Former Production Well Destruction Report
Lockheed Martin Corporation, Beaumont Site 2
Beaumont, California

Prepared for:

LOCKHEED MARTIN

Prepared by:

TETRA TECH
348 W. Hospitality Lane, Suite 100
San Bernardino, California 92408
February 2009

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LOCKHEED MARTIN

February 11, 2009

Mr. Daniel Zogaib
Southern California Cleanup Operations
Department of Toxic Substances Control
5796 Corporate Avenue
Cypress, CA 90630

Subject: Submittal of *Former Production Well Destruction Report, Lockheed Martin Corporation, Beaumont Site 2, Beaumont, California, February 2009*

Dear Mr. Zogaib:

Please find enclosed one (1) copy of the final *Former Production Well Destruction Report,* revised in response to comments from DTSC.

If you have any questions regarding this submittal, please contact me at 408.756.9595 or denise.kato@lmco.com.

Sincerely,

Denise Kato
Remediation Analyst Senior Staff

Enclosure

Copy with Enc:
Denise Kato, LMC (electronic copy)
Tom Villeneuve, Tetra Tech, Inc. (hard copy)
Gene Matsushita (electronic & hard copy)
John Eisenbeis, CDM (electronic copy)

RESPONSES TO DTSC COMMENTS ON THE FORMER PRODUCTION WELL DESTRUCTION REPORT, LOCKHEED-MARTIN BEAUMONT SITE 2, BEAUMONT, CALIFORNIA

General Comments		
Comment	**Response**	**Proposed Action**
1. All figures should have a practical scale that can be used with a common engineering scale that equals exactly 1 inch The print scaling should be checked before printing from a .pdf document.	The figures in this report were scaled individually to maximize the areas and data being presented. Tetra Tech does concur that standardized scales are helpful to the reader and therefore will make this change in all future documents. However, the level of effort to revise the figures in the current document is a lot given that the report has already been submitted and reviewed.	Standardized scales will be generated using a common engineering scale for future reports.
2 Additional figures should be included to show how the five wells relate to features, former site activities, and impacted soil and groundwater. A scale closer to 1 inch > 100 feet may be more appropriate.	Figure 1-2 shows the well locations relevant to each site feature. The figure will be revised to include the latest outline of the affected groundwater and soil so that the reader can visualize areas of known contamination relative to the former production wells.	Revise Figure 2-1 to include the general impacted groundwater location and the location of the known soil impacts.
3 The signature page should be revised to include a Professional Geologist's wet stamp with expiration date. An appropriate sized Professional Geologist stamp (no less than 1-1/2 inches) should be included in the report according to page 17 of the Geologist and Geophysical Act with Rules and Regulations dated 2007 http://www.geology.ca.gov/laws/act.pdf.	The requested correction will be made.	The final report will be stamped by a licensed professional geologist according to the Geologist and Geophysical Act requirements.

RESPONSES TO DTSC COMMENTS ON THE FORMER PRODUCTION WELL DESTRUCTION REPORT,
LOCKHEED-MARTIN BEAUMONT SITE 2,
BEAUMONT, CALIFORNIA

General Comments		
Comment	**Response**	**Proposed Action**
4. The geophysical log package (Appendix C) should be signed, stamped, and dated by a Professional Geophysicist. An appropriate sized Professional Geophysicist stamp (no [ess than 1-1/2 inches) should be included in the report according to page 17 of the Geologist and Geophysical Act with Rules and Regulations dated 2007 http://www.geology.ca.gov/laws/act.pdf	Welenco Well Logging Services, Inc. has their State Contractor's License number identified on the first page of each downhole log. Since Welenco is providing a service and not an interpretation, they would not be required to provide a wet signature on their logs. The interpretations made by the geologist regarding the data provided in the report will be signed by the Professional Geologist / Engineer who was in charge of the work, as instructed in the comment above.	The final report will be stamped by a licensed professional geologist according to the Geologist and Geophysical Act requirements.
5 Decontamination procedures for downhole tools should be included.	Decontamination procedures used on the geophysical equipment has been added to Section 2.1.2, Equipment Decontamination, of the report.	Text has been added to describe the decontamination procedures used on the downhole geophysical equipment following the logging of each former production well.
6. A tabular analytical summary table for all analytical results of soil and groundwater should be provided where volatile organic compounds (VOCs), metals, and perchlorate are included.	Table 4-1 provides a summary of the perchlorate and TCE results (COPCs for Site 2). Table 4-2 has been added to summarize metals results. The complete analytical data packages are provided in Appendix D	Table 4-2 has been added to summarize metals results. Table 4-1 provided a summary of analytical results for the primary COPCs perchlorate and TCE in soil and groundwater. In addition, complete analytical data packages are provided in Appendix D.

RESPONSES TO DTSC COMMENTS ON THE FORMER PRODUCTION WELL DESTRUCTION REPORT, LOCKHEED-MARTIN BEAUMONT SITE 2, BEAUMONT, CALIFORNIA

Specific Comments		
Comment	**Response**	**Proposed Action**
7. Figure 1-2: The symbol for the Destroyed Production Well Location for W2-2, W2-3, W2-5, UNKNOWN #1, and UNKNOWN #2 on the figure should match the legend.	The correction has been made as requested.	The correction has been made as requested.
8. Section 1.2, Page 1-4: GCR is highlighted in yellow It should be verified that Grand Central Rocket Company (GCR) purchased the property during the 1950s and the yellow highlighting should be explained.	The yellow highlighting has been removed. This was an artifact of peer and technical editing to ensure that all acronyms have been identified.	The typo has been corrected.
9. Section 2.1.2, Page 2-1: An appendix should be referenced in this section.	Reference to Appendix C has been added as requested. Addition of a new Section 2.1.2 Decontamination Procedures, requires the reference to Appendix C to be included in Section 2.1.3	The requested reference has been added to Section 2.1.3.
10.Section 3.1.2, Page 3-3: The "?" should be explained at the bottom of the page.	The typo has been removed. As in comment 8, this “?” was added to the text during peer review and technical editing and was inadvertently left in the text. The “?” has been removed from the text.	The “?” has been removed from the text.

RESPONSES TO DTSC COMMENTS ON THE FORMER PRODUCTION WELL DESTRUCTION REPORT, LOCKHEED-MARTIN BEAUMONT SITE 2, BEAUMONT, CALIFORNIA

Specific Comments		
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11.Section 3.1.2, Page 3·8: According to Tetra Tech, UNKNOWN WELL #1 was determined that it was not likely a former water well. An explanation should be provided on what basis this well not a well. Dry wells are typically cased on the sides near the surface with their bottoms exposed to native material. A full suite of analyses should be performed on soil samples collected in the near vicinity of this feature starting at ground surface.	The physical characteristics of Unknown Well #1 did not match any well description reviewed as part of this well destruction program. Tetra Tech performed various video surveys and downhole geophysical survey (wireline logs) to determine the nature and suspected purpose of the well. The data was inconclusive so during well abandonment procedures, soil samples were collected below the bottom of the hole at 45 feet, 50 feet, and 55 feet bgs to ensure we were in native material and to provide analytical results to determine if the well/borehole was a source of contamination. These soil samples were then sent to a state certified laboratory for analysis of perchlorate, VOCs, and metals to determine if the structure was used as a dry well. The VOC and metals results did not show any elevated concentrations. Perchlorate was present in soil samples at concentrations ranging from 30.5 µg/kg to 293 µg/kg but these samples were collected in the saturated zone which suggests that the soil or the water has perchlorate. The concentration of perchlorate, whether from soil or from groundwater is not indicative of a perchlorate source area; perchlorate concentrations in water from the area around Unknown #1 range from 7,000 to 8,000 µg/l in TT-MW2-1 to 15,000 to 16,000 µg/l in TT-MW2-18. Therefore, Unknown Well #1 was not considered a source for perchlorate and was not considered a dry well.	Text can be added to clarify that soil and groundwater samples were collected in Unknown Well #1 before the borehole was abandoned with cement.

RESPONSES TO DTSC COMMENTS ON THE FORMER PRODUCTION WELL DESTRUCTION REPORT, LOCKHEED-MARTIN BEAUMONT SITE 2, BEAUMONT, CALIFORNIA

Specific Comments		
Comment	**Response**	**Proposed Action**
12. Table 3-3, Pages 3-9 and 3-10' The title should wrap as "continued" to the next page and the "Notes" Should be completed.	The format of the tables will be modified such that the title will wrap onto the next page of the tables.	Tables will be formatted as requested.
13. Table 3-4, Page 3-15: The "Notes" should correspond to the table Also columns for TO and casing diameter should be added.	The Table has been modified as requested.	Table 3-4 has been modified as requested.

TETRA TECH

Former Production Well Destruction Report
Lockheed Martin Corporation, Beaumont Site 2
Beaumont, California

February 2009
TC 21505.04

Prepared for
Lockheed Martin Corporation
Burbank, California

Prepared by
Tetra Tech, Inc

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1.0 INTRODUCTION

This Well Abandonment Report (Report) was prepared by Tetra Tech, Inc. (Tetra Tech), on behalf of Lockheed Martin Corporation (LMC). A Well Abandonment Work Plan (Work Plan), dated October 2007, outlined the proposed well abandonment activities (Tetra Tech, 2007d) and was approved in a letter dated 12 October 2007 from the Department of Toxic Substances Control (DTSC),. The purpose of this Report is to document the destruction activities associated with three (3) known groundwater production wells and two (2) possible groundwater production wells that were properly destroyed at Beaumont Site 2 (Site). The wells were potential conduits for vertical migration of groundwater. In general each well was constructed of steel casing with rivets, welds, and/or ribbing on the interior. Based on the limited well construction information available, individual wells likely traversed one or more of the major geologic units beneath the Site. As a result, well decommissioning was recommended.

The objectives of this Report are to:

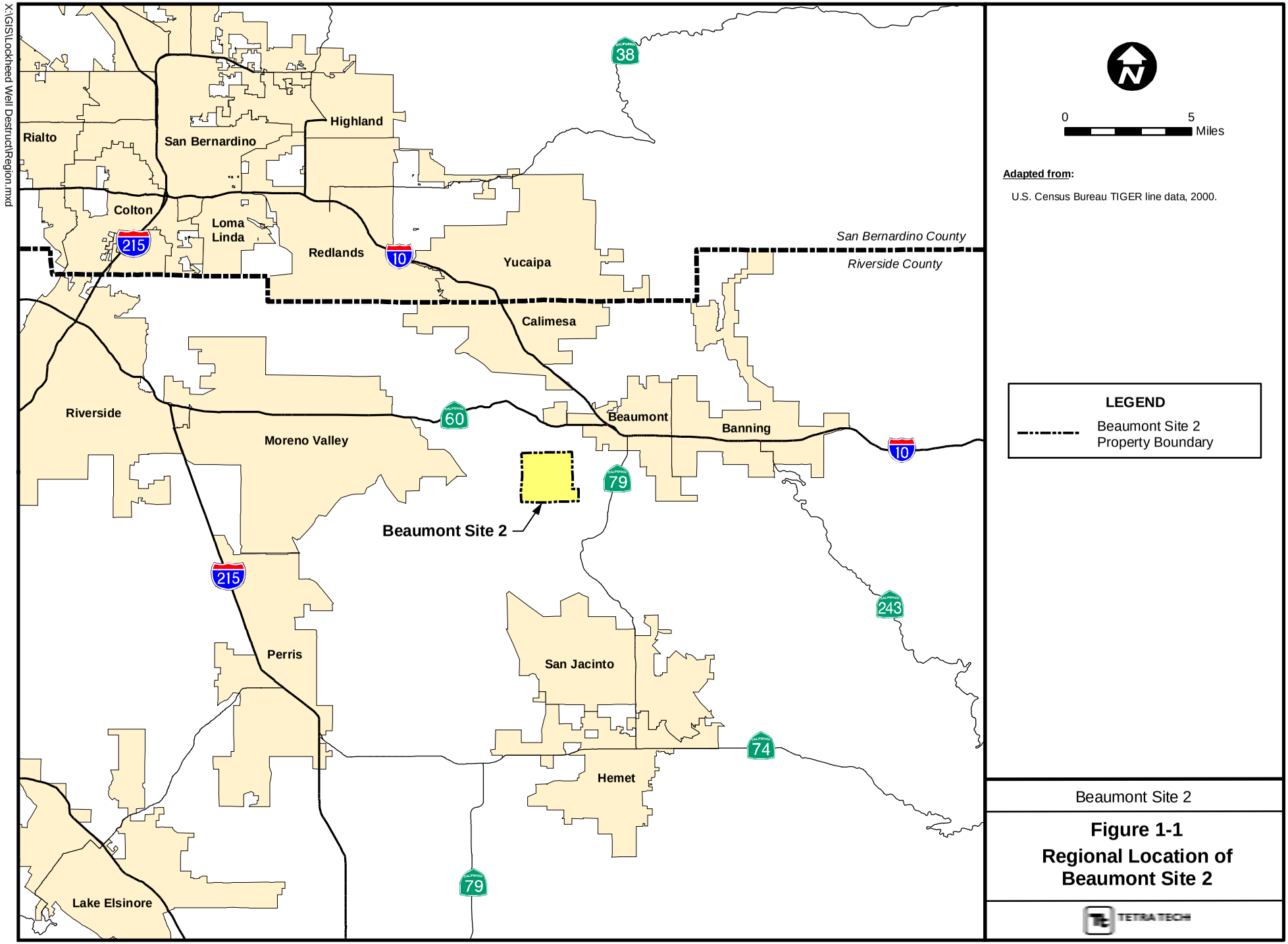
- Present the background history for the wells;
- Describe the procedures used for well testing and destruction activities;
- Present conclusions, data gaps and recommendations for further action.

This Report is organized into 4 major sections: 1) Introduction, 2) Field Methodology, 3), Results of Field Activities and 4) Summary and Conclusions.

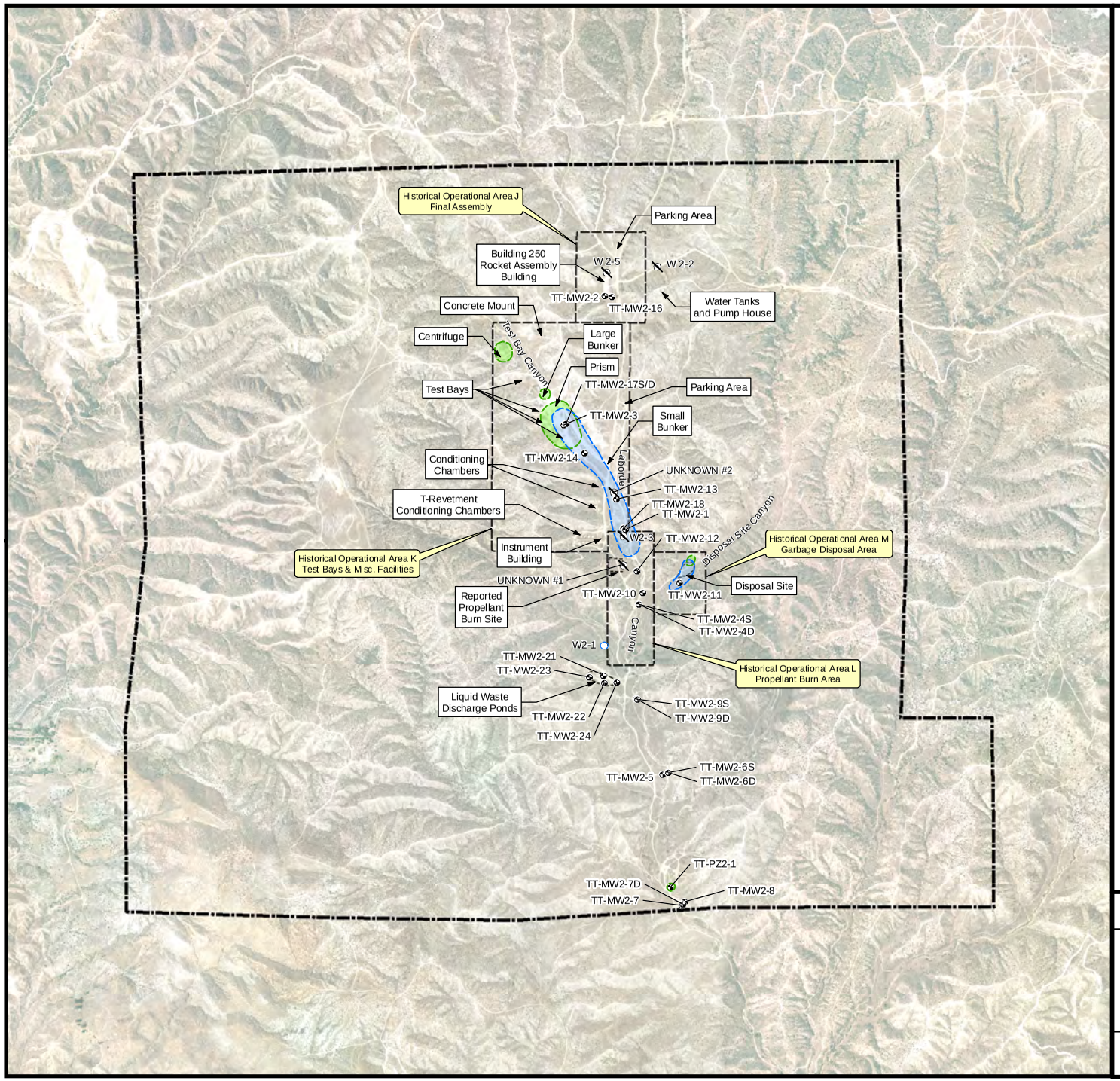
1.1 SITE BACKGROUND

The Site is a 2,668 acre parcel located southwest of Beaumont, California (Figure 1-1). The parcels that comprise the Site were owned by individuals and the United States (U.S.) government prior to 1958. Between 1958 and 1960, portions of the Site were purchased by Grand Central Rocket Company (GCR) and utilized as a remote test facility for early space and defense program efforts (Radian, 1968a). In 1960, Lockheed Aircraft Corporation (LAC) purchased one-half interest in GCR. GCR became a wholly-owned subsidiary of LAC in 1961. The remaining parcels of land that comprise the Site were purchased from the U.S. government between 1961 and 1964. Figure 1-2 presents a layout of the historical operational areas and features of the Site. In 1963, Lockheed Propulsion Company (LPC) became an operating division of LAC and was responsible for the operation of the Site until its closure in 1974.

Prior to 1958 the Site was used for agriculture. The Site was utilized by GCR and LPC from 1958 to 1974 for small rocket motor assembly, testing operations, propellant incineration, and minor disposal activities (Radian, 1986a). Ogden Labs is known to have leased portions of the Site in the 1970s. In 1989, DTSC issued a consent order requiring LMC to clean up contamination at the Site related to past testing


X:\GIS\Lockheed Well Destruct\Region.mxd
38
Highland
Rialto
San Bernardino
Colton
Loma Linda
215
Redlands
10
Yucaipa
San Bernardino County
Riverside County
Calimesa
Riverside
60
Moreno Valley
Beaumont
Banning
10
79
Beaumont Site 2
215
243
Perris
San Jacinto
74
Hemet
79
Lake Elsinore
0
5
Miles
Adapted from:
U.S. Census Bureau TIGER line data, 2000.
LEGEND
Beaumont Site 2
Property Boundary
Beaumont Site 2
Figure 1-1
Regional Location of
Beaumont Site 2
TETRA TECH

X:\GIS\LOCKHEED WELL DESTRUCTIOP AREAS.MXD



0 1,000 2,000 Feet

Adapted from: March 2007 aerial photograph.

LEGEND

- Monitoring Well Location
- Destroyed Production Well Location
- Reported Production Well Location
- Estimated Lateral Extent of Perchlorate Affected Groundwater
- Estimated Lateral Extent of Perchlorate Affected Soil
- Historical Operational Unit Boundary
- Beaumont Site 2 Property Boundary

Note: Beaumont Site 2 property boundary from Hillwig-Goodrow survey, May 2004.

Propellant Burn Site perimeter is estimated (Radian, 1986a).

Beaumont Site 2

Figure 1-2
Historical Operational Areas and Site Features

TETRA TECH

activities (CDHS, 1989). Based on characterization and cleanup activities performed at the Site, the DTSC issued a no further remedial action letter to LMC, closing the Site in 1993.

Based on regulatory interest in perchlorate and 1,4-dioxane, a groundwater sample was collected from an inactive groundwater production well (identified as W2-3) at the Site in January 2003. The sample was analyzed for volatile organic compounds (VOCs), perchlorate, and 1,4-dioxane to determine the potential presence and concentration of those chemicals in groundwater. The analytical results indicated that VOCs and 1,4-dioxane were not present at or above their respective laboratory reporting limits (LRLs). However, perchlorate was reported at a concentration of 4,080 micrograms per liter (µg/L), which exceeded the State of California Maximum Contaminant Level (MCL) of 6 µg/L. Based on the detection of perchlorate in the groundwater sample collected, the DTSC reopened the Site for further assessment.

1.2 BACKGROUND INFORMATION

Five potential groundwater production wells were identified through a search of historic documents and through previous field investigations at the Site. Three of the wells, W2-2, W2-3, and W2-5, were known production wells and two of the wells, Unknown #1 and Unknown #2, were known to exist but information regarding their construction and historic use was limited. A review of well records show limited well construction information is available for the wells located at the Site. The California Department of Water Resources (DWR) and Riverside Department of Environmental Health (DEH) were contacted to determine if any well records were on file. DWR located the well completion report for well W2-5; DEH was unable to locate any records for the site. A copy of the well completion report for W2-5 can be found in Appendix A. Well construction data based on historical information and field surveys is provided in Table 1-1.

Table 1-1
Well Construction Information

Well I.D.	Well Material Type (diameter – inches)	Total Depth (feet bgs)	Screened Interval (feet bgs)
W2-2	Steel-(10)	Unknown	Unknown
W2-3	Steel-(10)	209	Uncased below 57
W2-5	Steel-(12)	500	70-130, 160-490
Unknown 1	Steel-(12)	Unknown	Unknown
Unknown 2	Steel-(8)	Unknown	Unknown

Notes: bgs – below ground surface

Production well W2-2 was a former ranch well located in a roadway east of Building 250. The well supplied water for agricultural use until the property was purchased by GCR during the 1950s.

Production well W2-3 is located near the middle of the site. It is unknown who installed this well and whether the well was used by LPC.

Production well W2-5, located near the northwest corner of Building 250, was drilled in 1970 by LPC and was used to supply water for Short Range Attack Missile (SRAM) assembly.

Two additional potential production wells were located onsite. Unknown #1, was located approximately 50 yards north of monitoring well TT-MW2-12. Unknown #2, was located approximately 25 yards north of monitoring well TT-MW2-13.

In December of 1990, Radian Corporation conducted a downhole video logging survey of W2-3 and W2-5. The video logs showed deterioration of the well casings. A second downhole video logging survey was conducted during September 2007 by Tetra Tech of wells W2-2, W2-3, W2-5, and the two unknown potential production wells to determine if further deterioration had occurred and to identify any obstructions that might affect abandonment procedures.

The results of the September 2007 video log showed obstructions in W2-2, W2-5 and the two unknown potential production wells which appeared to be largely dirt and rock. No other foreign materials were observed in the video. The video log of W2-3 showed that the well appeared to be uncased approximately 57 below top of casing (BTOC). In the video, several potential fractures can be seen in the rock wall below the cased portion of the well.

2.0 FIELD METHODOLOGY

This section discusses the technical approach and objectives, background information, site preparation activities, downhole video and geophysical testing methods, and well destruction methods. Permits for the destruction of the wells were issued by DEH. Well destruction activities began November 13, 2007 and were completed on December 12, 2007.

2.1 OBJECTIVES AND TECHNICAL APPROACH

The objectives of the well destruction were to minimize the potential of cross-contamination of various water bearing zones and conduct downhole geophysical testing to gather additional information regarding the geology and hydrogeology at the Site.

2.1.1 Site Preparation Activities

The presence of the endangered Stephen's Kangaroo Rat (SKR) in the areas surrounding all well locations required the use of mitigation and monitoring methods approved by the United States Fish and Wildlife Service (USFWS). An approved Section 10A permitted biologist supervised all potential disturbances and observed and directed the measures taken to limit the effects of the disturbance. All well locations could be accessed with a truck mounted drill rig by using avoidance measures and load spreading mats as necessary.

2.1.2 Equipment Decontamination

All downhole equipment including the drill pipe and bits were thoroughly decontaminated by pressure washing with steam prior to use and between each well location. The video and geophysical logging instruments and the soil and groundwater sampling equipment were decontaminated in a solution of soap (non phosphate, i.e. Liquinox™) and potable water, and rinsed twice with potable water between sample intervals.

2.1.3 Video and Geophysical Logging

Video and geophysical logs were collected on wells W2-3, W2-5 and monitoring well TT-MW2-18 to expand and extrapolate geologic interpretation from existing geologic data obtained from logged and sampled borings and wells in the vicinity of these wells. Copies of the video and geophysical logs can be found in Appendix C.

2.1.4 Well Destruction Methods

In planning for the destruction of the wells, DEH was contacted to discuss abandonment methodology and to obtain well destruction permits. DEH personnel stated that the wells could be destroyed by

perforating the well casing and grouting the wells with a “neat” cement mixture of 5% bentonite and 95% cement from the bottom up using a tremie pipe. Prior to grouting, a minimum of four (4) perforations per linear foot were to be made using a Mills knife perforator. The grout was to be pumped at a slow rate to prevent bridging in the lower casing and/or borehole. Using the tremie grouting method, the amount of pumped grout was to be compared against the calculated volume of the casing/borehole diameter to verify the entire well casing/borehole volume had been filled.

Well permits for the destruction of the five wells were obtained in October 2007 for the destruction methods described above. DEH was contacted prior to and during the well destruction field activities and elected to only have an inspector present during grouting activities. Copies of the permits are provided in Appendix B.

Due to difficulties encountered while trying to clean out well W2-2, both DTSC and DEH were contacted and the final destruction procedures were modified and approved by both agencies.

3.0 RESULTS OF FIELD ACTIVITIES

This section presents the results of the investigation activities conducted.

3.1 VIDEO AND GEOPHYSICAL LOGS

Prior to destruction, video and geophysical logs were taken to measure and document physical properties in Wells W2-3 and W2-5. Geophysical logs were taken in TT-MW2-18, which had detailed lithologic logs that could be compared to the geophysical logs from the wells to be decommissioned. These logs included dual induction-gamma ray, spectral gamma ray, acoustic televiewer, impellor and flow vision well flow, caliper, and temperature and fluid conductivity. A description of the suite of geophysical logs run in each well is given in Table 3-1. Copies of the logs can be found in Appendix C.

Table 3-1
Geophysical Logs

Well I.D.	Geophysical Logs in Suite									
	Dual Induction Gamma Ray	Caliper	Resistivity	Spectral Gamma Ray	Temperature	Fluid Conductivity	AcousticTeleViewer	Impellor Well Flow	Flo-Vision Well Flow	Video
W2-2										X
W2-3	X	X	X	X	X	X	X	X	X	X
W2-5			X	X	X	X				X
TT-MW2-18	X			X						
Unknown #1										X
Unknown #2										X

3.1.1 General Observations

The Natural Gamma log is generally used to determine large scale changes in lithology, but by itself can be unreliable as an indicator of smaller scale sedimentary units such as is present in the Site 2 area. The natural gamma log can be useful for picking the contact between the Quaternary alluvium (Qal) and the weathered San Timoteo (STF) and for approximating the weathered / slightly weathered boundary within the STF, although confirmation from other data sources, including geologic logs with blow counts, are

needed. Since these geophysical logs were run in older boreholes/wells where detailed borehole lithologic data do not exist, correlation of the weathered versus more competent STF is difficult.

In general the Spectral Gamma Log demonstrates a reasonable differentiation of coarse and fine-grained sediments; however, it does not demonstrate a clearly discernable difference between lithified and unconsolidated STF at this site.

The induction logging tool [i.e., Dual Induction Log] was utilized in the open-hole portion on well W2-3 and in the PVC cased well TT-MW2-18. This tool responds to the conductivity of the formation pore water and generally finer-grained soils and rock will cause an increase in conductivity.

Only one well in this group of geophysically logged wells [W2-3] had an open borehole allowing the use of the caliper and sonic TeleViewer® logs. The fractures mapped by the TeleViewer® appeared to be partially confirmed by the caliper log but due to little to no movement of water at depth, the temperature logs were not very useful. These fractures and possible flow zones are discussed and summarized below in the detailed analysis for this well.

The Temperature/Conductivity logs were run in wells W2-3 and W2-5. The temperature log in particular indicates locations in the screened or open borehole where fluid movement may be occurring.

Impellor well flow and Flo-vision well flow were run in well W2-3 to quantify potential fluid movement within the well. The utility of these tools is limited to the degree to which water flows into and through the wells.

3.1.2 Well Specific Observations

The following specific observations were interpreted from the suite of logs run in each well. Appendix C contains the geophysical logs ran on each well or suspected well.

TT-MW2-18

Monitoring well TT-MW2-18 was used to correlate the response from the various geophysical logs to see what tools would work the best for the wells to be destroyed within Beaumont Site 2. Only two suites were run in this 4-inch diameter, 100 foot deep, PVC cased well: the Natural Gamma (Gamma Ray)/Dual Induction and the Spectral Gamma.

The contact between alluvium [Qal] and the weathered STF is about 53 feet bgs based on borehole geophysics (Spectral and Natural Gamma Logs). Based on the borehole log prepared during drilling, the contact between the alluvium and the weathered STF was placed at 44.5 feet bgs. The boundary between

the weathered and less weathered STF is at about 66 feet based on the borehole geophysics and is identified at 65 feet bgs in the borehole log generated during drilling.

Based on the formation conductivity measured by the deep induction curve, the ground water level is between 54 and 56 feet. The static water level measured at the time of drilling was 52 feet bgs. The gamma log and the Spectral Gamma Log shows alternating layers of siltstone and sandstone and can be correlated to the borehole log generated during drilling. However, the thickness of the alternating siltstone and sandstone units are so thin that individual units cannot be discerned.

W2-2

Based on well records and onsite observations, W2-2 was constructed of 10-inch diameter well casing but the depth and screened interval were unknown. Initial investigation showed the well was only open to 8 feet bgs, which suggested that the well had an obstruction.

Video Log

The video log shows well construction information as well as the obstruction located at eight (8) feet below top of casing (TOC). The obstruction was identified as dirt and rock.

Below is a summary of the video log:

Depth (feet bgs)	**Observations**
2	top of casing
2 – 6	outer casing
2 – 8	rebar appears to be present in well
6	outer casing appears to slide over inner casing
6 – 8	inner casing
7	non-welded pipe joint
8	Total Depth (TD) - dirt and rocks

W2-3

Based on well records and onsite observations, well W2-3 is constructed of 10-inch steel well casing, is reported to be 209 feet deep, and is an open borehole below 57 feet bgs.

Video Log

The video log was run twice in this well, once on September 5 and then a second time on November 26. The video log from September 5 shows well construction information as well as possible fracture locations. This video log identified the obstruction located at 140 feet as a large rock which was successfully pushed to the bottom of the well during the video logging. The second video log was run on

November 26 approximately three weeks after pushing the rock to the bottom of the well. Once the rock was dislodged, it created enough turbidity within the well that the well/borehole video did not provide useful information. The fact that the turbidity did not clear up suggests that there is very limited water movement through the well. Below is a summary of the video logs:

Depth (feet bgs)	Observations
0	top of corrugated casing
2	top of 8 inch inner casing
3	pipe joint
3 – 57	pipe joint every foot
14	two round holes in side of casing
33	heavy corrosion in side of pipe
48	static water level
57	end of casing
57 – 140	open borehole
82	suspected fracture
110	suspected fracture
121	suspected fracture
128 – 129	suspected fracture
133	cavity in side wall
138	cavity in side wall
140	TD - appears to be a large rock

After the obstruction at 140 feet had been removed a second video log was conducted to view the lower portion of the well. Below is a summary of this portion of the video log:

Depth (feet bgs)	Observations
49 – 194	water cloudy – very limited visibility
194	camera hung up;, restriction in well
200	bottom of well

Spectral Gamma Log

The logging speed was faster at the bottom of the hole [17 ft / min] than at the top [12 feet/min], creating the impression from the natural gamma curve that the bottom portion of the hole is sandier than the upper portion. The spectra curves do not appear to have been affected by the logging speed. From this log, the alluvium/STF contact is about 51 feet bgs and the weathered/unweathered contact is at about 70 feet bgs.

Natural Gamma/Dual Induction/Caliper Log

As discussed above, the Natural Gamma log does not display sufficient lithologic contrast, or at times appears to represent incorrect response to the lithology due to the canceling affects of the K/Th and U concentrations. Typically, the top of the STF can appear as a fairly distinctive feature of the curve.

However, in W2-3, it appears the contact is above the top of the steel casing. The possible weathered/more competent STF contact can be identified at about 68 feet. The caliper log suggests this contact is at 74 feet, where the boring diameter decreases and remains at approximately 9 inches to about 120 feet.

The induction curves suggest three prominent lower conductivity fresh water zones and two moderately conductive water zones correlated to sandstones at:

Depth (feet bgs)	Conductivity	Observations
78 – 82 feet	[760 µS/cm]	sandstone
98 - 102 feet	[980 µS/cm]	silty sandstone
118 – 120 feet	[800 µS/cm]	sandstone
150 – 152 feet	[900 µS/cm]	sandstone
159 – 162 feet	[620 µS/cm]	sandstone

It also suggests two highly conductive formation water zones are possible near the bottom of the boring at:

Depth (feet bgs)	Conductivity	Observations
192 – 194 feet	[2900 µS/cm]	sandstone
198 – 202 feet [1500 µS/cm]	sandstone	

Temperature and Conductivity Log

The thermal gradient increases linearly from the water table to total depth (TD). The thermal gradient is approximately 5° F/100 feet. This is generally within the range of a normal thermal gradient. Little to no variations to the thermal gradient occur along the temperature curve, suggesting that there is very little water movement through the well.

The Conductivity Log shows gradual, approximately linear increase in conductivity. Maximum well water conductivity is ~ 465 microsiemens per centimeter (µS/cm). The near linear increase in conductivity is also an indication that the well does not have significant water movement through it.

Sonic Borehole Televiewer Logs

The Travel Time/Amplitude Log detected some bedding planes in the top of the hole, where some contrast is evident. Contacts are not visible below about 77 feet, probably due to lack of contrast. Some fractures (or possibly bedding planes) are visible and have been identified as such by the Dip Log.

In general, it appears siltstones have a higher travel time and amplitude, likely related to rigidity, than the sandstones. It should be noted that the travel time appears to generally increase at about 78 feet, which

can be interpreted as the possible top of the less weathered, more competent San Timoteo Formation. This possible marker is deeper than that indicated by the spectral gamma log [70 feet]. Table 3-3 summarizes the potential fractures that can be interpreted from the Sonic Borehole Televiewer Logs. Appendix C contains the geophysical logs performed at each well.

W2-5

Based on well records and onsite observations, well W2-5 was constructed of 12-inch steel well casing, was reported to be 500 feet deep, and was screened from 70 to 130 feet bgs, and again from 160 to 490 feet bgs. The water level was at 80 feet. The spectral gamma, temperature/fluid conductivity, and downhole video logs were run in this well.

Video Log

The initial video log shows well construction information as well as identifying the obstruction located at 87 feet as dirt and rocks, which were successfully removed from the well after the initial video survey was completed. During the initial video survey, the borehole was dry to 87 feet bgs.

Below is a summary of the video log:

Depth (ft)	**Observations**
0 –2	outer casing
2	top of inner casing
2	threaded joint
3	opening in side of casing; possible pipe inlet
23	threaded joint, start of corrosion
42	threaded joint
62	threaded joint, heavy corrosion
82	threaded joint
87	TD - dirt and rocks

After drilling through and removing the obstruction at 87 feet, a second video log was conducted to view the lower portion of the well. Below is a summary of that portion of the video log. Although the driller's logs indicated that the well was perforated from 70 to 130 feet bgs, the video log did not confirm this. The initial video log was run in a dry hole and the well casing was heavily incrusted with scale, however, no apparent well screen material was identified in the downhole video that correlated to the driller's log indicating that the well was screened from 70 to 130 feet bgs. During the second video survey, while the water was cloudy from 80 to 135 feet bgs, it was clear enough to see the wall of the well casing, however, there was no indication that the well had been screened from 70 to 130 feet bgs.

Depth (ft.)	Observations
80	static water level
80 – 135	water cloudy – low visibility
135	water clears
164	start of screen – well screen is a louvered-type screen
164 – 465	minor corrosion on screen
465 – 480	corrosion increases, screen partially open
480 – 494	corrosion increases, screen mostly closed
494	end of screen
500	bottom of well (TD)

Spectral Gamma and Natural Gamma Logs

Like the other wells in this project, the spectral gamma ratios established in MW2-18 was used to help interpret lithology.

Like the other Natural Gamma curves, a characteristically shaped curve, with dropping overall counts suggests the top of the STF is at 72 to 73 feet. The spectral curves indicate increasing sands, decreasing silt and clay at this horizon, this is in good agreement with the Natural Gamma log.

Temperature and Conductivity Log

The Temperature curve shows a very gentle decrease in temperature from the water level temperature of 69.5 degrees Fahrenheit (º F) at 80 feet to 67.7º F at 210 feet. The trend reverses and gently increases to 68.6º F at 376 feet where sandstones begin to dominate the lower portion of the screened well. The gradient steepens rapidly at 376 feet to about 396 feet where siltstones are present. The temperature at 376 feet bgs was 68.6º F and increases to about 69.5º F at 396 feet bgs. The temperature gradient remains vertical [0 gradient] through the siltstone section until 410 feet where it resumed a rapid increase (69.5º F at 210 feet bgs to 73.7º F at 496 feet bgs). This gradient remained constant to the well TD.

The range of conductivity of the well fluid of 800 to 970 µS/cm was remarkably narrow for a well 500 feet deep. The conductivity within the non-perforated casing showed layering of water. Conductivity remained steady at 840 µS/cm from about 10 feet below the static water level to about 120 feet bgs. It rapidly increased to 880 µS/cm at 134 feet bgs and remained constant at 880 µS/cm to about 160 feet bgs, which is the top of the perforated casing.

Within the perforated casing, the gradient remained steady to 376 feet bgs [920 µS/cm]. At 376 feet bgs the gradient steepened, roughly equivalent to the depth at which the temperature gradient began to increase. The gradient remained roughly constant to the well TD.

Areas that displayed temperature variations, significant temperature gradient changes, conductivity variations, and conductivity gradient changes may indicate areas where ground water may be flowing into the well. The most significant of these are listed in Table 3.2

Table 3-2
Well W2-5 Temperature and Conductivity Gradient Changes

Depth of Temperature Change	Temperature (°F)	Depth of Conductivity Change	Conductivity (µS/cm)
168 feet	67.8	168 feet	888
180 feet	67.8	180 feet	895
197 feet	67.7	197 feet	903
229 –230 feet	67.8	229 – 230 feet	910
267 feet	68.0	272-286 feet	915
346 feet	68.3		
376 feet	68.6	376 feet	916
436 feet	70.4		
421- 440 feet	62.8-70.6	420 feet	928
450 – 452 feet	71.5		
472 –487 feet	72.7-73.3	471 – 482 feet	963-960
		482 – 486 feet	960-970

Unknown Well #1

Based on onsite observations, Unknown Well #1 had 12-inch diameter steel casing, but the depth and screened interval were unknown. The physical characteristics of Unknown Well #1 did not match any well description reviewed as part of this well destruction program. No records exist for this well and it is unknown as to the status of or purpose of this structure. During well abandonment procedures, soil samples were collected below the bottom of the hole at 45 feet, 50 feet, and 55 feet below ground surface to ensure that native material was being sampled and to provide analytical results to determine if the well/borehole was a source of contamination. The VOC and metals results did not show any elevated concentrations. Perchlorate was present in soil samples at concentrations ranging from 30.5 µg/kg to 293 µg/kg but these samples were collected in the saturated zone which suggests that the soil or the water has perchlorate. The concentration of perchlorate, whether from soil or from groundwater is not indicative of a perchlorate source area; perchlorate concentrations in water from the area around Unknown #1 range from 7,000 to 8,000 µg/l in TT-MW2-1 to 15,000 to 16,000 µg/l in TT-MW2-18. Therefore, Unknown Well #1 was not considered a source for perchlorate and was not considered a dry well

Video Log

The video log showed well construction information and the bottom of the well located at 18 feet bgs. The bottom of the well consisted of dirt and rocks. The bottom of the casing appeared to end at 18 feet bgs based on the borehole video log. It was determined that this was not likely a former water well.

Below is a summary of the video log:

Depth (feet bgs)	Observations
0 – 3	riveted pipe - appears to be slipped over well casing as a riser pipe
5	pipe joint
9	pipe joint - vertical crack in joint
9 – 18	corrosion seen on pipe
18	TD - dirt and rocks

Unknown Well #2

Based on onsite observations, Unknown Well #2 was constructed of 8-inch diameter steel well casing but the depth and screened interval was unknown.

Video Log

The video log shows well construction information as well as identifying the obstruction located at 61 feet bgs as dirt and rocks which were successfully removed from the well after the video log was completed.

Below is a summary of the video log:

Depth (feet bgs)	Observations
0	top of casing
10	pipe joint
20	pipe joint
21	start of corrosion on casing
21 – 61	vertical perforations or seams in casing (unclear what it is)
27	area of heavy corrosion
32 – 35	very heavy corrosion seen on casing
40	pipe joint
44 – 47	very heavy corrosion seen on casing
61	TD - dirt and rocks

3.1.3 Geophysical Log Summary

Table 3-3 summarizes the interpreted lithologies, formation contacts, and other important features of the three wells included in this geophysical logging project.

Table 3-3
Summary of Interpreted Lithologies and Formation Contacts

Well	Log Type	Qal/STF contact depth	Weathered vs More Competent STF Boundary	Significant Fractures	Lower Member of STF	Observations
W 2-3	Natural γ	51	68	----	184	
	Caliper	----	68	----	----	
	Induction	----	68	----	----	
	Spectral γ	51	70	----	184	
	Temperature	----	----	----	----	
	Conductivity	----	----	----	----	
	Sonic Televiewer	----	----78(?)	82.3-83.7, 85.2, 90.5-91, 95.4-95.9, 111, 129.3-130	----	
	Video	----	----	82, 110, 121, 128-129	----	uncased below 57 '
TT-MW2-18	Natural γ	52	67	----	----	
	Induction	----	----	----	----	
	Spectral γ	53 - 54	66	----	----	
W 2-5	Spectral γ	72 -73	90	----	150	
	Temperature	----	----	----	----	
	Conductivity	----	----	----	----	
	Video	----	----	----	----	

Note: QAL Quaternary alluvium
STF San Timoteo Formation
--- Indicates no data recorded

3.2 WELL DESTRUCTION

Three known production wells and two other possible production wells were destroyed by filling the well casing/borehole with a cement-bentonite grout using the tremie pipe grouting method from the bottom of the borehole/well to ground surface in accordance with the approved Work Plan. The tremie pipe and associated piping were attached to a diaphragm pump with the pipe lowered into these wells such that the tremie was near the bottom of the borehole when grout was pumped into the well casing. The temporary conductor casing was used to capture any water or grout that was displaced as the well filled with grout. Displaced liquids were contained in roll-off bins for later sampling and disposal. The casing in wells W2-3, W2-5, and Unknown #2 were perforated using a Mills knife prior to grouting. Wells W2-2 and

Unknown #1 were not perforated prior to grouting because W2-2 had obstructions in the casing, and Unknown #1 was determined not to be a well.

Groundwater samples were collected from each well or borehole where groundwater was present prior to destruction to determine if the groundwater was impacted by perchlorate or VOCs. Soil samples were collected from native material at the bottom of the two unknown well locations to determine if the soil had been impacted by perchlorate or VOCs. Soil samples were collected from Unknown Well #1 at depths of 45 feet, 50 feet, and 55 feet bgs. Soil samples were also collected from Unknown Well #2 at 120 feet bgs. Groundwater samples were collected from well W2-3 at 82.5 feet btoc, 95 feet btoc, 111 feet btoc, 121 feet btoc, and at 129.5 feet btoc. A groundwater sample was also collected from well W2-5 at 161 feet btoc and from Unknown Well #2 at 66 feet btoc.

3.2.1 Well W2-2

On 16 November 2007 well abandonment activities began at this location under DEH permit #33651. Video logs taken in September 2007 showed an obstruction consisting of dirt and rocks at 8-10 feet bgs. In order to remove the obstruction, drilling tools utilized were a 6½-inch tri-cone drilling bit with 4-inch diameter rods. An existing surface casing initially served as a conductor casing to contain the fluids as clean out progressed but due to difficulties during well abandonment activities was later replaced with a 20 foot long temporary conductor casing by digging out the original conductor casing with a backhoe, placing a new conductor casing over the borehole/well casing, and backfilling the excavation with dirt.

Obstructions, including steel debris starting at 10 feet bgs, were encountered while attempting to clean out the well. Initially, drilling tools were advanced to 60 feet bgs where they became bound up in the pump connectors and tooling. A 24-foot section of drill rod broke off down hole during the process of trying to clean out the well casing. After several attempts to remove the drill rod, it was removed from the borehole by excavating the debris with a backhoe. Once the tools were retrieved, a new conductor casing was placed over the well casing and cleanout activities resumed.

A second attempt to clean out the borehole beyond 60 feet bgs was made. This attempt was unsuccessful beyond 40 feet bgs. After conversations with Riverside County DEH and DTSC, drilling/cleanout was terminated at 40 feet bgs.

Due to the existing obstructions and the condition of the well casing, perforation of the casing using a Mills Knife was not completed. Four hundred gallons of grout was tremied down the 40 foot borehole. The calculated amount of grout required to fill the borehole was 163 gallons (based on 40-foot depth).

Therefore approximately 237 gallons of grout was pushed into the formation or surrounding void space or downhole.

Following the completion of grouting activities the 20 foot long temporary conductor casing was removed, a concrete cap was poured over the well casing at 20 feet bgs, and the open excavation was backfilled and compacted to grade with soil. Abandonment activities were completed on 13 December 2007.

3.2.2 Well W2-3

On 12 December 2007 well abandonment activities began at this location under DEH permit #33652. A video log taken in September 2007 showed an obstruction that appeared to be a large rock at 140 feet bgs. Prior to the start of abandonment activities, this obstruction was pushed to the bottom of the well utilizing a hollow stem auger drill rig that was on site for unrelated activities. The video also showed that the well was an open borehole below 57 feet bgs. A second video log was run in November 2007 after the obstruction was pushed to the bottom of the well. The existing surface casing served as a conductor casing during well abandonment activities.

On 26 November 2007 discrete groundwater samples were collected at 82.5 feet, 95 feet, 111 feet, 121 feet, and 129.5 feet btoc for laboratory analysis. At the time of sampling, depth to water was 49 feet btoc, the measured depth of the well prior to abandonment activities was 194.5 feet bgs. Prior to abandonment activities, no other obstructions were encountered in the well.

The existing casing was perforated with a Mills Knife from ground surface to the bottom of the cased hole, a depth of 57 feet bgs. Perforations were completed at a minimum spacing of 4 perforations per linear foot as directed by DEH.

Eight hundred (800) gallons of grout were tremied down the 194.5 foot borehole. The calculated amount of grout required to fill the borehole was 790 gallons (based on 194.5-foot depth); therefore, approximately 10 gallons of grout was pushed into the formation or surrounding void space.

Following the completion of grouting activities the existing surface casing was cut off at five feet bgs, a concrete cap was poured over the well casing, and the open excavation was backfilled and compacted to grade with soil. Abandonment activities were completed on 13 December 2007.

3.2.3 Well W2-5

On 13 November well abandonment activities began at this location under DEH permit #33653. A video log taken in September 2007 showed an obstruction appearing to be dirt and rock at 87 feet bgs. Clean out

activities showed the obstruction to be dirt and rock with a wire mesh material underneath. The well was cleaned out to a depth of 495 feet bgs with a drill rig. Drilling tools utilized to clean out the well included a 6½-inch tri-cone drilling bit with 4-inch diameter rods. The existing surface casing served as a conductor casing during well abandonment activities.

A second video log of the well was performed in November 2007 after cleanout activities were completed. The video showed the screened section of the well was located from 161 feet bgs to 494 bgs and was in good condition. The total reported depth of the well was 500 feet bgs.

On 19 November 2007 a depth discrete groundwater sample was collected at 161 feet btoc for laboratory analysis. At the time of sampling, depth to water was 90 feet btoc.

The casing was perforated with a Mills Knife from ground surface to the top of the well screen located at a depth of 165 feet bgs. Perforations were completed at a minimum rate of 4 perforations per linear foot.

A total of 3,100 hundred gallons of grout was tremied down the 495-foot borehole during two pumping events. The first pumping event filled the casing to above the screened interval. The grout was allowed to settle and partially cure, and three days later, the casing was filled to the surface. The calculated amount of grout required to fill the borehole was 2,894 gallons. Therefore, approximately 206 gallons of grout was pushed into the formation or surrounding void space.

Following the completion of grouting activities the existing surface casing was cut off at five feet bgs, a concrete cap was poured over the well casing, and the open excavation was backfilled and compacted to grade with soil. Abandonment activities were completed on 17 December 2007.

3.2.4 Well Unknown #1

On 14 November well abandonment activities began at this location under DEH permit # 33655. Based on site visits and observations made prior to well destruction activities, it was noted that the well casing consisted of 12-inch diameter steel pipe. The measured depth of the well was 19.19 feet below the top of casing; however, the true depth of the well was unknown.

During well destruction activities, drilling tools were advanced with a drill rig to 40-feet bgs in an attempt to determine the bottom of the well. Drilling tools utilized included a 10½-inch tri-cone drilling bit with 4-inch diameter rods. Beginning at 45-feet bgs soil samples were collected at 5-foot intervals to determine if native soil was present. Soil samples were collected at 45, 50, and 55-feet bgs using a split-spoon sampler. A determination was made by the field geologist that native soil was present from 45 to 55-feet bgs, and it was likely that native material was encountered below the bottom of the open hole at 19 feet below the top of the casing. Drilling was terminated at 55-feet bgs.

Since field observations established that no well existed at this location, no well perforating activities were completed. The borehole may have been associated with a drainage structure since the casing stopped at about 19 feet bgs. Since it was unclear what the structure was used for, the borehole was drilled to a total of 55 feet bgs until it was confirmed that the drilling activities were in native material. A total of 350 gallons of grout was tremied down the 55-foot deep borehole. The calculated amount of grout required to fill the borehole was 270 gallons. Therefore, approximately 80 gallons of grout was pushed into the formation or surrounding void space.

Following removal of the temporary conductor casing and grouting activities, the borehole was cut off 5 feet bgs. The excavation was backfilled and compacted to grade with soil. Abandonment activities were completed on 12 December 2007.

3.2.5 Well Unknown #2

On 29 November well abandonment activities began at this location under DEH permit # 33654. Based on the site visit and observations made prior to well destruction activities, the well was observed to have an 8-inch diameter well casing and was measured at 60.66 feet deep; however, the true depth of the well was unknown. Drilling tools utilized included a 5½-inch drag drilling bit with 4-inch diameter rods. A temporary conductor casing was placed around the well casing to 5-feet bgs and served as a conductor casing to contain potential well water and grout that would be pushed up the casing during well abandonment activities. A video log taken in September 2007 showed dirt and rock present at about 61 feet bgs. It was unclear whether this was an obstruction or the bottom of the well.

Drilling tools were advanced to 120-feet bgs where the driller indicated that they had encountered native material. An examination of the material from 120 feet bgs was made by the field geologist who concurred that they were in native material. On 3 December 2007, prior to abandonment activities, soil and groundwater samples were collected for laboratory analysis. A soil sample was collected at 120-feet bgs using a split-spoon sampler. The water sample was collected using a disposable bailer. The water level at the time of sampling was measured at 65.40 below top of casing.

Perforating of any existing casing was completed from ground surface to a depth of 120-feet bgs. A Mills Knife perforation tool was used per DEH standards. Perforations were completed at a minimum spacing of 4 perforations per linear foot from 120 feet bgs to ground surface to ensure that any potential casing was perforated.

A total of 1,000 gallons of grout was tremied down the 121 foot borehole. The calculated amount of grout required to fill the borehole was 311 gallons. Therefore, approximately 689 gallons of grout was pushed into the formation or surrounding void space.

Following removal of the temporary conductor casing and grouting activities, the steel casing was cut off 5 feet bgs and a concrete cap was poured over the casing. The borehole was then backfilled and compacted to grade with soil. Abandonment activities were completed on 12 December 2007.

3.3 SITE RESTORATION

Monuments and surface completions were removed at all well locations. Site restoration activities included grading the surface to pre-existing conditions. Onsite activities began on 12 November 2007 and well destruction was completed on 17 December 2007.

Table 3-4 summarizes the information known about each well and the associated destruction activities. The table also presents the quantity of grout calculated to fill each well casing or open borehole and the actual quantity pumped into each well.

Table 3-4 Well Destruction Information

Well ID	Date Drilled	Well Construction Information Available	Well Completion Records Available	Well Usage	Date of Well Desruction	Field Measurements		Grout Quantity		Comments
						Measured Depth	Casing Diameter (inches)	Quantity to Fill Well Casing or Open Borehole	Actual Quantity Pumped	
W2-2	Unknown	No information available	No completion records available	Unknown, assumed agricultural	11/16/07 – 12/13/07	Unknown	10	163 gal.	400 gal.	Filled 10-inch diameter casing / borehole from a depth of at least 40 feet bgs to ground surface. Approximately 237 gallons of grout pushed into surrounding void space.
W2-3	Unknown	No information available	No completion records available	Unknown, assumed agricultural	12/12/07 – 12/13/07	209	10	790 gal.	800 gal.	Filled 10-inch diameter casing / borehole from 194.5 feet bgs to ground surface. Approximately 10 gallons of grout pushed into surrounding void space.
W2-5 (first pumping event)	2/12/1970	Yes Drillers Log	Yes	Supplied water to SRAM Assembly Building	11/13/07 – 12/7/07	500	12	2427 gal.	2600 gal	Filled 12-inch diameter casing / borehole from 495 feet bgs to 80’ bgs. Approximately 173 gallons of grout pushed into surrounding void space.
W2-5 (second pumping event)	Unknown	Unknown	Unknown	Unknown	12/10/07 – 12/10/07	Unknown	Unknown	467 gal.	500 gal.	Filled 12-inch diameter casing / borehole from 80’ bgs to surface. Approximately 33 gallons of grout pushed into surrounding void space.
Unknown #1	Unknown	No information available	No completion records available	Unknown	11/14/07 – 12/12/07	Unknown	12	270 gal.	350 gal.	Filled 12-inch diameter casing / borehole from 55 feet bgs to surface. Approximately 80 gallons of grout pushed into surrounding void space.
Unknown #2	Unknown	No information available	No completion records available	Unknown	11/29/07 – 12/12/07	Unknown	8	311 gal.	1000 gal.	Filled 8-inch diameter casing / borehole from 121 feet bgs to surface. Approximately 689 gallons of grout pushed into surrounding void space.

Notes: bgs = below ground surface

4.0 SUMMARY AND CONCLUSIONS

The objectives of the well destruction activities were: (1) minimize the potential for hydraulic communication across various water bearing zones through the open boreholes by properly destroying the five (5) possible former production wells, and (2) conduct downhole geophysical testing to gather additional information regarding the geology and hydrogeology at the Site. As part of this investigation, three (3) former production wells and two (2) unknown wells were investigated and properly destroyed to prevent potential groundwater flow between water bearing zones in accordance with the approved Work Plan. This section presents conclusions derived from the results of the investigation.

4.1 SUMMARY OF WELL DESTRUCTION ACTIVITIES

Three known production wells and two suspected wells were properly destroyed in accordance with the Work Plan. All required permits and documentation were completed and filed with the appropriate agencies. Copies of the permits can be found in Appendix B.

4.2 RESULTS OF SOIL AND GROUNDWATER SAMPLING

The four wells from which groundwater and/or soil samples were collected are within the area of known perchlorate groundwater plumes. Groundwater in Unknown Well #1 is estimated to have been approximately 50 feet bgs, and groundwater in Unknown Well #2 was observed at 66 feet bgs. Analytical results showed that VOCs were non-detect for all COPCs in soil and groundwater samples collected. Perchlorate was present in all soil samples collected ranging from 28.5 µg/kg to 293 µg/kg. Perchlorate was detected in all groundwater samples collected ranging from 6.62 µg/l to 4,630 µg/l. Table 4-1 summarizes the chemicals of potential concern (COPCs) and VOCs for soil and groundwater sample results. Table 4-2 summarizes the metals sample results for soil. Laboratory analytical data packages, which include environmental, field QC, and laboratory QC results are provided in Appendix D.

Based on the analytical data collected during this well abandonment project, it does not appear that any of the former production wells were sources of VOC contamination. While perchlorate was present in all samples collected, concentrations were consistent with nearby groundwater monitoring wells suggesting that each of the abandoned wells were not sources of perchlorate in themselves. In addition, based on geophysical logs the wells do not appear to represent significant vertical conduits for the migration of contaminants. The Temperature and Fluid Conductivity logs of the deeper wells (W2-3 and W2-5) indicate that very little groundwater flow occurs in the wells even at the depths where fractures were observed in the video logs. The installation of additional groundwater monitoring wells during the next phase of investigation will further characterize the vertical distribution of contaminants at Site 2.

Table 4-1
Soil and Groundwater COPC and VOC Sample Results

Well I.D. (sample collection depth)	Sample Date	Laboratory Results (µg/kg)				
		TCE	Acetone	Carbon Disulfide	Methylene Chloride	Perchlorate
Unknown #1 (45' bgs)	Nov-07	ND (< 2.7)	16	ND (< 2.0)	2.8 J	230
Unknown #1 (50' bgs)	Nov-07	ND (< 2.0)	ND (< 4.9)	ND (< 2.0)	2.2 J	30.5
Unknown #1 (55' bgs)	Nov-07	ND (< 1.9)	5.0 J	ND (< 2.0)	2.1 J	293
Unknown #2 (120' bgs)	Nov-07	ND (< 1.8)	ND (< 4.6)	ND (< 1.8)	2.0 J	28.5
Method Detection Limit		1.8	4.6	1.8	1.8	12
Groundwater Sample Results						
Well I.D. (sample collection depth)	Sample Date	Laboratory Results (µg/L)				
		TCE	Acetone	Carbon Disulfide	Methylene Chloride	Perchlorate
W2-3 (140' btoc)	Jan-03	ND (< 5)	NA	NA	NA	4080
W2-3 (82.5' btoc)	Nov-07	ND (< 0.20)	ND (< 5)	<0.2	<0.5	4630
W2-3 (95' btoc)	Nov-07	ND (< 0.20)	ND (< 5)	0.21 Jq	<0.5	4610
W2-3 (111' btoc)	Nov-07	ND (< 0.20)	ND (< 5)	0.28 Jq	<0.5	4520
W2-3 (121' btoc)	Nov-07	ND (< 0.20)	ND (< 5)	0.4 Jq	<0.5	4440
W2-3 (129.5' btoc)	Nov-07	ND (< 0.20)	ND (< 5)	<0.2	<0.5	4550
W2-5 (161' btoc)	Nov-07	ND (< 0.20)	ND (< 5)	<0.2	0.54 Jq	6.62
Unknown #2	Nov-07	ND (< 0.20)	ND (< 5)	0.48 Jq	<0.5	144
Method Detection Limit		0.20	5	0.2	0.50	0.05
MCL (unless noted) / DWNL		5	-	-	5	6

Notes:
Only analytes positively detected in samples are presented in this table.
For a complete list of constituents analyzed, refer to the laboratory data package.
ug/kg – micrograms per kilogram
ug/L – micrograms per liter
bgs- below ground surface
btoc- below top of casing
NA – not analyzed
ND – not detected at or above the laboratory reporting limit
J - The analyte was positively identified, but the concentration is an estimated value.
q - The analyte detection was below the Practical Quantitation Limit (PQL).

Table 4-2
Metals Sample Results for Soil

Well I.D. (sample collection depth)	Sample Date	Laboratory Results (mg/kg)											
		Arsenic	Barium	Beryllium	Chromium	Cobalt	Copper	Lead	Nickel	Selenium	Thallium	Vanadium	Zinc
Unknown #1 (45' bgs)	Nov-07	0.619 J	74.4	0.399 J	16.3	8.31	13.1	3.68	12.8	0.942 J	0.907 J	30.41	33.9
Unknown #1 (50' bgs)	Nov-07	1.07 J	114	0.493 J	21.6	10.4	18.1	4.87	16.4	1.10 J	1.03 J	41.2	45.9
Unknown #1 (55' bgs)	Nov-07	0.866 J	109	0.503 J	22.2	10.9	17.9	5.27	16.9	1.05 J	1.12 J	40.6	45.4
Method Detection Limit		0.482	0.241	0.241	1.2	1.2	0.602	0.241	1.2	0.602	0.602	0.602	0.602

Notes: Only analytes positively detected in samples are presented in this table. For a complete list of constituents analyzed, refer to the laboratory data package.
mg/kg – milograms per kilogram
bgs- below ground surface
NA – not analyzed
J - The analyte was positively identified, but the concentration is an estimated value.

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Shacklette, H. T., and Boerngen, J. G.

1984 Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States, U.S. Survey Professional Paper 127, 1984.

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1975 Geology Field Guide to Southern California, Kendall/Hunt Geology Field Guide Series, Second Edition, 1975.

Tetra Tech, Incorporated (Tetra Tech)

2003 Groundwater Sampling Results, Former Production Well W2-3, Beaumont Site 2, February 5, 2003.

2004a Final Lockheed Martin Beaumont Site 2 Groundwater Monitoring Well Installation Work Plan Beaumont, California, January 23, 2004.

2004b Final Lockheed Martin Beaumont Site 2 Groundwater Monitoring Well Installation Report Beaumont, California, November 15, 2004.

2005 Lockheed Martin Third Quarter 2005 Groundwater Monitoring Report Beaumont Site 2, Beaumont, California, December 2005.

2006a Groundwater Monitoring Well Installation Work Plan, April 2006.

2006b Installation and Sampling of Down gradient Groundwater Monitoring Wells (TT-MW2-5 and TT-MW2-6S/D) Letter Report and Revised Supplemental Down gradient Well Installation Letter Work Plan, April 2006.

2007a Semiannual Groundwater Monitoring Report Second Quarter and Third Quarter 2006, Beaumont Site 2, Beaumont, California, February 2007.

2007b Groundwater Sampling and Analysis Plan, Lockheed Martin Corporation, Beaumont Site 2, Beaumont, California, May 29, 2007.

2007c Site Investigation Report for Soil Investigations at the Earthen Prism Shaped Structure and Possible Liquid Waste Discharge Ponds at Lockheed Martin Beaumont Site 2, October 2007

2007d Work Plan for Abandonment of Former Production Wells at Lockheed Martin Beaumont Site 2, October 2007

United States Fish and Wildlife Service (USFWS)

2005 Endangered Species Act Incidental Take Permit for Potrero Creek and Laborde Canyon Properties Habitat Conservation Plan, October 14, 2005.

6.0 ACRONYMS AND ABBREVIATIONS

ARCH	air rotary casing hammer
bgs	below ground surface
btoc	below top of casing
BOS	bottom of screen
CDHS	California Department of Health Services
COPCs	chemical(s) of potential concern
CSM	Conceptual Site Model
DTSC	Department of Toxic Substances Control
DWNL	drinking water notification level
EC	electrical conductivity
EPA	United States Environmental Protection Agency
ft/ft	feet per foot
ft/day	feet per day
GCR	Grand Central Rocket Company
GMP	Groundwater Monitoring Program
HCP	Habitat Conservation Plan
HSA	hollow stem auger
HSUs	hydrostratigraphic units
K	hydraulic conductivity.
LAC	Lockheed Aircraft Corporation
LEBs	Lockheed equipment blanks
LMC	Lockheed Martin Corporation
LPC	Lockheed Propulsion Company
LR	Linear Regression
MDLs	method detection limits
LTBs	Lockheed trip blanks
M	monitoring well
MCLs	maximum contaminant levels
mg/L	milligrams per liter

APPENDIX A W2-5 WELL COMPLETION REPORT

ORIGINAL
File with DWR

WATER WELL DRILLERS REPORT

(Sections 7079, 7080, 7081, 7082, Water Code)

THE RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES

Do Not Fill In

No 33564

State Well No. 3S/1W/18E1S

Other Well No.

FEB 20 1970

(1) OWNER:

Name LOCKHEED PROPULSION COMPANY

Address c/o Norman Engineering Company

5899 Venice Blvd., Los Angeles, Calif.

(2) LOCATION OF WELL:

County Riverside Owner's number, if any # 1

Township, Range, and Section SW¼ of NW¼ of Sec. 18,

Distance from cities, roads, railroads, etc. Twp. 3-S., Rge. 1-W.,

Riverside County, California.

(3) TYPE OF WORK *(check):*

New Well ☒ Deepening ☐ Reconditioning ☐ Destroying ☐

If destruction, describe material and procedure in Item 11.

(4) PROPOSED USE *(check):*

Domestic ☐ Industrial ☒ Municipal ☐

Irrigation ☐ Test Well ☐ Other ☐

(5) EQUIPMENT:

Rotary ☐

Cable ☒

Other ☐

(6) CASING INSTALLED:

STEEL: OTHER:

SINGLE ☐ DOUBLE ☐

From ft.	To ft.	Diam.	Gage or Wall	If gravel packed: Diameter of Bore	From ft.	To ft.
0	163	14"	#10	Double Wall Casing		
163	500	6-5/8"	#8	Single Casing		

Size of shoe or well ring: 14x8x3/4" Size of gravel:

Describe joint Adapter from 14" to 6-5/8"/

(7) PERFORATIONS OR SCREEN:

Type of perforation or name of screen

From ft.	To ft.	Perf. per row	Rows per ft.	Size in. x in.
70	130	7	4	5/32"x2½"
				in 14" and
160	490	6	1	"ful-flo" 1/8" x 2"

To the circle with Hydraulic Louver (perforator).

Pre-perforated

(8) CONSTRUCTION:

Was a surface sanitary seal provided? Yes ☐ No ☒ To what depth ft.

Were any strata sealed against pollution? Yes ☐ No ☒ If yes, note depth of strata

From ft. to ft.

From ft. to ft.

Method of sealing

(9) WATER LEVELS:

Depth at which water was first found, if known 85 ft.

Standing level before perforating, if known 85 ft.

Standing level after perforating and developing 75 ft.

(10) WELL TESTS:

Was pump test made? Yes ☒ No ☐ If yes, by whom? Contractor

18 gal./min. with 173 ft. drawdown after 3½ hrs.

Temperature of water Was a chemical analysis made? Yes ☐ No ☒

Was electric log made of well? Yes ☐ No ☒ If yes, attach copy

(11) WELL LOG:

Total depth 500 ft. Depth of completed well 500 ft.

Formation: *Describe by color, character, size of material, and structure*

ft. to	ft.	
0	85	Sandy brown clay
85	102	Sandy brown clay and granite gravel
102	142	Sandy brown clay
142	160	Brown clay
160	216	Sandy brown clay
216	241	Medium hard brown clay, some fine gravel
241	250	Sandy brown clay
250	270	Medium hard blue clay, some small gravel
270	282	Hard brown clay
282	326	Blue clay
326	345	Medium hard blue clay, some sand
345	349	Blue clay
349	378	Tight sand and blue clay
378	395	Blue Clay
395	420	Sandy blue clay
420	450	Brown clay
450	470	Medium hard brown clay
470	490	Blue clay
490	500	Medium hard blue clay, some small gravel

Work started 19 , Completed 19

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME ROSCOE MOSS COMPANY
(Person, firm, or corporation) (*Typed or printed*)

Address 4360 Worth St.
Los Angeles, Calif. 90037

[SIGNED] (Well Driller)

License No. 624-(C57) Dated Feb. 19, 1970

CONFIDENTIAL - NOT FOR PUBLIC RELEASE

SKETCH LOCATION OF WELL ON REVERSE SIDE

DWR 188 (REV. 9-65)

56391-950 10-65 50M TRIP ⓘ △ OSP

APPENDIX B WELL DESTRUCTION PERMITS

COUNTY OF RIVERSIDE COMMUNITY HEALTH AGENCY
DEPARTMENT OF ENVIRONMENTAL HEALTH

33651

WELL DRILLING PERMIT

Date October 16, 2007

ALL ELECTRICAL, PLUMBING, MECHANICAL, AND STRUCTURAL REPAIRS AND INSTALLATIONS SHALL BE DONE UNDER PERMIT FROM RIVERSIDE COUNTY DEPT. OF BUILDING AND SAFETY.

Expiration Date 4-12-08

Fee $154.02
(non-refundable)

This permit is granted on condition that the person named in the permit will comply with the laws, ordinances and regulations that are now or may hereafter be in force.

LOCATION OF PROPOSED WELL ____ ¼ ____ ¼; Sec. 18 ; T 3S ; R 1W

PHYSICAL ADDRESS OF WELL Off Laborde-Beaumont Site 2 Community Beaumont

APN: 421-080-001 Well W2-2

NAME Lockheed Martin Corp.

MAILING ADDRESS 2550 N. Hollywood Way, 3rd Flr.

CITY & STATE Burbank, CA 91505

DRILLER WDC Exploration & Wells
5566 Arrow Highway
Montclair, CA 91763

By Charlene Robbins
Charlene Robbins

ABANDONMENT

Distribution: WHITE—Environmental Health Department; YELLOW—Owner; PINK—Well Driller; GOLDENROD—Flood Control

COUNTY OF RIVERSIDE COMMUNITY HEALTH AGENCY
DEPARTMENT OF ENVIRONMENTAL HEALTH
WELL PERMIT APPLICATION
(For Construction, Reconstruction & Destruction)

☒ 4080 Lemon Street, 2nd Floor / P.O. Box 1206 - Riverside, CA 92502 - (951) 955-8980
☐ 82675 Hwy. 111, CAC - Indio, CA 92201 - (760) 863-7000
☐ 39493 Los Alamos - Murrieta, CA 92563 - (951) 600-6180

Engr's Ck # 5015
EHW070785

well: W2-2

PLEASE REPLY TO ADDRESS CHECKED ABOVE

NOTE: Any abandoned wells on the property must be properly destroyed before an application for construction or reconstruction can be processed.

FOR DEPARTMENT USE ONLY
Permit No. 33651
Expiration 10 4-12-08

Please Print

1. OWNER: Name Lockheed Martin Corp
Mailing Address 2550 N. Hollywood way, 3rd floor
City Burbank State Ca.
Zip 91505 Phone No. (818) 847-0899

2. DATE OF WORK (approximate):
Start 10-22-07 Complete 12-30-07

3. WELL DRILLER
Name Water Development Corp.
Riv. Co. Registration No. 04-051
C-57 License No. C-57 283 326

4. WELL CHECK (check)
☐ Community ☐ Monitoring ☐ Industrial
☐ Individual ☐ Cathodic ☐ Other
☐ Agricultural ☐ Horizontal

4A. FOR MONITORING WELL: (Name of Consultant)
Name TetraTech Inc. Phone (909) 381-1674

5. TYPE OF WORK (check)
☐ New ☐ Reconstruction ☒ Destruction

5A. If reconstruction or destruction, please describe method on reverse side of attached Plot Plan.

6. ANNUAL SEAL:
Depth _____ ft.
Borehole Diam. _____ in.
Conductor Diam. _____ in.
Annular Thickness _____ in.
Sealing Material _____

7. DEPTH OF WELL (feet) unknown
Proposed _____ Existing _____
DIAMETER OF BORE (in.) ~ 10" - 12"

8. PRODUCTION WELL CASING INSTALLED:
☒ Steel ☐ Plastic ☐ Other

From (ft.)	To (ft.)	Dia. (in.)	Wall (Gage)
0	unknown	10	

GRAVEL PACK: ☐ Yes ☐ No
From _____ to _____ ft.
Type of rig _____

9. PERFORATIONS (if applicable):
From _____ to _____ ft.

10. SEALED ZONES (if applicable):
From _____ to _____ ft.

11A. The California Labor code requires Worker's Compensation Insurance as a prerequisite to permit issuance unless the applicant signs the following certificate: **I certify that in the performance of the work for which this permit is issued, I shall not employ any person in any manner so as to become subject to the Workers Compensation Insurance laws of California.**

Driller's Signature _____ Date _____

11B. I have read this application and agree to comply with all laws regulating the type of work being performed.

Driller's Signature Jeffrey P. O'Connor Date 10/11/07

12. I declare under penalty of perjury under the laws of the State of California that the information furnished as part of this application is true and correct. I also understand that I am legally obligated to obey all requirements of state law and Riverside County Ordinances in connection with the approval of this application.

Property Owner's Signature for Lockheed Martin Attorney-in-Fact Date 10-11-07

10/12/07 MM

DISPOSITION OF PERMIT

Approved subject to the following: FOR DEPARTMENT USE ONLY

A. Notify the Department, , forty-eight (48) hours in advance to make an inspection of the following operations:
☐ Prior to sealing of the annular space or filling of the conductor casing.
☐ Verify the depth of the conductor (outer) casing prior to further drilling and installation of the inner casing.
☐ After installation of the surface protective slab and pumping equipment.
☒ During destruction of wells, prior to pouring the sealing material.

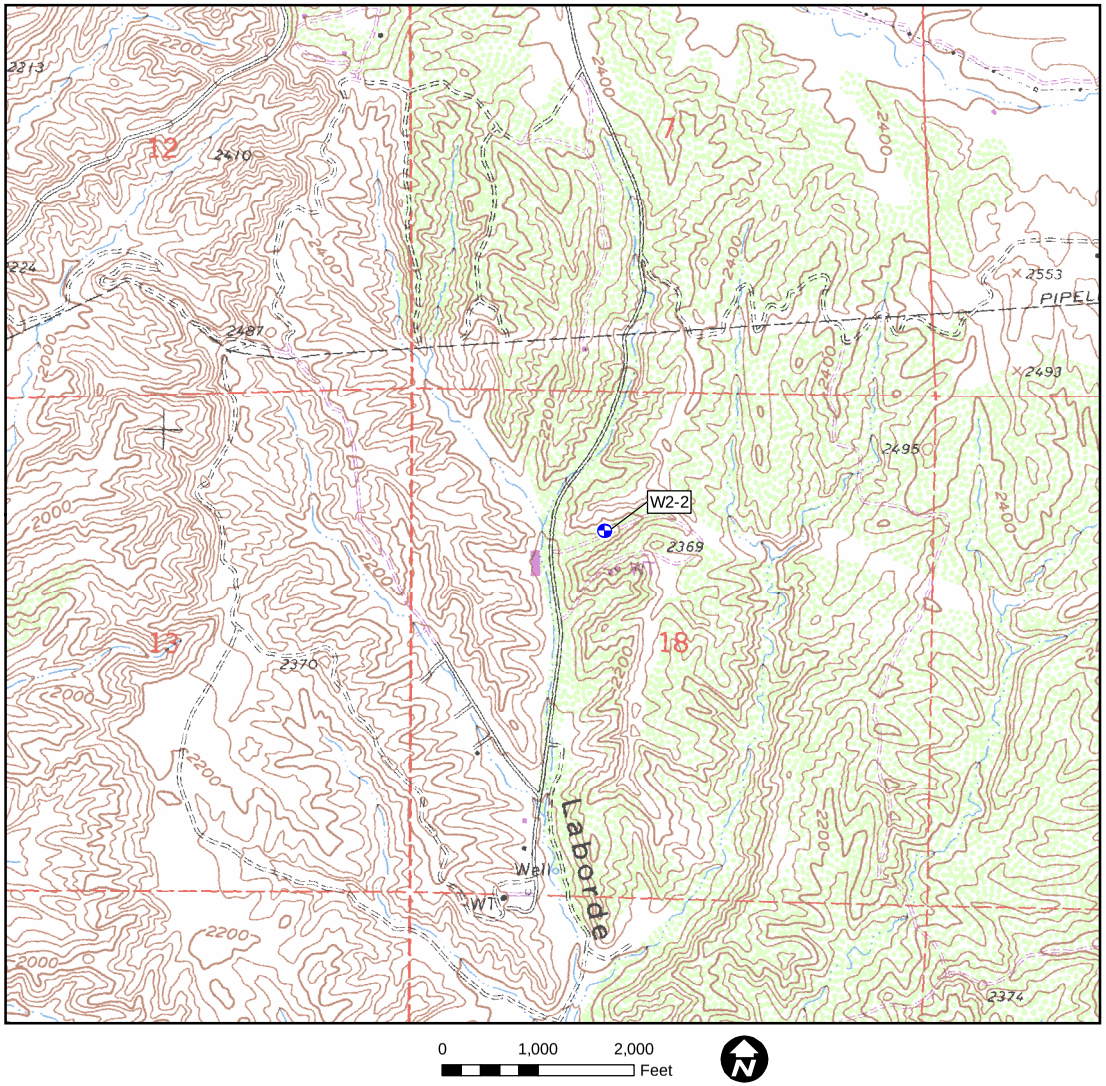
B. Approved Plot Plan.

C. Submit to the Department within thirty (60) days after completion of work, a copy of:
☒ Water Well Driller's Report (DWR 188).

NOTE: Property located within the Rancho California Water District may be subject to an existing Agency Agreement with said District.

D. Other: _____

X:\GIS\LOCKHEED 20245 WELL INVEST\WELL PERMIT W2-2.MXD



T3S, R1W SE 1/4 of the NW 1/4, Section 18, SBB&M

W2-2

COUNTY OF RIVERSIDE COMMUNITY HEALTH AGENCY
DEPARTMENT OF ENVIRONMENTAL HEALTH

33652

WELL DRILLING PERMIT

Date October 16, 2007

ALL ELECTRICAL, PLUMBING, MECHANICAL, AND STRUCTURAL REPAIRS AND INSTALLATIONS SHALL BE DONE UNDER PERMIT FROM RIVERSIDE COUNTY DEPT. OF BUILDING AND SAFETY.

Expiration Date 4-12-08

Fee $154.02
(non-refundable)

This permit is granted on condition that the person named in the permit will comply with the laws, ordinances and regulations that are now or may hereafter be in force.

LOCATION OF PROPOSED WELL ____ ¼ ____ ¼; Sec. 18 ; T 3S ; R 1W

PHYSICAL ADDRESS OF WELL Off Laborde-Beaumont Site 2 Community Beaumont
Well W2-3

APN: 421-080-001

NAME Lockheed Martin Corp.

DRILLER WDC Exploration & Wells
5566 Arrow Highway
Montclair, CA 91763

MAILING ADDRESS 2550 N. Hollywood Way, 3rd Flr.

CITY & STATE Burbank, CA 91505

By Charlene Robbins
Charlene Robbins

DEH-SAN-895 (Rev. 10/08)

Distribution: WHITE—Environmental Health Department; YELLOW—Owner; PINK—Well Driller; GOLDENROD—Flood Control

ABANDONMENT

COUNTY OF RIVERSIDE COMMUNITY HEALTH AGENCY
DEPARTMENT OF ENVIRONMENTAL HEALTH
WELL PERMIT APPLICATION
(For Construction, Reconstruction & Destruction)

☒ 4080 Lemon Street, 2nd Floor / P.O. Box 1206 - Riverside, CA 92502 - (951) 955-8980
☐ 82675 Hwy. 111, CAC - Indio, CA 92201 - (760) 863-7000
☐ 39493 Los Alamos - Murrieta, CA 92563 - (951) 600-6180

Well: W2-3

PLEASE REPLY TO ADDRESS CHECKED ABOVE

Env's CK# 5015
E4W070785

NOTE: Any abandoned wells on the property must be properly destroyed before an application for construction or reconstruction can be processed.

Please Print

FOR DEPARTMENT USE ONLY

Permit No. 33652

Expiration 4-12-08

1. OWNER: Name Lockheed Martin Corp.
   Mailing Address 2550 N. Hollywood Way, 3rd floor
   City Burbank State Ca.
   Zip 91505 Phone No. (818) 847-0899

2. DATE OF WORK (approximate):
   Start 10-22-07 Complete 12-30-07

3. WELL DRILLER
   Name Water Development Corp
   Riv. Co. Registration No. 04-051
   C-57 License No. C-57 283 326

4. WELL CHECK (check)
   ☐ Community ☐ Monitoring ☐ Industrial
   ☐ Individual ☐ Cathodic ☐ Other
   ☐ Agricultural ☐ Horizontal

4A. FOR MONITORING WELL: (Name of Consultant)
   Name TetraTech Inc Phone (909) 381-1674

5. TYPE OF WORK (check)
   ☐ New ☐ Reconstruction ☒ Destruction

5A. If reconstruction or destruction, please describe method on reverse side of attached Plot Plan.

6. ANNUAL SEAL:
   Depth ______ ft.
   Borehole Diam. ______ in.
   Conductor Diam. ______ in.
   Annular Thickness ______ in.
   Sealing Material ______

7. DEPTH OF WELL (feet)
   Proposed ______ Existing 209
   DIAMETER OF BORE (in.) ~10" - 12"

8. PRODUCTION WELL CASING INSTALLED:
   ☒ Steel ☐ Plastic ☐ Other uncased below 57 feet

From (ft.)	To (ft.)	Dia. (in.)	Wall (Gage)
0	57	10	

GRAVEL PACK: ☐ Yes ☐ No unknown

From ______ to ______ ft.

Type of rig ______

9. PERFORATIONS (if applicable):
   From ______ to ______ ft.

10. SEALED ZONES (if applicable):
   From ______ to ______ ft.

11A. The California Labor code requires Worker's Compensation Insurance as a prerequisite to permit issuance unless the applicant signs the following certificate: **I certify that in the performance of the work for which this permit is issued, I shall not employ any person in any manner so as to become subject to the Workers Compensation Insurance laws of California.**

Driller's Signature ______ Date ______

11B. I have read this application and agree to comply with all laws regulating the type of work being performed.

Driller's Signature Jeffrey P. O'Connor Date 10/11/07

12. I declare under penalty of perjury under the laws of the State of California that the information furnished as part of this application is true and correct. I also understand that I am legally obligated to obey all requirements of state law and Riverside County Ordinances in connection with the approval of this application.

For Lockheed Martin

Property Owner's Signature [signature] Date 10-11-07

10/12/07

DISPOSITION OF PERMIT

Approved subject to the following: **FOR DEPARTMENT USE ONLY**

A. Notify the Department, , forty-eight (48) hours in advance to make an inspection of the following operations:
   ☐ Prior to sealing of the annular space or filling of the conductor casing.
   ☐ Verify the depth of the conductor (outer) casing prior to further drilling and installation of the inner casing.
   ☐ After installation of the surface protective slab and pumping equipment.
   ☒ During destruction of wells, prior to pouring the sealing material.

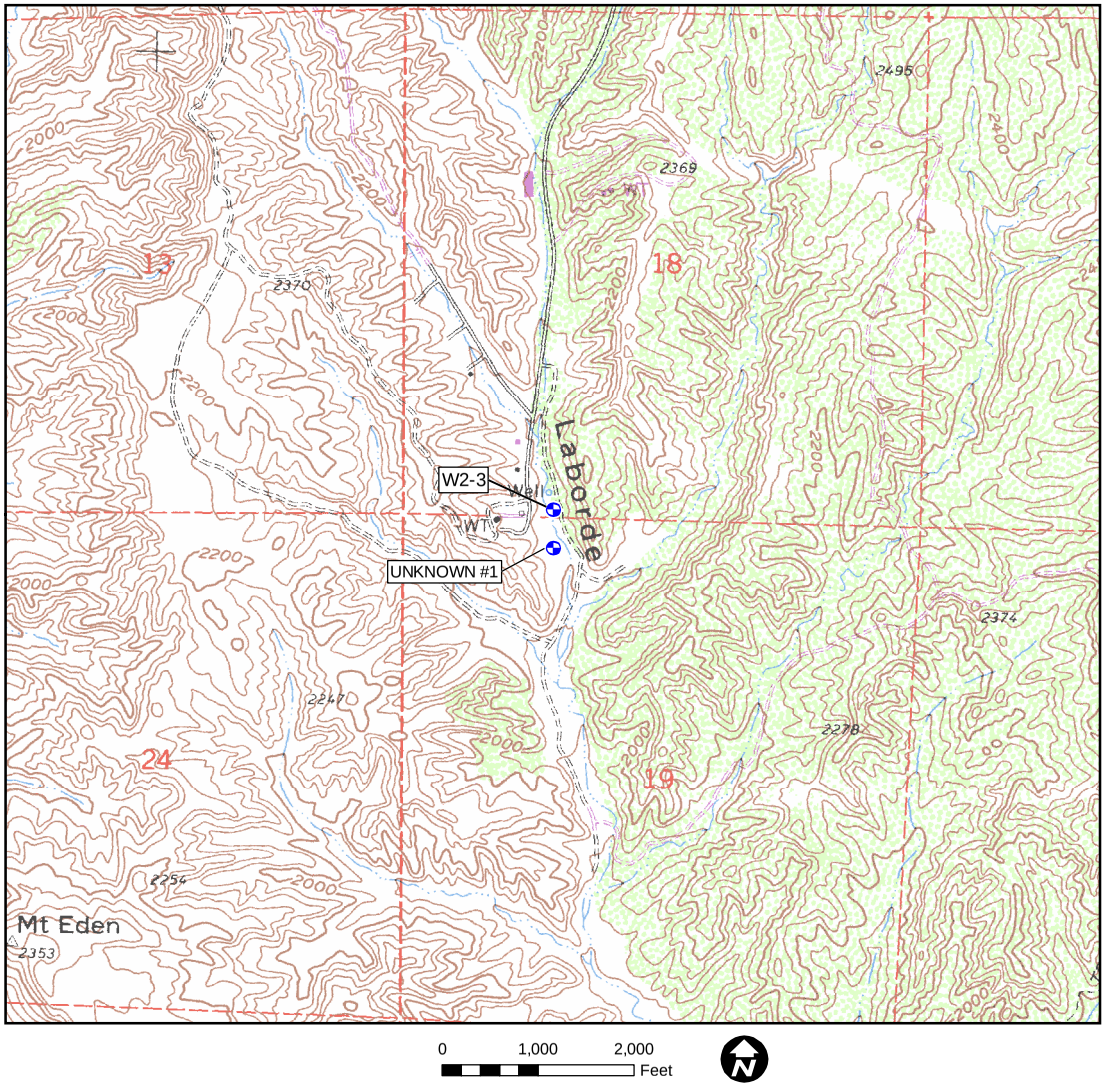
B. Approved Plot Plan.

C. Submit to the Department within thirty (60) days after completion of work, a copy of:
   ☒ Water Well Driller's Report (DWR 188).

NOTE: Property located within the Rancho California Water District may be subject to an existing Agency Agreement with said District.

D. Other: ______

X:\GIS\LOCKHEED 20245 WELL INVEST\WELL PERMIT W2-3.MXD



T3S, R1W SE 1/4 of the SW 1/4, Section 18, SBB&M

W2-3

COUNTY OF RIVERSIDE COMMUNITY HEALTH AGENCY
DEPARTMENT OF ENVIRONMENTAL HEALTH

33653

WELL DRILLING PERMIT

Date October 16, 2007

Expiration Date 4-12-08

Fee $154.02
(non-refundable)

ALL ELECTRICAL, PLUMBING, MECHANICAL, AND STRUCTURAL REPAIRS AND INSTALLATIONS SHALL BE DONE UNDER PERMIT FROM RIVERSIDE COUNTY DEPT. OF BUILDING AND SAFETY.

This permit is granted on condition that the person named in the permit will comply with the laws, ordinances and regulations that are now or may hereafter be in force.

LOCATION OF PROPOSED WELL ______ ¼ ______ ¼; Sec. 18 ; T 3S ; R 1W

PHYSICAL ADDRESS OF WELL Off Laborde-Beaumont Site 2 Well W2-5 Community Beaumont

APN: 421-080-001

NAME Lockheed Martin Corp.

MAILING ADDRESS 2550 N. Hollywood Way, 3rd Flr.

CITY & STATE Burbank, CA 91505

DRILLER WDC Exploration & Wells
5566 Arrow Highway
Montclair, CA 91763

By Charlene Robbins
Charlene Robbins

DEH-SAN-026 (Rev. 01/03)

ABANDONMENT

Distribution: WHITE—Environmental Health Department; YELLOW—Owner; PINK—Well Driller; GOLDENROD—Flood Control

COUNTY OF RIVERSIDE COMMUNITY HEALTH AGENCY
DEPARTMENT OF ENVIRONMENTAL HEALTH
WELL PERMIT APPLICATION
(For Construction, Reconstruction & Destruction)

☒ 4080 Lemon Street, 2nd Floor / P.O. Box 1206 - Riverside, CA 92502 - (951) 955-8980
☐ 82675 Hwy. 111, CAC - Indio, CA 92201 - (760) 863-7000
☐ 39493 Los Alamos - Murrieta, CA 92563 - (951) 600-6180

PLEASE REPLY TO ADDRESS CHECKED ABOVE

Well: W2-5

EHSCK # 5015
EHW070785

NOTE: Any abandoned wells on the property must be properly destroyed before an application for construction or reconstruction can be processed.

Please Print

FOR DEPARTMENT USE ONLY

Permit No. 33653

Expiration 4-12-07

1. OWNER: Name Lockheed Martin Corp
   Mailing Address 2550 N. Hollywood Way 3rd Floor
   City Burbank State Ca
   Zip 91505 Phone No (818)-847-0899

2. DATE OF WORK (approximate):
   Start 10-22-07 Complete 12-30-07

3. WELL DRILLER
   Name Water Development Corp
   Riv. Co. Registration No. 04-057
   C-57 License No. C-57 283 326

4. WELL CHECK (check)
   ☐ Community ☐ Monitoring ☐ Industrial
   ☐ Individual ☐ Cathodic ☐ Other
   ☐ Agricultural ☐ Horizontal

4A. FOR MONITORING WELL: (Name of Consultant)
   Name TetraTech INC. Phone 909 381-1674

5. TYPE OF WORK (check)
   ☐ New ☐ Reconstruction ☒ Destruction

5A. If reconstruction or destruction, please describe method on reverse side of attached Plot Plan.

6. ANNUAL SEAL:
   Depth ______ ft.
   Borehole Diam. ______ in.
   Conductor Diam. ______ in.
   Annular Thickness ______ in.
   Sealing Material ______

7. DEPTH OF WELL (feet)
   Proposed ______ Existing 481
   DIAMETER OF BORE (in.) ~ 8"-10"

8. PRODUCTION WELL CASING INSTALLED:
   ☒ Steel ☐ Plastic ☐ Other

From (ft.)	To (ft.)	Dia. (in.)	Wall (Gage)
0	481	8	

   GRAVEL PACK: ☐ Yes ☐ No
   From ______ to ______ ft.
   Type of rig ______

9. PERFORATIONS (if applicable):
   From 161 to 467 ft.

10. SEALED ZONES (if applicable):
   From ______ to ______ ft.

11A. The California Labor code requires Worker's Compensation Insurance as a prerequisite to permit issuance unless the applicant signs the following certificate: **I certify that in the performance of the work for which this permit is issued, I shall not employ any person in any manner so as to become subject to the Workers Compensation Insurance laws of California.**

Driller's Signature ______ Date ______

11B. I have read this application and agree to comply with all laws regulating the type of work being performed.

Driller's Signature Jeffrey P. O'Connor Date 10/11/07

12. I declare under penalty of perjury under the laws of the State of California that the information furnished as part of this application is true and correct. I also understand that I am legally obligated to obey all requirements of state law and Riverside County Ordinances in connection with the approval of this application.

Property Owner's Signature For Lockheed Martin [signature] Date 10-11-07

DISPOSITION OF PERMIT

10/12/07 [initials]

Approved subject to the following:

FOR DEPARTMENT USE ONLY

A. Notify the Department, , forty-eight (48) hours in advance to make an inspection of the following operations:
   ☐ Prior to sealing of the annular space or filling of the conductor casing.
   ☐ Verify the depth of the conductor (outer) casing prior to further drilling and installation of the inner casing.
   ☐ After installation of the surface protective slab and pumping equipment.
   ☒ During destruction of wells, prior to pouring the sealing material.

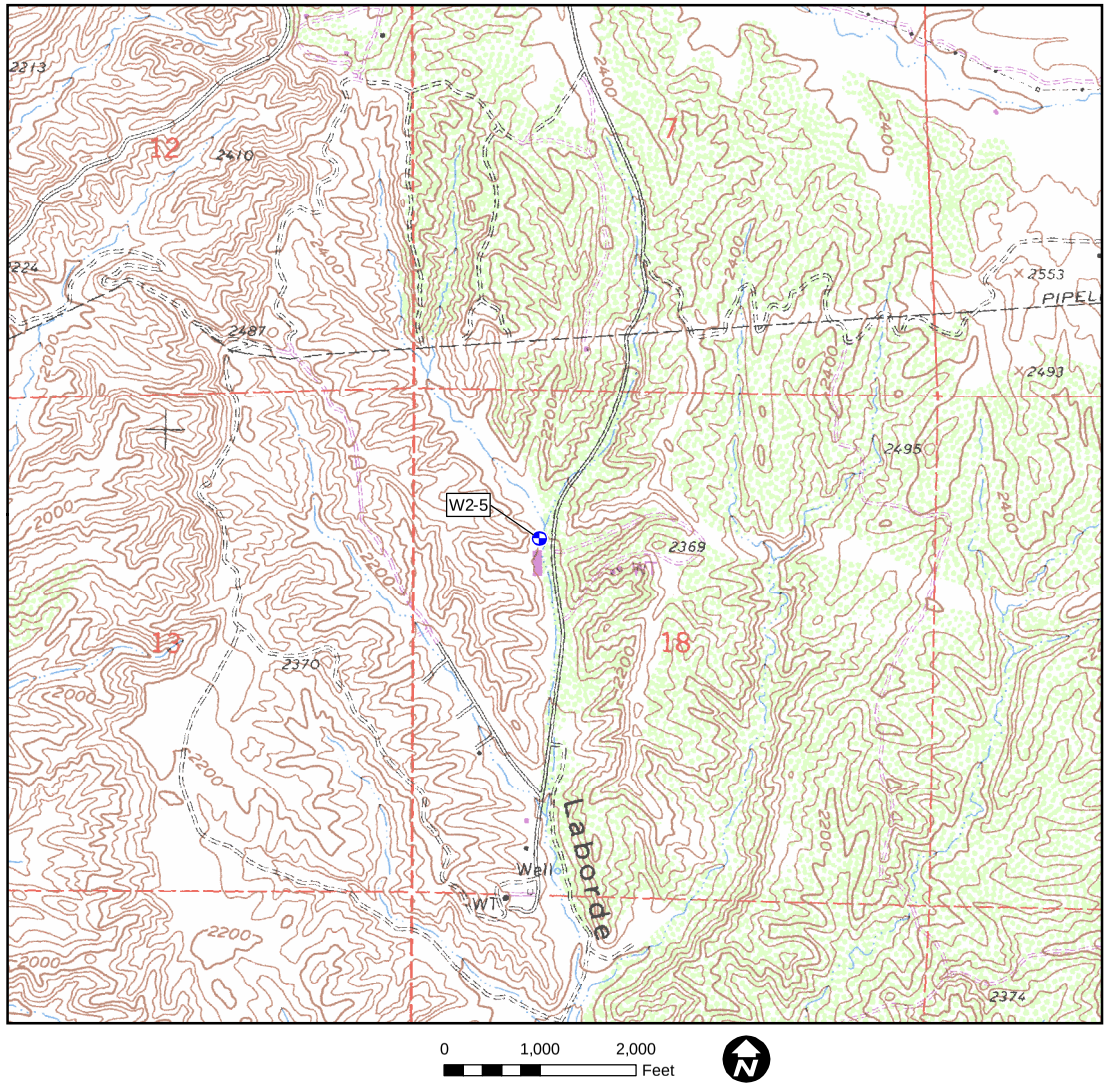
B. ✓ Approved Plot Plan.

C. Submit to the Department within thirty (60) days after completion of work, a copy of:
   ☒ Water Well Driller's Report (DWR 188).

NOTE: Property located within the Rancho California Water District may be subject to an existing Agency Agreement with said District.

D. Other: ______

X:\GIS\LOCKHEED 20245 WELL INVEST\WELL PERMIT W2-5.MXD



T3S, R1W SW 1/4 of the NW 1/4, Section 18, SBB&M

W2-5

COUNTY OF RIVERSIDE COMMUNITY HEALTH AGENCY
DEPARTMENT OF ENVIRONMENTAL HEALTH

33655

WELL DRILLING PERMIT

ALL ELECTRICAL, PLUMBING, MECHANICAL, AND STRUCTURAL REPAIRS AND INSTALLATIONS SHALL BE DONE UNDER PERMIT FROM RIVERSIDE COUNTY DEPT. OF BUILDING AND SAFETY.

Date October 16, 2007

Expiration Date 4-12-08

Fee $154.02 (non-refundable)

This permit is granted on condition that the person named in the permit will comply with the laws, ordinances and regulations that are now or may hereafter be in force.

LOCATION OF PROPOSED WELL ______ ¼ ______ ¼; Sec. 18 ; T 3S ; R 1W

PHYSICAL ADDRESS OF WELL Off Laborde-Beaumont Site 2 Community Beaumont

APN: 421-080-001 Well Unknown #1

NAME Lockheed Martin Corp.

MAILING ADDRESS 2550 N. Hollywood Way, 3rd Flr.

CITY & STATE Burbank, CA 91505

DRILLER WDC Exploration & Wells
5566 Arrow Highway
Montclair, CA 91763

By Charlene Robbins
Charlene Robbins

DEH-BAN-035 (Rev. 10/01)

Distribution: WHITE—Environmental Health Department; YELLOW—Owner; PINK—Well Driller; GOLDENROD—Flood Control

ABANDONMENT

COUNTY OF RIVERSIDE COMMUNITY HEALTH AGENCY
DEPARTMENT OF ENVIRONMENTAL HEALTH
WELL PERMIT APPLICATION
(For Construction, Reconstruction & Destruction)

☒ 4080 Lemon Street, 2nd Floor / P.O. Box 1206 - Riverside, CA 92502 - (951) 955-8980
☐ 82675 Hwy. 111, CAC - Indio, CA 92201 - (760) 863-7000
☐ 39493 Los Alamos - Murrieta, CA 92563 - (951) 600-6180

Eng's CK# 5015
EHW070785

PLEASE REPLY TO ADDRESS CHECKED ABOVE

Well: Unknown #1

NOTE: Any abandoned wells on the property must be properly destroyed before an application for construction or reconstruction can be processed.

FOR DEPARTMENT USE ONLY
Permit No. 33655
Expiration 4-12-08

Please Print

1. OWNER: Name Lockheed Martin Corp
Mailing Address 2550 N. Hollywood Way, 3rd Floor
City Burbank State Ca.
Zip 91505 Phone No (818) 847-0899

2. DATE OF WORK (approximate):
Start 10-22-07 Complete 12-30-07

3. WELL DRILLER
Name Water Development Corp.
Riv. Co. Registration No. 04-051
C-57 License No. C57-283 326

4. WELL CHECK (check)
☐ Community ☐ Monitoring ☐ Industrial
☐ Individual ☐ Cathodic ☐ Other
☐ Agricultural ☐ Horizontal

4A. FOR MONITORING WELL: (Name of Consultant)
Name Tetra Tech Inc Phone (909) 381-1674

5. TYPE OF WORK (check)
☐ New ☐ Reconstruction ☒ Destruction

5A. If reconstruction or destruction, please describe method on reverse side of attached Plot Plan.

6. ANNUAL SEAL:
Depth ______ ft.
Borehole Diam. ______ in.
Conductor Diam. ______ in.
Annular Thickness ______ in.
Sealing Material ______

7. DEPTH OF WELL (feet) Unknown
Proposed ______ Existing ______
DIAMETER OF BORE (in.) ~ 12" to 14"

8. PRODUCTION WELL CASING INSTALLED:
☐ Steel ☐ Plastic ☐ Other

From (ft.)	To (ft.)	Dia. (in.)	Wall (Gage)
0	Unknown	12	

GRAVEL PACK: ☐ Yes ☐ No
From ______ to ______ ft.
Type of rig ______

9. PERFORATIONS (if applicable):
From ______ to ______ ft.

10. SEALED ZONES (if applicable):
From ______ to ______ ft.

11A. The California Labor code requires Worker's Compensation Insurance as a prerequisite to permit issuance unless the applicant signs the following certificate: **I certify that in the performance of the work for which this permit is issued, I shall not employ any person in any manner so as to become subject to the Workers Compensation Insurance laws of California.**

Driller's Signature ______ Date ______

11B. I have read this application and agree to comply with all laws regulating the type of work being performed.

Driller's Signature Jeffrey P. O'Connor Date 10/11/07

12. I declare under penalty of perjury under the laws of the State of California that the information furnished as part of this application is true and correct. I also understand that I am legally obligated to obey all requirements of state law and Riverside County Ordinances in connection with the approval of this application. for Lockheed Martin

Property Owner's Signature Thomas J. [signature] Date 10-11-07

10/12/07 [initials]

DISPOSITION OF PERMIT

Approved subject to the following: **FOR DEPARTMENT USE ONLY**

A. Notify the Department, , forty-eight (48) hours in advance to make an inspection of the following operations:
☐ Prior to sealing of the annular space or filling of the conductor casing.
☐ Verify the depth of the conductor (outer) casing prior to further drilling and installation of the inner casing.
☐ After installation of the surface protective slab and pumping equipment.
☒ During destruction of wells, prior to pouring the sealing material.

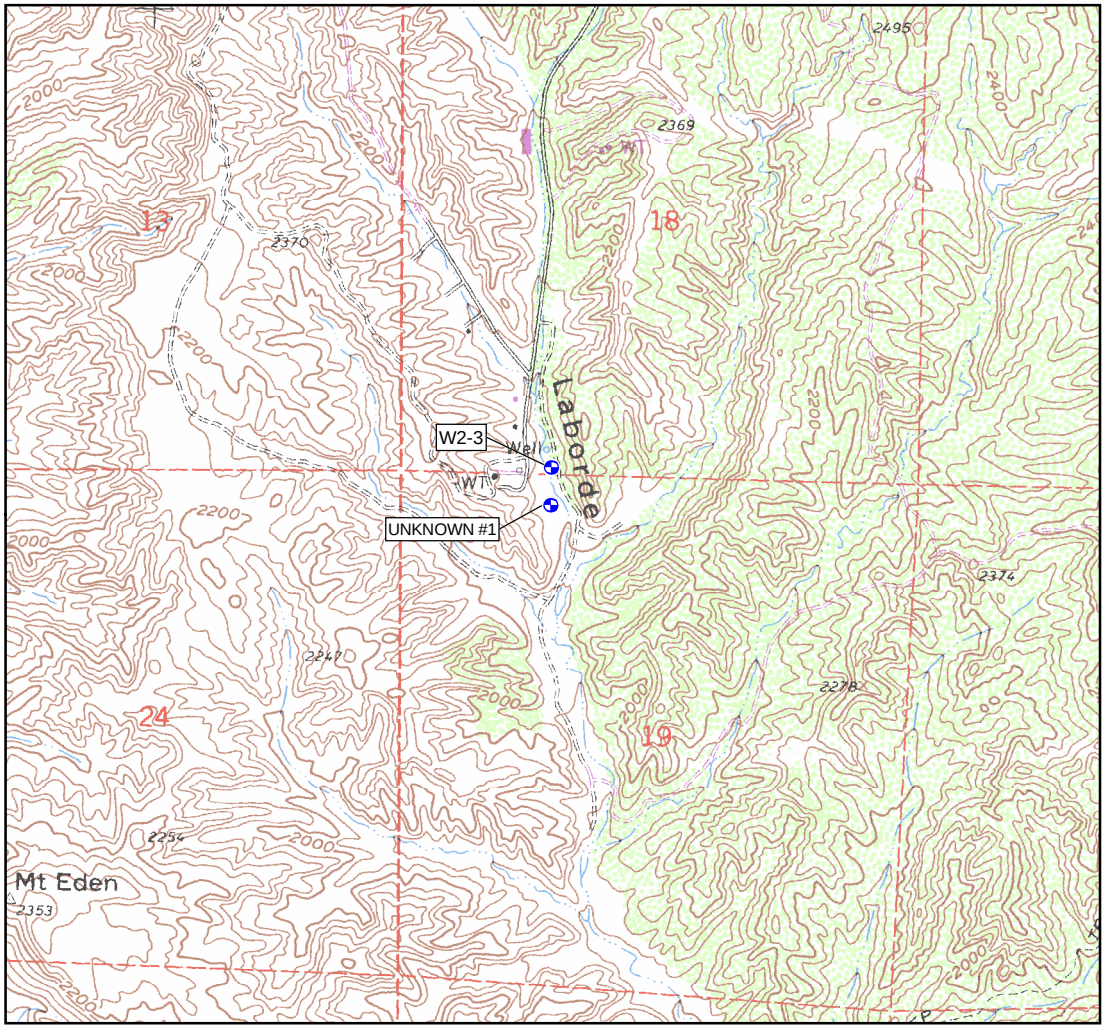
B. ✓ Approved Plot Plan.

C. Submit to the Department within thirty (60) days after completion of work, a copy of:
☒ Water Well Driller's Report (DWR 188).

NOTE: Property located within the Rancho California Water District may be subject to an existing Agency Agreement with said District.

D. Other: ______

X:\GIS\LOCKHEED 20245 WELL INVEST\WELL PERMIT UNK #1.MXD



T3S, R1W NE 1/4 of the NW 1/4, Section 19, SBB&M

UNKNOWN #1

COUNTY OF RIVERSIDE COMMUNITY HEALTH AGENCY
DEPARTMENT OF ENVIRONMENTAL HEALTH

33654

WELL DRILLING PERMIT

ALL ELECTRICAL, PLUMBING, MECHANICAL, AND STRUCTURAL REPAIRS AND INSTALLATIONS SHALL BE DONE UNDER PERMIT FROM RIVERSIDE COUNTY DEPT. OF BUILDING AND SAFETY.

Date October 16, 2007

Expiration Date 4-12-08

Fee $154.02 (non-refundable)

This permit is granted on condition that the person named in the permit will comply with the laws, ordinances and regulations that are now or may hereafter be in force.

LOCATION OF PROPOSED WELL ____ ¼ ____ ¼; Sec. 18 ; T 3S ; R 1W

PHYSICAL ADDRESS OF WELL Off Laborde-Beaumont Site 2 Community Beaumont

Well Unknown #2

APN: 421-080-001

NAME Lockheed Martin Corp.

MAILING ADDRESS 2550 N. Hollywood Way, 3rd Flr.

CITY & STATE Burbank, CA 91505

DRILLER WDC Exploration & Wells
5566 Arrow Highway
Montclair, CA 91763

By Charlene Robbins

Charlene Robbins

ABANDONMENT

Distribution: WHITE—Environmental Health Department; YELLOW—Owner; PINK—Well Driller; GOLDENROD—Flood Control

COUNTY OF RIVERSIDE, COMMUNITY HEALTH AGENCY
DEPARTMENT OF ENVIRONMENTAL HEALTH
WELL PERMIT APPLICATION
(For Construction, Reconstruction & Destruction)

☒ 4080 Lemon Street, 2nd Floor / P.O. Box 1206 - Riverside, CA 92502 - (951) 955-8980
☐ 82675 Hwy. 111, CAC - Indio, CA 92201 - (760) 863-7000
☐ 39493 Los Alamos - Murrieta, CA 92563 - (951) 600-6180

PLEASE REPLY TO ADDRESS CHECKED ABOVE

Engr's CK #3015
EHW070785

Well: unknown #2

NOTE: Any abandoned wells on the property must be properly destroyed before an application for construction or reconstruction can be processed.

FOR DEPARTMENT USE ONLY
Permit No. 07 33654
Expiration 4-12-08

Please Print

1. OWNER: Name Lockheed Martin Corp
Mailing Address 2550 N. Hollywood way, 3rd floor
City Burbank State Ca
Zip 91505 Phone No (818) 847-0899

2. DATE OF WORK (approximate):
Start 10-22-07 Complete 12-30-07

3. WELL DRILLER
Name Water Development Corp.
Riv. Co. Registration No. 04-051
C-57 License No. C-57 283 326

4. WELL CHECK (check)
☐ Community ☐ Monitoring ☐ Industrial
☐ Individual ☐ Cathodic ☐ Other
☐ Agricultural ☐ Horizontal

4A. FOR MONITORING WELL: (Name of Consultant)
Name TetraTech INC Phone (909) 381-1674

5. TYPE OF WORK (check)
☐ New ☐ Reconstruction ☒ Destruction

5A. If reconstruction or destruction, please describe method on reverse side of attached Plot Plan.

6. ANNUAL SEAL:
Depth _____ ft.
Borehole Diam. _____ in.
Conductor Diam. _____ in.
Annular Thickness _____ in.
Sealing Material _____

7. DEPTH OF WELL (feet) unknown
Proposed _____ Existing _____
DIAMETER OF BORE (in.) ~ 8" - 10"

8. PRODUCTION WELL CASING INSTALLED:
☒ Steel ☐ Plastic ☐ Other

From (ft.)	To (ft.)	Dia. (in.)	Wall (Gage)
0	unknown	8	

GRAVEL PACK: ☐ Yes ☐ No
From _____ to _____ ft.
Type of rig _____

9. PERFORATIONS (if applicable):
From _____ to _____ ft.

10. SEALED ZONES (if applicable):
From _____ to _____ ft.

11A. The California Labor code requires Worker's Compensation Insurance as a prerequisite to permit issuance unless the applicant signs the following certificate: **I certify that in the performance of the work for which this permit is issued, I shall not employ any person in any manner so as to become subject to the Workers Compensation Insurance laws of California.**

Driller's Signature _____ Date _____

11B. I have read this application and agree to comply with all laws regulating the type of work being performed.

Driller's Signature Jeffrey P. O'Connor Date 10/11/07

12. I declare under penalty of perjury under the laws of the State of California that the information furnished as part of this application is true and correct. I also understand that I am legally obligated to obey all requirements of state law and Riverside County Ordinances in connection with the approval of this application.

Property Owner's Signature For Lockheed Martin Date 10-11-07

10/12/07 MM

DISPOSITION OF PERMIT

Approved subject to the following:

FOR DEPARTMENT USE ONLY

A. Notify the Department, , forty-eight (48) hours in advance to make an inspection of the following operations:
☐ Prior to sealing of the annular space or filling of the conductor casing.
☐ Verify the depth of the conductor (outer) casing prior to further drilling and installation of the inner casing.
☐ After installation of the surface protective slab and pumping equipment.
☒ During destruction of wells, prior to pouring the sealing material.

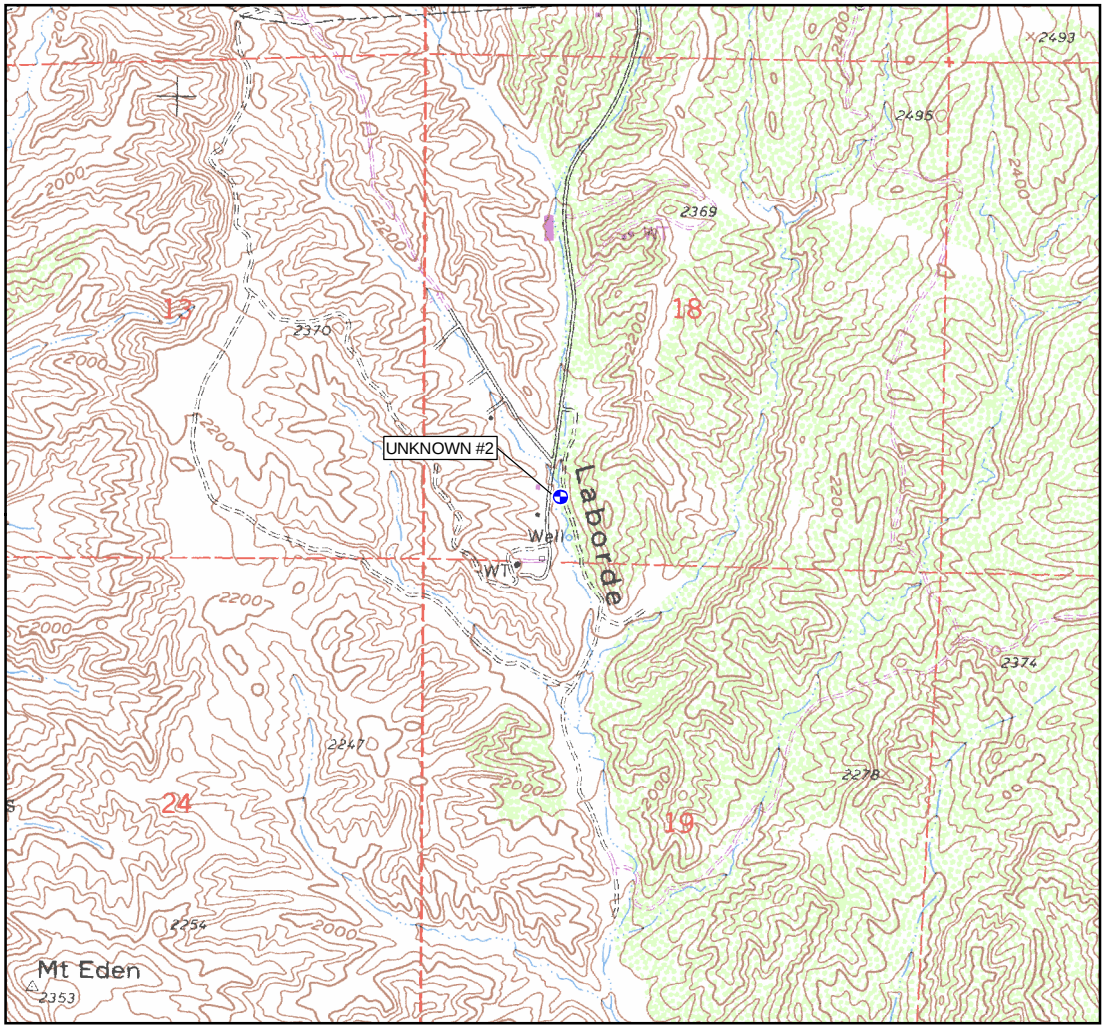
B. Approved Plot Plan.

C. Submit to the Department within thirty (60) days after completion of work, a copy of:
☐ Water Well Driller's Report (DWR 188).

NOTE: Property located within the Rancho California Water District may be subject to an existing Agency Agreement with said District.

D. Other: _____

X:\GIS\LOCKHEED 20245 WELL INVEST\WELL PERMIT UNK#1.MXD



T3S, R1W SE 1/4 of the SW 1/4, Section 18, SBB&M

UNKNOWN #2

APPENDIX C GEOPHYSICAL LOGS

welenco

5201 Woodmere Drive, Bakersfield, CA 93313-- www.welenco.com--(800) 445-9914
California Contractor's License No. 722373

DUAL INDUCTION - GAMMA RAY LOG

FILING NO.

COMPANY Tetra Tech

WELL TT-MW2-18

FIELD LMC Beaumont Site 2

STATE California COUNTY Riverside

LOCATION:
South of 60 Fwy and Jack Rabbit Trail

OTHER SERVICES:
Spec GR

JOB NO.
8513

SEC: 18 TWP: 3S RGE: 1W LAT.: 33° 54' 14.0" LONG.: 117° 1' 43.2" MERIDIAN.: San Bernardino

Permanent Datum: Top of PVC Casing , **Elev.** ____ **Ft.** **Elev.: K.B.** ____ **Ft.**
Log Measured From: Top of PVC Casing , 0 **Ft. Above Perm. Datum** **D.F.** ____ **Ft.**
Drilling Measured From: ____ **G.L.** ____ **Ft.**

Date	Nov. 13, 2007			
Type Of Log	Induction			
Run	One			
Depth-Driller	100 Ft	Ft	Ft	Ft
Depth-Logger	101.2 Ft	Ft	Ft	Ft
Top Logged Interval	7 Ft	Ft	Ft	Ft
Btm. Logged Interval	100 Ft	Ft	Ft	Ft
Type Fluid In Hole	Water			
Fluid Level	Unk. Ft	Ft	Ft	Ft
Max Temp	°F	°F	°F	°F
Operating Rig Time	.5 Hr	Hr	Hr	Hr
Van No. / Location	LV-1 / Bfld			
Recorded By	Craig Corbell			
Witnessed By	Chris Patrick			

RUN NO.	BOREHOLE RECORD BIT	FROM	TO	CASING RECORD SIZE	TYPE	FROM	TO
1	In	Ft	Ft	4 In	PVC	0 Ft	100 Ft
2	In	Ft	Ft	In		Ft	Ft
3	In	Ft	Ft	In		Ft	Ft

Miscellaneous Information

Remarks:

A recreational GPS accurate to +/- 45 feet set for Datum NAD27 was used to calculate Latitude, Longitude & Elevation values. The Section, Township, and Range then determined using the TRS program (TRS accuracy is not guaranteed). The TRS program converts Latitude and Longitude to Section, Township, and Range. The NOTICE at the bottom of this heading also applies.

Perforated Intervals:

Line Speed:

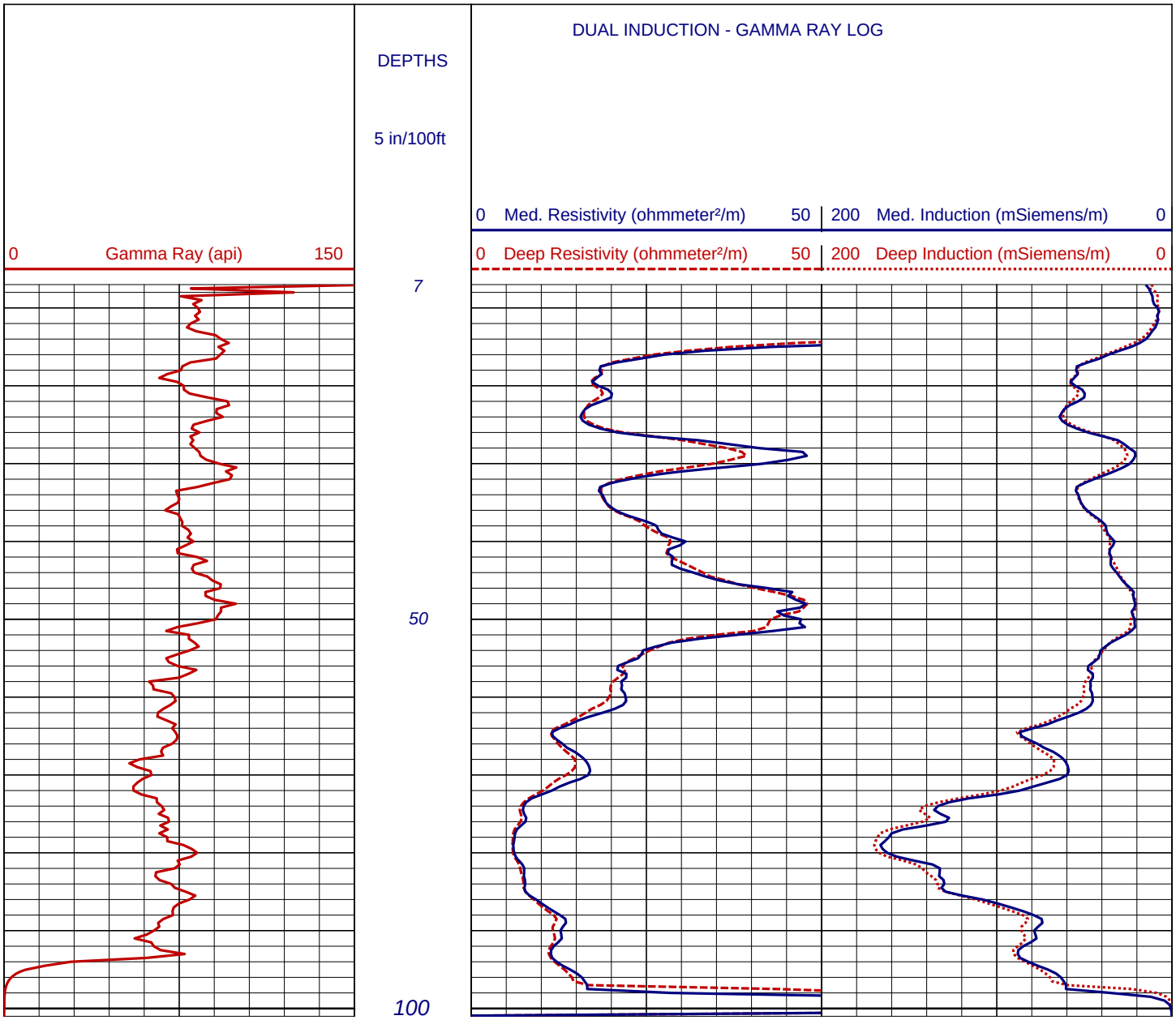
Borehole Volume Calculations:

Other Information:

NOTICE: All interpretations are opinions based on inferences from electrical and other measurements and we do not guarantee the accuracy or correctness of any verbal or written 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 one of our officers, agents or employees. These interpretations are also subject to our General Terms and Conditions as set out in our current Price Schedule.

welenco, inc. November 13, 2007

Tetra Tech TT-MW2-18 Nov 13, 2007



Log Page No. 1 of 1 Pages

Page Length: 7 - 101 Feet (94 Feet) Time: 01:00:54 PM Date: Nov 13, 2007

welenco

5201 Woodmere Drive, Bakersfield, CA 93313-- www.welenco.com--(800) 445-9914
California Contractor's License No. 722373

SPECTRAL GAMMA RAY LOG

FILING NO.

COMPANY Tetra Tech

WELL TT-MW2-18

FIELD LMC Beaumont Site 2

STATE California COUNTY Riverside

LOCATION:
South of 60 Fwy and Jack Rabbit Trail

OTHER SERVICES:
D-Ind

JOB NO.
8513

SEC: 18 TWP: 3S RGE: 1W LAT.: 33° 54' 14.0" LONG.: 117° 1' 43.2" MERIDIAN.: San Bernardino

Permanent Datum: Top of PVC Casing , **Elev.** ____ **Ft.** **Elev.: K.B.** ____ **Ft.**
Log Measured From: Top of PVC Casing , 0 **Ft. Above Perm. Datum** **D.F.** ____ **Ft.**
Drilling Measured From: ____ **G.L.** ____ **Ft.**

Date	Nov. 13, 2007			
Type Of Log	Spectral GR			
Run	One			
Depth-Driller	100 Ft	Ft	Ft	Ft
Depth-Logger	101.2 Ft	Ft	Ft	Ft
Top Logged Interval	5 Ft	Ft	Ft	Ft
Btm. Logged Interval	100 Ft	Ft	Ft	Ft
Type Fluid In Hole	Water			
Fluid Level	Unk. Ft	Ft	Ft	Ft
Max Temp	°F	°F	°F	°F
Operating Rig Time	.5 Hr	Hr	Hr	Hr
Van No. / Location	LV-1 / Bfld			
Recorded By	Craig Corbell			
Witnessed By	Chris Patrick			

RUN NO.	BOREHOLE RECORD BIT	FROM	TO	CASING RECORD SIZE	TYPE	FROM	TO
1	In	Ft	Ft	4 In	PVC	0 Ft	100 Ft
2	In	Ft	Ft	In		Ft	Ft
3	In	Ft	Ft	In		Ft	Ft

Miscellaneous Information

Remarks:

A recreational GPS accurate to +/- 45 feet set for Datum NAD27 was used to calculate Latitude, Longitude & Elevation values. The Section, Township, and Range then determined using the TRS program (TRS accuracy is not guaranteed). The TRS program converts Latitude and Longitude to Section, Township, and Range. The NOTICE at the bottom of this heading also applies.

Perforated Intervals:

Line Speed:

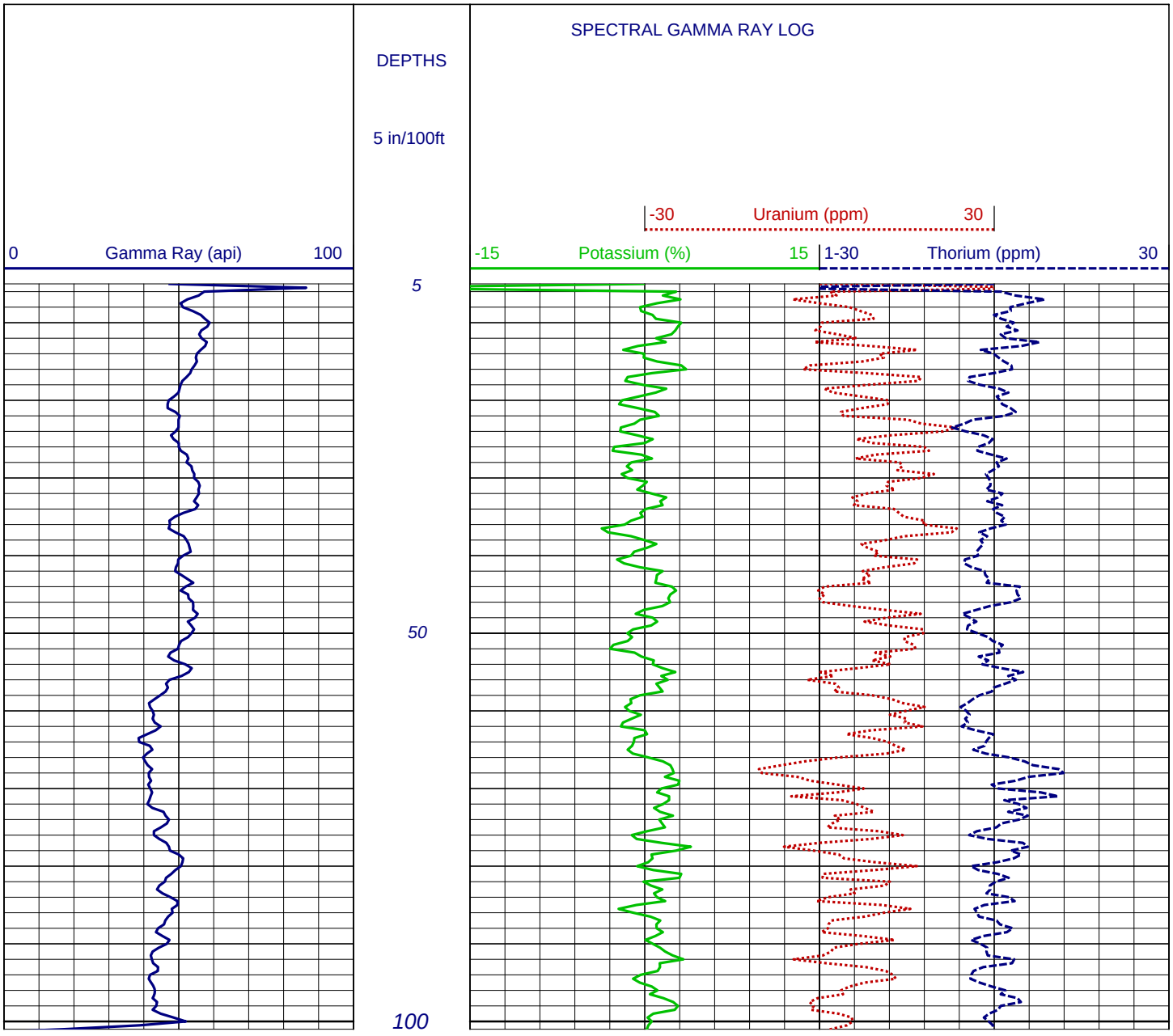
Borehole Volume Calculations:

Other Information:

NOTICE: All interpretations are opinions based on inferences from electrical and other measurements and we do not guarantee the accuracy or correctness of any verbal or written 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 one of our officers, agents or employees. These interpretations are also subject to our General Terms and Conditions as set out in our current Price Schedule.

welenco, inc. November 13, 2007

Tetra Tech TT-MW2-18 Nov 13, 2007



Log Page No. 1 of 1 Pages

Page Length: 5 - 101 Feet (96 Feet) Time: 01:10:40 PM Date: Nov 13, 2007

Wellbore Video Report

welenco
5201 Woodmere Drive Bakersfield, CA. 93313
Phone: (800) 445-9914 Fax: (661) 834-8100 Web: www.welenco.com

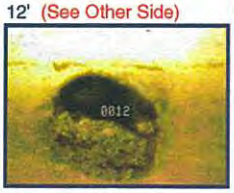
Company: Tetra Tech | Invoice No: 8492 | Run No.: 1
Address: 348 West Hospitality Lane, Suite 100 | Well Number: W2-3
City: San Bernardino | State: CA | Zip: 92408-3214 | Survey Date: Nov 9, 2007
Requested By: Christopher Patrick | P.O.: 20125-2 | Well Owner: Tetra Tech
Copy To: | Camera: CCV Color Flip Camera - Short L.H.
Reason For Survey: General Inspection | Zero Datum: Top of Casing
Operator: Dale Snyder | Lat.: 33° 54' 13.6" | Long.: 117° 1' 41.5" | Sec: 18 | Twp: 3S | Rge: 1W
Location: 2 miles South of Moreno Valley Freeway (60) - Beaumont | Depth: | Van: TO-5
Csg I.D.@Surface: 8" | I.D. Ref: Measured | Casing Buildup: Heavy, Increasing W/ Depth

(NOTE: Latitude and Longitude values determined using a recreational GPS accurate to about +/- 45'. SEC, TWP and RGE then determined using the TRS conversion program, accuracy not guaranteed.)

SELECTED WELLBORE SNAPSHOTS

0' (See Other Side)

12' (See Other Side)



32' (See Other Side)

46' (See Other Side)

85' (See Other Side)

110'

159' (See Other Side)

TRUE DEPTHS (SideScan - Feet)	WELLBORE / CASING INFORMATION
	Downview Depths are 7" deeper than SideScan Depths
0'	Recording Starts - Zeroed on Sideview Lens at Top of Casing
12'	**Sideview - Hole in casing**
32'	Sideview - Heavy corrosion or encrustation in casing
46'	Sideview - Static water level (Cloudy visibility)
85'	Downview - No visibility (Cloudy)
110'	Downview - No visibility (Cloudy)
159'	**Downview - Camera will not pass this point - End of survey**

Notes:

0' (Enlargement)

12' (Enlargement)

32' (Enlargement)

46' (Enlargement)

85' (Enlargement)

159' (Enlargement)

Wellbore Video Report

welenco
5201 Woodmere Drive Bakersfield, CA. 93313
Phone: (800) 445-9914 Fax: (661) 834-8100 Web: www.welenco.com

Company: Tetra Tech | Invoice No: 8497 | Run No.: 1
Address: 348 West Hospitality Lane, Suite 100 | Well Number: MW 2- 3
City: San Bernardino | State: CA | Zip: 92408-3214 | Survey Date: Nov 26, 2007
Requested By: Christopher Patrick | P.O.: | Well Owner:
Copy To: | Camera: CCV Color Flip Camera - Short L.H.
Reason For Survey: General Inspection | Zero Datum: Top of outer casing.
Operator: Zbigniew Bobinski | Lat.: 33° 54' 13.4" | Long.: 117° 1' 41.3" | Sec: 18 | Twp: 3S | Rge: 1W
Location: LMC Beaumont Site 2. | Depth: | Van: T-05
Csg I.D.@Surface: 10" | I.D. Ref: Measured | Casing Buildup: Heavy

(NOTE: Latitude and Longitude values determined using a recreational GPS accurate to about +/- 45'. SEC, TWP and RGE then determined using the TRS conversion program, accuracy not guaranteed.)

SELECTED WELLBORE SNAPSHOTS

35' (See Other Side)

48' (See Other Side)

62' (See Other Side)

79'

97'

124'

151' (See Other Side)

153'

175' (See Other Side)

182'

193' (See Other Side)

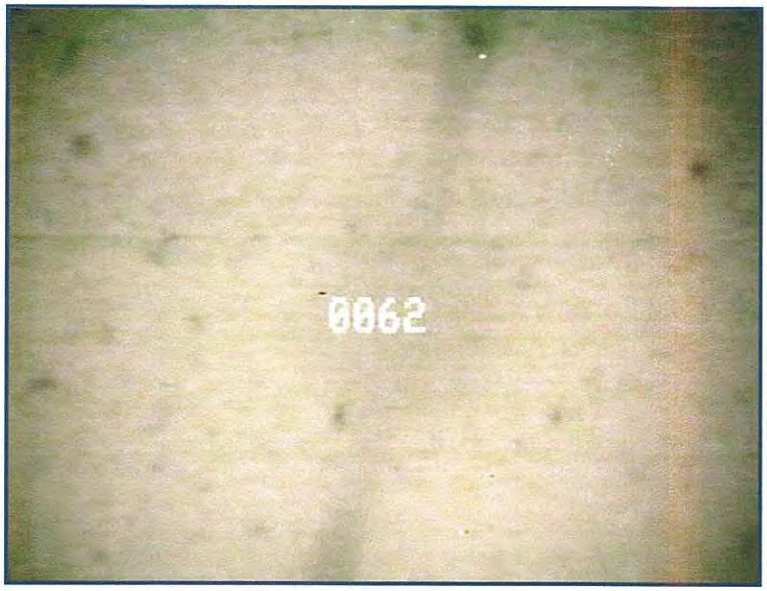
TRUE DEPTHS (SideScan - Feet)	WELLBORE / CASING INFORMATION
	Downview Depths are 7" deeper than SideScan Depths
0'	Recording Starts - Zeroed on Sideview Lens at top of outer casing.
3'	Entering 10" casing.
35'	Heavy incrustation starts - downview.
49'	Static water level.
to 193'	Zero visibility through the downview and near zero through sideview.
62'	Zero visibility - downview.
79'	Zero visibility - downview.
97'	Zero visibility - downview.
124'	Sideview - casing can be recognized but no details visible.
151'	Zero visibility - downview.
153'	Near zero visibility - sideview.
175'	Near zero visibility - sideview.
182'	Zero visibility - sideview.
193'	Camera repeatedly rests on something.
	This is probable junk not the well bottom, because camera light
	does not change intensity (does not submerge even partly in sediment).
	On the way up, the casing was continuously scanned.

Notes:

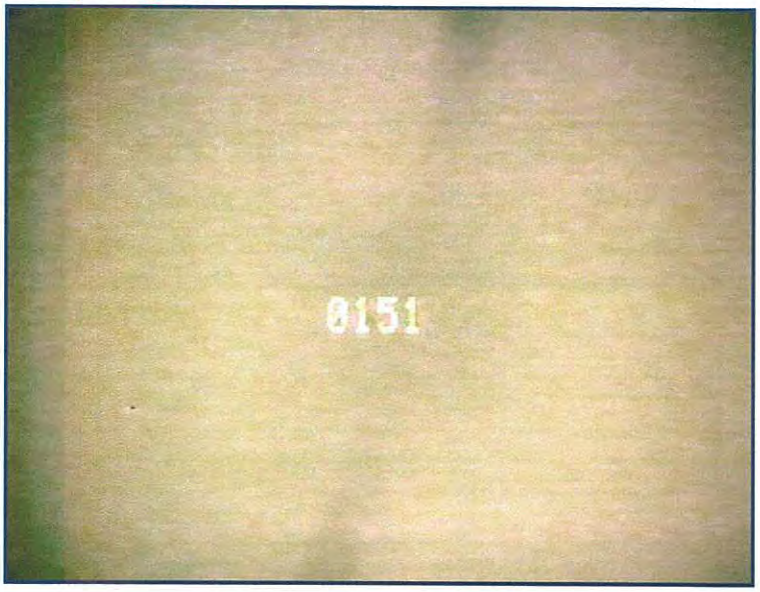
35' (Enlargement)

48' (Enlargement)

62' (Enlargement)



151' (Enlargement)



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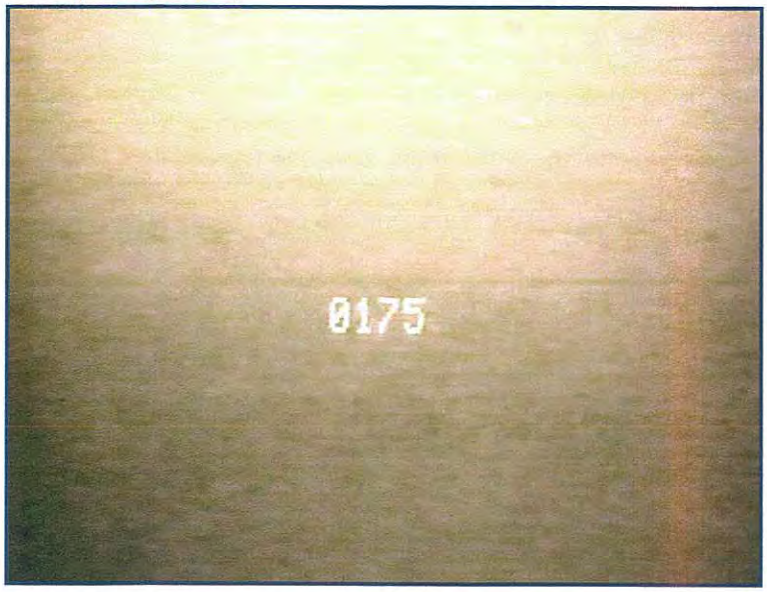
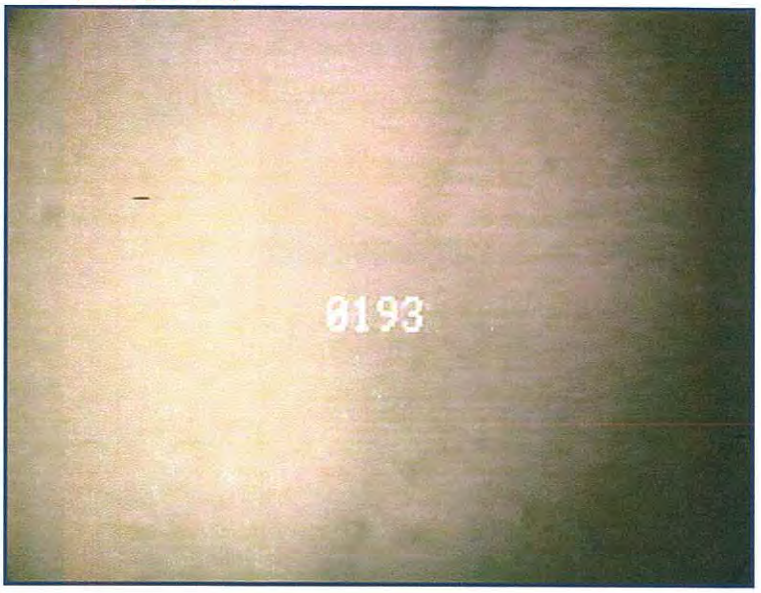


193' (Enlargement)



welenco
(800)445-9914

BHTV DATA PROCESSING
RGLDIP vsn 6.2
AMPLITUDE/TRAVEL-TIME LOG

28 Nov 2007

Tetra Tech

Borehole: W 2-3

Beaumont Site 2

top of borehole.....
East: _
North:_
Elev: _

North ref. is magnetic
Depth units are feet
Vertical scale: 1/20

Zone from 171.000 to 56.000ft
Format BHTV-NESWN

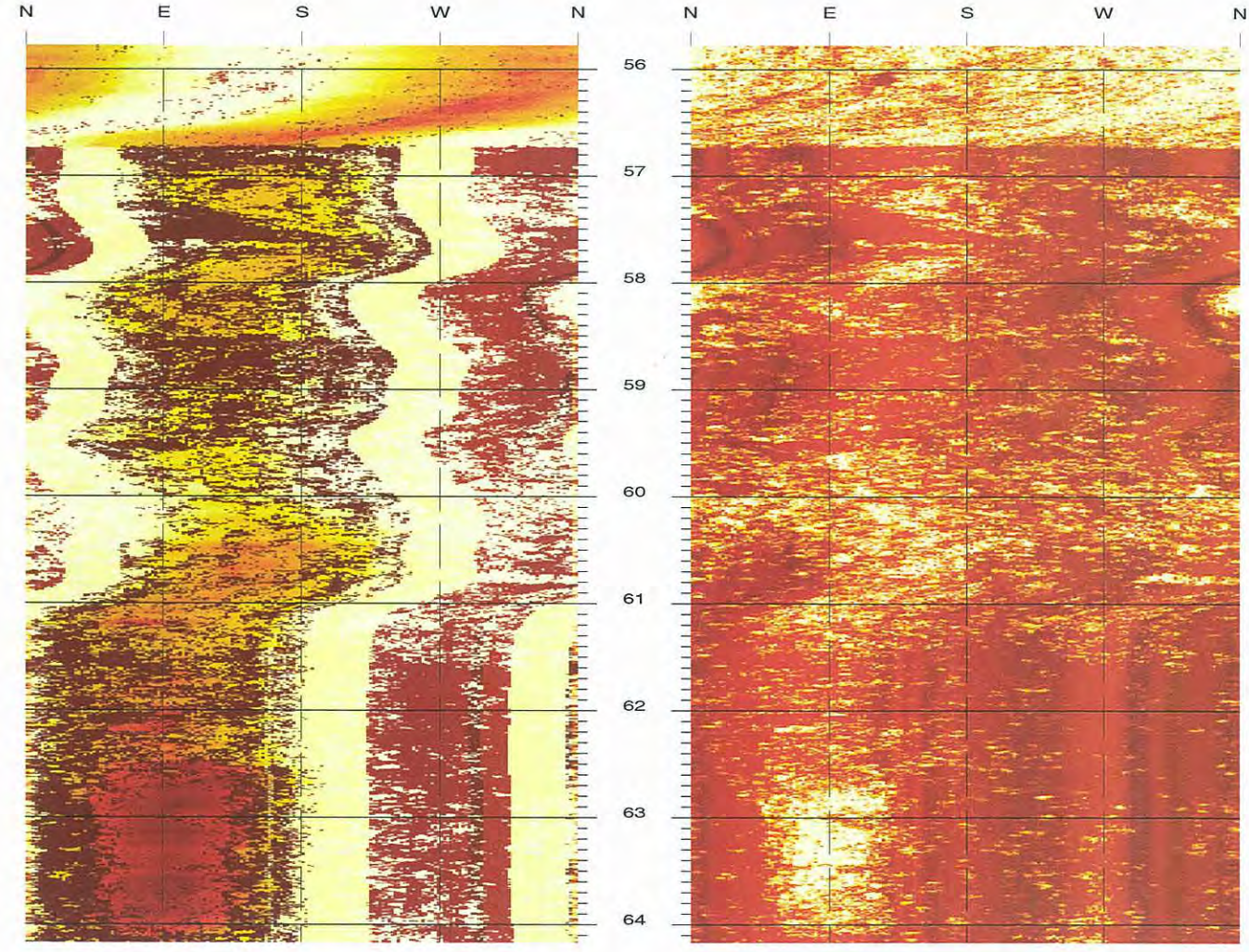
Borehole diam: 8.000inch
data intervals.....
azimuth: 2.000deg
depth: 0.004ft

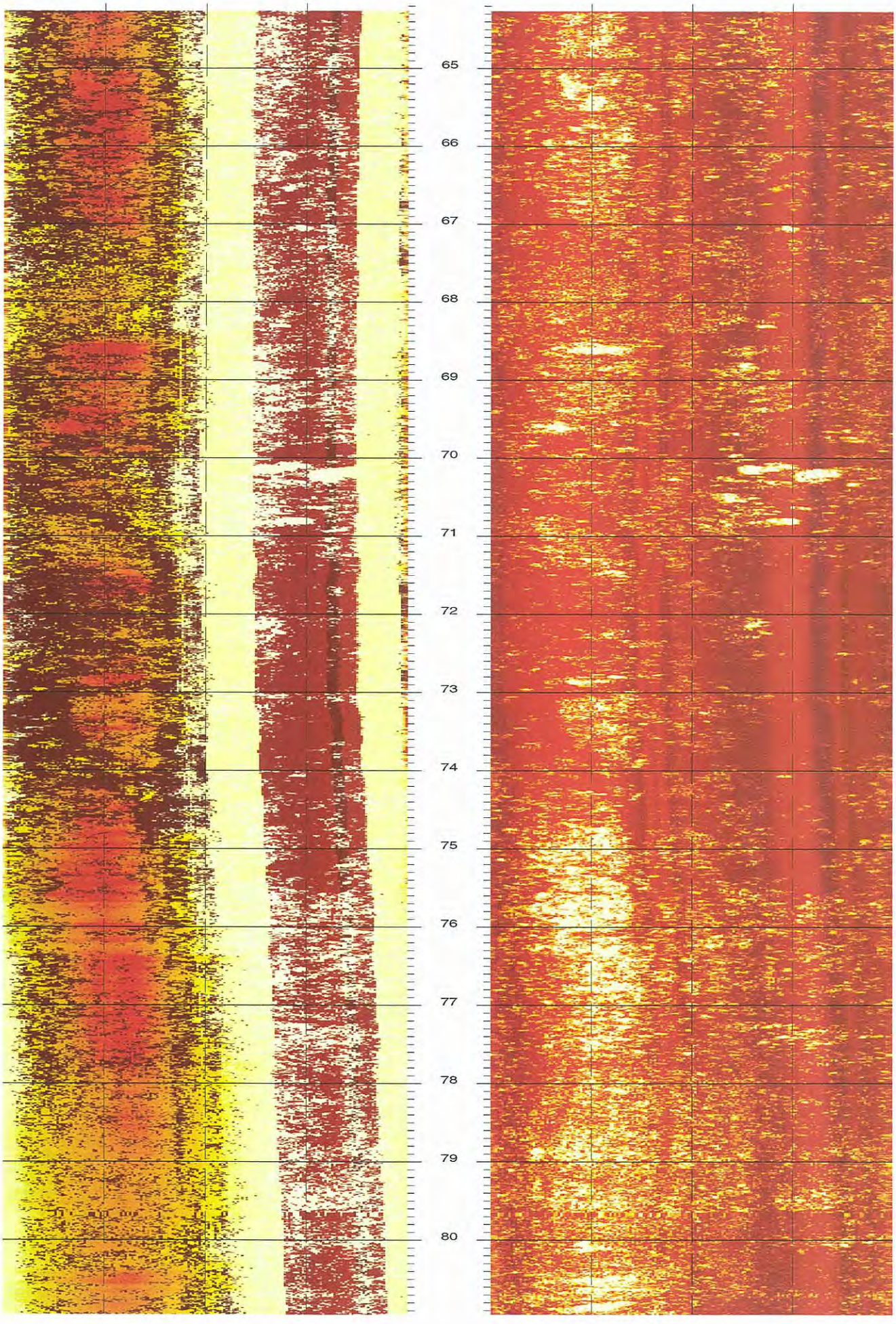
TRAVEL TIME (0.1µsec)

1919 2580

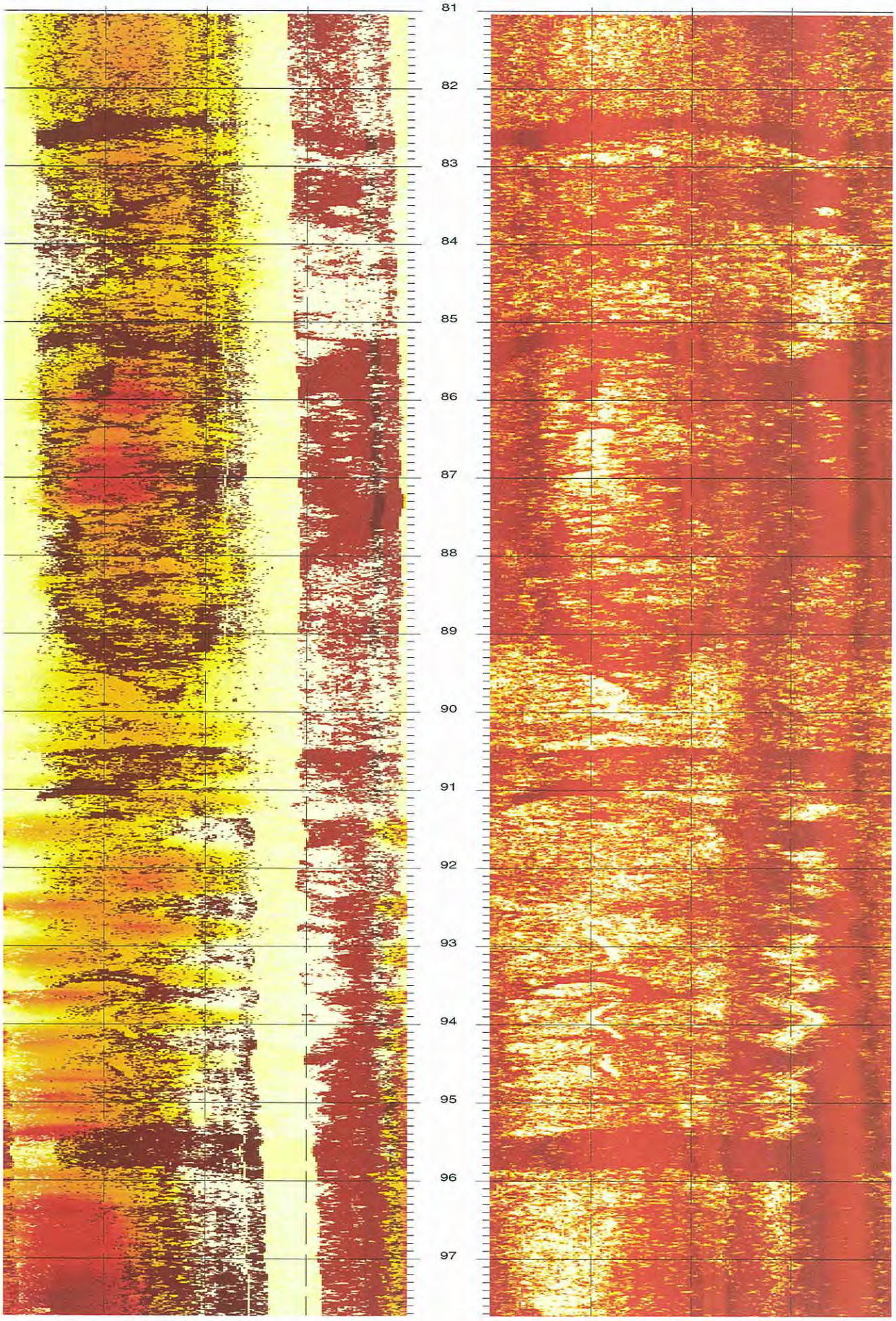
AMPLITUDE

19 114

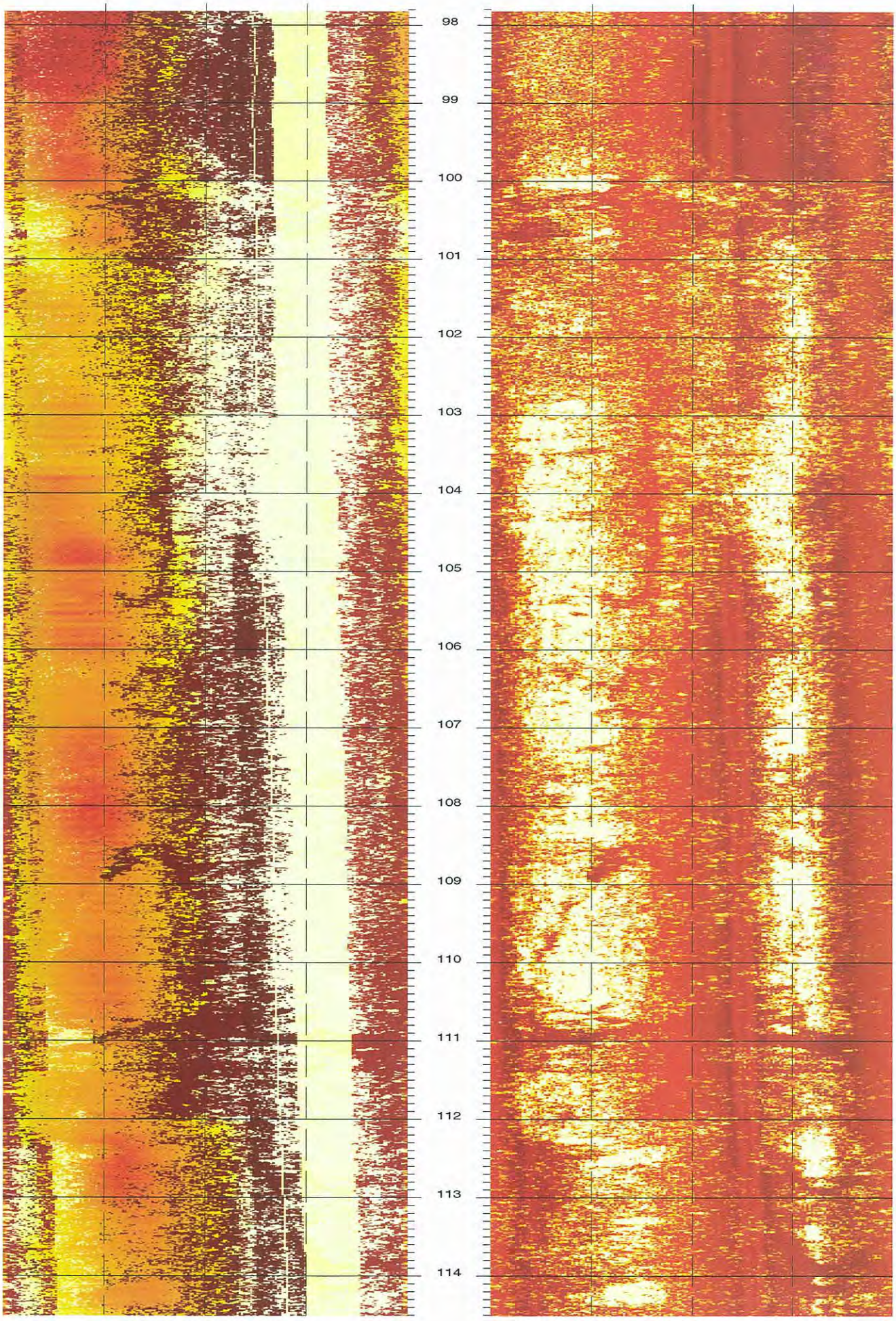




W 2-3 80.948 to 64.168ft



W 2-3 97.728 to 80.948ft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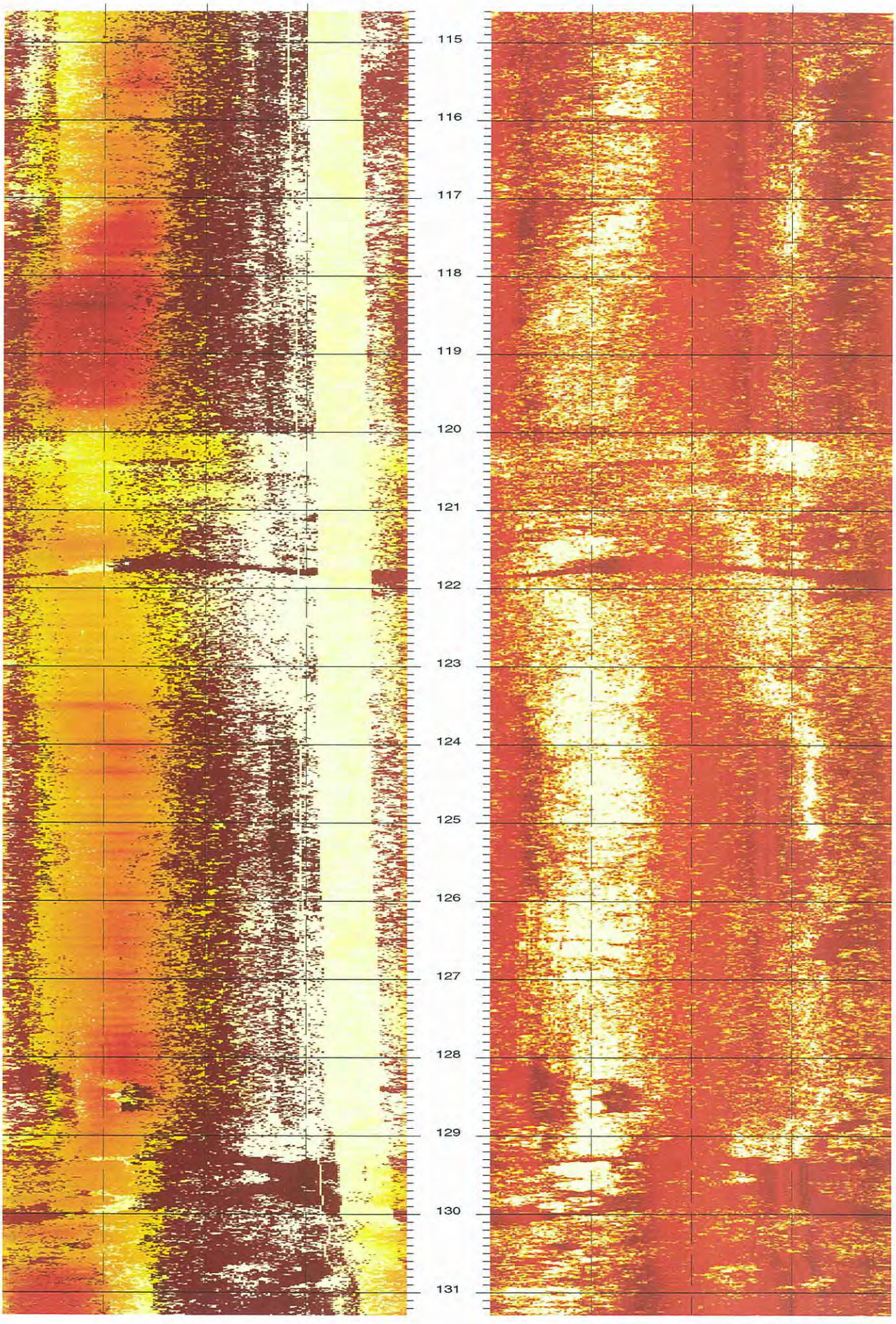
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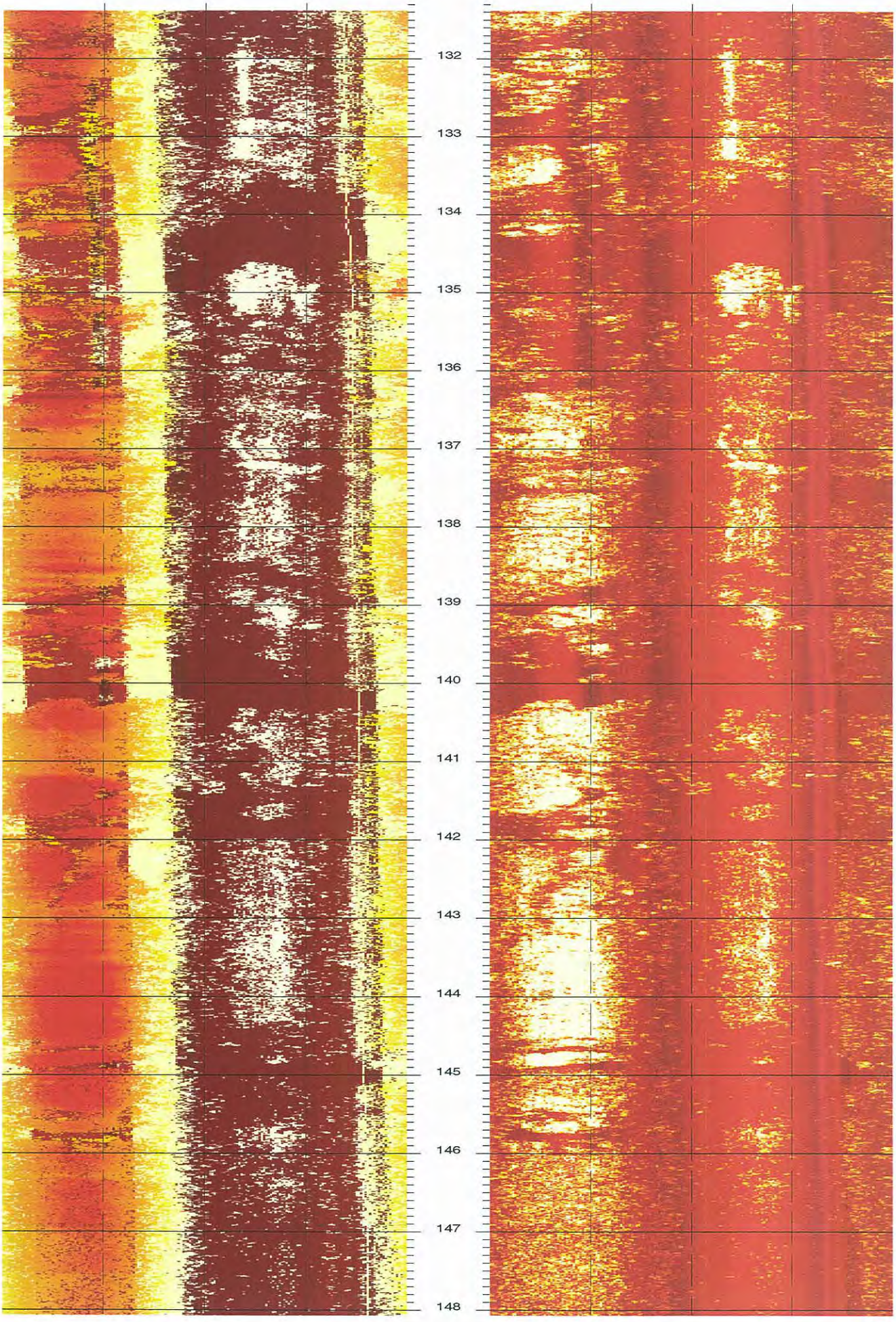
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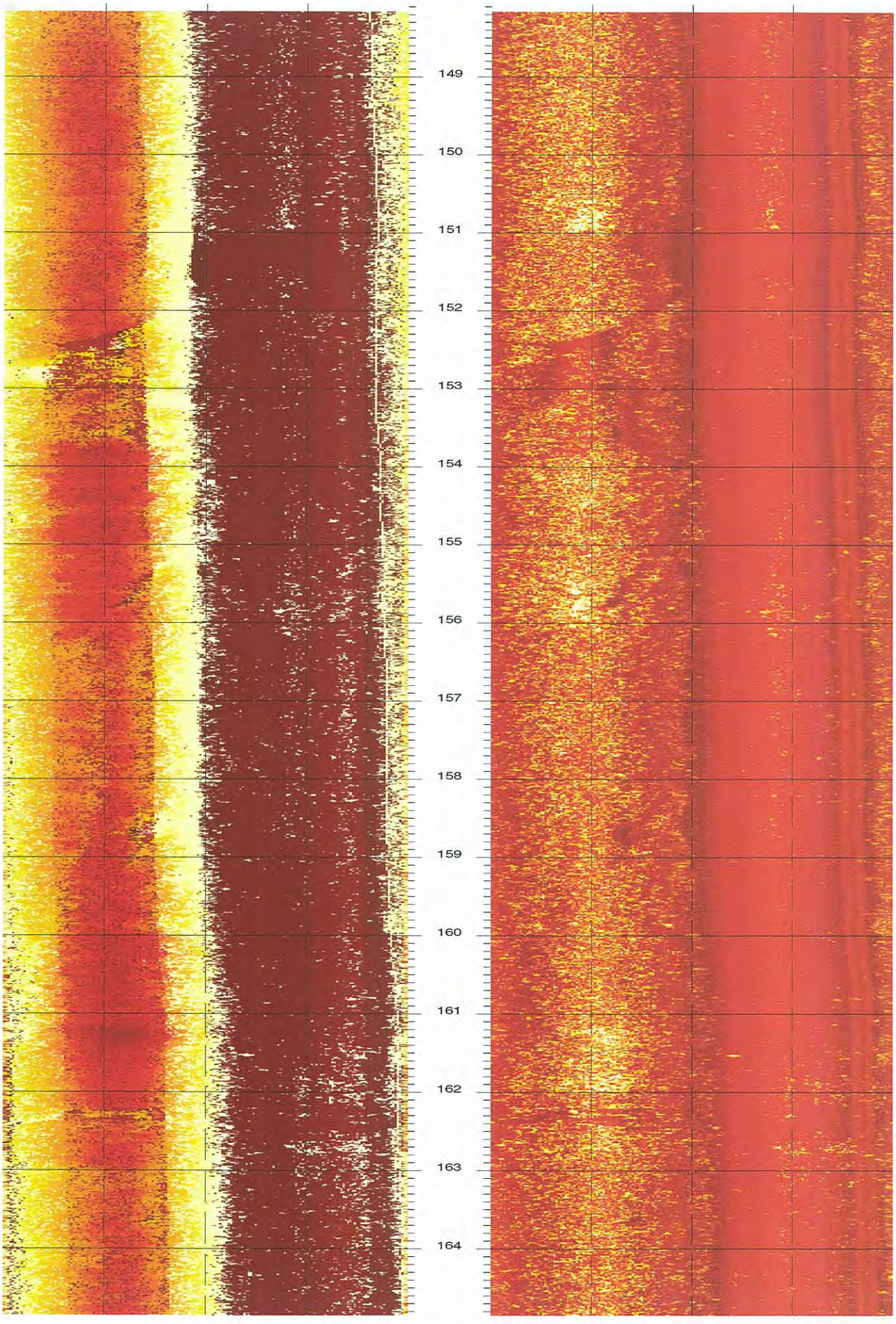
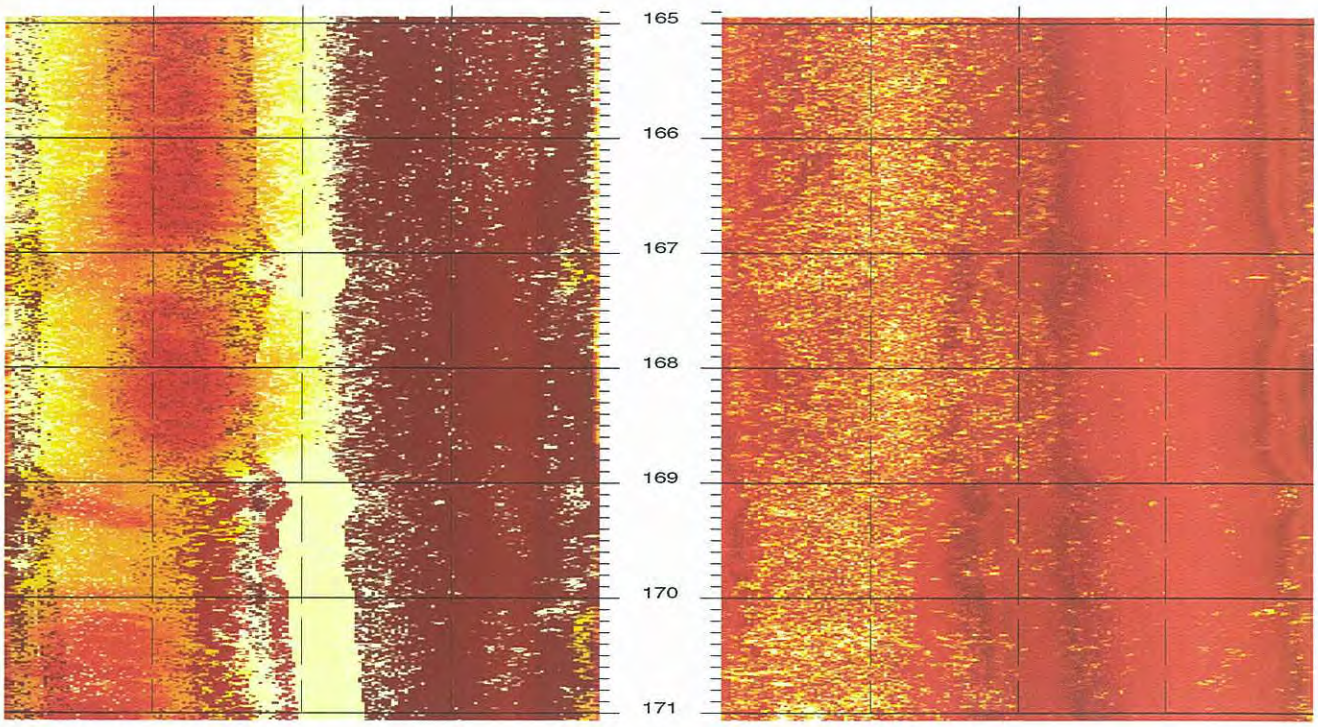


W 2-3 164.848 to 148.068ft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welenco
(800)445-9914

BHTV DATA PROCESSING
RGLDIP vsn 6.2
INTERPRETED BHTV DIPS LOG

28 Nov 2007

Tetra Tech

Borehole: W 2-3

Beaumont Site 2

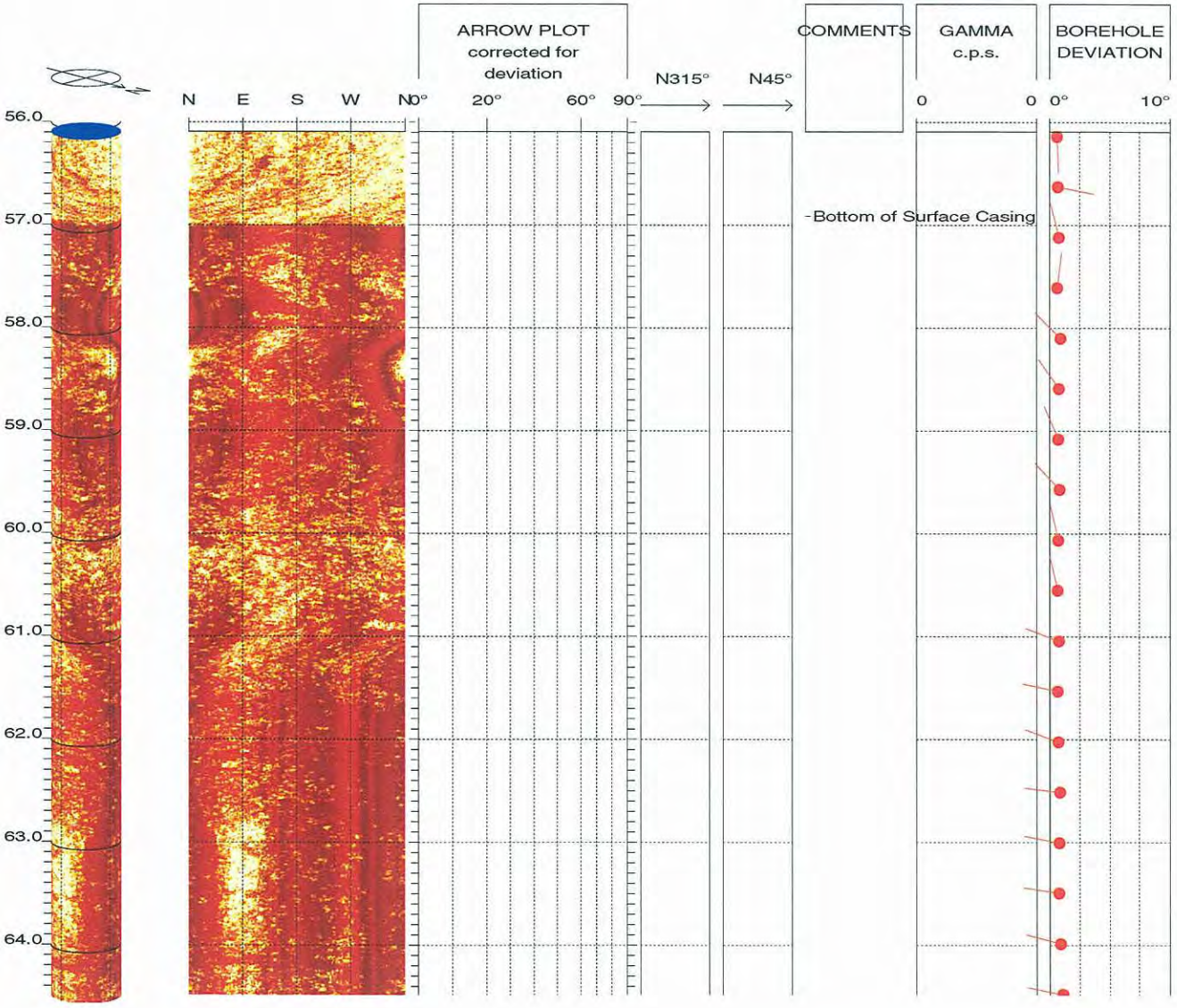
top of borehole.....
East: _
North:_
Elev: _

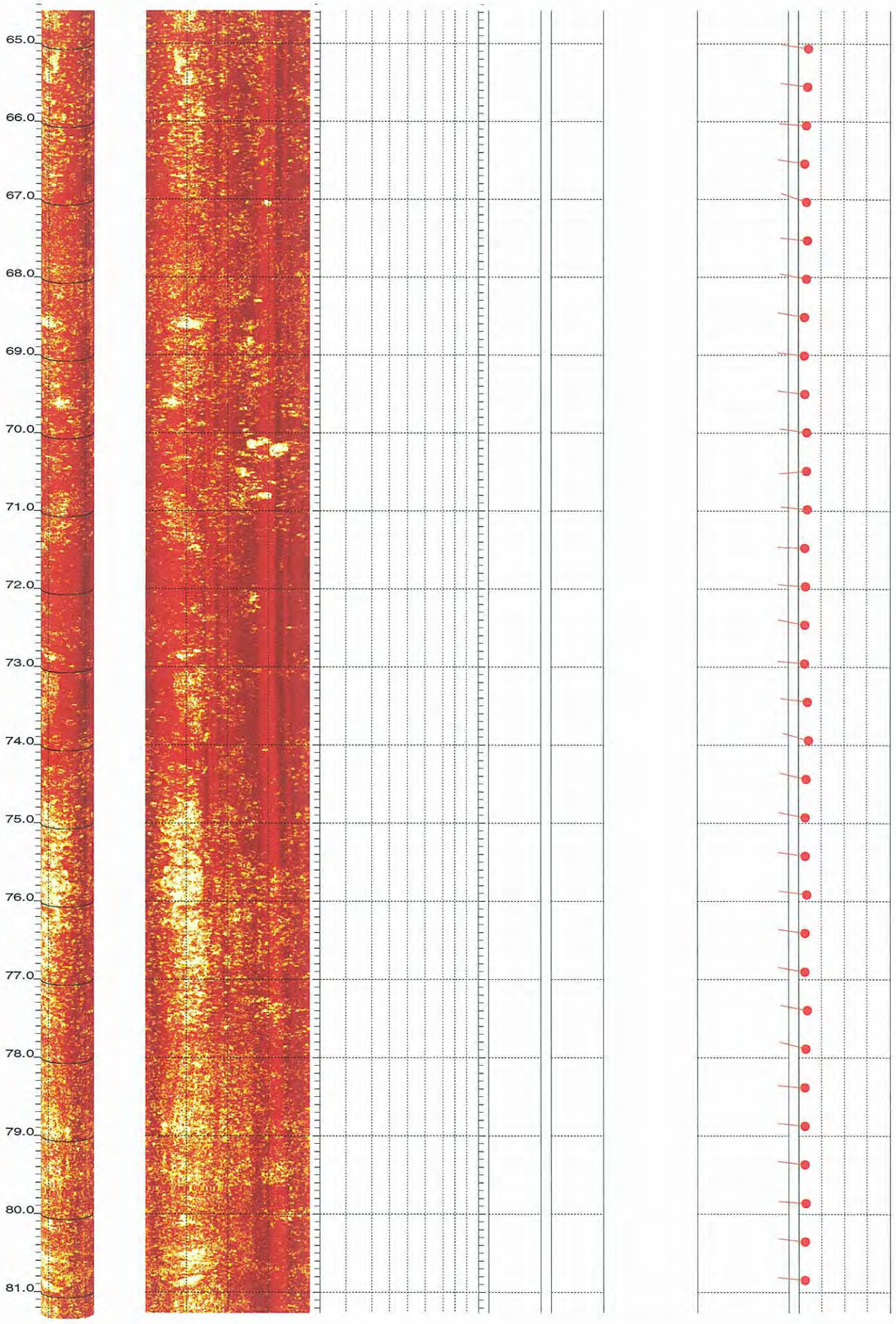
North ref. is magnetic
Depth units are feet
Vertical scale: 1/20
Horiz scale = 1.00x Vert scale

Zone from 171.000 to 56.000ft
Format: BHTV-NESWN

Borehole diam: 8.000inch
Vertical = borehole-axis
Image: Amplitude

Stratigraphic dips
Non-stratigraphic dips
Identified units

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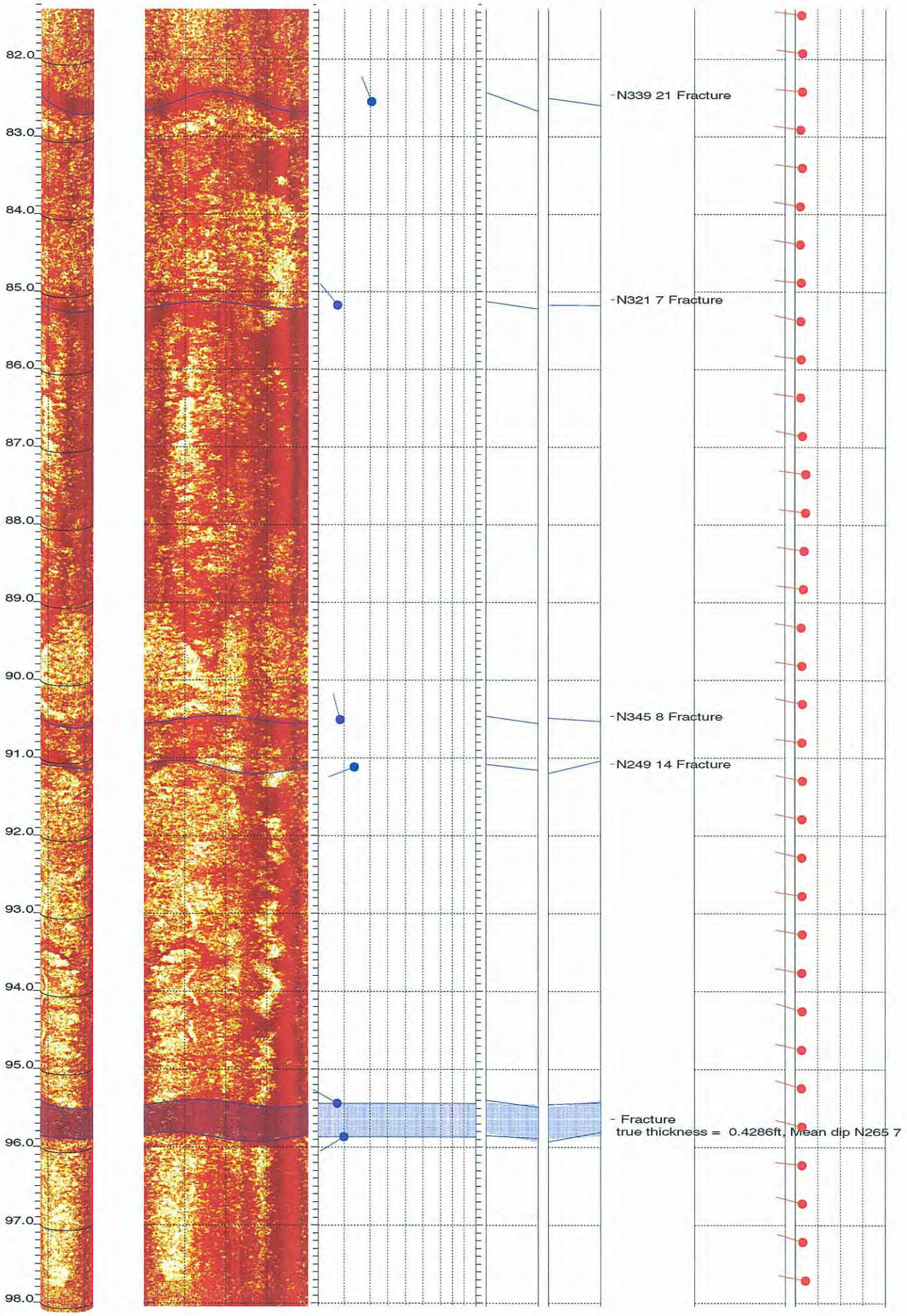
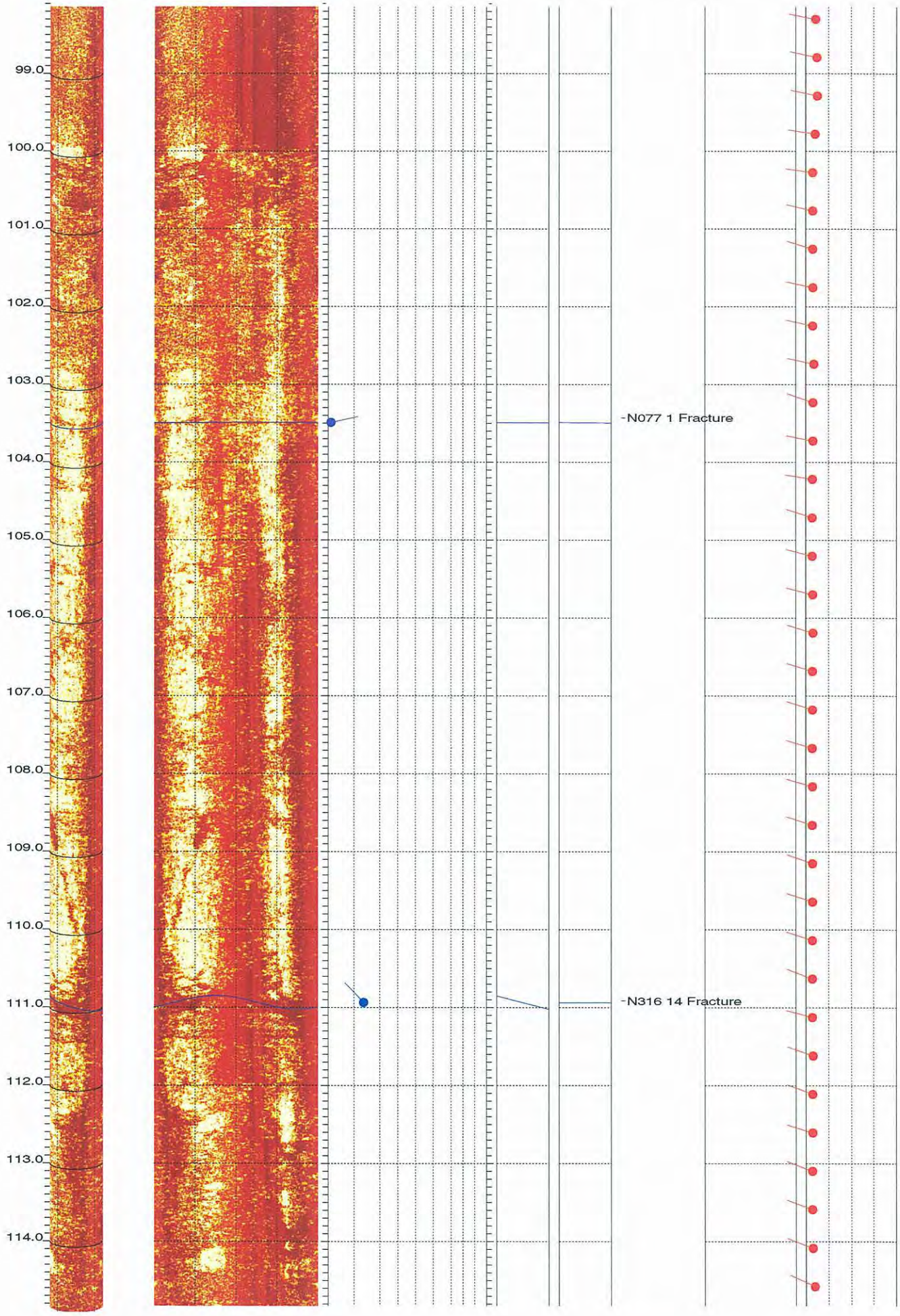
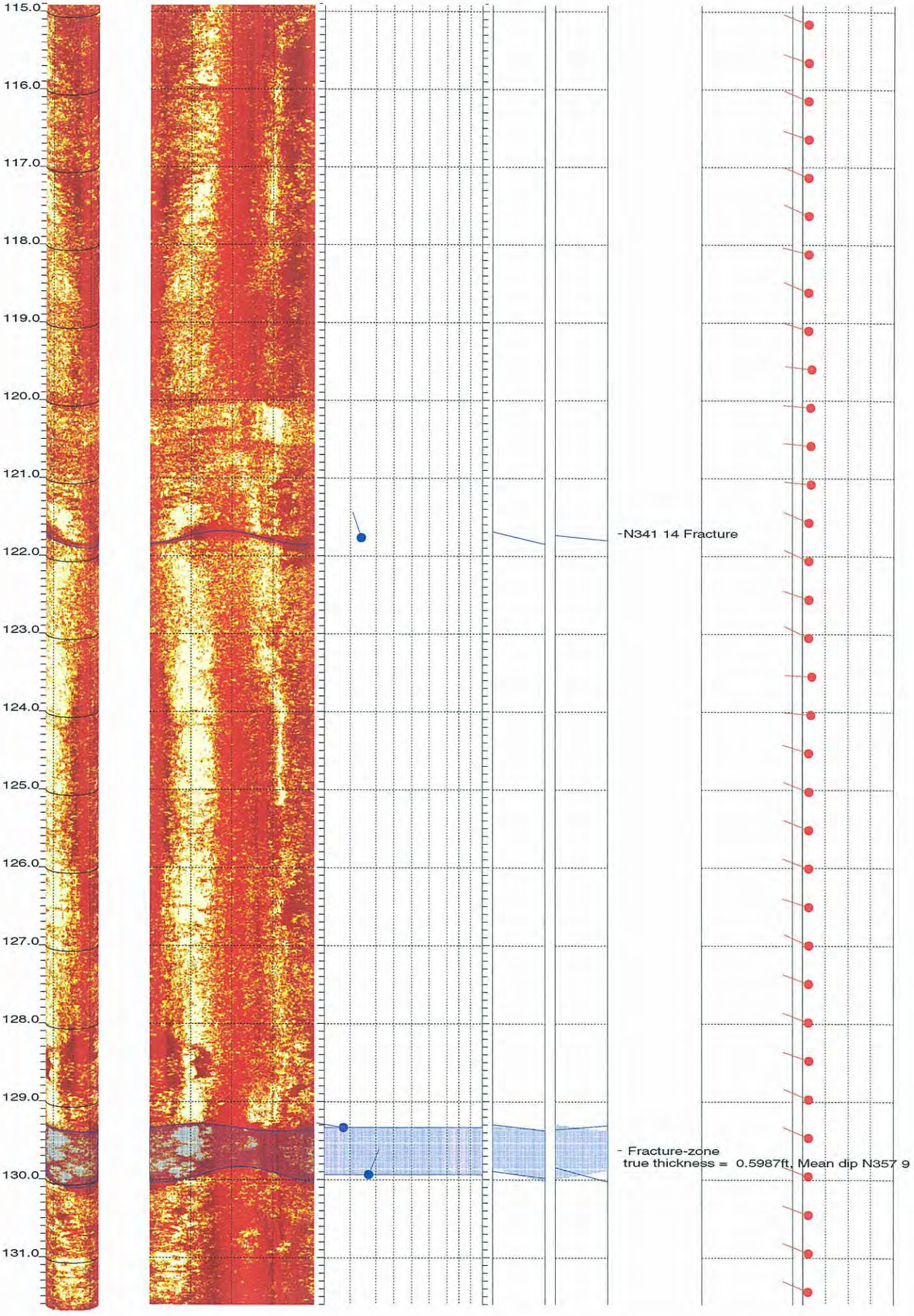
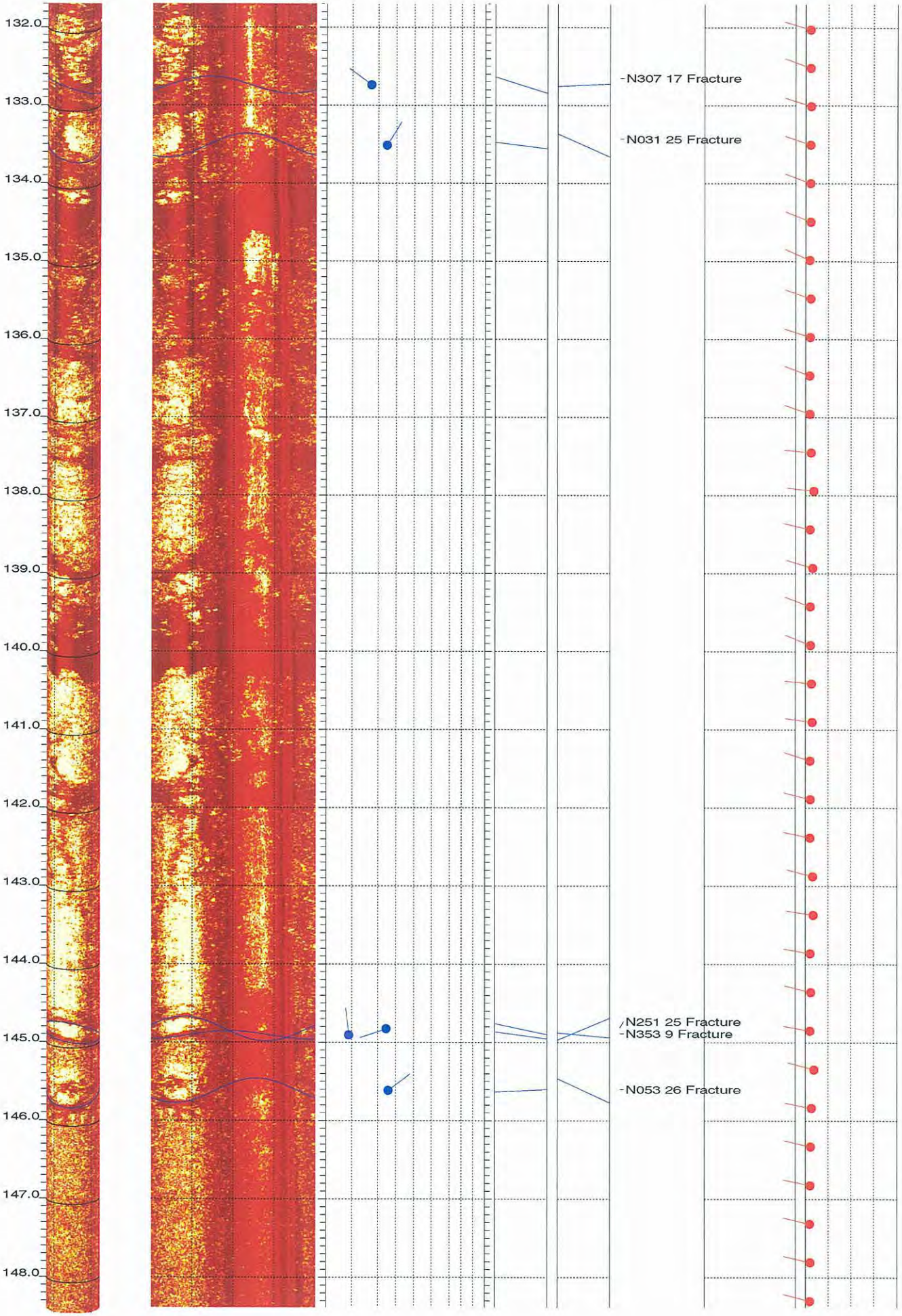
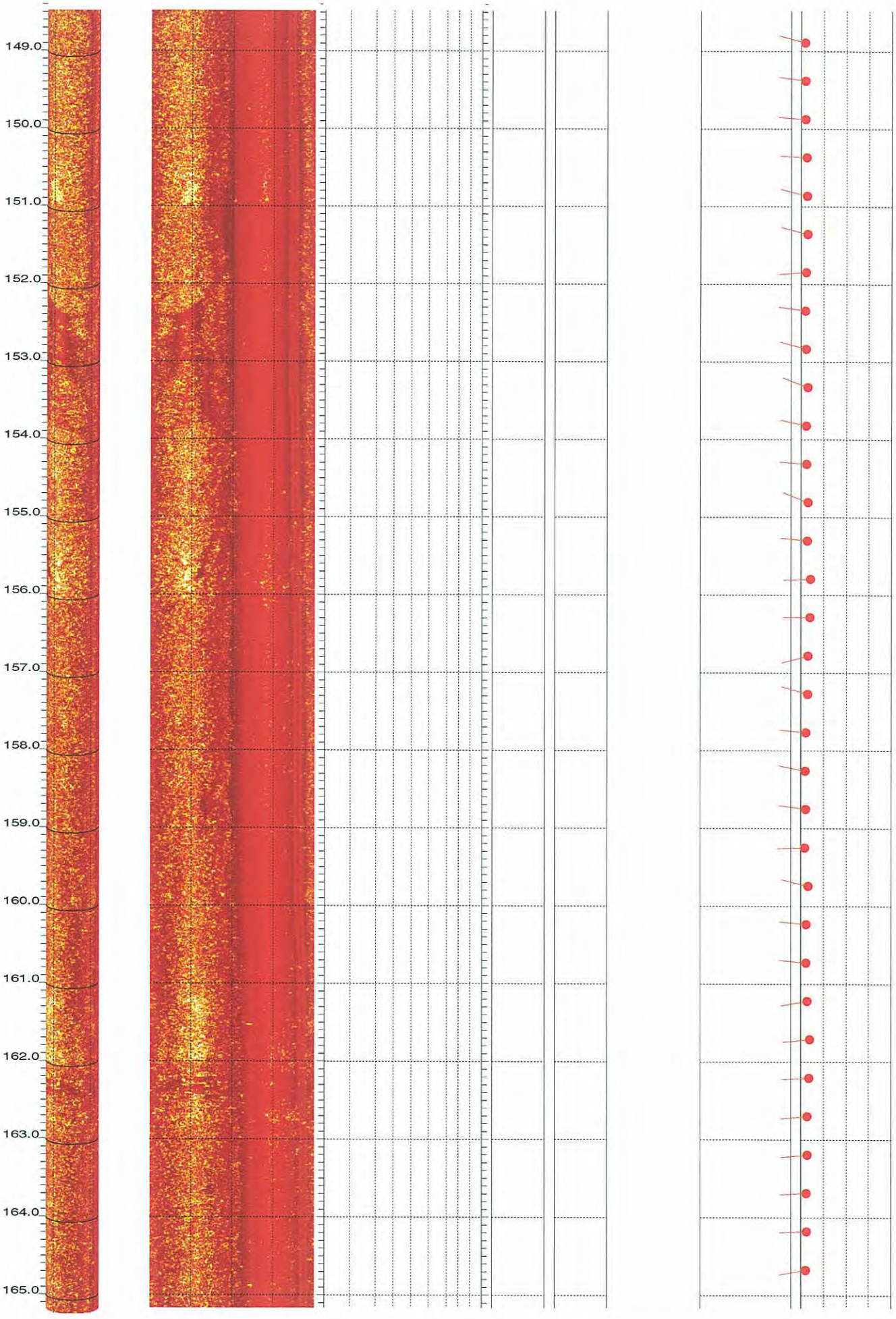
66.0
67.0
68.0
69.0
70.0
71.0
72.0
73.0
74.0
75.0
76.0
77.0
78.0
79.0
80.0
81.0

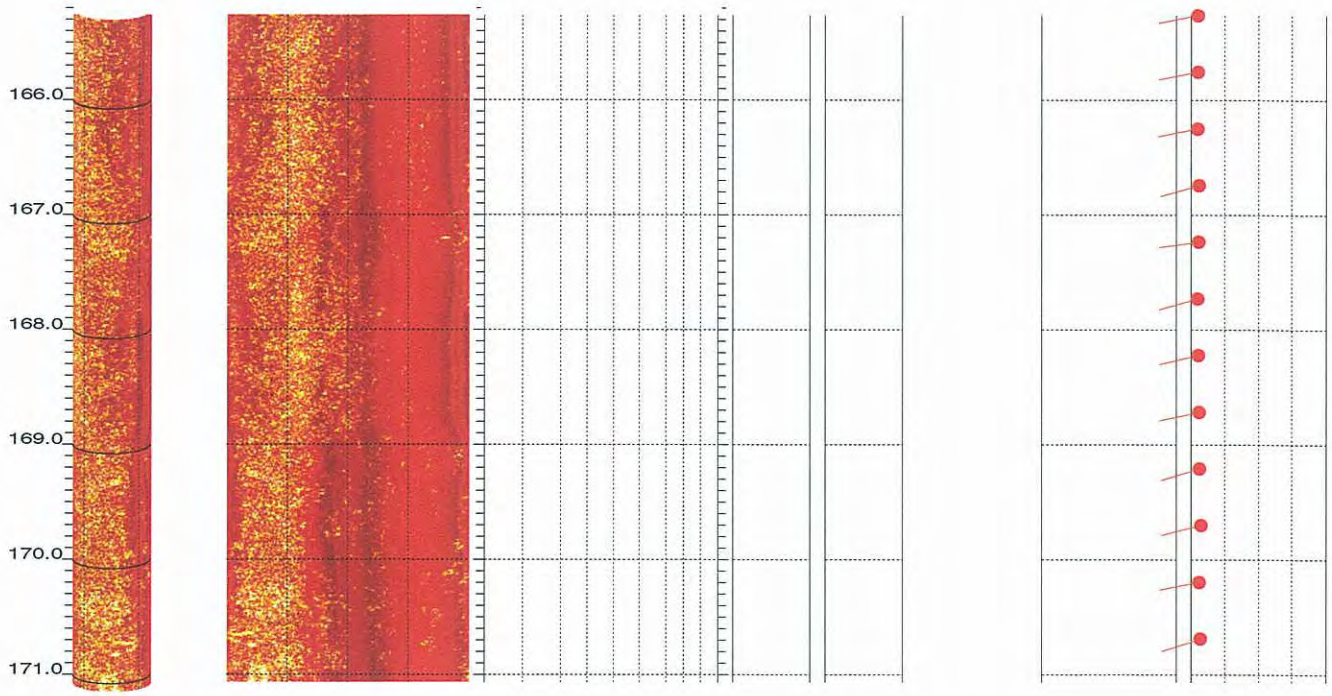

82.0
83.0
84.0
85.0
86.0
87.0
88.0
89.0
90.0
91.0
92.0
93.0
94.0
95.0
96.0
97.0
98.0
-N339 21 Fracture
-N321 7 Fracture
-N345 8 Fracture
-N249 14 Fracture
- Fracture
true thickness = 0.4286ft, Mean dip N265 7


99.0
100.0
101.0
102.0
103.0
104.0
105.0
106.0
107.0
108.0
109.0
110.0
111.0
112.0
113.0
114.0
-N077 1 Fracture
-N316 14 Fracture


115.0
116.0
117.0
118.0
119.0
120.0
121.0
122.0
123.0
124.0
125.0
126.0
127.0
128.0
129.0
130.0
131.0
-N341 14 Fracture
- Fracture-zone
true thickness = 0.5987ft, Mean dip N357 9


132.0
133.0
134.0
135.0
136.0
137.0
138.0
139.0
140.0
141.0
142.0
143.0
144.0
145.0
146.0
147.0
148.0
N307 17 Fracture
N031 25 Fracture
N251 25 Fracture
N353 9 Fracture
N053 26 Fracture


149.0
150.0
151.0
152.0
153.0
154.0
155.0
156.0
157.0
158.0
159.0
160.0
161.0
162.0
163.0
164.0
165.0


166.0
167.0
168.0
169.0
170.0
171.0

RGLDIPv6.2 BHTV results

K = 0: Stratigraphic dips
K = 2: Non-stratigraphic dips

borehole W 2-3
zone from 171.992 to 55.596 ft
North ref is magnetic
Dip format: Dip-azimuth and Dip
28 Nov 2007

	Depth	Azimuth	Dip	1-P0/100	n	Q	K	Upper Depth	Lower Depth	Well Diam	Well deviation Azimuth	Dev	Thickness	
1	145.600	N053	25.8	0.999	4	A	2	145.443	145.757	0.667	283.00	0.93	0.0000	Fracture
2	144.889	N353	8.9	1.000	3	A	2	144.836	144.942	0.667	281.19	0.53	0.0000	Fracture
3	144.809	N251	24.7	0.999	4	A	2	144.652	144.965	0.667	282.00	0.50	0.0000	Fracture
4	133.432	N031	24.8	1.000	3	A	2	133.278	133.585	0.667	297.46	0.54	0.0000	Fracture
5	132.650	N307	17.3	0.951	4	B	2	132.543	132.757	0.667	283.64	0.55	0.0000	Fracture
6	129.928	N022	17.2	0.967	5	B	2	129.825	130.031	0.667	288.47	0.60	0.5987	Fracture-zone
7	129.323	N280	7.4	0.972	5	B	2	129.276	129.370	0.667	292.00	0.63	0.0000	Fracture-zone
8	121.712	N341	14.3	0.980	5	A	2	121.625	121.800	0.667	290.53	0.74	0.0000	Fracture
9	110.913	N316	13.8	0.969	4	B	2	110.827	110.999	0.667	288.00	0.70	0.0000	Fracture
10	103.428	N077	1.2	1.000	3	A	2	103.424	103.432	0.667	292.00	0.72	0.0000	Fracture
11	95.857	N239	9.9	0.973	5	A	2	95.795	95.919	0.667	283.00	0.84	0.4286	Fracture
12	95.425	N301	7.3	0.980	4	A	2	95.378	95.472	0.667	282.48	0.76	0.0000	Fracture
13	91.080	N249	14.0	0.943	5	C	2	90.993	91.167	0.667	281.49	0.77	0.0000	Fracture
14	90.467	N345	8.5	0.985	4	A	2	90.416	90.519	0.667	281.00	0.66	0.0000	Fracture
15	85.103	N321	7.4	0.998	4	A	2	85.056	85.149	0.667	277.67	0.69	0.0000	Fracture
16	82.463	N339	20.8	0.970	4	B	2	82.334	82.592	0.667	279.00	0.71	0.0000	Fracture

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DIP DATA INTERPRETATION
RGLDIP vsn 6.2
DIP-AZIMUTH, FRACTURE ROSE-DIAGRAM

28 Nov 2007

Tetra Tech

Borehole: W 2-3

Beaumont Site 2

top of borehole.....
East:_
North:_
Alt: _

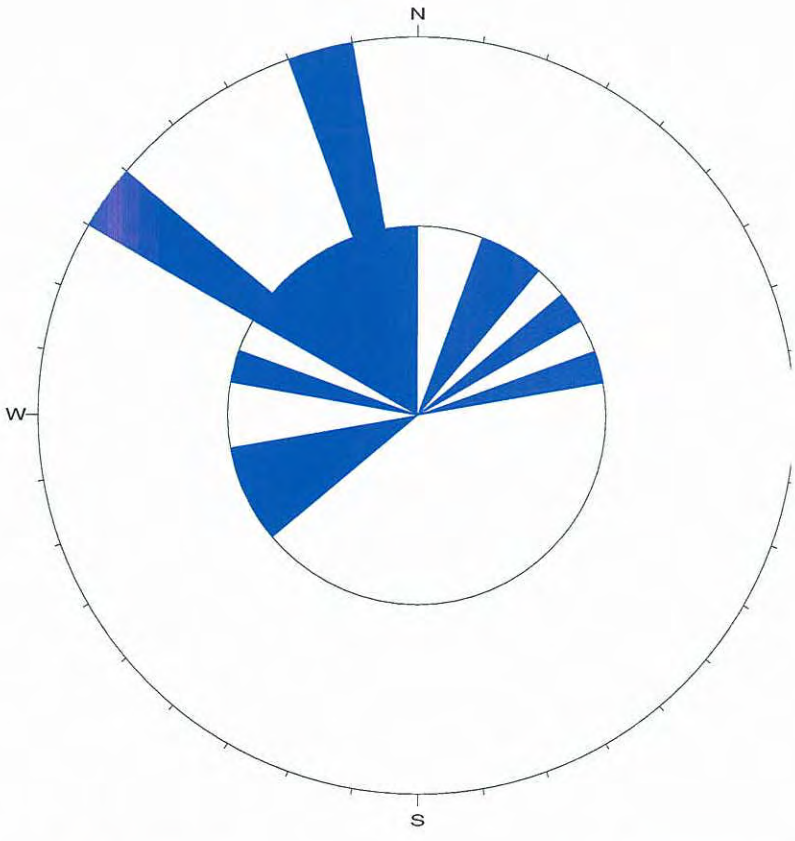
North ref. is magnetic
Depth units are feet

Zone from 146.100 to 81.963ft

Interpretation 1

Dip data sets .....
BHTV dips

W 2-3
81.963 - 146.100ft
Dip-azimuth, fracture rose-diagram



Azimuth Incr = 10°
N = 16

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DIP DATA INTERPRETATION
RGLDIP vsn 6.2
FRACTURE ANALYSIS STEREOGRAMS

28 Nov 2007

Tetra Tech

Borehole: W 2-3

Beaumont Site 2

top of borehole.....
East:_
North:_
Elev:_

North ref: magnetic
Depth units are feet

Zone from 146.100 to 81.963ft
Mean dip format: dip-azimuth and dip

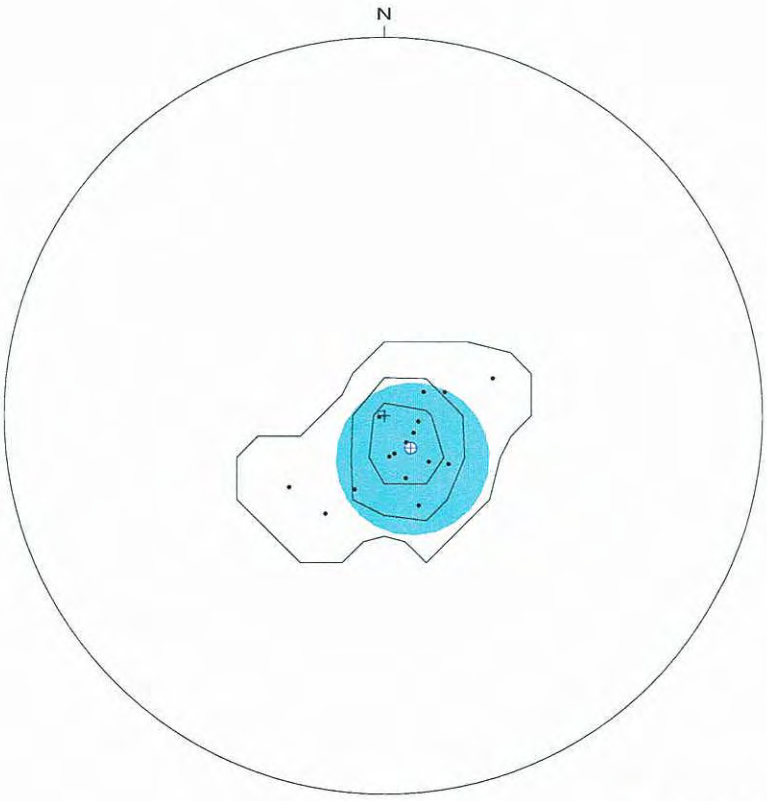
Interpretation 1

Dip data sets .....
BHTV dips

W 2-3
Zone 0. 81.963 - 146.090ft
Deviation 0.70 N284.60

dipdata sets.....
BHTV dips

	mean dip	n	f
N321 9	N321 9	13	0.20



⊕ mean dip
□ well axis

equal-area lower-hemisphere 0-90
contour-levels 1,3,6,

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DIP DATA INTERPRETATION
RGLDIP vsn 6.2
FRACTURE ANALYSIS LOG

28 Nov 2007

Tetra Tech

Borehole: W 2-3

Beaumont Site 2

top of borehole.....
East:_
North:_
Elev:_

North ref: magnetic
Depth units are feet
Vertical scale: 1/200

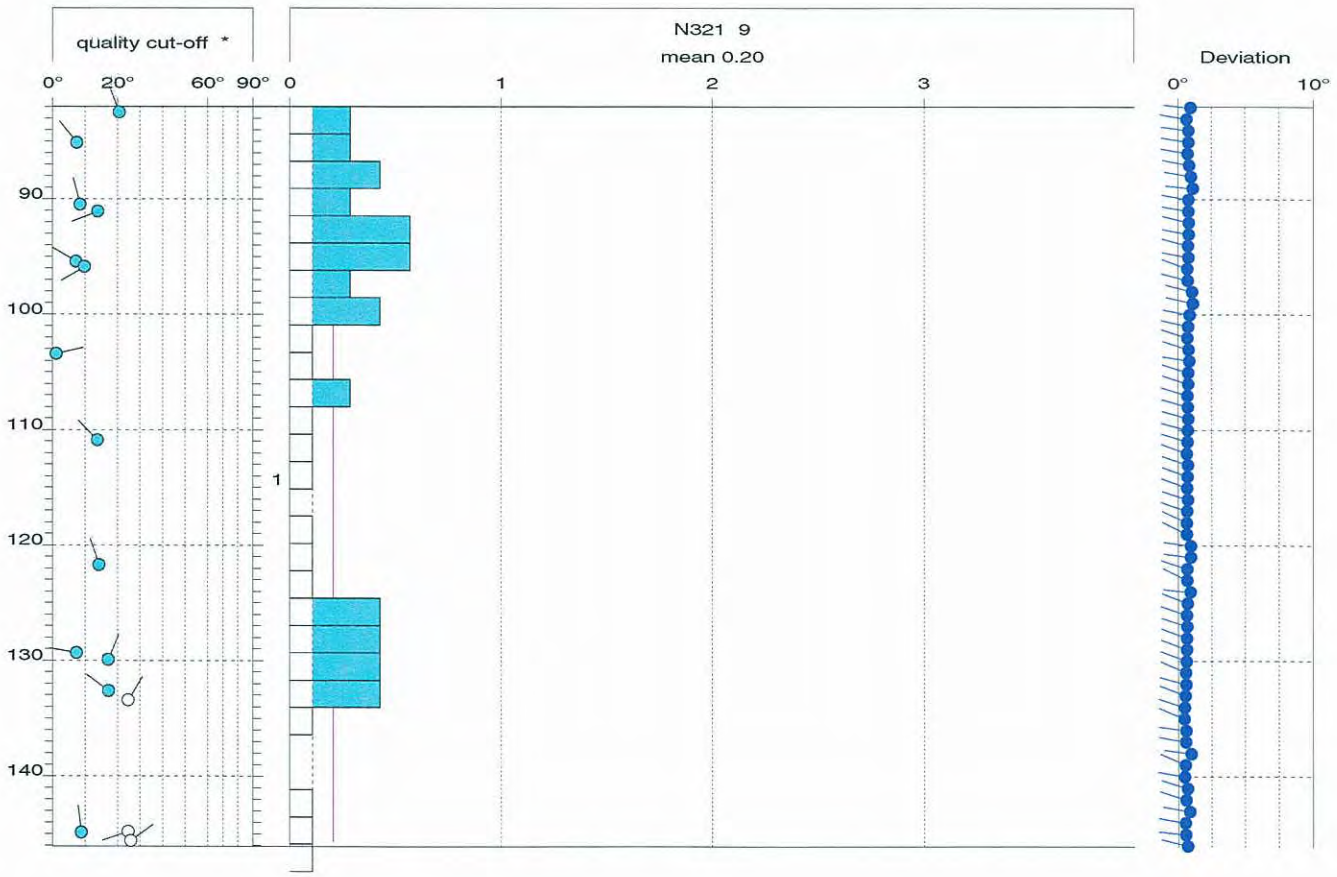
Zone from 146.100 to 81.963ft
Mean dip format: dip-azimuth and dip
Frequency histogram parameters:

measurement distance 7.101ft
step distance 2.367ft

Interpretation 1

Dip data sets .....
BHTV dips

open symbols not used in mean-dip/zone-axis calculation



RGLDIPv6.2 DIP DATA INTERPRETATION: FRACTURE ANALYSIS

borehole W 2-3
zone from 81.000 to 146.000 m
North ref is magnetic
28 Nov 2007

Data is classed into 1 types
3 BHTV_dips

Quality cut-off level: *

Mean well deviation: 0.7°deg to N284.6°

1 small-circles defined

	SEARCH AREA			MEAN DIP		
	azim	pl	cone	azimuth	dip	n	f
1	147.3°	78.7°	16.4°	231°	9°	13	0.20

Total number of data = 13
Number of data unaccounted for = 3

ZONE No.	DEVIATION Dev	Azim	DEPTHS m TOP	BASE	No. DATA	MEAN DIPS and FREQUENCIES Azi	Dip	n	f	Azi	Dip	n	f	Azi	Dip	n	f	Azi	Dip	n	f	Azi	Dip	n	f
1	0.7	284.6	81.97	146.09	16	231	9	13	0.21	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00

Flo-Pac™

FloVision Interpretation Package

Prepared Especially For

Tetra Tech

Well MW 2-3

November 26, 2007

This FloVision Flowmeter Interpretation Package represents our best efforts to provide a correct interpretation. Nevertheless, since all interpretations are opinions based on inferences from electrical or other types of measurements, we cannot and do not guarantee the accuracy or correctness of any interpretation, and we shall not be liable or responsible for any loss, costs, damages, or expenses incurred or sustained by Customer resulting from any interpretation made by this document. Welenco does not warrant or guarantee the accuracy of the data, specifically including (but without limitations) the accuracy of data transmitted by electronic process, and Welenco will not be responsible for accidental or intentional interception of such data by third parties. Welenco employees are not empowered to change or otherwise modify the attached interpretation. By accepting this Interpretation Package, the Customer agrees to the foregoing, and to the General Terms and Conditions of Welenco.

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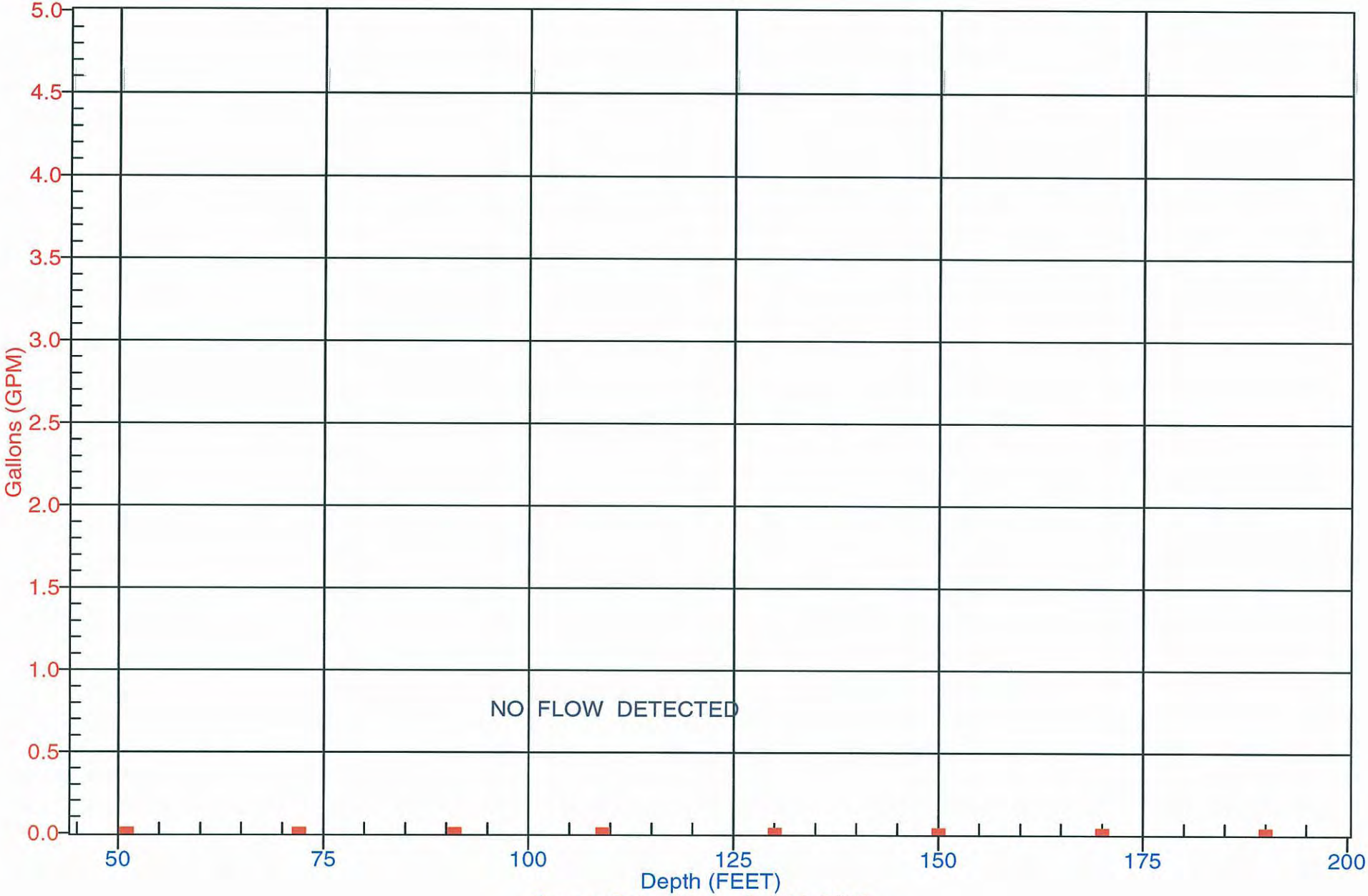
Flo-Pac welenco, inc. (800) 445-9914	FloVision FLOWMETER TABULAR RESULTS						
Company: Tetra Tech							
Well Name: Well MW 2-3							
Field: Beaumont							
Location: LMC Beaumont Site 2							
Date of Survey: November 26, 2007							
1st Hole Diameter, I.D.: 10 Inches To 193 Feet							
2nd Hole Diameter, I.D.: NONE							
Survey By: Zbigniew Bobinski							
	DEPTHS,	**TIME,**	**VELOCITY,**	**VOLUME,**	**DIRECTION**		**Run**
Survey Remarks	**In Feet**	**In Sec/Ft**	**In FPM**	**In GPM**	**UP**	**DOWN**	**No.**
Static water level found at 49 ft.	51	0	0.0	0.0			1
	72	0	0.0	0.0			1
	91	0	0.0	0.0			1
	109	0	0.0	0.0			1
	130	0	0.0	0.0			1
	150	0	0.0	0.0			1
Visibility worsens near the bottom, and on last reading position of	170	0	0.0	0.0			1
the sensor is not clear but, generally picture shows no sign of flow.	190	0	0.0	0.0			1
NO FLOW DETECTED .							

Tetra Tech

Well MW 2-3

FLO-PAC FloVision Flowmeter Results

Hole Diameter: 10 Inches to 193 Feet



Survey Date: November 26, 2007

welenco

5201 Woodmere Drive, Bakersfield, CA 93313-- www.welenco.com--(800) 445-9914
California Contractor's License No. 722373

DUAL INDUCTION - GAMMA - CALIPER LOG

FILING NO.

COMPANY Tetra Tech

WELL W 2-3

FIELD LMC Beaumont Site 2

STATE California COUNTY Riverside

LOCATION:
South of 60 Fwy and Jack Rabbit Trail

OTHER SERVICES:
Spec GR
ATV
TFC

JOB NO.
8513

SEC: 18 TWP: 3S RGE: 1W LAT.: 33° 54' 13.5" LONG.: 117° 1' 40.9" MERIDIAN.: San Bernardino

Permanent Datum: Top of Surface Casing (Corr) **, Elev.** ____ **Ft. Elev.: K.B.** ____ **Ft.**
Log Measured From: Top of Surface Casing (Corr) **, 0 Ft. Above Perm. Datum** **D.F.** ____ **Ft.**
Drilling Measured From: ____ **G.L.** ____ **Ft.**

Date	Nov. 13, 2007	Nov. 13, 2007		
Type Of Log	Induction	Caliper		
Run	Ind	Cal		
Depth-Driller	210 Ft	210 Ft	Ft	Ft
Depth-Logger	209 Ft	209 Ft	Ft	Ft
Top Logged Interval	57 Ft	2 Ft	Ft	Ft
Btm. Logged Interval	209 Ft	209 Ft	Ft	Ft
Type Fluid In Hole	Water			
Fluid Level	56 Ft	Ft	Ft	Ft
Max Temp	°F	°F	°F	°F
Operating Rig Time	2 Hr	Hr	Hr	Hr
Van No. / Location	LV-1 / Bfld			
Recorded By	Craig Corbell			
Witnessed By	Chris Patrick			

RUN	BOREHOLE RECORD			CASING RECORD			
NO.	BIT	FROM	TO	SIZE	TYPE	FROM	TO
1	In	Ft	Ft	8 In	Steel	0 Ft	57 Ft
2	In	Ft	Ft	In		Ft	Ft
3	In	Ft	Ft	In		Ft	Ft

Miscellaneous Information

Remarks:

GPS Coord. WGS 84

NOTICE at the bottom of this heading also applies.

Perforated Intervals:

57 Ft. To 209 Ft.		

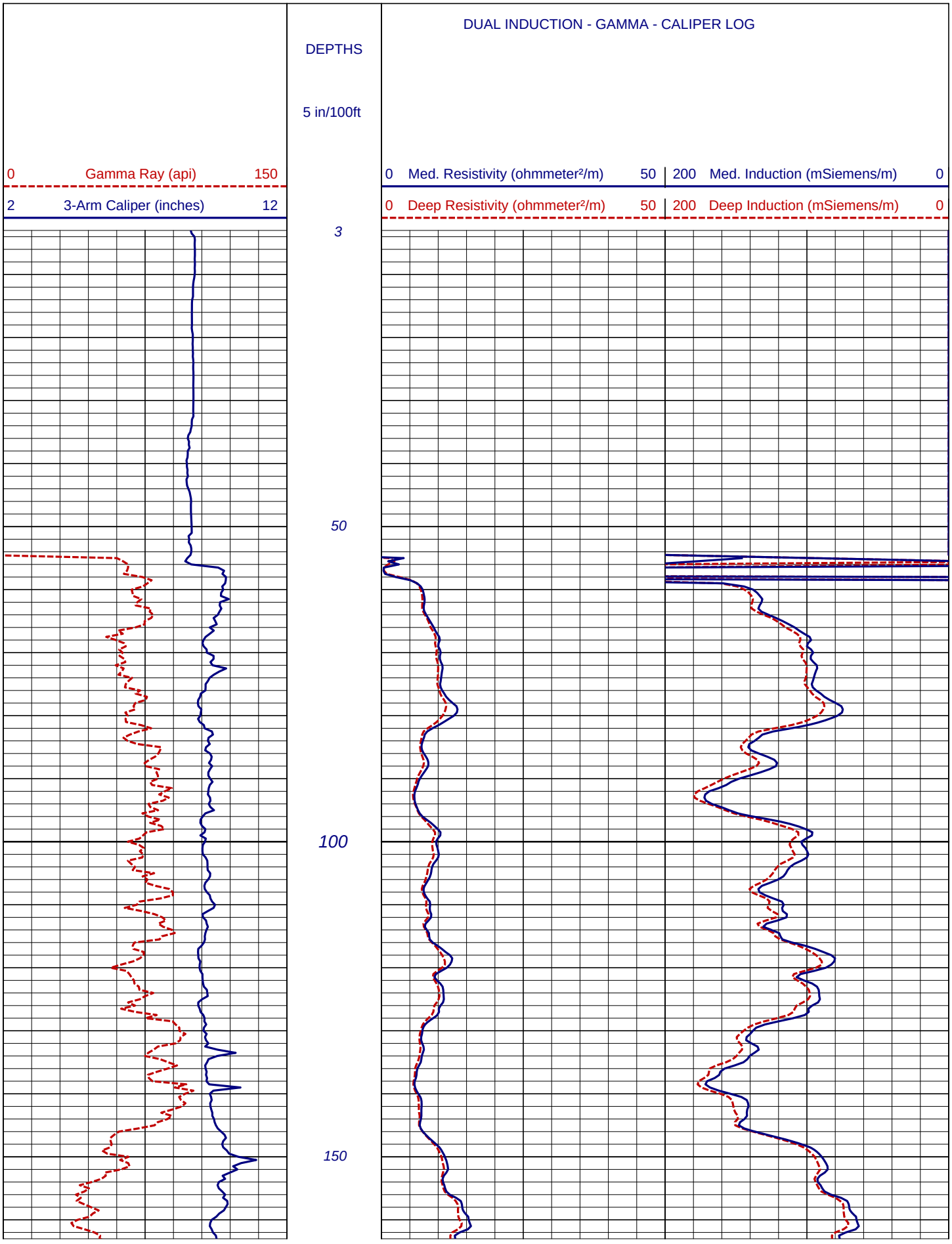
Line Speed:

Run #1: Solid Line, 30 FPM, Down	

Borehole Volume Calculations:

Other Information:

Tetra Tech W 2-3 Nov 13, 2007



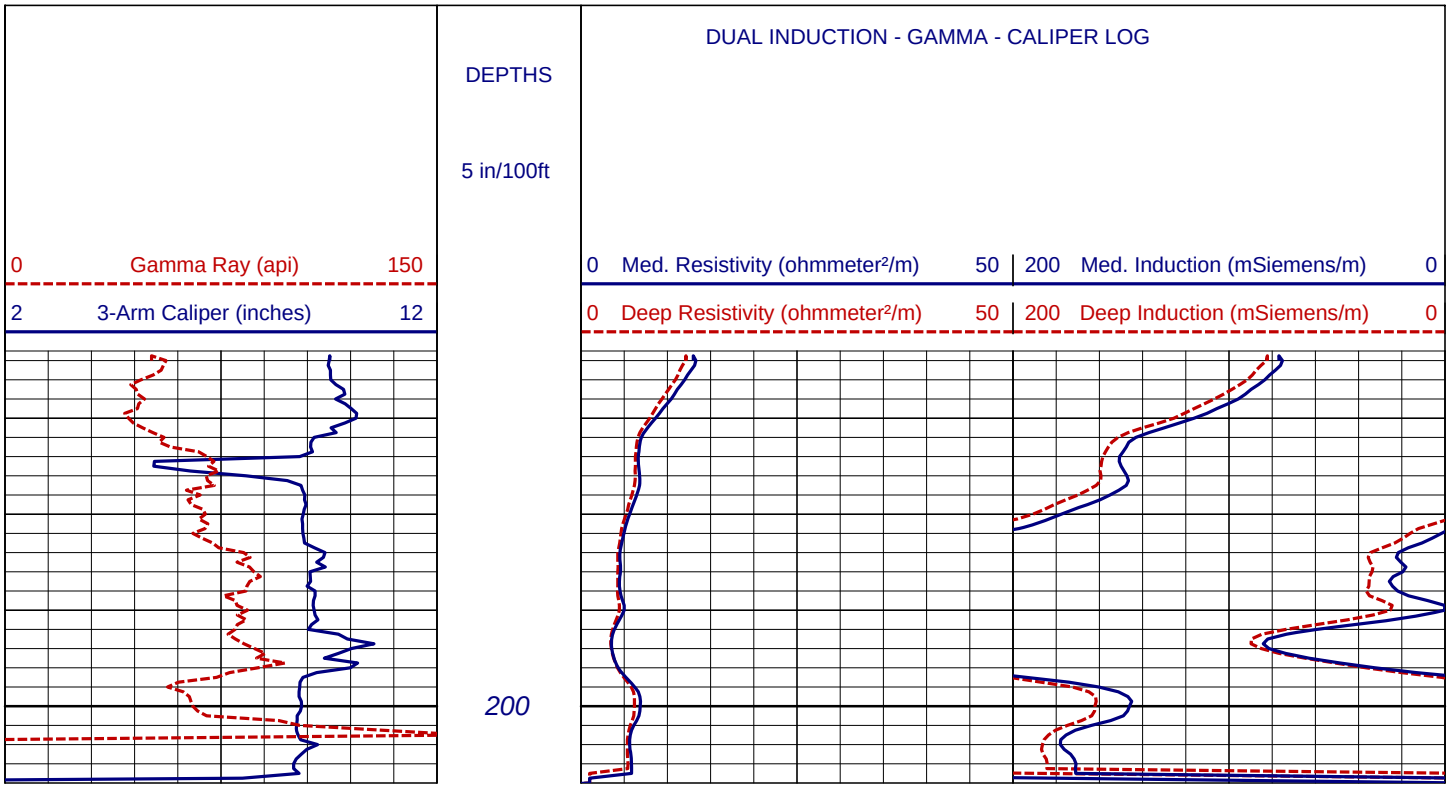
Log Page No. 1 of 2 Pages

Page Length: 3 - 163 Feet (160 Feet)

Time: 12:41:15 PM

Date: Nov 13, 2007

Tetra Tech W 2-3 Nov 13, 2007



Log Page No. 2 of 2 Pages

Page Length: 163 - 208 Feet (45 Feet)

Time: 12:41:15 PM

Date: Nov 13, 2007

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California Contractor's License No. 722373

SPECTRAL GAMMA RAY LOG

FILING NO.

COMPANY Tetra Tech

WELL W 2-3

FIELD LMC Beaumont Site 2

STATE California COUNTY Riverside

LOCATION:
South of 60 Fwy and Jack Rabbit Trail

OTHER SERVICES:
TFC
Cal
D Ind
ATV

JOB NO.
8513

SEC: 18 TWP: 3S RGE: 1W LAT.: 33° 54' 13.5" LONG.: 117° 1' 40.9" MERIDIAN.: San Bernardino

Permanent Datum: Top of Surface Casing (Corr) **, Elev.** ____ **Ft. Elev.: K.B.** ____ **Ft.**
Log Measured From: Top of Surface Casing (Corr) 0 **Ft. Above Perm. Datum** **D.F.** ____ **Ft.**
Drilling Measured From: ____ **G.L.** ____ **Ft.**

Date	Nov. 13, 2007			
Type Of Log	Spectral GR			
Run	One			
Depth-Driller	210 Ft	Ft	Ft	Ft
Depth-Logger	208 Ft	Ft	Ft	Ft
Top Logged Interval	0 Ft	Ft	Ft	Ft
Btm. Logged Interval	209 Ft	Ft	Ft	Ft
Type Fluid In Hole	Water			
Fluid Level	56 Ft	Ft	Ft	Ft
Max Temp	°F	°F	°F	°F
Operating Rig Time	2 Hr	Hr	Hr	Hr
Van No. / Location	LV-1 / Bfld			
Recorded By	Craig Corbell			
Witnessed By	Chris Patrick			

RUN	BOREHOLE RECORD			CASING RECORD			
NO.	BIT	FROM	TO	SIZE	TYPE	FROM	TO
1	In	Ft	Ft	8 In	Steel	0 Ft	57 Ft
2	In	Ft	Ft	In		Ft	Ft
3	In	Ft	Ft	In		Ft	Ft

Miscellaneous Information

Remarks:

GPS Coord. WGS 84

NOTICE at the bottom of this heading also applies.

Perforated Intervals:

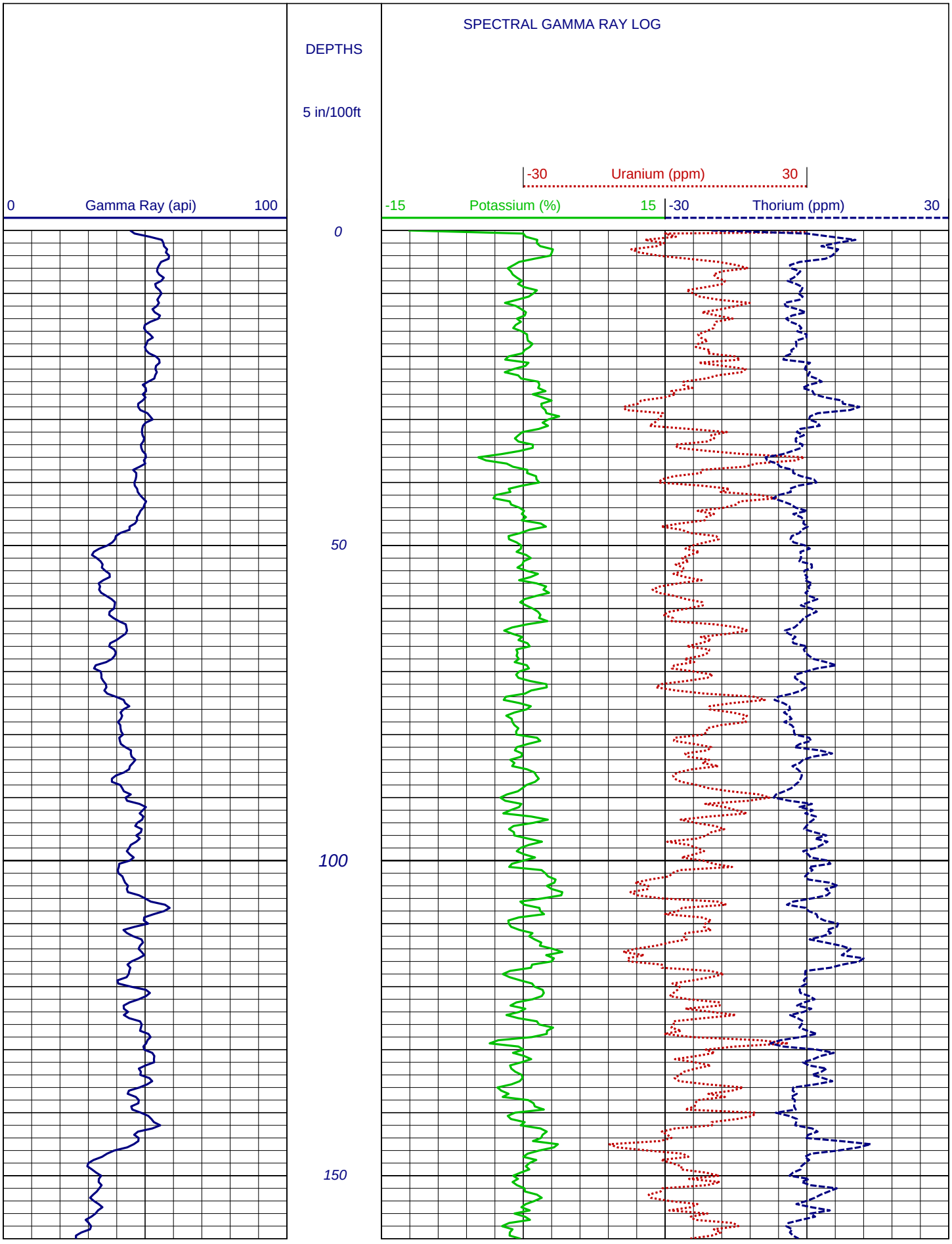
57 Ft. To 209 Ft.		

Line Speed:

Borehole Volume Calculations:

Other Information:

Tetra Tech W 2-3 Nov 13, 2007



Log Page No. 1 of 2 Pages

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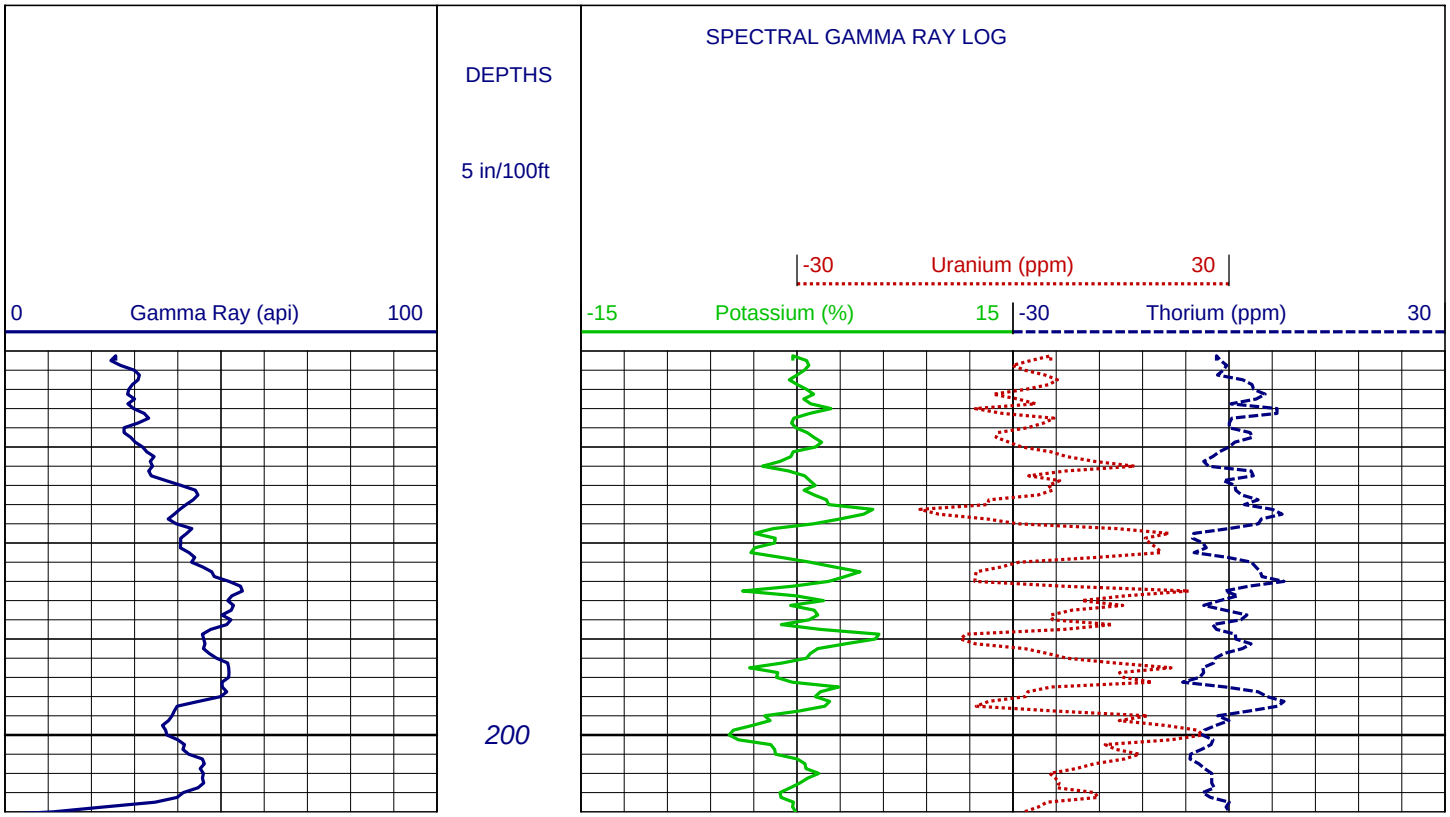
Time: 12:48:43 PM

Date: Nov 13, 2007

Tetra Tech W 2-3 Nov 13, 2007



Log Page No. 2 of 2 Pages

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Time: 12:48:44 PM

Date: Nov 13, 2007