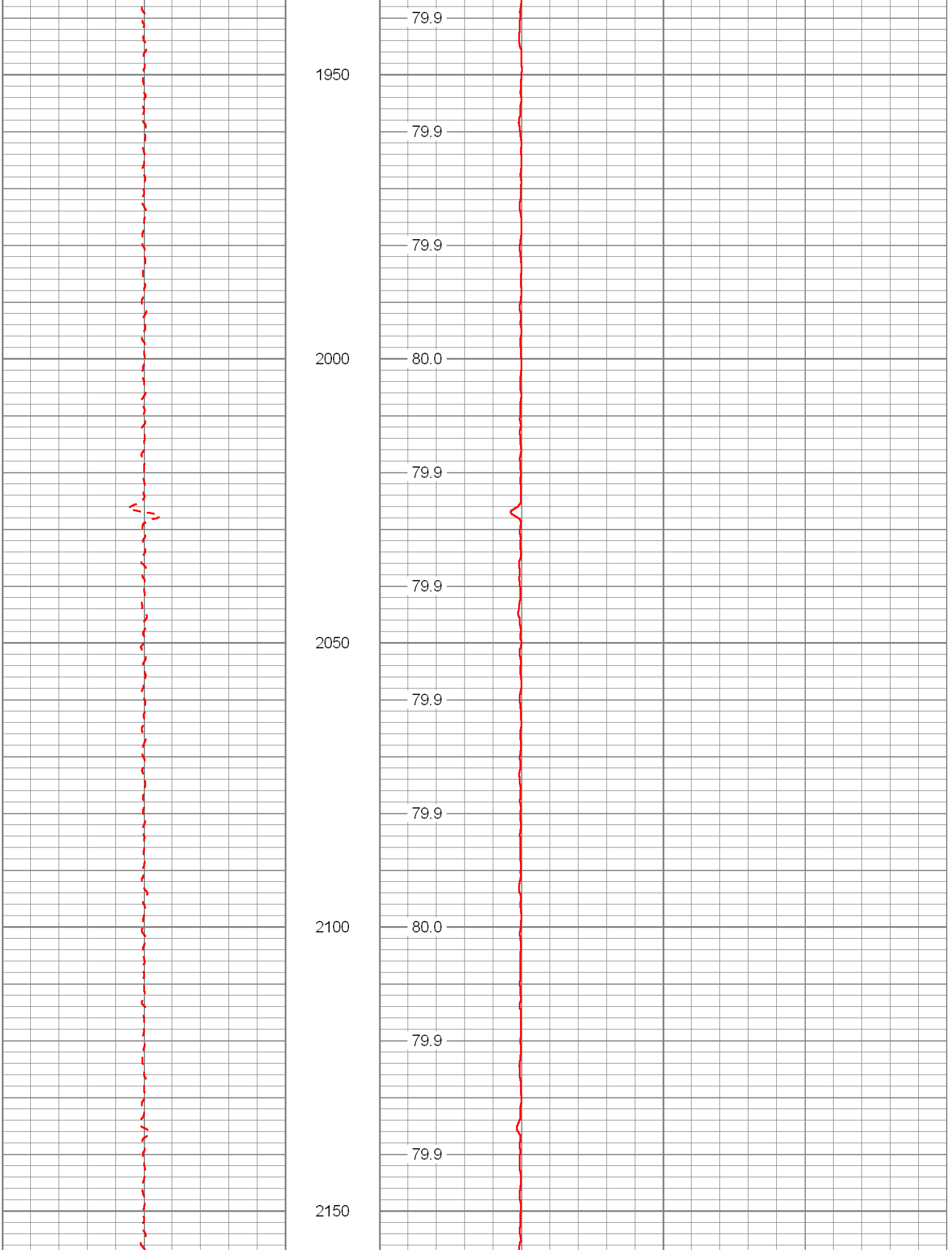

79.9
850
79.9
79.9
900
79.9
79.8
79.9
950
79.8
79.8
1000
79.8
79.8
79.8
1050

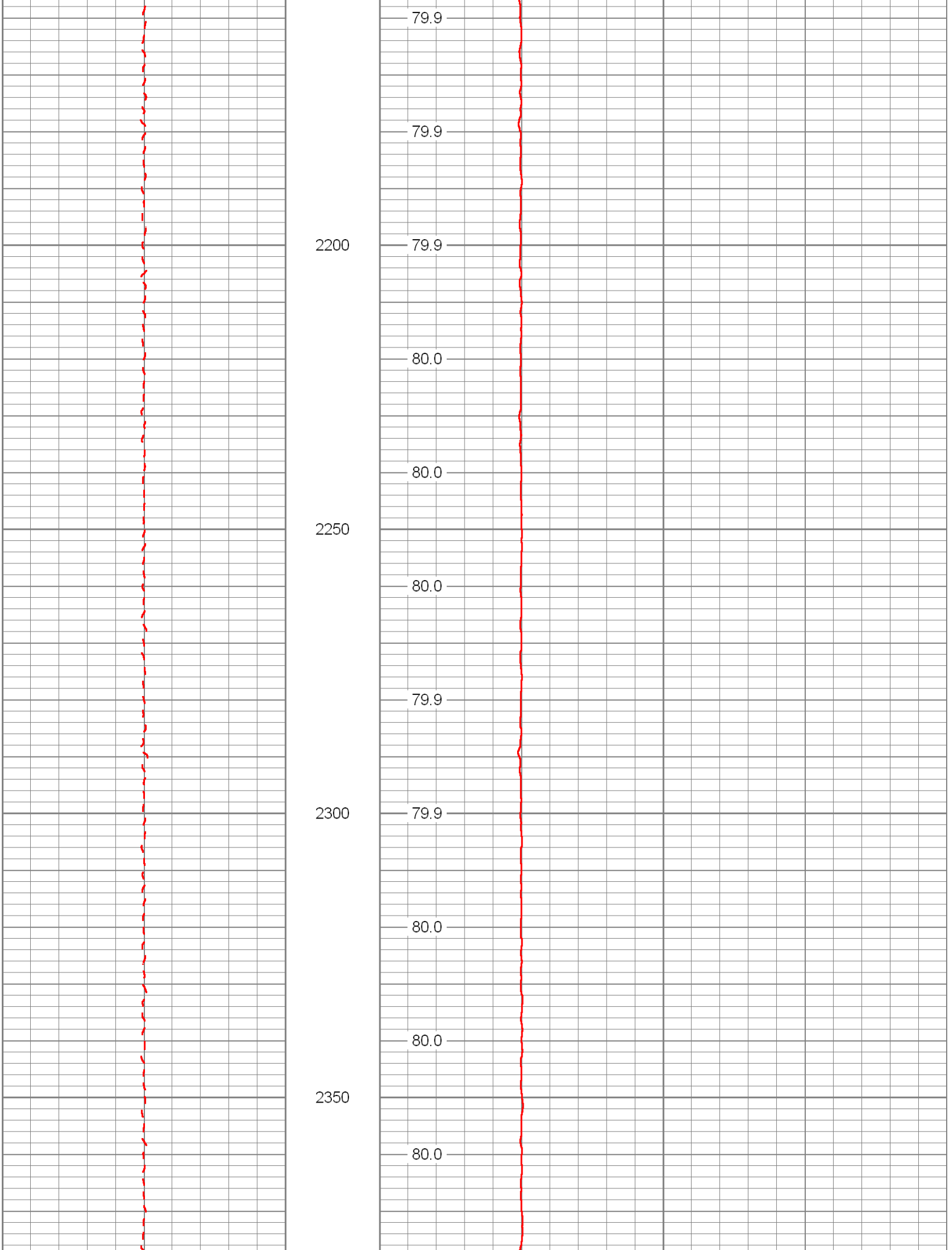

79.9
79.8
1100
79.8
79.9
79.8
1150
79.9
79.9
1200
79.9
79.9
79.8
1250
79.9

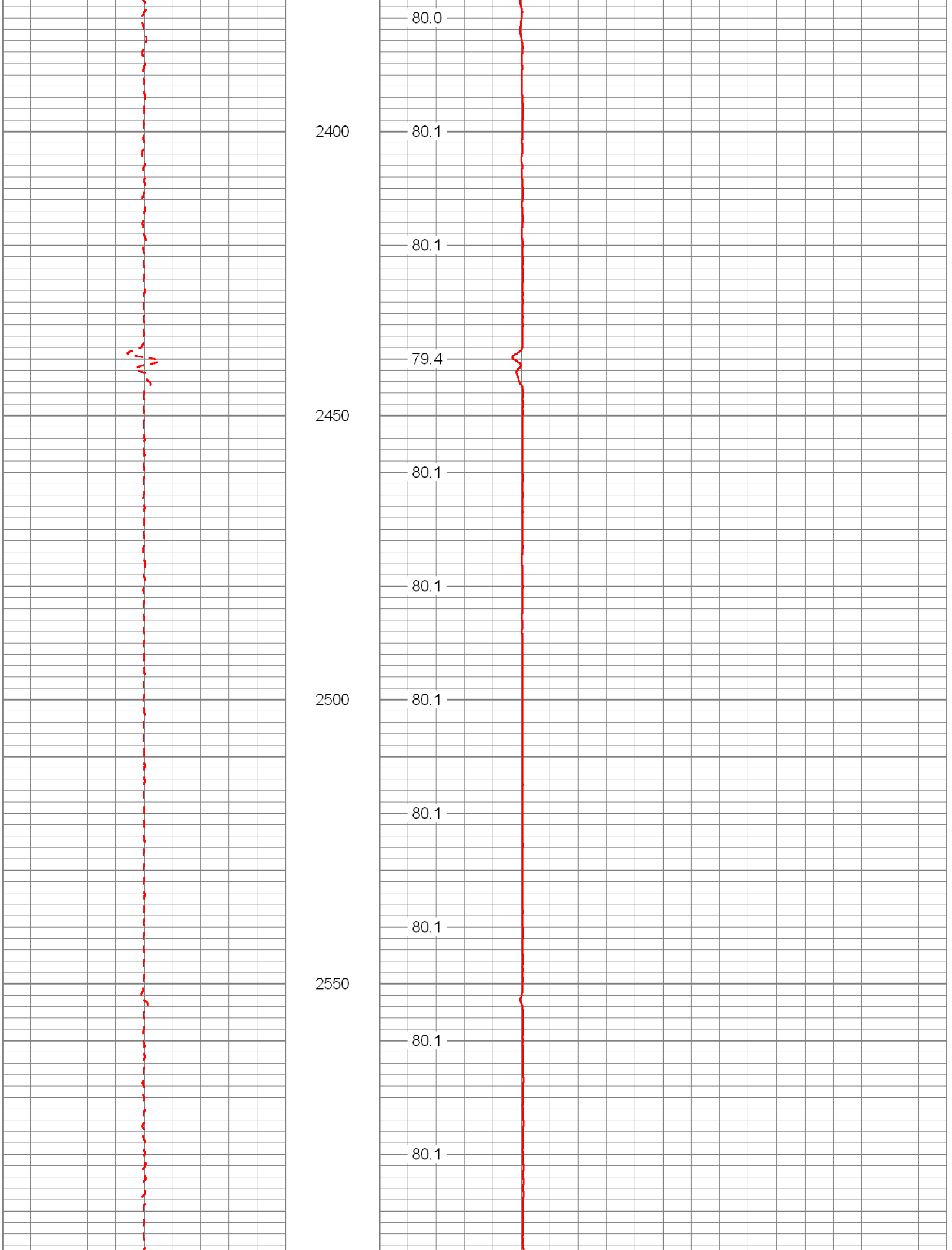

79.9
1300
79.8
79.8
79.9
1350
79.9
79.9
1400
79.9
79.9
79.9
1450
79.9
79.9

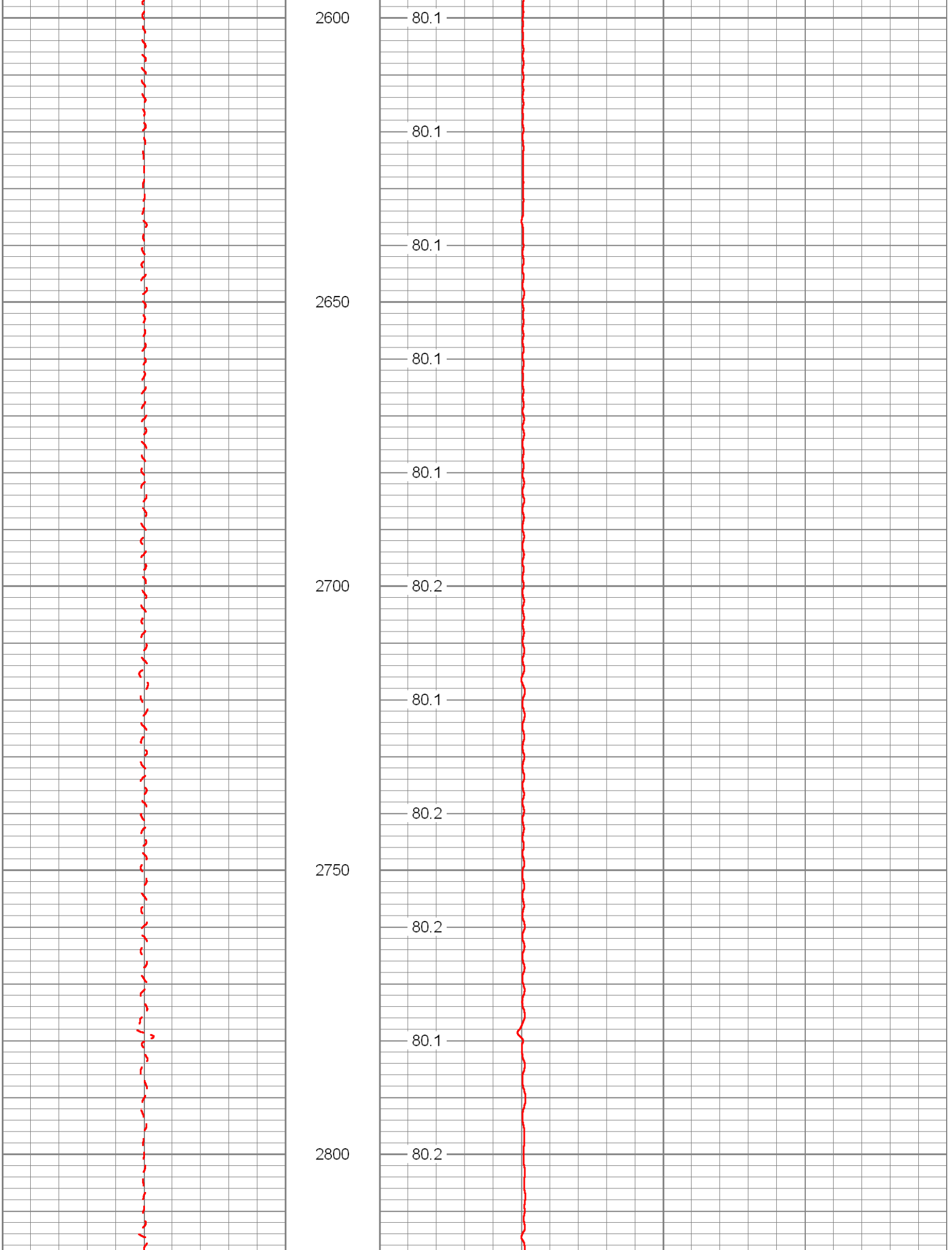

1500
79.9
79.8
79.9
1550
79.9
79.9
1600
79.9
79.9
79.9
1650
80.0
79.8
1700
79.9

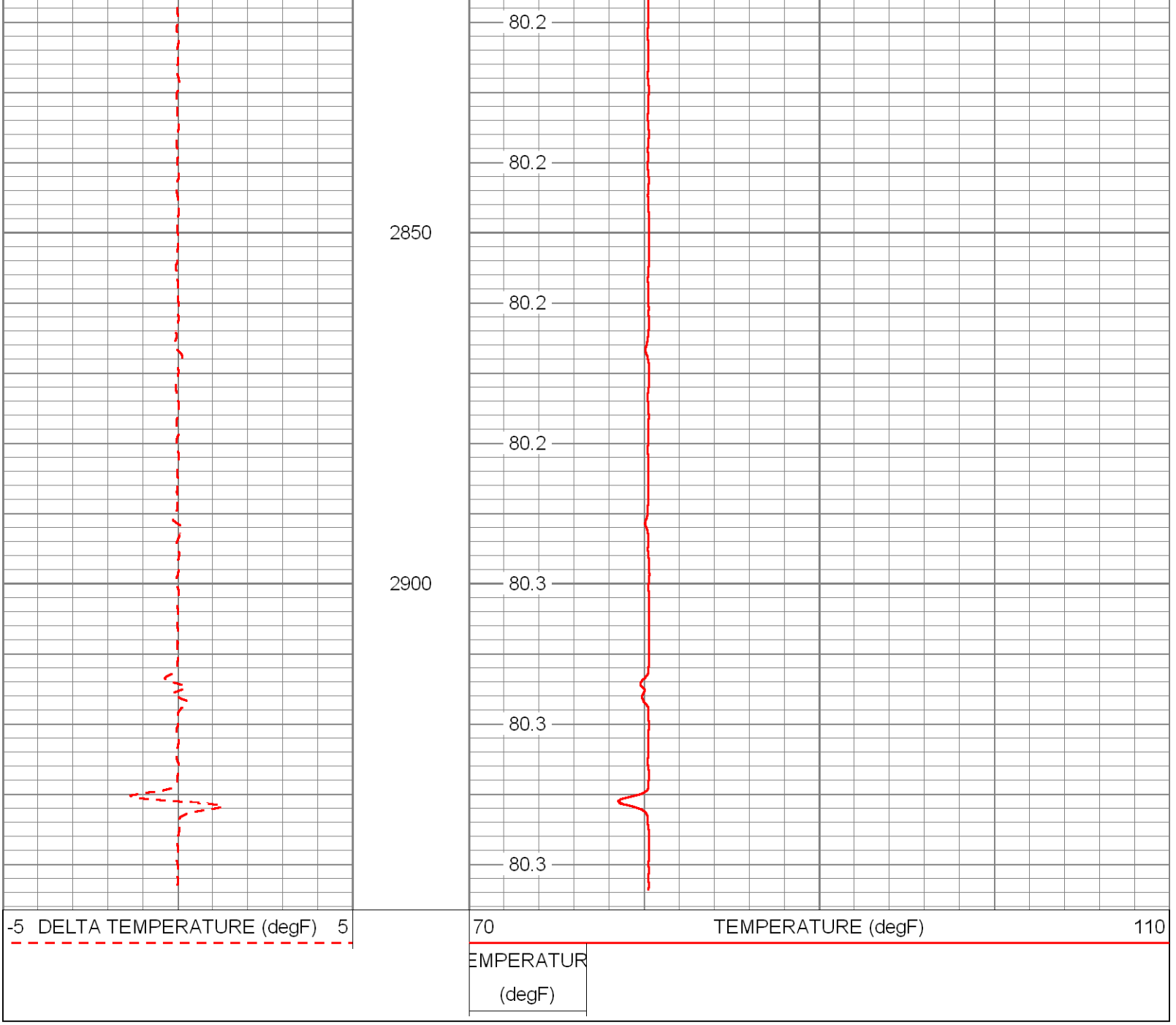

79.9
80.0
1750
79.9
80.0
1800
80.0
79.9
79.9
1850
79.9
79.9
1900
79.9
80.0


79.9
1950
79.9
79.9
2000
80.0
79.9
79.9
2050
79.9
79.9
2100
80.0
79.9
79.9
2150


79.9
79.9
2200
79.9
80.0
80.0
2250
80.0
79.9
2300
79.9
80.0
80.0
2350
80.0


80.0
2400
80.1
80.1
79.4
2450
80.1
80.1
2500
80.1
80.1
80.1
2550
80.1
80.1


2600
80.1
80.1
80.1
2650
80.1
80.1
2700
80.2
80.1
80.2
2750
80.2
80.1
2800
80.2



Calibration Report

Database File: sdwwtp-iw15.db
Dataset Pathname: pass1
Dataset Creation: Fri Sep 06 08:20:09 2013 by Log SOC 110722

Temperature Calibration Report

Serial Number: 952
Tool Model: RTS
Performed: Wed Jun 19 08:20:23 2013

Point #	Reading		Reference	
1	439.20	cps	33.00	degF
2	912.13	cps	85.00	degF
3	1637.63	cps	155.00	degF
4		cps		degF
5		cps		degF
6		cps		degF
7		cps		degF
8		cps		degF

9	cps	degF
10	cps	degF

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)
			TEMP-RTS (952)	25.50	1.69	70.00
TEMP	0.10					

Dataset: edu:tp.jw15.db:field/well/run1/pass1

Dataset:	sdwwtp-iw15.db: field/well/run1/pass1
Total Length:	25.50 ft
Total Weight:	70.00 lb
O.D.	1.69 in

Appendix F

Television Survey

Appendix G

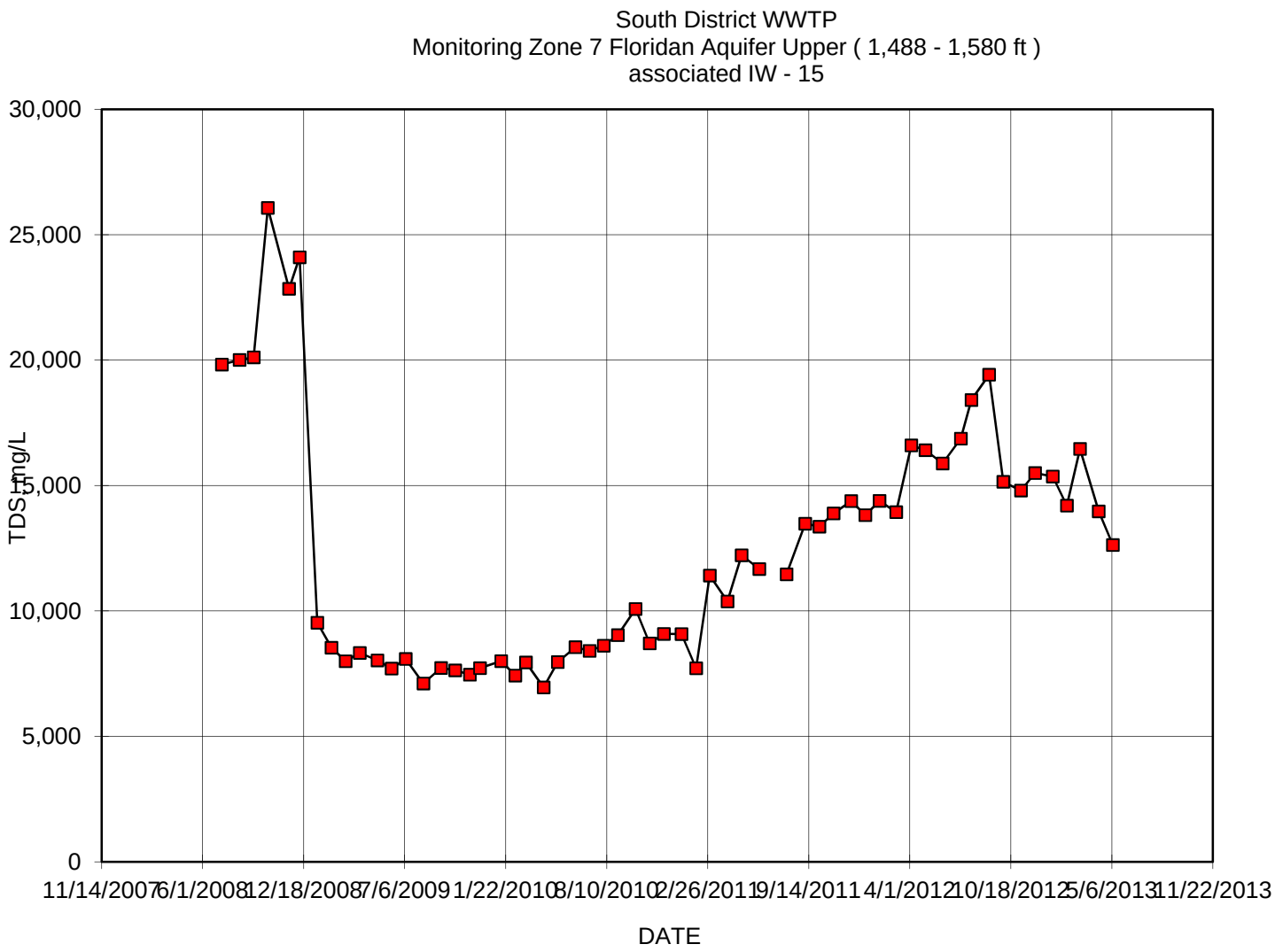
5 year Monitoring Data

FA-7 Upper

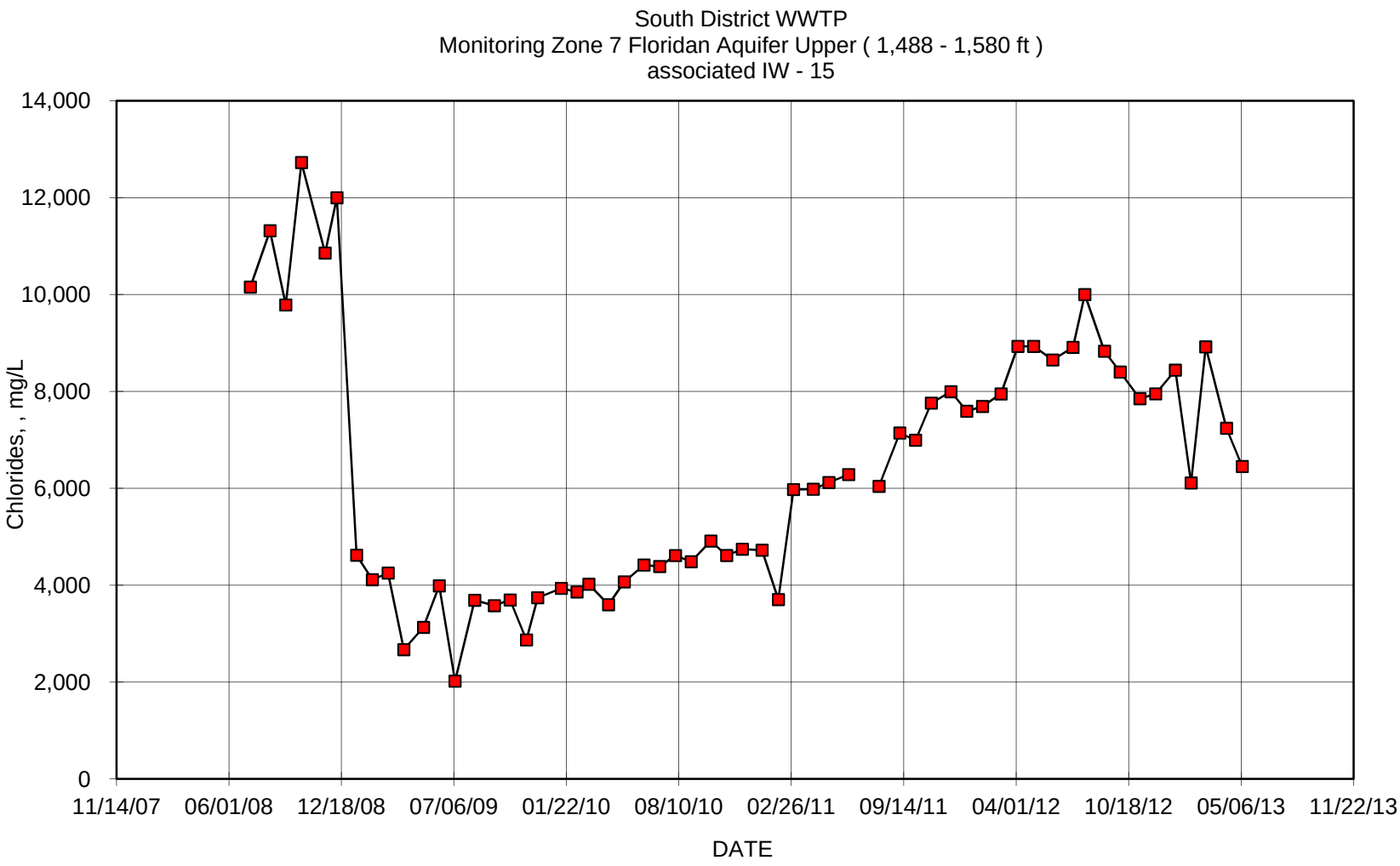
Date	TDS, mg/L	Sulfate, mg/L	Chlorides, mg/L	TKN, mg/L	NH3, mg/L	Conductivity, Micromho/cm	Temp., C	Temp., F	pH	TP, mg/L	NO3 mg/L	TSS mg/L	Sodium mg/L	Gross alpha pCi/L	Radium 226 pCi/L	Radium 228 pCi/L
07/09/08	19,824	1,240	10,155	6.72	5.41	28,560	27	80	7.6	0.01	0.03	23.40				
08/13/08	20,008	1,453	11,317	6.16	5.79	30,360	28	82	7.6	0.01	0.12	20.00				
09/10/08	20,112	1,250	9,785	6.61	6.39	29,270	27	80	7.6	0.01	0.08	17.60				
10/08/08	26,068	1,647	12,726	4.19	3.60	37,480	26	79	7.4	0.02	0.03	32.60				
11/19/08	22,844	1,330	10,857	11.70	8.86	32,850	25	78	7.6	0.00		21.60				
12/10/08	24,100	1,413	11,998	4.40	4.03	37,520	23	73	7.3	0.02	0.03	17.80				
01/14/09	9,532	616	4,619	12.94	12.35	15,210	20	67	7.4	0.04	0.03	23.80				
02/11/09	8,536	562	4,114	13.40	13.60	14,550	25	78	7.4	0.38	0.00	17.60				
03/11/09	7,996	552	4,250	15.10	13.70	13,240	25	77	7.3	0.03	0.00	13.00				
04/08/09	8,328	338	2,670	15.50	14.50	13,140	25	78	7.3	0.02	0.00	16.00				
05/13/09	8,028	397	3,130	13.00	12.80	12,910	29	83	7.4	0.00	0.00	11.20				
06/10/09	7,704	518	3,986	12.40	14.30	12,920	27	81	7.4	0.35	0.00	15.20				
07/08/09	8,088	252	2,019	11.90	14.20	12,760	28	83	7.2	0.03	0.00	14.20				
08/12/09	7,108	489	3,689	12.70	20.60	12,280	26	79	7.3	0.00	0.00	10.60				
09/16/09	7,728	494	3,577	14.57	13.24	12,520			7.3	0.01	0.05		7,728	17.3	3.1	0.9
10/14/09	7,632	537	3,695	14.63	13.40	12,150			7.3	0.02	0.00		2,110	13.5	0.2	0.7
11/12/09	7,460	386	2,870	14.51	13.44	11,780			7.5	0.02	0.00		1,990	13.1	3.8	0.9
12/02/09	7,720	438	3,741	14.66	14.09	12,250	28	82	7.4	0.02	0.00	13.80	1,990	5.0	3.1	0.8
01/13/10	8,000	484	3,935	13.79	13.06	12,720	21	69	7.4	0.01	0.00	21.00	6,380	8.6	3.6	0.9
02/10/10	7,424	463	3,861	14.23	13.65	12,070	25	76	7.4	0.02	0.00	13.20	2,060	13.8	3.5	0.7
03/03/10	7,948	522	4,020	13.80	13.73	13,130	22	71	7.3	0.02	0.00	13.80	2,220	6.6	5.5	0.9
04/07/10	6,952	433	3,597	13.60	12.60	11,570	29	84	7.2	0.01	0.00	13.40	1,880	19.8	2.5	0.8
05/05/10	7,964	526	4,069	15.70	10.50	12,400	28	82	7.3	0.01	0.00	15.60	2,220	12.1	3.6	0.9
06/09/10	8,556	562	4,416	9.81	11.40	13,990	28	83	7.3	0.22	0.01	16.20	2,260	24.9	3.9	0.8
07/07/10	8,408	562	4,386	9.83	5.75	13,810	29	85	7.4	0.03	0.00	14.40	2,260	8.2	4.3	0.8
08/04/10	8,616	585	4,612	13.80	13.40	13,260	26	78	7.4	0.18	0.00	0.01	2,340	17.4	2.2	0.7
09/01/10	9,036	580	4,485	16.80	12.70	14,420	26	79	7.4	0.02	0.01	24.40	2,310	12.3	3.7	0.7

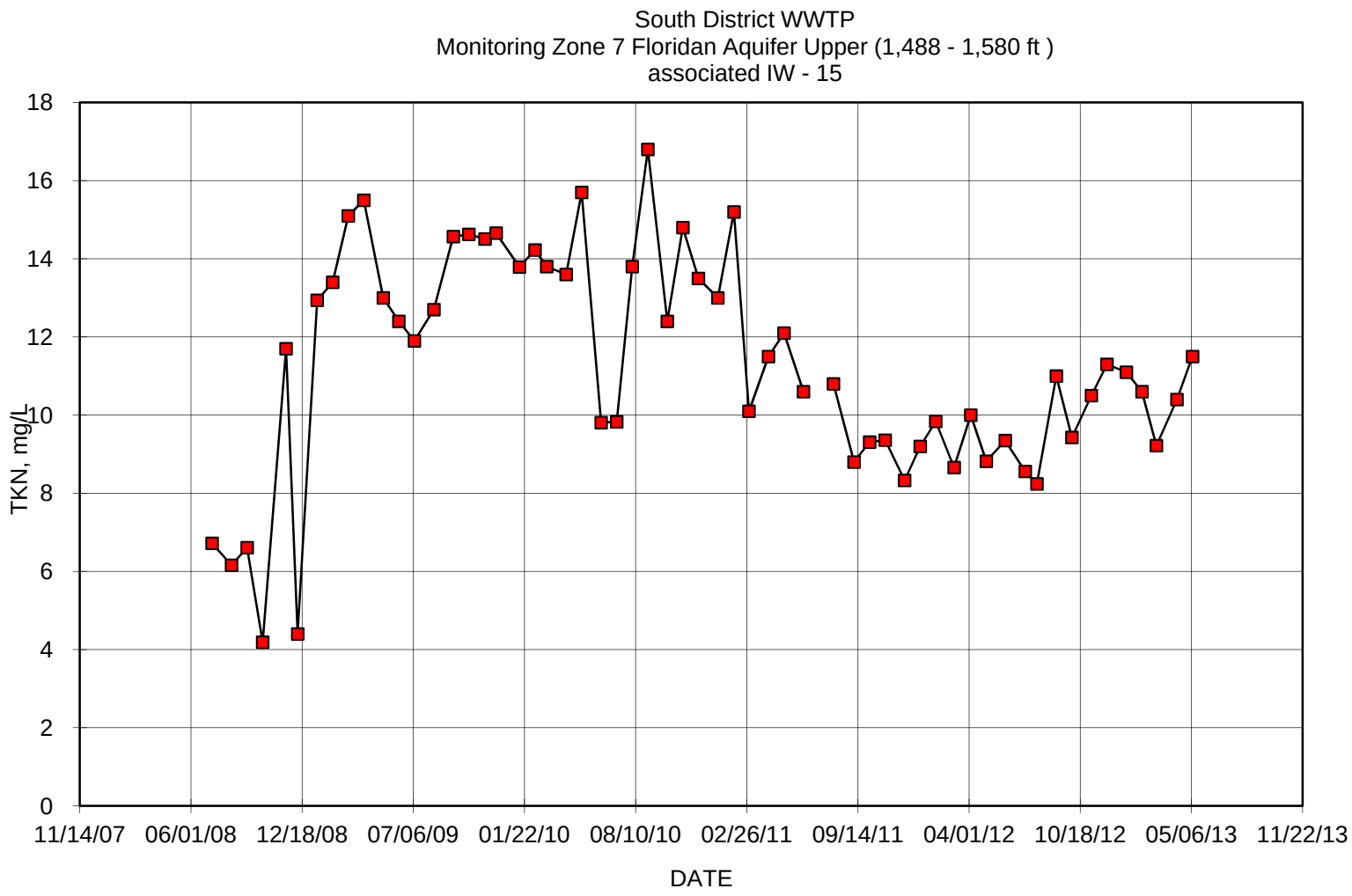
10/06/10	10,080	715	4,912	12.40	12.80	15,950	25	76	7.3	0.02	0.00	0.00	2,690	5.7	4.2	1.0
11/03/10	8,708	600	4,613	14.80	13.00	14,000	24	75	7.3	0.02	0.00	13.40	2,580	4.2	3.6	0.6
12/01/10	9,084	624	4,743	13.50	12.80	14,970	25	77	7.6	0.02	0.00	14.80	2,550	18.8	4.3	0.8
01/05/11	9,080	612	4,722	13.00	12.50	14,380	26	78	7.3	0.02	0.00	16.40	2,690	6.6	6.1	0.9
02/03/11	7,716	508	3,704	15.20	11.80	11,550	25	76	7.1	0.04	0.00	11.80	1,860	10.1	4.0	0.7
03/02/11	11,412	768	5,975	10.10	11.30	17,930	23	73	7.4	0.02	0.00	27.80	3,040	4.8	5.3	0.9
04/06/11	10,380	780	5,981	11.50	11.80	17,170	24	75	7.7	0.02	0.02	14.40	3,270	6.1	4.6	0.9
05/04/11	12,220	809	6,120	12.10	11.00	18,250	24	76	7.6	0.02	0.01	10.80	3,160	5.8	5.5	0.8
06/08/11	11,672	844	6,284	10.60	10.10	18,260	27	81	7.6	0.06	0.01	8.20	3,340	4.2	3.3	0.9
07/06/11																
08/01/11	11,460	786	6,041	10.80	12.00	17,630	32	89	7.4	0.01	0.00	10.80	3,470	4.7	4.5	0.8
09/07/11	13,480	929	7,142	8.80	10.30	20,370	29	84	7.9	0.04	0.01	10.00	3,850	5.1	4.7	1.0
10/05/11	13,360	896	6,993	9.31	10.90	19,570	25	76	7.8	0.03	0.00	8.90	3,900	5.7	5.0	1.0
11/02/11	13,890	986	7,759	9.36	9.27	20,350	26	80	7.9	0.03	0.01	10.50	4,320	4.3	3.1	1.0
12/07/11	14,380	1,018	7,994	8.33	6.62	22,100	23	73	8.1	0.03	0.01	9.30	4,620	4.0	3.8	0.8
01/04/12	13,820	982	7,591	9.20	11.20	20,090	18	65	7.8	0.02	0.01	9.70	4,340	4.8	3.9	0.8
02/01/12	14,390	977	7,690	9.84	10.90	19,920	26	79	7.8	0.02	0.01	8.40	4,190	5.4	5.0	0.7
03/05/12	13,940	985	7,949	8.66	10.10	22,892	26	79	7.9	0.01	0.01	0.00	4,610	6.2	4.8	0.9
04/04/12	16,600	1,100	8,930	10.00	6.30	26,157	26	78	8.0	0.03	0.50	0.50	4,860	5.2	5.6	0.8
05/02/12	16,410	1,050	8,930	8.82	9.06	25,172	28	82	8.0	0.04	0.00	0.00	4,830	6.6	5.7	0.7
06/05/12	15,880	1,100	8,650	9.35	8.98	24,540	25	77	8.3	0.03	0.01	5.90	4,780	8.3	7.7	0.8
07/11/12	16,870	1,150	8,910	8.56	7.02	25,260	25	77	8.1	0.03	0.01	2.50	4,950	6.4	5.4	0.8
08/01/12	18,410	1,280	10,000	8.24	8.17	28,149	29	83	8.2	0.03	0.01	0.10	5,790	6.7	5.4	0.7
09/05/12	19,420	1,130	8,830	11.00	8.39	34,912	24	76	8.2	0.06	0.01	0.00	4,410	5.1	4.4	0.9
10/03/12	15,150	1,020	8,400	9.43	10.00	22,960	25	78	8.1	0.03	0.01	0.00	4,340	5.8	4.6	0.8
11/07/12	14,800	985	7,850	10.50	9.41	21,910	24	75	8.1	0.01	0.01	7.20	4,450	6.2	5.9	0.8
12/05/12	15,500	1,010	7,950	11.30	10.30	23,120	24	75	8.1	0.04	0.02	4.80	4,490	6.0	4.3	0.9
01/09/13	15,360	1,060	8,440	11.10	10.20	23,874	26	78	8.2	0.09	0.05	2.80	4,560	5.8	4.8	0.8
02/06/13	14,200	1,020	6,110	10.60	11.90	22,534	24	75	8.1	0.01	0.00	5.70	3,880	7.7	7.6	0.7
03/04/13	16,460	1,140	8,920	9.22	9.30	25,644	19	67	8.0	0.03	0.00	13.70	5,600	6.2	5.8	0.7
04/10/13	13,970	933	7,240	10.40	9.70	21,854	25	77	7.8	0.01	0.01	0.01	4,210	5.0	4.6	0.8

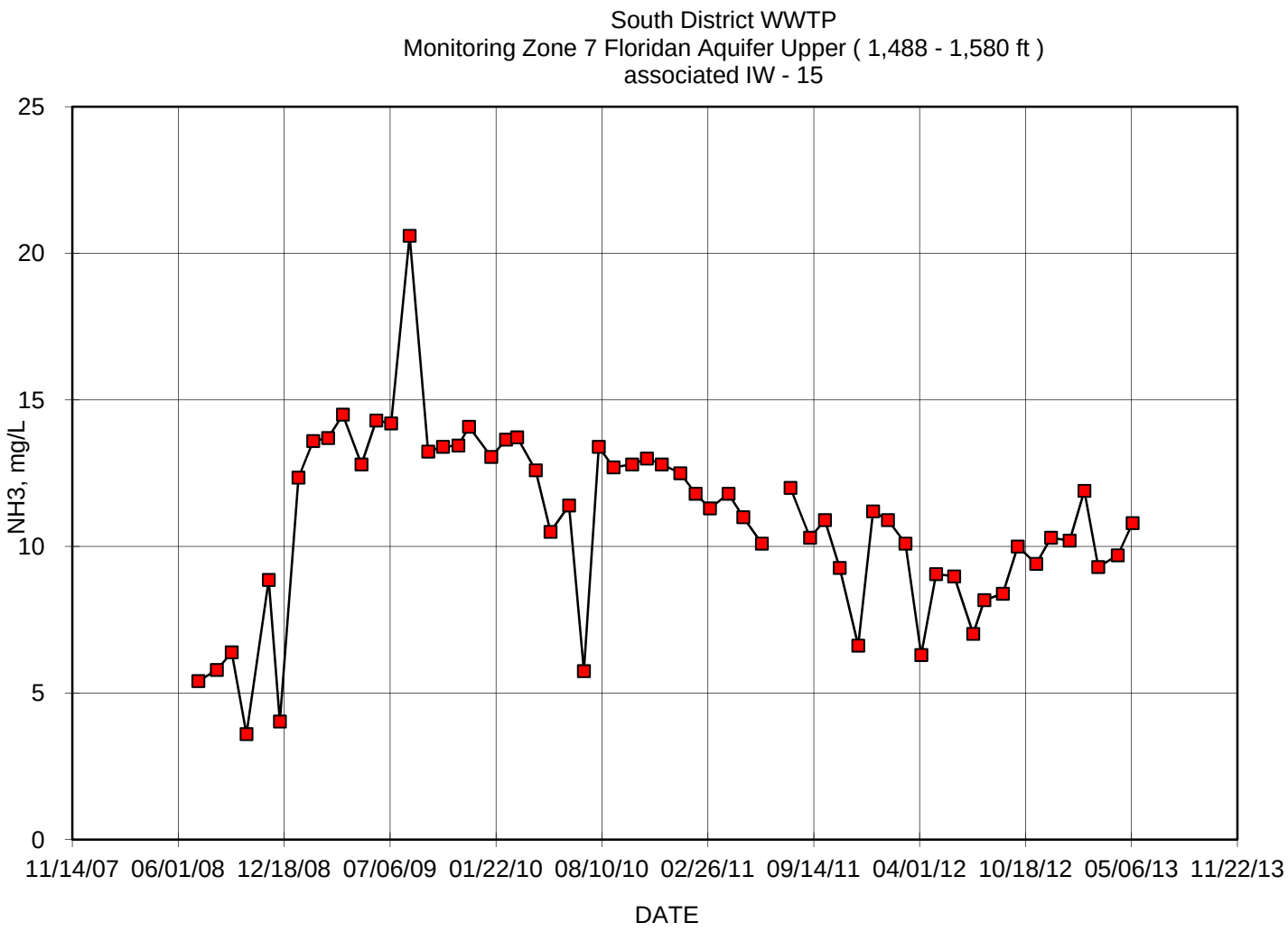
05/08/13	12,630	843	6,450	11.50	10.80	19,840	28	82	7.4	0.03	0.01	0.03	3,850	6.3	4.9	0.8

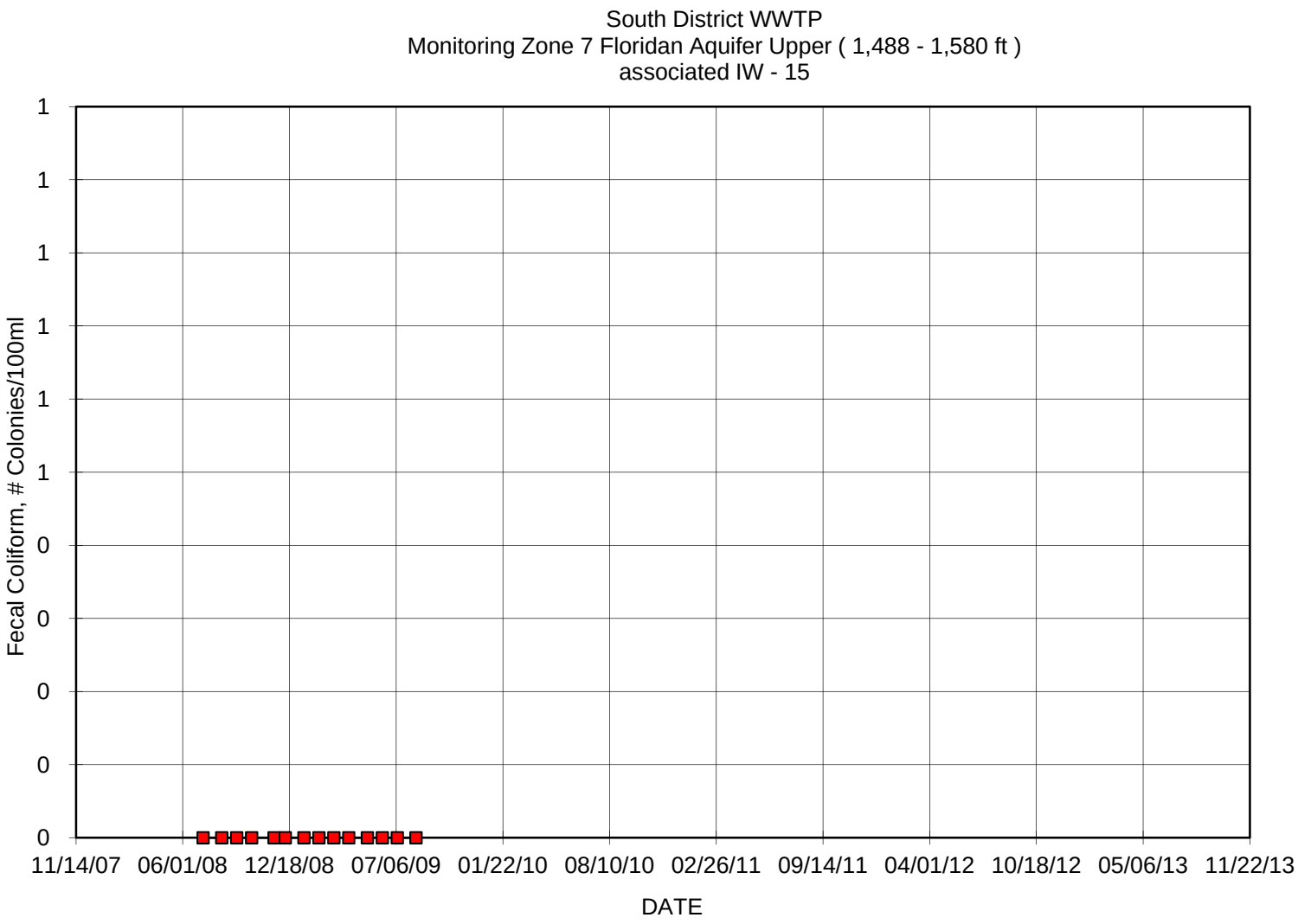

South District WWTP
Monitoring Zone 7 Floridan Aquifer Upper (1,488 - 1,580 ft)
associated IW - 15
30,000
25,000
20,000
15,000
10,000
5,000
0
TDS mg/L
11/14/2007
6/1/2008
12/18/2008
7/6/2009
1/22/2010
8/10/2010
2/26/2011
9/14/2011
4/1/2012
10/18/2012
5/6/2013
11/22/2013
DATE

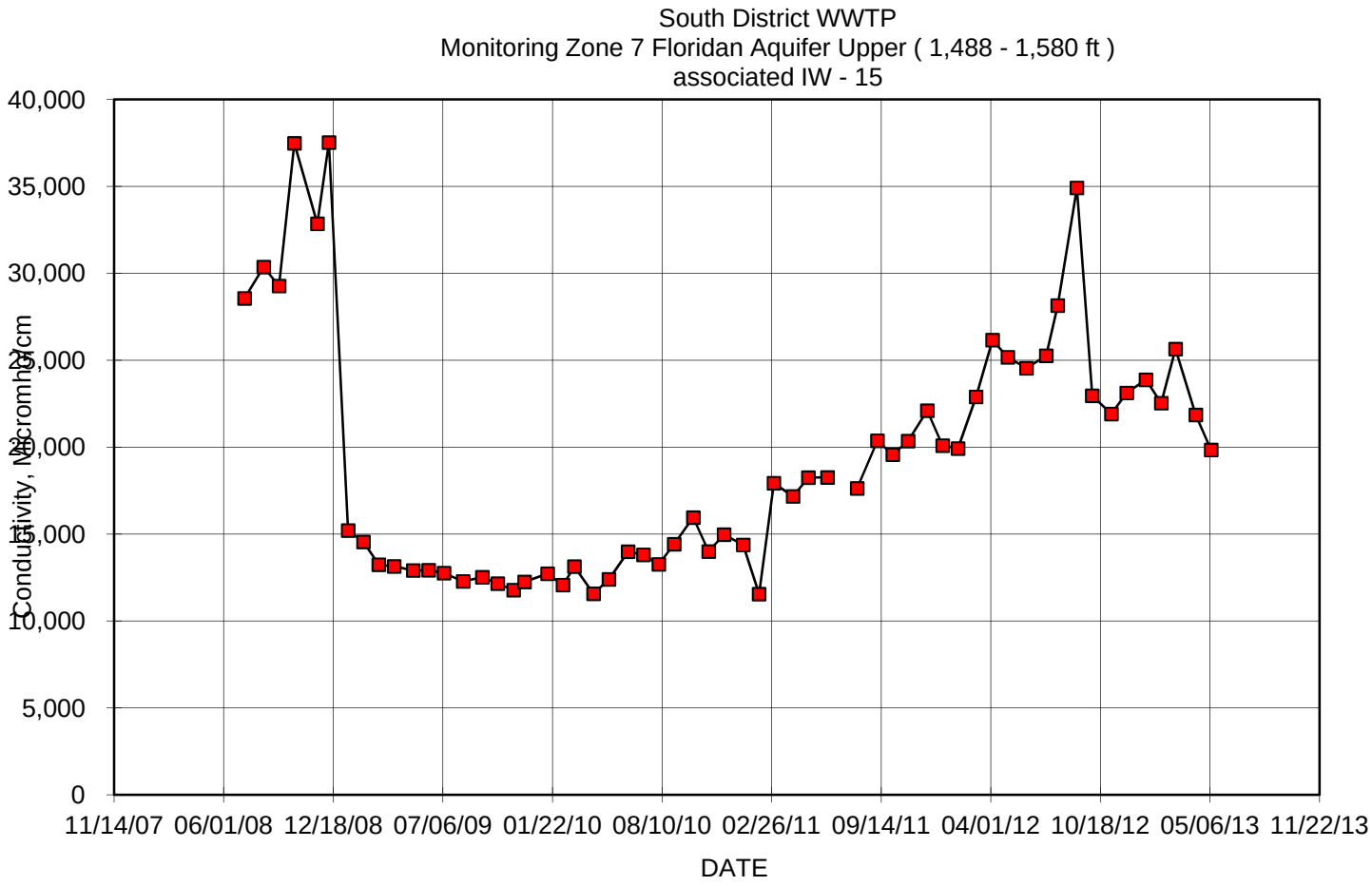
South District WWTP
Monitoring Zone 7 Floridan Aquifer Upper (1,488 - 1,580 ft)
associated IW - 15
Sulfate, mg/L
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
11/14/2007
6/1/2008
12/18/2008
7/6/2009
1/22/2010
8/10/2010
2/26/2011
9/14/2011
4/1/2012
10/18/2012
5/6/2013
11/22/2013
DATE

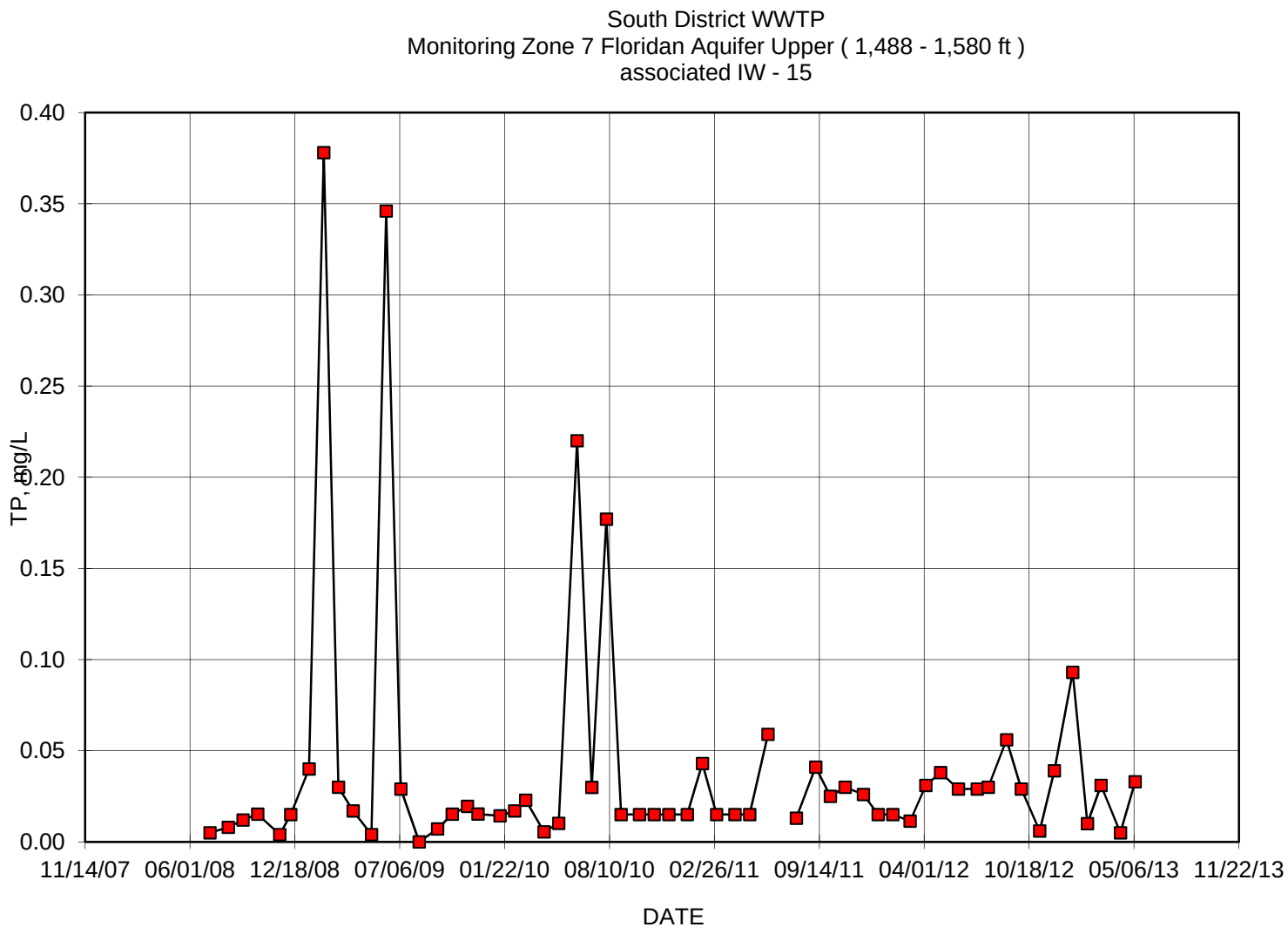

South District WWTP
Monitoring Zone 7 Floridan Aquifer Upper (1,488 - 1,580 ft)
associated IW - 15
Chlorides, , mg/L
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

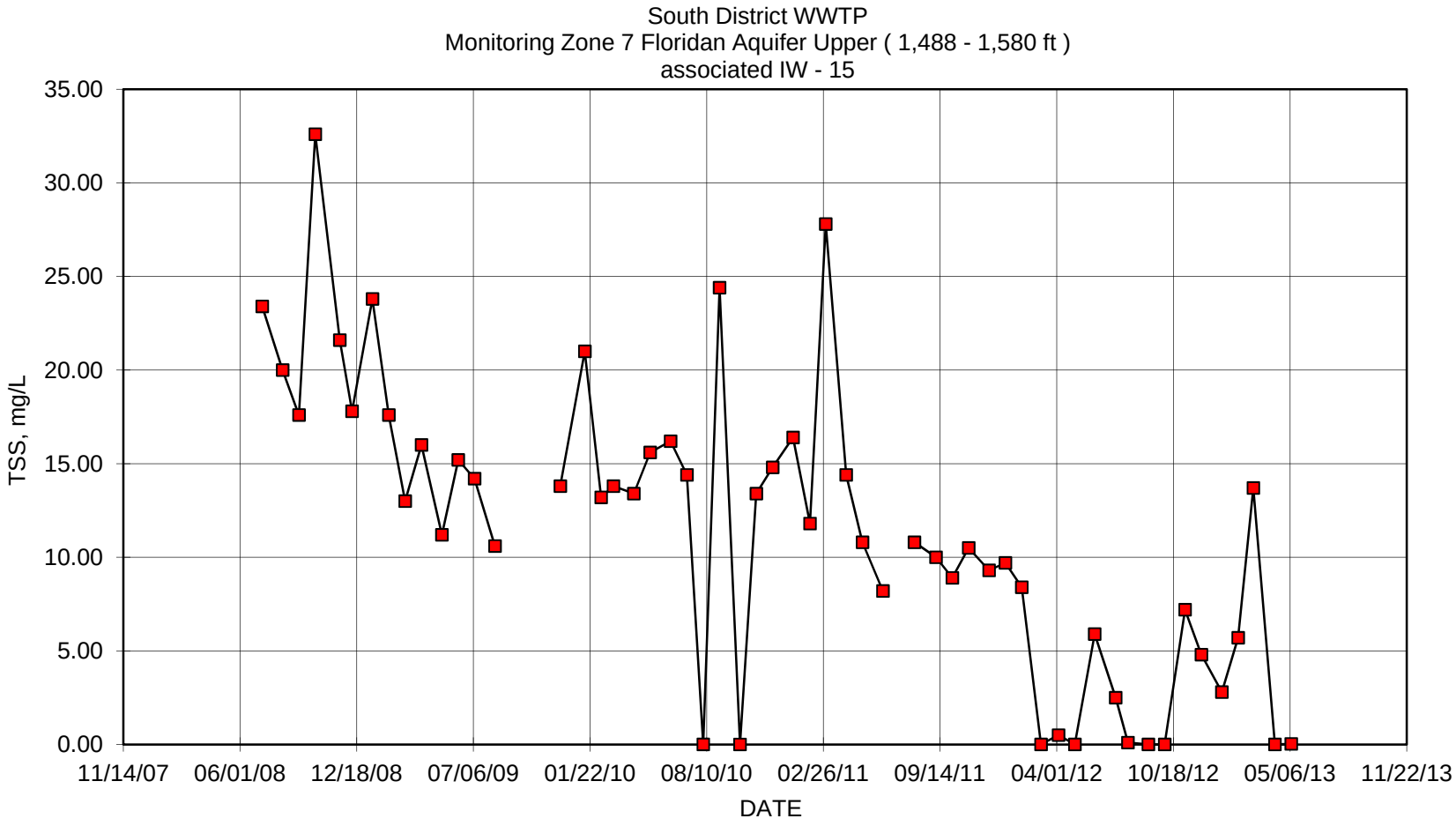

South District WWTP
Monitoring Zone 7 Floridan Aquifer Upper (1,488 - 1,580 ft)
associated IW - 15
TKN, mg/L
0
2
4
6
8
10
12
14
16
18
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitoring Zone 7 Floridan Aquifer Upper (1,488 - 1,580 ft)
associated IW - 15
NH3, mg/L
25
20
15
10
5
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitoring Zone 7 Floridan Aquifer Upper (1,488 - 1,580 ft)
associated IW - 15
Fecal Coliform, # Colonies/100ml
1
1
1
1
1
1
0
0
0
0
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitoring Zone 7 Floridan Aquifer Upper (1,488 - 1,580 ft)
associated IW - 15
Conductivity, Micromhos/cm
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitoring Zone 7 Floridan Aquifer Upper (1,488 - 1,580 ft)
associated IW - 15
TP, mg/L
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

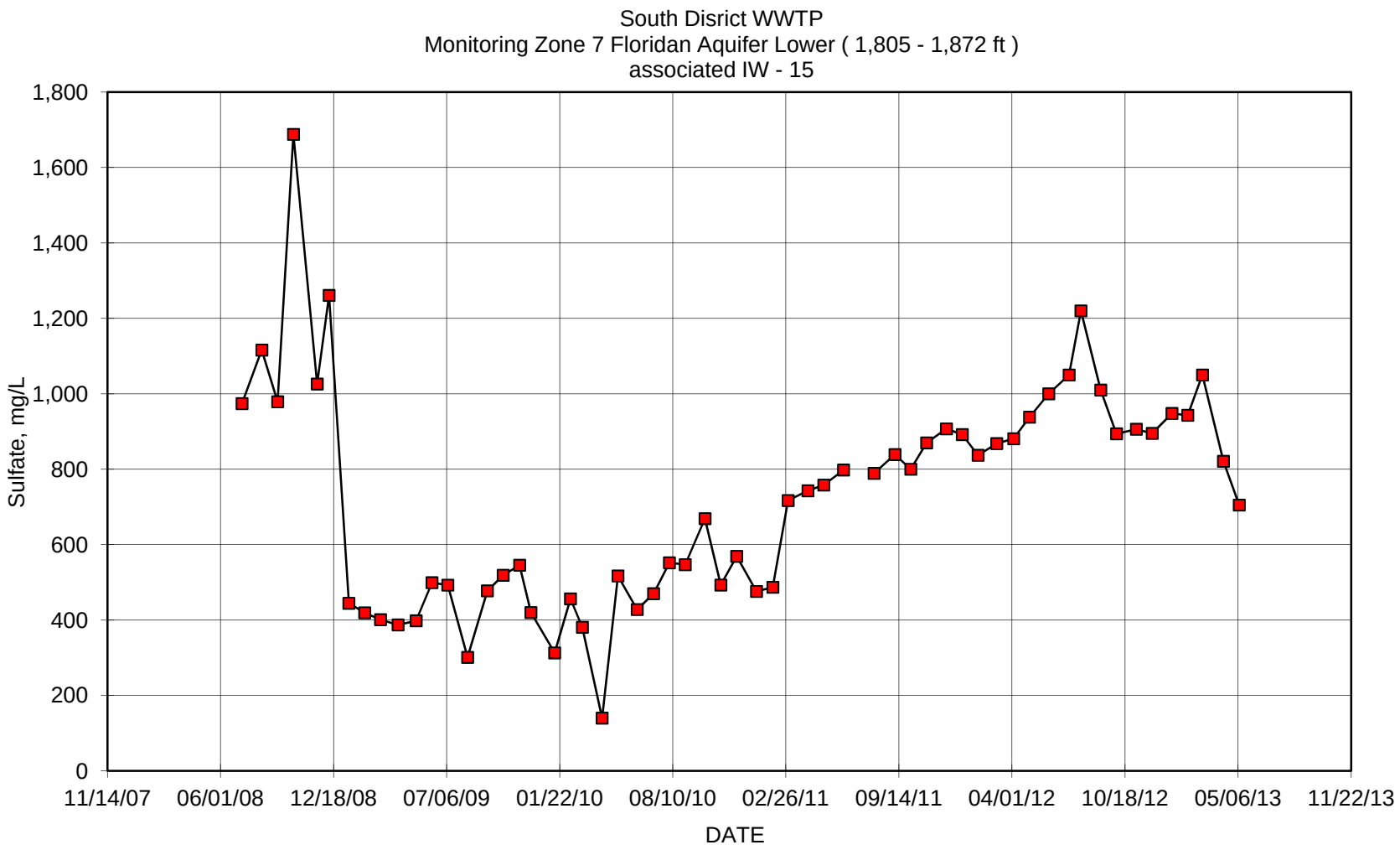

South District WWTP
Monitoring Zone 7 Floridan Aquifer Upper (1,488 - 1,580 ft)
associated IW - 15
TSS, mg/L
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

FA-7 Lower Data

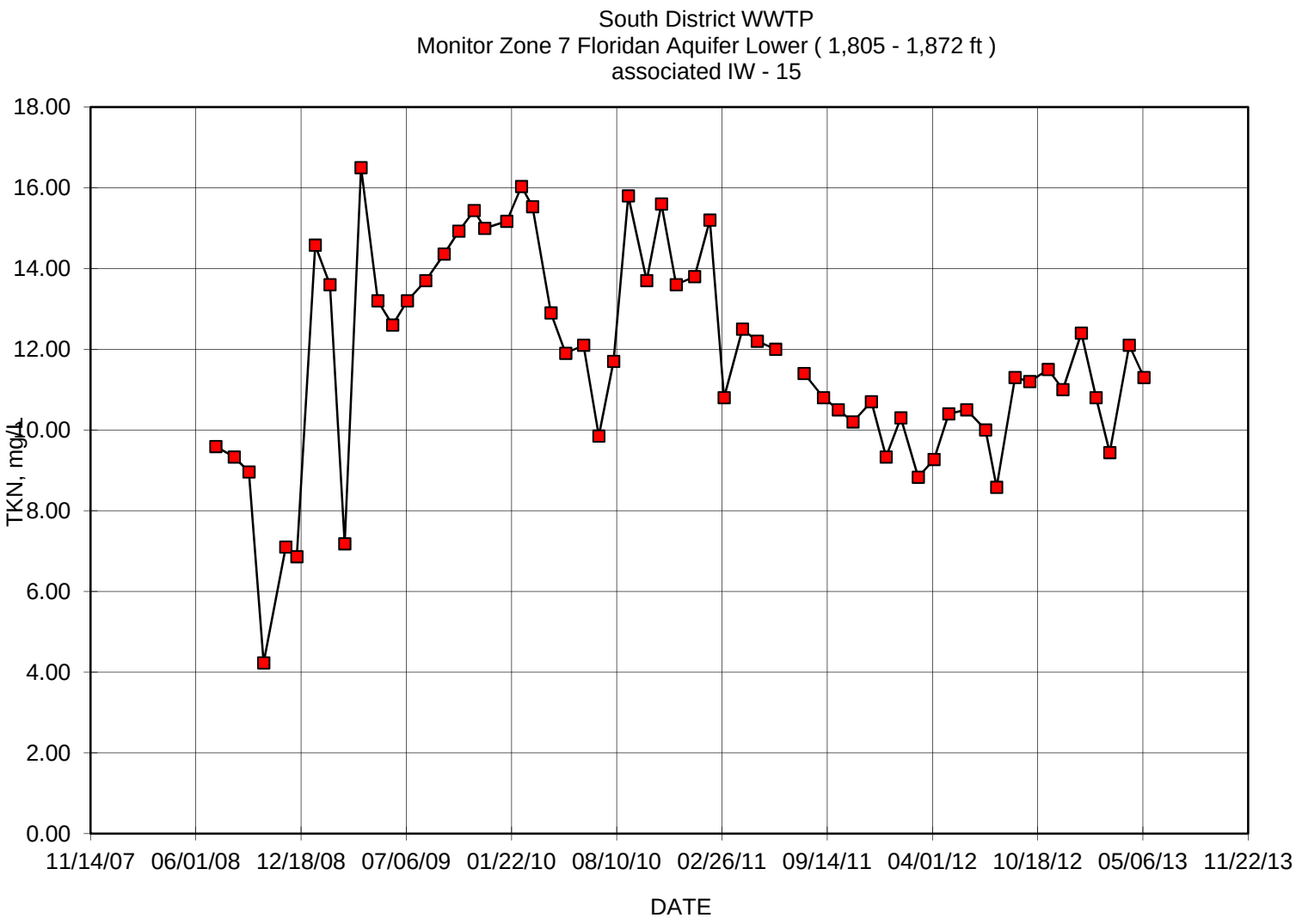
Date	TDS, mg/L	Sulfate, mg/L	Chlorides, mg/L	TKN, mg/L	NH3, mg/L	Conductivity, Micromho/cm	Temp., C	Temp., F	pH	TP, mg/L	NO3 mg/L	TSS mg/L	Sodium mg/L	Gross Alpha pCi/L	Radium 226 pCi/L	Radium 228 pCi/L
07/09/08	15,050	974	7,812	9.59	7.36	22,510	25	76	7.2	0.01	0.03	14.6				
08/13/08	14,880	1116	8,591	9.33	8.15	23,050	25	76	7.3	0.01	0.12	15.2				
09/10/08	15,110	979	7,474	8.96	8.86	20,610	25	77	7.3	0.02	0.08	12.6				
10/08/08	25,670	1688	12,755	4.23	3.54	35,160	27	81	7.8	0.01	0.03	24.8				
11/19/08	16,640	1026	8,076	7.10	4.42	24,410	24	75	7.4	0.00	0.03	12.8				
12/10/08	19,860	1261	9,413	6.86	6.01	31,120	22	72	7.3	0.02	0.03	24.4				
01/14/09	9,360	445	3,344	14.58	12.61	14,350	22	71	7.2	0.04	0.03	9.6				
02/11/09	8,330	419	3,067	13.60	13.80	13,510	24	76	7.3	0.38	0.02	2.8				
03/11/09	7,630	401	3,070	7.18	13.50	13,430	25	76	7.3	0.02	0.00	3.4				
04/11/09	7,950	387	3,013	16.50	14.70	12,910	24	76	7.1	0.03	0.00	4.4				
05/13/09	7,790	398	3,082	13.20	13.50	12,590	26	79	7.3	0.01	0.00	3.6				
06/10/09	8,040	499	3,807	12.60	14.50	13,560	25	78	7.2	0.26	0.01	6.2				
07/08/09	7,660	493	3,779	13.20	14.30	12,070	26	78	7.2	0.03	0.00	5.6				
08/12/09	7,030	301	2,296	13.70	17.50	11,630	25	77	7.2	0.01	0.00	5.6				
09/16/09	7,640	478	3,417	14.36	13.40	11,860			7.4	0.01	0.05		1,980	7.2	3.2	0.8
10/14/09	7,320	519	3,513	14.93	13.49	11,910			7.3	0.02	0.00		1,930	12.2	3.8	0.8
11/12/09	7,120	545	3,898	15.44	13.74	12,470			8.2	0.02	0.00		1,980	25.6	3.0	0.8
12/02/09	7,240	420	3,537	15.00	14.27	11,890	26	79	7.2	0.08	0.00	6.0	1,850	12.4	3.4	1.1
01/13/10	7,280	313	2,569	15.17	13.37	11,880	23	74	7.0	0.03	0.00	5.2	1,820	4.5	3.3	0.9
02/10/10	7,080	456	3,747	16.03	13.98	11,700	24	76	7.3	0.02	0.00	5.2	2,010	14.9	2.9	0.7
03/03/10	7,410	381	2,995	15.53	13.88	12,380	23	74	7.2	0.03	0.00	4.4	2,080	12.6	4.8	0.9
04/07/10	6,920	140	1,188	12.90	12.70	11,240	25	78	7.2	0.06	0.00	3.6	1,860	16.1	2.4	0.7
05/05/10	7,536	517	3,906	11.90	10.80	11,660	26	78	7.1	0.01	0.00	2.4	2,100	2.5	2.2	0.8
06/08/10	7,820	428	3,348	12.10	11.70	13,530	26	79	7.3	7.27	0.00	4.0	2,270	5.2	3.1	0.7
07/07/10	7,680	470	3,594	9.85	12.30	12,950	26	79	7.2	0.01	0.01	3.0	2,080	22.0	2.9	0.8
08/04/10	8,020	552	4,300	11.70	14.10	12,830	25	77	7.2	0.15	0.00	0.0	2,300	20.3	4.2	0.9
09/01/10	8,050	547	4,147	15.80	13.40	13,360	25	77	7.1	0.02	0.01	0.0	2,270	13.1	0.5	0.7
10/06/10	9,190	669	4,551	13.70	13.20	14,700	24	76	7.3	0.02	0.01	7.0	2,580	3.0	3.4	0.8
11/03/10	7,890	493	3,731	15.60	13.40	13,500	24	76	7.2	0.03	0.00	1.6	2,530	11.2	3.0	0.9
12/01/10	8,460	569	4,233	13.60	13.80	13,610	24	76	7.2	0.02	0.00	5.4	2,330	13.2	3.6	0.7
01/05/11	8,260	476	3,474	13.80	13.10	13,140	25	77	7.3	0.02	0.00	6.0	2,400	7.2	4.6	0.9
02/03/11	7,670	487	3,676	15.20	11.90	11,370	25	76	7.3	0.03	0.00	3.6	1,960	11.4	4.3	0.8

03/02/11	10,080	717	5,493	10.80	11.10	16,530	24	74	7.2	0.02	0.00	8.8	2,960	6.3	4.2	0.8
04/06/11	10,140	743	5,612	12.50	12.70	16,100	24	75	7.1	0.02	0.01	2.9	3,060	6.6	4.8	0.8
05/04/11	11,390	758	5,595	12.20	11.30	18,010	24	75	7.3	0.02	0.01	3.3	2,810	6.4	5.4	0.9
06/08/11	10,240	798	5,766	12.00	10.30	17,150	25	76	7.3	0.06	0.01	2.9	3,270	4.6	3.7	0.9
07/06/11																
08/01/11	11,180	789	5,979	11.40	13.20	16,180	26	79	7.3	0.02	0.00	7.3	3,300	4.5	4.4	0.9
09/07/11	11,810	839	6,282	10.80	11.60	18,810	25	77	7.7	0.04	0.00	10.5	3,370	5.6	5.7	1.0
10/05/11	11,530	800	8,088	10.50	12.20	17,720	24	75	7.2	0.04	0.00	5.9	3,500	7.1	5.2	0.9
11/02/11	11,840	870	6,611	10.20	10.80	18,300	24	76	7.5	0.04	0.01	6.7	3,560	4.4	3.3	0.9
12/07/11	12,670	907	6,893	10.70	10.30	17,350	23	74	7.6	0.03	0.01	5.3	2,110	3.8	3.4	0.8
01/04/12	12,000	892	6,808	9.33	12.70	17,030	22	71	7.3	0.02	0.01	7.2	3,440	5.7	4.1	0.8
02/01/12	12,310	837	6,370	10.30	12.80	18,906	24	75	7.3	0.02	0.01	0.0	3,600	5.2	4.8	0.8
03/05/12	14,450	868	6,980	8.83	9.90	19,380	25	78	7.8	0.01	0.01	0.0	4,450	6.6	5.9	0.9
04/04/12	14,010	881	7,322	9.27	9.73	18,500	24	75	7.3	0.03	0.50	0.5	4,000	5.4	4.6	0.9
05/02/12	14,460	938	7,790	10.40	10.10	22,420	24	75	7.5	0.04	0.01	20.7	4,360	5.5	4.7	0.8
06/05/12	14,000	1000	7,010	10.50	10.30	19,205	24	74	7.3	0.02	0.01	5.9	4,140	5.2	4.7	0.8
07/11/12	14,890	1050	7,900	10.00	7.66	22,750	23	74	7.5	0.03	0.01	22.7	4,340	5.3	4.6	0.9
08/01/12	17,320	1220	9,320	8.58	8.74	24,960	25	76	8.3	0.03	0.01	27.3	5,360	7.6	6.1	0.8
09/05/12	14,270	1010	7,600	11.30	9.94	21,400	23	74	7.5	0.05	0.00	6.8	3,820	6.2	4.9	0.8
10/03/12	13,200	894	7,140	11.20	11.10	21,157	24	75	7.5	0.03	0.01	9.5	3,760	5.5	4.8	0.8
11/07/12	12,910	906	6,820	11.50	10.50	20,185	23	74	7.4	0.03	0.01	6.3	3,990	4.7	3.8	0.8
12/05/12	13,530	895	6,830	11.00	11.30	20,370	23	74	7.3	0.04	0.02	4.4	3,900	5.6	4.0	0.8
01/09/13	13,420	948	7,270	12.40	11.40	20,990	24	75	7.5	0.11	0.05	5.1	3,990	4.9	4.5	4.5
02/06/13	12,410	943	6,480	10.80	12.30	19,218	24	75	7.5	0.02	0.01	4.7	3,270	6.7	4.6	0.8
03/04/13	14,840	1050	7,980	9.44	10.30	23,222	23	73	7.4	0.05	0.00	16.0	5,000	6.8	5.9	0.8
04/10/13	11,800	821	6,200	12.10	10.70	19,142	24	75	7.5	0.01	0.01	0.0	3,500	3.9	3.0	0.9
05/08/13	11,310	705	5,290	11.30	11.50	18,172	25	76	7.3	0.06	0.01	0.1	3,250	5.1	4.9	0.9

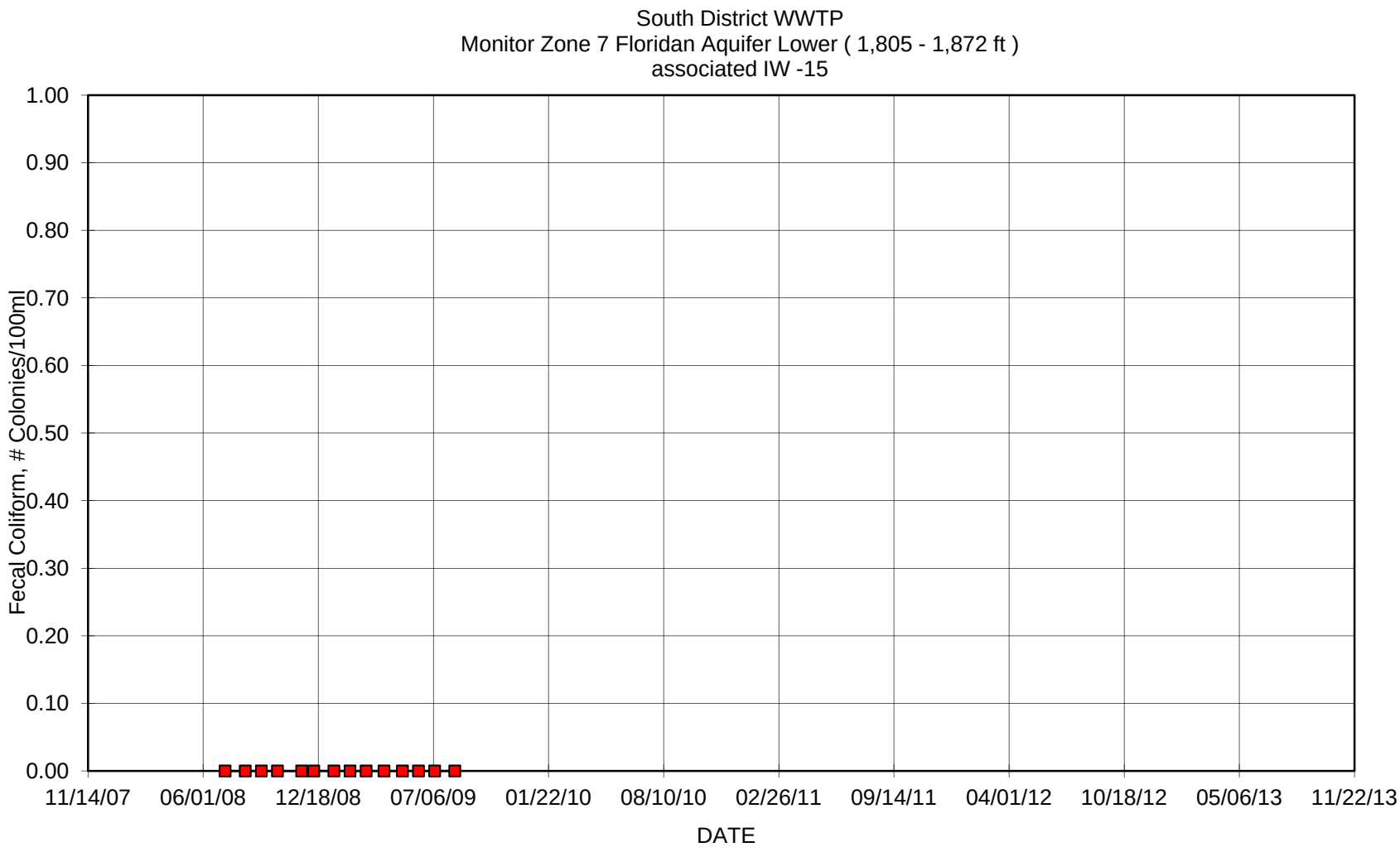
South Disrict WWTP
Monitoring Zone 7 Floridan Aquifer Lower (1,805 - 1,872 ft)
associated IW - 15
TDS, mg/L
30,000
25,000
20,000
15,000
10,000
5,000
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

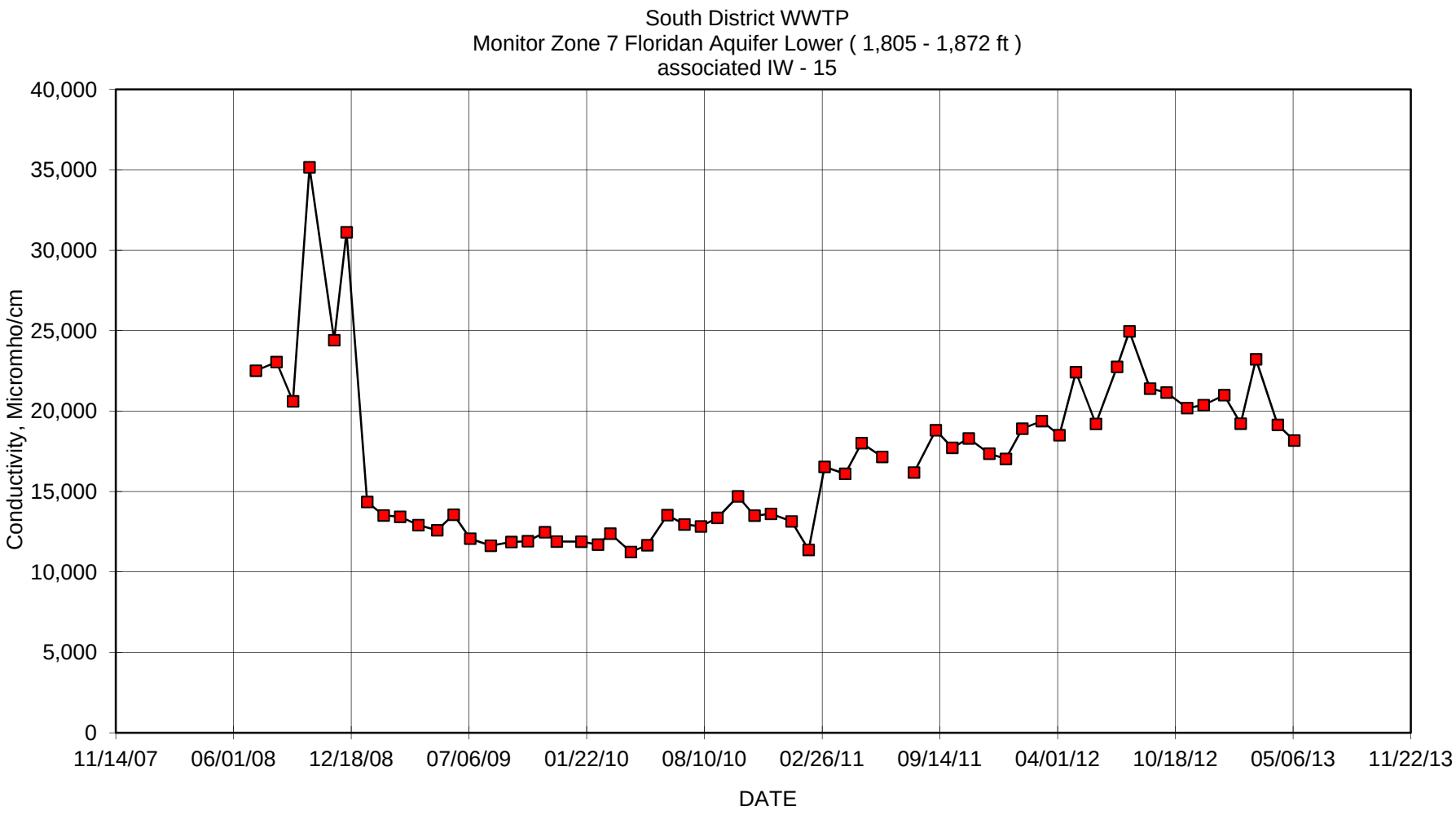

South Disrict WWTP
Monitoring Zone 7 Floridan Aquifer Lower (1,805 - 1,872 ft)
associated IW - 15
Sulfate, mg/L
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

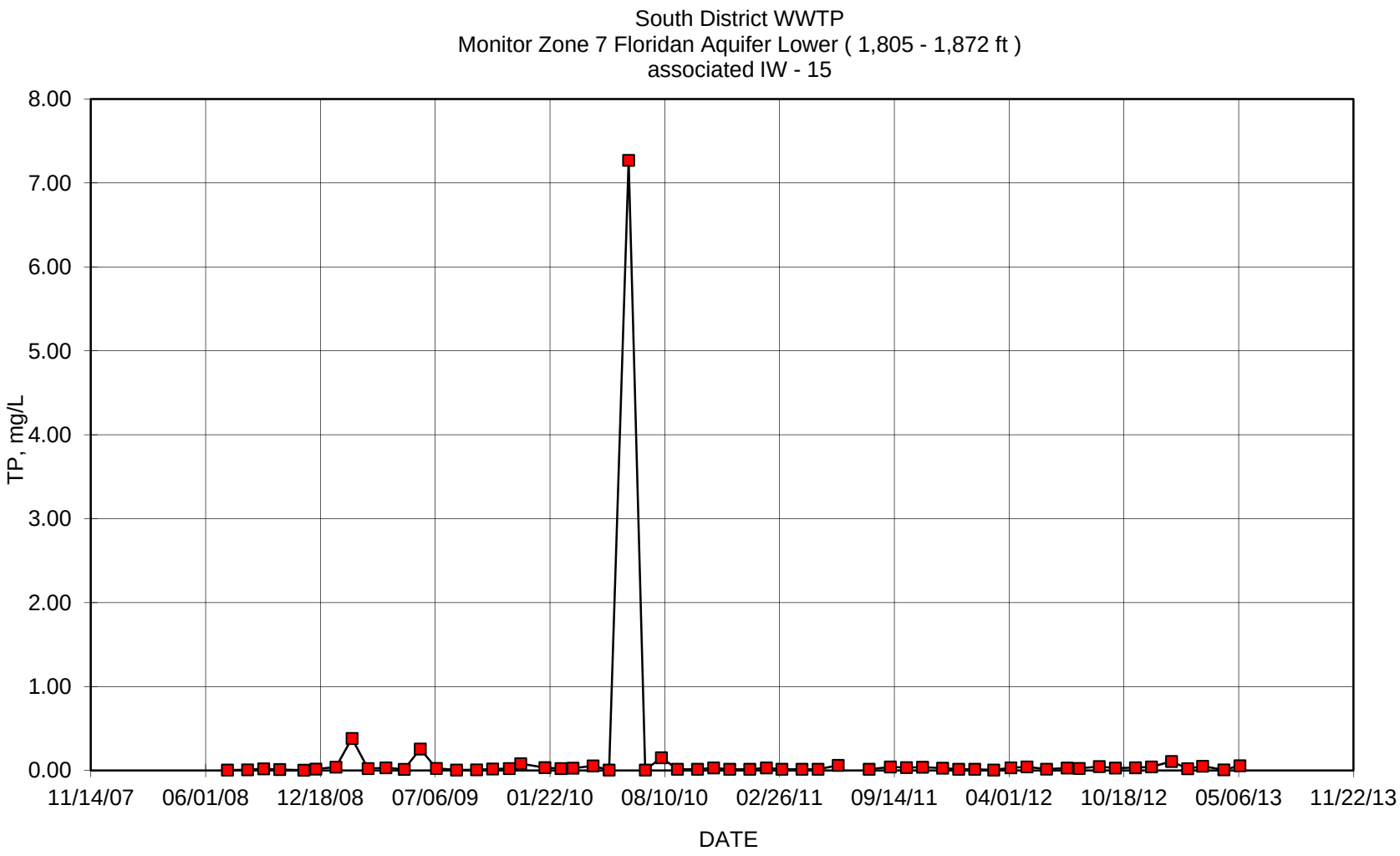
South District WWTP
Monitor Zone 7 Floridan Aquifer Lower (1,805 - 1,872 ft)
associated IW - 15
Chlorides, mg/L
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

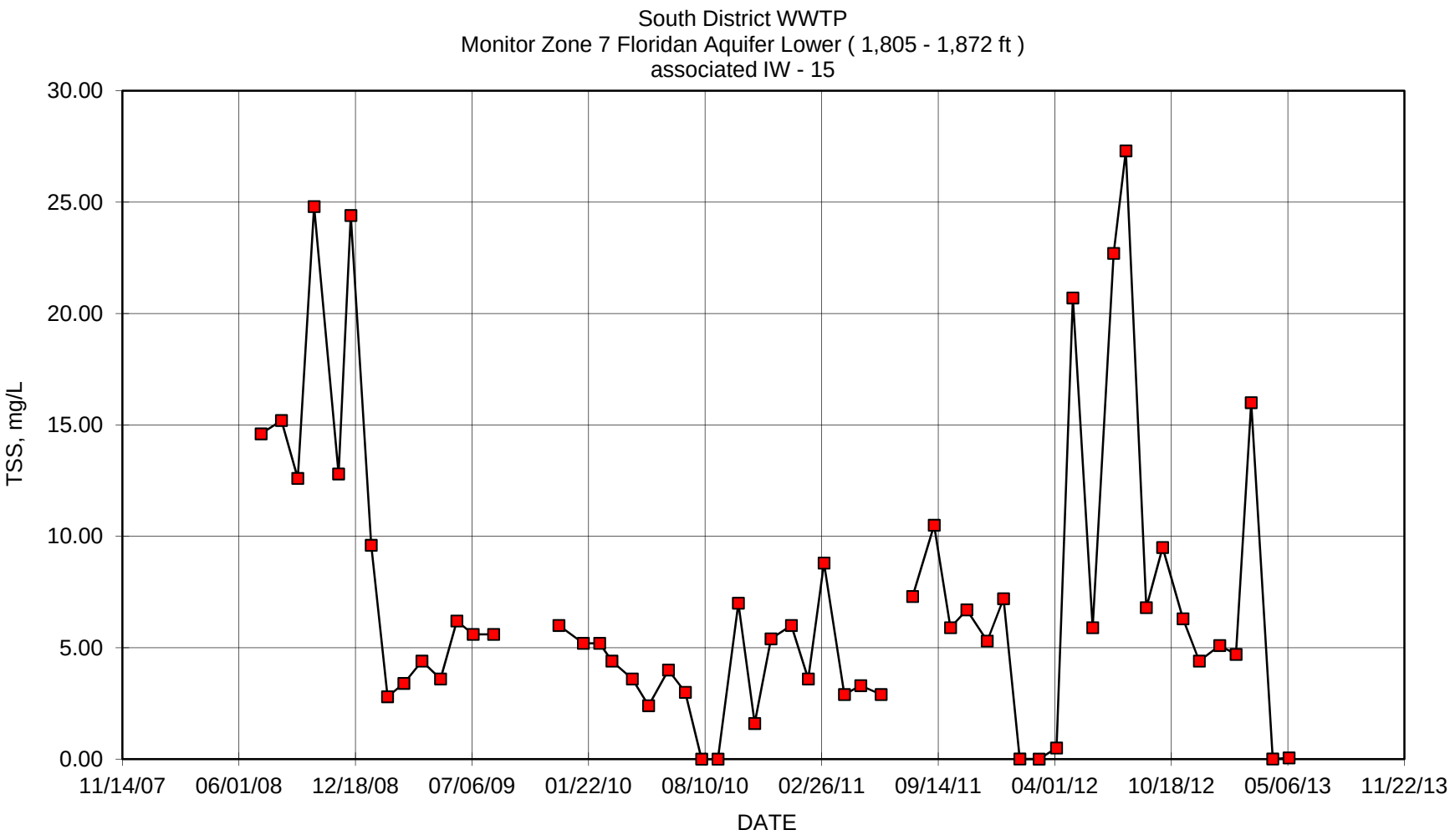

South District WWTP
Monitor Zone 7 Floridan Aquifer Lower (1,805 - 1,872 ft)
associated IW - 15
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
TKN, mg/L
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

South District WWTP
Monitor Zone 7 Floridan Aquifer Lower (1,805 - 1,872 ft)
associated IW - 15
NH3, mg/L
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 7 Floridan Aquifer Lower (1,805 - 1,872 ft)
associated IW -15
Fecal Coliform, # Colonies/100ml
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 7 Floridan Aquifer Lower (1,805 - 1,872 ft)
associated IW - 15
Conductivity, Micromho/cm
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 7 Floridan Aquifer Lower (1,805 - 1,872 ft)
associated IW - 15
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
TP, mg/L
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 7 Floridan Aquifer Lower (1,805 - 1,872 ft)
associated IW - 15
TSS, mg/L
30.00
25.00
20.00
15.00
10.00
5.00
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

MIAMI-DADE COUNTY
miamidade.gov

Water and Sewer
PO Box 330316 • 3071 SW 38 Avenue
Miami, Florida 33233-3016
T 305-665-7471

December 12, 2013

Mr. Joseph R. May, P.G.
Florida Department of Environmental Protection
400 North Congress Avenue, 3rd Floor
West Palm Beach, Florida 33401

CCN: 57718

Reference: Miami-Dade Water and Sewer Department -- Mechanical Integrity Testing (MIT) Report for Deep Injection Well No. IW-16 at the SDWWTP Site.

Dear Mr. May:

Enclosed please find the Certificate of Mechanical Integrity and the MIT Report on the re-testing of Deep Injection Well No. IW-16 at the South District Wastewater Treatment Plant site in Miami-Dade County.

All the tests were conducted in strict adherence to the specifications submitted to and approved by your office. The testing results for the well were good. Both external and internal mechanical integrity were demonstrated. The well casing and the wellhead components are in good condition. All the well head valves and all the well head components are scheduled to be rust-proofed and repainted when all the MITs are completed. Based on the results of the well testing we conclude that the well retains full mechanical integrity and recommend that MDWASD be allowed to continue operating the well in its normal mode.

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

The demonstration of mechanical integrity is being submitted per Chapter 62-528.300(6)(b)2., 62-528.300(6)(c), and 62-528.425(1)(d), F.A.C. and specific condition 3.j. of Permit 0061787-022-UO.

If you have any questions or require additional explanation of any item in the report, please do not hesitate to contact me at [redacted] or Sonia Villamil at [redacted].

Sincerely,

[redacted]

Assistant Director- Wastewater Operation Systems

Enclosures: Certificate of Mechanical Integrity
MIT Report Well IW-15 (1 copy)

cc: Joseph Haberfeld, FDEP - Tallahassee

MIAMI-DADE COUNTY
Delivering Excellence Every Day

Mechanical Integrity Test Report
Deep Injection Well No. IW-16
South District Wastewater Treatment Plant

Prepared by:
Miami-Dade Water and Sewer Department
3071 SW 38th Avenue
Miami, Florida 33146

CERTIFICATE OF MECHANICAL INTEGRITY

The **South District WWTP** deep injection well **IW-16** operated by **Miami-Dade Water and Sewer Department** has been tested for mechanical integrity. The tests followed standard engineering practices and used methods presented in the United States Environmental Protection Agency regulations for the purposes of these tests. The external and internal mechanical integrity tests followed Florida Department of Environmental Protection (FDEP) pre-approved testing specifications and all the critical test events were witnessed by representatives of the FDEP, the MDWASD and the contractor.

Having supervised the engineer and geologists that were present during the testing, conducted the examining of the results and the preparation this mechanical integrity report as part of this certification, the undersigned certifies that deep injection well **IW-16** operated by **Miami-Dade Water and Sewer Department** at the **South District Wastewater Treatment Plant Site in Miami-Dade County, Florida** has successfully passed all the test requirements for mechanical integrity under rules of Chapter 62-528 of the Florida Administrative Code and is therefore determined to have mechanical integrity.

Certified on December 12, 2013

[redacted]

Howard J. Fallon Jr., P.E.
Professional Engineer
License Number 24153

MECHANICAL INTEGRITY TEST REPORT
FOR
DEEP INJECTION WELL No. IW-16
AT THE
SOUTH DISTRICT WASTEWATER TREATMENT PLANT

Prepared by:

MIAMI-DADE WATER AND SEWER DEPARTMENT
3071 SW 38th Avenue
Miami, Florida 33146

For Submittal To:

UNDERGROUND INJECTION CONTROL
FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

November 2013

ABSTRACT

The internal mechanical integrity was investigated through a pressure test performed on the injection casing. The pressure test was conducted at 153.5 pounds per square inch (psi) which is approximately 1.5 times the maximum (100 psi) potential injection pressure and more than 1.7 times the maximum operational pressure that the well will be under when operating at its full permitted injection velocity of 10 feet per second (ft/sec). FDEP permits a 5% loss in pressure during the hour long test in order for the internal mechanical integrity to pass the pressure test.
IW-16 successfully passed the pressure test because the casing only lost 3.5 psi. The successful results of the pressure test for internal mechanical integrity were reinforced by the results of the second internal mechanical integrity test, the TV survey of the casing. The TV survey confirmed that the casing and the casing joints are in good condition and that the well has internal mechanical integrity down to 2,420 ft bls.

The external mechanical integrity was investigated using two test procedures, a Radioactive Tracer Survey (RTS) and a Temperature Log. Results of the RTS confirmed the integrity of the cement around the casing and the continued competence of its seal with the geologic strata. The temperature test showed that there are no anomalies that would indicate points where injected fluids could escape through the casing and cement into the formation. Similarly there were no temperature anomalies that would indicate injection fluids entering the formations at other than the approved injection depth.

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APPENDIX C – FIELD NOTES INCLUDING PRESSURE CHART AND GUAGE CERTIFICATION
APPENDIX D – RADIOACTIVE TRACER SURVEY (RTS) AND RTS TOOL CONFIGURATION
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Section 1

1. INTRODUCTION

1.1 BACKGROUND

On October 12, 2012, (see Appendix A) the Miami-Dade Water and Sewer Department (MDWASD) submitted the County's proposed plan and testing specifications for conducting the mechanical integrity tests (MITs) and repairs on some of the injection wells at the South District Wastewater Treatment Plant (SDWWTP) site (see Figure 1) to the Florida Department of Environmental Protection (FDEP). The plan, represented by the specifications, described the step-by-step procedure to be followed and included the testing schedule required to meet the 5-year MIT re-testing conditions of the FDEP permit for each of the injection wells. After receipt of these documents, the FDEP Staff reviewed the proposed plan and sent an approval on June 5, 2013 (see Appendix B).

The contract documents for conducting the MITs were let out for bids, and the winning bid was submitted on February 28, 2013 by Youngquist Brothers, Inc., a well drilling contractor from Ft. Meyers, Florida. After the contract was approved by the Board of Country Commissioners and signed by the County Manager, the MDWASD issued the notice to proceed on May 17, 2013 and the contractor began mobilizing to the site.

1.2 PURPOSE AND SCOPE

The purpose of this report is to provide FDEP with a document that describes the re-testing procedures for mechanical integrity applied to each of the SDWWTP deep injection wells (see Figure 2). The report also presents the field reports (see Appendix C), and the results of the tests in a single volume for ease of reference. The mechanical integrity re-testing operations involved conducting a pressure test on the well casing to show that there are no leaks in the casing, and conducting a TV survey on the well to reinforce the data from the pressure test. The re-testing includes tracking a radioactive liquid-tracer (iodine isotope I-131) injected down the well to show that there is no fluid movement upward behind the casing, into underground sources of drinking water (USDW). The radioactive test information is reinforced with temperature logs run on the well. Gamma ray logs are used to detect the movement of the radioactive tracer.

Figure 1. South District Wastewater Treatment Plant Site

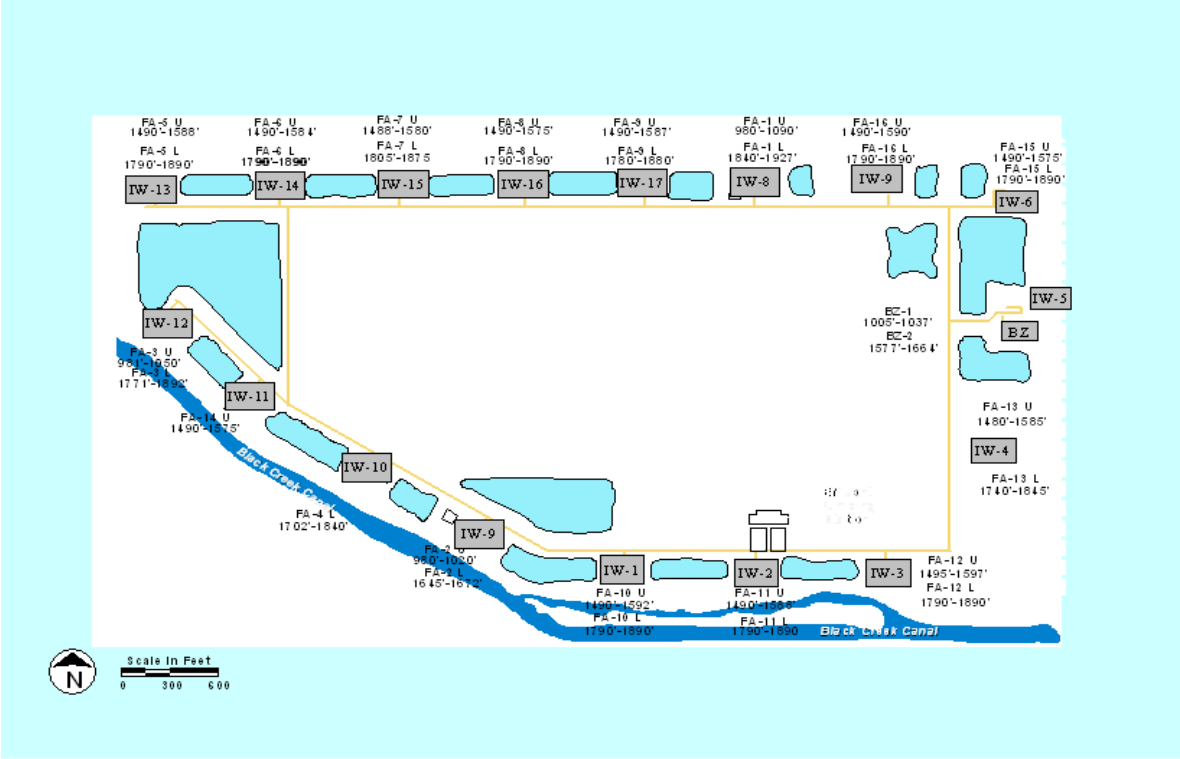


Figure 2. Well Locations Layout

Section 2

2. MECHANICAL INTEGRITY TESTING (MIT)

2.1 METHODS USED

The MIT program is designed to test two elements of the injection well system: 1. Internal integrity and 2. External integrity. The first test element, the internal mechanical integrity test of the well, tests the condition of the injection casing. The second test element, the external mechanical integrity test of the well, tests for leaks outside the casing. This is achieved through a series of field tests including a pressure test and a TV survey for the internal testing, and the temperature log, gamma ray log and RTS survey for the external testing. The first test element, the internal mechanical integrity test, tests for leaks in the injection pipe (casing). The second test element tests for leaks in the annular space outside the casing (cement-filled space between the periphery of the drilled hole and the casing) and in the near-to-the-well geologic strata.

2.2 CASING SCRUBBING

Because the mechanical integrity of injection wells has to be tested every five years, and because a TV inspection of the well is part of the test requirements, MITs provide a timely opportunity to clean the well of deposits that may have formed on the inside of the casing during the intervening years and at the same time provide a cleaner casing for the TV inspection. Cleaning the inside of the well casing is achieved by running a scrubbing brush up and down the casing. However, before the cleaning can be performed, flow out of the well must be controlled. The column of water inside the casing is fresh water and results in a positive hydraulic head inside the well. That head must first be controlled to prevent water from flowing out of the well during the cleaning operation.

2.2.1 Flow Suppression

Suppression of the fresh water head was achieved by first pre-mixing water with salt (NaCl) to form a heavy brine, and then pumping the brine down the well casing, through a 6-inch gate valve on the wellhead. This procedure results in the displacement down the well of the fresh water at the top of the column and replacement of the displaced fresh water with the brine solution. An equal volume of fresh water is displaced out of the well at the bottom of the casing. The procedure is repeated until the pressure head inside the well is suppressed. This method of displacement is used because it achieves flow suppression without first having to open the well to insert a tremie pipe to the bottom of the casing for introduction of the brine. This displacement method also provides a safe way of “killing” the well that at the same time reduces the volume of injected salt solution that would enter the formation at the bottom of the well. One additional advantage is that using this method the brine can be recovered and reused in flow suppression at other wells.

The brine was prepared in 1,000-gallon (gal.) batches by mixing the salt from a 2,000-pound (lbs.) sack in a 1,000 gal. tank of fresh water. The 1,000 gal. solution was then pumped down the well before other similarly mixed batches of salt solution were mixed and pumped down the well (see Figure 3). In the end, the operation was repeated 13 times, and a total of 13 sacks (approximately 26,000 lbs. of salt) were used to suppress the head in the well. This salt concentration represents a theoretical specific gravity of 1.239 for the brine, calculated from the salt solution used in the field of 10.3 lbs per gallon. The 26,000 lbs of salt suppressed the pressure head from approximately 26 feet above the top of the casing to approximately 15 feet below.

Figure 3. Flow Suppression Equipment

2.2.2 Scrubbing Operation

The brush used to clean the casing is made with an old drill rod that has an outside diameter of 7 inches with thick steel wire inserted and secured sticking out of the drill rod. The total diameter of the brush with the steel wire bristles is 24 inches. The brush is attached to the bottom of the packer and inserted into the well (see Figure 4). A 24-inch flange was bolted to the top of the well and pressure fittings installed to be used for packer inflation later on in the process. Then Youngquist lowers the brush and packer by attaching drill rods to the top of the packer and then raising and lowering the brush several times using a 50 ton crane. This process was repeated until the casing was scrubbed and the packer was at the depth required to perform the packer test on the well.

Figure 4. Scrubbing Brush and Hydraulic Packer

2.3 INTERNAL MECHANICAL INTEGRITY (CASING TESTS)

2.3.1 Pressure Test

After the pressure head was suppressed and the casing scrubbed, and the top of the inflatable packer was placed at a depth of 2,382 ft bls. This well is cased to a depth of 2,420 ft bls so the packer is in the bottom 50 feet of the casing. Additional pressure fittings were installed on the flange to pressurize the casing with water. A bleeder valve atop the 24-inch flange allows passage of the drill pipes that support the packer without loss of pressure in the casing (see Figure 5). A pretest was conducted on the casing to determine that the pressure was holding and that all the installed testing equipment was operating properly, then FDEP was informed that the well was ready for their inspection. The next day, September 6, 2013, the pressure test was repeated in the presence of FDEP Staff. The packer had been previously sealed against the casing, at an inflation pressure of 390 pounds per square inch (psi) and at 8:00 AM the casing was pressurized with water to a pressure of 153.5 psi.

Figure 5. Well-Head and Recorder Set Up for Pressure Test

At 9:22 A.M. the one-hour pressure test was started in the presence of Joseph May, P.G. representing FDEP and witnessed by Sonia Villamil, Maria Macfarlane, and Michael Ashe representing MDWASD, and by Chris Harp and others representing the drilling contractor. The pressure test ran for the required one-hour period. The pressure deviation (loss) in that time was 3.5 psi, well below the 7.5 psi deviation allowable under the 5 % criteria in the rules (see Table 2-1). The packer inflation pressure and the pressure in the casing were measured using certified gages (see Appendix C) graduated from 0 to 200 psi in increments of 1 psi. The pressure was read in person and recorded by hand at five minute intervals during the test. The pressure was also recorded on an In-Situ pressure transducer attached to the stand with the pressure gauges (see Figure 5).

Table 2-1 Casing Pressure Readings

Time	Casing Pressure (psi)	Pressure Change (psi)	Packer Pressure (psi)
9:22	153.5	0.0	390
9:27	153	0.5	390
9:32	153	0.0	390
9:37	153	0.0	390
9:42	152.5	0.5	390
9:47	152	0.5	380
9:52	152	0.0	380
9:57	152	0.0	380
10:02	151.5	0.5	380
10:07	151	0.5	380
10:12	151	0.0	380
10:17	150.5	0.5	380
10:22	150	0.5	380

2.3.2 Bleed-Off Calculations

At the completion of the pressure test the casing pressure was bled-off and the discharged volume from the bleeding was measured (see Table 2-2). Bleeding until the pressure resulted in zero flow produced approximately 28 gallons. This exercise provides a reasonable assurance that the packer is placed at the depth in the well that is within the last 50 feet of the casing.

Table 2-2. Bleeding Volumes versus Pressure

Bled Volume (gallons)	0	5	10	15	20	25	28
Casing Pressure (psi)	150	122	90	68	41	15	0

2.3.3 Television Survey

A closed circuit color television camera, encased in a pressure vessel capable of withstanding the pressures exerted at the depths to be televised, and equipped with a fish-eye lens, was introduced into the well through a pack-off stripper device on a standpipe above the injection well (see Figure 6). The camera is centralized in the casing, and is preceded down the well with a light source attached below the camera. The camera televises a view of the full circumference of the inside of the casing and the image is recorded on video tape. Prior to the video survey, the well was scrubbed and flushed with potable water to provide the best picture possible. The video

survey began at land surface and continued down to 2,900 feet, where the camera runs into an obstruction, but the hole below seems open below the partial obstruction where the tool was stuck. At selected intervals of interest, the camera was used to pan the intervals in a horizontal format prior to continuing the normal vertical recording.

A review of the video (see Appendix F) indicates that the casing is in good condition down to 2,426 feet. The video also shows that the scrubbing operation was successful. The scrubber has scrubbed the casing free of all growth down to 2,414 feet and this is confirmed by visible vertical scratches throughout that length of the casing; indicating that the scrubber had brushed the steel casing effectively. All the scratches are superficial, and do not detract from the physical and mechanical integrity of the casing. There are no gouges, grooves, nicks, or other physical damage visible in the casing for its whole length. Below 2,414 feet the casing was not scrubbed to avoid hanging the scrubber with the edge of the bottom of the casing at 2,426 feet.

In summary, the video picture meets the quality standards that are needed for a visual evaluation of the well. This video survey presents a clear view of the casing and of the welded joints of the casing. All the joints are clean and appear to be tight. From the TV survey it is concluded that this casing is in good condition throughout its whole depth from land surface to 2,426 feet.

Figure 6. Television Survey (Standpipe and Logging Truck)

2.4 EXTERNAL MECHANICAL INTEGRITY (CEMENT AND FORMATIONS)

The external mechanical integrity test consisted of two low flow dynamic tests The RTS was conducted on September 13, 2013, for the external mechanical integrity portion of the test was witnessed by the representative of FDEP (Joseph May, P.G.), by representatives of MDWASD (Sonia Villamil and Maria Macfarlane) and by representatives of the contractor (Luis Morey).

2.4.1 Radioactive Tracer Survey (RTS)

The radioactive tracer survey uses an isotope of iodine (I-131) as a tracer of water movement inside and outside the casing. Iodine –131 is used because it is a radioactive isotope commonly used in medical practice and therefore it is more easily available and lower in cost than other potential tracers. I-131 also has the advantage of having a half-life of 8 days. That half-life is quite suitable because it is long enough to allow time for transportation to the well site with little decay but also short enough so that it would quickly be reduced if there were any unexpected spills or if there were mechanical failures through which the isotope could travel with the water. The radiation levels of I-131 at the concentration used for RTS testing is in millicurie-range, which if it were considered a waste, would be characterized as a low level waste by the US Atomic Energy Commission.

The I-131 is first loaded into a container located in the logging tool. This container is electronically activated from the logging truck to eject the desired quantity of tracer at the desired depth through an ejection port. In addition to the tracer container, the logging tool is also assembled with three gamma ray detectors. One detector, the top gamma ray detector (GRT), is located 10 feet above the ejector. The other two detectors, the middle one (GRM) and the bottom one (GRB) are located immediately below the ejector at about 3 feet and 12.4 feet below the ejector respectively. The bottom of the logging tool also includes a temperature tool at the very bottom, and a casing collar locator (CCL) 1 foot below the GRM. Figure 7 shows the configuration of the RTS logging tool. The RTS log in the appendix (Appendix D) shows the distances between each of the logging tool components described above.

2.4.1.1 First Low Flow Dynamic Test

Prior to starting the low flow dynamic test, a background gamma ray log was conducted to establish the natural conditions. It was conducted right after the temperature log. Since the temperature log was run downward starting at land surface, the temperature log had ended with the logging tool at the bottom. The background gamma ray log was conducted from the bottom (2,900 feet) up to the surface.

From the surface, the logging tool was again lowered down the well and the casing collar locator (CCL) used to locate the bottom of the casing. The magnetic coils on the CCL give out a magnetic field and detect a change in the mass. If there is growth on the casing it is harder for the CCL to have a clean line. If the growth has some iron on it, it can cause a sort of interference with the CCL making it harder for the CCL to find the end of the casing. The CCL shows that the bottom of the casing is at 2,426 feet bls. After the bottom of the casing was located, the well was ready for the low-flow dynamic RTS test.

The ejector port of the I-131container was set at 2,421 feet and 1 millicurie (mCi) of I-131 was released while the flow down the well was kept at a constant rate of 93 gallons per minute (gpm). The logging tool was kept immobile after the ejection of the I-131 and the three gamma ray detectors continued to record in place. One (1) mCi of I-131 was ejected into the well. The middle detector, located 3 feet below the ejector port, picked up the radioactive tracer 24 seconds after the ejection. The bottom detector, which is located over 12 feet below the ejector, picked up the tracer 2 minute and 36 seconds after the ejection. The test ran for 60 minutes and the top detector did not pick up any tracer.

After the first low flow test ended, the tool was then raised up more than 200 feet, to a depth of 2,200 feet, to log out of position to make sure that the tracer did not migrate up the casing or the formation outside of the casing. No migration was detected.

Once the log out of position was conducted and the tool was placed back to depth, no staining on the casing was found which means no interference for the second RTS. Therefore, with the approval of Joseph May, P.G. from FDEP, the well was not flushed prior to the second RTS test.

Figure 7. RTS Tool and Temperature Probe

2.4.1.2 Second Low Flow Dynamic Test

The tool was placed back to a depth were the ejector was located at 2,421 feet with a flow of 82 gallons per minute set down the well. For this test, 2 milicuries of I-131 were ejected into the casing. The middle detector started picking up the tracer about 32 seconds after it was ejected. The bottom detector, which is located over 12 feet below the ejector, picked up the tracer 2 minutes and 52 seconds after the ejection. The upper detector did not pick up any tracer for the duration of the test, which lasted 30 minutes.

After the second low flow test ended, the tool was then raised up more than 200 feet, to a depth of 2,200 feet, to log out of position to make sure that the tracer did not migrate up the casing or the formation outside of the casing. No I-131 was found.

With the last low flow dynamic test, the mechanical integrity test was concluded, but before bringing the geophysical tools out of the well, the leftover I-131in the container was ejected and the container flushed-clean to insure that any remaining radioactive iodine was well dispersed. The tool was placed at a depth of 2,616.5 ft bls. The ejector was located at 2,603 ft bls, and the remaining Iodine 131 was ejected and the well was flushed with effluent at a rate of over 4,600 gallons per minute to ensure no staining of the tool. The logging tool was then brought up from the bottom and on the way up a final gamma ray log was made. Then the final gamma ray log was compared to the background gamma ray log, and the comparison showed that there are no noticeable differences in the two except for a residual stain at the bottom of the casing where the I-131 had been repeatedly released during the testing, and just below there, where the tracer exited the casing. Injection of water down the well at a rate of 5,200 gpm continued for the next hour to completely flush out the well.

2.4.2 Temperature Log

Youngquist Brothers Inc. conducted the temperature log on September 13, 2013 starting at about 8:50 A.M. and logging down to 2,900 feet. The temperature probe (Figure 7) was run from the surface downward to minimize the disturbing effect of the movement of the logging tool on the temperature of the water in the well. The temperature log was started more than 24 hours after the well had last been disturbed by outside influences. The TV survey was the last disturbance in the well.

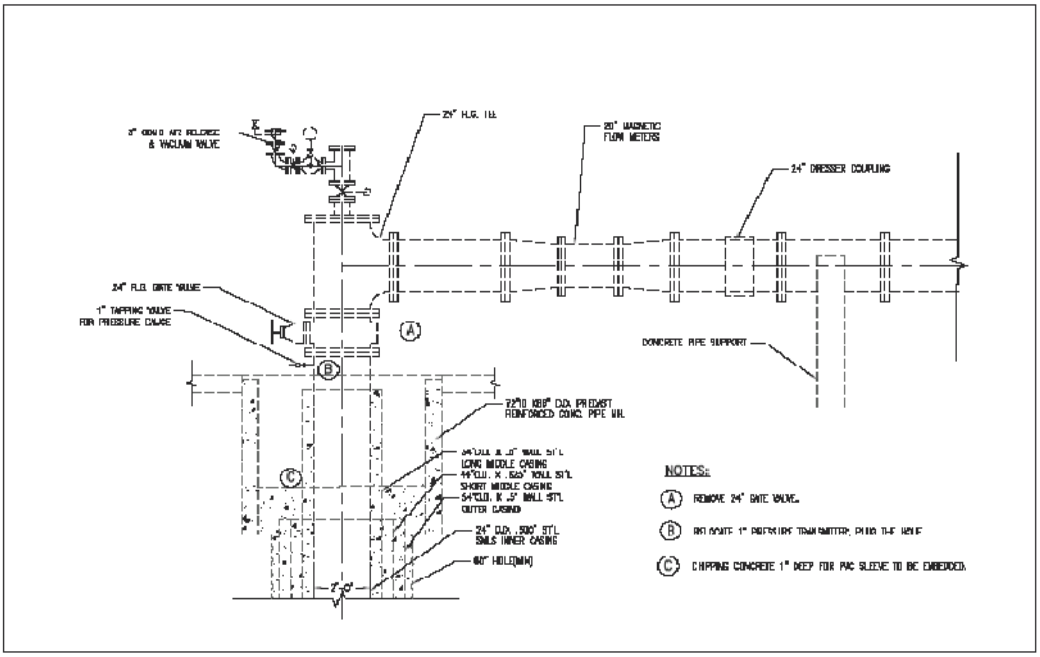
The temperature log (see Appendix H) shows the warmest interval is in the section from 2,350 to 2,426 feet. This is consistent with the higher temperature of the injected water in that interval. The temperature log did not detect any anomalies that would indicate that injection fluids are present outside the casing, and there is no indication of any upward movement of warm injection water either. The similarity of the temperature oscillations in this temperature log (in the interval from land surface down to the bottom of the casing) to those in the temperature logs from previous MITs and to those in the temperature log when the well was constructed, indicates that there has been no apparent change in the cased interval, and no upward movement of the injected water in the last 5 years.

2.5 WELL HEAD REPAIRS AND RE-INSTALLATION

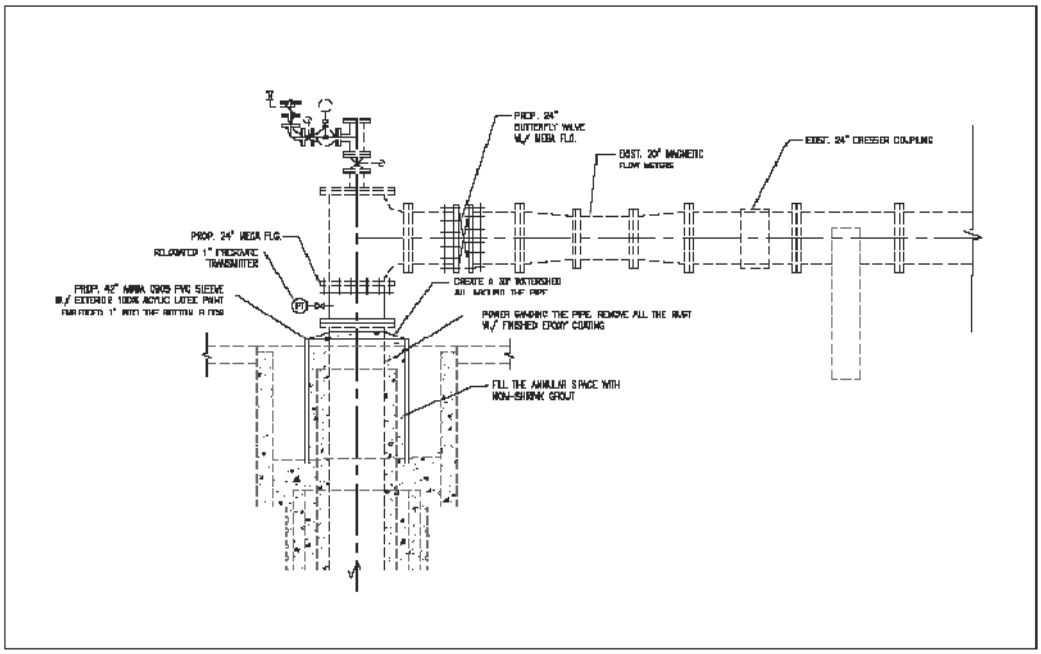
The work associated with the MIT ended when the wellhead was replaced. The air and vacuum release surge check valves were replaced prior to reinstallation of the wellhead. The 6 inch gate valve and air release were replaced. The well had a gate valve on the vertical part of the well before the T. The pressure tap for the instrumentation of the well was below the water line when the sump was full of water. Therefore this well was retrofit to replace the gate valve with a 24" butterfly valve installed on the horizontal pipe coming off the T the well and lift the pressure tap above the water line. A PVC liner was also installed at the base of the sump that protects the 24" OD steel casing from being exposed to FA purge water from the monitoring wells. The PVC was cemented into the bottom of the sump and the annulus was filled with grout to ensure that no water can reach the steel casing. Please see drawings of the retrofit below, Figure 8 and 9.

The wellheads are scheduled to be sandblasted, rust proofed and repainted after the MITs on all the other wells are completed. Injection well IW-16 has been placed back on line and flow from the plant's pump station is again discharging to this injection well.

Figure 8 Retrofit Well with PVC liner



REPAIR PLAN FOR I-13 TO I-17



PROPOSAL PLAN FOR I-13 TO I-17

Figure 9 Drawing showing before and after layouts for the Retrofit.

Section 3

3. CONCLUSIONS AND RECOMMENDATIONS

3.1 CONCLUSIONS

The pressure test was conducted successfully and it was concluded from the results that there is internal mechanical integrity. This conclusion is reinforced by the analysis of the TV survey down to the injection level at 2,426 feet. The TV survey indicated that the casing is in good condition and that all the casing joints appear to be tight and in good working order.

The two successful RTS conducted at low flow rates indicate that there is no upward movement of water outside the casing. Therefore, it was concluded that the RTS results show that there is external mechanical integrity. The temperature survey reinforced the results of the RTS by showing that there has been no movement of injected water anywhere except the injection zone.

3.2 RECOMMENDATIONS

The successful completion of all the tests for mechanical integrity confirms that IW-16 retains full mechanical integrity and as such it is appropriate to continue using this injection well. MDWASD also recommends that FDEP review the results of the tests presented in this report and based on those results determine that the well has mechanical integrity and may continue to be used for its intended purpose.

Finally, MDWASD recommends that although the well head will not be painted until all the MIT tests are completed on the other wells, IW-16 should receive mechanical integrity certification.

Appendix A

Mechanical Integrity Testing Procedures Submitted by MDWASD to FDEP
October 12, 2012

Miami-Dade Water and Sewer Department
Mechanical Integrity Testing Procedures

Miami-Dade Water and Sewer Department
Mechanical Integrity Testing and Repair Procedures
October 12, 2012

MECHANICAL INTEGRITY TESTING and REPAIR PLAN (SDWWTP and NDWWTP Injection Wells)

General Information

The Contractor shall carefully coordinate his activities with the Department to minimize interference with any existing operations or the operations of the Department. Department forces will isolate the well and turn over to the Contractor. Existing valves shall only be operated by Department personnel. The Contractor's personnel, under no circumstances, shall operate any such valve.

The Contractor shall provide all barricades and/or flashing warning lights necessary to warn workers and employee of the testing throughout the Project. This shall be done at the Contractor's expense and to the satisfaction of the Engineer. Every effort must be made to reduce inconvenience and nuisances to a minimum.

The Contractor shall at all times, use the assigned entrance to the Plants to bring in materials, equipment etc. required for the Project. Materials and equipment shall be stored in areas designated by the Engineer, and shall not interfere with the daily operations at the site or with other Projects. Suitable platforms shall be used for material storage to prevent damage to the landscaping. The Contractor shall exercise extreme caution when transporting equipment or materials within the Plant area.

The conveying vehicles shall be properly selected, and equipped, to prevent damage to paved areas, landscaping and other existing facilities including wells, well pads, fencing, underground pipelines, pipe chases, etc. If necessary, suitable wooden skids shall be used to distribute loads, and to prevent damage.

If any of the above existing structures, including the wells, or any other parts of the project area, are damaged, the contractor shall make suitable repairs or replacement at his expense, in a manner described by the Engineer, and to his satisfaction.

The Contractor shall also exercise extreme caution to prevent any spillage of sewage effluent. The County may charge t he Contractor for any cost incurred or penalties imposed on the County as a result of such spillage.

The wells to be tested are Injection Wells IW-l through IW-17 at the South District Wastewater Treatment Plant and IW-1N through IW-4N at the North District Wastewater Treatment! Plant

The Injection Wells have a 24-inch outside diameter (OD), 0.500-inch wall thickness injection casing set to total depths of 2,450 to 2,850 feet below land surface (bls), and were constructed with a nominal 22-inch diameter open borehole extending from the bottom of the casing to approximately 3,000 feet bls.
Except IW-5 at the SDWWTP, has a 20-inch outside diameter (OD), and 0.500 inch wall thickness.

The CONTRACTOR will perform internal and external mechanical integrity tests on the casings of twenty one deep injection wells and perform all appurtenant work in accordance with the above

Contract Documents.

The work shall be performed by a competent crew with equipment that is adequate to complete all phases of the testing and instruments of sufficient accuracy and resolution to identify anomalous responses to the tests. If the CONTRACTOR'S equipment is not capable of satisfactorily performing the work provided for in these specifications, the CONTRACTOR at his own expense shall substitute equipment.

The CONTRACTOR shall have not less than 5 years experience in constructing and testing wells and shall have tested not less than 5 wells of similar type and capacity. The CONTRACTOR shall be licensed by the State of Florida and the license number shall be affixed to all correspondence and reports.

All work shall comply with and be in full conformance with this Mechanical Integrity Test Plan submitted to FDEP together with subsequent response letters for the injection wells at the South and North District Wastewater Treatment Plants and with the appropriate sections of Chapter 62-528 FAC.

If remedial work or re-testing is required prior to final acceptance of the work to meet regulatory requirements and the specifications of the Contract Documents due to defective materials, accident, loss of equipment or equipment malfunction, or for any other cause directly attributable to the CONTRACTOR's actions, the CONTRACTOR shall bear the entire cost of the remediation or re-testing, including all additional materials, labor, and equipment required and any necessary additional Engineering costs. In the event of a problem, the ENGINEER shall be notified immediately, and the following shall apply:

1. The CONTRACTOR shall propose a method of correcting the problem, in writing, to The ENGINEER, who shall review the method of corrective action, and accept the plan in writing before work can proceed.

2. All work on the well must be in accordance with all applicable local, state and federal regulations.

The CONTRACTOR shall notify the ENGINEER a minimum of 72 hours prior to conducting the pressure test, geophysical logging and the radioactive tracer survey so that the ENGINEER and regulatory agency staff can be properly notified.

The CONTRACTOR shall provide all facilities, equipment and materials required for the removal of waste fluids from the well site.

The CONTRACTOR shall kill the well using a dense food- grade salt solution. No barite or mud-based additives shall be used in the well.

The CONTRACTOR shall comply with the OSHA regulations contained in 29CFR Section 1910 for General Industry Regulations and 29CFR Section 1926 for Construction Regulations.

Equipment and Procedures

1. Wellhead Assembly: The stripper head assembly used during the video survey, Geophysical logging, and the radioactive survey shall be bolted to the wellhead above the 6-inch gate valve. The stripper head assembly used must be of sufficient length to house the longest of the wire line tools used for the testing between the gate valve and the pack-off mounted at the top of the assembly. The pack-off must be adjusted so that the tools can be moved freely up and down the well with minimal leakage from the well. The assembly shall include a 4-inch valve and tee, which will be used to inject potable water during the surveys. The assembly shall be fitted with a

pressure gauge for use during the tests.

2. Wellhead Hardware: Should the nuts and/or bolts at the wellhead assembly become stripped during the CONTRACTOR's efforts, the CONTRACTOR shall replace them with equivalent hardware.

3. Water Line: The CONTRACTOR shall provide a potable water supply line for use during the video surveys. This line shall be connected to the existing 4-inch valve on the CONTRACTOR's stripper head. It shall be equipped with a check value to prevent the backflow of effluent into the water supply source. It shall also be equipped with a continuous recording digital flow meter and totalizer capable of measuring flows accurately in the range of 0 to 250 gpm.

Mechanical Integrity Testing (MIT)

The mechanical integrity testing under this Contract shall be accomplished using the following methods and general sequence, however the Contractor shall submit a more detailed sequence to the Engineer for approval before he begins work. The Contractor shall use extreme caution to prevent any loss of equipment, tools or other items into the wells and shall be fully responsible for retrieving any such items immediately, at no expense to the Department. All pressure tests must be conducted in the presence of the Engineer or his authorized representative.

MIT Clean and Pressure Test the Casing

1. The Contractor shall set up all equipment required to prepare for suppressing the density differential pressure, cleaning, performing the pressure test and the radioisotope and closed circuit television surveys.

2. The Contractor shall inject sufficient salt solution into the well to balance the differential pressure and disassemble the wellhead. The brine solution shall remain in the well during the cleaning and pressure testing steps, after which time it shall be transferred to another well if clean enough for reuse, or shall otherwise be disposed of by the Contractor. Under no circumstances shall brine solution be spilled or disposed of on the ground surface, however it may be disposed of into the injection well.

3. The Contractor shall clean the casing before proceeding with the pressure test. The entire length of casing shall be cleaned. If the later television survey indicates insufficient cleaning, the well shall be re-cleaned by the Contractor, at his expense, to the satisfaction of the Engineer. If the television survey must be repeated because of insufficient cleaning, in the opinion of the Engineer, it shall also be at the Contractor's expense.

4. The Contractor shall, when requested by the Engineer, place the packer through a stand-pipe with a packoff device to a point near the top of the well (but within the concrete encasement area) and test its integrity. This shall be accomplished as described in Steps 6, 7, and 8 below. If the packer fails the integrity test it shall be replaced with one that will meet the test. The Engineer is aware that packers have limited inflation cycles and will attempt to minimize the verification of packer operation. However, any integrity failure for which the packer operation can not be eliminated must be repeated at the Contractor's cost. It is anticipated that each new packer will be tested at the wellhead to verify its capacity to seat and deflate.

5. The Contractor shall lower and place the packer to a point within the lower 40 feet of the casing, but not the last 10 feet. The CONTRACTOR will be responsible to assure the proper seating of the packer. A preliminary test shall be performed to ensure proper operation of the test set-up. The CONTRACTOR shall notify the ENGINEER at least 24 hours before running the preliminary test. The test will be run following the same test program as the actual pressure test, as described below. IW-2 at SDWWTP will have the packer placed within 40 feet of the tear in the casing.

6. The Contractor shall inflate the packer to a pressure not exceeding 350 psig over the static condition as measured at the wellhead on a calibrated gauge to create a positive seal.

7. The Contractor shall pressurize the casing to 150 psig with no air in the casing or wellhead. The pressure shall be recorded on a chart and signed by the Engineer, the Contractor and any witnesses present. The pressure test gauge shall be calibrated within 6 months of performing the pressure test. The CONTRACTOR must present proof of calibration of the pressure gauge to the ENGINEER and FDEP staff at the time of testing each well. The pressure gauge must be mounted at or near eye level in order to ensure maximum visibility.

8. The test will be considered successful if the pressure does not change more than 5% psi in one hour.

9. If the test fails, the Contractor shall move the packer upwards for approximately 10 feet, and repeat Steps 6, 7 and 8.

10. If the test still fails, additional repositioning of the packer and repeating of Steps 6, 7 and 8 shall be as ordered by the Engineer. If the test still fails, and subsequent radioisotope surveys indicate no casing failure, it will be presumed that the Contractor's packer did not create a positive seal, and the Contractor shall be required to repeat Steps 4 through 8 at his expense. No payments will be made to the Contractor if it is subsequently determined that the test failure was caused by the seating of the packer. If the packer fails during packer operation verification, it will be concluded that the packer was faulty during any previous test that did not demonstrate casing integrity. The Contractor shall repeat this test at his expense.

11. After pressure testing, measure the depressurization bleed down with a 5 gallon bucket upon release of the pressure in the casing. The bleed down fluid will be properly disposed of by the Contractor.

12. The Contractor shall deflate the packer and withdraw it from the casing.

13. The Contractor shall reassemble the wellhead and connecting piping using new gaskets.

14. Prior to geophysical logging, the fluid used to "kill" the well, or for pressure testing the casing shall be flushed from the well and the well will be shut-in for a minimum of 12 hours.

MIT Video Surveys

A Video Survey inside the injection well casing be performed using the following procedures.

.A 6-inch diameter stripper head assembly will be bolted to the wellhead assembly above the existing 6-inch diameter gate valve. The stripper head will be of dimensions that allow the video operator to put his camera between the gate valve and the pack off and close both the valve and the pack off. The lower part of the assembly shall consist of a 4-inch tee and valve through which potable water may be introduced into the well.
.
Prior to performance of the survey and for a period of 24 hours, fresh water from an adjacent fire hydrant will be introduced into the well through a 4-inch diameter valve located on the stripper head assembly. Fresh water shall be pumped into the well to provide clarity for the survey.

3. If, after 24 hours of pumping potable water into the well, the water quality does not permit a clear picture of the inside of the well, the CONTRACTOR may be required to perform additional pumping services to assure a good survey as specified above.

4. The pumping of the potable water will continue at a rate of approximately 0 to 250 gpm during video surveying. If the open hole portion of the well is not clean, or visibility in any part of the well is poor, the CONTRACTOR shall perform additional pumping services to ensure a good video survey before running another or continuing with the survey.

5. During the video survey, the CONTRACTOR shall stop the camera's progress as instructed by the ENGINEER at depths where there may be potential flaws in the casing or other features to allow for thorough examination at those locations.

Upon reaching the total depth of the well with the video camera and obtaining a video survey satisfactory to the ENGINEER, the camera shall be removed from the well, and the well placed back in service.

MIT Radioisotope Tracer Survey and Temperature Survey

A radioisotope tracer survey shall be used to detect any fluid movement outside of the injection casing from the injection zone into the overlaying aquifers. The tool configuration shown below, or approved equal is required. The tool must be capable of ejecting the radioactive tracer and simultaneously monitoring the gamma ray sensors. No time lag between ejection and monitoring is permitted. A casing collar locator (CCL) shall be positioned below the tool as shown below, to precisely locate the bottom of the casing. Two low flow dynamic test runs, shall be performed. Additional low flow dynamic test runs can be done if results warrant additional testing, as determined by the ENGINEER in consultation with FDEP staff.

A temperature survey log shall also be performed from land surface to the total depth of the well. The temperature log shall be performed logging down at a rate of not more than 60 feet per minute. The temperature survey shall be performed after the well has been "shut in" and stabilized for at least 12 hours prior to the dynamic and static tests.

The Contractor shall perform an initial background gamma ray survey extending from the base of the land surface to the total depth of the well. The background gamma ray log shall be taken at a rate of not more than 60 feet per minute.

After the dynamic tests are completed, another background gamma ray survey shall be taken from the base of the casing to the base of the intermediate casing.

If additional radioisotope tracer survey work is ordered by the Engineer, it will be paid for at the hourly price proposed for additional radioisotope tracer surveys.

Radioactive Tracer Survey (RTS)

A RTS will be performed in the injection well. The tool used for testing will be configured according to information to be supplied by the service company performing the logs and as approved by the ENGINEER. Below is an example of a typical RTS tool that will be used for these surveys. The CONTRACTOR will provide a specific tool configuration with the logs.

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)
			CHD-SDSCHD (SDS) Cable Head	1.00	1.50	5.00
GR#3	23.83					
			GR #3 -GR#3 (GR#3_T) GR#3_TOP	9.33	1.69	50.00
			TREJCT-A (RTS) EJECTOR 14.5' FROM TOOL BOTTOM	3.00	1.69	10.00
			GR #2 -GR#2 (GR#2_M) GR#2_MIDDLE	3.58	1.69	25.00
GR#2	11.17					
CCL	9.63		CCL-000 (000001) RTS_CCL	0.75	1.69	5.00
			TRDET-GR#1 (GR#1_B) GR#1_BOTTOM	8.67	1.69	50.00
GR#1	0.58		TEMP-11116Temp (11116HT)	0.58	1.69	5.00
TEMP	0.17		RTS_TEMP			

Dataset: sdiw1.db: field/well/run1/FINBK
Total Length: 26.92 ft
Total Weight: 150.00 lb
O.D. 1.69 in

RTS tool Typical Configuration

The sequence of the tests shall be as follows:

First Low Flow Dynamic: The low flow run of the radioactive tracer survey shall be performed with a pumping-in velocity of 3 to 5 feet per minute. This would require a volume of between 65 gpm and 108 gpm to be injected during the survey. This is for the 24 inch wells, for Well I-5, which has a 20 inch casing this volume is 44 gpm and 73 gpm. Potable water from the same source as used for the video survey would be used as the most appropriate water supply for this portion of the test.

1) After beginning the flow of water into the well, the tool will be placed at a depth of approximately 5 feet above the base of the final casing, and a slug of 2 millicuries radioactive Iodine 131 is ejected. The tool will remain in place for a period of approximately one hour and the three gamma ray detectors in the "time drive" mode will record the movement of the slug. If tracer is detected at the uppermost detector, indicating potential staining of the tool, the tool may be moved upward to an alternate location.

2) After the one hour waiting period, a log out-of-position will be performed between the ejection point and a minimum of 200 feet above the highest point of tracer detection.

3) Upon completion of logging, the casing will be flushed with 3 to 5 casing volumes of effluent.

4) After flushing, the tool will immediately be run to the base of the casing, then the interval between the ejection point and 200 feet above the highest point of tracer detection will be logged.

Second Low Flow Dynamic: The process described above for the low flow dynamic log will be repeated to include a log out-of-position, a casing flush, and an after flush pass. A slug of tracer greater than or equal to 3 millicuries shall be used as determined by the ENGINEER.

If, during testing, no apparent anomalies appear that may indicate a lack of mechanical integrity in the injection well, the RTS will be concluded. If anomalies do occur, the RTS will be altered to track the radioactive tracer material. After RTS is complete, the RTS tool will be discharged in the injection zone and the well shall be flushed with 3 to 5 volumes of effluent. A second background log will be run from the bottom to the top of the well.

MIT Deadlines (sorted by date MIT pressure test due)

SDWWTP MIT Schedule of Completion

Well	Pressure Test	RTS/Video
IW-2	7/13/2013	7/25/2013
IW-1[1]	7/20/2013	7/31/2013
IW-3	7/24/2013	8/7/2013
IW-9[1]	7/30/2013	8/12/2013
IW-10[1]	8/6/2013	8/21/2013
IW-11	8/20/2013	9/3/2013
IW-12	8/25/2013	9/19/2013
IW-14	9/9/2013	9/26/2013
IW-13	9/16/2013	10/6/2013
IW-4	9/25/2013	10/14/2013
IW-6	9/30/2013	10/20/2013
IW-5	10/19/2013	10/27/2013
IW-7[2]	10/26/2013	1/7/2014
IW-8	11/2/2013	11/12/2013
IW-17	11/11/2013	11/19/2013
IW-16	11/18/2013	12/9/2013
IW-15	12/3/2013	12/16/2013

NOTES:
1.The original video was not clear enough and therefore a new video was done at the end of the MITs at SDWWTP.
2.The Computer failed during the RTS, because the Iodine 131 had already been injected, FDEP and DOH required 46 days b/f the RTS could be redone.

NDWWTP MIT Schedule of Completion

Well	Pressure Test	RTS/Video
IW-1N	3/14/2014	3/26/2014
IW-2N	3/25/2014	4/9/2014
IW-3N	4/2/2014	4/17/2014
IW-4N	4/9/2014	4/24/2014

REPAIR PLAN:

The following repair plans apply to wells at SDWWTP and NDWWTP.

Kill well and remove 24 inch gate valve and 4 inch bypass valves. Remove 1 inch pressure transmitter line and weld hold closed. Please see drawings included in below.

Sand existing casing in concrete pits and coat with Bitumastic. Please see drawings included in below.

Chip concrete around outer casing 1 inch deep, in order to embed PVC sleeve. Please see drawings included in below.

Install C905 PVC sleeve around casing pipe, embed 1 inch deep and fill annular space with grout, using Type II Neat cement. Slope top edge to create 30 degree watershed and seal at edges with sealant. Please see drawings included in below.

Relocate 1 inch pressure transmitter as indicated in drawings. Weld the hole. Please see drawings included in below.

At the NDWWTP IW-1N, IW-3N and IW-4N install new magmeters with any necessary spool pieces to be field determined. Please see drawings included in below.

Reassemble wellheads including installation of new 24 inch butterfly valve on horizontal part of well. Mega flanges will be used to ensure the layout of the pipe and the vales match. Please see drawings included in below.

On IW-4N at NDWWTP, install electric actuator for butterfly valve at base of injection well. Please see drawings included in below.

Appendix B

FDEP Approval of MIT Plan for SDWWTP and NDWWTP

November 26, 2012

Villamil, Sonia (WASD)

From: May, Joseph [redacted]
Sent: Monday, November 26, 2012 2:40 PM
To: Villamil, Sonia (WASD)
Cc: Vandor, Heidi; Silverman, Mark; Walsh, Virginia (WASD); Goldenberg, Bertha M. (WASD); Fallon Jr., Howard J. (WASD); Arrebola, Vicente (WASD); Macfarlane, Maria (WASD); Oakley, Clint (WASD)
Subject: RE: MDWASD MIT and Repair Plan Submittal

Importance: High

Hello all,

The Department approves the plan with the following understandings:

1) Medicinal grade I-131 should be specified since this solution is filtered to reduce precipitate material, as opposed to regular grade I-131, in the vial causing a tool malfunction. It has been our experience that an activity of ~1mCi/ml has been the easiest to work with in the field.
2) Please contact me a minimum of three days prior to mobilization to each site. Due to the travel time from West Palm Beach to the sites close coordination would be appreciated between myself and a designated contact person from the utility so that each pressure and RTS can be witnessed.

Thank you,

Joe

Please take a few minutes to share your comments on the service you received from the department by clicking on this link. DEP Customer Survey.

From: Villamil, Sonia (WASD) [mailto:[redacted]
Sent: Wednesday, October 17, 2012 9:42 AM
To: May, Joseph
Cc: Vandor, Heidi; Silverman, Mark; Walsh, Virginia (WASD); Goldenberg, Bertha M. (WASD); Fallon Jr., Howard J. (WASD); Arrebola, Vicente (WASD); Macfarlane, Maria (WASD); Oakley, Clint (WASD)
Subject: MDWASD MIT and Repair Plan Submittal

Hello Mr. May,

The MDWASD respectfully submits the attached MIT testing and repair plan for your approval. The paper copy is being sent via regular mail as well.

Thank you,

Sonia Villamil
Engineer II
Miami Dade Water and Sewer Department
3071 SW 38th Ave Room 554-8
Miami, FL 33146
[redacted]
fax: 786-552-8640
miamidade.gov

Appendix C

Field Notes from tests including gauge certification and pressure charts.

MIAMI-DADE WATER AND SEWER DEPARTMENT

MECHANICAL INTEGRITY TESTING OF DEEP INJECTION WELLS AND ASSOCIATED SERVICES

BID NO.: RPQ P0086

PRESSURE TEST IW - 16

September 6, 2013

TIME	CASING PRESSURE (psi)	PACKER PRESSURE (psi)
9:22	153.5	390
9:27	153	390
9:32	153	390-
9:37	153	395
9:42	152.5	390-
9:47	152	380+
9:52	152	380+
9:57	152	380+
10:02	151.5	380+
10:07	151	380+
10:12	151	380
10:17	150.5	380
10:22	150	380

MIAMI-DADE WATER AND SEWER DEPARTMENT

MECHANICAL INTEGRITY TESTING OF DEEP INJECTION WELLS AND ASSOCIATED SERVICES

BID NO.: RPQ P0086

BREAK OFF TEST IW - 16

September 6, 2013

GALLONS	CASING PRESSURE (psi)	PACKER PRESSURE (psi)
0	150	380
5	122	380
10	90	360+
15	68	360
20	41	340+
25	15	340
~~30~~ 28	0	330

Top of Packer: 2,382 **feet**

Bottom of Casing: 2,420 **feet**

MIAMI-DADE WATER AND SEWER DEPARTMENT

MECHANICAL INTEGRITY TESTING OF DEEP INJECTION WELLS AND ASSOCIATED SERVICES

BID NO.: RPQ P0086

PRESSURE TEST IW - 16

WITNESS LIST

September 6, 2013

NAME	SIGNATURE	COMPANY/AGENCY	TELEPHONE
Joe May	[redacted]	FDEP	[redacted]
CHRIS HARP		YBI	
Michael Ashe		WASD	
Maria MacFarlan		WASD	
Sonia Villamil		WASD	

IW-16 PT

Sensor/Session information

SensorSN	21325011	Modbus Ac	2
Sensor Type	PT2X	Initialized v	2. 9
Sensor Name	INW Smart Sensor	Uploaded	Aqua4Plus 1.9.3
Session Name	1MIN	Exported	Aqua4Plus 1.9.3
# Records	180		

Statistical Data		Temperatu	Pressure(psi)
	Sensor Range	-40 - +125 (	300 psia
	Minimum	73.2	0
	Maximum	96.2	153.573

	Field Cal Date	unknown	unknown
Rec #	Date/Time	Temperatu	Pressure(psi)
1	9/6/2013 9:19	86.9	153.573
2	9/6/2013 9:20	88.5	153.522
3	9/6/2013 9:21	89.6	153.465
4	9/6/2013 9:22	90.5	153.399
5	9/6/2013 9:23	91.1	153.355
6	9/6/2013 9:24	91.5	153.292
7	9/6/2013 9:25	91.8	153.239
8	9/6/2013 9:26	91.6	153.17
9	9/6/2013 9:27	91.7	153.118
10	9/6/2013 9:28	92.1	153.066
11	9/6/2013 9:29	92.5	153.013
12	9/6/2013 9:30	92.5	152.952
13	9/6/2013 9:31	92.7	152.9
14	9/6/2013 9:32	92.5	152.84
15	9/6/2013 9:33	92.6	152.789
16	9/6/2013 9:34	92.9	152.727
17	9/6/2013 9:35	92.9	152.666
18	9/6/2013 9:36	93	152.615
19	9/6/2013 9:37	93.2	152.553
20	9/6/2013 9:38	93.2	152.492
21	9/6/2013 9:39	93.2	152.442
22	9/6/2013 9:40	93.3	152.38
23	9/6/2013 9:41	93.6	152.328
24	9/6/2013 9:42	94.1	152.275
25	9/6/2013 9:43	94.3	152.213
26	9/6/2013 9:44	94.8	152.17
27	9/6/2013 9:45	94.4	152.101
28	9/6/2013 9:46	93.8	152.044
29	9/6/2013 9:47	93.2	151.986

30	9/6/2013 9:48	93	151.937
31	9/6/2013 9:49	93.5	151.883
32	9/6/2013 9:50	94.1	151.819
33	9/6/2013 9:51	94.4	151.767
34	9/6/2013 9:52	94	151.709
35	9/6/2013 9:53	94	151.648
36	9/6/2013 9:54	94.2	151.596
37	9/6/2013 9:55	94.4	151.544
38	9/6/2013 9:56	94.3	151.484
39	9/6/2013 9:57	94.5	151.432
40	9/6/2013 9:58	94.1	151.374
41	9/6/2013 9:59	93.5	151.326
42	9/6/2013 10:00	93.6	151.255
43	9/6/2013 10:01	93.9	151.203
44	9/6/2013 10:02	94.3	151.15
45	9/6/2013 10:03	94.8	151.087
46	9/6/2013 10:04	94.5	151.037
47	9/6/2013 10:05	93.9	150.98
48	9/6/2013 10:06	92.9	150.915
49	9/6/2013 10:07	92.2	150.857
50	9/6/2013 10:08	91.7	150.809
51	9/6/2013 10:09	91.3	150.751
52	9/6/2013 10:10	91.1	150.692
53	9/6/2013 10:11	90.7	150.633
54	9/6/2013 10:12	90.3	150.575
55	9/6/2013 10:13	89.9	150.526
56	9/6/2013 10:14	89.8	150.466
57	9/6/2013 10:15	90.6	150.421
58	9/6/2013 10:16	91.8	150.363
59	9/6/2013 10:17	92.9	150.317
60	9/6/2013 10:18	93.6	150.262
61	9/6/2013 10:19	94.3	150.218
62	9/6/2013 10:20	94.8	150.155
63	9/6/2013 10:21	94.9	111.718
64	9/6/2013 10:22	95	122.44
65	9/6/2013 10:23	95.6	90.553
66	9/6/2013 10:24	96.1	95.148
67	9/6/2013 10:25	96.2	55.629
68	9/6/2013 10:26	96.2	68.073
69	9/6/2013 10:27	95.9	42.355
70	9/6/2013 10:28	95.6	26.114
71	9/6/2013 10:29	95.1	23.198
72	9/6/2013 10:30	95.1	12.546
73	9/6/2013 10:31	95	15.381
74	9/6/2013 10:32	94.8	4.415
75	9/6/2013 10:33	95	1.276
76	9/6/2013 10:34	95.1	0

Certificate of Calibration

OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

Ozone Industries, Inc.
Precision Measurement Equipment Division

Purchase Order #

Calibration Performed By:
OZONE INDUSTRIES, INC.
15551 PINE RIDGE RD.
FORT MYERS, FL 33908

For:
YOUNGQUIST BROTHERS, INC.
15465 PINE RIDGE RD.
FORT MYERS, FL 33908

EQUIPMENT INFORMATION:

Description: PRESSURE GAUGE
Manufacter: MCDANIELS
Model Number: 300PSI
Part Number: N/A
Range: 0-300 PSI

Serial Number: 972062-1
Customer I.D.:
Cust. Barcode: N/A
Cust. Location: N/A
Specifications: +/- 0.25% FS

Cal Date: 6/6/2013
Cal. Due Date: 8/5/2013
Cal. Interval 60 DAYS
Received: IN TOLERANCE
Calibration Result: PASS
Environmental Conditions: 74 DEG F / 20% H
Performed By: Daniel McKissick

Procedure: STANDARD

This is to certify that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure at the points tested (unless otherwise noted). It has been Calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration is in accordance with Ozone Industries, Inc Quality Assurance Manual. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

Calibration Remarks:
THIS UNIT WAS FOUND TO BE IN TOLERANCE AT THE TIME OF CALIBRATION.
PERFORMED ROUTINE CALIBRATION / CERTIFICATION

Standards Used to Calibrate Equipment:

Company	I.D.	Description	Last Cal.	Cal. Due Date
OZONE	A1731	EATON UPC5000 PNEUMATIC CALIBRATOR	12/12/2012	12/12/2013

Signatures:

Certified by:
Print: Daniel McKissick
Date: 06/06/13
[redacted]

Approved by:
Print: Daniel McKissick
[redacted]

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ØZONE
INDUSTRIES
CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

PH: 239-433-3400
FAX: 239-489-3877

CONTROL NO: 032509-1

CUSTOMER: YBI15465

CALIBRATION DATA FORM

MFR:	MCDANIELS	**DESCRIPTION**	PRESSURE GAUGE
MODEL NO:	300 PSI .25%	**TECHNICIAN:**	0030
SERIAL NO:	972062-1	**CAL. DATE:**	06/06/13
CUST. ID:	N/A	**DUE DATE:**	08/05/13

* IF NO "AS LEFT" READING IS SHOWN ON THIS CHART, IT MEANS THE UNIT WAS IN TOLERANCE AND THERE WERE NO ADJUSTMENTS MADE TO IT.

RANGE: 0-300 PSI

NOMINAL	AS FOUND	AS LEFT *	LOW LIMIT	HIGH LIMIT
50	50.26		49.25	50.75
100	100.31		99.25	100.75
150	150.38		149.25	150.75
200	200.49		199.25	200.75
300	300.6		299.25	300.75

Certificate of Calibration

OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

Ozone Industries, Inc.
Precision Measurement Equipment Division

Purchase Order #

Calibration Performed By:
OZONE INDUSTRIES, INC.
15551 PINE RIDGE RD.
FORT MYERS, FL 33908

For:
YOUNGQUIST BROTHERS, INC.
15465 PINE RIDGE RD.
FORT MYERS, FL 33908

EQUIPMENT INFORMATION:

Description: PRESSURE GAUGE
Manufacter: McDaniel
Model Number: 300PSI
Part Number: N/A
Range: 0-300 PSI

Serial Number: 972034-2
Customer I.D.:
Cust. Barcode: N/A
Cust. Location: N/A
Specifications: +/- 0.25% FS

Cal Date: 5/17/2013
Cal. Due Date: 11/17/2013
Cal. Interval 6 MONTHS
Received: IN TOLERANCE
Calibration Result: PASS
Environmental Conditions: 74 DEG F / 80% H
Performed By: Daniel McKissick

Procedure: STANDARD

This is to certify that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure at the points tested (unless otherwise noted). It has been Calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration is in accordance with Ozone Industries, Inc Quality Assurance Manual. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

Calibration Remarks:
THIS UNIT WAS FOUND TO BE IN TOLERANCE AT THE TIME OF CALIBRATION.
PERFORMED ROUTINE CALIBRATION / CERTIFICATION

Standards Used to Calibrate Equipment:

Company	I.D.	Description	Last Cal.	Cal. Due Date
OZONE	A1731	EATON UPC5000 PNEUMATIC CALIBRATOR	12/12/2012	12/12/2013

Signatures:

Certified by:
Print: Daniel McKissick
[redacted]

Approved by:
Print: Daniel McKissick
Date: [redacted] 05/17/13
[redacted]

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ØZONE
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CORPORATION

15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

PH: 239-433-3400
FAX: 239-489-3877

CONTROL NO: 100809-7

CUSTOMER: YBI15465

CALIBRATION DATA FORM

MFR:	PIC	**DESCRIPTION**	PRESSURE GAUGE
MODEL NO:	300 PSI .25%	**TECHNICIAN:**	0030
SERIAL NO:	972034-2	**CAL. DATE:**	05/17/13
CUST. ID:	N/A	**DUE DATE:**	11/17/13

* IF NO "AS LEFT" READING IS SHOWN ON THIS CHART, IT MEANS THE UNIT WAS IN TOLERANCE AND THERE WERE NO ADJUSTMENTS MADE TO IT.

RANGE: 0-300 PSI

NOMINAL	AS FOUND	AS LEFT *	LOW LIMIT	HIGH LIMIT
50	49.59		49.25	50.75
100	99.47		99.25	100.75
150	149.45		149.25	150.75
200	199.43		199.25	200.75
300	299.4		299.25	300.75

Certificate of Calibration

OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

Ozone Industries, Inc.
Precision Measurement Equipment Division

Purchase Order #

Calibration Performed By:
OZONE INDUSTRIES, INC.
15551 PINE RIDGE RD.
FORT MYERS, FL 33908

For:
YOUNGQUIST BROTHERS, INC.
15465 PINE RIDGE RD.
FORT MYERS, FL 33908

EQUIPMENT INFORMATION:

Description: PRESSURE GAUGE
Manufacter: MCDANIELS
Model Number: 300PSI
Part Number: N/A
Range: 0-300 PSI

Serial Number: AB30128
Customer I.D.:
Cust. Barcode: N/A
Cust. Location: N/A
Specifications: +/- 0.25% FS

Cal Date: 6/17/2013
Cal. Due Date: 12/17/2013
Cal. Interval 6 MONTHS
Received: IN TOLERANCE
Calibration Result: PASS
Environmental Conditions: 73 DEG F / 40% H
Performed By: Daniel McKissick

Procedure: STANDARD

This is to certify that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure at the points tested (unless otherwise noted). It has been Calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration is in accordance with Ozone Industries, Inc Quality Assurance Manual. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

Calibration Remarks:
THIS UNIT WAS FOUND TO BE IN TOLERANCE AT THE TIME OF CALIBRATION.
PERFORMED ROUTINE CALIBRATION / CERTIFICATION

Standards Used to Calibrate Equipment:

Company	I.D.	Description	Last Cal.	Cal. Due Date
OZONE	A1731	EATON UPC5000 PNEUMATIC CALIBRATOR	12/12/2012	12/12/2013

Signatures:

Certified by:
Print: Daniel McKissick
Date: 06/17/13
[redacted]

Approved by:
Print: Daniel McKissick
Date: 06/17/13
[redacted]

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15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

PH: 239-433-3400
FAX: 239-489-3877

CONTROL NO: 080709-2

CUSTOMER: YBI15465

CALIBRATION DATA FORM

MFR:	MCDANIELS	**DESCRIPTION**	PRESSURE GAUGE
MODEL NO:	300 PSI .25%	**TECHNICIAN:**	0030
SERIAL NO:	AB30128	**CAL. DATE:**	06/17/13
CUST. ID:	N/A	**DUE DATE:**	12/17/13

* IF NO "AS LEFT" READING IS SHOWN ON THIS CHART, IT MEANS THE UNIT WAS IN TOLERANCE AND THERE WERE NO ADJUSTMENTS MADE TO IT.

RANGE: 0-200 PSI

NOMINAL	AS FOUND	AS LEFT *	LOW LIMIT	HIGH LIMIT
50	50.18		49.25	50.75
100	100.19		99.25	100.75
150	150.22		149.25	150.75
200	200.31		199.25	200.75
250	250.33		249.25	250.75
300	300.39		299.25	300.75

Appendix D

RTS and RTS Tool Configuration

YOUNGQUIST

GEOPHYSICAL LOGGING DIVISION

Radioactive Tracer Survey Tool Diagram

Date: 9-13-13 Job: SDWTP IW-16

Internal RTS: ___ External RTS: ✓ YB I Logger: Morey / A. Garcia

BOTTOM OF CASING: 2426'

-5' IN CASING: 2421'

+13.5' FOR BOTTOM OF TOOL: 2434.5'

Eject #1: 1 mCi Eject #2: 2 mCi

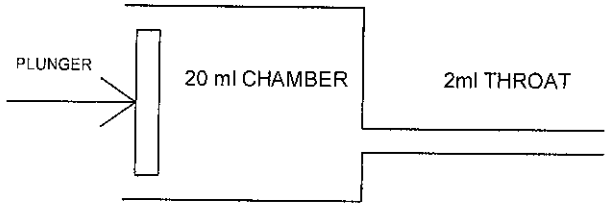
Eject #3: mCi Eject #4: mCi

Eject #5: mCi Eject #6: mCi

Total mCi of I-131 loaded in tool: 5 **1ml =1mCi**

Total volume of Chamber and Throat:22ml

EJECTOR PORT DIAGRAM



Total Eject Cycle Time (22ml): 24 **Sec**

Eject Cycle Time Per ml (Total Time / 22): 1.1 **Sec**

Throat Eject Cycle Time (2*Time Per ml): 2.2 **Sec**

TIME PER EJECT

(Total ml of I-131)/(20ml)= mCi per ml in the chamber

(5)/(20)= .25mCi per ml

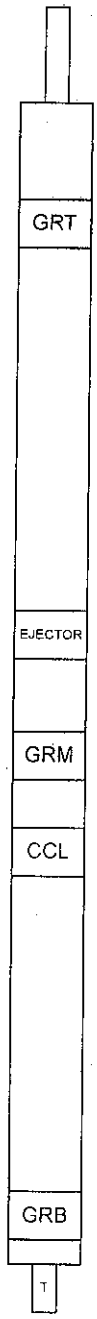
mCi = Throat Eject Cycle Time + (ml of Chamber Required)*(Eject Cycle Time Per ml)

1 mCi = 2.2 + (4)*(1.1) = 6.6 **seconds**

2 mCi = 2.2 + (8)*(1.1) = 11 **seconds**

3 mCi = + ( )*( ) = **seconds**

4 mCi = + ( )*( ) = **seconds**



TOP OF TOOL (25ft 2in)

GAMMA RAY TOP DECTOR (23ft 6in)

ALL MEASUREMENTS ARE FROM THE BOTTOM OF THE TOOL.

TOOL DIAMETER IS 1-11/16".

EJECTOR PORT (13ft 6in)

GAMMA RAY MIDDLE DECTOR (10ft 6in)

COLLAR LOCATOR (9ft 6in)

GAMMA RAY BOTTOM DECTOR (1ft 2in)

TEMPERATURE PROBE

Appendix E

Temperature Log

Appendix F

Television Survey

Appendix G

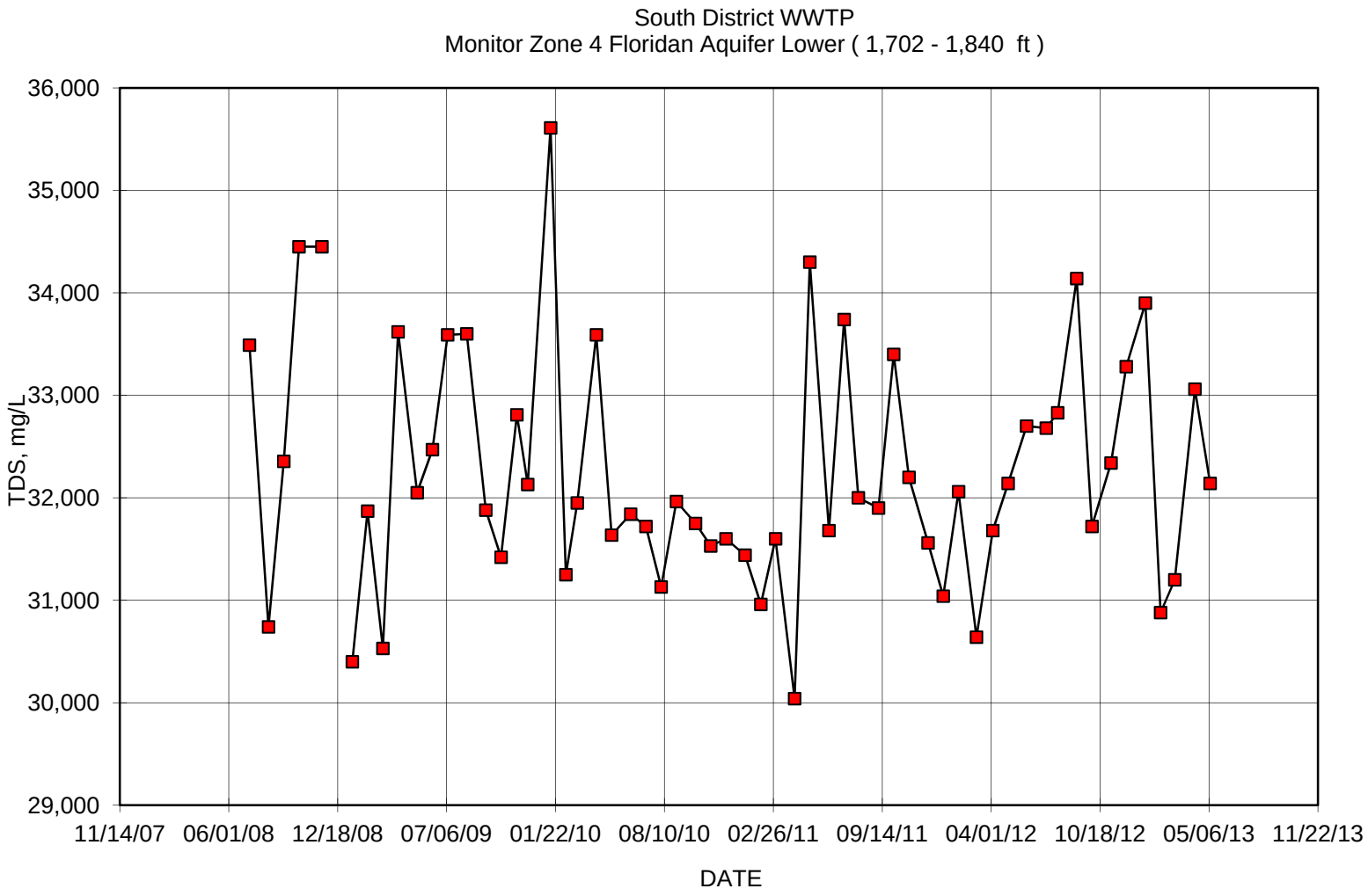
5 year Monitoring Data

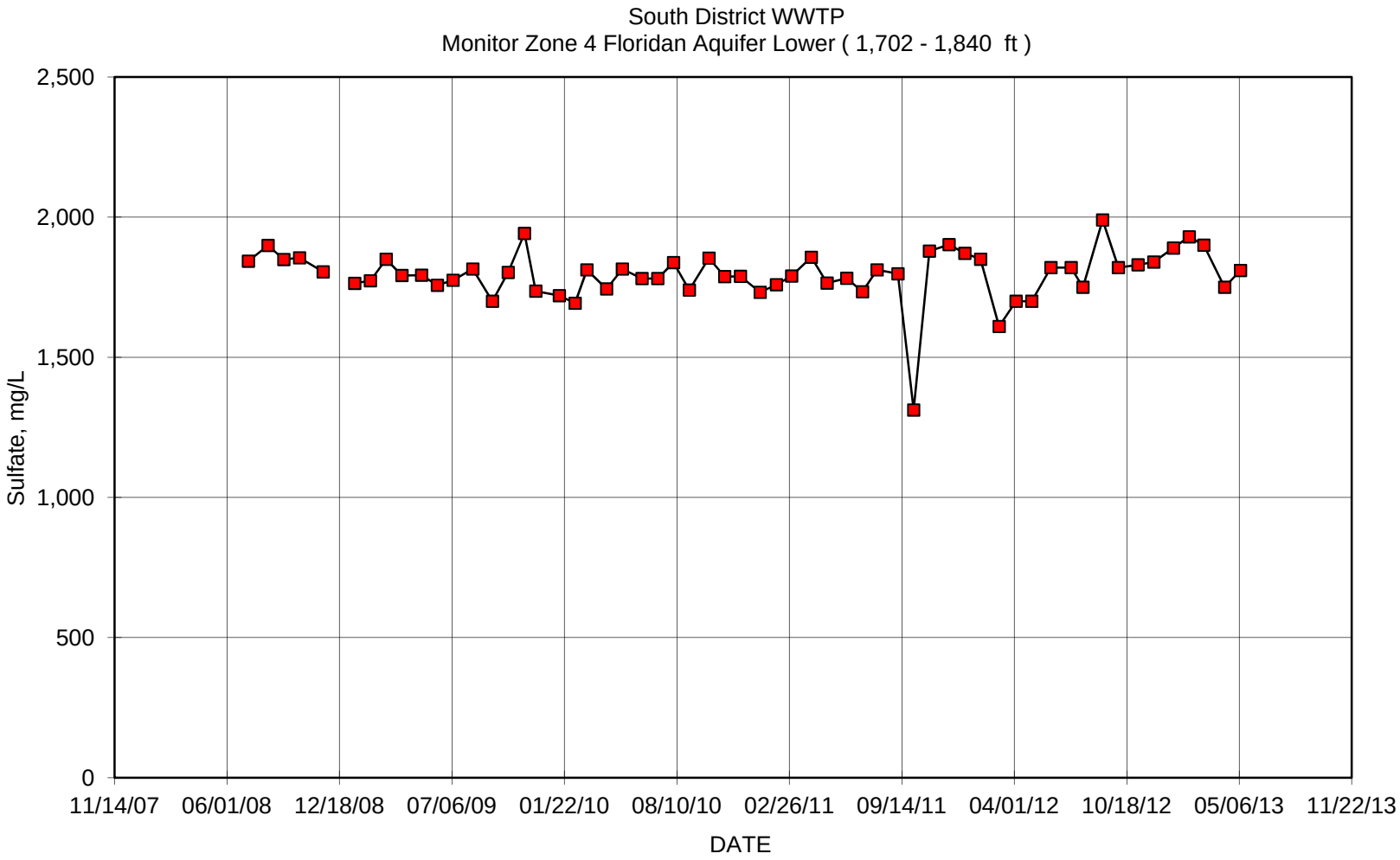
FA-4 Lower

DATE	TDS, mg/L	Sulfate, mg/L	Chlorides, mg/L	TKN, mg/L	NH3, mg/L	Conductivity Micromho/cm	Temp., C	Temp., F	pH	TP, mg/L	TSS, mg/L	NO_3, mg/L	NO_2, mg/L	Sodium, mg/L	Gross Alpha, pCi/L	Radium 226, pCi/L	Radium 228, pCi/L
07/09/08	33,490	1,843	16,993	0.32	0.07	46,050	24	75	7.6	0.01	26.80	0.03	0.00				
08/13/08	30,740	1,899	17,758	0.34	0.16	45,320	25	77	7.6	0.01	21.20	0.08	0.05				
09/10/08	32,356	1,849	16,356	0.35	0.10	46,210	24	76	7.6	0.02	9.40	0.08	0.05				
10/08/08	34,450	1,855	16,507	0.46	0.16	47,160	24	75	7.4	0.02	28.60	0.03	0.00				
11/19/08	34,450	1,805	16,895	0.51	0.02	46,440	23	74	7.4	0.00	17.80	0.03	0.00				
12/10/08																	
01/14/09	30,400	1,764	16,778	0.29	0.15	45,650	22	71	7.1	0.05	27.80	0.05	0.00				
02/11/09	31,870	1,773	16,270	0.36	0.15	4,880	24	75	7.2	1.61	16.40	0.00	0.00				
03/11/09	30,530	1,850	17,457	0.47	0.18	46,210	22	72	6.7	0.11	18.20	0.00	0.00				
04/08/09	33,620	1,792	16,978	0.38	0.21	46,470	22	72	7.1	0.03	20.80	0.00	0.00				
05/13/09	32,050	1,793	17,182	0.35	0.36	46,000	24	75	7.3	0.01	19.40	0.00	0.00				
06/10/09	32,470	1,757	16,617	0.22	0.24	45,290	23	74	7.3	0.37	19.40	0.00	0.00				
07/08/09	33,590	1,775	16,854	0.32	0.24	46,650	24	74	7.1	0.04	23.20	0.00	0.00				
08/12/09	33,600	1,815	16,899	0.39	0.62	48,250	24	76	7.2	0.01	13.80	0.00	0.00				
09/16/09	31,880	1,700	15,589	0.53	0.21	45,940			7.3	0.02		0.05	0.01	8790	17.5	12.1	0.8
10/14/09	31,420	1,803	14,921	0.43	0.19	46,090			7.3	0.03		0.00	0.00	8540	20.6	17.4	0.9
11/12/09	32,810	1,942	16,691	0.37	0.20	40,380			7.7	0.02		0.00	0.00	8090	14.1	12.7	1.0
12/02/09	32,130	1,736	16,843	0.34	0.21	48,170	24	75	7.4	0.02	20.20	0.00	0.00	9630	15.6	13.9	0.9
01/13/10	35,610	1,720	16,362	0.40	0.19	45,000	22	71	7.3	0.03	11.80	0.00	0.00	8050	15.1	12.1	0.9
02/10/10	31,250	1,693	15,787	0.49	0.17	44,860	22	72	7.4	0.02	21.40	0.00	0.00	8760	16.7	14.8	0.9

03/03/10	31,950	1,812	16,958	0.50	0.01	46,520	22	72	7.3	0.03	15.20	0.00	0.00	9350	16.6	14.4	0.7
04/07/10	33,590	1,744	17,466	0.41	0.18	46,920	25	76	7.2	0.01	19.20	0.00	0.00	8970	18	11.2	0.7
05/05/10	31,636	1,815	17,774	0.41	0.18	46,460	25	77	7.4	0.01	13.80	0.01	0.00	9110	15.1	14.5	0.9
06/09/10	31,840	1,781	17,486	1.37	0.16	46,570	24	74	7.1	0.05	18.20	0.02	0.00	8760	13.9	12.8	0.8
07/07/10	31,720	1,781	17,602	0.09	0.21	46,330	24	75	7.4	0.04	13.00	0.00	0.00	9040	14.7	15.8	0.8
08/04/10	31,130	1,838	17,606	0.48	1.11	43,390	25	76	7.4	0.16	16.60	0.00	0.00	8830	16.1	14.7	0.7
09/01/10	31,964	1,740	16,820	0.19	0.84	46,290	24	75	7.1	0.02	40.50	0.00	0.00	8610	14.5	15	0.8
10/06/10	31,750	1,854	15,146	0.20	0.91	46,110	25	76	7.2	0.01	19.60	0.01	0.00	9610	16.7	14.2	0.7
11/03/10	31,530	1,788	17,346	0.40	0.80	44,810	23	74	7.2	0.02	19.60	0.00	0.00	9020	16.9	13	0.7
12/01/10	31,600	1,789	16,892	0.45	0.91	45,660	24	76	7.2	0.02	18.60	0.00	0.02	8790	16.7	14.9	0.8
01/05/11	31,440	1,732	16,662	0.30	0.88	44,660	24	75	7.1	0.02	10.80	0.02	0.00	8790	18.5	15.3	0.9
02/03/11	30,960	1,759	17,026	0.30	1.42	43,830	24	75	7.1	0.02	10.80	0.00	0.00	8480	17.2	15.9	0.7
03/02/11	31,600	1,790	17,221	0.42	1.04	46,070	24	75	7.2	0.02	34.00	0.00	0.00	9230	16.9	13.7	0.7
04/06/11	30,040	1,857	17,735	0.23	1.05	44,330	24	74	7.3	0.02	23.00	0.00	0.00	9340	17.3	15.6	0.7
05/04/11	34,300	1,765	17,004	0.40	1.14	47,750	24	74	7.4	0.02	13.20	0.00	0.00	7990	20.4	18.4	0.8
06/08/11	31,680	1,782	16,637	0.36	1.14	46,130	24	75	7.2	0.06	12.20	0.01	0.00	9680	10.7	11.8	0.8
07/06/11	33,740	1,734	16,515	0.40	1.07	45,160	24	75	7.2	0.02	11.80	0.01	0.00	9820	13.3	11	0.8
08/01/11	32,000	1,812	17,441	0.49	1.05	44,380	24	75	7.2	0.02	17.30	0.00	0.00	9120	14.2	13.3	0.9
09/07/11	31,900	1,798	17,332	0.44	1.18	44,550	25	76	7.3	0.05	14.80	0.01	0.00	9000	19.4	16.3	0.9
10/05/11	33,400	1,312	12,742	0.66	1.41	43,720	26	79	7.4	0.03	18.10	0.01	0.00	9500	16.1	14.9	1.0
11/02/11	32,200	1,879	18,192	0.39	1.22	45,150	24	76	7.0	0.04	9.90	0.02	0.00	6920	13.3	13.7	0.8
12/07/11	31,560	1,902	18,373	0.50	1.33	45,059	24	74	7.7	0.02	10.80	0.02	0.00	8420	12	10.6	0.9

01/04/12	31,040	1,871	18,058	0.38	1.21	44,119	22	71	7.2	0.02	11.90	0.02	0.00	8880	11.2	10	0.8
02/01/12	32,060	1,850	17,700	0.39	1.48	45,145	24	75	7.2	0.02	12.10	0.01	0.00	9620	14.6	13.7	0.6
03/05/12	30,640	1,610	15,200	0.38	1.04	44,942	24	75	7.1	0.02	8.30	0.02	0.00	9770	15.2	14.8	0.7
04/04/12	31,680	1,700	16,700	0.42	0.69	47,255	26	78	7.3	0.06	14.70	0.50	2.50	8780	16.2	15.5	0.8
05/02/12	32,140	1,700	18,000	0.36	0.92	45,876	24	74	7.2	0.05	12.00	0.01	0.00	10600	14.4	14.2	0.8
06/05/12	32,700	1,820	17,300	0.45	0.96	46,030	23	74	7.7	0.01	13.60	0.01	0.00	9540	13.7	12.6	0.8
07/11/12	32,680	1,820	17,200	7.75	0.60	46,240	23	74	7.4	0.03	12.90	0.01	0.00	9450	14	13	0.8
08/01/12	32,830	1,750	16,500	1.68	0.82	45,917	24	75	7.5	0.15	5.50	0.01	0.00	11600	13.1	12.8	0.8
09/05/12	34,140	1,990	18,500	0.46	0.67	45,967	24	74	7.4	0.05	11.10	0.01	0.00	8940	11.4	11.8	0.8
10/03/12	31,720	1,820	17,900	0.52	0.80	47,137	23	74	7.5	0.03	14.90	0.01	0.00	8890	14.8	14.0	0.8
11/07/12	32,340	1,830	17,100	0.43	0.80	45,278	23	74	7.4	0.03	14.50		0.00	9760	14	12.5	0.9
12/05/12	33,280	1,840	17,700	0.26	0.80	46,282	23	74	7.3	0.03	13.20	0.01	0.01	10300	11.6	10.9	0.9
01/09/13	33,900	1,890	18,100	0.61	1.23	46,619	24	74	7.4	0.13	8.50	0.39	0.01	9740	14.1	13.5	0.8
02/06/13	30,880	1,930	18,600	0.49	1.13	45,293	23	74	7.3	0.05	8.40	0.02	0.01	8400	15.9	14.4	0.9
03/04/13	31,200	1,900	17,900	0.46	0.83	46,939	23	73	7.4	0.03	13.90	0.02	0.01	1970	16.4	14.0	0.7
04/10/13	33,060	1,750	16,600	0.51	0.91	46,560	23	74	7.2	0.02	0.02	0.02	0.01	9230	12.1	13.0	0.8
05/08/13	32,140	1,810	17,100	0.44	0.88	47,171	24	75	7.4	0.04	0.04	0.00	0.01	9590	8.7	7.9	0.7


South District WWTP
Monitor Zone 4 Floridan Aquifer Lower (1,702 - 1,840 ft)
36,000
35,000
34,000
33,000
32,000
31,000
30,000
29,000
TDS, mg/L
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE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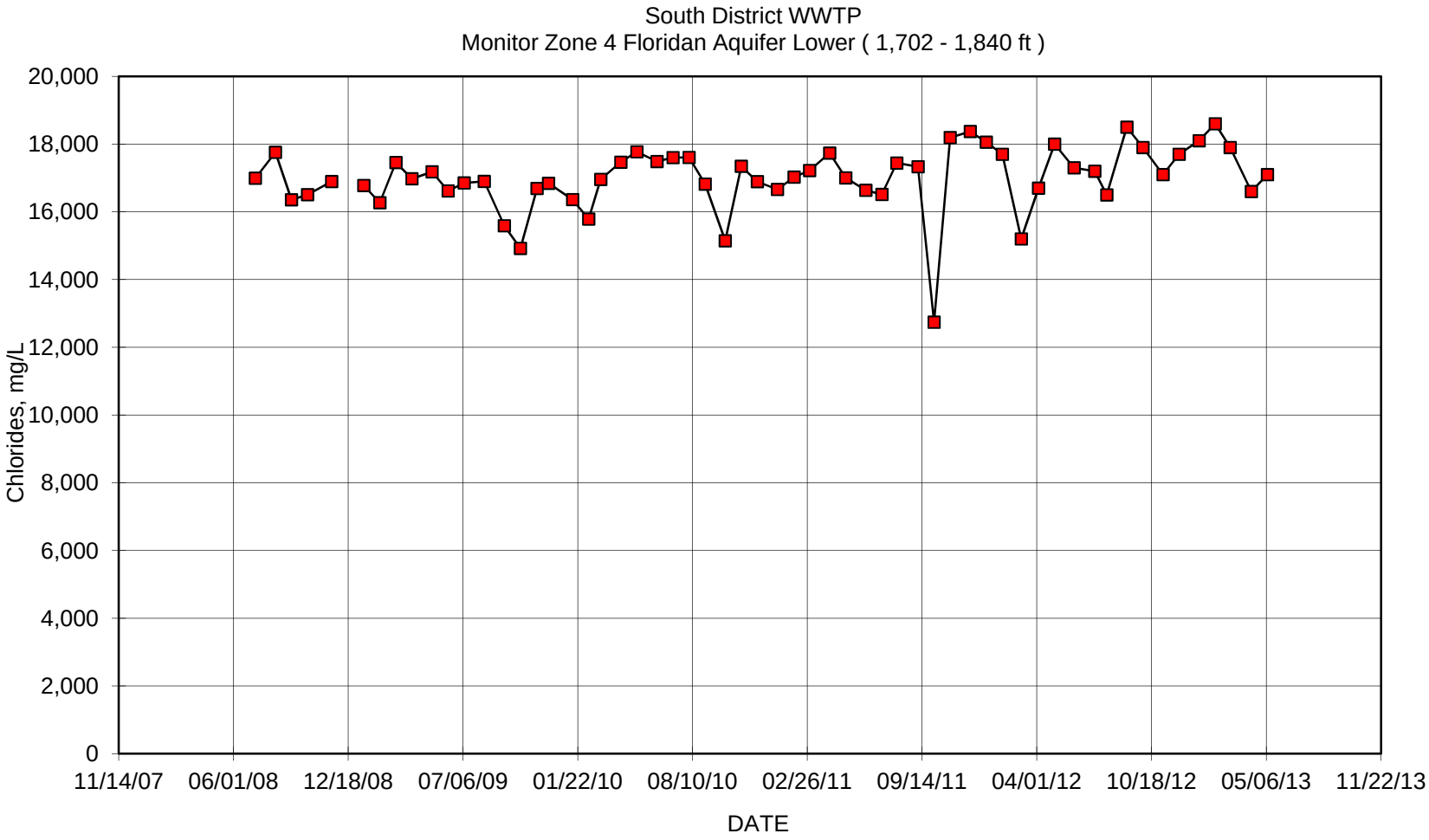
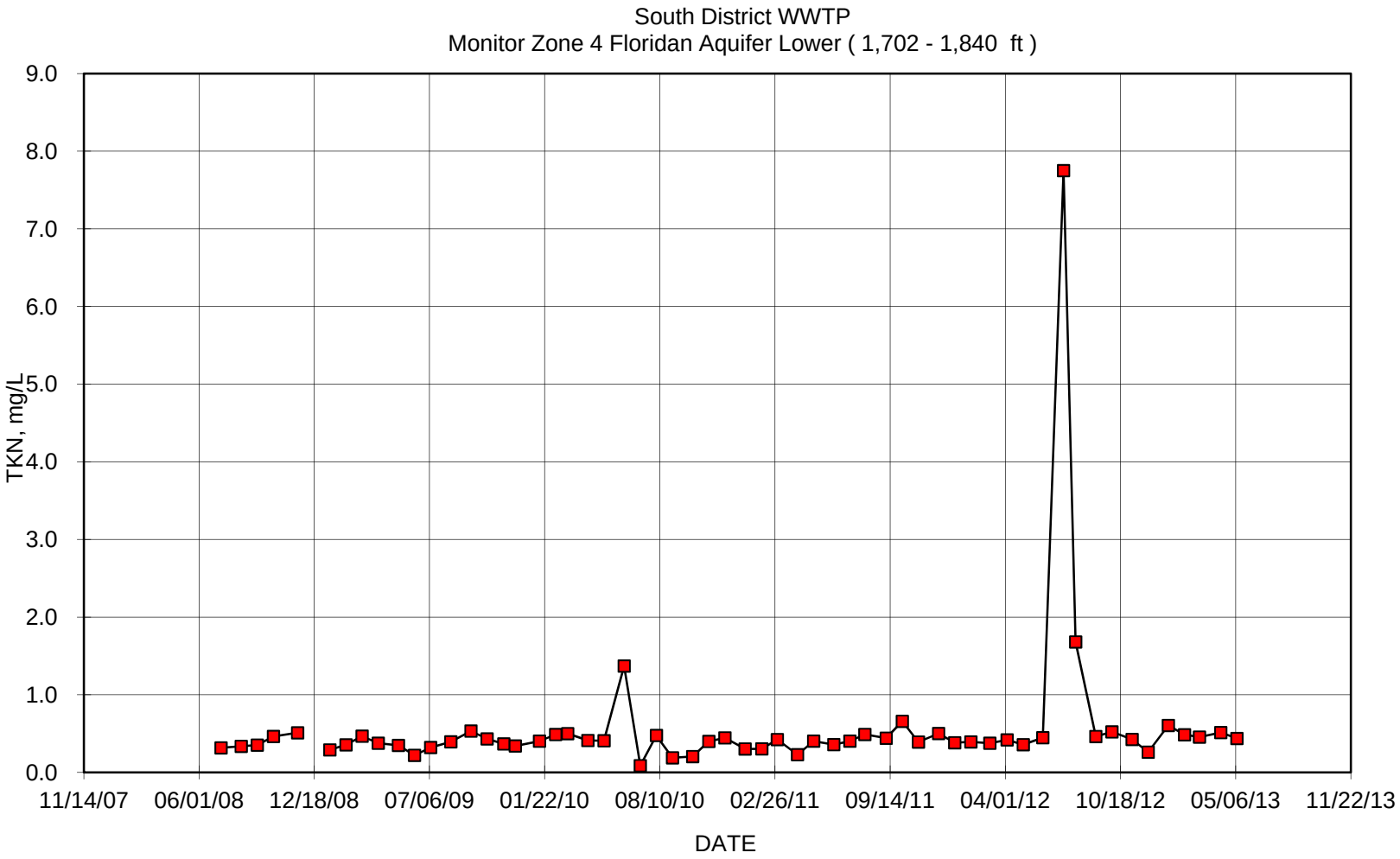
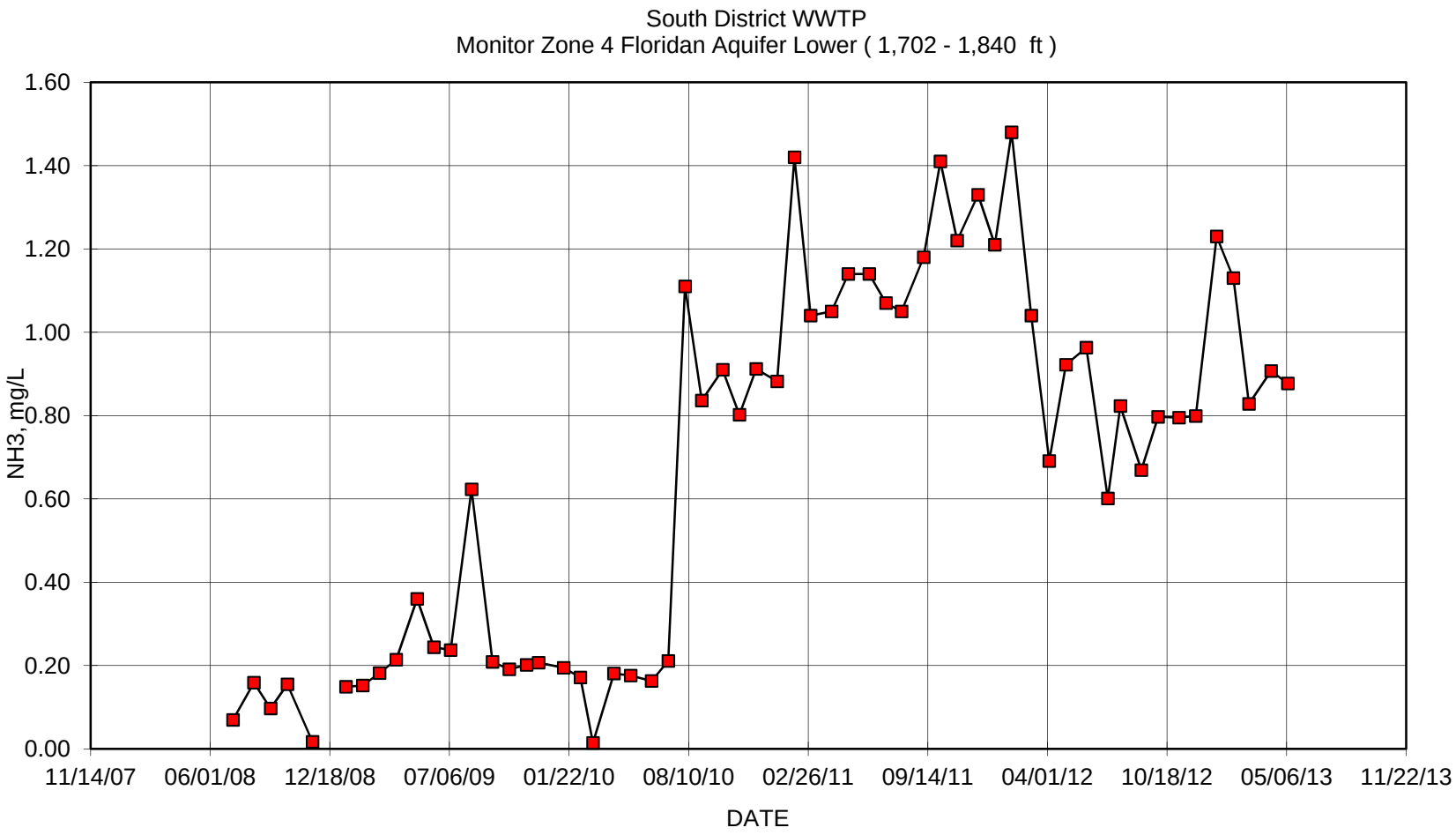
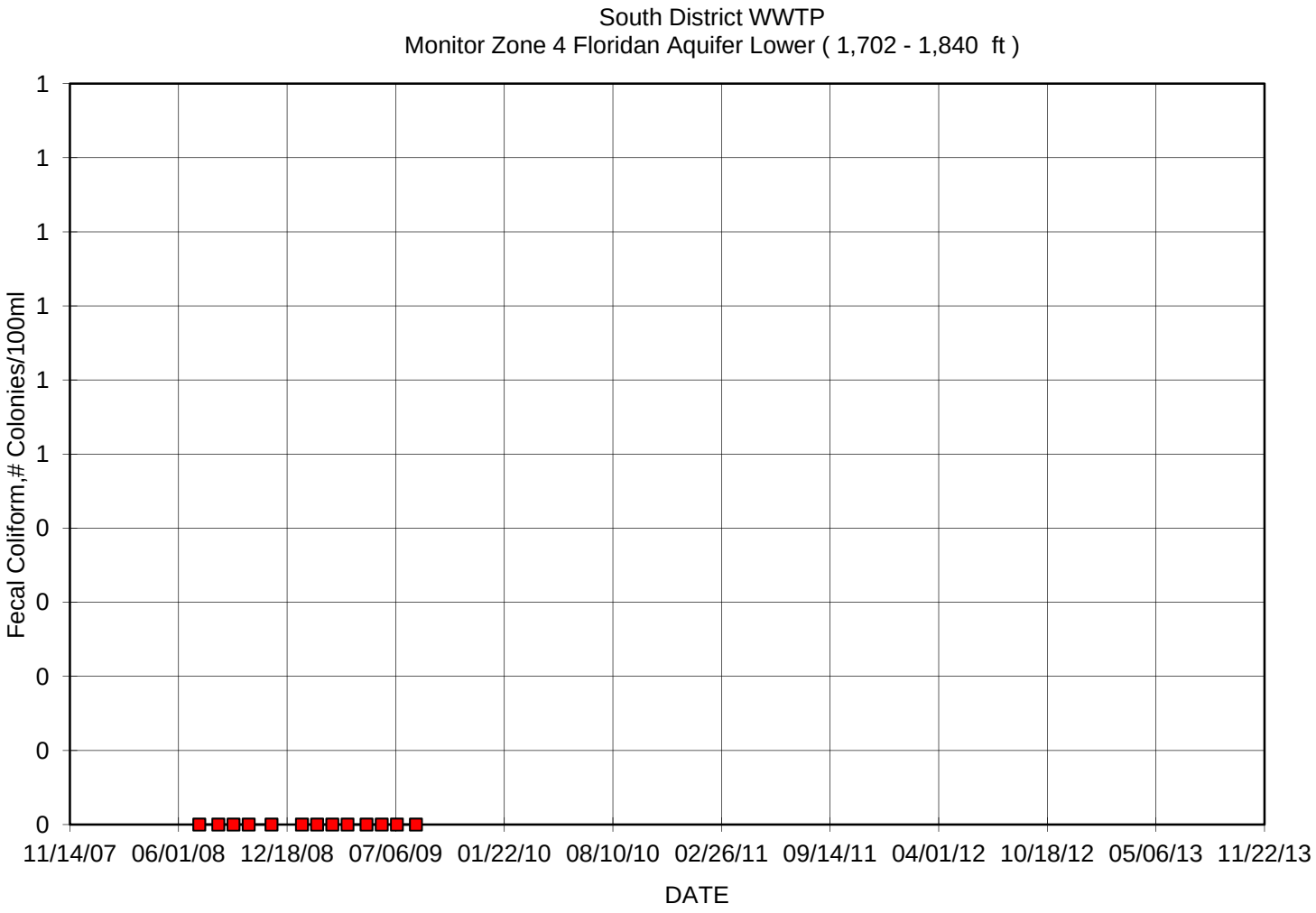
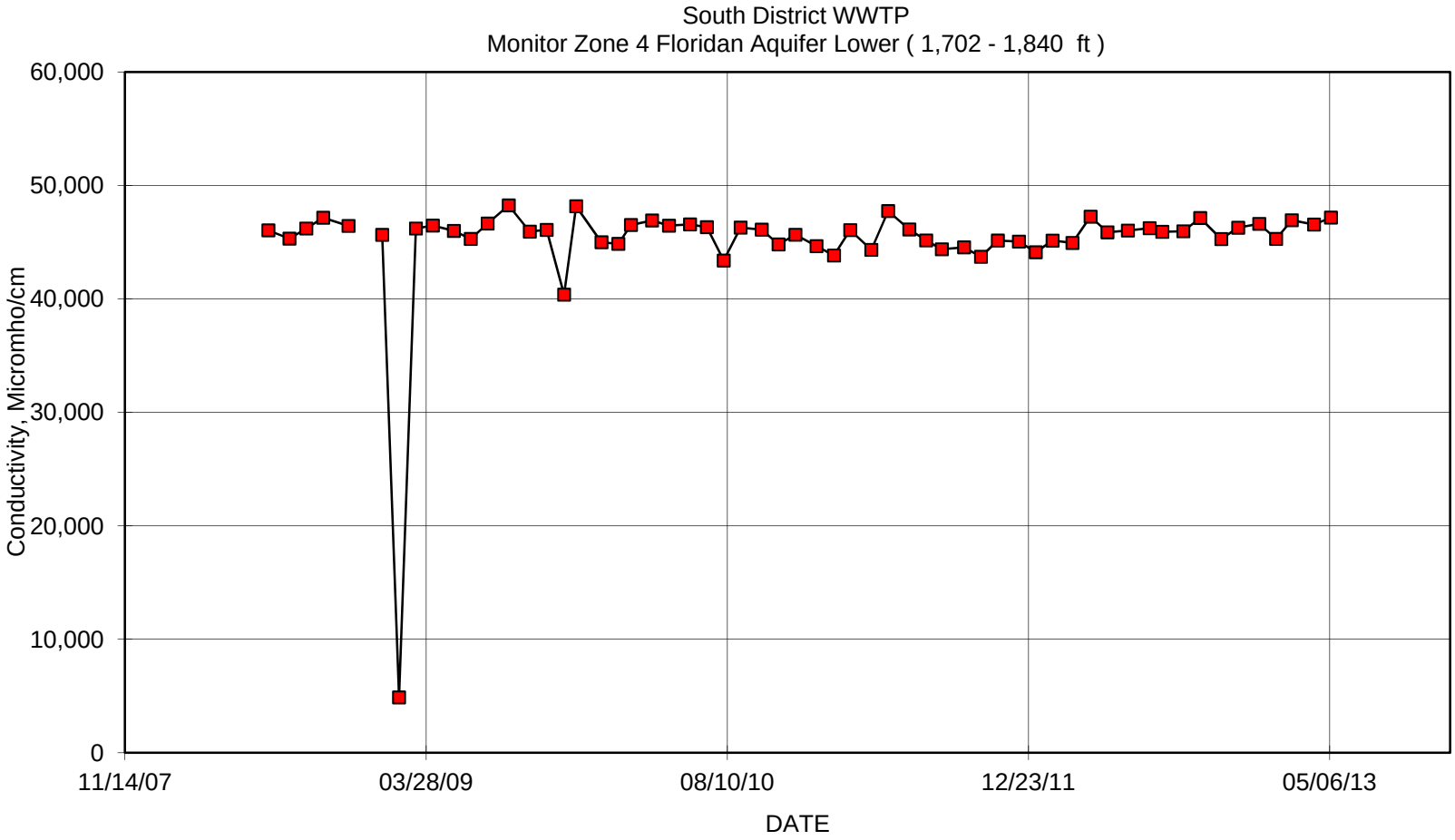
Monitor Zone 4 Floridan Aquifer Lower (1,702 - 1,840 ft)
Sulfate, mg/L
2,500
2,000
1,500
1,000
500
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

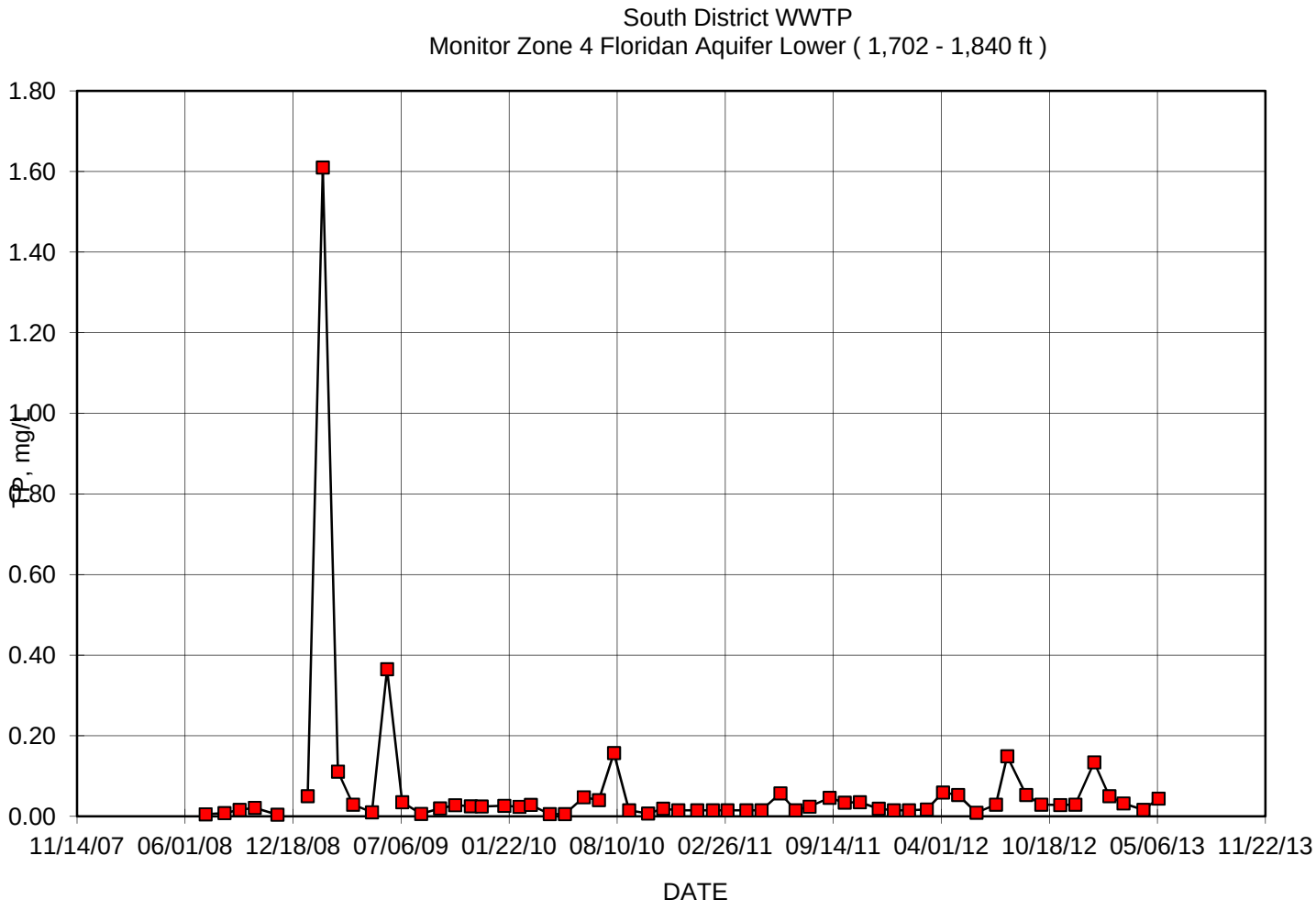

South District WWTP
Monitor Zone 4 Floridan Aquifer Lower (1,702 - 1,840 ft)
Chlorides, mg/L
20,000
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

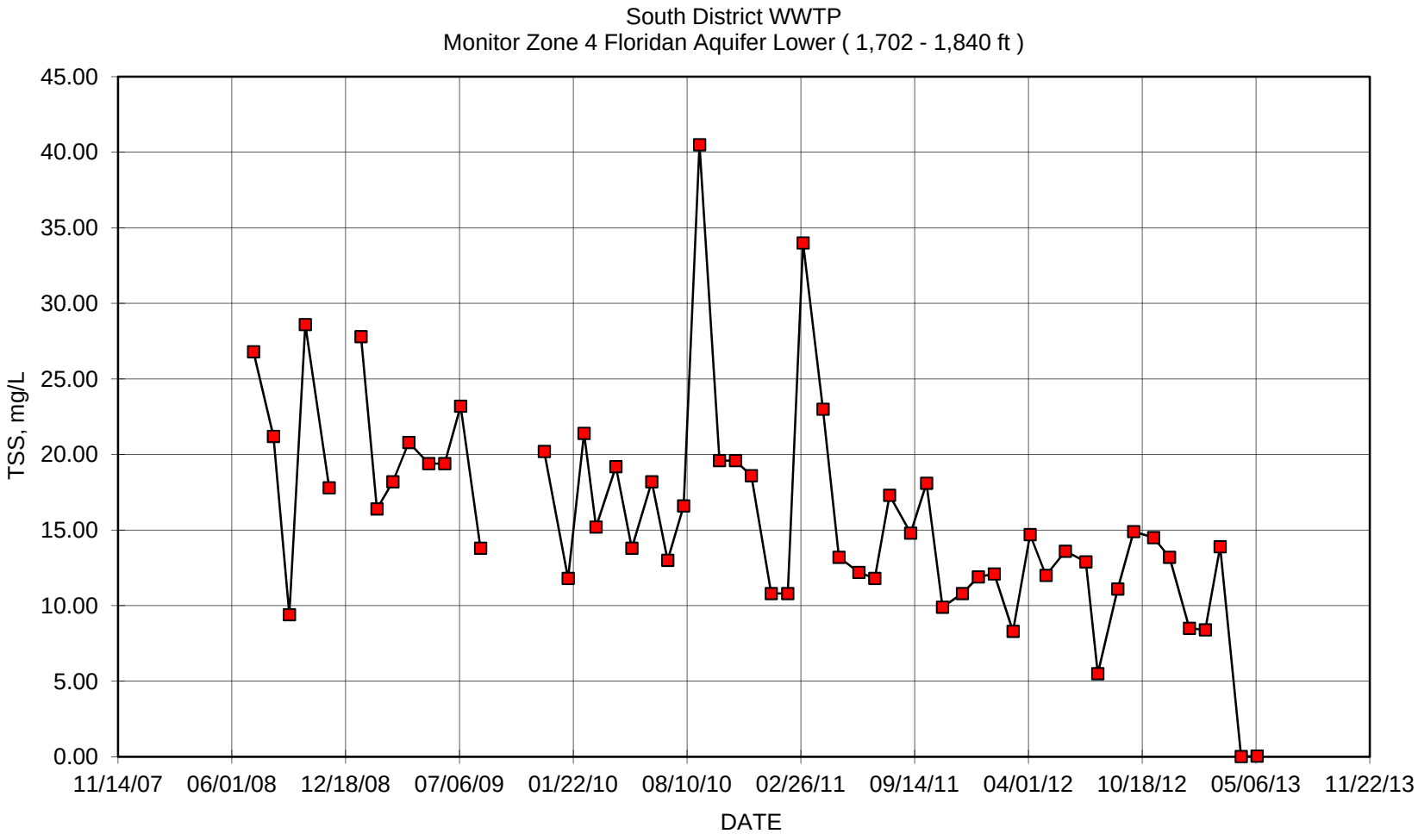

South District WWTP
Monitor Zone 4 Floridan Aquifer Lower (1,702 - 1,840 ft)
TKN, mg/L
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 4 Floridan Aquifer Lower (1,702 - 1,840 ft)
NH3, mg/L
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 4 Floridan Aquifer Lower (1,702 - 1,840 ft)
Fecal Coliform,# Colonies/100ml
1
1
1
1
1
1
0
0
0
0
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 4 Floridan Aquifer Lower (1,702 - 1,840 ft)
Conductivity, Micromho/cm
60,000
50,000
40,000
30,000
20,000
10,000
0
11/14/07
03/28/09
08/10/10
12/23/11
05/06/13
DATE


South District WWTP
Monitor Zone 4 Floridan Aquifer Lower (1,702 - 1,840 ft)
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
TP, mg/L
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 4 Floridan Aquifer Lower (1,702 - 1,840 ft)
TSS, mg/L
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

MIAMI-DADE COUNTY
miamidade.gov

Water and Sewer
PO Box 330316 • 3071 SW 38 Avenue
Miami, Florida 33233-3016
T 305-665-7471

October 1, 2013

Mr. Joseph R. May, P.G.
Florida Department of Environmental Protection
400 North Congress Avenue, 3rd Floor
West Palm Beach, Florida 33401

CCN: 57716

Reference: Miami-Dade Water and Sewer Department -- Mechanical Integrity Testing (MIT) Report for Deep Injection Well No. IW-17 at the SDWWTP Site.

Dear Mr. May:

Enclosed please find the Certificate of Mechanical Integrity and the MIT Report on the re-testing of Deep Injection Well No. IW-17 at the South District Wastewater Treatment Plant site in Miami-Dade County.

All the tests were conducted in strict adherence to the specifications submitted to and approved by your office. The testing results for the well were good. Both external and internal mechanical integrity were demonstrated. The well casing and the wellhead components are in good condition. All the well head valves and all the well head components are scheduled to be rust-proofed and repainted when all the MITs are completed. Based on the results of the well testing we conclude that the well retains full mechanical integrity and recommend that MDWASD be allowed to continue operating the well in its normal mode.

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

The demonstration of mechanical integrity is being submitted per Chapter 62-528.300(6)(b)2., 62-528.300(6)(c), and 62-528.425(1)(d), F.A.C. and specific condition 3.j. of Permit 0061787-022-UO.

If you have any questions or require additional explanation of any item in the report, please do not hesitate to contact me at [redacted] or Sonia Villamil at [redacted].

Sincerely,

[redacted]

Rafael A. Terrero, P.E.
Assistant Director- Wastewater Operation Systems

Enclosures: Certificate of Mechanical Integrity
MIT Report Well IW-17 (1 copy)

cc: Joseph Haberfeld, FDEP - Tallahassee

MIAMI-DADE COUNTY
Delivering Excellence Every Day

Mechanical Integrity Test Report
Deep Injection Well No. IW-17
South District Wastewater Treatment Plant

Prepared by:
Miami-Dade Water and Sewer Department
3071 SW 38th Avenue
Miami, Florida 33146

CERTIFICATE OF MECHANICAL INTEGRITY

The **South District WWTP** deep injection well **IW-17** operated by **Miami-Dade Water and Sewer Department** has been tested for mechanical integrity. The tests followed standard engineering practices and used methods presented in the United States Environmental Protection Agency regulations for the purposes of these tests. The external and internal mechanical integrity tests followed Florida Department of Environmental Protection (FDEP) pre-approved testing specifications and all the critical test events were witnessed by representatives of the FDEP, the MDWASD and the contractor.

Having supervised the engineer and geologists that were present during the testing, conducted the examining of the results and the preparation this mechanical integrity report as part of this certification, the undersigned certifies that deep injection well **IW-17** operated by **Miami-Dade Water and Sewer Department** at the **South District Wastewater Treatment Plant Site in Miami-Dade County, Florida** has successfully passed all the test requirements for mechanical integrity under rules of Chapter 62-528 of the Florida Administrative Code and is therefore determined to have mechanical integrity.

Certified on October 1, 2013

[redacted]

Howard J. Fallon Jr., P.E.
Professional Engineer
License Number 24153

MECHANICAL INTEGRITY TEST REPORT
FOR
DEEP INJECTION WELL No. IW-17
AT THE
SOUTH DISTRICT WASTEWATER TREATMENT PLANT

Prepared by:

MIAMI-DADE WATER AND SEWER DEPARTMENT
3071 SW 38th Avenue
Miami, Florida 33146

For Submittal To:

UNDERGROUND INJECTION CONTROL
FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

October 2013

ABSTRACT

The internal mechanical integrity was investigated through a pressure test performed on the injection casing. The pressure test was conducted at 154 pounds per square inch (psi) which is approximately 1.5 times the maximum (100 psi) potential injection pressure and more than 1.7 times the maximum operational pressure that the well will be under when operating at its full permitted injection velocity of 10 feet per second (ft/sec). FDEP permits a 5% loss in pressure during the hour long test in order for the internal mechanical integrity to pass the pressure test.
IW-17 successfully passed the pressure test because the casing only lost 3.5 psi. The successful results of the pressure test for internal mechanical integrity were reinforced by the results of the second internal mechanical integrity test, the TV survey of the casing. The TV survey confirmed that the casing and the casing joints are in good condition and that the well has internal mechanical integrity down to 2,413 ft bls.

The external mechanical integrity was investigated using two test procedures, a Radioactive Tracer Survey (RTS) and a Temperature Log. Results of the RTS confirmed the integrity of the cement around the casing and the continued competence of its seal with the geologic strata. The temperature test showed that there are no anomalies that would indicate points where injected fluids could escape through the casing and cement into the formation. Similarly there were no temperature anomalies that would indicate injection fluids entering the formations at other than the approved injection depth.

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Section 1

1. INTRODUCTION

1.1 BACKGROUND

On October 12, 2012, (see Appendix A) the Miami-Dade Water and Sewer Department (MDWASD) submitted the County's proposed plan and testing specifications for conducting the mechanical integrity tests (MITs) and repairs on some of the injection wells at the South District Wastewater Treatment Plant (SDWWTP) site (see Figure 1) to the Florida Department of Environmental Protection (FDEP). The plan, represented by the specifications, described the step-by-step procedure to be followed and included the testing schedule required to meet the 5-year MIT re-testing conditions of the FDEP permit for each of the injection wells. After receipt of these documents, the FDEP Staff reviewed the proposed plan and sent an approval on June 5, 2013 (see Appendix B).

The contract documents for conducting the MITs were let out for bids, and the winning bid was submitted on February 28, 2013 by Youngquist Brothers, Inc., a well drilling contractor from Ft. Meyers, Florida. After the contract was approved by the Board of Country Commissioners and signed by the County Manager, the MDWASD issued the notice to proceed on May 17, 2013 and the contractor began mobilizing to the site.

1.2 PURPOSE AND SCOPE

The purpose of this report is to provide FDEP with a document that describes the re-testing procedures for mechanical integrity applied to each of the SDWWTP deep injection wells (see Figure 2). The report also presents the field reports (see Appendix C), and the results of the tests in a single volume for ease of reference. The mechanical integrity re-testing operations involved conducting a pressure test on the well casing to show that there are no leaks in the casing, and conducting a TV survey on the well to reinforce the data from the pressure test. The re-testing includes tracking a radioactive liquid-tracer (iodine isotope I-131) injected down the well to show that there is no fluid movement upward behind the casing, into underground sources of drinking water (USDW). The radioactive test information is reinforced with temperature logs run on the well. Gamma ray logs are used to detect the movement of the radioactive tracer.

Figure 1. South District Wastewater Treatment Plant Site

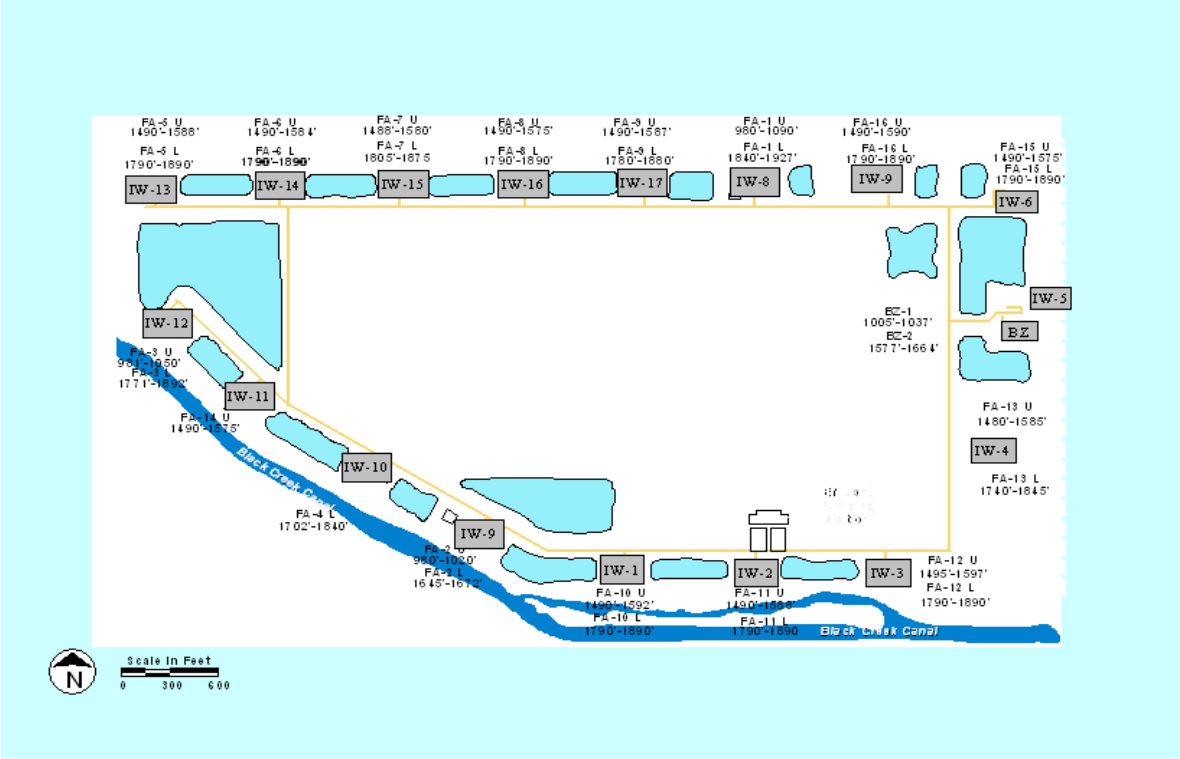


Figure 2. Well Locations Layout

Section 2

2. MECHANICAL INTEGRITY TESTING (MIT)

2.1 METHODS USED

The MIT program is designed to test two elements of the injection well system: 1. Internal integrity and 2. External integrity. The first test element, the internal mechanical integrity test of the well, tests the condition of the injection casing. The second test element, the external mechanical integrity test of the well, tests for leaks outside the casing. This is achieved through a series of field tests including a pressure test and a TV survey for the internal testing, and the temperature log, gamma ray log and RTS survey for the external testing. The first test element, the internal mechanical integrity test, tests for leaks in the injection pipe (casing). The second test element tests for leaks in the annular space outside the casing (cement-filled space between the periphery of the drilled hole and the casing) and in the near-to-the-well geologic strata.

2.2 CASING SCRUBBING

Because the mechanical integrity of injection wells has to be tested every five years, and because a TV inspection of the well is part of the test requirements, MITs provide a timely opportunity to clean the well of deposits that may have formed on the inside of the casing during the intervening years and at the same time provide a cleaner casing for the TV inspection. Cleaning the inside of the well casing is achieved by running a scrubbing brush up and down the casing. However, before the cleaning can be performed, flow out of the well must be controlled. The column of water inside the casing is fresh water and results in a positive hydraulic head inside the well. That head must first be controlled to prevent water from flowing out of the well during the cleaning operation.

2.2.1 Flow Suppression

Suppression of the fresh water head was achieved by first pre-mixing water with salt (NaCl) to form a heavy brine, and then pumping the brine down the well casing, through a 6-inch gate valve on the wellhead. This procedure results in the displacement down the well of the fresh water at the top of the column and replacement of the displaced fresh water with the brine solution. An equal volume of fresh water is displaced out of the well at the bottom of the casing. The procedure is repeated until the pressure head inside the well is suppressed. This method of displacement is used because it achieves flow suppression without first having to open the well to insert a tremie pipe to the bottom of the casing for introduction of the brine. This displacement method also provides a safe way of “killing” the well that at the same time reduces the volume of injected salt solution that would enter the formation at the bottom of the well. One additional advantage is that using this method the brine can be recovered and reused in flow suppression at other wells.

The brine was prepared in 1,000-gallon (gal.) batches by mixing the salt from a 2,000-pound (lbs.) sack in a 1,000 gal. tank of fresh water. The 1,000 gal. solution was then pumped down the well before other similarly mixed batches of salt solution were mixed and pumped down the well (see Figure 3). In the end, the operation was repeated 13 times, and a total of 13 sacks (approximately 26,000 lbs. of salt) were used to suppress the head in the well. This salt concentration represents a theoretical specific gravity of 1.239 for the brine, calculated from the salt solution used in the field of 10.3 lbs per gallon. The 26,000 lbs of salt suppressed the pressure head from approximately 26 feet above the top of the casing to approximately 15 feet below.

Figure 3. Flow Suppression Equipment

2.2.2 Scrubbing Operation

The brush used to clean the casing is made with an old drill rod that has an outside diameter of 7 inches with thick steel wire inserted and secured sticking out of the drill rod. The total diameter of the brush with the steel wire bristles is 24 inches. The brush is attached to the bottom of the packer and inserted into the well (see Figure 4). A 24-inch flange was bolted to the top of the well and pressure fittings installed to be used for packer inflation later on in the process. Then Youngquist lowers the brush and packer by attaching drill rods to the top of the packer and then raising and lowering the brush several times using a 50 ton crane. This process was repeated until the casing was scrubbed and the packer was at the depth required to perform the packer test on the well.

Figure 4. Scrubbing Brush and Hydraulic Packer

2.3 INTERNAL MECHANICAL INTEGRITY (CASING TESTS)

2.3.1 Pressure Test

After the pressure head was suppressed and the casing scrubbed, and the top of the inflatable packer was placed at a depth of 2,381 ft bls. This well is cased to a depth of 2,410 ft bls so the packer is in the bottom 50 feet of the casing. Additional pressure fittings were installed on the flange to pressurize the casing with water. A bleeder valve atop the 24-inch flange allows passage of the drill pipes that support the packer without loss of pressure in the casing (see Figure 5). A pretest was conducted on the casing to determine that the pressure was holding and that all the installed testing equipment was operating properly, then FDEP was informed that the well was ready for their inspection. The next day, July 10, 2013, the pressure test was repeated in the presence of FDEP Staff. The packer had been previously sealed against the casing, at an inflation pressure of 380 pounds per square inch (psi) and at 8:00 AM the casing was pressurized with water to a pressure of 154.5 psi.

Figure 5. Well-Head and Recorder Set Up for Pressure Test

At 9:20 A.M. the one-hour pressure test was started in the presence of Joseph May, P.G. representing FDEP and witnessed by Sonia Villamil, Maria Macfarlane, and Michael Ashe representing MDWASD, and by Chris Harp and others representing the drilling contractor. The pressure test ran for the required one-hour period. The pressure deviation (loss) in that time was 3.5 psi, well below the 7.5 psi deviation allowable under the 5 % criteria in the rules (see Table 2-1). The packer inflation pressure and the pressure in the casing were measured using certified gages (see Appendix C) graduated from 0 to 200 psi in increments of 1 psi. The pressure was read in person and recorded by hand at five minute intervals during the test. The pressure was also recorded on an In-Situ pressure transducer attached to the stand with the pressure gauges (see Figure 5).

Table 2-1 Casing Pressure Readings

Time	Casing Pressure (psi)	Pressure Change (psi)	Packer Pressure (psi)
9:20	154.5	0.0	380
9:25	154	0.5	380
9:30	154	0.0	380
9:35	154	0.0	380
9:40	153.5	0.5	380
9:45	153	0.5	380
9:50	153	0.0	380
9:55	152.5	0.5	380
10:00	152	0.5	380
10:05	152	0.0	380
10:10	151.5	0.5	380
10:15	151	0.5	380
10:20	151	0.0	380

2.3.2 Bleed-Off Calculations

At the completion of the pressure test the casing pressure was bled-off and the discharged volume from the bleeding was measured (see Table 2-2). Bleeding until the pressure resulted in zero flow produced approximately 30.1 gallons. This exercise provides a reasonable assurance that the packer is placed at the depth in the well that is within the last 50 feet of the casing.

Table 2-2. Bleeding Volumes versus Pressure

Bled Volume (gallons)	0	5	10	15	20	25	30.1
Casing Pressure (psi)	151	125	100	75	50	25	0

2.3.3 Television Survey

A closed circuit color television camera, encased in a pressure vessel capable of withstanding the pressures exerted at the depths to be televised, and equipped with a fish-eye lens, was introduced into the well through a pack-off stripper device on a standpipe above the injection well (see Figure 6). The camera is centralized in the casing, and is preceded down the well with a light source attached below the camera. The camera televises a view of the full circumference of the inside of the casing and the image is recorded on video tape. Prior to the video survey, the well

was scrubbed and flushed with potable water to provide the best picture possible. The video survey began at land surface and continued down to 3,013 feet, where the camera runs into an obstruction, but the hole below seems open below the partial obstruction where the tool was stuck. At selected intervals of interest, the camera was used to pan the intervals in a horizontal format prior to continuing the normal vertical recording.

A review of the video (see Appendix F) indicates that the casing is in good condition down to 2,413 feet. The video also shows that the scrubbing operation was successful. The scrubber has scrubbed the casing free of all growth down to 2,410 feet and this is confirmed by visible vertical scratches throughout that length of the casing; indicating that the scrubber had brushed the steel casing effectively. All the scratches are superficial, and do not detract from the physical and mechanical integrity of the casing. There are no gouges, grooves, nicks, or other physical damage visible in the casing for its whole length. Below 2,410 feet the casing was not scrubbed to avoid hanging the scrubber with the edge of the bottom of the casing at 2,413 feet. There are some growths and/or deposits visible inside the casing below 2,410feet.

In summary, the video picture meets the quality standards that are needed for a visual evaluation of the well. This video survey presents a clear view of the casing and of the welded joints of the casing. All the joints are clean and appear to be tight. From the TV survey it is concluded that this casing is in good condition throughout its whole depth from land surface to 2,413 feet.

Figure 6. Television Survey (Standpipe and Logging Truck)

2.4 EXTERNAL MECHANICAL INTEGRITY (CEMENT AND FORMATIONS)

The external mechanical integrity test consisted of two low flow dynamic tests The RTS and temperature survey, conducted on July 17 2013, for the external mechanical integrity portion of the test was witnessed by the representative of FDEP (Joseph May, P.G.), by representatives of MDWASD (Sonia Villamil and Maria Macfarlane) and by representatives of the contractor (Luis Morey).

2.4.1 Radioactive Tracer Survey (RTS)

The radioactive tracer survey uses an isotope of iodine (I-131) as a tracer of water movement inside and outside the casing. Iodine –131 is used because it is a radioactive isotope commonly used in medical practice and therefore it is more easily available and lower in cost than other potential tracers. I-131 also has the advantage of having a half-life of 8 days. That half-life is quite suitable because it is long enough to allow time for transportation to the well site with little decay but also short enough so that it would quickly be reduced if there were any unexpected spills or if there were mechanical failures through which the isotope could travel with the water. The radiation levels of I-131 at the concentration used for RTS testing is in millicurie-range, which if it were considered a waste, would be characterized as a low level waste by the US Atomic Energy Commission.

The I-131 is first loaded into a container located in the logging tool. This container is electronically activated from the logging truck to eject the desired quantity of tracer at the desired depth through an ejection port. In addition to the tracer container, the logging tool is also assembled with three gamma ray detectors. One detector, the top gamma ray detector (GRT), is located 10 feet above the ejector. The other two detectors, the middle one (GRM) and the bottom one (GRB) are located immediately below the ejector at about 3 feet and 12.4 feet below the ejector respectively. The bottom of the logging tool also includes a temperature tool at the very bottom, and a casing collar locator (CCL) 1 foot below the GRM. Figure 7 shows the configuration of the RTS logging tool. The RTS log in the appendix (Appendix D) shows the distances between each of the logging tool components described above.

2.4.1.1 First Low Flow Dynamic Test

Prior to starting the low flow dynamic test, a background gamma ray log was conducted to establish the natural conditions. It was conducted right after the temperature log. Since the temperature log was run downward starting at land surface, the temperature log had ended with the logging tool at the bottom. The background gamma ray log was conducted from the bottom (2,914 feet) up to the surface.

From the surface, the logging tool was again lowered down the well and the casing collar locator (CCL) used to locate the bottom of the casing. The magnetic coils on the CCL give out a magnetic field and detect a change in the mass. If there is growth on the casing it is harder for the CCL to have a clean line. If the growth has some iron on it, it can cause a sort of interference with the CCL making it harder for the CCL to find the end of the casing. The CCL shows that the bottom of the casing is at 2,413 feet bls. After the bottom of the casing was located, the well was ready for the low-flow dynamic RTS test.

The ejector port of the I-131container was set at 2,408 feet and 1 millicurie (mCi) of I-131 was released while the flow down the well was kept at a constant rate of 93 gallons per minute (gpm). The logging tool was kept immobile after the ejection of the I-131 and the three gamma ray detectors continued to record in place. One (1) mCi of I-131 was ejected into the well. The middle detector, located 3 feet below the ejector port, picked up the radioactive tracer 20 seconds after the ejection. The bottom detector, which is located over 12 feet below the ejector, picked up the tracer 1 minute and 50 seconds after the ejection. The test ran for 60 minutes and the top detector did not pick up any tracer.

After the first low flow test ended, the tool was then raised up more than 200 feet, to a depth of 2,200 feet, to log out of position to make sure that the tracer did not migrate up the casing or the formation outside of the casing. No migration was detected.

Once the log out of position was conducted and the tool was placed back to depth, no staining on the casing was found which means no interference for the second RTS. Therefore, with the approval of Joseph May, P.G. from FDEP, the well was not flushed prior to the second RTS test.

Figure 7. RTS Tool and Temperature Probe

2.4.1.2 Second Low Flow Dynamic Test

The tool was placed back to a depth were the ejector was located at 2,408 feet with a flow of 90 gallons per minute set down the well. For this test, 2 milicuries of I-131 were ejected into the casing. The middle detector started picking up the tracer about 8 seconds after it was ejected. The bottom detector, which is located over 12 feet below the ejector, picked up the tracer 1 minute and 52 seconds after the ejection. The flow was checked again because of the quick middle detection time, but the flow was confirmed at 90 gpm. The upper detector did not pick up any tracer for the duration of the test, which lasted 30 minutes.

After the second low flow test ended, the tool was then raised up more than 200 feet, to a depth of 2,200 feet, to log out of position to make sure that the tracer did not migrate up the casing or the formation outside of the casing. A small spike was detected at the ejection point and at 2421.5 ft bls. The stain on the casing from the ejection is not a problem there. It does not indicate any migration nor does it interfere with the second test, therefore no flushing was done. The spike at 2421.5 ft bls is below the casing and did not migrate up any further in the well, so there is no need to further investigate this small spike.

With the last low flow dynamic test, the mechanical integrity test was concluded, but before bringing the geophysical tools out of the well, the leftover I-131in the container was ejected and the container flushed-clean to insure that any remaining radioactive iodine was well dispersed. The tool was placed at a depth of 2,963.5 ft bls. The ejector was located at 2,950 ft bls, and the remaining Iodine 131 was ejected and the well was flushed with effluent at a rate of over 8,000 gallons per minute to ensure no staining of the tool. The logging tool was then brought up from the bottom and on the way up a final gamma ray log was made. Then the final gamma ray log was compared to the background gamma ray log, and the comparison showed that there are no noticeable differences in the two except for a residual stain at the bottom of the casing where the I-131 had been repeatedly released during the testing, and just below there, where the tracer exited the casing. Injection of water down the well at a rate of 8,000 gpm continued for the next hour to completely flush out the well.

2.4.2 Temperature Log

Youngquist Brothers Inc. conducted the temperature log on July 17, 2013 starting at about 8:10 A.M. and logging down to 3,013 feet. The temperature probe (Figure 7) was run from the surface downward to minimize the disturbing effect of the movement of the logging tool on the temperature of the water in the well. The temperature log was started more than 24 hours after the well had last been disturbed by outside influences. The TV survey was the last disturbance in the well.

The temperature log (see Appendix H) shows the warmest interval is in the section from 2,400 to 2,413 feet. This is consistent with the higher temperature of the injected water in that interval. The temperature log did not detect any anomalies that would indicate that injection fluids are present outside the casing, and there is no indication of any upward movement of warm injection water either. The similarity of the temperature oscillations in this temperature log (in the interval from land surface down to the bottom of the casing) to those in the temperature logs from

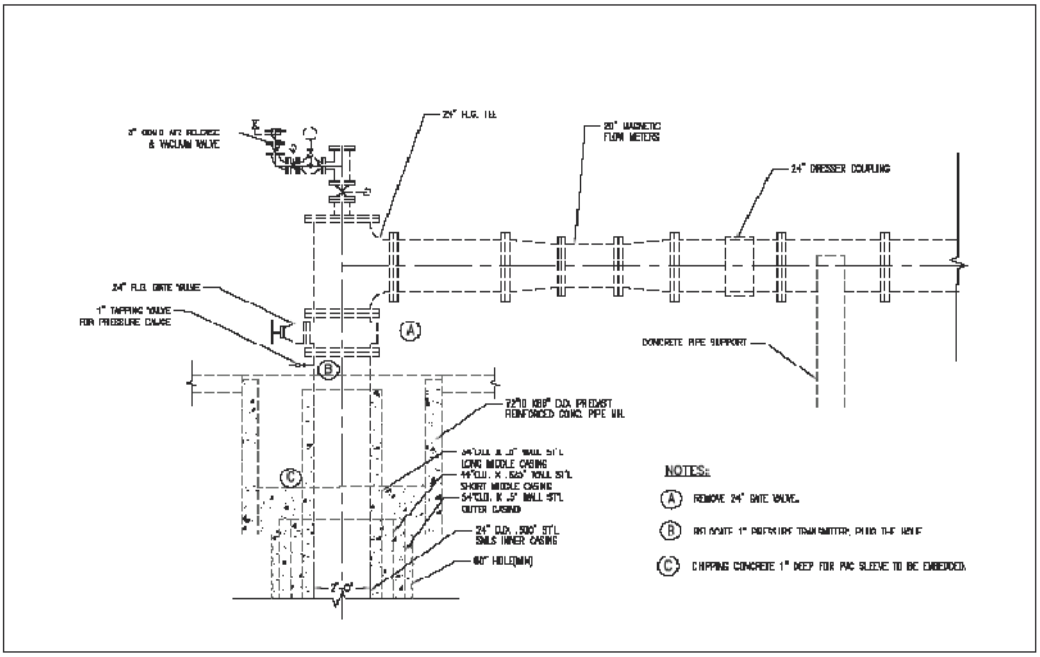
previous MITs and to those in the temperature log when the well was constructed, indicates that there has been no apparent change in the cased interval, and no upward movement of the injected water in the last 5 years.

2.5 WELL HEAD REPAIRS AND RE-INSTALLATION

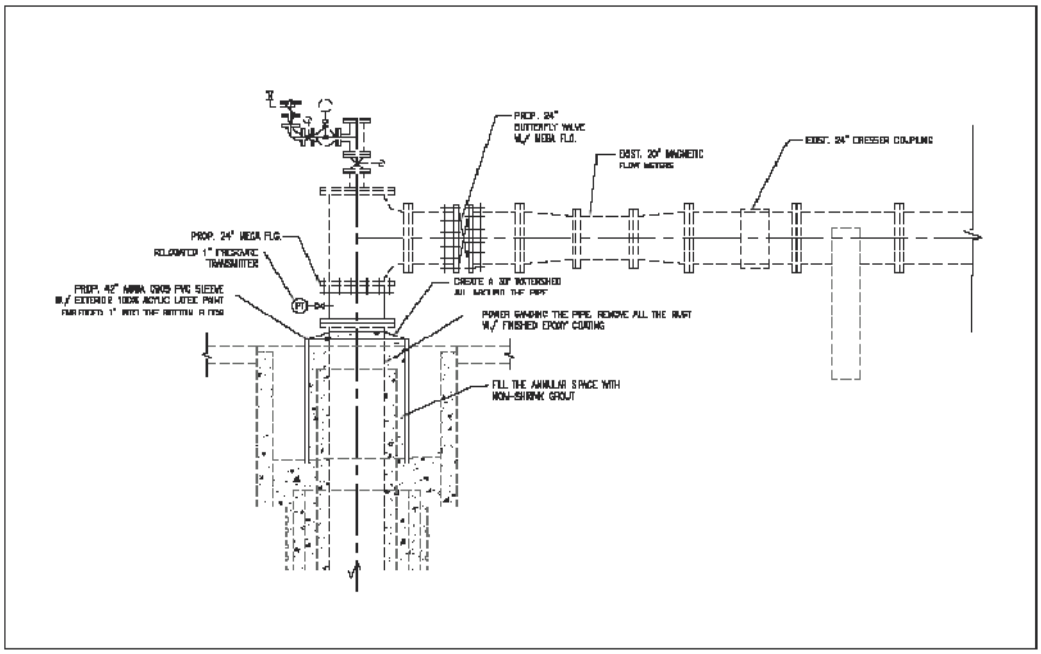
The work associated with the MIT ended when the wellhead was replaced. The air and vacuum release surge check valves were replaced prior to reinstallation of the wellhead. The 6 inch gate valve and air release were replaced. The well had a gate valve on the vertical part of the well before the T. The pressure tap for the instrumentation of the well was below the water line when the sump was full of water. Therefore this well was retrofit to replace the gate valve with a 24" butterfly valve installed on the horizontal pipe coming off the T the well and lift the pressure tap above the water line. A PVC liner was also installed at the base of the sump that protects the 24" OD steel casing from being exposed to FA purge water from the monitoring wells. The PVC was cemented into the bottom of the sump and the annulus was filled with grout to ensure that no water can reach the steel casing. Please see drawings of the retrofit below, Figure 8 and 9.

The wellheads are scheduled to be sandblasted, rust proofed and repainted after the MITs on all the other wells are completed. Injection well IW-17 has been placed back on line and flow from the plant's pump station is again discharging to this injection well, .

Figure 8 Retrofit Well with PVC liner



REPAIR PLAN FOR I-13 TO I-17



PROPOSAL PLAN FOR I-13 TO I-17

Figure 9 Drawing showing before and after layouts for the Retrofit.

Section 3

3. CONCLUSIONS AND RECOMMENDATIONS

3.1 CONCLUSIONS

The pressure test was conducted successfully and it was concluded from the results that there is internal mechanical integrity. This conclusion is reinforced by the analysis of the TV survey down to the injection level at 2,413 feet. The TV survey indicated that the casing is in good condition and that all the casing joints appear to be tight and in good working order.

The two successful RTS conducted at low flow rates indicate that there is no upward movement of water outside the casing. Therefore, it was concluded that the RTS results show that there is external mechanical integrity. The temperature survey reinforced the results of the RTS by showing that there has been no movement of injected water anywhere except the injection zone.

3.2 RECOMMENDATIONS

The successful completion of all the tests for mechanical integrity confirms that IW-17 retains full mechanical integrity and as such it is appropriate to continue using this injection well. MDWASD also recommends that FDEP review the results of the tests presented in this report and based on those results determine that the well has mechanical integrity and may continue to be used for its intended purpose.

Finally, MDWASD recommends that although the well head will not be painted until all the MIT tests are completed on the other wells, IW-17 should receive mechanical integrity certification.

Appendix A

Mechanical Integrity Testing Procedures Submitted by MDWASD to FDEP
October 12, 2012

Miami-Dade Water and Sewer Department
Mechanical Integrity Testing Procedures

Miami-Dade Water and Sewer Department
Mechanical Integrity Testing and Repair Procedures
October 12, 2012

MECHANICAL INTEGRITY TESTING and REPAIR PLAN (SDWWTP and NDWWTP Injection Wells)

General Information

The Contractor shall carefully coordinate his activities with the Department to minimize interference with any existing operations or the operations of the Department. Department forces will isolate the well and turn over to the Contractor. Existing valves shall only be operated by Department personnel. The Contractor's personnel, under no circumstances, shall operate any such valve.

The Contractor shall provide all barricades and/or flashing warning lights necessary to warn workers and employee of the testing throughout the Project. This shall be done at the Contractor's expense and to the satisfaction of the Engineer. Every effort must be made to reduce inconvenience and nuisances to a minimum.

The Contractor shall at all times, use the assigned entrance to the Plants to bring in materials, equipment etc. required for the Project. Materials and equipment shall be stored in areas designated by the Engineer, and shall not interfere with the daily operations at the site or with other Projects. Suitable platforms shall be used for material storage to prevent damage to the landscaping. The Contractor shall exercise extreme caution when transporting equipment or materials within the Plant area.

The conveying vehicles shall be properly selected, and equipped, to prevent damage to paved areas, landscaping and other existing facilities including wells, well pads, fencing, underground pipelines, pipe chases, etc. If necessary, suitable wooden skids shall be used to distribute loads, and to prevent damage.

If any of the above existing structures, including the wells, or any other parts of the project area, are damaged, the contractor shall make suitable repairs or replacement at his expense, in a manner described by the Engineer, and to his satisfaction.

The Contractor shall also exercise extreme caution to prevent any spillage of sewage effluent. The County may charge t he Contractor for any cost incurred or penalties imposed on the County as a result of such spillage.

The wells to be tested are Injection Wells IW-l through IW-17 at the South District Wastewater Treatment Plant and IW-1N through IW-4N at the North District Wastewater Treatment! Plant

The Injection Wells have a 24-inch outside diameter (OD), 0.500-inch wall thickness injection casing set to total depths of 2,450 to 2,850 feet below land surface (bls), and were constructed with a nominal 22-inch diameter open borehole extending from the bottom of the casing to approximately 3,000 feet bls.
Except IW-5 at the SDWWTP, has a 20-inch outside diameter (OD), and 0.500 inch wall thickness.

The CONTRACTOR will perform internal and external mechanical integrity tests on the casings of twenty one deep injection wells and perform all appurtenant work in accordance with the above

Contract Documents.

The work shall be performed by a competent crew with equipment that is adequate to complete all phases of the testing and instruments of sufficient accuracy and resolution to identify anomalous responses to the tests. If the CONTRACTOR'S equipment is not capable of satisfactorily performing the work provided for in these specifications, the CONTRACTOR at his own expense shall substitute equipment.

The CONTRACTOR shall have not less than 5 years experience in constructing and testing wells and shall have tested not less than 5 wells of similar type and capacity. The CONTRACTOR shall be licensed by the State of Florida and the license number shall be affixed to all correspondence and reports.

All work shall comply with and be in full conformance with this Mechanical Integrity Test Plan submitted to FDEP together with subsequent response letters for the injection wells at the South and North District Wastewater Treatment Plants and with the appropriate sections of Chapter 62-528 FAC.

If remedial work or re-testing is required prior to final acceptance of the work to meet regulatory requirements and the specifications of the Contract Documents due to defective materials, accident, loss of equipment or equipment malfunction, or for any other cause directly attributable to the CONTRACTOR's actions, the CONTRACTOR shall bear the entire cost of the remediation or re-testing, including all additional materials, labor, and equipment required and any necessary additional Engineering costs. In the event of a problem, the ENGINEER shall be notified immediately, and the following shall apply:

1. The CONTRACTOR shall propose a method of correcting the problem, in writing, to The ENGINEER, who shall review the method of corrective action, and accept the plan in writing before work can proceed.

2. All work on the well must be in accordance with all applicable local, state and federal regulations.

The CONTRACTOR shall notify the ENGINEER a minimum of 72 hours prior to conducting the pressure test, geophysical logging and the radioactive tracer survey so that the ENGINEER and regulatory agency staff can be properly notified.

The CONTRACTOR shall provide all facilities, equipment and materials required for the removal of waste fluids from the well site.

The CONTRACTOR shall kill the well using a dense food- grade salt solution. No barite or mud-based additives shall be used in the well.

The CONTRACTOR shall comply with the OSHA regulations contained in 29CFR Section 1910 for General Industry Regulations and 29CFR Section 1926 for Construction Regulations.

Equipment and Procedures

1. Wellhead Assembly: The stripper head assembly used during the video survey, Geophysical logging, and the radioactive survey shall be bolted to the wellhead above the 6-inch gate valve. The stripper head assembly used must be of sufficient length to house the longest of the wire line tools used for the testing between the gate valve and the pack-off mounted at the top of the assembly. The pack-off must be adjusted so that the tools can be moved freely up and down the well with minimal leakage from the well. The assembly shall include a 4-inch valve and tee, which will be used to inject potable water during the surveys. The assembly shall be fitted with a

pressure gauge for use during the tests.

2. Wellhead Hardware: Should the nuts and/or bolts at the wellhead assembly become stripped during the CONTRACTOR's efforts, the CONTRACTOR shall replace them with equivalent hardware.

3. Water Line: The CONTRACTOR shall provide a potable water supply line for use during the video surveys. This line shall be connected to the existing 4-inch valve on the CONTRACTOR's stripper head. It shall be equipped with a check value to prevent the backflow of effluent into the water supply source. It shall also be equipped with a continuous recording digital flow meter and totalizer capable of measuring flows accurately in the range of 0 to 250 gpm.

Mechanical Integrity Testing (MIT)

The mechanical integrity testing under this Contract shall be accomplished using the following methods and general sequence, however the Contractor shall submit a more detailed sequence to the Engineer for approval before he begins work. The Contractor shall use extreme caution to prevent any loss of equipment, tools or other items into the wells and shall be fully responsible for retrieving any such items immediately, at no expense to the Department. All pressure tests must be conducted in the presence of the Engineer or his authorized representative.

MIT Clean and Pressure Test the Casing

1. The Contractor shall set up all equipment required to prepare for suppressing the density differential pressure, cleaning, performing the pressure test and the radioisotope and closed circuit television surveys.

2. The Contractor shall inject sufficient salt solution into the well to balance the differential pressure and disassemble the wellhead. The brine solution shall remain in the well during the cleaning and pressure testing steps, after which time it shall be transferred to another well if clean enough for reuse, or shall otherwise be disposed of by the Contractor. Under no circumstances shall brine solution be spilled or disposed of on the ground surface, however it may be disposed of into the injection well.

3. The Contractor shall clean the casing before proceeding with the pressure test. The entire length of casing shall be cleaned. If the later television survey indicates insufficient cleaning, the well shall be re-cleaned by the Contractor, at his expense, to the satisfaction of the Engineer. If the television survey must be repeated because of insufficient cleaning, in the opinion of the Engineer, it shall also be at the Contractor's expense.

4. The Contractor shall, when requested by the Engineer, place the packer through a stand-pipe with a packoff device to a point near the top of the well (but within the concrete encasement area) and test its integrity. This shall be accomplished as described in Steps 6, 7, and 8 below. If the packer fails the integrity test it shall be replaced with one that will meet the test. The Engineer is aware that packers have limited inflation cycles and will attempt to minimize the verification of packer operation. However, any integrity failure for which the packer operation can not be eliminated must be repeated at the Contractor's cost. It is anticipated that each new packer will be tested at the wellhead to verify its capacity to seat and deflate.

5. The Contractor shall lower and place the packer to a point within the lower 40 feet of the casing, but not the last 10 feet. The CONTRACTOR will be responsible to assure the proper seating of the packer. A preliminary test shall be performed to ensure proper operation of the test set-up. The CONTRACTOR shall notify the ENGINEER at least 24 hours before running the preliminary test. The test will be run following the same test program as the actual pressure test, as described below. IW-2 at SDWWTP will have the packer placed within 40 feet of the tear in the casing.

6. The Contractor shall inflate the packer to a pressure not exceeding 350 psig over the static condition as measured at the wellhead on a calibrated gauge to create a positive seal.

7. The Contractor shall pressurize the casing to 150 psig with no air in the casing or wellhead. The pressure shall be recorded on a chart and signed by the Engineer, the Contractor and any witnesses present. The pressure test gauge shall be calibrated within 6 months of performing the pressure test. The CONTRACTOR must present proof of calibration of the pressure gauge to the ENGINEER and FDEP staff at the time of testing each well. The pressure gauge must be mounted at or near eye level in order to ensure maximum visibility.

8. The test will be considered successful if the pressure does not change more than 5% psi in one hour.

9. If the test fails, the Contractor shall move the packer upwards for approximately 10 feet, and repeat Steps 6, 7 and 8.

10. If the test still fails, additional repositioning of the packer and repeating of Steps 6, 7 and 8 shall be as ordered by the Engineer. If the test still fails, and subsequent radioisotope surveys indicate no casing failure, it will be presumed that the Contractor's packer did not create a positive seal, and the Contractor shall be required to repeat Steps 4 through 8 at his expense. No payments will be made to the Contractor if it is subsequently determined that the test failure was caused by the seating of the packer. If the packer fails during packer operation verification, it will be concluded that the packer was faulty during any previous test that did not demonstrate casing integrity. The Contractor shall repeat this test at his expense.

11. After pressure testing, measure the depressurization bleed down with a 5 gallon bucket upon release of the pressure in the casing. The bleed down fluid will be properly disposed of by the Contractor.

12. The Contractor shall deflate the packer and withdraw it from the casing.

13. The Contractor shall reassemble the wellhead and connecting piping using new gaskets.

14. Prior to geophysical logging, the fluid used to "kill" the well, or for pressure testing the casing shall be flushed from the well and the well will be shut-in for a minimum of 12 hours.

MIT Video Surveys

A Video Survey inside the injection well casing be performed using the following procedures.

.A 6-inch diameter stripper head assembly will be bolted to the wellhead assembly above the existing 6-inch diameter gate valve. The stripper head will be of dimensions that allow the video operator to put his camera between the gate valve and the pack off and close both the valve and the pack off. The lower part of the assembly shall consist of a 4-inch tee and valve through which potable water may be introduced into the well.
.
Prior to performance of the survey and for a period of 24 hours, fresh water from an adjacent fire hydrant will be introduced into the well through a 4-inch diameter valve located on the stripper head assembly. Fresh water shall be pumped into the well to provide clarity for the survey.

3. If, after 24 hours of pumping potable water into the well, the water quality does not permit a clear picture of the inside of the well, the CONTRACTOR may be required to perform additional pumping services to assure a good survey as specified above.

4. The pumping of the potable water will continue at a rate of approximately 0 to 250 gpm during video surveying. If the open hole portion of the well is not clean, or visibility in any part of the well is poor, the CONTRACTOR shall perform additional pumping services to ensure a good video survey before running another or continuing with the survey.

5. During the video survey, the CONTRACTOR shall stop the camera's progress as instructed by the ENGINEER at depths where there may be potential flaws in the casing or other features to allow for thorough examination at those locations.

Upon reaching the total depth of the well with the video camera and obtaining a video survey satisfactory to the ENGINEER, the camera shall be removed from the well, and the well placed back in service.

MIT Radioisotope Tracer Survey and Temperature Survey

A radioisotope tracer survey shall be used to detect any fluid movement outside of the injection casing from the injection zone into the overlaying aquifers. The tool configuration shown below, or approved equal is required. The tool must be capable of ejecting the radioactive tracer and simultaneously monitoring the gamma ray sensors. No time lag between ejection and monitoring is permitted. A casing collar locator (CCL) shall be positioned below the tool as shown below, to precisely locate the bottom of the casing. Two low flow dynamic test runs, shall be performed. Additional low flow dynamic test runs can be done if results warrant additional testing, as determined by the ENGINEER in consultation with FDEP staff.

A temperature survey log shall also be performed from land surface to the total depth of the well. The temperature log shall be performed logging down at a rate of not more than 60 feet per minute. The temperature survey shall be performed after the well has been "shut in" and stabilized for at least 12 hours prior to the dynamic and static tests.

The Contractor shall perform an initial background gamma ray survey extending from the base of the land surface to the total depth of the well. The background gamma ray log shall be taken at a rate of not more than 60 feet per minute.

After the dynamic tests are completed, another background gamma ray survey shall be taken from the base of the casing to the base of the intermediate casing.

If additional radioisotope tracer survey work is ordered by the Engineer, it will be paid for at the hourly price proposed for additional radioisotope tracer surveys.

Radioactive Tracer Survey (RTS)

A RTS will be performed in the injection well. The tool used for testing will be configured according to information to be supplied by the service company performing the logs and as approved by the ENGINEER. Below is an example of a typical RTS tool that will be used for these surveys. The CONTRACTOR will provide a specific tool configuration with the logs.

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)
			CHD-SDSCHD (SDS) Cable Head	1.00	1.50	5.00
GR#3	23.83					
			GR #3 -GR#3 (GR#3_T) GR#3_TOP	9.33	1.69	50.00
			TREJCT-A (RTS) EJECTOR 14.5' FROM TOOL BOTTOM	3.00	1.69	10.00
			GR #2 -GR#2 (GR#2_M) GR#2_MIDDLE	3.58	1.69	25.00
GR#2	11.17					
CCL	9.63		CCL-000 (000001) RTS_CCL	0.75	1.69	5.00
			TRDET-GR#1 (GR#1_B) GR#1_BOTTOM	8.67	1.69	50.00
GR#1	0.58		TEMP-11116Temp (11116HT)	0.58	1.69	5.00
TEMP	0.17		RTS_TEMP			

Dataset: sdiw1.db: field/well/run1/FINBK
Total Length: 26.92 ft
Total Weight: 150.00 lb
O.D. 1.69 in

RTS tool Typical Configuration

The sequence of the tests shall be as follows:

First Low Flow Dynamic: The low flow run of the radioactive tracer survey shall be performed with a pumping-in velocity of 3 to 5 feet per minute. This would require a volume of between 65 gpm and 108 gpm to be injected during the survey. This is for the 24 inch wells, for Well I-5, which has a 20 inch casing this volume is 44 gpm and 73 gpm. Potable water from the same source as used for the video survey would be used as the most appropriate water supply for this portion of the test.

1) After beginning the flow of water into the well, the tool will be placed at a depth of approximately 5 feet above the base of the final casing, and a slug of 2 millicuries radioactive Iodine 131 is ejected. The tool will remain in place for a period of approximately one hour and the three gamma ray detectors in the "time drive" mode will record the movement of the slug. If tracer is detected at the uppermost detector, indicating potential staining of the tool, the tool may be moved upward to an alternate location.

2) After the one hour waiting period, a log out-of-position will be performed between the ejection point and a minimum of 200 feet above the highest point of tracer detection.

3) Upon completion of logging, the casing will be flushed with 3 to 5 casing volumes of effluent.

4) After flushing, the tool will immediately be run to the base of the casing, then the interval between the ejection point and 200 feet above the highest point of tracer detection will be logged.

Second Low Flow Dynamic: The process described above for the low flow dynamic log will be repeated to include a log out-of-position, a casing flush, and an after flush pass. A slug of tracer greater than or equal to 3 millicuries shall be used as determined by the ENGINEER.

If, during testing, no apparent anomalies appear that may indicate a lack of mechanical integrity in the injection well, the RTS will be concluded. If anomalies do occur, the RTS will be altered to track the radioactive tracer material. After RTS is complete, the RTS tool will be discharged in the injection zone and the well shall be flushed with 3 to 5 volumes of effluent. A second background log will be run from the bottom to the top of the well.

MIT Deadlines (sorted by date MIT pressure test due)

SDWWTP MIT Schedule of Completion

Well	Pressure Test	RTS/Video
IW-2	7/13/2013	7/25/2013
IW-1[1]	7/20/2013	7/31/2013
IW-3	7/24/2013	8/7/2013
IW-9[1]	7/30/2013	8/12/2013
IW-10[1]	8/6/2013	8/21/2013
IW-11	8/20/2013	9/3/2013
IW-12	8/25/2013	9/19/2013
IW-14	9/9/2013	9/26/2013
IW-13	9/16/2013	10/6/2013
IW-4	9/25/2013	10/14/2013
IW-6	9/30/2013	10/20/2013
IW-5	10/19/2013	10/27/2013
IW-7[2]	10/26/2013	1/7/2014
IW-8	11/2/2013	11/12/2013
IW-17	11/11/2013	11/19/2013
IW-16	11/18/2013	12/9/2013
IW-15	12/3/2013	12/16/2013

NOTES:
1.The original video was not clear enough and therefore a new video was done at the end of the MITs at SDWWTP.
2.The Computer failed during the RTS, because the Iodine 131 had already been injected, FDEP and DOH required 46 days b/f the RTS could be redone.

NDWWTP MIT Schedule of Completion

Well	Pressure Test	RTS/Video
IW-1N	3/14/2014	3/26/2014
IW-2N	3/25/2014	4/9/2014
IW-3N	4/2/2014	4/17/2014
IW-4N	4/9/2014	4/24/2014

REPAIR PLAN:

The following repair plans apply to wells at SDWWTP and NDWWTP.

1. Kill well and remove 24 inch gate valve and 4 inch bypass valves. Remove 1 inch pressure transmitter line and weld hold closed. Please see drawings included in below.

2. Sand existing casing in concrete pits and coat with Bitumastic. Please see drawings included in below.

3. Chip concrete around outer casing 1 inch deep, in order to embed PVC sleeve. Please see drawings included in below.

4. Install C905 PVC sleeve around casing pipe, embed 1 inch deep and fill annular space with grout, using Type II Neat cement. Slope top edge to create 30 degree watershed and seal at edges with sealant. Please see drawings included in below.

5. Relocate 1 inch pressure transmitter as indicated in drawings. Weld the hole. Please see drawings included in below.

6. At the NDWWTP IW-1N, IW-3N and IW-4N install new magmeters with any necessary spool pieces to be field determined. Please see drawings included in below.

7. Reassemble wellheads including installation of new 24 inch butterfly valve on horizontal part of well. Mega flanges will be used to ensure the layout of the pipe and the vales match. Please see drawings included in below.

8. On IW-4N at NDWWTP, install electric actuator for butterfly valve at base of injection well. Please see drawings included in below.

Appendix B

FDEP Approval of MIT Plan for SDWWTP and NDWWTP

November 26, 2012

Villamil, Sonia (WASD)

From: May, Joseph [redacted]
Sent: Monday, November 26, 2012 2:40 PM
To: Villamil, Sonia (WASD)
Cc: Vandor, Heidi; Silverman, Mark; Walsh, Virginia (WASD); Goldenberg, Bertha M. (WASD); Fallon Jr., Howard J. (WASD); Arrebola, Vicente (WASD); Macfarlane, Maria (WASD); Oakley, Clint (WASD)
Subject: RE: MDWASD MIT and Repair Plan Submittal

Importance: High

Hello all,

The Department approves the plan with the following understandings:

1) Medicinal grade I-131 should be specified since this solution is filtered to reduce precipitate material, as opposed to regular grade I-131, in the vial causing a tool malfunction. It has been our experience that an activity of ~1mCi/ml has been the easiest to work with in the field.
2) Please contact me a minimum of three days prior to mobilization to each site. Due to the travel time from West Palm Beach to the sites close coordination would be appreciated between myself and a designated contact person from the utility so that each pressure and RTS can be witnessed.

Thank you,

Joe

Please take a few minutes to share your comments on the service you received from the department by clicking on this link. DEP Customer Survey.

From: Villamil, Sonia (WASD) [mailto:[redacted]
Sent: Wednesday, October 17, 2012 9:42 AM
To: May, Joseph
Cc: Vandor, Heidi; Silverman, Mark; Walsh, Virginia (WASD); Goldenberg, Bertha M. (WASD); Fallon Jr., Howard J. (WASD); Arrebola, Vicente (WASD); Macfarlane, Maria (WASD); Oakley, Clint (WASD)
Subject: MDWASD MIT and Repair Plan Submittal

Hello Mr. May,

The MDWASD respectfully submits the attached MIT testing and repair plan for your approval. The paper copy is being sent via regular mail as well.

Thank you,

Sonia Villamil
Engineer II
Miami Dade Water and Sewer Department
3071 SW 38th Ave Room 554-8
Miami, FL 33146
[redacted]
fax: 786-552-8640
miamidade.gov

Appendix C

Field Notes from tests including gauge certification and pressure charts.

MIAMI-DADE WATER AND SEWER DEPARTMENT

MECHANICAL INTEGRITY TESTING OF DEEP INJECTION WELLS AND ASSOCIATED SERVICES

BID NO.: RPQ P0086

PRESSURE TEST IW - 17

July 10, 2013

TIME	CASING PRESSURE (psi)	PACKER PRESSURE (psi)
9:20	154.5	380
9:25	154+	380
9:30	154	380
9:35	154-	380
9:40	153.5	380
9:45	153	380
9:50	153	380
9:55	152.5	380
10:00	152	380
10:05	152	380
10:10	151.5	380
10:15	151	380
10:20	151	380

MIAMI-DADE WATER AND SEWER DEPARTMENT

MECHANICAL INTEGRITY TESTING OF DEEP INJECTION WELLS AND ASSOCIATED SERVICES

BID NO.: RPQ P0086

BREAK OFF TEST IW - 17

July 10, 2013

GALLONS	CASING PRESSURE (psi)	PACKER PRESSURE (psi)
0	151	380
5	125	360
10	100	340+
15	75	340
20	50	320+
25	25	310
30	0	305
30.1	0	305

Top of Packer: _____ **feet**

Bottom of Casing: _____ **feet**

MIAMI-DADE WATER AND SEWER DEPARTMENT

MECHANICAL INTEGRITY TESTING OF DEEP INJECTION WELLS AND ASSOCIATED SERVICES

BID NO.: RPQ P0086

PRESSURE TEST IW - 17

WITNESS LIST

July 10, 2013

NAME	SIGNATURE	COMPANY/AGENCY	TELEPHONE
M. Macfarlane	[redacted]	WASD	[redacted]
Joe May		FDEP	
Sonia Villarril		WASD	
Michael Ashe		WASD	
CHRIS HARP		YBI	
GLEN HUGHES		YBI	

Sensor/Session information

SensorSN	21325011	Modbus Addr.	2
Sensor Type	PT2X	Initialized w/fw Rev	2. 9
Sensor Name	INW Smart Sensor	Uploaded	Aqua4Plus 1.9.3
Session Name	1MIN	Exported	Aqua4Plus 1.9.3

Rec #	Date/Time	Temperature (degF)	Pressure (psi)
1	7/10/2013 9:02	76	155.275
2	7/10/2013 9:03	75.6	155.176
3	7/10/2013 9:04	75.4	155.097
4	7/10/2013 9:05	75.3	155.017
5	7/10/2013 9:06	75.3	154.946
6	7/10/2013 9:07	75.2	154.876
7	7/10/2013 9:08	75.3	154.794
8	7/10/2013 9:09	75.3	154.733
9	7/10/2013 9:10	75.4	154.641
10	7/10/2013 9:11	75.4	154.59
11	7/10/2013 9:12	75.6	154.507
12	7/10/2013 9:13	75.8	154.435
13	7/10/2013 9:14	76	154.363
14	7/10/2013 9:15	76.1	154.291
15	7/10/2013 9:16	76.2	154.229
16	7/10/2013 9:17	76.3	154.137
17	7/10/2013 9:18	76.4	154.055
18	7/10/2013 9:19	76.5	153.983
19	7/10/2013 9:20	76.7	153.921
20	7/10/2013 9:21	76.7	153.85
21	7/10/2013 9:22	76.8	153.778
22	7/10/2013 9:23	76.9	153.717
23	7/10/2013 9:24	77	153.645
24	7/10/2013 9:25	77.1	153.583
25	7/10/2013 9:26	77.2	153.511
26	7/10/2013 9:27	77.2	153.44
27	7/10/2013 9:28	77.6	153.377
28	7/10/2013 9:29	77.8	153.304
29	7/10/2013 9:30	78.1	153.24
30	7/10/2013 9:31	78.5	153.167
31	7/10/2013 9:32	78.8	153.103
32	7/10/2013 9:33	79	153.03

33	7/10/2013 9:34	79.2	152.968
34	7/10/2013 9:35	79.5	152.905
35	7/10/2013 9:36	79.7	152.833
36	7/10/2013 9:37	79.8	152.771
37	7/10/2013 9:38	79.8	152.7
38	7/10/2013 9:39	79.7	152.63
39	7/10/2013 9:40	79.9	152.567
40	7/10/2013 9:41	80.1	152.495
41	7/10/2013 9:42	80.4	152.442
42	7/10/2013 9:43	80.8	152.368
43	7/10/2013 9:44	81.3	152.304
44	7/10/2013 9:45	81.8	152.239
45	7/10/2013 9:46	82.4	152.174
46	7/10/2013 9:47	82.8	152.11
47	7/10/2013 9:48	83.2	152.047
48	7/10/2013 9:49	83.1	151.967
49	7/10/2013 9:50	83	151.896
50	7/10/2013 9:51	82.8	151.836
51	7/10/2013 9:52	83.1	151.774
52	7/10/2013 9:53	83.4	151.711
53	7/10/2013 9:54	83.6	151.649
54	7/10/2013 9:55	83.9	151.586
55	7/10/2013 9:56	84.2	151.523
56	7/10/2013 9:57	84.6	151.449
57	7/10/2013 9:58	85	151.396
58	7/10/2013 9:59	85.1	151.324
59	7/10/2013 10:00	85.1	151.264
60	7/10/2013 10:01	85.2	151.192
61	7/10/2013 10:02	85.4	151.13
62	7/10/2013 10:03	85.7	151.067
63	7/10/2013 10:04	86	151.004
64	7/10/2013 10:05	86.3	150.941
65	7/10/2013 10:06	86.7	150.878
66	7/10/2013 10:07	86.9	150.816
67	7/10/2013 10:08	87.1	150.744
68	7/10/2013 10:09	87.2	150.682
69	7/10/2013 10:10	87.3	150.621
70	7/10/2013 10:11	87.3	150.56
71	7/10/2013 10:12	87.3	150.489
72	7/10/2013 10:13	87.2	150.429
73	7/10/2013 10:14	87.5	150.367
74	7/10/2013 10:15	87.5	150.296
75	7/10/2013 10:16	87.1	150.237
76	7/10/2013 10:17	87.2	150.176

77	7/10/2013 10:18	87.1	150.116
78	7/10/2013 10:19	87.1	145.669
79	7/10/2013 10:20	87.1	125.108
80	7/10/2013 10:21	87.1	124.429
81	7/10/2013 10:22	87.2	92.989
82	7/10/2013 10:23	87.3	97.212
83	7/10/2013 10:24	87.6	81.684
84	7/10/2013 10:25	87.9	66.237
85	7/10/2013 10:26	88.1	61.233
86	7/10/2013 10:27	88.5	44.307
87	7/10/2013 10:28	88.6	49.179
88	7/10/2013 10:29	88.8	21.934
89	7/10/2013 10:30	88.5	24.213
90	7/10/2013 10:31	88.2	8.484
91	7/10/2013 10:32	88.1	2.721
92	7/10/2013 10:33	88.1	0

Certificate of Calibration

OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

Ozone Industries, Inc.
Precision Measurement Equipment Division

Purchase Order #

Calibration Performed By:
OZONE INDUSTRIES, INC.
15551 PINE RIDGE RD.
FORT MYERS, FL 33908

For:
YOUNGQUIST BROTHERS, INC.
15465 PINE RIDGE RD.
FORT MYERS, FL 33908

EQUIPMENT INFORMATION:

Description: PRESSURE GAUGE
Manufacter: MCDANIELS
Model Number: 300PSI
Part Number: N/A
Range: 0-300 PSI

Serial Number: 972062-1
Customer I.D.:
Cust. Barcode: N/A
Cust. Location: N/A
Specifications: +/- 0.25% FS

Cal Date: 6/6/2013
Cal. Due Date: 8/5/2013
Cal. Interval 60 DAYS
Received: IN TOLERANCE
Calibration Result: PASS
Environmental Conditions: 74 DEG F / 20% H
Performed By: Daniel McKissick

Procedure: STANDARD

This is to certify that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure at the points tested (unless otherwise noted). It has been Calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration is in accordance with Ozone Industries, Inc Quality Assurance Manual. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

Calibration Remarks:
THIS UNIT WAS FOUND TO BE IN TOLERANCE AT THE TIME OF CALIBRATION.
PERFORMED ROUTINE CALIBRATION / CERTIFICATION

Standards Used to Calibrate Equipment:

Company	I.D.	Description	Last Cal.	Cal. Due Date
OZONE	A1731	EATON UPC5000 PNEUMATIC CALIBRATOR	12/12/2012	12/12/2013

Signatures:

Certified by:
Print: Daniel McKissick
Date: 06/06/13
[redacted]

Approved by:
Print: Daniel McKissick
[redacted]

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ØZONE
INDUSTRIES
CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

PH: 239-433-3400
FAX: 239-489-3877

CONTROL NO: 032509-1

CUSTOMER: YBI15465

CALIBRATION DATA FORM

MFR:	MCDANIELS	**DESCRIPTION**	PRESSURE GAUGE
MODEL NO:	300 PSI .25%	**TECHNICIAN:**	0030
SERIAL NO:	972062-1	**CAL. DATE:**	06/06/13
CUST. ID:	N/A	**DUE DATE:**	08/05/13

* IF NO "AS LEFT" READING IS SHOWN ON THIS CHART, IT MEANS THE UNIT WAS IN TOLERANCE AND THERE WERE NO ADJUSTMENTS MADE TO IT.

RANGE: 0-300 PSI

NOMINAL	AS FOUND	AS LEFT *	LOW LIMIT	HIGH LIMIT
50	50.26		49.25	50.75
100	100.31		99.25	100.75
150	150.38		149.25	150.75
200	200.49		199.25	200.75
300	300.6		299.25	300.75

Certificate of Calibration

OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

Ozone Industries, Inc.
Precision Measurement Equipment Division

Purchase Order #

Calibration Performed By:
OZONE INDUSTRIES, INC.
15551 PINE RIDGE RD.
FORT MYERS, FL 33908

For:
YOUNGQUIST BROTHERS, INC.
15465 PINE RIDGE RD.
FORT MYERS, FL 33908

EQUIPMENT INFORMATION:

Description: PRESSURE GAUGE
Manufacter: McDaniel
Model Number: 300PSI
Part Number: N/A
Range: 0-300 PSI

Serial Number: 972034-2
Customer I.D.:
Cust. Barcode: N/A
Cust. Location: N/A
Specifications: +/- 0.25% FS

Cal Date: 5/17/2013
Cal. Due Date: 11/17/2013
Cal. Interval 6 MONTHS
Received: IN TOLERANCE
Calibration Result: PASS
Environmental Conditions: 74 DEG F / 80% H
Performed By: Daniel McKissick

Procedure: STANDARD

This is to certify that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure at the points tested (unless otherwise noted). It has been Calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration is in accordance with Ozone Industries, Inc Quality Assurance Manual. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

Calibration Remarks:
THIS UNIT WAS FOUND TO BE IN TOLERANCE AT THE TIME OF CALIBRATION.
PERFORMED ROUTINE CALIBRATION / CERTIFICATION

Standards Used to Calibrate Equipment:

Company	I.D.	Description	Last Cal.	Cal. Due Date
OZONE	A1731	EATON UPC5000 PNEUMATIC CALIBRATOR	12/12/2012	12/12/2013

Signatures:

Certified by:
Print: Daniel McKissick
[redacted]

Approved by:
Print: Daniel McKissick
Date: [redacted] 05/17/13
[redacted]

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15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

PH: 239-433-3400
FAX: 239-489-3877

CONTROL NO: 100809-7

CUSTOMER: YBI15465

CALIBRATION DATA FORM

MFR:	PIC	**DESCRIPTION**	PRESSURE GAUGE
MODEL NO:	300 PSI .25%	**TECHNICIAN:**	0030
SERIAL NO:	972034-2	**CAL. DATE:**	05/17/13
CUST. ID:	N/A	**DUE DATE:**	11/17/13

* IF NO "AS LEFT" READING IS SHOWN ON THIS CHART, IT MEANS THE UNIT WAS IN TOLERANCE AND THERE WERE NO ADJUSTMENTS MADE TO IT.

RANGE: 0-300 PSI

NOMINAL	AS FOUND	AS LEFT *	LOW LIMIT	HIGH LIMIT
50	49.59		49.25	50.75
100	99.47		99.25	100.75
150	149.45		149.25	150.75
200	199.43		199.25	200.75
300	299.4		299.25	300.75

Certificate of Calibration

OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

Ozone Industries, Inc.
Precision Measurement Equipment Division

Purchase Order #

Calibration Performed By:
OZONE INDUSTRIES, INC.
15551 PINE RIDGE RD.
FORT MYERS, FL 33908

For:
YOUNGQUIST BROTHERS, INC.
15465 PINE RIDGE RD.
FORT MYERS, FL 33908

EQUIPMENT INFORMATION:

Description: PRESSURE GAUGE
Manufacter: MCDANIELS
Model Number: 300PSI
Part Number: N/A
Range: 0-300 PSI

Serial Number: AB30128
Customer I.D.:
Cust. Barcode: N/A
Cust. Location: N/A
Specifications: +/- 0.25% FS

Cal Date: 6/17/2013
Cal. Due Date: 12/17/2013
Cal. Interval 6 MONTHS
Received: IN TOLERANCE
Calibration Result: PASS
Environmental Conditions: 73 DEG F / 40% H
Performed By: Daniel McKissick

Procedure: STANDARD

This is to certify that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure at the points tested (unless otherwise noted). It has been Calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration is in accordance with Ozone Industries, Inc Quality Assurance Manual. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

Calibration Remarks:
THIS UNIT WAS FOUND TO BE IN TOLERANCE AT THE TIME OF CALIBRATION.
PERFORMED ROUTINE CALIBRATION / CERTIFICATION

Standards Used to Calibrate Equipment:

Company	I.D.	Description	Last Cal.	Cal. Due Date
OZONE	A1731	EATON UPC5000 PNEUMATIC CALIBRATOR	12/12/2012	12/12/2013

Signatures:

Certified by:
Print: Daniel McKissick
Date: 06/17/13
[redacted]

Approved by:
Print: Daniel McKissick
Date: 06/17/13
[redacted]

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OZONE
INDUSTRIES
CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

PH: 239-433-3400
FAX: 239-489-3877

CONTROL NO: 080709-2

CUSTOMER: YBI15465

CALIBRATION DATA FORM

MFR:	MCDANIELS	**DESCRIPTION**	PRESSURE GAUGE
MODEL NO:	300 PSI .25%	**TECHNICIAN:**	0030
SERIAL NO:	AB30128	**CAL. DATE:**	06/17/13
CUST. ID:	N/A	**DUE DATE:**	12/17/13

* IF NO "AS LEFT" READING IS SHOWN ON THIS CHART, IT MEANS THE UNIT WAS IN TOLERANCE AND THERE WERE NO ADJUSTMENTS MADE TO IT.

RANGE: 0-200 PSI

NOMINAL	AS FOUND	AS LEFT *	LOW LIMIT	HIGH LIMIT
50	50.18		49.25	50.75
100	100.19		99.25	100.75
150	150.22		149.25	150.75
200	200.31		199.25	200.75
250	250.33		249.25	250.75
300	300.39		299.25	300.75

Appendix D

RTS and RTS Tool Configuration

RADIOACTIVE TRACER SURVEY LOG

Company	SOUTH MIAMI-DADE W.W.T.P.
Well	IW-17
Field	S.D.W.W.T.P.
County	MIAMI-DADE
State	FLORIDA

Company SOUTH MIAMI-DADE W.W.T.P.
Well IW-17
Field S.D.W.W.T.P.
County MIAMI-DADE
State FLORIDA

Location: API # :

SEC TWP RGE

Other Services
SEE COMMENTS:

Permanent Datum	PAD	Elevation	PAD
Log Measured From	PAD		
Drilling Measured From	PAD		

Elevation
K.B.
D.F.
G.L.

Date	17-JUL-2013		
Run Number	2013 MIT		
Depth Driller	3018'		
Depth Logger	3018'		
Bottom Logged Interval	3018'		
Top Log Interval	SURFACE		
Open Hole Size	22"		
Type Fluid	WATER		
Density / Viscosity	NA		
Max. Recorded Temp.	NA		
Estimated Cement Top	NA		
Time Well Ready	ON ARRIVAL		
Time Logger on Bottom	0930		
Equipment Number	102		
Location	FT MYERS		
Recorded By	MOREY		
Witnessed By	S. VILLAMIL		

Borehole Record				Borehole Record			
Run Number	Bit	From	To	Run No	Bit	From	To

Casing Record	Size	Wgt/Ft	Top	Bottom
Surface String				
Prot. String				
Production String	24"	.500" W.T.	SURFACE	2413'
Liner				

<< Fold Here >>>

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

Comments

HIGH RESOLUTION TEMPERATURE

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)

GR#3	24.00					
			GR #3 -RTST (952T)	11.50	1.69	30.00
			TREJCT-A (952)	1.00	1.69	10.00
			GR #2 -RTSM (952M)	3.00	1.69	10.00
GR#2	10.50					
CCL	9.60		CCL-1.68GRRTS (952)	0.75	1.69	10.00
			GR-RTSB (952B)	9.25	1.69	10.00
GR	1.20					

Dataset: sdwwtp-iw17.db: field/well/run1/pass2
Total Length: 25.50 ft
Total Weight: 70.00 lb
O.D. 1.69 in

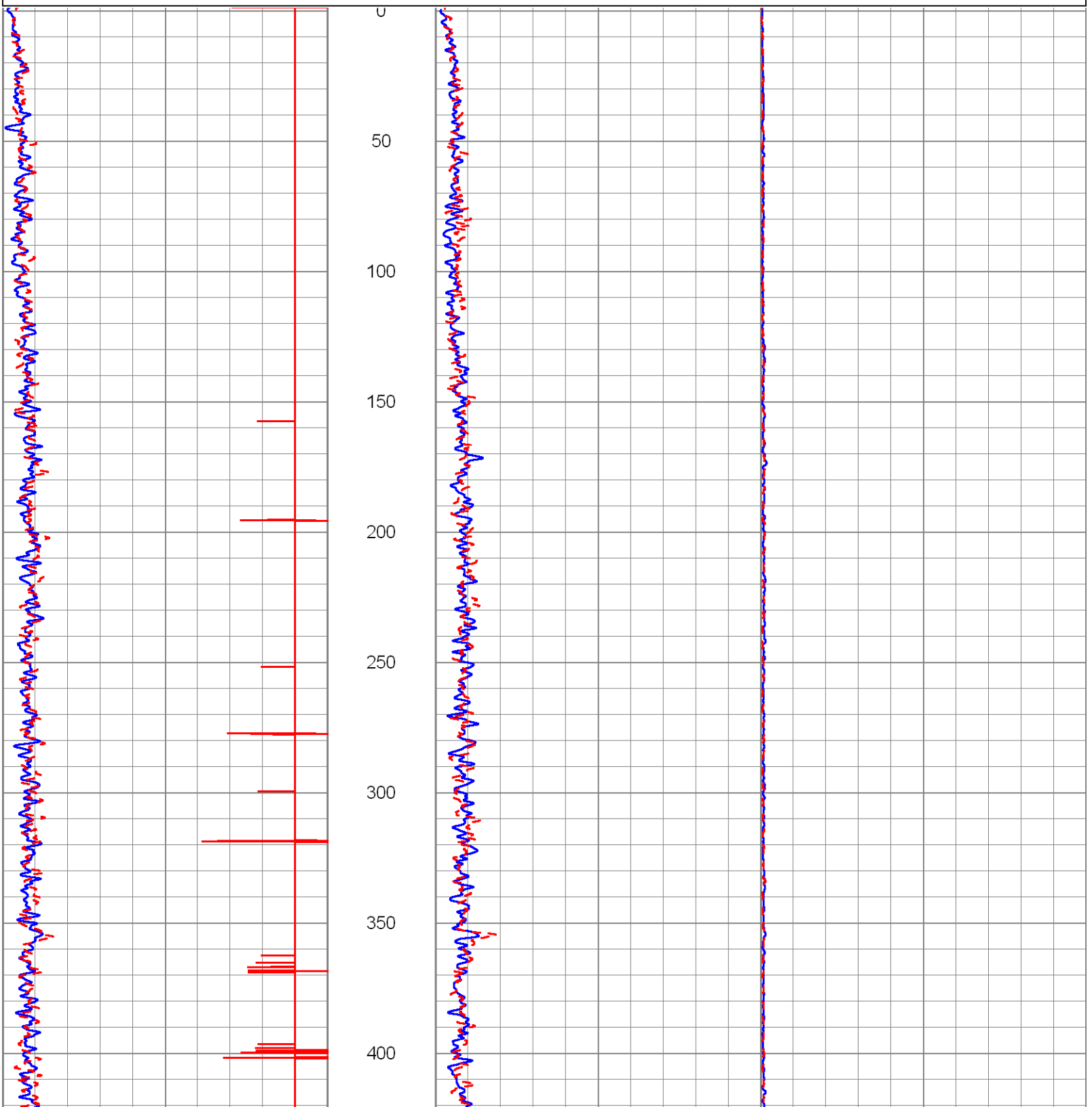
YOUNGQUIST

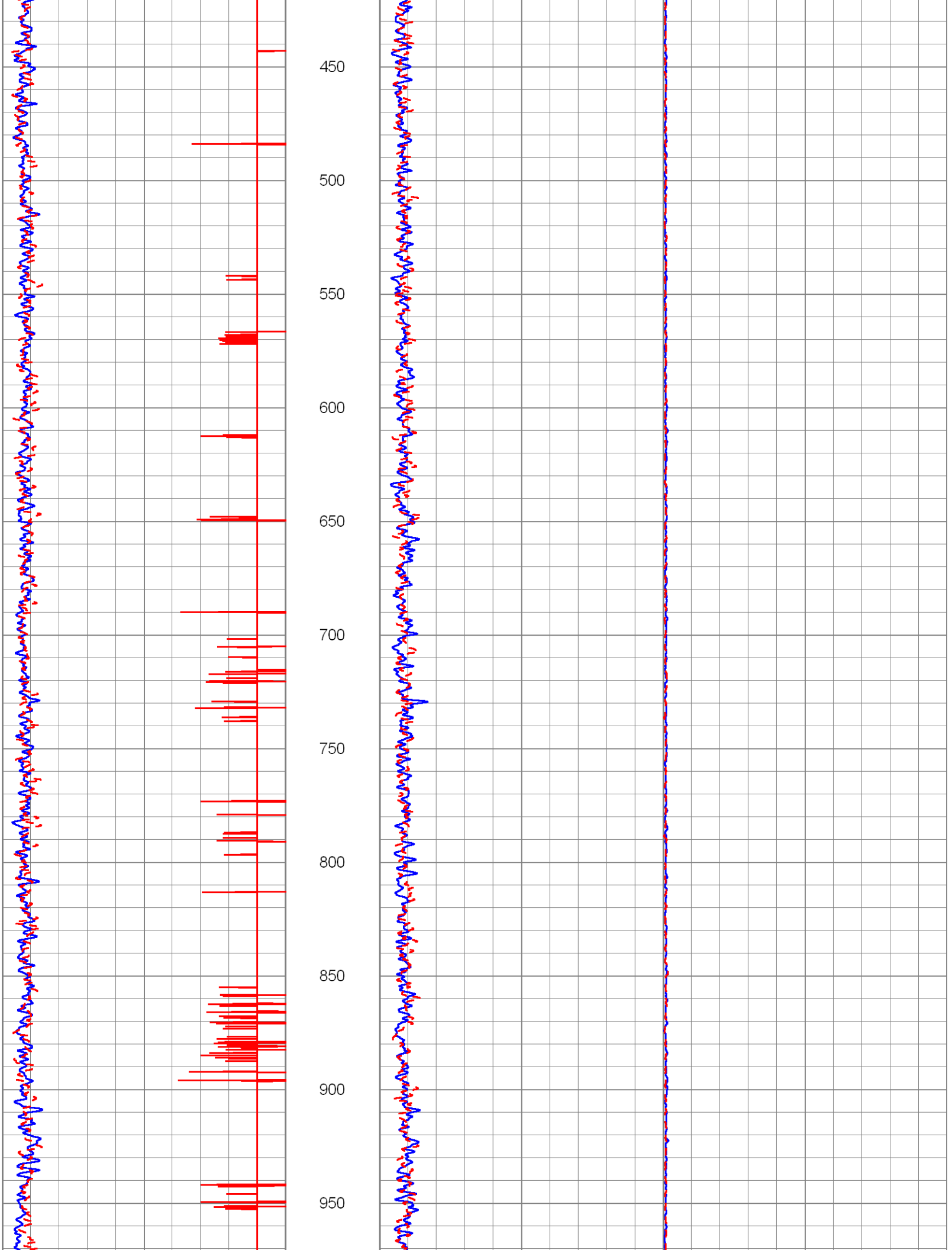
FINAL BACKGROUND

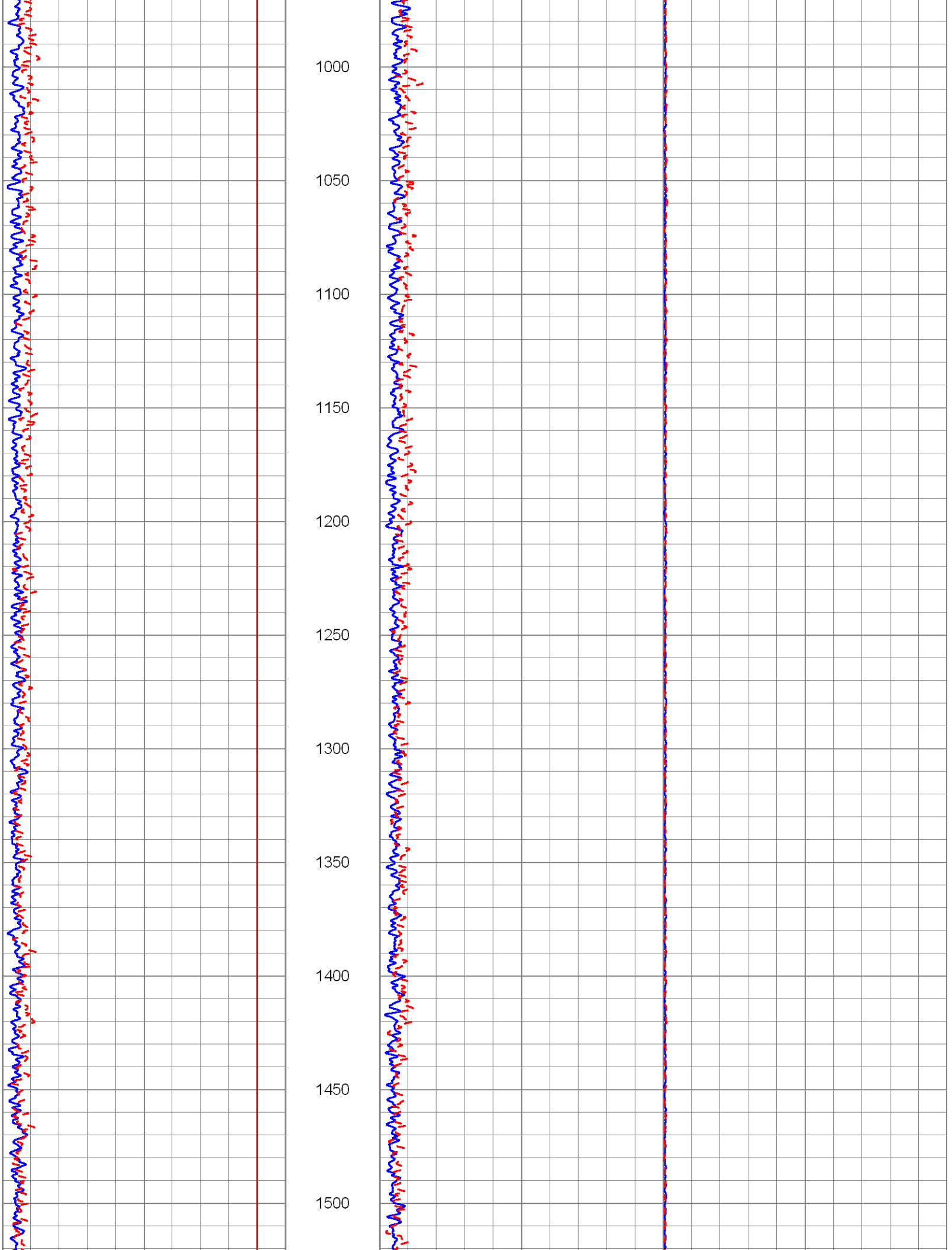
FINAL BACKGROUND

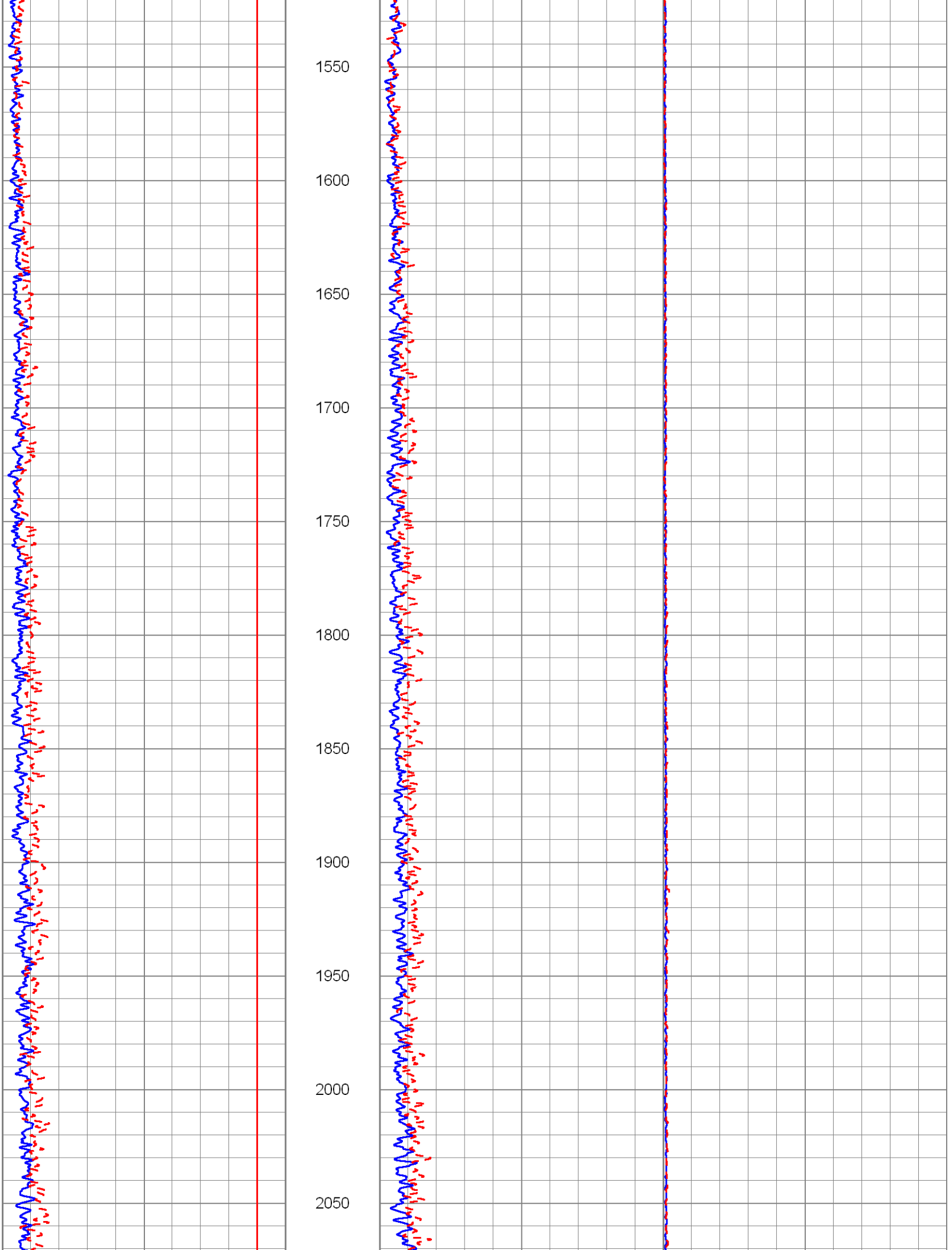
Database File:	sdwwtp-iw17.db
Dataset Pathname:	pass9
Presentation Format:	rts
Dataset Creation:	Wed Jul 17 14:30:31 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:600

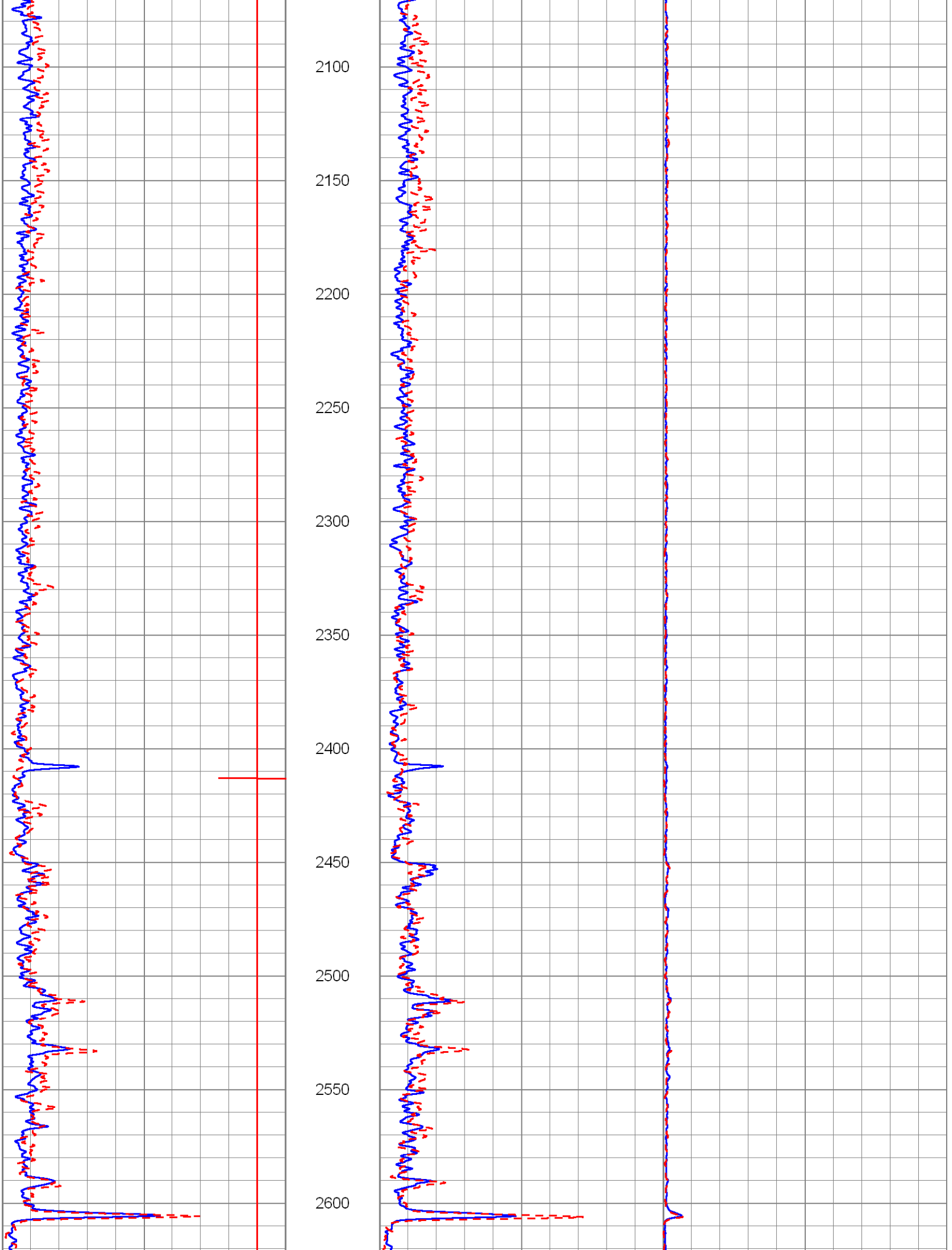
0	GRT (GAPI)	100	0	GRB (GAPI)	100	0	GRM (GAPI) 1000
0	GRT-BACKGRND (GAPI)	100	0	GRB-BACKGRD (GAPI)	100	0	GRM-BACKGRND (GAPI) 1000
0.9	CCL	-0.1					

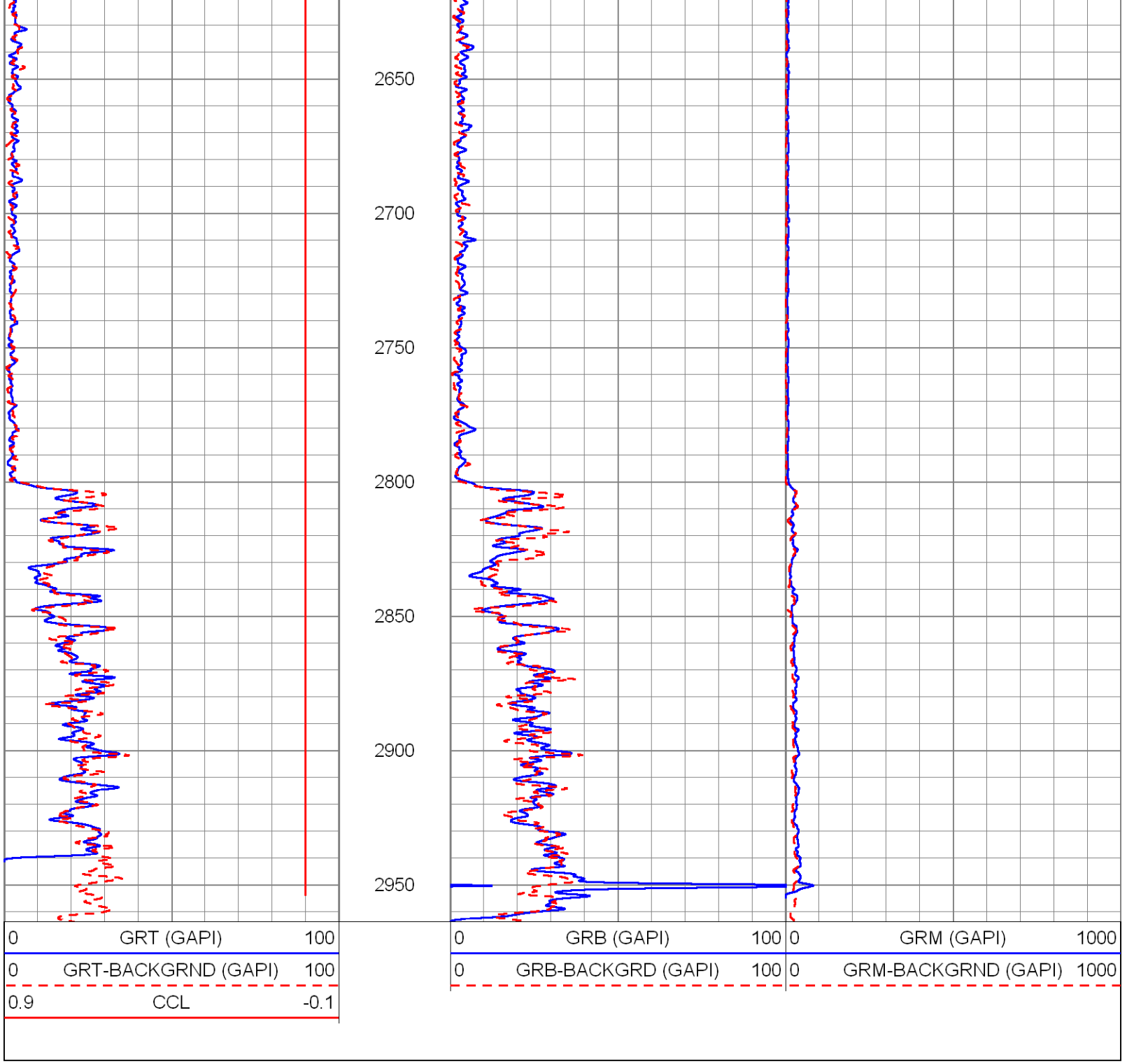



450
500
550
600
650
700
750
800
850
900
950


1000
1050
1100
1150
1200
1250
1300
1350
1400
1450
1500

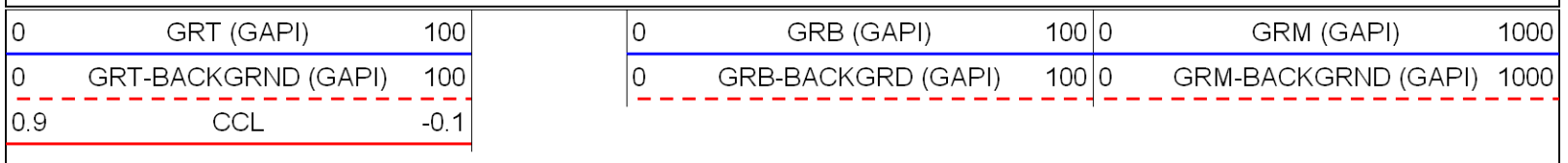

1550
1600
1650
1700
1750
1800
1850
1900
1950
2000
2050

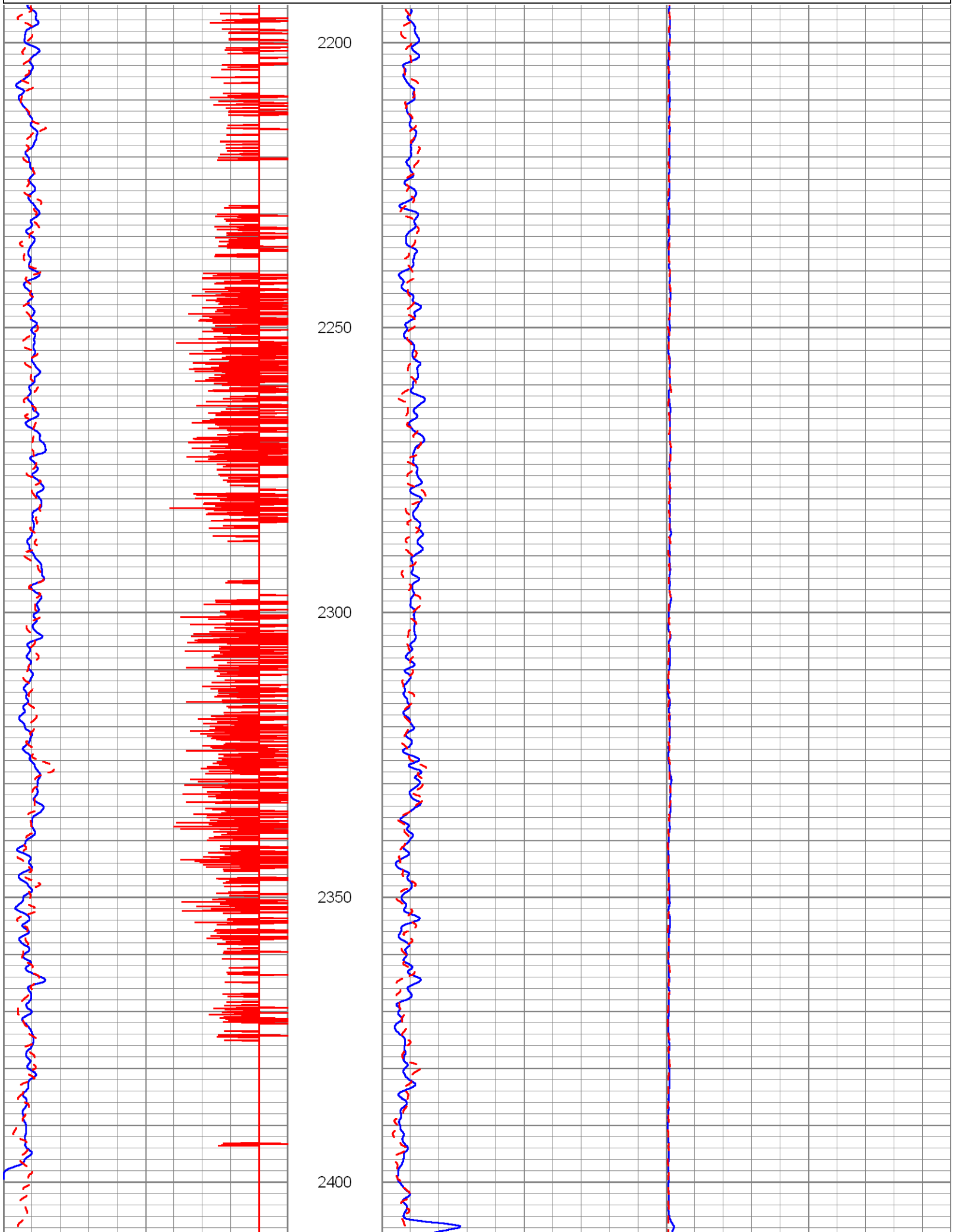

2100
2150
2200
2250
2300
2350
2400
2450
2500
2550
2600

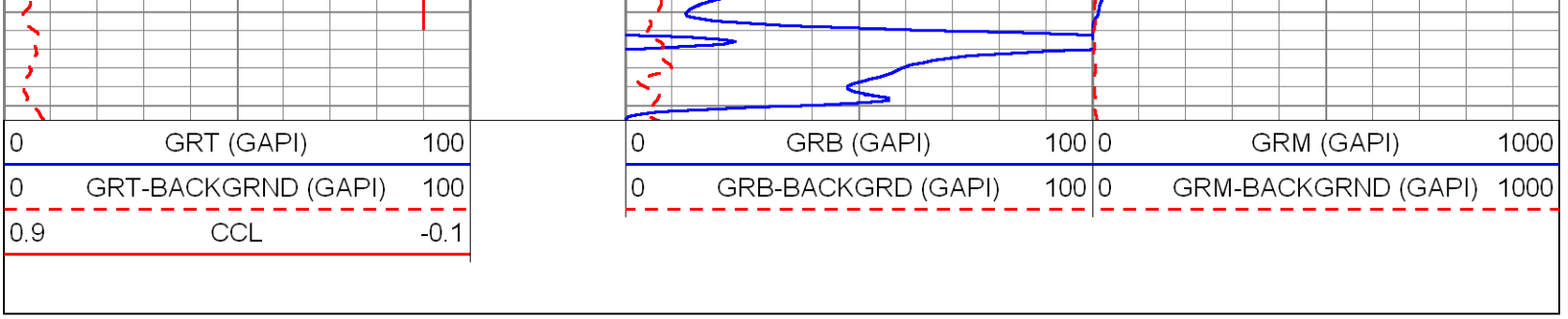


LOP # 2

Database File:	sdwwtp-iw17.db
Dataset Pathname:	pass8
Presentation Format:	rts
Dataset Creation:	Wed Jul 17 13:51:06 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:240

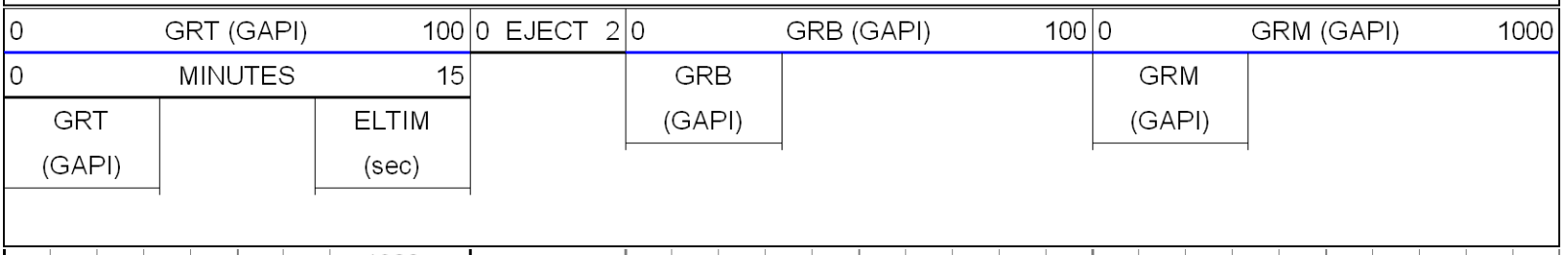


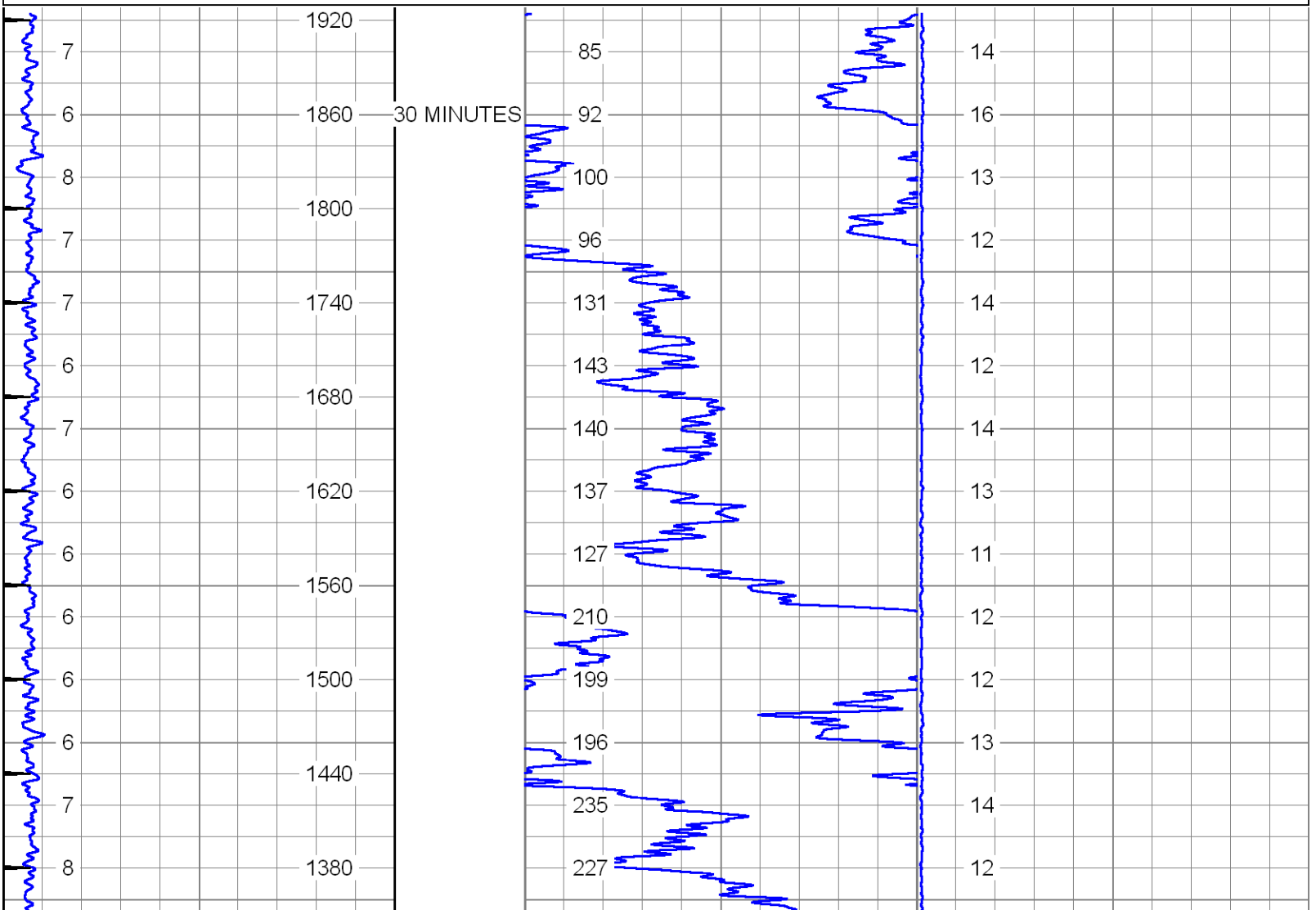

2200
2250
2300
2350
2400

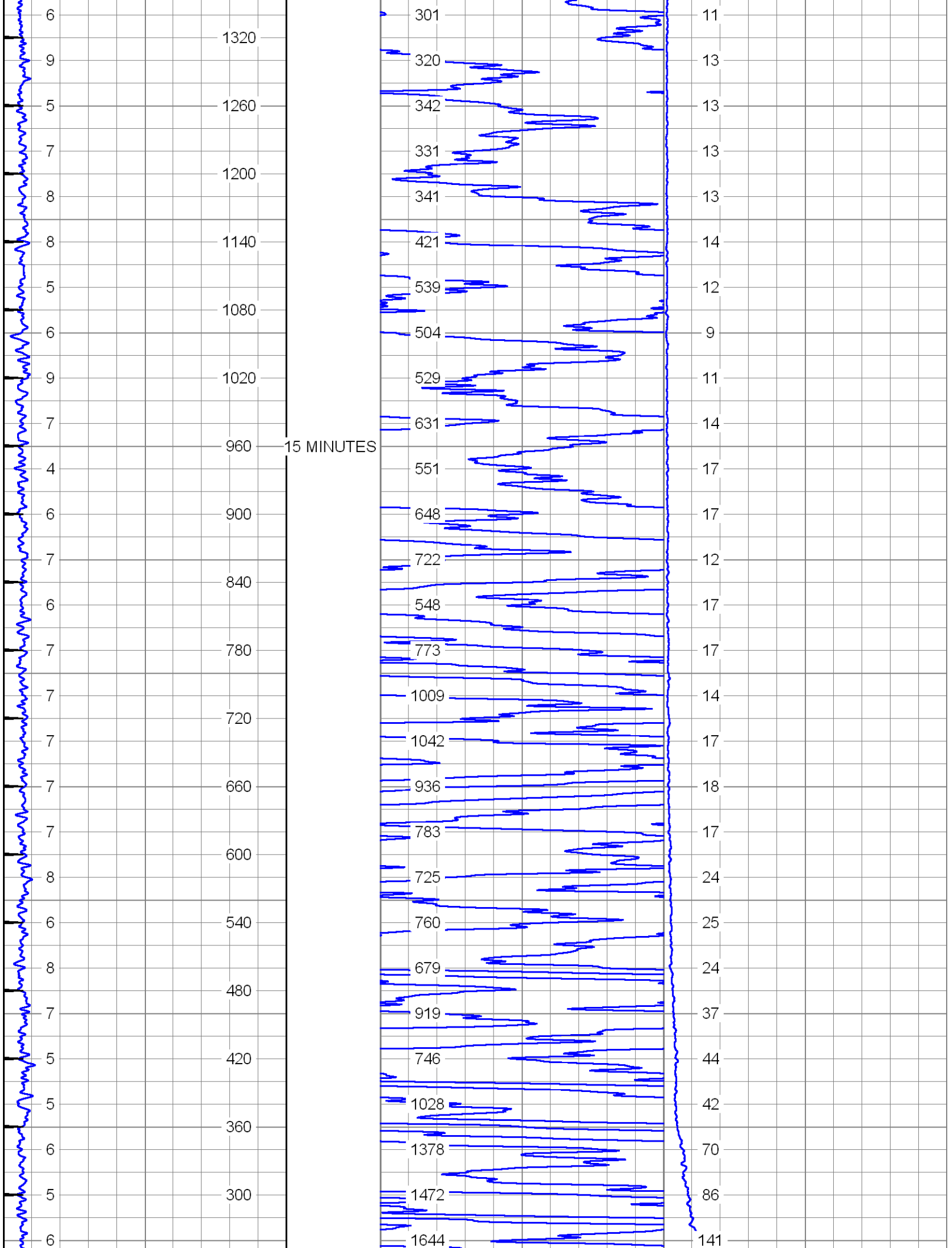


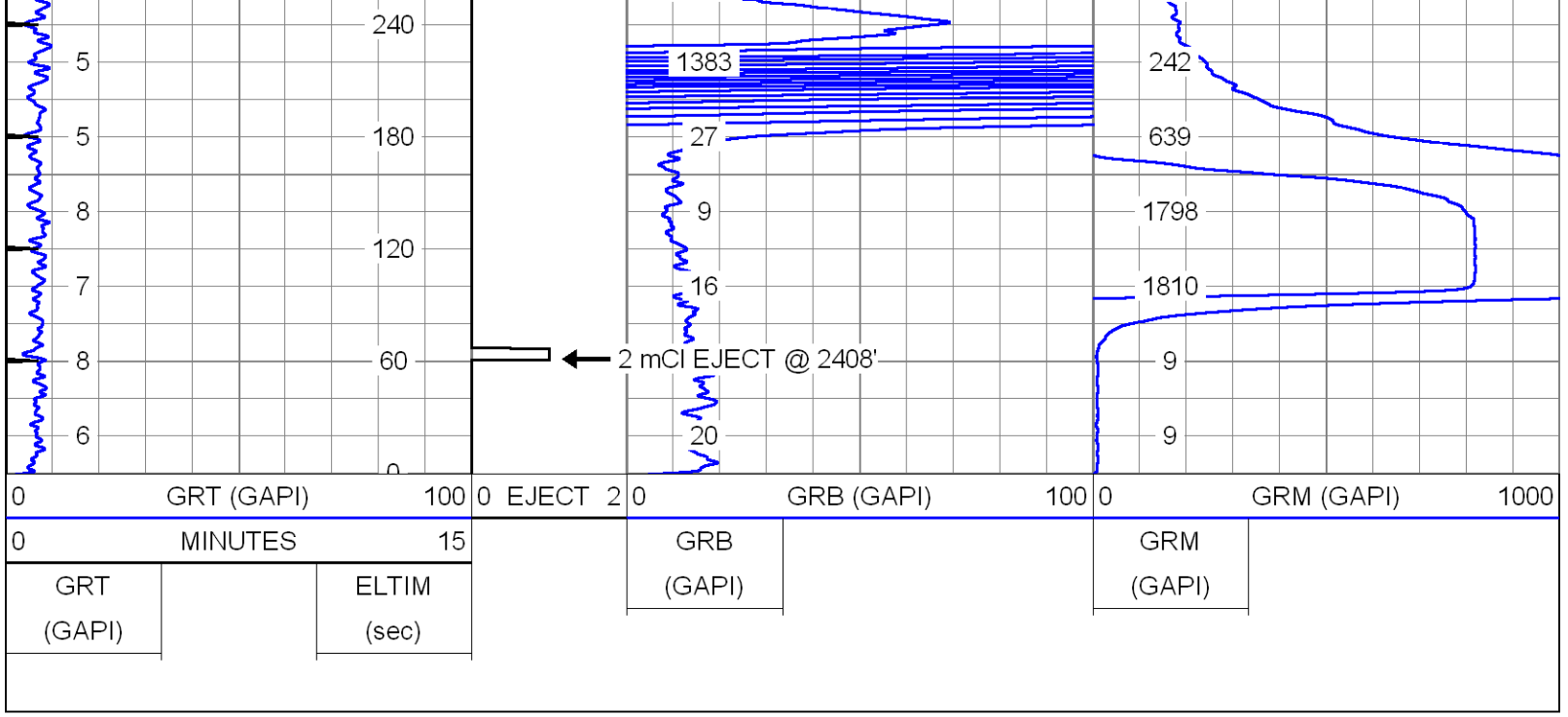
DYNAMIC TEST # 2 (90 GPM)

Database File:	sdwwtp-iw17.db
Dataset Pathname:	pass6
Presentation Format:	rtstime
Dataset Creation:	Wed Jul 17 13:17:24 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:600



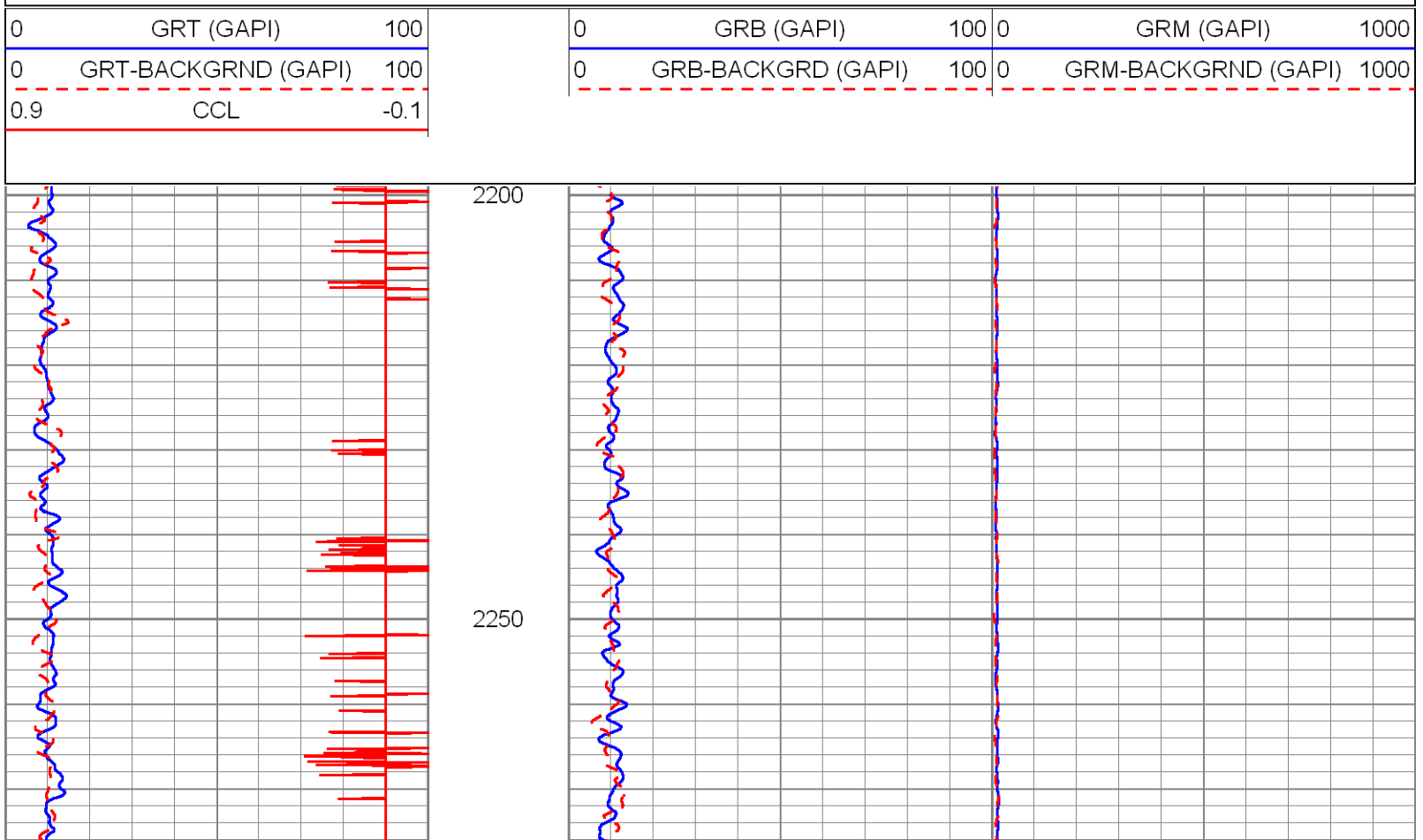


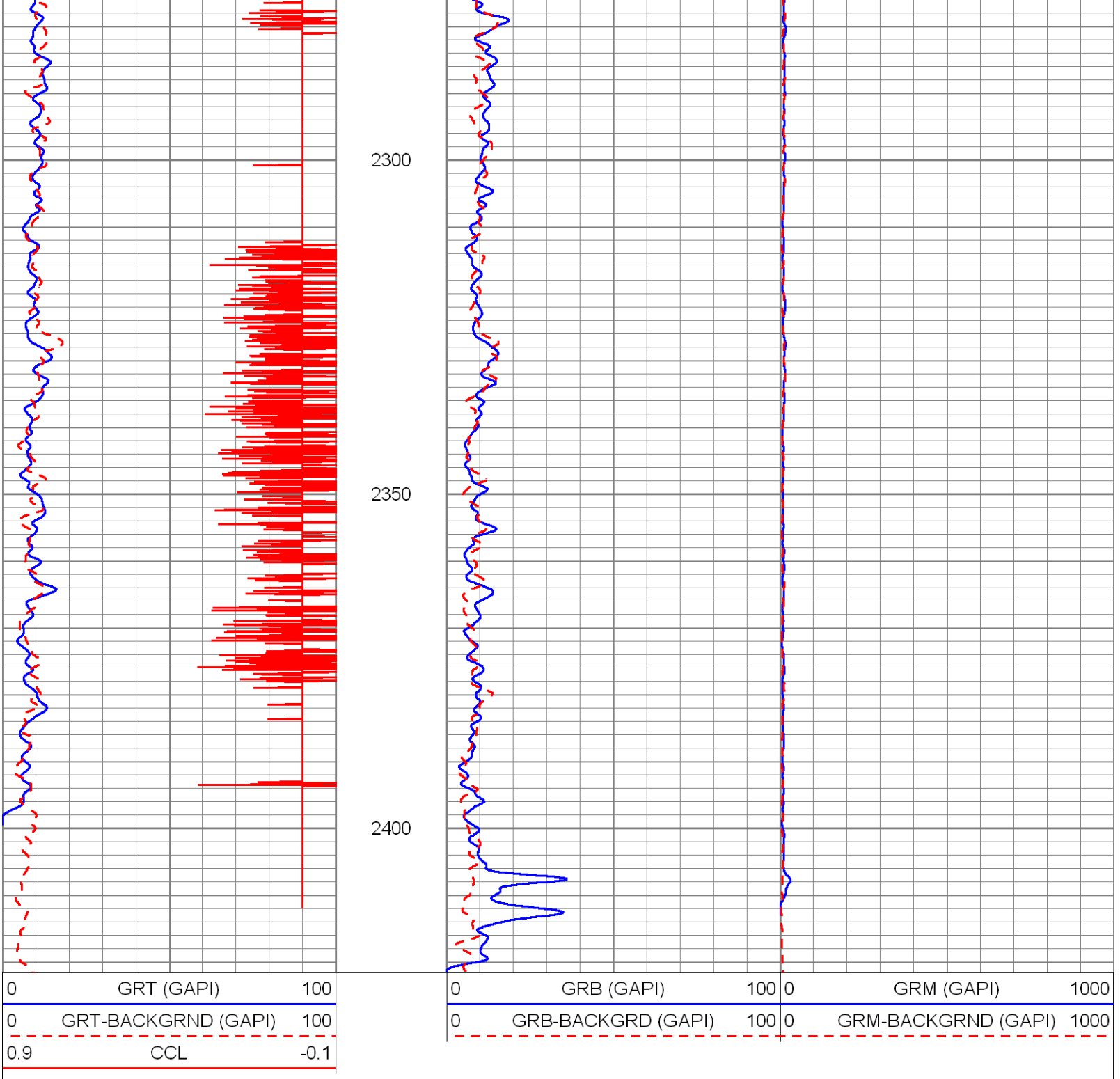

15 MINUTES
6
9
5
7
8
8
5
6
9
7
4
6
7
6
7
7
7
7
7
8
6
8
7
5
5
6
5
6
1320
1260
1200
1140
1080
1020
960
900
840
780
720
660
600
540
480
420
360
300
301
320
342
331
341
421
539
504
529
631
551
648
722
548
773
1009
1042
936
783
725
760
679
919
746
1028
1378
1472
1644
11
13
13
13
13
14
12
9
11
14
17
17
12
17
17
14
17
18
17
24
25
24
37
44
42
70
86
141



LOP #1

Database File:	sdwwtp-iw17.db
Dataset Pathname:	pass5
Presentation Format:	rts
Dataset Creation:	Wed Jul 17 13:00:36 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:240

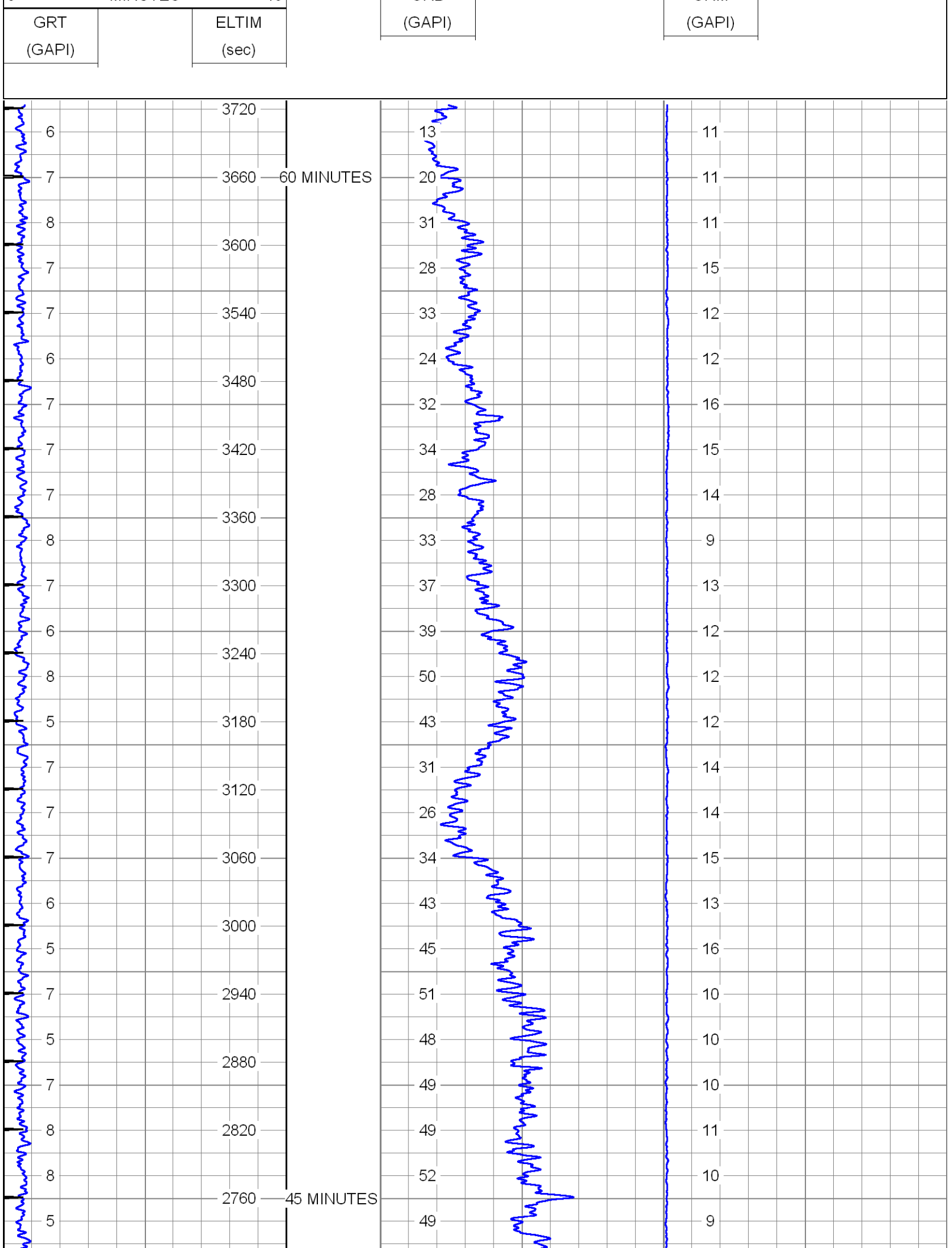


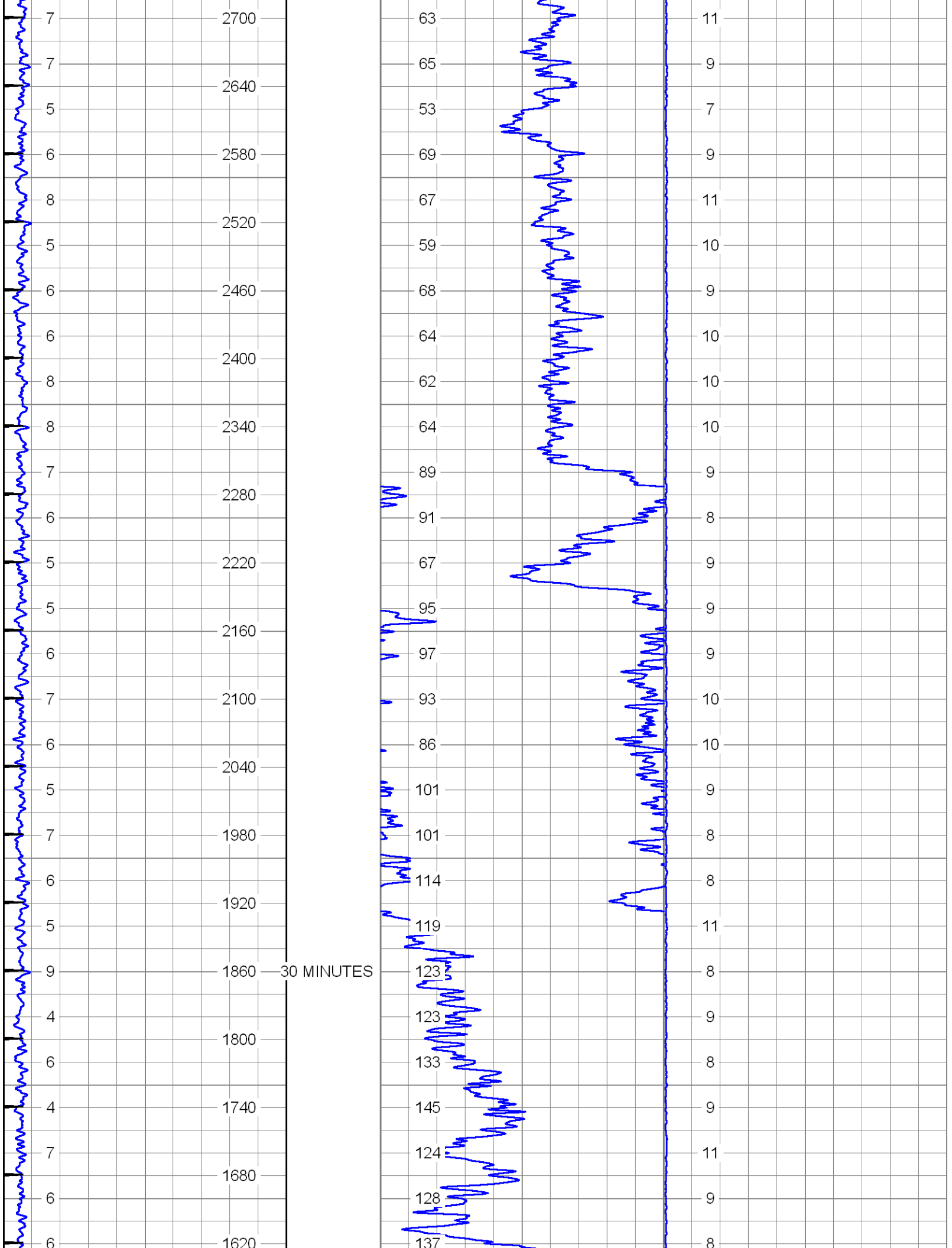


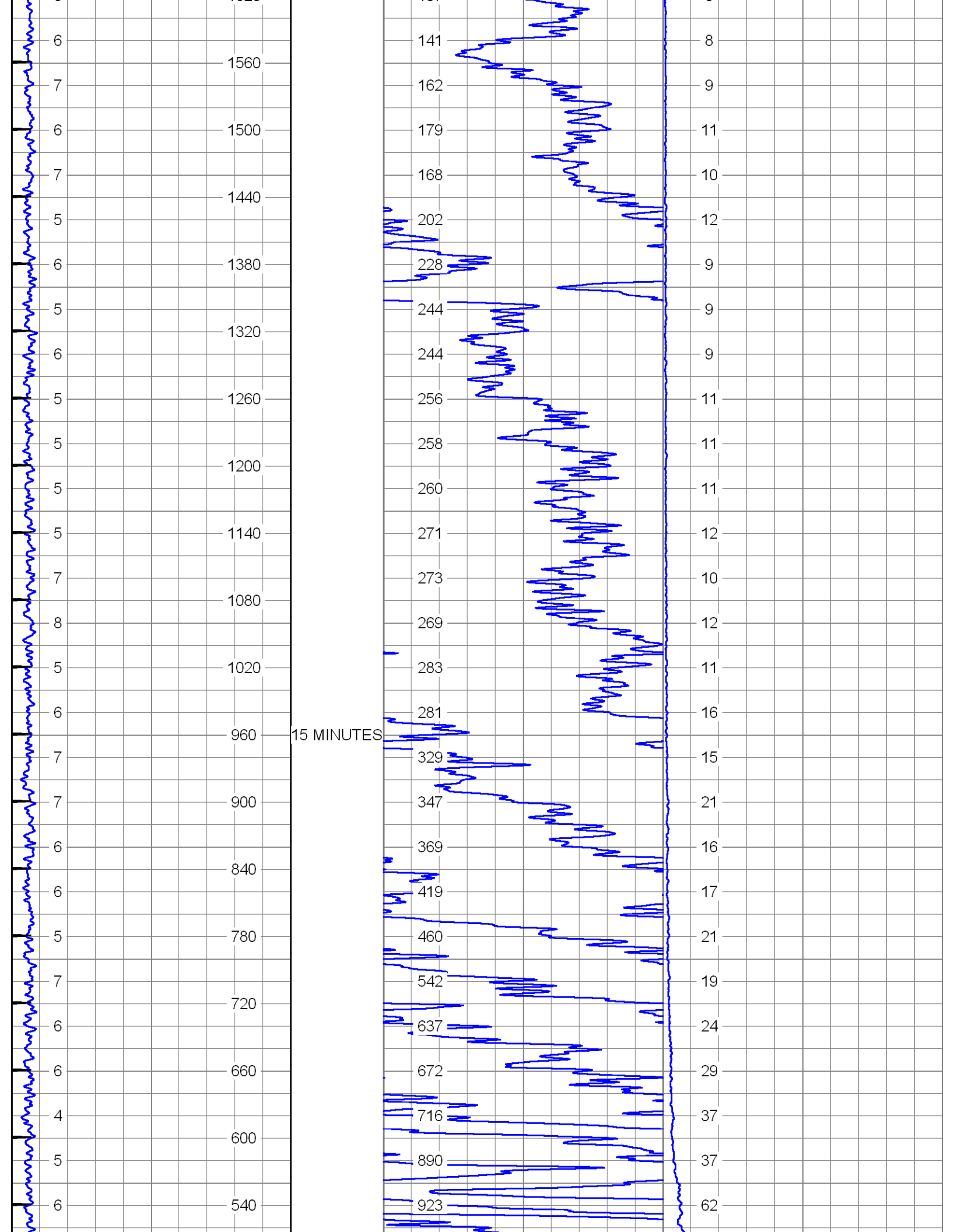
DYNAMIC TEST # 1 (93 GPM)

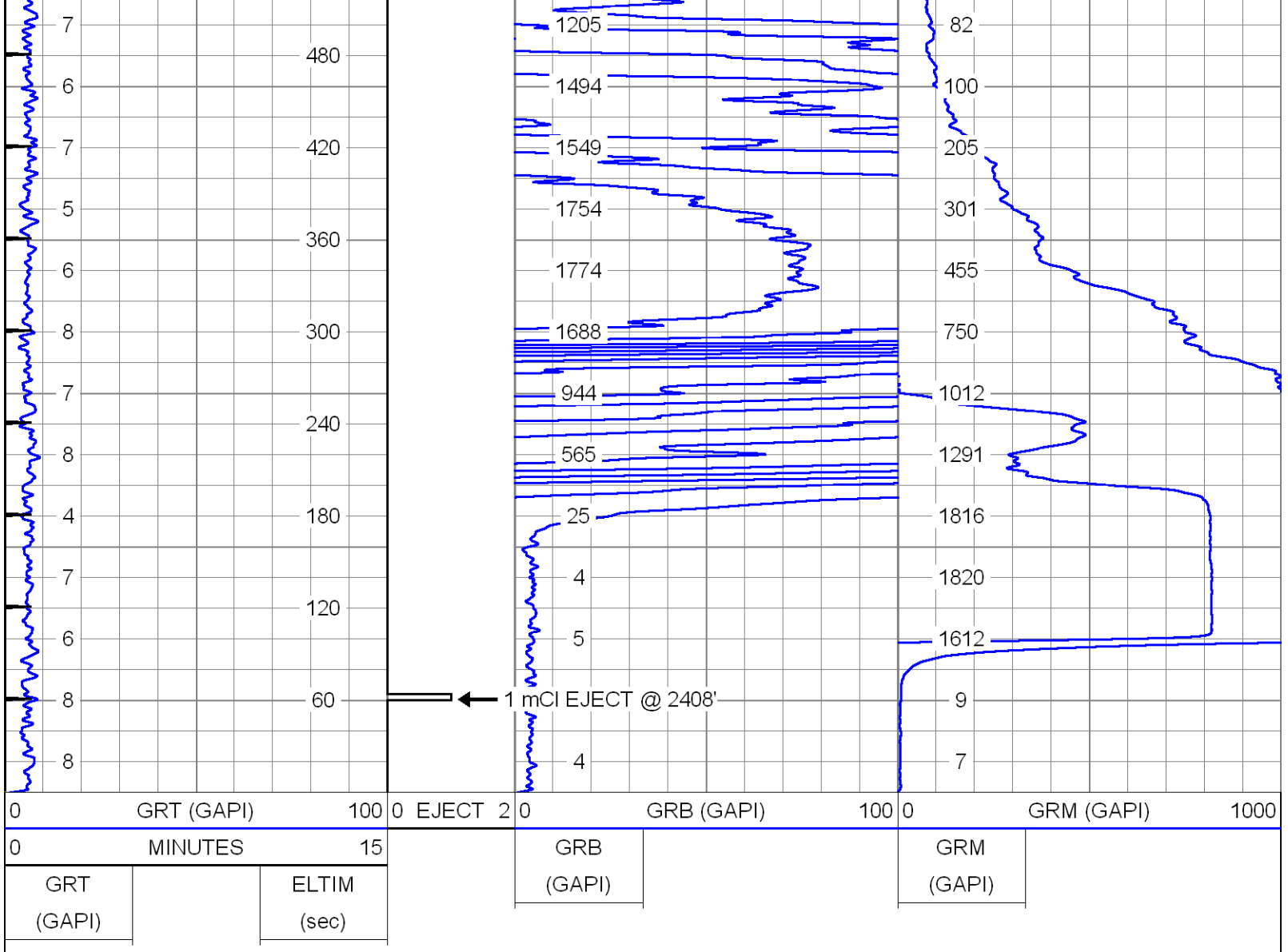
Database File:	sdwwtp-iw17.db
Dataset Pathname:	pass4
Presentation Format:	rtstime
Dataset Creation:	Wed Jul 17 11:55:48 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:600

0	GRT (GAPI)	100	0 EJECT 2	0	GRB (GAPI)	100	0 GRM (GAPI) 1000
0	MINUTES	15			GRB		GRM


GRT
(GAPI)
ELTIM
(sec)
(GAPI)
(GAPI)
3720
3660
60 MINUTES
3600
3540
3480
3420
3360
3300
3240
3180
3120
3060
3000
2940
2880
2820
2760
45 MINUTES

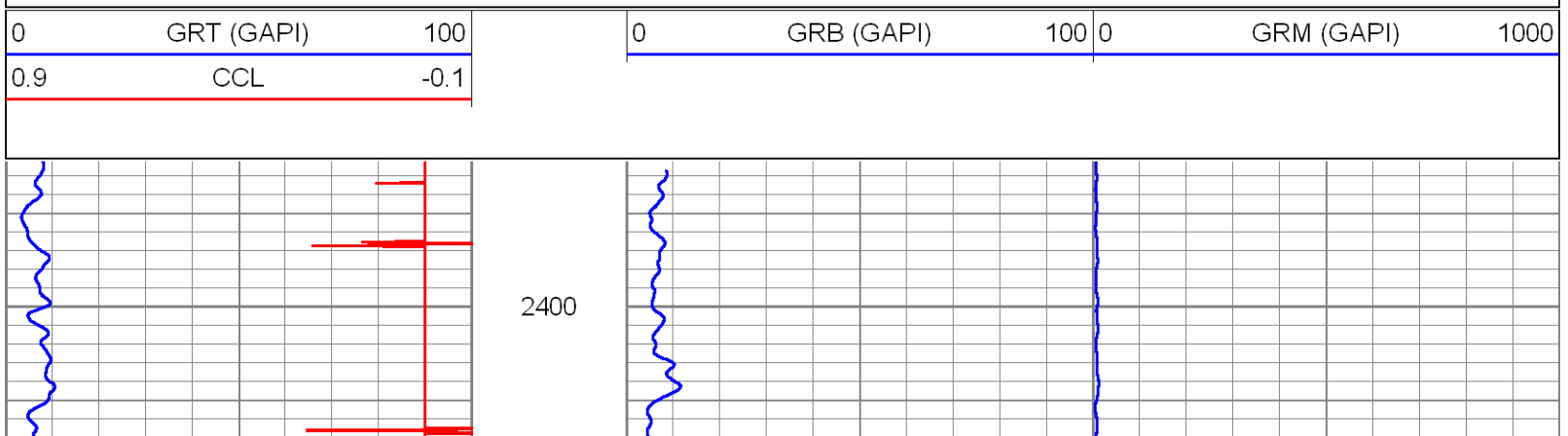

30 MINUTES

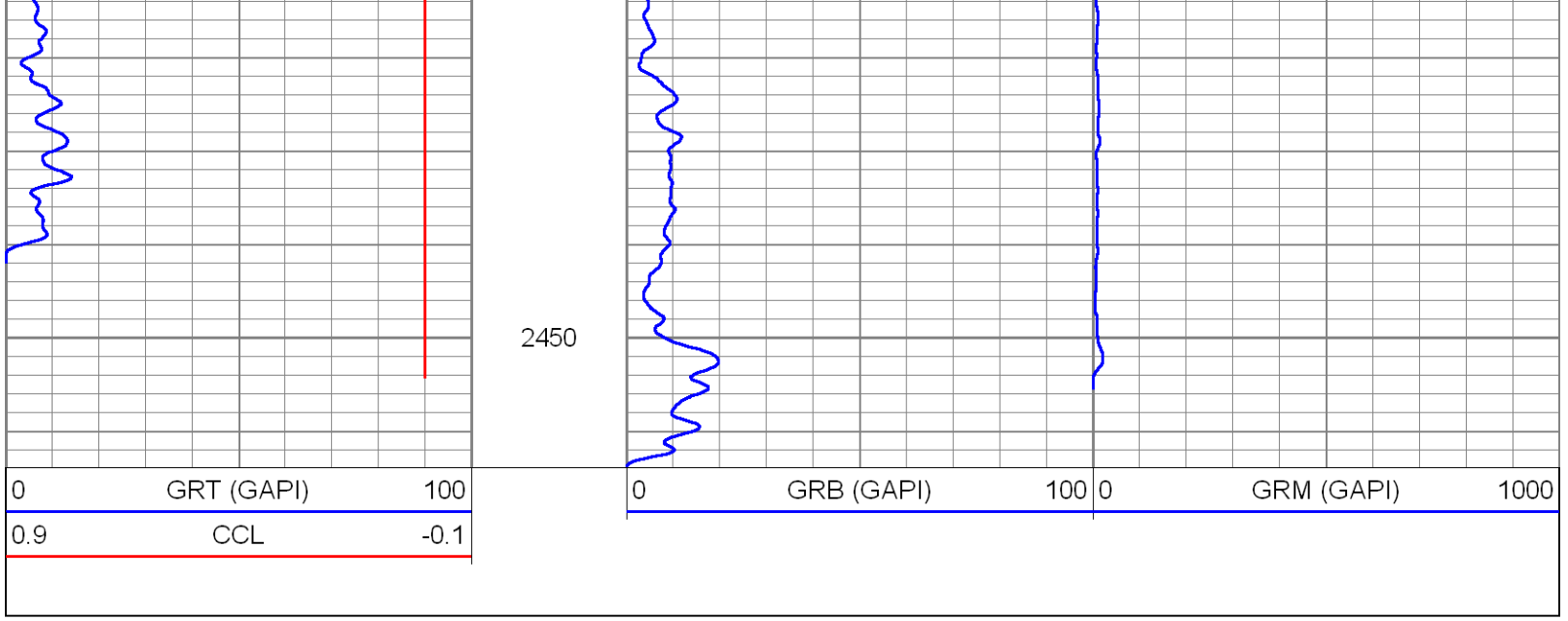

15 MINUTES



CASING TIE-IN

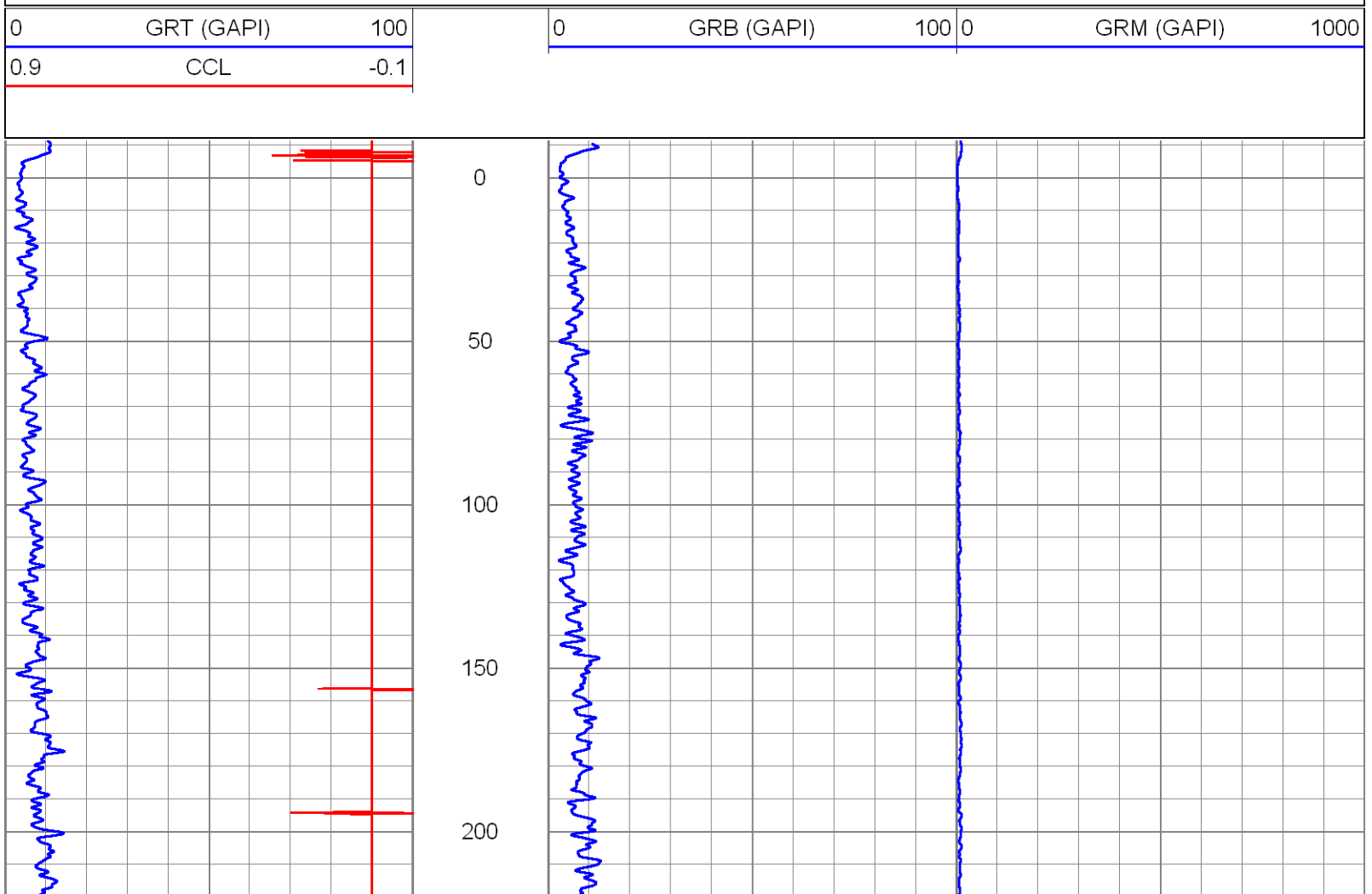
Database File:	sdwwtp-iw17.db
Dataset Pathname:	pass3
Presentation Format:	rts
Dataset Creation:	Wed Jul 17 11:43:15 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:240

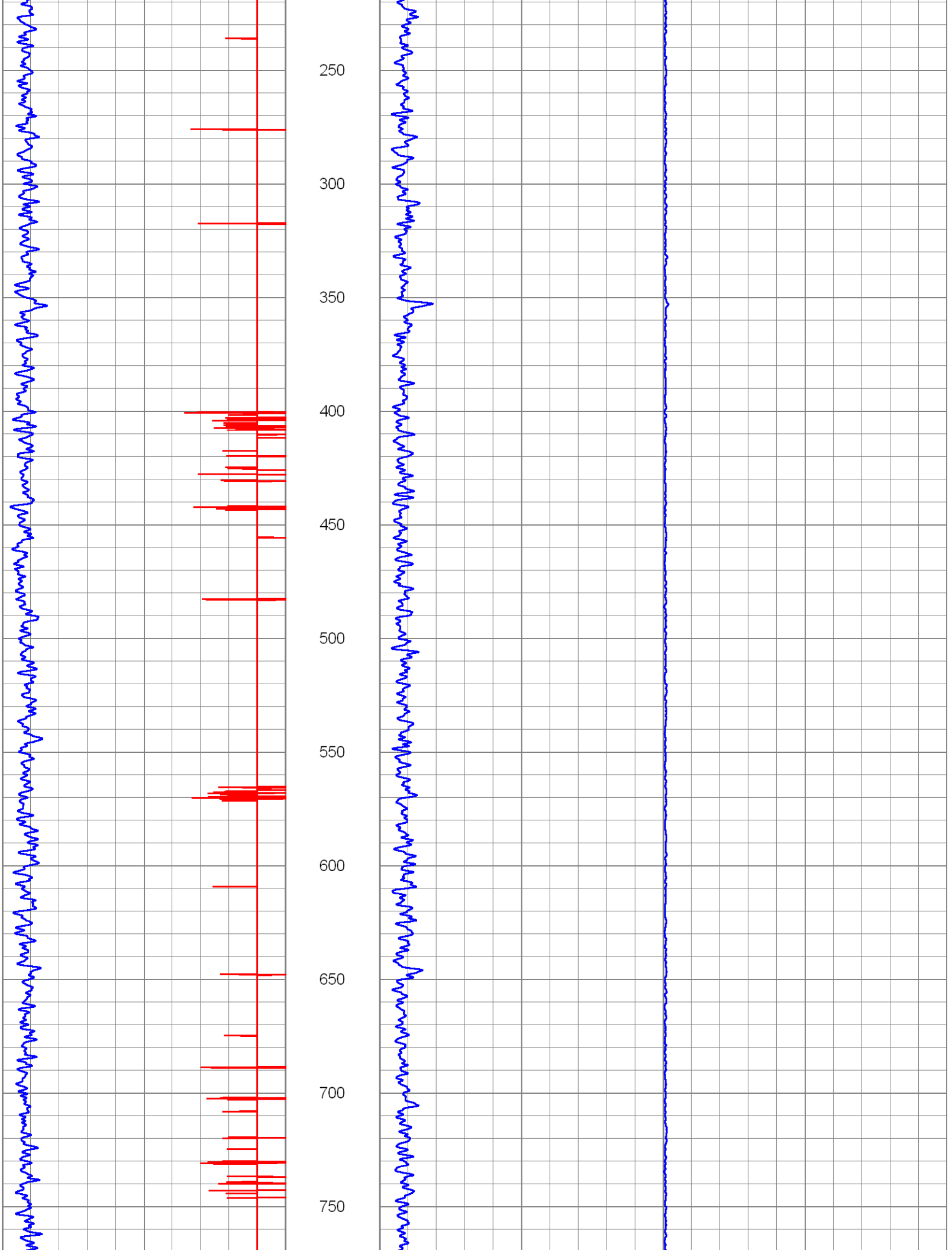


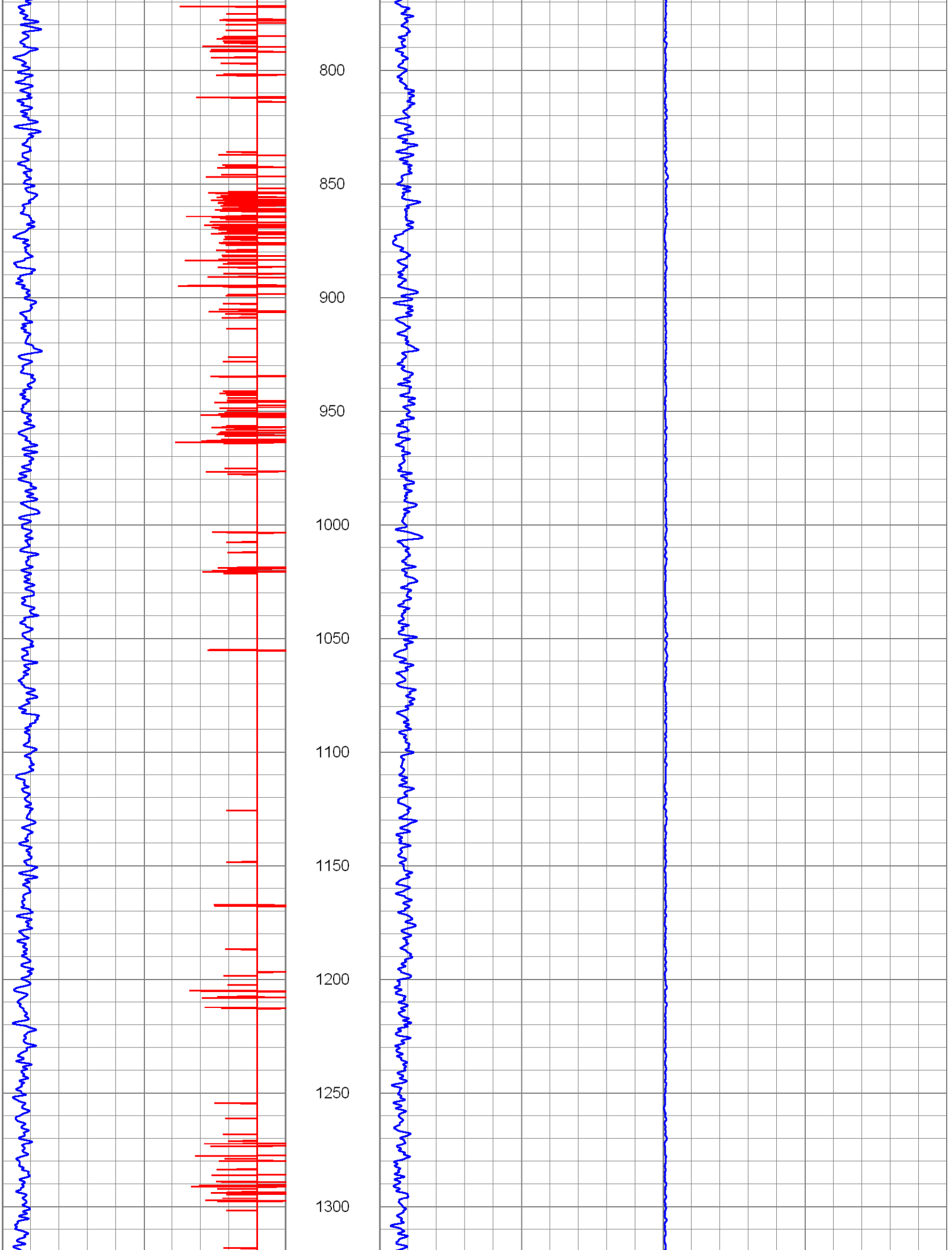


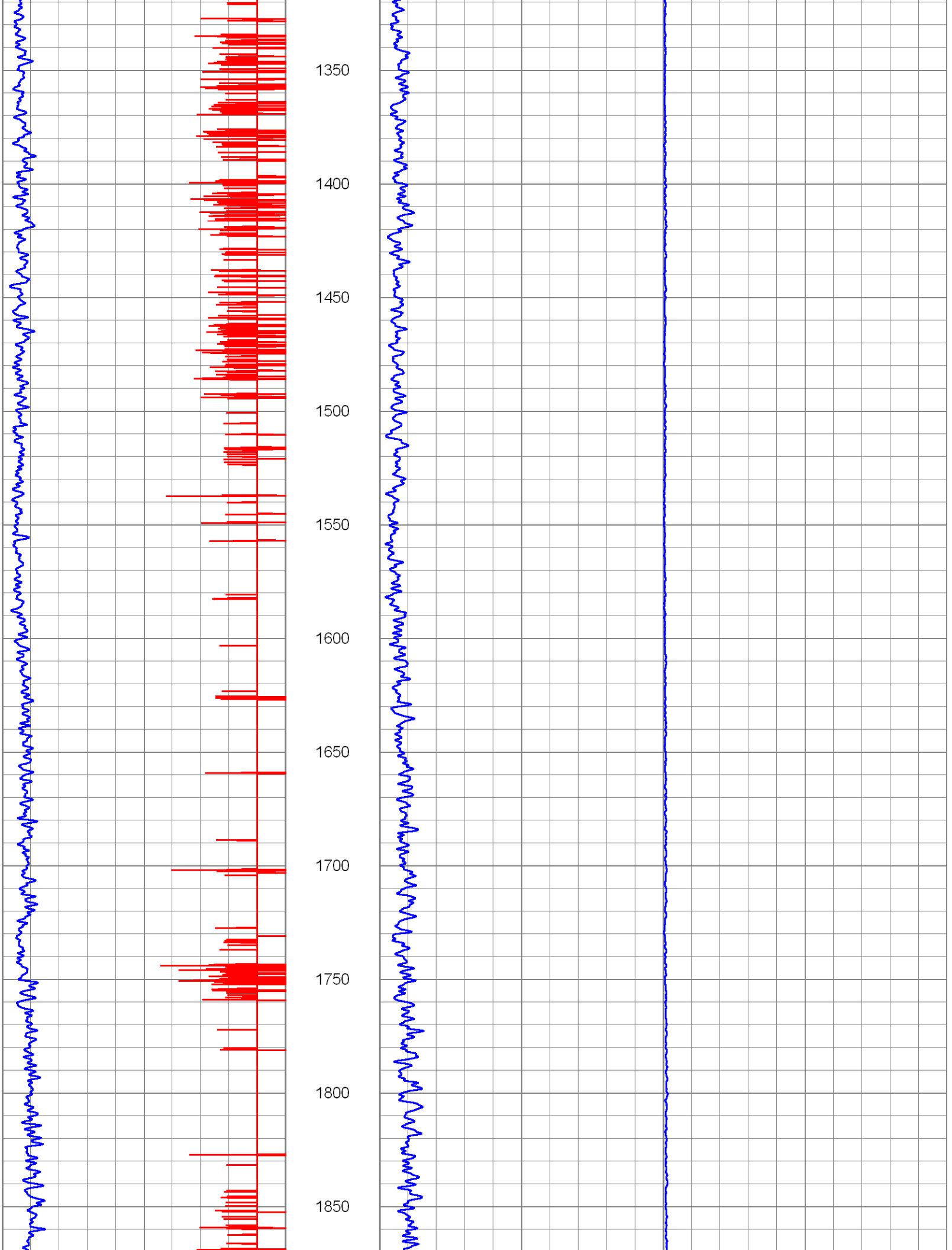
GAMMA-RAY BACKGROUND

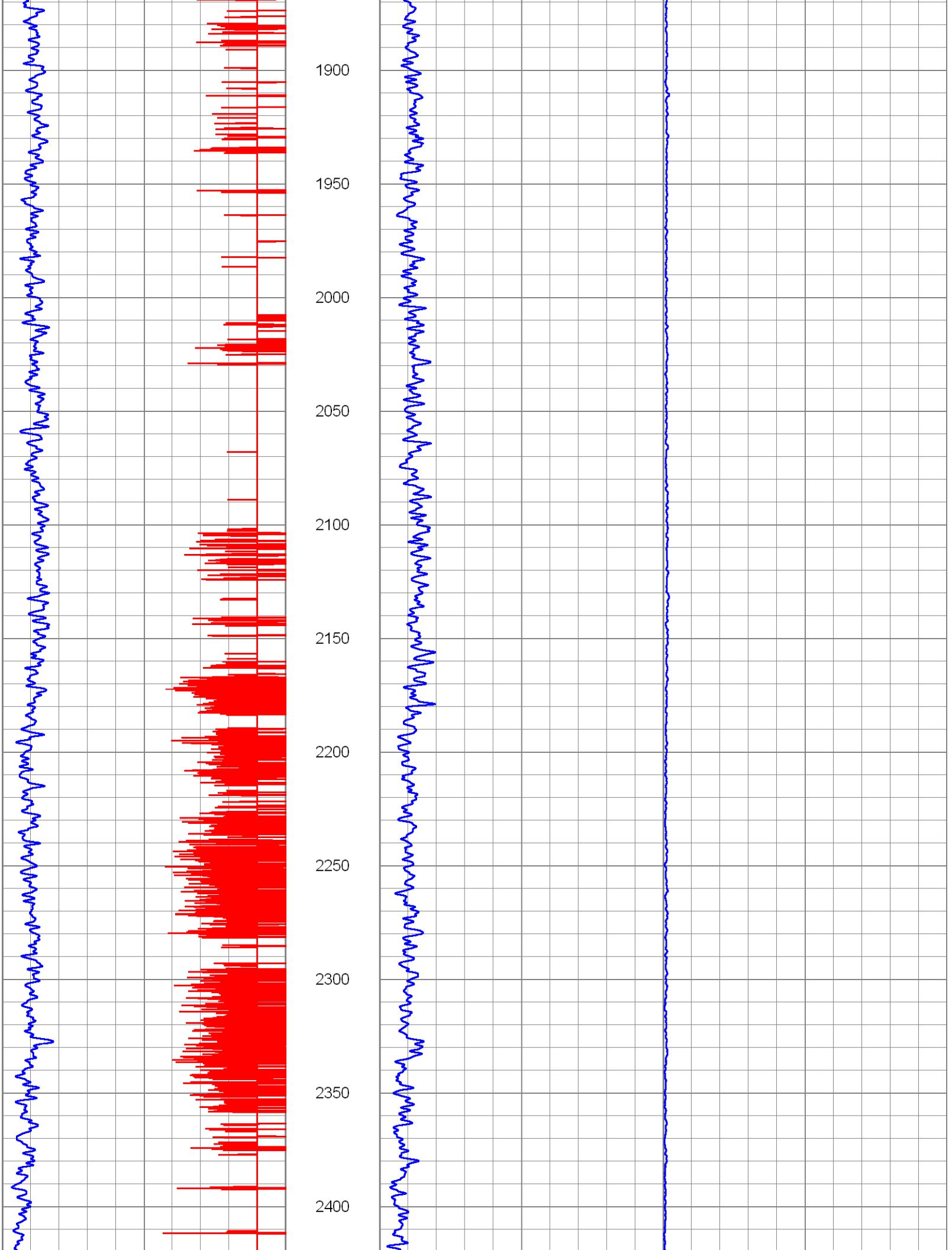
Database File:	sdwwtp-iw17.db
Dataset Pathname:	pass2
Presentation Format:	rts
Dataset Creation:	Wed Jul 17 09:42:12 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:600

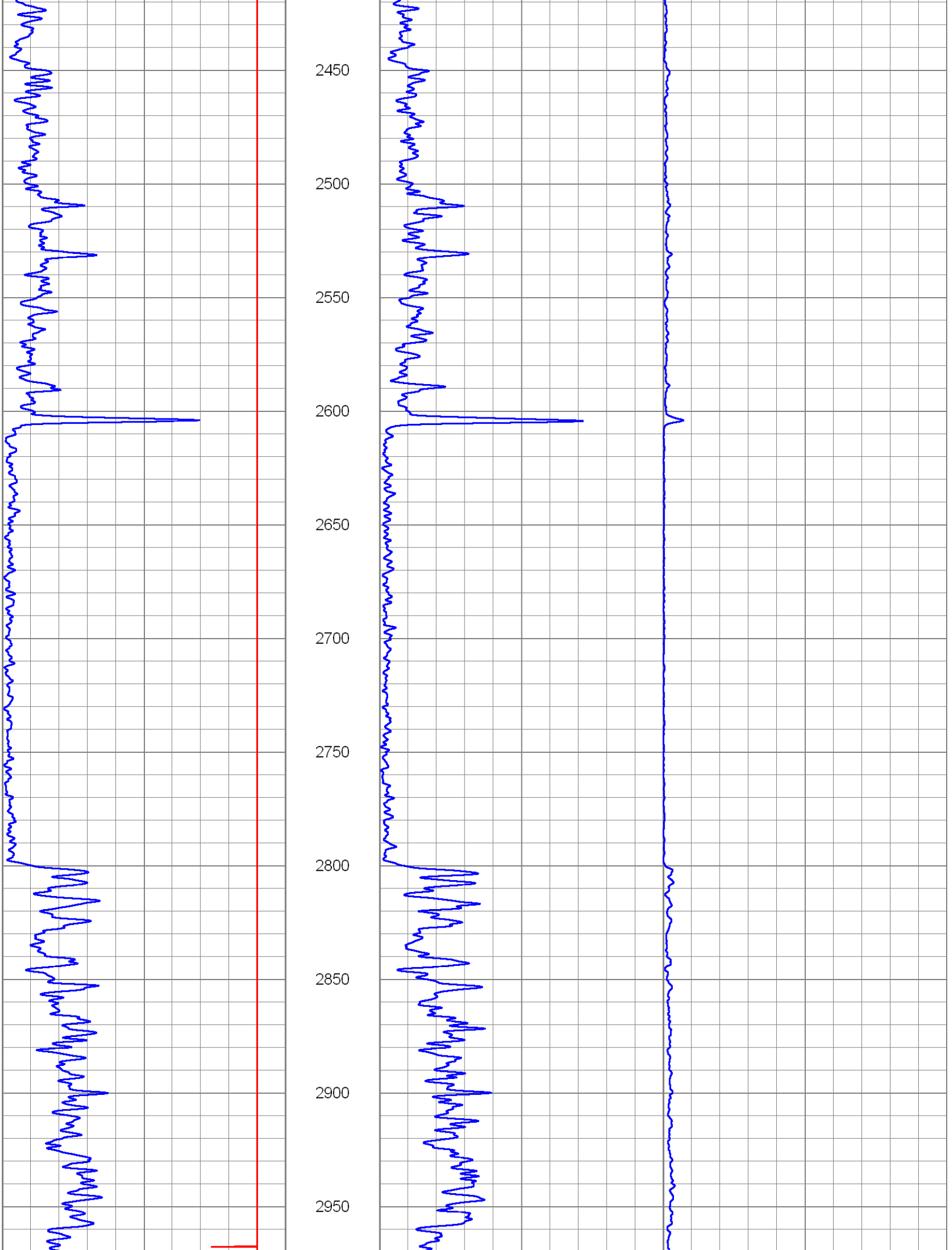


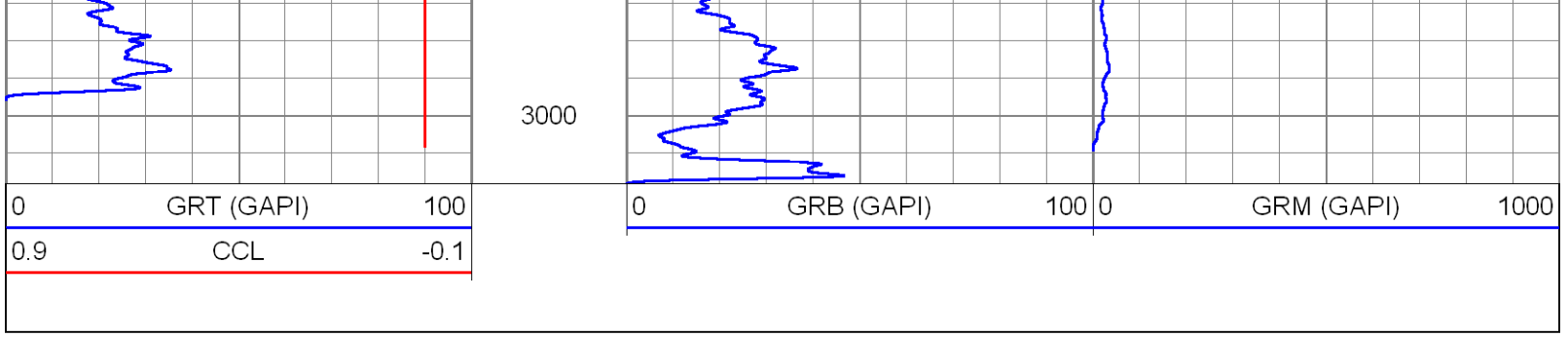

250
300
350
400
450
500
550
600
650
700
750


800
850
900
950
1000
1050
1100
1150
1200
1250
1300


1350
1400
1450
1500
1550
1600
1650
1700
1750
1800
1850


1900
1950
2000
2050
2100
2150
2200
2250
2300
2350
2400


2450
2500
2550
2600
2650
2700
2750
2800
2850
2900
2950



Calibration Report

Database File: sdwwtp-iw17.db
Dataset Pathname: pass2
Dataset Creation: Wed Jul 17 09:42:12 2013 by Log SOC 110722

Gamma Ray Calibration Report

Serial Number:	952B	
Tool Model:	RTSB	
Performed:	Wed Jul 17 07:58:17 2013	
Calibrator Value:	90.0	GAPI
Background Reading:	84.6	cps
Calibrator Reading:	246.2	cps
Sensitivity:	0.5568	GAPI/cps

Gamma Ray Calibration Report

Serial Number:	952M	
Tool Model:	RTSM	
Performed:	Wed Jul 17 07:58:30 2013	
Calibrator Value:	90.0	GAPI
Background Reading:	168.9	cps
Calibrator Reading:	328.1	cps
Sensitivity:	0.5655	GAPI/cps

Gamma Ray Calibration Report

Serial Number:	952T	
Tool Model:	RTST	
Performed:	Wed Jul 17 07:58:42 2013	
Calibrator Value:	90.0	GAPI
Background Reading:	101.1	cps
Calibrator Reading:	270.2	cps
Sensitivity:	0.5322	GAPI/cps

Appendix E

Temperature Log

HIGH RESOLUTION TEMPERATURE LOG

Company	SOUTH MIAMI-DADE W.W.T.P.
Well	IW-17
Field	S.D.W.W.T.P.
County	MIAMI-DADE
State	FLORIDA

Location: API # :

SEC TWP RGE

Other Services

Permanent Datum	PAD	Elevation	PAD
Log Measured From	PAD		
Drilling Measured From	PAD		

Elevation
K.B.
D.F.
G.L.

Date	17-JUL-2013		
Run Number	2013 MIT		
Depth Driller	3018'		
Depth Logger	3018'		
Bottom Logged Interval	3018'		
Top Log Interval	SURFACE		
Open Hole Size	22"		
Type Fluid	WATER		
Density / Viscosity	NA		
Max. Recorded Temp.	79.3 degF		
Estimated Cement Top	NA		
Time Well Ready	ON ARRIVAL		
Time Logger on Bottom	0930		
Equipment Number	102		
Location	FT MYERS		
Recorded By	MOREY		
Witnessed By	S. VILLAMIL		

Borehole Record				Borehole Record			
Run Number	Bit	From	To	Run No	Bit	From	To

Casing Record	Size	Wgt/Ft	Top	Bottom
Surface String				
Prot. String				
Production String	24"	.500" W.T.	SURFACE	2413'
Liner				

<< Fold Here >>>

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

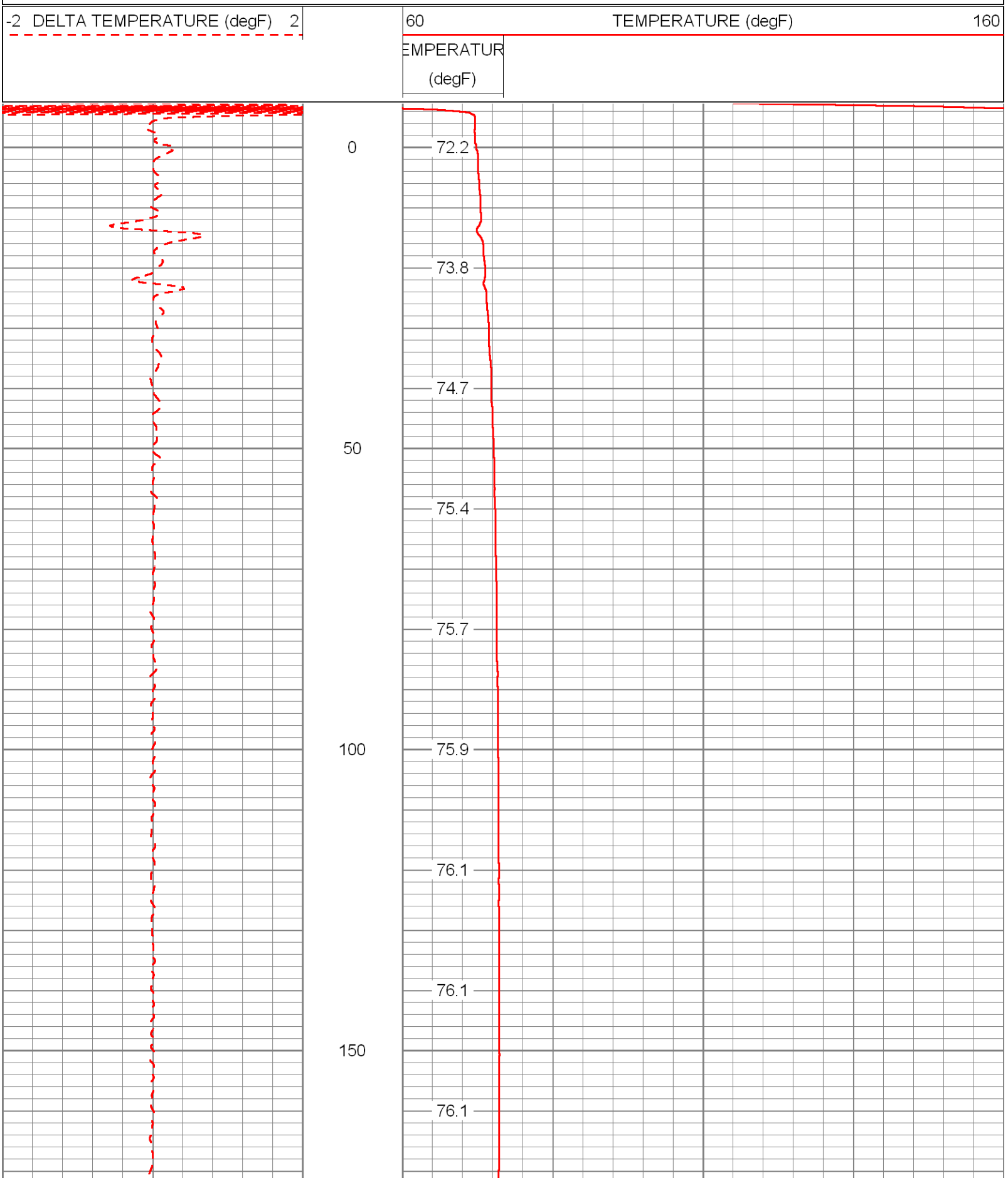
Comments

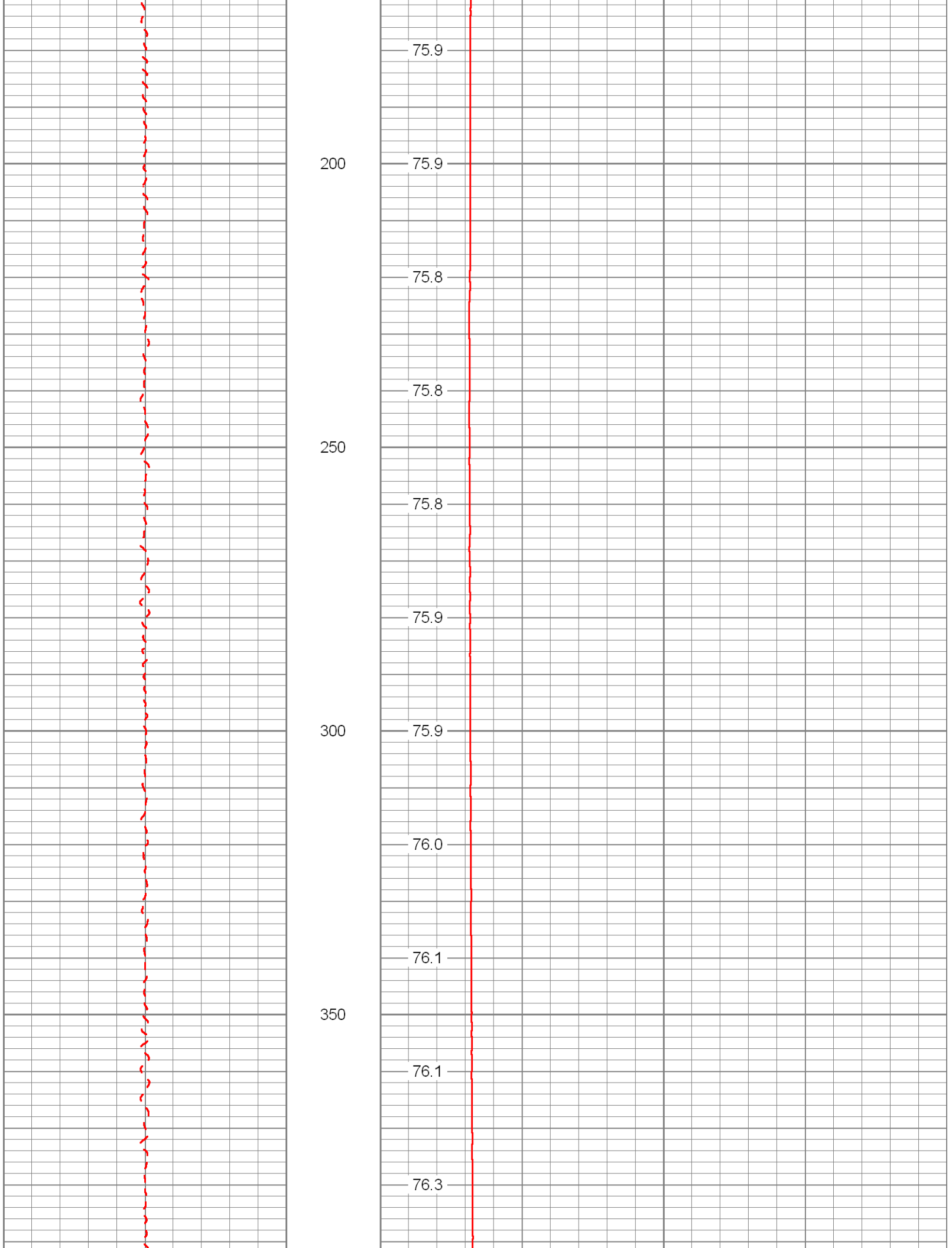
RADIOACTIVE TRACER SURVEY

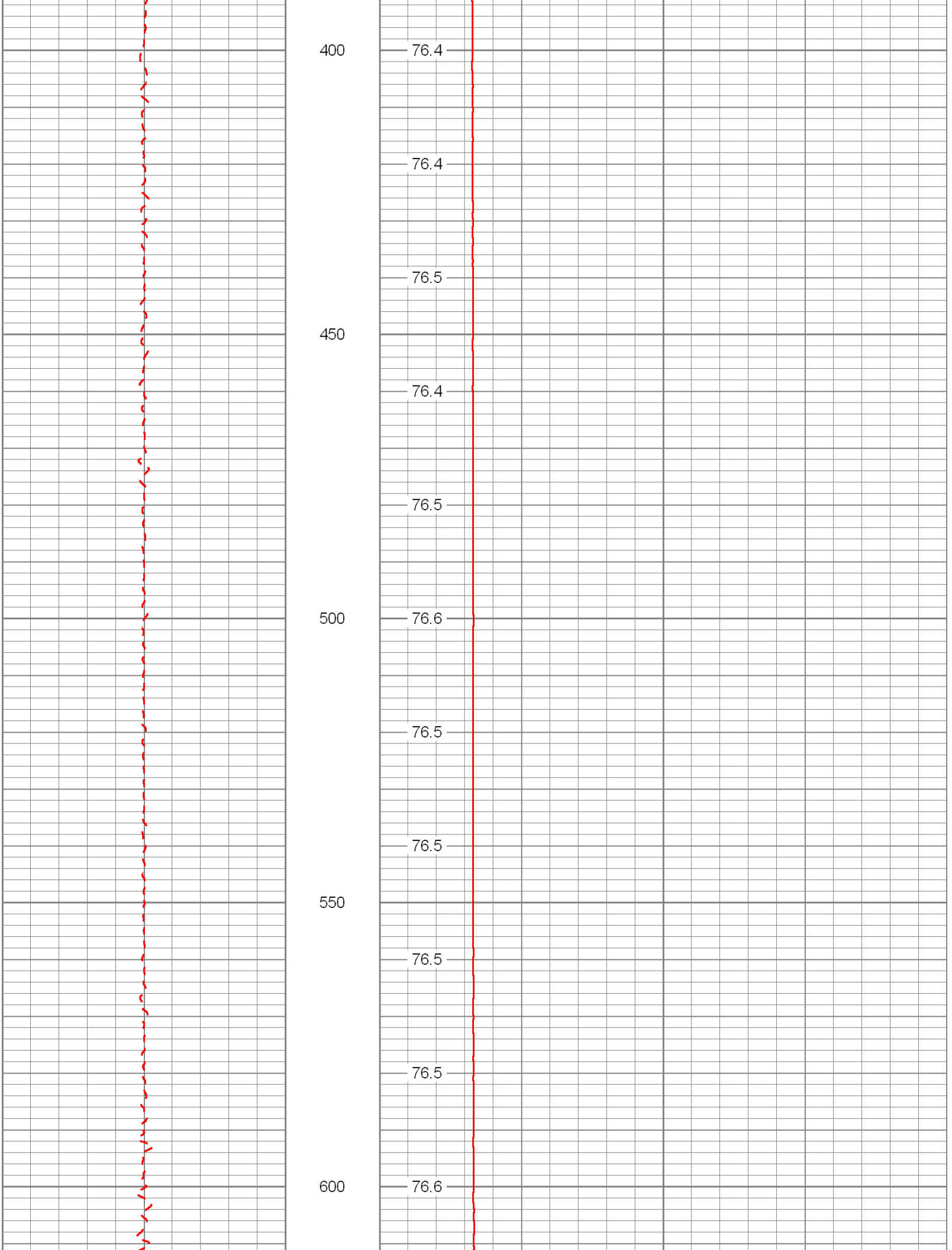
TEMPERATURE

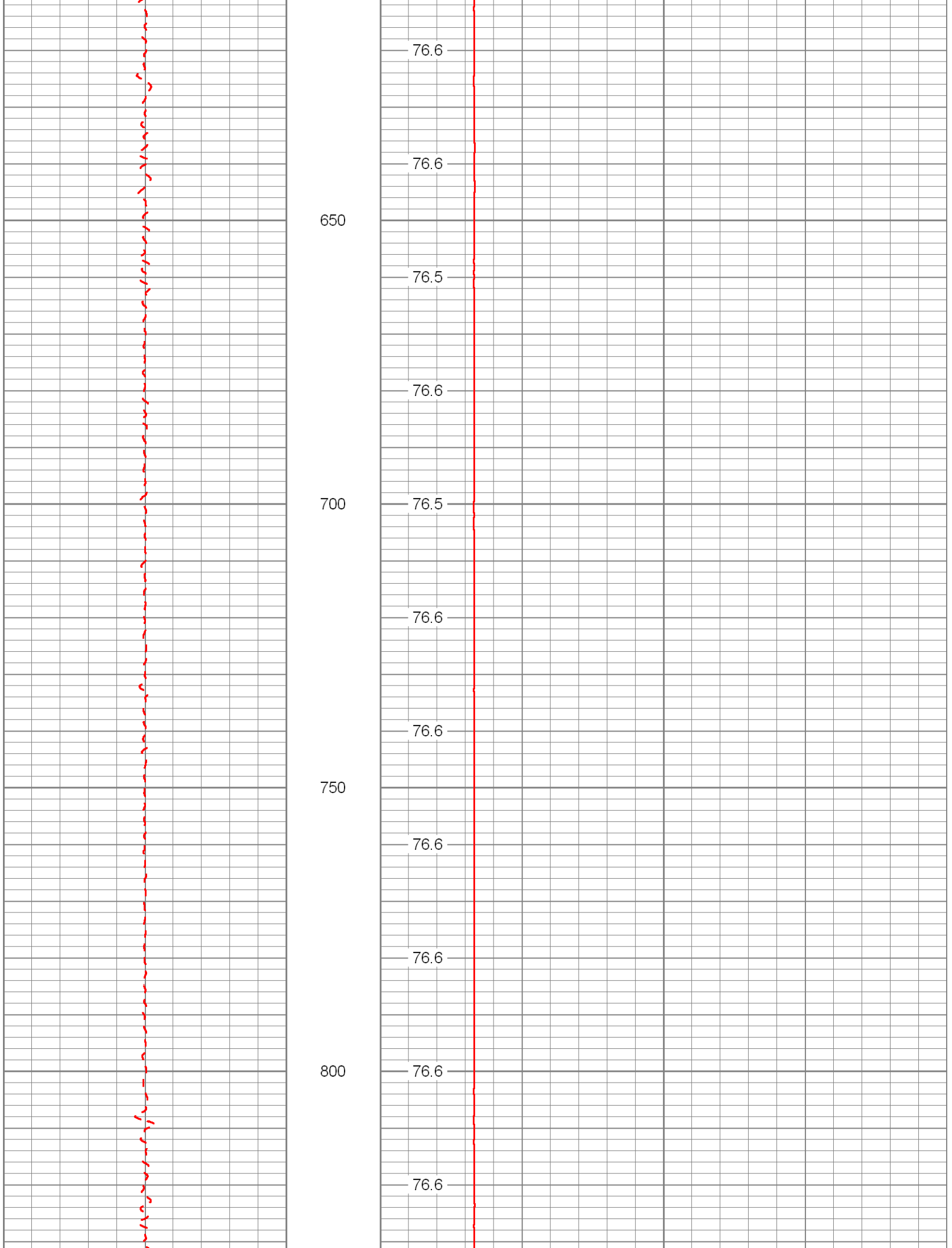
BROTHERS

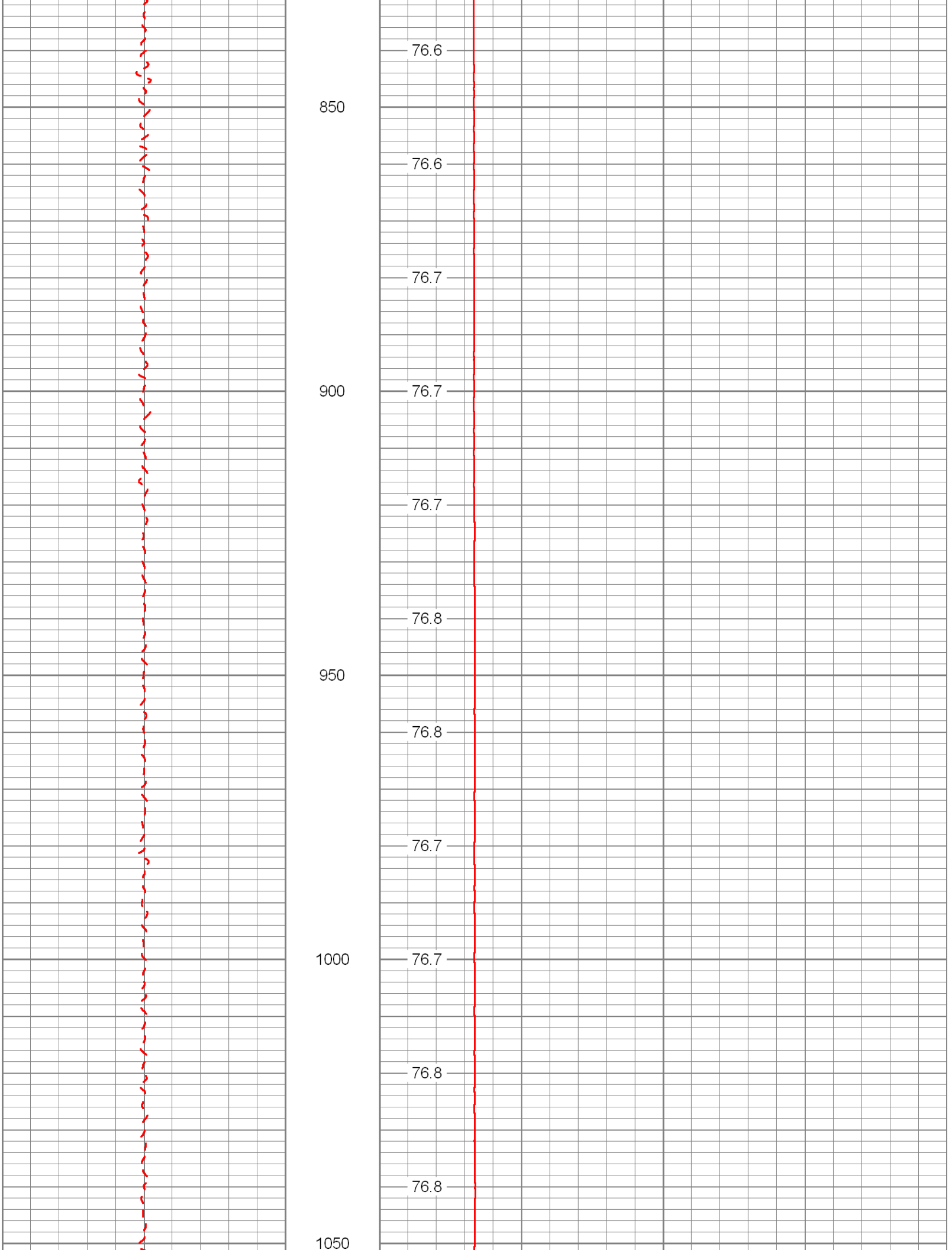
Database File:	sdwwtp-iw17.db
Dataset Pathname:	pass1
Presentation Format:	temp
Dataset Creation:	Wed Jul 17 08:41:10 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:240

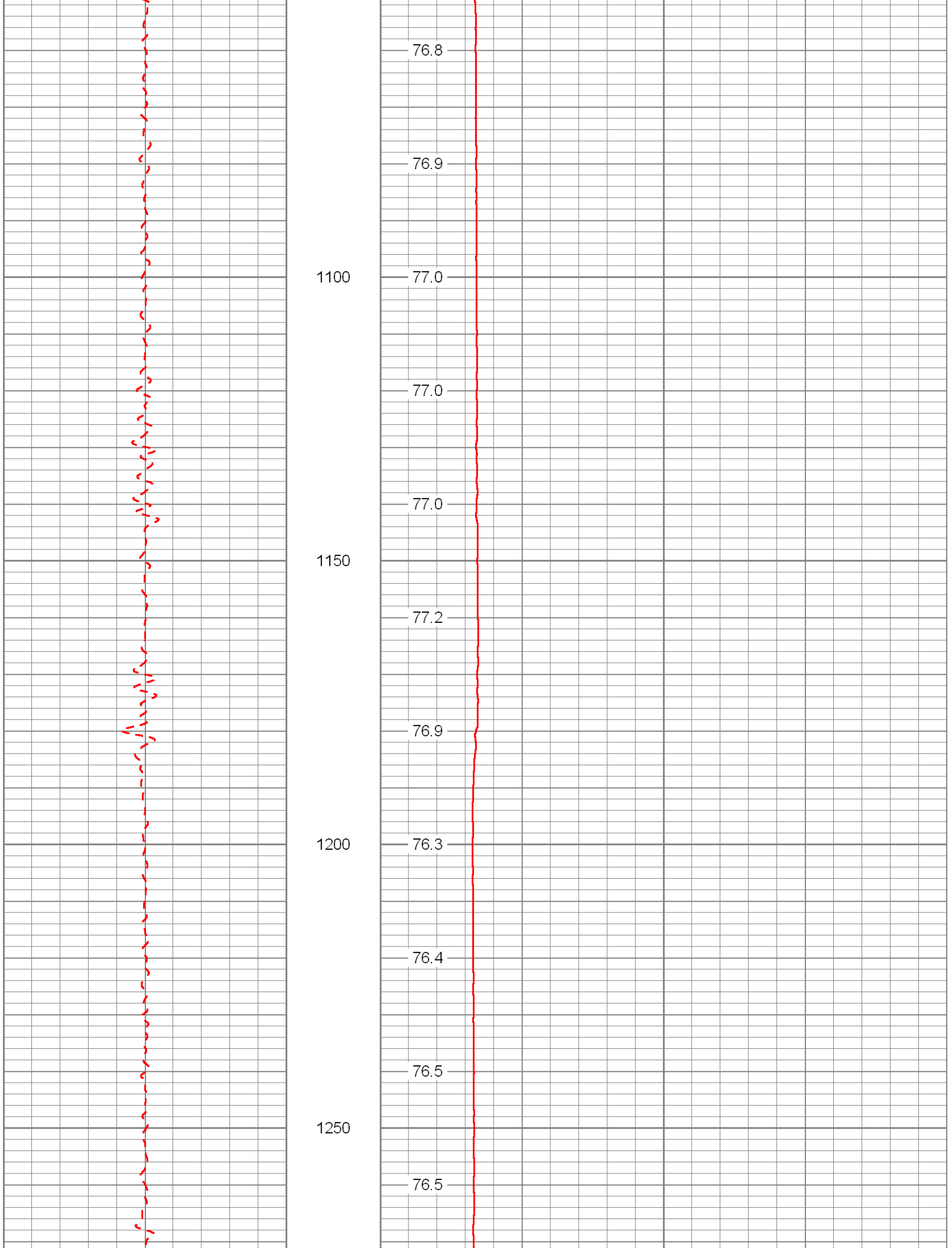


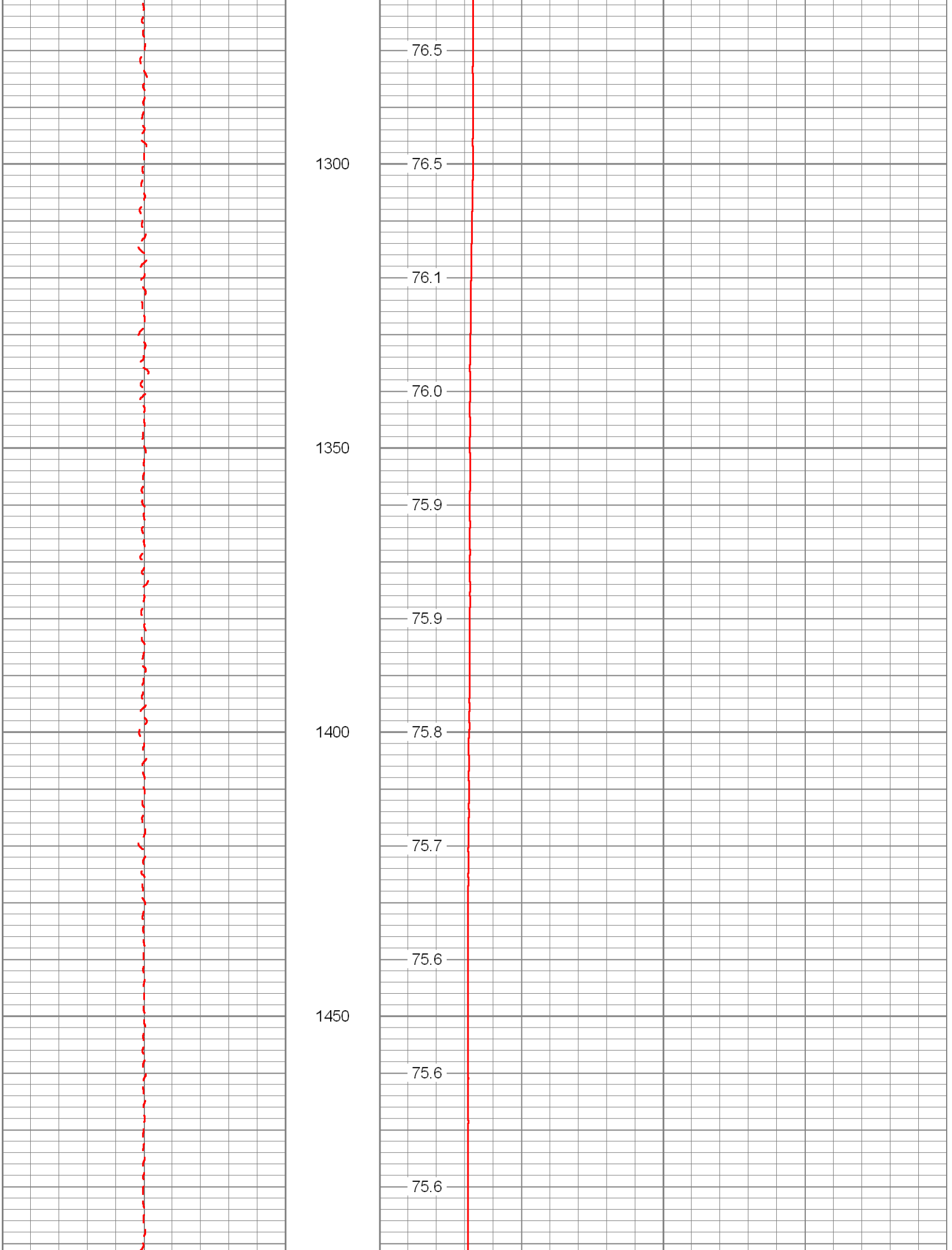

75.9
200
75.9
75.8
75.8
250
75.8
75.9
300
75.9
76.0
76.1
350
76.1
76.3

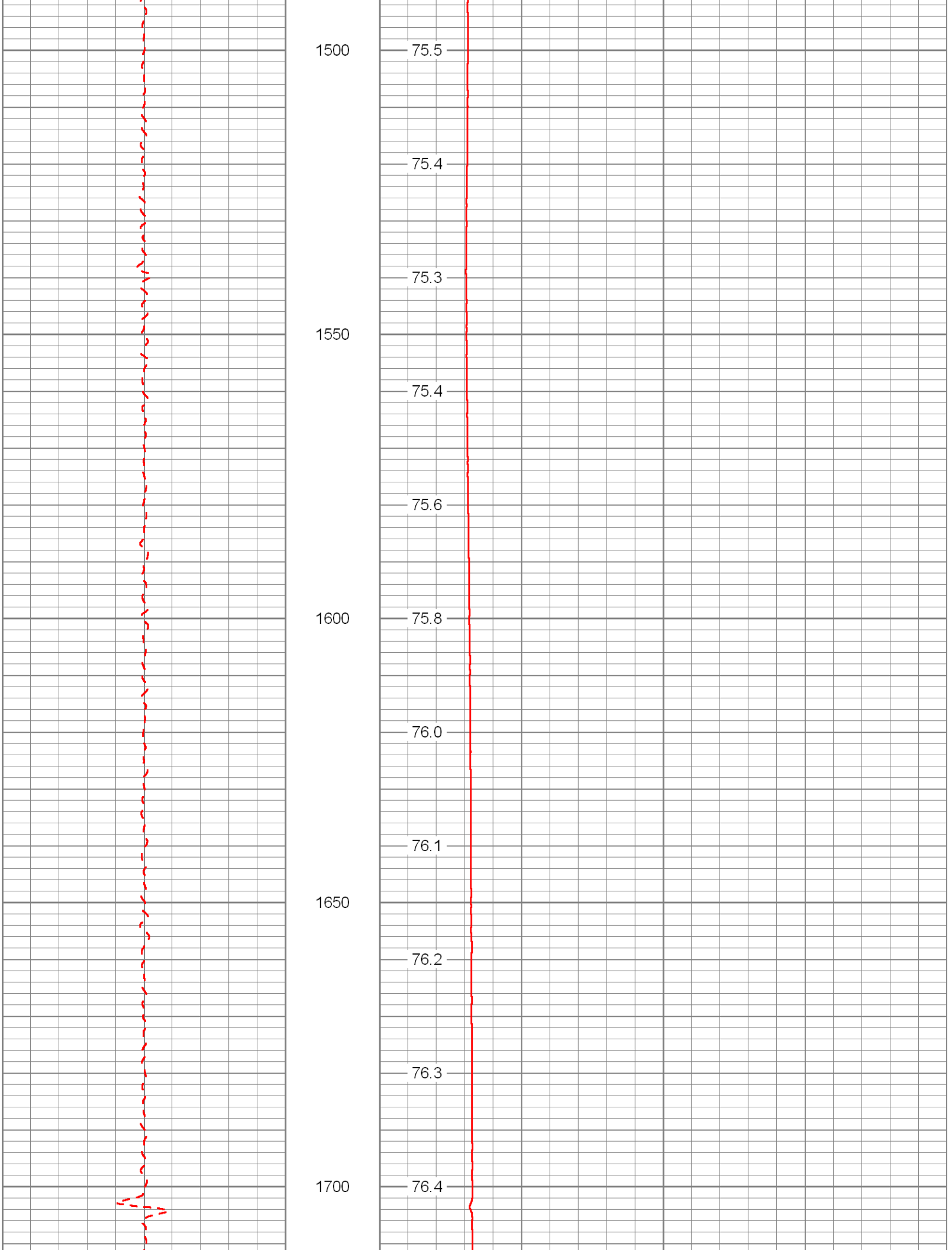

400
76.4
76.4
76.5
450
76.4
76.5
500
76.6
76.5
76.5
550
76.5
76.5
600
76.6


76.6
76.6
650
76.5
76.6
700
76.5
76.6
76.6
750
76.6
76.6
800
76.6
76.6


76.6
850
76.6
76.7
900
76.7
76.7
76.8
950
76.8
76.7
1000
76.7
76.8
76.8
1050


76.8
76.9
1100
77.0
77.0
77.0
1150
77.2
76.9
1200
76.3
76.4
76.5
1250
76.5


76.5
1300
76.5
76.1
76.0
1350
75.9
75.9
1400
75.8
75.7
75.6
1450
75.6
75.6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75.6
1600
75.8
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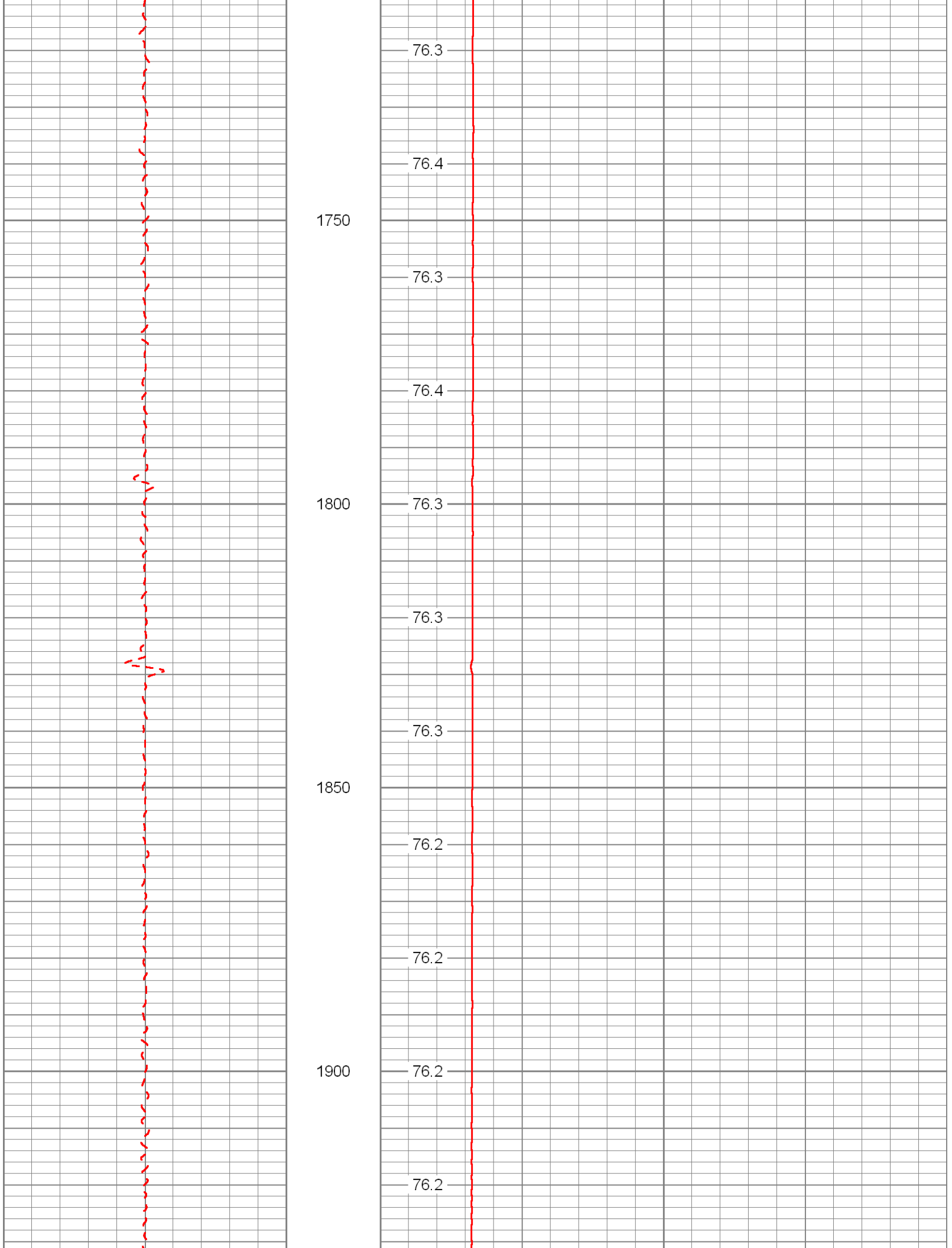
76.1
1650
76.2
76.3
1700
76.4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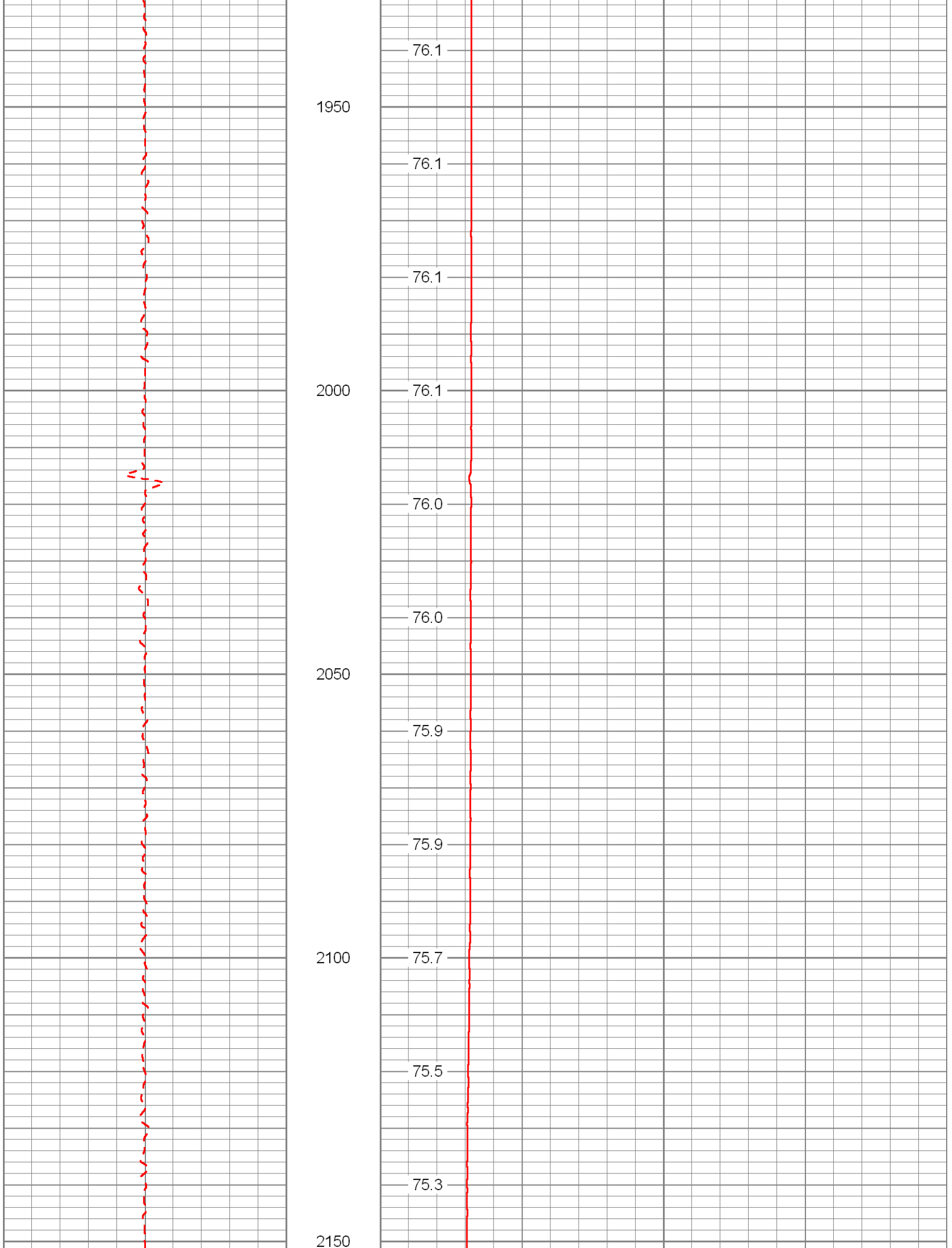
76.2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2000
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76.0
2050
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75.9
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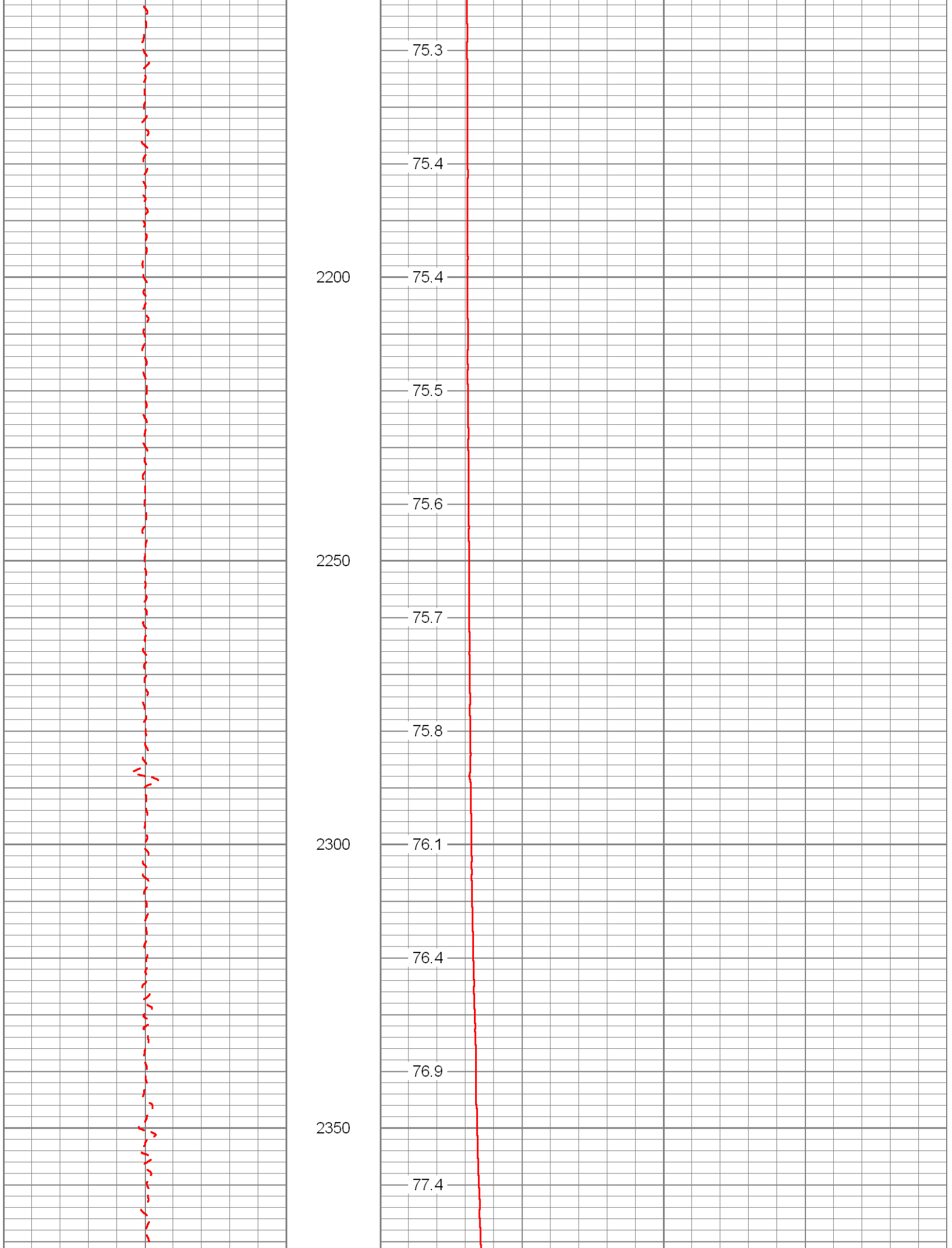
75.5
75.3
2150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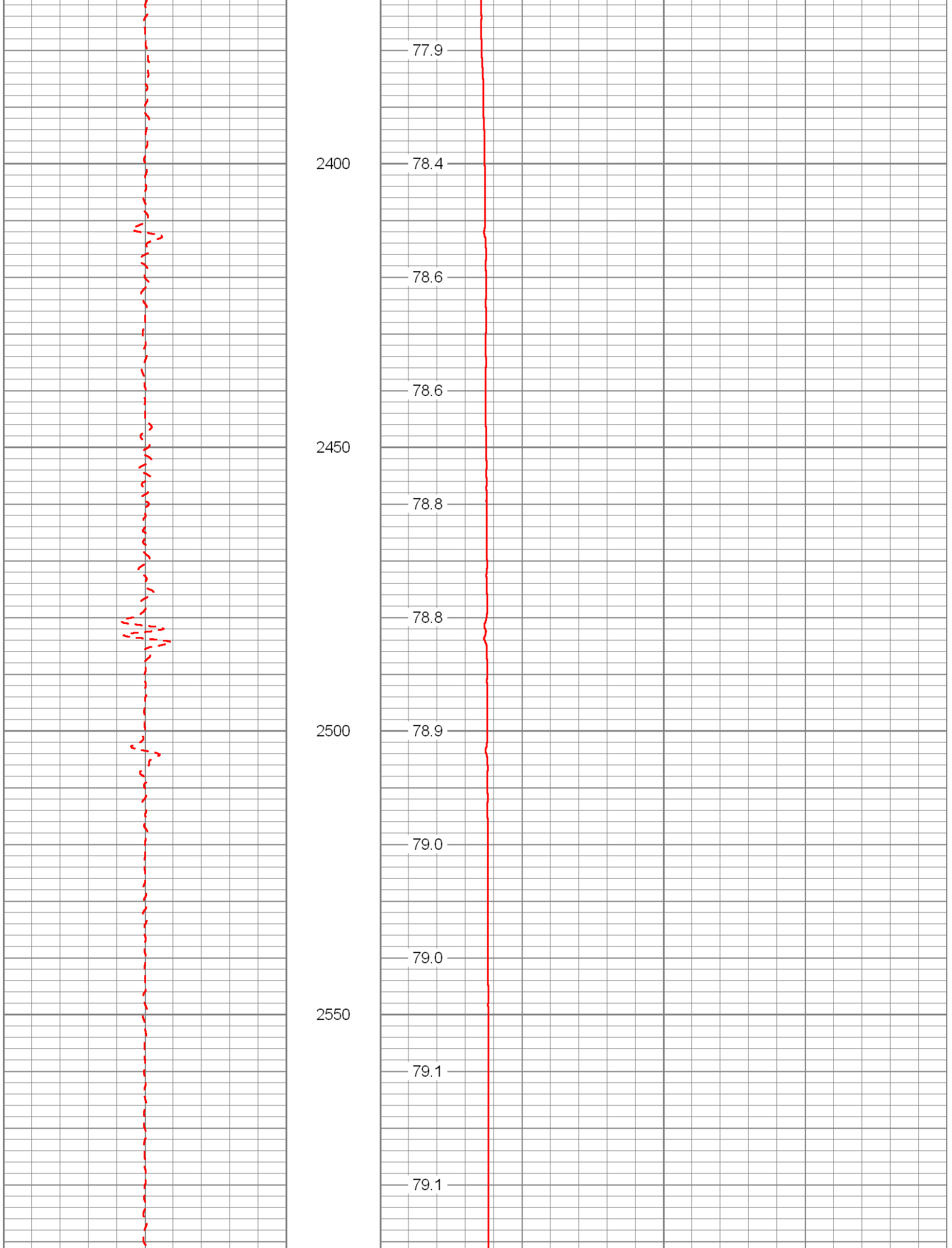
75.7
75.8
2300
76.1
76.4
76.9
2350
77.4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2400
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78.6
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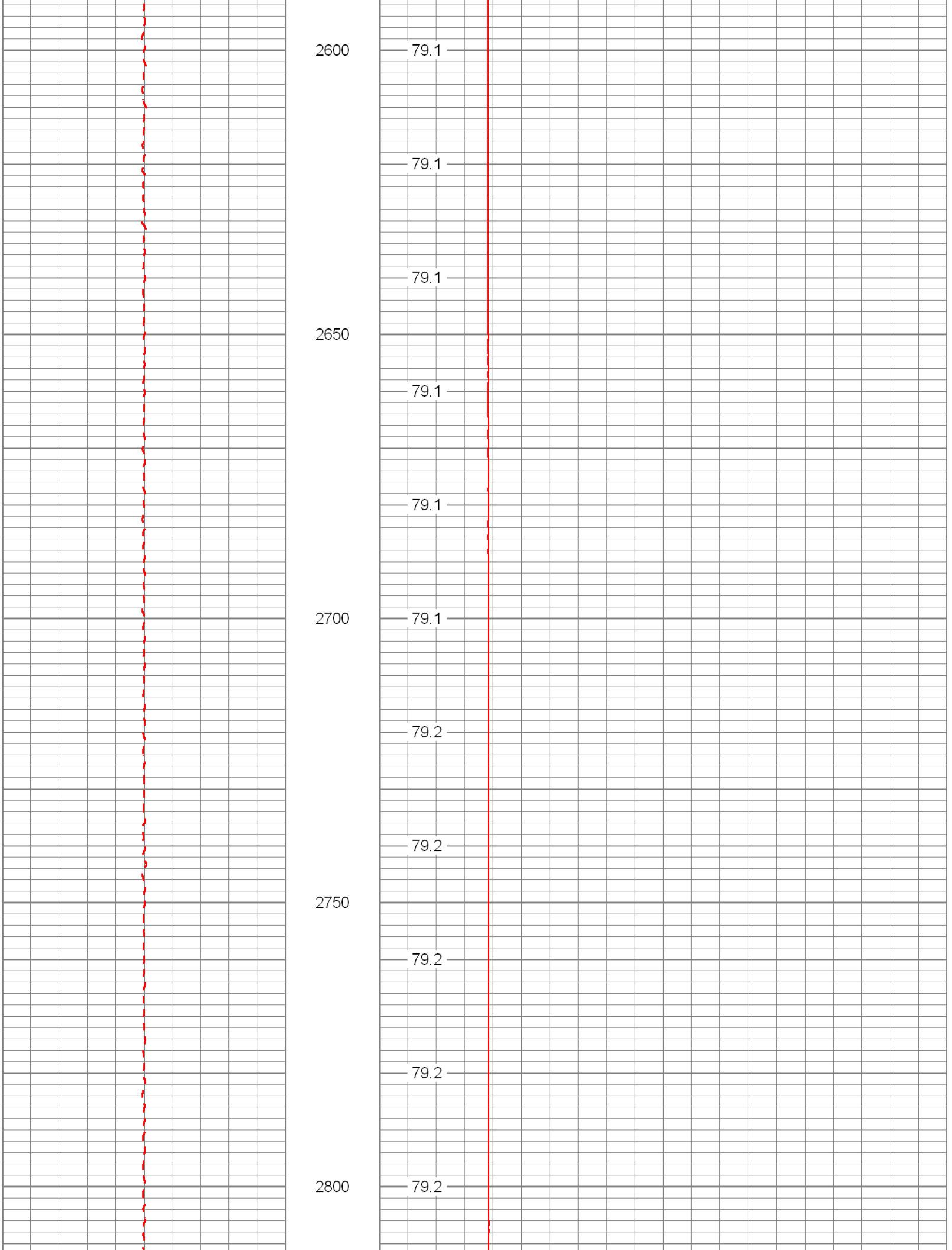
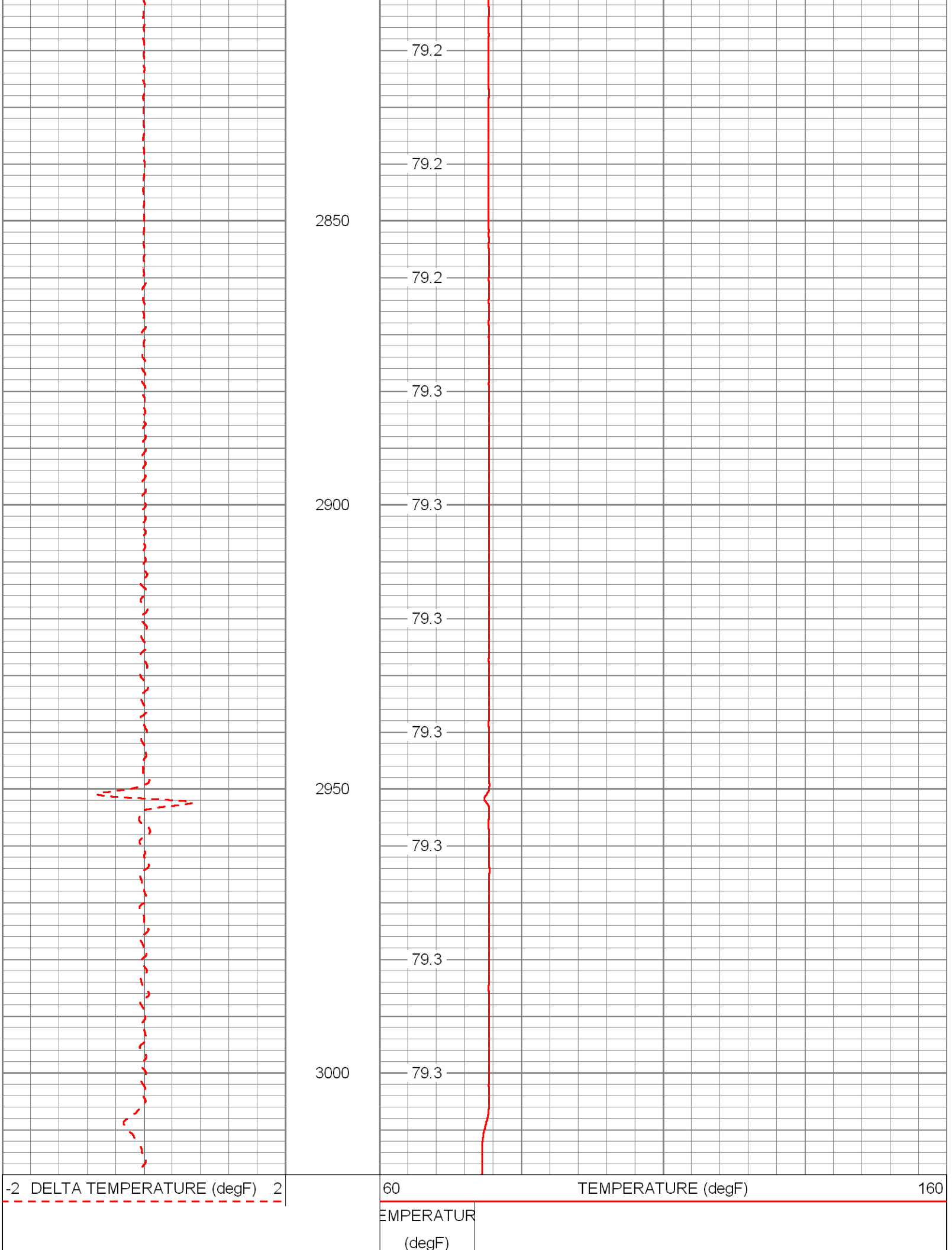
78.8
78.8
2500
78.9
79.0
79.0
2550
79.1
79.1


2600
79.1
79.1
79.1
2650
79.1
79.1
2700
79.1
79.2
79.2
2750
79.2
79.2
2800
79.2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79.2
2850
79.2
79.3
2900
79.3
79.3
79.3
2950
79.3
79.3
3000
79.3
-2 DELTA TEMPERATURE (degF) 2
60
TEMPERATURE (degF)
160
EMPERATUR
(degF)

Calibration Report

Database File: sdwwtp-iw17.db
Dataset Pathname: pass1
Dataset Creation: Wed Jul 17 08:41:10 2013 by Log SOC 110722

Temperature Calibration Report

Serial Number: 952
Tool Model: RTS
Performed: Wed Jun 19 08:20:23 2013

Point #	Reading		Reference	
1	439.20	cps	33.00	degF
2	912.13	cps	85.00	degF
3	1637.63	cps	155.00	degF
4		cps		degF
5		cps		degF
6		cps		degF
7		cps		degF
8		cps		degF
9		cps		degF
10		cps		degF

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)
			TEMP-RTS (952)	25.50	1.69	70.00

TEMP	0.10						

Dataset: sdwwtp-iw17.db: field/well/run1/pass1
Total Length: 25.50 ft
Total Weight: 70.00 lb
O.D. 1.69 in

Appendix F

Television Survey

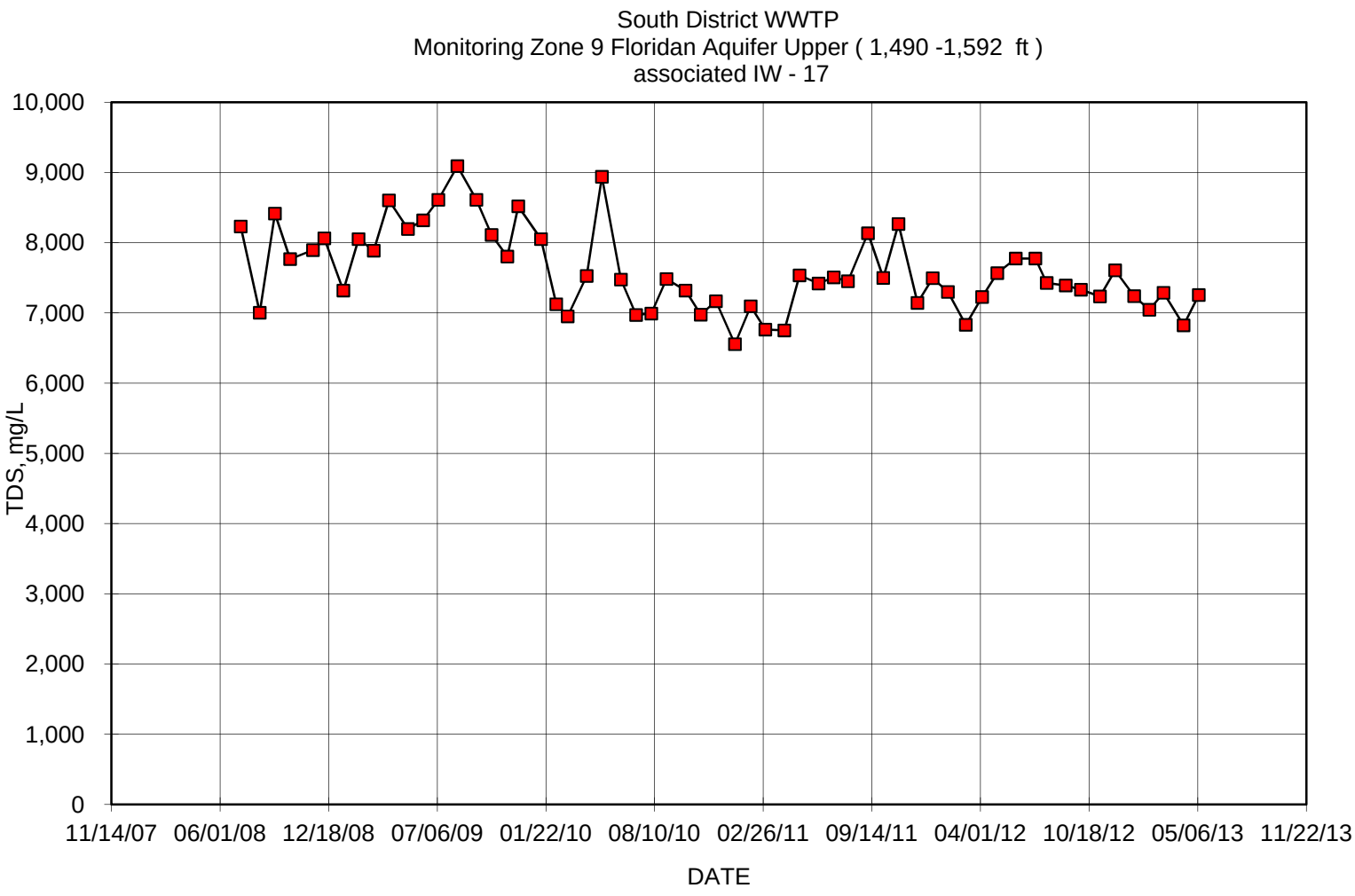
Appendix G

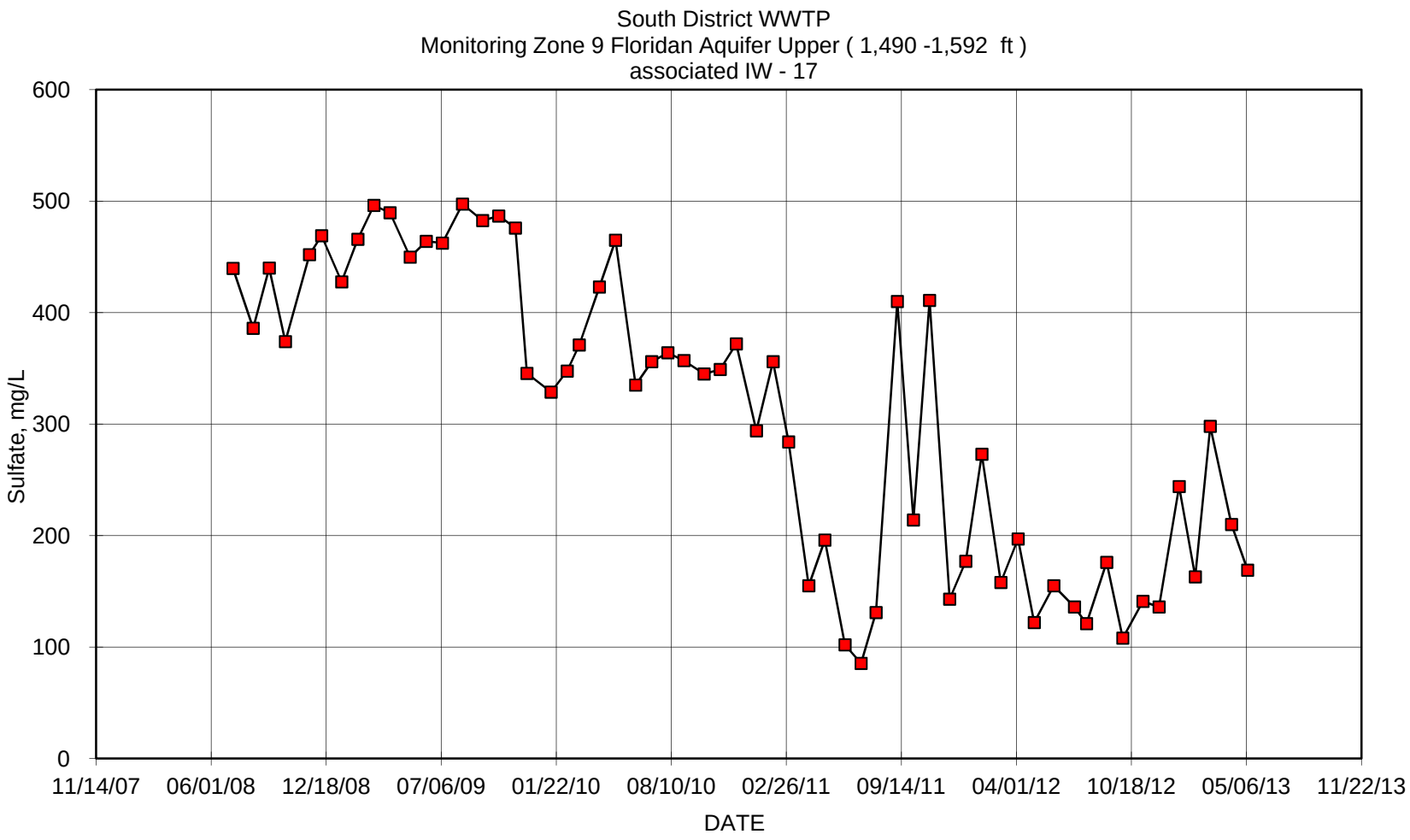
5 year Monitoring Data

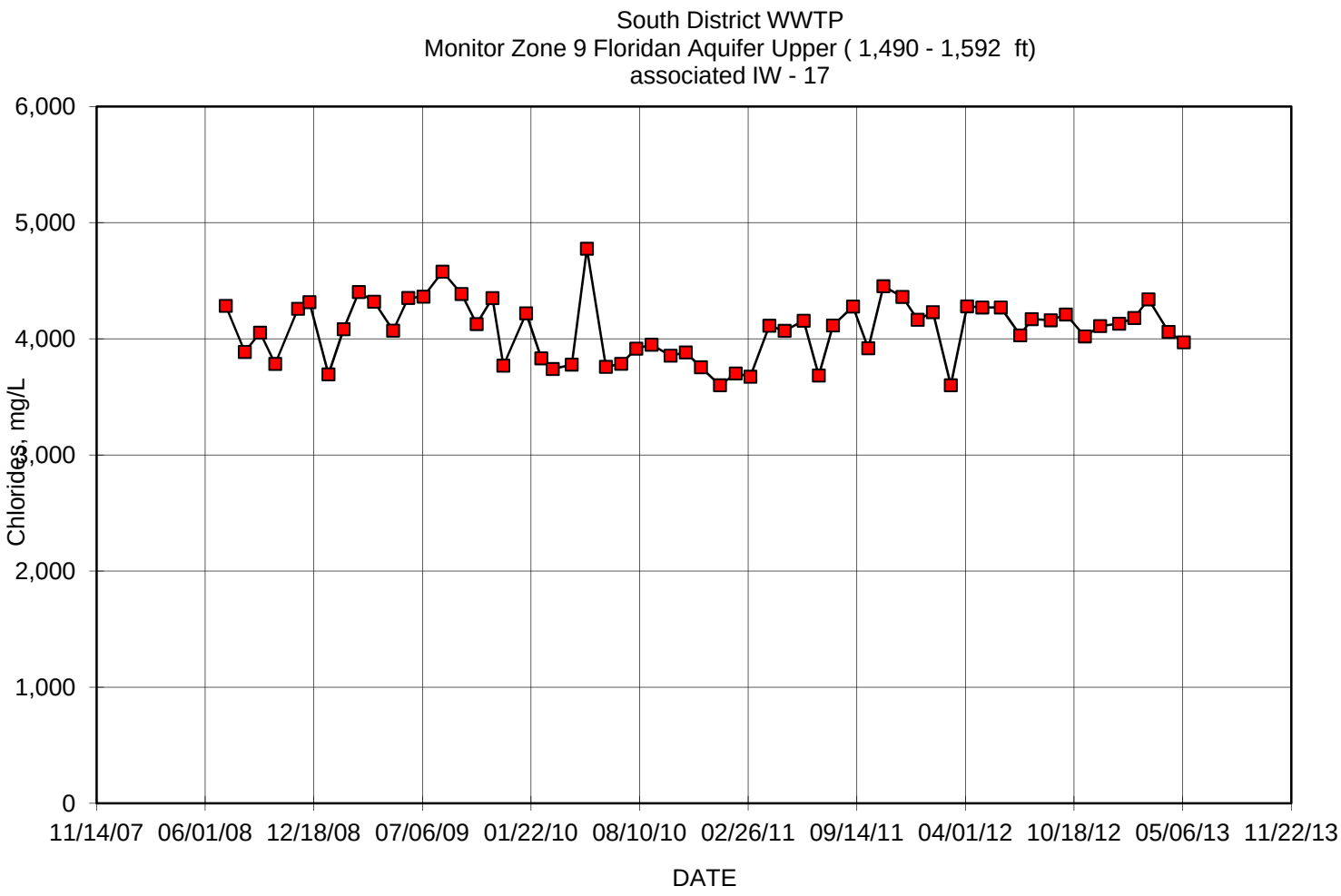
FA-9 Upper

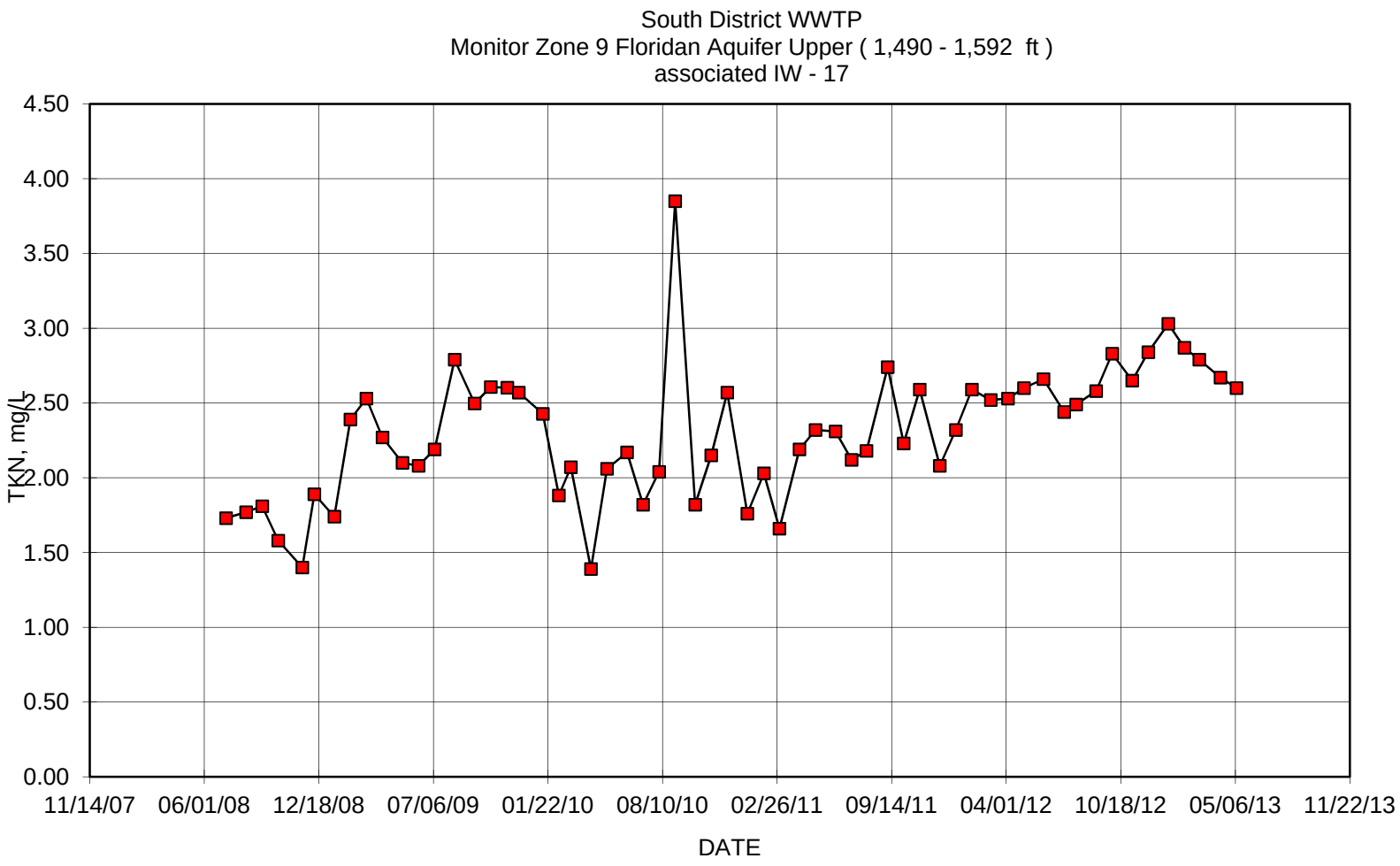
Date	TDS, mg/L	Sulfate, mg/L	Chlorides, mg/L	TKN, mg/L	NH3, mg/L	Conductivity, Micromho/cm	Temp., C	Temp., F	pH	TP, mg/L	NO3 mg/L	TSS mg/L	Sodium mg/L	Gross Aplha pCi/L	Radium 226 pCi/L	Radium 228 pCi/L
07/09/08	8,232	440	4,284	1.73	0.89	12,910	26	78	7.6	0.01	0.03	18.20				
08/13/08	7,004	386	3,887	1.77	1.35	11,820	27	80	7.2	0.01	0.01	16.80				
09/10/08	8,416	440	4,053	1.81	1.60	12,930	26	79	7.6	0.01	0.08	16.60				
10/08/08	7,768	374	3,784	1.58	1.23	12,380	26	79	7.2	0.01	0.03	16.20				
11/19/08	7,896	452	4,259	1.40	1.54	12,900	23	73	7.5	0.00	0.03	18.60				
12/10/08	8,064	469	4,316	1.89	1.60	12,980	25	76	7.2	0.02	0.03	16.00				
01/14/09	7,320	428	3,694	1.74	1.44	11,860	20	68	7.5	0.04	0.03	20.00				
02/11/09	8,052	466	4,083	2.39	2.03	13,880	24	76	7.4	0.12	0.00	14.20				
03/11/09	7,888	496	4,403	2.53	1.97	13,120	24	75	7.3	0.14	0.00	13.20				
04/08/09	8,604	490	4,320	2.27	2.27	13,440	24	75	7.5	0.02	0.00	18.60				
05/13/09	8,196	450	4,071	2.10	2.10	13,350	26	79	7.7	0.00	0.00	17.40				
06/10/09	8,320	464	4,352	2.08	2.23	13,220	26	78	7.5	0.14	0.03	20.60				
07/08/09	8,612	462	4,363	2.19	2.25	13,430	26	79	7.2	0.01	0.00	23.40				
08/12/09	9,092	497	4,578	2.79	3.70	14,310	25	76	7.4	0.01	0.00	17.20				
09/16/09	8,612	483	4,386	2.50	1.97	14,080			7.2	0.03	0.05		2410	21.1	7.0	0.9
10/14/09	8,112	487	4,127	2.61	2.12	13,080			7.3	0.01	0.00		2260	17.0	9.9	0.7
11/12/09	7,804	476	4,351	2.60	2.14	12,310			7.5	0.01	0.00		2020	15.1	7.8	0.8
12/02/09	8,520	346	3,769	2.57	2.24	12,850	27	81	7.3	0.01	0.03	26.80	2160	6.2	6.7	0.8
01/13/10	8,052	329	4,220	2.43	2.11	12,590	18	64	7.3	0.01	0.00	12.60	1880	7.5	5.5	1.5
02/10/10	7,124	348	3,832	1.88	1.71	11,520	24	75	7.2	0.02	0.00	13.80	1940	11.5	6.1	0.7
03/03/10	6,952	371	3,740	2.07	1.68	11,600	20	68	7.1	0.02	0.00	14.20	1950	5.3	5.8	0.9
04/07/10	7,528	423	3,778	1.39	1.63	11,830	27	81	7.2	0.01	0.01	21.80	1650	13.8	7.2	0.7
05/05/10	8,940	465	4,776	2.06	2.06	13,650	27	80	7.1	0.01	0.01	21.20	2430	7.2	7.5	0.9
06/09/10	7,476	335	3,759	2.17	1.58	12,340	30	87	7.1	0.03	0.01	13.00	1940	27.4	7.3	0.8
07/07/10	6,972	356	3,785	1.82	1.61	11,710	30	86	7.4	0.02	0.01	10.00	1910	16.7	6.5	0.6
08/04/10	6,992	364	3,916	2.04	1.90	10,900	27	81	7.4	0.23	0.01	14.60	1890	20.1	6.1	0.7
09/01/10	7,484	357	3,949	3.85	1.91	12,260	27	81	7.2	0.02	0.01	17.00	2040	12.9	4.7	0.9
10/06/10	7,320	345	3,855	1.82	1.97	11,860	24	76	7.3	0.02	0.00	7.00	2060	23.0	5.3	0.8
11/03/10	6,976	349	3,883	2.15	1.95	11,360	24	75	7.7	0.01	0.01	4.40	2260	13.6	5.0	0.9
12/01/10	7,168	372	3,755	2.57	1.96	11,530	24	76	7.6	0.02	0.00	6.40	1920	13.5	4.4	0.9
01/05/11	6,556	294	3,600	1.76	1.72	11,260	23	74	7.5	0.02	0.00	3.60	1980	12.1	5.6	0.9
02/03/11	7,096	356	3,702	2.03	1.72	10,860	23	73	7.5	0.11	0.01	6.10	1910	10.9	6.8	0.7

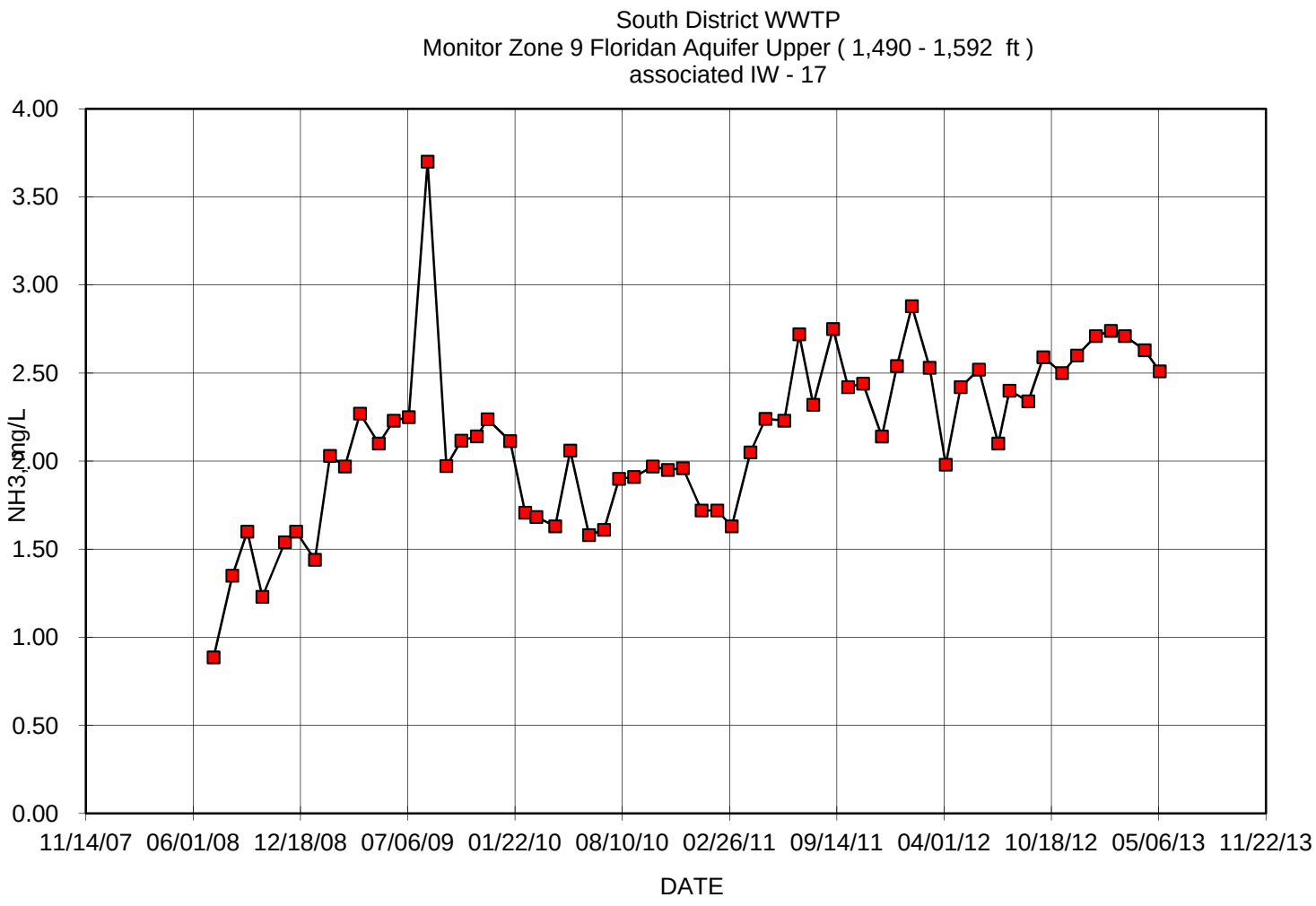
03/02/11	6,764	284	3,674	1.66	1.63	11,170	22	72	7.9	0.02	0.00	6.10	1800	7.7	4.6	0.8
04/06/11	6,752	155	4,113	2.19	2.05	11,370	22	72	8.6	0.02	0.01	2.50	2170	18.7	5.5	0.9
05/04/11	7,536	196	4,069	2.32	2.24	11,740	24	75	8.6	0.02	0.00	1.50	1800	12.3	5.3	0.8
06/08/11	7,420	102	4,156	2.31	2.23	11,960	27	80	8.7	0.04	0.04	1.10	2210	18.4	3.1	0.7
07/06/11	7,508	85	3,684	2.12	2.72	11,700	26	79	8.7	0.02	0.01	0.40	2270	8.0	4.1	0.7
08/01/11	7,452	131	4,115	2.18	2.32	11,590	34	92	8.8	0.00	0.00	1.20	2070	11.6	6.4	0.8
09/07/11	8,136	410	4,278	2.74	2.75	12,450	28	82	7.6	0.03	0.00	10.00	2220	45.8	7.1	0.9
10/05/11	7,500	214	3,919	2.23	2.42	11,360	23	74	8.3	0.02	0.00	3.30	2050	11.1	7.3	0.9
11/02/11	8,268	411	4,453	2.59	2.44	12,060	26	78	8.5	0.02	0.00	3.60	2290	14.5	5.5	0.9
12/07/11	7,144	143	4,361	2.08	2.14	12,010	24	76	8.8	0.02	0.01	1.30	2140	10.5	5.5	0.7
01/04/12	7,496	177	4,164	2.32	2.54	10,752	17	62	8.5	0.02	0.00	1.00	2210	14.0	4.6	0.6
02/01/12	7,300	273	4,230	2.59	2.88	10,860	25	77	8.7	0.02	0.01	1.50	2370	14.2	5.6	0.6
03/05/12	6,832	158	3,600	2.52	2.53	11,540	25	77	8.9	0.03	0.00	0.00	2270	14.4	7.0	1.0
04/04/12	7,228	197	4,280	2.53	1.98	11,801	24	75	8.6	0.03	0.50	0.50	2040	15.1	5.3	0.7
05/02/12	7,568	122	4,270	2.60	2.42	11,489	26	79	8.6	0.04	2.42	2.40	2300	10.8	6.0	0.8
06/05/12	7,776	155	4,270	2.66	2.52	12,190	24	75	9.4	0.00	0.01	0.50	2200	10.5	5.7	0.9
07/11/12	7,776	136	4,030	2.44	2.10	12,050	24	76	9.2	0.02	0.01	1.70	2250	11.1	0.5	0.9
08/01/12	7,428	121	4,170	2.49	2.40	11,879	26	79	9.1	0.01	0.01	0.30	2280	21.5	4.6	0.9
09/05/12	7,392	176	4,160	2.58	2.34	11,853	24	76	9.1	0.04	0.00	0.30	1980	7.8	5.2	0.8
10/03/12	7,332	108	4,210	2.83	2.59	11,570	25	77	9.1	0.03	0.00	0.50	2100	13.2	6.0	0.7
11/07/12	7,236	141	4,021	2.65	2.50	11,250	23	73	9.9	0.02	0.01	0.70	2250	13.7	7.3	0.9
12/05/12	7,608	136	4,110	2.84	2.60	11,870	23	74	9.1	0.03	0.00	2.50	2180	8.9	7.1	0.9
01/09/13	7,240	244	4,130	3.03	2.71	12,097	24	76	9.4	0.08	0.11	3.20	2120	11.2	4.3	4.3
02/06/13	7,046	163	4,180	2.87	2.74	11,890	25	77	9.1	0.01	0.02	0.40	1930	12.0	4.3	0.9
03/04/13	7,288	298	4,340	2.79	2.71	12,587	17	62	9.3	0.03	0.00	3.50	2520	13.7	5.2	0.8
04/10/13	6,824	210	4,060	2.67	2.63	12,264	24	75	9.1	0.03	0.00	0.03	2230	10.7	5.6	0.7
05/08/13	7,256	169	3,970	2.60	2.51	12,197	27	80	8.9	0.05	0.01	0.05	2270	15.4	5.1	0.9

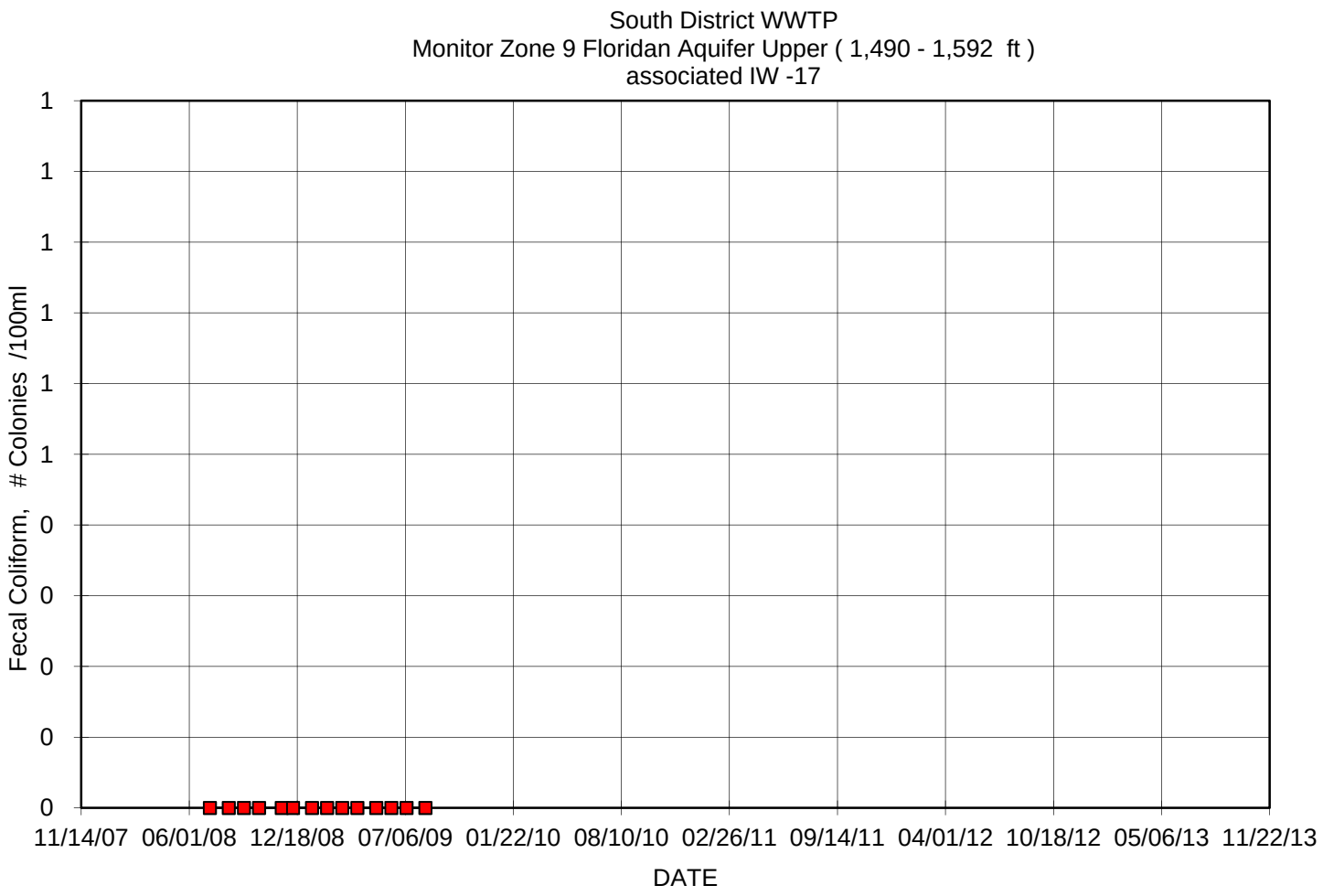

South District WWTP
Monitoring Zone 9 Floridan Aquifer Upper (1,490 -1,592 ft)
associated IW - 17
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
TDS, mg/L
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

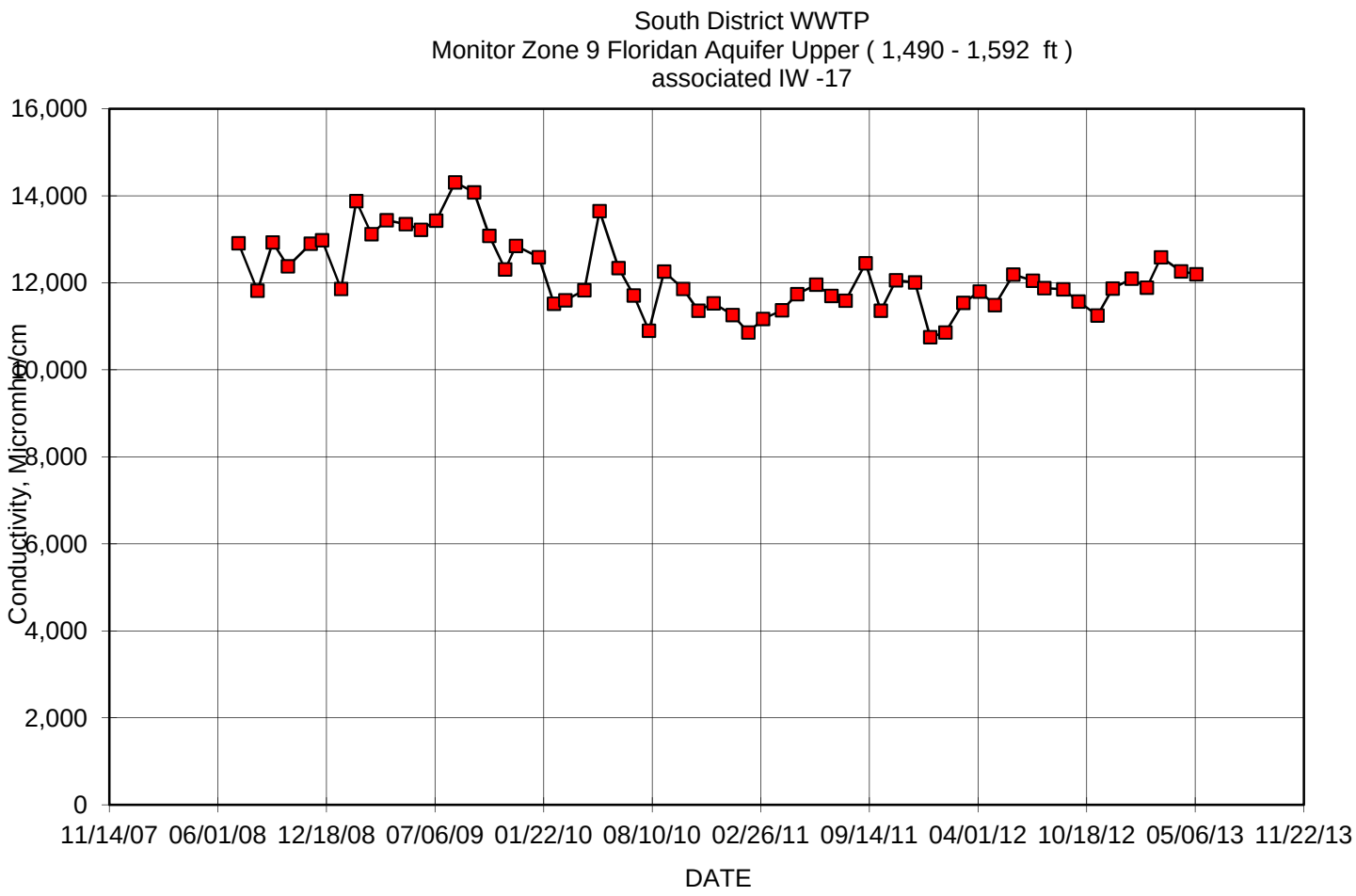

South District WWTP
Monitoring Zone 9 Floridan Aquifer Upper (1,490 -1,592 ft)
associated IW - 17
Sulfate, mg/L
600
500
400
300
200
100
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

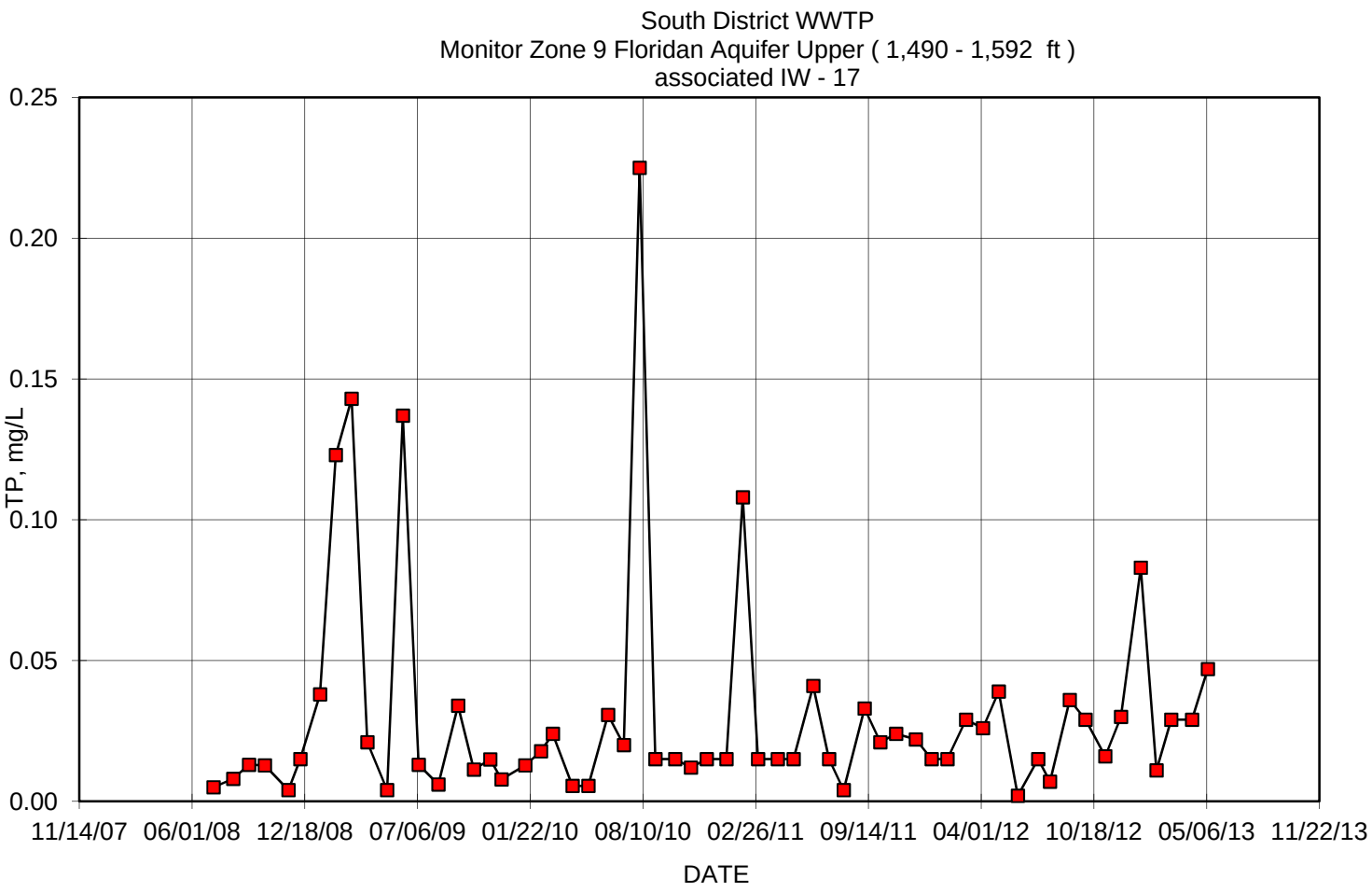

South District WWTP
Monitor Zone 9 Floridan Aquifer Upper (1,490 - 1,592 ft)
associated IW - 17
6,000
5,000
4,000
3,000
2,000
1,000
0
Chlorides, mg/L
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

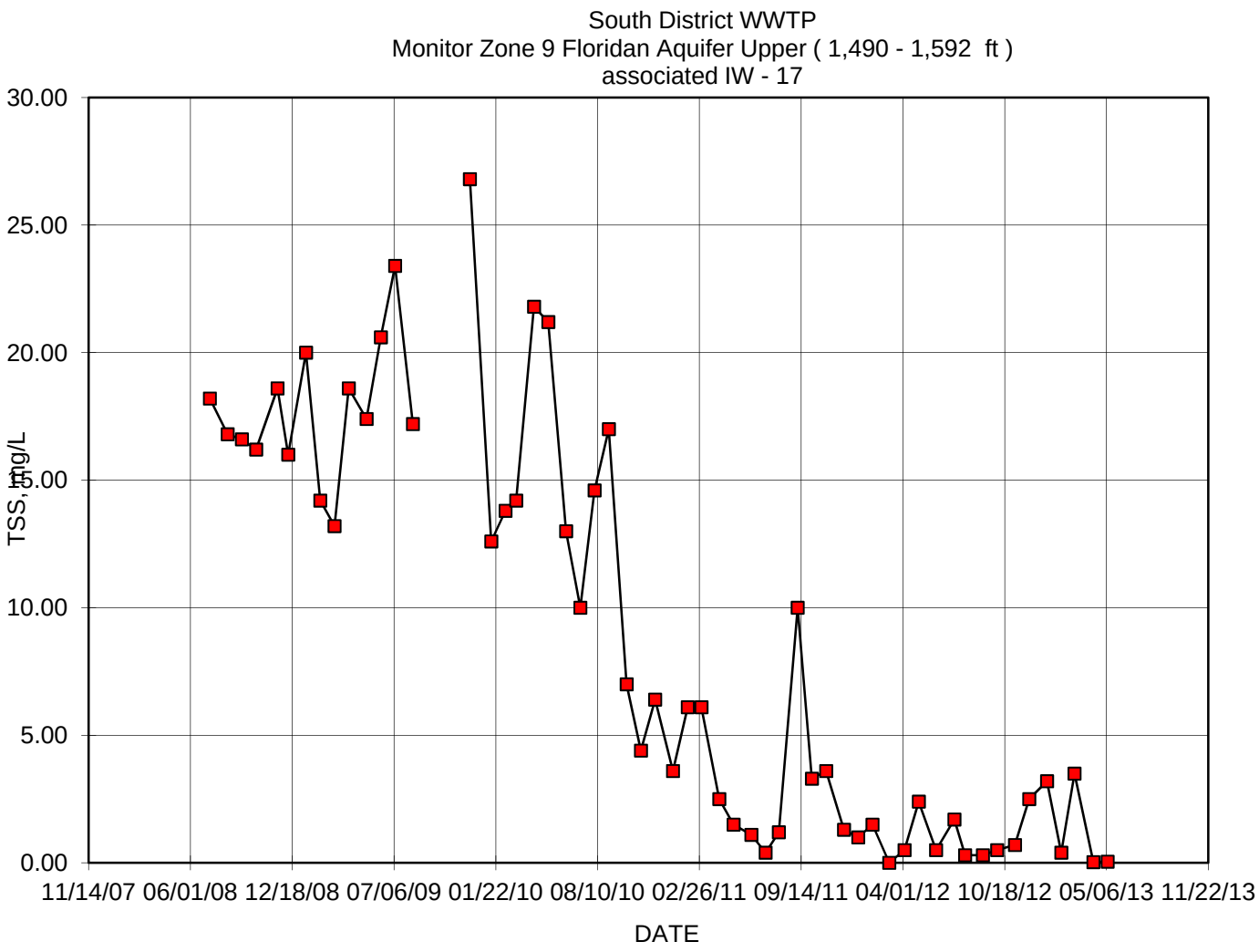

South District WWTP
Monitor Zone 9 Floridan Aquifer Upper (1,490 - 1,592 ft)
associated IW - 17
TKN, mg/L
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 9 Floridan Aquifer Upper (1,490 - 1,592 ft)
associated IW - 17
NH3,mg/L
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 9 Floridan Aquifer Upper (1,490 - 1,592 ft)
associated IW -17
Fecal Coliform, # Colonies /100ml
1
1
1
1
1
1
0
0
0
0
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 9 Floridan Aquifer Upper (1,490 - 1,592 ft)
associated IW -17
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
Conductivity, Micromho/cm
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

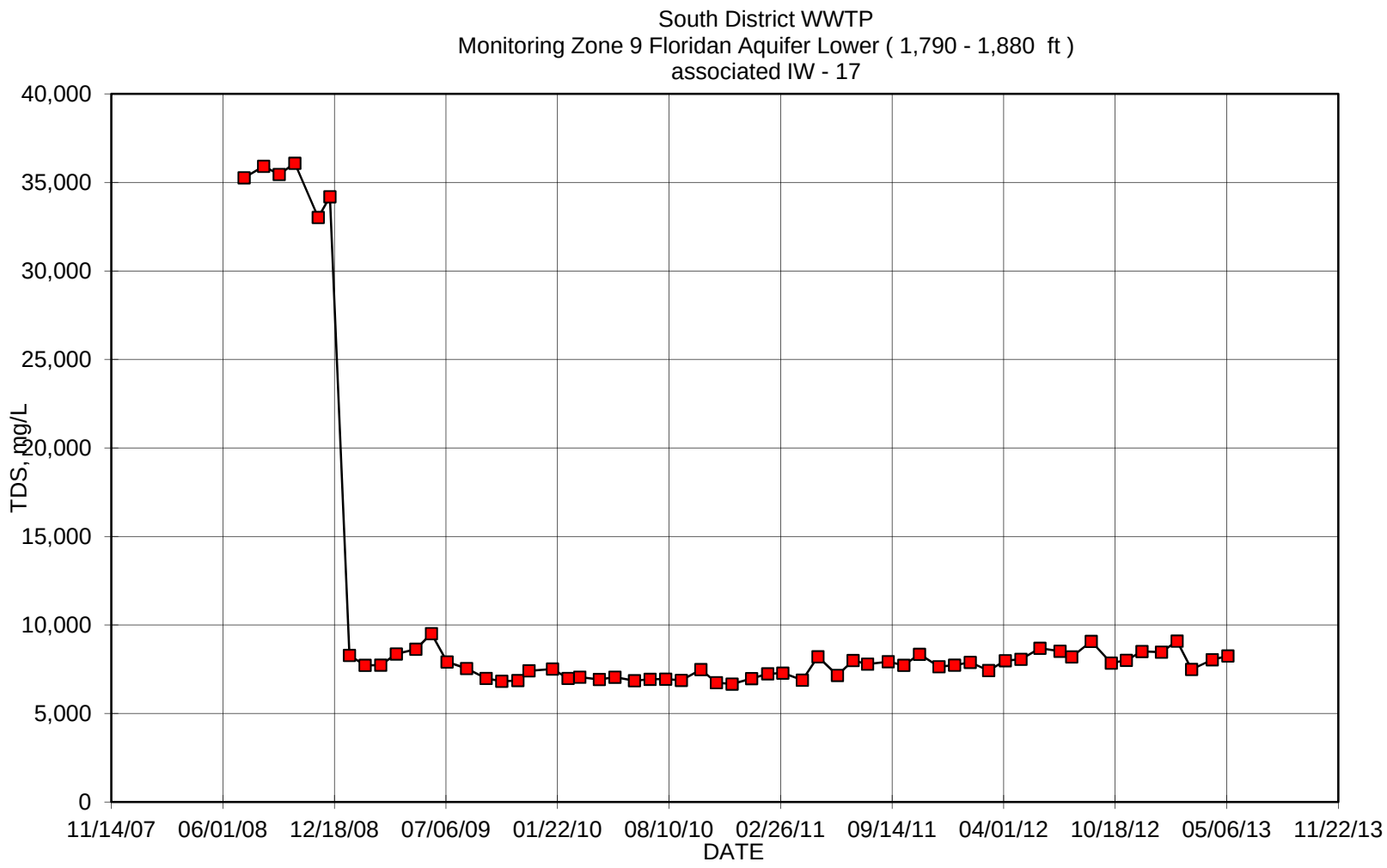

South District WWTP
Monitor Zone 9 Floridan Aquifer Upper (1,490 - 1,592 ft)
associated IW - 17
0.25
0.20
0.15
0.10
0.05
0.00
TP, mg/L
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

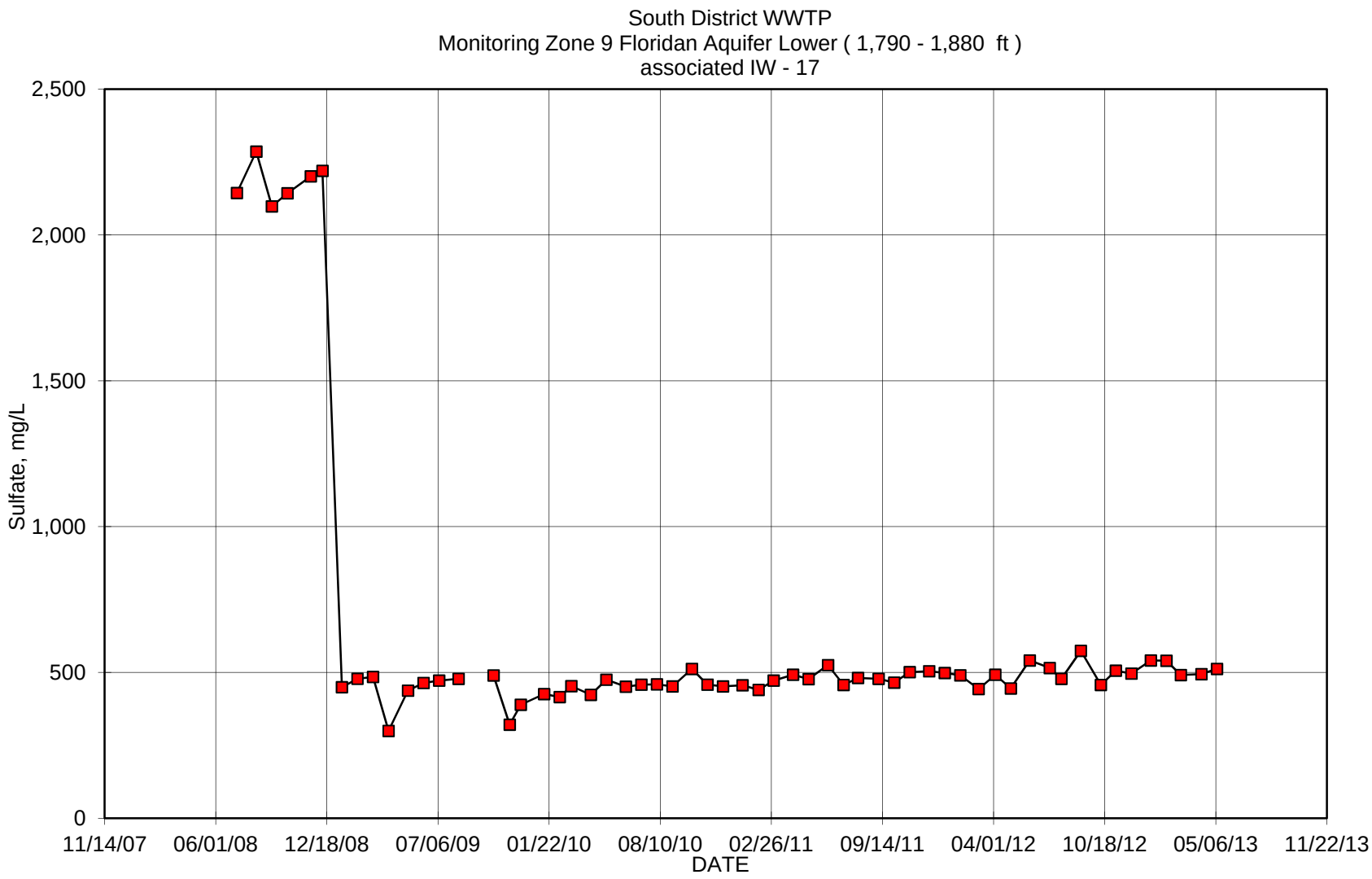

South District WWTP
Monitor Zone 9 Floridan Aquifer Upper (1,490 - 1,592 ft)
associated IW - 17
30.00
25.00
20.00
15.00
10.00
5.00
0.00
TSS, mg/L
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

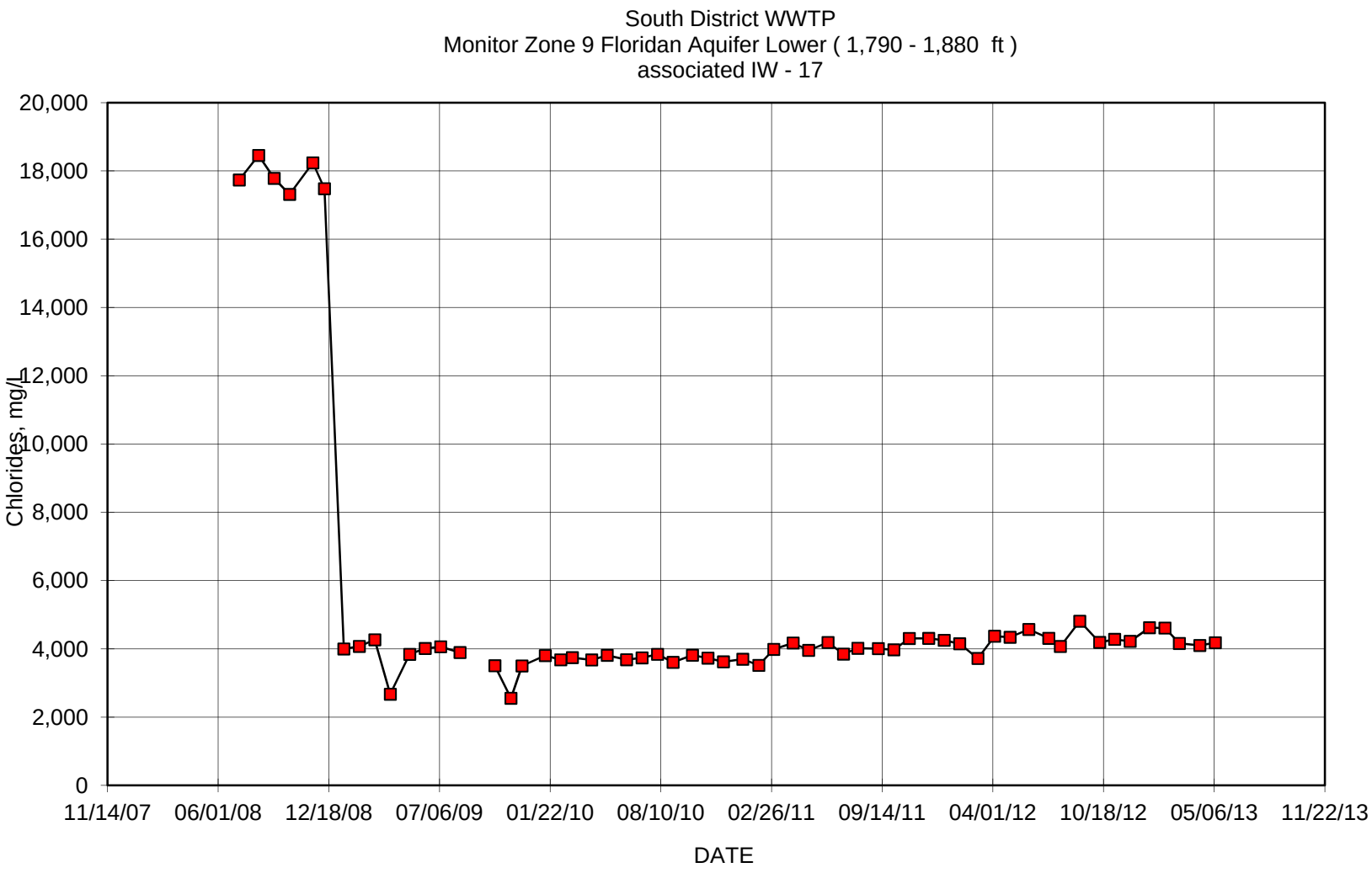
FA-9 Lower Data

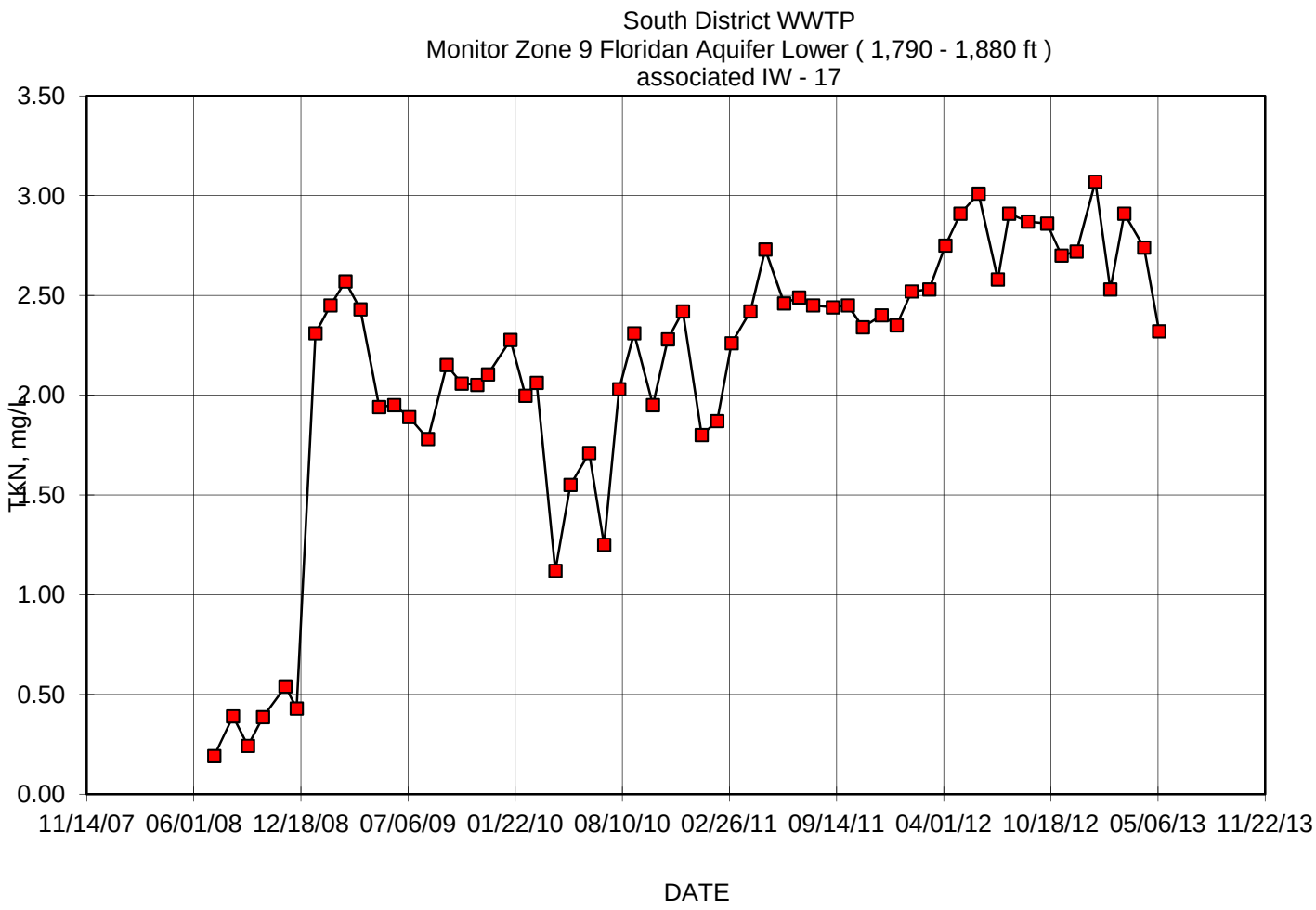
Date	TDS, mg/L	Sulfate, mg/L	Chlorides, mg/L	TKN, mg/L	NH3, mg/L	Conductivity, Micromho/cm	Temp., C	Temp., F	pH	TP, mg/L	NO3 mg/L	TSS mg/L	Sodium mg/L	Gross Aplha pCi/L	Radium 226 pCi/L	Radium 228 pCi/L
07/09/08	35,260	2,144	17,734	0.19	0.01	49,050	25	76	7.5	0.01	0.03	0.01				
08/13/08	35,910	2,286	18,455	0.39	0.10	48,700	25	78	7.6	0.01	0.08	25.20				
09/10/08	35,450	2,098	17,783	0.24	0.02	45,860	26	79	7.4	0.02	0.08	40.00				
10/08/08	36,080	2,143	17,313	0.39	0.05	46,230	25	78	7.6	0.02	0.03	35.20				
11/19/08	33,020	2,201	18,238	0.54	0.19	48,890	23	73	7.5	0.01	0.03	29.60				
12/10/08	34,190	2,220	17,480	0.43	0.07	48,760	24	75	7.3	0.02	0.03	20.60				
01/14/09	8,280	449	3,998	2.31	1.81	12,600	20	68	7.6	0.04	0.03	10.20				
02/11/09	7,720	478	4,073	2.45	2.06	13,330	24	74	7.6	0.11	0.00	9.60				
03/11/09	7,730	485	4,266	2.57	1.87	13,370	23	74	7.4	0.10	0.01	4.40				
04/08/09	8,360	299	2,672	2.43	2.13	13,090	23	73	7.3	0.03	0.00	7.20				
05/13/09	8,630	438	3,840	1.94	1.93	12,690	24	76	7.6	0.00	0.00	6.00				
06/10/09	9,510	464	4,012	1.95	2.02	13,660	24	75	7.4	0.16	0.00	4.40				
07/08/09	7,910	472	4,062	1.89	1.49	12,320	24	75	7.4	0.00	0.00	4.60				
08/12/09	7,540	478	3,893	1.78	2.93	12,220	23	74	7.7	0.01	0.00	5.80				
09/16/09	6,980			2.15	1.50	11,830			7.7	0.01	0.05		1950	48.6	6.5	0.8
10/14/09	6,820	490	3,507	2.06	1.54	11,590			7.7	0.01	0.00		1840	14.2	7.2	0.8
11/12/09	6,860	321	2,554	2.05	1.60	12,020			8.5	0.02	0.00		1890	15.0	6.7	0.9
12/02/09	7,410	389	3,501	2.10	1.77	11,300	24	75	7.6	0.02	0.00	6.60	1740	11.5	5.7	1.2
01/13/10	7,510	426	3,804	2.28	1.88	11,820	21	70	7.4	0.03	0.00	4.20	1830	20.5	7.5	1.0
02/10/10	6,980	416	3,679	2.00	1.71	11,280	23	73	7.5	7.53	0.00	2.40	1890	10.2	6.3	0.7
03/03/10	7,050	453	3,744	2.06	1.66	11,520	22	71	7.4	0.03	0.00	2.40	1900	22.0	8.3	0.8
04/07/10	6,920	423	3,676	1.12	1.53	11,520	23	74	7.5	0.03	0.00	4.40	1950	14.3	6.3	0.7
05/05/10	7,048	475	3,811	1.55	1.53	11,370	25	76	7.5	0.01	0.00	1.60	1930	13.1	6.1	0.8
06/09/10	6,850	451	3,682	1.71	1.48	11,750	25	77	7.5	0.06	0.02	0.00	1810	17.1	7.9	0.9
07/07/10	6,930	458	3,737	1.25	1.68	11,620	25	77	7.5	0.03	0.01	3.80	1970	15.0	8.2	0.7
08/04/10	6,940	459	3,841	2.03	2.01	11,320	24	75	7.5	0.15	0.00	4.20	1950	31.7	6.5	0.8
09/01/10	6,870	452	3,605	2.31	1.96	11,590	24	75	7.4	0.02	0.01	12.00	1920	13.6	6.3	0.9
10/06/10	7,480	512	3,814	1.95	2.18	11,930	23	73	7.7	0.02	0.01	0.60	2070	17.9	7.7	0.8
11/03/10	6,740	458	3,730	2.28	1.86	11,440	23	73	7.5	0.01	0.00	1.60	1880	14.8	7.0	0.8
12/01/10	6,660	452	3,621	2.42	1.87	11,420	23	73	7.4	0.02	0.00	3.80	1960	29.3	6.3	0.9
01/05/11	6,970	456	3,697	1.80	1.99	10,800	25	77	7.8	0.01	0.00	2.10	2000	11.4	7.9	0.9
02/03/11	7,240	440	3,517	1.87	1.69	10,710	23	74	7.6	0.10	0.01	2.50	1910	15.9	8.2	0.9
03/02/11	7,280	472	3,986	2.26	2.35	12,240	22	72	7.5	0.02	0.00	8.70	2040	30.0	6.1	0.8

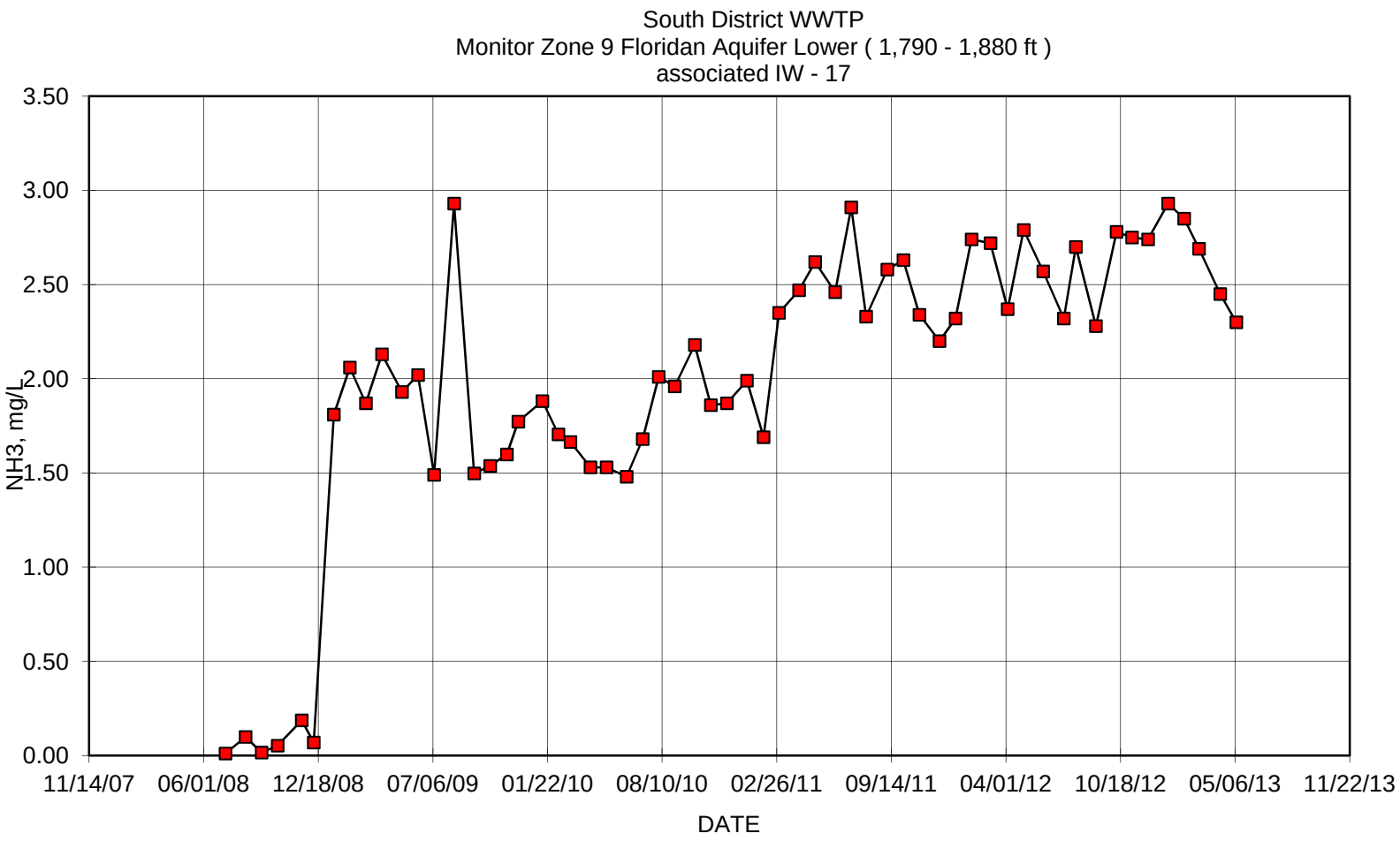
04/06/11	6,880	492	4,172	2.42	2.47	12,070	22	72	7.4	0.02	0.01	2.30	2170	14.8	8.3	0.8
05/04/11	8,204	477	3,956	2.73	2.62	13,080	23	73	7.7	0.02	0.00	2.70	1750	12.7	8.7	0.9
06/08/11	7,150	525	4,188	2.46	2.46	12,530	24	74	7.5	0.05	0.00	0.30	2290	15.8	6.2	0.8
07/06/11	7,992	457	3,848	2.49	2.91	12,320	23	74	7.8	7.78	0.01	3.90	2380	23.3	7.3	0.8
08/01/11	7,788	481	4,018	2.45	2.33	11,210	25	77	7.9	0.01	0.00	5.50	2030	20.5	7.9	0.8
09/07/11	7,924	478	4,008	2.44	2.58	12,450	24	76	7.5	0.04	0.00	3.20	2080	10.8	7.7	1.0
10/05/11	7,720	465	3,973	2.45	2.63	12,140	22	72	7.6	0.04	0.00	2.00	2090	13.2	8.2	0.9
11/02/11	8,344	501	4,305	2.34	2.34	12,480	24	75	7.6	0.03	0.01	3.60	2250	17.8	7.5	0.8
12/07/11	7,640	504	4,307	2.40	2.20	11,070	23	74	7.9	0.03	0.00	1.30	2060	12.5	6.5	0.7
01/04/12	7,728	498	4,251	2.35	2.32	10,920	20	69	7.6	0.02	0.01	0.60	2120	16.0	6.2	0.7
02/01/12	7,888	490	4,150	2.52	2.74	1,273	23	74	7.5	0.02	0.00	4.30	2270	16.3	8.2	0.8
03/05/12	7,424	443	3,720	2.53	2.72	10,500	24	75	7.7	0.00	0.00	0.00	2200	20.9	11.3	1.0
04/04/12	7,980	492	4,370	2.75	2.37	11,210	23	73	7.5	0.02	0.50	0.50	2160	21.6	7.6	0.8
05/02/12	8,060	445	4,340	2.91	2.79	12,970	24	75	7.7	0.05	0.03	5.60	2330	15.7	8.2	0.8
06/05/12	8,684	541	4,570	3.01	2.57	11,886	23	73	7.5	0.01	0.01	2.70	2370	23.5	7.0	0.8
07/11/12	8,516	515	4,310	2.58	2.32	12,910	23	73	7.7	0.02	0.02	3.20	2260	16.6	7.5	0.9
08/01/12	8,196	478	4,070	2.91	2.70	12,060	24	75	8.3	0.06	0.01	1.60	2350	6.9	5.8	0.9
09/05/12	9,072	574	4,810	2.87	2.28	14,210	23	73	7.6	0.04	2.28	2.50	2350	22.6	9.1	0.9
10/11/12	7,844	457	4,190	2.86	2.78	12,907	23	74	7.7	0.03	0.00	3.60	2080	21.9	7.0	0.8
11/07/12	8,004	506	4,280	2.70	2.75	12,963	23	73	7.7	0.02	0.01	5.10	2400	13.5	6.0	0.9
12/05/12	8,500	496	4,220	2.72	2.74	13,350	23	73	7.6	0.03	0.00	2.30	2370	38.5	8.1	0.9
01/09/13	8,464	541	4,620	3.07	2.93	13,600	24	75	7.7	0.10	0.00	2.40	2460	43.1	6.5	6.5
02/06/13	9,088	540	4,610	2.53	2.85	12,910	23	74	7.8	0.01	0.02	2.10	2110	13.7	6.6	0.7
03/04/13	7,488	491	4,160	2.91	2.69	12,723	21	70	7.6	0.05	0.00	1.70	2460	20.6	7.5	0.9
04/10/13	8,036	494	4,100	2.74	2.45	13,065	23	73	7.6	0.05	0.01	0.05	2240	31.3	6.5	0.8
05/08/13	8,248	512	4,180	2.32	2.30	13,542	23	74	7.3	0.01	0.01	0.01	2240	28.1	6.8	0.8

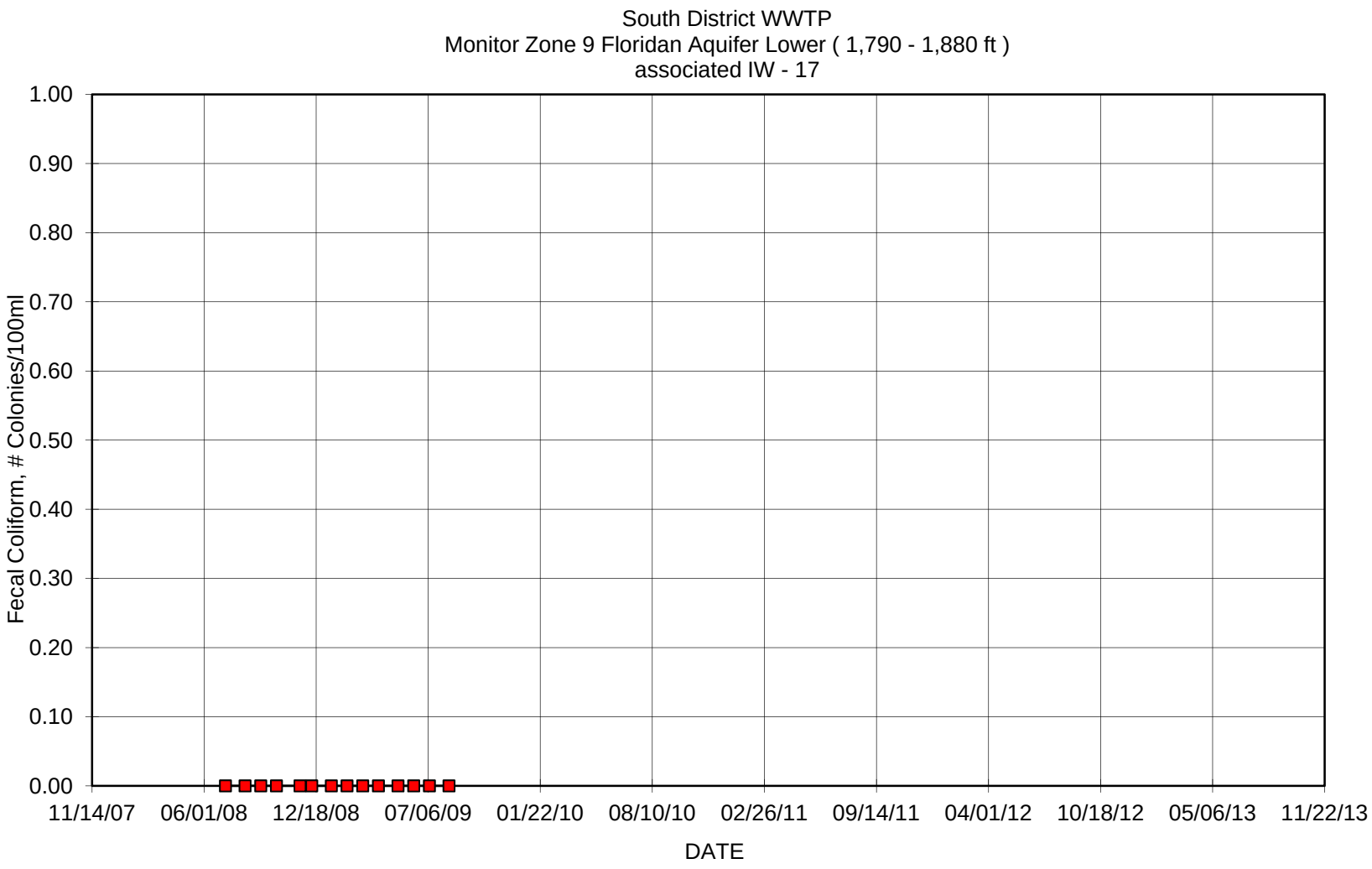

South District WWTP
Monitoring Zone 9 Floridan Aquifer Lower (1,790 - 1,880 ft)
associated IW - 17
TDS, mg/L
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

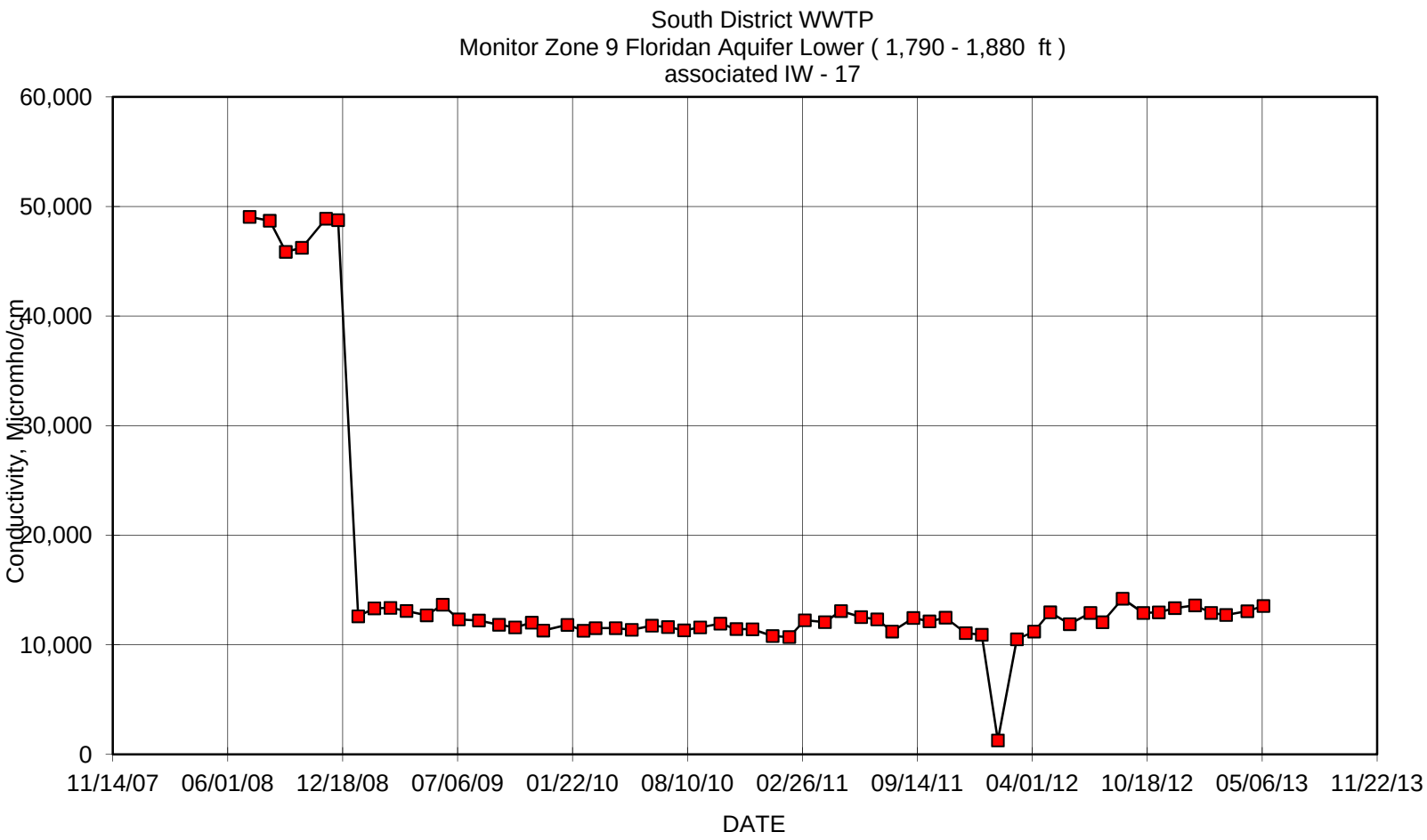

South District WWTP
Monitoring Zone 9 Floridan Aquifer Lower (1,790 - 1,880 ft)
associated IW - 17
Sulfate, mg/L
2,500
2,000
1,500
1,000
500
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

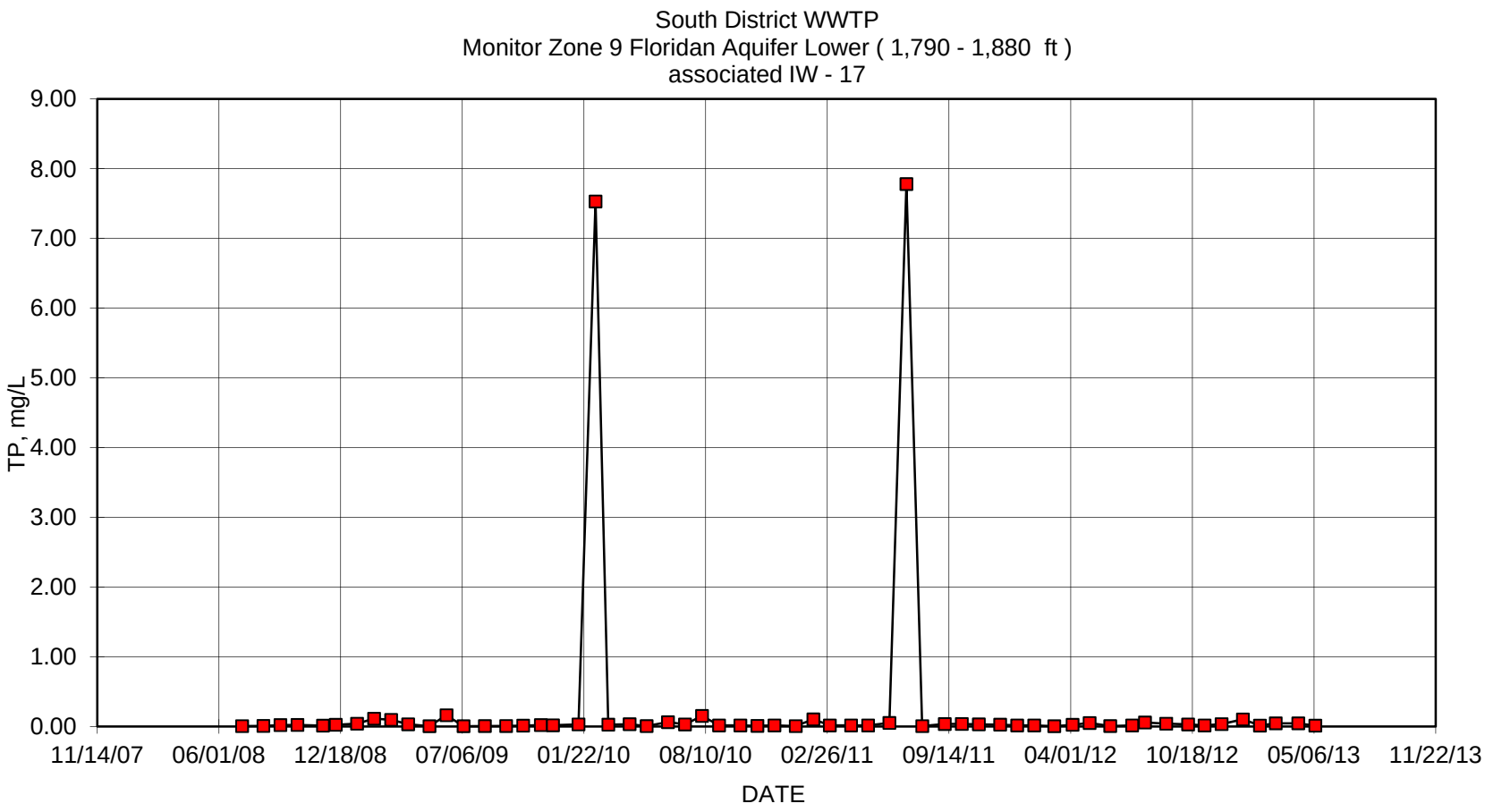

South District WWTP
Monitor Zone 9 Floridan Aquifer Lower (1,790 - 1,880 ft)
associated IW - 17
Chlorides, mg/L
20,000
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

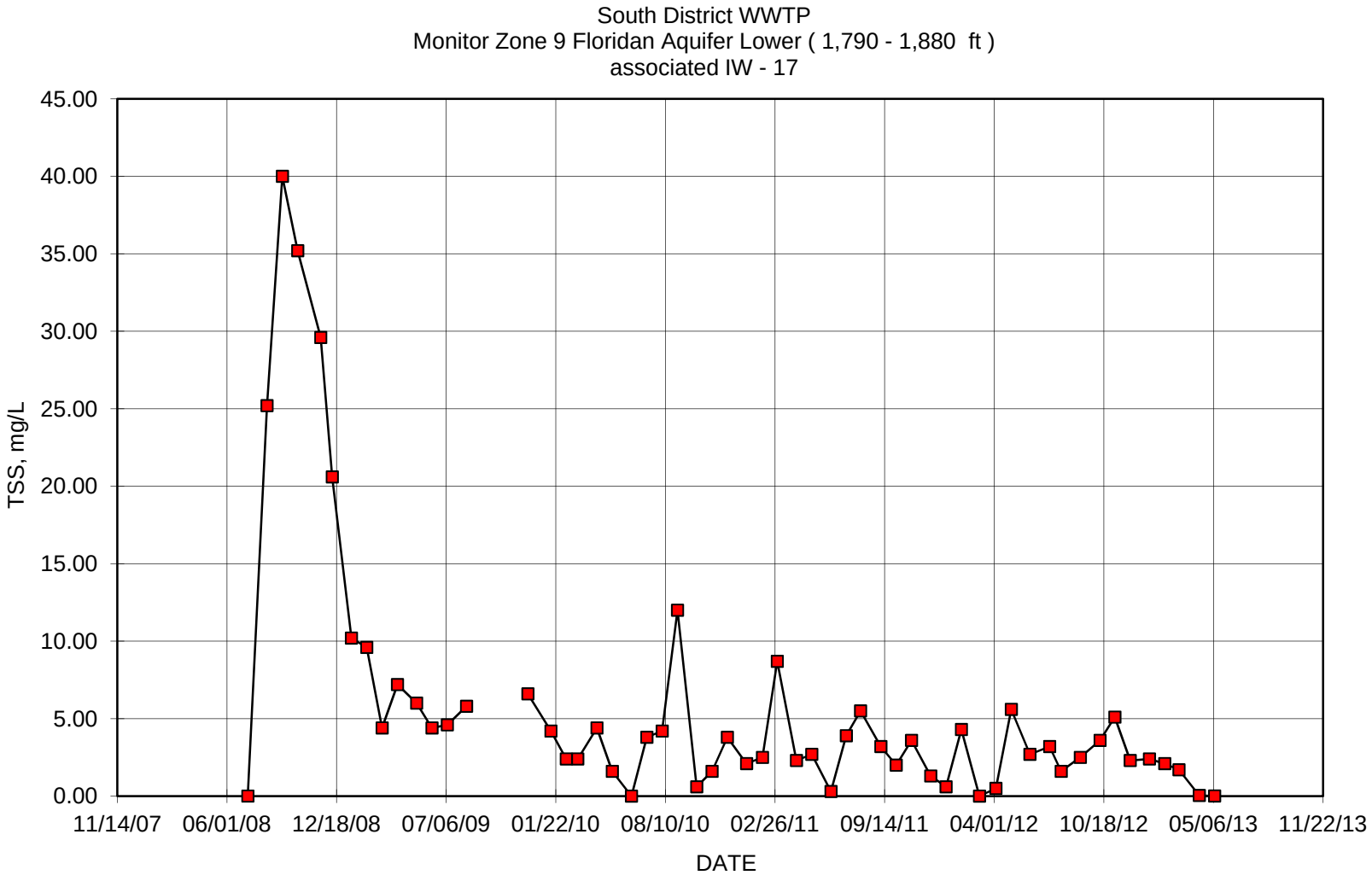

South District WWTP
Monitor Zone 9 Floridan Aquifer Lower (1,790 - 1,880 ft)
associated IW - 17
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
TKN, mg/L
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 9 Floridan Aquifer Lower (1,790 - 1,880 ft)
associated IW - 17
NH3, mg/L
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 9 Floridan Aquifer Lower (1,790 - 1,880 ft)
associated IW - 17
Fecal Coliform, # Colonies/100ml
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 9 Floridan Aquifer Lower (1,790 - 1,880 ft)
associated IW - 17
Conductivity, Micromho/cm
60,000
50,000
40,000
30,000
20,000
10,000
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 9 Floridan Aquifer Lower (1,790 - 1,880 ft)
associated IW - 17
TP, mg/L
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 9 Floridan Aquifer Lower (1,790 - 1,880 ft)
associated IW - 17
TSS, mg/L
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

MIAMI-DADE COUNTY
miamidade.gov

Water and Sewer
PO Box 330316 • 3071 SW 38 Avenue
Miami, Florida 33233-3016
T 305-665-7471

September 13, 2013

Mr. Joseph R. May, P.G.
Florida Department of Environmental Protection
400 North Congress Avenue, 3rd Floor
West Palm Beach, Florida 33401

Certified Mail
7001 0360 0001 6783 8628
CCN: 57695

Reference: Miami-Dade Water and Sewer Department -- Mechanical Integrity Testing (MIT) Report for Deep Injection Well No. IW-3 at the SDWWTP Site.

Dear Mr. May:

Enclosed please find the Certificate of Mechanical Integrity and the MIT Report on the re-testing of Deep Injection Well No. IW-3 at the South District Wastewater Treatment Plant site in Miami-Dade County.

All the tests were conducted in strict adherence to the specifications submitted to and approved by your office. The testing results for the well were good. Both external and internal mechanical integrity were demonstrated. The well casing and the wellhead components are in good condition. All the well head valves and all the well head components are scheduled to be rust-proofed and repainted when all the MITs are completed. Based on the results of the well testing we conclude that the well retains full mechanical integrity and recommend that MDWASD be allowed to continue operating the well in its normal mode.

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

The demonstration of mechanical integrity is being submitted per Chapter 62-528.300(6)(b)2., 62-528.300(6)(c), and 62-528.425(1)(d), F.A.C. and specific condition 3.j. of Permit 0061787-022-UO.

If you have any questions or require additional explanation of any item in the report, please do not hesitate to contact me at [redacted] or Sonia Villamil at [redacted].

[redacted]

Rafael Terrero, P.E.
Assistant Director- Wastewater

Enclosures: Certificate of Mechanical Integrity
MIT Report Well IW-3 (1 copy)

cc: Joseph Haberfeld, FDEP - Tallahassee

Mechanical Integrity Test Report
Deep Injection Well No. IW-3
South District Wastewater Treatment Plant

Prepared by:
Miami-Dade Water and Sewer Department
3071 SW 38th Avenue
Miami, Florida 33146

CERTIFICATE OF MECHANICAL INTEGRITY

The **South District WWTP** deep injection well **IW-3** operated by **Miami-Dade Water and Sewer Department** has been tested for mechanical integrity. The tests followed standard engineering practices and used methods presented in the United States Environmental Protection Agency regulations for the purposes of these tests. The external and internal mechanical integrity tests followed Florida Department of Environmental Protection (FDEP) pre-approved testing specifications and all the critical test events were witnessed by representatives of the FDEP, the MDWASD and the contractor.

Having supervised the engineer and geologists that were present during the testing, conducted the examining of the results and the preparation this mechanical integrity report as part of this certification, the undersigned certifies that deep injection well **IW-3** operated by **Miami-Dade Water and Sewer Department** at the **South District Wastewater Treatment Plant Site in Miami-Dade County, Florida** has successfully passed all the test requirements for mechanical integrity under rules of Chapter 62-528 of the Florida Administrative Code and is therefore determined to have mechanical integrity.

Certified on September 12, 2013

[redacted]

Howard J. Fallon Jr., P.E.
Professional Engineer
License Number 24153

MECHANICAL INTEGRITY TEST REPORT
FOR
DEEP INJECTION WELL No. IW-3
AT THE
SOUTH DISTRICT WASTEWATER TREATMENT PLANT

Prepared by:

MIAMI-DADE WATER AND SEWER DEPARTMENT
3071 SW 38th Avenue
Miami, Florida 33146

For Submittal To:

UNDERGROUND INJECTION CONTROL
FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

September 2013

ABSTRACT

The internal mechanical integrity was investigated through a pressure test performed on the injection casing. The pressure test was conducted at 152 pounds per square inch (psi) which is approximately 1.5 times the maximum (100 psi) potential injection pressure and more than 1.7 times the maximum operational pressure that the well will be under when operating at its full permitted injection velocity of 10 feet per second (ft/sec). FDEP permits a 5% loss in pressure during the hour long test in order for the internal mechanical integrity to pass the pressure test.
IW-3 successfully passed the pressure test because the casing only lost 1.5 psi. The successful results of the pressure test for internal mechanical integrity were reinforced by the results of the second internal mechanical integrity test, the TV survey of the casing. The TV survey confirmed that the casing and the casing joints are in good condition and that the well has internal mechanical integrity down to 2,632 ft bls.

The external mechanical integrity was investigated using two test procedures, a Radioactive Tracer Survey (RTS) and a Temperature Log. Results of the RTS confirmed the integrity of the cement around the casing and the continued competence of its seal with the geologic strata. The temperature test showed that there are no anomalies that would indicate points where injected fluids could escape through the casing and cement into the formation. Similarly there were no temperature anomalies that would indicate injection fluids entering the formations at other than the approved injection depth.

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Section 1

1. INTRODUCTION

1.1 BACKGROUND

On October 12, 2012, (see Appendix A) the Miami-Dade Water and Sewer Department (MDWASD) submitted the County's proposed plan and testing specifications for conducting the mechanical integrity tests (MITs) and repairs on some of the injection wells at the South District Wastewater Treatment Plant (SDWWTP) site (see Figure 1) to the Florida Department of Environmental Protection (FDEP). The plan, represented by the specifications, described the step-by-step procedure to be followed and included the testing schedule required to meet the 5-year MIT re-testing conditions of the FDEP permit for each of the injection wells. After receipt of these documents, the FDEP Staff reviewed the proposed plan and sent an approval on June 5, 2013 (see Appendix B).

The contract documents for conducting the MITs were let out for bids, and the winning bid was submitted on February 28, 2013 by Youngquist Brothers, Inc., a well drilling contractor from Ft. Meyers, Florida. After the contract was approved by the Board of Country Commissioners and signed by the County Manager, the MDWASD issued the notice to proceed on May 17, 2013 and the contractor began mobilizing to the site.

1.2 PURPOSE AND SCOPE

The purpose of this report is to provide FDEP with a document that describes the re-testing procedures for mechanical integrity applied to each of the SDWWTP deep injection wells (see Figure 2). The report also presents the field reports (see Appendix C), and the results of the tests in a single volume for ease of reference. The mechanical integrity re-testing operations involved conducting a pressure test on the well casing to show that there are no leaks in the casing, and conducting a TV survey on the well to reinforce the data from the pressure test. The re-testing includes tracking a radioactive liquid-tracer (iodine isotope I-131) injected down the well to show that there is no fluid movement upward behind the casing, into underground sources of drinking water (USDW). The radioactive test information is reinforced with temperature logs run on the well. Gamma ray logs are used to detect the movement of the radioactive tracer.

Figure 1. South District Wastewater Treatment Plant Site

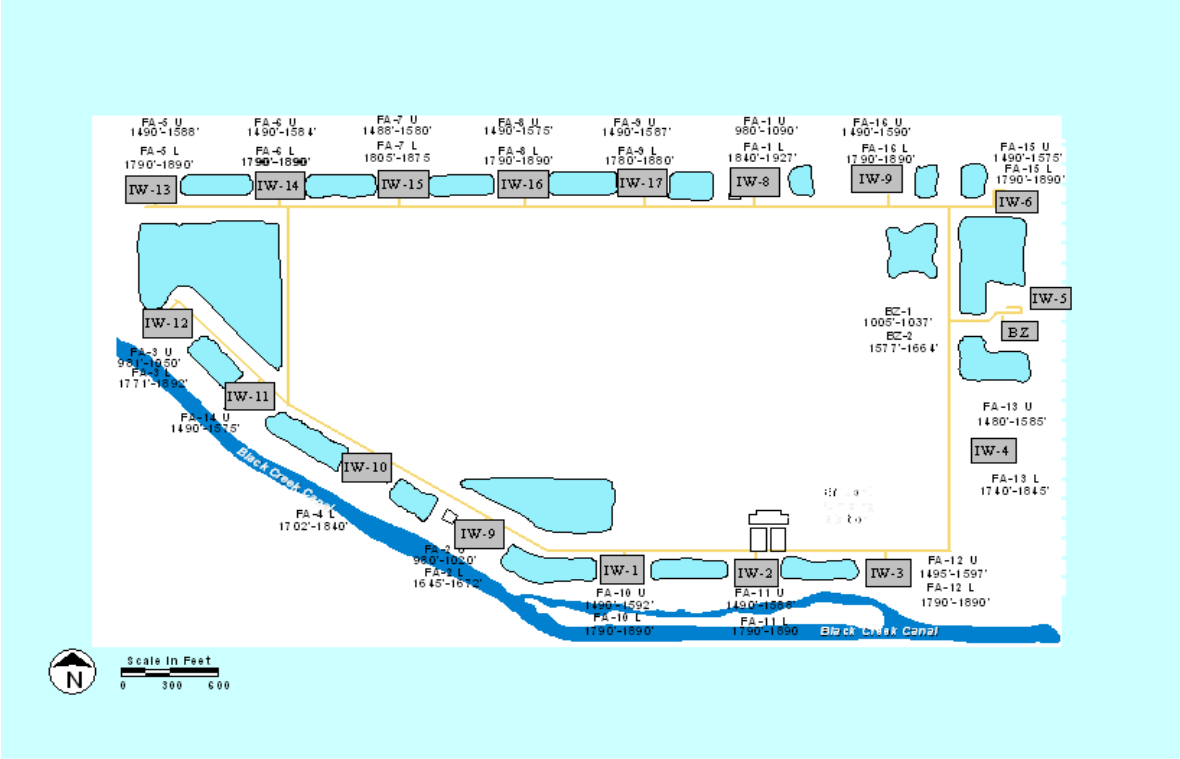

Figure 2. Well Locations Layout

Section 2

2. MECHANICAL INTEGRITY TESTING (MIT)

2.1 METHODS USED

The MIT program is designed to test two elements of the injection well system: 1. Internal integrity and 2. External integrity. The first test element, the internal mechanical integrity test of the well, tests the condition of the injection casing. The second test element, the external mechanical integrity test of the well, tests for leaks outside the casing. This is achieved through a series of field tests including a pressure test and a TV survey for the internal testing, and the temperature log, gamma ray log and RTS survey for the external testing. The first test element, the internal mechanical integrity test, tests for leaks in the injection pipe (casing). The second test element tests for leaks in the annular space outside the casing (cement-filled space between the periphery of the drilled hole and the casing) and in the near-to-the-well geologic strata.

2.2 CASING SCRUBBING

Because the mechanical integrity of injection wells has to be tested every five years, and because a TV inspection of the well is part of the test requirements, MITs provide a timely opportunity to clean the well of deposits that may have formed on the inside of the casing during the intervening years and at the same time provide a cleaner casing for the TV inspection. Cleaning the inside of the well casing is achieved by running a scrubbing brush up and down the casing. However, before the cleaning can be performed, flow out of the well must be controlled. The column of water inside the casing is fresh water and results in a positive hydraulic head inside the well. That head must first be controlled to prevent water from flowing out of the well during the cleaning operation.

2.2.1 Flow Suppression

Suppression of the fresh water head was achieved by first pre-mixing water with salt (NaCl) to form a heavy brine, and then pumping the brine down the well casing, through a 6-inch gate valve on the wellhead. This procedure results in the displacement down the well of the fresh water at the top of the column and replacement of the displaced fresh water with the brine solution. An equal volume of fresh water is displaced out of the well at the bottom of the casing. The procedure is repeated until the pressure head inside the well is suppressed. This method of displacement is used because it achieves flow suppression without first having to open the well to insert a tremie pipe to the bottom of the casing for introduction of the brine. This displacement method also provides a safe way of “killing” the well that at the same time reduces the volume of injected salt solution that would enter the formation at the bottom of the well. One additional advantage is that using this method the brine can be recovered and reused in flow suppression at other wells.

The brine was prepared in 1,000-gallon (gal.) batches by mixing the salt from a 2,000-pound (lbs.) sack in a 1,000 gal. tank of fresh water. The 1,000 gal. solution was then pumped down the well before other similarly mixed batches of salt solution were mixed and pumped down the well (see Figure 3). In the end, the operation was repeated 13 times, and a total of 13 sacks (approximately 26,000 lbs. of salt) were used to suppress the head in the well. This salt concentration represents a theoretical specific gravity of 1.239 for the brine, calculated from the salt solution used in the field of 10.3 lbs per gallon. The 26,000 lbs of salt suppressed the pressure head from approximately 26 feet above the top of the casing to approximately 15 feet below.

Figure 3. Flow Suppression Equipment

2.2.2 Scrubbing Operation

The brush used to clean the casing is made with an old drill rod that has an outside diameter of 7 inches with thick steel wire inserted and secured sticking out of the drill rod. The total diameter of the brush with the steel wire bristles is 24 inches. The brush is attached to the bottom of the packer and inserted into the well (see Figure 4). A 24-inch flange was bolted to the top of the well and pressure fittings installed to be used for packer inflation later on in the process. Then Youngquist lowers the brush and packer by attaching drill rods to the top of the packer and then raising and lowering the brush several times using a 50 ton crane. This process was repeated until the casing was scrubbed and the packer was at the depth required to perform the packer test on the well.

Figure 4. Scrubbing Brush and Hydraulic Packer

2.3 INTERNAL MECHANICAL INTEGRITY (CASING TESTS)

2.3.1 Pressure Test

After the pressure head was suppressed and the casing scrubbed, and the inflatable packer was placed at a depth of 2,597 ft bls. This well is cased to a depth of 2,632 ft bls so the packer is in the bottom 50 feet of the casing. Additional pressure fittings were installed on the flange to pressurize the casing with water. A bleeder valve atop the 24-inch flange allows passage of the drill pipes that support the packer without loss of pressure in the casing (see Figure 5). A pretest was conducted on the casing to determine that the pressure was holding and that all the installed testing equipment was operating properly, then FDEP was informed that the well was ready for their inspection. The next day, June 14, 2013, the pressure test was repeated in the presence of FDEP Staff. The packer had been previously sealed against the casing, at an inflation pressure of 345 pounds per square inch (psi) and at 8:00 AM the casing was pressurized with water to a pressure of 152 psi.

Figure 5. Well-Head and Recorder Set Up for Pressure Test

At 8:35 A.M.. the one-hour pressure test was started in the presence of Joseph May, P.G. representing FDEP and witnessed by Sonia Villamil, Maria Macfarlane, and Michael Ashe representing MDWASD, and by Chris Harp and others representing the drilling contractor. The pressure test ran for the required one-hour period. The pressure deviation (loss) in that time was 1.5 psi, well below the 7.5 psi deviation allowable under the 5 % criteria in the rules (see Table 2-1). The packer inflation pressure and the pressure in the casing were measured using certified gages (see Appendix C) graduated from 0 to 200 psi in increments of 1 psi. The pressure was read in person and recorded by hand at five minute intervals during the test. The pressure was also recorded on an In-Situ pressure transducer attached to the stand with the pressure gauges (see Figure 5).

Table 2-1 Casing Pressure Readings

Time	Casing Pressure (psi)	Pressure Change (psi)	Packer Pressure (psi)
8:35	152	0.0	345
8:40	152	0.0	345
8:45	152	0.0	340
8:50	151.5	0.5	340
8:55	151.5	0.0	340
9:00	151	0.5	340
9:05	151	0.0	340
9:10	151	0.0	340
9:15	151	0.0	340
9:20	151	0.0	340
9:25	150.5	0.5	340
9:30	150.5	0.0	340
9:35	150.5	0.0	340

2.3.2 Bleed-Off Calculations

At the completion of the pressure test the casing pressure was bled-off and the discharged volume from the bleeding was measured (see Table 2-2). Bleeding until the pressure resulted in zero flow produced approximately 34 gallons. This exercise provides a reasonable assurance that the packer is placed at the depth in the well that is within the last 50 feet of the casing.

Table 2-2. Bleeding Volumes versus Pressure

Bled Volume (gallons)	0	5	10	15	20	25	30	34
Casing Pressure (psi)	150.5	127	105	77	60	37	15	0

2.3.3 Television Survey

A closed circuit color television camera, encased in a pressure vessel capable of withstanding the pressures exerted at the depths to be televised, and equipped with a fish-eye lens, was introduced into the well through a pack-off stripper device on a standpipe above the injection well (see Figure 6). The camera is centralized in the casing, and is preceded down the well with a light source attached below the camera. The camera televises a view of the full circumference of the inside of the casing and the image is recorded on video tape. Prior to the video survey, the well was scrubbed and flushed with potable water to provide the best picture possible. The video

survey began at land surface and continued down to 2,663 feet, where the camera runs into an obstruction. At selected intervals of interest, the camera was used to pan the intervals in a horizontal format prior to continuing the normal vertical recording.

A review of the video (see Appendix F) indicates that the casing is in good condition down to 2,632 feet. The video also shows that the scrubbing operation was successful. The scrubber has scrubbed the casing free of all growth down to 2,621 feet and this is confirmed by visible vertical scratches throughout that length of the casing; indicating that the scrubber had brushed the steel casing effectively. All the scratches are superficial, and do not detract from the physical and mechanical integrity of the casing. There are no gouges, grooves, nicks, or other physical damage visible in the casing for its whole length. Below 2,621 feet the casing was not scrubbed to avoid hanging the scrubber with the edge of the bottom of the casing at 2,632 feet. There are some growths and/or deposits visible inside the casing below 2,621 feet.

In summary, the video picture meets the quality standards that are needed for a visual evaluation of the well. This video survey presents a clear view of the casing and of the welded joints of the casing. All the joints are clean and appear to be tight. From the TV survey it is concluded that this casing is in good condition throughout its whole depth from land surface to 2,632 feet.

Figure 6. Television Survey (Standpipe and Logging Truck)

2.4 EXTERNAL MECHANICAL INTEGRITY (CEMENT AND FORMATIONS)

The external mechanical integrity test consisted of two low flow dynamic tests The RTS and temperature survey, conducted on June 19 2013, for the external mechanical integrity portion of the test was witnessed by the representative of FDEP (Joseph May, P.G.), by representatives of MDWASD (Sonia Villamil and Maria Macfarlane) and by representatives of the contractor (Miguel Martinez).

2.4.1 Radioactive Tracer Survey (RTS)

The radioactive tracer survey uses an isotope of iodine (I-131) as a tracer of water movement inside and outside the casing. Iodine –131 is used because it is a radioactive isotope commonly used in medical practice and therefore it is more easily available and lower in cost than other potential tracers. I-131 also has the advantage of having a half-life of 8 days. That half-life is quite suitable because it is long enough to allow time for transportation to the well site with little decay but also short enough so that it would quickly be reduced if there were any unexpected spills or if there were mechanical failures through which the isotope could travel with the water. The radiation levels of I-131 at the concentration used for RTS testing is in millicurie-range, which if it were considered a waste, would be characterized as a low level waste by the US Atomic Energy Commission.

The I-131 is first loaded into a container located in the logging tool. This container is electronically activated from the logging truck to eject the desired quantity of tracer at the desired depth through an ejection port. In addition to the tracer container, the logging tool is also assembled with three gamma ray detectors. One detector, the top gamma ray detector (GRT), is located 10 feet above the ejector. The other two detectors, the middle one (GRM) and the bottom one (GRB) are located immediately below the ejector at about 3 feet and 12.4 feet below the ejector respectively. The bottom of the logging tool also includes a temperature tool at the very bottom, and a casing collar locator (CCL) 1 foot below the GRM. Figure 7 shows the configuration of the RTS logging tool. The RTS log in the appendix (Appendix D) shows the distances between each of the logging tool components described above.

2.4.1.1 First Low Flow Dynamic Test

Prior to starting the low flow dynamic test, a background gamma ray log was conducted to establish the natural conditions. It was conducted right after the temperature log. Since the temperature log was run downward starting at land surface, the temperature log had ended with the logging tool at the bottom. The background gamma ray log was conducted from the bottom (2,740 feet) up to the surface. The logger was able to push the RTS tool lower than the obstruction witnessed in the video at 2,663 feet because the logging tool is more robust and thinner than the camera.

From the surface, the logging tool was again lowered down the well and the casing collar locator (CCL) used to locate the bottom of the casing. The magnetic coils on the CCL give out a magnetic field and detect a change in the mass. If there is growth on the casing it is harder for the CCL to have a clean line. If the growth has some iron on it, it can cause a sort of interference with the CCL making it harder for the CCL to find the end of the casing. The CCL shows that the bottom of the casing is at 2,630 feet bls. After the bottom of the casing was located, the well

was ready for the low-flow dynamic RTS test.

The ejector port of the I-131container was set at 2,625 feet and 1 millicurie (mCi) of I-131 was released while the flow down the well was kept at a constant rate of 88 gallons per minute (gpm). The logging tool was kept immobile after the ejection of the I-131 and the three gamma ray detectors continued to record in place. One (1) mCi of I-131 was ejected into the well. The middle detector, located 3 feet below the ejector port, picked up the radioactive tracer 20 seconds after the ejection. The bottom detector, which is located over 12 feet below the ejector, picked up the tracer 1 minute and 52 seconds after the ejection. The middle detector seems to pick up some interference from the ejection motor on the tool when the ejection occurs and this shows up on the log at the same time of ejection. However, this interference is at a much lower level and is dismissed as nothing more than interference from the ejection motor. The test ran for 60 minutes and the top detector did not pick up any tracer.

After the first low flow test ended, the tool was then raised up more than 200 feet, to a depth of 2,400 feet, to log out of position to make sure that the tracer did not migrate up the casing or the formation outside of the casing. No migration was detected.

Once the log out of position was conducted and the tool was placed back to depth, no staining on the casing was found which means no interference for the second RTS. Therefore, with the approval of Joseph May, P.G. from FDEP, the well was not flushed prior to the second RTS test.

Figure 7. RTS Tool and Temperature Probe

2.4.1.2 Second Low Flow Dynamic Test

The tool was placed back to a depth were the ejector was located at 2,625 feet with a flow of 87 gallons per minute set down the well. For this test, 2 milicuries of I-131 were ejected into the casing. The middle detector started picking up the tracer about 24 seconds after it was ejected. The bottom detector, which is located over 12 feet below the ejector, picked up the tracer 2 minutes and 20 seconds after the ejection. Again the middle detector picked up some interference from the ejector motor at the time the I-131 was released. The upper detector did not pick up any tracer for the duration of the test, which lasted 30 minutes.

After the second low flow test ended, the tool was then raised up more than 200 feet, to a depth of 2,400 feet, to log out of position to make sure that the tracer did not migrate up the casing or the formation outside of the casing. No migration was detected.

With the last low flow dynamic test, the mechanical integrity test was concluded, but before bringing the geophysical tools out of the well, the leftover I-131in the container was ejected and the container flushed-clean to insure that any remaining radioactive iodine was well dispersed. The tool was placed at a depth of 2,679 ft bls. The ejector was located at 2,667 ft bls, and the remaining Iodine 131 was ejected and the well was flushed with effluent at a rate of over 8,750 gallons per minute to ensure no staining of the tool. The logging tool was then brought up from the bottom and on the way up a final gamma ray log was made. Then the final gamma ray log was compared to the background gamma ray log, and the comparison showed that there are no noticeable differences in the two except for a residual stain at the bottom of the casing where the I-131 had been repeatedly released during the testing, and just below there, where the tracer exited the casing. Injection of water down the well at a rate of 8,750 gpm continued for the next hour to completely flush out the well.

2.4.2 Temperature Log

Youngquist Brothers Inc. conducted the temperature log on June 19, 2013 starting at about 8:20 A.M. and logging down to 2,740 feet. The temperature probe (Figure 7) was run from the surface downward to minimize the disturbing effect of the movement of the logging tool on the temperature of the water in the well. The temperature log was started more than 24 hours after the well had last been disturbed by outside influences. The TV survey was the last disturbance in the well.

The temperature log (see Appendix H) shows the warmest interval is in the section from 2,600 to 2,720 feet. This is consistent with the higher temperature of the injected water in that interval. The temperature log did not detect any anomalies that would indicate that injection fluids are present outside the casing, and there is no indication of any upward movement of warm injection water either. The similarity of the temperature oscillations in this temperature log (in the interval from land surface down to the bottom of the casing) to those in the temperature logs from previous MITs and to those in the temperature log when the well was constructed, indicates that there has been no apparent change in the cased interval, and no upward movement of the injected water in the last 5 years.

2.5 WELL HEAD REPAIRS AND RE-INSTALLATION

The work associated with the MIT ended when the wellhead was replaced. The air and vacuum release surge check valves were replaced prior to reinstallation of the wellhead. The 6 inch gate valve and air release were replaced. The wellheads are scheduled to be sandblasted, rust proofed and repainted after the MITs on all the other wells are completed. Injection well IW-3 has been placed back on line and flow from the plant's pump station is again discharging to this injection well.

Section 3

3. CONCLUSIONS AND RECOMMENDATIONS

3.1 CONCLUSIONS

The pressure test was conducted successfully and it was concluded from the results that there is internal mechanical integrity. This conclusion is reinforced by the analysis of the TV survey down to the injection level at 2,632 feet. The TV survey indicated that the casing is in good condition and that all the casing joints appear to be tight and in good working order.

The two successful RTS conducted at low flow rates indicate that there is no upward movement of water outside the casing. Therefore, it was concluded that the RTS results show that there is external mechanical integrity. The temperature survey reinforced the results of the RTS by showing that there has been no movement of injected water anywhere except the injection zone.

3.2 RECOMMENDATIONS

The successful completion of all the tests for mechanical integrity confirms that IW-3 retains full mechanical integrity and as such it is appropriate to continue using this injection well. MDWASD also recommends that FDEP review the results of the tests presented in this report and based on those results determine that the well has mechanical integrity and may continue to be used for its intended purpose.

Finally, MDWASD recommends that although the well head will not be painted until all the MIT tests are completed on the other wells, IW-3 should receive mechanical integrity certification.

Appendix A

Mechanical Integrity Testing Procedures Submitted by MDWASD to FDEP
October 12, 2012

Miami-Dade Water and Sewer Department
Mechanical Integrity Testing and Repair Procedures
October 12, 2012

MECHANICAL INTEGRITY TESTING and REPAIR PLAN (SDWWTP and NDWWTP Injection Wells)

General Information

The Contractor shall carefully coordinate his activities with the Department to minimize interference with any existing operations or the operations of the Department. Department forces will isolate the well and turn over to the Contractor. Existing valves shall only be operated by Department personnel. The Contractor's personnel, under no circumstances, shall operate any such valve.

The Contractor shall provide all barricades and/or flashing warning lights necessary to warn workers and employee of the testing throughout the Project. This shall be done at the Contractor's expense and to the satisfaction of the Engineer. Every effort must be made to reduce inconvenience and nuisances to a minimum.

The Contractor shall at all times, use the assigned entrance to the Plants to bring in materials, equipment etc. required for the Project. Materials and equipment shall be stored in areas designated by the Engineer, and shall not interfere with the daily operations at the site or with other Projects. Suitable platforms shall be used for material storage to prevent damage to the landscaping. The Contractor shall exercise extreme caution when transporting equipment or materials within the Plant area.

The conveying vehicles shall be properly selected, and equipped, to prevent damage to paved areas, landscaping and other existing facilities including wells, well pads, fencing, underground pipelines, pipe chases, etc. If necessary, suitable wooden skids shall be used to distribute loads, and to prevent damage.

If any of the above existing structures, including the wells, or any other parts of the project area, are damaged, the contractor shall make suitable repairs or replacement at his expense, in a manner described by the Engineer, and to his satisfaction.

The Contractor shall also exercise extreme caution to prevent any spillage of sewage effluent. The County may charge t he Contractor for any cost incurred or penalties imposed on the County as a result of such spillage.

The wells to be tested are Injection Wells IW-l through IW-17 at the South District Wastewater Treatment Plant and IW-1N through IW-4N at the North District Wastewater Treatment! Plant

The Injection Wells have a 24-inch outside diameter (OD), 0.500-inch wall thickness injection casing set to total depths of 2,450 to 2,850 feet below land surface (bls), and were constructed with a nominal 22-inch diameter open borehole extending from the bottom of the casing to approximately 3,000 feet bls.
Except IW-5 at the SDWWTP, has a 20-inch outside diameter (OD), and 0.500 inch wall thickness.

The CONTRACTOR will perform internal and external mechanical integrity tests on the casings of twenty one deep injection wells and perform all appurtenant work in accordance with the above

Contract Documents.

The work shall be performed by a competent crew with equipment that is adequate to complete all phases of the testing and instruments of sufficient accuracy and resolution to identify anomalous responses to the tests. If the CONTRACTOR'S equipment is not capable of satisfactorily performing the work provided for in these specifications, the CONTRACTOR at his own expense shall substitute equipment.

The CONTRACTOR shall have not less than 5 years experience in constructing and testing wells and shall have tested not less than 5 wells of similar type and capacity. The CONTRACTOR shall be licensed by the State of Florida and the license number shall be affixed to all correspondence and reports.

All work shall comply with and be in full conformance with this Mechanical Integrity Test Plan submitted to FDEP together with subsequent response letters for the injection wells at the South and North District Wastewater Treatment Plants and with the appropriate sections of Chapter 62-528 FAC.

If remedial work or re-testing is required prior to final acceptance of the work to meet regulatory requirements and the specifications of the Contract Documents due to defective materials, accident, loss of equipment or equipment malfunction, or for any other cause directly attributable to the CONTRACTOR's actions, the CONTRACTOR shall bear the entire cost of the remediation or re-testing, including all additional materials, labor, and equipment required and any necessary additional Engineering costs. In the event of a problem, the ENGINEER shall be notified immediately, and the following shall apply:

1. The CONTRACTOR shall propose a method of correcting the problem, in writing, to The ENGINEER, who shall review the method of corrective action, and accept the plan in writing before work can proceed.

2. All work on the well must be in accordance with all applicable local, state and federal regulations.

The CONTRACTOR shall notify the ENGINEER a minimum of 72 hours prior to conducting the pressure test, geophysical logging and the radioactive tracer survey so that the ENGINEER and regulatory agency staff can be properly notified.

The CONTRACTOR shall provide all facilities, equipment and materials required for the removal of waste fluids from the well site.

The CONTRACTOR shall kill the well using a dense food- grade salt solution. No barite or mud-based additives shall be used in the well.

The CONTRACTOR shall comply with the OSHA regulations contained in 29CFR Section 1910 for General Industry Regulations and 29CFR Section 1926 for Construction Regulations.

Equipment and Procedures

1. Wellhead Assembly: The stripper head assembly used during the video survey, Geophysical logging, and the radioactive survey shall be bolted to the wellhead above the 6-inch gate valve. The stripper head assembly used must be of sufficient length to house the longest of the wire line tools used for the testing between the gate valve and the pack-off mounted at the top of the assembly. The pack-off must be adjusted so that the tools can be moved freely up and down the well with minimal leakage from the well. The assembly shall include a 4-inch valve and tee, which will be used to inject potable water during the surveys. The assembly shall be fitted with a

pressure gauge for use during the tests.

2. Wellhead Hardware: Should the nuts and/or bolts at the wellhead assembly become stripped during the CONTRACTOR's efforts, the CONTRACTOR shall replace them with equivalent hardware.

3. Water Line: The CONTRACTOR shall provide a potable water supply line for use during the video surveys. This line shall be connected to the existing 4-inch valve on the CONTRACTOR's stripper head. It shall be equipped with a check value to prevent the backflow of effluent into the water supply source. It shall also be equipped with a continuous recording digital flow meter and totalizer capable of measuring flows accurately in the range of 0 to 250 gpm.

Mechanical Integrity Testing (MIT)

The mechanical integrity testing under this Contract shall be accomplished using the following methods and general sequence, however the Contractor shall submit a more detailed sequence to the Engineer for approval before he begins work. The Contractor shall use extreme caution to prevent any loss of equipment, tools or other items into the wells and shall be fully responsible for retrieving any such items immediately, at no expense to the Department. All pressure tests must be conducted in the presence of the Engineer or his authorized representative.

MIT Clean and Pressure Test the Casing

1. The Contractor shall set up all equipment required to prepare for suppressing the density differential pressure, cleaning, performing the pressure test and the radioisotope and closed circuit television surveys.

2. The Contractor shall inject sufficient salt solution into the well to balance the differential pressure and disassemble the wellhead. The brine solution shall remain in the well during the cleaning and pressure testing steps, after which time it shall be transferred to another well if clean enough for reuse, or shall otherwise be disposed of by the Contractor. Under no circumstances shall brine solution be spilled or disposed of on the ground surface, however it may be disposed of into the injection well.

3. The Contractor shall clean the casing before proceeding with the pressure test. The entire length of casing shall be cleaned. If the later television survey indicates insufficient cleaning, the well shall be re-cleaned by the Contractor, at his expense, to the satisfaction of the Engineer. If the television survey must be repeated because of insufficient cleaning, in the opinion of the Engineer, it shall also be at the Contractor's expense.

4. The Contractor shall, when requested by the Engineer, place the packer through a stand-pipe with a packoff device to a point near the top of the well (but within the concrete encasement area) and test its integrity. This shall be accomplished as described in Steps 6, 7, and 8 below. If the packer fails the integrity test it shall be replaced with one that will meet the test. The Engineer is aware that packers have limited inflation cycles and will attempt to minimize the verification of packer operation. However, any integrity failure for which the packer operation can not be eliminated must be repeated at the Contractor's cost. It is anticipated that each new packer will be tested at the wellhead to verify its capacity to seat and deflate.

5. The Contractor shall lower and place the packer to a point within the lower 40 feet of the casing, but not the last 10 feet. The CONTRACTOR will be responsible to assure the proper seating of the packer. A preliminary test shall be performed to ensure proper operation of the test set-up. The CONTRACTOR shall notify the ENGINEER at least 24 hours before running the preliminary test. The test will be run following the same test program as the actual pressure test, as described below. IW-2 at SDWWTP will have the packer placed within 40 feet of the tear in the casing.

6. The Contractor shall inflate the packer to a pressure not exceeding 350 psig over the static condition as measured at the wellhead on a calibrated gauge to create a positive seal.

7. The Contractor shall pressurize the casing to 150 psig with no air in the casing or wellhead. The pressure shall be recorded on a chart and signed by the Engineer, the Contractor and any witnesses present. The pressure test gauge shall be calibrated within 6 months of performing the pressure test. The CONTRACTOR must present proof of calibration of the pressure gauge to the ENGINEER and FDEP staff at the time of testing each well. The pressure gauge must be mounted at or near eye level in order to ensure maximum visibility.

8. The test will be considered successful if the pressure does not change more than 5% psi in one hour.

9. If the test fails, the Contractor shall move the packer upwards for approximately 10 feet, and repeat Steps 6, 7 and 8.

10. If the test still fails, additional repositioning of the packer and repeating of Steps 6, 7 and 8 shall be as ordered by the Engineer. If the test still fails, and subsequent radioisotope surveys indicate no casing failure, it will be presumed that the Contractor's packer did not create a positive seal, and the Contractor shall be required to repeat Steps 4 through 8 at his expense. No payments will be made to the Contractor if it is subsequently determined that the test failure was caused by the seating of the packer. If the packer fails during packer operation verification, it will be concluded that the packer was faulty during any previous test that did not demonstrate casing integrity. The Contractor shall repeat this test at his expense.

11. After pressure testing, measure the depressurization bleed down with a 5 gallon bucket upon release of the pressure in the casing. The bleed down fluid will be properly disposed of by the Contractor.

12. The Contractor shall deflate the packer and withdraw it from the casing.

13. The Contractor shall reassemble the wellhead and connecting piping using new gaskets.

14. Prior to geophysical logging, the fluid used to "kill" the well, or for pressure testing the casing shall be flushed from the well and the well will be shut-in for a minimum of 12 hours.

MIT Video Surveys

A Video Survey inside the injection well casing be performed using the following procedures.

.A 6-inch diameter stripper head assembly will be bolted to the wellhead assembly above the existing 6-inch diameter gate valve. The stripper head will be of dimensions that allow the video operator to put his camera between the gate valve and the pack off and close both the valve and the pack off. The lower part of the assembly shall consist of a 4-inch tee and valve through which potable water may be introduced into the well.
.
Prior to performance of the survey and for a period of 24 hours, fresh water from an adjacent fire hydrant will be introduced into the well through a 4-inch diameter valve located on the stripper head assembly. Fresh water shall be pumped into the well to provide clarity for the survey.

3. If, after 24 hours of pumping potable water into the well, the water quality does not permit a clear picture of the inside of the well, the CONTRACTOR may be required to perform additional pumping services to assure a good survey as specified above.

4. The pumping of the potable water will continue at a rate of approximately 0 to 250 gpm during video surveying. If the open hole portion of the well is not clean, or visibility in any part of the well is poor, the CONTRACTOR shall perform additional pumping services to ensure a good video survey before running another or continuing with the survey.

5. During the video survey, the CONTRACTOR shall stop the camera's progress as instructed by the ENGINEER at depths where there may be potential flaws in the casing or other features to allow for thorough examination at those locations.

Upon reaching the total depth of the well with the video camera and obtaining a video survey satisfactory to the ENGINEER, the camera shall be removed from the well, and the well placed back in service.

MIT Radioisotope Tracer Survey and Temperature Survey

A radioisotope tracer survey shall be used to detect any fluid movement outside of the injection casing from the injection zone into the overlaying aquifers. The tool configuration shown below, or approved equal is required. The tool must be capable of ejecting the radioactive tracer and simultaneously monitoring the gamma ray sensors. No time lag between ejection and monitoring is permitted. A casing collar locator (CCL) shall be positioned below the tool as shown below, to precisely locate the bottom of the casing. Two low flow dynamic test runs, shall be performed. Additional low flow dynamic test runs can be done if results warrant additional testing, as determined by the ENGINEER in consultation with FDEP staff.

A temperature survey log shall also be performed from land surface to the total depth of the well. The temperature log shall be performed logging down at a rate of not more than 60 feet per minute. The temperature survey shall be performed after the well has been "shut in" and stabilized for at least 12 hours prior to the dynamic and static tests.

The Contractor shall perform an initial background gamma ray survey extending from the base of the land surface to the total depth of the well. The background gamma ray log shall be taken at a rate of not more than 60 feet per minute.

After the dynamic tests are completed, another background gamma ray survey shall be taken from the base of the casing to the base of the intermediate casing.

If additional radioisotope tracer survey work is ordered by the Engineer, it will be paid for at the hourly price proposed for additional radioisotope tracer surveys.

Radioactive Tracer Survey (RTS)

A RTS will be performed in the injection well. The tool used for testing will be configured according to information to be supplied by the service company performing the logs and as approved by the ENGINEER. Below is an example of a typical RTS tool that will be used for these surveys. The CONTRACTOR will provide a specific tool configuration with the logs.

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)
			CHD-SDSCHD (SDS) Cable Head	1.00	1.50	5.00
GR#3	23.83					
			GR #3 -GR#3 (GR#3_T) GR#3_TOP	9.33	1.69	50.00
			TREJCT-A (RTS) EJECTOR 14.5' FROM TOOL BOTTOM	3.00	1.69	10.00
			GR #2 -GR#2 (GR#2_M) GR#2_MIDDLE	3.58	1.69	25.00
GR#2	11.17					
CCL	9.63		CCL-000 (000001) RTS_CCL	0.75	1.69	5.00
			TRDET-GR#1 (GR#1_B) GR#1_BOTTOM	8.67	1.69	50.00
GR#1 TEMP	0.58 0.17		TEMP-11116Temp (11116HT) RTS_TEMP	0.58	1.69	5.00

Dataset: sdiw1.db: field/well/run1/FINBK
Total Length: 26.92 ft
Total Weight: 150.00 lb
O.D. 1.69 in

RTS tool Typical Configuration

The sequence of the tests shall be as follows:

First Low Flow Dynamic: The low flow run of the radioactive tracer survey shall be performed with a pumping-in velocity of 3 to 5 feet per minute. This would require a volume of between 65 gpm and 108 gpm to be injected during the survey. This is for the 24 inch wells, for Well I-5, which has a 20 inch casing this volume is 44 gpm and 73 gpm. Potable water from the same source as used for the video survey would be used as the most appropriate water supply for this portion of the test.

1) After beginning the flow of water into the well, the tool will be placed at a depth of approximately 5 feet above the base of the final casing, and a slug of 2 millicuries radioactive Iodine 131 is ejected. The tool will remain in place for a period of approximately one hour and the three gamma ray detectors in the "time drive" mode will record the movement of the slug. If tracer is detected at the uppermost detector, indicating potential staining of the tool, the tool may be moved upward to an alternate location.

2) After the one hour waiting period, a log out-of-position will be performed between the ejection point and a minimum of 200 feet above the highest point of tracer detection.

3) Upon completion of logging, the casing will be flushed with 3 to 5 casing volumes of effluent.

4) After flushing, the tool will immediately be run to the base of the casing, then the interval between the ejection point and 200 feet above the highest point of tracer detection will be logged.

Second Low Flow Dynamic: The process described above for the low flow dynamic log will be repeated to include a log out-of-position, a casing flush, and an after flush pass. A slug of tracer greater than or equal to 3 millicuries shall be used as determined by the ENGINEER.

If, during testing, no apparent anomalies appear that may indicate a lack of mechanical integrity in the injection well, the RTS will be concluded. If anomalies do occur, the RTS will be altered to track the radioactive tracer material. After RTS is complete, the RTS tool will be discharged in the injection zone and the well shall be flushed with 3 to 5 volumes of effluent. A second background log will be run from the bottom to the top of the well.

MIT Deadlines (sorted by date MIT pressure test due)

SDWWTP MIT Schedule of Completion

Well	Pressure Test	RTS/Video
IW-2	7/13/2013	7/25/2013
IW-1[1]	7/20/2013	7/31/2013
IW-3	7/24/2013	8/7/2013
IW-9[1]	7/30/2013	8/12/2013
IW-10[1]	8/6/2013	8/21/2013
IW-11	8/20/2013	9/3/2013
IW-12	8/25/2013	9/19/2013
IW-14	9/9/2013	9/26/2013
IW-13	9/16/2013	10/6/2013
IW-4	9/25/2013	10/14/2013
IW-6	9/30/2013	10/20/2013
IW-5	10/19/2013	10/27/2013
IW-7[2]	10/26/2013	1/7/2014
IW-8	11/2/2013	11/12/2013
IW-17	11/11/2013	11/19/2013
IW-16	11/18/2013	12/9/2013
IW-15	12/3/2013	12/16/2013

NOTES:
1.The original video was not clear enough and therefore a new video was done at the end of the MITs at SDWWTP.
2.The Computer failed during the RTS, because the Iodine 131 had already been injected, FDEP and DOH required 46 days b/f the RTS could be redone.

NDWWTP MIT Schedule of Completion

Well	Pressure Test	RTS/Video
IW-1N	3/14/2014	3/26/2014
IW-2N	3/25/2014	4/9/2014
IW-3N	4/2/2014	4/17/2014
IW-4N	4/9/2014	4/24/2014

REPAIR PLAN:

The following repair plans apply to wells at SDWWTP and NDWWTP.

1. Kill well and remove 24 inch gate valve and 4 inch bypass valves. Remove 1 inch pressure transmitter line and weld hold closed. Please see drawings included in below.

2. Sand existing casing in concrete pits and coat with Bitumastic. Please see drawings included in below.

3. Chip concrete around outer casing 1 inch deep, in order to embed PVC sleeve. Please see drawings included in below.

4. Install C905 PVC sleeve around casing pipe, embed 1 inch deep and fill annular space with grout, using Type II Neat cement. Slope top edge to create 30 degree watershed and seal at edges with sealant. Please see drawings included in below.

5. Relocate 1 inch pressure transmitter as indicated in drawings. Weld the hole. Please see drawings included in below.

6. At the NDWWTP IW-1N, IW-3N and IW-4N install new magmeters with any necessary spool pieces to be field determined. Please see drawings included in below.

7. Reassemble wellheads including installation of new 24 inch butterfly valve on horizontal part of well. Mega flanges will be used to ensure the layout of the pipe and the vales match. Please see drawings included in below.

8. On IW-4N at NDWWTP, install electric actuator for butterfly valve at base of injection well. Please see drawings included in below.

Appendix B

FDEP Approval of MIT Plan for SDWWTP and NDWWTP

November 26, 2012

Villamil, Sonia (WASD)

From: May, Joseph [[redacted]
Sent: Monday, November 26, 2012 2:40 PM
To: Villamil, Sonia (WASD)
Cc: Vandor, Heidi; Silverman, Mark; Walsh, Virginia (WASD); Goldenberg, Bertha M. (WASD); Fallon Jr., Howard J. (WASD); Arrebola, Vicente (WASD); Macfarlane, Maria (WASD); Oakley, Clint (WASD)
Subject: RE: MDWASD MIT and Repair Plan Submittal

Importance: High

Hello all,

The Department approves the plan with the following understandings:

1) Medicinal grade I-131 should be specified since this solution is filtered to reduce precipitate material, as opposed to regular grade I-131, in the vial causing a tool malfunction. It has been our experience that an activity of ~1mCi/ml has been the easiest to work with in the field.
2) Please contact me a minimum of three days prior to mobilization to each site. Due to the travel time from West Palm Beach to the sites close coordination would be appreciated between myself and a designated contact person from the utility so that each pressure and RTS can be witnessed.

Thank you,

Joe

Please take a few minutes to share your comments on the service you received from the department by clicking on this link. DEP Customer Survey.
From: Villamil, Sonia (WASD) [mailto:[redacted]
Sent: Wednesday, October 17, 2012 9:42 AM
To: May, Joseph
Cc: Vandor, Heidi; Silverman, Mark; Walsh, Virginia (WASD); Goldenberg, Bertha M. (WASD); Fallon Jr., Howard J. (WASD); Arrebola, Vicente (WASD); Macfarlane, Maria (WASD); Oakley, Clint (WASD)
Subject: MDWASD MIT and Repair Plan Submittal

Hello Mr. May,

The MDWASD respectfully submits the attached MIT testing and repair plan for your approval. The paper copy is being sent via regular mail as well.

Thank you,

Sonia Villamil
Engineer II
Miami Dade Water and Sewer Department
3071 SW 38th Ave Room 554-8
Miami, FL 33146
[redacted]
fax: 786-552-8640
miamidade.gov

Appendix C

Field Notes from tests including gauge certification and pressure charts.

MIAMI-DADE WATER AND SEWER DEPARTMENT

MECHANICAL INTEGRITY TESTING OF DEEP INJECTION WELLS AND ASSOCIATED SERVICES

BID NO.: RPQ P0086

PRESSURE TEST IW - 3

June 14, 2013

TIME	CASING PRESSURE (psi)	PACKER PRESSURE (psi)
8:35	152	345
8:40	152	345 -
8:45	152 -	340 +
8:50	151.5	340 +
8:55	151.5	340+
9:00	151 +	340+
9:05	151	340+
9:10	151	340+
9:15	151	340+
9:20	151	340+
9:25	150.5	340+
9:30	150.5	340+
9:35	150.5	340+
9:36	150.5	340+

BREAK OFF TEST

GALLONS	CASING PRESSURE (psi)	PACKER PRESSURE (psi)
0	150.5	340+
5	127+	340-
10	105	330
15	77	320
20	60-	310
25	37+	300+
30	15-	300-
34	0	290

Top of Packer: 2,597 **feet**

Bottom of Casing: 2,632 **feet**

MIAMI-DADE WATER AND SEWER DEPARTMENT

MECHANICAL INTEGRITY TESTING OF DEEP INJECTION WELLS AND ASSOCIATED SERVICES

BID NO.: RPQ P0086

PRESSURE TEST IW - 3

WITNESS LIST

June 14, 2013

NAME	SIGNATURE	COMPANY/AGENCY	TELEPHONE
Michael Ashe	[redacted]	WASD	[redacted]
Anamaria Sarmiento		WASD	
Mana Macfarlane		WASD	
CHRIS HARP		YBJ	
Joe May		DEP	

IW-3 PT

In-Situ Inc.	Hermit 3000	
Report generated:	6/21/2013	12:07:17
Report from file:	C:\WIN-SITU\Data\SN45406 2013-06-14 083733 Test #1.bin	
DataMgr Version	3.69	
Serial number:	45406	
Firmware Version	7.1	
Unit name:	Hermit 3000	
Test name:	Test #1	
Test defined on:	6/11/2013	15:27:42
Test started on:	6/14/2013	8:37:33
Test stopped on:	6/14/2013	10:03:46
Test extracted on:	6/21/2013	12:05:40

Data gathered using Linear testing
Time between data points:
1.0000 Minutes.
Number of data samples: 87

TOTAL DATA SAMPLES 87

Date	Time	ET (min)	Chan[1] PSI
	6/14/2013 8:37	0	153.56
	6/14/2013 8:38	1	153.483
	6/14/2013 8:39	2	153.452
	6/14/2013 8:40	3	153.545
	6/14/2013 8:41	4	153.498
	6/14/2013 8:42	5	153.468
	6/14/2013 8:43	6	153.452
	6/14/2013 8:44	7	153.421
	6/14/2013 8:45	8	153.375
	6/14/2013 8:46	9	153.344
	6/14/2013 8:47	10	153.298
	6/14/2013 8:48	11	153.252
	6/14/2013 8:49	12	153.221
	6/14/2013 8:50	13	153.175
	6/14/2013 8:51	14	153.129
	6/14/2013 8:52	15	153.098
	6/14/2013 8:53	16	153.067
	6/14/2013 8:54	17	153.036
	6/14/2013 8:55	18	152.99
	6/14/2013 8:56	19	152.959

6/14/2013 8:57	20	152.913
6/14/2013 8:58	21	152.898
6/14/2013 8:59	22	152.836
6/14/2013 9:00	23	152.79
6/14/2013 9:01	24	152.759
6/14/2013 9:02	25	152.728
6/14/2013 9:03	26	152.682
6/14/2013 9:04	27	152.667
6/14/2013 9:05	28	152.636
6/14/2013 9:06	29	152.59
6/14/2013 9:07	30	152.559
6/14/2013 9:08	31	152.528
6/14/2013 9:09	32	152.497
6/14/2013 9:10	33	152.482
6/14/2013 9:11	34	152.42
6/14/2013 9:12	35	152.389
6/14/2013 9:13	36	152.359
6/14/2013 9:14	37	152.328
6/14/2013 9:15	38	152.312
6/14/2013 9:16	39	152.251
6/14/2013 9:17	40	152.22
6/14/2013 9:18	41	152.189
6/14/2013 9:19	42	152.158
6/14/2013 9:20	43	152.128
6/14/2013 9:21	44	152.081
6/14/2013 9:22	45	152.051
6/14/2013 9:23	46	152.004
6/14/2013 9:24	47	151.974
6/14/2013 9:25	48	151.943
6/14/2013 9:26	49	151.912
6/14/2013 9:27	50	151.881
6/14/2013 9:28	51	151.866
6/14/2013 9:29	52	151.82
6/14/2013 9:30	53	151.758
6/14/2013 9:31	54	151.743
6/14/2013 9:32	55	151.712
6/14/2013 9:33	56	151.666
6/14/2013 9:34	57	151.635
6/14/2013 9:35	58	151.589
6/14/2013 9:36	59	151.558
6/14/2013 9:37	60	151.465
6/14/2013 9:38	61	151.419
6/14/2013 9:39	62	151.373
6/14/2013 9:40	63	151.419
6/14/2013 9:41	64	151.388
6/14/2013 9:42	65	151.373
6/14/2013 9:43	66	151.219
6/14/2013 9:44	67	130.225
6/14/2013 9:45	68	119.353
6/14/2013 9:46	69	110.931
6/14/2013 9:47	70	80.612

6/14/2013 9:48	71	82.576
6/14/2013 9:49	72	70.876
6/14/2013 9:50	73	83.312
6/14/2013 9:51	74	41.775
6/14/2013 9:52	75	60.807
6/14/2013 9:53	76	46.581
6/14/2013 9:54	77	22.627
6/14/2013 9:55	78	29.614
6/14/2013 9:56	79	13.153
6/14/2013 9:57	80	7.853
6/14/2013 9:58	81	5.928
6/14/2013 9:59	82	2.6
6/14/2013 10:00	83	0.569
6/14/2013 10:01	84	-0.438
6/14/2013 10:02	85	-0.591
6/14/2013 10:03	86	-0.804

Certificate of Calibration

OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

Ozone Industries, Inc.
Precision Measurement Equipment Division

Purchase Order #

Calibration Performed By:
OZONE INDUSTRIES, INC.
15551 PINE RIDGE RD.
FORT MYERS, FL 33908

For:
YOUNGQUIST BROTHERS, INC.
15465 PINE RIDGE RD.
FORT MYERS, FL 33908

EQUIPMENT INFORMATION:

Description: PRESSURE GAUGE
Manufacter: MCDANIELS
Model Number: 300PSI
Part Number: N/A
Range: 0-300 PSI

Serial Number: 972062-1
Customer I.D.:
Cust. Barcode: N/A
Cust. Location: N/A
Specifications: +/- 0.25% FS

Cal Date: 6/6/2013
Cal. Due Date: 8/5/2013
Cal. Interval 60 DAYS
Received: IN TOLERANCE
Calibration Result: PASS
Environmental Conditions: 74 DEG F / 20% H
Performed By: Daniel McKissick

Procedure: 5TANDARD

This is to certify that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure at the points tested (unless otherwise noted). It has been Calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration is in accordance with Ozone Industries, Inc Quality Assurance Manual. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

Calibration Remarks:
THIS UNIT WAS FOUND TO BE IN TOLERANCE AT THE TIME OF CALIBRATION.
PERFORMED ROUTINE CALIBRATION / CERTIFICATION

Standards Used to Calibrate Equipment:

Company	I.D.	Description	Last Cal.	Cal. Due Date
OZONE	A1731	EATON UPC5000 PNEUMATIC CALIBRATOR	12/12/2012	12/12/2013

Signatures:

Certified by:
Print: Daniel McKissick
[redacted]

Approved by:
Print: Daniel McKissick
[redacted]

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15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

PH: 239-433-3400
FAX: 239-489-3877

CONTROL NO: 032509-1

CUSTOMER: YBI15465

CALIBRATION DATA FORM

MFR:	MCDANIELS	**DESCRIPTION**	PRESSURE GAUGE
MODEL NO:	300 PSI .25%	**TECHNICIAN:**	0030
SERIAL NO:	972062-1	**CAL. DATE:**	06/06/13
CUST. ID:	N/A	**DUE DATE:**	08/05/13

* IF NO "AS LEFT" READING IS SHOWN ON THIS CHART, IT MEANS THE UNIT WAS IN TOLERANCE AND THERE WERE NO ADJUSTMENTS MADE TO IT.

RANGE: 0-300 PSI

NOMINAL	AS FOUND	AS LEFT *	LOW LIMIT	HIGH LIMIT
50	50.26		49.25	50.75
100	100.31		99.25	100.75
150	150.38		149.25	150.75
200	200.49		199.25	200.75
300	300.6		299.25	300.75

Certificate of Calibration

OZONE INDUSTRIES CORPORATION

15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

Ozone Industries, Inc.

Precision Measurement Equipment Division

Purchase Order #

Calibration Performed By:
OZONE INDUSTRIES, INC.
15551 PINE RIDGE RD.
FORT MYERS, FL 33908

For:
YOUNGQUIST BROTHERS, INC.
15465 PINE RIDGE RD.
FORT MYERS, FL 33908

EQUIPMENT INFORMATION:

Description: PRESSURE GAUGE
Manufacter: McDaniel
Model Number: 300PSI
Part Number: N/A
Range: 0-300 PSI

Serial Number: 972034-2
Customer I.D.:
Cust. Barcode: N/A
Cust. Location: N/A
Specifications: +/- 0.25% FS

Cal Date: 5/17/2013
Cal. Due Date: 11/17/2013
Cal. Interval 6 MONTHS
Received: IN TOLERANCE
Calibration Result: PASS
Environmental Conditions: 74 DEG F / 80% H
Performed By: Daniel McKissick

Procedure: STANDARD

This is to certify that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure at the points tested (unless otherwise noted). It has been Calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration is in accordance with Ozone Industries, Inc Quality Assurance Manual. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

Calibration Remarks:
THIS UNIT WAS FOUND TO BE IN TOLERANCE AT THE TIME OF CALIBRATION.
PERFORMED ROUTINE CALIBRATION / CERTIFICATION

Standards Used to Calibrate Equipment:

Company	I.D.	Description	Last Cal.	Cal. Due Date
OZONE	A1731	EATON UPC5000 PNEUMATIC CALIBRATOR	12/12/2012	12/12/2013

Signatures:

Certified by:

Print: Daniel McKissick
Date: 05/17/13
[redacted]

Approved by:

Print: Daniel McKissick
[redacted]

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15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

PH: 239-433-3400
FAX: 239-489-3877

CONTROL NO: 100809-7

CUSTOMER: YBI15465

CALIBRATION DATA FORM

MFR:	PIC	**DESCRIPTION**	PRESSURE GAUGE
MODEL NO:	300 PSI .25%	**TECHNICIAN:**	0030
SERIAL NO:	972034-2	**CAL. DATE:**	05/17/13
CUST. ID:	N/A	**DUE DATE:**	11/17/13

* IF NO "AS LEFT" READING IS SHOWN ON THIS CHART, IT MEANS THE UNIT WAS IN TOLERANCE AND THERE WERE NO ADJUSTMENTS MADE TO IT.

RANGE: 0-300 PSI

NOMINAL	AS FOUND	AS LEFT *	LOW LIMIT	HIGH LIMIT
50	49.59		49.25	50.75
100	99.47		99.25	100.75
150	149.45		149.25	150.75
200	199.43		199.25	200.75
300	299.4		299.25	300.75

Certificate of Calibration

OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

Ozone Industries, Inc.

Precision Measurement Equipment Division

Purchase Order #

Calibration Performed By:
OZONE INDUSTRIES, INC.
15551 PINE RIDGE RD.
FORT MYERS, FL 33908

For:
YOUNGQUIST BROTHERS, INC.
15465 PINE RIDGE RD.
FORT MYERS, FL 33908

EQUIPMENT INFORMATION:

Description: PRESSURE GAUGE
Manufacter: MCDANIELS
Model Number: 300PSI
Part Number: N/A
Range: 0-300 PSI

Serial Number: AB30128
Customer I.D.:
Cust. Barcode: N/A
Cust. Location: N/A
Specifications: +/- 0.25% FS

Cal Date: 6/17/2013
Cal. Due Date: 12/17/2013
Cal. Interval 6 MONTHS
Received: IN TOLERANCE
Calibration Result: PASS
Environmental Conditions: 73 DEG F / 40% H
Performed By: Daniel McKissick

Procedure: STANDARD

This is to certify that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure at the points tested (unless otherwise noted). It has been Calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration is in accordance with Ozone Industries, Inc Quality Assurance Manual. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

Calibration Remarks:

THIS UNIT WAS FOUND TO BE IN TOLERANCE AT THE TIME OF CALIBRATION.
PERFORMED ROUTINE CALIBRATION / CERTIFICATION

Standards Used to Calibrate Equipment:

Company	I.D.	Description	Last Cal.	Cal. Due Date
OZONE	A1731	EATON UPC5000 PNEUMATIC CALIBRATOR	12/12/2012	12/12/2013

Signatures:

Certified by:
Print: Daniel McKissick
Date: 06/17/13
[redacted]

Approved by:
Print: Daniel McKissick
[redacted]

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CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

PH: 239-433-3400
FAX: 239-489-3877

CONTROL NO: 080709-2

CUSTOMER: YBI15465

CALIBRATION DATA FORM

MFR:	MCDANIELS	**DESCRIPTION**	PRESSURE GAUGE
MODEL NO:	300 PSI .25%	**TECHNICIAN:**	0030
SERIAL NO:	AB30128	**CAL. DATE:**	06/17/13
CUST. ID:	N/A	**DUE DATE:**	12/17/13

* IF NO "AS LEFT" READING IS SHOWN ON THIS CHART, IT MEANS THE UNIT WAS IN TOLERANCE AND THERE WERE NO ADJUSTMENTS MADE TO IT.

RANGE: 0-200 PSI

NOMINAL	AS FOUND	AS LEFT *	LOW LIMIT	HIGH LIMIT
50	50.18		49.25	50.75
100	100.19		99.25	100.75
150	150.22		149.25	150.75
200	200.31		199.25	200.75
250	250.33		249.25	250.75
300	300.39		299.25	300.75

Appendix D

RTS and RTS Tool Configuration

RADIOACTIVE TRACER SURVEY LOG

Company	MIAMI-DADE WATER & SEWER
Well	IW-#3
Field	S.D.W.W.T.P.
County	MIAMI-DADE
State	FL

Company MIAMI-DADE WATER & SEWER
Well IW-#3
Field S.D.W.W.T.P.
County MIAMI-DADE
State FL

Company MIAMI-DADE WATER & SEWER
Well IW-#3
Field S.D.W.W.T.P.
County MIAMI-DADE State FL

Location: API # :

SEC TWP RGE

Other Services

Elevation

Permanent Datum G.L Elevation
Log Measured From
Drilling Measured From

K.B.
D.F.
G.L.

Date	19-JUN-2013		
Run Number	2013 MIT		
Depth Driller	3123'		
Depth Logger	2740'		
Bottom Logged Interval	2740'		
Top Log Interval	SURFACE		
Open Hole Size	24"		
Type Fluid	WATER		
Density / Viscosity	NA		
Max. Recorded Temp.	NA		
Estimated Cement Top	NA		
Time Well Ready	UPON ARRIVAL		
Time Logger on Bottom	1130		
Equipment Number	102		
Location	FT. MYERS		
Recorded By	MARTINEZ	MOREY	
Witnessed By	S. VILLAMIL	M. MACFARLANE	

Borehole Record				Borehole Record			
Run Number	Bit	From	To	Run No	Bit	From	To

Casing Record	Size	Wgt/Ft	Top	Bottom
Surface String				
Prot. String				
Production String	24"	.500" W.T	SURFACE	2630'
Liner				

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

Comments

HIGH RESOLUTION TEMPERATURE

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)

GR#3	24.00	GR #3 -RTST (952T)	11.50	1.69	30.00
		TREJCT-A (952)	1.00	1.69	10.00
		GR #2 -RTSM (952M)	3.00	1.69	10.00
GR#2	10.50				
CCL	9.60	CCL-1.68GRRTS (952)	0.75	1.69	10.00
		GR-RTSB (952B)	9.25	1.69	10.00
GR	1.20				

Dataset: sdwwtp-iw-3.db: field/well/run1/pass4
Total Length: 25.50 ft
Total Weight: 70.00 lb
O.D. 1.69 in

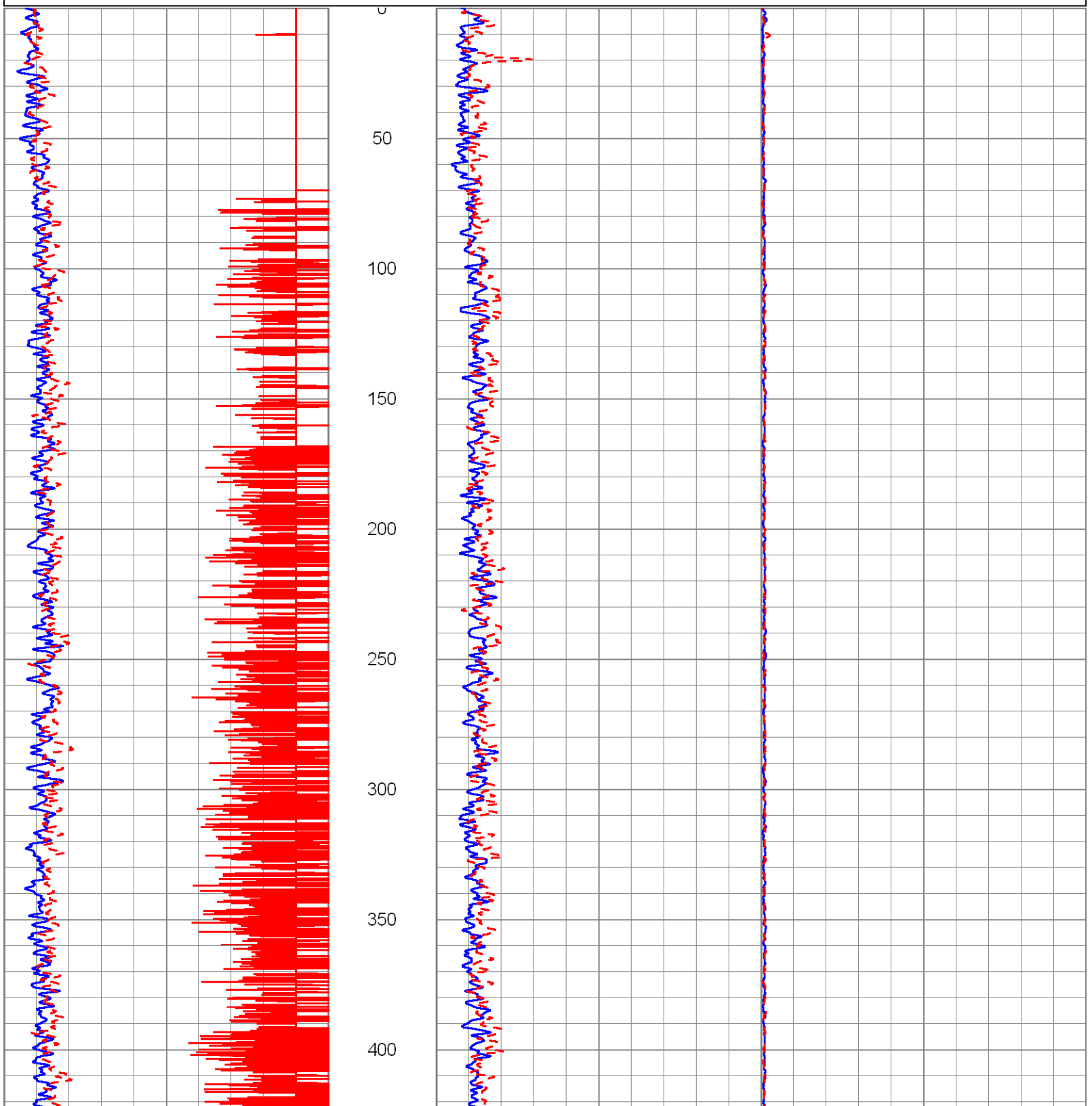
YOUNGQUIST

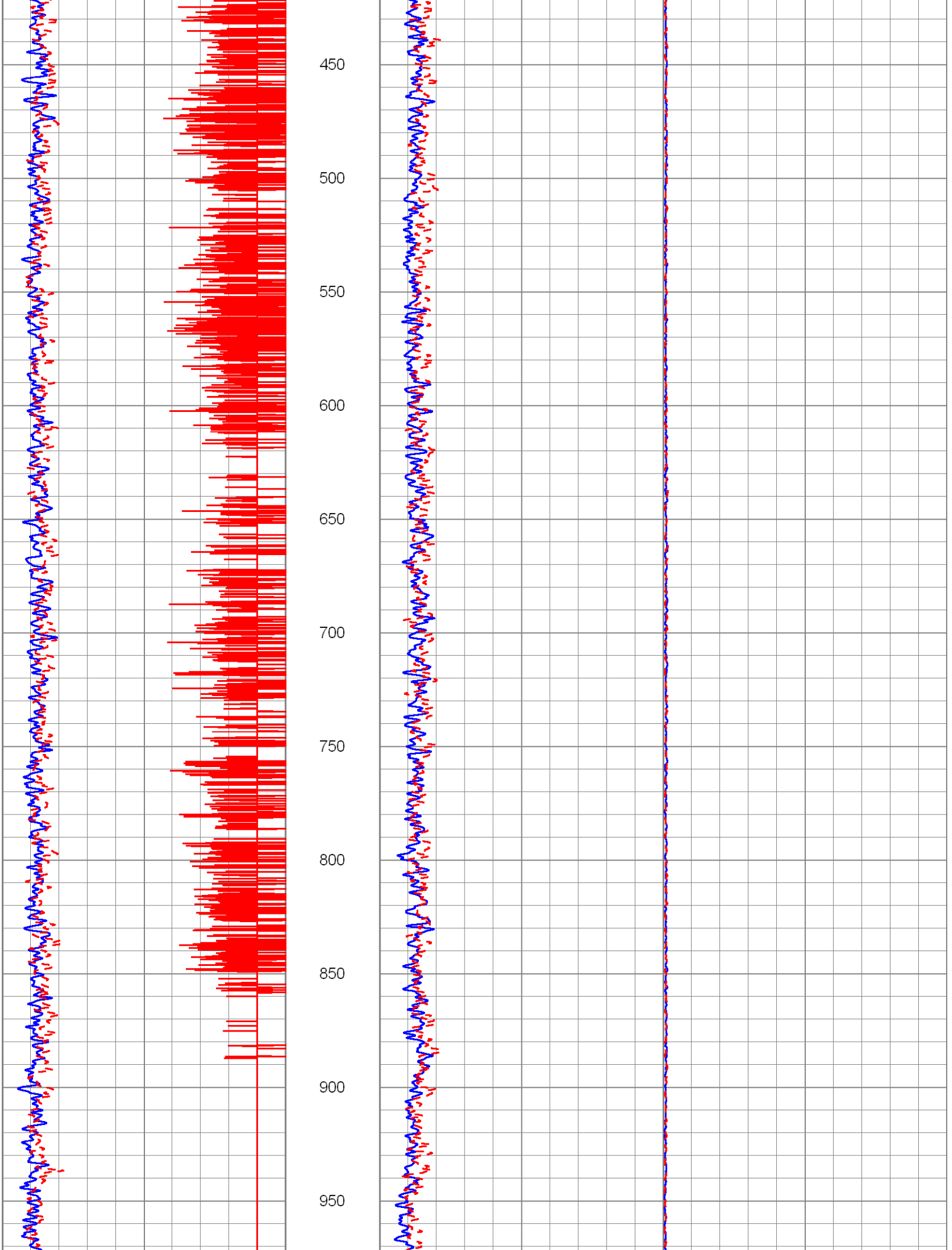
FINAL BACKGROUND

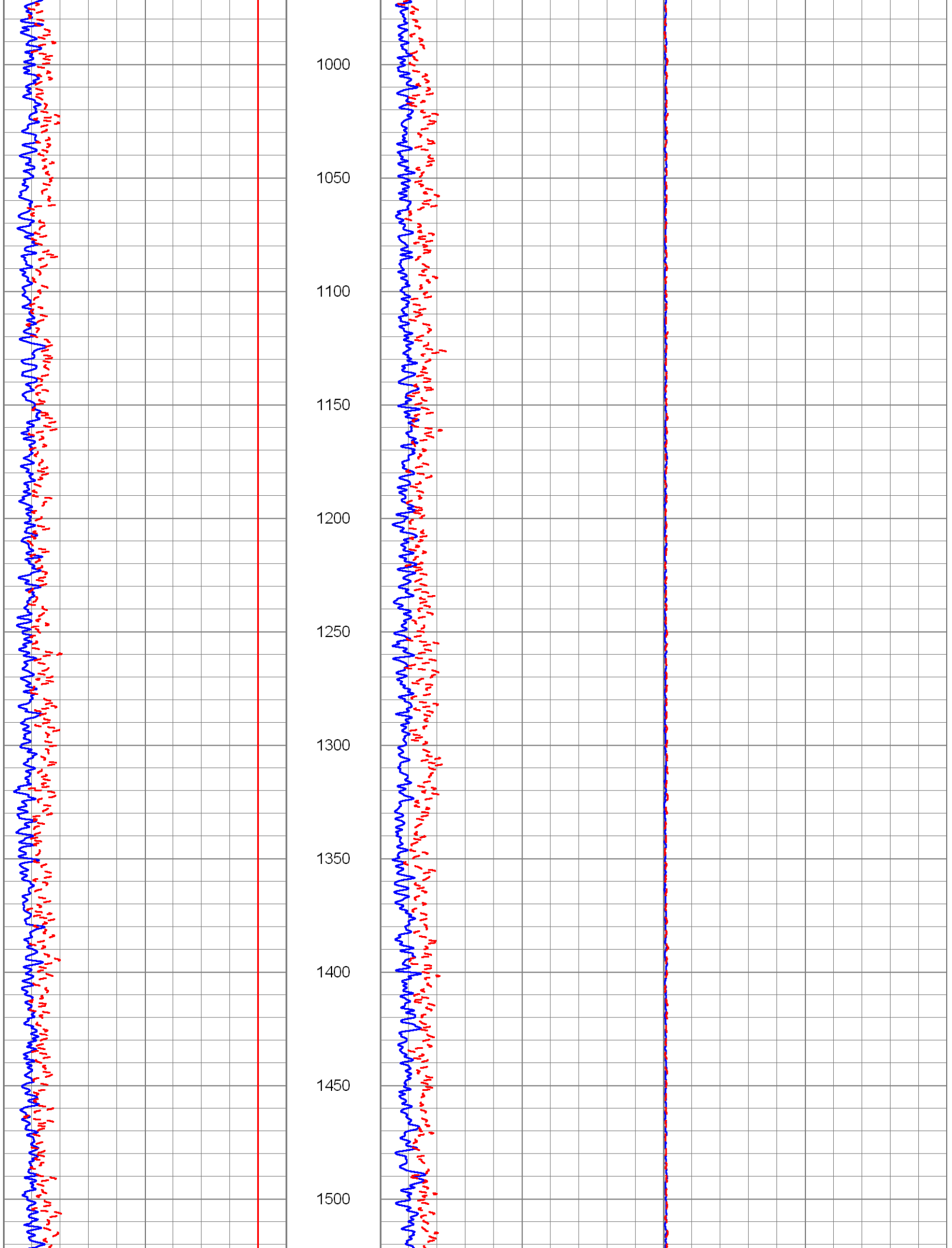
FINAL BACKGROUND

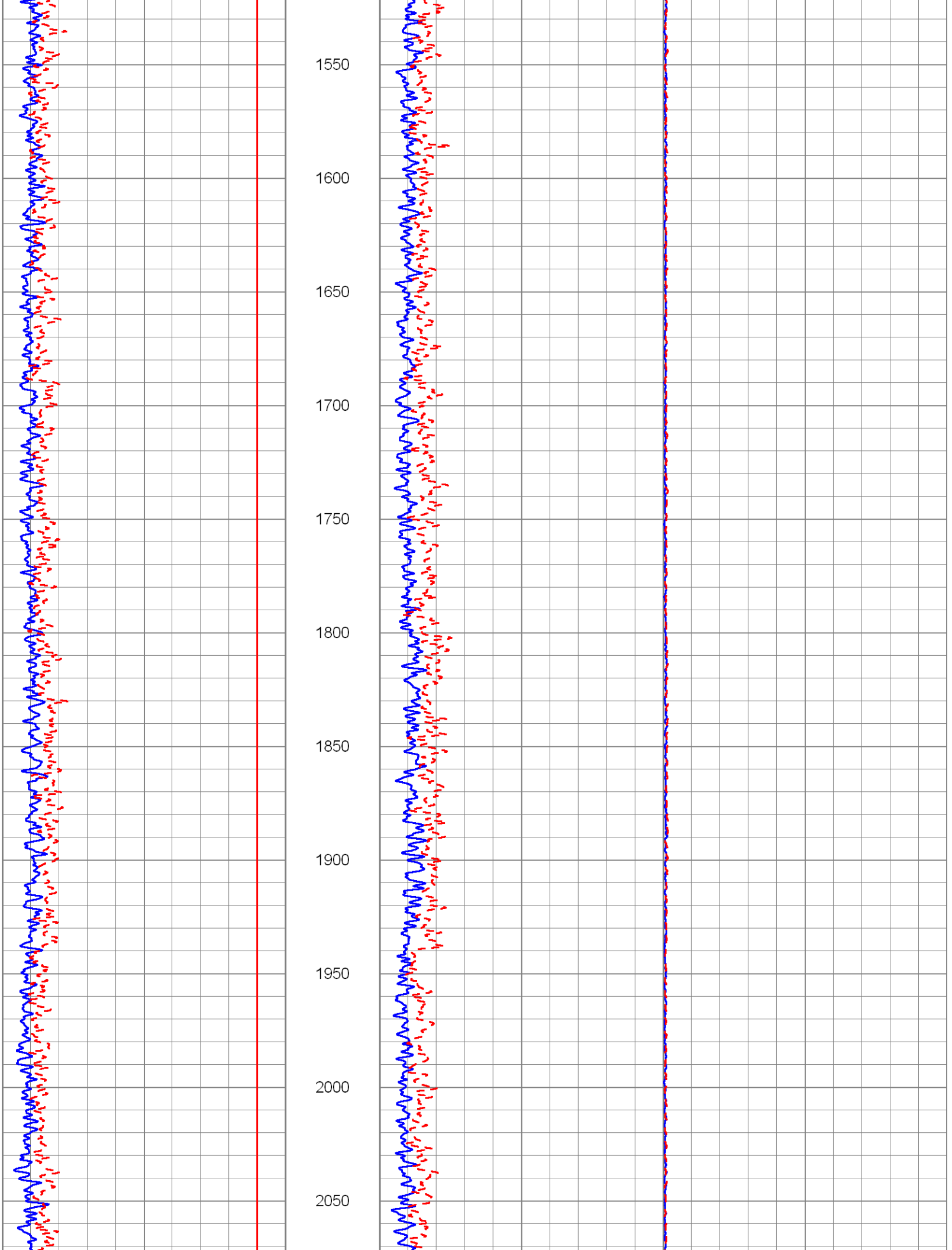
Database File:	sdwwtp-iw-3.db
Dataset Pathname:	pass10
Presentation Format:	rts
Dataset Creation:	Wed Jun 19 13:54:47 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:600

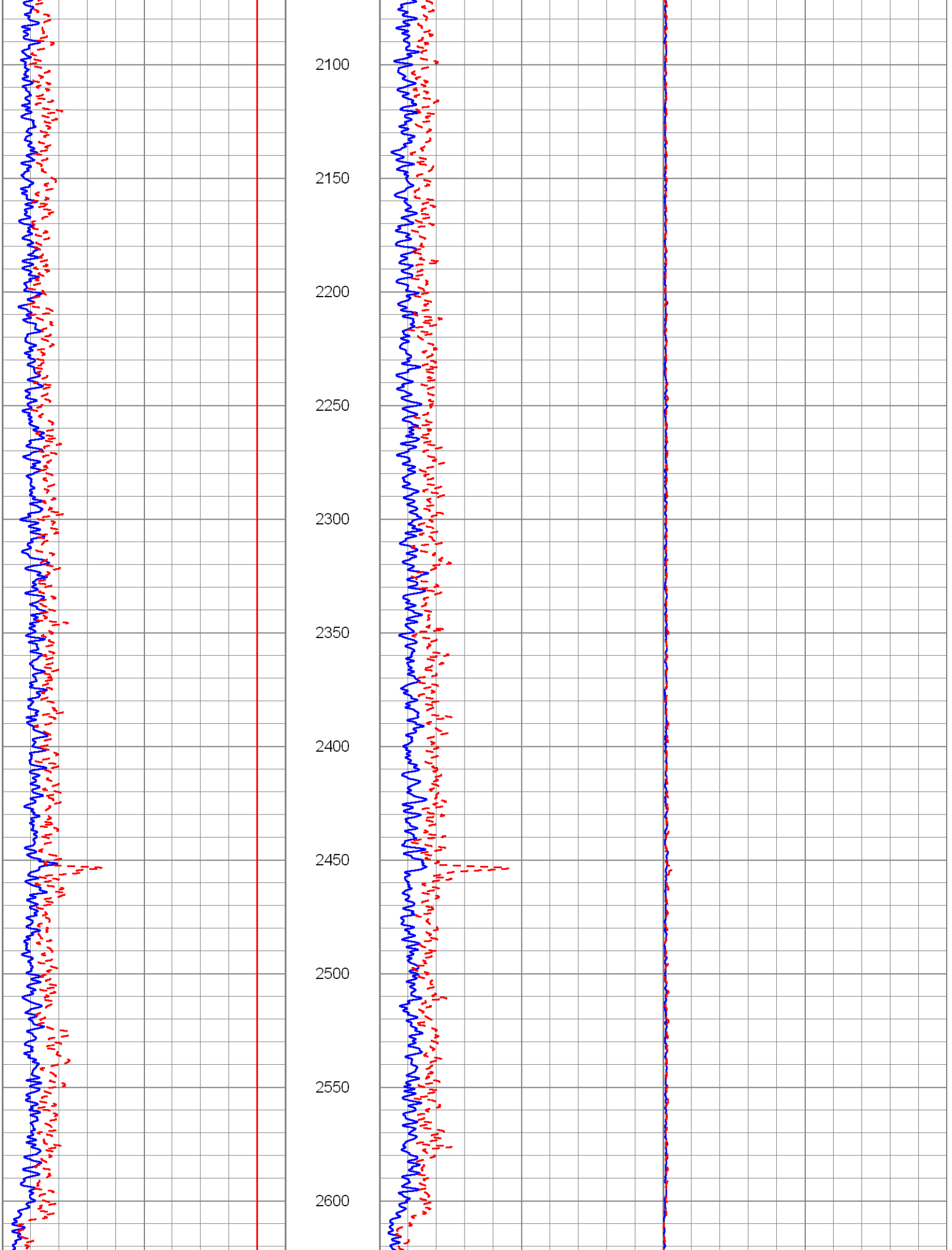
0	GRT (GAPI)	100	0	GRB (GAPI)	100	0	GRM (GAPI) 1000
0	GRT-BACKGRND (GAPI)	100	0	GRB-BACKGRD (GAPI)	100	0	GRM-BACKGRND (GAPI) 1000
0.9	CCL	-0.1					

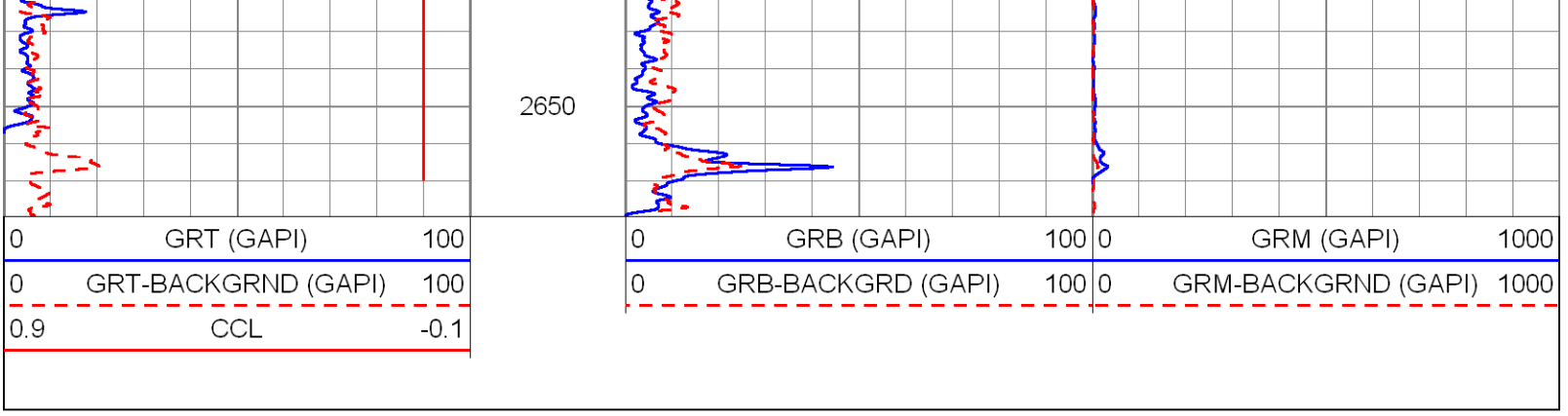



450
500
550
600
650
700
750
800
850
900
950


1000
1050
1100
1150
1200
1250
1300
1350
1400
1450
1500

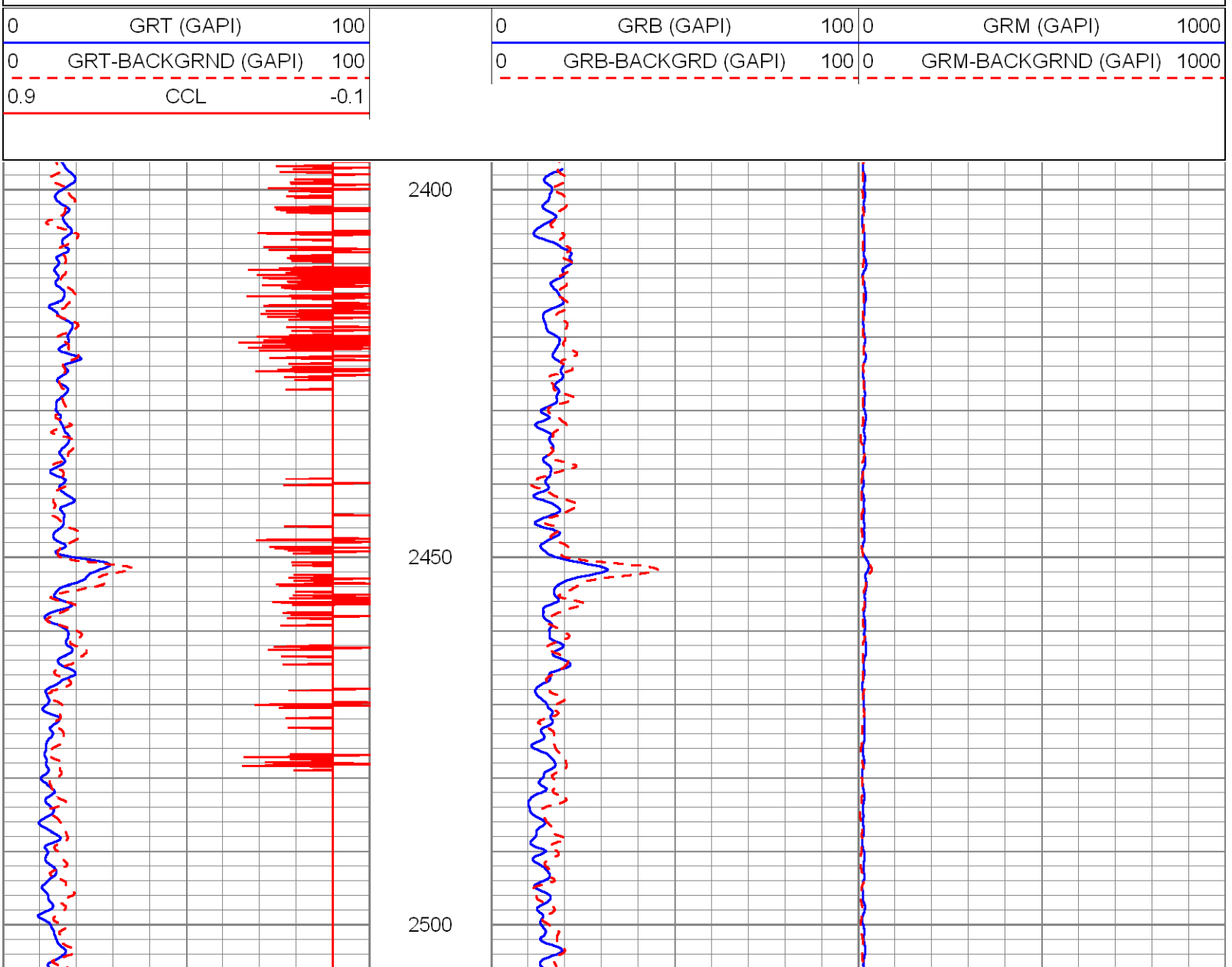

1550
1600
1650
1700
1750
1800
1850
1900
1950
2000
2050

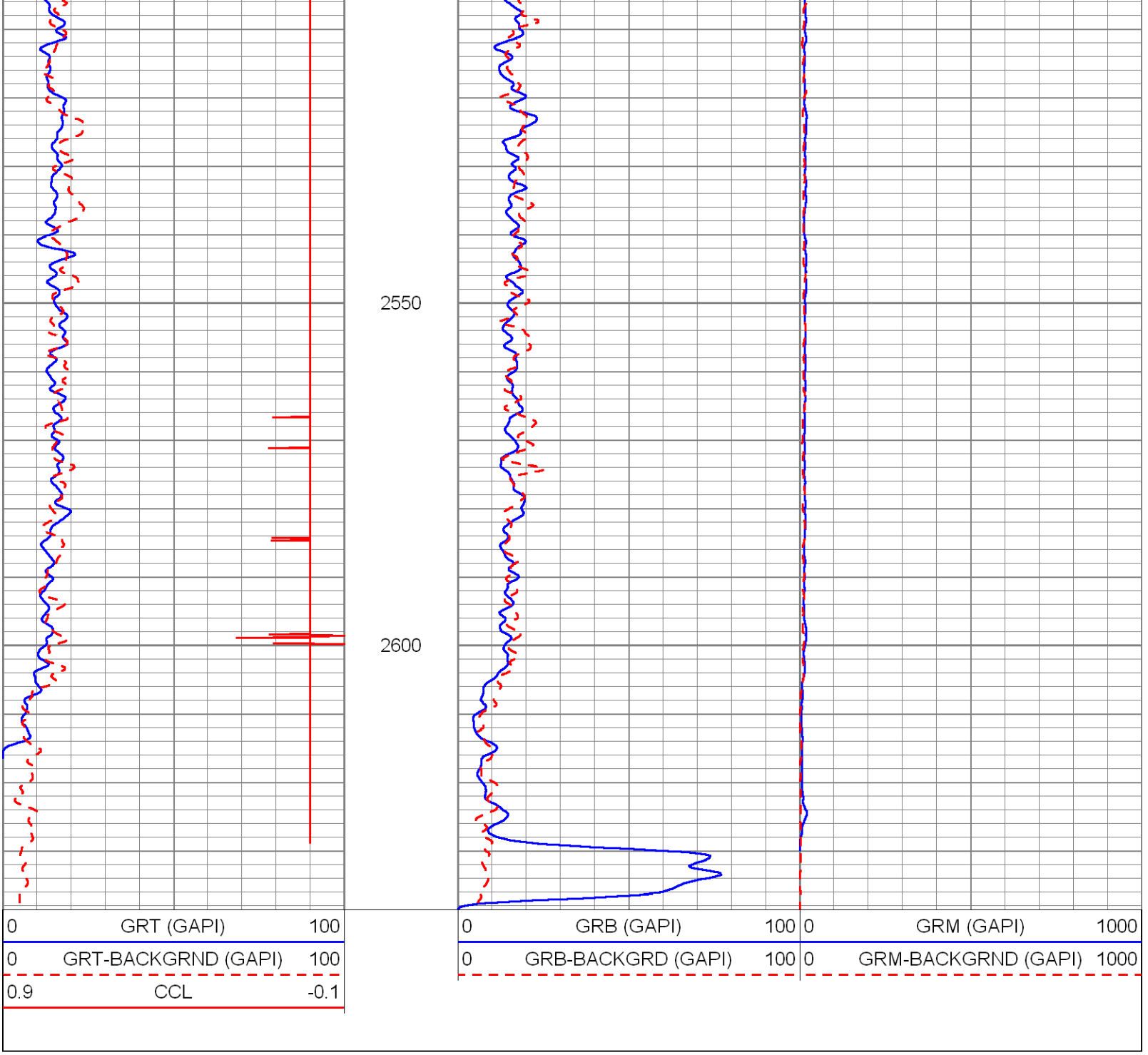

2100
2150
2200
2250
2300
2350
2400
2450
2500
2550
2600



LOP #2

Database File:	sdwwtp-iw-3.db
Dataset Pathname:	pass9
Presentation Format:	rts
Dataset Creation:	Wed Jun 19 13:23:11 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:240

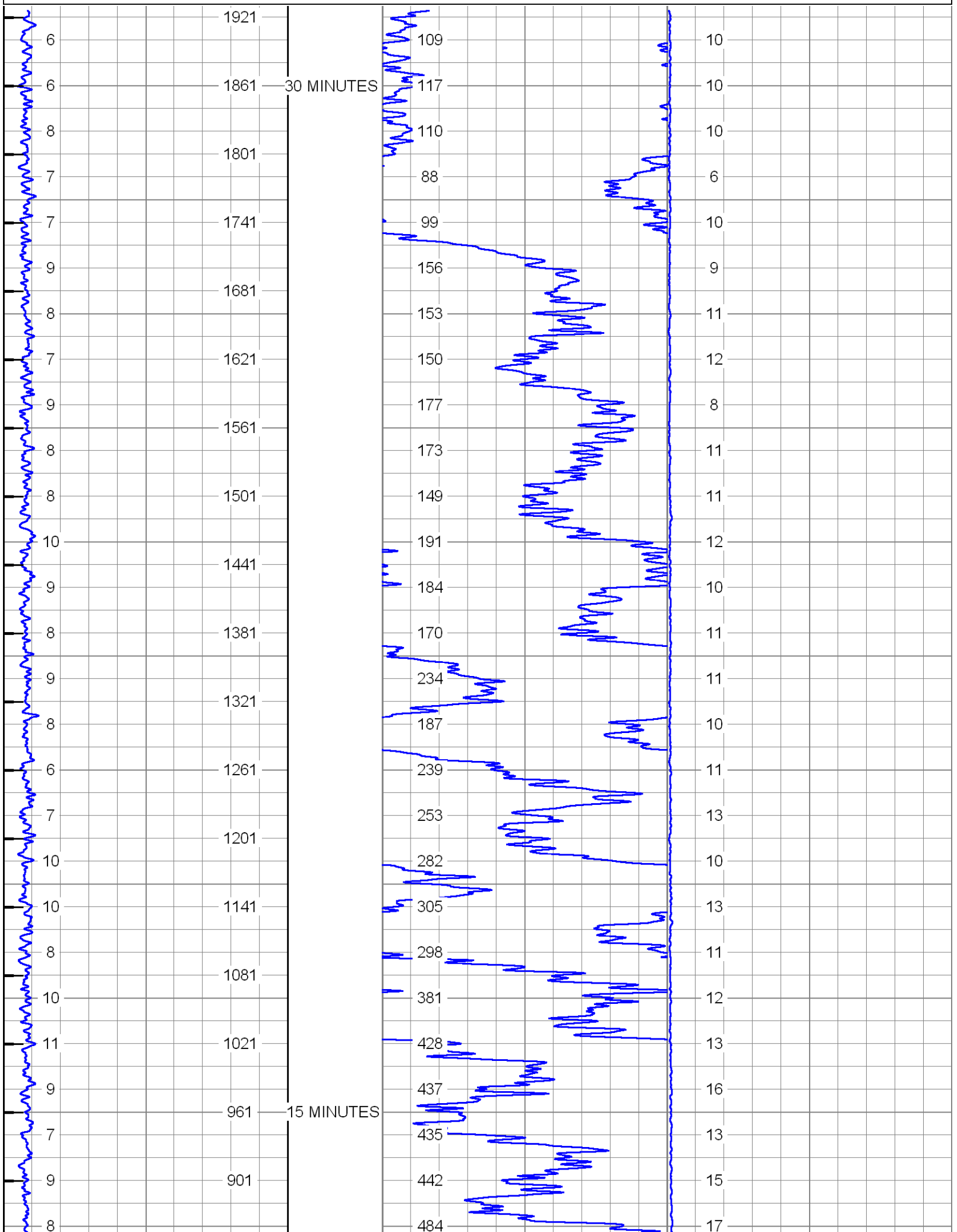




DYNAMIC TEST #2 (87 GPM)

Database File:	sdwwtp-iw-3.db
Dataset Pathname:	pass8
Presentation Format:	rtstime
Dataset Creation:	Wed Jun 19 12:48:50 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:600

0	GRT (GAPI)	100	0 EJECT 2	0	GRB (GAPI)	100	0	GRM (GAPI) 1000
0	MINUTES	15			GRB (GAPI)			GRM (GAPI)
GRT (GAPI)		ELTIM (sec)						


1921
1861
30 MINUTES
1801
1741
1681
1621
1561
1501
1441
1381
1321
1261
1201
1141
1081
1021
961
15 MINUTES
901
6
6
8
7
7
9
8
7
9
8
8
10
9
8
9
8
6
7
10
10
8
10
11
9
7
9
8
109
117
110
88
99
156
153
150
177
173
149
191
184
170
234
187
239
253
282
305
298
381
428
437
435
442
484
10
10
10
6
10
9
11
12
8
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12
10
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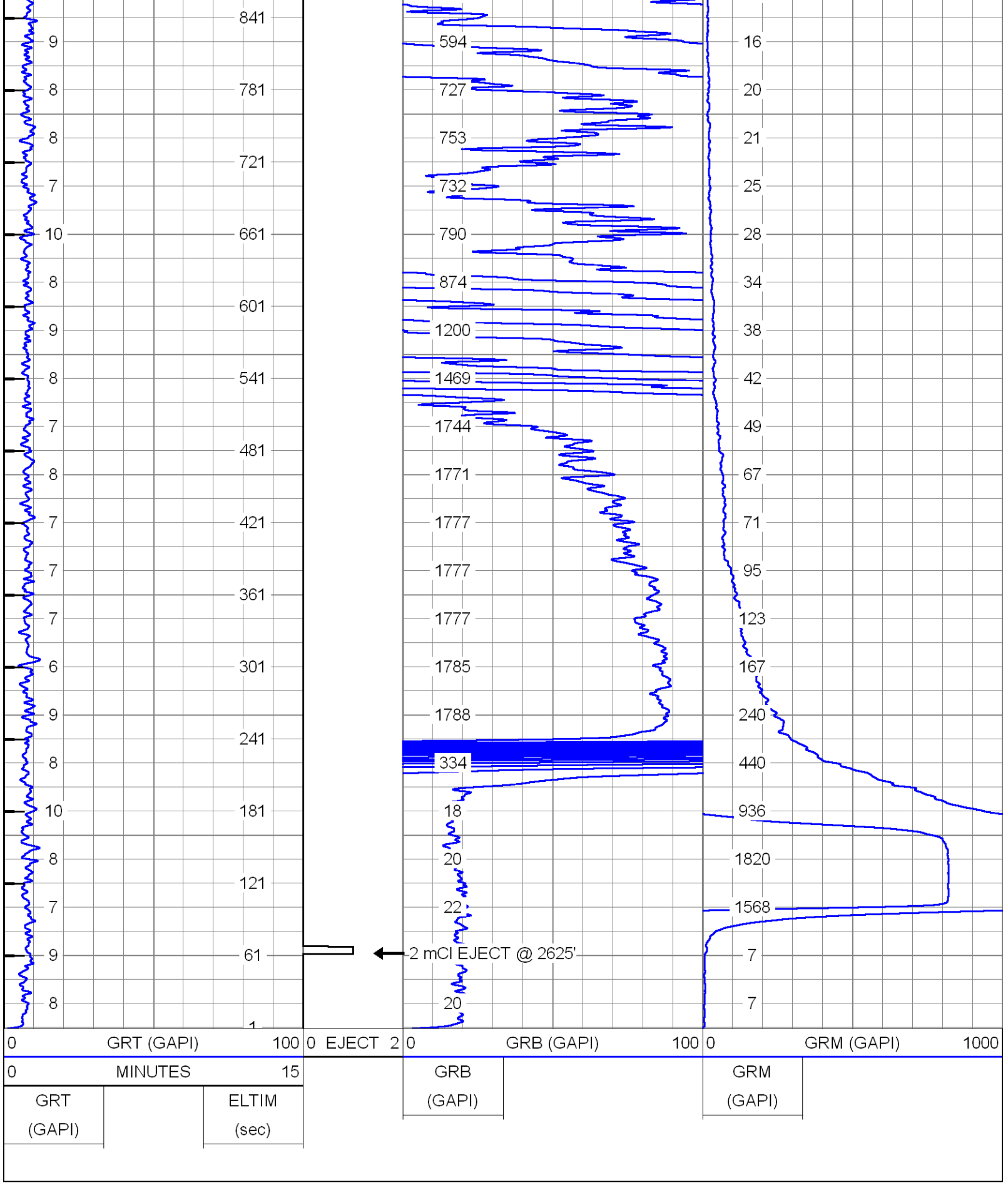
11
13
10
13
11
12
13
16
13
15
17

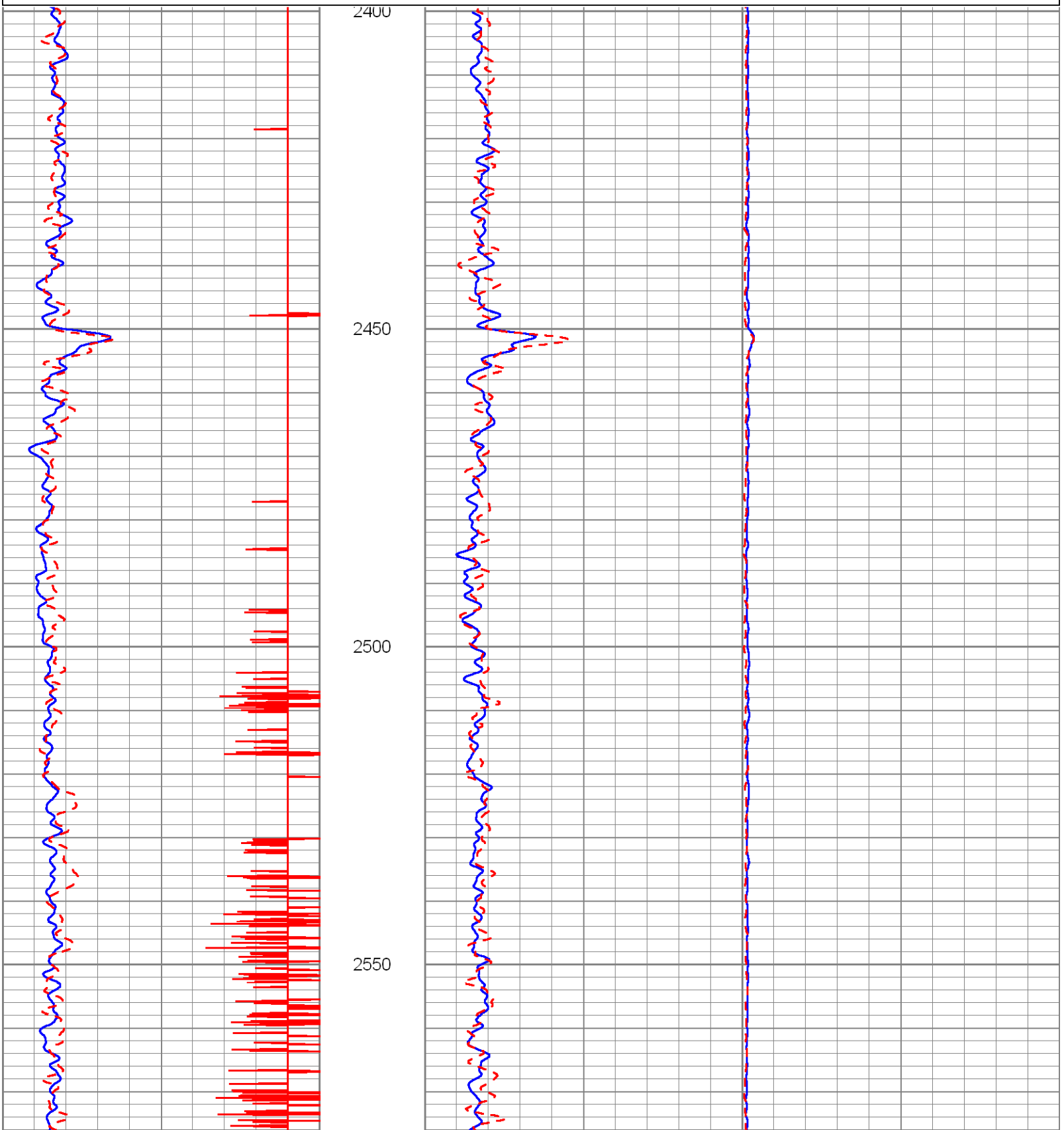


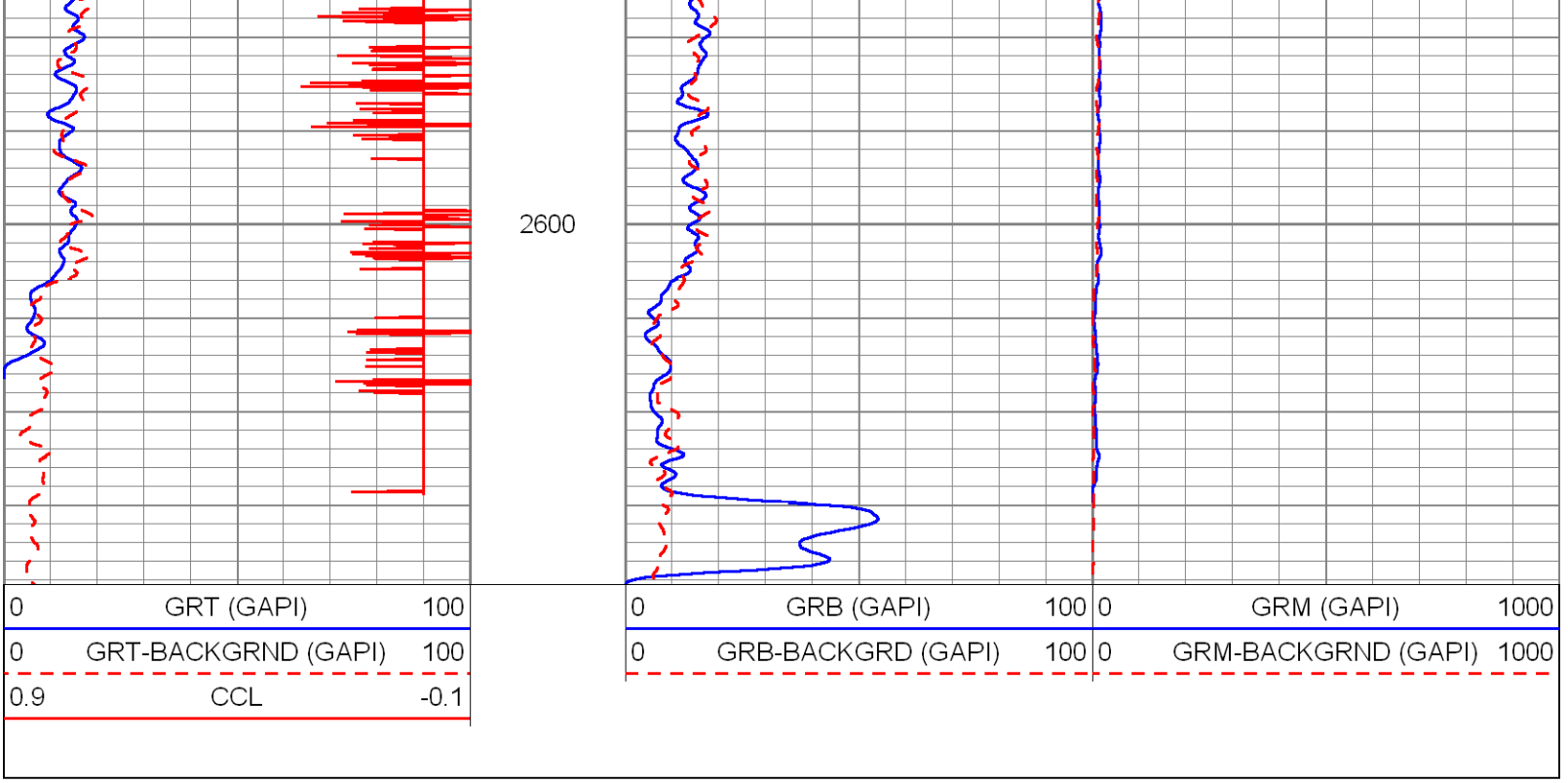
YOUNGQUIST BROTHERS

LOP #1

Database File: sdwwtp-iw-3.db
Dataset Pathname: pass7
Presentation Format: rts
Dataset Creation: Wed Jun 19 12:29:07 2013 by Log SOC 110722
Charted by: Depth in Feet scaled 1:240

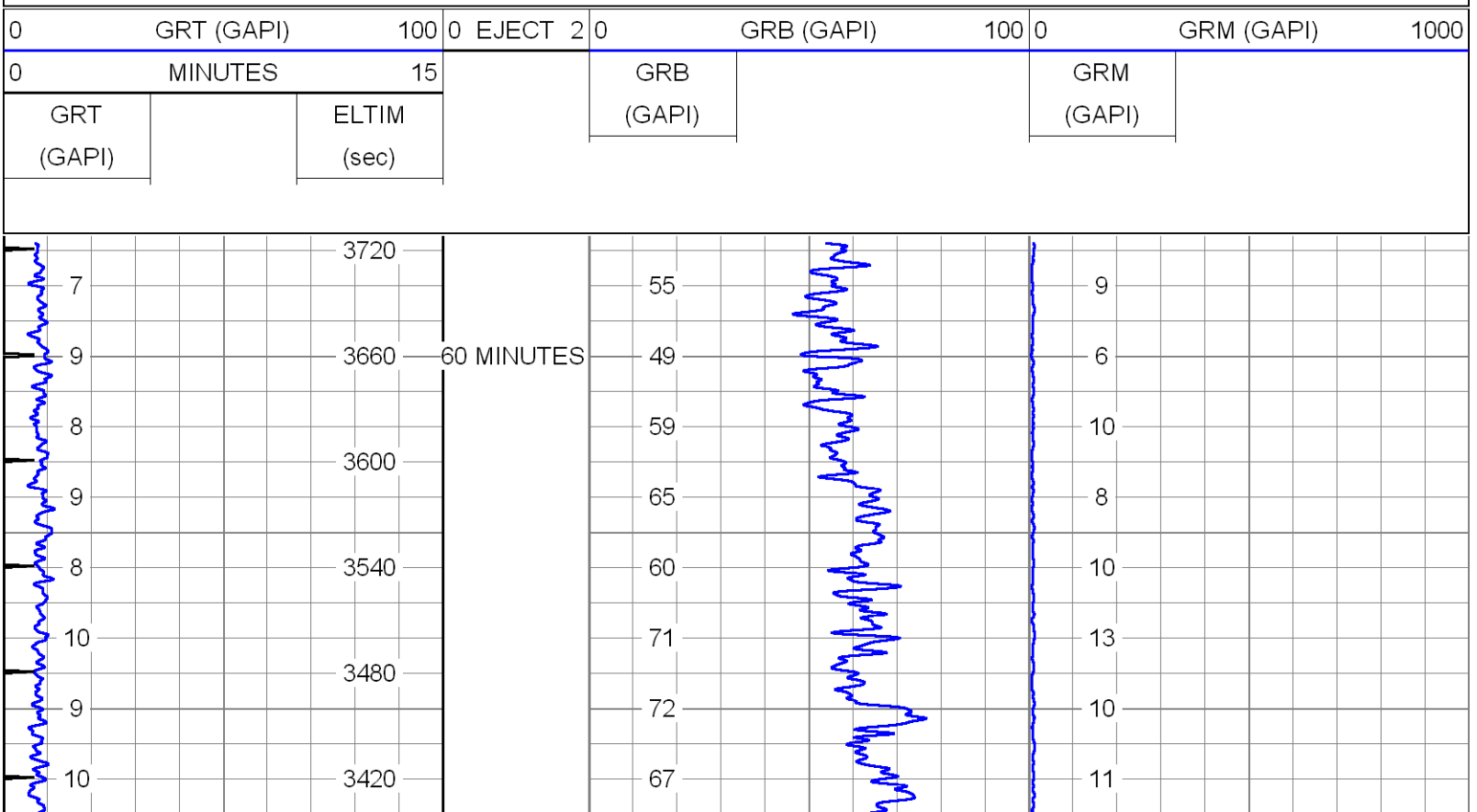
0	GRT (GAPI)	100		0	GRB (GAPI)	100	0	GRM (GAPI) 1000
0	GRT-BACKGRND (GAPI)	100		0	GRB-BACKGRD (GAPI)	100	0	GRM-BACKGRND (GAPI) 1000
0.9	CCL	-0.1						

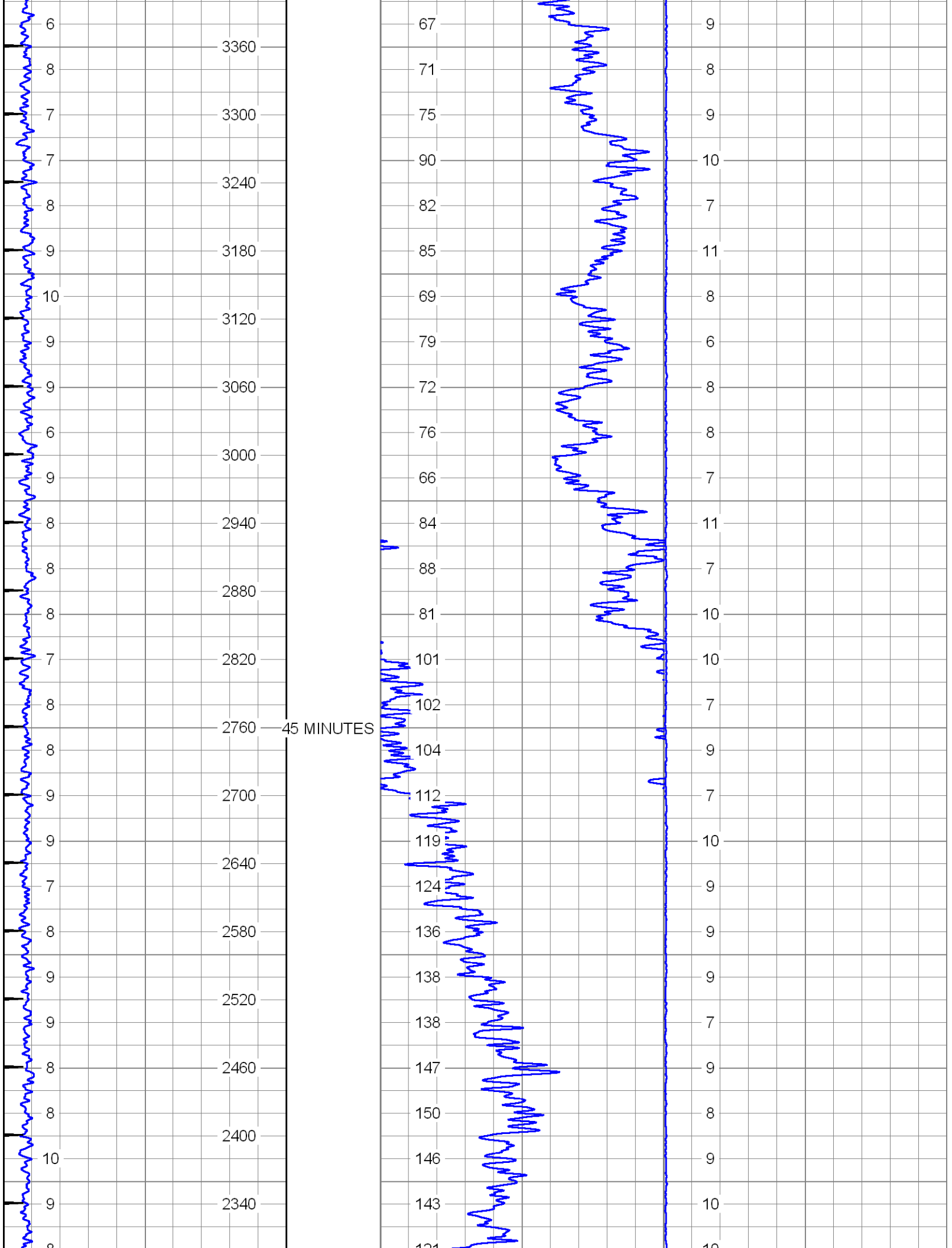


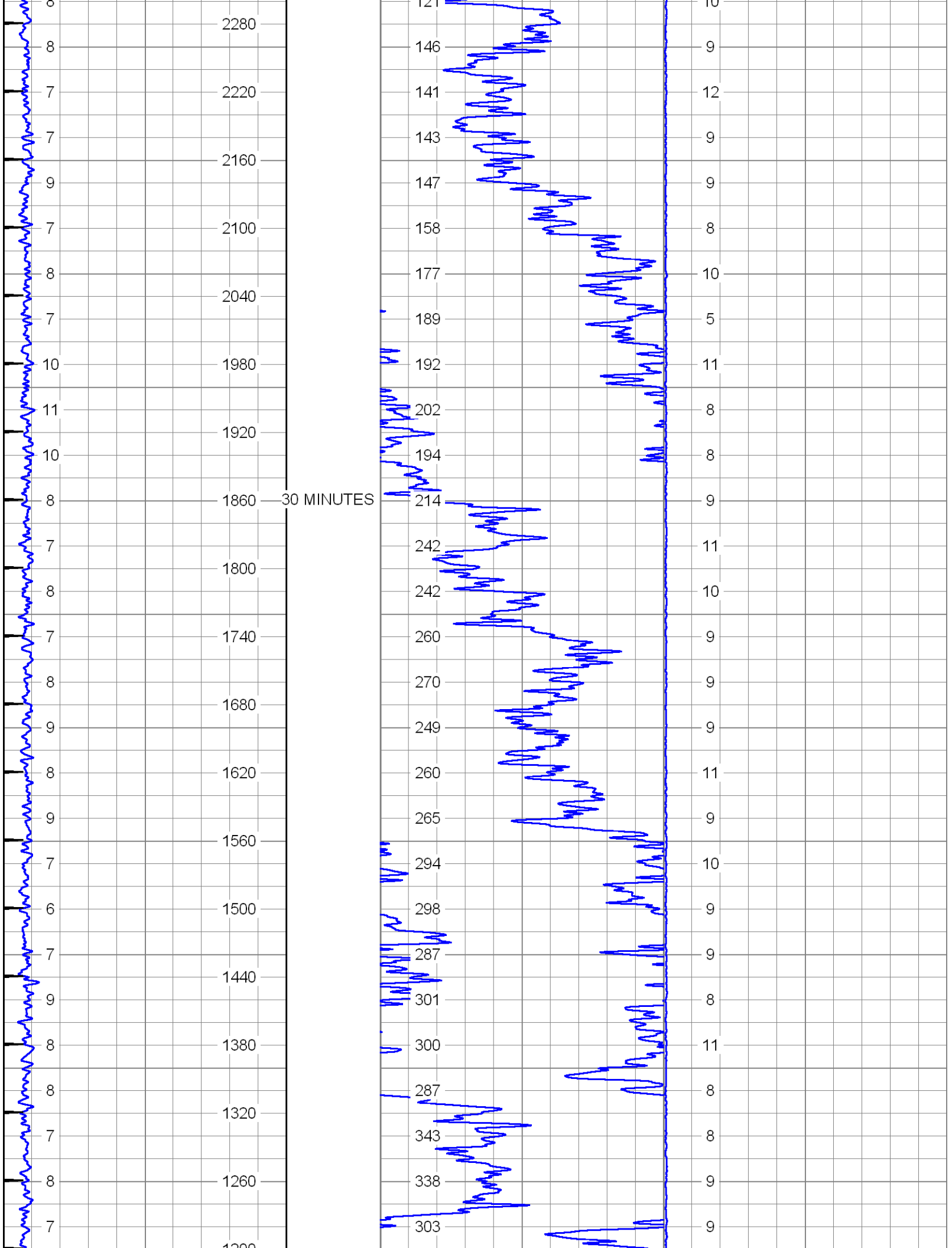


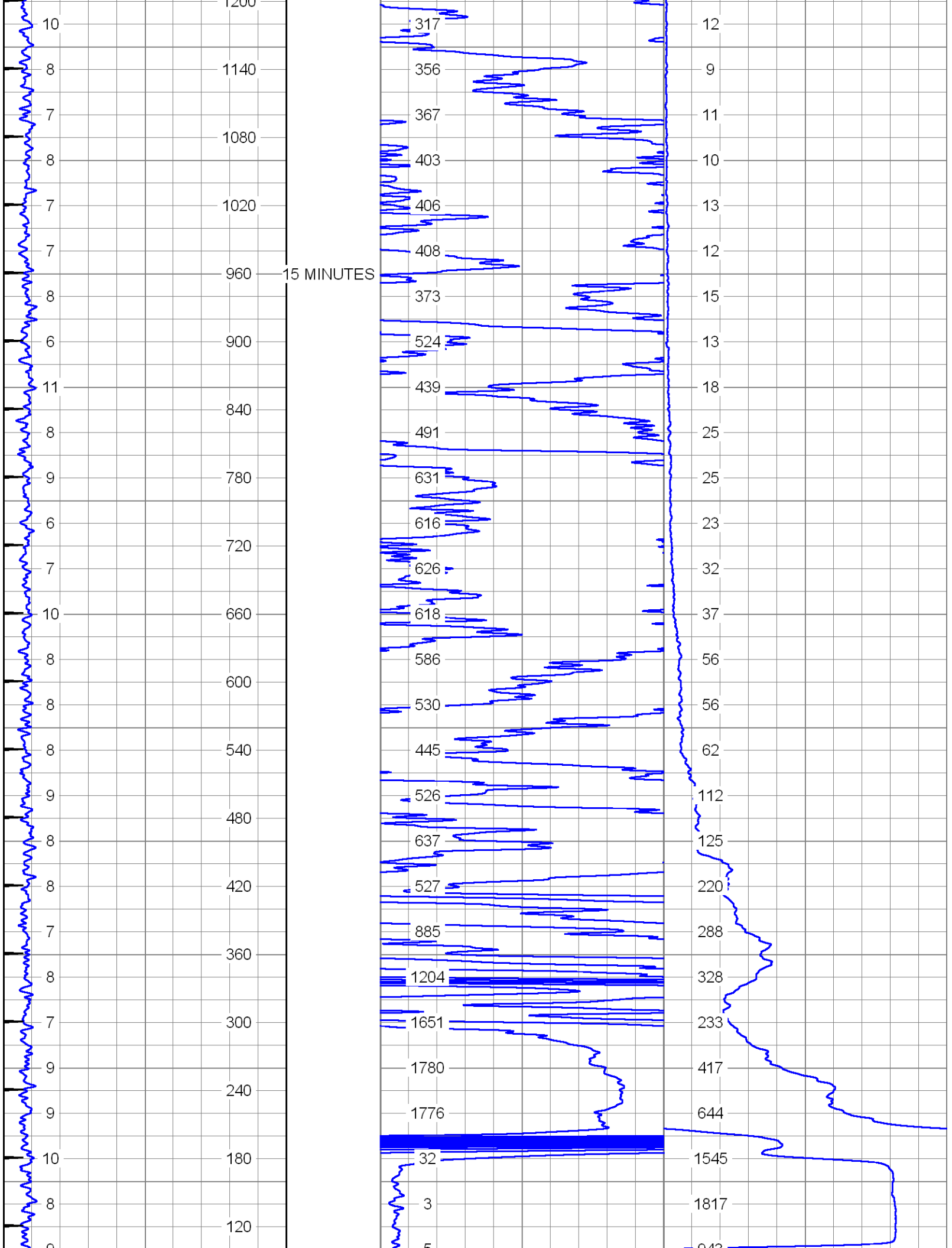
DYNAMIC TEST #1 (88 GPM)

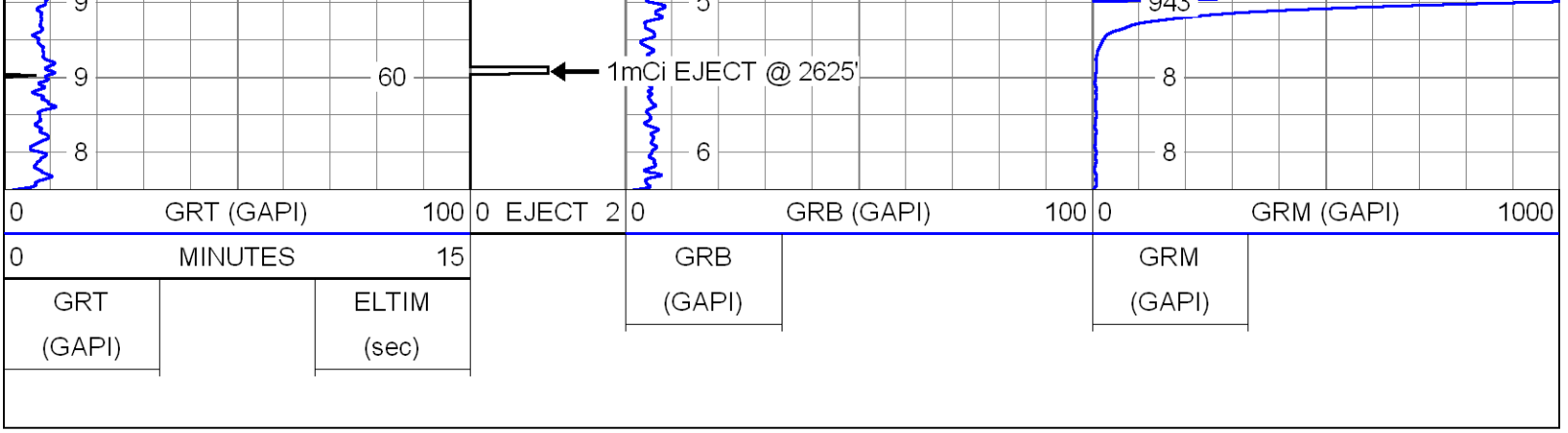
Database File:	sdwwtp-iw-3.db
Dataset Pathname:	pass6
Presentation Format:	rtstime
Dataset Creation:	Wed Jun 19 11:22:13 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:600




45 MINUTES

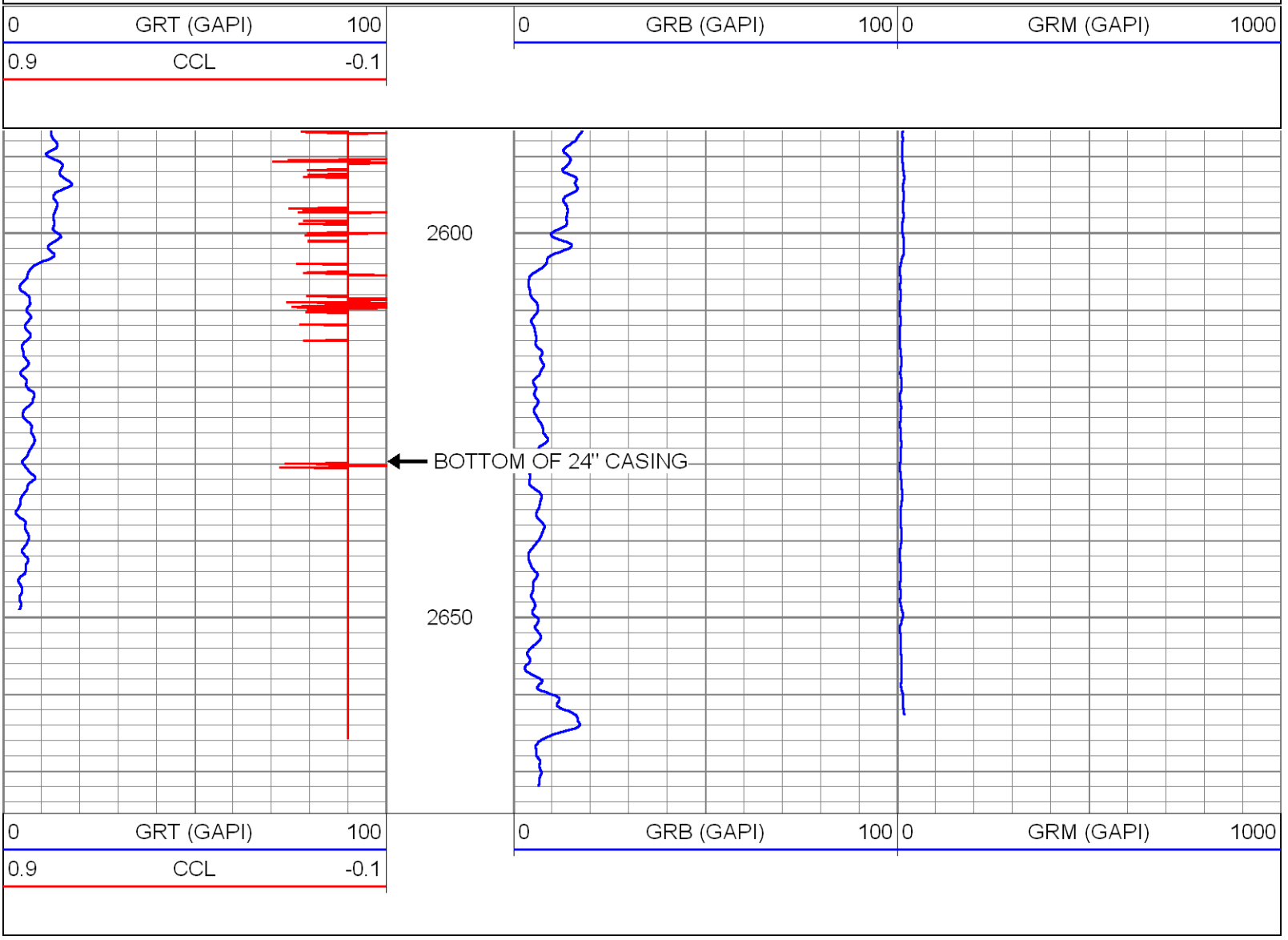

30 MINUTES
2280
2220
2160
2100
2040
1980
1920
1860
1800
1740
1680
1620
1560
1500
1440
1380
1320
1260
1200
146
141
143
147
158
177
189
192
202
194
214
242
242
260
270
249
260
265
294
298
287
301
300
287
343
338
303


15 MINUTES
1200
1140
1080
1020
960
900
840
780
720
660
600
540
480
420
360
300
240
180
120
10
8
7
8
7
7
8
6
11
8
9
6
7
10
8
8
8
9
8
8
7
8
7
9
9
10
8
317
356
367
403
406
408
373
524
439
491
631
616
626
618
586
530
445
526
637
527
885
1204
1651
1780
1776
32
3
5
12
9
11
10
13
12
15
13
18
25
25
23
32
37
56
56
62
112
125
220
288
328
233
417
644
1545
1817



CASING TIE-IN

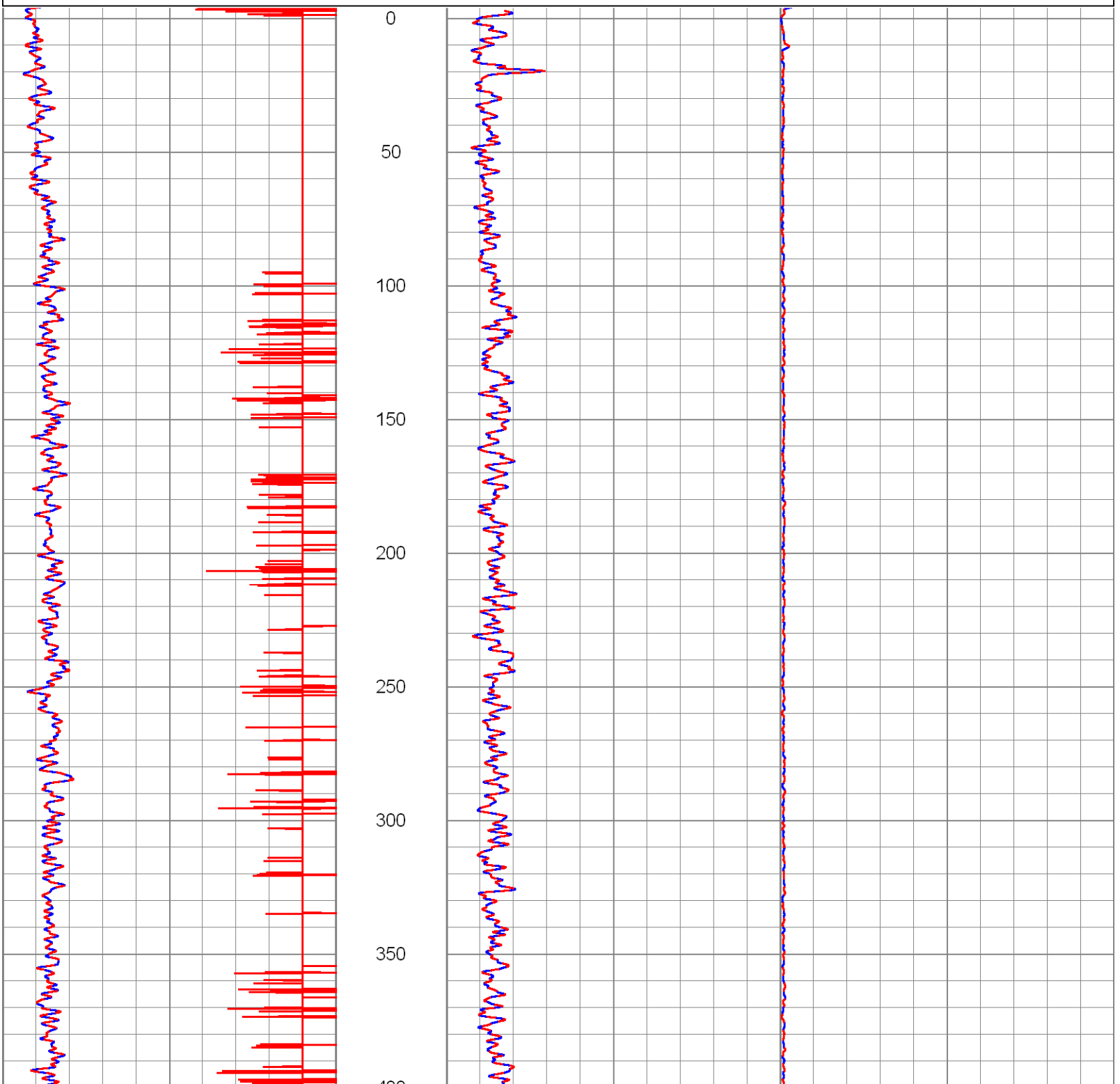
Database File:	sdwwtp-iw-3.db
Dataset Pathname:	pass5
Presentation Format:	rts
Dataset Creation:	Wed Jun 19 10:59:07 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:240

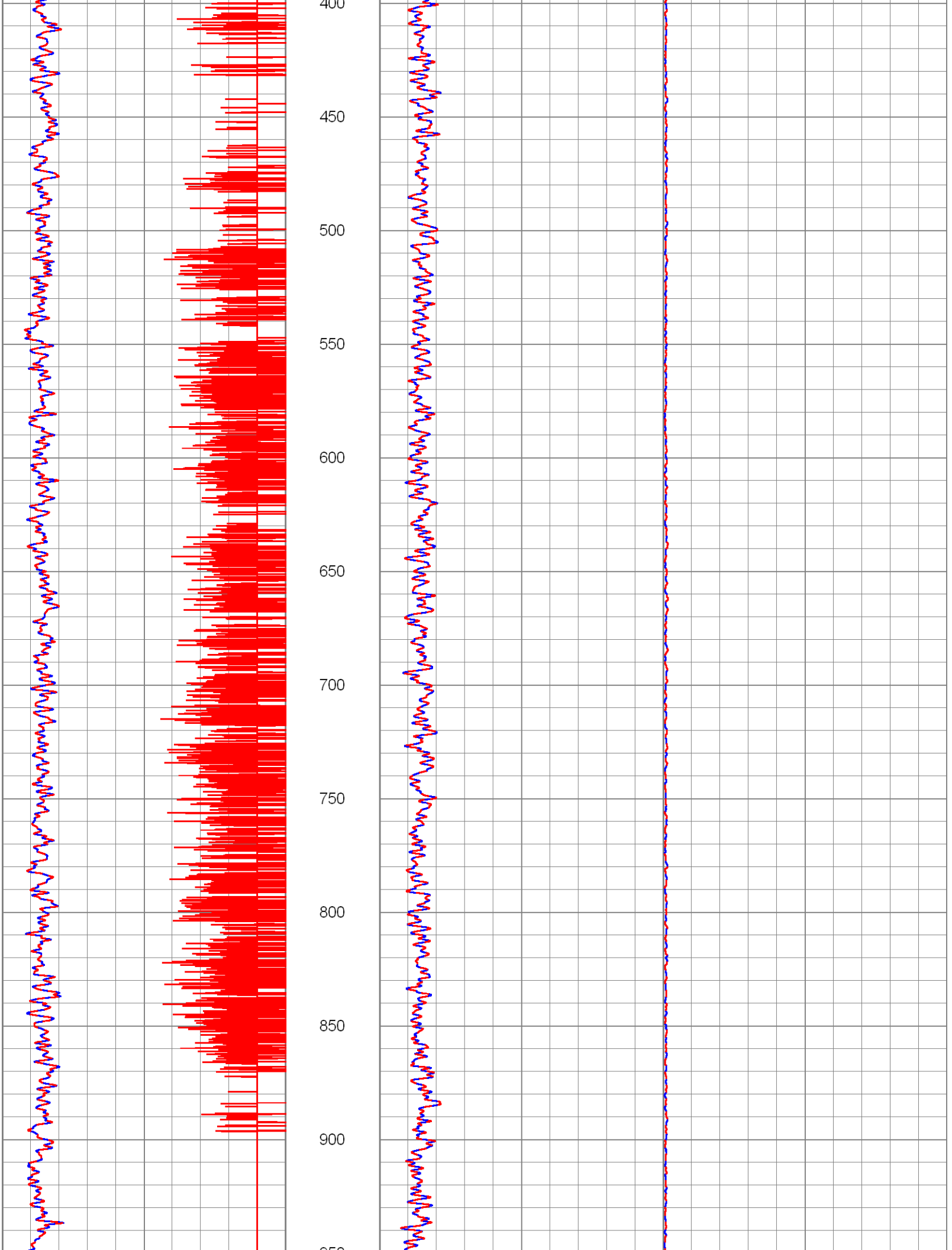


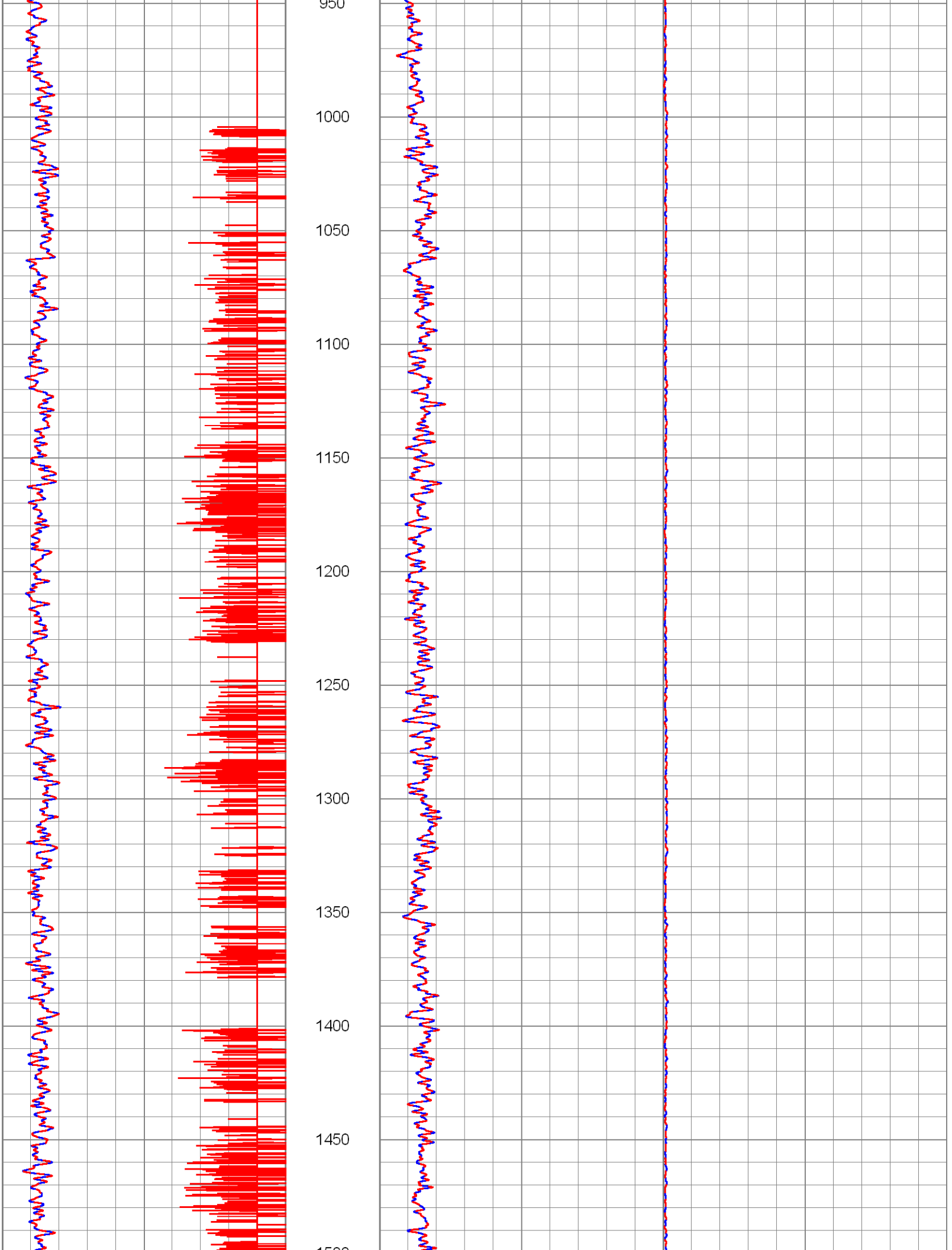
BACKGROUND GAMMA RAY

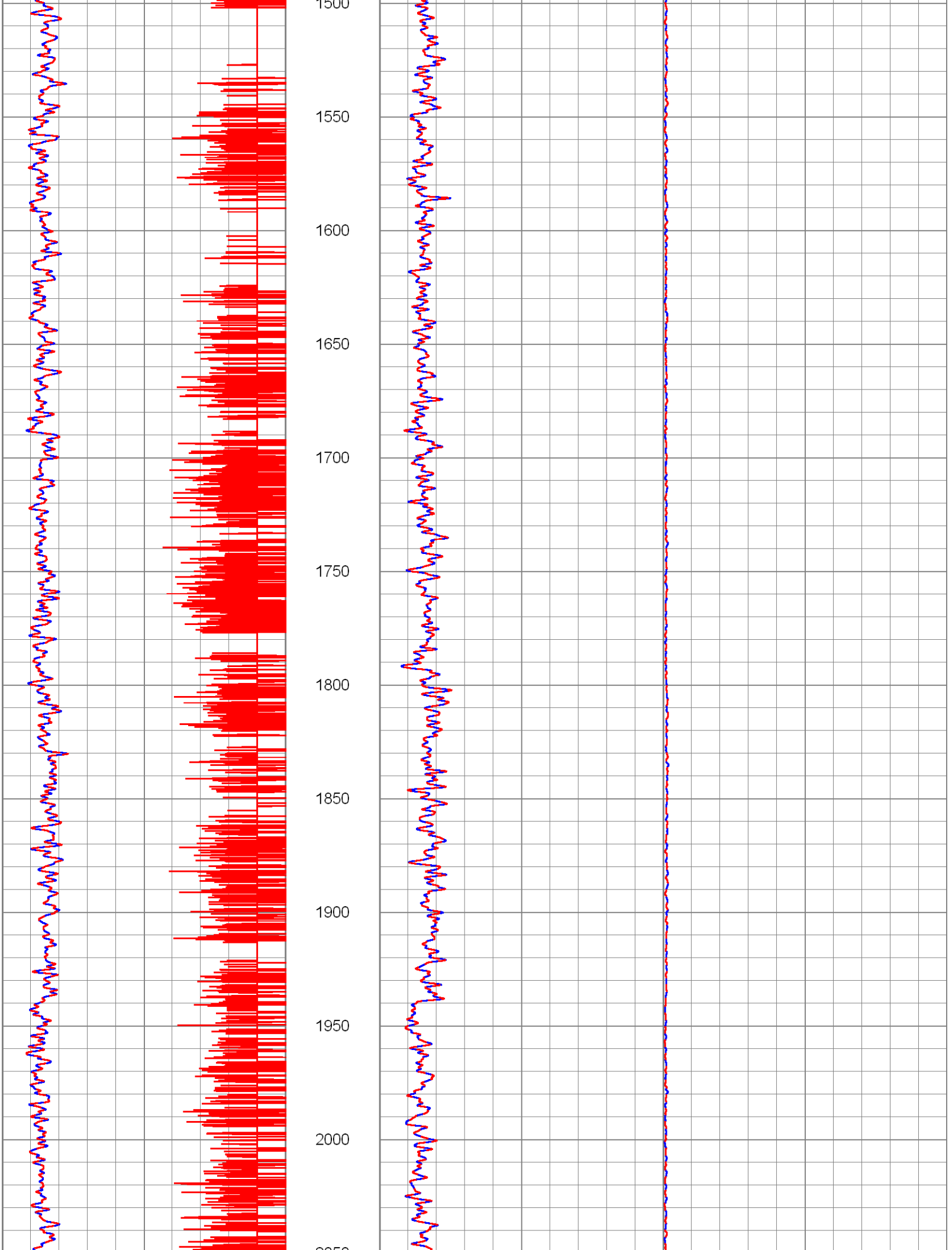
Database File:	sdwwtp-iw-3.db
Dataset Pathname:	pass4
Presentation Format:	rts
Dataset Creation:	Wed Jun 19 09:16:09 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:600

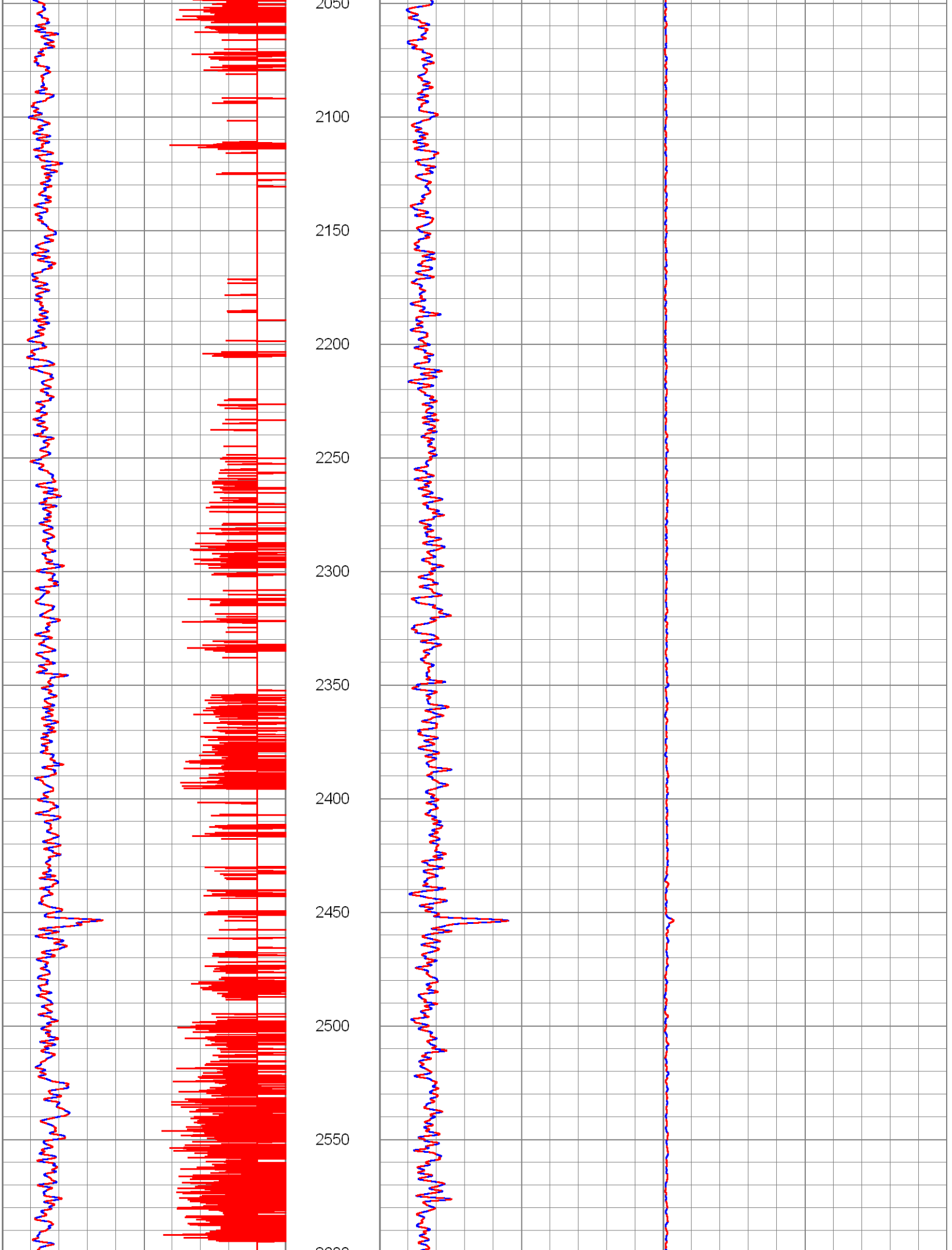
0	GRT (GAPI)	100	0	GRB (GAPI)	100	0	GRM (GAPI)	1000
0	GRT-BACKGRND (GAPI)	100	0	GRB-BACKGRD (GAPI)	100	0	GRM-BACKGRND (GAPI)	1000
0.9	CCL	-0.1						

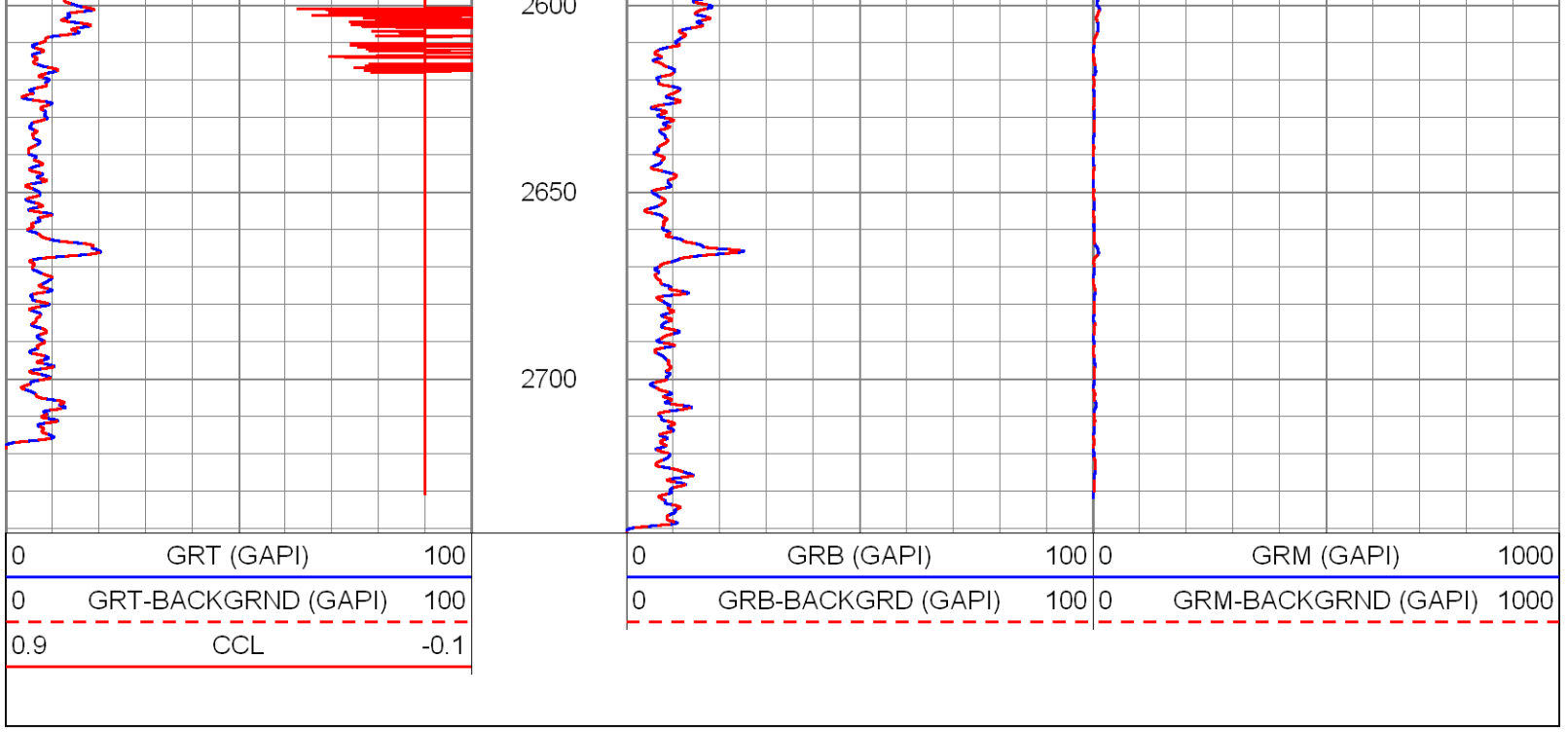



400
450
500
550
600
650
700
750
800
850
900


950
1000
1050
1100
1150
1200
1250
1300
1350
1400
1450


1500
1550
1600
1650
1700
1750
1800
1850
1900
1950
2000


2050
2100
2150
2200
2250
2300
2350
2400
2450
2500
2550



Calibration Report

Database File: sdwwtp-iw-3.db
Dataset Pathname: pass4
Dataset Creation: Wed Jun 19 09:16:09 2013 by Log SOC 110722

Gamma Ray Calibration Report

Serial Number:	952B	
Tool Model:	RTSB	
Performed:	Wed Jun 19 08:19:38 2013	
Calibrator Value:	90.0	GAPI
Background Reading:	84.6	cps
Calibrator Reading:	246.2	cps
Sensitivity:	0.5568	GAPI/cps

Gamma Ray Calibration Report

Serial Number:	952M	
Tool Model:	RTSM	
Performed:	Wed Jun 19 08:19:45 2013	
Calibrator Value:	90.0	GAPI
Background Reading:	168.9	cps
Calibrator Reading:	328.1	cps
Sensitivity:	0.5655	GAPI/cps

Gamma Ray Calibration Report

Serial Number:	952T	
Tool Model:	RTST	
Performed:	Wed Jun 19 08:19:52 2013	
Calibrator Value:	90.0	GAPI
Background Reading:	101.1	cps
Calibrator Reading:	270.2	cps

Sensitivity:	0.5322	GAPI/cps

Appendix E

Temperature Log

HIGH RESOLUTION TEMPERATURE LOG

Company MIAMI-DADE WATER & SEWER
Well IW-#3
Field S.D.W.W.T.P.
County MIAMI-DADE
State FL

Company MIAMI-DADE WATER & SEWER

Well IW-#3

Field S.D.W.W.T.P.

County MIAMI-DADE State FL

Location: API # :

SEC TWP RGE

Other Services

Elevation

Permanent Datum G.L Elevation

Log Measured From

Drilling Measured From

K.B.
D.F.
G.L.

Date	19-JUN-2013		
Run Number	2013 MIT		
Depth Driller	3123'		
Depth Logger	2740'		
Bottom Logged Interval	2740'		
Top Log Interval	SURFACE		
Open Hole Size	24"		
Type Fluid	WATER		
Density / Viscosity	NA		
Max. Recorded Temp.	84.0 degF		
Estimated Cement Top	NA		
Time Well Ready	UPON ARRIVAL		
Time Logger on Bottom	1130		
Equipment Number	102		
Location	FT. MYERS		
Recorded By	MARTINEZ	MOREY	
Witnessed By	S. VILLAMIL	M. MACFARLANE	

Borehole Record				Borehole Record			
Run Number	Bit	From	To	Run No	Bit	From	To

Casing Record	Size	Wgt/Ft	Top	Bottom
Surface String				
Prot. String				
Production String	24"	.500" W.T	SURFACE	2630'
Liner				

<< Fold Here >>>

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

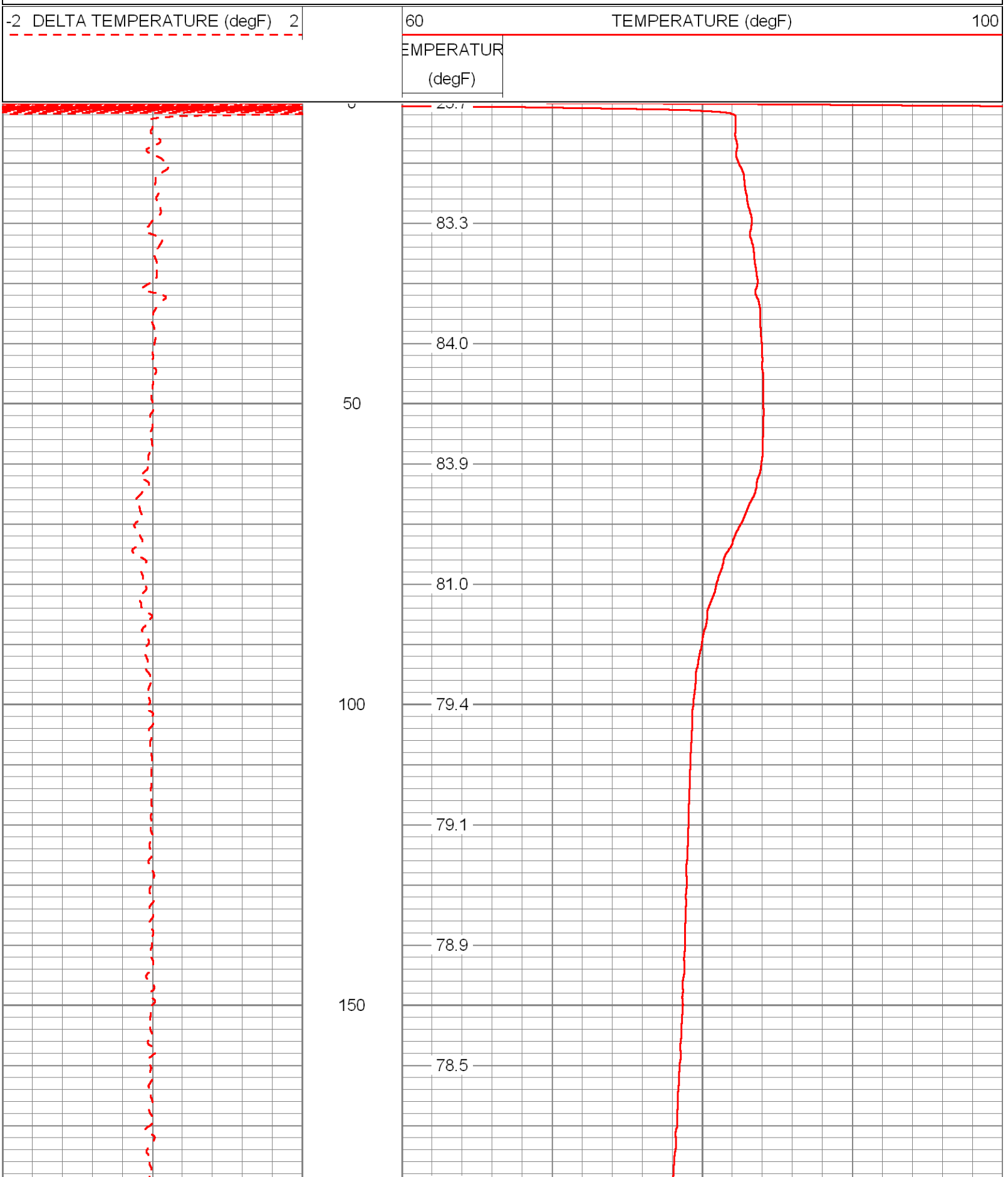
Comments

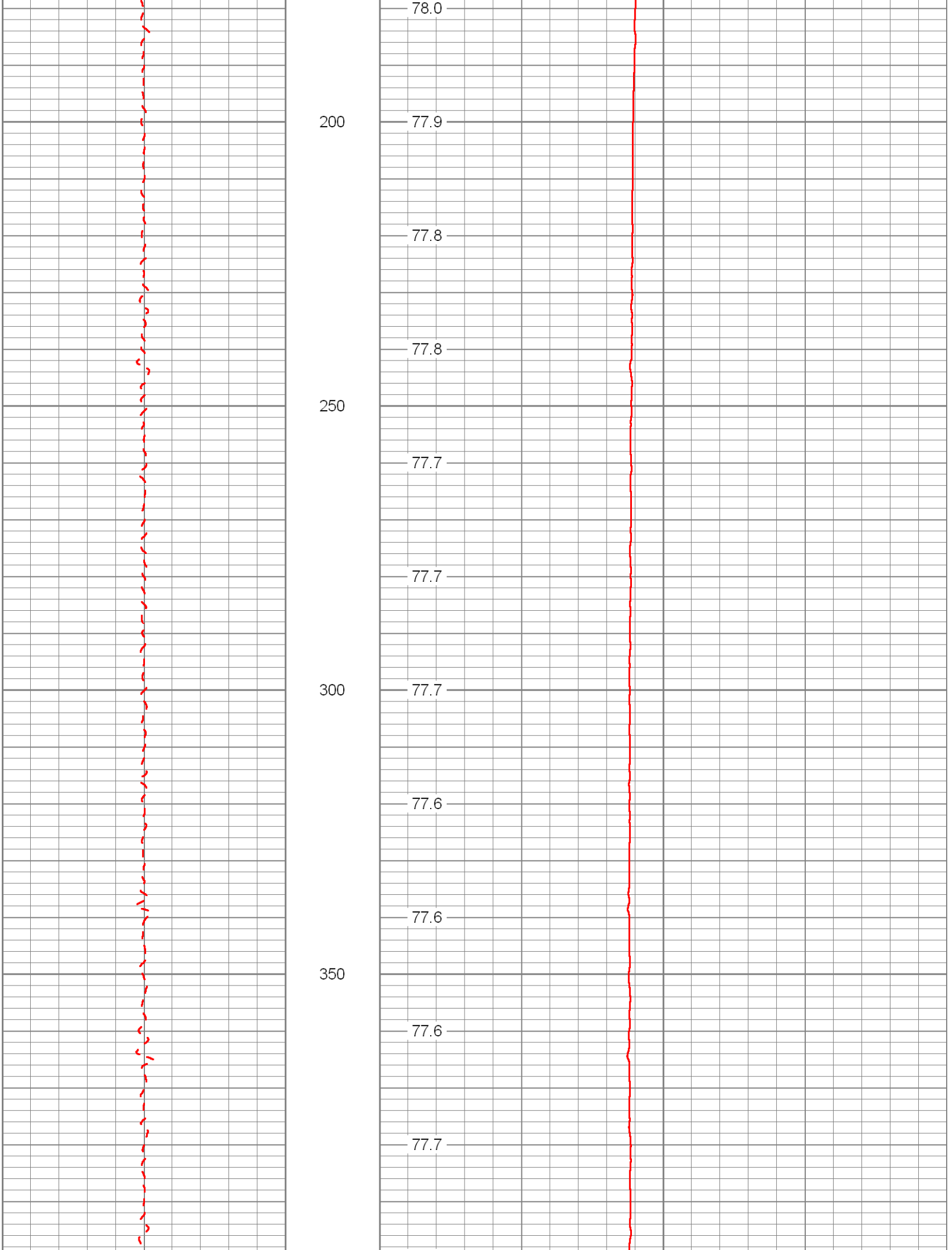
RADIOACTIVE TRACER SURVEY

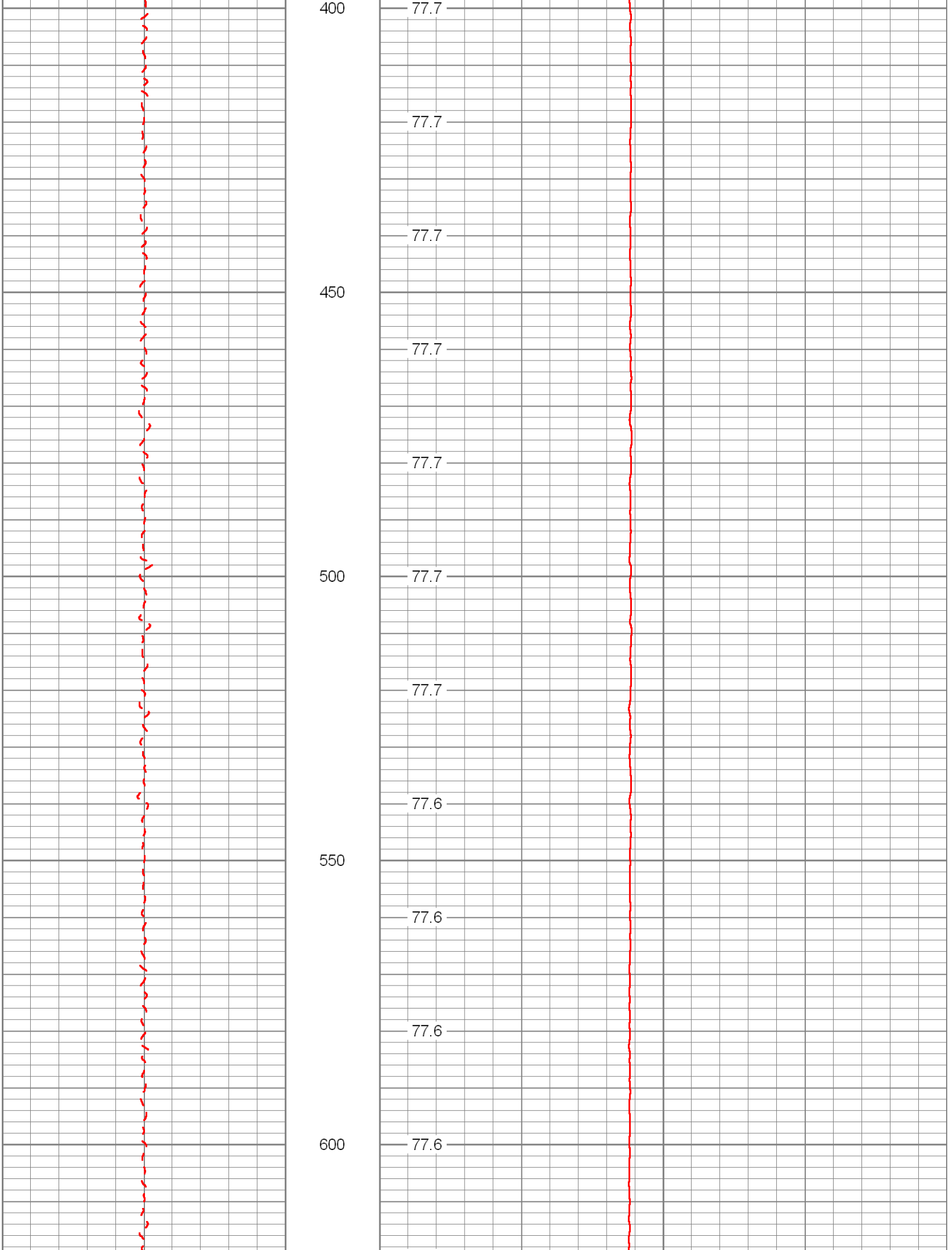
TEMPERATURE

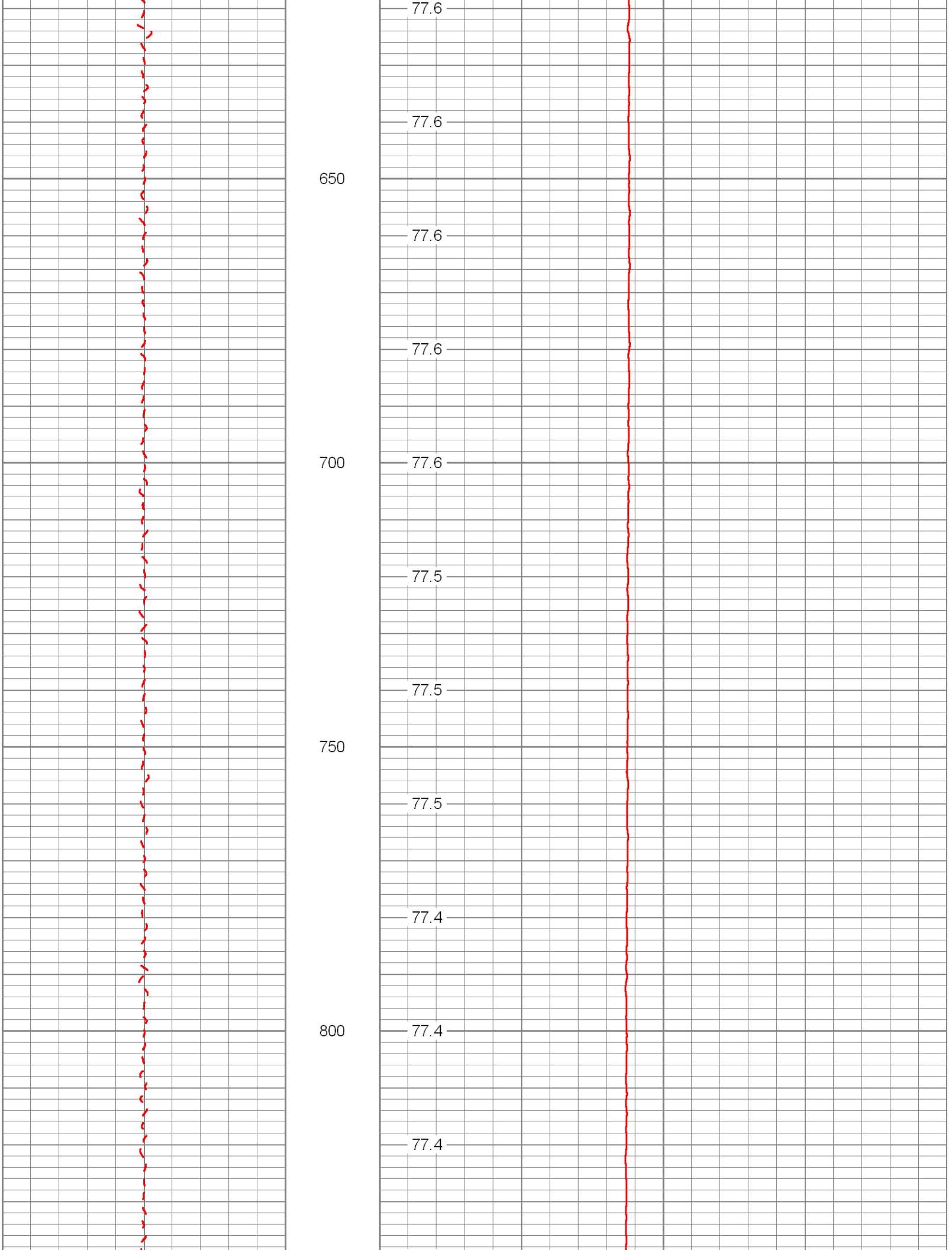
BROTHERS

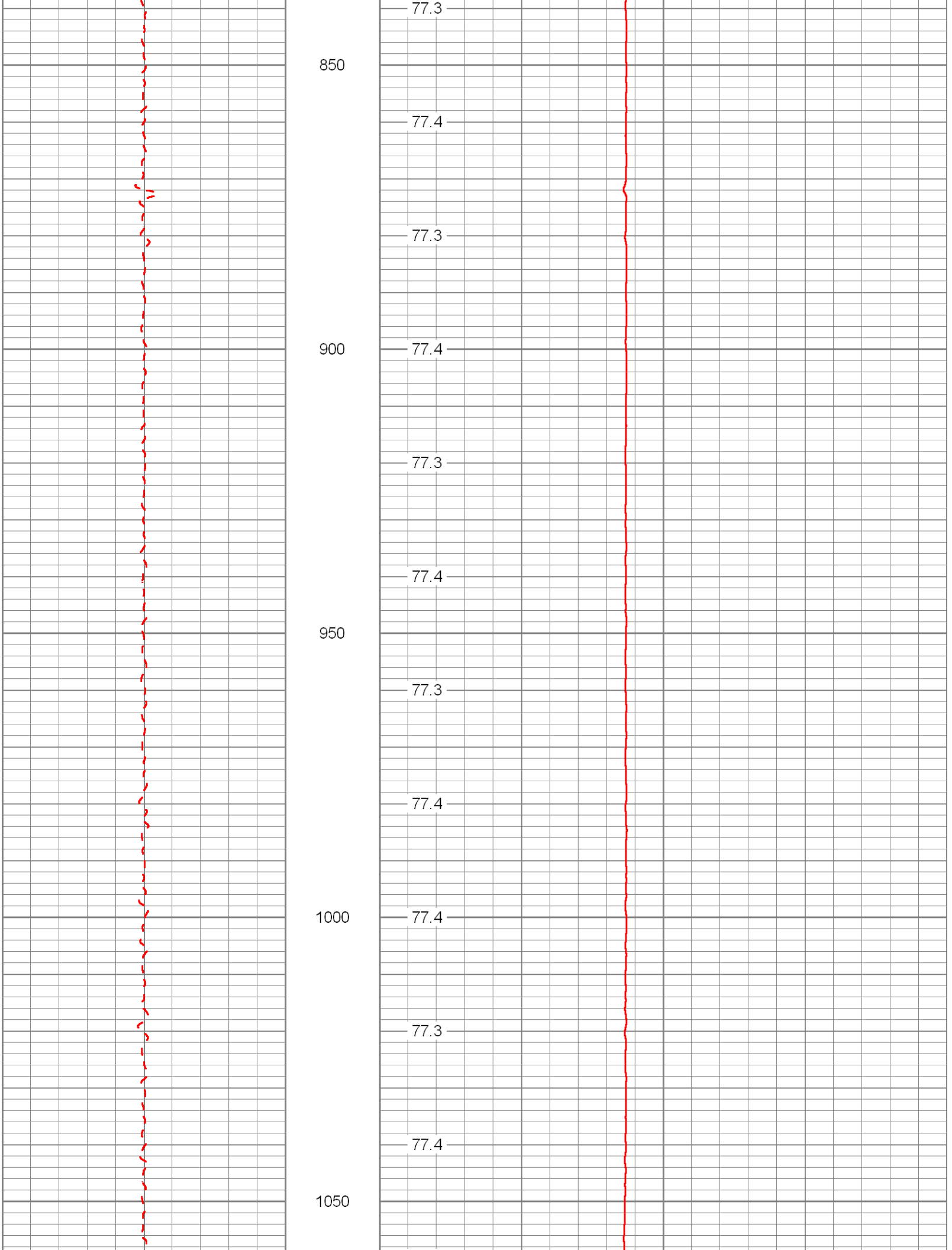
Database File:	sdwwtp-iw-3.db
Dataset Pathname:	pass3
Presentation Format:	temp
Dataset Creation:	Wed Jun 19 08:20:58 2013 by Log SOC 110722
Charted by:	Depth in Feet scaled 1:240

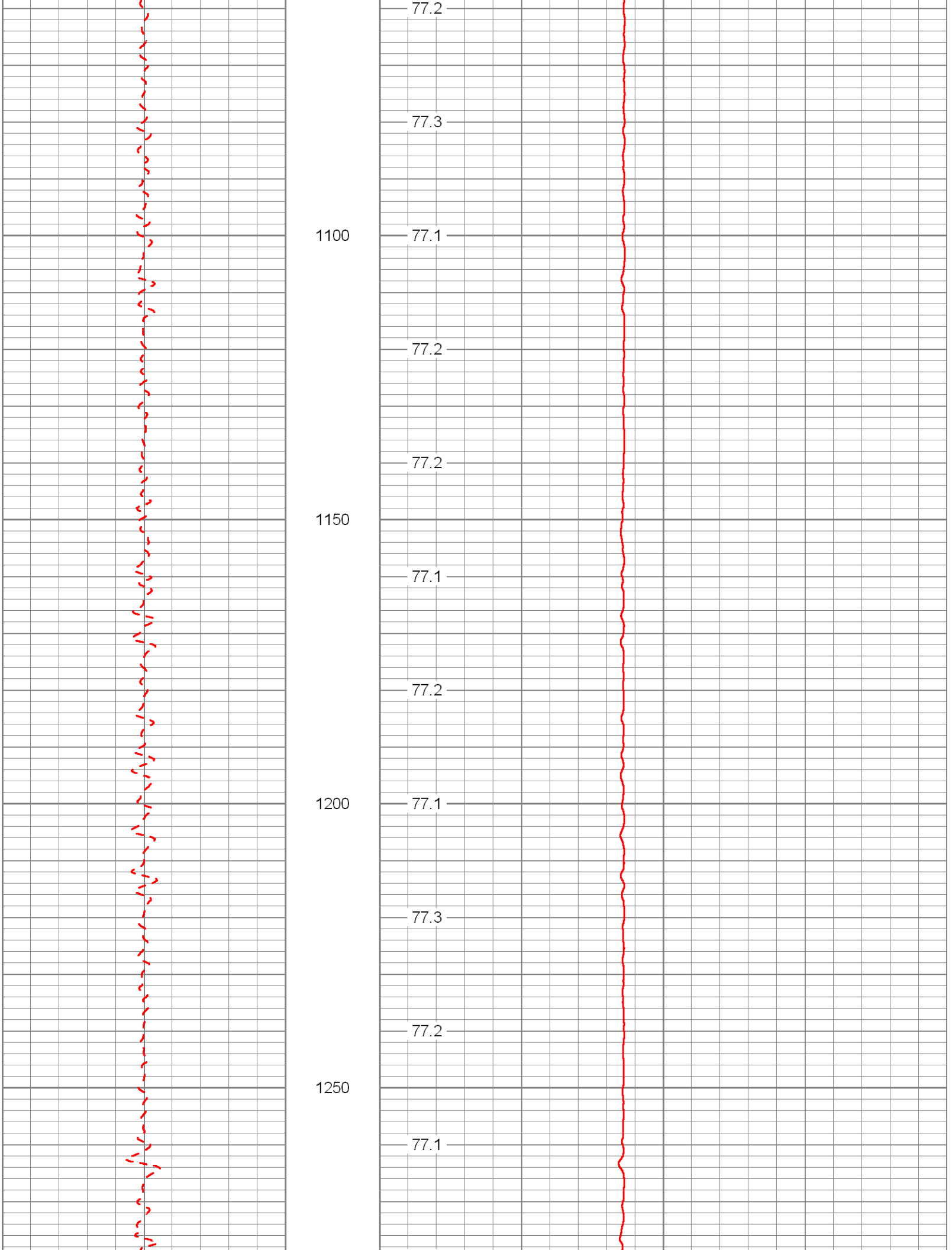



78.0
200
77.9
77.8
77.8
250
77.7
77.7
300
77.7
77.6
77.6
350
77.6
77.7


400
450
500
550
600
77.7
77.7
77.7
77.7
77.7
77.7
77.7
77.6
77.6
77.6
77.6


77.6
77.6
650
77.6
77.6
700
77.6
77.5
77.5
750
77.5
77.4
800
77.4
77.4


850
900
950
1000
1050
77.3
77.4
77.3
77.4
77.3
77.4
77.3
77.4
77.4
77.3
77.4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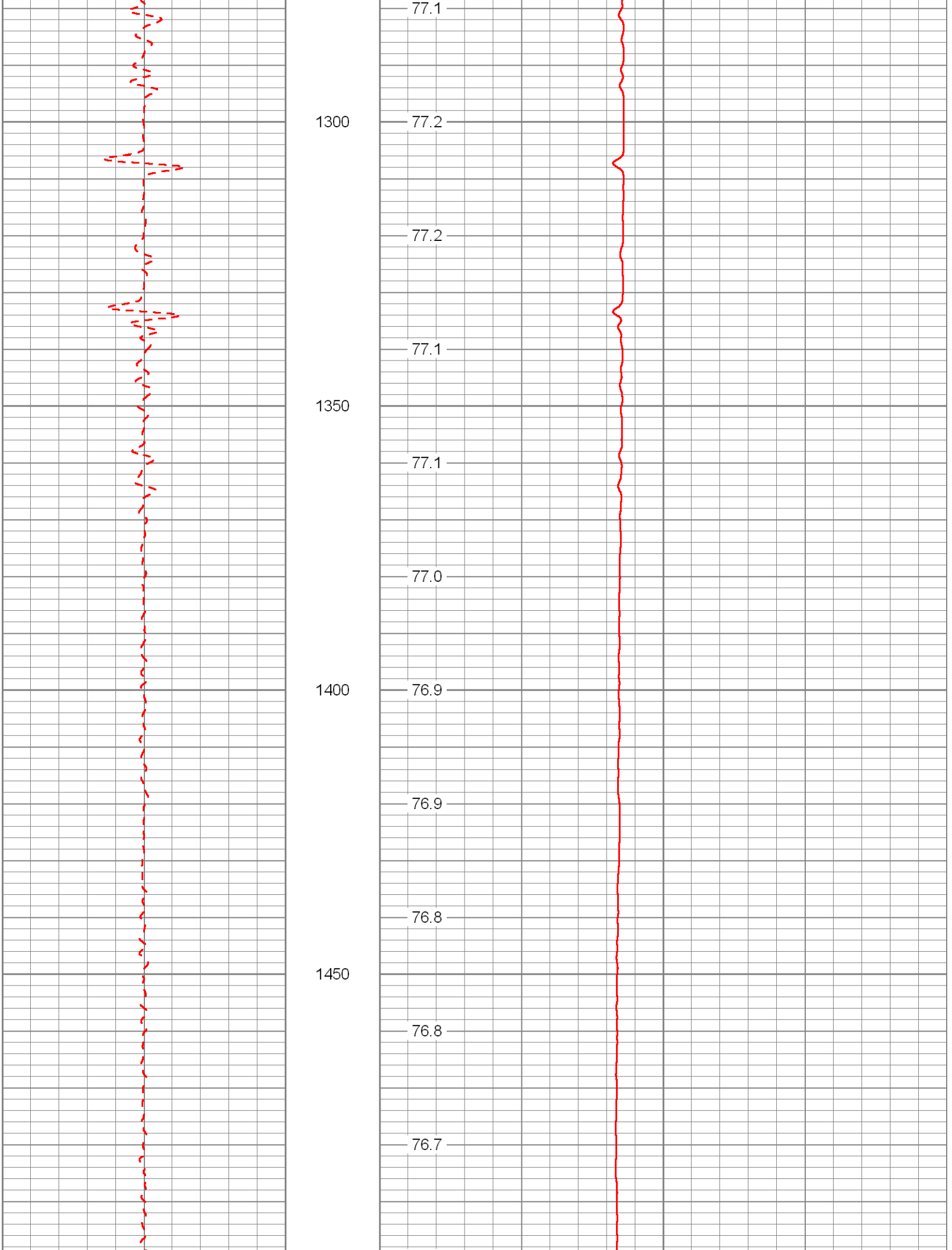
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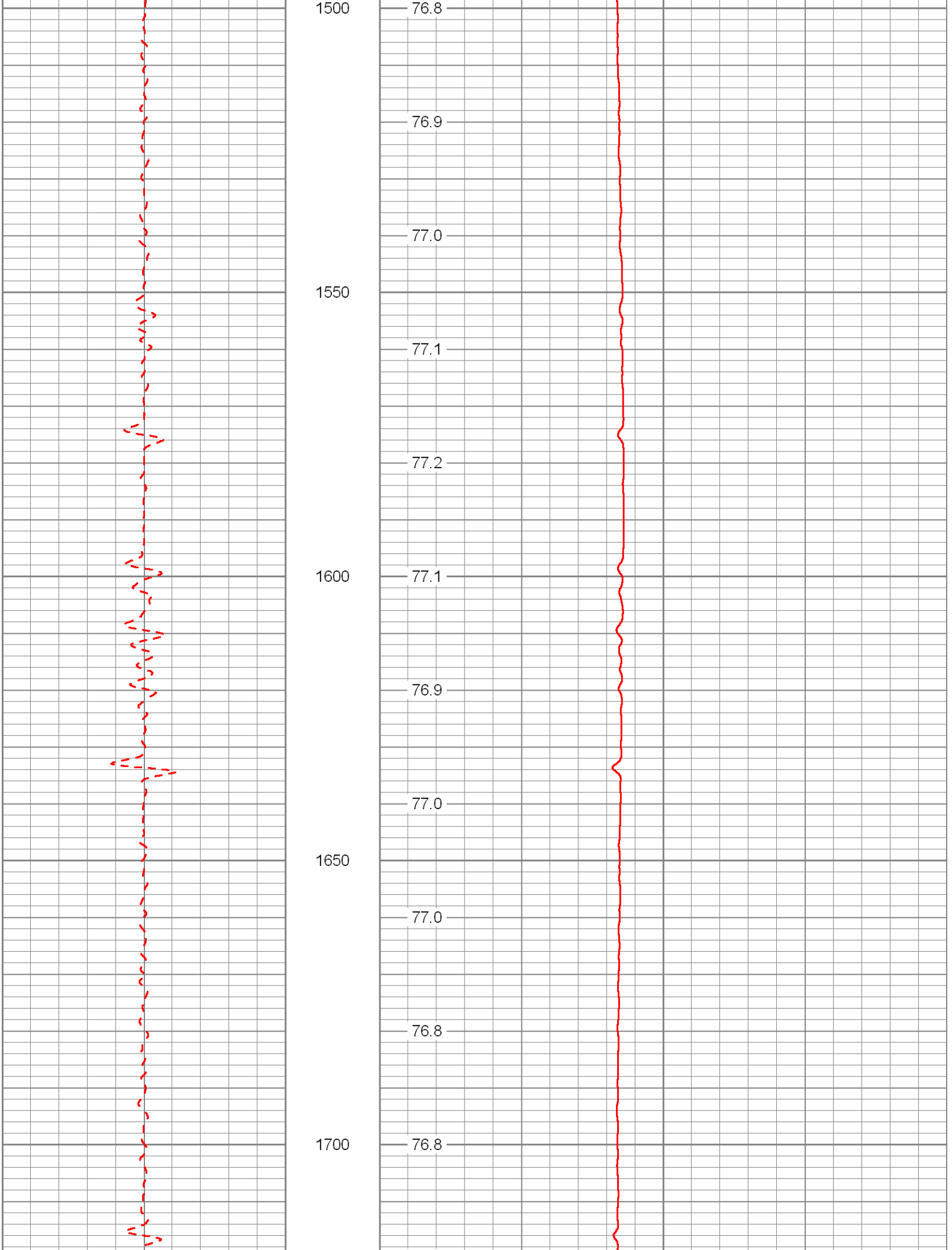
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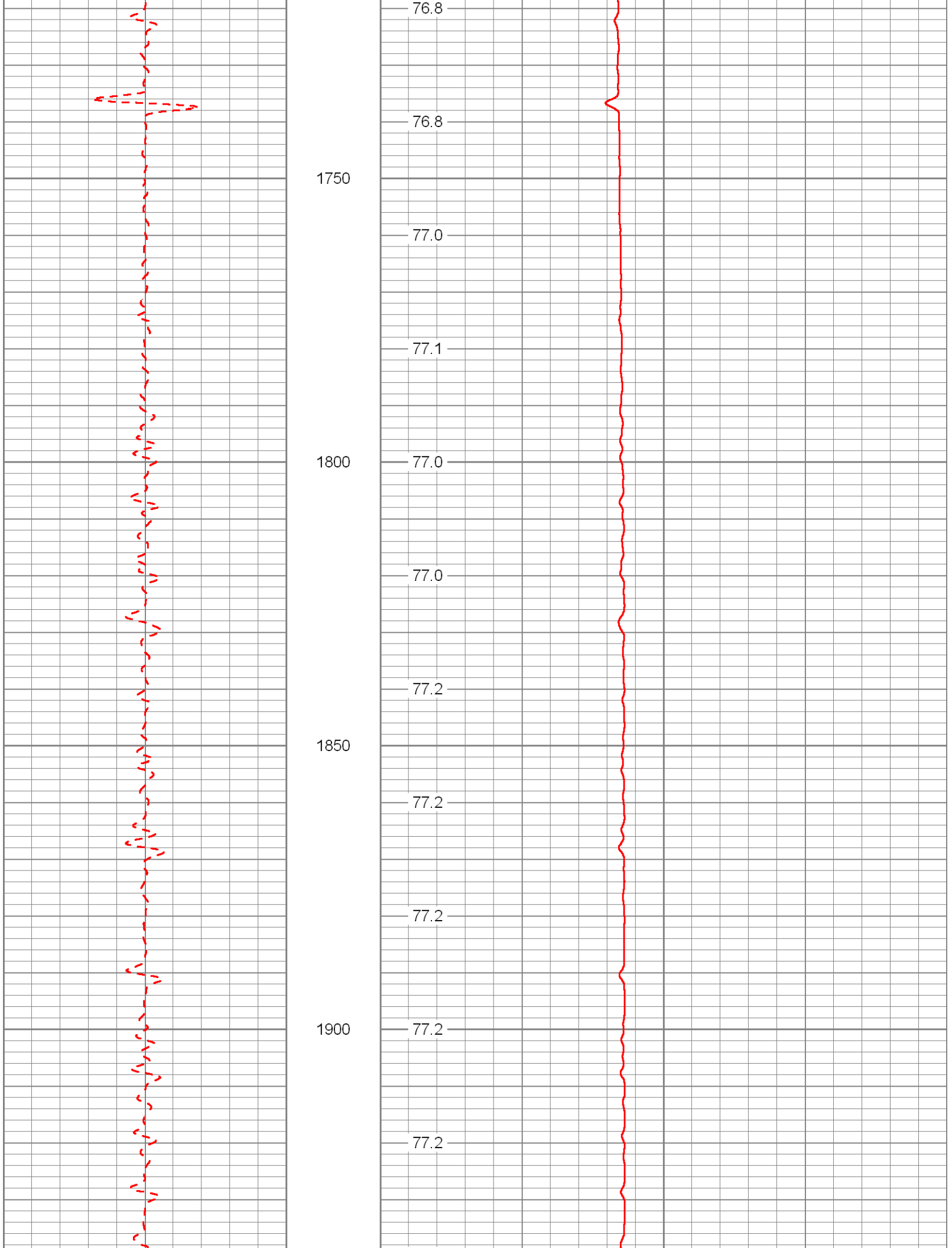
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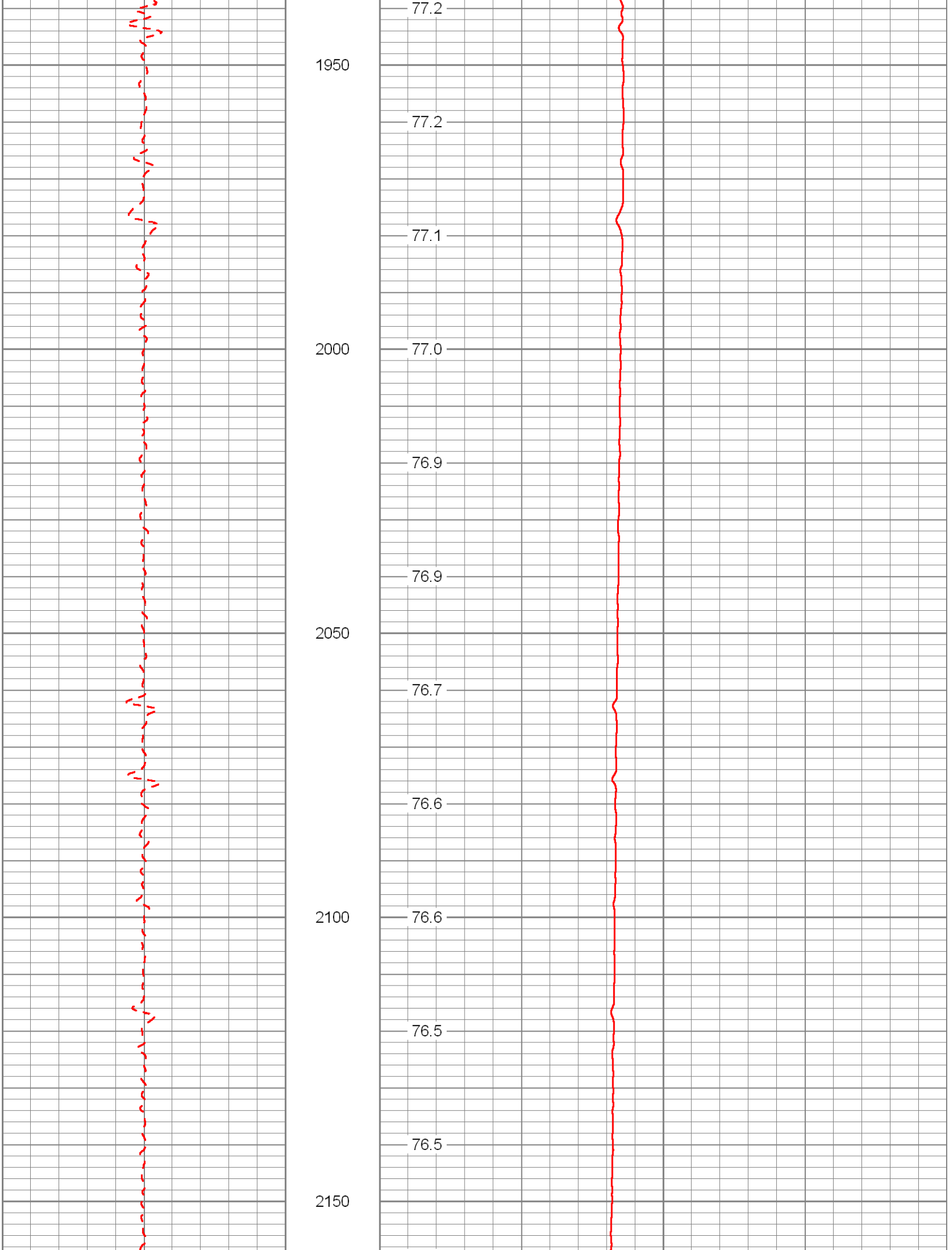
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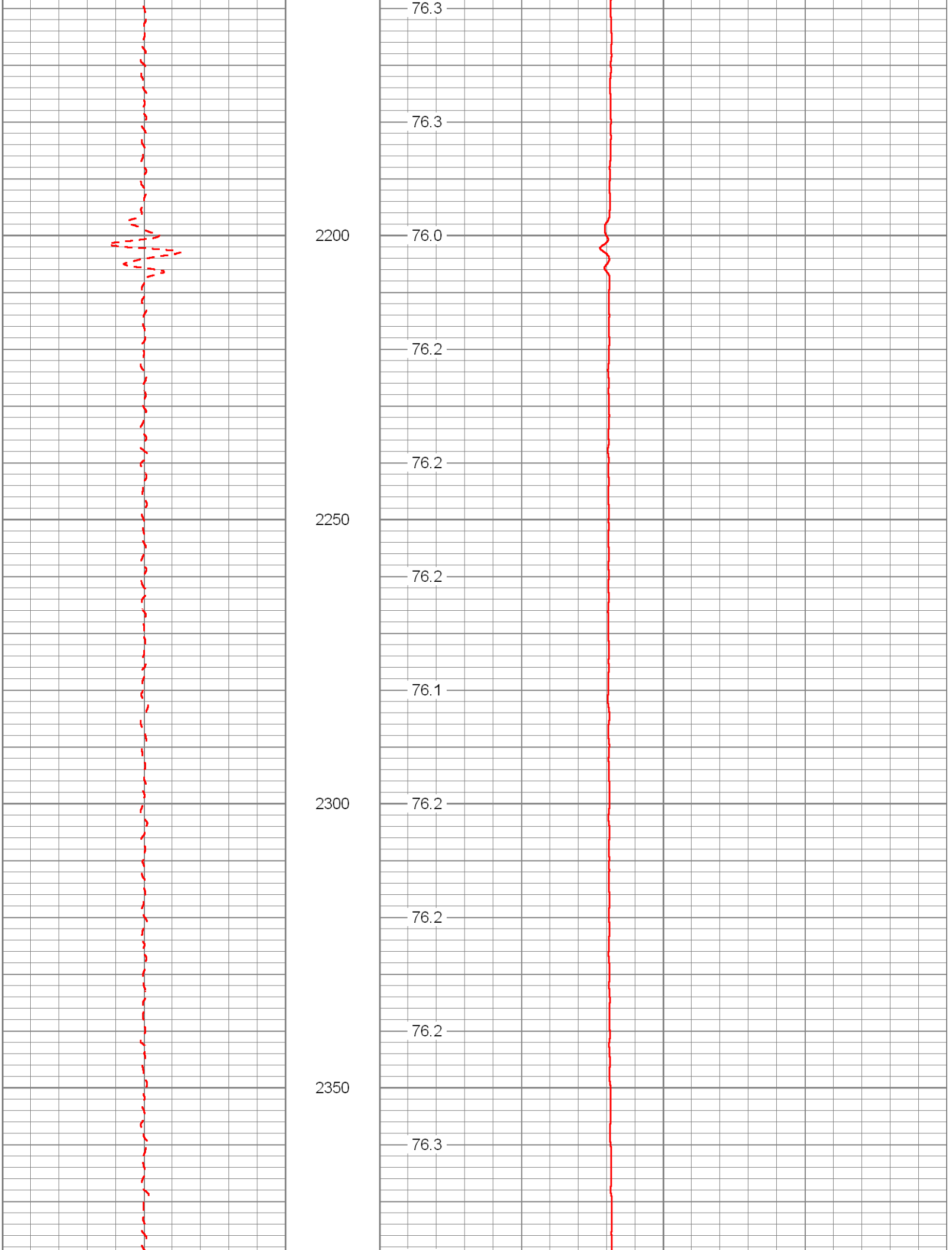
76.5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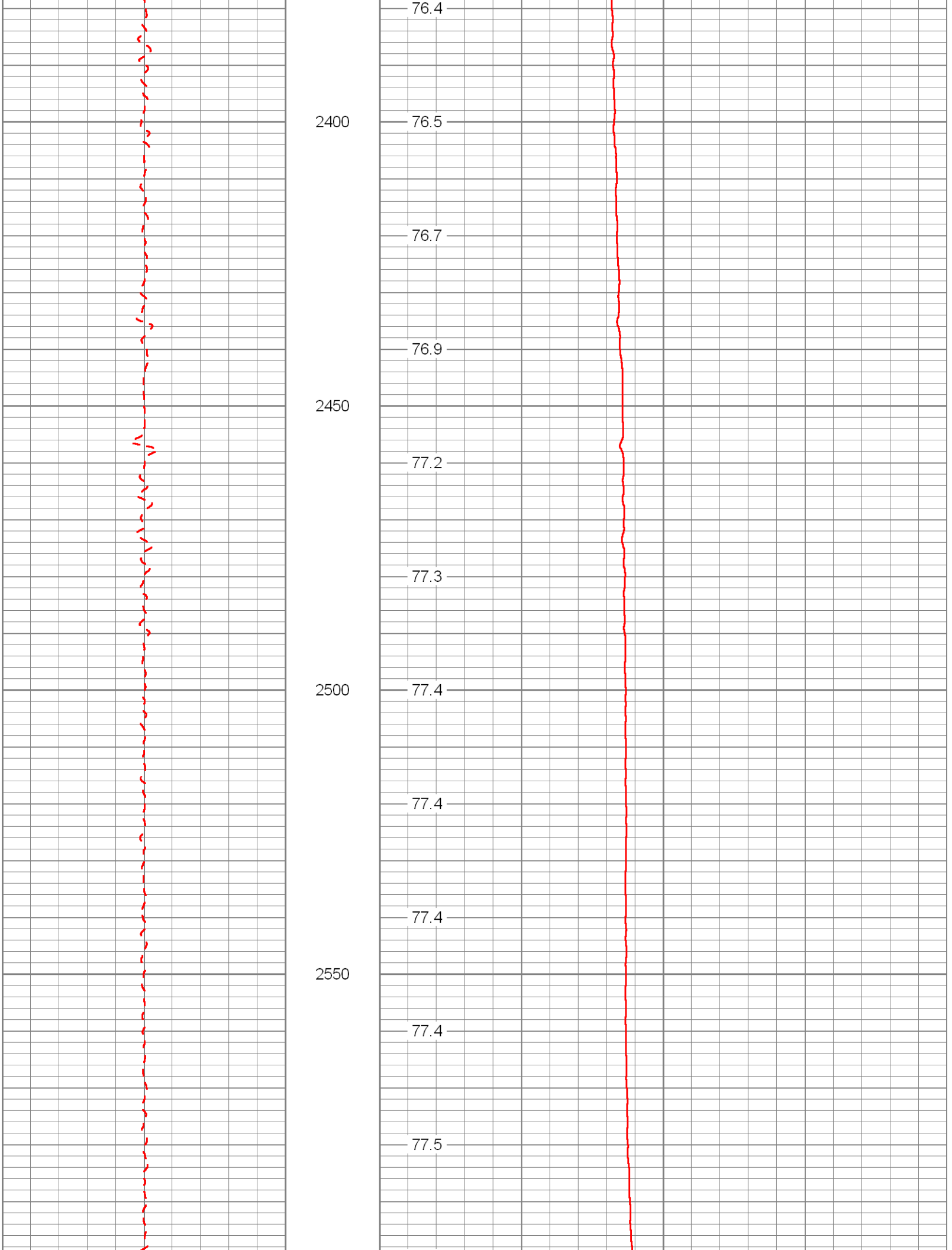
76.2
2350
76.3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77.4
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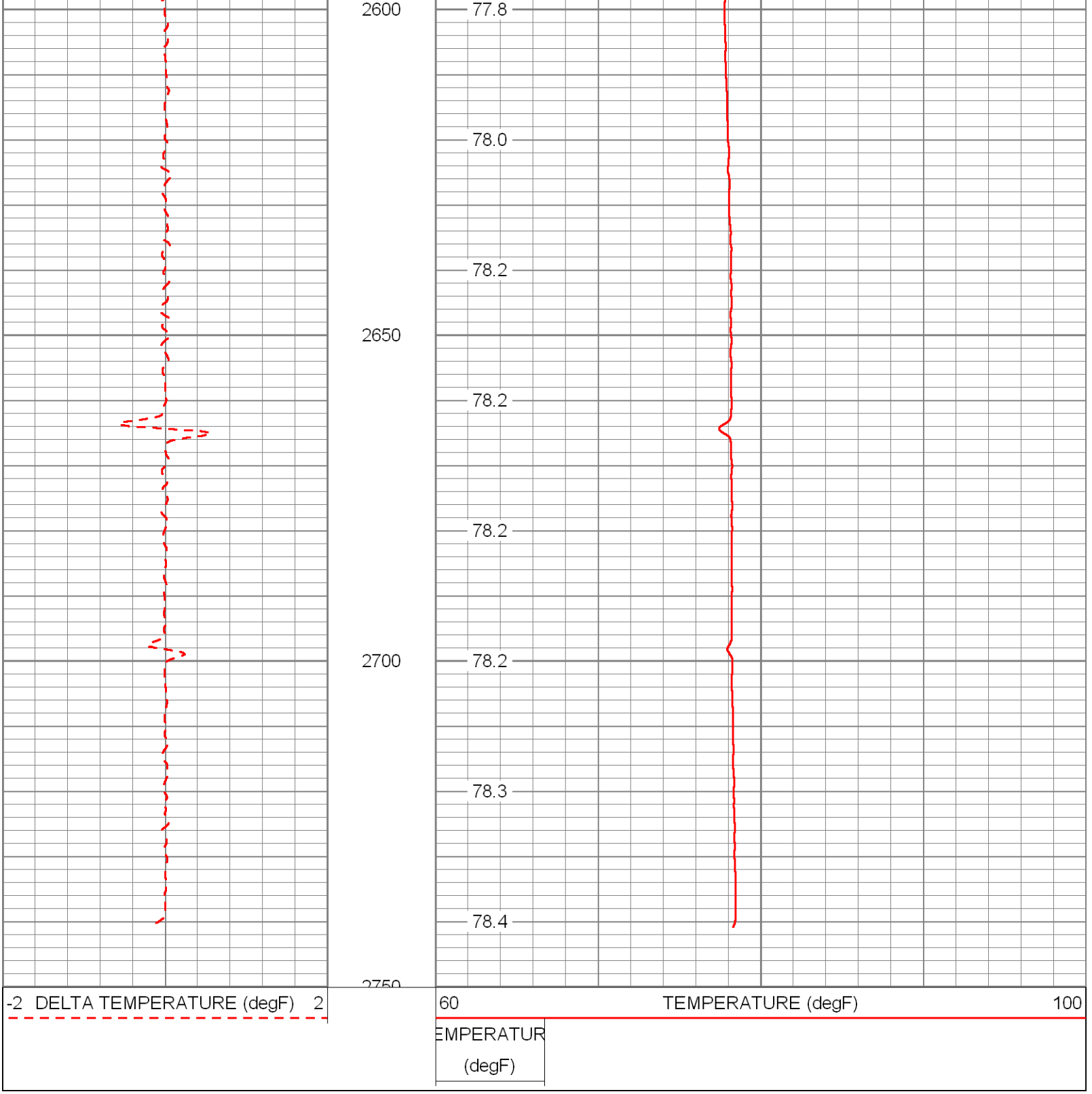
77.4
77.5



Calibration Report

Database File: sdwwtp-iw-3.db
Dataset Pathname: pass3
Dataset Creation: Wed Jun 19 08:20:58 2013 by Log SOC 110722

Temperature Calibration Report

Serial Number: 952
Tool Model: RTS
Performed: Wed Jun 19 08:20:23 2013

Point #	Reading		Reference	
1	439.20	cps	33.00	degF

2	912.13	cps	85.00	degF
3	1637.63	cps	155.00	degF
4		cps		degF
5		cps		degF
6		cps		degF
7		cps		degF
8		cps		degF
9		cps		degF
10		cps		degF

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)
			TEMP-RTS (952)	25.50	1.69	70.00

TEMP	0.10					

Dataset:	sdwwtp-iw-3.db: field/well/run1/pass3
Total Length:	25.50 ft
Total Weight:	70.00 lb
O.D.	1.69 in

Appendix F

Television Survey

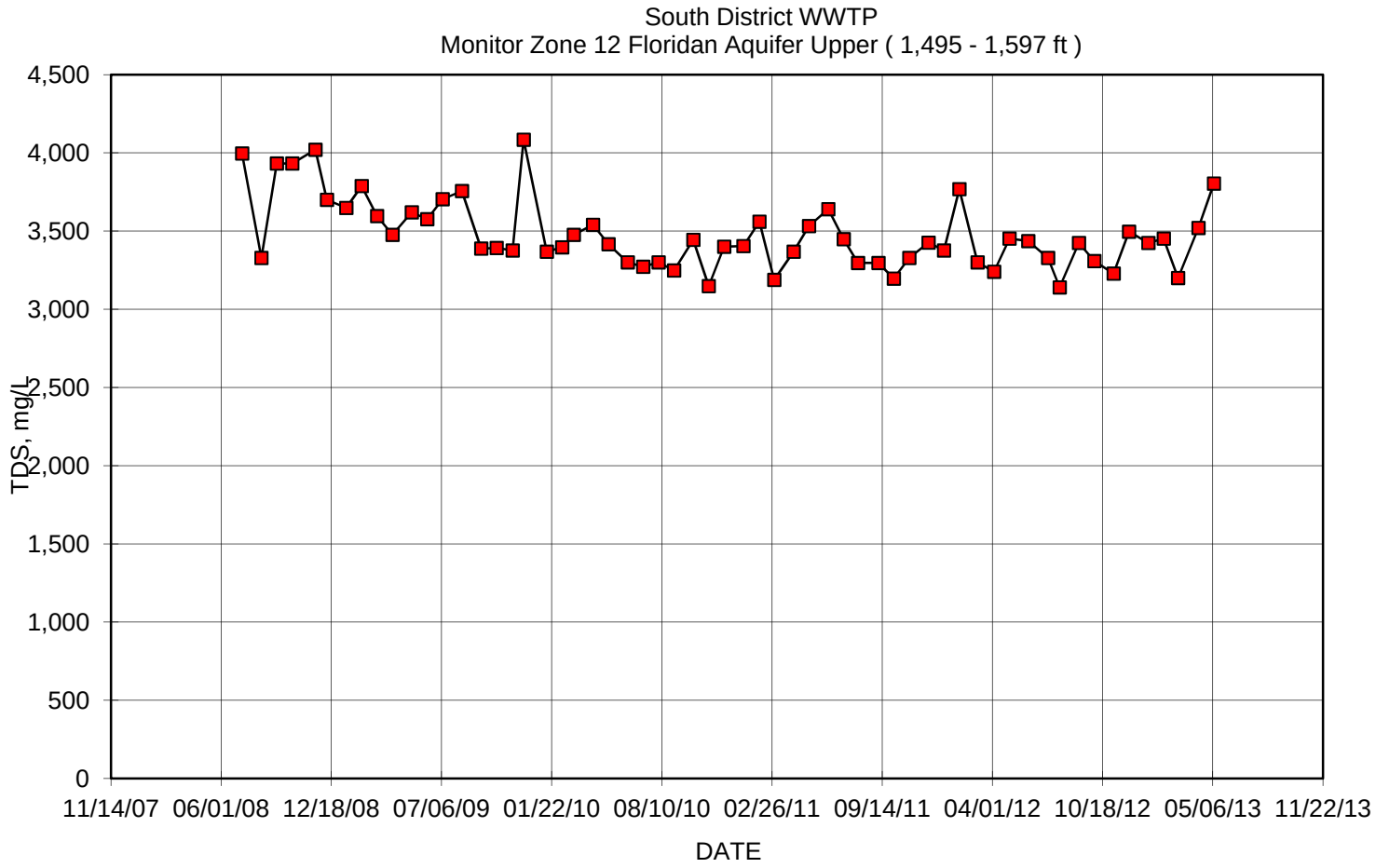
Appendix G

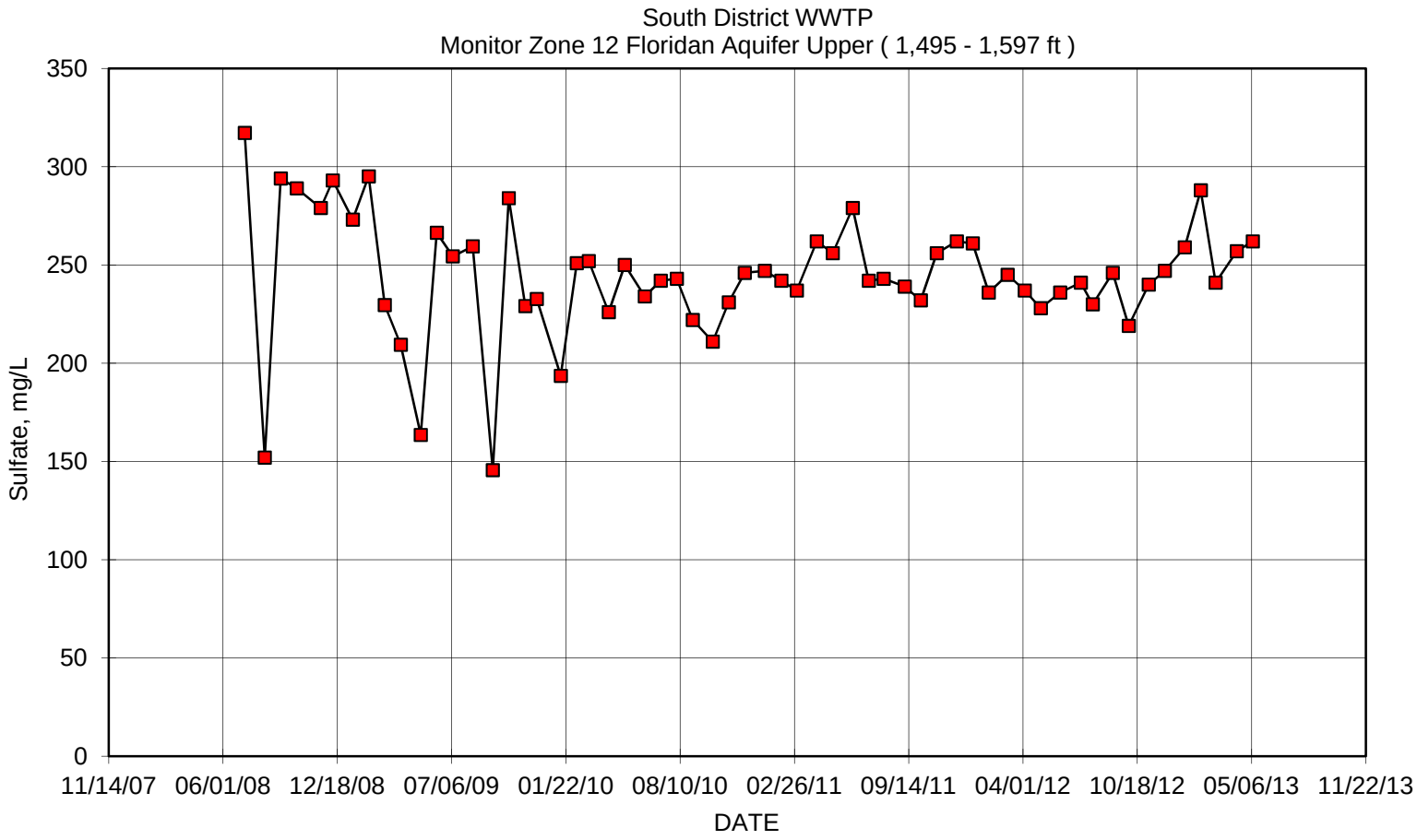
5 year Monitoring Data

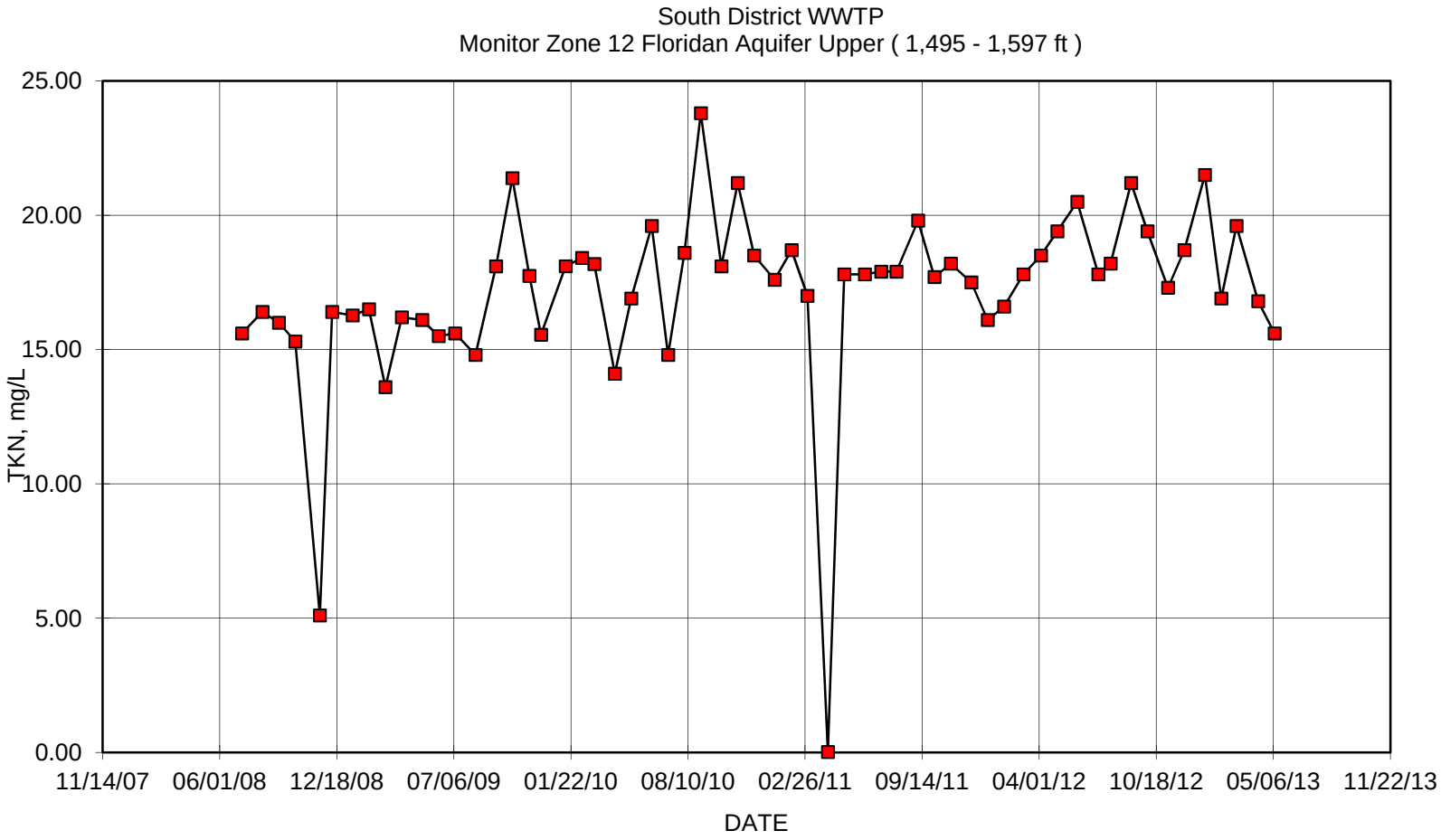
FA-12 Upper

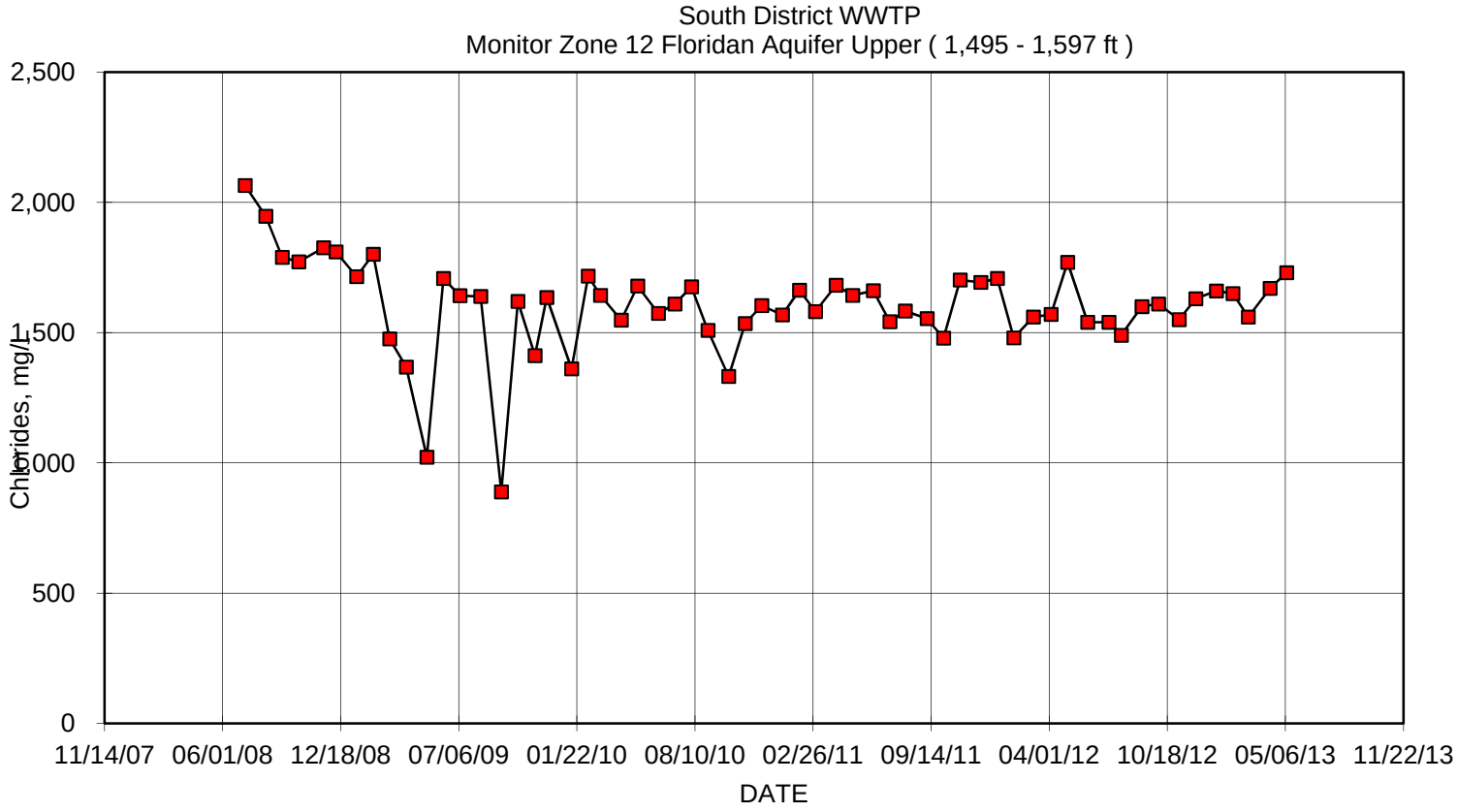
Date	TDS, mg/L	Sulfate, mg/L	Chlorides, mg/L	TKN, mg/L	NH3, mg/L	Conductivity, Micromho/cm	Temp., C	Temp., F	pH	TP, mg/L	TSS mg/L	NO_3 mg/L	NO_2 mg/L	Sodium mg/L	Gross Alpha, pCi/L	Radium 226, pCi/L	Radium 228, pCi/L
07/09/08	3,996	317	2,065	15.60	13.00	6,558	26	79	7.5	0.01	1.76	0.03	0.00				
08/13/08	3,328	152	1,947	16.40	15.00	6,096	28	82	8.4	0.01	1.76	0.12	0.01				
09/10/08	3,932	294	1,789	16.00	15.70	6,562	26	80	7.5	0.05	1.76	0.08	0.05				
10/08/08	3,932	289	1,772	15.30	14.50	6,722	26	79	7.4	0.02	1.76	0.03	0.00				
11/19/08	4,020	279	1,826	5.10	3.23	6,575	26	80	7.4	0.00	1.76	0.03	0.00				
12/10/08	3,700	293	1,810	16.40	15.80	6,426	26	78	7.3	0.07	2.80	0.03	0.02				
01/14/09	3,648	273	1,715	16.27	15.70	6,273	24	76	7.4		1.80	0.03	0.00				
02/11/09	3,788	295	1,801	16.50	15.60	7,044	25	78	7.5	0.29	2.40	0.01	0.00				
03/11/09	3,596	230	1,476	13.60	18.30	6,046	25	76	7.4	0.17	3.40	0.00	0.00				
04/08/09	3,476	209	1,368	16.20	18.80	6,095	24	76	7.4	0.02	4.20	0.00	0.01				
05/13/09	3,620	164	1,022	16.10	15.80	6,090	27	80	7.4	0.01	2.00	0.00	0.01				
06/10/09	3,576	266	1,708	15.50	17.60	6,054	26	79	7.5	0.11	2.20	0.00	0.01				
07/08/09	3,704	254	1,642	15.60	17.20	5,958	26	80	7.4	0.04	5.00	0.01	0.01				
08/12/09	3,756	260	1,639	14.80	18.60	6,311	27	81	7.3	0.01	3.80	0.00	0.00				
09/16/09	3,388	146	889	18.10	16.86	6,005			7.2	0.00		0.05	0.01	888	6.1	2.1	0.8
10/14/09	3,392	284	1,620	21.38	16.56	5,886			7.3	0.02		0.00	0.01	900	8.0	3.0	0.8
11/12/09	3,376	229	1,412	17.74	17.06	5,604			7.3	0.02		0.00	0.00	855	12.3	2.9	0.9
12/02/09	4,084	233	1,635	15.55	14.44	6,511	26	79	7.4	0.02	2.60	0.02	0.00	971	11.8	4.1	0.9
01/13/10	3,368	194	1,361	18.10	17.55	5,811	25	78	7.4	0.01	18.80	0.00	0.01	771	10.1	2.7	0.7
02/10/10	3,396	251	1,717	18.41	17.18	5,738	25	77	7.5	0.01	6.00	0.01	0.01	849	5.1	2.4	0.9
03/03/10	3,476	252	1,643	18.18	17.19	5,999	26	78	7.3	0.02	4.80	0.00	0.00	943	14.7	2.6	0.6
04/07/10	3,540	226	1,548	14.10	15.00	6,154	26	80	7.3	0.01	8.20	0.00	0.00	919	6.9	3.4	0.7
05/05/10	3,416	250	1,679	16.90	16.20	5,799	27	80	7.4	0.01	5.60	0.00	0.00	902	10	3.2	0.9
06/09/10	3,300	234	1,574	19.60	16.20	5,809	26	78	7.4	0.05	6.20	0.00	0.00	889	7.7	2.9	0.7
07/07/10	3,272	242	1,610	14.80	17.30	5,815	26	79	7.4	0.03	3.80	0.00	0.00	825	7.7	3.3	0.7
08/04/10	3,300	243	1,676	18.60	18.70	5,472	26	80	7.4	0.12	5.60	0.00	0.00	856	9.6	3.1	0.7
09/01/10	3,248	222	1,509	23.80	18.50	5,844	27	80	7.4	0.02	5.80	0.00	0.01	870	10.5	3.4	0.8
10/06/10	3,444	211	1,332	18.10	18.30	5,912	26	79	7.1	0.02	4.20	0.00	0.00	909	9	2.5	0.9
11/03/10	3,148	231	1,535	21.20	18.80	5,500	26	78	7.3	0.02	14.00	0.00	0.00	883	9.1	2.5	0.7
12/01/10	3,400	246	1,604	18.50	18.80	5,847	26	79	7.3	0.02	5.20	0.00	0.00	877	5.6	2.6	0.8
01/05/11	3,404	247	1,568	17.60	17.60	5,732	27	80	7.4	0.02	2.70	0.00	0.01	886	9.9	2.6	0.7
02/03/11	3,560	242	1,663	18.70	16.30	5,689	26	80	7.2	0.19	7.50	0.00	0.00	873	9.5	3.5	0.7
03/02/11	3,188	237	1,581	17.00	18.40	5,776	26	79	7.4	0.02	4.50	0.00	0.00	873	13.5	4.2	0.9
04/06/11	3,368	262	1,682	0.02	18.10	5,699	26	80	7.4	0.02	6.10	0.00	0.00	876	7.8	2.6	0.7

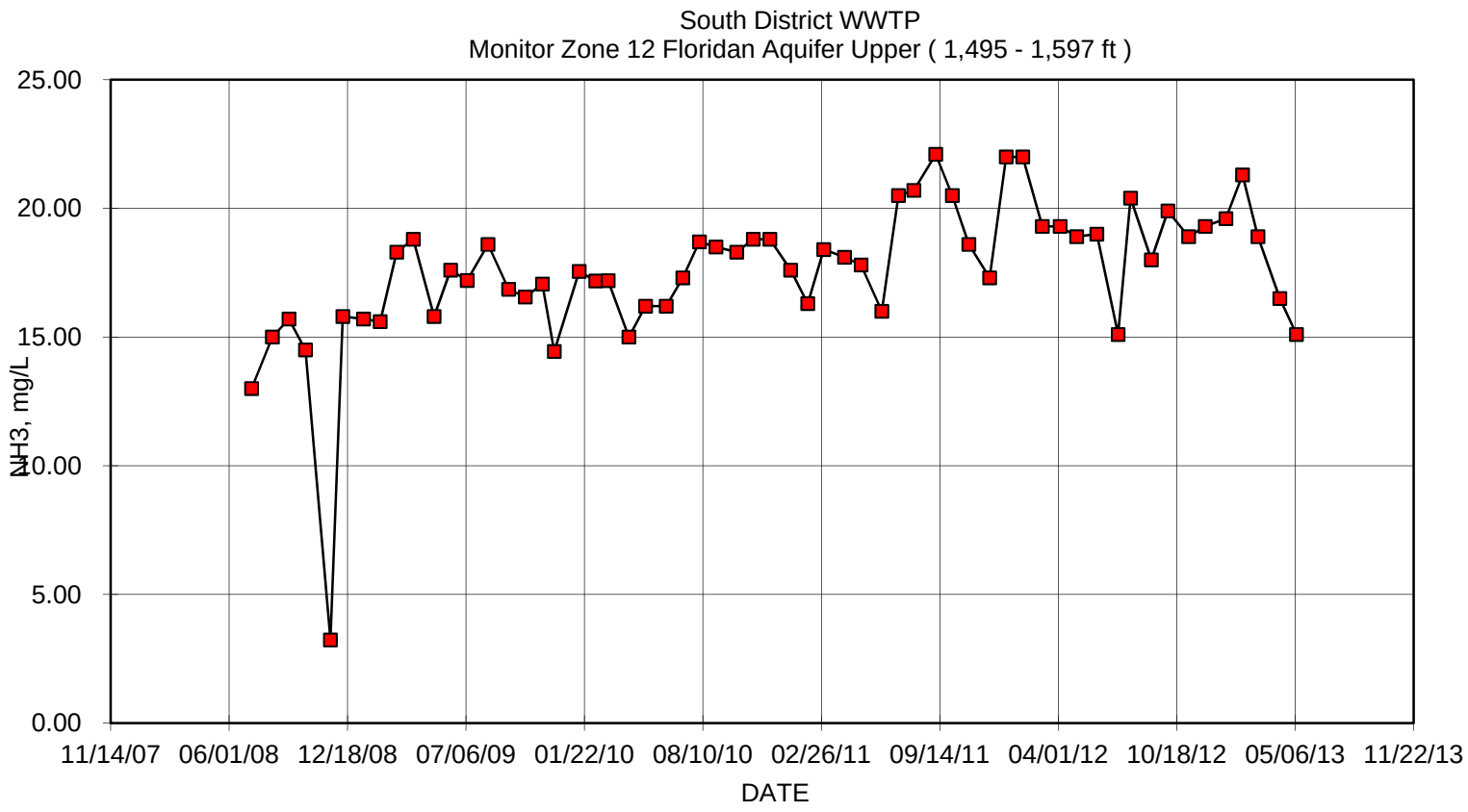
05/04/11	3,532	256	1,643	17.80	17.80	5,805	26	79	7.3	0.02	5.10	0.00	0.00	930	7.2	3.6	0.8
06/08/11	3,640	279	1,661	17.80	16.00	5,859	26	79	7.4	0.03	1.90	0.00	0.00	839	8.7	3.2	0.8
07/06/11	3,448	242	1,542	17.90	20.50	5,740	26	79	7.2	0.02	2.70	0.00	0.00	971	7.9	2.3	0.8
08/01/11	3,296	243	1,583	17.90	20.70	5,485	27	80	7.3	0.02	4.10	0.00	0.00	813	8.0	3.1	1.0
09/07/11	3,296	239	1,554	19.80	22.10	5,540	27	80	7.6	0.04	4.10	0.00	0.00	850	9.1	2.3	0.9
10/05/11	3,196	232	1,479	17.70	20.50	5,451	28	82	7.4	0.03	4.80	0.00	0.00	852	6.2	2.4	0.8
11/02/11	3,328	256	1,702	18.20	18.60	5,665	27	81	7.6	0.03	5.70	0.00	0.00	927	9.9	2.6	0.9
12/07/11	3,426	262	1,693	17.50	17.30	5,751	26	80	7.7	0.03	6.00	0.00	0.00	915	13.1	2.8	0.7
01/04/12	3,376	261	1,708	16.10	22.00	5,522	26	79	7.4	0.02	5.20	0.00	0.00	921	9.6	3.2	0.9
02/01/12	3,768	236	1,480	16.60	22.00	4,790	26	80	7.3	0.02	5.00	0.00	0.00	899	9	2.7	0.8
03/05/12	3,300	245	1,560	17.80	19.30	5,633	26	80	7.3	0.03	2.40	0.04	0.00	987	8.5	3.7	0.8
04/04/12	3,240	237	1,570	18.50	19.30	5,534	26	79	7.3	0.03	20.40	0.50	0.50	884	8.8	2.6	0.8
05/02/12	3,452	228	1,770	19.40	18.90	5,343	26	79	7.5	0.02	3.20	0.01	0.00	913	7.3	2.6	0.9
06/05/12	3,436	236	1,540	20.50	19.00	5,649	26	80	7.6	0.01	29.50	0.00	0.00	856	7.1	2.6	1
07/11/12	3,328	241	1,540	17.80	15.10	5,544	26	79	7.4	0.03	1.20	0.02	0.00	899	10.6	2.8	0.8
08/01/12	3,140	230	1,490	18.20	20.40	5,420	26	79	7.5	0.04	4.40	0.00	0.00	874	7.4	3	0.8
09/05/12	3,424	246	1,600	21.20	18.00	5,693	27	80	7.4	0.03	1.60	0.03	0.00	832	7.1	3	0.9
10/03/12	3,308	219	1,610	19.40	19.90	5,543	26	79	7.5	0.03	5.50	0.00	0.00	890	8.0	3.1	0.8
11/07/12	3,228	240	1,550	17.30	18.90	5,414	26	79	7.4	0.02	3.10	0.00	0.00	905	8.1	2.2	0.8
12/05/12	3,496	247	1,630	18.70	19.30	5,616	26	79	7.4	0.03	8.90	0.02	0.01	966	6.9	2.8	0.8
01/09/13	3,424	259	1,660	21.50	19.60	5,879	26	79	7.4	0.07	0.80	0.01	0.00	920	5.5	3.1	0.9
02/06/13	3,452	288	1,650	16.90	21.30	5,603	28	83	7.3	0.03	8.30	0.00	0.00	917	10	2.9	0.9
03/04/13	3,200	241	1,560	19.60	18.90	5,676	26	79	7.3	0.03	2.90	0.00	0.00	951	16.2	2.7	1.4
04/10/13	3,520	257	1,670	16.80	16.50	6,115	26	79	7.2	0.02	0.02	0.01	0.00	975	14.1	2.8	0.9
05/08/13	3,804	262	1,730	15.60	15.10	6,689	27	80	7.2	0.03	0.03	0.01	0.00	1040	8.4	2.2	0.8

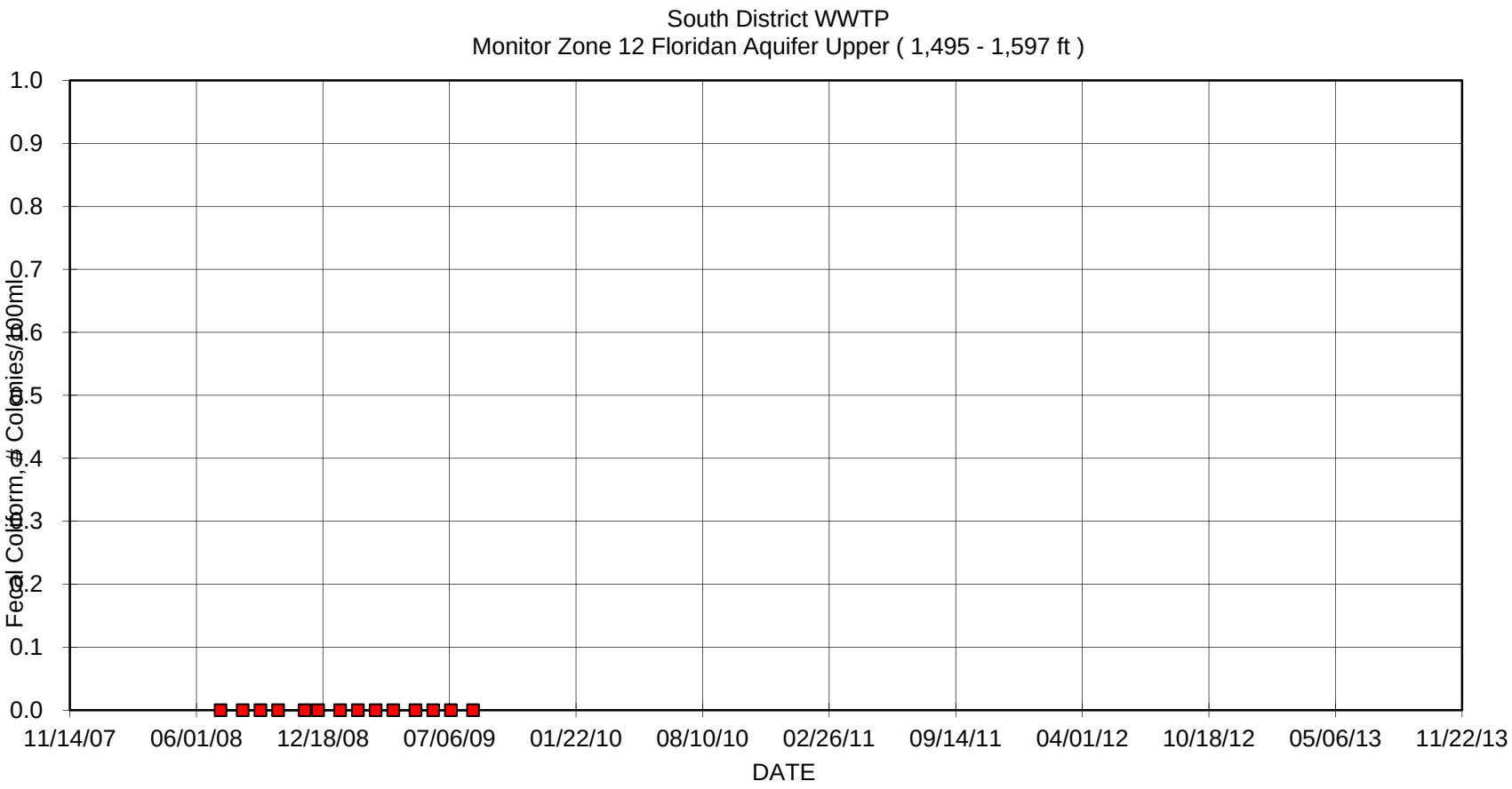

South District WWTP
Monitor Zone 12 Floridan Aquifer Upper (1,495 - 1,597 ft)
TDS, mg/L
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

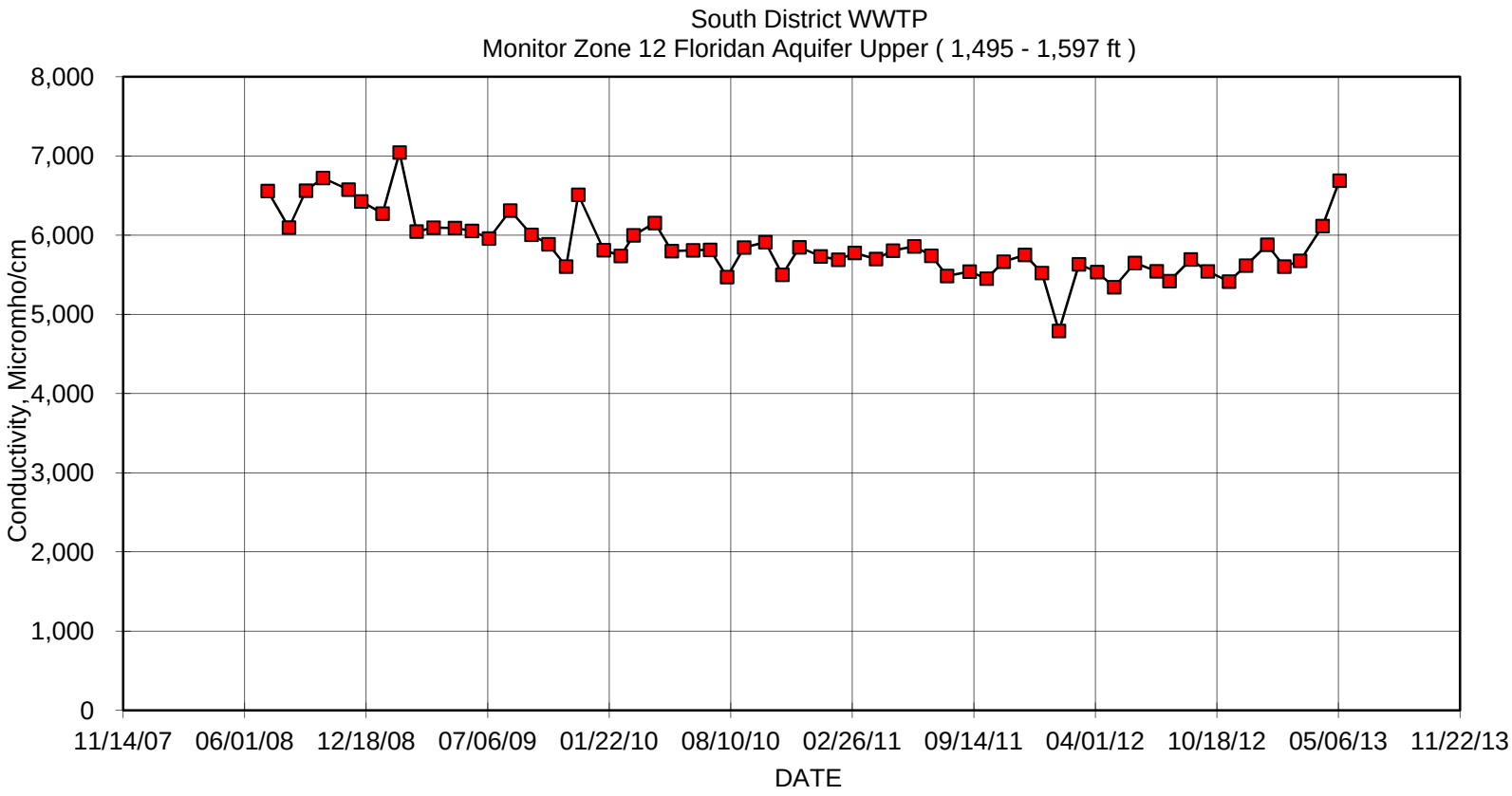

South District WWTP
Monitor Zone 12 Floridan Aquifer Upper (1,495 - 1,597 ft)
Sulfate, mg/L
350
300
250
200
150
100
50
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

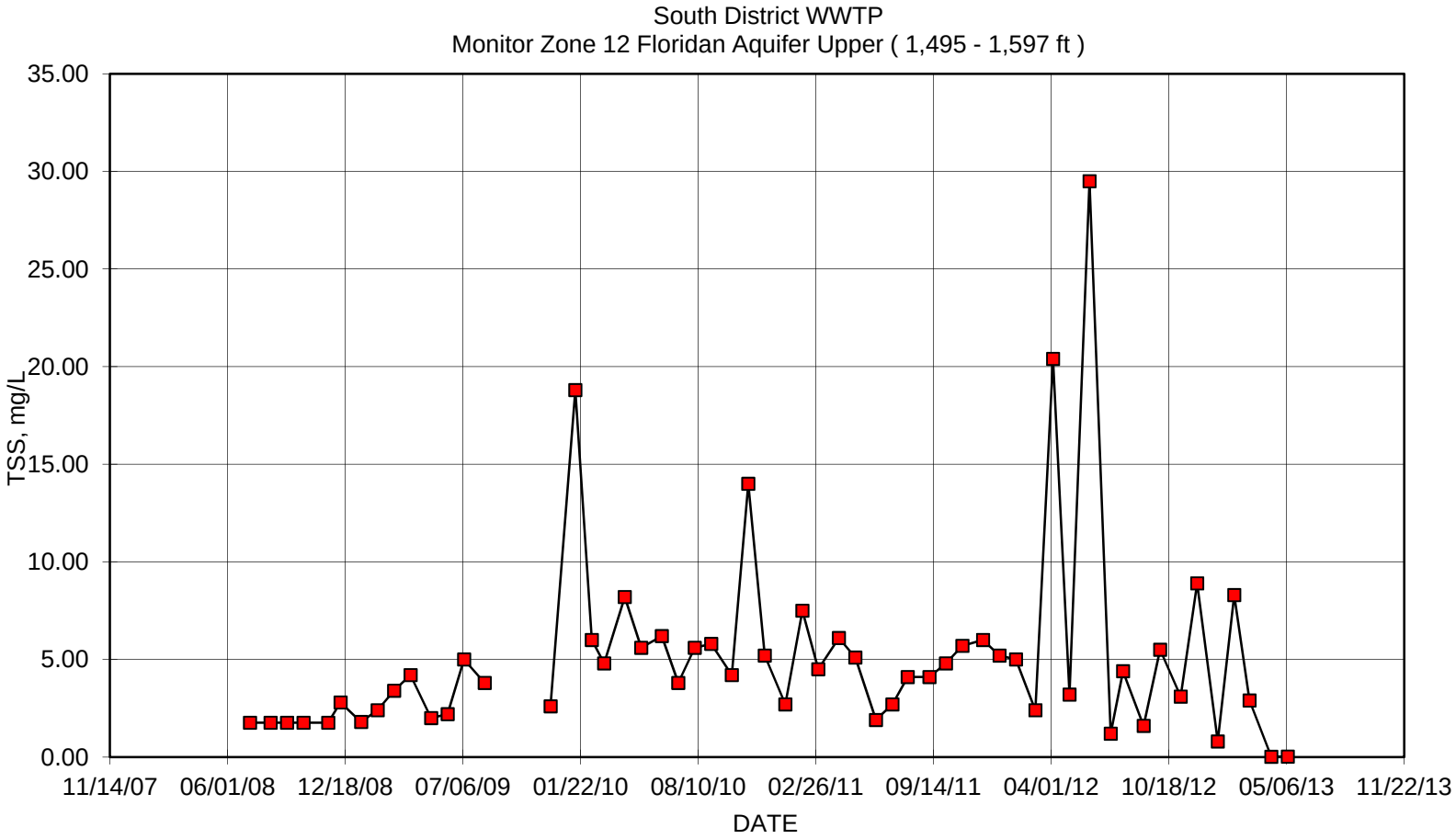

South District WWTP
Monitor Zone 12 Floridan Aquifer Upper (1,495 - 1,597 ft)
TKN, mg/L
25.00
20.00
15.00
10.00
5.00
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

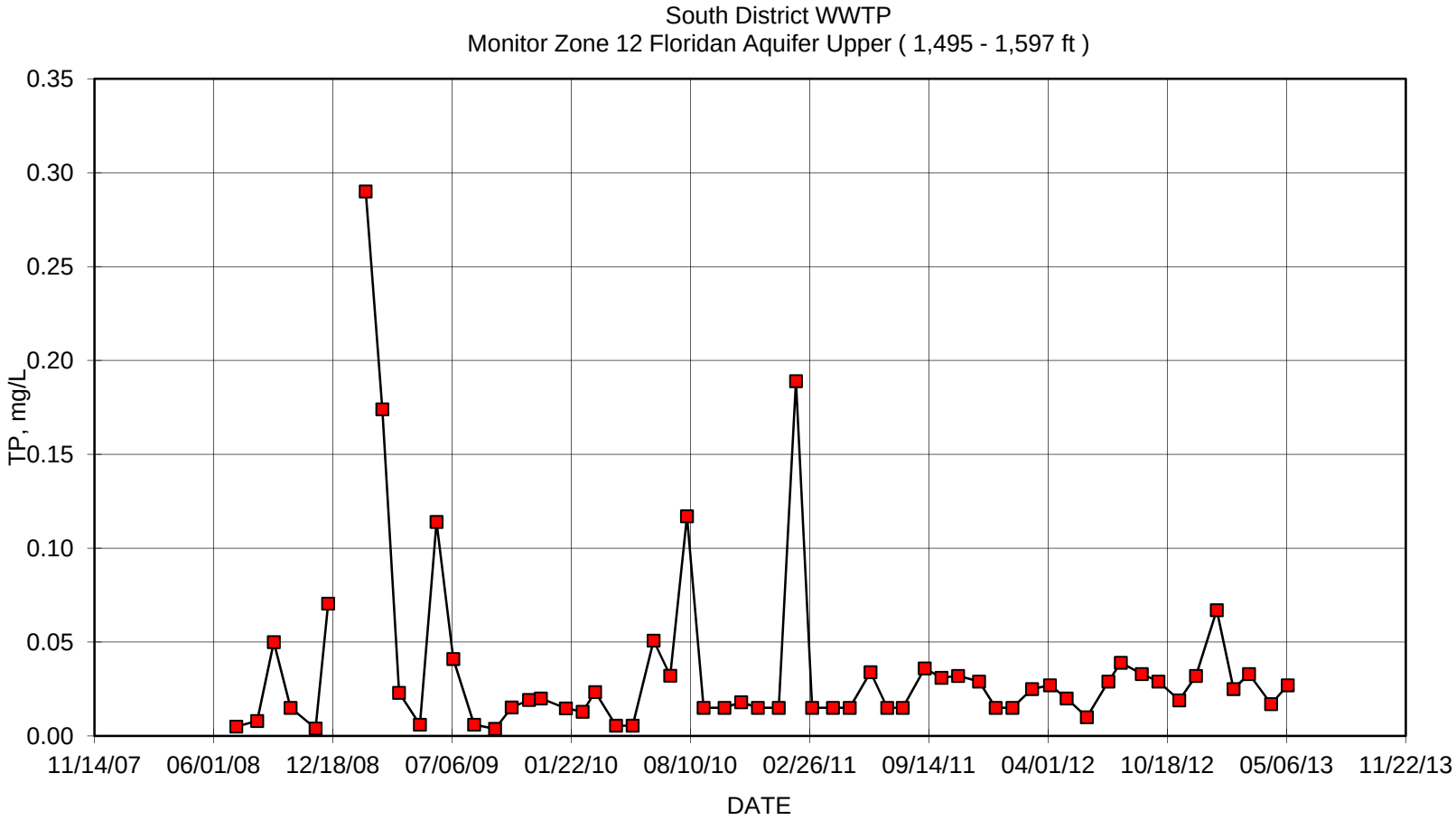

South District WWTP
Monitor Zone 12 Floridan Aquifer Upper (1,495 - 1,597 ft)
Chlorides, mg/L
2,500
2,000
1,500
1,000
500
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 12 Floridan Aquifer Upper (1,495 - 1,597 ft)
25.00
20.00
15.00
10.00
5.00
0.00
NH3, mg/L
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 12 Floridan Aquifer Upper (1,495 - 1,597 ft)
Fecal Coliform, # Colonies/100ml
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 12 Floridan Aquifer Upper (1,495 - 1,597 ft)
Conductivity, Micromho/cm
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

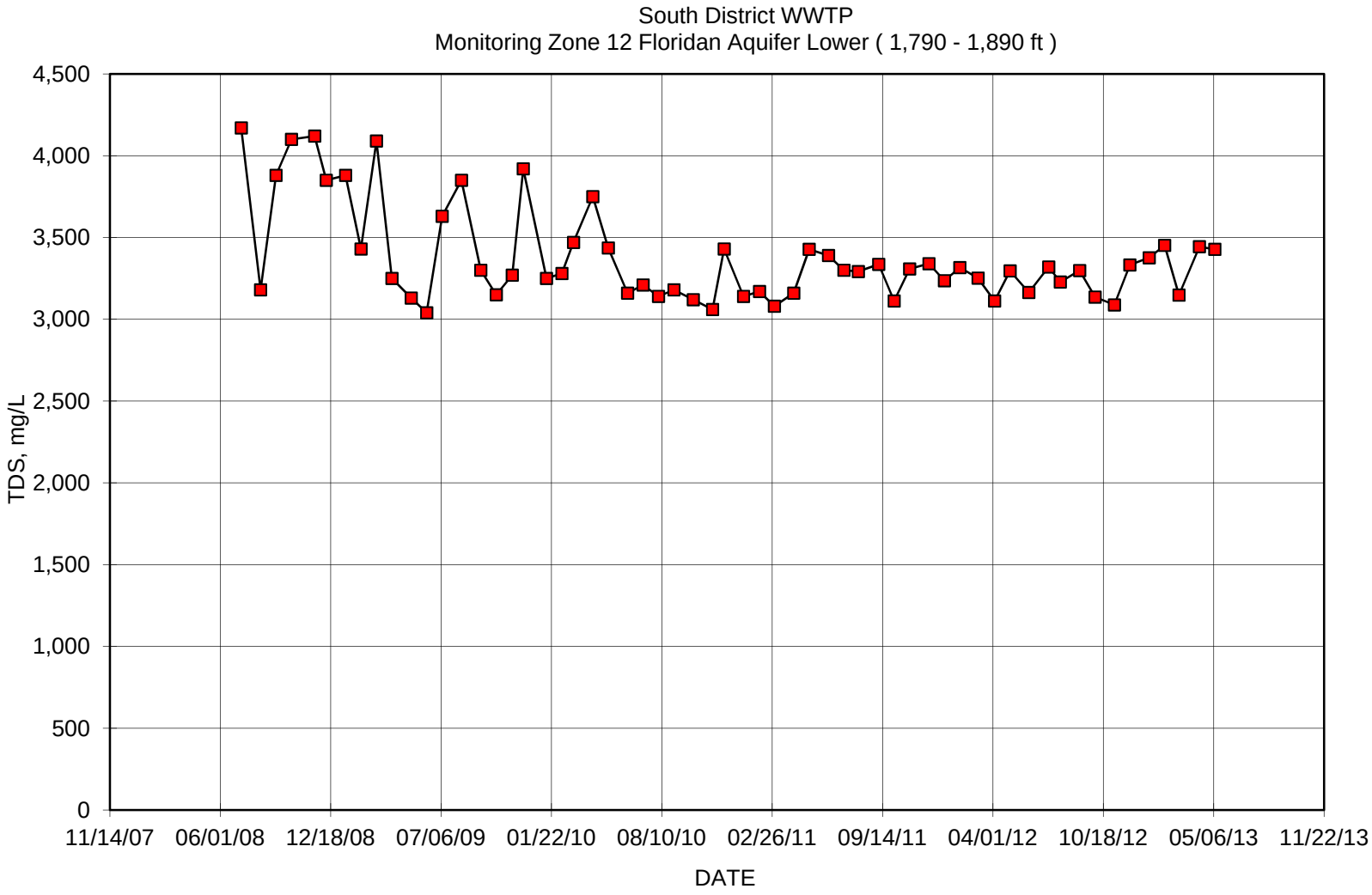

South District WWTP
Monitor Zone 12 Floridan Aquifer Upper (1,495 - 1,597 ft)
TSS, mg/L
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

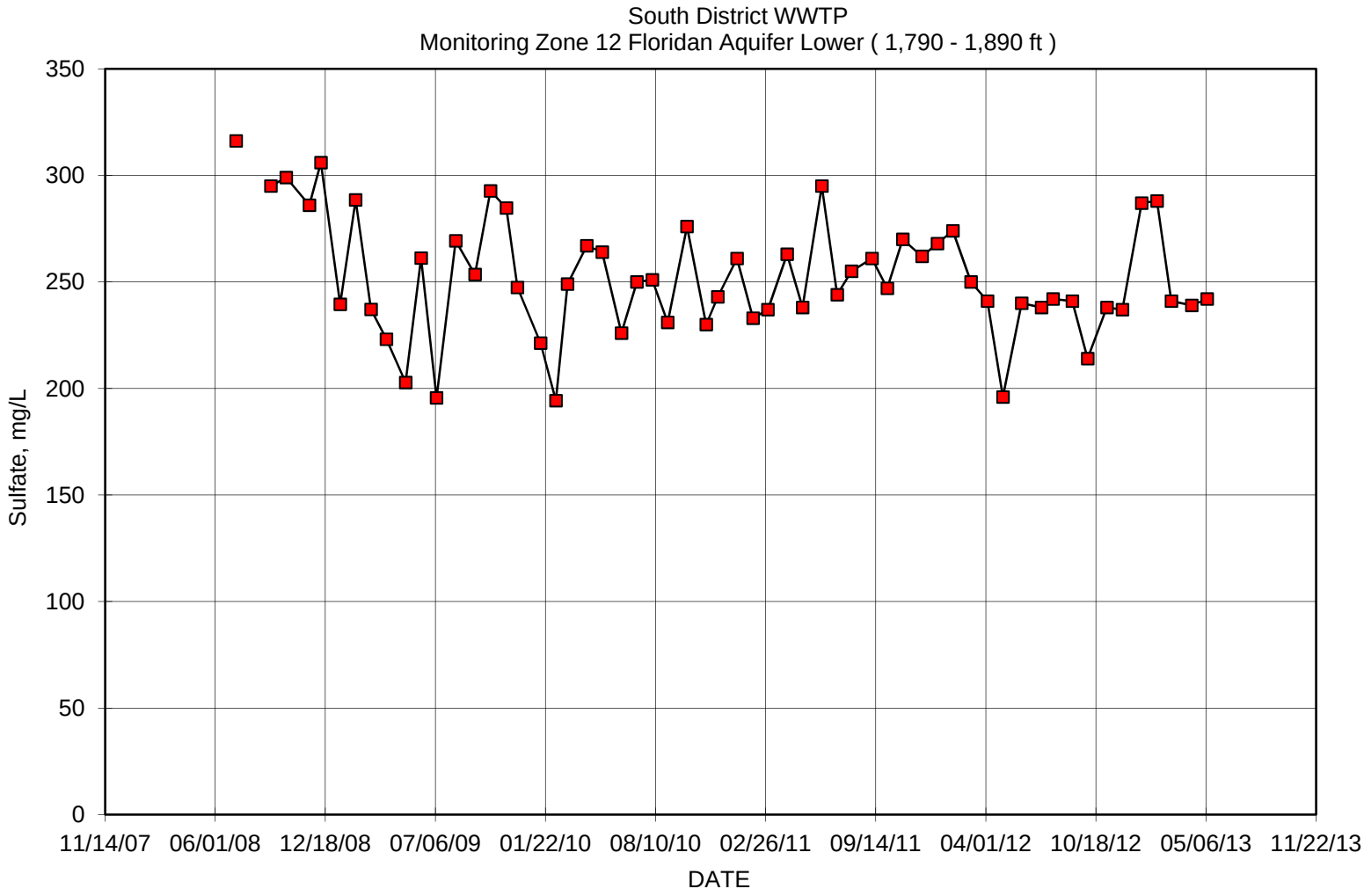

South District WWTP
Monitor Zone 12 Floridan Aquifer Upper (1,495 - 1,597 ft)
TP, mg/L
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

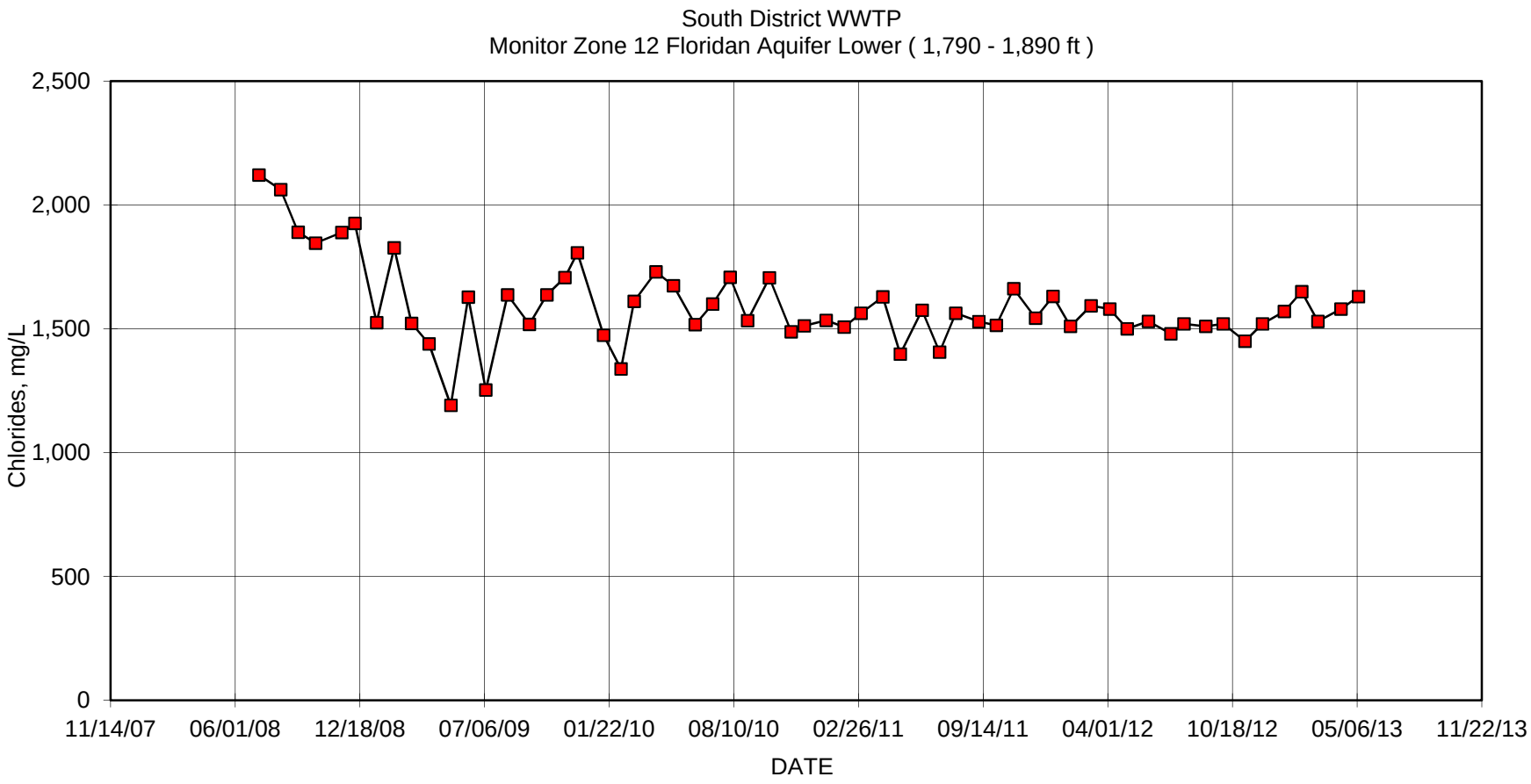
FA-12 Lower Data

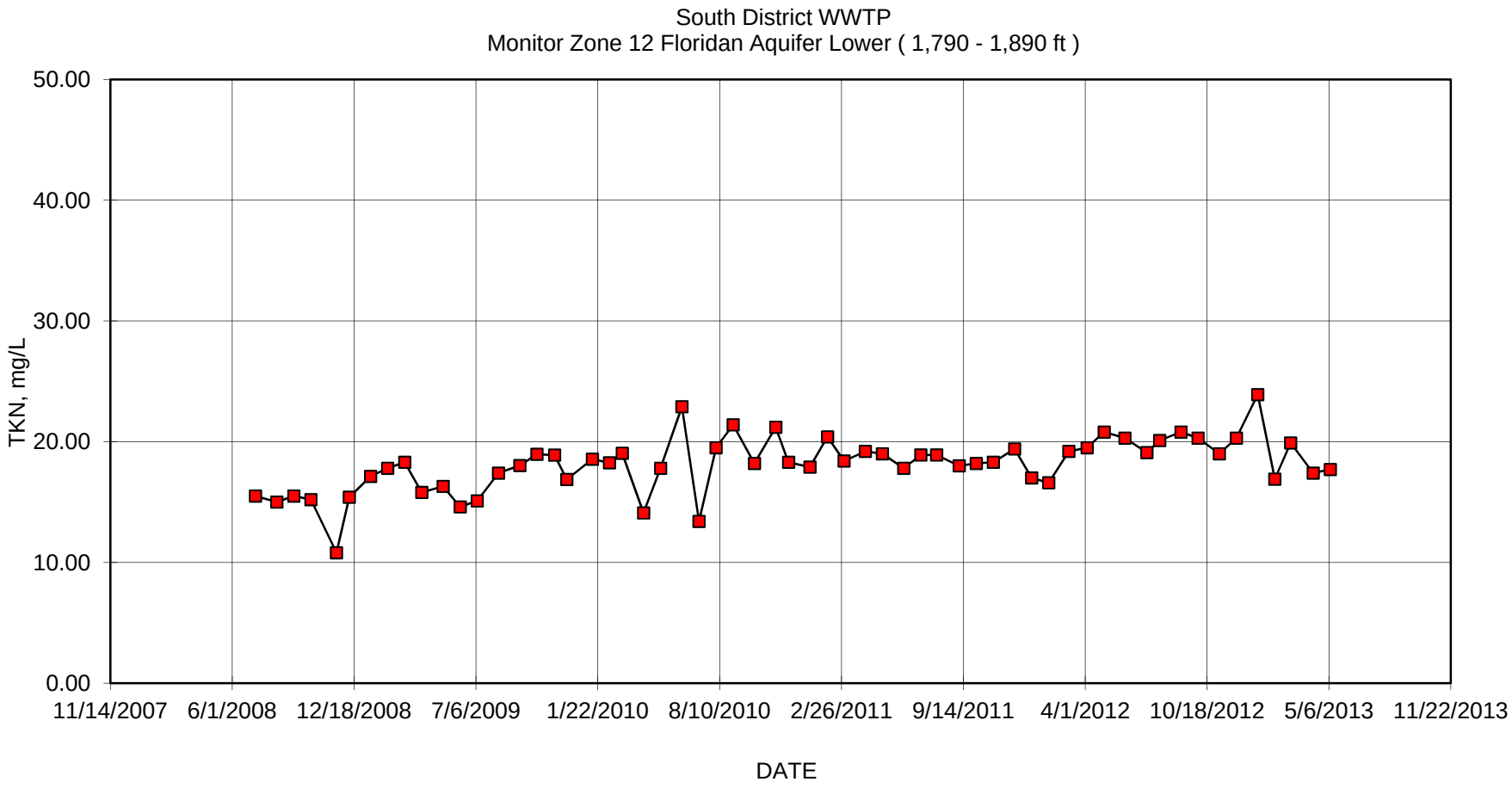
Date	TDS, mg/L	Sulfate, mg/L	Chlorides, mg/L	TKN, mg/L	NH3, mg/L	Conductivity, Micromho/cm	Temp., C	Temp., F	pH	TP, mg/L	TSS mg/L	NO_3 mg/L	NO_2 mg/L	Sodium mg/L	Gross Alpha pCi/L	Radium 226 pCi/L	Radium 228 pCi/L
07/09/08	4,170	316	2,121	15.50	12.80	6,816	26	79	7.2	0.01	1.76	0.03	0.00				
08/13/08	3,180		2,062	15.00	13.60	6,109	28	82	8.5	0.01	1.76	0.08	0.05				
09/10/08	3,880	295	1,890	15.50	15.80	6,204	27	80	7.3	0.08	1.76	0.08	0.05				
10/08/08	4,100	299	1,846	15.20	14.30	6,420	27	80	7.4	0.08	1.76	0.03	0.02				
11/19/08	4,120	286	1,889	10.80	14.60	6,792	27	80	7.3	0.00	5.80	0.03	0.00				
12/10/08	3,850	306	1,926	15.40	15.30	6,495	26	78	7.3	0.04	5.00	0.03	0.02				
01/14/09	3,880	240	1,525	17.13	15.10	6,383	24	76	7.3	0.06	2.60	0.03	0.02				
02/11/09	3,430	289	1,827	17.80	16.20	6,845	26	78	7.3	0.18	2.00	0.01	0.00				
03/11/09	4,090	237	1,522	18.30	17.00	6,332	25	77	7.3	0.16	3.00	0.00	0.00				
04/08/09	3,250	223	1,439	15.80	18.30	6,296	25	77	7.3	0.03	2.40	0.00	0.00				
05/13/09	3,130	203	1,191	16.30	16.10	6,034	27	80	7.3	0.00	2.20	0.00	0.01				
06/10/09	3,040	261	1,628	14.60	18.50	6,430	26	78	7.3	0.13	2.00	0.00	0.07				
07/08/09	3,630	196	1,253	15.10	17.80	6,061	26	79	7.7	0.00	3.80	0.00	0.01				
08/12/09	3,850	269	1,637	17.40	18.10	6,118	27	81	7.3	0.01	1.00	0.00	0.02				
09/16/09	3,300	254	1,518	18.03	16.56	6,105			7.3	0.01		0.05	0.01	924	8.4	2.8	0.9
10/14/09	3,150	293	1,637	18.96	16.84	6,019			7.2	0.03		0.00	0.04	901	7.2	2.8	0.8
11/12/09	3,270	285	1,707	18.89	17.03	6,069			7.4	0.02		0.00	0.00	862	7.2	3.0	0.9
12/02/09	3,920	247	1,807	16.87	15.51	6,506	26	79	7.3	0.02	3.40	0.00	0.01	958	10.3	3.4	0.8
01/13/10	3,250	221	1,474	18.56	17.69	5,665	25	76	7.1	0.02	2.60	0.01	0.01	788	9.5	2.7	0.8
02/10/10	3,280	194	1,338	18.25	17.50	5,754	25	77	7.5	0.01	3.40	0.00	0.02	848	9.0	2.3	0.8
03/03/10	3,470	249	1,611	19.05	17.49	6,068	26	78	7.2	0.03	3.60	0.00	0.00	935	9.9	3.0	0.7
04/07/10	3,750	267	1,730	14.10	16.20	6,203	26	79	7.3	0.04	4.80	0.00	0.00	945	5.1	3.0	0.6
05/05/10	3,436	264	1,674	17.80	16.60	5,870	27	80	7.2	0.01	8.00	0.00	0.00	910	10.4	2.4	0.8
06/09/10	3,160	226	1,517	22.90	15.90	5,789	26	79	7.4	0.04	3.60	0.00	0.00	885	11.5	3.3	0.6
07/07/10	3,210	250	1,600	13.40	18.10	5,783	26	79	7.3	0.04	2.00	0.00	0.00	885	8.0	3.4	0.9
08/04/10	3,140	251	1,708	19.50	19.80	5,739	26	80	7.2	0.17	2.80	0.00	0.00	909	9.1	3.5	0.7
09/01/10	3,180	231	1,533	21.40	18.60	5,878	27	80	7.2	0.02	5.40	0.00	0.00	868	7.3	2.8	0.8
10/06/10	3,120	276	1,706	18.20	18.80	5,879	26	80	7.2	0.02	3.00	0.00	0.01	936	10.1	2.4	0.8
11/10/10	3,060	230	1,488	21.20	18.00	5,627	26	79	7.2	0.02	3.80	0.00	0.00	878	8.4	2.6	0.8
12/01/10	3,430	243	1,512	18.30	19.30	5,697	27	80	7.2	0.02	3.20	0.00	0.00	838	10.4	3.1	0.8
01/05/11	3,140	261	1,534	17.90	18.40	5,650	27	80	7.3	0.02	3.60	0.00	0.02	882	7.9	3.2	1.1
02/03/11	3,170	233	1,507	20.40	18.40	5,372	27	80	7.3	0.20	11.60	0.00	0.00	867	11.1	2.5	0.8
03/02/11	3,080	237	1,563	18.40	19.20	5,694	26	79	7.3	0.02	3.60	0.00	0.01	806	10.4	3.0	0.8
04/06/11	3,160	263	1,629	19.20	19.10	5,586	27	80	7.2	0.02	12.80	0.00	0.00	846	10.4	2.5	0.9

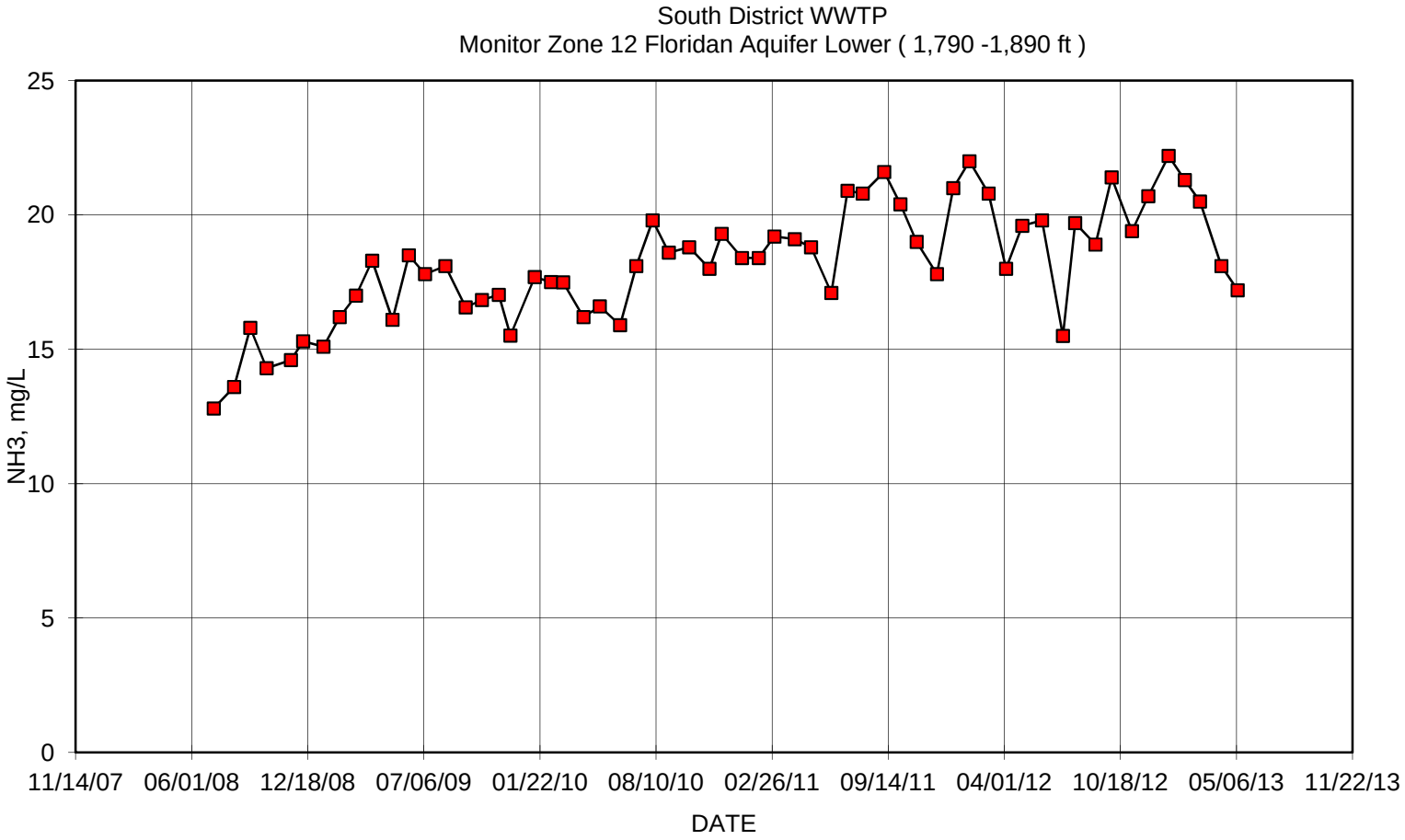
05/04/11	3,428	238	1,398	19.00	18.80	5,957	26	79	7.5	0.02	3.50	0.00	0.00	860	8.5	2.2	0.9
06/08/11	3,390	295	1,575	17.80	17.10	5,716	26	79	7.4	0.03	2.80	0.00	0.01	861	7.7	2.9	0.7
07/06/11	3,300	244	1,406	18.90	20.90	5,627	26	79	7.3	0.02	1.50	0.00	0.00	1010	11.0	2.2	0.8
08/01/11	3,292	255	1,563	18.90	20.80	5,320	27	80	7.4	0.01	8.40	0.00	0.01	643	8.1	2.4	1.0
09/07/11	3,336	261	1,529	18.00	21.60	5,722	27	80	7.4	0.04	4.30	0.00	0.00	839	8.4	2.5	1.0
10/05/11	3,112	247	1,514	18.20	20.40	5,474	27	81	7.2	0.04	7.10	0.00	0.00	859	7.9	2.3	1.0
11/02/11	3,308	270	1,662	18.30	19.00	5,378	27	80	7.4	0.02	2.00	0.00	0.00	925	9.0	1.7	1.0
12/07/11	3,340	262	1,543	19.40	17.80	5,210	26	80	7.5	0.03	10.10	0.01	0.00	883	10.6	3.3	0.8
01/04/12	3,236	268	1,631	17.00	21.00	5,288	26	78	7.2	0.02	1.30	0.00	0.00	891	6.5	2.7	1.0
02/01/12	3,316	274	1,510	16.60	22.00	5,494	29	84	7.4	0.02	14.70	0.01	0.00	893	7.2	2.3	0.9
03/05/12	3,252	250	1,593	19.20	20.80	5,061	27	80	7.3	0.02	96.10	0.01	0.00	910	10.8	3.2	0.7
04/04/12	3,112	241	1,580	19.50	18.00	4,881	26	79	7.1	0.03		0.50	0.50	882	8.5	3.5	0.8
05/02/12	3,296	196	1,500	20.80	19.60	5,668	27	80	7.3	0.02	7.30	0.00	0.00	914	17.1	2.1	0.9
06/05/12	3,164	240	1,530	20.30	19.80	4,878	27	80	7.4	0.02	4.00	0.03	0.00	853	27.9	2.8	1.0
07/11/12	3,320	238	1,480	19.10	15.50	5,547	26	79	7.3	0.01	26.70	0.01	0.00	874	9.5	2.9	0.8
08/01/12	3,228	242	1,520	20.10	19.70	5,216	27	80	7.7	0.02	38.30	0.00	0.00	851	16.7	2.7	0.9
09/05/12	3,298	241	1,510	20.80	18.90	5,500	27	81	7.2	0.05	6.00	0.01	0.01	802	7.1	3.3	0.8
10/03/12	3,136	214	1,520	20.30	21.40	5,605	27	80	7.3	0.03	7.20	0.00	0.00	816	8.2	2.6	0.7
11/07/12	3,088	238	1,450	19.00	19.40	5,396	27	80	7.3	0.02	4.30	0.00	0.00	951	11.5	1.7	0.8
12/05/12	3,332	237	1,520	20.30	20.70	5,892	26	79	7.2	0.02	8.00	0.02	0.01	899	8.8	2.5	0.9
01/09/13	3,376	287	1,570	23.90	22.20	5,677	27	80	7.3	0.09	4.40	0.02	0.00	893	11.6	2.9	0.8
02/06/13	3,452	288	1,650	16.90	21.30	5,603	28	83	7.3	0.03	9.30	0.00	0.00	917	10.0	2.9	0.9
03/04/13	3,148	241	1,530	19.90	20.50	5,591	26	79	7.1	0.03	1.90	0.00	0.00	902	7.1	3.6	1.8
04/10/13	3,444	239	1,580	17.40	18.10	5,954	26	79	7.2	0.06	0.06	0.00	0.01	919	12.5	4.0	0.8
05/08/13	3,428	242	1,630	17.70	17.20	6,304	27	81	7.2	0.02	0.02	0.01	0.00	946	8.8	2.7	0.8

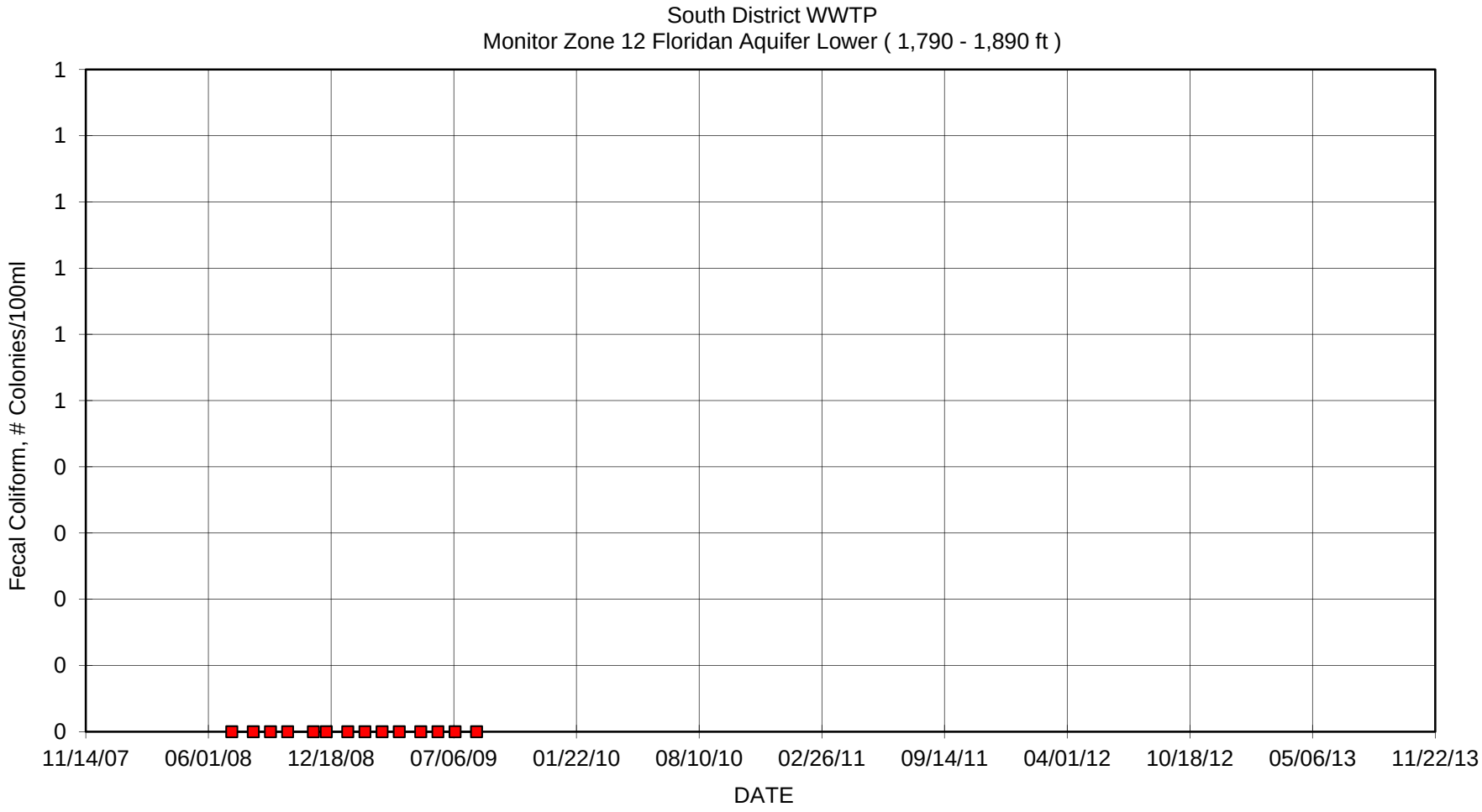

South District WWTP
Monitoring Zone 12 Floridan Aquifer Lower (1,790 - 1,890 ft)
TDS, mg/L
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

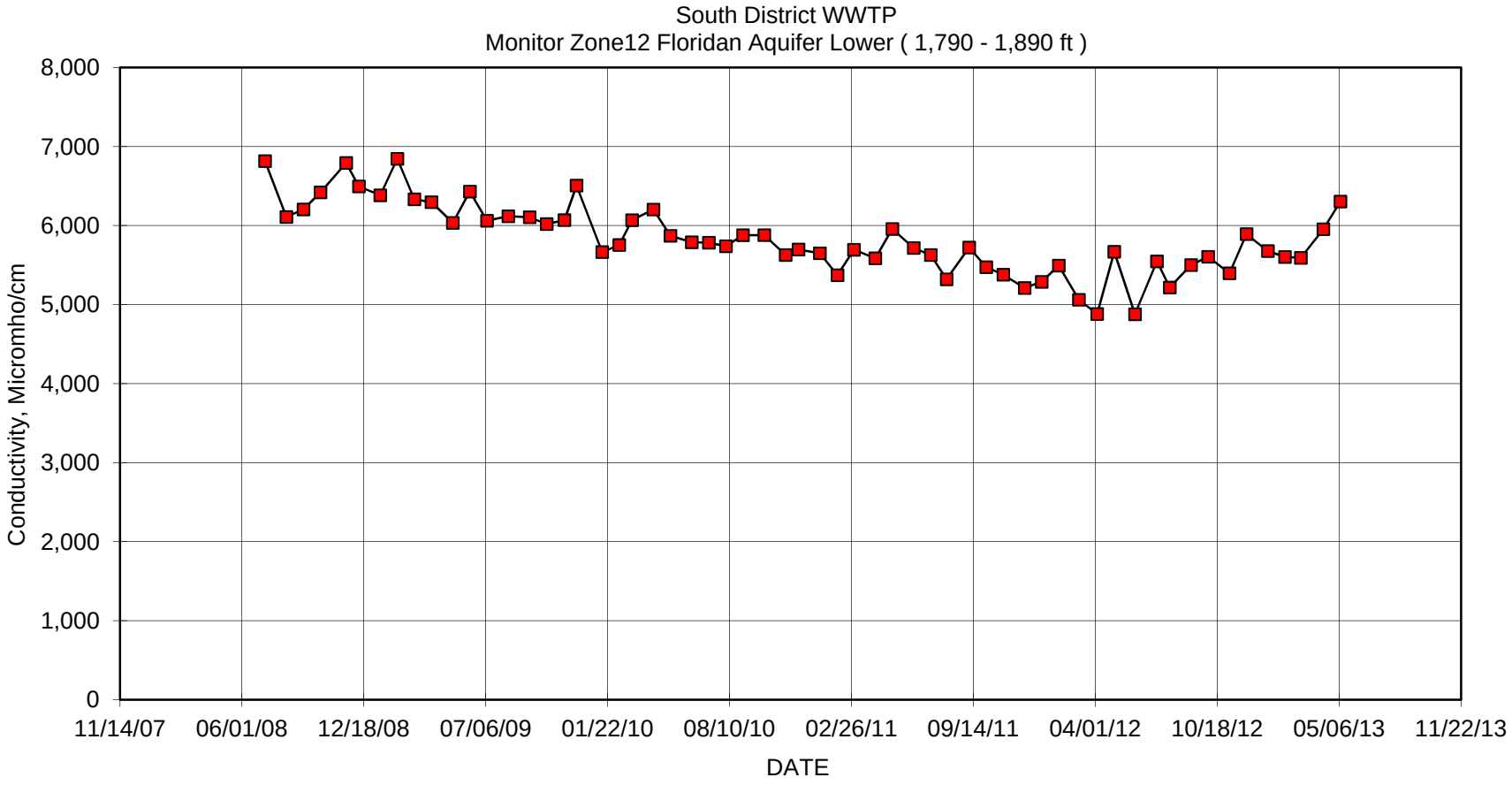

South District WWTP
Monitoring Zone 12 Floridan Aquifer Lower (1,790 - 1,890 ft)
Sulfate, mg/L
350
300
250
200
150
100
50
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

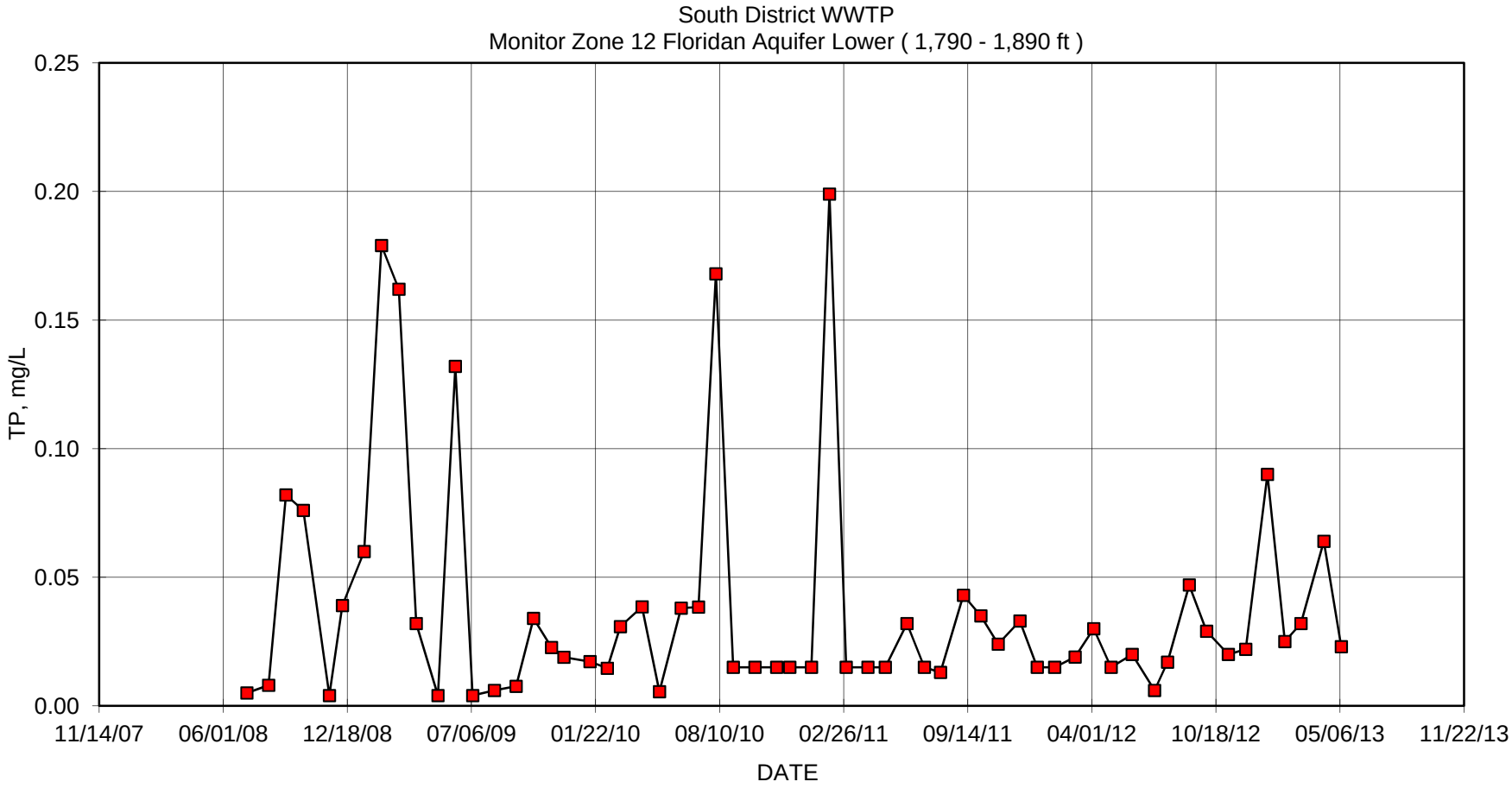

South District WWTP
Monitor Zone 12 Floridan Aquifer Lower (1,790 - 1,890 ft)
Chlorides, mg/L
2,500
2,000
1,500
1,000
500
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE

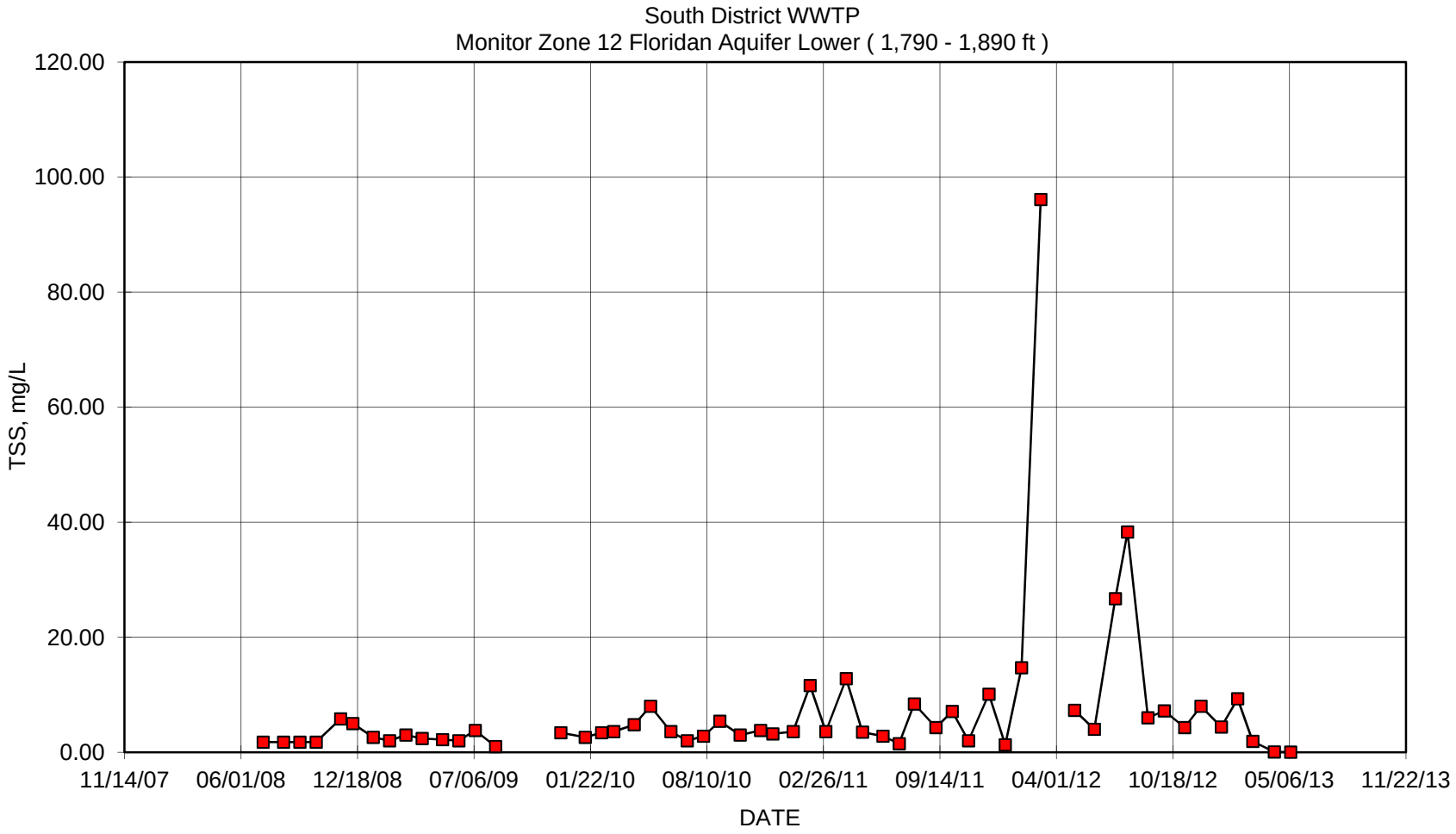

South District WWTP
Monitor Zone 12 Floridan Aquifer Lower (1,790 - 1,890 ft)
TKN, mg/L
50.00
40.00
30.00
20.00
10.00
0.00
11/14/2007
6/1/2008
12/18/2008
7/6/2009
1/22/2010
8/10/2010
2/26/2011
9/14/2011
4/1/2012
10/18/2012
5/6/2013
11/22/2013
DATE


South District WWTP
Monitor Zone 12 Floridan Aquifer Lower (1,790 -1,890 ft)
NH3, mg/L
25
20
15
10
5
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 12 Floridan Aquifer Lower (1,790 - 1,890 ft)
Fecal Coliform, # Colonies/100ml
1
1
1
1
1
1
0
0
0
0
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone12 Floridan Aquifer Lower (1,790 - 1,890 ft)
Conductivity, Micromho/cm
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 12 Floridan Aquifer Lower (1,790 - 1,890 ft)
TP, mg/L
0.25
0.20
0.15
0.10
0.05
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE


South District WWTP
Monitor Zone 12 Floridan Aquifer Lower (1,790 - 1,890 ft)
TSS, mg/L
120.00
100.00
80.00
60.00
40.00
20.00
0.00
11/14/07
06/01/08
12/18/08
07/06/09
01/22/10
08/10/10
02/26/11
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
DATE