Western Refining Southwest LLC
A subsidiary of Marathon Petroleum Corporation
I-40 Exit 39
Jamestown, NM 87347

September 15, 2021

Mr. Kevin Pierard, Chief
New Mexico Environment Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505

RE: Response to Disapproval
Marketing Tank Farm Laser-Induced Fluorescence/Hydraulic Profiling Investigation Report
Western Refining Southwest Inc., Marathon Gallup Refinery
EPA ID #NMD000333211, HWB-WRG-21-007

Dear Mr. Pierard:

Attached please find the response to comments contained in the New Mexico Environment Department (NMED) Disapproval letter dated June 2, 2021. This submittal also includes two copies of the revised report and a CD with an electronic copy of the redlined report and the revised report. The electronic copies will also be submitted by email to NMED.

A timeline of the reporting is shown below:

- *Marketing Tank Farm Laser-Induced Fluorescence/Hydraulic Profiling Investigation Report*, submitted March 31, 2021
- *Disapproval*, received June 2, 2021

If you have any questions or comments regarding the information contained herein, please do not hesitate to contact Mr. John Moore at (505) 879-7643.

Certification

I certify under penalty of law that this document and all attachments were prepared under my direction of supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is,

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to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Sincerely,
Western Refining Southwest LLC, Marathon Gallup Refinery

Ruth A. Cade

Ruth Cade
Vice-President

Enclosure

cc: D. Cobrain, NMED HWB
G. McCartney, Marathon Petroleum Corporation
M. Suzuki, NMED HWB
K. Luka, Marathon Petroleum Corporation
T. McDill, NMOCD
J. Moore, Marathon Gallup Refinery
L. King, EPA Region 6
H. Jones, Trihydro Corporation

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ATTACHMENT A. RESPONSE TO COMMENTS

New Mexico Environment Department (NMED) to Marathon Petroleum Company (MPC) Comment Letter "Disapproval Marketing Tank Farm Laser-Induced Fluorescence/Hydraulic Profiling Investigation Report" (June 2, 2021)

NMED Comments	MPC Responses
Comment 1:	**Response 1:**
The cover letter states, "[t]he LIF/HP lithologic boring logs will be submitted to the New Mexico Environment Department under separate cover letter by April 30, 2021." Appendix C, LIF/HP logs, that presents the LIF/HP lithologic boring logs is included in the Report. Clarify whether the referenced logs are already included in the Report or if there are additional logs. If not, the referenced logs have not been received by NMED as of May 27, 2021. In this case, submit the referenced document to NMED upon receipt of this letter.	This comment has been acknowledged. The lithologic boring logs are available in Attachment C of this Response to Comments (RTC) letter.
Comment 2:	**Response 2:**
In the Executive Summary, page 3, and Section 4.0, *Conclusion*, page 16, the Permittee states, "[t]he gasoline occurrence splits into two lobes at the west side of the parking lot (Figure 3-2)." The gasoline lobes are designated as northern and southern lobes and the diesel lobes are designated as the east and west lobes. Figure 3-2, Approximate Locations of SPH Occurrence Marketing Tank Farm/Loading Rack, does not identify the boundary of each lobe. Provide a figure that identifies the boundaries in the revised Report.	An updated figure and discussion can be referenced in the Sitewide LIF/HP Investigation Report, which will be submitted to NMED on or before October 31, 2021. The Executive Summary, Section 3.0, and Section 4.0 text has been revised to remove the word lobes and clarify which borings belong to each designation. In the Executive summary, page 3, and Section 4.0, Conclusion, page 17, the text regarding the northern gasoline and southern gasoline lobes was updated to state, "[i]n the northern occurrence (borings MKTF-LIF-54, MKTF-LIF-74, MKTF-LIF-61, MKTF-LIF-62, MKTF-LIF-72, and MKTF-LIF-59), SPH from the north gasoline release has migrated west of monitoring well MKTF-33 and is surfacing in the borrow pit" and "[t]he southern occurrence (borings MKTF-LIF-90, MKTF-LIF-77, MKTF-79A, and MKTF-LIF-67) is migrating to

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NMED Comments	MPC Responses
	the southwest towards the 90-day pad but has not reached the water seep located just to the east of the pad (west of MKTF-LIF-90)." . The text in the Executive Summary has been modified for clarification to state, "[a] north diesel occurrence (borings MKTF-LIF-39, MKTF-LIF-40, MKTF-LIF-47, MKTF-LIF-48, MKTF-LIF-49, MKTF-LIF-50, MKTF-LIF-51, MKTF-LIF-52, MKTF-LIF-56, MKTF-LIF-66, MKTF-LIF-83, MKTF-LIF-84, MKTF-LIF-86, and MKTF-LIF-87) emanating from the Marketing Tank Farm appears to be moving through a paleochannel to the north towards the hydrocarbon seep located near monitoring well MKTF-01." In Section 3.1 Laser-induced Fluorescence Results, page 12, the text regarding the northern and southern gasoline lobes was updated to state, "[t]he north gasoline occurrence refers to borings MKTF-LIF-54, MKTF-LIF-74, MKTF-LIF-61, MKTF-LIF-62, MKTF-LIF-72, and MKTF-LIF-59" and "[t]he south gasoline occurrence refers to borings MKTF-LIF-90, MKTF-LIF-77, MKTF-79A, and MKTF-LIF-67." The text in Section 3.1 Laser-induced Fluorescence Results, page 13, has been revised for clarification to state, "[t]he north diesel occurrence refers to borings MKTF-LIF-39, MKTF-LIF-40, MKTF-LIF-47, MKTF-LIF-48, MKTF-LIF-49, MKTF-LIF-50, MKTF-LIF-51, MKTF-LIF-52, MKTF-LIF-56, MKTF-LIF-66, MKTF-LIF-83, MKTF-LIF-84, MKTF-LIF-86, and MKTF-LIF-87."

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NMED Comments	MPC Responses
Comment 3:	**Response 3:**
In the Executive Summary, page 3, and Section 4.0, *Conclusion*, page 16, the Permittee states, "[t]he leading edge of the north gasoline occurrence appears to be in the area of the borrow pit hydrocarbon seep (between MKTF-LIF-73 and MKTF-LIF-74)." Gasoline is detected at multiple borings (e.g., MKTF-LIF-60) located north of borings MKTF-LIF-73 and MKTF-LIF-74 according to Figure 3-2. Provide explanation to support the assertion or revise the statement for accuracy in the revised Report.	Executive Summary, page 3, was revised for clarity to state, "[t]he western leading edge of the north gasoline occurrence appears to be in the area of the borrow pit hydrocarbon seep (between MKTF-LIF-73 and MKTF-LIF-74)." Section 4.0, *Conclusion*, page 17, was also revised to state, "The western leading edge of the north gasoline occurrence appears to have stopped at the borrow pit hydrocarbon seep (between MKTF-LIF-73 and MKTF-LIF-74)."
Comment 4:	**Response 4:**
In the Executive Summary, page 3, and Section 4.0, *Conclusion*, page 16, the Permittee states, "SPH is in the near surface (less than 6 feet below ground surface) east of the borrow pit hydrocarbon seep near MKTF-LIF-74." According to the MKTF-LIF-74 log included in Appendix C, an elevated % RE signal is observed at a depth of approximately three feet below ground surface (bgs) and diminished at a depth of approximately six feet bgs. The depth of the water table at boring MKTF-LIF-74 is presumably below six feet bgs based on the gauging data collected from adjacent MKTF wells. Since the location of boring MKTF-LIF-74 is approximately 800 feet west of the source location, groundwater would be the only transport mechanism for SPH detected at the location. Therefore, it is not clear how SPH has migrated approximately 800 feet downgradient from the source location and been detected at a depth where groundwater is absent. Provide explanation in the revised Report.	The borrow pit hydrocarbon seep area has had approximately 20 vertical feet of soil removed causing its surface elevation to be lower. However, the removal of surface soil did not change the underlying stratigraphy or potentiometric surface. Executive Summary, page 3, and Section 4.0, *Conclusion*, page 17, were revised to state, "SPH is in the near surface (less than 6 feet below ground surface [ft bgs]) east of the borrow pit hydrocarbon seep near MKTF-LIF-74. SPH was observed between 3.41 and 5.33 feet bgs and groundwater was observed between 5.04 and 8.31 feet while installing sumps in the borrow pit hydrocarbon seep area." These data are also presented and discussed in the Borrow Pit Interceptor Sumps Installation Summary Letter, submitted to NMED on July 13, 2021.

New Mexico Environment Department (NMED) to Marathon Petroleum Company (MPC) Comment Letter "Disapproval Marketing Tank Farm Laser-Induced Fluorescence/Hydraulic Profiling Investigation Report" (June 2, 2021)

NMED Comments	MPC Responses
Comment 5:	**Response 5:**
In the Executive Summary, page 3, and Section 4.0, *Conclusion*, page 16, the Permittee states, "southern [gasoline] lobe is migrating to the southwest towards the 90-day pad but has not reached the water seep located just to the east of the pad (west of MKTF-LIF-90)." According to Figure 3-2, no boring was advanced west of MKTF-LIF-90; therefore, the leading edge of the gasoline plume is not delineated. Well MKTF-42 is suitable as a sentinel well for the detection of SPH migrating west of MKTF-LIF-90. However, the water seep location must also be visually monitored on a monthly basis for potential breakthrough. Propose to monitor the seep and report the monitoring results in the future quarterly hydrocarbon seep interim measures status reports.	The water seep location will be visually monitored on a monthly basis and was reported in the second quarterly hydrocarbon seep report, submitted on July 30, 2021.
Comment 6:	**Response 6:**
In the Executive Summary, page 3, and Section 4.0, *Conclusion*, page 16, the Permittee states, "[a] north diesel occurrence emanating from the Marketing Tank Farm appears to be moving through a paleochannel to the north towards the hydrocarbon seep located near monitoring well MKTF-01." Note that the location of the referenced paleochannel may coincide with that of the sewer line to the Sanitary Lagoon. Therefore, the diesel migration may follow the sewer line. The Permittee's Sanitary Lagoon Investigation Phase II Work Plan, dated March 31, 2021, proposes to install trenches along the sewer line. The investigation may help identify the diesel migration path toward the hydrocarbon seep area. Incorporate the findings from this LIF/HP investigation in the Sanitary Lagoon investigation report, as appropriate.	This comment has been acknowledged. The results from the LIF Investigation will be considered in the Sanitary Lagoon investigation report, as appropriate.

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NMED Comments	MPC Responses
Comment 7:	**Response 7:**
In the Executive Summary, page 3, and Section 4.0, *Conclusion*, page 16, the Permittee states, "[t]he west [diesel] lobe of the occurrence appears to be comingling in the south with the MKTF gasoline occurrence and in the north with the naphtha occurrence, migrating beneath the road from the east." The statement is not clear because the references to the statement are not provided (see also Comment 2). Revise the statement for clarity.	The Executive Summary, page 3, and Section 4.0, *Conclusion*, page 17, has been clarified to state, "[t]he north diesel occurrence appears to be mixing in the south with the MKTF gasoline occurrence (e.g., MKTF-LIF-36 and MKTF-LIF-47) and in the north with the naphtha occurrence (e.g., MKTF-LIF-84 and MKTF-LIF-86). The diesel on the eastern side of the Refinery is migrating to the west towards the crude tanks from the process area and is nearing the Marketing Tank Farm complex (MKTF-LIF-66)."
Comment 8:	**Response 8:**
In the Executive Summary, page 3, and Section 4.0, *Conclusion*, page 16, the Permittee states, "[t]he east lobe of the occurrence is migrating to the west towards the crude tanks from the process area and is nearing the Marketing-Tank Farm complex (MKTF-LIF-66). The waveforms from this occurrence are similar to the waveforms observed in PA-LIF-4." According to Appendix C, the % RE signals of boring MKTF-LIF-66 (max % RE = 708.9% at 8.57 feet bgs) are much greater than those of boring PA-LIF-4 at any depth (max % RE = 196.1% at 10.48 feet bgs). If diesel were migrating from the process area to the crude tanks and marketing tank farm, the % RE responses of boring PA-LIF-4 would likely be greater since it is located closer to the source area (Process Area); however, the data indicates otherwise. Provide explanation for why diesel may be originating from the process area rather than other potential source areas such as SWMU 6 -Tank Farm in the revised Report.	It is possible that there are two distinct sources that are not connected. The additional data collected during the May 2021 event discusses these data. Reference the Sitewide LIF/HP Investigation Report, which will be submitted to NMED on or before October 31, 2021.

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NMED Comments	MPC Responses
Comment 9:	**Response 9:**
In the Executive Summary, page 4, the Permittee states, "[the recommendations include] [i]nvestigating the Process Area diesel occurrence to evaluate the eastern extent prior to recommending any remediation activities." NMED concurs that the Process Area needs further investigation. Submit a work plan proposing to investigate the Process Area no later than November 30, 2021.	The comment has been acknowledged and an additional work plan proposing to investigate the Process Area (AOC 26) will be submitted by November 30, 2021.
Comment 10:	**Response 10:**
In Section 3.0, *Investigation Results*, page 11, the Permittee states, "[t]he air knife excavations were backfilled with dry cuttings prior to installing the LIF/HP boreholes. Therefore, the LIF/HP interval of 0-5 ft was not representative of undisturbed subsurface conditions." According to the MKTF-LIF-74 log included in Appendix C, an elevated % RE signal is observed at a depth of approximately three feet below ground surface (bgs) and diminished at a depth of approximately six feet bgs. Provide a clarification whether the interval of boring MKTF-LIF-74 represents backfill material. If it represents backfill material, the data collected from MKTF-LIF-74 is not representative. If it does not represent backfill material, provide a table that indicates which borings used the air knife excavation/backfill procedures in the revised Report.	The top five feet of MKTF-LIF-74 represents backfill emplaced after air knifing activities were completed for utility locates. Sometimes when potholing and removing the native soils, fluid can fill into the hole before or after it has been backfilled. MKTF-LIF-74 is located in the borrow pit area. In April 2021, five sumps were installed in this area to depths of 8 ft bgs and have up to 6 ft of SPH present. These data can be reviewed in the Borrow Pit Interceptor Sumps Installation Summary Letter, submitted to NMED on July 13, 2021. The MKTF-LIF-74 log showed SPH in shallow soil, which is confirmed by the presence of SPH in the sumps. Because all of the LIF borings completed during the February 2021 event were air knifed and backfilled, a table has not been provided in the revised report. However, the text in Section 3.0, *Investigation Results*, page 11, has been clarified to state, "[t]he air knife excavations were backfilled with excavated material prior to installing the LIF/HP boreholes. Therefore, the LIF/HP interval of 0-5 ft was not representative of undisturbed subsurface conditions."

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NMED Comments	MPC Responses
Comment 11:	**Response 11:**
Section 3.1, *Laser-Induced Fluorescence Results*, pages 11 through 13, discusses the LIF results for borings designated as MKTF-LIF and PA-LIF. Figure 3-2 also presents borings designated as EB-LIF that were advanced in the vicinity of Tank 572. Elevated % RE signals were observed from these borings according to Appendix C. However, the Report does not discuss the results collected from the borings designated as EB-LIF. Revise the Report to include the discussion for the data collected from the borings designated as EB-LIF.	The boring locations designated as EB-LIF have been removed from the figures for this report. A discussion of the EB-LIF borings is included in the Sitewide LIF/HP Report, which will be submitted to NMED on or before October 31, 2021.
Comment 12:	**Response 12:**
In Section 3.1, *Laser-Induced Fluorescence Results*, page 12, the Permittee states, "[a] classic gasoline waveform appears in MKTF-LIF-37 below approximately 6 ft bgs." According to the MKTF-LIF-37 log included in Appendix C, elevated % RE signals are observed at the depth intervals of approximately 5 - 17 feet bgs and 22 - 29.5 feet bgs. Although elevated % RE signals were detected at a termination depth of 29.5 feet, boring MKTF-LIF-37 was not advanced to a deeper interval. Therefore, the vertical extent of the SPH distribution at boring MKTF-LIF-37 was not determined. The boring should have been advanced to the depth where % RE signals diminish. Include this provision in future LIF investigations. No response required.	This comment has been acknowledged. Due to the nature of the probe used to collect LIF/HP data, it is vulnerable to damage once it reaches tight or competent material. Because tighter, more competent material was encountered at the termination depth in MKTF-LIF-37, the boring was not advanced any deeper despite continued % RE signals due to probe refusal. Future efforts will include an attempt with a dummy tip to advance deeper. In addition, future reports will note if refusal is reached with the LIF/HP probe.

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NMED Comments	MPC Responses
Comment 13:	**Response 13:**
In Section 3.1, *Laser-Induced Fluorescence Results*, page 12, the Permittee states, "[i]n MKTF-LIF-42, the SPH is following lower permeability zones at 11.0 to 11.5 ft bgs, 15.5 to 16.0 ft bgs, and at the alluvium/Chinle Group interface at 20.0 ft bgs. The predominant SPH pathway appears to be from 15.5 to 18.5 ft bgs where % RE responses of up to 367 % were recorded." The statement does not appear to be accurate. Elevated % RE signals are observed at depths of approximately 11.5 to 28 feet bgs according to the MKTF-LIF-42 log included in Appendix C. Note that the % RE signal exceeding 350% appears at a depth of approximately 27.5 feet bgs rather than 15.5 to 18.5 ft bgs. Correct the statement in the revised Report.	Section 3.1, *Laser-Induced Fluorescence Results*, page 12, has been revised to state, "[i]n MKTF-LIF-42, elevated % RE signals appear from 11.5 to 28 ft bgs. The SPH is following lower permeability zones at 11.0 to 11.5 ft bgs, 15.5 to 16.0 ft bgs, and at the alluvium/Chinle Group interface at 20.0 ft bgs. The predominant SPH pathway appears to be from 15.5 to 18.5 ft bgs where % RE responses of up to 367 % were recorded. Elevated % RE signals below 20 ft bgs exceeded 350% at approximated 27.5 ft."
Comment 14:	**Response 14:**
In Section 3.1, *Laser-Induced Fluorescence Results*, page 12, the Permittee states, "[m]oving west to MKTF-LIF-42 and MKTF-LIF-43, the MKTF gasoline occurrence appears to bifurcate along western and southwestern paths (Figure 3-2)." It is not clear what data suggests that the MKTF gasoline occurrence bifurcates west of boring MKTF-LlF-42 and MKTF-LIF-43. Provide additional data and discussion to support the assertion in the revised Report.	The gasoline occurrence appears to bifurcate due to the row of LIF/HP borings with residual or no response (e.g., MKTF-LIF-64, MKTF-LIF-65, MKTF-LIF-132) that splits the northern and southern occurrences. Refer to MPC's Response 2 and Section 3.1, *Laser-Induced Fluorescence Results*, page 12 for the boring groupings.

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NMED Comments	MPC Responses
Comment 15:	**Response 15:**
In Section 3.1, *Laser-Induced Fluorescence Results*, page 12, the Permittee states, "MKTF-LIF-61 marks the northern edge of the north gasoline occurrence with a peak response at 23.73 ft bgs, similar to the depths at MKTF-LIF-62 and MKTF-LIF-54 to the south." The statement is contradictory to the previous statement in the Executive Summary and in Section 4.0 stating, "[t]he leading edge of the north gasoline occurrence appears to be in the area of the borrow pit hydrocarbon seep (between MKTF-LIF-73 and MKTF-LIF-74)" (see also Comment 3). Resolve the discrepancy in the revised Report.	In this report, the leading edge refers to the edge of the gasoline occurrence that is moving, which is west towards the borrow pit. The northern edge refers to the northern boundary of the occurrence, it does not mean that it is moving to the north. To clarify, Section 3.1, *Laser-Induced Fluorescence Results*, page 12, has been revised to state, "MKTF-LIF-58, MKTF-LIF-70, and MKTF-LIF-71 bound the northern edge of the north gasoline occurrence based on the lack of elevated % RE."
Comment 16:	**Response 16:**
In Section 3.1, *Laser-Induced Fluorescence Results*, page 12, the Permittee states, "[t]he south gasoline occurrence forms a path between MKTF-LIF-43 and MKTF-LIF-90 (Figure 3-2). This portion occurs as a very thin interval where potential product was identified in the LIF pushes. The maximum response signal is 56.4% RE at 19.91 ft bgs and is centered on a less permeable zone between 18.5 and 20.0 ft bgs." According to the MKTF-LIF-43 and MKTF-LIF-90 logs included in Appendix C, neither log appears to represent the described observation in the statement. The maximum response signals are recorded as 287.0% at 14.61 feet bgs in boring MKTF-LIF-43 and 83.2% at 16.68 feet bgs in boring MKTF-LIF-43. Correct the statement in the revised Report.	This was a typing error. The sentence in Section 3.1, *Laser-Induced Fluorescence Results*, page 12, the Permittee should have stated, "[t]he south gasoline occurrence forms a path between MKTF-LIF-43 and MKTF-LIF-90 (Figure 3-2). This portion occurs as a very thin interval where potential product was identified in the LIF pushes. The maximum response signal in MKTF-LIF-67 is 56.4% RE at 19.91 ft bgs and is centered on a less permeable zone between 18.5 and 20.0 ft bgs."

New Mexico Environment Department (NMED) to Marathon Petroleum Company (MPC) Comment Letter "Disapproval Marketing Tank Farm Laser-Induced Fluorescence/Hydraulic Profiling Investigation Report" (June 2, 2021)

NMED Comments	MPC Responses
Comment 17:	**Response 17:**
In Section 3.1, *Laser-Induced Fluorescence Results*, page 12, the Permittee states, "MKTF-LIF-77 has a strong response of 321% RE at 18.03 ft bgs with the SPH filling a less permeable zone between 17.0 and 19.0 ft bgs. This permeable zone appears to resemble the permeable zone in MKTF-LIF-67." The former and latter sentences appear to be contradictory regarding the description of permeable zone. According to the MKTF-LIF-77 log included in Appendix C, the conductivity readings at a depth of approximately 17 and 19 feet bgs range 40 to 70 mS/m, which is notably lower than those at other depth intervals. Therefore, the soils at a depth of approximately 17 and 19 feet bgs would rather be relatively more permeable. Correct the statement in the revised Report.	In response, Section 3.1, *Laser-Induced Fluorescence Results*, page 12, has been revised to state, "[f]urther to the southwest, MKTF-LIF-77 has a strong response of 321% RE at 18.03 ft bgs with the SPH filling a more permeable zone between 17.0 and 19.0 ft bgs. This permeable zone appears to resemble the permeable zone in MKTF-LIF-67."

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NMED Comments	MPC Responses
Comment 18:	**Response 18:**
In Section 3.1, *Laser-Induced Fluorescence Results*, page 12, the Permittee states, "[b]oring locations in the MKTF, north, and south gasoline occurrences with greater than 100% RE include MKTF-LIF-46 (409%), MKTF-LIF-45 (329%), MKTF-LIF-44 (315%), MKTF-LIF-37 (339%), MKTF-LIF-42 (367%), MKTF-LIF-43 (287%), MKTF-LIF-77 (321%), MKTF-LIF-62 (361%), MKTF-LIF-61 (105%), MKTF-LIF-72 (305%), and MKTF-LIF-74 (538%). The LIF response at these locations indicate the presence of gasoline and diesel product within the soil and formation pore space." According to Figure 3-2, boring locations MKTF-LIF-46, MKTF-LIF-45, and MKTF-LIF-44 indicate the presence of both gasoline and diesel while boring locations MKTF-LIF-37, MKTF-LIF-42, MKTF-LIF-43, MKTF-LIF-77, MKTF-LIF-62, MKTF-LIF-61, MKTF-LIF-72, and MKTF-LIF-74 indicate the presence of only gasoline. Revise the statement for accuracy in the revised Report. Furthermore, other MKTF borings with greater than 100% RE are present according to Appendix C. For example, boring MKTF-LIF-36, located north of boring location MKTF-LIF-37, indicates the presence of both gasoline and diesel with the % RE signals exceeding 100%. Boring MKTF-LIF-36 is not included in the discussion. Revise the statement or explain the criteria for selecting the boring locations discussed in the statement.	Upon further analysis and new data from May 2021, the discussion has been revised with the missing locations. Section 3.1, *Laser-Induced Fluorescence Results*, page 12 and 13, has been revised to state, "[b]oring locations in the MKTF, north, and south gasoline occurrences with greater than 100% RE include MKTF-LIF-36 (419%), MKTF-LIF-37 (339%), MKTF-LIF-42 (367%), MKTF-LIF-43 (287%), MKTF-LIF-45 (329%), MKTF-LIF-77 (321%), MKTF-LIF-62 (361%), MKTF-LIF-61 (105%), MKTF-LIF-72 (305%), and MKTF-LIF-74 (538%). The LIF response at these locations indicate the presence of gasoline product within the soil and formation pore space. MKTF-LIF-46 (409%), MKTF-LIF-44 (315%), MKTF-LIF-47 (515%), and MKTF-LIF-57 (510%) LIF responses indicate the presence of gasoline and diesel product within the soil and formation pore space."

New Mexico Environment Department (NMED) to Marathon Petroleum Company (MPC) Comment Letter "Disapproval Marketing Tank Farm Laser-Induced Fluorescence/Hydraulic Profiling Investigation Report" (June 2, 2021)

NMED Comments	MPC Responses
Comment 19:	**Response 19:**
In Section 3.1, *Laser-Induced Fluorescence Results*, page 13, the Permittee states, "[a]s observed in MKTF-LIF-36, the waveform indicates the presence of gasoline (blue and green waveforms) mixed with a small amount of diesel (orange and red peaks that are higher than what would be expected in a gasoline)." The statement indicates that gasoline is dominant rather than diesel at boring location MKTF-LIF-36. According to the MKTF-LIF-36 log included in Appendix C, diesel rather appears to be dominant with orange peaks. Correct the statement or explain the interpretation in the revised Report.	In response, Section 3.1, *Laser-Induced Fluorescence Results*, page 13, has been corrected to state, "[a]s observed in MKTF-LIF-36, the waveform indicates a small amount of gasoline (blue and green waveforms) mixed with diesel (orange and red peaks that are higher than what would be expected in a gasoline)."

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NMED Comments	MPC Responses
Comment 20:	**Response 20:**
In Section 3.1, Laser-Induced Fluorescence Results, page 13, the Permittee states, "[t]he north diesel occurrence appears to have headed further to the northwest and is evident in MKTF-LIF-56, where it appears to have mixed with the naphtha occurrence moving in from the east." According to Figure 3-2, only diesel was detected at boring location MKTF-LIF-56. Resolve the discrepancy in the revised Report. In addition, the western extent of diesel contamination detected boring MKTF-LIF-56 was not delineated. Explain why the western extent of diesel was not investigated or propose to submit a work plan to investigate the extent in the revised Report. Furthermore, the Permittee explained that blue and green peaks represent gasoline and orange and red peaks represent diesel. However, it is not clear how naphtha peaks are differentiated from gasoline and diesel peaks. Naphtha may range from a gas condensate to a kerosene-like product. First, define the naphtha (e.g., composition); then, explain how the naphtha peaks are differentiated from gasoline and diesel peaks in the revised Report.	The discrepancy at boring location MKTF-LIF-56 is acknowledged. Section 3.1, Laser-Induced Fluorescence Results, page 13, has been revised to state, "[t]he north diesel occurrence appears to have headed further to the northwest and is evident in MKTF-LIF-56." The diesel occurrence was not investigated downgradient of MKTF-LIF-56 due to the presence of SPH in MKTF-23 and observance of dissolved phase VOCs in MKTF-24, MKTF-25, and MKTF-31, which are located adjacent to and cross- and down-gradient of MKTF-LIF-56. As noted in the Annual Groundwater Monitoring Report – 2019 (submitted September 15, 2019), SPH was measured in MKTF-23 in May and August of 2020 at 0.07 and 0.03 inches, respectively. The October 2019 dissolved phase data were reviewed for total benzene, toluene, ethylbenzene, and xylenes (BTEX), methyl tert butyl ether (MTBE), total petroleum hydrocarbon (TPH) diesel range organics (DRO) gasoline range organics (GRO). - MKTF-23: Total BTEX was detected at 21.4 milligrams per liter (mg/L); MTBE at 0.33 mg/L; TPH-DRO at 2,200 mg/L; TPH-GRO at 55 mg/L. - MKTF-24: Total BTEX was detected at 5.33 mg/L; MTBE at 0.11; TPH-GRO at 17 mg/L. TPH-DRO was non-detect. - MKTF-25: Total BTEX was measured at 0.37 mg/L; MTBE at 0.88 mg/L; TPH-GRO at 3 mg/L. TPH-DRO was non-detect.

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NMED Comments	MPC Responses
	- MKTF-31: Total BTEX was measured at 0.0006 mg/L; MTBE at 0.10 mg/L; TPH-GRO at 0.096 mg/L. TPH-DRO was non-detect. - Semivolatile organics were also detected in all samples. Therefore, to take advantage of the LIF rig and equipment, it was determined to continue investigating areas where SPH data were limited. MPC respectfully disagrees with further investigation near MKTF-LIF-56. Based on the boring location within an area of known SPH and dissolved phase impacts, MPC does not see the value in doing additional investigation in the area. To define the composition of naphtha, the MPC Safety Data Sheet (SDS) was reviewed. SDS information regarding MPC produced diesel and gasoline were also reviewed. The products have the following characteristics: - Naphtha is a mixture of paraffinic, cycloparaffinic, and aromatic hydrocarbons, predominately C4-C12. - Diesel is a mixture of paraffins, olefins, and aromatic hydrocarbons, predominately C11 to C20. - Gasoline is a mixture of paraffins, cycloparaffins, aromatic and olefinic hydrocarbons, predominately C4-C10 In samples identified with naphtha as part of the LIF signature, three different criteria were used to determine fuel type. - **LIF waveforms**. The waveform peaks were evaluated based on height, size, and lifetime (refer to Attachment D,

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	UVOST® Resource Guide by Dakota Technologies, LLC [Dakota]). - Diesel: Green is the dominant peak and there is overlap between orange and red (some green) peaks. Diesel peaks have longer lifetimes across the board, which could mask the waveform type if product types are mixed (e.g., diesel and naphtha). - Naphtha: Blue is the dominant peak. There is minimal overlap between peaks due to their shorter lifetimes. The minimal overlap would be masked by the diesel in a mixed product scenario. - Gasoline: Blue, green, and orange peaks are of similar magnitude; the red peak is small in comparison. Gasoline peaks have shorter lifetimes and minimal overlap (similar to naphtha) and could be masked in a mixed product scenario. - **Dakota expertise**. Dakota is one of the primary providers supporting LIF/HP technology. Dakota was consulted regarding complex waveforms to assist with identifying product types. **Sample location**. Boring locations were considered, based on the documented release that occurred. LIF readings in the release area that did not have a clear resemblance to diesel were then also evaluated for naphtha. These borings appeared to have a hybrid diesel-naphtha waveform. Dakota was used to confirm or revise the identification because variability may affect interpretation.

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NMED Comments	MPC Responses
Comment 21:	**Response 21:**
In Section 3.1, *Laser-Induced Fluorescence Results*, page 13, the Permittee states, "[t]he north diesel occurrence is present in MKTF-LIF-87 and may also be present in MKTF-LIF-86 (the orange coloration at 9 to 10 ft bgs)." According to Figure 3-2, both diesel and naphtha were detected at borings MKTF-LIF-86 and MKTF-LIF-87. Correct the statement in the revised Report. In addition, the northern extent of diesel and naphtha was not delineated. Explain why the northern extent of diesel and naphtha was not investigated or propose to submit a work plan to investigate the extent in the revised Report.	In Section 3.1, *Laser-Induced Fluorescence Results*, page 13, the text was revised to state, "[t]he north diesel occurrence is present in MKTF-LIF-87 and MKTF-LIF-86 (the orange coloration at 9 to 10 ft bgs) and appears to have mixed with the naphtha occurrence moving in from the east." The northern extent of the diesel and naphtha was not delineated because of known dissolved phase constituents and SPH in wells MKTF-49 and MKTF-50. These wells are located north of MKTF-LIF-84 and MKTF-LIF-86.
Comment 22:	**Response 22:**
In Section 3.1, *Laser-Induced Fluorescence Results*, page 13, the Permittee states, "[t]he SPH in MKTF-LIF-85 is an unidentified petroleum product that may possibly be from the sour naphtha release on March 26, 2017. The waveform in the LIF response is representative of naphtha, and the boring is located within the naphtha release area." According to Figure 3-2, naphtha was detected at boring MKTF-LIF-85. It appears that there is sufficient evidence to state that the SPH detected in MKTF-LIF-85 is naphtha; however, the Permittee labels it as an unidentified petroleum product. Revise the statement for clarity.	In response, Section 3.1, *Laser-Induced Fluorescence Results*, page 13, has been revised to state "The SPH in MKTF-LIF-85 is assumed to be a mixture of diesel and naphtha from the sour naphtha release on March 26, 2017."

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NMED Comments	MPC Responses
Comment 23:	**Response 23:**
in Section 3.1, Laser-induced Fluorescence Results, page 13, the Permittee states, "[a]s further evidence of a diesel fuel composition, recently found SPH in MKTF-39 (between MKTF-LIF-66 and PA-LIF-04) has an initial boiling point of 333°F, which is within the range (310-691°F) in Section 9 of the MPC #2 Ultra Low Sulfur Diesel Safety Data Sheet. This diesel waveform is also found in MKTF-LIF-84, which is northwest of MKTF-LIF-66." According to Figure 3-2, only naphtha was detected at boring MKTF-LIF-84 and the detection of diesel is not indicated. Resolve the discrepancy in the revised Report. In addition, boring MKTF-LIF-66, where diesel was detected, was advanced adjacent to well MKTF-16, where elevated benzene concentrations in groundwater samples have persisted in recent years. Diesel detected in boring MKTF-LIF-66 is unlikely the source of benzene detected in well MKTF-16. The LIF instrument is not capable of detecting dissolved phase constituents and the source of benzene in well MKTF-16 remains unknown. Discuss the potential source of benzene in well MKTF-16 and propose to investigate the source of benzene in well MKTF-16 in the revised Report.	Figure 3-2 has been revised to show diesel in MKTF-LIF-84. MPC agrees that diesel is not the source of benzene. The source of benzene in well MKTF-16 is currently unknown. However, the area around MKTF-16 is being investigated during the sour naphtha release investigation and the heat exchanger bundle cleaning pad investigation. Refer to the Sour Naphtha Release Investigation and the Bundle Cleaning Pad Work Plans for details of the field investigations.

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NMED Comments	MPC Responses
Comment 24:	**Response 24:**
In Section 3.2, *Hydraulic Profiling Results*, page 13, the Permittee states, "[t]his low K prevented the dissipation test from being conducted during the first mobilization in November 2019 due to the extremely long dissipation time (hours). Dissipation tests were conducted at four locations during the second mobilization in February 2021. These locations were PA-LIF-02, PA-LIF-06, MKTF-LIF-83, and MKTF-LIF-84." Clarify if the purpose of the dissipation tests is to determine depth of the water table. In addition, it is not clear why the dissipation tests were conducted in February 2021 but not in November 2019 and why the tests were conducted at only four locations in February 2021. It is useful to compare depths of the water table relative to the depths where SPH is distributed. If existing hydraulic profiling data allow calculation of the water table depth, revise the LIF/HP logs in Appendix C to include the estimated depths of the water table.	The purpose of the dissipation tests is to ultimately to determine hydraulic conductivity which is valuable information for remediation efforts but can also be used in estimating depth to water. Groundwater monitoring wells are a better indicator of depth to water. Dissipation tests at this site are difficult and lengthy to complete due to tight soil at the site and challenges discerning if the test has truly equilibrated. It was a better use of time to drill more LIF borings to understand the breadth of impacts rather than waiting long hours for a dissipation test to complete during November 2019. In addition, there are enough wells in the area to use for elevation data (over 50 marketing tank farm wells), so the dissipation test did not provide the same value as more LIF borings did. The calculation of the water table depth already exists on the submitted boring logs from February 2021 and is indicated with the blue dashed line.
Comment 25:	**Response 25:**
In Section 3.2, *Hydraulic Profiling Results*, page 14, the Permittee states, "[l]ow K values (high P Dwn) on the HP logs roughly correlate with the alluvium/Chinle Group contact as shown on the Figure 3-4 cross section." In Figure 3-4, Cross Sections with Maximum Separate Phase Hydrocarbons, the only borings advanced to the alluvium/Chinle interface are historical borings LR-1 and LR-2, which are not relevant to the hydraulic profiling investigation. Provide explanation for clarity or revise the statement for accuracy in the revised Report.	The statement has been revised for accuracy. Section 3.2, *Hydraulic Profiling Results*, page 14, now states, "[l]ow K values (high P Dwn) on the HP logs roughly correlate with a change in soil composition as shown on the Figure 3-4 cross section."

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NMED Comments	MPC Responses
Comment 26:	**Response 26:**
In Section 3.2, *Hydraulic Profiling Results*, pages 13 and 14, the Permittee states, "Figure 3-3 presents the cross-section location map; Figure 3-4 presents the cross-sections with maximum historical SPH thickness." Figure 3-4 depicts the surface elevations of borings MKTF-LIF-42, MKTF-LIF-73, MKTF-LIF-74, MKTF-LIF-81, and MKTF-LIF-89; however, the LIF/HP logs included in Appendix C indicate that the elevations are unavailable, if the elevation data are available, include the data in the LIF/HP logs; otherwise, explain how the surface elevations were determined in the revised Report.	Elevation surface data were collected by Dakota using a GPS during the field event but were not included on the LIF/HP logs. The data are included Appendix D of the Sitewide LIF/HP Investigation Report, which will be submitted to NMED on or before October 31, 2021.
Comment 27:	**Response 27:**
In Section 3.2, *Hydraulic Profiling Results*, page 14, the Permittee states, "[f]ractures and/or bedding planes are possible pathways for SPH migration below the alluvium/Chinle Group contact and are indicated by a slight decrease in P Dwn on the HP logs." According to Figure 3-4, no LIF/HP borings or groundwater monitoring wells were advanced to the depth of the alluvium/Chinle interface. It is not clear which data suggests such observations. Provide an explanation for clarity.	MPC agrees with this comment and has revised Section 3.2, *Hydraulic Profiling Results*, page 14, to state, "Changes in soil composition are possible pathways for SPH migration in the subsurface and are indicated by a slight decrease in P Dwn on the HP logs."

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NMED Comments	MPC Responses
Comment 28:	**Response 28:**
In Section 3.2, *Hydraulic Profiling Results*, page 14, the Permittee states, "[e]xamples of P Dwn indicating a fracture and/or bedding planes can be seen recurring in MKTF-LIF-45 at 25 ft bgs (Appendix C). This example represents micro or thin fractures that likely contribute to most of the permeability, resulting in a bulk average permeability similar to a clayey silt rather than intact bedrock." Boring MKTF-LIF-45 was advanced along the A - A' cross section according to Figure 3-3, Cross-section Location Map; however, it is not included in Figure 3-4 that presents the cross sections. Revise Figure 3-4 to include boring MKTF-LIF-45.	Boring MKTF-LIF-45 was not included on Figure 3-4 because the permittee used MKTF-36 on Figures 3-3 and 3-4. MKTF-LIF-45 is located adjacent to monitoring well MKTF-36. MKTF-36 is included on the location transect and cross section (Figures 3-3 and 3-4) because of the detail provided in the geological log constructed during well drilling. The geological log of MKTF-LIF-45 is interpolated from the P Dwn data included on the waveform log without physical confirmation. Therefore, because physical evidence observed during well drilling and completion is considered to be more accurate, the text in Section 3.2, *Hydraulic Profiling Results*, page 14, has been revised to state, "[l]ow K values (high P Dwn) on the HP logs roughly correlate with a change in soil material as shown on the Figure 3-4 cross section. Changes in soil material are possible pathways for SPH migration in the subsurface and are indicated by a slight decrease in P Dwn on the HP logs."
Comment 29:	**Response 29:**
In Section 3.3, *Electrical Conductivity Results*, page 14, the Permittee states, "[e]xamples of conductivity indicating a fracture and/or bedding planes can be seen in MKTF-LIF-77 at 18.0 ft bgs and 19.73 ft bgs on MKTF-LIF-79A (Appendix C)." The lower electrical conductivity readings observed in the LIF/HP logs represent a presence of coarser sediments; however, they do not necessarily represent a presence of fractures. Revise the statement for accuracy or provide explanation to support the assertion in the revised Report.	MPC agrees that EC readings represent the presence of coarser sediments rather than presence of fractures. Section 3.3, *Electrical Conductivity Results*, page 14, has been revised to state, "[e]xamples of conductivity indicating a change in soil composition (i.e., fine grains to gravels) can be seen in MKTF-LIF-77 at 18.0 ft bgs and 19.73 ft bgs on MKTF-LIF-79A (Appendix C)."

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NMED Comments	MPC Responses
Comment 30:	**Response 30:**
In Section 3.4, *Soil Sampling Results*, page 15, the Permittee states, "[t]he samples [that were analyzed for TPH] were labeled as MKTF-LIF-44 (6 to 7 ft, 8 to 10 ft, and 18 to 19 ft), MKTF-LIF-53 (7 to 8 ft and 8 to 9 ft), MKTF-LIF-74 (2 to 3 ft, 4 to 5 ft, and 5 to 6 ft), MKTF-LIF-85 (7 to 9 ft), and PA-LIF-07 (11 to 13 ft and 13 to 14 ft)." According to Appendix C, higher % RE signals are recorded from other boring locations (e.g., 708.9% RE at 8.57 feet bgs in MKTF-LIF-66). Provide an explanation for why these five sampling locations were selected in the revised Report. In addition, one soil sample was collected from a depth of 7 – 9 feet bgs from boring MKTF-LIF-85. According to the MKTF-LIF-85 log included in Appendix C, the % RE signals are recorded as less than 100% at the selected sampling interval. The higher % RE signals are recorded at a depth of approximately 11 feet bgs (608.7%) in the boring. Explain why the soil sample was collected from the selected interval of 7 – 9 feet bgs in the revised Report.	The sampling locations were selected based on visual observations and odors rather than % RE. In Section 3.4, *Soil Sampling Results*, page 15, a sentence has been added for clarification, "[t]he samples were labeled as MKTF-LIF-44 (6 to 7 ft, 8 to 10 ft, and 18 to 19 ft), MKTF-LIF-53 (7 to 8 ft and 8 to 9 ft), MKTF-LIF-74 (2 to 3 ft and 4 to 5 ft), MKTF-LIF-85 (7 to 9 ft), and PA-LIF-07 (11 to 13 ft). Samples were collected based on visual and olfactory observations."

New Mexico Environment Department (NMED) to Marathon Petroleum Company (MPC) Comment Letter "Disapproval Marketing Tank Farm Laser-Induced Fluorescence/Hydraulic Profiling Investigation Report" (June 2, 2021)

NMED Comments	MPC Responses
Comment 31:	**Response 31:**
In Section 3.4, *Soil Sampling Results*, page 15, the Permittee states, "TPH-DRO ranged from non-detect to 840 milligrams per kilogram (mg/kg) and TPH-GRO ranged from 82 mg/kg to 2,300 mg/kg," and "TPH-DRO and TPH-GRO concentrations maybe lower than might be expected based on the reference emitter (%RE)." The TPH-DRO concentration in the soil sample collected from boring MKTF-LIF-44 at a depth of 18 – 19 feet bgs is recorded as 840 mg/kg, which is the highest TPH-DRO concentration detected; however, the % RE signals at the same sampling interval are recorded as less than 50%. The TPH-DRO concentration in the soil sample collected from boring PA-LIF-07 at a depth of 11 - 13 feet bgs is recorded as 130 mg/kg, which is relatively low; however, the % RE signals at the same sampling interval are recorded as more than 200%. Similarly, the TPH-GRO concentration in the soil sample collected from boring MKTF-LIF-74 at a depth of 4 - 5 feet bgs is recorded as 2,300 mg/kg, which is the highest TPH- GRO concentration detected; however, the % RE signals at the same sampling "interval remain less than 300%." The TPH-GRO concentration in the soil sample collected from the same boring (MKTF-LIF-74) at a depth of 2 - 3 feet bgs is recorded as 1,500 mg/kg; however, the % RE signals at the same sampling interval exceed 500%. The TPH concentrations do not correlate with respective % RE signals. % RE signals qualitatively identify the presence or absence of SPH. Provide additional explanation to support the assertion or revise the statement for accuracy.	The statements have been removed from the report because it is attempting to correlate soil TPH concentrations and % RE signals, as stated in Comment 36.

New Mexico Environment Department (NMED) to Marathon Petroleum Company (MPC) Comment Letter "Disapproval Marketing Tank Farm Laser-Induced Fluorescence/Hydraulic Profiling Investigation Report" (June 2, 2021)

NMED Comments	MPC Responses
Comment 32:	**Response 32:**
In Section 3.4, *Soil Sampling Results*, page 15, the Permittee states, "[g]rain-size analysis indicate that the majority of the materials are gravels and sands." Table 3-2, *LIF Investigation - Grain Size Analysis*, indicates that the composition of each soil sample is variable. It is not accurate to generalize the soil samples as gravels and sands. For example, the majority of materials were silt and clay in the sample collected from location MKTF-LIF-85 at 7 - 9 feet bgs. Revise the Report accordingly.	In response, Section 3.4, *Soil Sampling Results*, page 15, has been revised to state, "[g]rain-size analyses are shown on Table 3-2, and indicate that soil from 6 to 10 ft bgs in MKTF-LIF-44 are gravel sand mixtures while soils from a depth of 18 to 19 ft bgs are sands, silts, and clays. Soils from 7 to 9 ft bgs in MKTF-LIF-53 were reported as silty sands and sandy gravels. Soils from 2 to 3 ft bgs in MKTF-LIF-74 are silty sands which transition into sandy silt form the sample collected at 4 to 5 ft bgs. Soils from 11 to 13 ft bgs in PA-LIF-07 are silty sands with some gravel."

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NMED Comments	MPC Responses
Comment 33:	**Response 33:**
In Section 3.4, Soil Sampling Results, item 1, page 15, the Permittee states, "[t]he higher TPH concentrations, at locations MKTF-LlF-44 (18 to 19 ft) and MKTF-LIF-74 (4 to 5 ft) are around 2,500 -3,000 mg/kg total TPH (i.e., the sum of GRO and DRO). This is consistent with SPH saturations in the range of 3% to 5% (Hawthorne and Kirkman 2012) and likely near the residual saturation limit." Table 3-1 indicates that the sums of GRO and DRO for the samples collected from locations MKTF-LIF-44 (18 to 19 ft) and MKTF-LlF-74 (4 to 5 ft) are calculated as 2,340 and 2,480 mg/kg, respectively, that are less than the described range of 2,500 - 3,000 mg/kg. Revise the statement for accuracy. According the TPH in Soil to NAPL Saturation Fraction Conversion Matrix in the reference (Hawthorne and Kirkman 2012), when TPH value is 5,000 mg/kg, SPH saturation level ranges 2% to 6%, regardless of any differences in the input variables (e.g., soil porosity and SPH density). Note that the saturation range (2% to 6%) is not the residual saturation limit, where non- aqueous phase liquid (NAPL) becomes mobile. The TPH ranging 2,500-3,000 mg/kg may possibly equate the range of 3% to 5% saturation level as stated; however, the range is not near its saturation limit, regardless of the soil and NAPL types. Correct the statement in the revised Report. In addition, it is not clear how SPH saturation was calculated. Explain how SPH saturation was calculated in the revised	The statements have been removed from the report because it is attempting to correlate soil TPH concentrations and % RE signals, as stated in Comment 36.

New Mexico Environment Department (NMED) to Marathon Petroleum Company (MPC) Comment Letter "Disapproval Marketing Tank Farm Laser-Induced Fluorescence/Hydraulic Profiling Investigation Report" (June 2, 2021)

NMED Comments	MPC Responses
Report. Provide explanation for all assumptions used in the calculation. Furthermore, Table 3-2, *LIF investigation - Grain Size Analysis*, indicates that the composition of the soils at locations MKTF-LlF-44 (18 to 19 ft) and MKTF-LlF-74 (4 to 5 ft) is different. Explain how porosity and soil density of each soil were determined in the revised Report. According to the reference (Hawthorne and Kirkman 2012), SPH saturation is a function of grain/soil density, porosity and density of the SPH. Among these variables, the porosity value appears to influence the result of the calculation the most. Since some soils at the site consist of fine sediments (e.g., silt and clay), the values of effective and total porosity would be widely different. Clarify whether the porosity used to calculate SPH saturation is an effective or total porosity in the revised Report.	
Comment 34:	**Response 34:**
In Section 3.4, *Soil Sampling Results*, item 1, page 15, the Permittee states, "[a]lthough the highest soil TPH concentrations [in locations MKTF-LIF-44 (18 to 19 ft) and MKTF-LIF-74 (4 to 5 ft)] are consistent with SPH at or near residual saturation at those locations, the LIF data suggest that SPH at higher saturations exist in portions of the subsurface from which soil samples were not collected." A total of three soil samples including the one with the highest % RE intervals were collected from both borings MKTF-LlF-44 and MKTF-LIF-74. It is not clear what data suggest that SPH at higher saturations may exist in portions of the subsurface from which soil samples were not collected. Provide an explanation in the revised Report.	This statement has been removed from the report because it is attempting to correlate soil TPH concentrations and % RE signals, as stated in Comment 36.

New Mexico Environment Department (NMED) to Marathon Petroleum Company (MPC) Comment Letter "Disapproval Marketing Tank Farm Laser-Induced Fluorescence/Hydraulic Profiling Investigation Report" (June 2, 2021)

NMED Comments	MPC Responses
Comment 35:	**Response 35:**
In Section 3.4, *Soil Sampling Results*, item 2, page 15, the Permittee states, "[d]iscrete soil sampling intervals commonly miss small intervals of very high SPH saturation in the subsurface and/or average those small intervals across larger intervals with lower saturation overall." Provide a discussion of the sampling technique used to collect a discrete soil sample from each sampling interval in the revised Report.	This statement has been removed from the report because it is attempting to correlate soil TPH concentrations and % RE signals, as stated in Comment 36.
Comment 36:	**Response 36:**
In Section 3.4, *Soil Sampling Results*, page 15, the Permittee states, "LIF data are a better indicator of the presence/absence and/or location of SPH than the TPH data, while the TPH data are a better indicator of SPH saturation than the LIF data. Therefore, the two datasets aren't really measuring the same thing." NMED concurs with the statement. However, the Permittee attempted to provide discussion regarding the correlation between soil TPH concentrations and % RE signals in the Report. The discussion is unnecessary. Remove the discussion from the revised Report, as appropriate.	Discussions attempting to correlate soil TPH concentrations and % RE signals have been removed from the Report.

New Mexico Environment Department (NMED) to Marathon Petroleum Company (MPC) Comment Letter "Disapproval Marketing Tank Farm Laser-Induced Fluorescence/Hydraulic Profiling Investigation Report" (June 2, 2021)

NMED Comments	MPC Responses
Comment 37:	**Response 37:**
In Section 4.0, *Conclusion*, page 16, the Permittee states, "Based on the information collected during this investigation, the recommendations include: - installing a row of five sumps in the borrow pit to cut off the western migration of the north gasoline occurrence. - Installing a recovery well between MKTF-LIF-77 and MKTF-LIF-90 to intercept migration of the south gasoline occurrence." NMED concurs with the recommendations. Comment 5 of the NMED's *Approval with Modifications Hydrocarbon Seep Interim Measures 2020 Fourth Quarter Status Report*, dated March 30, 2021, states, "[s]ubmit an interim measure work plan to eliminate the source of the gasoline plume no later than July 30, 2021." The interim measure work plan required by Comment 5 of the NMED's March 30, 2021 Approval with Modifications is no longer necessary because of the recommendations provided in the Report. However, when the remediation system is implemented, its effectiveness must be evaluated and reported to the NMED. Submit an interim measures report that summarizes the monitoring data collected and effectiveness of the remediation system no later than **December 31, 2021**.	The row of five sumps was installed in April 2021. A summary memo describing the remediation system was submitted to NMED on July 13, 2021. The recovery well between MKTF-LIF-77 and MKTF-LIF-90 was installed the week of July 19, 2021. A summary report including all wells installed during that week will be submitted to NMED within 90 days of completion of the work. MPC will not be submitting an additional interim measures report for this reason.

New Mexico Environment Department (NMED) to Marathon Petroleum Company (MPC) Comment Letter "Disapproval Marketing Tank Farm Laser-Induced Fluorescence/Hydraulic Profiling Investigation Report" (June 2, 2021)

NMED Comments	MPC Responses
Comment 38:	**Response 38:**
Table 3-1, *LIF Investigation - Soil Sample Result*s, does not include soil screening levels for an evaluation of the risk associated with the constituents in the samples. Revise the table to include all applicable soil screening levels. In addition, it is not necessary to tabulate a reporting limit for every sampling result. Rather, the constituent concentrations recorded as "ND (not detected)" must only indicate their reporting limits (e.g., <50 mg/kg for MRO at 6 - 7 feet bgs collected from MKTF-LIF-44). Revise the table accordingly.	NMED's comment has been acknowledged. Table 3-1 has been revised to include applicable soil screening levels (Attachment B). In addition, reporting limits have been removed for detected samples and have replaced the ND designation in the table, where applicable.
Comment 39:	**Response 39:**
Figures 3-3 and 3-4 include historical borings designated as "LR". Provide a copy of the boring logs in the revised Report. In addition, Figure 3-4 includes the cross section of 12 MKTF wells. A copy of these boring logs must also be provided in the revised Report.	Boring logs for LR-1, LR-2, and the MKTF wells shown on the cross section are included Attachment E.

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ATTACHMENT B. RED LINE STRIKE OUT REVISIONS

MARATHON PETROLEUM CORPORATION

GALLUP REFINING DIVISION

MARKETING TANK FARM LASER-INDUCED FLUORESCENCE/HYDRAULIC PROFILING INVESTIGATION REPORT

~~**MARCH 31, 2021**~~

REVISED SEPTEMBER 14, 2021

Printed on September 1, 2021~~August 31, 2021~~~~August 25, 2021~~

Certification

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

Name: Kateri Luka

Date

Title: Senior HSE Professional

Executive Summary

The Marathon Petroleum Company (MPC), Gallup Refining Division is submitting this laser-induced fluorescence (LIF) and hydraulic profiling (HP) investigation report for the Marketing Tank Farm to identify areas where residual and/or mobile separate phase hydrocarbons (SPH) from releases may potentially exist. The investigation results will assist in the remedial alternative evaluation. The investigation took place during the weeks of November 18, 2019 and February 1, 2021. The investigation scope was conducted in accordance with a series of verbal discussions and agreements between the New Mexico Environment Department and MPC.

Field work for the LIF/HP Investigation consisted of drilling and probing 54 direct push (DP) boreholes. Utility clearance using ground-penetrating radar was completed by Ground Penetrating Radar Systems (GPRS) in the week prior to the drilling activities. Gallup Pipeline and Compliance Services performed borehole clearance using air-knife excavation. Terracon performed the DP drilling and Dakota Technologies, LLC performed LIF/HP probing activities.

This investigation was conducted to evaluate the migration extent of the 2019 Marketing Tank Farm gasoline release and to assist in preparing the remedial alternatives. However, during the investigation of the gasoline release, diesel and naphtha were discovered and the investigation area expanded to the north and west. This report presents the data collected to date on the western half of the refinery. Figure 3-2 presents the locations and extent of the SPH occurrences. Significant conclusions include:

- The gasoline occurrence splits into two ~~lobes~~parts at the west side of the parking lot (Figure 3-2). In the northern ~~lobe~~occurrence (borings MKTF-LIF-54, MKTF-LIF-74, MKTF-LIF-61, MKTF-LIF-62, MKTF-LIF-72, and MKTF-LIF-59), SPH from the north gasoline release has migrated west of monitoring well MKTF-33 and is surfacing in the borrow pit. The western leading edge of the north gasoline occurrence appears to be in the area of the borrow pit hydrocarbon seep (between MKTF-LIF-73 and MKTF-LIF-74). SPH is in the near surface (less than 6 feet below ground surface [bgs]) east of the borrow pit hydrocarbon seep near MKTF-LIF-74. SPH was observed between 3.41 and 5.33 ft bgs and groundwater was observed between 5.04 and 8.31 ft bgs. The ~~second,~~ southern ~~lobe~~occurrence (borings MKTF-LIF-90, MKTF-LIF-77, MKTF-79A, and MKTF-LIF-67) is migrating to the southwest towards the 90-day pad but has not reached the water seep located just to the east of the pad (west of MKTF-LIF-90). However, there is an area from the western edge of the parking lot and west where no subsurface data have been collected due to subsurface obstructions and topography. Additional data would confirm that these lobes have a common source.
- A north diesel occurrence (borings MKTF-LIF-39, MKTF-LIF-40, MKTF-LIF-47, MKTF-LIF-48, MKTF-LIF-49, MKTF-LIF-50, MKTF-LIF-51, MKTF-LIF-52, MKTF-LIF-56, MKTF-LIF-66, MKTF-LIF-83, MKTF-LIF-84, MKTF-LIF-86, and MKTF-LIF-87) emanating from the Marketing Tank Farm appears to be moving through a paleochannel to the north towards the hydrocarbon seep located near monitoring well MKTF-01. The north diesel ~~west lobe of the~~ occurrence appears to be mixing ~~comingling~~ in the south with the MKTF gasoline occurrence (e.g., MKTF-LIF-36 and MKTF-LIF-47) and in the north with

the naphtha occurrence (e.g., MKTF-LIF-84 and MKTF-LIF-86)~~, migrating beneath the road from the east~~. The ~~east lobe of the occurrence~~ diesel on the eastern side of the Refinery is migrating to the west towards the crude tanks from the process area and is nearing the Marketing Tank Farm complex (MKTF-LIF-66). The waveforms from this occurrence are similar to the waveforms observed in PA-LIF-4.

Based on the information collected during this investigation, the recommendations include:

- Installing a row of five sumps in the borrow pit to cut off the western migration of the north gasoline occurrence.
- Installing a recovery well between MKTF-LIF-77 and MKTF-LIF-90 to intercept migration of the south gasoline occurrence.
- Investigating the Process Area diesel occurrence to evaluate the eastern extent prior to recommending any remediation activities. The scope of the investigation may be limited due to underground utilities in the process area.

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List of Acronyms and Abbreviations

% RE	percent of reference emitter
bgs	below ground surface
cm/sec	centimeters per second
DP	direct push
EC	electrical conductivity
ft	foot or feet
ft/d	feet per day
HP	hydraulic profiling
K	hydraulic conductivity
LIF	laser-induced fluorescence
mg/kg	milligram per kilogram
mL/min	milliliters per minute
MPC	Marathon Petroleum Company
mS/m	millisiemens per meter
NM	New Mexico
P Dwn	downhole hydraulic pressure
SPH	separate phase hydrocarbon
TPH-DRO	Total Petroleum Hydrocarbon-Diesel Range Organics
TPH-GRO	Total Petroleum Hydrocarbon-Gasoline Range Organics
TPH-MRO	Total Petroleum Hydrocarbon-Motor Oil Range Organics

1.0 Introduction and Background

The Marathon Petroleum Company (MPC), Gallup Refining Division (Refinery) is located approximately 17 miles east of Gallup, McKinley County, New Mexico (NM) along the north side of Interstate Highway I-40 (Figure 1-1). The physical address is I-40, Exit #39 Jamestown, NM, 87347. The Refinery property covers approximately 810 acres. The Refinery processed crude oil transported by pipeline or tanker truck from the Four Corners region. Various process units operated at the Refinery included crude distillation, reformer, fluidized catalytic cracker, alkylation, sulfur recovery, merox treater, and hydrotreater. Past operations have produced gasoline, diesel fuels, jet fuels, kerosene, propane, butane, and residual fuel. Refinery operations were idled in April 2020. The Refinery was officially idled indefinitely on October 9, 2020.

MPC is submitting this investigation report for the laser-induced fluorescence (LIF) and hydraulic profiling (HP) of the Refinery's Marketing Tank Farm area. The investigation was conducted to identify areas where residual and/or mobile separate phase hydrocarbons (SPH) potentially exist due to Marketing Tank Farm hydrocarbon releases. The investigation was expanded to include areas around the Marketing Tank Farm due to the discovery of diesel and naphtha during the LIF/HP investigation. The Refinery location and investigation area are shown on Figure 1-1. Fifty-four direct push (DP) boreholes were installed to collect high-resolution site characterization data using LIF and HP downhole tools. An electrical conductivity (EC) tool was used to record soil conditions for 27 boreholes because the HP tool malfunctioned during the field investigation. To calibrate and benchmark these analyses, nine soil samples were collected at four locations for laboratory analysis. Specific investigation objectives are presented in the next section.

1.1 Investigation Objectives

As determined by the MPC Refinery, the objectives were as follows:

- Identify areas where residual and/or mobile SPH may potentially exist.
- Use the investigation results to assist in the selecting remedial alternatives for evaluation.

1.2 Site Surface and Subsurface Conditions

Site topographic features include high ground in the southeast gradually decreasing to a lowland fluvial plain to the northwest. Elevations on the refinery property range from 7,040 feet (ft) to 6,860 ft. Surface soils within most of the area of investigation are primarily Rehobeth silty clay loam.

Based on existing boring logs, shallow subsurface fluvial and alluvial soils are comprised of primarily clays and silts with minor inter-bedded sand layers. Very low permeability bedrock (e.g., claystones and siltstones) underlie the surface soils and effectively form an aquitard. The Chinle Group, from the Upper Triassic period, crops out over a large area on the southern margin of the San Juan Basin. The uppermost recognized local Formation is the Petrified Forest Formation. The Sonsela Sandstone Bed is the uppermost recognized regional aquifer. Aquifer tests of the Sonsela Bed northeast of Prewitt indicated a transmissivity of greater than 100 ft^2/day (Stone et al., 1983). The Sonsela Sandstone's

highest point occurs southeast of the site and slopes downward to the northwest as it passes under the Refinery. The Sonsela Sandstone forms a water-bearing reservoir with artesian conditions throughout the central and western portions of the Refinery property. The regional stratigraphy around the Refinery is shown on Figure 1-2.

The diverse properties and complex, irregular stratigraphy of the surface soils across the Refinery cause a wide range of hydraulic conductivity ranging from less than 10^{-2} centimeters per second (cm/sec) for gravel-like sands immediately overlying the Petrified Forest Formation to 10^{-8} cm/sec in the clay soils located near the surface. Generally, shallow groundwater at the Refinery follows the upper contact of the Petrified Forest Formation (Chinle Group) with prevailing flow from the southeast to the northwest, although localized areas may have varying flow directions based on the subsurface geology.

1.3 Existing Data

Historically, several releases have occurred in the investigation area, including an October 2019 gasoline release from a subsurface pipeline between the Truck Loading Rack and the marketing tank farm. During this investigation, the project scope was expanded from the 2019 gasoline release to evaluate other releases in the area, including diesel and naphtha occurrences. SPH have been detected in monitoring wells MKTF-01, MKTF-03, MKTF-05 to MKTF-09, MKTF-11 to MKTF-15, MKTF-17, MKTF-19 to MKTF-23, MKTF-26, MKTF-33, MKTF-36 to MKTF-37, MKTF-39, MKTF-45, MKTF-48, and MKTF-48. Those monitoring wells with intermittent measurements of 0.02 ft or less are not included in the above list. Historical measurements of SPH thickness and depth in these monitoring wells were used to develop the scope of work for the investigation. SPH thicknesses in the Marketing Tank Farm monitoring wells are shown on Figure 1-3. Measurements of SPH thickness and depth in these monitoring wells are in Appendix A.

2.0 Investigation Methods

During this investigation, site characterization was conducted utilizing LIF combined with HP and LIF combined with EC. The LIF/HP probing output provides a comparison of the LIF response to that of a known reference standard and is presented as percent of the reference emitter (% RE). LIF response intensity (i.e., % RE) is influenced by the quantity of hydrocarbons present and the waveform pattern is a function of the relative proportions of the polycyclic aromatic hydrocarbons present. Additional details on the LIF/HP technique are described in Appendix B. The investigation results are presented in Section 3.0. The concepts of mobility and migration are discussed with respect to the investigation results in Sections 3.0 and 4.0.

For clarity, in discussing the migration potential of SPH, a distinction should be drawn between potential SPH mobility and migration, as these terms can be confused (ITRC 2009). In this report, mobility and mobility potential refer to the potential of SPH to gravity drain from the soil pore space, which can only occur if the residual saturation is exceeded. This gravity drainage typically manifests itself as SPH in a monitoring well. In contrast, SPH migration refers to the lateral spread of SPH under the influence of SPH characteristics, the prevailing groundwater hydraulic gradient, and permeability, as governed by Darcy's Law. Exceedance of local residual saturation is a necessary condition for migration, but it is not alone sufficient for migration. Sufficient SPH head and other conditions described in this report must be present for SPH to migrate downgradient.

3.0 Investigation Results

The initial investigation in the area of the Marketing Tank Farm began the week of November 18, 2019. Due to the delays caused by the COVID-19 pandemic, the investigation fieldwork for the Marketing Tank Farm and surrounding areas was completed the week of February 1, 2021. LIF/HP investigation locations are presented on Figure 3-1 and the LIF/HP logs are provided in Appendix C.

In the December 18, 2020 "Response to Comments Approval with Modifications OW-61 through OW-65 Well Installation Report" submitted to the New Mexico Environment Department (NMED), MPC proposed to hydro-excavate V-trenches to locate subsurface utilities as requested by NMED. The advantage of V-trenching is that undisturbed shallow soils can be evaluated for potential impacts. NMED approved the method and requested additional information in the "Approval, Response to Comments Approval with Modifications OW-61 through OW-65 Well Installation Report" letter dated January 13, 2021. Per the NMED approval letter, V-trenching was to be performed during the LIF Investigation and presented in this report. The NMED approval letter was received after planning and scheduling for the February 2021 LIF investigation; therefore, V-trenching was not used in the February 2021 investigation. V-trenching will be used in future subsurface investigations where shallow soil evaluation is necessary. Appendix D provides a description of the V-trench method and includes a schematic of the V-trench.

During the 2019 and 2021 investigations, each location was first cleared by Ground Penetrating Radar Systems for pipelines, subsurface electrical lines, and water lines. Gallup Pipeline and Compliance Services then performed the utility clearance using air-knife excavation to a depth of 5 ft below ground surface (bgs). The air knife excavations were backfilled with excavated material ~~dry cuttings~~ prior to installing the LIF/HP boreholes. Therefore, the LIF/HP interval of 0-5 ft was not representative of undisturbed subsurface conditions.

Terracon performed the DP drilling and Dakota Technologies, LLC performed LIF/HP probing activities. Soil borings with no LIF response were abandoned with soil cuttings from the borehole, and a bentonite plug was placed from 2 feet below ground surface (ft bgs) to ground surface. Contaminated borings were abandoned using bentonite chips.

3.1 Laser-Induced Fluorescence Results

The initial focus of this investigation was to determine the extent of SPH migration resulting from the MKTF gasoline release from the underground gasoline transfer line between the Marketing Tank Farm and the truck loading rack. The MKTF gasoline release migrated to the southwest, then west under the truck parking lot. During the investigation, diesel and naphtha occurrences were discovered in the LIF results in the area to the north of Marketing Tank Farm. Figure 3-2 presents the locations of the occurrences and their estimated extents.

LIF borings MKTF-LIF-46, MKTF-LIF-45, MKTF-LIF-44, and MKTF-LIF-37 show the initial advancement of the MKTF gasoline occurrence to the southwest from the gasoline release area. MKTF-LIF-57 and

MKTF-LIF-53 show the presence of an old diesel occurrence. The waveform for the various depths in MKTF-LIF-46 indicate that the gasoline has mixed with diesel, which is shown on Figure 3-2 with the two occurrences overlapping. This is evident by the shortening of the retention time in the 350-nanometer wavelength (blue) at all depths. MKTF-LIF-45 and MKTF-LIF-44 also show indications of a mixture of gasoline with diesel (Figure 3-2). A classic gasoline waveform appears in MKTF-LIF-37 below approximately 6 ft bgs. Above this depth the waveform appears to be a weathered gasoline.

Moving west to MKTF-LIF-42 and MKTF-LIF-43, the MKTF gasoline occurrence appears to bifurcate along western and southwestern paths (Figure 3-2). In MKTF-LIF-42, elevated % RE signals appear from 11.5 to 28 ft bgs.~~elevated % RE signals appear from 11.5 to 28 ft bgs.~~ ~~t~~The SPH is following lower permeability zones at 11.0 to 11.5 ft bgs, 15.5 to 16.0 ft bgs, and at the alluvium/Chinle Group interface at 20.0 ft bgs. The predominant SPH pathway appears to be from 15.5 to 18.5 ft bgs where % RE responses of up to 367 % were recorded. Elevated % RE signals below 20 ft bgs exceeded 350% at approximated 27.5 ft. The north gasoline occurrence appears to move more to the northwest at MKTF-LIF-54 (MKTF-33) as the response is attenuated to almost residual saturation even though MKTF-33 had 6.08 ft of SPH on December 4, 2020. The north gasoline occurrence refers to borings MKTF-LIF-54, MKTF-LIF-74, MKTF-LIF-61, MKTF-LIF-62, MKTF-LIF-72, and MKTF-LIF-59. The residual response in MKTF-LIF-54 is in a sand or more permeable lens at approximately 25 ft bgs. In MKTF-LIF-62, to the northwest, there is a strong % RE at depths of 23.5 to 26.35 ft bgs with a gasoline signature. MKTF-LIF-58, MKTF-LIF-70, and MKTF-LIF-71 bound ~~MKTF-LIF-61 marks~~ the northern edge of the north gasoline occurrence based on the lack of elevated % RE~~ with a peak response at 23.73 ft bgs, similar to the depths at MKTF-LIF-62 and MKTF-LIF-54 to the south~~. The north gasoline occurrence is found further to the west in MKTF-LIF-72 and MKTF-LIF-74 at depths of less than six ft bgs. The SPH surfaces at a borrow pit hydrocarbon seep located between MKTF-LIF-74 and MKTF-LIF-73. There is also some staining to the northeast of MKTF-LIF-74.

The south gasoline occurrence forms a path between MKTF-LIF-43 and MKTF-LIF-90 (Figure 3-2). The south gasoline occurrence refers to borings MKTF-LIF-90, MKTF-LIF-77, MKTF-79A, and MKTF-LIF-67. This portion occurs as a very thin interval where potential product was identified in the LIF pushes. The maximum response signal in MKTF-LIF-67 is 56.4% RE at 19.91 ft bgs and is centered on a less permeable zone between 18.5 and 20.0 ft bgs. The maximum peak may possibly be potentially mobile or just at maximum residual saturation. Further to the southwest, MKTF-LIF-77 has a strong response of 321% RE at 18.03 ft bgs with the SPH filling a more ~~less~~ permeable zone between 17.0 and 19.0 ft bgs. This permeable zone appears to resemble the permeable zone in MKTF-LIF-67. MKTF-LIF-90 has a similar permeable zone between 16.64 and 17.92 ft bgs with the strongest response of 83.2% RE at 16.86 ft bgs. The north and south gasoline occurrences could be disconnected to some degree from the primary suspected source areas. A possible mechanism for the occurrence of these impacts could be following a paleochannel along the bedrock surface. However, there is an area between these SPH occurrences and the primary source areas where little to no data exist due to subsurface obstructions and topography.

Boring locations in the MKTF, north, and south gasoline occurrences with greater than 100% RE include ~~MKTF-LIF-46 (409%), MKTF-LIF-45 (329%), MKTF-LIF-44 (315%),~~ MKTF-LIF-36 (419%), MKTF-LIF-37 (339%), MKTF-LIF-42 (367%), MKTF-LIF-43 (287%), MKTF-LIF-45 (329%), MKTF-LIF-77 (321%), MKTF-LIF-62 (361%), MKTF-LIF-61 (105%), MKTF-LIF-72 (305%), and MKTF-LIF-74 (538%). The LIF response at these locations indicate the presence of gasoline product within the soil and formation pore space. MKTF-LIF-46 (409%), MKTF-LIF-44 (315%), MKTF-LIF-47 (515%), MKTF-LIF-57 (510%) LIF responses indicate the presence of gasoline and diesel product within the soil and formation pore space.

The north diesel occurrence has migrated in a northwesterly, then northerly direction from the Marketing Tank Farm and Truck Loading Rack (Figure 3-2). The north diesel occurrence refers to borings MKTF-LIF-39, MKTF-LIF-40, MKTF-LIF-47, MKTF-LIF-48, MKTF-LIF-49, MKTF-LIF-50, MKTF-LIF-51, MKTF-LIF-52, MKTF-LIF-56, MKTF-LIF-66, MKTF-LIF-83, MKTF-LIF-84, MKTF-LIF-86, and MKTF-LIF-87. As observed in MKTF-LIF-36, the waveform indicates ~~the presence of~~ a small amount of gasoline (blue and green waveforms) mixed with ~~a small amount of~~ diesel (orange and red peaks that are higher than what would be expected in a gasoline). Moving to the northwest, MKTF-LIF-39 indicates the presence of a weathered diesel product with possibly a small percentage of weathered gasoline. A small residual peak of gasoline that is perhaps related to the MKTF release to the south is present at a depth of 21 ft bgs (Appendix C, MKTF-LIF-39). MKTF-LIF-40 waveforms indicate the presence of a diesel product with little to no gasoline presence. MKTF-LIF-50 waveforms also indicate a diesel product similar to what is found in MKTF-LIF-40. The diesel in both borings appear to be at similar depths. The north diesel occurrence appears to have headed further to the northwest and is evident in MKTF-LIF-56 ~~where it appears to have mixed with the naphtha occurrence moving in from the east~~. The north diesel occurrence is present in MKTF-LIF-87 and ~~may also be present in~~ MKTF-LIF-86 (the orange coloration at 9 to 10 ft bgs) and appears to have mixed with the naphtha occurrence moving in from the east.

The SPH in MKTF-LIF-85 is assumed to be a mixture of diesel and sour naphtha from ~~an unidentified petroleum product that may possibly be from~~ the sour naphtha release on March 26, 2017. The waveform in the LIF response is representative of naphtha, and the boring is located within the naphtha release area. This SPH can also be found in MKTF-LIF-86, MKTF-LIF-87, and MKTF-LIF-84 at approximately 15.5 ft bgs. This SPH type is not found in the borings further to the east suggesting that it is related to the sour naphtha release.

SPH in MKTF-LIF-66, just west of the bundle cleaning pad also appears to be a diesel fuel. However, this waveform signature is very similar to waveforms in PA-LIF-04 and PA-LIF-06 further to the east in the process area. As further evidence of a diesel fuel composition, recently found SPH in MKTF-39 (between MKTF-LIF-66 and PA-LIF-04) has an initial boiling point of 333°F, which is within the range (310-691°F) in Section 9 of the MPC #2 Ultra Low Sulfur Diesel Safety Data Sheet. This diesel waveform is also found in MKTF-LIF-84, which is northwest of MKTF-LIF-66.

3.2 Hydraulic Profiling Results

The HP data are included on the right-hand side of each LIF/HP log (Appendix C). The K value on the HP log represents relative hydraulic conductivity, as dissipation tests were not feasible due to the low K deeper in the boring. This low K prevented the dissipation test from being conducted during the first mobilization in November 2019 due to the extremely long dissipation time (hours). Dissipation tests were conducted at four locations during the second mobilization in February 2021. These locations were PA-LIF-02, PA-LIF-06, MKTF-LIF-83, and MKTF-LIF-84. The calculated water table depth in PA-LIF-02 was 13.0 ft bgs. The water table depth for PA-LIF-06 was 12.1 ft bgs. The calculated water table depths for MKTF-LIF-83 and MKTF-LIF-84 were 12.4 and 14.2 feet respectively. The water level in MKTF-15 was approximately 13.6 ft below the measuring point in January 2021, which is comparable to the calculated fluid levels in MKTF-LIF-83 and MKTF-LIF-84.

HP data were used to evaluate subsurface geology with respect to potential SPH flow. Figure 3-3 presents the cross-section location map; Figure 3-4 presents the cross-sections with maximum historical SPH thickness. Low K values (high P Dwn) on the HP logs roughly correlate with a change in soil composition ~~the alluvium/Chinle Group contact~~ as shown on the Figure 3-4 cross section.

~~Fractures and/or bedding planes~~ Changes in soil composition are possible pathways for SPH migration in the subsurface ~~below the alluvium/Chinle Group contact~~ and are indicated by a slight decrease in P Dwn on the HP logs. ~~Examples of P Dwn indicating a fracture and/or bedding planes can be seen recurring in MKTF-LIF-45 at 25 ft bgs (Appendix C). This example represents micro or thin fractures that likely contribute to most of the permeability, resulting in a bulk average permeability similar to a clayey silt rather than intact bedrock.~~

3.3 Electrical Conductivity Results

The HP tool failed after the completion of 13 boring locations: MKTF-LIF-60, MKTF-LIF-61, MKTF-LIF-66, MKTF-LIF-68, MKTF-LIF-81, MKTF-LIF-83, MKTF-LIF-84, MKTF-LIF-87, PA-LIF-02, PA-LIF-03, PA-LIF-04, PA-LIF-05, PA-LIF-06. The HP tool was replaced with an EC tool for the remainder of the locations. The EC logs are included on the right-hand side of each LIF/EC log (Appendix C). The conductivity value on the EC log represents the electrical conductivity of the soils. EC in the 0 to 50 millisiemens per meter (mS/m) range can be interpreted as sand (coarser to finer), silts are normally in the 50 to 100 mS/m range, clayey silts and silty clays range up to 200 mS/m, and clays are normally greater than 200 mS/m (Christy, et al., 1994).

The EC data were used to evaluate subsurface geology with respect to potential SPH flow. Low K values (high conductivity) on the EC logs roughly correlate with the Chinle Group contact as shown on the Figure 3-3 cross section. All soil K data gathered via HP or EC tools should be correlated with physical soil samples to ensure that the tools are accurately representing subsurface conditions.

Fractures and/or bedding planes are possible pathways for SPH migration below the alluvium/Chinle interface and are indicated by a decrease in conductivity on the EC logs. Examples of conductivity

indicating a change in soil composition (i.e., fine grains to gravels) ~~fracture and/or bedding planes~~ can be seen in MKTF-LIF-77 at 18.0 ft bgs and 19.73 ft bgs on MKTF-LIF-79A (Appendix C). These examples represent micro or thin fractures that likely contribute to most of the permeability, resulting in a bulk average permeability similar to a clayey silt rather than intact bedrock.

3.4 Soil Sampling Results

As stated above, LIF data offer a qualitative representation of the SPH saturation magnitude; therefore, additional soil data were collected to assist in the evaluation of SPH mobility. Soil cores were collected via DP technology to generate continuous lithologic data and allow visual evaluation of any SPH encountered. Locations were determined by the on-site Professional Geologist after interpretation of the LIF/HP logs at locations and depths where LIF/HP results indicated the presence of SPH based on the % RE. The selected locations included PA-LIF-07, MKTF-LIF-44, MKTF-LIF-53, MKTF-LIF-74, and MKTF-LIF-85, as shown on Figure 3-5.

Soil cores were collected using a Geoprobe© by driving a 5-ft long by 2-inch diameter macro-core barrel in locations within 2 ft of the selected LIF/HP boring locations. The samples were labeled as MKTF-LIF-44 (6 to 7 ft, 8 to 10 ft, and 18 to 19 ft), MKTF-LIF-53 (7 to 8 ft and 8 to 9 ft), MKTF-LIF-74 (2 to 3 ft, 4 to 5 ft, and 5 to 6 ft), MKTF-LIF-85 (7 to 9 ft), and PA-LIF-07 (11 to 13 ft and 13 to 14 ft). Samples were analyzed for total petroleum hydrocarbon-diesel range organics (TPH-DRO) and total petroleum hydrocarbons-motor oil range organics (TPH-MRO) analysis by the United States Environmental Protection Agency (USEPA) Method 8015M, and total petroleum hydrocarbon-gasoline range organics (TPH-GRO) analysis by the USEPA Method 8260B. In addition, samples were collected for particle size analysis by American Society of Agronomy Method 15-5. The samples were labeled as MKTF-LIF-44 (6 to 7 ft, 8 to 10 ft, and 18 to 19 ft), MKTF-LIF-53 (7 to 8 ft and 8 to 9 ft), MKTF-LIF-74 (2 to 3 ft and 4 to 5 ft), MKTF-LIF-85 (7 to 9 ft), and PA-LIF-07 (11 to 13 ft). Samples were collected based on visual and olfactory observations. Laboratory analytical results are presented in Tables 3-1 and 3-2; laboratory data are provided in Appendix E.

TPH-DRO ranged from non-detect to 840 milligrams per kilogram (mg/kg) and TPH-GRO ranged from 82 mg/kg to 2,300 mg/kg. TPH-MRO was non-detect for all samples. Grain-size ~~analysis~~analyses are shown on Table 3-2 and indicate that soil from 6 to 10 ft bgs in MKTF-LIF-44 are gravel sand mixtures while soils from a depth of 18 to 19 ft bgs are sands, silts, and clays. Soils from 7 to 9 ft bgs in MKTF-LIF-53 were reported as silty sands and sandy gravels. Soils from 2 to 3 ft bgs in MKTF-LIF-74 are silty sands which transition into sandy silt form the sample collected at 4 to 5 ft bgs. Soils from 11 to 13 ft bgs in PA-LIF-07 are silty sands with some gravel.~~indicate that the majority of the materials are gravels and sands.~~

~~TPH-DRO and TPH-GRO concentrations maybe lower than might be expected based on the reference emitter (%RE). However, there are several factors that might explain this.~~

~~The higher TPH concentrations, at locations MKTF-LIF-44 (18 to 19 ft) and MKTF-LIF-74 (4 to 5 ft) are around 2,500-3,000 mg/kg total TPH (i.e., the sum of GRO and DRO). This is consistent with SPH saturations in the range of 3% to 5% (Hawthorne and Kirkman 2012) and likely near the residual saturation limit. Although the highest soil TPH concentrations are consistent with SPH at or near residual saturation at those locations, the LIF data suggest that SPH at higher saturations exist in portions of the subsurface from which soil samples were not collected.~~

~~Discrete soil sampling intervals commonly miss small intervals of very high SPH saturation in the subsurface and/or average those small intervals across larger intervals with lower saturation overall. An example seems to be location PA-LIF-07, where the soil sample from 11 to 13 ft indicates total TPH of 430 mg/kg (relatively low). The LIF log indicates narrow zones of high %RE (>100%) at around 11.8 ft and 12.2 ft, while the interval from 11ft to 11.8 ft has near zero %RE. Aggregating the sample across the entire 2 ft soil sample interval would likely lead to a lower TPH result.~~

~~The soil samples were collected within 2 ft laterally of the LIF borings; however, as noted above, a lot can change geologically in 2 ft, so the TPH values in the soil samples shouldn't be expected to match perfectly with this LIF logs.~~

LIF data are a better indicator of the presence/absence and/or location of SPH than the TPH data, while the TPH data are a better indicator of SPH saturation than the LIF data. Therefore, the two datasets aren't really measuring the same thing.

4.0 Conclusions

Significant conclusions include:

- The gasoline occurrence splits into two ~~lobes~~ parts at the west side of the parking lot (Figure 3-2). In the northern occurrence (borings MKTF-LIF-54, MKTF-LIF-74, MKTF-LIF-61, MKTF-LIF-62, MKTF-LIF-72, and MKTF-LIF-59)~~lobe~~, SPH from the north gasoline release has migrated west of monitoring well MKTF-33 and is surfacing in the borrow pit. The western leading edge ~~This part~~ of the north gasoline occurrence appears to have stopped at the borrow pit hydrocarbon seep (between MKTF-LIF-73 and MKTF-LIF-74). SPH is in the near surface (less than 6 ft bgs) east of the borrow pit hydrocarbon seep near MKTF-LIF-74. SPH was observed between 3.41 and 5.33 ft bgs and groundwater was observed between 5.04 and 8.31 ft bgs. The ~~second,~~ southern occurrence (borings MKTF-LIF-90, MKTF-LIF-77, MKTF-79A, and MKTF-LIF-67)~~lobe~~ is migrating to the southwest towards the 90-day pad but has not reached a water seep located just to the east of the pad (west of MKTF-LIF-90). However, there is an area from the western edge of the parking lot and west where no subsurface data have been collected due to subsurface obstructions and topography. Additional data would confirm that these lobes have a common source.
- A north diesel occurrence (borings MKTF-LIF-39, MKTF-LIF-40, MKTF-LIF-47, MKTF-LIF-48, MKTF-LIF-49, MKTF-LIF-50, MKTF-LIF-51, MKTF-LIF-52, MKTF-LIF-56, MKTF-LIF-66, MKTF-LIF-83, MKTF-LIF-84, MKTF-LIF-86, and MKTF-LIF-87) emanating from the Marketing Tank Farm appears to be moving through a paleochannel to the north towards the hydrocarbon seep located near monitoring well MKTF-01. The north diesel ~~west lobe of the~~ occurrence appears to be ~~comingling~~ mixing in the south with the MKTF gasoline occurrence (e.g., MKTF-LIF-36 and MKTF-LIF-47) and in the north with the naphtha occurrence (e.g., MKTF-LIF-84 and MKTF-LIF-86)~~, coming down beneath the road from the east~~. The ~~east lobe of the occurrence~~ diesel on the eastern side of the Refinery is migrating to the west towards the crude tanks from the process area and is nearing the Marketing Tank Farm complex (MKTF-LIF-66). The waveforms from this occurrence are similar to the waveforms observed in PA-LIF-4.

Based on the information collected during this investigation, the recommendations include:

- Installing a row of five sumps in the borrow pit to cut off the western migration of the north gasoline occurrence.
- Installing a recovery well between MKTF-LIF-77 and MKTF-LIF-90 to intercept migration of the south gasoline occurrence.
- Investigating the Process Area diesel occurrence to evaluate the eastern extent prior to recommending any remediation activities. The scope of the investigation may be limited due to underground utilities in the process area.

Printed on September 1, 2021~~August 31, 2021~~~~August 25, 2021~~

5.0 References

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Appendices

Appendix A – Fluid Level Measurements

Appendix B – LIF/HP Methods

Appendix C – LIF/HP Logs

Appendix D – V-trench Excavation Method

Appendix E – Laboratory Analytical Reports

Appendix A – Fluid Level Measurements

Appendix B – LIF/HP Methods

Appendix C – LIF/HP Logs

Appendix D – V-trench Excavation Method

Appendix E – Laboratory Analytical Reports

Tables

TABLE 3-1. LIF INVESTIGATION - SOIL SAMPLE RESULTS
MARATHON PETROLEUM COMPANY
GALLUP REFINING DIVISION, GALLUP NEW MEXICO

Sample ID	Date Sampled	Sample Depth (ft)	DRO (mg/kg)	MRO (mg/kg)	GRO (mg/kg)
MKTF-LIF-44	11/24/2019	6 - 7	84	ND(50)	97
MKTF-LIF-44	11/24/2019	8 - 10	98	ND(53)	**1400**
MKTF-LIF-44	11/24/2019	18 - 19	840	ND(61)	**1500**
MKTF-LIF-53	11/25/2019	7 - 8	100	ND(57)	**1600**
MKTF-LIF-53	11/25/2019	8 - 9	270	ND(56)	**1100**
MKTF-LIF-74	2/4/2021	2 - 3	490	ND(62)	**1500**
MKTF-LIF-74	2/4/2021	4 - 5	180	ND(59)	**2300**
MKTF-LIF-74	2/4/2021	5 - 6	22	ND(62)	**630**
MKTF-LIF-85	2/5/2021	7 - 9	ND(13)	ND(64)	130
PA-LIF-07	2/5/2021	11 - 13	130	ND50)	300
PA-LIF-07	2/5/2021	13 - 14	11	ND(53)	82
NMED Industrial Soil Screening Levels			**3000**	**500**	**3000**

Notes:

Bolded values indicate exceedences
DRO = Diesel range organics
ft = Feet
GRO = Gasoline range organics
ID = Identification
LIF = Laser induced fluorescence
mg/kg = Milligrams per kilogram
MRO = Motor oil range organics
ND = Not detected at the reporting limit
RL = Reporting limit

TABLE 3-2. LIF INVESTIGATION - GRAIN SIZE ANALYSIS
MARATHON PETROLEUM COMPANY
GALLUP REFINING DIVISION, GALLUP NEW MEXICO

Sample ID	Date Sampled	Sample Depth (ft)	% Med-Coarse Gravel (> 8mm)	% Fine Gravel (8mm-2mm)	% Gravel (> 4.75mm)	% Coarse Sand (2mm-0.5mm)	% Medium Sand (0.5mm-0.25mm)	% Fine Sand (0.25mm-0.125mm)	% Very Fine Sand (0.125mm-0.063mm)	% Sand (4.75mm-0.075mm)	% Coarse Silt (0.063mm-0.038mm)	% Fine Silt (0.038mm-0.002mm)	% Silt (0.075mm-0.002mm)	% Clay [1] (<0.002mm)
MKTF-LIF-44	11/24/2019	6 - 7	16.6	35.4	NA	15.4	5.8	7.0	3.8	NA	1.7	6.2	NA	8.1
MKTF-LIF-44	11/24/2019	8 - 10	21.0	16.1	NA	9.6	10.3	12.9	5.1	NA	2.4	12.2	NA	10.4
MKTF-LIF-44	11/24/2019	18 - 19	0.0	0.4	NA	0.8	4.9	16.9	15.8	NA	6.4	31.4	NA	23.4
MKTF-LIF-53	11/25/2019	7 - 8	4.6	1.5	NA	2.7	8.6	21.8	12.4	NA	5.5	26.0	NA	17.0
MKTF-LIF-53	11/25/2019	8 - 9	22.9	20.3	NA	17.1	10.3	8.7	3.4	NA	1.7	8.8	NA	6.8
MKTF-LIF-74	2/4/2021	2 - 3	NA	NA	0.9	NA	NA	NA	NA	54.9	NA	NA	33.2	11.0
MKTF-LIF-74	2/4/2021	4 - 5	NA	NA	0.0	NA	NA	NA	NA	30.3	NA	NA	51.9	17.8
MKTF-LIF-85	2/5/2021	7 - 9	NA	NA	0.0	NA	NA	NA	NA	23.5	NA	NA	55.9	20.6
PA-LIF-07	2/5/2021	11 - 13	NA	NA	13.5	NA	NA	NA	NA	59.0	NA	NA	19.4	8.1

[1] United Soil Classification System does not classify clay fraction based on particle size. United States Department of Agriculture definition of clay (< 0.002mm) used in this table.

Notes:
> = Greater than
< = Less than
% = Percent
ft - Feet
ID = Identification
LIF = Laser induced fluorescence
mm = Millimeter
NA = Not analyzed

Figures

EXPLANATION

- 02/2021 LIF BORING LOCATION
- 11/2019 LIF BORING LOCATION
- MONITORING WELL
- SITE FEATURE

N

0 160'

NOTE:

LIF - LASER-INDUCED FLORESCENCE

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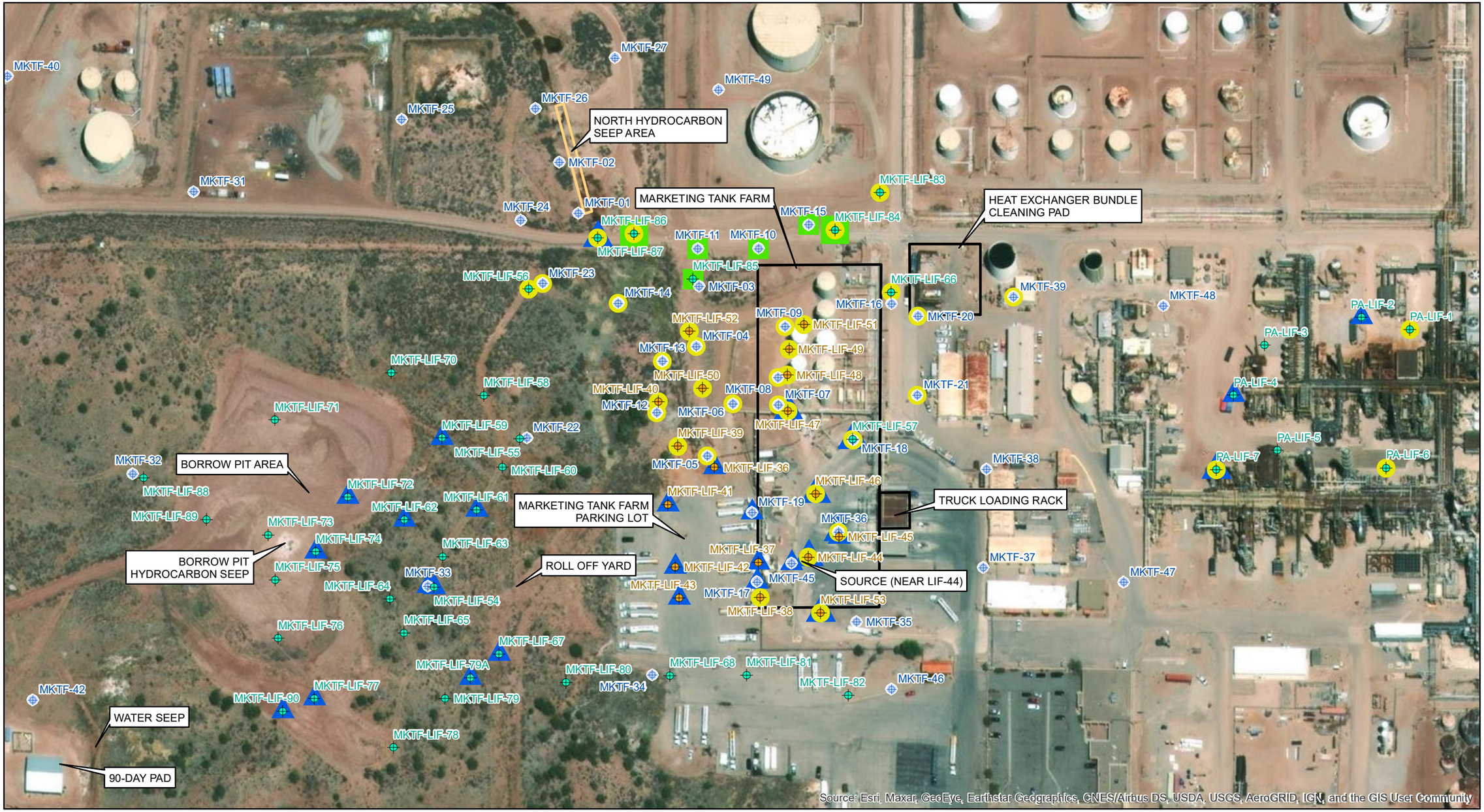
FIGURE 3-1

LIF SAMPLE LOCATIONS
MARKETING TANK FARM/LOADING RACK

MARATHON PETROLEUM COMPANY
GALLUP REFINING DIVISION
GALLUP, NEW MEXICO

Drawn By: KEJ	Checked By: PH	Scale: 1 " = 160 '	Date: 8/24/21	File: 3-1_LIF_MarketingTankFarm_LoadingRack_Fig3-1.mxd

M:\ITON\MARATHON\GIS\PROJECTS\GALLUP\REFINERY\AOC\AOC_35_MKTF\2021\03_ADDITIONALLIF_RPT\3-1_LIF_MARKETINGTANKFARM_LOADINGRACK_FIG3-1.MXD



EXPLANATION

- 02/2021 LIF BORING LOCATION
- 11/2019 LIF BORING LOCATION
- MONITORING WELL
- SEEP AREA
- SITE FEATURE

SPH OCCURRENCE

- DIESEL
- GASOLINE
- NAPHTHA

N

0 160'

NOTES:

-LIF - LASER-INDUCED FLORESCENCE
-SPH - SEPARATE PHASE HYDROCARBON
-PLUME DEFINITION IS BASED ON A COMBINATION ON THE PRESENCE OF SPH IN WELLS AND LIF SIGNATURES.

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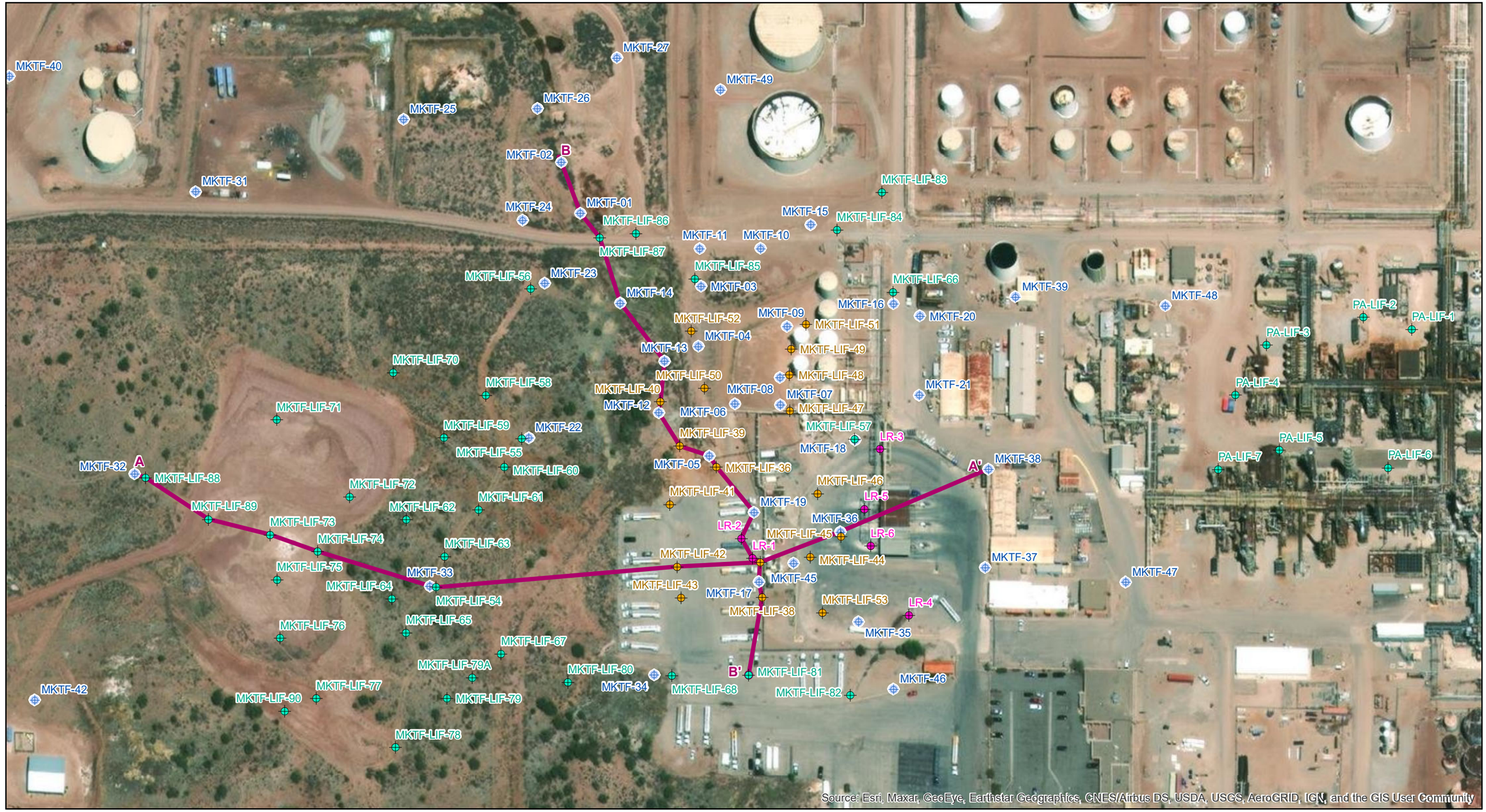
FIGURE 3-2

APPROXIMATE LOCATIONS OF SPH OCCURRENCE MARKETING TANK FARM/LOADING RACK

MARATHON PETROLEUM COMPANY GALLUP REFINING DIVISION GALLUP, NEW MEXICO

Drawn By: KEJ	Checked By: PH	Scale: 1 " = 160 '	Date: 8/24/21	File: 3-2_Plume_MarketingTankFarm_LoadingRack_Fig3-2.mxd

M:\ITON\MARATHON\GIS\PROJECTS\GALLUP\REFINERY\AOC\AOC_35_MKTF\2021\03_ADDITIONAL\LIF_RPT\3-2_PLUME_MARKETINGTANKFARM_LOADINGRACK_FIG3-2.MXD



EXPLANATION

- HISTORICAL BORING LOCATION
- 02/2021 LIF BORING LOCATION
- 11/2019 LIF BORING LOCATION
- MONITORING WELL
- CROSS-SECTION LINE

N

0 160'

NOTE:

LIF - LASER-INDUCED FLORESCENCE

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FIGURE 3-3

CROSS-SECTION LOCATION MAP
MARKETING TANK FARM/LOADING RACK

MARATHON PETROLEUM COMPANY
GALLUP REFINING DIVISION
GALLUP, NEW MEXICO

Drawn By: KEJ	Checked By: PH	Scale: 1 " = 160 '	Date: 9/2/21	File: 3-3_XSect_MarketingTankFarm_LoadingRack_Fig3-3.mxd

EXPLANATION

- 05/2021 LIF BORING LOCATION
- 02/2021 LIF BORING LOCATION
- 11/2019 LIF BORING LOCATION
- MONITORING WELL
- SOIL SAMPLE LOCATION
- SITE FEATURE

N

0 160'

NOTE:

LIF - LASER-INDUCED FLORESCENCE

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FIGURE 3-5

SOIL SAMPLE LOCATIONS
MARKETING TANK FARM/LOADING RACK

MARATHON PETROLEUM COMPANY
GALLUP REFINING DIVISION
GALLUP, NEW MEXICO

Drawn By: KEJ	Checked By: PH	Scale: 1 " = 160 '	Date: 8/24/21	File: 3-5_SoilS_MarketingTankFarm_LoadingRack_Fig3-5.mxd

M:\ITON\MARATHON\GIS\PROJECTS\GALLUP\REFINERY\AOC\AOC_35_MKTF\20210103_ADDITIONALLIF_RPT\3-5_SOILS_MARKETINGTANKFARM_LOADINGRACK_FIG3-5.MXD

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ATTACHMENT C. SOIL LOGS

Trihydro CORPORATION

Lithology Log Sheet 1 of 1

LOCATION ID: PA-LIF-07

Project Name: Additional LIF Investigation (2/2021)	Project Number: 697-085-001		Site ID: Gallup Refinery, Gallup, NM
Drilling Company: Terracon	Driller:	Ground Elevation:	Total Drilled Depth: 14 feet-bgs
Drilling Equipment:	Drilling Method:	Borehole Diameter: __ inches	Drilling Date: 2/5/2021
Type of Sampling Device:		Water Level (bgs): NA	Date/Time Total Depth Reached:
Sample Hammer — Type: Driving Weight: Drop:		Geologist: P. Hildebrandt	Checked by/Date:
Location Description (include sketch in field logbook):			

Depth (ft)	Interval	Recovery	Blow Counts	Description (Include lithology, grain size, sorting, angularity, Munsell color name & notation, minerology, bedding, plasticity, density, consistency, etc., as applicable)	ASTM Code	Remarks (Include all sample types & depth, odor, organic vapor measurements, etc.)
0				0-5: Potholed, no sample collected		
2						
4						
6				5-8.2: Gravelly sand with minor silt, dry, poorly sorted, no odor	GP	
8						
10				8.2-11: Silty sand, dry, slight HC odor	SM	
12				11-14: Gravelly sand with minor silt, HC saturated, poorly sorted, strong HC odor	GP	Sample collected from 11 ft to 13 ft Sample collected from 13 ft to 14 ft
14						
16				Total depth = 14 ft		
18						
20						

Trihydro CORPORATION

Lithology Log Sheet 1 of 1

LOCATION ID: MKTF-LIF-74

Project Name: Additional LIF Investigation (2/2021)	Project Number: 697-085-001		Site ID: Gallup Refinery, Gallup, NM
Drilling Company: Terracon	Driller:	Ground Elevation:	Total Drilled Depth: 6 feet-bgs
Drilling Equipment:	Drilling Method:	Borehole Diameter: __ inches	Drilling Date: 2/4/2021
Date/Time Total Depth Reached:			
Type of Sampling Device:		Water Level (bgs): NA	
Sample Hammer — Type: Driving Weight: Drop:		Geologist: P. Hildebrandt	Checked by/Date:
Location Description (include sketch in field logbook):			

Depth (ft)	Interval	Recovery	Blow Counts	Description (Include lithology, grain size, sorting, angularity, Munsell color name & notation, minerology, bedding, plasticity, density, consistency, etc., as applicable)	ASTM Code	Remarks (Include all sample types & depth, odor, organic vapor measurements, etc.)
0				0-1.6: Sandy silt, grading from silt to sand what about the pothole?	SM-SP	
1						
2				1.6-2: Sand, poorly sorted, dry	SP	
				2-2.4: Sandy silt, dry, some sand, HC odor	SM	Sample collected from 2 ft to 3 ft
				2.4-2.6: Sand, poorly sorted, strong HC odor, saturated w product	SP	
3				2.6-6: Silty sand and sandy silt (alternating layers), poorly sorted, strong HC odor, staurated with HC from 2.6 ft to 4.8 ft	SM-SP	
4						Sample collected from 4 ft to 5 ft
5						Sample collected from 5 ft to 6 ft
6				Total depth = 6 ft		
7						
8						
9						
10						

Trihydro CORPORATION

Lithology Log Sheet 1 of 1

LOCATION ID: MKTF-LIF-85

Project Name: Additional LIF Investigation (2/2021)	Project Number: 697-085-001		Site ID: Gallup Refinery, Gallup, NM
Drilling Company: Terracon	Driller:	Ground Elevation:	Total Drilled Depth: 14 feet-bgs
Drilling Equipment:	Drilling Method:	Borehole Diameter: __ inches	Drilling Date: 2/4/2021
Type of Sampling Device:		Water Level (bgs): NA	Date/Time Total Depth Reached:
Sample Hammer — Type: Driving Weight: Drop:		Geologist: P. Hildebrandt	Checked by/Date:
Location Description (include sketch in field logbook):			

Depth (ft)	Interval	Recovery	Blow Counts	Description (Include lithology, grain size, sorting, angularity, Munsell color name & notation, minerology, bedding, plasticity, density, consistency, etc., as applicable)	ASTM Code	Remarks (Include all sample types & depth, odor, organic vapor measurements, etc.)
0				0-5: Potholed, no sample collected		
2						
4						
6				5-7.2: Clay, very little silt, plastic, dry, no odor	CL	
8				7.2-7.8: Silty clay, dry, some sand, slight HC odor	CL	Sample collected from 7 ft to 9 ft
				7.8-10: Silty clay and sandy silt (alternating layers), poorly sorted, strong HC odor	SM	
10				10-12: Silty sand and sandy silt (alternating layers), poorly sorted, HC odor, saturated with HC from 10 to 12 ft	SM	
12				12-13: Silty sand, poorly sorted, saturated, no HC odor	SM	
14				Total depth = 14 ft		
16						
18						
20						

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ATTACHMENT D. UVOST REFERENCE GUIDE

Dakota Technologies
UVOST®-HP Reference Log

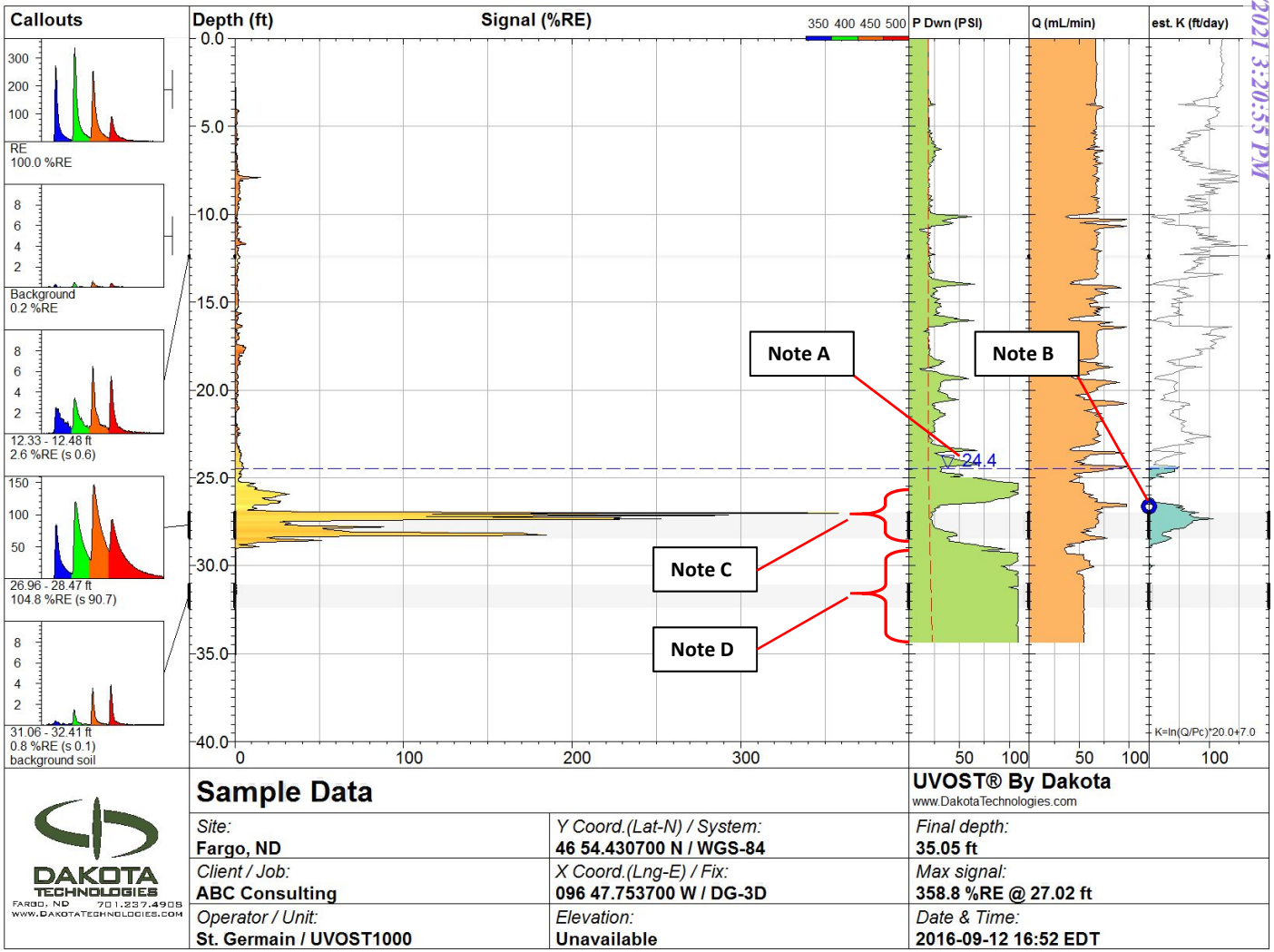
Callouts: Waveforms from selected depths or depth ranges showing the multi-wavelength waveform for that depth. The four peaks are due to fluorescence at four wavelengths and referred to as "channels". Each channel is assigned a color. Various NAPLs will have a unique waveform "fingerprint" due to the relative amplitude of the four channels and/or broadening of one or more channels. Basic waveform statistics and any operator notes are given below the callout.

Main Plot: Signal (total fluorescence) versus depth where signal is relative to the Reference Emitter (RE). The total area of the waveform is divided by the total area of the Reference Emitter yielding the %RE. This %RE scales with the NAPL fluorescence. The fill color is based on the relative distribution of each channel's area to the total waveform area (see callout waveform). The channel-to-color relationship and corresponding wavelengths are given in the upper right corner of the plot.

Hydraulic Pressure (P Dwn): Downhole hydraulic pressure is measured in response to pumping water into the formation at a constant rate. Measurements are logged simultaneously with UVOST data. The resulting log gives insight into the permeability of the soils.

Flow (Q): Water is pumped out of the port of the UVOST-HP probe at a constant rate of 60 mL/min. A change in flow (usually accompanied by an inverse pressure change) is an indicator of hydraulic properties of the soil.

Estimated K: The estimated hydraulic conductivity (K) is internally calculated by utilizing pressure and flow data in conjunction with dissipation test(s) performed at each location. The estimated K is calculated by the equation: K = ln(Q/P')*20.0 + 7.0.



Note A: The water table has been calculated and plotted at 24.4' bgs.

Note B: The circle on the Estimated K plot represents the location(s) of dissipation tests. Here, a single dissipation test was performed at 26.67 bgs'.

Note C: The highest LNAPL response in this log is present in an area of relatively higher permeability, as indicated by low pressure and higher estimated k values at approximately 26' to 28'.

Note D: The increase in pressure starting near 29' (transducer is maxed out, 100 psi) is due to low permeability conditions. In this example, the increase in pressure below the LNAPL represents a potential confining unit.

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ATTACHMENT E. BORING LOGS

SHEET 1 OF 6 | PRECISION ENGINEERING, INC. | File No. 93-026

Boring Location Outside Loading Rack | LOG OF TEST BORINGS | Location Ciniza Refinery

Fence, Adj. to Additive Tanks | Elevation Existing

Boring Number: One LR-1 | Water Level 12.0' @ 20Hrs. Date: 3/08/93

Time	DEPTH	SAMPLE TYPE OR SPT N	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR, GRAINSIZE, ETC.)	%M	LL	PI	CLASS.
12:40	0.0 - 5.0	CONTINUOUS	*\\o\		C	CLAY, SANDY, GRAVELLY, WET, REDDISH BROWN, NO HYDROCARBON ODOR APPARENT				
			*\\o\		C					
			*\\o\		C					
			*\\o\		C					
			*\\o\	5	C					
12:45	5.0 - 10.0	CONTINUOUS	\\\\\\		C	CLAY, REDDISH BROWN, WET, NO HYDROCARBON ODOR APPARENT				
			\\\\\\		C					
			\\\\\\		C					
			\\\\\\		C					
			\\\\\\	10	C					
12:52	10.0 - 15.0		\\\\\\			STRONG HYDROCARBON ODOR APPARENT IN CUTTINGS, NO SAMPLING 10-15'				
			\\\\\\							
			\\\\\\							
			\\\\\\							
			\\\\\\	15						
1:10	15.0 - 16.5	2-3-4	**\		S	SLIGHT HYDROCARBON ODOR APPARENT IN SAMPLE,				
			**\		S	THIN SAND SEAMS/PARTINGS WITH ODOR APPARENT IN				
			**\			SAND SEAMS, 1ST WATER BEARING SAND STRATA				
			**\			APPROX. 17'-19', THIN SAND LENSES IN CLAY ZONE				
			**\	20						
1:15	20.0 - 21.5	2-5-7	**\		S	SLIGHT HYDROCARBON ODOR APPARENT, SAND SEAMS				
			**\		S	SATURATED/WATER BEARING				
			**\							
			**\							
			**\	25						
1:58	25.0 - 26.5	6-8-8	**\		S	SANDIER, WATER BEARING SANDS STILL HAVE HYDRO-				
			**\		S	CARBON ODOR, BUT NOT AS STRONG AS ABOVE				
			**\							
			**\							
			**\	30						
2:18	30.0 - 30.2	5-	**\		S					
2:18	30.2 - 31.5	-8-9	**\		S	CLAY, SANDY, LIGHT GREEN, WET, NO HYDROCARBON				
			**\			ODOR APPARENT				
			**\							
			**\	35						
2:45	35.0 - 35.9	19-60(5")	=*=*=		S	SHALE, SANDY, VERY DENSE, LIGHT GREEN, DAMP TO				
			=*=*=			DRY, NO HYDROCARBON ODOR APPARENT				
			=*=*=							
			=*=*=							
			=*=*=	40						
3:02	40.0 - 40.8	19-	=*=*=		S					
3:02	40.8 - 41.3	-41-50(5")	=\=\=		S	SHALE, CLAYEY, DARK PURPLE, DRY, VERY DENSE,				
	TOTAL DEPTH					NO HYDROCARBON ODOR APPARENT				
				45		NOTES: STATIC WATER LEVEL 12.0' AT 8:30AM 3/9/93, BOTTOM OF HOLE 10.5' @ 2:00 PM 3/11/93, SPT SAMPLES TAKEN WITH 3" STAINLESS STEEL SPLIT SPOON SAMPLER, CONTINUOUS SAMPLES TAKEN WITH 4-1/4" SPLIT TUBE SAMPLER, GROUTED BACK HOLE ON 3/18/93 WITH 1786 #'S CEMENT AND 130 GALLONS H_2O, AND 50#'S BENSEAL BENTONITE				

Size & Type of Boring: 4-1/4" ID Hollow Stemmed Auger | Logged By: PLJ

SHEET 2 OF 6 | PRECISION ENGINEERING, INC. | File No. 93-026

Boring Location Tanker Parking Lot, | LOG OF TEST BORINGS | Location Ciniza Refinery

Space #28, 10'W of Fence | Elevation Existing

Boring Number: Two LR-2 | Water Level Approx. 13' Date: 3/09/93

Time	DEPTH	SAMPLE TYPE OR SPT N	PLOT	SAMPLE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	%M	LL	PI	CLASS.
9:06	0.0 - 0.5	CONTINUOUS	XXXXXX		C	PMBP, BLACK, 6" THICKNESS				
9:06	0.0 - 4.5	CONTINUOUS	*\\O\		C	CLAY, SANDY, GRAVELLY, WET, REDDISH BROWN, NO				
			*\\O\		C	HYDROCARBON ODOR APPARENT				
			*\\O\		C					
9:06	4.5 - 5.0	CONTINUOUS	*O**O*	5	C	SAND, GRAVELLY, REDDISH BROWN TO GREY, DAMP TO				
9:18	5.0 - 6.0	CONTINUOUS	*O**O*		C	WET, SLIGHT ORGANIC ODOR APPARENT				
9:18	6.0 - 10.0	CONTINUOUS	\\\\\\		C	CLAY, REDDISH BROWN, WET, NO HYDROCARBON ODOR				
			\\\\\\		C	APPARENT				
			\\\\\\		C					
			\\\\\\	10	C					
9:52	10.0 - 13.0	CONTINUOUS	**\		C	THIN SAND SEAMS WITH HYDROCARBON ODOR APPARENT				
			**\		C					
			**\		C					
9:52	13.0 - 15.0	CONTINUOUS	*-***		C	SAND, SILTY, WITH THIN CLAYEY LENSES, WATER				
			*-***	15	C	BEARING, STRONG HYDROCARBON ODOR FROM 13-14',				
9:58	15.0 - 17.5	CONTINUOUS	*-**		C	POSSIBLY THIN FREE PRODUCT ZONE AT 13.0'				
			*-**		C	STRONG ODOR, FREE PRODUCT APPARENT @ 17-17.5'				
			*-**		C					
9:58	17.5 - 20.0	CONTINUOUS	\\\\\\		C	CLAY, REDDISH BROWN, WET, NO HYDROCARBON ODOR				
			\\\\\\	20	C	APPARENT				
10:28	20.0 - 25.0	CONTINUOUS	**\		C	WITH SANDY LENSES, NO HYDROCARBON ODOR				
			**\		C	APPARENT				
			**\		C					
			**\		C					
			**\	25	C					
10:42	25.0 - 27.5	CONTINUOUS	**\		C	LIGHT REDDISH BROWN TO TAN				
			**\		C					
			**\		C					
10:42	27.5 - 30.0	CONTINUOUS	**\		C	CLAY, SANDY, TAN, WET, NO HYDROCARBON ODOR				
			**\	30	C	APPARENT				
10:59	30.0 - 35.0	CONTINUOUS	=*=*=		C	SHALE, SANDY, VERY DENSE, LIGHT GREEN AND DARK				
			=*=*=		C	PURPLE, VERY FINE LAMINATIONS/BEDS, NO HYDRO-				
			=*=*=		C	CARBON ODOR APPARENT				
			=*=*=		C					
			=*=*=	35	C					
11:08	35.0 - 40.0	CONTINUOUS	=*=*=		C	DARK PURPLE, NO HYDROCARBON ODOR APPARENT				
			=*=*=		C					
			=*=*=		C					
			=*=*=		C					
			=*=*=	40	C					
	TOTAL DEPTH									
				45		NOTES: STATIC WATER LEVEL NOT DETERMINED ON FOLLOWING DAY, HOLE ABOVE WATER LEVEL, HOLE OPEN TO 10' @ 2:00 PM ON 3/11/93, ALL SAMPLES TAKEN WITH 4-1/4" SPLIT TUBE SAMPLER, HOLE GROUTED BACK ON 3/17/93 AFTER HOLE WAS WASHED OUT WITH 580 GALLONS H_2O, GROUTED WITH # 2162 CEMENT, 160 GALLONS H2O, AND #50 BENSEAL BENTONITE.				

Size & Type of Boring: 4-1/4" ID Hollow Stemmed Auger | Logged By: PLJ

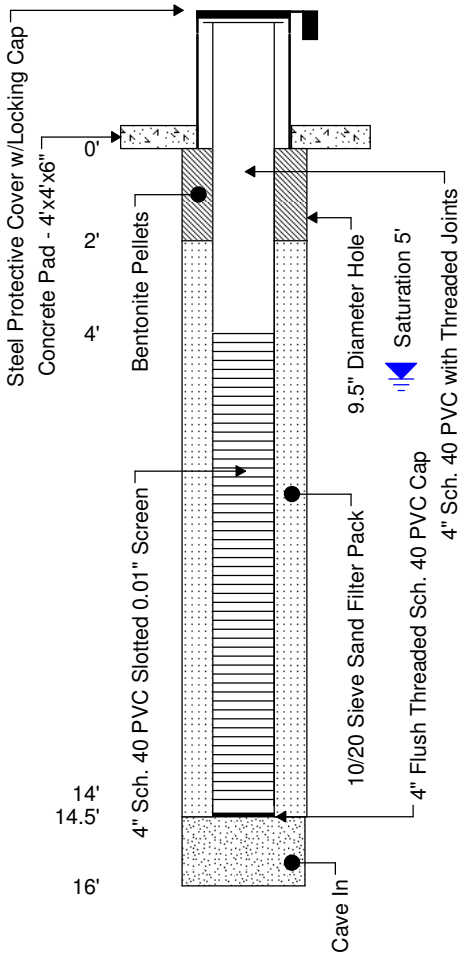
WELL INSTALLATION

Well No.: MKTF-01
Start Date: 11/14/2013
Finish Date: 11/14/2013

Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01809
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: Split Spoon
Comments: N 35°29.346' W 108°25.782'; Boring ID - HA1

Total Depth: 16' bgl
Ground Water: Saturated @ 5' bgl
Elev., TOC (ft. msl): 6920.67
Elev., PAD (ft. msl): 6918.28
Elev., GL (ft. msl): --
Site Coordinates:
N 1,633,864.41 **E** 2,545,561.73

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
					Ground Surface
0 - 5				100	**Silty Clay (CL)** Low plasticity, soft, damp, reddish brown to brown, no odor
5 - 15		5'		100	**Silty Clay/Clayey Silt (CL/ML)** Low plasticity, very soft, moist to saturated, brown grading to black, gravelly, bio odor, no phase-separated hydrocarbon
15					Total Depth = 16' BGL



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WELL INSTALLATION

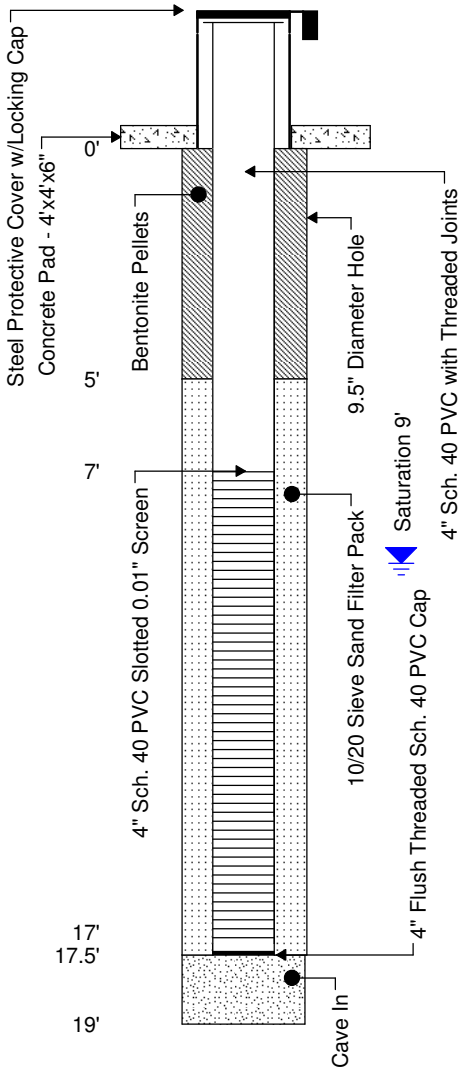
Well No.: MKTF-02
Start Date: 11/14/2013
Finish Date: 11/14/2013

Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01809
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: Split Spoon
Comments: N 35°29.360' W 108°25.789'; Boring ID HA3

Total Depth: 19' bgl
Ground Water: Saturated @ 9' bgl
Elev., TOC (ft. msl): 6917.45
Elev., PAD (ft. msl): 6915.00
Elev., GL (ft. msl): --
Site Coordinates:
N 1,633,946.93 **E** 2,545,530.46

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
0					Ground Surface
1				100	**Silty Clay (CL)** Low plasticity, firm, damp, brown-reddish brown, no odor
3	24.6				
5	20.1			100	**Silty Clay (CL)** Similar to above, odor at 6' bgl with black discoloration
7	400				
9	933 800	9'		100	**Sandy Clay (CL)** Low plasticity, soft, moist to saturated at 9' bgl, hydrocarbon odor, no phase-separated hydrocarbon
11					**Sandy Clay/Clayey Sand (SC/CL)** Fine grain, compact, saturated, dark brown, hydrocarbon odor, no phase-separated hydrocarbon
13				100	
15					
17					
19					Total Depth = 19' BGL

Completion Results



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WELL INSTALLATION

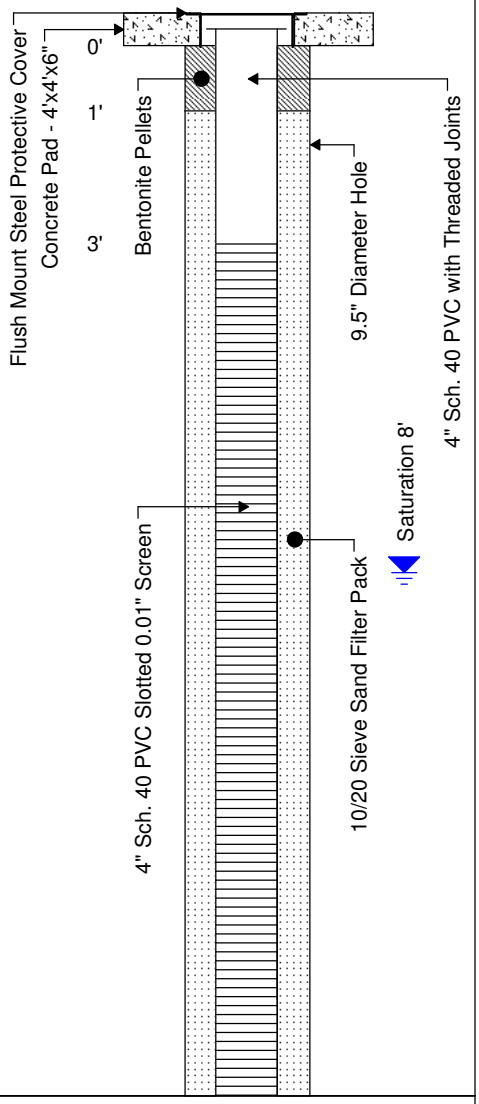
Well No.: MKTF-03
Start Date: 11/7/2013
Finish Date: 11/7/2013

Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01809
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: Split Spoon
Comments: N 35°29.328' W108°25.743'; Boring ID - SB01

Total Depth: 19' bgl
Ground Water: Saturated @ 8' bgl
Elev., TOC (ft. msl): 6931.31
Elev., PAD (ft. msl): 6931.73
Elev., GL (ft. msl): --
Site Coordinates:
N 1,633,746.53 **E** 2,545,756.87

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
-1					Ground Surface
1	164			60	**Fill (Silt/Sand)** Fine grain, loose, dry to damp, brown, no odor
3	423			40	**Silty Clay (CL)** Low plasticity, firm, damp, brown/reddish brown, no odor
5	330			70	**Silty Clay (CL)** Similar to above, no odor
7	75			90	**Silty Clay (CL)** Similar to above, sandy at base from 7.75-8.0' bgl, no odor
9	326	8'		90	**Silty Clay (CL)** Fine grain sand seams throughout, saturated, phase-separated hydrocarbon, hydrocarbon odor, clear phase-separated hydrocarbon poured out of split spoon
11	312			90	**Silty Clay (CL)** Similar to above with sand seams, saturated with phase-separated hydrocarbon, hydrocarbon odor, dark brown
13	368			80	**Gravelly Sand (SW)** Fine to medium to coarse grain, loose, saturated with phase-separated hydrocarbon, black, hydrocarbon odor
15	700			60	**Gravelly Sand (SW)** Similar to above

Completion Results



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WELL INSTALLATION

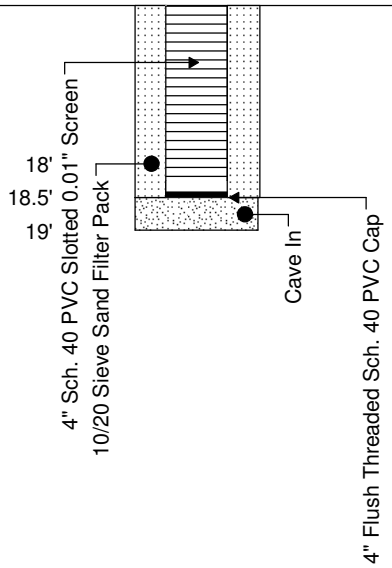
Well No.: MKTF-03
Start Date: 11/7/2013
Finish Date: 11/7/2013

Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01809
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: Split Spoon
Comments: N 35°29.328' W108°25.743'; Boring ID - SB01

Total Depth: 19' bgl
Ground Water: Saturated @ 8' bgl
Elev., TOC (ft. msl): 6931.31
Elev., PAD (ft. msl): 6931.73
Elev., GL (ft. msl): --
Site Coordinates:
N 1,633,746.53 **E** 2,545,756.87

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
17				10	**Silty Sand/Silty Clay (SM/CL)** Low plasticity, firm, moist, brown, faint odor, no phase-separated hydrocarbon
					Silty Clay (CL) Poor recovery
19	225			80	**Clay (CH)** High plasticity, very dense, damp, light reddish brown, faint odor
					Total Depth = 19' BGL
21					
23					
25					
27					
29					
31					

Completion Results



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WELL INSTALLATION

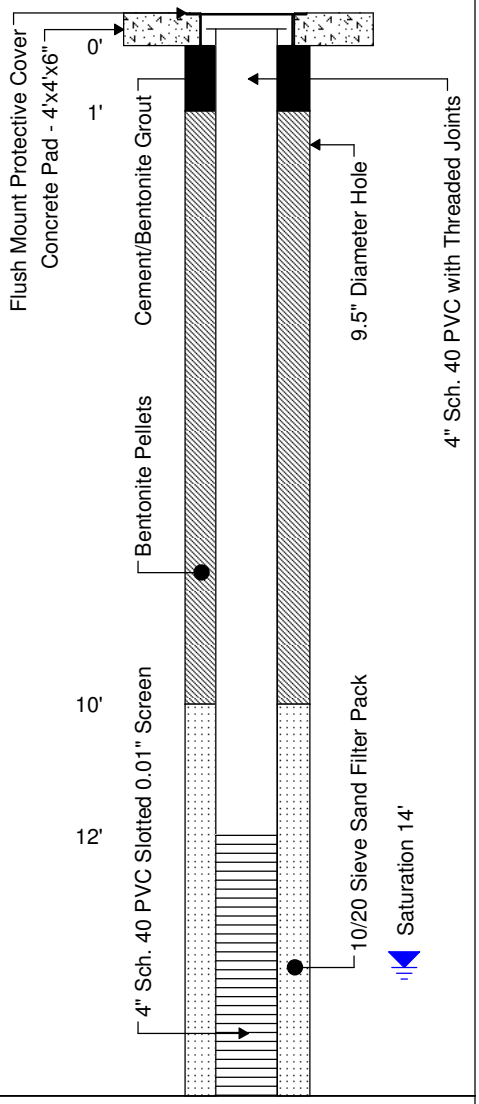
Well No.: MKTF-04
Start Date: 11/12/2013
Finish Date: 11/12/2013

Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01809
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: Split Spoon
Comments: N 35°29.310' W 108°25.742'; Boring ID SB03

Total Depth: 24' bgl
Ground Water: Saturated @ 14' bgl
Elev., TOC (ft. msl): 6933.57
Elev., PAD (ft. msl): 6933.90
Elev., GL (ft. msl): --
Site Coordinates:
N 1,633,649.46 **E** 2,545,752.83

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
-1					Ground Surface
1	10.2			90	**Fill (Silt/Gravel)** Low plasticity, very dense, dry, light brown, no odor
3	11.7			80	**Fill (Silt/Gravel)** Similar to above, black, dense at base, no odor
5	16			90	**Silty Clay (CL)** Low plasticity, stiff, damp, reddish brown, no odor, calcareous
7	26			90	**Gravelly Sandy Clay (CL)** Low plasticity, loose to firm, damp, brown, no odor
9	708			70	**Silty Clay (CL)** Low plasticity, very soft, damp, reddish brown, hydrocarbon odor
11	369			80	**Clay (CH)** High plasticity, firm, damp, reddish brown, hydrocarbon odor
13	660	14'		90	**Sandy Clay/Clayey Sand (SC/CL)** Low plasticity, fine grain, soft, damp, reddish brown, hydrocarbon odor
15	85			90	**Sandy Clay (SC)** Similar to above, saturated sand seams, hydrocarbon odor, brown

Completion Results



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WELL INSTALLATION

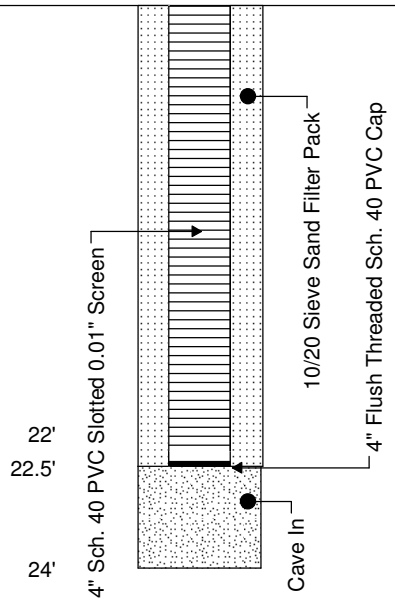
Well No.: MKTF-04
Start Date: 11/12/2013
Finish Date: 11/12/2013

Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01809
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: Split Spoon
Comments: N 35°29.310' W 108°25.742'; Boring ID SB03

Total Depth: 24' bgl
Ground Water: Saturated @ 14' bgl
Elev., TOC (ft. msl): 6933.57
Elev., PAD (ft. msl): 6933.90
Elev., GL (ft. msl): --
Site Coordinates:
N 1,633,649.46 **E** 2,545,752.83

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
17	64			70	**Sandy Clay (SC)** Similar to above, moist to saturated, hydrocarbon odor, brown
	33				**Sandy Clay (SC)** Low plasticity, fine grain, soft, moist to saturated, light reddish brown, hydrocarbon odor, gravelly at base
19					**Silty Clay (CL)** Low plasticity, stiff, damp, light reddish brown grading to yellowish/greenish gray, becomes more silty at base
21				90	
23					Total Depth = 24' BGL
25					
27					
29					
31					

Completion Results



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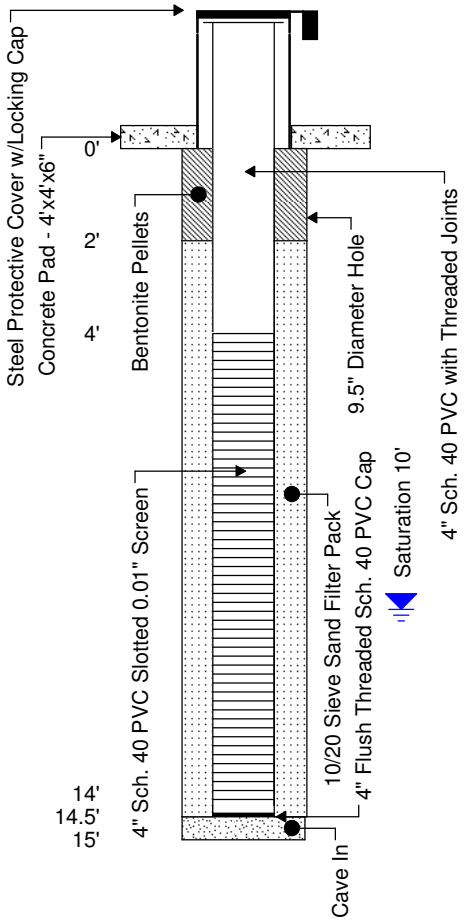
WELL INSTALLATION

Well No.: MKTF-05
Start Date: 11/12/2013
Finish Date: 11/12/2013

Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01809
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: Split Spoon
Comments: N 35°29.282' W 108°25.739'; Boring ID - SB06

Total Depth: 15' bgl
Ground Water: Saturated @ 10' bgl
Elev., TOC (ft. msl): 6942.22
Elev., PAD (ft. msl): 6939.49
Elev., GL (ft. msl): --
Site Coordinates:
N 1,633,472.30 **E** 2,545,769.95

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
					Ground Surface
1	52.6			60	**Fill (Silty Clay/Gravel)** Low plasticity, firm, damp, brown, faint odor
3	180			100	**Silty Clay (CL)** Low plasticity, firm, damp, reddish brown, odor, calcareous
5	224			90	**Sandy Clay/Clayey Sand (CL/SC)** Low plasticity, fine grain, damp, dark brown, hydrocarbon odor, sand seams present
7	1202			90	**Sandy Clay/Clayey Sand (CL)** Similar to above
9	1228	10'		90	**Sandy Silty Clay (CL)** Low plasticity, soft, damp, dark brown, hydrocarbon odor
11	1525			90	**Sandy Clay (CL)** Similar to above, with moist to saturated sand seams, hydrocarbon odor
13	377			90	**Clayey Sand (SC)** Fine grain, loose to compact, saturated, hydrocarbon odor, dark brown
15					**Sandy Clay (CL)** Low plasticity, soft to firm, moist, dark brown, hydrocarbon odor
					Total Depth = 15' BGL



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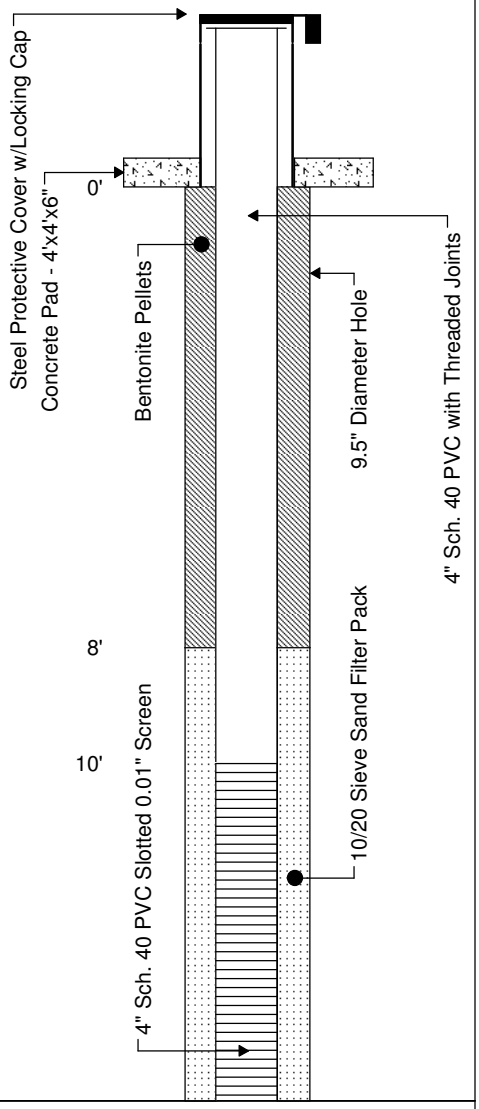
WELL INSTALLATION

Well No.: MKTF-06
Start Date: 11/11/2013
Finish Date: 11/11/2013

Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01809
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: Split Spoon
Comments: N 35°29.295' W 108°25.732'; Boring ID - SB08

Total Depth: 21' bgl
Ground Water: Saturated @ 17.5' bgl
Elev., TOC (ft. msl): 6946.81
Elev., PAD (ft. msl): 6944.24
Elev., GL (ft. msl): --
Site Coordinates:
N 1,633,556.28 **E** 2,545,811.85

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
					Ground Surface
1	15.9			70	**Fill (Silt/Silty Clay)** Low plasticity, stiff, dry, light brown, no odor
3	228			60	**Fill (Silty Clay/Gravel)** Similar to above, dry, no odor
5	177			60	**Fill (Silty Clay)** Similar to above, damp, no odor
7	264			40	**Fill (Silty Clay)** Low plasticity, soft, damp, brown, gravel and wood debris
9				--	No recovery
11	90			10	**Fill (Silty Clay/Gravel)** Similar to above
13	660			100	**Sandy Silty Clay (CL)** Low plasticity, soft, damp to moist at base, brown, hydrocarbon odor
15					



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WELL INSTALLATION

Well No.: MKTF-06
Start Date: 11/11/2013
Finish Date: 11/11/2013

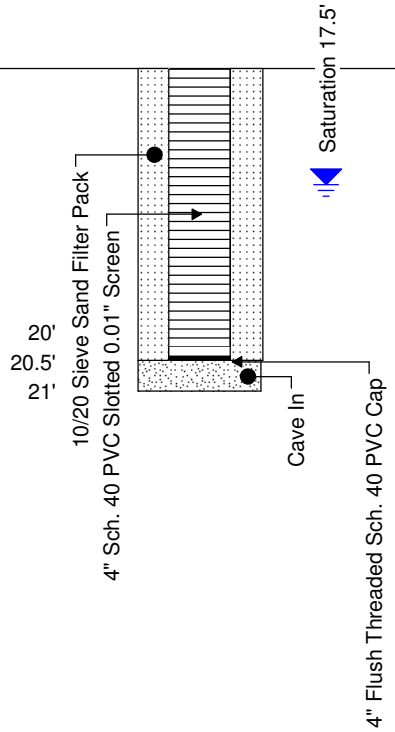
Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01809
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: Split Spoon

Total Depth: 21' bgl
Ground Water: Saturated @ 17.5' bgl
Elev., TOC (ft. msl): 6946.81
Elev., PAD (ft. msl): 6944.24
Elev., GL (ft. msl): --
Site Coordinates:
N 1,633,556.28 **E** 2,545,811.85

Comments: N 35°29.295' W 108°25.732'; Boring ID - SB08

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
17	1115	17.5'		100	**Sandy Silty Clay (CL)** Similar to above, moist, oily, hydrocarbon odor
19	225			100	**Gravelly Sandy Clay (CL)** Low plasticity, firm, moist, oily, 1" gravel, strong hydrocarbon odor
21				100	**Clayey Gravel Sand (SC)** Fine to medium grain, loose, saturated, phase-separated hydrocarbon present, black, hydrocarbon odor
23					**Sandy Clay (CL)** Low plasticity, firm, moist, black hydrocarbon odor
25					Total Depth = 21' BGL
27					
29					
31					
33					

Completion Results



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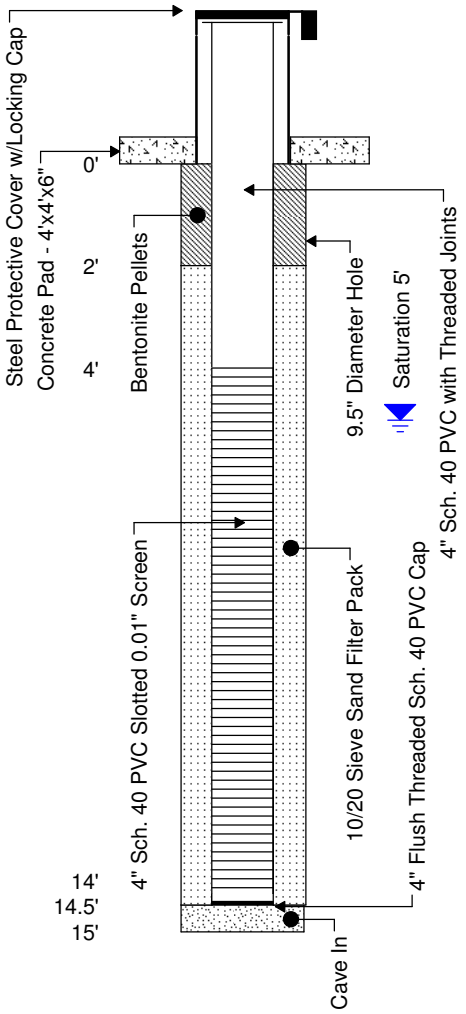
WELL INSTALLATION

Well No.: MKTF-07
Start Date: 11/11/2013
Finish Date: 11/11/2013

Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01809
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: Split Spoon
Comments: N 35°29.295' W 108°25.710'; Boring ID - SB10

Total Depth: 15' bgl
Ground Water: Saturated @ 5' bgl
Elev., TOC (ft. msl): 6947.18
Elev., PAD (ft. msl): 6944.40
Elev., GL (ft. msl): --
Site Coordinates:
N 1,633,555.11 **E** 2,545,885.42

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
0					Ground Surface
1	132			90	**Fill (Silty Clay)** Low plasticity, firm, dry to damp, brown, faint odor
3	235			90	**Fill (Clay/Sand/Gravel)** Damp, hydrocarbon odor
5	1202	5' ▼		50	**Fill (Clay/Caliche Rock)** Odor
7	372			90	**Silty Sand (SM)** Fine grain, loose, saturated, phase-separated hydrocarbon, oily, brown to dark brown, hydrocarbon odor
9					**Silty Sand (SM)** Similar to above, saturated
11				--	**Silty Clay (CL)** Low plasticity, firm, damp, brown, hydrocarbon odor No recovery
15					Total Depth = 15' BGL



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WELL INSTALLATION

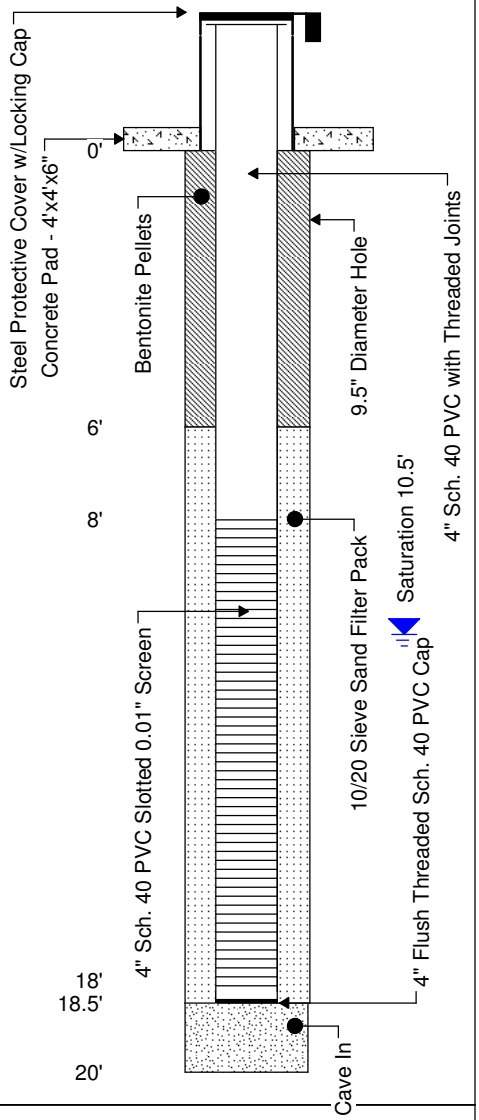
Well No.: MKTF-08
Start Date: 11/11/2013
Finish Date: 11/11/2013

Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01809
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: Split Spoon
Comments: N 35°29.302' W 108°25.716'; Boring ID - SB11

Total Depth: 20' bgl
Ground Water: Saturated @ 10.5' bgl
Elev., TOC (ft. msl): 6947.09
Elev., PAD (ft. msl): 6944.02
Elev., GL (ft. msl): --
Site Coordinates:
N 1,633,598.94 **E** 2,545,885.02

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
0					Ground Surface
1	85			90	**Fill (Silty Clay/Gravel)** Low plasticity, firm, dry to damp, odor
3	273			80	**Fill (Silty Clay/Gravel)** Similar to above
5	86			90	**Clay (CH)** High plasticity, stiff, damp, brown with light brown pockets of silt, odor
7	308			90	**Silty Clay (CL)** Low plasticity, soft/crumbly, dry to damp, brown, hydrocarbon odor
9	1126			80	**Silty Clay (CL)** Low plasticity, soft, damp, brown, hydrocarbon odor
10.5		▼			
11	789			80	**Silty Clay (CL)** Similar to above, moist
13	558			90	**Silty Clay (CL)** Medium grain, loose, saturated, phase-separated hydrocarbon, hydrocarbon odor, brown
15					**Sandy Silty Clay (CL)** Low plasticity, soft to firm, moist, hydrocarbon odor
17					**Sandy Clay (CL)** Low plasticity, soft to compact, saturated, phase-separated hydrocarbon, hydrocarbon odor
19					
20					Total Depth = 20' BGL

Completion Results



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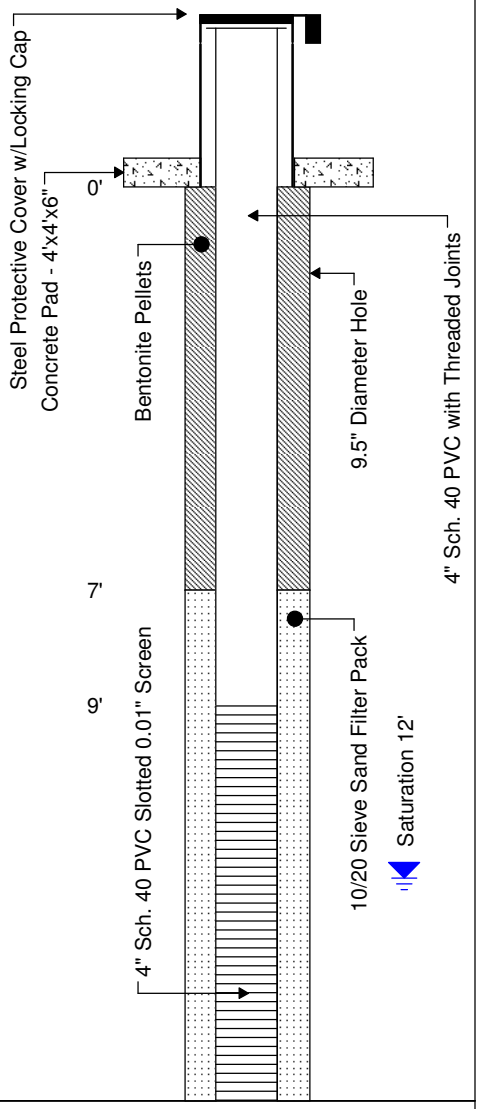
WELL INSTALLATION

Well No.: MKTF-09
Start Date: 11/11/2013
Finish Date: 11/11/2013

Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01809
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: Split Spoon
Comments: N 35°29.316' W 108°25.715'; Boring ID - SB13

Total Depth: 22' bgl
Ground Water: Saturated @ 12' bgl
Elev., TOC (ft. msl): 6946.50
Elev., PAD (ft. msl): 6943.57
Elev., GL (ft. msl): --
Site Coordinates:
N 1,633,681.33 **E** 2,545,895.93

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
-3					
-1					Ground Surface
1	21.9			90	**Fill (Silty Clay)** Low plasticity, stiff, dry to damp, no odor, brown
3	32.7			90	**Fill (Silty Clay)** Similar to above, gravel
5	36.1			90	**Silty Clay (CL)** Low plasticity, soft, damp, brown, faint odor
7	37			90	**Silty Clay (CL)** Similar to above
9	533			90	**Silty Clay (CL)** Similar to above
					Sandy Clay (CL) Similar to above, increase in sand and moisture
11	314	12'		90	**Sandy Clay (CL)** Similar to above, moist, hydrocarbon odor, dark brown
13	651			90	**Sandy Clay/Clayey Sand (CL/SC)** Fine to medium grain, compact, moist to saturated, hydrocarbon odor
15	587				**Sandy Clay/Clayey Sand (CL/SC)** Similar to above, saturated, sheen observed on split spoon, black, hydrocarbon odor



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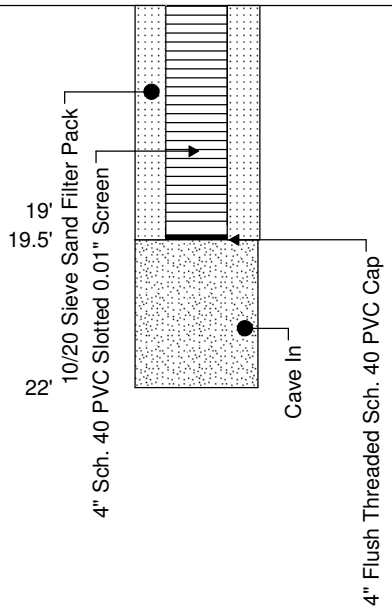
WELL INSTALLATION

Well No.: MKTF-09
Start Date: 11/11/2013
Finish Date: 11/11/2013

Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01809
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: Split Spoon
Comments: N 35°29.316' W 108°25.715'; Boring ID - SB13

Total Depth: 22' bgl
Ground Water: Saturated @ 12' bgl
Elev., TOC (ft. msl): 6946.50
Elev., PAD (ft. msl): 6943.57
Elev., GL (ft. msl): --
Site Coordinates:
N 1,633,681.33 **E** 2,545,895.93

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description	Completion Results
17–33				90	**Sandy Clay/Clayey Sand (CL/SC)** Fine to medium grain, compact, saturated, sheen observed on split spoon, black, hydrocarbon odor	
22					Total Depth = 22' BGL	



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WELL INSTALLATION

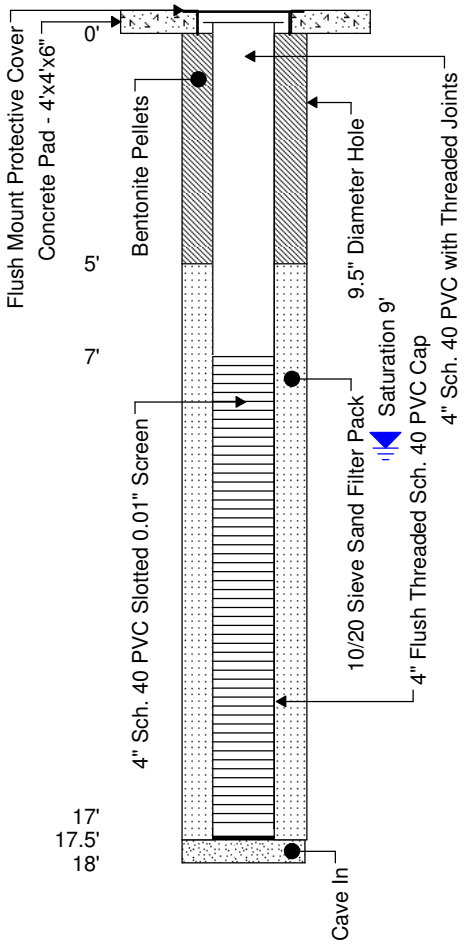
Well No.: MKTF-10
Start Date: 10/31/2013
Finish Date: 10/31/2013

Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01809
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: Split Spoon
Comments: N 35°29.336' W 108°25.724'; Boring ID SB16

Total Depth: 18' bgl
Ground Water: Saturated @ 9' bgl
Elev., TOC (ft. msl): 6937.16
Elev., PAD (ft. msl): 6937.51
Elev., GL (ft. msl): --
Site Coordinates:
N 1,633,807.47 **E** 2,545,853.54

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
					Ground Surface
1	90			90	**Fill (Silt/Gravel)** Low plasticity, loose, dry, light brown
3	14			90	**Fill (Silty Clay/Gravel)** Similar to above
5	431			90	**Silty Clay (CL)** Low plasticity, stiff, dry, reddish brown, odor, calcareous
7	448			60	**Sand (SP)** Fine grain, loose, dry, reddish brown, odor
9	654	9'		60	**Sand (SP)** Similar to above, saturated at 9' bgl, phase-separated hydrocarbon, hydrocarbon odor
11	1559			90	**Clayey Sand (SC)** Fine grain, soft, saturated, phase-separated hydrocarbon, brown to black, hydrocarbon odor
13	713			90	**Clayey Sand/Sandy Clay (SC/CL)** Low plasticity, firm to stiff, moist to saturated, hydrocarbon odor, dark brown
15					
17					
					Total Depth = 18' BGL
19					
21					

Completion Results



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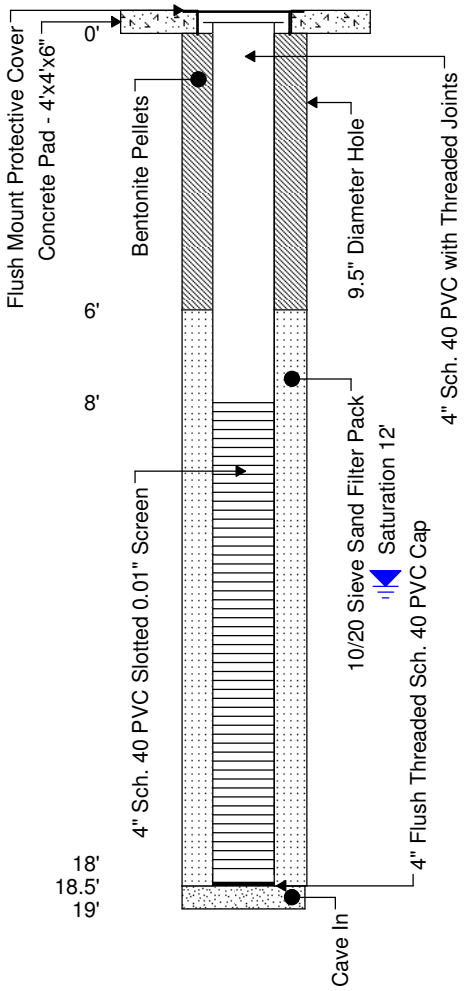
WELL INSTALLATION

Well No.: MKTF-11
Start Date: 10/31/2013
Finish Date: 10/31/2013

Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01809
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: Split Spoon
Comments: N 35°29.336' W 108°25.739'; Boring ID - SB17

Total Depth: 19' bgl
Ground Water: Saturated @ 12' bgl
Elev., TOC (ft. msl): 6931.34
Elev., PAD (ft. msl): 6931.61
Elev., GL (ft. msl): --
Site Coordinates:
N 1,633,806.93 **E** 2,545,754.77

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
					Ground Surface
1	14			60	**Fill (Silty Clay/Gravel)** Low plasticity, stiff, dry, light brown
3	36			70	**Fill (Silty Clay)** Similar to above
5	80			90	**Silty Clay (CL)** Low plasticity, firm, damp, brown, calcareous
7	125			80	**Silty Clay (CL)** Similar to above
9	1259			80	**Silty Clay (CL)** Low plasticity, firm, damp, oily, hydrocarbon odor, dark brown
11	860	12'		70	**Silty Clay (CL)** Similar to above, moist, hydrocarbon odor, oily, phase-separated hydrocarbon
13	1716			60	**Sandy Clay (CL)** Low plasticity, soft, moist to saturated, hydrocarbon odor, dark brown
15	1050			70	**Silty Sand (SM)** Medium grain, loose, saturated, hydrocarbon odor, dark brown to black
17					**Sandy/Silty Clay (CL)** Low plasticity, firm, saturated, dark brown to black, hydrocarbon odor
19					Total Depth = 19' BGL



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WELL INSTALLATION

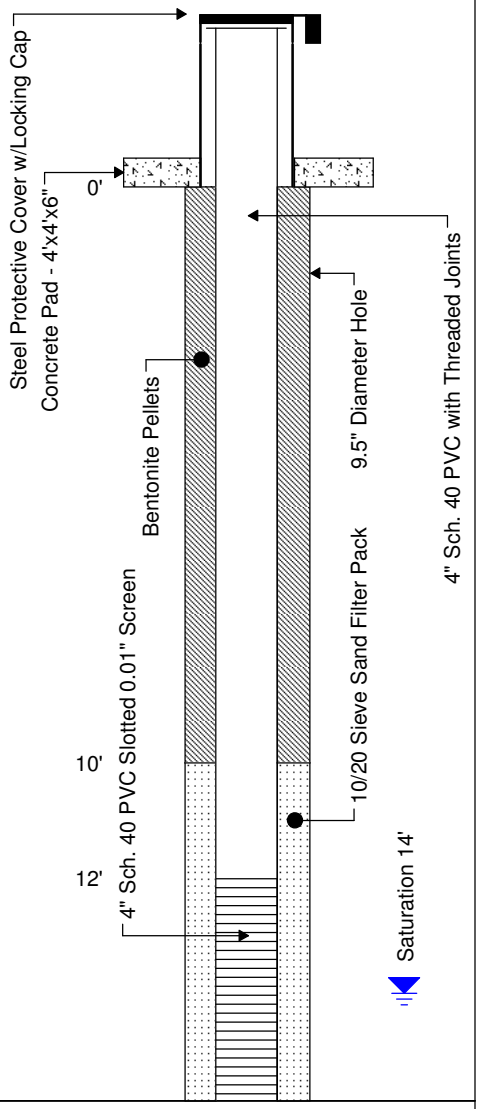
Well No.: MKTF-12
Start Date: 11/7/2013
Finish Date: 11/7/2013

Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01809
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: Split Spoon
Comments: N 35°29.294' W 108°25.754'; Boring ID - SB19

Total Depth: 23' bgl
Ground Water: Saturated @ 14' bgl
Elev., TOC (ft. msl): 6942.11
Elev., PAD (ft. msl): 6939.70
Elev., GL (ft. msl): --
Site Coordinates:
N 1,633,542.07 **E** 2,545,688.29

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
-3					
-1					Ground Surface
1	8.7			90	**Silt/Gravel (ML)** Low plasticity, soft, dry/damp, no odor, brown
3	54			80	**Silt/Gravel (ML)** Similar to above
5	7			70	**Gravel/Silt (GW)** 1/2 to 1" gravel, loose, compact, dry, no odor
7	7.5			70	**Clayey Sandy Silt (ML)** Very fine grain, compact, dry to damp, brown, no odor
9	5.5			60	**Sandy Clay (CL)** Low plasticity, firm, damp, light brown, no odor
11	5.8			70	**Sandy Clay (CL)** Similar to above, brown, no odor
13	10	14'		70	**Sandy Clay (CL)** Similar to above
					Silty Sand (SM) Fine to medium grain, loose, damp, brown, no odor
15	225			50	**Sandy Clay (CL)** Low plasticity, firm, moist to saturated in sand seams, hydrocarbon odor, dark brown

Completion Results



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WELL INSTALLATION

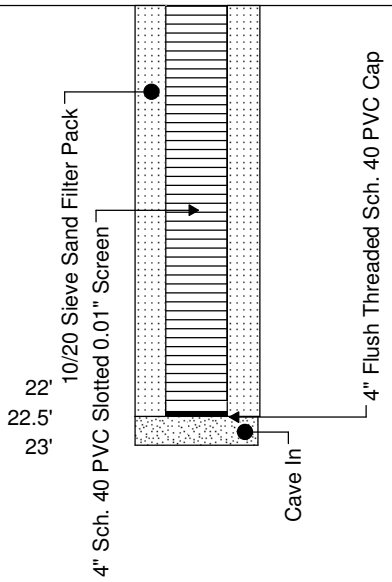
Well No.: MKTF-12
Start Date: 11/7/2013
Finish Date: 11/7/2013

Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01809
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: Split Spoon
Comments: N 35°29.294' W 108°25.754'; Boring ID - SB19

Total Depth: 23' bgl
Ground Water: Saturated @ 14' bgl
Elev., TOC (ft. msl): 6942.11
Elev., PAD (ft. msl): 6939.70
Elev., GL (ft. msl): --
Site Coordinates:
N 1,633,542.07 **E** 2,545,688.29

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
17	319			70	**Sandy Clay (CL)** Similar to above, moist, hydrocarbon odor
19	400			--	**Sandy Clay (CL)** Similar to above, moist, hydrocarbon odor
21	532			--	**Sandy Clay/Clayey Sand (CL)** Very fine grain, compact, moist to saturated, sheen observed in split spoon, hydrocarbon odor
23					Total Depth = 23' BGL
25					
27					
29					
31					
33					

Completion Results



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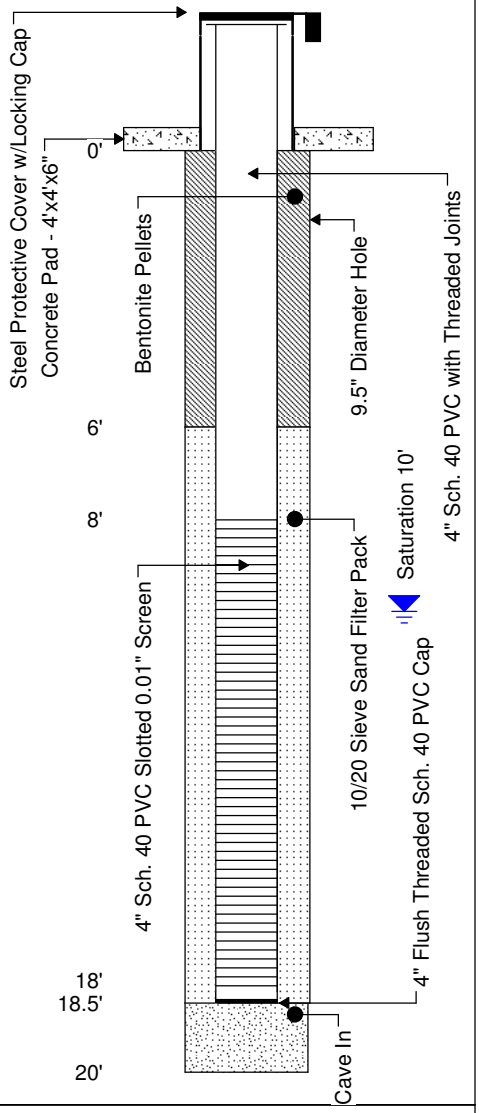
WELL INSTALLATION

Well No.: MKTF-13
Start Date: 11/12/2013
Finish Date: 11/12/2013

Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01809
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: Split Spoon
Comments: N 35°29.307' W 108°25.755'; Boring ID - SB20

Total Depth: 20' bgl
Ground Water: Saturated @ 10' bgl
Elev., TOC (ft. msl): 6935.18
Elev., PAD (ft. msl): 6933.67
Elev., GL (ft. msl): --
Site Coordinates:
N 1,633,625.25 **E** 2,545,697.39

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
-3					
-1					Ground Surface
1	8			90	**Silt (ML)** Low plasticity, soft, damp, brown, no odor
3	12.7			90	**Silt (ML)** Similar to above, trace gravel
5	13			80	**Sandy Clay (CL)** Low plasticity, stiff, dry, brown, calcareous
7	17			90	**Silty Sand/Sandy Silt (SM/ML)** Very fine grain, loose to compact, dry, calcareous, brown
9	59	10'		90	**Sandy Silt (ML)** Similar to above, no odor
11	1165			90	**Sandy Clay/Clayey Sand (SC/CL)** Medium grain, compact, moist to saturated, hydrocarbon odor, brown
13	1200			90	**Clayey Sand (SC)** Similar to above, saturated, hydrocarbon odor
15					
17					
19					Total Depth = 20' BGL



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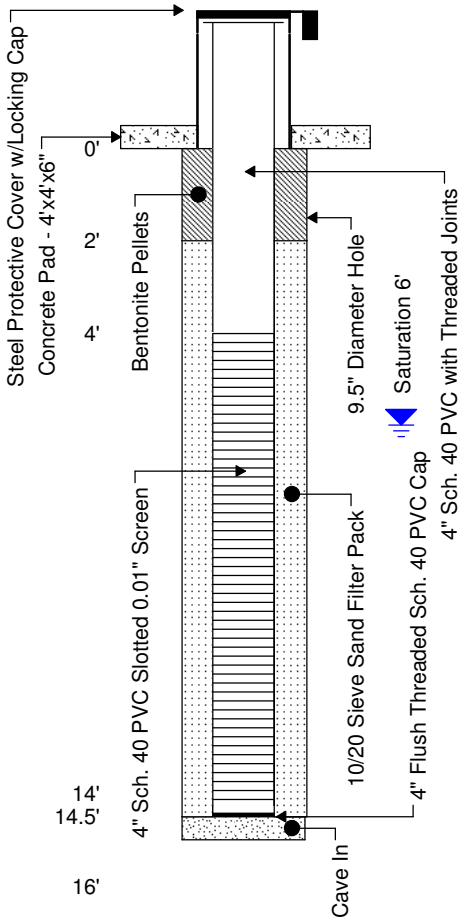
WELL INSTALLATION

Well No.: MKTF-14
Start Date: 11/12/2013
Finish Date: 11/12/2013

Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01809
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: Split Spoon
Comments: N 35°29.323' W 108°25.769'; Boring ID SB22

Total Depth: 15' bgl
Ground Water: Saturated @ 6' bgl
Elev., TOC (ft. msl): 6928.02
Elev., PAD (ft. msl): 6925.65
Elev., GL (ft. msl): --
Site Coordinates:
N 1,633,719.43 **E** 2,545,625.96

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
					Ground Surface
1	18			20	**Silty Clay (CL)** Low plasticity, soft, damp, brown
3	308			90	**Silty Clay (CL)** Similar to above, odor
5	793			90	**Sandy Clay (CL)** Low plasticity, firm, moist, oily, brown, trace gravel
7	504	6'		90	**Clayey Sand (SC)** Medium grain, loose to compact, saturated, phase-separated hydrocarbon, hydrocarbon odor, black
9	760			90	**Clayey Sand (SC)** Similar to above
15					Total Depth = 15' BGL



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WELL INSTALLATION

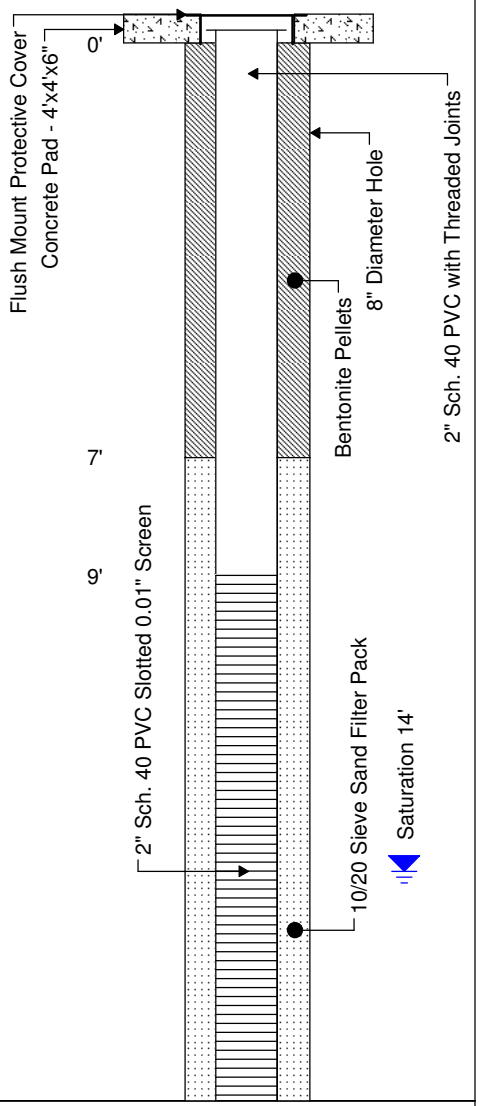
Well No.: MKTF-15
Start Date: 10/29/2013 09:30
Finish Date: 10/29/2013 12:15

Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01809
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: Five-Foot Core Barrel
Comments: N 35°29.343' W 108°25.708'; Boring ID - SB31

Total Depth: 22' bgl
Ground Water: Saturated @ 14' bgl
Elev., TOC (ft. msl): 6943.48
Elev., PAD (ft. msl): 6943.74
Elev., GL (ft. msl): --
Site Coordinates:
N 1,633,845.57 **E** 2,545,934.58

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
-1					Ground Surface
1	6.7			0	**Fill (Clay and Gravel)** No recovery
3	14.6			90	**Fill (Clay and Gravel)** Reddish brown
5				90	**Fill (Clay and Gravel)** Similar to above, no odor
7	823			90	**Fill (Silty Clay)** Reddish brown, hydrocarbon odor
9	1004			90	**Silty Sandy Clay (CL)** Low plasticity, firm to soft, damp, reddish brown, hydrocarbon odor
11	293			70	**Silty Sand (SM)** Fine grain, compact, damp, light reddish brown, no odor
13	221	14'		80	**Sand (SP)** Similar to above, odor, moist to very moist
15				80	**Sand (SP)** Fine to medium grain, loose, saturated, brown, hydrocarbon odor, phase-separated hydrocarbon present
17				60	**Sandy Silt (ML)** Low plasticity, very soft, damp to moist, brown, hydrocarbon odor

Completion Results



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WELL INSTALLATION

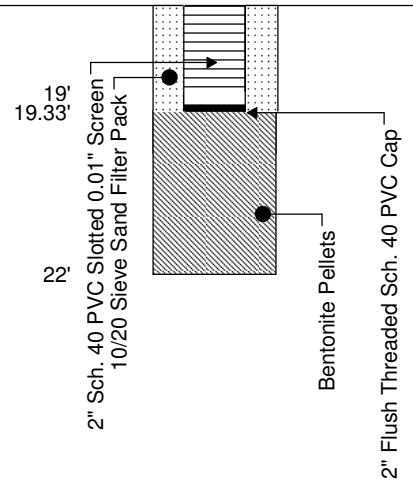
Well No.: MKTF-15
Start Date: 10/29/2013 09:30
Finish Date: 10/29/2013 12:15

Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01809
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: Five-Foot Core Barrel
Comments: N 35°29.343' W 108°25.708'; Boring ID - SB31

Total Depth: 22' bgl
Ground Water: Saturated @ 14' bgl
Elev., TOC (ft. msl): 6943.48
Elev., PAD (ft. msl): 6943.74
Elev., GL (ft. msl): --
Site Coordinates:
N 1,633,845.57 **E** 2,545,934.58

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
19				90	**Sandy Silt/Silty Sand (ML/SM)** Fine grain, loose to compact, moist to saturated, hydrocarbon odor, dark brown to black
					Sandy Silt/Silty Sand (ML/SM) Similar to above, saturated in silty sand lenses, hydrocarbon odor
21				90	**Silty Clay (CL)** Low plasticity, firm, damp, brown, faint odor
					Silty Clay (CL) Similar to above, odor
23					Total Depth = 22' BGL
25					
27					
29					
31					
33					
35					

Completion Results



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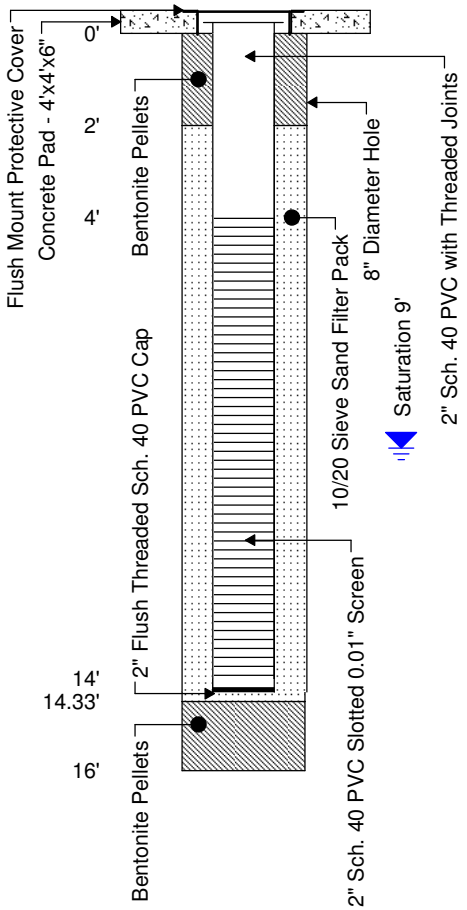
WELL INSTALLATION

Well No.: MKTF-16
Start Date: 11/7/2013 08:40
Finish Date: 11/7/2013 11:00

Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01809
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: Split Spoon
Comments: N 35°29.323' W 108°25.680'; Boring ID - SB32

Total Depth: 16' bgl
Ground Water: Saturated @ 9' bgl
Elev., TOC (ft. msl): 6950.58
Elev., PAD (ft. msl): 6951.00
Elev., GL (ft. msl): --
Site Coordinates:
N 1,633,718.14 **E** 2,546,068.55

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
					Ground Surface
1				0	**Fill (Clay/Gravel)** No recovery
3	469			10	**Fill (Clay/Gravel)** Similar to above
5				0	**Fill (Clay/Gravel)** Similar to baove
7				0	**Fill (Clay/Gravel)** Similar to above
9	1445	9'		90	**Fill (Clay/Gravel)** Saturated at 9' bgl, black discoloration, hydrocarbon odor
11	1255			90	**Gravelly Sand (SW)** High plasticity, firm, damp, dark brown, hydrocarbon odor
13	1412			40	**Clayey Sand (SC)** Similar to above, hydrocarbon odor
15	439			80	**Clayey Sand (SC)** Moderate plasticity, firm, damp, brown, hydrocarbon odor
					Total Depth = 16' BGL



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WELL INSTALLATION

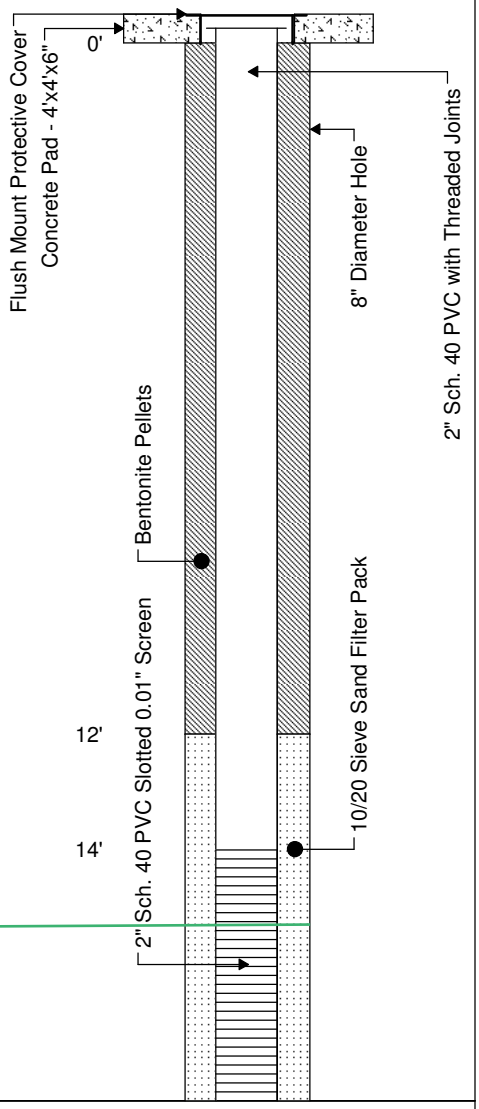
Well No.: MKTF-17
Start Date: 11/14/2013 13:00
Finish Date: 11/14/2013 15:00

Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01809
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: Split Spoon
Comments: N 35°29.248' W 108°25.724'; Boring ID - SB33

Total Depth: 25' bgl
Ground Water: Saturated @ 20' bgl
Elev., TOC (ft. msl): 6945.76
Elev., PAD (ft. msl): 6945.79
Elev., GL (ft. msl): --
Site Coordinates:
N 1,633,268.93 **E** 2,545,850.73

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
					Ground Surface
1				10	**Fill (Asphalt/Base/Clay)** Low plasticity, soft, damp, brown
3	150			10	**Fill (Clay)** Similar to above
5	157			90	**Fill (Sand/Gravel/Clay)** Moist to very moist, reddish brown, no odor
7	92.1			20	**Fill (Sand/Gravel/Clay)** Similar to above, saturated, odor
9	65.9			90	**Clay (CH)** High plasticity, firm, damp, faint odor, brown
11	17			60	**Clay (CH)** Similar to above
13	55			70	**Clay (CH)** High plasticity, soft, damp, dark brown and black, odor
15	17.5			60	**Clay (CH)** Similar to above, faint odor
					GW Elevation - 15.40' 9/14/20
17	11.3			10	**Clay (CH)** Similar to above, trace fine grain sand

Completion Results



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512/347-7588
512/347-8243

WELL INSTALLATION

Well No.: MKTF-17
Start Date: 11/14/2013 13:00
Finish Date: 11/14/2013 15:00

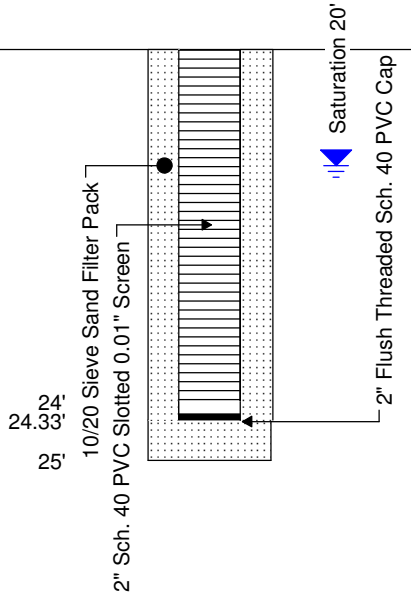
Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01809
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: Split Spoon

Total Depth: 25' bgl
Ground Water: Saturated @ 20' bgl
Elev., TOC (ft. msl): 6945.76
Elev., PAD (ft. msl): 6945.79
Elev., GL (ft. msl): --
Site Coordinates:
N 1,633,268.93 **E** 2,545,850.73

Comments: N 35°29.248' W 108°25.724'; Boring ID - SB33

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
20	17.2	20'		10	**Clay (CH)** High plasticity, soft, damp, brown
	17.5			70	**Sandy Clay (CH)** Moderate plasticity, soft, very moist to saturated in sand seams
22				80	**Silty Clayey Gravel (GM)** Compact to loose, medium grain sand to 1/4" gravel - angular, saturated, brown
24				90	**Clay (CH)** Moderate plasticity, firm to stiff, damp, greenish gray
					Total Depth = 25' BGL

Completion Results



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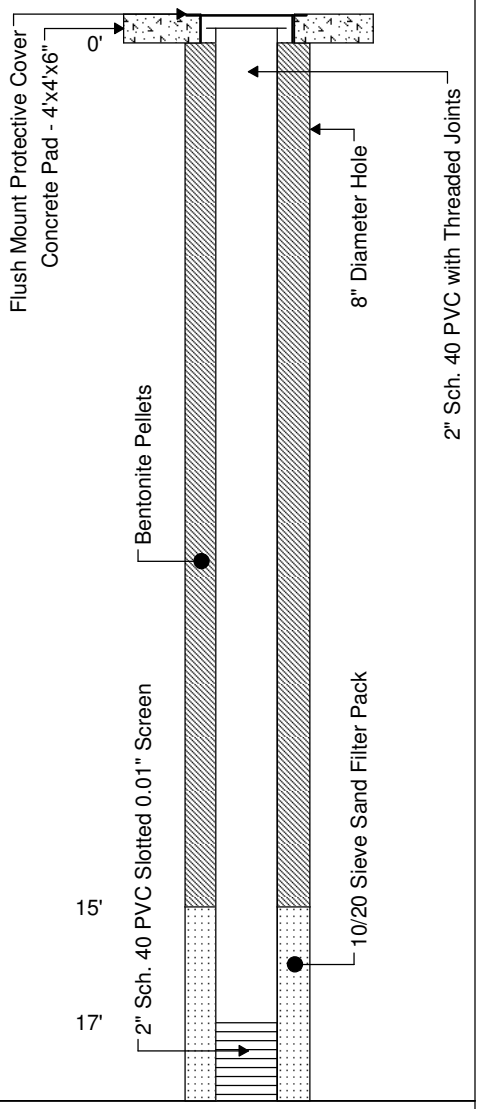
WELL INSTALLATION

Well No.: MKTF-18
Start Date: 11/15/2013 10:00
Finish Date: 11/15/2013 15:00

Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01809
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: Split Spoon
Comments: N 35°29.288' W 108°25.692'; Boring ID - SB34

Total Depth: 27' bgl
Ground Water: Saturated @ 23' bgl
Elev., TOC (ft. msl): 6950.65
Elev., PAD (ft. msl): 6950.97
Elev., GL (ft. msl): --
Site Coordinates:
N 1,633,497.53 **E** 2,546,006.29

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
-1					Ground Surface
1				--	**Fill (Gravel and Silty Clay)**
3	1009			20	**Fill (Gravel and Silty Clay)** Similar to above, strong hydrocarbon odor, damp
5	693			60	**Fill (Gravel and Silty Clay)** Similar to above
7	1108			70	**Fill (Silty Clay)** Low plasticity, firm, damp, brown, gravel present, strong hydrocarbon odor
9	901			90	**Fill (Clay/Sand/Gravel)** Similar to above, saturated, odor, sheen observed
11	803			60	**Clay (CH)** High plasticity, stiff, damp, brown, hydrocarbon odor
13	254			70	**Clay (CH)** Similar to above, very fine grain, sand in partings
15	200			30	**Clay (CH)** Similar to above
17				--	No recovery



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WELL INSTALLATION

Well No.: MKTF-18
Start Date: 11/15/2013 10:00
Finish Date: 11/15/2013 15:00

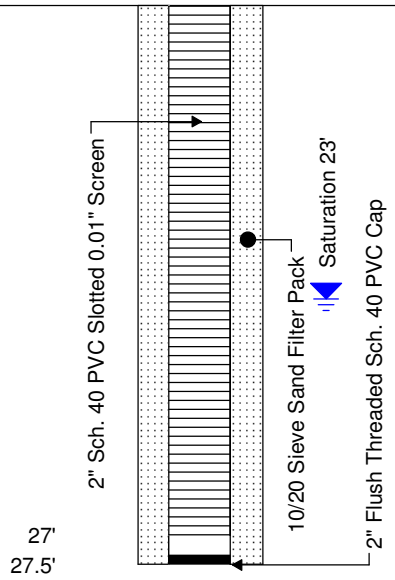
Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01809
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: Split Spoon

Total Depth: 27' bgl
Ground Water: Saturated @ 23' bgl
Elev., TOC (ft. msl): 6950.65
Elev., PAD (ft. msl): 6950.97
Elev., GL (ft. msl): --
Site Coordinates:
N 1,633,497.53 **E** 2,546,006.29

Comments: N 35°29.288' W 108°25.692'; Boring ID - SB34

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
20	112			30	**Clay (CH)** High plasticity, firm, damp, brown, faint odor
	55			20	**Clay (CH)** Similar to above
22					
	323	23'		80	**Clay (CH)** Similar to above
24					**Sandy Clay/Clayey Sand (SC/CL)** Fine grain, compact, very moist to saturated, brown, hydrocarbon present
				90	**Clayey Sand (SC)** Similar to above, saturated
26					**Sandy Clay (CL)** Low plasticity, firm, damp, hydrocarbon odor, greenish gray
28					Total Depth = 27' BGL
30					
32					
34					
36					

Completion Results



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WELL INSTALLATION

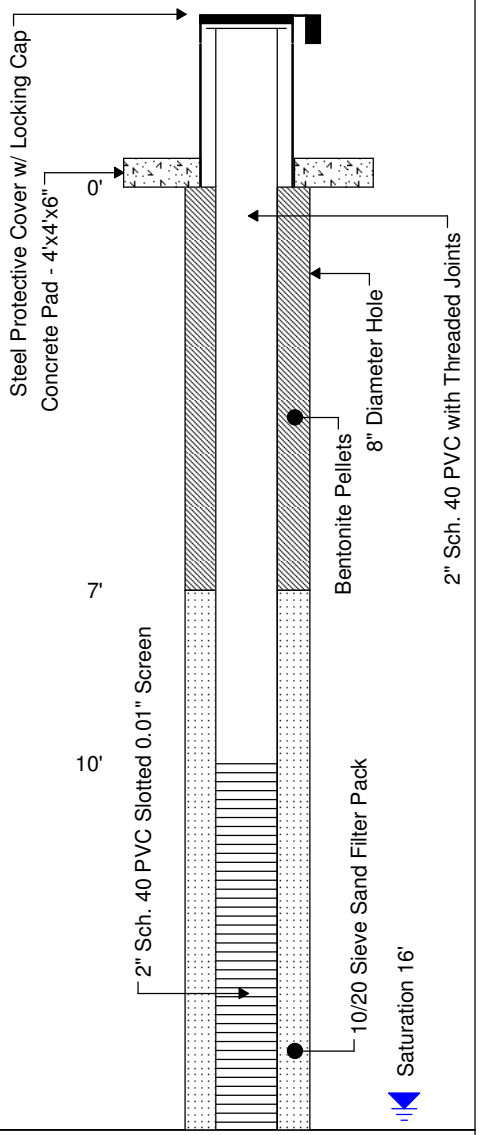
Well No.: MKTF-19
Start Date: 11/5/2013 08:50
Finish Date: 11/5/2013 11:20

Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01809
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: Five-Foot Core Barrel
Comments: N 35°29.268' W 108°25.726'; Boring ID - SB35

Total Depth: 20' bgl
Ground Water: Saturated @ 16' bgl
Elev., TOC (ft. msl): --
Elev., PAD (ft. msl): --
Elev., GL (ft. msl): --
Site Coordinates:
N **W**

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
0					Ground Surface
1				--	**Fill (Asphate/Base/Clay)** Odor
3	1178			50	**Fill (Silty Clay/Sandy Gravel)** Brown, strong hydrocarbon odor
5	1232			90	**Fill (Silty Clay/Sandy Gravel)** Similar to above, gray discoloration, strong hydrocarbon odor
7	120			80	**Clay (CH)** High plasticity, stiff, damp, brown, odor, calcareous, sampling tube is oily
9	375			70	**Clay (CH)** Similar to above, odor, oily
11	601			70	**Silty Sandy Clay (CL)** Moderate plasticity, firm, damp, brown, hydrocarbon odor, sampling tube is oily
13	1279			70	**Sandy Clay (CL)** Low plasticity, soft, damp to moist in sand seams, brown, strong hydrocarbon odor
15	249	16'		90	**Sandy Clay (CL)** Similar to above, hydrocarbon odor, tube is oily

Completion Results



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WELL INSTALLATION

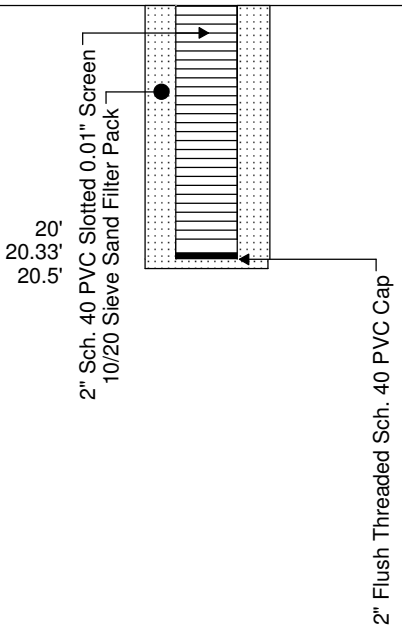
Well No.: MKTF-19
Start Date: 11/5/2013 08:50
Finish Date: 11/5/2013 11:20

Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01809
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: Five-Foot Core Barrel
Comments: N 35°29.268' W 108°25.726'; Boring ID - SB35

Total Depth: 20' bgl
Ground Water: Saturated @ 16' bgl
Elev., TOC (ft. msl): --
Elev., PAD (ft. msl): --
Elev., GL (ft. msl): --
Site Coordinates:
N **W**

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
18				90	**Silty Sand (SM)** Fine grain, loose, saturated, oily/phase-separated hydrocarbon, hydrocarbon odor, clay at base
20				90	**Silty Sand (SM)** Similar to above
					Total Depth = 20' BGL

Completion Results



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WELL INSTALLATION

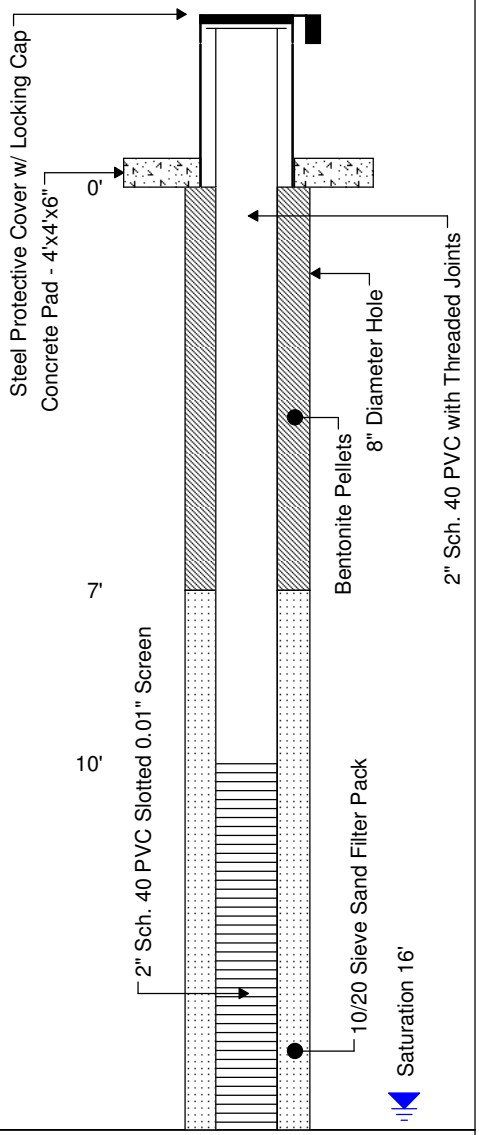
Well No.: MKTF-19
Start Date: 11/5/2013 08:50
Finish Date: 11/5/2013 11:20

Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01809
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: Five-Foot Core Barrel
Comments: N 35°29.268' W 108°25.726'; Boring ID - SB35

Total Depth: 20' bgl
Ground Water: Saturated @ 16' bgl
Elev., TOC (ft. msl): 6944.67
Elev., PAD (ft. msl): 6944.89
Elev., GL (ft. msl): 6944.34
Site Coordinates:
N 1633381.19 **E** 2545842.82

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
					Ground Surface
1				--	**Fill (Asphalt/Base/Clay)** Odor
3	1178			50	**Fill (Silty Clay/Sandy Gravel)** Brown, strong hydrocarbon odor
5	1232			90	**Fill (Silty Clay/Sandy Gravel)** Similar to above, gray discoloration, strong hydrocarbon odor
7	120			80	**Clay (CH)** High plasticity, stiff, damp, brown, odor, calcareous, sampling tube is oily
9	375			70	**Clay (CH)** Similar to above, odor, oily
11	601			70	**Silty Sandy Clay (CL)** Moderate plasticity, firm, damp, brown, hydrocarbon odor, sampling tube is oily
13	1279			70	**Sandy Clay (CL)** Low plasticity, soft, damp to moist in sand seams, brown, strong hydrocarbon odor
15	249	16'		90	**Sandy Clay (CL)** Similar to above, hydrocarbon odor, tube is oily

Completion Results



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WELL INSTALLATION

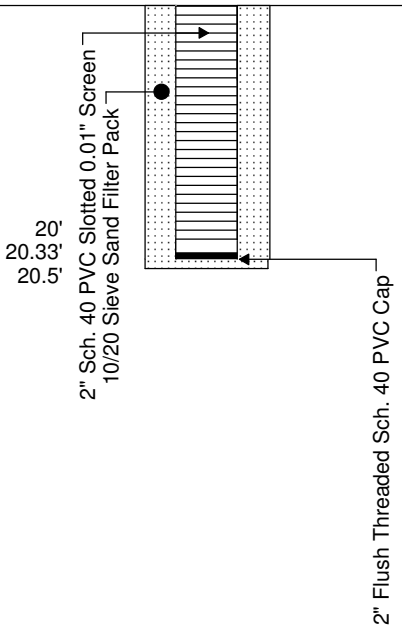
Well No.: MKTF-19
Start Date: 11/5/2013 08:50
Finish Date: 11/5/2013 11:20

Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01809
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: Five-Foot Core Barrel
Comments: N 35°29.268' W 108°25.726'; Boring ID - SB35

Total Depth: 20' bgl
Ground Water: Saturated @ 16' bgl
Elev., TOC (ft. msl): 6944.67
Elev., PAD (ft. msl): 6944.89
Elev., GL (ft. msl): 6944.34
Site Coordinates:
N 1633381.19 **E** 2545842.82

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
18				90	**Silty Sand (SM)** Fine grain, loose, saturated, oily/phase-separated hydrocarbon, hydrocarbon odor, clay at base
20				90	**Silty Sand (SM)** Similar to above
					Total Depth = 20' BGL

Completion Results



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WELL INSTALLATION

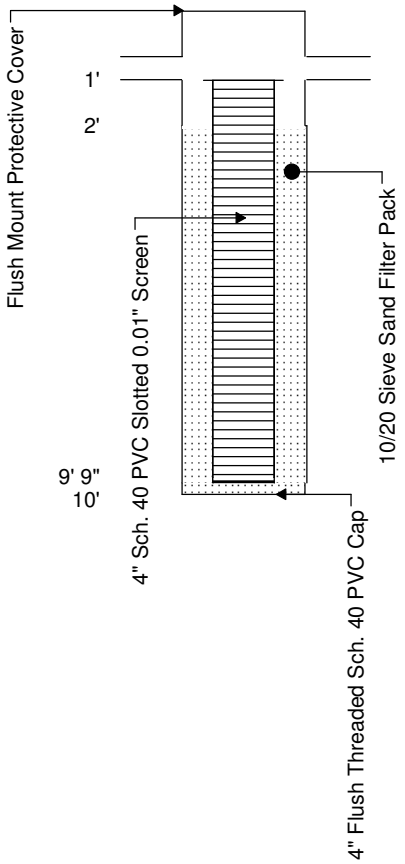
Well No.: MKTF-20
Start Date: 2/10/2014
Finish Date: 2/10/2014

Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01867
Geologist: Not Applicable
Driller: Western Refining Southwest, Inc.
Drilling Rig: Not Applicable
Drilling Method: Not Applicable
Sampling Method: Not Applicable

Total Depth: 10' bgl
Ground Water: 7.86' ft. BTOC
Elev., TOC (ft. msl): 6951.78
Elev., PAD (ft. msl): 6951.89
Elev., GL (ft. msl): 6951.17
Site Coordinates:
N 1633698.28 **E** 2546111.23

Comments: N 35°29.319' W 108°25.674'; Boring ID: Sump-N

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
0					Ground Surface
1				--	**Fill Material**
10					Total Depth = 10' BGL



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WELL INSTALLATION

Well No.: MKTF-21
Start Date: 2/10/2014
Finish Date: 2/10/2014

Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01867
Geologist: Not Applicable
Driller: Western Refining Southwest, Inc.
Drilling Rig: Not Applicable
Drilling Method: Not Applicable
Sampling Method: Not Applicable
Comments: N 35°29.295' W 108°25.675'; Boring ID: Sump-S

Total Depth: 10' bgl
Ground Water: 7.60' ft. BTOC
Elev., TOC (ft. msl): 6952.57
Elev., PAD (ft. msl): 6952.68
Elev., GL (ft. msl): 6952.00
Site Coordinates:
N 1633570.30 **E** 2546110.00

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description	Completion Results
-3 to 19				--	Ground Surface **Fill Material** Total Depth = 10' BGL	Flush Mount Protective Cover; 1'; 2'; 4" Sch. 40 PVC Slotted 0.01" Screen; 9' 9"; 10'; 10/20 Sieve Sand Filter Pack; 4" Flush Threaded Sch. 40 PVC Cap

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WELL INSTALLATION

Well No.: MKTF-22
Start Date: 11/8/2013 12:15
Finish Date: 11/8/2013 15:30

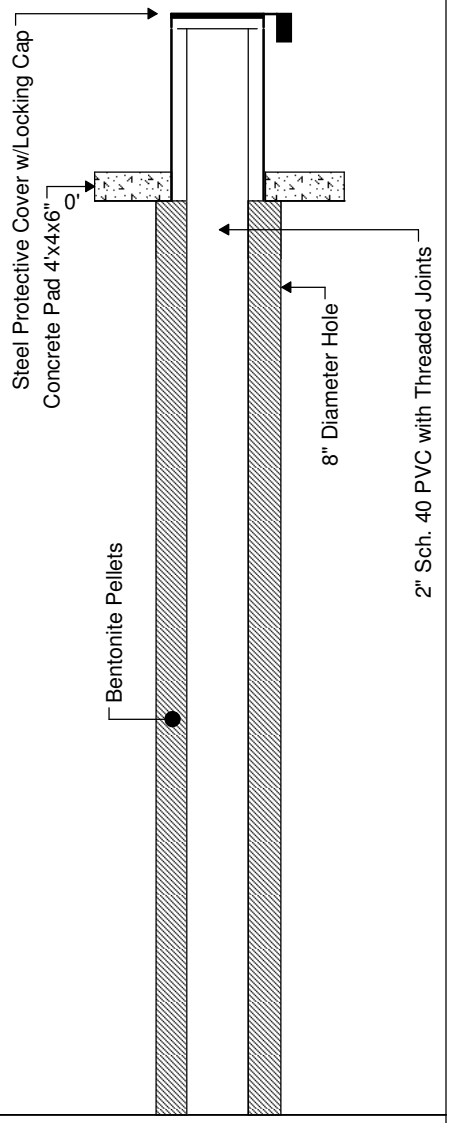
Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01809
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: Split Spoon

Total Depth: 32' bgl
Ground Water: Saturated @ 26' bgl
Elev., TOC (ft. msl): 6942.31
Elev., PAD (ft. msl): 6939.76
Elev., GL (ft. msl): 6938.57
Site Coordinates:
N 1633501.64 **E** 2545478.20

Comments: N 35°29.288' W 108°25.802'; Boring ID - SB23

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
					Ground Surface
1	3.4			10	**Clayey Silt (ML)** Low plasticity, very fine grain, compact to loose, damp, tan, no odor
3	8.9			20	**Clayey Silt (ML)** Similar to above
5	7.0			20	**Clayey Silt (ML)** Similar to above
7	7.9			50	**Clayey Silt (ML)** Similar to above, light brown, no odor
9	6.4			40	**Clayey Silt (ML)** Low plasticity, stiff, damp, light brown, no odor
11	13.7			50	**Clayey Silt (ML)** Similar to above
13	12.7			10	**Clayey Silt (ML)** Similar to above, very stiff
15	10.1			70	**Clayey Silt (ML)** Very fine grain, stiff, damp, brown, no odor, becomes sandy at base

Completion Results



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WELL INSTALLATION

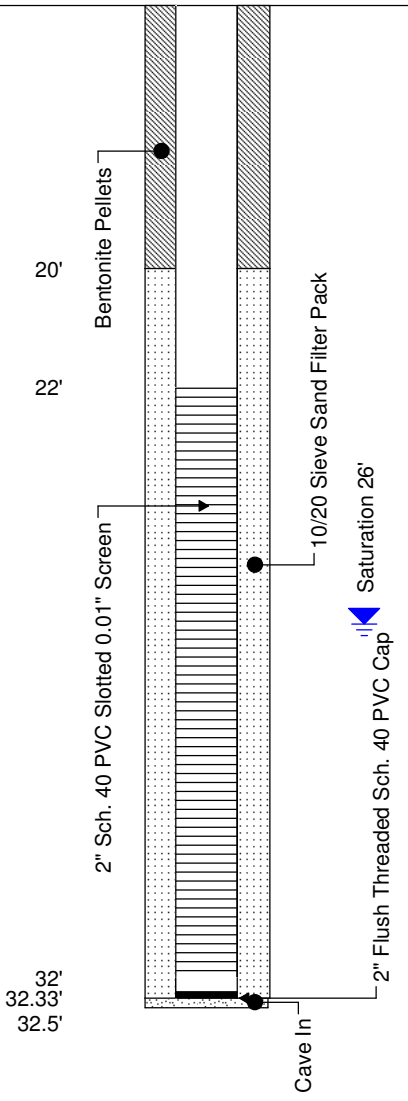
Well No.: MKTF-22
Start Date: 11/8/2013 12:15
Finish Date: 11/8/2013 15:30

Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01809
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: Split Spoon
Comments: N 35°29.288' W 108°25.802'; Boring ID - SB23

Total Depth: 32' bgl
Ground Water: Saturated @ 26' bgl
Elev., TOC (ft. msl): 6942.31
Elev., PAD (ft. msl): 6939.76
Elev., GL (ft. msl): 6938.57
Site Coordinates:
N 1633501.64 **E** 2545478.20

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
17	13.2			10	**Silty Clay/Clayey Silt (CL)** Similar to above, increase in clay, damper, no odor
19	17.2			90	**Silty Clay (CL)** Low plasticity, firm, damp, brown, no odor
21	14.1			90	**Sandy Clay (CL)** Low plasticity, soft, damp, brown, no odor
23	43.1			90	**Sandy Clay (CL)** Similar to above, damp, faint odor
25	73.1			90	**Sandy Clay (CL)** Similar to above, very moist in sand seams, hydrocarbon odor
27		26'		90	**Silty Sand (SM)** Fine to medium grain, loose, saturated, brownish gray, hydrocarbon odor
29				90	**Clayey Silt (ML)** Very fine grain, soft, moist, dark brown, hydrocarbon odor
31				90	**Sand (SP)** Fine to medium grain, loose, saturated, brown, odor
33					**Silty Clay (CL)** Low plasticity, firm, damp, greenish gray, no odor

Total Depth = 32' BGL



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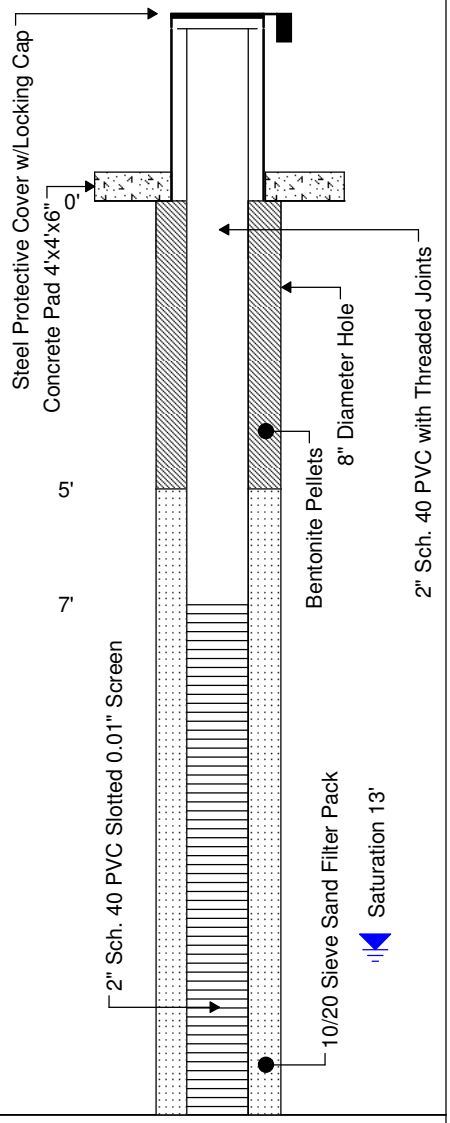
WELL INSTALLATION

Well No.: MKTF-23
Start Date: 11/4/2013 14:00
Finish Date: 11/4/2013 16:00

Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01809
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: Five-Foot Core Barrel
Comments: N 35°29.327' W 108°25.795'; Boring ID - SB25

Total Depth: 20' bgl
Ground Water: Saturated @ 13' bgl
Elev., TOC (ft. msl): 6929.98
Elev., PAD (ft. msl): 6927.23
Elev., GL (ft. msl): 6925.79
Site Coordinates:
N 1633750.93 **E** 2545503.70

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
0					Ground Surface
1	10.3			90	**Silty Clay/Clayey Silt (ML/CL)** Low plasticity, firm, damp, brown, no odor
3	9.7				**Silty Clay/Clayey Silt (ML/CL)** Similar to above
5	13.4				**Silty Clay/Clayey Silt (ML/CL)** Similar to above
	21.9				**Clayey Silt (ML)** Low plasticity, soft, damp, brown, no odor
7	22			90	**Clayey Silt (ML)** Similar to above
9	29.1				**Clayey Sand (SC)** Very fine grain, compact, damp, brown, no odor
11	211	13'		80	**Clayey Sand (SC)** Similar to above, odor, moist
13	1022				**Clayey Sand (SC)** Fine grain, compact, moist to saturated in sand seam, hydrocarbon odor, phase-separated hydrocarbon present
15					



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512/347-8243

WELL INSTALLATION

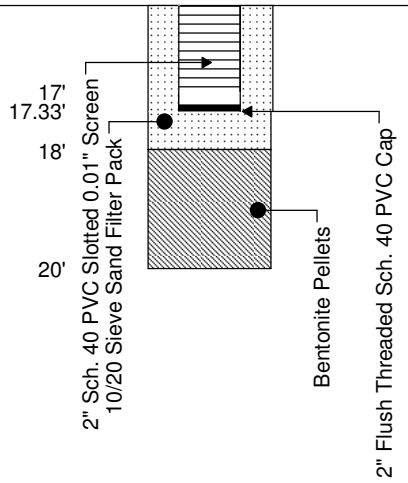
Well No.: MKTF-23
Start Date: 11/4/2013 14:00
Finish Date: 11/4/2013 16:00

Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01809
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: Five-Foot Core Barrel
Comments: N 35°29.327' W 108°25.795'; Boring ID - SB25

Total Depth: 20' bgl
Ground Water: Saturated @ 13' bgl
Elev., TOC (ft. msl): 6929.98
Elev., PAD (ft. msl): 6927.23
Elev., GL (ft. msl): 6925.79
Site Coordinates:
N 1633750.93 **E** 2545503.70

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
17	32.6			90	**Clay (CH)** High plasticity, stiff, damp, brown, no odor
19	28.9				
21	22.7				**Sandy Clay (CL)** Moderate plasticity, firm, damp, brown and gray, no odor
23					Total Depth = 20' BGL
25					
27					
29					
31					
33					

Completion Results



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WELL INSTALLATION

Well No.: MKTF-24
Start Date: 10/29/2013 13:15
Finish Date: 10/29/2013 16:15

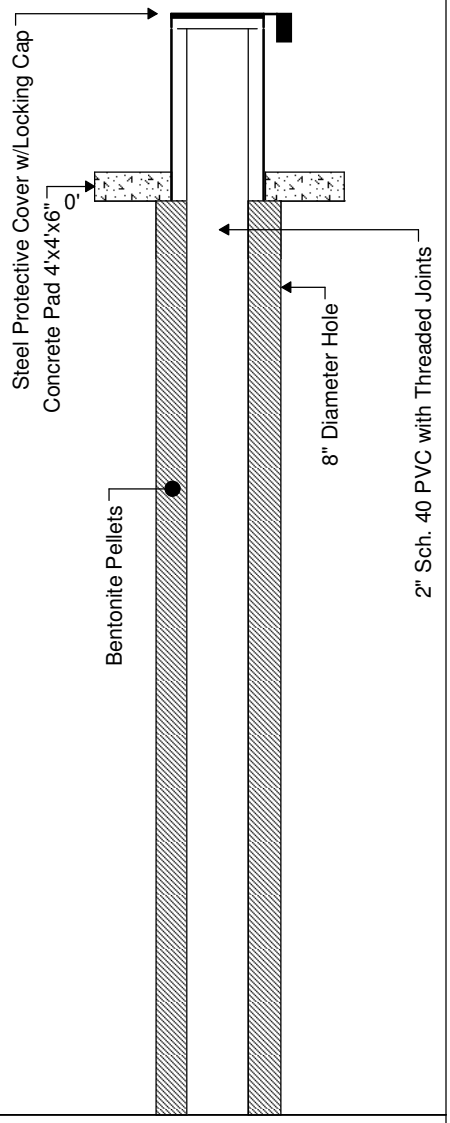
Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01809
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: Split Spoon

Total Depth: 30' bgl
Ground Water: Saturated @ 20' bgl
Elev., TOC (ft. msl): 6928.72
Elev., PAD (ft. msl): 6926.07
Elev., GL (ft. msl): 6924.62
Site Coordinates:
N 1633853.19 **E** 2545468.48

Comments: N 35°29.342' W 108°25.800'; Boring ID - SB26

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
-3					
-1					Ground Surface
1	14.1			90	**Silt/Silty Sand (ML/SM)** Very fine to fine grain, loose, dry, brown
3	11.2			10	**Silty Sand (SM)** Fine grain, compact/very dense, damp, brown
5	12.5			90	**Silty Sandy Clay (CL)** Low plasticity, very dense, damp, brown
7	11.8			90	**Silty Sandy Clay (CL)** Similar to above
9	14.8			60	**Silty Sandy Clay (CL)** Similar to above
11	12.5			90	**Silty Sandy Clay (CL)** Similar to above
13	12.8			90	**Silty Sandy Clay (CL)** Similar to above
15	13.4			90	**Clay (CH)** High plasticity, firm, damp, brown, trace silt, no odor

Completion Results



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512/347-8243

WELL INSTALLATION

Well No.: MKTF-24
Start Date: 10/29/2013 13:15
Finish Date: 10/29/2013 16:15

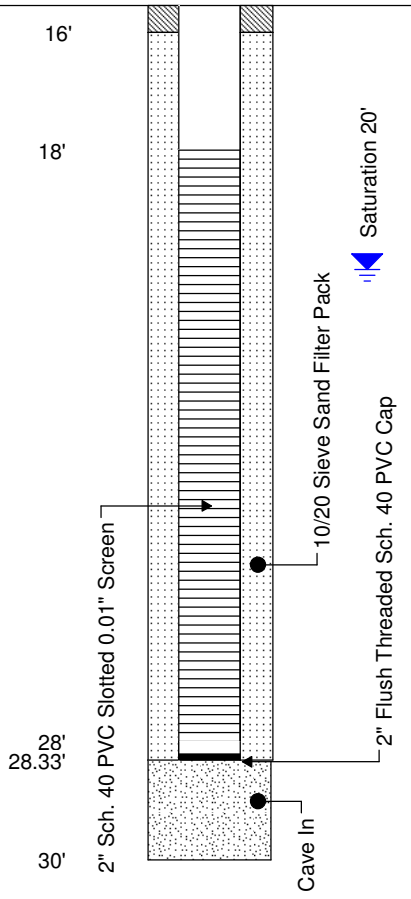
Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01809
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: Split Spoon

Total Depth: 30' bgl
Ground Water: Saturated @ 20' bgl
Elev., TOC (ft. msl): 6928.72
Elev., PAD (ft. msl): 6926.07
Elev., GL (ft. msl): 6924.62
Site Coordinates:
N 1633853.19 **E** 2545468.48

Comments: N 35°29.342' W 108°25.800'; Boring ID - SB26

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
17	16.8			70	**Silty Sandy Clay (CL)** Low plasticity, firm, damp, brown, no odor
19	33.7	20'		90	**Sandy Clay (CL)** Low plasticity, soft, damp, brown, no odor
21	40.8			90	**Sandy Clay/Clayey Sand (CL/SC)** Fine grain, compact to soft, moist to saturated, brown, no odor
23				90	**Sandy Clay/Clayey Sand (CL/SC)** Similar to above, moist to saturated, no odor
25				90	**Sandy Clay/Clayey Sand (CL/SC)** Similar to above, moist to saturated, no odor
27				90	**Sandy Clay/Clayey Sand (CL/SC)** Similar to above, moist to saturated, greenish gray sand at base
29				90	**Silt/Siltstone (ML)** Low plasticity, very dense, dry, crumbly, brown/reddish brown, no odor
31					Total Depth = 30' BGL
33					

Completion Results



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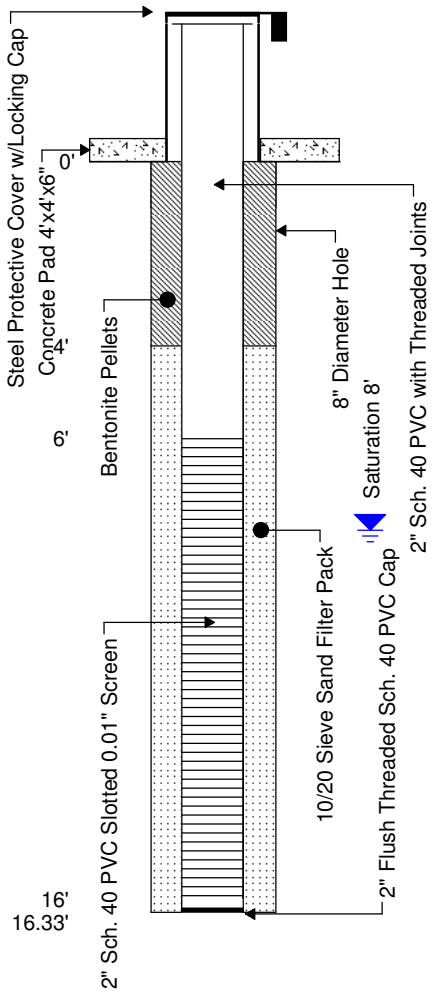
WELL INSTALLATION

Well No.: MKTF-25
Start Date: 10/30/2013 14:45
Finish Date: 10/30/2013 16:30

Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01809
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: Split Spoon
Comments: N 35°29.372' W 108°25.840'; Boring ID - SB28

Total Depth: 16' bgl
Ground Water: Saturated @ 8' bgl
Elev., TOC (ft. msl): 6916.19
Elev., PAD (ft. msl): 6913.35
Elev., GL (ft. msl): 6911.79
Site Coordinates:
N 1634015.86 **E** 2545275.68

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
					Ground Surface
1	10.9			60	**Fill (Silty Clay/Gravel)** Low plasticity, stiff, damp, brown, no odor
3	14.5			70	**Fill (Silty Clay/Gravel)** Similar to above
5	12.9			20	**Silty Clay (CL)** Low plasticity, stiff, damp, brown
7	14.5			70	**Silty Clay (CL)** Similar to above
9	21.1	8'		60	**Gravelly Sand (SW)** Fine to medium grain, loose, brown, saturated, odor
11				80	**Gravelly Sand (SW)** Fine to medium grain, compact, brown, very moist to saturated, odor
13				70	**Clayey Sand (SC)** Fine grain, compact, brown, moist to saturated in sand seams, odor
15				80	**Clayey Sand (SC)** Similar to above, odor
					Total Depth = 16' BGL



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WELL INSTALLATION

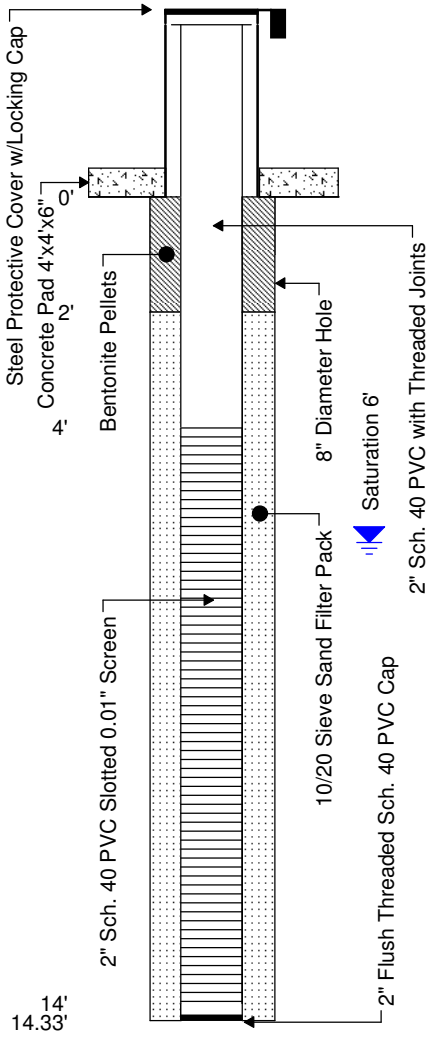
Well No.: MKTF-26
Start Date: 10/30/2013 10:40
Finish Date: 10/30/2013 12:00

Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01809
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: Split Spoon
Comments: N 35°29.373' W 108°25.796'; Boring ID - SB29

Total Depth: 14' bgl
Ground Water: Saturated @ 6' bgl
Elev., TOC (ft. msl): 6915.31
Elev., PAD (ft. msl): 6912.55
Elev., GL (ft. msl): 6911.35
Site Coordinates:
N 1634033.63 **E** 2545492.39

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
0					Ground Surface
1	17.5			80	**Silty Clay (CL)** Low plasticity, soft, damp, brown, no odor, trace small gravel
3	9.4			60	**Silty Clay (CL)** Similar to above
5	4.8			60	**Silty Clay (CL)** Similar to above
7	34.8	6'		90	**Sandy Clay/Clayey Sand (SC/CL)** Very fine grain, compact/soft, brown, moist, faint odor, saturated at base
9				70	**Sandy Clay (SC)** Low plasticity, stiff, damp, brown, no odor
11				60	**Silt/Siltstone (ML)** Low plasticity, very dense, dry, reddish brown, very fine grain sand in fissures, no odor
13				60	**Silt/Siltstone (ML)** Similar to above
14					Total Depth = 14' BGL
15					

Completion Results



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WELL INSTALLATION

Well No.: MKTF-27
Start Date: 10/30/2013 09:00
Finish Date: 10/30/2013 10:20

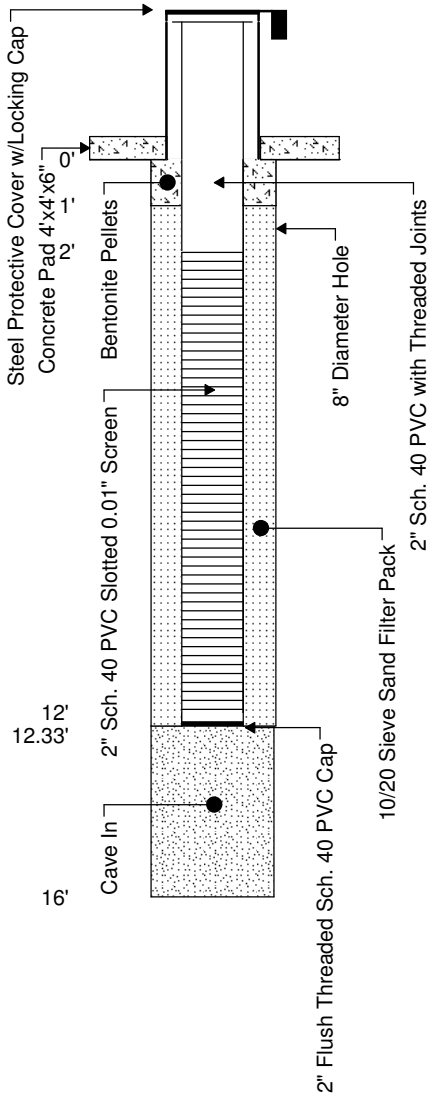
Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01809
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: Split Spoon

Total Depth: 16' bgl
Ground Water: Not Encountered
Elev., TOC (ft. msl): 6917.90
Elev., PAD (ft. msl): 6915.36
Elev., GL (ft. msl): 6914.18
Site Coordinates:
N 1634115.56 **E** 2545620.98

Comments: N 35°29.387' W 108°25.771'; Boring ID - SB30

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
-3					
-1					Ground Surface
1	3.3			90	**Silty Clay (CL)** Low plasticity, firm, damp, brown, occasional gravel
3	4.1			80	**Silty Clay (CL)** Similar to above
5	2.4			90	**Silty Clay (CL)** Similar to above
7	4.1			90	**Silty Clay (CL)** Low to moderate plasticity, firm to soft, damp, brown, no odor, calcareous organics present
9	3.3			80	**Silt/Siltstone (ML)** Low plasticity, very dense, dry, reddish brown with greenish gray very fine grain sand in fissures, no odor
11	3.7			80	**Silt/Siltstone (ML)** Similar to above
13	4.5			80	**Silt/Siltstone (ML)** Similar to above
15	3.9			80	**Silt/Siltstone (ML)** Similar to above
					Total Depth = 16' BGL
17					
19					

Completion Results



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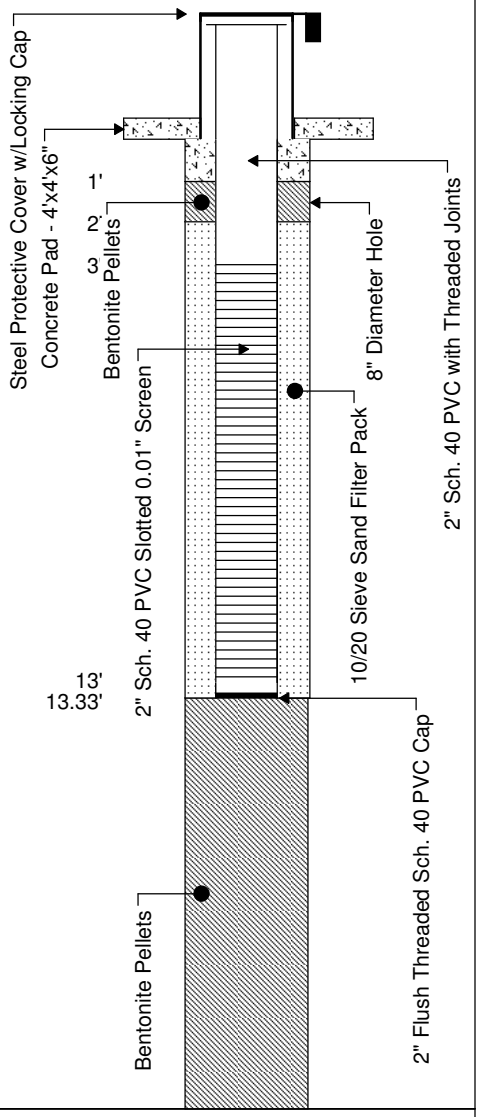
WELL INSTALLATION

Well No.: MKTF-28
Start Date: 4/2/2014 11:30
Finish Date: 4/2/2014 14:25

Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01867
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: 5-Foot Split Spoon
Comments: N 35°29.412' W 108°25.763', Air Temp: 48°F

Total Depth: 30' bgl
Ground Water: Not Encountered
Elev., TOC (ft. msl): 6921.52
Elev., PAD (ft. msl): 6918.67
Elev., GL (ft. msl): 6917.51
Site Coordinates:
N 1634263.44 **E** 2545650.04

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
0					Ground Surface
1	2.6			90	**Fill (Silty Clay)** Low plasticity, soft, damp, brown, no odor, sandy at base, moist
3	5.0				
5	3.6				
7	7.6			60	**Silty Clay (CL)** Similar to above, damp to moist at 7.5' bgl
9	8.2				
11	8.1			60	**Silty Clay (CL)** Low plasticity, stiff, damp to dry, crumbly, brown, no odor
13	7.5				
15	9.1			60	**Silty Clay (CL)** Similar to above
17	5.5				
19	7.8			60	**Silty Clay (CL)** Similar to above
21	3.5				



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WELL INSTALLATION

Well No.: MKTF-28
Start Date: 4/2/2014 11:30
Finish Date: 4/2/2014 14:25

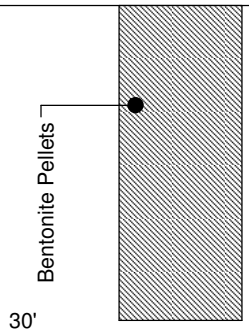
Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01867
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: 5-Foot Split Spoon

Total Depth: 30' bgl
Ground Water: Not Encountered
Elev., TOC (ft. msl): 6921.52
Elev., PAD (ft. msl): 6918.67
Elev., GL (ft. msl): 6917.51
Site Coordinates:
N 1634263.44 **E** 2545650.04

Comments: N 35°29.412' W 108°25.763', Air Temp: 48°F

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
24	4.3				**Clay (CH)** High plasticity, very stiff, reddish brown and gray, no odor, crumbly
26	4.1			60	**Clay (CH)** Similar to above
28	3.3				
30					Total Depth = 30' BGL
32					
34					
36					
38					
40					
42					
44					
46					
48					

Completion Results



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WELL INSTALLATION

Well No.: MKTF-29
Start Date: 4/2/2014 08:30
Finish Date: 4/2/2014 11:15

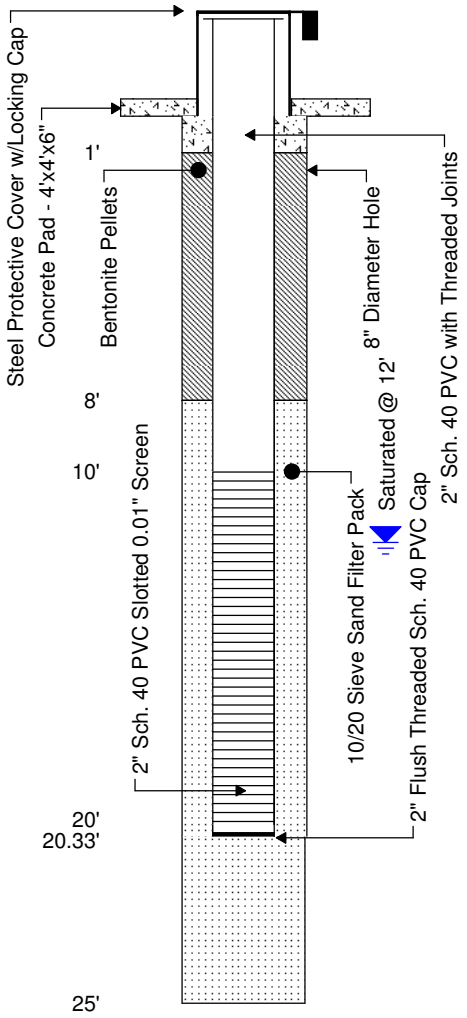
Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01867
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: 5-Foot Split Spoon

Total Depth: 25' bgl
Ground Water: Saturated @ 12' bgl
Elev., TOC (ft. msl): 6901.62
Elev., PAD (ft. msl): 6898.83
Elev., GL (ft. msl): 6897.67
Site Coordinates:
N 1634249.76 **E** 2545258.34

Comments: N 35°29.406' W 108°25.846', Air Temp: 41°F

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
0					Ground Surface
1	2.2			95	**Silty Clay (CL)** Low plasticity, firm, damp, brown, no odor
3	3.9				
5	3.1			95	**Silty Clay (CL)** Similar to above, no odor
7	1.3				
9	4.4				
11	2.4			60	**Silty Clay (CL)** Similar to above, no odor
13	2.9	12'			**Clayey Sand (SC)** Fine grain, compact, saturated, brown, no odor
15	2.8				**Clayey Sand (SC)** Similar to above, saturated
17	2.7			60	
19	1.0				**Clay (CH)** High plasticity, very stiff, dry, damp, reddish brown/gray, no odor
21	1.0			90	**Clay (CH)** Similar to above, no odor
23	1.2				
25					Total Depth = 25' BGL
27					

Completion Results



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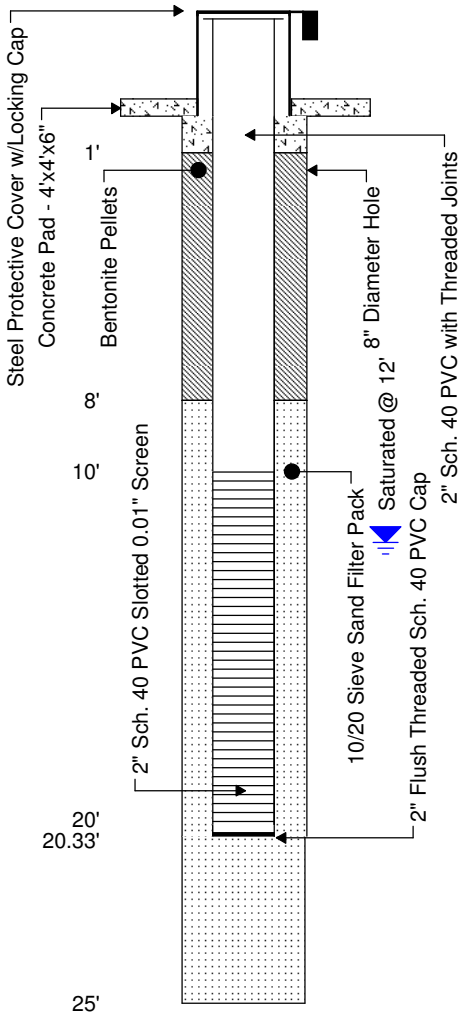
WELL INSTALLATION

Well No.: MKTF-30
Start Date: 4/1/2014 13:00
Finish Date: 4/1/2014 15:00

Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01867
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: 5-Foot Split Spoon
Comments: N 35°29.405' W 108°25.910', Air Temp: 58°F

Total Depth: 25' bgl
Ground Water: Saturated @ 12' bgl
Elev., TOC (ft. msl): 6900.80
Elev., PAD (ft. msl): 6898.10
Elev., GL (ft. msl): 6896.68
Site Coordinates:
N 1634225.67 **E** 2544937.91

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
					Ground Surface
1	12.3			30	**Fill (Silty Clay)** Low plasticity, firm, dry, brown, no odor
5	12.3			90	**Fill (Silty Clay)** Similar to above, dry, crumbly, no odor, sand at base
9	17.1	12'		80	**Silty Sand (SM)** Fine grain, compact to loose, moist to saturated at 12' bgl, brown, no odor, clayey at 14' bgl
13	13.1			90	**Sandy Clay (CL)** Low plasticity, firm, damp, brown, no odor
17	13.8				**Clayey Sand (SC)** Very fine grain, compact, saturated, brown, no odor
19					**Sandy Clay (CL)** Low plasticity, firm, damp, brown, no odor
21	9.1			95	**Clay (CH)** Moderate to high plasticity, stiff, damp to dry, crumbly, brown/gray, no odor
23	6.2				
25					Total Depth = 25' BGL



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WELL INSTALLATION

Well No.: MKTF-31
Start Date: 4/1/2014 08:20
Finish Date: 4/1/2014 12:00

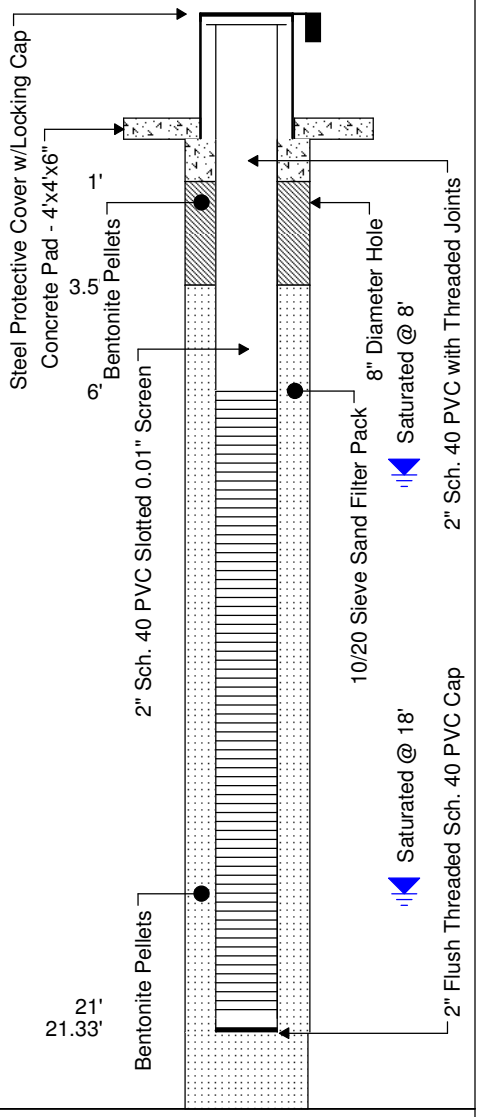
Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01867
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: 5-Foot Split Spoon

Total Depth: 30' bgl
Ground Water: Saturated @ 8' bgl
Elev., TOC (ft. msl): 6906.87
Elev., PAD (ft. msl): 6904.26
Elev., GL (ft. msl): 6903.11
Site Coordinates:
N 1633898.83 **E** 2544938.99

Comments: N 35°29.350' W 108°25.909', Air Temp: 48°F; Boring ID - SB20

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
0					Ground Surface
1	2.0			90	**Fill (Silty Clay)** Low plasticity, firm, damp, brown, no odor, gravel throughout
3	2.7				
5	6.5				**Silty Clay (CL)** Low plasticity, firm, damp, brown, no odor
7	5.2	8'		70	**Clayey Sand (SC)** Very fine grain, compact, very moist at 6' bgl to saturated at 8' bgl, brown, no odor
9	4.8				
11				95	**Clayey Sand/Silty Sand (SC/SM)** Similar to above, saturated, brown, no odor
13	5.8				**Clay (CH)** High plasticity, stiff, damp, brown, no odor
15				95	**Sandy Clay (CL)** Low to moderate plasticity, firm, damp in sand seams, brown, no odor
17	3.3	18'			
19	4.6				**Clayey Sand (SC)** Very fine grain, compact, moist to saturated, brown, no odor
21	5.2			90	**Sandy Clay (CL)** Low to moderate plasticity, firm, damp in sand seams, brown, no odor

Completion Results



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WELL INSTALLATION

Well No.: MKTF-31
Start Date: 4/1/2014 08:20
Finish Date: 4/1/2014 12:00

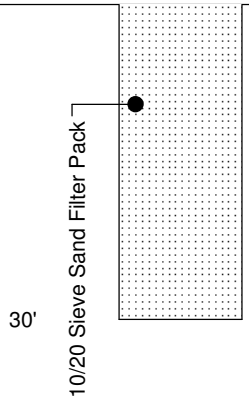
Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01867
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: 5-Foot Split Spoon

Total Depth: 30' bgl
Ground Water: Saturated @ 8' bgl
Elev., TOC (ft. msl): 6906.87
Elev., PAD (ft. msl): 6904.26
Elev., GL (ft. msl): 6903.11
Site Coordinates:
N 1633898.83 **E** 2544938.99

Comments: N 35°29.350' W 108°25.909', Air Temp: 48°F; Boring ID - SB20

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
24	7.2				
26	2.5			90	**Clay (CH)** Moderate plasticity, firm, dry to damp, crumbly, reddish brown, no odor
28	2.3				
30					Total Depth = 30' BGL
32					
34					
36					
38					
40					
42					
44					
46					
48					

Completion Results



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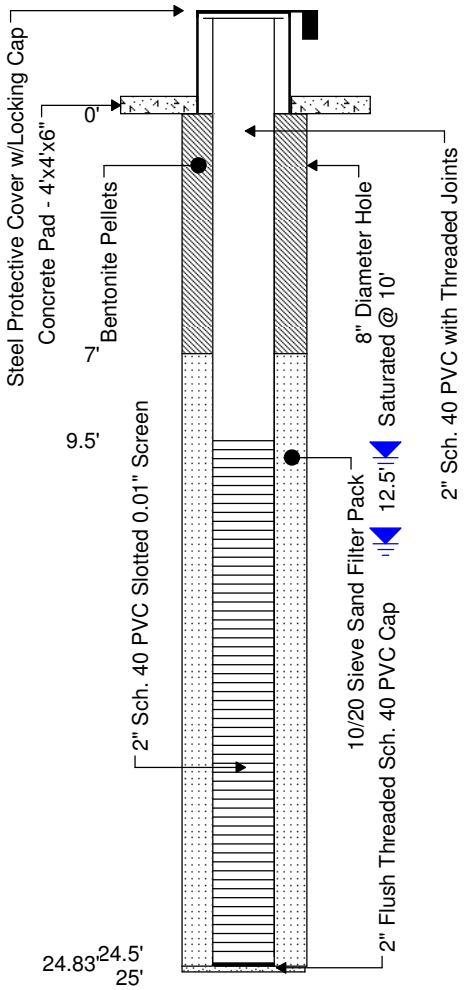
WELL INSTALLATION

Well No.: MKTF-32
Start Date: 3/31/2014 14:40
Finish Date: 3/31/2014 16:30

Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01867
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: 5-Foot Split Spoon
Comments: N 35°29.275' W 108°25.928', Air Temp: 58°F

Total Depth: 25' bgl
Ground Water: Saturated @ 10' bgl
Elev., TOC (ft. msl): 6911.11
Elev., PAD (ft. msl): 6908.44
Elev., GL (ft. msl): 6907.16
Site Coordinates:
N 1633443.56 **E** 2544840.32

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
-3					Ground Surface
-1					
1	16.3			95	**Clayey Silt (ML)** Low plasticity, firm, dry, brown, no odor
3	10.0				
5	8.7				
7	10.1			100	**Clayey Silt/Silty Clay (ML/CL)** Low plasticity, firm, dry, brown, no odor
9	9.1				
11	13.6	10' ▼ 12.5' ▼		90	**Silty Clay (CL)** Similar to above, damp, no odor **Sandy Clay/Clayey Sand (SC/CL)** Low plasticity, very fine grain, brown, moist, saturated at 10-11', bgl and 12.5-13.5' bgl, no odor
13	9.3				
15	10.9			80	**Silty Clay/Clay (CH)** Moderate to high plasticity, firm to stiff, damp, brown, no odor
17	10.6				
19	14.1				
21	12.6			80	**Clay (CH)** Similar to above
23	10.4				**Sandy Clay (SC)** Moderate plasticity, firm, moist in sand seams, brown, no odor
25					**Silty Clay (CL)** Low plastiicty, stiff gray to greenish gray, gravelly at base, damp, no odor
27					Total Depth = 25' BGL



RPS
1250 S. Capital of Texas Hwy., Bldg. 3, Suite 200
Austin, Texas 78746

Sheet: **1 of 1**

512/347-7588
512/347-8243

WELL INSTALLATION

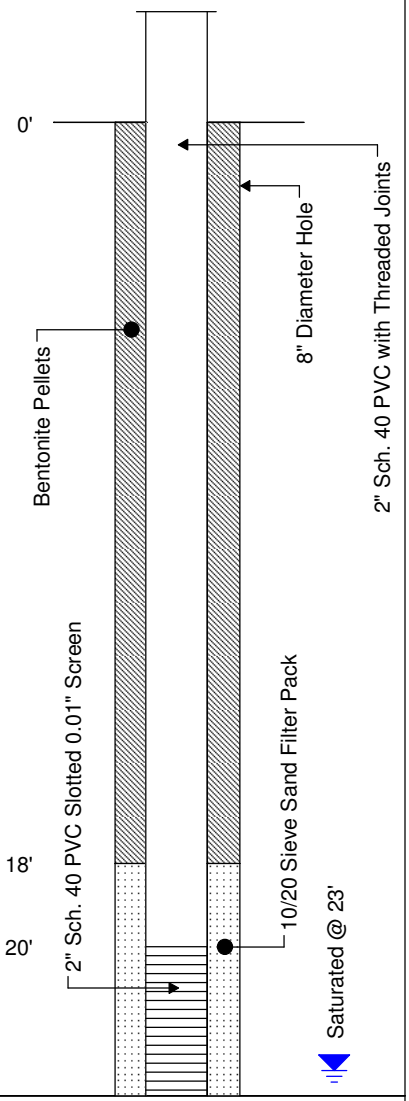
Well No.: MKTF-33
Start Date: 4/3/2014 08:40
Finish Date: 4/3/2014 12:00

Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01867
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: 5-Foot Split Spoon
Comments: N 35°29.246' W 108°25.830', Air Temp: 30°F

Total Depth: 35' bgl
Ground Water: Saturated @ 23' bgl
Elev., TOC (ft. msl): 6939.75
Elev., PAD (ft. msl): --
Elev., GL (ft. msl): 6936.59
Site Coordinates:
N 1633261.99 **E** 2545318.27

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
0					Ground Surface
1	0.9				**Silty Clay (CL)** Low plasticity, firm, damp, brown, no odor
3	1.1			95	**Clayey Silt (ML)** Low plasticity, dense, dry, light brown, no odor, calcareous
5	2.1				
7	2.2			95	**Clayey Silt (ML)** Similar to above
9	2.8				
11	3.8			60	**Clayey Sand (SC)** Fine grain, loose to compact, dry, brown, no odor
13	3.7				
15	4.5				**Clay (CH)** High plasticity, very stiff, dry, brown, no odor
17	2.9			50	**Sand/Clayey Sand (SP/SC)** Fine grain, loose to compact, dry, brown, no odor
19					
21	2.5			90	**Sandy Clay/Clay (CL/CH)** High to moderate plasticity, stiff, damp, brown, no odor, sand seam at 21' bgl, saturated sand lense at 23' bgl
23	2.9	23'			

Completion Results



RPS
1250 S. Capital of Texas Hwy., Bldg. 3, Suite 200
Austin, Texas 78746

Sheet: **1 of 2**

512/347-7588
512/347-8243

WELL INSTALLATION

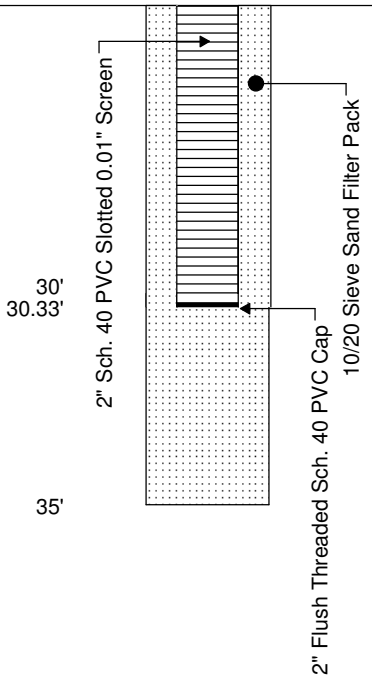
Well No.: MKTF-33
Start Date: 4/3/2014 08:40
Finish Date: 4/3/2014 12:00

Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01867
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: 5-Foot Split Spoon
Comments: N 35°29.246' W 108°25.830', Air Temp: 30°F

Total Depth: 35' bgl
Ground Water: Saturated @ 23' bgl
Elev., TOC (ft. msl): 6939.75
Elev., PAD (ft. msl): --
Elev., GL (ft. msl): 6936.59
Site Coordinates:
N 1633261.99 **E** 2545318.27

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
25	3.4				
27	1.6			90	**Clayey Sand/Sandy Clay (SC/CL)** Moderate plasticity, firm, moist to saturated throughout interval, brown, interbedded sand/clay, no odor
29	2.5				
31				95	**Clay (CH)** High plasticity, very stiff, brown, damp, no odor
33					
35					Total Depth = 35' BGL
37					
39					
41					
43					
45					
47					
49					

Completion Results



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1250 S. Capital of Texas Hwy., Bldg. 3, Suite 200
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Sheet: **2 of 2**

512/347-7588
512/347-8243

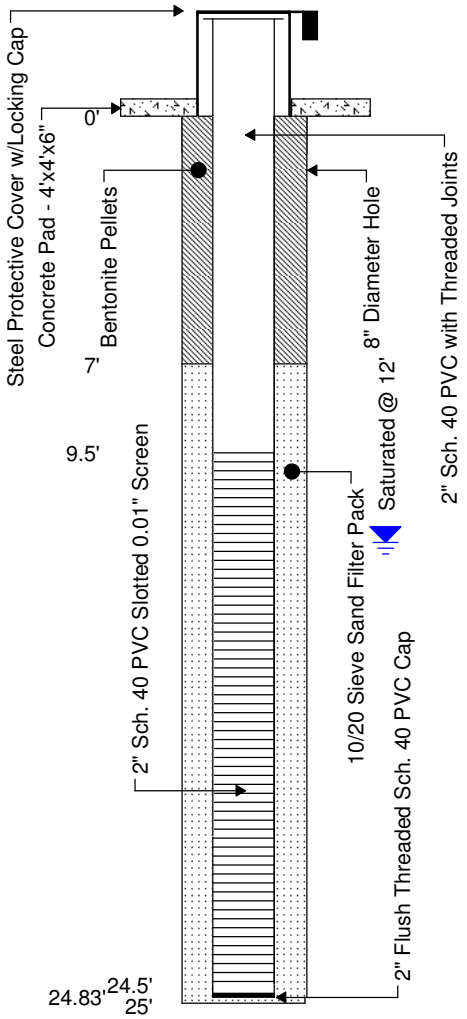
WELL INSTALLATION

Well No.: MKTF-34
Start Date: 3/31/2014 11:00
Finish Date: 3/31/2014 13:45

Client: Western Refining Southwest, Inc.
Site: Gallup Refinery - Seep West of Tank 102
Job No.: UEC01867
Geologist: Tracy Payne
Driller: Enviro-Drill, Inc.
Drilling Rig: CME 75
Drilling Method: Hollow Stem Augers
Sampling Method: 5-Foot Split Spoon
Comments: N 35°29.224' W 108°25.757', Air Temp: 49-51°F

Total Depth: 25' bgl
Ground Water: Saturated @ 12' bgl
Elev., TOC (ft. msl): 6945.35
Elev., PAD (ft. msl): 6942.42
Elev., GL (ft. msl): 6943.52
Site Coordinates:
N 1633118.42 **E** 2545681.30

Depth (ft.)	PID (ppm)	Saturation	USCS Class	Recovery (%)	Sample Description
0					Ground Surface
1	13.6			95	**Silty Clay/Clayey Silt (CL/SM)** Low plasticity, soft, damp, brown, no odor, calcareous
3	7.8				
5	15.6				
7	12.1			60	**Clay (CH)** High plasticity, stiff, damp, brown, no odor
9	10.7				
11	12.3			60	**Sandy Clay (CL)** Moderate plasticity, firm, moist, brown, no odor
13	11.9	12'			**Clayey Sand (SC)** Similar to above, saturated, no odor
15	9.0				**Sandy Clay (CL)** Moderate plasticity, firm, moist, brown, no odor
17	8.1			90	**Silty Sandy Clay (CL)** Low to moderate plasticity, firm, damp, no odor
19	16.3				
21	13.4			95	**Silty Clay (CL)** Similar to above, damp, no odor
23	13.6				
25	15.8				**Gravelly Clay (CL)** Low plasticity, firm, crumbly, damp, no odor, greenish gray
27	11.5				Total Depth = 25' BGL
	11.7				



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512/347-8243

Sheet: **1 of 1**

DiSorbo Environmental Consulting Firm

Western Refining SW, Inc.
Gallup Refinery - Hydrocarbon Seep
Job No. WEST14003

Geologist	: Tracy Payne
Driller	: C. Ortiz
Drilling Rig	: CME 75
Drilling Method	: Hollow Stem Auger 7.5"
Sampling Method	: Split Spoon 2" Dia, 2' Long
Comments	:
Total Depth	: 18'
Ground Water	: 10'
Start Date	: 11/19/2014
Finish Date	: 11/19/2014

MKTF-35

(Sheet 1 of 1)

Elev., TOC (ft.msl)	: 6951.65
Elev., PAD (ft. msl)	: 6951.90
Elev., GL (ft. msl)	: 6951.25
Site Coordinates	:
N	: 1633204.45
E	: 2546011.60

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery (%)	Sample	DESCRIPTION
0					100		ASPHALT/BASE,
1	4.5			CL	100		SILTY CLAY, low, very stiff, damp, brown,
2							
3	46.6			CL	20		SILTY CLAY, SIMILAR TO ABOVE (STA), odor, gravel present,
4							
5	95			CL/SP	90		SILTY CLAY/SAND/GRAVEL, low, damp, reddish brown, odor, very coarse grain sand, 1/4" to 1" gravel, odor,
6							
7	64			CL	80		SILTY CLAY, low, firm, damp, reddish brown, odor, occasional gravel,
8							
9	78			CL/SP	90		SILTY CLAY/SAND/GRAVEL, SIMILAR TO 4-6', damp to moist, odor,
10		▼					
11	1790			CL/SP	90		SILTY CLAY/SAND/GRAVEL, SIMILAR TO ABOVE (STA), saturated, hydrocarbon (hc) odor,
12				CL	90		SILTY CLAY, low, stiff, damp, reddish brown, light grey clay @ base, hc odor,
13	2400			CL/SC	90		SILTY CLAY/SANDY CLAY, low, firm to stiff, damp, grey, hc odor, sand/silt varies across interval,
14							
15	745			CL	50		SANDY GRAVELLY CLAY, STA, damp, grey, brown @ base, hc odor,
16							
17	37			CL	90		CLAY, mod, very stiff, damp, brown and grey, faint odor.
18							
19							

Saturation
▼ Saturation

Completion Results

MKTF-35

- Flush Mount Completion 2'x2'x6"
- Bentonite Pellets
- 2" Sch 40 PVC Casing Threaded Joints
- 10/20 Sieve Sand Filter Pack
- 2" Sch 40 PVC Slotted 0.01" Screen w/Threaded Joints
- 2" Flush Threaded Sch 40 PVC Cap

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DiSorbo Environmental Consulting Firm

Western Refining SW, Inc.
Gallup Refinery - Hydrocarbon Seep
Job No. WEST14003

Geologist	: Tracy Payne
Driller	: C. Ortiz
Drilling Rig	: CME 75
Drilling Method	: Hollow Stem Auger 7.5"
Sampling Method	: Split Spoon 2" Dia, 2' Long
Comments	:
Total Depth	: 16'
Ground Water	: 10'
Start Date	: 11/19/2014
Finish Date	: 11/19/2014

MKTF-36

(Sheet 1 of 1)

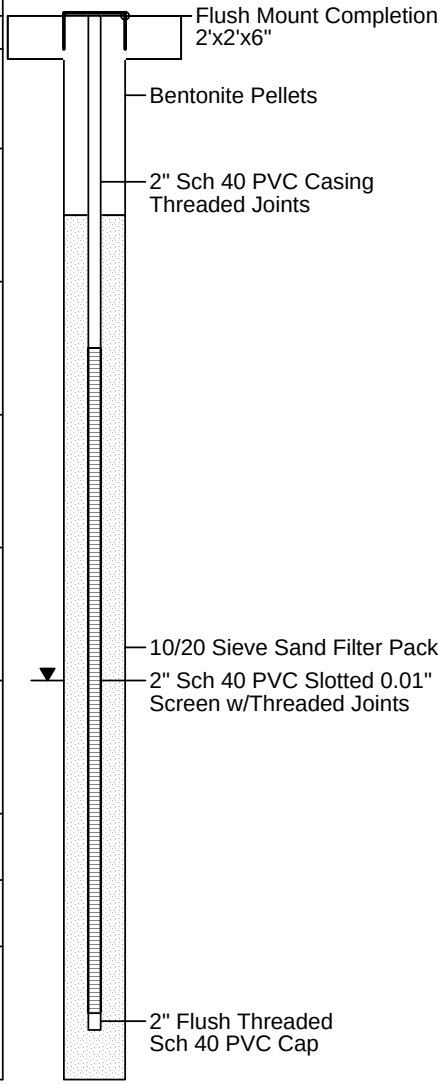
Elev., TOC (ft.msl)	: 6950.12
Elev., PAD (ft. msl)	: 6950.67
Elev., GL (ft. msl)	: 6949.87
Site Coordinates	:
N	: 1633349.47
E	: 2545982.58

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery (%)	Sample	DESCRIPTION
0					100		ASPHALT/BASE,
1	812			CL	90		SANDY CLAY, low, stiff, dry, tan, no odor, gravel throughout,
2							
3	276			CL	60		SILTY CLAY, low, very stiff, dry, brown, hydrocarbon (hc) odor,
4							
5	1700			CL	60		SILTY CLAY, SIMILAR TO ABOVE (STA), trace sand/gravel, hc odor,
6							
7	2411			CL/SP	90		SILTY CLAY/SAND/GRAVEL, low, firm, damp, tan, very coarse sand, 1/4" to 1" gravel, hc odor, moist to very moist in seams,
8							
9	2278			CL/SP	90		SILTY CLAY/SAND/GRAVEL, STA, moist, fluid in top of sampling spoon, strong hc odor, trace phase separated hydrocarbon (psh),
10		▼					
11	1879			CL/SP	90		SILTY CLAY/SAND/GRAVEL, STA, saturated, psh,
12				CL/SP	90		SILTY CLAY/SAND/GRAVEL, STA, saturated, psh,
13	405			CL	90		SILTY CLAY, low, stiff, damp, brown, hc odor,
14							
15	450			CL	90		SILTY CLAY, STA, damp, hc odor.
16							

Saturation
▼ Saturation

Completion Results

MKTF-36



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Western Refining SW, Inc.
Gallup Refinery - Hydrocarbon Seep
Job No. WEST14003

Geologist	: Tracy Payne
Driller	: C. Ortiz
Drilling Rig	: CME 75
Drilling Method	: Hollow Stem Auger 7.5"
Sampling Method	: Split Spoon 2" Dia, 2' Long
Comments	:
Total Depth	: 24'
Ground Water	: 8'
Start Date	: 11/18/2014
Finish Date	: 11/18/2014

MKTF-37

(Sheet 1 of 1)

Elev., TOC (ft.msl)	: 6958.87
Elev., PAD (ft. msl)	: 6959.07
Elev., GL (ft. msl)	: 6958.62
Site Coordinates	:
N	: 1633291.89
E	: 2546216.67

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery (%)	Sample	DESCRIPTION
0–1	69				40		ASPHALT/GRAVEL BASE, CLAY, very stiff, brown, damp, faint odor,
2–3	367			CL	50		SILTY CLAY, low, very stiff, brown, damp, odor, gravel present,
4–5	355			CL/SP	60		SILTY CLAY/SAND/GRAVELLY, low to firm, damp, brown with sand/gravel, odor,
6–7	1790			CL/SP	80		SILTY CLAY/SAND/GRAVELLY, SIMILAR TO ABOVE (STA), odor,
8		▼		CL	90		SILTY CLAY, low, soft, moist to very moist, brown, strong odor,
9	2140			SW/GW	90		SANDY GRAVEL/GRAVELLY SAND, coarse to very coarse grain, compact, very moist, odor, tan,
10–11	404			CL/SP	90		SILTY CLAY/SAND/GRAVEL, low to firm, damp, brown with coarse sand & gravel, odor,
12–13	454			CL	20		SANDY CLAY, low, soft, damp, odor, light grey, gravel @ base,
14–15	660			CL	50		SANDY CLAY, low, very stiff, damp, odor, light grey,
16–17	340			CL	30		SANDY CLAY, STA,
18–19	344			CL	30		SANDY CLAY, STA,
20				CL	60		SANDY CLAY, STA,
21	421			SH	60		SHALE, CLAYEY, light purple, damp, very stiff, odor,
22–23	375			SH	30		SHALE, STA,
24–25							

Saturation
▼ Saturation

Completion Results

MKTF-37

- Flush Mount Completion 2'x2'x6"
- Bentonite Pellets
- 2" Sch 40 PVC Casing Threaded Joints
- 10/20 Sieve Sand Filter Pack
- 2" Sch 40 PVC Slotted 0.01" Screen w/Threaded Joints
- 2" Flush Threaded Sch 40 PVC Cap

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Western Refining SW, Inc.
Gallup Refinery - Hydrocarbon Seep
Job No. WEST14003

Geologist	: Tracy Payne
Driller	: C. Ortiz
Drilling Rig	: CME 75
Drilling Method	: Hollow Stem Auger 7.5"
Sampling Method	: Split Spoon 2" Dia, 2' Long
Comments	:
Total Depth	: 20.25'
Ground Water	: 8'
Start Date	: 11/20/2014
Finish Date	: 11/20/2014

MKTF-38

(Sheet 1 of 1)

Elev., TOC (ft.msl)	: 6954.89
Elev., PAD (ft. msl)	: 6955.17
Elev., GL (ft. msl)	: 6954.54
Site Coordinates	:
N	: 1633451.01
E	: 2546222.09

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery (%)	Sample	DESCRIPTION
0					100		ASPHALT/BASE,
1	217			CL/SP	90		SILTY CLAY/SAND/GRAVEL, low, firm, damp, brown, coarse grain sand, 1/4" to 1" gravel, odor,
3	70			CL/SP	90		SILTY CLAY/SAND/GRAVEL, SIMILAR TO ABOVE (STA), odor,
5	42			CL/SP	90		SILTY CLAY/SAND/GRAVEL, STA, odor,
7	20			CL/SP	90		SILTY CLAY/SAND/GRAVEL, STA, odor,
9	9			CL/SP	90		SILTY CLAY/SAND/GRAVEL, STA, decrease in clay content, very moist to saturated, odor,
11	7			GW	90		SANDY GRAVEL, compact, brown, saturated, faint odor, very coarse grain sand, 1/4" to 1.5" gravel,
				CL	90		
12				GW	90		SANDY CLAY, low, firm to soft, moist, brown,
13	8			GW	10		SANDY GRAVEL, STA (10-11), saturated,
14							SANDY GRAVEL, STA, saturated,
15	6			GW	10		SANDY GRAVEL, STA, saturated,
17	4			CL	50		SANDY CLAY, low, firm, damp to moist, greyish brown, faint odor,
19	5			CL	60		SANDY CLAY, STA,

Saturation
▼ Saturation

Completion Results

MKTF-38

Flush Mount Completion 2'x2'x6"
Bentonite Pellets
2" Sch 40 PVC Casing Threaded Joints
10/20 Sieve Sand Filter Pack
2" Sch 40 PVC Slotted 0.01" Screen w/Threaded Joints
2" Flush Threaded Sch 40 PVC Cap

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Western Refining SW, Inc.
Gallup Refinery - Hydrocarbon Seep
Job No. WEST14003

Geologist	: Tracy Payne
Driller	: C. Ortiz
Drilling Rig	: CME 75
Drilling Method	: Hollow Stem Auger 7.5"
Sampling Method	: Split Spoon 2" Dia, 2' Long
Comments	:
Total Depth	: 16'
Ground Water	: 12'
Start Date	: 11/14/2014
Finish Date	: 11/14/2014

MKTF-39

(Sheet 1 of 1)

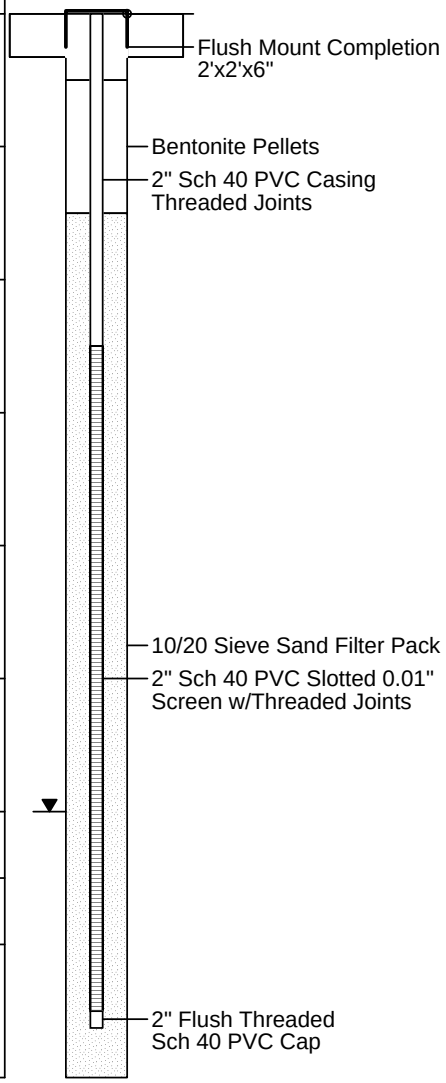
Elev., TOC (ft.msl)	: 6953.75
Elev., PAD (ft. msl)	: 6953.97
Elev., GL (ft. msl)	: 6953.12
Site Coordinates	:
N	: 1633729.23
E	: 2546265.99

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery (%)	Sample	DESCRIPTION
0	2.1			ML	100		GRAVEL/CLAYEY SILT, FILL, brown, damp, faint odor,
2	29.4			CL	100		GRAVEL/SILTY CLAY, FILL, mod, stiff, damp, brown, no odor,
4	6.5			CL	90		SANDY SILTY CLAY, FILL, low, soft, damp, brown, pea sized gravel, no odor, damp,
6	4.5			SW	90		SILTY GRAVELLY SAND, FILL, loose, medium sand to 1.5" gravel, brown, no odor, damp,
8	400			CL/SC	90		SANDY CLAY/CLAYEY SAND, coarse, compact, damp to moist, brown, hydrocarbon (hc) odor, gravelly,
10	569			CL	90		SANDY CLAY/CLAYEY SAND, SIMILAR TO ABOVE (STA), moist/oily, hc odor, gravelly,
12	-	▼		GP	90		SANDY GRAVEL, loose, brown, saturated, hc odor, very coarse sand to 3/4" gravel,
13	51			CL	90		SILTY CLAY, low, very stiff, dry to damp, grey, faint odor @ base,
14	18			CL	90		SILTY CLAY, STA.
16							

Saturation
▼ Saturation

Completion Results

MKTF-39



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Western Refining SW, Inc.
Gallup Refinery - Hydrocarbon Seep
Job No. WEST14003

Geologist	: Tracy Payne
Driller	: C. Ortiz
Drilling Rig	: CME 75
Drilling Method	: Hollow Stem Auger 7.5"
Sampling Method	: Split Spoon 2" Dia, 2' Long
Comments	:
Total Depth	: 22'
Ground Water	: 10'
Start Date	: 11/13/2014
Finish Date	: 11/13/2014

MKTF-40

(Sheet 1 of 1)

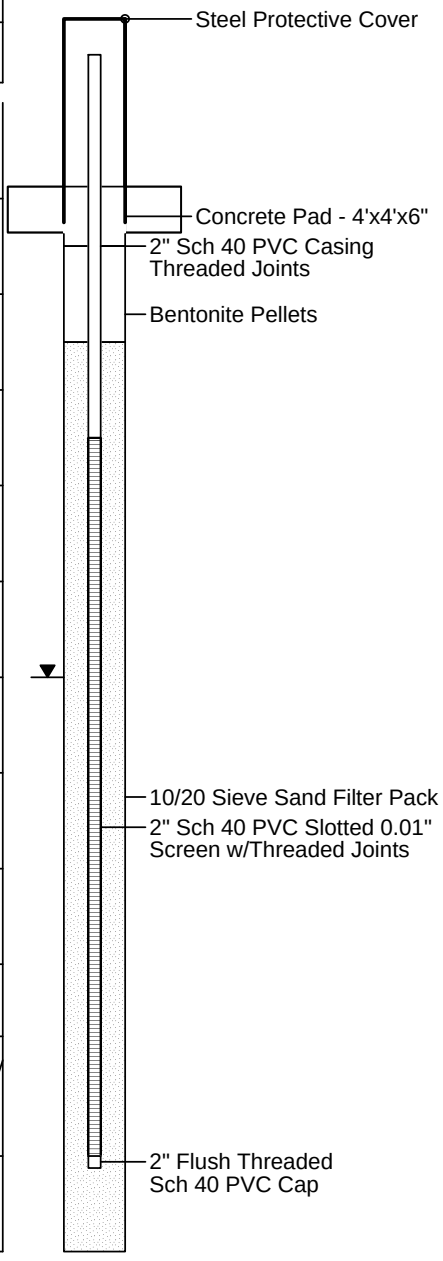
Elev., TOC (ft.msl)	: 6894.33
Elev., PAD (ft. msl)	: 6891.35
Elev., GL (ft. msl)	: 6890.48
Site Coordinates	:
N	: 1634085.50
E	: 2544637.81

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery (%)	Sample	DESCRIPTION
0							CLAY, mod, stiff, damp, brown, no odor, gravel,
1	0.8			CL	100		
2							CLAY, SIMILAR TO ABOVE (STA), gravel,
3	0.1			CL	90		
4							CLAY, STA,
5	0.7			CL	80		
6							SANDY CLAY, low, firm to soft, damp, brown, no odor, moist 7-8' ,
7	1.8			CL	90		
8							SANDY CLAY, STA, damp to moist,
9	2.0			CL	70		
10		▼					SANDY CLAY/CLAYEY SAND, STA, moist to saturated in clayey sand seams, no odor,
11	0.6			CL/SC	90		
12							SANDY SILTY CLAY, low, stiff, damp, brown, no odor, moist to saturated in sand seams,
13	1.5			CL	20		
14							SANDY CLAY/CLAYEY SAND, low, firm to soft,moist to saturated in clayey sand seams,
15	2.2			CL/SC	80		
16							SANDY CLAY/CLAYEY SAND, STA, moist to saturated,
17	2.2			CL/SC	80		
18				CL	90		SILTY CLAY, low, very stiff, damp, reddish brown and grey, no odor,
19	2.5			CL	80		SILTY CLAY, STA,
20							SILTY CLAY, STA,
21	2.6			CL	50		
22							
23							

Saturation
▼ Saturation

Completion Results

MKTF-40



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DiSorbo Environmental Consulting Firm

Western Refining SW, Inc.
Gallup Refinery - Hydrocarbon Seep
Job No. WEST14003

Geologist	: Tracy Payne
Driller	: C. Ortiz
Drilling Rig	: CME 75
Drilling Method	: Hollow Stem Auger 7.5"
Sampling Method	: Split Spoon 2" Dia, 2' Long
Comments	:
Total Depth	: 37.25'
Ground Water	: 34'
Start Date	: 11/13/2014
Finish Date	: 11/14/2014

MKTF-41

(Sheet 1 of 2)

Elev., TOC (ft.msl)	: 6893.64
Elev., PAD (ft. msl)	: 6891.11
Elev., GL (ft. msl)	: 6889.80
Site Coordinates	:
N	: 1633499.80
E	: 2544567.57

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery (%)	Sample	DESCRIPTION
0							SANDY SILTY CLAY, low, stiff, dry, brown, no odor, fine grained sand, occasional gravel,
1	2.6			CL	80		
2							SANDY SILTY CLAY, SIMILAR TO ABOVE (STA), no odor,
3	2.3			CL	70		
4							SANDY SILTY CLAY, STA, no odor,
5	1.2			CL	40		
6							SILTY CLAY/CLAYEY SILT, low, firm, dry, brown, no odor,
7	2.4			CL/ML	50		
8							SANDY CLAY, low, very stiff, dry, brown, no odor,
9	3.9			CL	60		
10							SANDY CLAY, STA, damp,
11	4.8			CL	30		
12							SANDY CLAY, STA,
13	3.5			CL	40		
14							SANDY CLAY, STA,
15	1.2			CL	10		
16							SILTY CLAY, low, very stiff, dry/damp, light reddish brown with grey @ base, no odor,
17	3.9			CL	50		
18							SILTY CLAY, STA, reddish brown and light grey,
19	4.0			CL			

Saturation
▼ Saturation

Completion Results

MKTF-41

Steel Protective Cover
Concrete Pad - 4'x4'x6"
2" Sch 40 PVC Casing Threaded Joints
Grout
Bentonite Pellets

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512-693-4190

DiSorbo Environmental Consulting Firm

Western Refining SW, Inc.
Gallup Refinery - Hydrocarbon Seep
Job No. WEST14003

Geologist	: Tracy Payne
Driller	: C. Ortiz
Drilling Rig	: CME 75
Drilling Method	: Hollow Stem Auger 7.5"
Sampling Method	: Split Spoon 2" Dia, 2' Long
Comments	:
Total Depth	: 37.25'
Ground Water	: 34'
Start Date	: 11/13/2014
Finish Date	: 11/14/2014

MKTF-41

(Sheet 2 of 2)

Elev., TOC (ft.msl)	: 6893.64
Elev., PAD (ft. msl)	: 6891.11
Elev., GL (ft. msl)	: 6889.80
Site Coordinates	:
N	: 1633499.80
E	: 2544567.57

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery (%)	Sample	DESCRIPTION
19							
20	4.0			CL	80		
21	3.9			CL	50		SILTY CLAY, STA, light reddish brown,
22							
23	3.6			CL	40		SILTY CLAY, STA, light reddish brown and trace grey,
24							
25	3.3			CL	50		SILTY CLAY, STA, light reddish brown,
26							
27	2.1			CL	10		SILTY CLAY, STA,
28							
29	2.8			CL	20		SILTY CLAY, STA,
30							
31	2.6			CL	40		SILTY CLAY, STA, moist @ top of sample,
32							
33	3.1			CL	50		SILTY CLAY, STA, calcareous,
34		▼					
35	2.9			CL	50		SILTY CLAY, STA, gravelly, moist to saturated, no odor, shale @ base,
36							
37	-			SH	10		SHALE, dark grey, dense to very dense,
38							
39							
40							

Saturation
▼ Saturation

Completion Results

MKTF-41

- Bentonite Pellets
- 2" Sch 40 PVC Casing Threaded Joints
- 10/20 Sieve Sand Filter Pack
- 2" Sch 40 PVC Slotted 0.01" Screen w/Threaded Joints
- 2" Flush Threaded Sch 40 PVC Cap

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Gallup Refinery - Hydrocarbon Seep
Job No. WEST14003

Geologist	: Tracy Payne
Driller	: C. Ortiz
Drilling Rig	: CME 75
Drilling Method	: Hollow Stem Auger 7.5"
Sampling Method	: Split Spoon 2" Dia, 2' Long
Comments	:
Total Depth	: 30.25'
Ground Water	:
Start Date	: 11/12/2014
Finish Date	: 11/12/2014

MKTF-42

(Sheet 1 of 1)

Elev., TOC (ft.msl)	: 6892.95
Elev., PAD (ft. msl)	: 6890.42
Elev., GL (ft. msl)	: 6888.75
Site Coordinates	:
N	: 1633078.09
E	: 2544678.55

Water Level

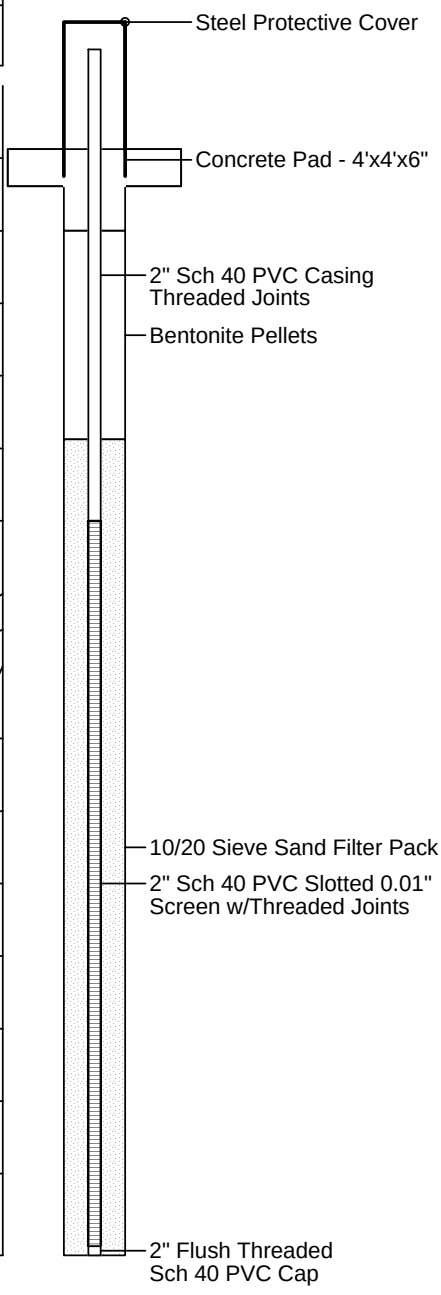
Depth to water - 18.79 ftbtoc 11-18-14

(not known to be static)

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery (%)	Sample	DESCRIPTION
0-1	1.7			CL	100		SILTY CLAY, low, firm, dry, light brown, no odor,
2-3	2.8			CL	90		SILTY CLAY, low, very stiff, dry, light brown, calcareous, no odor, crumbly,
4-5	3.8			CL	60		SILTY CLAY, SIMILAR TO ABOVE (STA),
6-7	2.4			CL	60		SILTY CLAY, STA,
8-9	4.1			CL	30		SILTY CLAY, STA,
10-11	2.8			CL	50		SANDY CLAY, low, stiff, dry, light reddish brown with medium grained sand and interbedded sandstone less than 1/2" thick,
12				CL	80		SANDY CLAY, STA,
13	3.9			CL	80		SILTY CLAY, low, very stiff, damp/dry, light reddish brown, no odor, calcareous,
14-15	2.5			CL	60		SILTY CLAY, STA, increase in moisture,
16-17	2.3			CL	50		SILTY CLAY, STA, trace sand, standstone seam @ 17.5', very dense,
18-19	2.4			CL	80		SILTY CLAY, STA, odor, extremely calcareous (50%),
20-21	1.5			CL	80		SILTY CLAY, STA, calcareous,
22-23	2.5			CL	10		SILTY CLAY, low, stiff, damp, reddish brown, no odor,
24-25	1.4			CL	60		SILTY CLAY, STA,
26-27	1.5			CL	60		SILTY CLAY, STA, trace grey,
28-29	1.2			CL	50		SILTY CLAY, STA, grey and reddish brown.
30-31							

Completion Results

MKTF-42



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Western Refining SW, Inc.
Gallup Refinery - Hydrocarbon Seep
Job No. WEST14003

Geologist	: Tracy Payne
Driller	: C. Ortiz
Drilling Rig	: CME 75
Drilling Method	: Hollow Stem Auger 7.5"
Sampling Method	: Split Spoon 2" Dia, 2' Long
Comments	:
Total Depth	: 28'
Ground Water	:
Start Date	: 11/11/2014
Finish Date	: 11/11/2014

MKTF-43

(Sheet 1 of 1)

Elev., TOC (ft.msl)	: 6876.90
Elev., PAD (ft. msl)	: 6874.12
Elev., GL (ft. msl)	: 6873.22
Site Coordinates	:
N	: 1633490.97
E	: 2544190.23

Water Level

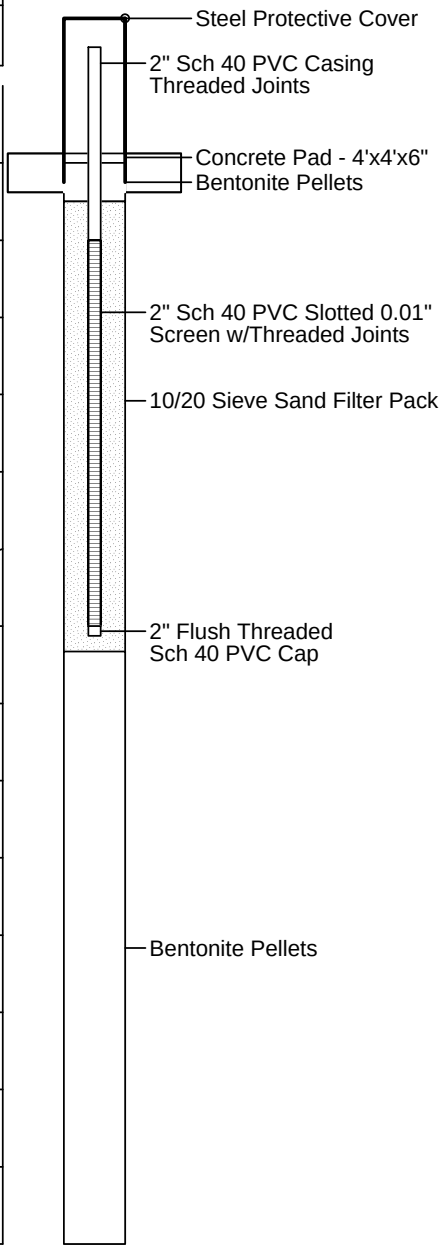
Depth to water - 6.95 ftbtoc 11-18-14

(not known to be static)

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery (%)	Sample	DESCRIPTION
1	3.6			CH	100		CLAY, high, stiff, damp, brown, no odor,
3	4.6			CH	50		CLAY, SIMILAR TO ABOVE (STA), moist in seams,
5	4.2			CH	90		CLAY, STA, moist in seams,
7	4.6			CH	90		CLAY, STA, reddish brown,
9	4.0			CL	90		SILTY CLAY, low, soft, damp, reddish brown, crumbly, no odor, trace grey clay @ 9.5',
11	3.3			CL	80		SILTY CLAY, STA, stiff,
13	3.8			CL	60		SILTY CLAY, STA, very stiff,
15	3.8			CL	80		SILTY CLAY, STA, very stiff, calcareous,
17	2.9			CL	80		SILTY CLAY, STA,
19	3.1			CL	50		SILTY CLAY, STA,
21	3.1			CL	60		SILTY CLAY, STA,
23	3.2			CL	10		SILTY CLAY, STA,
25	3.3			CL	30		SILTY CLAY, STA, sandstone seam 24.50',
27	3.2			CL	30		SILTY CLAY, STA.

Completion Results

MKTF-43



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Western Refining SW, Inc.
Gallup Refinery - Hydrocarbon Seep
Job No. WEST14003

Geologist	: Tracy Payne
Driller	: C. Ortiz
Drilling Rig	: CME 75
Drilling Method	: Hollow Stem Auger 7.5"
Sampling Method	: Split Spoon 2" Dia, 2' Long
Comments	:
Total Depth	: 50'
Ground Water	:
Start Date	: 11/11/2014
Finish Date	: 11/12/2014

MKTF-44

(Sheet 1 of 2)

Elev., TOC (ft.msl)	: 6869.95
Elev., PAD (ft. msl)	: 6867.41
Elev., GL (ft. msl)	: 6866.06
Site Coordinates	:
N	: 1633681.48
E	: 2542981.45

Water Level

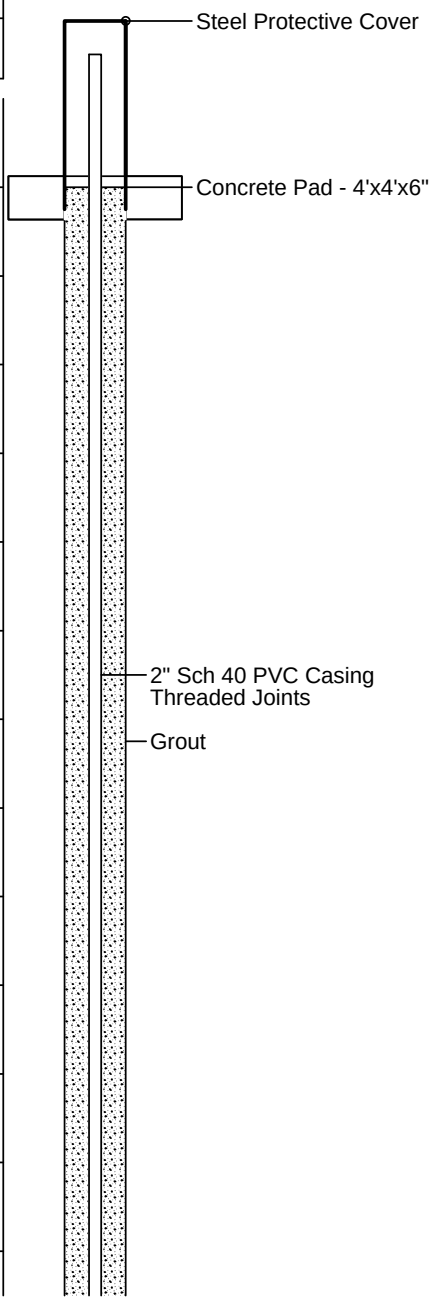
Depth to water - 48.80 ftbtoc 11-17-14

(not known to be static)

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery (%)	DESCRIPTION
0-1	6.3			CH	100	CLAY, high, very stiff, damp, brown, no odor,
2-3	8.3			CH	80	CLAY, SIMILAR TO ABOVE (STA),
4-5	8.2			CH	70	CLAY, STA,
6-7	8.6			CH	90	CLAY, STA,
8-9	8.2			CH	80	CLAY, STA,
10-11	7.9			CH	90	CLAY, STA, trace silt,
12-13	7.8			CH	90	CLAY, high, very stiff, damp, brown, no odor,
14-15	6.5			CH	10	CLAY, STA,
16-17	7.1			CH	80	CLAY, STA,
18-19	7.6			CL	70	SANDY SILTY CLAY, low, stiff, damp, light brown, no odor, gravel @ base, soft/crumbly 19-19.5' with lesser amount of clay,
20-21	5.5			CL	80	SILTY CLAY, STA with sand seams/sandstone fro 20.5-22, dry, crumbly,
22-23	6.4			CL	80	SANDY SILTY CLAY, low, stiff, dry to damp, light brown, no odor,
24-25	4.8			CL		GRAVELLY CLAY, STA, with gravel,

Completion Results

MKTF-44



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Western Refining SW, Inc.
Gallup Refinery - Hydrocarbon Seep
Job No. WEST14003

Geologist	: Tracy Payne
Driller	: C. Ortiz
Drilling Rig	: CME 75
Drilling Method	: Hollow Stem Auger 7.5"
Sampling Method	: Split Spoon 2" Dia, 2' Long
Comments	:
Total Depth	: 50'
Ground Water	:
Start Date	: 11/11/2014
Finish Date	: 11/12/2014

MKTF-44

(Sheet 2 of 2)

Elev., TOC (ft.msl)	: 6869.95
Elev., PAD (ft. msl)	: 6867.41
Elev., GL (ft. msl)	: 6866.06
Site Coordinates	:
N	: 1633681.48
E	: 2542981.45

Water Level

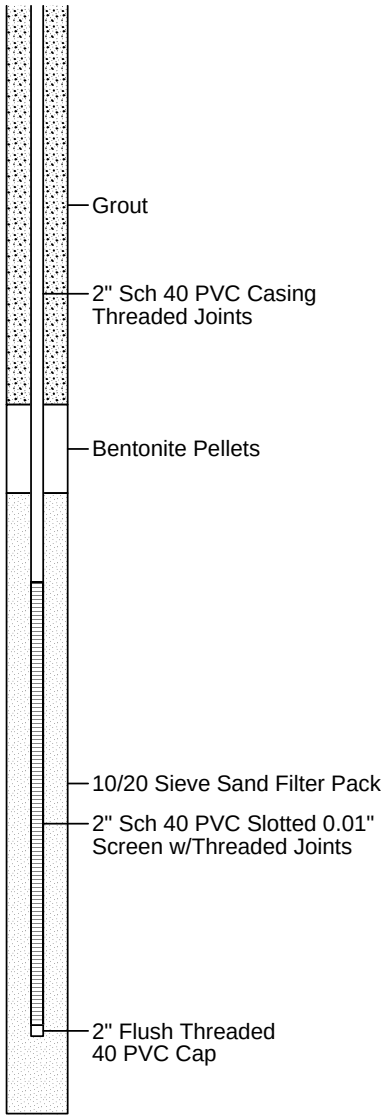
Depth to water - 48.80 ftbtoc 11-17-14

(not known to be static)

Depth (ft.)	PID (ppm)	Saturation	Lithology	USCS	Recovery (%)	DESCRIPTION
25	4.8			CL	70	
26						GRAVELLY CLAY, STA, very stiff,
27	3.8			CL	50	
28						SILTY CLAY, low, very stiff, damp/dry, reddish brown, no odor, calcareous,
29	4.8			CL	50	
30						SILTY CLAY, low, firm/crumbly, damp to dry, reddish brown, no odor, calcareous,
31	4.6			CL	90	
32						SILTY CLAY, STA, stiff to very stiff,
33	4.3			CL	80	
34						SILTY CLAY, STA,
35	3.6			CL	80	
36						SILTY CLAY, STA,
37	1.9			CL	10	
38						SILTY CLAY, STA,
39	4.4			CL	20	
40						SILTY CLAY, STA,
41	3.8			CL	80	
42						SILTY CLAY, low, very stiff, crumbly, damp to dry, reddish brown, no odor,
43	3.8			CL	20	
44						SILTY CLAY, STA,
45	3.9			CL	60	
46						SILTY CLAY, STA,
47	3.8			CL	40	
48						SILTY CLAY, STA,
49	3.7			CL	20	
50						
51						
52						

Completion Results

MKTF-44



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Phone:(505) 334-6178 Fax:(505) 334-6170
District IV
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Phone:(505) 476-3470 Fax:(505) 476-3462

State of New Mexico
Energy, Minerals and Natural Resources
Oil Conservation Division
1220 S. St Francis Dr.
Santa Fe, NM 87505

CONDITIONS

Action 51834

CONDITIONS

Operator: Western Refining Southwest LLC 539 South Main Street Findlay, OH 45840	OGRID: 267595
	Action Number: 51834
	Action Type: [UF-DP] Discharge Permit (DISCHARGE PERMIT)

CONDITIONS

Created By	Condition	Condition Date
jburdine	Accepted for Record Retention Purposes-Only	11/22/2022