



February 28, 2023

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

Re: 2022 Annual Groundwater Monitoring Report Submittal
HF Sinclair Navajo Refining LLC, Artesia Refinery
RCRA Permit No. NMD048918817

Dear Mr. Shean:

Please find enclosed paper and electronic copies of the 2022 Annual Groundwater Monitoring Report (report) for the HF Sinclair Navajo Refining LLC (HFSNR) refinery in Artesia, New Mexico. This report fulfills requirements of 4.7.6.b of the Post Closure Care Permit.

If you should have any questions or comments regarding this report, please contact me at (575) 746-5487 or Michael Holder at (575) 308-1115.

Sincerely,

Kawika Tupou
Environmental Manager
HF Sinclair Navajo Refining LLC

cc: NMED: D. Cobrain, L. Tsinnajinnie, and M. Suzuki
HF Sinclair: M. Holder
TRC: J. Speer, D. Helbert, S. Hoover

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2022 Annual Groundwater Monitoring Report

February 2023

HF Sinclair Navajo Refining LLC

Artesia Refinery

NMD048918817 and DP GW-028

Prepared For:

HF Sinclair Navajo Refining LLC

501 E Main Street,

Artesia, NM 88210



2022 Annual Groundwater Monitoring Report

NMD048918817 and DP GW-028

**HF Sinclair Navajo Refining LLC
Artesia Refinery
Artesia, New Mexico**

Prepared for:



**HF Sinclair Navajo Refining LLC
Artesia, New Mexico**

Prepared by:



**TRC Environmental Corporation
Austin, Texas**

TRC Project No. 527024

TRC Site Lead

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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.



Kawika Tupou

Environmental Manager, HF Sinclair Navajo Refining LLC



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ACRONYMS AND ABBREVIATIONS

Notation	Description
1,2,4-TMB	1,2,4-Trimethylbenzene
1,3,5-TMB	1,3,5-Trimethylbenzene
cis-1,2,-DCE	cis-1,2,-Dichloroethene
CGWSL	Critical Groundwater Screening Level
COC(s)	Constituent(s) of Concern
DO	Dissolved Oxygen
DRO	Diesel Range Organics
EDB	Ethylene Dibromide, 1,2-dibromoethane
EP(s)	Evaporation Pond(s)
FWGMWP	Facility- Wide Groundwater Monitoring Workplan
GRO	Gasoline Range Organics
HMI	Hydrologic Monitoring, LLC
HWB	Hazardous Waste Bureau
HFSNR	HF Sinclair Navajo Refining LLC
MCL	Maximum Contaminant Level
mg/L	Milligrams per liter
MTBE	Methyl Tert-Butyl Ether
NCL	North Colony Landfarm
NewFields	NewFields Companies, LLC.
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
NWS	National Weather Service
O&M	Operation and Maintenance
OCD	New Mexico Energy, Minerals and Natural Resources Department Oil Conservation Division
ORP	Oxidation-Reduction Potential
PCC Permit	Post-Closure Care Permit
PSH	Phase-Separated Hydrocarbons
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
RO	Reverse Osmosis



Notation	Description
SVOCs	Semi-Volatile Organic Compounds
SWMU	Solid Waste Management Units
TDS	Total Dissolved Solids
TEL	Tetra Ethyl Lead
TMD	Three Mile Ditch
TPH	Total Petroleum Hydrocarbons
TRC	TRC Environmental Corporation
USEPA	United States Environmental Protection Agency
VOCs	Volatile Organic Compounds



Executive Summary

This *2022 Annual Groundwater Monitoring Report* documents groundwater monitoring and recovery activities conducted at the HF Sinclair Navajo Refining LLC (HFSNR) Artesia Refinery (refinery) located at 501 East Main Street in Artesia, New Mexico. The refinery is subject to a Post-Closure Care Permit (PCC Permit) issued by the New Mexico Environment Department (NMED) in October 2003 and later modified in December 2010; as well as Discharge Permit GW-028 issued by New Mexico Energy, Minerals and Natural Resources Department Oil Conservation Division (OCD) on August 16, 2022. Both the PCC Permit and Discharge Permit require HFSNR to conduct facility-wide groundwater monitoring to evaluate the presence, nature, and extent of groundwater impacts; and to remediate impacted groundwater. This report provides the results of all groundwater monitoring and remedial activities that were conducted in 2022 to satisfy both the NMED PCC Permit and the OCD Discharge Permit.

The groundwater monitoring program consists of semiannual well gauging and groundwater sampling in accordance with the *2021 Facility-Wide Groundwater Monitoring Work Plan* (2021 FWGMWP) that was submitted to the NMED and OCD in June 2021 and approved with modifications on February 8, 2022. Additional sampling was conducted in 2022 in accordance with NMED's May 7, 2021, comments letter on the September 2019 report titled *Evaluation of Methyl Tert-Butyl Ether (MTBE) in Groundwater*. Remedial activities consist of recovery of phase-separated hydrocarbons (PSH) and impacted groundwater. The groundwater monitoring and remediation program covers the following refinery areas:

- The closed Tetra Ethyl Lead (TEL) Impoundment
- The closed North Colony Landfarm (NCL)
- The inactive Evaporation Ponds (EPs)
- Three Mile Ditch (TMD)
- The impacted vadose zone located beneath the refinery in the following other areas: Field East of Refinery, North Refinery, South Refinery, Reverse Osmosis (RO) Reject Fields, Cross-gradient of Refinery, and Up-gradient of Refinery

The 2022 groundwater monitoring results indicate physical and chemical groundwater conditions are generally consistent with historical data. Groundwater predominantly flows to the east beneath the refinery towards the Pecos River, and to the southeast beneath the EPs. Measurable PSH was present in wells located at or near the EPs, Field East of Refinery, North Refinery, NCL, South Refinery, and TEL areas in 2022, with a maximum measured thickness of 11.60 feet during the first semiannual event and 4.33 feet during the second semiannual event.



The occurrence of measurable PSH in 2022 is generally consistent with the 2021 semiannual events and no new occurrence of measurable PSH was observed in any well in 2022. Measured PSH thicknesses are overall stable to decreasing over time despite fluctuations inversely related to groundwater elevations. Any increases of PSH thickness measured in 2022 are attributable to declining groundwater elevations and are not indicative of a new release or PSH migration. Groundwater elevations have generally decreased since 2017 and remained historically low in many wells with PSH in 2022. The reduction in groundwater elevations since 2017 is consistent with the occurrence of drought conditions across southeastern New Mexico during this time.

The following constituents of concern (COCs) were detected in groundwater at concentrations in exceedance of critical groundwater screening levels (CGWSLs): total petroleum hydrocarbons (TPH) diesel range organics (DRO) and gasoline range organics (GRO); select volatile organic compounds (VOCs) including target COCs benzene, toluene, ethylbenzene, xylenes, methyl tert-butyl ether (MTBE), and naphthalene; select semi-volatile organic compounds (SVOCs); select total metals including target COC arsenic; and water quality parameters chloride, fluoride, sulfate, total dissolved solids (TDS), and nitrate/nitrite. COC concentrations in groundwater are generally stable to decreasing over time despite occasional fluctuations.

PSH and impacted groundwater were continually recovered at the refinery from an automated system of recovery trenches and recovery wells throughout 2022. An estimated 6,102,398 gallons of groundwater and an estimated 159,042 gallons were recovered through operation of the automated recovery system in 2022. PSH was also recovered from well MW-132, which is not connected to the automated system, by pumping on a periodic basis.



1.0 Introduction

On behalf of HF Sinclair Navajo Refining LLC (HFSNR), TRC Environmental Corporation (TRC) prepared this *2022 Annual Groundwater Monitoring Report* (report) to summarize the results of groundwater monitoring and recovery activities conducted in 2022 at the Navajo Artesia Refinery (refinery) located at 501 East Main Street in Artesia, New Mexico. The location of the refinery is shown on Figure 1. The refinery has been in operation since the 1920s and processes crude oil into asphalt, fuel oil, gasoline, diesel, jet fuel, and liquefied petroleum gas.

The refinery is regulated under the Resource Conservation and Recovery Act (RCRA). In October 2003, the Secretary of the New Mexico Environment Department (NMED) issued a Post-Closure Care Permit (PCC Permit) to HFSNR for the Artesia Refinery (United States Environmental Protection Agency [US EPA] ID number NMD048918817). The PCC Permit was modified and reissued in December 2010 (NMED 2010). The PCC Permit authorizes and requires HFSNR (the Permittee) to conduct post-closure care at the closed tetra ethyl lead (TEL) surface impoundment and the North Colony Landfarm (NCL) and to take appropriate actions to achieve RCRA closure of the inactive Evaporation Ponds (EPs). These areas and the locations of all existing monitoring and recovery wells are shown on Figure 2.

The PCC Permit requires HFSNR to maintain a groundwater monitoring program to evaluate the effectiveness of the corrective action program for groundwater and to meet the requirements of New Mexico Administrative Code (NMAC) 20.4.1.500 (incorporating 40 Code of Federal Regulations Part 264, Subpart F) during the post-closure care period. The PCC Permit also requires HFSNR to recover phase-separated hydrocarbon (PSH), where present, from the shallow groundwater.

The refinery is also regulated by the New Mexico Energy, Minerals and Natural Resources Department – Oil Conservation Division (OCD). The OCD issued a renewal to Discharge Permit GW-028 (OCD 2022) on August 16, 2022. Among other requirements, the Discharge Permit requires semiannual facility-wide groundwater monitoring and submittal of an annual report summarizing the groundwater monitoring and remediation conducted throughout each year.

This report provides the results of all groundwater monitoring and remedial activities that were conducted during 2022 to satisfy both the NMED PCC Permit and the OCD Discharge Permit. The format of this report follows specifications in Appendix E.4 of the PCC Permit.

Groundwater monitoring activities conducted in 2022 consisted of semiannual well gauging and groundwater sampling. The semiannual monitoring events were performed in accordance with the (1) 2021 Facility-Wide Groundwater Monitoring Work Plan (2021 FWGMWP; TRC 2021) that was submitted to the NMED and OCD in June 2021 and approved with modifications by the NMED on February 8, 2022 (NMED 2022a). The 2021 FWGMWP included additional sampling



requirements specified in the NMED's May 7, 2021, comments letter (NMED 2021a) on the September 2019 report titled *Evaluation of Methyl Tert-Butyl Ether (MTBE) in Groundwater* (MTBE Groundwater Report [Wood 2019]). Remedial activities conducted in 2022 consisted of recovery of PSH and impacted groundwater and periodic gauging of recovery wells. The groundwater monitoring and remediation activities were performed in the following refinery areas of interest:

- The closed TEL Impoundment
- The closed NCL
- The inactive EPs
- Three Mile Ditch (TMD)
- The impacted vadose zone located beneath the refinery in the following other areas:
 - Field East of Refinery
 - North Refinery
 - South Refinery
 - Reverse Osmosis (RO) Reject Fields (North and South)
 - Cross-gradient of Refinery
 - Up-gradient of Refinery



2.0 Scope of Services

Groundwater monitoring, remedial, and other associated activities performed in 2022 are summarized in this section. The first semiannual groundwater monitoring event was conducted from April 11 to April 13, 2022. The second semiannual groundwater sampling event was conducted from October 11 to October 12, 2022. Routine remedial activities were conducted throughout 2022.

2.1 Monitoring Well Installation, Maintenance, and Repairs

No wells were installed or abandoned in 2022. South Refinery Area well MW-48 was repaired in December 2022. The following well maintenance was performed in 2022:

- Locking J-plugs and locks were replaced on various monitoring wells as required throughout 2022.
- Repair activities were conducted at South Refinery Area well MW-48 on December 1, 2022. This well has not been gauged or sampled since the second 2020 semiannual event because the surface completion was damaged and covered with sediment or gravel. A permitted well driller cleared the sediment and utilized a downhole camera to verify the integrity of the well. The driller determined the well screen, casing, and filter pack are in good condition, and replaced the flush-mount surface completion. No changes were made to the original surface casing and therefore a new elevation survey of the well was not required. Well MW-48 will be gauged and sampled as part of the routine groundwater monitoring program during future monitoring events.

2.2 Phase-Separated Hydrocarbon and Water Level Measurements

Synoptic fluid gauging was conducted by Hydrologic Monitoring LLC (HMI) at the beginning of each semiannual monitoring event in accordance with the 2021 FWGMWP. Wells were gauged to determine the groundwater elevation, flow direction, and gradient, the presence or absence of PSH, and apparent PSH thickness. A decontaminated oil-water interface probe was used to measure depth to PSH (if present), depth to water, and total depth in the monitoring and recovery wells. All measurements were recorded to the nearest 0.01-foot from the surveyed datum marking on each well casing. If the survey datum mark was not visible, measurements were obtained from the northern side of each well riser. Measurements were recorded on the field data sheets for each event.

The first semiannual gauging event was conducted from April 11 to April 13, 2022. All wells were gauged within 48 hours in accordance with the 2021 FWGMWP. No rainfall was recorded at the refinery, or at a National Weather Service (NWS) gauging station located approximately 6 miles south of the refinery during the days on which gauging occurred. No rainfall was recorded



at the NWS gauging station during the month of April 2022. A copy of the NWS data for April 2022 is provided in Appendix A.

The second semiannual gauging event was conducted on October 11 and October 12, 2022. All wells were gauged within 48 hours in accordance with the 2021 FWGMWP. No rainfall was recorded at the refinery or the NWS gauging station during the days on which gauging occurred. A total of 3.48 inches of rainfall was recorded at the NWS gauging station during the month of October 2022. According to NWS records, 2.34 inches of rainfall was recorded from October 5 to October 10, 2022, and 1.14 inches was recorded from October 16 to October 25, 2022. A copy of the NWS data for October 2022 is provided in Appendix A.

Results of the 2022 semiannual gauging events are summarized in Table 1. Potentiometric surface maps of the shallow saturated zone and valley fill zone are provided as Figures 4 through 7. PSH thickness maps are provided as Figures 8 and 9.

2.3 Groundwater Sample Collection and Handling

Semiannual groundwater sampling was conducted by HMI in accordance with the 2021 FWGMWP. No sample was collected from a well containing PSH with a measured thickness greater than or equal to ($\geq$) 0.03 feet in accordance with the 2021 FWGMWP. The following wells were not sampled during each 2022 semiannual event due to the presence of PSH at thicknesses $\geq$ 0.03 feet:

- First semiannual event: MW-23, MW-28, MW-39, MW-40, MW-41, MW-43, MW-58, MW-59, MW-60, MW-65, MW-66, MW-67, MW-85, MW-86, MW-91, MW-92, MW-94, MW-95, MW-99, MW-107, MW-111, MW-112, MW-126A, MW-127, MW-128, MW-131, MW-132, MW-133, MW-137, MW-137A, MW-138, MW-138A, KWB-1A, KWB-2R, KWB-4, KWB-5, KWB-6, KWB-8, KWB-10R, KWB-11A, NCL-34A, RW-1, RW-2, RW-5R, RW-6, RW-7, RW-8, RW-10, RW-12R, RW-13R, RW-14R, RW-15C, RW-19, RW-22, TEL-1, TEL-2, and TEL-3; and
- Second semiannual event: MW-23, MW-28, MW-39, MW-43, MW-57, MW-58, MW-60, MW-65, MW-66, MW-67, MW-85, MW-86, MW-91, MW-92, MW-94, MW-99, MW-111, MW-112, MW-126A, MW-127, MW-128, MW-131, MW-132, MW-133, MW-137, MW-138, NCL-34A, KWB-2R, KWB-4, KWB-5, KWB-6, KWB-8, KWB-10R, TEL-1, TEL-2, and TEL-3.

Groundwater was purged and sampled from monitoring and recovery wells with a peristaltic pump and dedicated tubing or a dedicated bladder pump using low-flow methods in accordance with the NMED Hazardous Waste Bureau (HWB) Position Paper "Use of Low-Flow and Other Non-Traditional Sampling Techniques for Compliance Groundwater Monitoring" (NMED 2001). Groundwater was purged and sampled from water supply wells by attaching a



decontaminated or dedicated hose barb to the available spigot. The spigot was located at a point before the water supply is introduced into any storage tanks or treatment units. The method by which each well was purged and sampled is provided in Table 2.

A multi-parameter water quality meter with flow-through cell and hand-held turbidity meter were used during the purging process of monitoring and recovery wells to monitor for field water quality parameters (pH, temperature, specific conductance, oxidation-reduction potential [ORP], dissolved oxygen [DO], and turbidity) and demonstrate stabilization. Water quality parameters were recorded approximately every three minutes during purging on a groundwater sampling form. The water quality parameters, depth to water (in non-supply wells only), and a qualitative description of the water quality (e.g., turbidity, sheen, odor) were also recorded during the purging process. Copies of the groundwater sampling forms are provided in Appendix A.

Water supply wells were purged and sampled from a sampling point (i.e., tap or spigot) located at or near the well head or pump house and before the water supply is introduced into any storage tank or treatment unit. The wells were purged at the sample point to remove any standing water from the well casing and surface piping. Grab readings of geochemical parameters including pH, temperature, conductivity, ORP, dissolved oxygen, and turbidity were also collected during the purging process.

The purging process was considered complete and groundwater sampling commenced when at least four of the purge parameters had stabilized. The specified stabilization criteria were ± 0.2 standard unit for pH, ± 0.2 degree Celsius for temperature, ± 0.2 milligrams per liter (mg/L) for DO, ± 0.02 Siemen per meter for specific conductance, and ± 20 millivolts for ORP. The final stabilized water quality parameters measured at each well are summarized in Table 2. In addition, other observations of relative water quality (color and odor) are included in Table 2.

Groundwater samples were collected directly from the dedicated tubing or water supply well sampling point into laboratory-provided sample containers. Care was taken to not overflow the containers and potentially remove preservatives from pre-preserved containers. Samples that were to be analyzed for dissolved metals were field-filtered by attaching a disposable 0.45-micron filter to the tubing and directing the flow through the filter into the sample container.

Sample labels were placed on each container and included the well name, sample name, date and time, sampler's initials, and analytical method(s) to be performed. Glass sample containers were placed in padded packing sleeves to prevent breakage. All samples were placed on wet ice in a shipping container. All groundwater samples collected during the 2022 semiannual events were submitted to Pace Analytical National Center for Testing & Innovation in Mount Juliet, Tennessee under appropriate chain-of-custody documentation for laboratory analyses specified



in the 2021 FWGMWP. Shipping containers were sent overnight to the laboratory via Federal Express. Copies of the chain-of-custody forms are included in Appendix B with the analytical data reports.

2.4 Equipment Decontamination Procedures

The oil-water interface probes used to gauge the PSH, and water levels were the only equipment that was placed within multiple wells. This equipment was decontaminated between uses at each well to prevent cross-contamination between wells. The probe and the attached measuring tape were washed in a mixture of water and non-phosphate detergent (Alconox™). The equipment was then rinsed with water. Distilled water purchased from a local store was used for washing and rinsing the equipment.

The flow-through cell and probes of the water quality meters used for low-flow purging was also decontaminated between uses at each well. Decontamination of this equipment included submersing the flow-through cell in a mixture of water and non-phosphate detergent (Alconox™), washing the cell with a soft brush, submersing the probe end of the meters in the soapy water mixture, and brushing the end of the probe with a soft brush. The equipment was then rinsed with distilled water purchased from a local store.

Dedicated tubing was used for sample collection from each well; therefore, decontamination of sample collection tubing was not required. The dedicated tubing was left in the well between sampling events, with the upper portion coiled to ensure that the lower portion did not remain in the water column. At the beginning of each sampling event, the tubing was inspected and replaced if staining or mold was observed.

2.5 Investigation-Derived Waste

All purge water and decontamination liquids were temporarily contained. The liquids were disposed daily in the refinery process wastewater system upstream of the oil/water separator. The volumes of purge water collected at each well were recorded on the HMI groundwater sampling forms and copies of these forms are provided in Appendix A.

Solid wastes generated during sampling activities included disposable gloves, paper towels, plastic bags, and tubing. All solid waste was contained in plastic bags and placed in the refinery trash receptacles for later disposal.

2.6 Exceptions to Groundwater Monitoring Work Plan

The following exceptions to the 2021 FWGMWP occurred during the first semiannual monitoring event conducted from April 11 to April 13, 2022:



- Wells KWB-3AR and KWB-9 were not gauged or sampled, and well RA-1227 was not sampled because access was denied by the landowner. The landowner has not granted HFSNR access to these wells since 2011, but HFSNR continues to pursue access.
- Wells KWB-12A, RW-11-0, RW-16B, RW-17A, RW-18A, RW-20 (RW-20A and RW-20B) were not sampled because each was dry.
- Well MW-132 was not gauged because a PSH recovery pump installed in the well prevented measurement.
- Well MW-48 was not gauged or sampled because the surface completion was damaged and the well appeared to be bridged with surface sediment.
- Well MW-14 was not gauged because an obstruction was present in the wellbore preventing measurement.
- Wells MW-93, MW-97, MW-106, and MW-129 were not gauged or sampled because they could not be located (likely covered or obstructed due to refinery construction activities).
- Irrigation well RA-4196 was not sampled because the in-well pump was inoperable.

The following exception to the 2021 FWGMWP occurred during the second semiannual monitoring event conducted from October 11 to October 12, 2022:

- Wells KWB-3AR was not gauged or sampled and KWB-9 was not gauged because access was denied by the landowner. The landowner has not granted HFSNR access to these wells since 2011.
- Well MW-132 was not gauged because a PSH recovery pump installed in the well prevented measurement.
- Well MW-48 was not gauged or sampled because the surface completion was damaged and the well appeared to be bridged with surface sediment.
- MW-14 was not gauged because an obstruction was present in the wellbore preventing measurement.
- Wells MW-93, MW-97, and MW-106 were not gauged or sampled because they could not be located (likely covered or obstructed due to refinery construction activities).
- Irrigation well RA-4196 was not sampled because the in-well pump was inoperable



3.0 Regulatory Criteria

Regulatory standards or screening levels used to evaluate the data collected for the groundwater monitoring program are based on the presumption that the shallow groundwater might be used as a source of drinking water. Use of these screening levels are conservative because the shallow groundwater is not a documented source of drinking water. The Critical Groundwater Screening Level (CGWSL) used for each constituent of concern (COC) is the lower value of either the New Mexico Water Quality Control Commission (WQCC) standard from 20.6.2.3103 NMAC (last updated in December 2018) or the Maximum Contaminant Level (MCL) from the United States Environmental Protection Agency (USEPA) Regional Screening Levels (RSLs) (USEPA 2022). For COCs where neither a WQCC standard or MCL exists, the CGWSL is the NMED Groundwater Screening Level listed in the NMED Risk Assessment Guidance for Investigations and Remediation updated in November 2022 (NMED 2022b). If no NMED Groundwater Screening Level value is available, then the CGWSL is the USEPA Tap Water RSL value (USEPA 2022).

Available regulatory screening levels and the applicable CGWSL for each COC is presented in Table 3. The CGWSL for each COC is also provided for comparison in the analytical data summary tables, as discussed later in this report.

The 2022 TPH diesel range organics (DRO) groundwater data, in all areas except the EPs, was screened against the groundwater screening level for “unknown oil” included in Table 6-4 of the 2022 guidance document (NMED 2022b). The 2022 TPH DRO groundwater data for the EPs was screened against the groundwater screening level for “Diesel #2/New Crankcase Oil” in Table 6-4 of the 2022 NMED guidance document, consistent with the approved investigation report for the EPs (Arcadis 2015a). The 2022 TPH gasoline range organics (GRO) groundwater data was screened against the screening value for “gasoline,” on Table 6-4 of the 2022 NMED guidance document (NMED 2022b).

An evaluation of background (or baseline) groundwater quality was conducted between July 2014 and June 2015 for the purpose of determining the concentrations of COCs that may be present hydraulically up- and cross-gradient of refinery operations. The evaluation was performed according to an approved work plan (Arcadis 2014) and a report summarizing the evaluation was submitted to NMED and OCD in September 2015 (Arcadis 2015b). The background groundwater investigation included statistical evaluation of COCs and calculation of upper tolerance limits, where a statistically valid set of data was available. HFSNR requested to use the background groundwater evaluation to develop alternative screening standards for specific COCs where the background data set demonstrates that the COCs are present above the WQCC standards or MCLs. Alternative standards development is pending further discussion and approval from OCD and NMED and so they are not included in this report. However, it



should be noted that concentrations of manganese, chloride, fluoride, sulfate, nitrate/nitrite, and TDS that exceed the screening levels using the WQCC standards or USEPA MCLs may not exceed up-gradient concentrations.



4.0 Monitoring Results

Results of the 2022 semiannual groundwater monitoring events are summarized in this section.

4.1 Groundwater Gauging Results

Well gauging was conducted from April 11 to 13, 2022 and on October 11 and 12, 2022. Depth to water measurements, depth to PSH (if present) measurements, and groundwater elevations are presented in Table 1. For wells with PSH present, the groundwater elevation was corrected for the presence of PSH (with a specific gravity of 0.8). Groundwater potentiometric surface maps based on the 2022 semiannual gauging results for the shallow saturated zone and the valley fill zone are presented in Figures 4 through 7.

The 2022 gauging results indicate groundwater predominantly flows eastward beneath the refinery towards the Pecos River, with localized variations in both the shallow saturated zone and the valley fill zone. The groundwater flow direction beneath the EPs is generally to the southeast. The 2022 gauging results are consistent with historical results and groundwater elevations are stable to decreasing at most locations. Groundwater mounding was observed around wells MW-114, MW-115, and MW-117 during both semiannual gauging events, despite cessation of discharge of RO reject water to the RO Reject Fields in January 2019. Groundwater mounding was also observed around wells MW-113 and KWB-11A during the second semiannual gauging event due to agricultural flood irrigation. Localized groundwater sinks were observed around various recovery wells during both semiannual gauging events due to active groundwater pumping at those recovery wells.

4.2 Phase-Separated Hydrocarbons

The presence of PSH and measured apparent in-well PSH thicknesses are shown on Figures 8 and 9 for the 2022 first and second semiannual events, respectively. PSH is present in the following general areas at the refinery: in a segmented area across multiple wells in the northern portion of the refinery (North Refinery Area, NCL, and the TEL Surface Impoundment) extending east through the field owned by HFSNR east of the refinery (Field East of Refinery), in a segmented area across multiple wells in the southern portion of the refinery (South Refinery Area) extending east through the Field East of Refinery and Bolton Road, and one isolated area on the western end of the EPs near the former discharge point into Pond 1.

On February 10, 2022, a PSH sample was collected from South Refinery Area well MW-28 for hydrocarbon fingerprint (capillary gas chromatography) analysis to evaluate the increase of apparent PSH thickness observed in April 2021 and September 2021. The sample was submitted to NewFields Companies, LLC. (NewFields) in Rockland, Massachusetts for analysis and interpretation of results. A copy of the report is provided in Appendix B.



A summary of the hydrocarbon fingerprint analysis and interpretation from NewFields is provided below:

- The MW-28 PSH sample is composed predominantly of diesel fuel (61%) with a lesser amount of gasoline (37%). The polycyclic aromatic hydrocarbons (PAH) analysis indicates a minor contribution of weathered middle distillates and heavier fuel oils.
- The tetraethyl lead (TEL) content indicated the gasoline component originated prior to 1960 or between 1985 and 1996.
- Both the diesel and gasoline components of the PSH sample appear weathered. Evidence of both evaporative weathering and water washing was indicated on the histogram of the gasoline-range PIANO compounds (paraffin, isoparaffin, [mono-] aromatic, naphthene, and olefin compounds).
- The gasoline component of the sample is a comingling of a modern, alkylate-rich fuel along with a leaded gasoline component.

The results of the PSH hydrocarbon fingerprint analysis indicate that the increase of PSH thickness at MW-28 is not associated with a new or undiscovered release. PSH thicknesses in MW-28 decreased in 2022, as discussed in Section 4.2.6 below.

Plots presenting apparent in-well PSH thicknesses and groundwater elevations over time for wells that have historically contained measurable PSH are provided in Appendix C. Screened intervals, if known, are also included on the plots in accordance with the NMED request provided in an email on August 11, 2021 (NMED 2021b).

The occurrence of measurable PSH in 2022 is generally consistent with the 2021 semiannual events. PSH thicknesses across all areas of interest are generally stable to declining over time, except in parts of the North Refinery, South Refinery, and Field East of Refinery areas in which increases during 2020 and 2021 are attributable to declining groundwater elevations and are not indicative of a new release or PSH migration. Groundwater elevations have generally decreased across the refinery since 2017 and were near historical lows in many wells during the April 2021 event. PSH thicknesses across the refinery generally appear to be inversely affected by fluctuations in groundwater elevations and recent increases in PSH thicknesses are directly attributed to reductions in groundwater elevations (except in South Refinery Area recovery well RW-5R, as discussed in Section 4.2.6 below). Groundwater elevations in 2022 were consistent with or slightly increased from the 2021 semiannual events and remain historically low. The reduction in groundwater elevations observed since 2017 is consistent with the occurrence of drought conditions across southeastern New Mexico during this time.

The presence of PSH within each area of interest is discussed in the following subsections. PSH recovery activities and results are provided in Section 6.0.



4.2.1 North Colony Landfarm – PSH Gauging Results

PSH was measured in NCL well NCL-34A at a thickness of 2.57 feet in April 2022 and 2.78 feet in October 2022. PSH was measured in NCL-34A from March 2011 through March 2013 (at a historical maximum of 5.87 feet in September 2011) and in October 2020 through October 2022. PSH presence and thickness in this well directly correlates with reductions in the groundwater elevation observed during these times.

4.2.2 Tetra Ethyl Lead Surface Impoundment – PSH Gauging Results

In April 2022, PSH was measured in wells TEL-1, TEL-2, and TEL-3 at thicknesses of 0.50 feet, 2.91 feet, and 2.86 feet, respectively. In October 2022, PSH was measured in wells TEL-1, TEL-2, and TEL-3 at thicknesses of 0.24 feet, 1.27 feet, and 1.23 feet, respectively. PSH has intermittently been present in these three TEL wells since at least 2010. PSH thicknesses in TEL-2 increased to a historical maximum of 2.91 feet in April 2022 but decreased to 1.27 feet in October 2022. PSH thicknesses in wells TEL-1 and TEL-3 have overall decreased from historical maximums measured in April 2021. PSH presence and apparent thickness in these wells generally correlate with reductions in groundwater elevations during those corresponding monitoring periods. Groundwater elevations have overall decreased in these wells since 2017, with historical minimums observed in April 2021. Further, the well screens were submerged prior to 2020.

4.2.3 Evaporation Ponds – PSH Gauging Results

PSH was measured in EP wells MW-85 and MW-86 at thicknesses of 0.42 feet and 0.17 feet, respectively, in April 2022; and 0.50 feet and 1.01 feet, respectively, in October 2022. These wells are located near the original discharge point in EP 1 (Pond 1). PSH thicknesses in MW-85 and MW-86 have overall decreased since 2012, despite fluctuations between the gauging events attributable to fluctuations in groundwater elevations.

4.2.4 Three Mile Ditch – PSH Gauging Results

No measurable PSH was present in any wells along the TMD during either 2022 semiannual event.

4.2.5 North Refinery Area – PSH Gauging Results

PSH was measured in wells MW-23, MW-39, MW-40, MW-41, MW-43, MW-59, MW-60, MW-62, MW-67, MW-91, MW-92, MW-94, MW-95, MW-137, MW-137A, MW-138, MW-138A, RW-1, RW-2, RW-7, RW-8, and RW-10 in April 2022 at thicknesses ranging from 0.01 feet in MW-62 to 4.57 feet in MW-138. In October 2022, PSH was measured in MW-23, MW-39, MW-40, MW-41, MW-42, MW-43, MW-59, MW-60, MW-62, MW-67, MW-91, MW-92, MW-94,



MW-95, MW-137, MW-137A, MW-138, MW-138A, RW-1, RW-7, RW-8, and RW-10 at thicknesses ranging from 0.01 feet in MW-62 to 4.33 feet in MW-138. The apparent occurrence and extent of PSH was generally consistent with the occurrence and extent observed in 2021. Although average PSH thickness in North Refinery wells overall decreased as compared to 2021, PSH apparent thicknesses increased to historical maximums in 2022 in the following wells which have previously contained PSH: MW-39, MW-41, MW-43, MW-138, MW-138A, and RW-10. The increased apparent thicknesses of PSH in these North Refinery Area are attributed to overall decrease in groundwater elevations since 2017 and are not indicative of a new release or PSH migration, as follows:

- MW-39: PSH thicknesses in MW-39 increased to a historical maximum of 2.25 feet in April 2022 but decreased to 0.55 feet in October 2022. PSH has periodically been measured in this well since 2011. Groundwater elevations in this well were measured at a historical minimum in April 2021 and remain historically low.
- MW-41: PSH thicknesses in MW-41 overall increased from the first measurable occurrence in September 2021 (0.84 feet) to a historical maximum of 1.77 feet in October 2022. Although groundwater elevations have fluctuated seasonally in this well since April 2021, they remain near historical lows observed since April 2020 which is the first time the well screen was not submerged. HFSNR continues to monitor and evaluate PSH at this well.
- MW-43: PSH thicknesses in MW-43 increased to a historical maximum of 0.50 feet in April 2022 but decreased to 0.15 feet in October 2022. PSH was first measured in MW-43 in April 2021 (0.40 feet), which corresponded to the historic groundwater minimum elevation. PSH thicknesses and groundwater elevations have inversely fluctuated in this well since April 2021.
- MW-138: PSH thicknesses in MW-138 overall increased from April 2019 to a historical maximum of 4.57 feet in April 2022. PSH thickness decreased to 4.33 feet in October 2022. Groundwater elevations have decreased 10.12 feet from a historical maximum in April 2016 (first gauging event for this well) to a historical minimum in April 2021. Groundwater elevations increased in September 2021 but subsequently decreased in 2022 and remain historically low.
- MW-138A: PSH thicknesses in MW-138A increased slightly since October 2021 to a historical maximum of 1.06 feet in October 2022, while groundwater elevations have decreased over the same period to a historical minimum. However, there is limited historical data available for this well as it was installed in September 2020. PSH has been measured in this well since the first monitoring event conducted in October 2020.



- **RW-10:** PSH thicknesses in RW-10 increased from the first measurable occurrence in September 2021 (3.04 feet) to a historical maximum of 3.14 feet in April 2022 and decreased slightly to 2.97 feet in October 2022. Groundwater elevations in this well decreased 13.30 feet from a historical maximum in April 2017 to a historical minimum in April 2021. Although groundwater elevations have fluctuated seasonally in this well since April 2021, they remain historically low. HFSNR continues to monitor and evaluate PSH at this well.

Groundwater elevations decreased across all areas of the refinery between approximately 2015 and late 2021, as discussed above, and the decrease is mostly attributable to reductions in rainfall over this time as the shallow groundwater potentiometric surface across the North Refinery, South Refinery, and Field East of Refinery areas was relatively consistent over this time. However, the reductions in groundwater and corresponding apparent increase in the occurrence and thickness of PSH in the North Refinery Area since between 2019 and 2021 may be exacerbated by the cessation of discharging RO reject water to the RO Reject Fields in January 2019. Groundwater elevations in 2022 were generally stable or slightly increased as compared to the 2021 semiannual events. The apparent occurrence and extent of PSH during both 2022 semiannual events were generally consistent with that observed in 2021.

PSH and groundwater are routinely removed from this plume by automated pumping from RW-1R, RW-2R, RW-7R, and/or RW-8R. Measurable volumes of PSH (as measured by the automated recovery system) were recovered from recovery wells RW-1R, RW-2R, and RW-7R in 2022 (see Section 6.0 and Table 5 for details). The recovered PSH is pumped to Tank 49 within the refinery and then to crude tanks for processing.

4.2.6 South Refinery Area – PSH Gauging Results

PSH was measured in wells KWB-2R, KWB-4, KWB-5, KWB-6, MW-28, MW-65, MW-66, MW-99, MW-107, RW-5R, RW-6, RW-15C, and RW-19 in April 2022 at thicknesses ranging from 0.12 feet in KWB-2R to 11.60 feet in RW-5R. In October 2022, PSH was measured in wells KWB-2R, KWB-4, KWB-5, KWB-6, MW-28, MW-65, MW-66, MW-99, MW-107, RW-5R, RW-15C, and RW-19 at thicknesses ranging from 0.13 feet in KWB-2R to 2.89 feet in KWB-4.

PSH thicknesses have generally decreased or are stable over time in most of these wells, despite fluctuations attributed to changes in groundwater elevation. The apparent occurrence and extent of PSH during 2022 was generally consistent with that observed in 2021. PSH thicknesses in South Refinery wells overall decreased in 2022 as compared to 2021, except in recovery well RW-5R which increased to a historical maximum of 11.60 feet in April 2022. The PSH thickness in RW-5R decreased to 0.22 feet in October 2022. The fluctuation of PSH thickness in RW-5R is attributed to the influence of active pumping from the associated recovery trench and is not indicative of a new release or PSH migration.



PSH thicknesses in MW-28 increased throughout 2021 to a historical maximum of 1.95 feet in September 2021. From 2008 to 2020, PSH was intermittently present in this well at thicknesses of 0.02 feet or less. MW-28 is located downgradient of Tank 401, which contains gasoline blendstock and had a floor leak discovered and reported in November 2019. The tank floor was replaced in 2020. As the increasing PSH thickness in MW-28 in 2021 could not be directly attributed to a reduction groundwater elevation, HFSNR collected a PSH sample from the well for hydrocarbon fingerprinting, as discussed above. PSH thickness at MW-28 subsequently decreased in 2022 to 0.47 feet in April 2022 and 0.46 feet in October 2022. PSH thickness in this well will continue to be closely monitored in 2023.

PSH and groundwater is routinely removed from this plume by automated pumping from RW-4R, RW-5R, RW-6R, RW-15 (RW-15 recovery trench wells A, B, D, and/or E), and/or RW-19. Measurable volumes of PSH (as measured by the automated recovery system) were recovered from recovery wells RW-4R, RW-5R, RW-6R and RW-19 in 2022 (see Section 6.0 and Table 5 for details). The recovered PSH is pumped to Tank 49 within the refinery and then to crude tanks for processing.

4.2.7 Field East of Refinery – PSH Gauging Results

PSH was measured in wells KWB-1A, KWB-1B, KWB-8, KWB-10R, KWB-11A, MW-58, MW-111, MW-112, MW-126A, MW-127, MW-128, MW-131, MW-132, MW-133, RW-12R, RW-13R, RW-14R, and RW-22 in April 2022, at thicknesses ranging from 0.05 feet in KWB-11A to 2.92 feet in RW-14R. In October 2022, PSH was measured in wells KWB-1A, KWB-1B, KWB-8, KWB-10R, MW-57, MW-58, MW-111, MW-112, MW-126A, MW-127, MW-128, MW-129, MW-131, MW-132, MW-133, RW-13R, RW-14R, and RW-22 at thicknesses ranging from 0.02 feet in KWB-1A to 1.95 feet in MW-128.

PSH thicknesses have generally decreased or are stable over time in most of these wells, despite fluctuations attributed to changes in groundwater elevation. However, PSH thicknesses increased to historical maximums in wells MW-128 and RW-12R in April 2022. These wells have historically contained PSH and the April 2022 increases are attributed to recent reductions in groundwater elevations, and are not indicative of a new release or PSH migration, as follows:

- **MW-128:** PSH thicknesses in MW-128 overall increased since the first measurable occurrence in October 2019 to a historical maximum of 2.69 feet in April 2022, and then decreased to 1.95 feet in October 2022. Groundwater elevations decreased 9.32 feet since October 2016 to a historical minimum in April 2021 and remain historically low. PSH thicknesses and groundwater elevations have inversely fluctuated in this well since April 2021.



- RW-12R: PSH thicknesses in RW-12R increased to a historical maximum of 1.15 feet in April 2022 but PSH was not measured in this well in October 2022. PSH thicknesses and groundwater elevations have inversely fluctuated at this well since at least April 2021.

Groundwater elevations in Field East of Refinery wells in 2022 have generally stabilized or slightly increased since 2021. The extent and occurrence of PSH has also stabilized in the Field East of Refinery and the average apparent PSH thicknesses decreased slightly as compared to 2021.

PSH thicknesses fluctuate in the wells with active PSH recovery and wells located nearby. PSH and groundwater is routinely removed from this plume by automated pumping from RW-12R, RW-13R, RW-14R, RW-20, and/or RW-22. Measurable volumes of PSH (as measured by the automated recovery system) were recovered from wells RW-14R and RW-22 in 2022. The recovered PSH is pumped to Tank 49 within the refinery and then to crude tanks for processing.

4.2.8 Cross-Gradient and Up-Gradient Areas – PSH Gauging Results

No measurable PSH was present in any wells located up-gradient or cross-gradient of the refinery during either 2022 semiannual event. The up-gradient wells are only gauged on an annual basis.

4.2.9 RO Reject Fields – PSH Gauging Results

No measurable PSH was present in any wells located within the North or South RO Reject Fields during either 2022 semiannual event.



5.0 Chemical Analytical Data

The chemical laboratory analyses and results of groundwater samples collected at the refinery in 2022 are summarized in this section.

5.1 Sample Laboratory Analyses

Groundwater samples collected during the 2022 semiannual sampling events were submitted for laboratory analysis of one or more of the following COCs by the associated analytical methods in accordance with the 2021 FWGMWP:

- TPH DRO by Method 8015 Modified
- TPH GRO by Method 8015 Modified
- Volatile organic compounds (VOCs) by Method 8260
- Metals by Methods 6010/6020 or 7470 (arsenic, barium, chromium, iron, lead, manganese, and selenium in all wells that were analyzed for metals; boron, cadmium, cobalt, mercury, nickel, uranium, and vanadium were additionally analyzed in select wells)
 - Total metals were analyzed during both the first and second semiannual events
 - Dissolved metals were analyzed during the first semiannual event (for the same list of metals as the total metal list)
- Cyanide by Method 4500
- Major cations and anions by Methods 6020 or 300 (calcium, chloride, fluoride, potassium, sodium, and sulfate)
- Nitrates/nitrites (as nitrogen) by Method 300
- Total dissolved solids (TDS) by Method 2540
- Semi-volatile organic chemicals (SVOCs) by EPA Method 8270.

The specific analytical suite for each groundwater sample was in accordance with Tables 1 and 2 of the approved 2021 FWGMWP. Laboratory analytical reports are provided in Appendix B.

In accordance with NMED's May 7, 2021, comments letter on the September 2019 MTBE Groundwater Report (NMED 2021a), groundwater samples collected from select wells were analyzed for 1,4-dioxane by Method 8270, ethylene dibromide (or 1,2-dibromomethane, EDB) by Method 8011, and Tert-Butyl Alcohol (TBA) by Method 8260.



5.2 Data Validation

Laboratory analytical results were reviewed and validated following the guidelines of the PCC Permit. The data validation and a discussion of any data quality exceptions are provided in Appendix D. Data qualifier flags were added to the data based on the data validation results and are summarized in tabulated form in Appendix B.

Although some data quality exceptions were noted, the analytical results are generally usable for the intended purpose, with one exception. As described in the data usability summary in Appendix D, the laboratory noted in the narrative that the nitrate-nitrite analysis of sample MW-74 was performed from an unpreserved, insufficiently, or inadequately preserved sample container. Due to lack of or inadequate preservation, the nondetect result for nitrate-nitrite in sample MW-74 collected on October 11, 2022, is not useable for project objectives.

5.3 Laboratory Analytical Results

Laboratory analytical results of all wells sampled in 2022, and during at least the three previous sampling events, are summarized in Tables 4A through 4D, as follows:

- Table 4A – GRO, DRO, and select VOCs (VOCs detected above the CGWSL in more than one well in 2022)
- Table 4B – Total Metals
- Table 4C – Water quality parameters (TDS, nitrate/nitrite, major cations, major anions) and Cyanide
- Table 4D – SVOCs (SVOCs detected above the CGWSL in at least one well from 2019 to 2022)

Analytical results of the 2022 monitoring events and the three prior sampling events are included in the tables as required by the PCC Permit. The timeframe required to provide data for the three prior sampling events varies by well because wells are sampled semiannually, annually, or biennially. Wells that are sampled on a biennial basis are sampled during odd calendar years and therefore were not sampled during April 2022. For consistency of the timeframe summarized in the analytical results tables, no data prior to 2013 is included for the wells that are sampled biennially or were not sampled during this timeframe for whatever reason (e.g., PSH present at a thickness ≥ 0.03 feet, lack of well access, etc.). Analytical results in Tables 4A through 4D are organized by the major area of interest in which each well is located. The applicable CGWSL is provided at the top of each data table and exceedances of the CGWSL are highlighted in yellow. Analytical results of all detected COCs are summarized in tables organized by well in numeric order that are included in Appendix B.



Plots of historical concentrations of target COCs are provided in Appendix C for wells with historical exceedances of CGWSLs. These plots are organized by well within major areas of interest and include concentration plots for the following target COCs: GRO, DRO, benzene, ethylbenzene, toluene, total xylenes, methyl tert-butyl ether (MTBE), naphthalene, and arsenic.

Figures 10 through 19 present the extent of the CGWSL exceedance areas of the following target COCs for both the first and second semiannual 2022 sampling events: DRO, arsenic, benzene, naphthalene, and MTBE.

Figures 20 through 29 depict the extent of CGWSL exceedance areas of the following water quality parameters for both the first and second semiannual 2022 events in accordance with the Discharge Permit requirements: chloride, fluoride, sulfate, TDS, and nitrate/nitrite.

The 2022 analytical results in each major area of interest are summarized in the following subsections. Analytical results were compared to CGWSLs and evaluated relative to historical results using visual and statistical techniques. Concentration trends of target COCs were visually evaluated based on the plots provided in Appendix C. Concentration trends of all COCs since 2018 (i.e., for at least four annual monitoring events) were also statistically evaluated using the Mann-Kendall Test with a calculated 95% confidence interval, which is consistent with EPA guidance for RCRA facilities (EPA 2009). Mann-Kendall "S" Statistical results were critically evaluated and any applicable increasing trends of detected COCs are described below. Any new exceedances of CGWSLs are also described below.

5.3.1 North Colony Landfarm – Analytical Results

Groundwater monitoring is ongoing beneath and near the closed NCL. Groundwater samples were collected from the NCL wells listed below during the 2022 semiannual sampling events:

- First Semiannual Event (12 wells): MW-18, MW-45, MW-53R, MW-54A, MW-55, MW-56, MW-108, NCL-31, NCL-32, NCL-33, NCL-44, and NCL-49.
- Second Semiannual Event (9 wells): MW-45, MW-54A, MW-55, MW-108, NCL-31, NCL-32, NCL-33, NCL-44, and NCL-49.

Groundwater samples collected from these NCL area wells were analyzed for DRO, VOCs, the standard total metals list (arsenic, barium, chromium, iron, lead, manganese, and selenium), and water quality parameters (calcium, chloride, fluoride, potassium, sodium, sulfate, TDS, and nitrate/nitrite). In addition, the groundwater samples collected from MW-55 during both 2022 semiannual events were analyzed for GRO. Groundwater samples from MW-18, MW-45, and MW-55 were analyzed for cyanide and the expanded total metals list (boron, cadmium, cobalt, mercury, nickel, uranium, and vanadium).



Analytical results of groundwater samples collected from wells located in and near the NCL in 2022 indicate COCs are present in groundwater above their respective CGWSLs, as highlighted in Tables 4A through 4C and discussed in the following subsections.

Total Petroleum Hydrocarbons – Diesel Range Organics and Gasoline Range Organics, NCL

In 2022, groundwater samples were collected from wells located in and near the NCL for analysis of TPH DRO and GRO. TPH results that exceeded their respective CGWSL in NCL wells are summarized in the table below:

Area	Analyte	CGWSL (mg/L)	No. Wells Sampled	No. Wells > CGWSL	Max. Concentration mg/L (Well)
NCL	<i>First Semiannual Event (April 2022)</i>				
	TPH-DRO	0.0858	12	11	12.6 (NCL-33)
	TPH-GRO	0.0101	1	1	0.190 (MW-55)
	<i>Second Semiannual Event (October 2022)</i>				
	TPH-DRO	0.0858	9	8	13.0 (NCL-33)
	TPH-GRO	0.0101	1	1	0.0658 J (MW-55)

As summarized above and highlighted in Table 4A, DRO and GRO were detected in exceedance of their respective CGWSLs in NCL area wells sampled during both 2022 semiannual events.

As shown in the COC concentration plots included in Appendix C, DRO concentrations in NCL wells have exhibited a stable to decreasing trend since at least 2016, with exceptions listed below.

- DRO concentrations in well MW-54A were overall stable between 2014 and 2020 but increased from June 2020 (1.97 mg/L) to a historical maximum in October 2022 (5.32 mg/L). DRO concentrations in this well will be reviewed again in 2023.
- DRO concentrations in well NCL-33 have overall increased since 2011 but were stabilizing between 2016 and 2020. DRO concentrations increased to a historical maximum of 17.3 mg/L in April 2021 in this well and have since decreased to 12.6 mg/L in April 2022 and 13.0 mg/L in October 2022. DRO concentrations in this well will be reviewed again in 2023.

GRO concentrations in MW-54B are stable. GRO concentrations in MW-55 exhibited an overall increasing trend from April 2017 to October 2020 but have decreased throughout 2021 and 2022. GRO concentrations in this well will be reviewed again in 2023.



Volatile Organic Compounds, NCL

In 2022, groundwater samples were collected from wells located in and near the NCL for analysis of VOCs. VOC results that exceeded their respective CGWSL in NCL wells are summarized in the table below:

Area	Analyte	CGWSL (mg/L)	No. Wells Sampled	No. Wells > CGWSL	Max. Concentration mg/L (Well)
NCL	<i>First Semiannual Event (April 2022)</i>				
	Benzene	0.005	12	1	0.0819 (MW-108)
	MTBE	0.100	12	1	0.438 (MW-55)
	<i>Second Semiannual Event (October 2022)</i>				
	Benzene	0.005	9	1	0.0702 (MW-108)

As summarized above and highlighted in Table 4A, benzene and MTBE were detected in exceedance of their respective CGWSLs in an NCL area well during at least one 2022 sampling event. No other VOC was detected above its respective CGWSL during either semiannual event.

The 2022 VOC results in groundwater beneath and near the NCL were generally consistent with historical results, with exceptions listed below. As shown in the COC concentration plots included in Appendix C, concentrations of target VOCs in wells located in and near the NCL are overall stable to declining over time, except for MTBE in MW-55. MTBE concentrations in MW-55 have exhibited an overall increasing trend since April 2015; and increased to the well's historical maximum of 0.449 mg/L in April 2021. MTBE concentrations decreased to 0.318 mg/L in September 2021, increased to 0.438 mg/L in April 2022 and decreased to 0.0772 mg/L in October 2022, which is below the CGWSL of 0.100 mg/L. MTBE concentrations in this well will be reviewed again in 2023.

MW-55 is located approximately 550 feet down- and cross-gradient of the NCL. MTBE concentrations in wells located in the immediate vicinity of the NCL remain stable and below the CGWSL, including wells NCL-33 and NCL-34A which are located on the down-gradient boundary of the NCL (Note: NCL-34A was not sampled in 2021 and 2022 due to the presence of PSH, but MTBE concentrations decreased in NCL-34A between 2016 and 2020). Therefore, the presence of MTBE in MW-55 is not associated with the NCL.

TBA in well MW-45 increased from 0.00568 mg/L in April 2022 to a historical maximum of 0.0176 mg/L in October 2022. However, TBA has only been analyzed during the three most recent events in this well and concentrations remain below the CGWSL of 0.150 mg/L.

Total Metals, NCL

Groundwater samples were collected from wells located in and near the NCL for analysis of the standard total metals list (arsenic, barium, chromium, iron, lead, manganese, and selenium). In



addition, groundwater samples collected from wells MW-18, MW-45, and MW-55 were analyzed for the expanded total metals list (boron, cadmium, cobalt, mercury, nickel, uranium, and vanadium). Total metal results that exceeded their respective CGWSL in NCL wells are summarized in the table below:

Area	Analyte	CGWSL (mg/L)	No. Wells Sampled	No. Wells > CGWSL	Max. Concentration mg/L (Well)
NCL	<i>First Semiannual Event (April 2022)</i>				
	Arsenic	0.0100	12	2	0.0149 (NCL-44)
	Boron	0.750	3	1	2.17 (MW-18)
	Iron	1.00	12	2	3.76 (NCL-33)
	Manganese	0.200	12	8	1.55 (NCL-31)
	Uranium	0.0300	3	1	0.0460 (MW-18)
	<i>Second Semiannual Event (October 2022)</i>				
	Arsenic	0.0100	9	2	0.0155 (NCL-44)
	Iron	1.00	9	2	3.87 (MW-45)
	Manganese	0.200	9	6	2.00 (NCL-32)
	Selenium	0.0500	9	1	0.0638 (MW-108)

As summarized above and highlighted in Table 4B, arsenic, boron, iron, manganese, selenium, and uranium were detected in exceedance of their respective CGWSLs in NCL wells during at least one 2022 sampling event. No other total metal was detected above its respective CGWSL during either semiannual event.

The total metal results in groundwater beneath and near the NCL were generally consistent with or less than historical results, except as follows:

- Manganese concentrations increased in well MW-55 over the six most recent sampling events. Manganese exceeded the CGWSL of 0.200 mg/L in MW-55 in September 2021 for the first time since at least April 2019 and increased to 0.350 mg/L in October 2022. Manganese concentrations have fluctuated above and below the CGWSL across the refinery over time.
- Cobalt and selenium concentrations increased by an order of magnitude in well MW-55 in October 2022 but remain below their respective CGWSLs.
- Selenium concentrations increased in well MW-108 from not detected above the method detection limit of 0.000300 mg/L in April 2022 to 0.0638 mg/L in October 2022, which is the first exceedance of the CGWSL of 0.0500 since at least April 2019. Selenium concentrations in this well will be watched reviewed again in 2023.
- Selenium concentrations increased in well NCL-31 from not detected above the method detection limit of 0.000300 mg/L in April 2022 to 0.00374 mg/L in October 2022, which



is the first detection in this well since at least April 2019. However, selenium concentrations in this well remain an order of magnitude below the CGWSL.

As shown in the COC concentration plots included in Appendix C, concentrations of target COC arsenic in wells located in and near the NCL are overall stable to declining, except in well MW-45 as discussed above.

Cyanide, NCL

Groundwater samples collected from wells MW-18 during the first 2022 semiannual event and MW-45 and MW-55 during both 2022 semiannual events were analyzed for cyanide. Cyanide was not detected above the method detection limit in groundwater samples collected from any NCL well during the April 2022 or October 2022 sampling events.

Water Quality Parameters, NCL

In 2022, groundwater samples were collected from wells located in and near the NCL for analysis of water quality parameters (calcium, chloride, fluoride, potassium, sodium, sulfate, TDS, and nitrate/nitrite [as nitrogen]).

No CGWSLs are applicable for calcium, potassium, or sodium. Chloride, fluoride, nitrate/nitrite, sulfate, and TDS were detected at concentrations in exceedance of their respective CGWSLs in groundwater samples from various wells in and near the NCL, as highlighted in Table 4C. The reported concentrations of these constituents generally exhibit an overall stable trend across the NCL, with some seasonal fluctuations between the first and second semiannual events. Nitrate/nitrite concentrations in NCL-49 have overall increased from 5.63 mg/L in April 2019 to 14.7 mg/L in April 2022, which is above the CGWSL of 10.0 mg/L then decreased slightly to 13.2 mg/L in October 2022. Nitrate/nitrite concentrations in this well will be reviewed again in 2023.

5.3.2 Tetra Ethyl Lead Surface Impoundment – Analytical Results

Groundwater monitoring beneath the closed TEL surface impoundment is ongoing. Groundwater samples were collected from the following wells during the 2022 semiannual events:

- First Semiannual Event (2 wells): MW-49 and TEL-4.
- Second Semiannual Event (2 wells): MW-49 and TEL-4.

Groundwater samples collected from these TEL area wells were analyzed for GRO, DRO, VOCs, the standard total metals list (arsenic, barium, chromium, iron, lead, manganese, and selenium), and water quality parameters (calcium, chloride, fluoride, potassium, sodium, sulfate, TDS, and nitrate/nitrite). In addition, groundwater samples collected from MW-49 were



analyzed for the expanded total metals list (boron, cadmium, cobalt, mercury, nickel, uranium, and vanadium) and cyanide.

Analytical results of groundwater samples collected from TEL wells in 2022 indicate COCs are present in groundwater above their respective CGWSLs, as highlighted in Tables 4A through 4C and discussed in the following subsections.

Total Petroleum Hydrocarbons – Diesel Range Organics and Gasoline Range Organics, TEL

In 2022, groundwater samples were collected from wells located in and near the TEL for analysis of TPH DRO and GRO. TPH results that exceeded their respective CGWSL in TEL wells are summarized in the table below:

Area	Analyte	CGWSL (mg/L)	No. Wells Sampled	No. Wells > CGWSL	Max. Concentration mg/L (Well)
TEL	<i>First Semiannual Event (April 2022)</i>				
	TPH-DRO	0.0858	2	2	6.29 (MW-49)
	TPH-GRO	0.0101	2	2	4.35 (MW-49)
	<i>Second Semiannual Event (October 2022)</i>				
	TPH-DRO	0.0858	2	2	4.55 (MW-49)
	TPH-GRO	0.0101	2	2	2.84 (MW-49)

As summarized above and highlighted in Table 4A, DRO and GRO were detected in exceedance of their respective CGWSLs in both TEL area wells sampled during both 2022 semiannual events.

DRO and GRO concentrations in both TEL area wells have exhibited a stable to decreasing trend over at least the four most recent sampling events, as shown in the COC concentration plots included in Appendix C.

Volatile Organic Compounds, TEL

In 2022, groundwater samples were collected from wells located in and near the TEL for analysis of VOCs. VOC results that exceeded their respective CGWSL in TEL wells are summarized in the table below:



Area	Analyte	CGWSL (mg/L)	No. Wells Sampled	No. Wells > CGWSL	Max. Concentration mg/L (Well)
TEL	<i>First Semiannual Event (April 2022)</i>				
	Benzene	0.00500	2	2	0.236 (MW-49)
	MTBE	0.100	2	1	0.183 (MW-49)
	1,2,4-TMB	0.0560	2	1	0.0603 (MW-49)
	<i>Second Semiannual Event (October 2022)</i>				
	Benzene	0.00500	2	1	0.278 (MW-49)
	MTBE	0.100	2	1	0.168 (MW-49)
	1,2,4-TMB	0.0560	2	1	0.0719 (MW-49)
	Vinyl Chloride	0.00200	2	1	0.00213 J3 (MW-49)

J3: The associated batch QC was outside the established quality control range for precision.

As summarized above and highlighted in Table 4A and Appendix B (Table B.4), benzene, MTBE, 1,2,4-Trimethylbenzene (1,2,4-TMB), and vinyl chloride were detected in exceedance of their respective CGWSLs in TEL wells during at least one 2022 sampling event. No other VOC was detected above its respective CGWSL during either semiannual event.

The 2022 VOC results of groundwater in TEL area wells were consistent with historical results. As shown in the COC concentration plots included in Appendix C, concentrations of target VOCs in TEL area wells exhibited stable trends over time despite occasional fluctuations, with the following exceptions:

- MTBE concentrations have overall increased in MW-49 from 2013 to April 2021 after declining between 2009 and 2013. MTBE concentrations increased to the historical maximum of 0.257 mg/L in April 2021 and have subsequently exhibited a stable to slightly decreasing trend. Concentrations decreased to 0.210 mg/L in September 2021, to 0.183 mg/L in April 2022, and to 0.168 mg/L in October 2022. MTBE concentrations in MW-49 will be reviewed again in 2023. MW-49 is located approximately 650 feet cross- and downgradient of the TEL. MTBE concentrations in wells located immediately downgradient of the TEL (TEL-1, TEL-2, and TEL-3) are stable over time (with data through 2020), indicating the increasing trend of MTBE concentrations at MW-49 is not associated with the TEL. Additionally, the TEL has not received waste since 1983, which is the first year that MTBE was used at the refinery. A work plan to investigate MTBE in groundwater was submitted to NMED on December 15, 2021 (Wood 2021), and revised August 26, 2022 (Wood 2022).
- Benzene concentrations in TEL-4 have fluctuated significantly above and below the CGWSL of 0.0050 mg/L since 2006. Benzene concentrations decreased to below the CGWSL during both 2022 semiannual sampling events.



Total Metals, TEL

Groundwater samples were collected from wells located in and near the TEL for analysis of the standard total metals list (arsenic, barium, chromium, iron, lead, manganese, and selenium). In addition, groundwater sample collected from MW-49 were analyzed for the expanded total metals list (boron, cadmium, cobalt, mercury, nickel, uranium, and vanadium). Total metal results that exceeded their respective CGWSL in TEL wells are summarized in the table below:

Area	Analyte	CGWSL (mg/L)	No. Wells Sampled	No. Wells > CGWSL	Max. Concentration mg/L (Well)
TEL	<i>First Semiannual Event (April 2022)</i>				
	Chromium	0.0500	2	1	0.111 (TEL-4 FD)
	Manganese	0.200	2	1	0.746 (TEL-4 FD)
	<i>Second Semiannual Event (October 2022)</i>				
	Chromium	0.0500	2	1	0.303 (TEL-4)
	Manganese	0.200	2	2	1.03 (TEL-4)

FD: Field Duplicate

As summarized above and highlighted in Table 4B, chromium and manganese were detected in exceedance of their respective CGWSLs in at least one TEL well during both 2022 sampling events. No other total metal was detected above its respective CGWSL during either semiannual event.

The 2022 total metal results in TEL wells were generally consistent with historical results.

Groundwater concentrations of target COC arsenic in TEL area wells are overall stable to declining, despite occasional fluctuations, as shown in the COC concentration plots included in Appendix C. Arsenic concentrations in TEL-4 overall increased since 2018, but concentrations reduced over the last four sampling events and remain below historical maximum concentrations for this well.

Cyanide, TEL

Groundwater samples collected from MW-49 during both 2022 semiannual events were analyzed for cyanide. Cyanide concentrations during both semiannual events were not detected above the method detection limit.

Water Quality Parameters, TEL

Chloride, sulfate, and TDS were detected at concentrations in exceedance of their respective CGWSLs in groundwater samples collected from TEL area wells during 2022, as highlighted in Table 4C. The reported concentrations of these constituents in 2022 were overall consistent with historical results. Fluoride and nitrate/nitrite were not detected above the CGWSL in any



TEL area well. No CGWSLs are applicable for calcium, potassium, or sodium. Analytical results of these analytes in all TEL area wells were consistent with historical results.

5.3.3 Evaporation Ponds Analytical – Results

Groundwater monitoring is ongoing beneath the inactive EPs. Analytical results of groundwater samples collected from EP wells in 2022 indicate COCs are present in groundwater above their respective CGWSLs, as highlighted in Tables 4A through 4C and discussed in the following subsections.

Total Petroleum Hydrocarbons – Diesel Range Organics and Gasoline Range Organics, EPs

In 2022, groundwater samples were collected from the following EP wells during each semiannual event for analysis of DRO and GRO, unless noted otherwise:

- First Semiannual Event (41 wells): MW-1R (DRO only), MW-2A, MW-3, MW-4A, MW-5A, MW-6A, MW-7A, MW-10, MW-11A, MW-15, MW-18A (DRO only), MW-22A, MW-70, MW-72, MW-73, MW-74, MW-75, MW-76, MW-77, MW-78, MW-79, MW-80, MW-81, MW-82, MW-83, MW-84, MW-87, MW-88, MW-120, MW-121, MW-122, MW-123, MW-124, OCD-1R, OCD-2A, OCD-3, OCD-4, OCD-5, OCD-6, OCD-7AR, and OCD-8A.
- Second Semiannual Event (30 wells): MW-2A, MW-3, MW-4A, MW-5A, MW-7A, MW-10, MW-18A (DRO only), MW-22A, MW-70, MW-74, MW-75, MW-76, MW-79, MW-83, MW-84, MW-87, MW-88, MW-120, MW-121, MW-122, MW-123, MW-124, OCD-1R, OCD-2A, OCD-3, OCD-4, OCD-5, OCD-6, OCD-7AR, and OCD-8A.

TPH results that exceeded their respective CGWSL in EP wells are summarized in the table below:

Area	Analyte	CGWSL (mg/L)	No. Wells Sampled	No. Wells > CGWSL	Max. Concentration mg/L (Well)
Evaporation Ponds	<i>First Semiannual Event (April 2022)</i>				
	TPH-GRO	0.0101	39	31	1.75 (MW-5A)
	TPH-DRO-EP	0.0167	41	41	79.4 (MW-84)
	<i>Second Semiannual Event (October 2022)</i>				
	TPH-GRO	0.0101	29	19	3.34 (MW-75)
	TPH-DRO-EP	0.0167	30	28	42.2 (MW-84)

As summarized above and highlighted in Table 4A, DRO and GRO were detected in exceedance of their respective CGWSLs in EP wells sampled during both 2022 semiannual events.

As shown in the COC concentration plots included in Appendix C, DRO and GRO concentrations in EP wells have been overall stable since at least 2016 despite occasional fluctuations, with the following exceptions:



- DRO concentrations in MW-7A have overall exhibited a stable trend since approximately 2012. Concentrations increased slightly from 0.873 mg/L in April 2022 to 1.39 mg/L in October 2022, which is the same as the historical maximum observed in October 2017.
- DRO and GRO concentrations in MW-5C were overall stable from 2014 to 2019 but increased by two orders of magnitude to a historical maximum of 11.3 mg/L and 1.98 mg/L, respectively, in April 2021. This well is sampled biennially and therefore was not sampled in 2022. DRO and GRO concentrations in MW-5C will be reviewed again in 2023.
- DRO concentrations in MW-78 were overall stable from 2015 to 2020 but increased to a historical maximum of 385 mg/L in April 2021. DRO concentrations decreased to 32.5 mg/L in April 2022, which is consistent with concentrations from 2014 to 2020. DRO concentrations in MW-78 will be reviewed again in 2023.
- DRO and GRO concentrations in OCD-5 have overall increased since October 2016 but have stabilized over the seven most recent sampling events. DRO and GRO concentrations in OCD-5 will be reviewed again in 2023.

Apparent GRO concentration increases shown on the COC concentration plots included in Appendix C for EP wells MW-78 (June 2020), MW-84 (October 2020), MW-86 (October 2020) and MW-122 (June and October 2020) are attributed to elevated detection limits. In 2022, GRO concentrations in these wells were either not detected above method detection limits of 0.0314 mg/L (MW-122 in October 2022) or 0.157 mg/L (MW-78 in April 2022) or at concentrations consistent with historical concentrations (0.279 mg/L in April 2022 and 0.855 mg/L in October 2022 at MW-84; 0.0541 mg/L in April 2022 at MW-122).

Volatile Organic Compounds, EPs

In 2022, groundwater samples collected from the following EP wells during each semiannual event were analyzed for VOCs:

- First Semiannual Event (41 wells): MW-1R, MW-2A, MW-3, MW-4A, MW-5A, MW-6A, MW-7A, MW-10, MW-11A, MW-15, MW-18A, MW-22A, MW-70, MW-72, MW-73, MW-74, MW-75, MW-76, MW-77, MW-78, MW-79, MW-80, MW-81, MW-82, MW-83, MW-84, MW-87, MW-88, MW-120, MW-121, MW-122, MW-123, MW-124, OCD-1R, OCD-2A, OCD-3, OCD-4, OCD-5, OCD-6, OCD-7AR, and OCD-8A.
- Second Semiannual Event (2 wells): MW-7A and MW-120.

VOCs were not detected above their respective CGWSLs in the EP wells sampled during both 2022 semiannual events. The 2022 VOC results in EP wells are consistent with historical results.



Total Metals, EPs

In 2022, groundwater samples were collected from the following EP wells during each semiannual event for analysis of the standard total metals list (arsenic, barium, chromium, iron, lead, manganese, and selenium):

- First Semiannual (41 wells): MW-1R, MW-2A, MW-3, MW-4A, MW-5A, MW-6A, MW-7A, MW-10, MW-11A, MW-15, MW-18A, MW-22A, MW-70, MW-72, MW-73, MW-74, MW-75, MW-76, MW-77, MW-78, MW-79, MW-80, MW-81, MW-82, MW-83, MW-84, MW-87, MW-88, MW-120, MW-121, MW-122, MW-123, MW-124, OCD-1R, OCD-2A, OCD-3, OCD-4, OCD-5, OCD-6, OCD-7AR, and OCD-8A.
- Second Semiannual Event (30 wells): MW-2A, MW-3, MW-4A, MW-5A, MW-7A, MW-10, MW-18A, MW-22A, MW-70, MW-74, MW-75, MW-76, MW-79, MW-83, MW-84, MW-87, MW-88, MW-120, MW-121, MW-122, MW-123, MW-124, OCD-1R, OCD-2A, OCD-3, OCD-4, OCD-5, OCD-6, OCD-7AR, and OCD-8A.

In addition, groundwater samples collected from wells MW-18A and OCD-8A were analyzed for the expanded total metals list (boron, cadmium, cobalt, mercury, nickel, uranium, and vanadium). Total metal results that exceeded their respective CGWSL in EP wells are summarized in the table below:

Area	Analyte	CGWSL (mg/L)	No. Wells Sampled	No. Wells > CGWSL	Max. Concentration mg/L (Well)
Evaporation Ponds	<i>First Semiannual Event (April 2022)</i>				
	Arsenic	0.0100	41	21	0.153 (MW-5A)
	Boron	0.750	2	2	1.87 (MW-18A)
	Chromium	0.0500	41	2	0.147 (MW-78)
	Iron	1.00	41	18	13.5 (OCD-5)
	Manganese	0.200	41	34	3.47 (MW-123)
	<i>Second Semiannual Event (October 2022)</i>				
	Arsenic	0.0100	30	19	0.277 (MW-75)
	Boron	0.750	2	2	2.04 (MW-18A)
	Iron	1.00	30	19	14.7 (OCD-1R)
	Manganese	0.200	30	30	5.93 (OCD-1R)

As summarized above and highlighted in Table 4B, arsenic, boron, chromium, iron, and manganese, were detected in exceedance of their respective CGWSLs in EP wells during at least one 2022 sampling event. No other total metal was detected above its respective CGWSL during either semiannual event.

The 2022 analytical results of total metals in groundwater samples collected from EP wells were generally consistent with historical results, with the following exceptions:



- Arsenic concentrations in MW-5C were stable from 2013 to 2019 but increased to a historical maximum in 0.178 mg/L in April 2021. This well is sampled biennially and therefore was not sampled in 2022. Arsenic concentrations in MW-5C will be reviewed again in 2023.
- Arsenic concentrations in MW-10 increased from 0.0194 mg/L in September 2021 to a historical maximum of 0.0429 mg/L in April 2022 but decreased to 0.0204 mg/L in October 2022, which is consistent with historical results.
- Arsenic concentrations in well OCD-1R increased from 0.00235 mg/L in April 2022 to 0.0307 mg/L in October 2022, which is the first exceedance of the CGWSL of 0.0100 mg/L since 2013. However, the October 2022 concentration is below the historical maximum of 0.0558 mg/L in June 2004 (OCD-1).
- Chromium was detected above the method detection limit and exceeded the CGWSL in MW-79 in April 2022 for the first time since June 2020. However, chromium was not detected above the method detection limit in October 2022.
- Iron concentrations have fluctuated up to two orders of magnitude in many EP wells over time. Iron concentrations in EP wells during the 2022 semiannual sampling events were generally consistent with historical results except in MW-10, MW-80, OCD-1R, and OCD-5, which all increased to a historical maximum since at least 2019 or 2020. Iron concentrations have historically exceeded the CGWSL in these wells except in MW-10 and MW-80 which were the first exceedances of the CGWSL since at least October 2020.

As shown in the COC concentration plots included in Appendix C, concentrations of target COC arsenic in EP wells are overall stable despite occasional fluctuations, except in wells discussed above.

Cyanide, EPs

Groundwater samples collected from EP wells MW-18A and OCD-8A during both 2022 semiannual events were analyzed for cyanide. Cyanide was detected in OCD-8A at an estimated concentration of 0.00362 J mg/L in April 2022. Cyanide was not above the method detection limit in MW-18 during both semiannual events and in OCD-8A during the second semiannual event. Cyanide was not detected above the CGWSL in groundwater samples collected from any EP wells during either semiannual event.

Water Quality Parameters, EPs

In 2022, groundwater samples were collected from the following EP wells during each semiannual event for analysis of water quality parameters (calcium, chloride, fluoride, potassium, sodium, sulfate, TDS, and nitrate/nitrite [as nitrogen]):



- First Semiannual Event (41 wells): MW-1R, MW-2A, MW-3, MW-4A, MW-5A, MW-6A, MW-7A, MW-10, MW-11A, MW-15, MW-18A, MW-22A, MW-70, MW-72, MW-73, MW-74, MW-75, MW-76, MW-77, MW-78, MW-79, MW-80, MW-81, MW-82, MW-83, MW-84, MW-87, MW-88, MW-120, MW-121, MW-122, MW-123, MW-124, OCD-1R, OCD-2A, OCD-3, OCD-4, OCD-5, OCD-6, OCD-7AR, and OCD-8A.
- Second Semiannual Event (25 wells): MW-2A, MW-3, MW-4A, MW-5A, MW-7A, MW-10, MW-11A, MW-18A, MW-22A, MW-74, MW-75, MW-76, MW-79, MW-83, MW-84, MW-120, MW-121, MW-122, MW-123, MW-124, OCD-1R, OCD-5, OCD-6, OCD-7AR, and OCD-8A.

No CGWSLs are applicable for calcium, potassium, or sodium. Chloride, fluoride, nitrate/nitrite, sulfate, and TDS were detected at concentrations in exceedance of their respective CGWSLs in groundwater samples from various EP wells, as highlighted in Table 4C. The reported concentrations of these constituents in 2022 were overall consistent with historical results, with the following exceptions:

- Chloride, potassium, sodium, sulfate, and TDS concentrations have overall increased since 2020 in well MW-2A. Concentrations of sodium, sulfate, and TDS decreased from September 2021. Concentrations of chloride and potassium increased to a historical maximum since at least 2020 in April 2022 and October 2022, respectively.
- Concentrations of calcium, chloride, potassium, sodium, sulfate, TDS, nitrate/nitrite in well MW-22A have exhibited seasonal fluctuations. Concentrations of each of these analytes increased in October 2022. Chloride, fluoride, and sulfate concentrations increased to historical maximums since at least 2020 and exceed their respective CGWSLs. TDS concentrations are above the CGWSL but decreased compared to September 2021 results. Calcium, potassium, sodium, and nitrate/nitrite concentrations remain below the CGWSL and September 2021 results.

5.3.4 Three Mile Ditch – Analytical Results

Groundwater monitoring is ongoing along the inactive TMD. Analytical results of groundwater samples collected from TMD wells in 2022 indicate COCs are present in groundwater above their respective CGWSLs, as highlighted in Tables 4A through 4C and discussed in the following subsections.

Total Petroleum Hydrocarbons – Diesel Range Organics and Gasoline Range Organics, TMD

In 2022, groundwater samples were collected from the following TMD wells during each semiannual event for analysis of DRO:



- First Semiannual Event (11 wells): MW-8, MW-16, MW-20, MW-21, MW-25, MW-26, MW-27, MW-46R, MW-68, MW-71, and MW-89.
- Second Semiannual Event (2 wells): MW-21 and MW-46R.

In addition, groundwater samples collected from wells MW-8 (first semiannual event only) and MW-21 were analyzed for GRO. TPH results that exceeded their respective CGWSL in TMD wells are summarized in the table below:

Area	Analyte	CGWSL (mg/L)	No. Wells Sampled	No. Wells > CGWSL	Max. Concentration mg/L (Well)
Three Mile Ditch	<i>First Semiannual Event (April 2022)</i>				
	TPH-DRO	0.0858	11	8	0.305 (MW-21)
	TPH-GRO	0.0101	2	1	0.0546 J (MW-8)
	<i>Second Semiannual Event (October 2022)</i>				
	TPH-DRO	0.0858	2	1	0.157 (MW-46R)
	TPH-GRO	0.0101	1	1	0.180 (MW-21)

As summarized above and highlighted in Table 4A, DRO and GRO were detected in exceedance of their respective CGWSLs in TMD wells sampled in at least one 2022 semiannual event.

As shown in the COC concentration plots included in Appendix C, DRO concentrations have overall exhibited a stable to decreasing trend since 2015 except in MW-21 and MW-25. DRO concentrations in MW-21 and MW-25 have fluctuated since 2015 but remained below the historical maximum in each well in 2022. DRO concentrations in these wells will be reviewed again in 2023.

As shown in the COC concentration plots included in Appendix C, GRO concentrations have overall decreased since at least October 2020 in TMD wells MW-8 and MW-21. GRO concentrations in both these wells were in 2022 were consistent with historical results.

Volatile Organic Compounds, TMD

In 2022, groundwater samples collected from the following TMD wells during each semiannual event were analyzed for VOCs:

- First Semiannual Event (13 wells): MW-8, MW-16, MW-20, MW-21, MW-25, MW-26, MW-27, MW-46R, MW-68, MW-71, MW-89, NP-1, and NP-6.
- Second Semiannual Event (3 wells): MW-21, MW-46R, and NP-1.

VOC results that exceeded their respective CGWSL in TMD wells are summarized in the table below:



Area	Analyte	CGWSL (mg/L)	No. Wells Sampled	No. Wells > CGWSL	Max. Concentration mg/L (Well)
Three Mile Ditch	<i>First Semiannual Event (April 2022)</i>				
	MTBE	0.100	12	2	0.623 (NP-1)
	<i>Second Semiannual Event (October 2022)</i>				
	MTBE	0.100	3	2	0.554 (NP-1)

As summarized above and highlighted in Table 4A, MTBE was detected in exceedance of its CGWSL in TMD wells during both 2022 sampling events. No other VOC was detected above its respective CGWSL during either semiannual event.

The 2022 VOC results for groundwater samples collected from TMD wells were generally consistent with historical results. As shown in the COC concentration plots included in Appendix C, concentrations of target VOCs in TMD wells are overall stable, except for MTBE in wells MW-8, MW-21, and NP-1, as discussed below:

- MTBE concentrations in MW-8 have overall increased since April 2016 and exceeded the CGWSL for the first time in June 2020. MTBE concentrations have overall decreased slightly from the historical maximum of 0.149 mg/L in June 2020 to 0.124 mg/L in April 2022 and remain above the CGWSL.
- MTBE concentrations in MW-21 have exhibited an overall increasing trend since October 2013 but appear to be stabilizing since October 2019 despite seasonal fluctuations. MTBE concentrations have fluctuated above and below the CGWSL of 0.100 mg/L since April 2019. MTBE concentrations decreased from 0.191 mg/L in September 2021 to 0.0685 mg/L in April 2022 (below the CGWSL) and increased to 0.222 mg/L in October 2022, which is below the historical maximum of 0.243 mg/L (October 2020).
- MTBE concentrations in NP-1 have overall increased with seasonal fluctuations since November 2014 and increased from 0.503 mg/L in September 2021 to 0.623 mg/L in April 2022, which is the historical maximum for this well. MTBE concentrations decreased slightly to 0.554 mg/L in October 2022.

MTBE concentrations in these wells will be reviewed again in 2023. A work plan to investigate MTBE in groundwater was submitted to NMED on December 15, 2021 (Wood 2021), and revised August 26, 2022 (Wood 2022).

Total Metals, TMD

In 2022, groundwater samples were collected from the following TMD wells during each semiannual event for analysis of the standard total metals list (arsenic, barium, chromium, iron, lead, manganese, and selenium):



- First Semiannual Event (11 wells): MW-8, MW-16, MW-20, MW-21, MW-25, MW-26, MW-27, MW-46R, MW-68, MW-71, and MW-89.
- Second Semiannual Event (2 wells): MW-21 and MW-46R.

In addition, the groundwater sample collected from TMD well MW-71 during the first 2022 semiannual event was analyzed for the expanded total metals list (boron, cadmium, cobalt, mercury, nickel, uranium, and vanadium). Total metal results that exceeded their respective CGWSL in TMD wells are summarized in the table below:

Area	Analyte	CGWSL (mg/L)	No. Wells Sampled	No. Wells > CGWSL	Max. Concentration mg/L (Well)
Three Mile Ditch	<i>First Semiannual Event (April 2022)</i>				
	Arsenic	0.0100	11	1	0.0105 (MW-89)
	Manganese	0.200	11	4	2.51 (MW-25)
	Selenium	0.0500	11	2	0.0783 (MW-8)
	Uranium	0.0300	1	1	0.0693 (MW-71)
	<i>Second Semiannual Event (October 2022)</i>				
	Iron	1.00	2	1	1.71 (MW-46R)
	Manganese	0.200	2	1	0.637 (MW-21)
	Selenium	0.0500	2	1	0.0549 (MW-21)

As summarized above and highlighted in Table 4B, arsenic, iron, manganese, selenium, and uranium were detected in exceedance of their respective CGWSLs in TMD wells during at least one 2022 semiannual sampling event. No other total metal was detected above its respective CGWSL during either semiannual event.

The 2022 analytical results of total metals in groundwater samples collected from TMD wells were generally consistent with historical results, with the following exceptions:

- Manganese concentrations in wells MW-16 and MW-25 have increased since 2019. Manganese concentrations in MW-16 increased from 0.0793 mg/L in April 2019 to 0.254 mg/L in April 2022; manganese concentrations in MW-25 increased from 0.439 mg/L in April 2019 to 2.51 mg/L in April 2022. Both 2022 results are the historical maximum concentrations at each well since at least 2019.
- Selenium concentrations in TMD well MW-8 have overall increased since 2019. Selenium concentrations in MW-8 increased slightly from 0.0543 mg/L in April 2021 to 0.0783 mg/L which is the historical maximum for this well since at least 2019.

Concentrations of target COC arsenic in TMD wells are overall stable, as shown in the COC concentration plots included in Appendix C.



Cyanide, TMD

Cyanide was not detected above the method detection limit or the CGWSL in the groundwater sample collected from TMD well MW-71 during the first 2022 semiannual event.

Water Quality Parameters, TMD

In 2022, groundwater samples were collected from the following TMD wells during each semiannual event for analysis of water quality parameters (calcium, chloride, fluoride, potassium, sodium, sulfate, TDS, and nitrate/nitrite [as nitrogen]):

- First Semiannual Event (12 wells): MW-8, MW-16, MW-20, MW-21, MW-25, MW-26, MW-27, MW-46R, MW-68, MW-71, MW-89, and NP-1.
- Second Semiannual Event (2 wells): MW-21 and MW-46R.

No CGWSLs are applicable for calcium, potassium, or sodium. Chloride, fluoride, nitrate/nitrite, sulfate, and TDS were detected at concentrations in exceedance of their respective CGWSLs in groundwater samples from TMD wells, as highlighted in Table 4C. The reported concentrations of these constituents in 2022 were consistent with historical results, with the following exceptions:

- Chloride and potassium concentrations in well MW-8 increased over at least the four most recent sampling events. The 2022 results for each of these analytes is the historical maximum for this well since at least 2019. Chloride has historically exceeded the CGWSL in this well.
- Calcium, chloride, potassium, sodium, sulfate, and TDS concentrations in well MW-25 have overall increased over the four most recent sampling events. The 2022 results for each of these analytes is the historical maximum for this well since at least 2019. Chloride, sulfate, and TDS have historically exceeded their respective CGWSL in this well.

5.3.5 North Refinery Area – Analytical Results

Groundwater monitoring is ongoing in the northern portion of the active refinery (i.e., North Refinery Area). Groundwater samples were collected from the following North Refinery Area wells listed below during the 2022 semiannual sampling events:

- First Semiannual Event (9 wells): MW-29, MW-42, MW-61, MW-62, MW-62R, MW-90, MW-96, MW-98, and RW-9.
- Second Semiannual Event (6 wells): MW-29, MW-61, MW-62, MW-90, MW-96, and MW-98.



Groundwater samples collected from these North Refinery Area wells were analyzed for DRO, GRO, VOCs, the standard total metals list (arsenic, barium, chromium, iron, lead, manganese, and selenium), and water quality parameters (calcium, chloride, fluoride, potassium, sodium, sulfate, TDS, and nitrate/nitrite).

Analytical results of groundwater samples collected from wells located within the North Refinery Area in 2022 indicate COCs are present in groundwater above their respective CGWSLs, as highlighted in Tables 4A through 4C and discussed in the following subsections.

Total Petroleum Hydrocarbons – Diesel Range Organics and Gasoline Range Organics, North Refinery Area

In 2022, groundwater samples were collected from North Refinery Area wells for analysis of TPH DRO and GRO. TPH results that exceeded their respective CGWSL in North Refinery Area wells are summarized in the table below:

Area	Analyte	CGWSL (mg/L)	No. Wells Sampled	No. Wells > CGWSL	Max. Concentration mg/L (Well)
North Refinery	<i>First Semiannual Event (April 2022)</i>				
	TPH-DRO	0.0858	9	9	9.22 (MW-62R)
	TPH-GRO	0.0101	9	8	16.5 (MW-98)
	<i>Second Semiannual Event (October 2022)</i>				
	TPH-DRO	0.0858	6	6	8.20 (MW-96)
	TPH-GRO	0.0101	6	6	24.9 (MW-96)

As summarized above and highlighted in Table 4A, DRO and GRO were detected in exceedance of their respective CGWSLs in all North Refinery Area wells sampled during both 2022 semiannual events.

As shown in the COC concentration plots included in Appendix C, DRO concentrations in North Refinery Area wells have exhibited a stable to decreasing trend despite occasional fluctuations since at least 2016 except in MW-29, MW-41, MW-43, and MW-59, as follows:

- DRO concentrations in MW-29 increased to the historical maximum of 8.12 mg/L in September 2021 but decreased to 4.53 mg/L in April 2022 and 4.28 mg/L in October 2022.
- DRO concentrations in MW-41 and MW-43 increased over three sampling events to the historical maximum in 2019 but decreased during two subsequent sampling events. MW-41 and MW-43 were not sampled in 2022 due to the presence of PSH at a thickness ≥ 0.03 feet.



- DRO concentrations in MW-59 increased over three sampling events to the historical maximum in June 2020 but was not sampled in 2021 or 2022 due to the presence of PSH at a thickness ≥ 0.03 feet.

DRO concentrations in the remaining North Refinery Area wells are overall stable over time.

GRO analytical results in groundwater samples collected from North Refinery Area wells in 2022 were generally consistent with historical results. As shown in the COC concentration plots included in Appendix C, GRO concentrations in North Refinery Area wells are overall stable over time despite occasional fluctuations, except in wells MW-59, MW-91, and RW-10. GRO concentrations in these wells increased to historical maximums in June 2020, but these wells have not been sampled since due to the presence of PSH at a thickness of ≥ 0.03 feet.

Volatile Organic Compounds, North Refinery Area

In 2022, groundwater samples were collected from North Refinery Area wells for analysis of VOCs. VOC results that exceeded their respective CGWSL in North Refinery Area wells are summarized in the table below:

Area	Analyte	CGWSL (mg/L)	No. Wells Sampled	No. Wells > CGWSL	Max. Concentration mg/L (Well)
North Refinery	<i>First Semiannual Event (April 2022)</i>				
	Benzene	0.00500	9	5	3.20 (MW-62R)
	MTBE	0.100	9	2	28.0 (MW-96)
	Naphthalene	0.0300	9	3	0.238 J (MW-98)
	1,2,4-TMB	0.0560	9	3	1.12 (MW-62)
	1,3,5-TMB	0.0600	9	2	0.0219 (MW-62)
	TBA	0.150	9	1	4.13 (MW-96)
	Trichloroethene	0.00500	9	1	0.0100 J (MW-62R)
	Total Xylenes	0.620	9	3	1.79 (MW-62)
	<i>Second Semiannual Event (October 2022)</i>				
	Benzene	0.00500	6	3	1.80 (MW-62)
	Chloromethane	0.0203	6	1	0.0567 J (MW-61)
	MTBE	0.100	6	2	32.3 (MW-96)
	Naphthalene	0.0300	6	3	0.267 (MW-61)
	1,2,4-TMB	0.0560	6	3	0.520 (MW-62)
	1,3,5-TMB	0.0600	6	2	0.102 (MW-98)
	TBA	0.150	6	1	3.30 (MW-96)
	Total Xylenes	0.620	6	3	1.45 (MW-98)

As summarized above and highlighted in Table 4A and Appendix B (Table B.4), benzene, chloromethane, MTBE, naphthalene, 1,2,4-trimethylbenzene (1,2,4-TMB), 1,3,5-



trimethylbenzene (1,3,5-TMB), TBA, trichloroethene, and total xylenes, were detected in exceedance of their respective CGWSLs in North Refinery Area wells during at least one 2022 semiannual sampling event. No other VOC was detected above its respective CGWSL during either semiannual event.

The 2022 VOC results in groundwater samples collected from North Refinery Area wells were generally consistent with historical results with exceptions listed below:

- MTBE concentrations in well MW-29 have overall increased since 2018 and increased from 0.00436 mg/L in April 2022 to a historical maximum of 0.0587 mg/L in October 2022 but remain below the CGWSL.
- MTBE concentrations in MW-42 have increased over the last four sampling events from 0.00655 mg/L in April 2019 to a historical maximum of 0.0413 mg/L in April 2022 but remain below the CGWSL.
- In well MW-61, concentrations of 1,2,4-TMB and 1,3,5-TMB have overall increased since 2020. 1,2,4-TMB concentrations increased from 0.260 mg/L in April 2022 to 0.372 mg/L, which is the historical maximum since at least 2020. 1,3,5-TMB concentrations have increased over the last five sampling events, increasing from not detected above the method detection limit in June 2020 to an estimated concentration of 0.0448 J mg/L in October 2022.
- Chloromethane in well MW-61 was detected above the method detection limit and CGWSL for the first time since at least June 2020 at an estimated concentration of 0.0567 J mg/L.
- Chloroform in well MW-62 was detected above the method detection limit for the first time since at least June 2020 at an estimated concentration of 0.0567 J mg/L, which is below the CGWSL of 0.0800 mg/L.
- MTBE concentrations in RW-9 increased over the five most recent sampling events from 0.00409 mg/L in April 2018 to a historical maximum of 0.417 mg/L in April 2022. MTBE in this well has exceeded the CGWSL for two sampling events (since April 2021).

VOC concentrations in the above wells will be reviewed again in 2023. As shown in the COC concentration plots included in Appendix C, concentrations of target VOCs in North Refinery Area wells have exhibited an overall stable trend over time despite occasional fluctuations except as noted above or in some wells that were not sampled in 2022. A work plan to investigate MTBE in groundwater was submitted to NMED on December 15, 2021 (Wood 2021), and revised August 26, 2022 (Wood 2022).



Total Metals, North Refinery Area

In 2022, groundwater samples were collected from North Refinery Area wells for analysis of total metals. Total metal results that exceeded their respective CGWSL in North Refinery Area wells are summarized in the table below:

Area	Analyte	CGWSL (mg/L)	No. Wells Sampled	No. Wells > CGWSL	Max. Concentration mg/L (Well)
North Refinery	<i>First Semiannual Event (April 2022)</i>				
	Arsenic	0.0100	9	3	0.0692 (MW-62R)
	Manganese	0.200	9	2	0.385 (MW-29)
	<i>Second Semiannual Event (October 2022)</i>				
	Arsenic	0.0100	6	2	0.103 (MW-29)
	Iron	1.00	6	1	12.9 (MW-29)
	Manganese	0.200	6	1	1.16 (MW-29)
	Selenium	0.0500	6	1	0.0724 (MW-90)

As summarized above and highlighted in Table 4B, arsenic, iron, manganese, and selenium were detected in exceedance of their respective CGWSLs in North Refinery wells during at least one 2022 semiannual sampling event. No other total metal was detected above its respective CGWSL during either semiannual event.

The 2022 analytical results of total metals in groundwater samples collected from North Refinery Area wells were generally consistent with historical results, with the following exceptions:

- Arsenic concentrations in MW-29 have overall increased since April 2019 but decreased from a historical maximum of 0.104 mg/L in April 2021 to 0.0110 mg/L in April 2022. Arsenic concentrations increased to 0.103 mg/L in October 2022, which is just below the historical maximum. Arsenic concentrations have fluctuated above and below the CGWSL over time in this well.
- Selenium was detected at estimated concentrations above the method detection limit for the first time since 2019 or 2020 in wells MW-42 (0.000333 J mg/L in April 2022), MW-62 (0.000378 J mg/L in April 2022 and 0.000484 J mg/L in October 2022), and MW-62R (0.000401 J mg/L in April 2022). These concentrations are two orders of magnitude below the CGWSL.
- Selenium concentrations in MW-90 have overall increased since 2020 and increased from 0.000543 mg/L in April 2022 to 0.0724 mg/L in October 2022, which is the first exceedance of the CGWSL and the historical maximum since at least June 2020.



- Arsenic concentrations in MW-62 have overall increased since October 2018 but decreased from a historical maximum of 0.0901 mg/L in September 2021 to 0.0504 mg/L in April 2022. Arsenic concentrations increased to 0.0825 mg/L in October 2022, which is just below the historical maximum. Arsenic concentrations have fluctuated above and below the CGWSL in this well over time.
- Notable previous concentration increases of barium and iron in MW-62R (April 2021) and manganese in MW-42 (April 2021) and MW-90 (September 2021) above their respective CGWSL in 2021, decreased in 2022 to below the CGWSL.

Concentrations of total metals in the above wells will be reviewed again in 2023. As shown in the COC concentration plots included in Appendix C, concentrations of target COC arsenic in North Refinery Area wells have fluctuated above and below the CGWSL over time in wells MW-23, MW-29, MW-39, MW-41, MW-42, MW-43, MW-60, MW-62, MW-67, MW-90, MW-93, RW-1, RW-2, RW-7, RW-16, and RW-17. Arsenic concentrations are overall stable to declining, despite occasional fluctuations, with the exceptions noted above.

Cyanide, North Refinery Area

No groundwater samples collected from North Refinery Area wells in 2022 were analyzed for cyanide.

Water Quality Parameters, North Refinery Area

In 2022, groundwater samples were collected from North Refinery Area wells for analysis of water quality parameters (calcium, chloride, fluoride, potassium, sodium, sulfate, TDS, and nitrate/nitrite [as nitrogen]).

No CGWSLs are applicable for calcium, potassium, or sodium. Chloride, fluoride, sulfate, nitrate/nitrite, and TDS were detected at concentrations in exceedance of their respective CGWSLs in groundwater samples from various North Refinery Area wells, as highlighted in Table 4C. The reported concentrations of these constituents were generally consistent with historical results, with the following exceptions:

- Chloride concentrations in wells MW-29, MW-42, MW-90, and RW-9 have overall increased since at least 2019 and are above the CGWSL. Water quality parameter concentrations in these wells have fluctuated over time.
- Nitrate/nitrite concentrations in MW-42 increased from an estimated 0.0775 J mg/L in April 2021 to 14.7 mg/L in April 2022, which is the first exceedance of the CGWSL since at least April 2019.



5.3.6 South Refinery Area – Analytical Results

Groundwater monitoring is ongoing in the southern portion of the active refinery (i.e., South Refinery Area). Analytical results of groundwater samples collected from wells located within the South Refinery Area in 2022 indicate COCs are present in groundwater above their respective CGWSLs, as highlighted in Tables 4A through 4C and discussed in the following subsections.

Total Petroleum Hydrocarbons – Diesel Range Organics and Gasoline Range Organics, South Refinery Area

Groundwater samples were collected from the following South Refinery Area wells during each 2022 semiannual event for analysis of DRO and GRO, unless noted otherwise:

- First Semiannual Event (12 wells): MW-50 (DRO only), MW-52, MW-64, MW-101, MW-102, MW-103, MW-104, MW-105, MW-109, MW-110, MW-139 and RW-4 (DRO only).
- Second Semiannual Event (10 wells): MW-50 (DRO only), MW-52, MW-64, MW-101, MW-102, MW-104, MW-105, MW-109, MW-110, and MW-139.

TPH results that exceeded their respective CGWSL in South Refinery Area wells are summarized in the table below:

Area	Analyte	CGWSL (mg/L)	No. Wells Sampled	No. Wells > CGWSL	Max. Concentration mg/L (Well)
South Refinery	<i>First Semiannual Event (April 2022)</i>				
	TPH-DRO	0.0858	12	12	14.6 (MW-105)
	TPH-GRO	0.0101	10	9	110 (MW-64)
	<i>Second Semiannual Event (October 2022)</i>				
	TPH-DRO	0.0858	10	10	6.84 (MW-64)
	TPH-GRO	0.0101	9	8	88.0 (MW-64)

As summarized above and highlighted in Table 4A, DRO and GRO were detected in exceedance of their respective CGWSLs in South Refinery Area wells sampled during both 2022 semiannual events.

DRO analytical results in 2022 were generally consistent with historical results. As shown in the COC concentration plots included in Appendix C, DRO concentrations in South Refinery Area wells have exhibited a stable to decreasing trend since at least 2017, except in MW-106. DRO concentrations had overall decreased in MW-106 between October 2017 and April 2019 but then overall increased over four sampling events to a historical maximum in April 2021. MW-



106 was covered by construction-related gravel during both 2022 semiannual events and was not sampled in 2022. DRO concentrations in this well will be reviewed again in 2023.

GRO analytical results in 2022 were generally consistent with historical results. As shown in the COC concentration plots included in Appendix C, GRO concentrations in South Refinery Area wells have exhibited a stable trend since 2016 despite occasional fluctuations, except in MW-101. GRO concentrations in MW-101 were stable from April 2018 to June 2020 (between 0.421 mg/L and 0.553 mg/L) and increased to 5.37 mg/L in October 2020 but decreased during both 2021 semiannual events and the April 2022 semiannual event to 1.08 mg/L in April 2022. GRO concentrations increased slightly in October 2022 to 2.54 mg/L but remain well below the historical maximum of 24.4 mg/L (April 2009).

Volatile Organic Compounds, South Refinery Area

Groundwater samples were collected from the following South Refinery Area wells during each 2022 semiannual event for analysis of VOCs:

- First Semiannual Event (13 wells): MW-50, MW-52, MW-64, MW-101, MW-102, MW-103, MW-104, MW-105, MW-109, MW-110, MW-139, RA-313, and RW-4.
- Second Semiannual Event (10 wells): MW-50, MW-52, MW-64, MW-101, MW-102, MW-104, MW-105, MW-109, MW-110, and MW-139.

VOC results that exceeded their respective CGWSL in North Refinery Area wells are summarized in the table below:



Area	Analyte	CGWSL (mg/L)	No. Wells Sampled	No. Wells > CGWSL	Max. Concentration mg/L (Well)
South Refinery	<i>First Semiannual Event (April 2022)</i>				
	Benzene	0.00500	13	9	23.8 (MW-64)
	Toluene	1.00	13	1	12.4 (MW-64)
	Ethylbenzene	0.700	13	2	1.65 (MW-64)
	o-Xylene	0.193	13	1	1.43 (MW-64)
	Total Xylenes	0.620	13	1	5.01 (MW-64)
	MTBE	0.100	13	2	0.706 (MW-102 FD)
	Naphthalene	0.0300	13	2	0.168 J (MW-102)
	1,2,4-TMB	0.0560	13	2	0.483 (MW-64)
	1,3,5-TMB	0.060	13	1	0.0957 (MW-64)
	TBA	0.150	13	2	3.09 (MW-64)
	<i>Second Semiannual Event (October 2022)</i>				
	Benzene	0.00500	10	5	28.9 (MW-64)
	Toluene	1.00	10	1	9.56 (MW-64)
	Ethylbenzene	0.700	10	2	1.60 (MW-64)
	o-Xylene	0.193	10	1	1.05 (MW-64)
	Total Xylenes	0.620	10	2	4.17 (MW-64)
	MTBE	0.100	10	2	0.500 (MW-64)
	1,2,4-TMB	0.056	10	2	0.438 (MW-64)
	1,3,5-TMB	0.060	10	1	0.0964 J (MW-64)
	TBA	0.150	10	1	2.90 (MW-64)

FD: Field Duplicate

As summarized above and highlighted in Table 4A, benzene, toluene, ethylbenzene, o-xylene, total xylenes, MTBE, naphthalene, 1,2,4-TMB, 1,3,5-TMB, and TBA were detected in exceedance of their respective CGWSLs in South Refinery Area wells during at least one 2022 sampling event. No other VOC was detected above its respective CGWSL during either semiannual event.

The 2022 analytical results of VOCs in groundwater samples collected from South Refinery Area wells were generally consistent with historical results with exceptions listed below.

- In MW-101, concentrations of benzene, ethylbenzene, naphthalene, o-xylene, toluene, and total xylenes have overall increased since June 2020 but decreased during both 2021 semiannual events and the April 2022 semiannual event. Concentrations of each VOC increased slightly in October 2022 but remain below their respective CGWSL, except for benzene which had historically exceeded the CGWSL prior to 2017 and since October 2020.
- In MW-110, concentrations of 1,2,4-TMB, 1,3,5-TMB, benzene, naphthalene, TBA, toluene, and total xylenes increased by at least an order of magnitude from September



2021 to April 2022 but then decreased by an order of magnitude in October 2022. Only benzene exceeded its CGWSL in April 2022 in this well. Benzene concentrations have fluctuated above and below the CGWSL over time in this well and remain below the historical maximum of 0.370 mg/L (January 2011). Naphthalene, toluene, and total xylenes have fluctuated over time in this well but remain below their respective CGWSL.

- As discussed further in Section 5.3.11, TBA exceeded the CGWSL of 0.150 mg/L in well MW-64 at concentrations of 3.09 mg/L in April 2022 and 2.90 mg/L in October 2022; in well MW-102 at a concentration of 0.316 mg/L in April 2022; and in well MW-103 at a concentration of 0.192 mg/L in April 2022. TBA has been analyzed in wells MW-64 and MW-102 for three consecutive semiannual events since September 2021. The April 2022 sampling event was the first sampling event where TBA was analyzed in well MW-103. TBA concentrations did not exceed the CGWSL in any other well. An evaluation of TBA results and recommendations for inclusion of EDB to the facility-wide groundwater monitoring program will be made in a future FWGMWP update, after completion of four required sampling events in all wells.

VOC concentrations in the above wells will be reviewed again in 2023. As shown in the COC concentration plots included in Appendix C, concentrations of target VOCs in South Refinery Area wells have exhibited overall stable trends over time despite occasional fluctuations except as noted above or in some wells that were not sampled during 2022.

Total Metals, South Refinery Area

In 2022, groundwater samples were collected from the following South Refinery Area wells during each semiannual event for analysis of the standard total metals list (arsenic, barium, chromium, iron, lead, manganese, and selenium):

- First Semiannual Event (12 wells): MW-50, MW-52, MW-64, MW-101, MW-102, MW-103, MW-104, MW-105, MW-109, MW-110, MW-139 and RW-4.
- Second Semiannual Event (10 wells): MW-50, MW-52, MW-64, MW-101, MW-102, MW-104, MW-105, MW-109, MW-110, and MW-139.

In addition, groundwater samples collected from South Refinery Area well MW-52 were also analyzed for the expanded metals list (boron, cadmium, cobalt, mercury, nickel, uranium, and vanadium) during both 2022 semiannual events. Total metals results that exceeded their respective CGWSL in South Refinery Area wells are summarized in the table below:



Area	Analyte	CGWSL (mg/L)	No. Wells Sampled	No. Wells > CGWSL	Max. Concentration mg/L (Well)
South Refinery	<i>First Semiannual Event (April 2022)</i>				
	Arsenic	0.0100	12	3	0.0231 (MW-64)
	Barium	2.00	12	2	2.17 (MW-102 FD)
	Boron	0.750	1	1	0.762 (MW-52)
	Manganese	0.200	12	4	1.44 (MW-139)
	<i>Second Semiannual Event (October 2022)</i>				
	Arsenic	0.0100	10	2	0.0388 (MW-110)
	Barium	2.00	10	1	2.12 (MW-64)
	Boron	0.750	1	1	0.761 (MW-52)
	Iron	1.00	10	3	3.39 (MW-109)
	Manganese	0.200	10	4	2.00 (MW-110)
	Selenium	0.0500	10	2	0.145 (MW-139)

FD: Field Duplicate

As summarized above and highlighted in Table 4B, arsenic, barium, boron, iron, manganese, and selenium were detected in exceedance of their respective CGWSLs in South Refinery Area wells during at least one 2022 sampling event. No other total metal was detected above its respective CGWSL during either semiannual event.

The 2022 analytical results of total metals in groundwater in South Refinery Area wells were generally consistent with historical results, with the following exceptions:

- Selenium concentrations in well MW-50 have fluctuated above and below the CGWSL since at least 2020. Concentrations increased from 0.0132 mg/L in April 2022 to 0.0551 mg/L in October 2022 but remain below the historical maximum since at least 2020 of 0.120 mg/L (September 2021). Selenium concentrations in this well will be reviewed again in 2023.
- Selenium concentrations in well MW-139 increased from not detected above the method detection limit of 0.000300 mg/L in April 2022 to 0.145 mg/L in October 2022, which is the first detection above the method detection limit and exceedance of the CGWSL since at least 2020. Selenium concentrations in this well will be reviewed again in 2023.
- Nickel concentrations in MW-52 have increased from 0.0260 mg/L in June 2020 to 0.0446 mg/L in April 2022 and decreased slightly to 0.0436 mg/L in October 2022 but remain below the CGWSL of 0.0500 mg/L.
- Iron concentrations have fluctuated up to two orders of magnitude in South Refinery Area wells over time. Iron concentrations fluctuated above the CGWSL in wells MW-105, MW-109, and MW-110 in October 2022. Iron has exceeded the CGWSL in MW-105 and



MW-110 during at least one other sampling event conducted since 2019. This is the first exceedance of the CGWSL for iron in well MW-109 since at least 2020.

As shown in the COC concentration plots included in Appendix C, concentrations of target COC arsenic in South Refinery Area wells are overall stable despite occasional fluctuations, except in MW-106 which was not sampled in 2022. Arsenic concentrations have fluctuated above and below the CGWSL over time in wells KWB-6, MW-28, MW-48, MW-50, MW-52, MW-65, MW-66, MW-99, MW-104 through MW-107, MW-109, and MW-110.

Cyanide, South Refinery Area

Groundwater samples collected from South Refinery Area well MW-52 during both 2022 semiannual events were analyzed for cyanide. Cyanide was not detected above the method detection limit or the CGWSL in groundwater samples collected from these wells.

Water Quality Parameters, South Refinery Area

In 2022, groundwater samples were collected from the following South Refinery Area wells during each semiannual event for analysis of water quality parameters (calcium, chloride, fluoride, potassium, sodium, sulfate, TDS, and nitrate/nitrite [as nitrogen]):

- First Semiannual Event (13 wells): MW-50, MW-52, MW-64, MW-101, MW-102, MW-103, MW-104, MW-105, MW-109, MW-110, MW-139, RA-313, and RW-4.
- Second Semiannual Event (10 wells): MW-50, MW-52, MW-64, MW-101, MW-102, MW-104, MW-105, MW-109, MW-110, and MW-139.

No CGWSLs are applicable for calcium, potassium, or sodium. Chloride, fluoride, nitrate/nitrite, sulfate, and TDS were detected at concentrations in exceedance of their respective CGWSLs in groundwater samples collected from at least one South Refinery Area well as highlighted in Table 4C. The reported concentrations of these constituents in 2022 were generally consistent with historical results, except for fluoride in MW-110. Fluoride concentrations in MW-110 increased from 1.44 mg/L in September 2021 to 1.82 mg/L in April 2022, which is the first exceedance of the CGWSL (1.60 mg/L) since at least 2020. Fluoride concentrations decreased in October 2022 to 1.30 mg/L, which is below the CGWSL and consistent with historical results.

5.3.7 Field East of Refinery – Analytical Results

Groundwater monitoring is ongoing in the Field East of Refinery located between the refinery and the EPs. Analytical results of groundwater samples collected from wells located within the Field East of Refinery in 2022 indicate COCs are present in groundwater above their respective CGWSLs, as highlighted in Tables 4A through 4C and discussed in the following subsections.



Total Petroleum Hydrocarbons – Diesel Range Organics and Gasoline Range Organics, Field East of Refinery

Groundwater samples were collected from the following wells located within the Field East of Refinery during each 2022 semiannual event for analysis of DRO and GRO, unless noted otherwise:

- First Semiannual Event (14 wells): KWB-7 (DRO only), KWB-11B, KWB-12B, MW-57, MW-113, MW-125, MW-126B, MW-130, MW-134, MW-135, MW-145, MW-146, MW-147, and MW-148.
- Second Semiannual Event (16 wells): KWB-1A (DRO only), KWB-7 (DRO only), KWB-11A, KWB-11B, KWB-12A, KWB-12B, MW-113, MW-125, MW-126B, MW-130, MW-134, MW-135, MW-145, MW-146, MW-147, and MW-148.

TPH results that exceeded their respective CGWSL Field East of Refinery wells are summarized in the table below:

Area	Analyte	CGWSL (mg/L)	No. Wells Sampled	No. Wells > CGWSL	Max. Concentration mg/L (Well)
Field East of Refinery	<i>First Semiannual Event (April 2022)</i>				
	TPH-DRO	0.0858	14	8	1.07 (KWB-7)
	TPH-GRO	0.0101	13	2	1.30 (MW-113)
	<i>Second Semiannual Event (October 2022)</i>				
	TPH-DRO	0.0858	16	8	4.82 (MW-113)
	TPH-GRO	0.0101	14	3	24.1 (MW-113 FD)

FD: Field Duplicate

As summarized above and highlighted in Table 4A, DRO and GRO were detected in exceedance of their respective CGWSLs in Field East of Refinery wells sampled during both 2022 semiannual events.

As shown in the COC concentration plots included in Appendix C, DRO concentrations in Field East of Refinery wells have exhibited a stable to decreasing trend since at least 2015 despite occasional fluctuations, with the following exceptions:

- DRO concentrations in well KWB-1A increased from an estimate concentration of 0.0960 JB mg/L (B qualifier indicates analyte was also detected in the associated method blank) in October 2020 to 0.182 mg/L in October 2022, which is the historical maximum for this well.
- DRO concentrations in KWB-11A and MW-113 have fluctuated seasonally since 2015 and 2016, respectively. DRO concentrations in KWB-11A have overall decreased from a historical maximum of 12.2 mg/L in October 2017 to 0.341 mg/L in October 2022



despite the seasonal fluctuations. DRO concentrations in MW-113 decreased from a historical maximum of 6.19 mg/L in September 2021 to 0.334 mg/L in April 2022 and increased to 4.82 mg/L in October 2022.

- DRO concentrations in MW-58 increased to a historical maximum in October 2019 after being overall stable to decreasing between 2015 and 2018. This well has not been sampled since October 2019 due to the presence of PSH at a thickness ≥ 0.03 feet.
- DRO concentrations in KWB-8 have overall increased over the four sampling events conducted in this well from 2016 and 2020. This well has not been sampled since October 2020 due to the presence of PSH presence at a thickness ≥ 0.03 feet.

GRO analytical results in groundwater samples collected from wells located in the Field East of Refinery in 2022 were overall consistent with historical results, as shown in the COC concentration plots included in Appendix C, with the following exceptions:

- GRO concentrations in well KWB-11A have fluctuated seasonally since 2017. GRO concentrations in KWB-11A increased from an estimated concentration of 0.0992 J mg/L in October 2020 to a historical maximum of 0.994 mg/L in September 2021 and decreased to 0.153 mg/L in October 2022.
- GRO concentrations in well MW-113 have overall increased, with fluctuations, since 2015. GRO concentrations decreased from 22.6 mg/L in September 2021 to 1.30 mg/L in April 2022, then increased to a historical maximum of 24.1 mg/L (field duplicate sample) in October 2022. GRO concentrations in this well will be reviewed again in 2023.

Volatile Organic Compounds, Field East of Refinery

Groundwater samples were collected from the following wells located in the Field East of Refinery during each 2022 semiannual event for analysis of VOCs:

- First Semiannual Event (15 wells): KWB-7, KWB-11B, KWB-12B, MW-57, MW-113, MW-125, MW-126B, MW-130, MW-134, MW-135, MW-145, MW-146, MW-147, MW-148, and RA-4798.

Second Semiannual Event (16 wells): KWB-1A, KWB-7, KWB-11A, KWB-11B, KWB-12A, KWB-12B, MW-113, MW-125, MW-126B, MW-130, MW-134, MW-135, MW-145, MW-146, MW-147, and MW-148.

VOC results that exceeded their respective CGWSL in Field East of Refinery wells are summarized in the table below:



Area	Analyte	CGWSL (mg/L)	No. Wells Sampled	No. Wells > CGWSL	Max. Concentration mg/L (Well)
Field East of Refinery	<i>First Semiannual Event (April 2022)</i>				
	1,2,4-TMB	0.05600	15	1	0.057 (MW-113)
	Benzene	0.00500	15	2	0.190 (KWB-7)
	<i>Second Semiannual Event (October 2022)</i>				
	1,2,4-TMB	0.0560	16	1	0.706 (MW-113 FD)
	Benzene	0.00500	16	2	8.52 (MW-113 FD)
	Ethylbenzene	0.700	16	1	2.63 (MW-113 FD)
	Naphthalene	0.0300	16	1	0.329 JB (MW-113)
	Total Xylenes	0.620	16	1	1.20 (MW-113 FD)

FD: Field Duplicate

As summarized above and highlighted in Table 4A, 1,2,4-TMB, benzene, ethylbenzene, naphthalene, and total xylenes were detected in exceedance of their respective CGWSLs in Field East of Refinery wells during at least one 2022 sampling event. No other VOC was detected above its respective CGWSL during either semiannual event.

The 2022 analytical results of VOCs in groundwater samples collected from wells located in the Field East of Refinery were generally consistent with historical results with exceptions listed below. Discussion of notable increasing trends observed in 2021 relative to 2022 results are also included below.

- In KWB-1A, 1,2,4-TMB, 1,3,5-TMB, benzene, naphthalene, o-xylene, and total xylenes were detected above the method detection limit in October 2022 for the first time since at least 2019. Concentrations of the VOCs remain below their respective CGWSLs.
- In KWB-7, concentrations of benzene, ethylbenzene, naphthalene, toluene, o-xylene, total xylenes, 1,2,4-TMB, and 1,3,5-TMB increased by at least an order of magnitude in April 2021 then decreased in September 2021. With the exception of benzene, each VOC concentration continued to decrease during both 2022 semiannual events to below each respective CGWSL. Benzene concentrations decreased from a historical maximum of 1.01 mg/L in April 2021 to 0.0131 mg/L in September 2021, then increased to 0.190 mg/L in April 2022 and decreased to 0.00172 mg/L October 2022, which is below the CGWSL. VOC concentrations in KWB-7 have fluctuated over time and will be reviewed again in 2023.
- In KWB-11A, concentrations of benzene, ethylbenzene, and total xylenes increased to historical maximums in September 2021, with only benzene detected above its respective CGWSL. Concentrations of each of these VOCs decreased in October 2022. Benzene concentrations remained above the CGWSL but decreased from 0.0512 mg/L in



September 2021 to 0.0129 mg/L in October 2022. Concentrations of these VOCs will be reviewed again in 2023.

- In MW-57, benzene and ethylbenzene were detected above the method detection limit in April 2022 for the first time since October 2016 or April 2015, respectively, at estimated concentrations of 0.000183 J mg/L and 0.000221 J mg/L, respectively. These concentrations are at least an order of magnitude below each respective CGWSL.
- In MW-113, concentrations of benzene, ethylbenzene, MTBE, naphthalene, toluene, total xylenes, 1,2,4-TMB, and 1,3,5-TMB have fluctuated seasonally by at least an order of magnitude since April 2019. Concentrations of these VOCs decreased from September 2021 to April 2022 and increased in October 2022 (all of which were historical maximums in this well except for MTBE). Benzene, naphthalene, total xylenes, and 1,2,4-TMB concentrations have historically fluctuated above and below their respective CGWSL since groundwater monitoring began in 2013. Ethylbenzene concentrations have fluctuated above and below the CGWSL since 2021. MTBE, toluene, and 1,3,5-TMB concentrations remain below their respective CGWSL. VOC concentrations in this well will be reviewed again in 2023.

As shown in the COC concentration plots included in Appendix C, concentrations of target VOCs in wells located in the Field East of Refinery have wells have exhibited stable to trends over time, with the exceptions listed above and in wells KWB-8, MW-58, MW-111, MW-128, and MW-131 which were not sampled in 2022 due to the presence of PSH at a thickness ≥ 0.03 feet. Target VOCs in wells KWB-8, MW-58, MW-111, MW-128, and MW-131 have generally fluctuated over time with increasing trends for at least one VOC over the three most recent sampling events conducted in each well.

Total Metals, Field East of Refinery

In 2022, groundwater samples were collected from the following wells located in the Field East of Refinery during each 2022 semiannual event for analysis of the standard total metals list (arsenic, barium, chromium, iron, lead, manganese, and selenium):

- First Semiannual Event (15 wells): KWB-7, KWB-11B, KWB-12B, MW-57, MW-113, MW-125, MW-126B, MW-130, MW-134, MW-135, MW-145, MW-146, MW-147, and MW-148.
- Second Semiannual Event (16 wells): KWB-1A, KWB-7, KWB-11A, KWB-11B, KWB-12A, KWB-12B, MW-113, MW-125, MW-126B, MW-130, MW-134, MW-135, MW-145, MW-146, MW-147, and MW-148.

In addition, groundwater samples collected from wells KWB-7, KWB-11B, and KWB-12B during both 2022 semiannual events and wells KWB-1A, KWB-12A, and KWB-12B during the second



2022 semiannual event were analyzed for the expanded metals list (boron, cadmium, cobalt, mercury, nickel, uranium, and vanadium). Total metals results that exceeded their respective CGWSL in Field East of Refinery wells are summarized in the table below:

Area	Analyte	CGWSL (mg/L)	No. Wells Sampled	No. Wells > CGWSL	Max. Concentration mg/L (Well)
Field East of Refinery	<i>First Semiannual Event (April 2022)</i>				
	Iron	1.00	14	4	2.10 (MW-148)
	Manganese	0.200	14	5	1.42 (KWB-7)
	Uranium	0.0300	3	1	0.0304 (KWB-12B)
	<i>Second Semiannual Event (October 2022)</i>				
	Iron	1.00	16	1	1.74 (MW-130)
	Manganese	0.200	16	5	2.31 (KWB-7)
	Uranium	0.0300	6	1	0.0309 (KWB-12B & KWB-12B FD)

FD: Field Duplicate

As summarized above and highlighted in Table 4B, iron, manganese, and uranium were detected in exceedance of their respective CGWSLs in Field East of Refinery wells during both 2022 sampling events. No other total metal was detected above its respective CGWSL during either semiannual event.

The 2022 groundwater analytical results of total metals in wells located in the Field East of Refinery were generally consistent with historical results, with the following exceptions:

- Iron concentrations in well MW-134 overall increased since June 2020. Concentrations increased from not detected above the method detection limit in June 2020 to 0.542 mg/L in October 2022. Concentrations remain below the CGWSL of 1.00 mg/L.
- Uranium concentrations in well KWB-12B exceeded the CGWSL of 0.030 mg/L for the first time since at least 2020 in April 2022 (0.0304 mg/L) and in October 2022 (0.0309 mg/L). Uranium concentrations in KWB-12B have only slightly increased since June 2020 (0.0275 mg/L).

As shown in the COC concentration plots included in Appendix C, concentrations of target COC arsenic in wells located in the Field East of Refinery are overall stable to decreasing since at least 2019 (with many since at least 2014) despite some fluctuations, except in KWB-8. Arsenic concentrations have increased over the only four sampling events conducted in KWB-8 (well not often sampled due to PSH at a thickness ≥ 0.03 feet).

Cyanide, Field East of Refinery

Groundwater samples collected from wells KWB-7, KWB-11B, and KWB-12B during both 2022 semiannual events and wells KWB-1A, KWB-11A, and KWB-12A during the second 2022



semiannual event were analyzed for were analyzed for cyanide. Cyanide was not detected above the method detection limit or the CGWSL in groundwater samples collected from any Field East of Refinery wells during either semiannual event.

Water Quality Parameters, Field East of Refinery

In 2022, groundwater samples were collected from the following wells located in the Field East of Refinery during each semiannual event for analysis of water quality parameters (calcium, chloride, fluoride, potassium, sodium, sulfate, TDS, and nitrate/nitrite [as nitrogen]):

- First Semiannual Event (15 wells): KWB-7, KWB-11B, KWB-12B, MW-57, MW-113, MW-125, MW-126B, MW-130, MW-134, MW-135, MW-145, MW-146, MW-147, MW-148, and RA-4798.
- Second Semiannual Event (17 wells): KWB-1A, KWB-7, KWB-11A, KWB-11B, KWB-12A, KWB-12B, MW-57, MW-113, MW-125, MW-126B, MW-130, MW-134, MW-135, MW-145, MW-146, MW-147, and MW-148.

No CGWSLs are applicable for calcium, potassium, or sodium. Chloride, fluoride, nitrate/nitrite, sulfate, and TDS were detected at concentrations in exceedance of their respective CGWSLs in groundwater samples from at least one well within the Field East of Refinery as highlighted in Table 4C. The reported concentrations of these constituents were generally consistent with historical results, with the following exceptions:

- Fluoride concentrations in MW-147 increased from 0.925 mg/L in April 2022 to a historical maximum at 1.98 mg/L in October 2022, which is above the CGWSL of 1.6 mg/L. However, fluoride has only been analyzed in this well since April 2021 (three preceding semiannual events) and exceeded the CGWSL in one prior event (April 2021).
- Notable increases of nitrate/nitrite concentrations in wells KWB-12A, KWB-12B, and MW-57 were observed in September 2021. Nitrate/nitrite concentrations in these wells decreased during 2022.

5.3.8 Areas Cross-Gradient and Up-Gradient of Refinery – Analytical Results

Groundwater monitoring is ongoing in areas both cross-gradient and up-gradient of the refinery. Cross-gradient wells KWB-13 (located south of the refinery) and RA-3156 (located southeast of the refinery); and up-gradient wells UG-1, UG-2, UG-3R, and UG-4 (all located to the west of the refinery), were sampled during the first 2022 semiannual event. Cross-gradient well MW-136 (located north of the refinery) was sampled during both 2022 semiannual events. Analytical results of groundwater samples collected from cross-gradient and up-gradient wells in 2022 indicate COCs are present in groundwater above their respective CGWSLs, as highlighted in Tables 4A through 4C and discussed in the following subsections.



Total Petroleum Hydrocarbons – Diesel Range Organics and Gasoline Range Organics, Areas Cross-gradient and Up-gradient of Refinery

In 2022, groundwater samples were collected from the following cross-gradient and up-gradient wells during each semiannual event for analysis of DRO and GRO, unless noted otherwise:

- First Semiannual Event (6 wells): KWB-13 (DRO only), MW-136, UG-1, UG-2, UG-3R, and UG-4.
- Second Semiannual Event (one well): MW-136.

TPH results that exceeded their respective CGWSL in cross-gradient and up-gradient wells are summarized in the table below:

Area	Analyte	CGWSL (mg/L)	No. Wells Sampled	No. Wells > CGWSL	Max. Concentration mg/L (Well)
Cross- & Up-gradient	<i>First Semiannual Event (April 2022)</i>				
	No TPH Exceedance				
	<i>Second Semiannual Event (October 2022)</i>				
	TPH-DRO	0.0858	1	1	0.124 (MW-136)
	TPH-GRO	0.0101	1	1	0.0314 J (MW-136)

As shown in Table 4A, DRO and GRO were detected at concentrations in exceedance of the CGWSL during the second 2022 semiannual event. DRO or GRO did not exceed CGWSLs during the first 2022 semiannual event. As shown in the COC concentration plots included in Appendix C, DRO and GRO concentrations in cross-gradient and up-gradient wells are generally stable over time despite occasional fluctuations, with the following exceptions:

- DRO has overall increased since 2019 at up-gradient well UG-3R. DRO concentrations decreased slightly from the historical maximum concentration of 0.0931 J mg/L in April 2021 to an estimated concentration of 0.0857 J mg/L in April 2022.
- DRO concentrations in cross-gradient well MW-136 increased from an estimated concentration of 0.0432 J mg/L in September 2021 to an estimated concentration of 0.0485 J mg/L in April 2022 to 0.124 mg/L in October 2022, which is the historical maximum for this well.

Volatile Organic Compounds, Areas Cross-Gradient and Up-Gradient of Refinery

In 2022, groundwater samples collected from the following cross-gradient and up-gradient wells during each semiannual event were analyzed for VOCs:



- First Semiannual Event (7 wells): KWB-13, MW-136, RA-3156, UG-1, UG-2, UG-3R, and UG-4.
- Second Semiannual Event (one well): MW-136.

No VOCs were detected above their respective CGWSL during either 2022 semiannual event, as shown in Table 4A. The 2022 VOC results for groundwater samples collected from cross-gradient and up-gradient wells were consistent with historical results.

Total Metals, Areas Cross-Gradient and Up-Gradient of Refinery

In 2022, groundwater samples were collected from the following cross-gradient and up-gradient wells during each semiannual event for analysis of the standard total metals list (arsenic, barium, chromium, iron, lead, manganese, and selenium) and the expanded metals list (boron, cadmium, cobalt, mercury, nickel, uranium, and vanadium), unless noted otherwise:

- First Semiannual Event (6 wells): KWB-13, MW-136, UG-1, UG-2, UG-3R, and UG-4.
- Second Semiannual Event (one well): MW-136

Total metal results that exceeded their respective CGWSL in cross-gradient and up-gradient wells are summarized in the table below:

Area	Analyte	CGWSL (mg/L)	No. Wells Sampled	No. Wells > CGWSL	Max. Concentration mg/L (Well)
Cross- & Upgradient	<i>First Semiannual Event (April 2022)</i>				
	Uranium	0.0300	6	3	0.0431 (UG-1)
	<i>Second Semiannual Event (October 2022)</i>				
	Uranium	0.0300	1	1	0.0368 (MW-136)

As summarized above and highlighted in Table 4B, uranium was detected in exceedance of its CGWSL in cross-gradient and up-gradient wells during both 2022 sampling events. No other total metal was detected above its respective CGWSL during either semiannual event.

The 2022 analytical results of total metals in groundwater samples collected from cross-gradient and up-gradient wells were generally consistent with historical results, except for uranium in UG-1. Uranium concentrations in UG-1 have increased slightly over the four most recent sampling events from 0.0353 mg/L in April 2019 to 0.0431 mg/L in April 2022. Uranium has exceeded the CGWSL of 0.0300 mg/L for the last four sampling events (April 2019, June 2020, April 2021, and April 2022) in this well.

As shown in the COC concentration plots included in Appendix C, concentrations of target COC arsenic in cross-gradient and up-gradient wells are overall stable despite occasional fluctuations.



Cyanide, Areas Cross-Gradient and Up-Gradient of Refinery

Groundwater samples collected from wells KWB-13, RA-3156, UG-1, UG-2, UG-3R, and UG-4 during the first 2022 semiannual event and MW-136 during both 2022 semiannual events were analyzed for cyanide. Cyanide was not detected above the method detection limit in groundwater samples collected from any cross-gradient or up-gradient well during the April 2022 or October 2022 sampling events.

Water Quality Parameters, Areas Cross-Gradient and Up-Gradient of Refinery

In 2022, groundwater samples were collected from the following cross-gradient and up-gradient wells during each semiannual event for analysis of water quality parameters (calcium, chloride, fluoride, potassium, sodium, sulfate, TDS, and nitrate/nitrite [as nitrogen]):

- First Semiannual Event (7 wells): KWB-13, MW-136, RA-3156, UG-1, UG-2, UG-3R, and UG-4.
- Second Semiannual Event (one well): MW-136.

No CGWSLs are applicable for calcium, potassium, or sodium. Chloride, fluoride, nitrate/nitrite, sulfate, and TDS were detected at concentrations in exceedance of their respective CGWSLs in cross-gradient and up-gradient wells, as highlighted in Table 4C. The reported concentrations of these constituents in 2022 were generally consistent with historical results. Nitrate/nitrite concentrations increased over the four most recent sampling events from 10.1 mg/L in April 2019 to 12.4 mg/L in April 2022. Nitrate/nitrite concentrations in this well have historically exceeded the CGWSL of 10.0 mg/L.

5.3.9 RO Reject Fields – Analytical Results

The reject water from HFSNR's RO system was historically discharged to agricultural fields located north of the refinery in accordance with the Discharge Permit, but discharge ceased in January 2019. These areas are referred to as the North and South RO Reject Fields. Groundwater samples were collected from the following six wells during both 2022 semiannual events:

- North RO Reject Field wells (3 wells): MW-117, MW-118, and MW-119.
- South RO Reject Field wells (3 wells): MW-114, MW-115, and MW-116.

Groundwater samples collected from these wells were all analyzed for GRO, DRO, the standard total metals list (arsenic, barium, chromium, iron, lead, manganese, and selenium), and water quality parameters (calcium, chloride, fluoride, potassium, sodium, sulfate, TDS, and nitrate/nitrite).



Analytical results of groundwater samples collected from RO Reject Field wells in 2022 indicate COCs are present in groundwater above their respective CGWSLs, as highlighted in Tables 4A through 4C and discussed in the following subsections.

Total Petroleum Hydrocarbons – Diesel Range Organics and Gasoline Range Organics, RO Reject Discharge Fields

In 2022, groundwater samples were collected from wells located in and near the RO Reject Discharge Fields for analysis of TPH DRO and GRO. TPH results that exceeded their respective CGWSL in RO Reject Field wells are summarized in the table below:

Area	Analyte	CGWSL (mg/L)	No. Wells Sampled	No. Wells > CGWSL	Maximum Concentration mg/L (Well)
North & South RO Fields	<i>First Semiannual Event (April 2022)</i>				
	TPH-DRO	0.0858	6	3	0.756 (MW-114)
	TPH-GRO	0.0101	6	1	0.042 J (MW-115)
	<i>Second Semiannual Event (October 2022)</i>				
	TPH-DRO	0.0858	6	4	1.85 (MW-114)
	TPH-GRO	0.0101	6	1	0.0652 J (MW-114)

As summarized above and highlighted in Table 4A, DRO and GRO were detected in exceedance of the CGWSL in RO Reject Field wells sampled during at least one 2022 semiannual events.

As shown in the COC concentration plots included in Appendix C, DRO concentrations in RO Reject Field wells MW-114, MW-115, MW-116, and MW-117 have overall increased since 2019, as follows:

- DRO concentrations in South RO Reject Field wells MW-114 and MW-115 increased over the three most recent sampling events to the historical maximum in October 2022. DRO concentrations in MW-114 increased from 0.502 mg/L in September 2021 to 0.756 mg/L in April 2022 to the historical maximum of 1.85 mg/L in October 2022. DRO concentrations in MW-115 increased from 0.173 mg/L in September 2021 to 0.460 mg/L in April 2022 to the historical maximum of 0.621 mg/L in October 2022.
- DRO concentrations in South RO Reject Field well MW-116 and North RO Reject Field well MW-117 have overall increased since at least 2019 but were below the historical maximums in 2022. DRO concentrations increased to 0.219 mg/L in MW-116 and to 0.248 mg/L in MW-117 in October 2022, which is below the historical maximums of 0.231 mg/L in MW-116 (April 2021) and 0.385 mg/L in MW-117 (October 2017).

GRO concentrations in RO Reject Field wells are overall stable over time despite occasional fluctuations, as shown in the COC concentration plots included in Appendix C. GRO concentrations in South RO Reject Field wells MW-114 and MW-115 have historically fluctuated



above and below the CGWSL and the method detection limit. Detected GRO concentrations in 2022 of 0.0652 J mg/L (MW-114) and 0.0420 mg/L (MW-115) are below the respective historical maximums.

Volatile Organic Compounds, RO Reject Discharge Fields

VOCs were not detected above their respective CGWSLs in the six RO Reject Field wells sampled during both 2022 semiannual events. The 2022 VOC results in RO Reject Field wells are consistent with historical results, with the following exceptions:

- MTBE concentrations in South RO Field well MW-114 have overall increased since October 2019 to the historical maximum of 0.0674 mg/L in October 2022. However, MTBE concentrations in this well remain below the CGWSL.
- MTBE concentrations in South RO Field well MW-115 and in North RO Field well MW-117 have overall increased since October 2019 but decreased over each 2022 sampling event and remain below the CGWSL.

A work plan to investigate MTBE in groundwater was submitted to NMED on December 15, 2021 (Wood 2021), and revised August 26, 2022 (Wood 2022).

Total Metals, RO Reject Discharge Fields

Groundwater samples were collected from wells located in the North and South RO Reject Fields for analysis of the standard total metals list (arsenic, barium, chromium, iron, lead, manganese, and selenium). Total metal results that exceeded their respective CGWSL in North and South RO Reject Field wells are summarized in the table below:

Area	Analyte	CGWSL (mg/L)	No. Wells Sampled	No. Wells > CGWSL	Maximum Concentration mg/L (Well)
North & South RO Reject Fields	<i>First Semiannual Event (April 2022)</i>				
	Manganese	0.200	6	1	0.695 (MW-114)
	<i>Second Semiannual Event (October 2022)</i>				
	Manganese	0.200	6	1	0.890 (MW-114)

As summarized above and highlighted in Table 4B, manganese was detected in exceedance of its CGWSLs in one RO Reject Field well during both 2022 semiannual events. No other total metal was detected above its respective CGWSL during either semiannual event.

The 2022 analytical results of total metals in groundwater samples collected from RO Reject Field wells were consistent with historical results. Concentrations of target COC arsenic in RO Reject Field wells are overall stable, as shown in the COC concentration plots included in Appendix C. Arsenic concentrations in well MW-114 increased to a historical maximum



concentration of 0.00529 mg/L in October 2022; however, this concentration is below the CGWSL of 0.0100 mg/L.

Cyanide, RO Reject Discharge Fields

Groundwater samples collected from RO Reject Field wells in 2022 were not analyzed for cyanide.

Water Quality Parameters, RO Reject Discharge Fields

Chloride, fluoride, sulfate, and TDS were detected at concentrations in exceedance of their respective CGWSLs in groundwater samples collected from some RO Reject Field wells, as highlighted in Table 4C. No CGWSLs are applicable for calcium, potassium, or sodium. The reported concentrations of these constituents in 2022 were generally consistent with historical results except for chloride in well MW-114. Chloride concentrations increased from 114 mg/L in April 2022 to 408 mg/L in October 2022. Chloride has fluctuated above and below the CGWSL in this well.

5.3.10 Semi Volatile Organic Compounds

In 2022, groundwater: samples collected from the following wells located in the vicinity of solid waste management units (SWMUs) 20 and 22 (North Refinery Area) during each semiannual event were analyzed for SVOCs:

- First Semiannual Event (two wells): MW-61 and MW-62
- Second Semiannual Event (two wells): MW-61 and MW-62.

SVOC results that exceeded their respective CGWLs in 2022 are summarized below:

Analyte	CGWSL (mg/L)	No. Wells Sampled	No. Wells > CGWSL	Max Concentration mg/L (Well)
First Semiannual Event (April 2022)				
Bis(2-ethylhexyl)phthalate	0.00600	2	1	0.0152 (MW-61)
1-Methylnaphthalene	0.0300	2	2	0.108 (MW-62)
2-Methylnaphthalene	0.0300	2	2	0.0581 (MW-62)
Naphthalene	0.0300	2	2	0.161 (MW-62)
Second Semiannual Event (October 2022)				
Bis(2-ethylhexyl)phthalate	0.00600	2	1	0.0143 (MW-61)
1-Methylnaphthalene	0.0300	2	2	0.0738 (MW-61)
Naphthalene	0.0300	2	2	0.0978 (MW-61)



Bis(2-ethylhexyl)phthalate, 1-methylnaphthalene, 2-methylnaphthalene, and naphthalene (by Method 8270) were detected in exceedance of their respective CGWSLs during at least one 2022 semiannual sampling event, as summarized above and highlighted in Table 4D. No other SVOC was detected above its respective CGWSL. The 2022 results were generally consistent with previous sampling events conducted between 2019 and 2021, except in MW-61. Concentrations of bis(2-ethylhexyl)phthalate, 1-methylnaphthalene, 2-methylnaphthalene, and naphthalene increased in MW-61 to historical maximums in April 2022 but decreased in October 2022. Concentrations of 1-methylnaphthalene, 2-methylnaphthalene, and naphthalene have previously exceeded their respective CGWSL in MW-61. The bis(2-ethylhexyl)phthalate result in April 2022 was the only exceedance of the CGWSL in MW-61 (decreased to below CGWSL in October 2022).

5.3.11 1,4-Dioxane Analysis

In accordance with NMED's May 7, 2021, comments letter (NMED 2021a) on the September 2019 MTBE Groundwater Report (Wood 2019), groundwater samples collected from wells with any historical detection of chlorinated solvents since 2010 are to be sampled for 1,4-dioxane by Method 8270 for two consecutive sampling events. For wells that are sampled on a semiannual basis, the first required 1,4-dioxane sampling event was completed during the second semiannual monitoring event of 2021; for wells that are sampled on an annual basis, the first required 1,4-dioxane sampling event was completed during the first semiannual monitoring event of 2022. Groundwater samples were collected from the following wells during the 2022 semiannual events for analysis of 1,4-dioxane:

- First Semiannual Event (47 wells): KWB 11B, MW-3, MW-4A, MW-6A, MW 21, MW-22A, MW 29, MW-42, MW-45, MW-49, MW-50, MW-53R, MW-54A, MW-61, MW-62, MW-71, MW-74, MW-76, MW-78, MW-90, MW-101, MW-102, MW-104, MW-108, MW-109, MW-110, MW-113, MW-114, MW-117, MW-120, MW-121, MW-122, MW-123, MW-126B, MW-134, MW-135, MW-139, NCL-31, NCL-49, NP-1, OCD-3, OCD-6, RA-313, RA-4798, RW-9, TEL-4, and UG-1.
- Second Semiannual Event (3 wells): KWB-11A, MW-61, and MW-62.

Groundwater samples were not collected from wells KWB-2R, KWB-6, KWB-10R, MW-23, MW-28, MW-39, MW-43, MW-60, MW-67, MW-91, MW-92, MW-94, MW-111, MW-127, MW-128, and MW-138 due to the presence of PSH at a thickness ≥ 0.03 feet during at least one 2022 semiannual event. A groundwater sample was not collected from irrigation well RA-4196 because the in-well pump was inoperable. Well MW-106 was not gauged or sampled because it could not be accessed due to refinery construction activities.

As shown in Appendix B (Table B.6), 1,4-dioxane was not detected above the CGWSL in any well during the second 2021 semiannual event or either 2022 semiannual event. An evaluation of



1,4-dioxane results and recommendations for inclusion of 1,4-dioxane to the facility-wide groundwater monitoring program will be made in a future FWGMWP update, after completion of the two required sampling events in all wells.

5.3.12 Tert-Butyl Alcohol (TBA) Analysis

In accordance with NMED's May 7, 2021, comments letter (NMED 2021a) on the September 2019 MTBE Groundwater Report (Wood 2019), in response to the Refinery's planned pilot test to enhance biodegradation of hydrocarbon constituents under sulfate reducing conditions, groundwater samples collected from all wells where VOCs are currently analyzed are to be sampled for TBA by Method 8260 for four consecutive sampling events.

The first three of the required TBA sampling events were completed during the September 2021 through October 2022 semiannual monitoring events.

As highlighted in Table 4A and discussed in Sections 5.3.5 and 5.3.6 above, TBA results exceeded the CGWSL of 0.150 mg/L during the first 2022 semiannual event in North Refinery well MW-96 (4.13 mg/L) and South Refinery Area wells MW-64 (3.09 mg/L), MW-102 (0.316 mg/L), and MW-103 (0.192 mg/L); and during the second 2022 semiannual event in North Refinery Area wells MW-96 (3.30 mg/L) and South Refinery Area well MW-64 (2.90 mg/L). TBA concentrations did not exceed the CGWSL in any other well. An evaluation of TBA results and recommendations for inclusion of EDB to the facility-wide groundwater monitoring program will be made in a future FWGMWP update, after completion of four required sampling events in all wells.

5.3.13 Ethylene Dibromide (EDB)

In accordance with NMED's May 7, 2021, comments letter (NMED 2021a) on the September 2019 MTBE Groundwater Report (Wood 2019), groundwater samples collected from wells with any historical detection of 1,2-dichloroethane (EDC) since 2010 are to be analyzed for EDB by Method 8011 for two consecutive sampling events for these wells. The first of the required EDB sampling events was completed during the September 2021 for wells that are sampled semiannually or the April 2022 semiannual event for wells that are sampled annually, as indicated in Table 2 of the 2021 FWGMWP. EDB samples from well MW-54B, which is sampled biennially, will be collected during the April 2023 and April 2025 semiannual events. The required two rounds of EDB analysis were completed for the following wells during the April or October 2022 semiannual monitoring events: KWB-11B, MW-50, MW-62, MW-102, MW-108, MW-113, MW-114, MW-126, NP-1, and RA-4798. Groundwater samples were not collected from wells KWB-6, MW-60, MW-111, and MW-127 during at least one 2022 semiannual event due to the presence of PSH at a thickness ≥ 0.03 feet. A groundwater sample was not collected from irrigation well RA-4196 because the in-well pump was inoperable. The required EDB



sampling in these wells will be completed during subsequent monitoring events. Groundwater samples were collected from the following wells during the second 2021 semiannual event for analysis of EDB:

- First Semiannual Event (12 wells): KWB-11B, MW-113, MW-126B, KWB-11B, MW-50, MW-62, MW-71, MW-102, MW-108, MW-114, MW-126B, NP-1, RA-4798, and RW-9.
- Second Semiannual Event (1 well): KWB-11A

As shown in the analytical summary tables in Appendix B (Table B-4), EDB was not detected in any well above the method detection limit in the second semiannual event of 2021 or either event in 2022.

An evaluation of EDB results and recommendations for inclusion of EDB to the facility-wide groundwater monitoring program will be made in a future FWGMWP update, after completion of two required sampling events in all wells.



6.0 Remediation System Monitoring

The PCC Permit and Discharge Permit both require recovery of PSH present in the shallow groundwater within and adjacent to the refinery. PSH and impacted groundwater are continually recovered at the refinery from a system of recovery trenches and recovery wells. Additionally, PSH is recovered from wells not connected to the recovery system on a periodic basis. A summary of the recovery system, manual recovery activities, and recovery results are summarized in this section.

6.1 Recovery System

The system described below only includes the recovery wells/trenches that have infrastructure installed (RW-1, RW-2, RW-4, RW-5, RW-6, RW-7, RW-8, RW-12, RW-13, RW-14, RW-15, RW-19, RW-20, and RW-22). Recovery trenches associated with wells RW-9, RW-16, RW-17, and RW-18 have not been observed to contain measurable PSH and thus have never been included in a recovery system. The recovery trench associated with well RW-11-0 was not included in the upgraded system installation in 2012 because it had not contained measurable PSH since at least 2007 and was often dry. Measurable PSH was present in RW-11-0 in September 2021 for the first time since the system upgrade but was not in 2022. Infrastructure was not previously installed at the recovery trench associated with well RW-10 because it historically did not contain measurable PSH. PSH was measured in well RW-10 for the first time in 2021. Recovery trench RW-10 will be reevaluated for upgrade in 2023.

The recovery system consists of automated pumping of PSH and groundwater from recovery wells using dedicated groundwater and PSH pumps (both types of fluid pumps installed in each well). Pumps are installed, operated, and removed from each well based on PSH thicknesses and observed recovery during operation and maintenance (O&M) activities. The pumps are typically operated automatically, with remote data sensing and recording. Recovered PSH is pumped into centralized holding tanks, then pumped to Tank 49, associated with the wastewater treatment system, which then transfers the product to crude tank(s) (Tank 1225 or 437) for processing within the refinery. Recovered groundwater is pumped to the nearest process wastewater sump and directed to the process wastewater treatment system. Thus, recovered PSH is recycled into the refinery process while groundwater is treated to remove residual hydrocarbons.

O&M of the recovery system was conducted throughout 2022 on an approximate weekly basis. O&M activities included gauging recovery wells RW-1R, RW-2R, RW-4R, RW-5R, RW-6R, RW-7R, RW-8R, RW-12R, RW-13R, RW-14R, RW-15, RW-19, RW-20, and RW-22 to assess the effectiveness of the recovery system and to determine in which wells to install and operate PSH and groundwater pumps. Recovery system gauging results measured during 2022 O&M



activities are summarized in Appendix E. Measurable PSH was not observed in wells RW-12R, RW-15, and RW-20 at quantities great enough for recovery by the automated system during 2022.

6.2 Additional Recovery

A solar-powered PSH recovery pump (Magnum Spill Buster™) was installed and maintained in well MW-132 to recover PSH throughout 2022. PSH recovered from MW-132 was temporarily stored in an aboveground container located next to the well and routinely removed and transported via vac truck to the refinery process wastewater treatment system (upstream of the oil/water separator). The total recovered PSH volume from MW-132 during 2022 cannot be quantified, but new procedures will be deployed in 2023 to ensure better accounting.

6.3 Estimated Volume of Fluids Recovered

Volumes of groundwater and PSH recovered by the recovery system during 2022 are summarized in Table 5 and additional recovery details are provided in Appendix E. An estimated 6,102,398 gallons of groundwater and an estimated 159,042 gallons of PSH were recovered through operation of the automated recovery system in 2022. The majority of recovered PSH during 2022 was from RW-1R (12,656 gallons), RW-2R (58,066 gallons), RW-7R (31,120 gallons), RW-14R (28,157 gallons), and RW-22 (26,757 gallons). As shown on Table 5, PSH recovery was limited during the first quarter of 2022 due to a blockage in the PSH recovery line into Tank 49.



7.0 Conclusions

Conclusions based on the results of groundwater monitoring and remedial activities conducted during 2022 and comparison to historical results are discussed below.

Groundwater flow direction was generally consistent with previous monitoring events with flow predominantly east beneath the refinery and southeast beneath the EPs towards the Pecos River. Localized groundwater sinks are occasionally observed around various recovery wells due to active pumping of groundwater. Mounding at the RO reject fields continues despite cessation of discharge of RO reject water to the RO Reject Fields in January 2019.

The presence and distribution of PSH in 2022 were generally consistent with the 2021 semiannual events. No new occurrence of measurable PSH was observed in any well in 2022. PSH thicknesses are generally stable to declining over time despite fluctuations inversely related to groundwater elevations. Recent increases of PSH thicknesses in parts of the North Refinery, South Refinery, TEL, and Field East of Refinery areas are attributable to declining groundwater elevations and are not indicative of a new release or PSH migration. Groundwater elevations have generally decreased across since 2017 and reached historical minimums in many wells in April 2021. Groundwater elevations remained historically low in 2022. The reduction in groundwater elevations since 2017 is consistent with the occurrence of drought conditions across southeastern New Mexico during this time.

Concentrations of COCs in groundwater have generally remained stable over time, although increasing trends were noted in select wells in specific areas of interest. During 2022 and previous years, the following COCs were detected in groundwater at concentrations in exceedance of their respective CGWSL:

- TPH GRO and DRO;
- Select VOCs including target COCs benzene, toluene, ethylbenzene, xylenes, MTBE, and naphthalene;
- Select total metals including target COC arsenic; and
- Water quality parameters chloride, fluoride, sulfate, TDS, and nitrate/nitrite.

SVOCs were also detected in groundwater at concentrations in exceedance of their respective CGWLS in samples collected from select wells in the vicinity of SWMUs 20 and 22 (North Refinery wells). Additional groundwater analysis (1,4-dioxane, EDB by Method 8011, and TBA) was conducted in accordance with NMED's May 7, 2021, comments letter on the September 2019 MTBE Groundwater Report. 1,4-Dioxane was not detected in groundwater above the CGWSL, EDB was not detected in groundwater above the method detection limit, and TBA was detected above the CGWSL in four wells.



It should be noted that many of the concentrations of inorganic COCs (manganese, chloride, fluoride, nitrate/nitrite, sulfate, and TDS) depicted as “exceedances” in this report may actually be similar to and reflective of groundwater concentrations up-gradient of the refinery, as detailed in the background evaluation that was submitted to NMED and OCD in September 2015 (Arcadis 2015b).

The PSH and groundwater recovery system operated throughout 2022. An estimated 6,102,398 gallons of groundwater and an estimated 159,042 gallons of PSH were recovered through operation of the automated recovery system in 2022. PSH was also recovered from well MW-132 by periodic pumping.

According to the requirements of the updated PCC Permit, an updated FWGMWP will be submitted in June 2023.



8.0 References

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Table 1 - Well Information and Gauging Data

2022 Annual Groundwater Monitoring Report
 HF Sinclair Navajo Refining LLC, Artesia Refinery, Artesia, New Mexico

Area	Well ID	Water-Bearing Zone ⁽¹⁾	Northing (ft)	Easting (ft)	Land Surface Elevation (ft amsl)	TOC Elevation (ft amsl)	Top of Screen Elevation (ft amsl)	Screen Interval (ft bgs)	Date Measured	Depth to PSH (ft btoc)	Depth to Water (ft btoc)	Corrected Groundwater Elevation ⁽²⁾ (ft amsl)	PSH Thickness (ft)
Cross-Gradient	KWB-13	Shallow	669077.00	524892.42	3366.02	3365.67	Unknown	Unknown	04/12/22	--	29.00	3,336.67	--
									10/11/22	--	28.20	3,337.47	--
	NP-5	Shallow	675512.24	524698.19	3,346.31	3,349.29	3,336.06	10.25 to 20	04/12/22	--	19.51	3,329.78	--
									10/11/22	--	13.80	3,335.49	--
	MW-136	Shallow	675343.45	522975.40	3,358.62	3,360.83	3,348.62	10 to 25	04/12/22	--	18.89	3,341.94	--
Evaporation Ponds									10/11/22	--	19.35	3,341.48	--
	MW-1R	Shallow	675135.17	538636.78	3,310.49	3,314.20	3,302.49	8 to 23	04/13/22	--	11.46	3,302.74	--
									10/11/22	--	10.60	3,303.60	--
	MW-2A	Shallow	675979.09	540803.91	3,310.55	3,312.97	Unknown	Unknown	04/12/22	--	9.90	3,303.07	--
									10/11/22	--	10.02	3,302.95	--
	MW-2B	Valley Fill	675969.73	540801.44	3,309.94	3,312.49	3,271.44	38.5 to 48	04/12/22	--	11.51	3,300.98	--
									10/11/22	--	10.94	3,301.55	--
	MW-3	Shallow	674443.34	540503.24	3,309.20	3,312.26	Unknown	Unknown	04/13/22	--	11.91	3,300.35	--
									10/12/22	--	11.34	3,300.92	--
	MW-4A	Shallow	674083.00	540529.44	3,308.63	3,312.20	Unknown	Unknown	04/13/22	--	12.06	3,300.14	--
									10/11/22	--	11.48	3,300.72	--
	MW-4B	Valley Fill	674089.71	540541.34	3,308.73	3,312.01	3,248.48	60.25 to 70	04/13/22	--	11.82	3,300.19	--
									10/11/22	--	11.24	3,300.77	--
	MW-5A	Shallow	674272.84	541759.78	3,306.59	3,308.62	Unknown	Unknown	04/13/22	--	9.01	3,299.61	--
									10/12/22	--	7.35	3,301.27	--
	MW-5B	Valley Fill	674272.33	541739.12	3,306.71	3,308.95	3,265.21	41.5 to 50.5	04/13/22	--	9.17	3,299.78	--
									10/12/22	--	8.48	3,300.47	--
	MW-5C	Valley Fill	674279.57	541728.80	3,306.55	3,309.28	3,247.30	59.25 to 68.75	04/13/22	--	9.39	3,299.89	--
									10/12/22	--	8.46	3,300.82	--
	MW-6A	Shallow	674427.07	539833.47	3,310.40	3,313.46	Unknown	Unknown	04/13/22	--	13.16	3,300.30	--
									10/11/22	--	12.57	3,300.89	--
	MW-6B	Valley Fill	674418.57	539834.04	3,310.09	3,313.35	3,270.59	39.5 to 49	04/13/22	--	13.07	3,300.28	--
									10/11/22	--	12.48	3,300.87	--
	MW-7A	Shallow	674447.64	542716.01	3,304.61	3,308.01	Unknown	Unknown	04/13/22	--	9.78	3,298.23	--
									10/12/22	--	8.86	3,299.15	--
	MW-7B	Valley Fill	674455.63	542715.61	3,306.05	3,307.87	3,266.55	39.5 to 49	04/13/22	--	9.54	3,298.33	--
									10/12/22	--	8.65	3,299.22	--
	MW-10	Shallow	672121.15	541540.05	3,304.12	3,304.76	3,304.12	0 to 19.4	04/13/22	--	6.04	3,298.72	--
									10/11/22	--	5.71	3,299.05	--
	MW-11A	Shallow	677317.73	543675.36	3,308.42	3,310.76	3,302.92	5.5 to 20	04/12/22	--	9.97	3,300.79	--
									10/11/22	--	8.98	3,301.78	--

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Evaporation Ponds	MW-11B	Valley Fill	677305.72	543685.50	3,308.34	3,310.76	3,272.84	35.5 to 45	04/12/22	--	9.98	3,300.78	--
									10/11/22	--	8.96	3,301.80	--
	MW-12	Shallow	676952.63	541505.50	3,310.37	3,312.73	3,303.87	6.5 to 16	04/13/22	--	10.51	3,302.22	--
									10/12/22	--	--	--	--
	MW-13	Shallow	674951.80	539762.62	3,311.95	3,314.24	3,302.45	9.5 to 19	04/13/22	--	12.80	3,301.44	--
									10/12/22	--	--	--	--
	MW-14	Shallow	676122.48	543280.49	3,309.44	3,311.84	3,303.94	5.5 to 20	04/13/22	--	>11.81	-- ⁽⁴⁾	--
									10/12/22	--	-- ⁽⁴⁾	-- ⁽⁴⁾	--
	MW-15	Shallow	674731.39	539003.75	3,310.97	3,313.72	3,301.97	9 to 19	04/13/22	--	12.62	3,301.10	--
									10/11/22	--	11.86	3,301.86	--
	MW-18A	Shallow	672548.16	543447.78	3,306.33	3,308.58	3,296.33	10 to 20	04/12/22	--	10.54	3,298.04	--
									10/12/22	--	9.95	3,298.63	--
	MW-18B	Valley Fill	672557.96	543458.22	3,306.23	3,308.74	3,269.23	37 to 47	04/12/22	--	10.55	3,298.19	--
									10/12/22	--	9.96	3,298.78	--
	MW-18T	Valley Fill	672559.79	543449.75	3,306.30	3,308.55	3,269.30	37 to 47	04/12/22	--	10.66	3,297.89	--
									10/12/22	--	10.07	3,298.48	--
	MW-22A	Shallow	672866.82	541801.63	3,305.24	3,307.62	3,299.74	5.5 to 20.5	04/13/22	--	8.61	3,299.01	--
									10/11/22	--	8.28	3,299.34	--
	MW-22B	Valley Fill	672866.58	541786.97	3,305.08	3,307.63	3,262.78	42.3 to 52	04/13/22	--	8.39	3,299.24	--
									10/11/22	--	7.99	3,299.64	--
	MW-24	Shallow	676498.23	544101.56	3,310.33	3,312.85	3,295.33	15 to 20	04/13/22	--	12.20	3,300.65	--
									10/12/22	--	--	--	--
	MW-69	Shallow	675962.29	540401.29	3,311.40	3,313.86	3,306.40	5 to 20	04/13/22	--	11.42	3,302.44	--
									10/12/22	--	--	--	--
	MW-70	Shallow	670892.66	542787.60	3,303.84	3,306.30	3,298.84	5 to 20	04/12/22	--	8.69	3,297.61	--
									10/12/22	--	8.32	3,297.98	--
	MW-72	Shallow	676691.27	542662.31	3,306.40	3,308.45	3,304.40	2 to 12	04/12/22	--	7.70	3,300.75	--
									10/11/22	--	6.95	3,301.50	--
	MW-73	Shallow	675910.20	542130.56	3,308.02	3,310.18	3,306.02	2 to 17	04/12/22	--	9.41	3,300.77	--
									10/11/22	--	8.87	3,301.31	--
	MW-74	Shallow	675059.14	541546.30	3,307.78	3,310.03	3,305.78	2 to 17	04/12/22	--	9.63	3,300.40	--
									10/11/22	--	8.91	3,301.12	--
	MW-75	Shallow	674622.31	541132.78	3,307.80	3,310.21	3,304.80	3 to 18	04/13/22	--	9.98	3,300.23	--
									10/12/22	--	9.35	3,300.86	--
	MW-76	Shallow	674482.47	541053.83	3,309.70	3,311.84	3,306.70	3 to 18	04/13/22	--	11.57	3,300.27	--
									10/12/22	--	10.94	3,300.90	--

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Evaporation Ponds	MW-77	Shallow	674529.89	541104.86	3,307.97	3,310.07	3,304.97	3 to 18	04/13/22	--	9.82	3,300.25	--
									10/12/22	--	8.92	3,301.15	--
	MW-78	Shallow	674529.23	541073.45	3,307.94	3,310.14	3,305.94	2 to 17	04/13/22	--	9.88	3,300.26	--
									10/12/22	--	7.22	3,302.92	--
	MW-79	Shallow	675349.67	540906.08	3,309.08	3,311.43	3,307.08	2 to 17	04/12/22	--	10.55	3,300.88	--
									10/11/22	--	9.88	3,301.55	--
	MW-80	Shallow	675371.74	540646.46	3,310.27	3,310.79	3,308.27	2 to 17	04/12/22	--	9.49	3,301.30	--
									10/11/22	--	8.73	3,302.06	--
	MW-81	Shallow	675252.80	540544.47	3,310.19	3,312.34	3,308.19	2 to 17	04/12/22	--	11.41	3,300.93	--
									10/11/22	--	10.65	3,301.69	--
	MW-82	Shallow	675035.42	540806.88	3,308.64	3,310.75	3,306.64	2 to 17	04/13/22	--	10.22	3,300.53	--
									10/11/22	--	9.45	3,301.30	--
	MW-83	Shallow	674524.97	540832.80	3,307.93	3,310.19	3,305.93	2 to 17	04/13/22	--	9.84	3,300.35	--
									10/12/22	--	8.92	3,301.27	--
	MW-84	Shallow	674798.43	540109.13	3,309.83	3,311.59	3,307.83	2 to 17	04/13/22	--	10.50	3,301.09	--
									10/11/22	--	9.42	3,302.17	--
	MW-85	Shallow	674566.12	539805.49	3,308.99	3,311.09	3,305.99	3 to 18	04/13/22	10.66	11.08	3,300.35	0.42
									10/11/22	10.05	10.55	3,300.94	0.50
	MW-86	Shallow	674645.96	539671.17	3,308.98	3,311.06	3,306.98	2 to 17	04/13/22	10.43	10.60	3,300.60	0.17
									10/11/22	9.57	10.58	3,301.29	1.01
	MW-87	Shallow	673379.98	543280.45	3,305.42	3,307.64	3,303.42	2 to 17	04/12/22	--	8.99	3,298.65	--
									10/12/22	--	8.16	3,299.48	--
	MW-88	Shallow	672899.14	540832.09	3,306.43	3,308.68	3,303.43	3 to 18	04/13/22	--	9.36	3,299.32	--
									10/11/22	--	9.02	3,299.66	--
	MW-120	Shallow	674678.95	539555.77	3,310.66	3,313.55	3,300.66	10 to 25	04/13/22	--	13.13	3,300.42	--
									10/11/22	--	12.27	3,301.28	--
	MW-121	Shallow	674851.38	539923.70	3,311.77	3,314.68	3,301.77	10 to 25	04/13/22	--	12.19	3,302.49	--
									10/11/22	--	12.20	3,302.48	--
	MW-122	Shallow	675231.06	540401.60	3,308.78	3,311.69	3,298.78	10 to 20	04/12/22	--	11.08	3,300.61	--
									10/11/22	--	10.29	3,301.40	--
	MW-123	Shallow	671352.15	541523.94	3,302.78	3,303.98	3,292.78	10 to 25	04/13/22	--	6.51	3,297.47	--
									10/12/22	--	6.29	3,297.69	--
	MW-124	Shallow	669844.77	542735.51	3,302.99	3,305.84	3,297.99	5 to 20	04/12/22	--	9.28	3,296.56	--
									10/12/22	--	9.08	3,296.76	--
	OCD-1R	Shallow	676741.31	541568.00	3,310.69	3,314.27	Unknown	Unknown	04/12/22	--	12.62	3,301.65	--
									10/11/22	--	11.52	3,302.75	--

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Evaporation Ponds	OCD-2A	Shallow	677036.12	542157.14	3,310.83	3,314.16	3,302.33	8.5 to 23.5	04/12/22	--	12.57	3,301.59	--
									10/11/22	--	11.73	3,302.43	--
	OCD-2B	Valley Fill	677034.65	542167.57	3,310.66	3,313.07	3,272.16	38.5 to 48	04/12/22	--	12.20	3,300.87	--
									10/11/22	--	11.33	3,301.74	--
	OCD-3	Shallow	677516.31	543024.47	3,310.88	3,314.29	3,304.38	6.5 to 21.5	04/12/22	--	12.89	3,301.40	--
									10/11/22	--	12.03	3,302.26	--
	OCD-4	Shallow	678099.52	543893.55	3,310.10	3,313.70	3,303.60	6.5 to 21.5	04/12/22	--	12.44	3,301.26	--
									10/11/22	--	11.61	3,302.09	--
	OCD-5	Shallow	677081.54	544295.35	3,308.71	3,311.34	Unknown	Unknown	04/12/22	--	10.53	3,300.81	--
									10/11/22	--	9.63	3,301.71	--
	OCD-6	Shallow	676538.82	543540.03	3,307.20	3,311.36	3,299.20	8 to 23	04/12/22	--	10.97	3,300.39	--
									10/11/22	--	9.84	3,301.52	--
	OCD-7AR	Shallow	676169.74	543071.88	3,308.86	3,310.03	3,303.36	5.5 to 19.5	04/12/22	--	9.93	3,300.10	--
									10/11/22	--	8.82	3,301.21	--
	OCD-7B	Valley Fill	676157.36	543081.99	3,307.57	3,310.26	3,264.07	43.5 to 52.5	04/12/22	--	9.85	3,300.41	--
									10/11/22	--	9.05	3,301.21	--
	OCD-7C	Valley Fill	676155.95	543069.21	3,307.74	3,310.10	3,247.49	60.25 to 69.75	04/12/22	--	9.58	3,300.52	--
									10/11/22	--	8.79	3,301.31	--
	OCD-8A	Shallow	674976.41	543376.95	3,306.26	3,308.79	3,303.26	3 to 18	04/13/22	--	9.24	3,299.55	--
									10/12/22	--	7.59	3,301.20	--
	OCD-8B	Valley Fill	674992.24	543375.06	3,306.11	3,309.19	3,262.61	43.5 to 53	04/13/22	--	9.42	3,299.77	--
									10/12/22	--	7.78	3,301.41	--
Field East of Refinery	KWB-1A	Shallow	672969.12	526181.36	3,351.25	3,353.46	3,333.25	18 to 32	04/12/22	18.97	19.19	3,334.45	0.22
									10/11/22	16.45	16.47	3,337.01	0.02
	KWB-1B	Shallow	672968.90	526191.02	3,351.14	3,352.83	3,333.14	18 to 32	04/12/22	20.70	21.09	3,332.05	0.39
									10/11/22	18.13	18.39	3,334.65	0.26
	KWB-1C	Valley Fill	672968.22	526202.95	3,351.18	3,351.38	3,320.68	30.5 to 49.5	04/12/22	--	21.36	3,330.02	--
									10/11/22	--	18.80	3,332.58	--
	KWB-7	Shallow	671266.72	529055.47	3,343.00	3,346.16	3,325.00	18 to 32	04/13/22	--	25.93	3,320.23	--
									10/11/22	--	10.85	3,335.31	--
	KWB-8	Shallow	671000.57	527874.87	3,347.90	3,350.41	3,332.90	15 to 34	04/13/22	26.60	29.42	3,323.25	2.82
									10/11/22	11.50	11.54	3,338.90	0.04
	KWB-10R	Shallow	671756.34	526206.06	3,351.23	3,350.97	3,342.23	9 to 29	04/12/22	20.10	22.49	3,330.39	2.39
									10/11/22	17.63	19.18	3,333.03	1.55
	KWB-11A	Shallow	670643.67	529043.46	3,346.13	3,348.72	3,316.13	30 to 39.5	04/13/22	26.93	26.98	3,321.78	0.05
									10/11/22	--	10.66	3,338.06	--

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Field East of Refinery	KWB-11B	Valley Fill	670653.84	529044.06	3,345.91	3,348.03	3,295.91	50 to 69.5	04/13/22	--	27.67	3,320.36	--
									10/11/22	--	11.56	3,336.47	--
	KWB-12A	Shallow	669074.44	527590.88	3,352.01	3,351.81	3,336.51	15.5 to 24.5	04/12/22	--	Dry	--	--
									10/11/22	--	20.01	3,331.80	--
	KWB-12B	Valley Fill	669064.18	527590.12	3,351.84	3,351.63	3,326.34	25.5 to 39.5	04/12/22	--	29.31	3,322.32	--
									10/11/22	--	19.95	3,331.68	--
	KWB-P4	Shallow	670970.10	537416.92	3,305.76	3,305.39	Unknown	Unknown	--	--	--	--	--
									--	--	--	--	--
	MW-57	Shallow	669935.59	527579.02	3,350.95	3,350.91	3,340.95	10 to 30	04/12/22	--	26.48	3,324.43	--
									10/11/22	17.15	17.93	3,333.60	0.78
	MW-58	Shallow	670207.27	525197.99	3,362.56	3,362.22	3,349.56	13 to 28	04/12/22	24.45	25.35	3,337.59	0.90
									10/11/22	23.89	24.44	3,338.22	0.55
	MW-111	Shallow	670494.22	525254.30	3,362.52	3,365.51	3,337.52	25 to 40	04/12/22	27.92	28.54	3,337.47	0.62
									10/11/22	27.29	27.89	3,338.10	0.60
	MW-112	Shallow	670890.64	526198.73	3,355.38	3,358.38	3,330.38	25 to 35	04/12/22	24.56	26.85	3,333.36	2.29
									10/11/22	22.41	23.91	3,335.67	1.50
	MW-113	Shallow	670693.80	527483.95	3,350.06	3,352.93	3,330.06	20 to 35	04/13/22	--	26.99	3,325.94	--
									10/11/22	--	14.92	3,338.01	--
	MW-125	Shallow	673288.01	524663.00	3,355.60	3,358.81	3,340.60	15 to 25	04/13/22	--	20.64	3,338.17	--
									10/11/22	--	18.24	3,340.57	--
	MW-126A	Shallow	672845.69	525458.24	3,353.60	3,356.60	3,334.60	19 to 34	04/12/22	21.71	22.02	3,334.83	0.31
									10/11/22	19.20	19.47	3,337.35	0.27
	MW-126B	Valley Fill	672843.26	525464.41	3,353.60	3,356.67	3,313.60	40 to 50	04/12/22	--	21.69	3,334.98	--
									10/11/22	--	19.12	3,337.55	--
	MW-127	Shallow	672184.21	525464.20	3,355.50	3,358.39	3,335.50	20 to 50	04/12/22	23.73	25.24	3,334.36	1.51
									10/11/22	21.98	23.02	3,336.20	1.04
	MW-128	Shallow	671846.09	524917.06	3,358.80	3,358.77	3,343.80	15 to 35	04/13/22	19.38	22.07	3,338.85	2.69
									10/12/22	18.22	20.17	3,340.16	1.95
	MW-129	Shallow	671184.95	524876.21	3,363.10	3,362.91	3,343.10	20 to 50	04/12/22	--	-- ⁽³⁾	-- ⁽³⁾	--
									10/11/22	23.60	23.71	3,339.29	0.11
	MW-130	Shallow	670331.35	524029.44	3,370.20	3,369.86	3,340.20	30 to 45	04/13/22	--	22.98	3,346.88	--
									10/12/22	--	22.83	3,347.03	--
	MW-131	Shallow	671104.83	525228.77	3,360.40	3,363.49	3,340.40	20 to 50	04/12/22	26.54	28.09	3,336.64	1.55
									10/11/22	25.83	26.65	3,337.50	0.82
	MW-132	Shallow	670346.80	526629.79	3,354.30	3,357.12	3,339.30	15 to 40	04/12/22	>23.50	>23.50	NM ⁽⁵⁾	>0.00
									10/11/22	>20.10	>20.10	NM ⁽⁵⁾	>0.00

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Field East of Refinery	MW-133	Shallow	672005.89	527446.73	3,343.40	3,349.45	3,328.40	15 to 35	04/13/22	22.44	23.31	3,326.84	0.87
									10/11/22	15.40	15.49	3,334.03	0.09
	MW-134	Shallow	673271.80	527263.99	3,343.10	3,346.23	3,323.10	20 to 30	04/13/22	--	19.69	3,326.54	--
									10/11/22	--	17.31	3,328.92	--
	MW-135	Shallow	671758.72	530211.23	3,338.00	3,337.65	3,303.00	35 to 65	04/12/22	--	32.89	3,304.76	--
									10/11/22	--	28.93	3,308.72	--
	RW-12R	Shallow	670542.50	527519.20	3,350.58	3,351.54	3,335.58	15 to 35	04/13/22	27.65	28.80	3,323.66	1.15
									10/11/22	--	15.64	3,335.90	--
	RW-13R	Shallow	671049.37	527506.74	3,349.60	3,351.54	3,334.60	15 to 35	04/13/22	25.60	26.46	3,325.77	0.86
									10/11/22	13.88	15.82	3,337.27	1.94
	RW-14R	Shallow	671592.73	527504.45	3,347.39	3,349.37	3,332.39	15 to 35	04/13/22	22.55	25.47	3,326.24	2.92
									10/11/22	14.58	14.87	3,334.73	0.29
	RW-18A	Shallow	673750.19	526188.64	3,349.04	3,350.84	Unknown	Unknown	04/12/22	--	Dry	--	--
									10/11/22	--	15.16	3,335.68	--
	RW-20A	Shallow	671032.06	527790.95	3,347.75	3,348.44	Unknown	Unknown	04/13/22	--	Dry	--	--
									10/11/22	--	9.81	3,338.63	--
	RW-20B	Shallow	671032.06	527790.95	3,347.75	3,348.44	Unknown	Unknown	04/13/22	--	Dry	--	--
									10/11/22	--	9.74	3,338.70	--
	RW-22	Shallow	671009.70	527889.44	3,347.17	3,349.21	3,335.67	11.5 to 39	04/13/22	28.58	28.68	3,320.61	0.10
									10/11/22	11.36	11.79	3,337.76	0.43
	MW-145	Shallow	672914.54	527283.92	3,343.94	3,347.07	3,334.94	9 to 29	04/12/22	--	20.62	3,326.45	--
									10/11/22	--	17.32	3,329.75	--
	MW-146	Shallow	673173.05	527636.61	3,340.34	3,343.09	3,330.34	10 to 30	04/12/22	--	23.38	3,319.71	--
									10/11/22	--	20.51	3,322.58	--
North Refinery	MW-147	Shallow	671265.08	530212.28	3,339.85	3,339.48	3,329.85	20 to 40	04/12/22	--	33.80	3,305.68	--
									10/11/22	--	28.73	3,310.75	--
	MW-148	Shallow	670534.37	530218.56	3,342.79	3,342.59	3,332.79	20 to 40	04/12/22	--	36.64	3,305.95	--
									10/11/22	--	34.34	3,308.25	--
	MW-23	Shallow	672851.25	522821.05	3,365.09	3,368.38	3,350.09	15 to 20	04/12/22	17.05	18.65	3,351.01	1.60
									10/11/22	16.55	18.85	3,351.37	2.30
	MW-29	Shallow	673481.15	523544.65	3,359.79	3,360.64	3,350.04	9.75 to 19.25	04/12/22	--	22.36	3,338.28	--
									10/11/22	--	20.33	3,340.31	--
	MW-30	Shallow	674124.92	523550.16	3,359.14	3,361.98	Unknown	Unknown	04/13/22	--	18.87	3,343.11	--
									10/11/22	--	13.12	3,348.86	--
	MW-39	Shallow	673039.50	523422.93	3,357.94	3,358.79	3,343.94	14 to 24	04/12/22	16.30	18.55	3,342.04	2.25
									10/11/22	14.91	15.46	3,343.77	0.55

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North Refinery	MW-40	Shallow	673161.12	523489.02	3,356.56	3,356.93	Unknown	Unknown	04/13/22	14.76	18.73	3,341.38	3.97
									10/11/22	13.03	15.86	3,343.33	2.83
	MW-41	Shallow	673379.87	523374.64	3,356.38	3,356.58	3,342.38	14 to 19	04/13/22	14.60	15.39	3,341.82	0.79
									10/11/22	12.68	14.45	3,343.55	1.77
	MW-42	Shallow	673480.27	523263.53	3,355.64	3,358.44	Unknown	Unknown	04/12/22	--	17.09	3,341.35	--
									10/11/22	15.05	15.91	3,343.22	0.86
	MW-43	Shallow	673115.86	522950.40	3,363.38	3,365.49	3,347.88	15.5 to 20.5	04/12/22	15.31	15.81	3,350.08	0.50
									10/11/22	14.60	14.75	3,350.86	0.15
	MW-59	Shallow	672814.66	523854.12	3,359.44	3,362.43	3,344.44	15 to 30	04/13/22	17.97	18.46	3,344.36	0.49
									10/12/22	16.35	16.78	3,345.99	0.43
	MW-60	Shallow	672849.58	524143.12	3,359.26	3,361.98	3,344.26	15 to 30	04/12/22	19.22	19.70	3,342.66	0.48
									10/12/22	17.66	17.93	3,344.27	0.27
	MW-61	Shallow	672453.76	522578.38	3,369.45	3,369.47	3,355.45	14 to 29	04/13/22	--	12.97	3,356.50	--
									10/11/22	--	13.74	3,355.73	--
	MW-62	Shallow	672650.76	522696.50	3,368.35	3,368.81	3,354.35	14 to 29	04/12/22	16.41	16.42	3,352.40	0.01
									10/11/22	16.61	16.62	3,352.20	0.01
	MW-62R	Shallow	672656.02	522699.19	Unknown	3,368.53	Unknown	5 to 25	04/12/22	--	15.33	3,353.20	--
									10/11/22	--	16.40	3,352.92	--
	MW-67	Shallow	673224.88	522342.43	3,365.59	3,365.45	3,353.59	12 to 27	04/12/22	13.79	15.62	3,351.29	1.83
									10/11/22	12.90	14.34	3,352.26	1.44
	MW-90	Shallow	672909.28	521960.18	3,367.13	3,369.42	3,362.13	5 to 20	04/12/22	--	13.65	3,355.77	--
									10/11/22	--	12.90	3,356.52	--
	MW-91	Shallow	672945.86	522167.26	3,365.72	3,367.73	3,358.72	7 to 22	04/12/22	14.08	14.21	3,353.62	0.13
									10/11/22	13.09	13.19	3,354.62	0.10
	MW-92	Shallow	672766.10	522167.26	3,366.75	3,368.72	3,361.75	5 to 20	04/12/22	13.95	14.86	3,354.59	0.91
									10/11/22	13.96	14.92	3,354.57	0.96
	MW-93	Shallow	672897.25	522446.83	3,364.22	3,363.79	3,359.22	5 to 20	04/13/22	--	-- ⁽³⁾	-- ⁽³⁾	--
									10/12/22	--	-- ⁽³⁾	-- ⁽³⁾	--
	MW-94	Shallow	673510.54	522336.27	3,365.82	3,367.97	3,360.82	5 to 20	04/12/22	17.18	19.70	3,350.29	2.52
									10/11/22	16.49	16.81	3,351.42	0.32
	MW-95	Shallow	673084.72	522308.89	3,366.48	3,368.70	3,359.48	7 to 22	04/12/22	16.38	17.03	3,352.19	0.65
									10/11/22	15.46	16.46	3,353.04	1.00
	MW-96	Shallow	673143.60	521917.50	3,366.83	3,368.92	3,359.83	7 to 22	04/12/22	--	14.38	3,354.54	--
									10/11/22	--	13.56	3,355.36	--
	MW-97	Shallow	672660.45	522295.96	3,366.38	3,365.92	3,358.38	8 to 23	04/12/22	--	-- ⁽³⁾	-- ⁽³⁾	--
									10/11/22	--	-- ⁽³⁾	-- ⁽³⁾	--

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Area	Well ID	Water-Bearing Zone ⁽¹⁾	Northing (ft)	Easting (ft)	Land Surface Elevation (ft amsl)	TOC Elevation (ft amsl)	Top of Screen Elevation (ft amsl)	Screen Interval (ft bgs)	Date Measured	Depth to PSH (ft btoc)	Depth to Water (ft btoc)	Corrected Groundwater Elevation ⁽²⁾ (ft amsl)	PSH Thickness (ft)
North Refinery	MW-98	Shallow	672517.05	523220.39	3,358.96	3,361.36	3,345.96	13 to 23	04/12/22	--	12.81	3,348.55	--
									10/11/22	--	12.30	3,349.06	--
	MW-137	Shallow	672923.48	522924.27	3,363.15	3,364.83	3,353.15	10 to 30	04/12/22	12.42	13.31	3,352.23	0.89
									10/11/22	11.92	12.95	3,352.70	1.03
	MW-137A	Shallow	672872.20	523039.47	Unknown	3,363.45	Unknown	5.5 to 15.5	04/12/22	12.42	13.28	3,350.86	0.86
									10/11/22	12.49	13.20	3,350.82	0.71
	MW-138	Shallow	672876.52	523041.05	3,364.73	3,363.24	3,354.73	10 to 25	04/12/22	13.75	18.32	3,348.58	4.57
									10/11/22	13.22	17.55	3,349.15	4.33
	MW-138A	Shallow	672924.49	522916.09	Unknown	3,364.56	Unknown	5.5 to 15.5	04/12/22	13.13	14.14	3,351.22	1.01
									10/11/22	13.96	15.02	3350.38	1.06
	RW-1	Shallow	672825.27	522204.68	3,365.29	3,367.03	Unknown	Unknown	04/12/22	14.84	14.90	3,352.18	0.06
									10/11/22	14.86	14.92	3,352.16	0.06
	RW-2	Shallow	672781.86	522337.29	3,368.17	3,368.17	Unknown	Unknown	04/13/22	16.24	18.05	3,351.57	1.81
									10/11/22	--	14.85	3,353.32	--
	RW-7	Shallow	673579.35	522098.94	3,365.03	3,367.09	Unknown	Unknown	04/12/22	16.18	18.30	3,350.49	2.12
									10/11/22	14.59	14.93	3,352.43	0.34
	RW-8	Shallow	673266.20	522321.21	3,364.89	3,368.10	Unknown	Unknown	04/12/22	15.57	17.39	3,352.17	1.82
									10/11/22	14.64	14.81	3,353.43	0.17
	RW-9	Shallow	673423.49	523371.16	3,356.30	3,359.51	Unknown	Unknown	04/13/22	--	16.83	3,342.68	--
									10/11/22	--	14.98	3,344.53	--
North RO Reject Field	MW-117	Shallow	674301.52	522979.73	3,360.07	3,363.01	3,350.07	10 to 25	04/12/22	--	15.90	3,347.11	--
									10/11/22	--	12.85	3,350.16	--
	MW-118	Shallow	674819.18	523375.94	3,359.62	3,361.95	3,349.62	10 to 25	04/12/22	--	20.11	3,341.84	--
									10/11/22	--	18.74	3,343.21	--
	MW-119	Shallow	674860.11	524575.80	3,353.83	3,356.11	3,343.83	10 to 25	04/12/22	--	19.09	3,337.02	--
									10/11/22	--	13.65	3,342.46	--
NCL	MW-18	Shallow	674172.45	522318.86	3,358.54	3,361.02	3,343.54	15 to 19	04/12/22	--	16.53	3,344.49	--
									10/11/22	--	15.28	3,345.74	--
	MW-19	Shallow	673597.29	521670.75	3,366.00	3,368.00	3,361.00	5 to 19.5	04/12/22	--	15.42	3,352.58	--
									10/11/22	--	13.92	3,354.08	--

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NCL	MW-45	Shallow	674247.07	523663.75	3,351.32	3,351.51	3,340.82	10.5 to 15.5	04/13/22	--	13.62	3,337.89	--
									10/11/22	--	7.92	3,343.59	--
	MW-53R	Shallow	673615.99	521463.00	3,368.87	3,368.75	3,354.87	14 to 24	04/12/22	--	15.51	3,353.24	--
									10/11/22	--	14.11	3,354.64	--
	MW-54A	Shallow	674138.65	522110.51	3,363.55	3,366.49	3,350.85	12.7 to 27.7	04/12/22	--	17.29	3,349.20	--
									10/11/22	--	16.12	3,350.37	--
	MW-54B	Valley Fill	674148.44	522118.80	3,363.47	3,366.47	3,329.67	33.8 to 43.8	04/12/22	--	17.32	3,349.15	--
									10/11/22	--	16.21	3,350.26	--
	MW-55	Shallow	674091.95	522766.46	3,361.90	3,364.77	3,348.20	13.7 to 23.7	04/12/22	--	16.20	3,348.57	--
									10/11/22	--	14.02	3,350.75	--
	MW-56	Shallow	674160.38	523450.14	3,354.84	3,357.44	3,341.44	13.4 to 23.4	04/13/22	--	18.24	3,339.20	--
									10/11/22	--	13.62	3,343.82	--
	MW-108	Shallow	673659.33	521910.16	3,366.25	3,369.11	3,357.25	9 to 24	04/12/22	--	17.94	3,351.17	--
									10/11/22	--	16.58	3,352.53	--
	NCL-31	Shallow	673629.51	521669.01	3,366.21	3,367.54	3,353.21	13 to 18	04/12/22	--	15.11	3,352.43	--
									10/11/22	--	13.64	3,353.90	--
	NCL-32	Shallow	673984.83	521808.14	3,364.96	3,364.91	3,347.96	17 to 22	04/12/22	--	14.96	3,349.95	--
									10/11/22	--	13.91	3,351.00	--
	NCL-33	Shallow	673967.20	522245.18	3,364.26	3,363.97	3,351.26	13 to 18	04/12/22	--	14.54	3,349.43	--
									10/11/22	--	13.31	3,350.66	--
	NCL-34A	Shallow	673885.52	522235.08	3,364.82	3,365.49	3,348.82	16 to 21	04/12/22	15.34	17.91	3,349.64	2.57
									10/11/22	14.31	17.09	3,350.62	2.78
	NCL-44	Shallow	673986.41	522062.11	3,364.01	3,364.45	Unknown	Unknown	04/12/22	--	14.48	3,349.97	--
									10/11/22	--	13.31	3,351.14	--
	NCL-49	Shallow	674099.16	521648.40	3,368.26	3,371.13	3,351.46	16.8 to 17.8	04/12/22	--	20.89	3,350.24	--
									10/11/22	--	19.76	3,351.37	--
South Refinery	KWB-2R	Shallow	670207.24	524897.59	3,364.56	3,364.32	Unknown	Unknown	04/13/22	25.43	25.55	3,338.87	0.12
									10/11/22	25.15	25.28	3,339.14	0.13
	KWB-4	Shallow	670616.38	524572.44	3,368.36	3,370.25	3,348.36	20 to 39	04/13/22	26.67	29.71	3,342.97	3.04
									10/11/22	26.55	29.44	3,343.12	2.89
	KWB-5	Shallow	670729.55	525244.51	3,362.60	3,364.72	3,337.90	24.7 to 38.7	04/12/22	26.64	28.51	3,337.71	1.87
									10/11/22	26.11	27.19	3,338.39	1.08
	KWB-6	Shallow	670449.36	526158.70	3,358.02	3,360.30	3,340.52	17.5 to 36.5	04/12/22	25.50	27.90	3,334.32	2.40
									10/11/22	23.59	24.75	3,336.48	1.16

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South Refinery	MW-28	Shallow	671508.38	524521.56	3,366.79	3,370.27	3,341.79	25 to 30	04/13/22	21.03	21.50	3,349.15	0.47
									10/12/22	19.98	20.44	3,350.20	0.46
	MW-48	Shallow	670689.39	524080.35	3,363.04	3,362.97	Unknown	Unknown	04/12/22	--	-- ⁽⁴⁾	-- ⁽⁴⁾	--
									10/11/22	--	-- ⁽⁴⁾	-- ⁽⁴⁾	--
	MW-50	Shallow	671502.45	521857.84	3,368.91	3,371.05	Unknown	Unknown	04/12/22	--	15.34	3,355.71	--
									10/11/22	--	14.92	3,356.13	--
	MW-52	Shallow	670165.24	523370.99	3,368.36	3,368.30	Unknown	Unknown	04/13/22	--	21.08	3,347.22	--
									10/12/22	--	21.01	3,347.29	--
	MW-64	Shallow	670716.03	523338.61	3,365.56	3,369.52	3,350.56	15 to 30	04/13/22	--	21.31	3,348.21	--
									10/11/22	--	20.89	3,348.63	--
	MW-65	Shallow	670949.22	523711.75	3,363.84	3,363.60	3,349.34	14.5 to 29.5	04/13/22	18.70	19.62	3,344.72	0.92
									10/11/22	18.11	18.68	3,345.38	0.57
	MW-66	Shallow	671247.57	524560.06	3,363.66	3,363.46	3,349.06	14.6 to 29.6	04/13/22	19.92	20.12	3,343.50	0.20
									10/12/22	19.22	19.42	3,344.20	0.20
	MW-99	Shallow	671652.52	524579.74	3,365.11	3,364.51	3,353.11	12 to 27	04/13/22	20.86	21.32	3,343.56	0.46
									10/11/22	20.39	21.16	3,343.97	0.77
	MW-101	Shallow	671627.36	523504.79	3,362.98	3,366.15	3,354.98	8 to 23	04/13/22	--	17.55	3,348.60	--
									10/11/22	--	13.51	3,352.64	--
	MW-102	Shallow	671176.70	522937.01	3,365.51	3,367.64	3,353.51	12 to 27	04/13/22	--	16.31	3,351.33	--
									10/11/22	--	15.76	3,351.88	--
	MW-103	Shallow	670472.55	522607.80	3,370.89	3,372.47	3,363.89	7 to 22	04/13/22	--	17.80	3,354.67	--
									10/11/22	--	17.33	3,355.14	--
	MW-104	Shallow	670450.35	522729.44	3,369.41	3,371.43	3,366.41	3 to 18	04/13/22	--	13.02	3,358.41	--
									10/11/22	--	11.71	3,359.72	--
	MW-105	Shallow	671924.44	522454.93	3,365.20	3,364.99	3,357.20	8 to 18	04/13/22	--	9.19	3,355.80	--
									10/11/22	--	10.20	3,354.79	--
	MW-106	Shallow	672207.14	523454.55	3,359.29	3,358.98	3,359.29	0 to 11	04/13/22	--	-- ⁽³⁾	-- ⁽³⁾	--
									10/11/22	--	-- ⁽³⁾	-- ⁽³⁾	--
	MW-107	Shallow	671961.38	524600.45	3,359.63	3,359.44	3,347.63	12 to 22	04/13/22	17.51	18.42	3,341.75	0.91
									10/12/22	16.37	18.03	3,342.74	1.66
	MW-109	Shallow	670174.25	523065.52	3,368.27	3,368.09	3,353.27	15 to 29.5	04/13/22	--	19.13	3,348.96	--
									10/12/22	--	19.13	3,348.96	--
	MW-110	Shallow	670174.33	522796.69	3,368.46	3,368.03	3,353.46	15 to 29.5	04/13/22	--	15.62	3,352.41	--
									10/12/22	--	15.91	3,352.12	--
	MW-139	Shallow	670687.2	522149.2	3374.32	3374.05	3,364.32	10 to 30	04/12/22	--	14.38	3,359.67	--
									10/11/22	--	14.19	3,359.86	--

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South Refinery	RW-4	Shallow	671378.27	523010.47	3,364.41	3,364.86	Unknown	Unknown	04/13/22	--	18.84	3,346.02	--
									10/12/22	--	19.13	3,345.73	--
	RW-5R	Shallow	671258.01	523662.01	3,362.79	3,368.56	3,349.79	13 to 33	04/13/22	19.30	30.90	3,346.94	11.60
									10/12/22	18.46	18.68	3,350.06	0.22
	RW-6	Shallow	670969.39	522843.22	3,366.03	3,368.36	Unknown	Unknown	04/13/22	15.53	16.02	3,352.73	0.49
									10/12/22	--	15.27	3,353.09	--
	RW-11-0	Shallow	669938.15	527541.66	3,351.48	3,353.95	Unknown	Unknown	04/12/22	--	Dry	--	--
									10/11/22	--	18.33	3,335.62	--
	RW-15C	Shallow	670820.45	524123.41	3,362.65	3,361.41	Unknown	Unknown	04/13/22	18.94	19.71	3,342.32	0.77
									10/11/22	19.07	19.40	3,342.27	0.33
	RW-19	Shallow	670611.43	524592.99	3,367.09	3,369.11	3,356.09	11 to 46	04/13/22	26.41	27.43	3,342.50	1.02
									10/11/22	26.23	27.62	3,342.60	1.39
South RO Reject Field	MW-114	Shallow	673082.16	523818.86	3,358.62	3,361.68	3,338.62	20 to 35	04/13/22	--	17.33	3,344.35	--
									10/11/22	--	15.27	3,346.41	--
	MW-115	Shallow	673997.34	523932.93	3,356.48	3,359.31	3,346.48	10 to 25	04/13/22	--	18.37	3,340.94	--
									10/11/22	--	13.84	3,345.47	--
	MW-116	Shallow	673966.06	525339.63	3,350.99	3,353.77	3,340.99	10 to 25	04/12/22	--	18.20	3,335.57	--
									10/12/22	--	14.30	3,339.47	--
TEL	MW-49	Shallow	672051.80	523610.79	3,359.73	3,359.63	Unknown	Unknown	04/13/22	--	13.14	3,346.49	--
									10/11/22	--	12.26	3,347.37	--
	TEL-1	Shallow	672966.33	523412.82	3,356.79	3,358.23	3,343.79	13 to 23	04/12/22	15.82	16.32	3,342.31	0.50
									10/12/22	14.21	14.45	3,343.97	0.24
	TEL-2	Shallow	672885.90	523419.29	3,356.80	3,359.12	3,343.80	13 to 23	04/12/22	16.14	19.05	3,342.40	2.91
									10/12/22	15.07	16.34	3,343.80	1.27
	TEL-3	Shallow	672796.06	523459.33	3,356.43	3,358.33	3,343.43	13 to 23	04/12/22	15.16	18.02	3,342.60	2.86
									10/12/22	14.08	15.31	3,344.00	1.23
	TEL-4	Shallow	672715.99	523181.18	3,358.21	3,360.24	3,345.21	13 to 23	04/12/22	--	13.62	3,346.62	--
									10/12/22	--	12.68	3,347.56	--
TMD	MW-8	Shallow	673215.93	529055.18	3,334.81	3,336.42	Unknown	Unknown	04/12/22	--	17.95	3,318.47	--
									10/11/22	--	10.83	3,325.59	--
	MW-9	Shallow	673169.56	529232.03	3,334.50	3,336.20	Unknown	Unknown	04/13/22	--	18.54	3,317.66	--
									10/11/22	--	11.37	3,324.83	--
	MW-16	Shallow	675613.35	534389.17	3,313.50	3,316.12	3,305.00	8.5 to 19	04/12/22	--	12.02	3,304.10	--
									10/11/22	--	6.07	3,310.05	--
	MW-20	Shallow	673800.56	527834.67	3,338.43	3,340.91	3,328.93	9.5 to 23.5	04/13/22	--	17.59	3,323.32	--
									10/11/22	--	13.03	3,327.88	--

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2022 Annual Groundwater Monitoring Report
 HF Sinclair Navajo Refining LLC, Artesia Refinery, Artesia, New Mexico

Area	Well ID	Water-Bearing Zone ⁽¹⁾	Northing (ft)	Easting (ft)	Land Surface Elevation (ft amsl)	TOC Elevation (ft amsl)	Top of Screen Elevation (ft amsl)	Screen Interval (ft bgs)	Date Measured	Depth to PSH (ft btoc)	Depth to Water (ft btoc)	Corrected Groundwater Elevation ⁽²⁾ (ft amsl)	PSH Thickness (ft)
TMD	MW-21	Shallow	673180.38	529150.62	3,334.65	3,337.31	3,327.15	7.5 to 22	04/12/22	--	17.19	3,320.12	--
									10/11/22	--	10.28	3,327.03	--
	MW-25	Shallow	675386.30	537955.86	3,310.35	3,312.29	3,294.60	15.75 to 25.25	04/13/22	--	11.31	3,300.98	--
									10/11/22	--	10.32	3,301.97	--
	MW-26	Shallow	676229.18	535348.61	3,312.08	3,314.87	3,296.83	15.25 to 24.25	04/12/22	--	13.87	3,301.00	--
									10/11/22	--	8.02	3,306.85	--
	MW-27	Shallow	674495.64	532942.65	3,319.46	3,320.85	3,301.21	18.25 to 27.75	04/12/22	--	20.83	3,300.02	--
									10/11/22	--	14.16	3,306.69	--
	MW-46R	Shallow	674223.03	524920.28	3,350.41	3,350.11	3,346.91	3.5 to 18.5	04/12/22	--	15.68	3,334.43	--
									10/12/22	--	10.54	3,339.57	--
	MW-68	Shallow	674301.02	531466.90	3,325.81	3,328.21	3,311.06	14.75 to 24.5	04/12/22	--	23.74	3,304.47	--
									10/11/22	--	14.64	3,313.57	--
	MW-71	Shallow	673016.80	529560.41	3,332.99	3,335.29	3,323.24	9.75 to 19.5	04/12/22	--	18.82	3,316.47	--
									10/11/22	--	12.18	3,323.11	--
	MW-89	Shallow	675221.56	533835.00	3,316.38	3,318.32	3,314.38	2 to 17	04/12/22	--	14.37	3,303.95	--
									10/11/22	--	7.58	3,310.74	--
	NP-1	Shallow	672992.73	528035.04	3,339.69	3,342.40	3,330.19	9.5 to 19	04/12/22	--	20.03	3,322.37	--
									10/11/22	--	14.85	3,327.55	--
	NP-2	Shallow	673571.19	527611.64	3,340.58	3,342.77	3,331.08	9.5 to 18.5	04/13/22	--	19.54	3,323.23	--
									10/11/22	--	17.09	3,325.68	--
	NP-3	Shallow	673990.66	528019.54	3,340.40	3,342.93	3,330.90	9.5 to 18.5	04/13/22	--	19.61	3,323.32	--
									10/11/22	--	13.41	3,329.52	--
	NP-4	Shallow	674337.35	528351.85	3,343.24	3,345.73	3,318.74	24.5 to 33.5	04/13/22	--	32.39	3,313.34	--
									10/11/22	--	34.88	3,310.85	--
	NP-6	Shallow	672945.23	529083.91	3,336.31	3,338.05	3,327.56	8.75 to 18.75	04/13/22	--	17.29	3,320.76	--
									10/11/22	--	9.70	3,328.35	--
	NP-8	Shallow	675399.60	538245.49	3,310.53	3,314.67	Unknown	Unknown	04/13/22	--	13.37	3,301.30	--
									10/11/22	--	12.59	3,302.08	--
	NP-9	Shallow	674767.14	523571.69	3,357.86	3,360.62	Unknown	Unknown	04/12/22	--	19.26	3,341.36	--
									10/11/22	--	16.70	3,343.92	--

Table 1 - Well Information and Gauging Data

2022 Annual Groundwater Monitoring Report
 HF Sinclair Navajo Refining LLC, Artesia Refinery, Artesia, New Mexico

Area	Well ID	Water-Bearing Zone ⁽¹⁾	Northing (ft)	Easting (ft)	Land Surface Elevation (ft amsl)	TOC Elevation (ft amsl)	Top of Screen Elevation (ft amsl)	Screen Interval (ft bgs)	Date Measured	Depth to PSH (ft btoc)	Depth to Water (ft btoc)	Corrected Groundwater Elevation ⁽²⁾ (ft amsl)	PSH Thickness (ft)
Up-Gradient	UG-1	Shallow	672453.27	520746.73	3,373.02	3,372.94	3,365.02	8 to 23	04/11/22	--	13.94	3,359.00	--
									--	--	--	--	--
	UG-2	Shallow	670726.77	520942.36	3,380.30	3,380.41	3,365.30	15 to 30	04/11/22	--	18.80	3,361.61	--
									--	--	--	--	--
	UG-3R	Shallow	671992.70	519424.77	3,384.62	3,384.08	3,367.62	17 to 37	04/11/22	--	22.04	3,362.04	--
									--	--	--	--	--
	UG-4	Shallow	674087.85	520541.74	3,377.78	3,377.36	3,358.28	19.5 to 39.5	04/11/22	--	21.12	3,356.24	--
									--	--	--	--	--

Notes:

⁽¹⁾ Wells screened in the shallow water-bearing zone are typically screened at depths ranging between 5 and 35 ft bgs. The shallow water-bearing zone varies between confined and unconfined conditions. Wells screened in the valley fill zone are typically screened at depths ranging between 35 and 70 ft bgs. The clay lens separating the shallow and valley fill zones is discontinuous in some locations resulting in connectivity between the two zones.

⁽²⁾ Water elevations corrected for PSH, if present, using a specific gravity of 0.8.

⁽³⁾ Well not accessible due to construction activities.

⁽⁴⁾ Obstruction in well preventing measurement.

⁽⁵⁾ Not measured due to pump interference.

Definitions:

ft = feet

-- = not applicable

amsl = above mean sea level

bgs = below ground surface

btoc = below top of casing

NCL = North Colony Landfarm

TEL = Tetra Ethyl Lead Surface Impoundment

unknown = screen interval not readily available

TMD = Three Mile Ditch

PSH = phase separated hydrocarbons

RO = Reverse Osmosis

NM = not measured

TMD = Three Mile Ditch

TOC = Top of Casing

Table 2 - Well Purging and Water Quality Field Measurement Data

2022 Annual Groundwater Monitoring Report
HF Sinclair Navajo Refining LLC, Artesia Refinery, Artesia, New Mexico

Area	Well	Purge Method ⁽¹⁾	Date	Time	Temperature (°C)	Specific Conductivity (umho/cm)	Specific Conductivity (S/m)	DO (mg/L)	pH (std units)	ORP (mV)	Field Observations of Purge Water ⁽²⁾
Cross-Gradient	KWB-13	Bladder	4/12/22	1400	21.0	4,140	0.414	4.8	6.83	168.2	Cloudy, tan
	RA-3156	Grab	4/13/22	1350	21.4	3,590	0.359	5.9	7.21	8.2	Brown, clr
	MW-136	Low Flow	4/12/22	1250	21.4	4,030	0.403	0.7	6.84	115.7	Clear
			10/11/22	900	19.7	2,650	0.265	1.0	6.89	103.6	Clear
Evaporation Ponds	MW-1R	Low Flow	4/13/22	920	18.8	5,940	0.594	1.5	7.38	-91.8	Clear
	MW-2A	Low Flow	4/12/22	1345	19.5	16,980	1.698	1.1	6.97	22.8	Clear
			10/11/22	1215	23.1	15,490	1.549	2.2	6.74	83.8	Clear
	MW-3	Low Flow	4/13/22	1610	19.3	6,810	0.681	1.0	6.98	49.0	Clear
			10/12/22	925	21.2	7,140	0.714	1.7	6.72	62.1	Clear
	MW-4A	Low Flow	4/13/22	1120	19.4	7,000	0.700	1.8	7.55	-128.9	Clr, blk ptcls, odor
			10/11/22	1610	22.4	7,350	0.735	1.6	7.17	-136.9	Clr, HC odor
	MW-5A	Low Flow	4/13/22	1015	19.5	12,950	1.295	2.1	7.54	-102.7	Clear
			10/12/22	1025	23.0	15,680	1.568	1.5	7.30	-113.5	Clear
	MW-6A	Low Flow	4/13/22	1235	19.2	5,280	0.528	1.0	7.40	-91.2	Clear
			10/12/22	905	22.3	7,560	0.756	1.5	7.17	-68.1	Clear
	MW-7A	Low Flow	4/13/22	920	17.7	9,830	0.983	1.8	7.55	-82.7	Clear
			10/12/22	905	22.3	7,560	0.756	1.5	7.17	-68.1	Clear
	MW-10	Low Flow	4/13/22	1310	19.9	6,630	0.663	1.5	7.31	-37.8	Clr, orange particles
			10/11/22	1520	22.4	8,540	0.854	1.5	7.04	-15.3	Clear
	MW-11A	Low Flow	4/12/22	1500	21.0	27,400	2.740	1.6	7.30	96.8	Clr, orange particles
			10/11/22	1140	23.4	26,700	2.670	1.2	6.90	-59.2	Clr, orange particles
	MW-15	Low Flow	4/13/22	830	18.2	7,570	0.757	2.0	7.51	62.4	Clear
	MW-18A	Low Flow	4/12/22	955	20.4	19,870	1.987	1.4	7.37	64.3	Clr, brown particles
			10/12/22	940	21.9	22,500	2.250	1.8	7.08	-127.3	Clear
	MW-22A	Low Flow	4/13/22	1400	18.4	13,540	1.354	1.3	7.33	27.6	Clear
			10/11/22	1400	23.0	41,100	4.110	1.3	7.03	80.7	Clear
	MW-70	Low Flow	4/12/22	1150	19.7	7,550	0.755	1.3	7.56	17.6	Clr, orange particles
			10/12/22	1110	22.4	4,880	0.488	1.1	7.12	-121.4	Clear
	MW-72	Low Flow	4/12/22	1255	20.0	12,060	1.206	1.1	7.08	85.9	Clear
	MW-73	Low Flow	4/12/22	925	19.3	13,660	1.366	1.3	7.36	1.0	Clear
	MW-74	Low Flow	4/12/22	1010	19.5	11,710	1.171	1.5	7.15	85.3	Clear
			10/11/22	1445	22.5	11,560	1.156	2.1	6.69	56.4	Clear
	MW-75	Low Flow	4/13/22	1425	19.2	7,770	0.777	1.4	7.17	-27.9	Clear
			10/12/22	1045	22.1	8,470	0.847	2.3	6.82	-116.4	Clear
	MW-76	Low Flow	4/13/22	1215	20.5	6,700	0.670	1.6	7.17	-67.0	Clear
			10/12/22	950	21.5	7,330	0.733	1.9	6.59	-76.7	Clear
	MW-77	Low Flow	4/13/22	1300	20.0	6,850	0.685	2.0	7.25	0.7	Clr, gold tint, odor
	MW-78	Low Flow	4/13/22	1515	18.9	3,920	0.392	1.6	6.71	72.4	Clear, gold tint

Table 2 - Well Purging and Water Quality Field Measurement Data

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Area	Well	Purge Method ⁽¹⁾	Date	Time	Temperature (°C)	Specific Conductivity (umho/cm)	Specific Conductivity (S/m)	DO (mg/L)	pH (std units)	ORP (mV)	Field Observations of Purge Water ⁽²⁾
Evaporation Ponds	MW-79	Low Flow	4/12/22	1615	19.5	8,500	0.850	1.8	7.18	68.6	Clear
			10/11/22	1040	21.3	7,750	0.775	2.1	6.85	63.1	Clear
	MW-80	Low Flow	4/12/22	1525	20.5	6,380	0.638	1.1	7.21	77.9	Clear
	MW-81	Low Flow	4/12/22	1435	20.6	7,680	0.768	2.1	7.20	62.3	Clear
	MW-82	Low Flow	4/13/22	955	19.3	8,360	0.836	2.2	6.97	50.7	Clear
	MW-83	Low Flow	4/13/22	1335	19.9	6,210	0.621	1.5	6.99	102.7	Clear
			10/12/22	905	21.5	6,940	0.694	2.0	6.65	-27.8	Clear, gold tint
	MW-84	Low Flow	4/13/22	905	18.9	11,170	1.117	2.7	7.05	20.7	Clear, gold tint
			10/11/22	1610	23.7	11,030	1.103	2.0	6.77	-97.4	Clear, gold tint
	MW-87	Low Flow	4/12/22	910	19.8	16,210	1.621	1.7	6.81	85.1	Clear
			10/12/22	1005	22.5	11,240	1.124	1.3	7.08	-21.0	Clear
	MW-88	Low Flow	4/13/22	1120	19.0	8,210	0.821	1.4	7.48	39.6	Clear
			10/11/22	1320	22.4	7,870	0.787	1.5	7.19	15.8	Clear
	MW-120	Low Flow	4/13/22	1140	19.0	9,760	0.976	1.2	7.18	-70.8	Clear
			10/11/22	905	20.3	11,630	1.163	2.6	6.90	-47.6	Clear
	MW-121	Low Flow	4/13/22	1045	17.8	6,900	0.690	1.4	7.25	57.4	Clear
			10/11/22	950	21.9	7,590	0.759	1.9	6.93	62.7	Clear
	MW-122	Low Flow	4/12/22	1715	19.8	5,970	0.597	1.9	7.23	-26.9	Clear
			10/11/22	1130	21.2	5,780	0.578	2.2	7.01	-98.2	Clear
	MW-123	Low Flow	4/13/22	1210	19.5	7,330	0.733	1.4	7.29	4.2	Clear
			10/12/22	1150	20.8	8,150	0.815	1.3	7.04	-32.7	Clear
	MW-124	Low Flow	4/12/22	1100	19.8	13,660	1.366	1.3	7.57	-21.2	Clr, orange particles
			10/12/22	1030	22.4	14,840	1.484	1.5	6.97	-80.9	Clear
	OCD-1R	Low Flow	4/12/22	1635	21.8	8,130	0.813	1.5	7.49	29.6	Clear
			10/11/22	1220	23.2	10,920	1.092	1.1	6.91	-102.3	Clear
	OCD-2A	Low Flow	4/12/22	1550	20.8	6,670	0.667	1.6	7.62	52.7	Clear
			10/11/22	840	20.8	7,590	0.759	1.7	6.77	41.3	Clear

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Area	Well	Purge Method ⁽¹⁾	Date	Time	Temperature (°C)	Specific Conductivity (umho/cm)	Specific Conductivity (S/m)	DO (mg/L)	pH (std units)	ORP (mV)	Field Observations of Purge Water ⁽²⁾
Evaporation Ponds	OCD-3	Low Flow	4/12/22	1415	21.2	4,950	0.495	1.8	7.67	60.4	Clear
			10/11/22	925	22.0	6,530	0.653	1.5	7.06	77.5	Clear
	OCD-4	Low Flow	4/12/22	1330	21.6	17,240	1.724	1.6	7.54	48.2	Clear
			10/11/22	1010	22.4	20,300	2.030	1.3	7.02	46.2	Clr, orange particles
	OCD-5	Low Flow	4/12/22	1240	20.8	18,140	1.814	1.4	7.30	-35.8	Clr, orange particles
			10/11/22	1050	22.6	19,130	1.913	1.4	7.07	-48.5	Clr, orange particles
	OCD-6	Low Flow	4/12/22	1205	20.4	17,700	1.770	1.6	7.02	19.5	Clear
			10/11/22	1305	22.3	16,000	1.600	2.3	6.76	-37.6	Clear
	OCD-7AR	Low Flow	4/12/22	1110	21.1	14,700	1.470	1.7	6.97	-76.9	Clr, lt. tan
			10/11/22	1350	23.9	14,500	1.450	2.2	6.79	-92.4	Clr, lt. tan
	OCD-8A	Low Flow	4/13/22	835	18.1	17,690	1.769	2.1	7.65	-48.6	Clear
			10/12/22	840	22.2	20,100	2.010	1.6	6.93	-18.1	Clear
Field East of Refinery	KWB-7	Low Flow	4/13/22	1320	22.2	3,650	0.365	0.7	6.79	-262.7	Clr, HC odor
			10/11/22	1350	21.5	3,770	0.377	1.7	6.90	-238.4	Clr, HC odor
	KWB-11A	Low Flow	10/11/22	1430	21.1	3,680	0.368	1.5	6.72	-167.4	Clear
	KWB-11B	Low Flow	4/13/22	1725	21.9	3,450	0.345	1.0	6.88	22.3	Clear
			10/11/22	1510	20.9	3,240	0.324	1.4	6.80	-6.2	Clear
	KWB-12A	Low Flow	10/11/22	1330	24.0	4,240	0.424	3.0	6.78	125.3	Clear
	KWB-12B	Bladder	4/12/22	1025	20.3	4,080	0.408	4.0	6.89	79.8	Clear
			10/11/22	1415	23.0	3,640	0.364	3.2	6.90	-3.1	Clear
	MW-57	Bladder	4/12/22	1135	24.5	4,360	0.436	3.6	6.82	55.2	Clear
	MW-113	Low Flow	4/13/22	1700	20.8	3,020	0.302	1.6	6.72	-24.7	Clear
		Bladder	10/11/22	1005	19.6	3,090	0.309	2.2	6.79	-1.7	Clear
	MW-125	Low Flow	4/13/22	955	23.8	4,460	0.446	2.4	6.71	131.2	Clear
			10/11/22	1610	21.7	4,190	0.419	2.5	6.78	62.4	Clear
	MW-126B	Low Flow	4/12/22	1110	22.5	3,560	0.356	0.8	6.67	130.1	Clear
			10/11/22	1055	21.0	3,010	0.301	0.7	6.70	89.4	Clear
	MW-130	Low Flow	4/13/22	930	24.0	2,210	0.221	2.8	6.78	-12.2	Cloudy, white tint
		Bladder	10/12/22	1310	23.2	2,720	0.272	2.3	6.62	35.5	Cloudy, white tint
	MW-134	Low Flow	4/13/22	1525	24.0	6,770	0.677	1.3	6.65	54.8	Clear
			10/11/22	1115	18.1	4,620	0.462	2.8	6.83	-3.7	Clear

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Area	Well	Purge Method ⁽¹⁾	Date	Time	Temperature (°C)	Specific Conductivity (umho/cm)	Specific Conductivity (S/m)	DO (mg/L)	pH (std units)	ORP (mV)	Field Observations of Purge Water ⁽²⁾
Field East of Refinery	MW-135	Bladder	4/12/22	1225	22.2	5,710	0.571	5.9	6.78	105.7	Clear
			10/11/22	1100	20.5	5,960	0.596	6.8	6.86	118.5	Clear
	MW-145	Low Flow	4/12/22	1005	21.0	4,670	0.467	2.1	6.75	102.1	Clear
			10/11/22	1305	21.2	4,780	0.478	1.8	6.83	109.7	Clear
	MW-146	Low Flow	4/12/22	1100	22.5	4,570	0.457	2.0	6.75	121.9	Clear
			10/11/22	1140	20.2	4,870	0.487	1.7	6.94	126.2	Clear
	MW-147	Bladder	4/12/22	1320	21.0	5,530	0.553	5.6	6.76	149.1	Clear
			10/11/22	1015	18.6	5,910	0.591	8.1	6.92	121.6	Clear
	MW-148	Bladder	4/12/22	1410	22.1	3,690	0.369	6.0	6.95	125.1	Sl. Cloudy
10/11/22			930	19.0	3,860	0.386	5.9	6.87	105.2	Clear	
RA-4798	Grab	4/13/22	1745	22.8	2,642	0.264	4.2	7.29	-23.8	Clear	
North Refinery	MW-29	Low Flow	4/12/22	1455	26.0	3,900	0.390	1.9	6.79	-150.1	Clear
			10/11/22	1600	23.7	4,530	0.453	3.1	6.72	-103.6	Clear
	MW-42	Low Flow	4/12/22	1600	24.1	3,790	0.379	1.4	6.85	-312.5	Clear
	MW-61	Low Flow	4/13/22	1250	22.8	2,470	0.247	6.0	7.04	-423.1	Clear
			10/11/22	1115	23.4	3,060	0.306	1.1	6.70	-404.5	Clear
	MW-62	Low Flow	4/12/22	1305	24.5	2,900	0.290	1.4	7.09	-418.2	Clear
			10/11/22	925	22.5	3,150	0.315	1.1	6.57	-379.0	Clear, odor
	MW-62R	Low Flow	4/12/22	1405	23.5	2,120	0.212	1.4	6.82	-396.1	Clear
			10/11/22	1015	23.7	2,780	0.278	0.9	6.53	-375.1	Clear, odor
	MW-90	Low Flow	4/12/22	1310	21.9	3,330	0.333	1.2	6.78	-313.9	Clear
			10/11/22	1035	22.6	3,470	0.347	2.8	6.75	-341.9	Clear
	MW-96	Low Flow	4/12/22	1200	22.9	1,885	0.189	1.3	6.79	-312.4	Clear
			10/11/22	1120	23.4	2,180	0.218	3.0	6.79	-330.1	Clear
	MW-98	Low Flow	4/12/22	1035	25.5	2,750	0.275	0.6	7.14	-408.9	Clear, odor
			10/11/22	1340	24.8	3,190	0.319	0.6	6.66	-409.6	Clear, odor
RW-9	Low Flow	4/13/22	910	19.4	3,570	0.357	1.8	7.05	-380.4	Clear	
North RO Reject Field	MW-117	Low Flow	4/12/22	1405	23.3	3,810	0.381	3.6	6.95	7.5	Clear
			10/11/22	1510	22.3	2,630	0.263	1.1	6.73	127.7	Clear
	MW-118	Low Flow	4/12/22	1320	23.2	3,970	0.397	3.4	7.11	95.6	Clear
			10/11/22	1430	21.5	3,480	0.348	1.2	6.81	120.7	Clear
	MW-119	Low Flow	4/12/22	1235	21.8	4,410	0.441	2.7	7.06	90.7	Clear
10/11/22			1330	21.5	3,120	0.312	1.2	6.79	102.6	Clear	

Table 2 - Well Purging and Water Quality Field Measurement Data

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 HF Sinclair Navajo Refining LLC, Artesia Refinery, Artesia, New Mexico

Area	Well	Purge Method ⁽¹⁾	Date	Time	Temperature (°C)	Specific Conductivity (umho/cm)	Specific Conductivity (S/m)	DO (mg/L)	pH (std units)	ORP (mV)	Field Observations of Purge Water ⁽²⁾
NCL	MW-18	Low Flow	4/12/22	1230	21.7	2,940	0.294	1.3	6.96	-22.4	Clear
	MW-45	Low Flow	4/13/22	1250	20.5	4,510	0.451	1.1	6.72	-85.3	Clear
			10/11/22	1715	24.8	4,700	0.470	1.6	6.80	-112.6	Clear
	MW-53R	Low Flow	4/12/22	1430	24.1	2,350	0.235	1.4	7.26	22.2	Clear
	MW-54A	Low Flow	4/12/22	1550	25.3	2,540	0.254	1.8	6.53	52.3	Clear
			10/11/22	1125	23.3	2,930	0.293	2.0	7.28	74.1	Clear
	MW-55	Low Flow	4/12/22	1415	22.7	2,830	0.283	2.9	6.64	-132.6	Clear
			10/11/22	1245	22.3	3,020	0.302	2.6	6.80	-19.8	Clear
	MW-56	Low Flow	4/13/22	1035	20.1	2,870	0.287	1.4	6.82	-24.9	Clear
	MW-108	Low Flow	4/12/22	1100	25.2	2,050	0.205	0.9	6.98	-334.9	Clear
			10/11/22	1620	24.6	2,180	0.218	2.0	6.87	-333.3	Clear
	NCL-31	Low Flow	4/12/22	1535	24.4	1,760	0.176	1.1	7.24	-65.9	Clear
			10/11/22	1400	24.5	1,881	0.188	1.6	7.00	-154.9	Clear
	NCL-32	Low Flow	4/12/22	1100	21.6	2,890	0.289	1.0	7.24	-55.1	Clear
			10/11/22	1445	28.3	2,870	0.287	1.6	6.97	29.8	Clear
	NCL-33	Low Flow	4/12/22	1145	21.7	4,500	0.450	1.1	6.73	-32.7	Clear
			10/11/22	1030	23.4	4,080	0.408	1.8	6.69	-57.1	Clear
	NCL-44	Low Flow	4/12/22	1010	21.5	2,820	0.282	1.0	6.79	-132.0	Clear
			10/11/22	1530	23.7	2,530	0.253	1.0	6.72	-221.1	Clear
South Refinery	MW-49	Low Flow	4/12/22	1325	21.5	3,480	0.348	2.2	7.19	23.3	Clear
			10/11/22	1220	24.2	3,450	0.345	2.2	6.94	95.1	Clear
	MW-50	Low Flow	4/12/22	1300	24.1	7,610	0.761	1.2	6.82	-6.2	Clear
			10/11/22	1430	24.7	6,620	0.662	2.6	6.85	52.1	Clear
	MW-52	Low Flow	4/13/22	1400	24.0	2,640	0.264	1.8	7.06	-79.0	Clear
			10/12/22	935	20.5	3,220	0.322	4.2	6.91	83.9	Clear
	MW-64	Low Flow	4/13/22	1425	25.5	2,540	0.254	0.7	6.92	-312.7	Clear, odor
			10/11/22	1545	27.5	2,460	0.246	4.7	6.91	-314.2	Clear
	MW-101	Low Flow	4/13/22	1445	23.1	1,624	0.162	1.4	7.03	-353.2	Clear
			10/11/22	1205	25.8	2,080	0.208	0.6	6.65	-372.8	Clear
	MW-102	Low Flow	4/13/22	1550	22.7	2,180	0.218	0.9	6.89	-338.6	Clear
			10/11/22	1705	24.5	2,290	0.229	1.7	6.91	-368.5	Clear
	MW-103	Low Flow	4/13/22	1045	23.6	13,430	1.343	1.7	7.14	-306.7	Clear
	MW-104	Low Flow	4/13/22	955	17.5	1,458	0.146	0.7	7.11	-281.6	Clear
			10/11/22	1410	25.7	1,534	0.153	0.8	7.13	-323.4	Clear

Table 2 - Well Purging and Water Quality Field Measurement Data

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 HF Sinclair Navajo Refining LLC, Artesia Refinery, Artesia, New Mexico

Area	Well	Purge Method ⁽¹⁾	Date	Time	Temperature (°C)	Specific Conductivity (umho/cm)	Specific Conductivity (S/m)	DO (mg/L)	pH (std units)	ORP (mV)	Field Observations of Purge Water ⁽²⁾
South Refinery	MW-105	Low Flow	4/13/22	1355	20.8	1,980	0.198	1.0	7.13	-402.5	Clear, odor
			10/11/22	825	23.1	1,034	0.103	1.0	6.14	-120.8	Clear
	MW-109	Low Flow	4/13/22	1200	24.0	2,560	0.256	1.9	7.46	-399.3	Clr, HC odor
			10/12/22	1140	23.6	3,020	0.302	2.7	7.08	-300.1	Clear
	MW-110	Low Flow	4/13/22	1300	24.1	1,549	0.155	1.8	7.35	-316.6	Clear
			10/12/22	1025	22.1	1,860	0.186	3.1	7.16	-121.6	Clear
	MW-139	Low Flow	4/12/22	1410	24.5	2,950	0.295	0.9	7.05	-190.4	Clear
			10/11/22	1725	21.6	3,530	0.353	2.6	6.80	-231.3	Clear
South RO Reject Field	RA-313	Grab	4/13/22	1145	22.7	1,702	0.170	4.1	8.09	118.3	Clear
	RW-4	Grab	4/13/22	1140	22.0	2,880	0.288	1.6	6.80	-303.9	Clear
	MW-114	Low Flow	4/13/22	855	21.5	2,856	0.286	2.2	6.82	95.6	Clear
			10/11/22	1730	22.7	3,440	0.344	2.1	6.69	46.6	Clear
	MW-115	Low Flow	4/13/22	1100	25.6	4,660	0.466	2.1	6.70	140.3	Clear
			10/11/22	1650	21.3	4,110	0.411	2.1	6.77	106.1	Clear
			4/12/22	1600	20.8	4,020	0.402	1.5	6.77	95.2	Clear
			10/12/22	1130	18.9	4,070	0.407	0.8	6.81	11.2	Clear
TEL	MW-49	Low Flow	4/13/22	1420	23.6	2,420	0.242	2.3	6.59	-313.8	Clear
			10/11/22	1250	24.5	2,470	0.247	0.8	6.67	-398.1	Clear
	TEL-4	Low Flow	4/12/22	925	23.8	2,740	0.274	1.0	6.70	-317.2	Clear
			10/12/22	855	23.9	3,630	0.363	0.7	6.60	-361.2	Clear, lt. sheen
TMD	MW-8	Low Flow	4/12/22	1700	20.4	6,060	0.606	0.9	6.81	172.7	Clear
	MW-16	Low Flow	4/12/22	1230	19.0	4,430	0.443	2.1	7.07	91.8	Clear
	MW-20	Low Flow	4/13/22	1600	22.6	4,540	0.454	1.7	6.76	21.0	Clear
	MW-21	Low Flow	4/12/22	1605	21.3	5,970	0.597	1.1	6.84	439.3	Clear
			10/11/22	1235	20.9	5,450	0.545	1.4	6.88	210.7	Clear
	MW-25	Low Flow	4/13/22	1010	19.2	16,750	1.675	1.4	7.48	97.8	Clear
	MW-26	Low Flow	4/12/22	1045	19.5	6,360	0.636	1.3	6.98	88.6	Clear
	MW-27	Low Flow	4/12/22	955	20.8	2,250	0.225	1.6	6.94	120.1	Clear
	MW-46R	Low Flow	4/12/22	1655	21.7	2,870	0.287	1.4	6.88	20.0	Clear
			10/12/22	1210	21.1	2,580	0.258	1.9	7.00	4.3	Clear
	MW-68	Low Flow	4/12/22	905	21.3	3,260	0.326	3.6	6.82	106.1	Clear
	MW-71	Low Flow	4/12/22	1540	20.4	6,540	0.654	2.0	6.88	132.9	Clear
	MW-89	Low Flow	4/12/22	1135	19.2	3,030	0.303	1.4	6.99	87.2	Clear
	NP-1	Low Flow	4/12/22	1625	21.6	4,450	0.445	1.8	6.72	182.3	Clear
			10/11/22	1310	20.3	4,440	0.444	1.9	6.77	58.7	Clear

Table 2 - Well Purging and Water Quality Field Measurement Data

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Area	Well	Purge Method ⁽¹⁾	Date	Time	Temperature (°C)	Specific Conductivity (umho/cm)	Specific Conductivity (S/m)	DO (mg/L)	pH (std units)	ORP (mV)	Field Observations of Purge Water ⁽²⁾
Up-Gradient	UG-1	Low Flow	4/11/22	1625	23.6	3,430	0.343	4.3	6.94	140.9	Clear
	UG-2	Low Flow	4/11/22	1530	23.5	2,260	0.226	6.4	7.18	146.4	Clear
	UG-3R	Bladder	4/11/22	1810	21.3	2,810	0.281	5.8	6.80	145.0	Clear
	UG-4	Low Flow	4/11/22	1710	21.6	3,980	0.398	2.4	6.75	136.8	Clear

⁽¹⁾ Purge Methods:

Low Flow = peristaltic pump with dedicated tubing, purged until parameters stabilized
Bladder = bladder pump with dedicated tubing, purged until parameters stabilized
Grab = irrigation well sample collected from tap or valve

Definitions:

°C = Degrees Celsius
DO = Dissolved Oxygen
mg/L = milligrams per liter
mV = milliVolts
ORP = oxidation/reduction potential
S/m = Siemens per meter
std units = standard pH units

⁽²⁾ Potential Explanations of Water Quality Observations:

"Odor" likely due to the presence of petroleum hydrocarbons
"Cloudy water" likely due to presence of suspended inorganic particles (silt, clay)
Dark, black, brown, yellow, gold, gray, orange, and "rusty" tints likely due to suspended clay/silt particles or microbial activity
"Particles" of varying color likely due to suspended clay/silt particles
"Orange algae" likely due to microbial activity

Table 3 - Groundwater Screening Levels and Selected Critical Groundwater Screening Levels

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Analyte	WQCC GW Human Health (20.6.2.3103.A)	WQCC GW Domestic (20.6.2.3103.B)	WQCC GW Irrigation (20.6.2.3103.C)	USEPA MCL	NMED Tap Water (Table A-1)	USEPA Tap Water	NMED TPH (Table 6-4)	CGWSL	CGWSL Source
TPH (mg/L)									
TPH - gasoline range organics							1.01E-02	1.01E-02	NMED TPH (Table 6-4)
TPH - diesel range organics							8.58E-02	8.58E-02	NMED TPH (Table 6-4)
TPH - diesel range organics (Evaporation Ponds)							1.67E-02	1.67E-02	NMED TPH (Table 6-4)
VOCs (mg/L)									
1,1,1-Trichloroethane	2.00E-01			2.00E-01				2.00E-01	WQCC GW Human Health (20.6.2.3103.A)
1,1,2,2-Tetrachloroethane	1.00E-02							1.00E-02	WQCC GW Human Health (20.6.2.3103.A)
1,1,1,2-Tetrachloroethane						5.70E-04		5.70E-04	USEPA Tap Water
1,1,2-Trichloroethane	5.00E-03			5.00E-03				5.00E-03	WQCC GW Human Health (20.6.2.3103.A)
1,1-Dichloroethane	2.50E-02							2.50E-02	WQCC GW Human Health (20.6.2.3103.A)
1,1-Dichloroethene	7.00E-03			7.00E-03				7.00E-03	WQCC GW Human Health (20.6.2.3103.A)
1,2-Dibromo-3-chloropropane				2.00E-04				2.00E-04	USEPA MCL
1,2-Dibromoethane (ethylene dibromide)	5.00E-05			5.00E-05				5.00E-05	WQCC GW Human Health (20.6.2.3103.A)
1,2-Dichloroethane	5.00E-03			5.00E-03				5.00E-03	WQCC GW Human Health (20.6.2.3103.A)
1,2-Dichloropropane	5.00E-03			5.00E-03				5.00E-03	WQCC GW Human Health (20.6.2.3103.A)
1,2,4-Trimethylbenzene						5.60E-02		5.60E-02	USEPA Tap Water
1,3,5-Trimethylbenzene						6.00E-02		6.00E-02	USEPA Tap Water
2-Butanone (methyl ethyl ketone)					5.56E+00			5.56E+00	NMED Tap Water (Table A-1)
2-Hexanone						3.80E-02		3.80E-02	USEPA Tap Water
2-Phenylbutane (sec-butylbenzene)						2.00E+00		2.00E+00	USEPA Tap Water
4-Methyl-2-Pentanone (methyl isobutyl ketone)					1.24E+00			1.24E+00	NMED Tap Water (Table A-1)
Acetone					1.41E+01			1.41E+01	NMED Tap Water (Table A-1)
Benzene	5.00E-03			5.00E-03				5.00E-03	WQCC GW Human Health (20.6.2.3103.A)
Bromodichloromethane				8.00E-02				8.00E-02	USEPA MCL
Bromoform				8.00E-02				8.00E-02	USEPA MCL
Bromomethane					7.54E-03			7.54E-03	NMED Tap Water (Table A-1)
Carbon Disulfide					8.10E-01			8.10E-01	NMED Tap Water (Table A-1)
Carbon tetrachloride	5.00E-03			5.00E-03				5.00E-03	WQCC GW Human Health (20.6.2.3103.A)
Chlorobenzene				1.00E-01				1.00E-01	USEPA MCL
Chloroethane (ethyl chloride)					2.09E+01			2.09E+01	NMED Tap Water (Table A-1)
Chloroform	1.00E-01			8.00E-02				8.00E-02	USEPA MCL
Chloromethane					2.03E-02			2.03E-02	NMED Tap Water (Table A-1)
cis-1,2-Dichloroethene	7.00E-02			7.00E-02				7.00E-02	WQCC GW Human Health (20.6.2.3103.A)
cis-1,3-Dichloropropene					4.71E-03			4.71E-03	NMED Tap Water (Table A-1)
Dibromochloromethane				8.00E-02				8.00E-02	USEPA MCL
Dichlorodifluoromethane					1.97E-01			1.97E-01	NMED Tap Water (Table A-1)
Ethylbenzene	7.00E-01			7.00E-01				7.00E-01	WQCC GW Human Health (20.6.2.3103.A)
Isopropylbenzene (cumene)					4.47E-01			4.47E-01	NMED Tap Water (Table A-1)
m-Xylene					1.93E-01			1.93E-01	NMED Tap Water (Table A-1)
Methyl acetate					1.99E+01			1.99E+01	NMED Tap Water (Table A-1)
Methylene chloride (dichloromethane)	5.00E-03			5.00E-03				5.00E-03	WQCC GW Human Health (20.6.2.3103.A)
Methyl tert-butyl ether		1.00E-01						1.00E-01	WQCC GW Domestic (20.6.2.3103.B)
n-Butylbenzene						1.00E+00		1.00E+00	USEPA Tap Water
n-Propylbenzene						6.60E-01		6.60E-01	USEPA Tap Water
Naphthalene	3.00E-02							3.00E-02	WQCC GW Human Health (20.6.2.3103.A)
o-Xylene					1.93E-01			1.93E-01	NMED Tap Water (Table A-1)
Styrene	1.00E-01			1.00E-01				1.00E-01	WQCC GW Human Health (20.6.2.3103.A)
tert-Butyl alcohol						1.50E-01		1.50E-01	USEPA Tap Water
Tetrachloroethene	5.00E-03			5.00E-03				5.00E-03	WQCC GW Human Health (20.6.2.3103.A)
Toluene	1.00E+00			1.00E+00				1.00E+00	WQCC GW Human Health (20.6.2.3103.A)
trans-1,2-Dichloroethene	1.00E-01			1.00E-01				1.00E-01	WQCC GW Human Health (20.6.2.3103.A)
trans-1,3-Dichloropropene								--	--
Trichloroethene	5.00E-03			5.00E-03				5.00E-03	WQCC GW Human Health (20.6.2.3103.A)
Trichlorofluoromethane					1.14E+00			1.14E+00	NMED Tap Water (Table A-1)
Vinyl chloride	2.00E-03			2.00E-03				2.00E-03	WQCC GW Human Health (20.6.2.3103.A)
Xylenes	6.20E-01			1.00E+01				6.20E-01	WQCC GW Human Health (20.6.2.3103.A)

Table 3 - Groundwater Screening Levels and Selected Critical Groundwater Screening Level

Table 3 - Groundwater Screening Levels and Selected Critical Groundwater Screening Levels

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Analyte	WQCC GW Human Health (20.6.2.3103.A)	WQCC GW Domestic (20.6.2.3103.B)	WQCC GW Irrigation (20.6.2.3103.C)	USEPA MCL	NMED Tap Water (Table A-1)	USEPA Tap Water	NMED TPH (Table 6-4)	CGWSL	CGWSL Source
Metals (mg/L)									
Aluminum			5.00E+00					5.00E+00	WQCC GW Irrigation (20.6.2.3103.C)
Arsenic	1.00E-02			1.00E-02				1.00E-02	WQCC GW Human Health (20.6.2.3103.A)
Barium	2.00E+00			2.00E+00				2.00E+00	WQCC GW Human Health (20.6.2.3103.A)
Beryllium	4.00E-03			4.00E-03				4.00E-03	WQCC GW Human Health (20.6.2.3103.A)
Boron			7.50E-01					7.50E-01	WQCC GW Irrigation (20.6.2.3103.C)
Cadmium	5.00E-03			5.00E-03				5.00E-03	WQCC GW Human Health (20.6.2.3103.A)
Chromium	5.00E-02			1.00E-01				5.00E-02	WQCC GW Human Health (20.6.2.3103.A)
Cobalt			5.00E-02					5.00E-02	WQCC GW Irrigation (20.6.2.3103.C)
Copper		1.00E+00		1.30E+00				1.00E+00	WQCC GW Domestic (20.6.2.3103.B)
Iron		1.00E+00						1.00E+00	WQCC GW Domestic (20.6.2.3103.B)
Lead	1.50E-02			1.50E-02				1.50E-02	WQCC GW Human Health (20.6.2.3103.A)
Manganese		2.00E-01						2.00E-01	WQCC GW Domestic (20.6.2.3103.B)
Mercury	2.00E-03			2.00E-03				2.00E-03	WQCC GW Human Health (20.6.2.3103.A)
Molybdenum			1.00E+00					1.00E+00	WQCC GW Irrigation (20.6.2.3103.C)
Nickel			2.00E-01					2.00E-01	WQCC GW Irrigation (20.6.2.3103.C)
Selenium	5.00E-02			5.00E-02				5.00E-02	WQCC GW Human Health (20.6.2.3103.A)
Silver	5.00E-02							5.00E-02	WQCC GW Human Health (20.6.2.3103.A)
Vanadium					6.31E-02			6.31E-02	NMED Tap Water (Table A-1)
Water Quality Parameters (mg/L, unless noted otherwise)									
Chloride		2.50E+02						2.50E+02	WQCC GW Domestic (20.6.2.3103.B)
Cyanide	2.00E-01			2.00E-01				2.00E-01	WQCC GW Human Health (20.6.2.3103.A)
Fluoride	1.60E+00			4.00E+00				1.60E+00	WQCC GW Human Health (20.6.2.3103.A)
Nitrate (NO ₃ as N)	1.00E+01			1.00E+01				1.00E+01	WQCC GW Human Health (20.6.2.3103.A)
pH (Std pH units)		6 to 9						0.00E+00	WQCC GW Human Health (20.6.2.3103.A)
Sulfate		6.00E+02						6.00E+02	WQCC GW Domestic (20.6.2.3103.B)
Total Dissolved Solids		1.00E+03						1.00E+03	WQCC GW Domestic (20.6.2.3103.B)
SVOCs (mg/L)									
1,1'-Biphenyl					3.71E-02			3.71E-02	NMED Tap Water (Table A-1)
1-Methylnaphthalene	3.00E-02							3.00E-02	WQCC GW Human Health (20.6.2.3103.A)
1,4 Dioxane					4.59E-03			4.59E-03	NMED Tap Water (Table A-1)
2,4-Dimethylphenol					3.54E-01			3.54E-01	NMED Tap Water (Table A-1)
2-Methylnaphthalene	3.00E-02							3.00E-02	WQCC GW Human Health (20.6.2.3103.A)
2-Methylphenol								0.00E+00	WQCC GW Human Health (20.6.2.3103.A)
Acenaphthene					5.35E-01			5.35E-01	NMED Tap Water (Table A-1)
Anthracene					1.72E+00			1.72E+00	NMED Tap Water (Table A-1)
Atrazine	3.00E-03			3.00E-03				3.00E-03	WQCC GW Human Health (20.6.2.3103.A)
Benzo(a)pyrene	2.00E-04			2.00E-04				2.00E-04	WQCC GW Human Health (20.6.2.3103.A)
Benzo(g,h,i)perylene								0.00E+00	WQCC GW Human Health (20.6.2.3103.A)
Bis(2-ethylhexyl)phthalate				6.00E-03				6.00E-03	USEPA MCL
Butylbenzylphthalate						1.60E-02		1.60E-02	USEPA Tap Water
Carbazole								0.00E+00	WQCC GW Human Health (20.6.2.3103.A)
Dibenzofuran						7.90E-03		7.90E-03	USEPA Tap Water
Diethyl phthalate					1.48E+01			1.48E+01	NMED Tap Water (Table A-1)
Di-n-butylphthalate					8.85E-01			8.85E-01	NMED Tap Water (Table A-1)
Fluoranthene					8.02E-01			8.02E-01	NMED Tap Water (Table A-1)
Fluorene					2.88E-01			2.88E-01	NMED Tap Water (Table A-1)
Naphthalene	3.00E-02							3.00E-02	WQCC GW Human Health (20.6.2.3103.A)
Phenanthrene					1.70E-01			1.70E-01	NMED Tap Water (Table A-1)
Phenol		5.00E-03			5.76E+00			5.76E+00	NMED Tap Water (Table A-1)
Pyrene					1.17E-01			1.17E-01	NMED Tap Water (Table A-1)

Table 3 - Groundwater Screening Levels and Selected Critical Groundwater Screening Level

Table 3 - Groundwater Screening Levels and Selected Critical Groundwater Screening Levels

2022 Annual Groundwater Monitoring Report
HF Sinclair Navajo Refining LLC, Artesia Refinery, Artesia, New Mexico

Analyte	WQCC GW Human Health (20.6.2.3103.A)	WQCC GW Domestic (20.6.2.3103.B)	WQCC GW Irrigation (20.6.2.3103.C)	USEPA MCL	NMED Tap Water (Table A-1)	USEPA Tap Water	NMED TPH (Table 6-4)	CGWSL	CGWSL Source
Other Parameters (mg/L, unless noted otherwise)									
Uranium	3.00E-02			3.00E-02				3.00E-02	WQCC GW Human Health (20.6.2.3103.A)
Polychlorinated Biphenyls	5.00E-04			5.00E-04				5.00E-04	WQCC GW Human Health (20.6.2.3103.A)

Definitions and Notes:

Blank cell indicates no standard is available

CGWSL = Critical Groundwater Screening Level

Heirarchy of selecting the CGWSL is as follows:

1. Lowest of either NM WQCC GW Standard (20.6.2.3103) or USEPA MCL.
2. If no NM WQCC GW Standard or USEPA MCL available, NMED Tap Water value.
3. If no NMED Tap Water value, USEPA Tap Water value, if available.
4. NMED TPH screening for "unknown oil" used for TPH-DRO.
5. NMED TPH screening value for "Diesel #2/New Crankase Oil" applied to TPH DRO samples collected from Evaporation Ponds.

NMAC = New Mexico Administrative Code

NMED = New Mexico Environment Department

NMED Tap Water = NMED Risk Assessment Guidance for Site Investigations and Remediation, November 2022, Table A-1, Tap Water Screening Level

NMED TPH = NMED Risk Assessment Guidance for Site Investigations and Remediation, November 2022, Table 6-4, TPH Groundwater Screening Levels

mg/L = Milligrams per Liter

pCi/L = PicoCuries per Liter

SVOC = Semivolatile Organic Compound

TPH = Total Petroleum Hydrocarbons

USEPA MCL = United States Environmental Protection Agency Maximum Contaminant Level from "Regional Screening Level (RSL) Summary Table", November 2022

USEPA Tap Water = United States Environmental Protection Agency Tap Water Screening Level from "Regional Screening Level (RSL) Summary Table", November 2022

VOC = Volatile Organic Compound

WQCC = New Mexico Water Quality Control Commission

WQCC GW Domestic = WQCC groundwater standard for domestic exposure, 20.6.2.3103.B NMAC

WQCC GW Human Health = WQCC groundwater standard for human health exposure, 20.6.2.3103.A NMAC

WQCC GW Irrigation = WQCC groundwater standard for irrigation exposure, 20.6.2.3103.C NMAC

Table 4A - Summary of Groundwater Analytical Data - Total Petroleum Hydrocarbons and Volatile Organic Compounds
2022 Annual Groundwater Monitoring Report
HF Sinclair Navajo Refining LLC, Artesia Refinery, Artesia, New Mexico

Analyte Group				TPH			Volatile Organic Compounds									
				GRO	DRO	DRO - EP	1,2,4-TMB	1,3,5-TMB	Benzene	Ethylbenzene	MTBE	Naphthalene	o-Xylene	TBA	Toluene	Total Xylenes
				TPH-GRO	TPH-DRO	TPH-DRO	95-63-6	108-67-8	71-43-2	100-41-4	1634-04-4	91-20-3	95-47-6	75-65-0	108-88-3	1330-20-7
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
				CGWSL	0.0101	0.0858	0.0167	0.0560	0.0600	0.00500	0.700	0.100	0.0300	0.193	0.150	1.00
CGWSL Source				NMED TPH			USEPA TW	USEPA TW	WQCC HH	WQCC HH	WQCC Dom	WQCC HH	WQCC TW	USEPA TW	WQCC HH	WQCC HH
Area	Well ID	Date	Dup													
Cross-Gradient	KWB-13	Apr-19			<0.0247		0.00191	<0.000387	<0.000331	<0.000384	<0.000367	0.00236 J4	<0.000341		<0.000412	<0.00106
	KWB-13	Jun-20			0.0396 J		<0.000322	<0.000104	0.000205 J	0.000234 J	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174
	KWB-13	Apr-21			0.0527 J		<0.000322	<0.000104	0.000162 J	0.000210 J	<0.000101	<0.00100	<0.000174		<0.000278	0.000438 J
	KWB-13	Apr-22			<0.0247		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174
	MW-136	Jun-20		0.326 v3	0.0924 J		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174
	MW-136	Oct-20		0.0320 J	0.0873 JB		<0.000322	<0.000104	<0.0000941	<0.000137	0.000122 J	<0.00100	<0.000174		<0.000278	<0.000174
	MW-136	Apr-21		<0.0314	0.110		<0.000322	<0.000104	<0.0000941	<0.000137	0.000430 J	<0.00100	<0.000174		<0.000278	<0.000174
	MW-136	Sep-21		<0.0314	0.0432 J		<0.000322	<0.000104	<0.0000941	<0.000137	0.000624 J	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174
	MW-136	Apr-22		<0.0314	0.0485 J		<0.000322	<0.000104	<0.0000941	<0.000137	0.000602 J	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174
	MW-136	Oct-22		0.0314 J	0.124		<0.000322	<0.000104	<0.0000941	<0.000137	0.000291 J	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174
	NP-5	Apr-15			0.0387 J		0.000804 J	<0.000390	<0.000330	<0.000380	<0.000370	<0.00100	<0.000340	<0.000370	<0.000780	<0.00110
	NP-5	Apr-17			<0.0247		<0.000373	<0.000387	<0.000331	<0.000384	<0.000367	<0.00100	<0.000341		<0.000412	<0.00106
	NP-5	Apr-19			<0.0247		<0.000373	<0.000387	<0.000331	<0.000384	<0.000367	<0.00100	<0.000341		<0.000412	<0.00106
	NP-5	Apr-21			0.0663 J		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174
	RA-3156	Apr-19					<0.000373	<0.000387	<0.000331	<0.000384	<0.000367	<0.00100 J4	<0.000341		<0.000412	<0.00106
	RA-3156	Jun-20					<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174
	RA-3156	Apr-21					<0.000322	<0.000104	<0.0000941	<0.000137	0.000124 J	<0.00100	<0.000174		<0.000278	<0.000174
	RA-3156	Apr-22					<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174
Evaporation Ponds	MW-1R	Apr-19				0.0756 J	<0.000373	<0.000387	<0.000331	<0.000384	<0.000367	<0.00100	<0.000341		<0.000412	<0.00106
	MW-1R	Jun-20			<0.0247		<0.000322	<0.000104 J4	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174
	MW-1R	Apr-21				0.124	<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174
	MW-1R	Apr-22				0.0957 J	<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100 J4	<0.000174	<0.00406	<0.000278	<0.000174
	MW-2A	Jun-20		0.0484 J		<0.0247	<0.000322	<0.000104 J4	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174
	MW-2A	Oct-20		<0.0314		0.153	<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174
	MW-2A	Apr-21		<0.0314		1.25	<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100 J4	<0.000174		<0.000278	<0.000174
	MW-2A	Sep-21		0.0423 J		0.181										
	MW-2A	Apr-22		0.0387 JB		0.0837 JB	<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174
	MW-2A	Oct-22		<0.0314		0.151										
	MW-3	Jun-20		<1.57		7.01	<0.00805	<0.00260	<0.00235	<0.00343	<0.00253	<0.0250	<0.00435		<0.00695	<0.00435
	MW-3	Jun-20	FD	0.691		7.98	<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174
	MW-3	Oct-20		4.06 JB		6.84	<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174
	MW-3	Oct-20	FD	0.491		7.08	<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174
	MW-3	Apr-21		0.681		7.71	<0.00805	<0.00260	<0.00235	<0.00343	<0.00253	<0.0250	<0.00435		<0.00695	<0.00435
	MW-3	Apr-21	FD	0.591		7.86	<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174
	MW-3	Sep-21		0.242		6.28										
	MW-3	Sep-21	FD	0.239		7.13										
	MW-3	Apr-22		0.446		6.46	<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174	0.00964	<0.000278	<0.000174
	MW-3	Apr-22	FD	<0.157		6.38	<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174	0.0140	<0.000278	<0.000174
	MW-3	Oct-22		0.394 B		8.39										
	MW-3	Oct-22	FD	0.398		8.21										
	MW-4A	Jun-20		0.377		4.07	<0.000322	<0.000104	<0.0000941	<0.000137	0.000195 J	<0.00100	<0.000174		<0.000278	0.000627 J
	MW-4A	Oct-20		0.586		4.93	0.000437 J	<0.000104	<0.0000941	<0.000137	0.000244 J	<0.00100	0.000202 J		<0.000278	0.00234 J
	MW-4A	Apr-21		0.620		5.71	0.000560 J	<0.000104	<0.0000941	<0.000137	0.000252 J	<0.00100 J4	<0.000174		<0.000278	0.000907 J
	MW-4A	Sep-21		0.291		4.50										
	MW-4A	Apr-22	</													

Table 4A - Summary of Groundwater Analytical Data - Total Petroleum Hydrocarbons and Volatile Organic Compounds

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HF Sinclair Navajo Refining LLC, Artesia Refinery, Artesia, New Mexico

Analyte Group				TPH			Volatile Organic Compounds										
				GRO	DRO	DRO - EP	1,2,4-TMB	1,3,5-TMB	Benzene	Ethylbenzene	MTBE	Naphthalene	o-Xylene	TBA	Toluene	Total Xylenes	
				TPH-GRO	TPH-DRO	TPH-DRO	95-63-6	108-67-8	71-43-2	100-41-4	1634-04-4	91-20-3	95-47-6	75-65-0	108-88-3	1330-20-7	
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
				CGWSL	CGWSL	CGWSL	CGWSL	CGWSL	CGWSL	CGWSL	CGWSL	CGWSL	CGWSL	CGWSL	CGWSL	CGWSL	
CGWSL Source				NMED TPH			USEPA TW	USEPA TW	WQCC HH	WQCC HH	WQCC Dom	WQCC HH	WQCC TW	USEPA TW	WQCC HH	WQCC HH	
Area	Well ID	Date	Dup														
Evaporation Ponds	MW-15	Apr-19		0.136 B		0.475	<0.000373	<0.000387	<0.000331	<0.000384	0.000549 J	<0.00100	<0.000341		<0.000412	<0.00106	
	MW-15	Jun-20		<0.0314		<0.0247	<0.000322	<0.000104 J4	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-15	Apr-21		0.0455 J		0.358	<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-15	Apr-22		0.0437 J		0.719	<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100 J4	<0.000174	<0.00406	<0.000278	<0.000174	
	MW-18A	Jun-20				0.408	<0.000322	<0.000104	<0.0000941	<0.000137	0.000734 J	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-18A	Oct-20				0.373 B	<0.000322	<0.000104	<0.0000941	<0.000137	0.000678 J	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-18A	Apr-21				0.518	<0.000322	<0.000104	<0.0000941	<0.000137	0.000522 J	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-18A	Sep-21				0.491											
	MW-18A	Apr-22				0.495	<0.000322	0.000327 J	0.000179 J	<0.000137	0.000636 J	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174	
	MW-18A	Oct-22				0.417											
	MW-18B	Apr-15		<0.0310		0.280	<0.000370	<0.000390	<0.000330	<0.000380	<0.000370	<0.00100	<0.000340	<0.000370	<0.000780	<0.00110	
	MW-18B	Apr-17		0.0932 J		0.287	<0.000373	<0.000387	<0.000331	<0.000384	<0.000367	<0.00100	<0.000341		<0.000412	<0.00106	
	MW-18B	Apr-19		0.105 B		0.230	<0.000373	<0.000387	<0.000331	<0.000384	<0.000367	<0.00100	<0.000341		<0.000412	<0.00106	
	MW-18B	Apr-21		0.0456 J		0.335	<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-22A	Jun-20		2.73		2.91	<0.000322	<0.000104	<0.0000941	<0.000137	0.00242	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-22A	Jun-20	FD	2.10		2.72	0.000411 J	<0.000104 J4	<0.0000941	<0.000137	0.00254	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-22A	Oct-20		1.68		3.45	<0.000322	<0.000104	<0.0000941	<0.000137	0.00286	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-22A	Oct-20	FD	2.13		3.13	<0.000322	<0.000104	<0.0000941	<0.000137	0.00273	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-22A	Apr-21		1.43		4.19	<0.000322	<0.000104	<0.0000941	<0.000137	0.00245	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-22A	Apr-21	FD	1.45		3.94	<0.000322	<0.000104	<0.0000941	<0.000137	0.00245	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-22A	Sep-21		0.539		1.16											
	MW-22A	Sep-21	FD	0.541		1.37											
	MW-22A	Apr-22		0.955		3.11	<0.000322	<0.000104	<0.0000941	<0.000137	0.00239	<0.00100 J4	<0.000174	0.00473 J	<0.000278	<0.000174	
	MW-22A	Apr-22	FD	0.989		3.11	<0.000322	<0.000104	<0.0000941	<0.000137	0.00231	<0.00100 J4	<0.000174	<0.00406	<0.000278	<0.000174	
	MW-22A	Oct-22		0.824		1.36											
	MW-22A	Oct-22	FD	0.750 Q		0.839											
	MW-22B	Apr-15		2.34		5.60	<0.000370	<0.000390	<0.000330	<0.000380	0.00634	<0.00100	<0.000340	<0.000370	<0.000780 UJ	<0.00110	
	MW-22B	Apr-17		1.76		5.25	<0.000373	<0.000387	<0.000331	<0.000384	0.00564	<0.00100	<0.000341		<0.000412	<0.00106	
	MW-22B	Apr-19		2.58		4.77	<0.000373	<0.000387	<0.000331	<0.000384	0.00582	<0.00100	<0.000341		<0.000412	<0.00106	
	MW-22B	Apr-21		1.97		5.69	<0.000322	<0.000104	<0.0000941	<0.000137	0.00462	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-70	Jun-20		1.29		0.833	<0.000322	<0.000104	<0.0000941	<0.000137	0.000119 J	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-70	Oct-20		2.28		0.805	<0.000322	<0.000104	<0.0000941	<0.000137	0.000124 J	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-70	Apr-21		1.57		1.05	<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-70	Sep-21		1.81		0.860											
	MW-70	Apr-22		1.18		1.10	<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174	
	MW-70	Oct-22		2.10		1.04											
	MW-72	Apr-19		0.0396 J		0.497	<0.000373	<0.000387	<0.000331	<0.000384	<0.000367	<0.00100 J3	<0.000341		<0.000412	<0.00106	
	MW-72	Jun-20		0.0544 J		0.303	<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-72	Apr-21		0.0371 JB		0.362	<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100 J4	<0.000174		<0.000278	<0.000174	
	MW-72	Apr-22		0.0505 JB		0.281 B	<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174	
	MW-73	Apr-19		0.0435 J		2.56	<0.000373	<0.000387	<0.000331	<0.000384	0.000992 J	<0.00100	<0.000341		<0.000412	<0.00106	
	MW-73	Jun-20		0.408		2.86	0.000589 J	<0.000104	<0.0000941	<0.000137	0.00105	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-73	Apr-21		0.426		3.48	0.000447 J	<0.000104	<0.0000941	<0.000137	0.00102	<0.00100 J4	<0.000174		<0.000278	<0.000174	
	MW-73	Apr-22		0.363 B		2.17	0.000695 J	<0.000104	<0.0000941	<0.000137	0.000576 J	<0.00100	<0.000174	0.00677	<0.000278	<0.000174	
	MW-74	Jun-20		0.490		21.9	0.000772 J	<0.000104	<0.0000941	<0.000137	0.000294 J	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-74	Oct-20		1.64		15.6	0.00157	0.000124 J	<0.0000941	<0.000137	0.000761 J	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-74	Apr-21		1.47		15.9	0.000857 J	<									

Table 4A - Summary of Groundwater Analytical Data - Total Petroleum Hydrocarbons and Volatile Organic Compounds

2022 Annual Groundwater Monitoring Report
HF Sinclair Navajo Refining LLC, Artesia Refinery, Artesia, New Mexico

Analyte Group				TPH			Volatile Organic Compounds									
				GRO	DRO	DRO - EP	1,2,4-TMB	1,3,5-TMB	Benzene	Ethylbenzene	MTBE	Naphthalene	o-Xylene	TBA	Toluene	Total Xylenes
				TPH-GRO	TPH-DRO	TPH-DRO	95-63-6	108-67-8	71-43-2	100-41-4	1634-04-4	91-20-3	95-47-6	75-65-0	108-88-3	1330-20-7
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
				CGWSL	0.0101	0.0858	0.0167	0.0560	0.0600	0.00500	0.700	0.100	0.0300	0.193	0.150	1.00
CGWSL Source				NMED TPH			USEPA TW	USEPA TW	WQCC HH	WQCC HH	WQCC Dom	WQCC HH	WQCC TW	USEPA TW	WQCC HH	WQCC HH
Area	Well ID	Date	Dup													
Evaporation Ponds	MW-87	Jun-20		<0.0314		0.260	<0.000322	<0.000104	<0.0000941	<0.000137	0.000725 J	<0.00100	<0.000174		<0.000278	<0.000174
	MW-87	Oct-20		0.0469 JB		0.270 B	<0.000322	<0.000104	<0.0000941	<0.000137	0.000777 J	<0.00100	<0.000174		<0.000278	<0.000174
	MW-87	Apr-21		<0.0314		0.371	<0.000322	<0.000104	<0.0000941	<0.000137	0.000558 J	<0.00100	<0.000174		<0.000278	<0.000174
	MW-87	Sep-21		<0.0314		0.386										
	MW-87	Apr-22		<0.0314		0.386	<0.000322	<0.000104	<0.0000941	<0.000137	0.000586 J	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174
	MW-87	Oct-22		<0.0314		0.282										
	MW-88	Jun-20		0.0434 J		0.317	<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174
	MW-88	Oct-20		0.0806 JB		0.405	<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174
	MW-88	Apr-21		0.0750 JB		0.410	<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100 J4	<0.000174		<0.000278	<0.000174
	MW-88	Sep-21		0.0602 J		0.421										
	MW-88	Apr-22		<0.0314		0.458	<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100 J4	<0.000174	<0.00406	<0.000278	<0.000174
	MW-88	Oct-22		0.0489 J		0.460										
	MW-120	Jun-20		0.0458 J		0.262	<0.00161	<0.000520	<0.000471	<0.000685	<0.000505	<0.00500	<0.000870		<0.00139	<0.000870
	MW-120	Oct-20		<0.0314		0.402	<0.00161	<0.000520	<0.000471	<0.000685	<0.000505	<0.00500	<0.000870		<0.00139	<0.000870
	MW-120	Apr-21		0.0797 J		0.614 B	<0.00161	<0.000520	<0.000471	<0.000685	<0.000505	<0.00500	<0.000870		<0.00139	<0.000870
	MW-120	Sep-21		0.0867 J		0.346	<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174
	MW-120	Apr-22		0.0765 JB		0.240	<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100 J4	<0.000174	<0.00406	<0.000278	<0.000174
	MW-120	Oct-22		0.0449 J		0.640	<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174
	MW-121	Jun-20		<0.0314		0.204	<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174
	MW-121	Oct-20		<0.0314		0.268	<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174
	MW-121	Apr-21		<0.0314		0.368 B	<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174
	MW-121	Sep-21		<0.0314		0.212										
	MW-121	Apr-22		<0.0314		0.115	<0.000322	<0.000104	0.000159 J	<0.000137	<0.000101	<0.00100 J4	<0.000174	0.00915	<0.000278	<0.000174
	MW-121	Oct-22		<0.0314		0.245										
	MW-122	Jun-20		<1.57		0.0398 J	<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174
	MW-122	Oct-20		<1.57		0.122	<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174
	MW-122	Apr-21		<0.0314		0.0845 J	<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100 J4	<0.000174		<0.000278	<0.000174
	MW-122	Sep-21		<0.0314		0.0810 J										
	MW-122	Apr-22		0.0541 JB		0.202 B	<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174
	MW-122	Oct-22		<0.0314		0.165										
	MW-123	Jun-20		2.03		2.01	<0.000322	<0.000104 J4	<0.0000941	<0.000137	0.00149	<0.00100	<0.000174		<0.000278	<0.000174
	MW-123	Oct-20		1.30		2.29	<0.000322	<0.000104	<0.0000941	<0.000137	0.00174	<0.00100	<0.000174		<0.000278	<0.000174
	MW-123	Apr-21		1.24		2.51	<0.000322	<0.000104	<0.0000941	<0.000137	0.00153	<0.00100	<0.000174		<0.000278	<0.000174
	MW-123	Sep-21		0.989		2.35										
	MW-123	Apr-22		0.956		2.14	<0.000322	<0.000104	<0.0000941	<0.000137	0.00164	<0.00100 J4	<0.000174	<0.00406	<0.000278	<0.000174
	MW-123	Oct-22		0.793		2.09										
	MW-124	Jun-20		<0.0314		<0.0247	<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174
	MW-124	Oct-20		<0.0314		0.0406 JB	<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174
	MW-124	Apr-21		<0.0314		0.0508 J	<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174
	MW-124	Sep-21		<0.0314		0.0518 J										
	MW-124	Apr-22		<0.0314		0.0566 J	<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100 J4	<0.000174	<0.00406	<0.000278	<0.000174
	MW-124	Oct-22		<0.0314		0.0283 J										
	OCD-1R	Jun-20		<0.0314		0.110	<0.000322	<0.000104 J4	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174
	OCD-1R	Oct-20		0.0461 JB		0.117	<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174
	OCD-1R	Apr-21		<0.0314		0.174	<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174
	OCD-1R	Sep-21		<0.0314		0.184										
	OCD-1R	Apr-22		0.0387 JB		0.176	<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.				

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Analyte Group				TPH			Volatile Organic Compounds										
				GRO	DRO	DRO - EP	1,2,4-TMB	1,3,5-TMB	Benzene	Ethylbenzene	MTBE	Naphthalene	o-Xylene	TBA	Toluene	Total Xylenes	
				TPH-GRO	TPH-DRO	TPH-DRO	95-63-6	108-67-8	71-43-2	100-41-4	1634-04-4	91-20-3	95-47-6	75-65-0	108-88-3	1330-20-7	
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
				CGWSL	CGWSL	CGWSL	CGWSL	CGWSL	CGWSL	CGWSL	CGWSL	CGWSL	CGWSL	CGWSL	CGWSL	CGWSL	
CGWSL Source				NMED TPH			USEPA TW	USEPA TW	WQCC HH	WQCC HH	WQCC Dom	WQCC HH	WQCC TW	USEPA TW	WQCC HH	WQCC HH	
Area	Well ID	Date	Dup														
Field East of Refinery	KWB-7	Jun-20			7.29		0.0876	<0.000104	0.0545	0.00936	0.00932	0.00822	0.00226		0.000536 J	0.0413	
	KWB-7	Oct-20			1.05		0.00287	<0.000104	0.00789	0.00262	0.00365	<0.00100	0.000402 J		<0.000278	0.00289 J	
	KWB-7	Apr-21			1.94		0.212	0.00556	1.01	0.459	0.00489	0.0306	0.0116		0.0255	0.179	
	KWB-7	Sep-21			1.37		0.200	0.000709 J	0.0131	0.331	0.00580	0.0108	0.00582	0.0287	0.00322	0.0822	
	KWB-7	Apr-22			1.07		0.00243	<0.000104	0.190	0.00103	0.00646	0.00138 J	0.000254 J	0.0191	0.000657 J	0.00128 J	
	KWB-7	Oct-22			2.14		0.00146	0.000299 JB	0.00172	0.00122	0.00469	0.00143 JB	<0.000174	<0.00406	<0.000278	<0.000174	
	KWB-8	Oct-16			3.02		0.170 J	<0.0774	11.5	0.828	<0.0734	<0.200 J4	0.150 J		1.48	1.16	
	KWB-8	Apr-17			3.41		0.380	0.0863 J	5.62	1.24	0.129	0.141 J	0.145		0.747	2.07	
	KWB-8	Oct-17			3.30		0.114	0.0225	12.5	0.617	0.134 v3	0.0519	0.0133		0.336	0.795	
	KWB-8	Oct-20			6.80		0.833	0.191 J	17.8	2.89	0.0230 J	0.539 J	0.139 J		1.08	4.19	
	KWB-10R	Apr-17			4.01		0.360	0.0907	4.95	0.505	3.65	0.156 J	0.198		0.0605	0.914	
	KWB-10R	Oct-17			5.18		0.302	0.0759	7.06	0.530	5.41	0.152	0.112 J		0.0588	0.767	
	KWB-10R	Apr-18			3.23		0.214 J	<0.0968	3.06	0.354	2.74	<0.250	0.0922 J		<0.103	0.549 J	
	KWB-10R	Oct-18			3.35		0.215 J	<0.0968	3.81	0.238 J	4.12	<0.250	<0.0852		<0.103	<0.265	
	KWB-11A	Jun-20		0.444	2.28		0.0486	<0.000104	0.000492 J	0.000576 J	0.00359	<0.00100	<0.000174		<0.000278	<0.000174	
	KWB-11A	Oct-20		0.0992 J	0.376		0.00151	<0.000104	0.00234	<0.000137	0.00307	<0.00100	<0.000174		<0.000278	<0.000174	
	KWB-11A	Sep-21		0.994	1.35		0.0190	0.000835 J	0.0512	0.0382	0.00221	0.00154 J	0.000426 J	0.0932	0.000984 J	0.0213	
	KWB-11A	Oct-22		0.153	0.341		0.000699 J	<0.000104	0.0129	0.000721 J	0.00158	<0.00100	<0.000174	0.0114	<0.000278	<0.000174	
	KWB-11B	Jun-20		<0.0314	0.0514 J		<0.000322	<0.000104	<0.0000941	<0.000137	0.00140	<0.00100	<0.000174		<0.000278	<0.000174	
	KWB-11B	Oct-20		<0.0314	0.0956 J		<0.000322	<0.000104	0.00192	<0.000137	0.00156	<0.00100	<0.000174		<0.000278	<0.000174	
	KWB-11B	Apr-21		<0.0314	0.0356 J		<0.000322	<0.000104	<0.0000941	<0.000137	0.00105	<0.00100	<0.000174		<0.000278	<0.000174	
	KWB-11B	Sep-21		<0.0314	0.0363 J		<0.000322	<0.000104	0.0000957 J	0.000419 J	0.00152	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174	
	KWB-11B	Apr-22		<0.0314	0.0827 J		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174	
	KWB-11B	Oct-22		<0.0314	0.0733 J		<0.000322	<0.000104	0.000106 J	<0.000137	0.00145	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174	
	KWB-12A	Jun-20		<0.0314	0.0477 J		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174	
	KWB-12A	Oct-20		0.0364 J	<0.0247		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174	
	KWB-12A	Sep-21		<0.0314	<0.0247		0.000476 J	<0.000104	0.000531 J	0.000527 J	<0.000101	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174	
	KWB-12A	Oct-22		<0.0314	0.0451 J		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174	
	KWB-12B	Jun-20		<0.0314	0.0305 J		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174	
	KWB-12B	Jun-20	FD	0.0359 JB	0.0415 J		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174	
	KWB-12B	Oct-20		0.0358 J	<0.0247		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174	
	KWB-12B	Oct-20	FD	<0.0314	0.0684 J		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174	
	KWB-12B	Apr-21		<0.0314	0.0955 J		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174	
	KWB-12B	Apr-21	FD	0.0590 J	0.0537 J		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174	
	KWB-12B	Sep-21		<0.0314	<0.0247		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174	
	KWB-12B	Sep-21	FD	<0.0314	<0.0247		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174	
	KWB-12B	Apr-22		<0.0314	<0.0247		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174	
	KWB-12B	Apr-22	FD	<0.0314	<0.0247		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174	
	KWB-12B	Oct-22		<0.0314	<0.0247		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174	
	KWB-12B	Oct-22	FD	<0.0314	<0.0247		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174	
	KWB-P4	Apr-15			0.0820 J		<0.000370	<0.000390	<0.000330	<0.000380	<0.000370	<0.00100	<0.000340	<0.000370	<0.000780	<0.00110	
	KWB-P4	Apr-17			0.0526 J		<0.000373	<0.000387	<0.000331	<0.000384	<0.000367	<0.00100	<0.000341		<0.000412	<0.00106	
	KWB-P4	Apr-19			0.0361 J		<0.000373	<0.000387	<0.000331	<0.000384	<0.000367	<0.00100 J4	<0.000341		<0.000412	<0.00106	
	KWB-P4	Apr-21			0.0330 J	</											

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				TPH-GRO	TPH-DRO	TPH-DRO	95-63-6	108-67-8	71-43-2	100-41-4	1634-04-4	91-20-3	95-47-6	75-65-0	108-88-3	1330-20-7	
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
				CGWSL	CGWSL	CGWSL	CGWSL	CGWSL	CGWSL	CGWSL	CGWSL	CGWSL	CGWSL	CGWSL	CGWSL	CGWSL	
CGWSL Source				NMED TPH			USEPA TW	USEPA TW	WQCC HH	WQCC HH	WQCC Dom	WQCC HH	WQCC TW	USEPA TW	WQCC HH	WQCC HH	
Area	Well ID	Date	Dup														
Field East of Refinery	MW-131	Apr-17		6.81	1.77		0.0137	0.00348	3.09	0.0532	3.99	0.0295	0.0406		0.153	0.114	
	MW-131	Oct-17		4.95	1.58		<0.0932	0.00174	1.39	<0.0960	5.25	0.0303	<0.0852		0.0627	<0.265	
	MW-131	Oct-19		8.71	1.46		0.167	0.0432	0.796	0.0255	4.95	0.0314	0.312		0.232	0.993	
	MW-131	Jun-20		8.68	1.83		0.110	0.0408 J	0.907	0.0171 J	2.91	<0.0500	0.242		0.150	0.786	
	MW-133	Nov-14		9.40	2.80		0.280	0.0530 J	0.620	0.300	5.60	<0.100	0.0380 J	<0.0370	0.100 J	0.220 J	
	MW-133	Apr-15		11.3	3.10		0.138	<0.0390	0.788	0.199	6.67	<0.100	<0.0340	<0.0370	<0.0780	<0.110	
	MW-134	Jun-20		0.0330 JB	0.0820 J		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-134	Jun-20	FD	0.0332 J	<0.0247		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-134	Oct-20		<0.0314	0.107 B		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-134	Oct-20	FD	<0.0314	0.129		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-134	Apr-21		0.0419 J	0.120		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-134	Apr-21	FD	0.101	0.0992 J		<0.000322	<0.000104	0.000102 J	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-134	Sep-21		<0.0314	0.297		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174	
	MW-134	Sep-21	FD	<0.0314	0.304		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174	
	MW-134	Apr-22		<0.0314	0.0989 J		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174	
	MW-134	Apr-22	FD	<0.0314	0.104		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174	
	MW-134	Oct-22		<0.0314	0.108		<0.000322	<0.000104	0.00235	0.000544 J	<0.000101	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174	
	MW-134	Oct-22	FD	<0.0314	0.117		<0.000322	<0.000104	0.00117	0.000280 J	<0.000101	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174	
	MW-135	Jun-20		0.0425 J	0.0380 J		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-135	Oct-20		<0.0314	0.0723 JB		<0.000322	<0.000104	0.00250	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-135	Apr-21		<0.0314	0.0720 J		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-135	Sep-21		<0.0314	<0.0247		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	0.00174 J	<0.000174	<0.00406	<0.000278	0.000707 J	
	MW-135	Apr-22		<0.0314	<0.0247		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174	
	MW-135	Oct-22		<0.0314	0.0437 J		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174	
	MW-145	Oct-20					<0.000322	<0.000104	<0.0000941	<0.000137	0.000496 J	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-145	Oct-20	FD				<0.000322	<0.000104	<0.0000941	<0.000137	0.000507 J	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-145	Apr-21		<0.0314	0.288		<0.000322	<0.000104	<0.0000941	<0.000137	0.000546 J	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-145	Sep-21		<0.0314	0.302		<0.000322	<0.000104	<0.0000941	<0.000137	0.000998 J	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174	
	MW-145	Apr-22		<0.0314	0.133		<0.000322	<0.000104	<0.0000941	<0.000137	0.000832 J	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174	
	MW-145	Oct-22		<0.0314	0.225		<0.000322	<0.000104	<0.0000941	<0.000137	0.00101	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174	
	MW-146	Oct-20					<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-146	Apr-21		<0.0314	0.0733 J		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-146	Sep-21		<0.0314	0.0874 J		<0.000322	<0.000104	<0.0000941	<0.000137	0.000125 J	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174	
	MW-146	Sep-21	FD	<0.0314	0.0993 J		<0.000322	<0.000104	<0.0000941	<0.000137	0.000105 J	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174	
	MW-146	Apr-22		<0.0314	<0.0247		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174	
	MW-146	Apr-22	FD	<0.0314	0.0918 J		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174	
	MW-146	Oct-22		<0.0314	0.0433 J		<0.000322	<0.000104	<0.0000941	<0.000137	0.000213 J	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174	
	MW-146	Oct-22	FD	<0.0314	0.0341 J		<0.000322	<0.000104	<0.0000941	<0.000137	0.000211 J	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174	
	MW-147	Oct-20					<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-147	Apr-21		<0.0314	<0.0247		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-147	Sep-21		<0.0314	0.0884 J		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174	
	MW-147	Apr-22		<0.0314.													

Table 4A - Summary of Groundwater Analytical Data - Total Petroleum Hydrocarbons and Volatile Organic Compounds

2022 Annual Groundwater Monitoring Report
HF Sinclair Navajo Refining LLC, Artesia Refinery, Artesia, New Mexico

Analyte Group				TPH			Volatile Organic Compounds									
				GRO	DRO	DRO - EP	1,2,4-TMB	1,3,5-TMB	Benzene	Ethylbenzene	MTBE	Naphthalene	o-Xylene	TBA	Toluene	Total Xylenes
				TPH-GRO	TPH-DRO	TPH-DRO	95-63-6	108-67-8	71-43-2	100-41-4	1634-04-4	91-20-3	95-47-6	75-65-0	108-88-3	1330-20-7
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
				CGWSL	0.0101	0.0858	0.0167	0.0560	0.0600	0.00500	0.700	0.100	0.0300	0.193	0.150	1.00
CGWSL Source				NMED TPH			USEPA TW	USEPA TW	WQCC HH	WQCC HH	WQCC Dom	WQCC HH	WQCC TW	USEPA TW	WQCC HH	WQCC HH
Area	Well ID	Date	Dup													
NCL	MW-56	Apr-19			0.583		<0.000373	<0.000387	<0.000331	<0.000384	0.00208	<0.00100	<0.000341		<0.000412	<0.00106
	MW-56	Jun-20			0.110		<0.000322	<0.000104	<0.0000941	<0.000137	0.000339 J	<0.00100	<0.000174		<0.000278	<0.000174
	MW-56	Apr-21			0.175		<0.000322	<0.000104	<0.0000941	<0.000137	0.000138 J	<0.00100	<0.000174		<0.000278	<0.000174
	MW-56	Apr-22			0.197		<0.000322	<0.000104	<0.0000941	<0.000137	0.000112 J	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174
	MW-108	Jun-20			2.79		0.0128	0.00213 J	0.235	0.00278 J	<0.000505	<0.00500 J4	0.00120 J		0.00293 J	0.0415
	MW-108	Oct-20			3.18		0.00527	0.000782 J	0.100	<0.000685	<0.000505	<0.00500	<0.000870		0.00141 J	0.0176
	MW-108	Apr-21			4.44		0.00750	0.000774 J	0.200	0.00278 J	<0.000505	<0.00500	<0.000870		0.00286 J	0.0313
	MW-108	Sep-21			2.90		0.00684 J	<0.00104	0.141	<0.00137	0.00231 J	<0.0100	<0.00174	<0.0406	<0.00278	0.0194 J
	MW-108	Apr-22			2.83		0.00119	<0.000104	0.0819	0.000543 J	<0.000101	<0.00100 J4	0.000211 J	<0.00406	0.000503 J	0.00407
	MW-108	Oct-22			3.10		0.000811 J	<0.000104	0.0702	0.000558 J	<0.000101	<0.00100	0.000415 J	<0.00406	0.000557 J	0.00308
	NCL-31	Jun-20			0.494		0.000542 J	0.000195 J	<0.0000941	0.000241 J	<0.000101	<0.00100 J4	0.000287 J		<0.000278	0.000954 J
	NCL-31	Oct-20			0.587		0.000771 J	0.000160 J	<0.0000941	0.000275 J	<0.000101	<0.00100	0.000396 J		<0.000278	0.00123 J
	NCL-31	Apr-21			0.974		0.00249	0.000458 J	<0.0000941	0.000613 J	<0.000101	0.00252 J	0.000352 J		<0.000278	0.00128 J
	NCL-31	Sep-21			0.720		0.000439 J	<0.000104	<0.0000941	<0.000137	<0.000101	0.00185 J	<0.000174	<0.00406	<0.000278	<0.000174
	NCL-31	Apr-22			0.469		0.000623 J	0.000135 J	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174
	NCL-31	Oct-22			0.457		0.000386 J	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174
	NCL-32	Jun-20			0.533		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100 J4	<0.000174		<0.000278	<0.000174
	NCL-32	Oct-20			0.800		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174
	NCL-32	Apr-21			0.984		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174
	NCL-32	Sep-21			1.56		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174
	NCL-32	Apr-22			0.962		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174
	NCL-32	Oct-22			3.46		0.000461 J	0.000111 J	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174
	NCL-33	Jun-20			7.21		<0.000322	<0.000104	<0.0000941	<0.000137	0.000208 J	<0.00100 J4	<0.000174		<0.000278	<0.000174
	NCL-33	Oct-20			8.54		<0.000322	<0.000104	<0.0000941	<0.000137	0.000230 J	<0.00100	<0.000174		<0.000278	<0.000174
	NCL-33	Apr-21			17.3		<0.000322	<0.000104	<0.0000941	<0.000137	0.000449 J	<0.00100	<0.000174		<0.000278	<0.000174
	NCL-33	Sep-21			10.2		<0.000322	<0.000104	<0.0000941	<0.000137	0.000377 J	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174
	NCL-33	Apr-22			12.6		<0.000322	<0.000104	<0.0000941	<0.000137	0.000495 J	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174
	NCL-33	Oct-22			13.0		<0.000322	<0.000104	<0.0000941	<0.000137	0.000516 J	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174
	NCL-34A	Oct-18			7.41		0.00612 J	<0.00387	1.11	0.00672 J	<0.00367	<0.0100	<0.00341		<0.00412	0.0266 J
	NCL-34A	Apr-19			6.59		<0.00746	<0.00774	0.479	<0.00768	<0.00734	<0.0200 J3J4	<0.00682		<0.00824	<0.0212
	NCL-34A	Oct-19			5.90		0.00369 J	0.00207 J	0.562	0.00677	<0.00184	<0.00500	<0.00170		<0.00206	0.0175
	NCL-34A	Jun-20			6.58		0.0113 J	0.00286 J	1.10	0.00476 J	<0.00202	<0.0200 J4	<0.00348		<0.00556	0.0335 J
	NCL-44	Jun-20			4.52		<0.000322	<0.000104	<0.0000941	<0.000137	0.000383 J	<0.00100 J4	<0.000174		<0.000278	<0.000174
	NCL-44	Oct-20			5.12		<0.000322	<0.000104	<0.0000941	<0.000137	0.000412 J	<0.00100	<0.000174		<0.000278	<0.000174
	NCL-44	Apr-21			5.52		<0.000322	<0.000104	<0.0000941	<0.000137	0.000426 J	<0.00100	<0.000174		<0.000278	<0.000174
	NCL-44	Sep-21			3.77		<0.000322	<0.000104	<0.0000941	<0.000137	0.000313 J	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174
	NCL-44	Apr-22			3.70		<0.000322	<0.000104	<0.0000941	<0.000137	0.000327 J	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174
	NCL-44	Oct-22			3.07		<0.000322	<0.000104	<0.0000941	<0.000137	0.000401 J	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174
	NCL-49	Jun-20			0.0917 J		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174
	NCL-49	Jun-20	FD		0.0640 J		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174
	NCL-49	Oct-20			0.0702 J		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174
	NCL-49	Oct-20	FD		0.0750 J		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<			

Table 4A - Summary of Groundwater Analytical Data - Total Petroleum Hydrocarbons and Volatile Organic Compounds

2022 Annual Groundwater Monitoring Report
HF Sinclair Navajo Refining LLC, Artesia Refinery, Artesia, New Mexico

Analyte Group				TPH			Volatile Organic Compounds										
				GRO	DRO	DRO - EP	1,2,4-TMB	1,3,5-TMB	Benzene	Ethylbenzene	MTBE	Naphthalene	o-Xylene	TBA	Toluene	Total Xylenes	
				TPH-GRO	TPH-DRO	TPH-DRO	95-63-6	108-67-8	71-43-2	100-41-4	1634-04-4	91-20-3	95-47-6	75-65-0	108-88-3	1330-20-7	
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
				CGWSL	CGWSL	CGWSL	CGWSL	CGWSL	CGWSL	CGWSL	CGWSL	CGWSL	CGWSL	CGWSL	CGWSL	CGWSL	
CGWSL Source	NMED TPH			USEPA TW	USEPA TW	WQCC HH	WQCC HH	WQCC Dom	WQCC HH	WQCC TW	USEPA TW	WQCC HH	WQCC HH				
Area	Well ID	Date	Dup														
North Refinery	MW-90	Jun-20		0.412	3.69		<0.000322	<0.000104	0.00305	0.000290 J	<0.000101	<0.00100	0.000299 J		0.000350 J	0.000299 J	
	MW-90	Oct-20		0.498	3.99		<0.000322	<0.000104	0.00334	0.000310 J	<0.000101	<0.00100	0.000349 J		0.000323 J	0.000349 J	
	MW-90	Apr-21		0.477	4.25		<0.000322	<0.000104	0.00164	0.000228 J	<0.000101	<0.00100	0.000225 J		<0.000278	0.000225 J	
	MW-90	Sep-21		0.384	3.31		<0.00322	<0.00104	0.00730 J	<0.00137	<0.00101	<0.0100	<0.00174	<0.0406 J3	<0.00278	<0.00174	
	MW-90	Apr-22		0.399	3.92		<0.000322	<0.000104	0.00495	0.000282 J	<0.000101	<0.00100	0.000381 J	<0.00406	0.000359 J	0.000381 J	
	MW-90	Oct-22		0.396	4.23		<0.000322	<0.000104	0.00213	0.000277 J	<0.000101	<0.00100	0.000280 J	<0.00406	0.000385 J	<0.000174	
	MW-91	Oct-18		16.7	11.8		0.182	0.0510 J	2.86	0.210	<0.0367	<0.100	0.164		1.24	0.716	
	MW-91	Apr-19		13.8	15.8		0.216	0.0571 J	2.89	0.481	<0.0367	<0.100	0.187		1.94	0.799	
	MW-91	Oct-19		34.8 B	10.8		0.239	0.0675 J	4.07	1.48	<0.0367	<0.100	0.548		7.07 J4	2.12	
	MW-91	Jun-20		36.2	11.5		0.234	0.0671 J	4.12	1.85	<0.0101	<0.100	0.649		6.95	2.50	
	MW-92	Apr-16		5.50	20.4		0.0588	0.0174	2.87	0.462	0.113	0.224 J	0.0268		0.0173	0.188	
	MW-92	Oct-16		6.05	22.8		0.0308	0.00835 J	2.05	0.400	0.134	0.174	0.0151 J		<0.0156	0.110	
	MW-93	Apr-17		3.73	7.89		0.148	0.0236 J	0.633	<0.00960	<0.00918	0.0422 J	<0.00852		<0.0103	0.326	
	MW-93	Apr-18		3.59	5.05		0.116	0.0260	0.857	0.00738	<0.000367	0.0256	0.00452		0.00797	0.336	
	MW-93	Apr-19		2.82	7.92		0.187	0.0356	0.673	0.00962	<0.000367	0.0482	0.00409		0.00748	0.303	
	MW-93	Jun-20		6.28	8.54		0.111	0.0243	1.21	0.00622 J	<0.00202	0.0519 J	<0.00348		0.0123 J	0.296	
	MW-94	Oct-15		6.12	25.6		0.432	0.0857	0.339	0.509	0.798	0.202	0.360	<0.00372	0.553	0.574	
	MW-94	Apr-16		7.91	8.69		0.489	0.100	0.417	0.553	0.621	0.228 J	0.387		0.687	0.615	
	MW-94	Oct-16		6.83	9.76		0.458	0.0917	0.297	0.564	2.01	0.128	0.390		0.468	0.592	
	MW-94	Apr-17		10.2	9.96		0.398	0.0785	0.284	0.432	0.958	0.174	0.292		0.435	0.460	
	MW-95	Apr-17		0.0826 J	6.96		<0.000373	<0.000387	<0.000331	<0.000384	<0.000367	<0.00100	<0.000341		<0.000412	<0.00106	
	MW-95	Apr-18		<0.0314	3.68		<0.000373	<0.000387	<0.000331	<0.000384	<0.000367	<0.00100	<0.000341		<0.000412	<0.00106	
	MW-95	Apr-19		<0.0314	7.34		<0.000373	<0.000387	<0.000331	<0.000384	<0.000367	<0.00100	<0.000341		<0.000412	<0.00106	
	MW-95	Jun-20		0.162 B	6.29		<0.000322	<0.000104	0.000603 J	0.000196 J	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-96	Jun-20		30.4	8.28		<0.0805	<0.0260	<0.0235	<0.0343	37.6	<0.250	<0.0435		<0.0695	<0.0435	
	MW-96	Oct-20		71.6	6.91		<0.0805	<0.0260	0.0424 J	<0.0343	40.5	<0.250	<0.0435		<0.0695	<0.0435	
	MW-96	Sep-21		14.5	8.33		0.0116	0.00109 J	0.00122 J	0.00320 J	29.5	0.0248 J	0.00179 J	<0.0406	<0.00278	0.00179 J	
	MW-96	Apr-22		13.8	7.75		0.00475 J	<0.00104	0.000995 J	0.00147 J	28.0	<0.0100	<0.00174	4.13	<0.00278	<0.00174	
	MW-96	Oct-22		24.9	8.20		<0.00644	<0.00208	<0.00188	<0.00274	32.3	<0.0200	<0.00348	3.30	<0.00556	<0.00348	
	MW-98	Jun-20		16.7	6.31		0.646	0.110	1.74	0.711	<0.00505	0.255	0.0256 J		0.202	2.17	
	MW-98	Oct-20		22.0	5.31		0.371	0.0820	1.73	0.788	<0.00505	0.207 J	0.0254 J		0.236	1.88	
	MW-98	Apr-21		14.4	4.89		0.431	0.0924	1.12	0.938	<0.00505	0.294	0.0253 J		0.227	1.84	
	MW-98	Sep-21		14.1	6.01		0.392	0.0923	1.20	0.629	<0.00505	0.223 J	0.0253 J	<0.203	0.204	1.76	
	MW-98	Apr-22		16.5	5.19		0.437	0.109	0.910	0.660	<0.00505	0.238 J	0.0282 J	<0.203	0.194	1.69	
	MW-98	Oct-22		7.46	5.13		0.469	0.102	0.674	0.510	<0.00505	0.271	0.0261 J	<0.203	0.181	1.45	
	MW-137	Oct-17		33.1	11.3		0.559	0.137 J	12.5	1.53	0.0754 J	0.317 J	0.265		1.54	1.16	
	MW-137	Apr-18		26.6	9.60		0.531	0.125 J	9.63	1.86	0.0758 J	0.373 J	0.398		1.83	1.30	
	MW-137	Oct-18		32.6	8.76		0.342	<0.0774	10.6	1.09	0.0876 J	0.237 J	0.165 J		0.977	0.688	
	MW-137	Apr-19		33.2	9.76		0.426	0.0946 J	7.93	1.21	<0.0734	<0.200	0.274		1.28	0.821	
	MW-138	Oct-17		2.20	15.0		0.00547	<0.00194	0.701	0.0244	0.163	0.0635	<0.00170		0.00577	0.00565 J	
	MW-138	Apr-18		2.44	6.05		0.0413	0.00633	0.741	0.222	0.188	0.0667	0.00541		0.0128	0.0492	
	MW-138	Oct-18		4.06	6.00		0.0799	0.0121	0.628	0.423	0.269	0.0379	0.00635		0.00806	0.115	
	MW-138	Apr-19		4.17	6.67		0.126	0.0214	0.663	0.389	0.171	0.0377	0.00315 J		0.00480 J	0.100	
	RW-1R	Apr-16		2.13	8.54		0.00369	0.000516 J	0.426	0.0214	0.0133	0.00762	0.00110		0.00542	0.0122	
	RW-1	Apr-17		2.20	21.5		<0.00373	<0.00387	0.696	0.0169	0.0441	<0.0100	<0.00341		0.0102	<0.0106	
	RW-1	Apr-18		6.05	8.92		0.0303	0.00550	1.52	0.0964	0.0292	0.0132	0.00282		0.0176	0.0855	
	RW-1	Apr-19		5.13	16.1		0.0348	0.00566	<0.000331	0.102	0.0218	0.00849	0.00412		0.0221	0.0844	
	RW-2	Apr-15		18.3	19.7		0.330	0.0772	5.34	1.02	<0.00370	0.157 J	0.0853	<0.0930	0.115	0.530	
	RW-2R	Apr-16		20.8	17.3		0.188	0.0419 J	5.86	0.591	0.0226 J	0.145 J					

Table 4A - Summary of Groundwater Analytical Data - Total Petroleum Hydrocarbons and Volatile Organic Compounds

2022 Annual Groundwater Monitoring Report
HF Sinclair Navajo Refining LLC, Artesia Refinery, Artesia, New Mexico

Analyte Group				TPH			Volatile Organic Compounds										
				GRO	DRO	DRO - EP	1,2,4-TMB	1,3,5-TMB	Benzene	Ethylbenzene	MTBE	Naphthalene	o-Xylene	TBA	Toluene	Total Xylenes	
				TPH-GRO	TPH-DRO	TPH-DRO	95-63-6	108-67-8	71-43-2	100-41-4	1634-04-4	91-20-3	95-47-6	75-65-0	108-88-3	1330-20-7	
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
				CGWSL	CGWSL	CGWSL	CGWSL	CGWSL	CGWSL	CGWSL	CGWSL	CGWSL	CGWSL	CGWSL	CGWSL	CGWSL	
CGWSL Source				NMED TPH			USEPA TW	USEPA TW	WQCC HH	WQCC HH	WQCC Dom	WQCC HH	WQCC TW	USEPA TW	WQCC HH	WQCC HH	
Area	Well ID	Date	Dup														
South Refinery	MW-28	Apr-19		5.37	8.80		0.107	<0.0194	1.43	0.0274 J	0.268	0.0736 J	<0.0170		0.0272 J	0.140 J	
	MW-28	Oct-19		10.4 B	11.6		0.213	0.0243 J	1.51	0.0375 J	0.692	0.137 J	<0.0170		0.0384 J	0.264	
	MW-28	Jun-20		3.94	3.91		0.0527	<0.000520	0.397	0.0201	0.194	0.0157 J	0.00154 J		0.0126	0.0916	
	MW-28	Oct-20		1.65	5.28		0.0430	0.00133 J	0.362	0.0136	0.214	0.00638 J	0.00171 J		0.00882	0.0626	
	MW-48	Apr-18		45.6	6.50		0.381	<0.0968	14.9	1.36	0.171 J	<0.250	<0.0852		1.02	0.955	
	MW-48	Oct-18		21.8	5.56		0.377	<0.0968	7.97	0.479	0.611	<0.250	<0.0852		<0.103	0.358 J	
	MW-48	Apr-19		17.7	6.53		0.564	<0.0968	4.87	0.603	0.372	1.20 JJ4	<0.0852		0.152 J	0.498 J	
	MW-48	Oct-19		31.9 B	6.48		0.240 J	<0.0967	5.04	0.118 J	0.517	<0.250	<0.0852		0.138 J	0.290 J	
	MW-50	Jun-20			0.522		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-50	Oct-20			0.526		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-50	Apr-21			0.396		<0.000322	<0.000104	0.000515 J	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-50	Sep-21			0.437		0.000688 J	0.000143 J	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174	
	MW-50	Apr-22			0.506		0.000435 J	0.000404 J	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174	
	MW-50	Oct-22			0.373		0.000450 J	<0.000104	<0.0000941	<0.000137	<0.000101	0.00114 J	<0.000174	<0.00406	<0.000278	<0.000174	
	MW-52	Jun-20		<0.0314	0.294		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-52	Oct-20		<0.0314	0.282		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-52	Apr-21		<0.0314	0.270		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-52	Sep-21		<0.0314	0.432		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174	
	MW-52	Apr-22		<0.0314	0.332		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100 J4	<0.000174	<0.00406	<0.000278	<0.000174	
	MW-52	Oct-22		<0.0314	0.328		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174	
	MW-64	Jun-20		102	8.18		0.453 J	0.0760 J	27.5	1.76	0.461 J	<0.500	1.03		9.93	4.29	
	MW-64	Oct-20		94.8	6.54		0.252 J	<0.0520	27.2	1.55	0.560	<0.500	0.794		8.09	3.10	
	MW-64	Apr-21		100	6.54		0.436 J	0.0967 J	27.1	1.80	0.431 J	<0.500	0.928		8.88	4.15	
	MW-64	Sep-21		98.2	7.63		0.315	0.0602	25.1	1.03	0.491	0.105 J	0.822	2.48	9.03	3.06	
	MW-64	Apr-22		110	5.63		0.483	0.0957	23.8	1.65	0.505	0.141	1.43	3.09	12.4	5.01	
	MW-64	Oct-22		88.0	6.84		0.438	0.0964 J	28.9	1.60	0.500	<0.250	1.05	2.90	9.56	4.17	
	MW-65	Apr-18		15.5	5.05		<0.0373	<0.0387	4.39	0.0528 J	1.73	0.253 J	<0.0341		<0.0412	<0.106	
	MW-65	Oct-18		10.4	4.57		<0.0373	<0.0387	2.84	<0.0384	2.38	<0.100	<0.0341		<0.0206	<0.106	
	MW-65	Apr-19		16.9	4.86		<0.0373	<0.0387	5.45	0.0628 J	2.35	0.152 J	<0.0341		<0.0412	<0.106	
	MW-65	Oct-19		21.4 B	3.59		<0.0373	<0.0387	6.07	0.0565 J	1.82	0.148 J	<0.0341		<0.0412	<0.106	
	MW-66	Oct-19		7.15 B	2.77		<0.00933	<0.00968	1.24	<0.00960	1.69	0.0758 J	<0.00852		<0.0103	<0.0265	
	MW-66	Jun-20		8.44	2.19		0.000705 J	<0.000104	1.18	0.00717	1.62	0.167	0.00239		0.00581	0.0145	
	MW-66	Oct-20		4.41	3.36		<0.00322	<0.00104	0.965	0.00643 J	1.90	0.0737	0.00183 J		0.00445 J	0.00787 J	
	MW-66	Apr-21		5.16	3.52		0.00570 J	0.00114 J	0.701	0.0185	3.15	0.0620	0.00451 J		0.0129	0.0268 J	
	MW-99	Oct-18		11.9	2.23		0.284	<0.0387	2.54	0.201	3.10	<0.100	<0.0341		<0.0412	0.358	
	MW-99	Apr-19		14.9	2.93		0.352	<0.0387	1.67	0.491	2.24	<0.100	<0.0341		<0.0412	0.379	
	MW-99	Oct-19		5.02	2.30		0.234	<0.0387	0.233	0.241	0.533	<0.100	<0.0341		<0.0412	0.218 J	
	MW-99	Jun-20		3.97	4.19		0.149	<0.00104	0.414	0.0866	0.379	<0.0100	0.00630 J		0.00330 J	0.0784	
	MW-101	Jun-20		0.553	4.85		<0.000322	<0.000104	0.00438	0.000302 J	0.0502	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-101	Oct-20		5.37	6.07		0.0254	0.00284	2.32	0.0180	0.0532	0.0180	0.000814 J		0.00858	0.0779	
	MW-101	Apr-21		2.91	4.65		<0.00644	<0.00208	0.810	0.0141 J	0.0567	<0.0200	<0.00348		<0.00556	<0.00348	
	MW-101	Sep-21		2.07	6.14		0.00172	0.000333 J	0.687	0.00801	0.0635	0.00215 J	0.000274 J	0.108	0.00279	0.00375	
	MW-101	Apr-22		1.08	6.81		0.000845 J	0.000556 J	0.173	0.00323	0.0629	0.00141 J	<0.000174	0.114	0.00114	0.00122 J	
	MW-101	Oct-22		2.54	6.12		0.00640	0.000484 J	0.467	0.00483	0.0657	0.00368 J	0.000380 J	0.108	0.00260	0.0168	
	MW-102	Jun-20		27.1	5.50		0.0927 J	<0.0104	7.10	0.477	0.719	0.142 J	<0.0174		0.0484 J	0.188 J	
	MW-102	Oct-20		28.9	9.97		0.0910 J	0.0117 J	8.72	0.537	1.20	0.127 J	0.0274 J		0.0746 J	0.254 J	
	MW-102	Apr-21		19.7	12.6		0.114	<0.0104	7.61	0.418	1.23	0.156 J	<0.0174		0.0385 J	0.165 J	
	MW-102	Sep-21		33.4	14.5		0.131	0.00901 J	10.7	0.6							

Table 4A - Summary of Groundwater Analytical Data - Total Petroleum Hydrocarbons and Volatile Organic Compounds

2022 Annual Groundwater Monitoring Report
HF Sinclair Navajo Refining LLC, Artesia Refinery, Artesia, New Mexico

Analyte Group				TPH			Volatile Organic Compounds										
				GRO	DRO	DRO - EP	1,2,4-TMB	1,3,5-TMB	Benzene	Ethylbenzene	MTBE	Naphthalene	o-Xylene	TBA	Toluene	Total Xylenes	
				CAS	TPH-GRO	TPH-DRO	TPH-DRO	95-63-6	108-67-8	71-43-2	100-41-4	1634-04-4	91-20-3	95-47-6	75-65-0	108-88-3	1330-20-7
				Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
				CGWSL	0.0101	0.0858	0.0167	0.0560	0.0600	0.00500	0.700	0.100	0.0300	0.193	0.150	1.00	0.620
CGWSL Source				NMED TPH			USEPA TW	USEPA TW	WQCC HH	WQCC HH	WQCC Dom	WQCC HH	WQCC TW	USEPA TW	WQCC HH	WQCC HH	
Area	Well ID	Date	Dup														
South Refinery	RW-5R	Apr-15			6.42		0.298	0.0558	2.92	1.03	2.15	0.174	0.522	<0.00370	2.26	1.91	
	RW-5R	Apr-16			7.39		0.437	0.100	3.48	1.20	1.64	0.205	0.570		2.51	2.25	
	RW-6	Apr-15			11.4		0.134	0.0280	0.636	0.0476	2.27	0.0602	0.0558	<0.00370	0.0126 J	0.158	
	RW-6R	Apr-16			4.20		0.00555	0.00111	0.218	0.00474	2.68	0.00574	0.00275		0.00683	0.00747	
	RW-6	Apr-18			3.04		0.0143	0.00259	2.67	0.0838	<0.000367	0.0290	0.0570		0.448	0.150	
	RW-6	Apr-19			3.23		0.0110 J	<0.00774	1.18	0.0487	0.792	0.0678 J	0.00804 J		0.0211	0.0304 J	
	RW-15C	Apr-17			9.74		1.46	0.231	19.1	4.19	4.25	0.383	0.472		0.172	5.39	
	RW-15C	Apr-18			9.27		1.06	0.138	21.9	3.93	3.02	<0.500	0.0285		0.111	3.01	
RW-15C	Apr-19			11.7		0.728	0.0476	<0.00331	3.03	3.66	0.173 J4	0.00812 J		0.0871	1.05		
South RO Field	MW-114	Jun-20		<0.0314	0.436		<0.000322	<0.000104	<0.0000941	<0.000137	0.00475	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-114	Oct-20		<0.0314	0.663		<0.000322	<0.000104	<0.0000941	<0.000137	0.0112	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-114	Apr-21		<0.0314	0.736		<0.000322	<0.000104	<0.0000941	<0.000137	0.0101	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-114	Sep-21		0.0655 J	0.502		<0.000322	0.000276 J	<0.0000941	<0.000137	0.0120	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174	
	MW-114	Apr-22		<0.0314	0.756		<0.000322	0.000358 JB	<0.0000941	<0.000137	0.00308	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174	
	MW-114	Oct-22		0.0652 J	1.85		<0.000322	<0.000104	<0.0000941	<0.000137	0.0674	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174	
	MW-115	Jun-20		<0.0314	0.0430 J		<0.000322	<0.000104	<0.0000941	<0.000137	0.00126	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-115	Oct-20		<0.0314	0.222 B		<0.000322	<0.000104	<0.0000941	<0.000137	0.00364	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-115	Apr-21		<0.0314	0.313		<0.000322	<0.000104	<0.0000941	<0.000137	0.0113	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-115	Sep-21		<0.0314	0.173		<0.000322	<0.000104	<0.0000941	<0.000137	0.0228	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174	
	MW-115	Apr-22		0.0420 J	0.460		<0.00322	<0.00104	<0.000941	<0.00137	0.0198	<0.0100	<0.00174	<0.0406	<0.00278	<0.00174	
	MW-115	Oct-22		<0.0314	0.621		<0.000322	<0.000104	<0.0000941	<0.000137	0.0205	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174	
	MW-116	Jun-20		<0.0314	<0.0247		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-116	Oct-20		<0.0314	0.127 B		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-116	Apr-21		<0.0314	0.231		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174	
	MW-116	Sep-21		<0.0314	0.214		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174	
MW-116	Apr-22		<0.0314	0.0610 J		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174		
MW-116	Oct-22		<0.0314	0.219		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174		
TEL	MW-49	Jun-20		5.45	4.96		0.115	0.0214	0.600	0.0249	0.148	0.0241 J	<0.00348		0.00895 J	0.179	
	MW-49	Oct-20		5.05	5.44		0.0763	0.0154 J	0.404	0.0121 J	0.196	<0.0200	<0.00348		<0.00556	0.113	
	MW-49	Apr-21		2.56	6.65		0.0527	0.0105 J	0.280	0.00827 J	0.257	<0.0250	<0.00435		<0.00695	0.0793	
	MW-49	Sep-21		2.57	6.81		0.0403	0.00713 J	0.280	0.00787 J	0.210	0.0201 J	<0.00174	<0.0406	0.00473 J	0.0675	
	MW-49	Apr-22		4.35	6.29		0.0603	0.00959	0.236	0.00809	0.183	0.00626 J	0.00125 J	0.0466	0.00334 J	0.0882	
	MW-49	Oct-22		2.84	4.55		0.0719	0.00818	0.278	0.00844	0.168	0.00786	0.00131	0.0443	0.00564	0.108	
	TEL-1	Oct-18		0.381	8.36		<0.00186	<0.00194	<0.00166	<0.00192	0.00255 J	<0.00500	<0.00170		<0.00206	<0.00530	
	TEL-1	Apr-19		0.357	8.30		0.000820 J	<0.000387	<0.000331	0.000481 J	0.00297	<0.00100	0.00126		0.000600 J	0.00126 J	
	TEL-1	Oct-19		0.736 JB	8.74		0.00140	<0.000387	<0.000331	0.000750 J	0.00310	<0.00100	0.00196		0.000961 J	0.00284 J	
	TEL-1	Jun-20		0.366 J	5.74		0.00114	0.000302 J	<0.0000941	0.000831 J	0.00230	<0.00100	0.00155		0.000961 J	0.00294 J	
	TEL-2	Oct-18		5.19	14.8		0.115	0.0165 J	0.936	0.0121 J	<0.00918	<0.0250	<0.00852		0.0209 J	0.123	
	TEL-2	Apr-19		4.27	15.8		0.0639	0.00655 J	1.08	0.00401 J	0.00752 J	<0.0100	<0.00341		0.0113	0.0843	
	TEL-2	Oct-19		3.00 B	13.5		0.0603	0.00551 J	0.618	0.00384 J	0.00496 J	<0.0100	<0.00341		0.00920 J	0.0638	
	TEL-2	Jun-20		1.89	8.16		0.0402	0.00377 J	0.362	0.00152 J	0.00459 J	<0.0100	<0.00174		0.00510 J	0.0489	
	TEL-3	Apr-18		2.05	7.42		0.0200	0.000983 J	0.392	0.00162	0.0637	<0.00100	0.00313		0.00394	0.0219	
	TEL-3	Apr-19		0.999	4.14		0.0226	<0.000387	0.162	0.000779 J	0.00433	<0.00100	0.00165		0.00166	0.00882	
	TEL-3	Oct-19		1.54 B	4.82		0.0379	<0.000387	0.0573	0.000766 J	0.00175	0.00119 J	0.00191				

Table 4A - Summary of Groundwater Analytical Data - Total Petroleum Hydrocarbons and Volatile Organic Compounds

2022 Annual Groundwater Monitoring Report																
HF Sinclair Navajo Refining LLC, Artesia Refinery, Artesia, New Mexico																
Analyte Group				TPH			Volatile Organic Compounds									
				Analyte	GRO	DRO	DRO - EP	1,2,4-TMB	1,3,5-TMB	Benzene	Ethylbenzene	MTBE	Naphthalene	o-Xylene	TBA	Toluene
CAS				TPH-GRO	TPH-DRO	TPH-DRO	95-63-6	108-67-8	71-43-2	100-41-4	1634-04-4	91-20-3	95-47-6	75-65-0	108-88-3	1330-20-7
Units				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
CGWSL				0.0101	0.0858	0.0167	0.0560	0.0600	0.00500	0.700	0.100	0.0300	0.193	0.150	1.00	0.620
CGWSL Source				NMED TPH			USEPA TW	USEPA TW	WQCC HH	WQCC HH	WQCC Dom	WQCC HH	WQCC TW	USEPA TW	WQCC HH	WQCC HH
Area	Well ID	Date	Dup													
Three Mile Ditch	NP-1	Jun-20					<0.000322	<0.000104	<0.0000941	<0.000137	0.216	<0.00100 J4	<0.000174		<0.000278	<0.000174
	NP-1	Oct-20					0.000430 J	0.000104 J	<0.0000941	0.000245 J	0.217	<0.00100	<0.000174		<0.000278	0.000456 J
	NP-1	Apr-21					<0.000322	<0.000104	<0.0000941	<0.000137	0.101	<0.00100	<0.000174		<0.000278	<0.000174
	NP-1	Sep-21					<0.00805	0.000215 J	<0.0000941	<0.00343	0.503	0.00145 J	<0.000174	<0.00406	<0.000278	<0.000174
	NP-1	Apr-22					<0.000322	<0.000104	0.000161 J	<0.000137	0.623	<0.00100 J4	<0.000174	0.00750	<0.000278	<0.000174
	NP-1	Oct-22					<0.00644	<0.00208	<0.00188	<0.00274	0.554	<0.0200	<0.00348	<0.0812	<0.00556	<0.00348
	NP-6	Apr-15					<0.000370	<0.000390	<0.000330	<0.000380	0.00878	<0.00100 UJ	<0.000340	<0.000370	<0.000780	<0.00110
	NP-6	Apr-17					<0.000373	<0.000387	<0.000331	<0.000384	0.0353	<0.00100	<0.000341		<0.000412	<0.00106
	NP-6	Apr-19					<0.000373	<0.000387	<0.000331	<0.000384	0.0729	<0.00100 J3J4	<0.000341		<0.000412	<0.00106
NP-6	Apr-21					<0.000322	<0.000104	<0.0000941	<0.000137	0.0407	<0.00100	<0.000174		<0.000278	<0.000174	
Upgradient	UG-1	Apr-19		<0.0314	<0.0247		<0.000373	<0.000387	<0.000331	<0.000384	<0.000367	<0.00100	<0.000341		<0.000412	<0.00106
	UG-1	Jun-20		<0.0314	<0.0247		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174
	UG-1	Apr-21		<0.0314	0.0579 J		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174
	UG-1	Apr-22		<0.0314	<0.0247		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174
	UG-2	Apr-19		<0.0314	0.0647 J		<0.000373	<0.000387	<0.000331	<0.000384	<0.000367	<0.00100	<0.000341		<0.000412	<0.00106
	UG-2	Jun-20		<0.0314	<0.0247		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174
	UG-2	Apr-21		<0.0314	0.0316 J		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174
	UG-2	Apr-22		<0.0314	<0.0247		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174
	UG-3R	Apr-19		<0.0314	<0.0247		<0.000373	<0.000387	<0.000331	<0.000384	<0.000367	<0.00100	<0.000341		<0.000412	<0.00106
	UG-3R	Jun-20		0.0421 J	0.0478 J		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174
	UG-3R	Apr-21		<0.0314	0.0931 J		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174
	UG-3R	Apr-22		<0.0314	0.0857 J		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174
	UG-4	Apr-19		<0.0314	<0.0247		<0.000373	<0.000387	<0.000331	<0.000384	<0.000367	<0.00100	<0.000341		<0.000412	<0.00106
	UG-4	Jun-20		<0.0314	<0.0247		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174
	UG-4	Apr-21		<0.0314	0.0643 J		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174		<0.000278	<0.000174
UG-4	Apr-22		<0.0314	<0.0247		<0.000322	<0.000104	<0.0000941	<0.000137	<0.000101	<0.00100	<0.000174	<0.00406	<0.000278	<0.000174	

Definitions

X

Reported concentration, X, exceeds the CGWSL.

X

Analyte detected above the detection limit at a concentration equal to X.

<x

Analyte not detected at detection limit equal to x.

<x

Analyte not detected at detection limit equal to x, but x exceeds the CGWSL.

Blank cell indicates a sample was collected from the well during the indicated sampling event, but the analyte was not analyzed.

No applicable CGWSL.

Abbreviations

1,2,4-TMB

1,2,4-Trimethylbenzene

1,3,5-TMB

1,3,5-Trimethylbenzene

CGWSL

Critical Groundwater Screening Level (see Table 3)

CGWSL Source

Source for CGWSL value (see Table 3)

DRO

Diesel Range Organics

DRO-EP

Diesel Range Organics data from wells located in the Evaporation Ponds area

Dup

Duplicate sample

FD

Field duplicate sample

GRO

Gasoline Range Organics

mg/L

Milligrams per Liter

MTBE

Methyl Tert-Butyl Ether

NMED TPH

NMED Risk Assessment Guidance for Site Investigations and Remediation, November 2022, Table 6-4 TPH Groundwater Screening Level

NMED TW

NMED Risk Assessment Guidance for Site Investigations and Remediation, November 2022, Table A-1 Tap Water Screening Level

TBA

tert-Butyl alcohol (tert-Butanol)

TPH

Total Petroleum Hydrocarbons

USEPA TW

United States Environmental Protection Agency Tap Water Screening Level, "Regional Screening Levels (RSL) Summary Table", November 2022

WQCC Dom

NMED Groundwater standard for domestic water supply, 20.6.2.3103.B NMAC

WQCC HH

NMED Groundwater standard for human health exposure, 20.6.2.3103.A NMAC

Lab Footnote

B

Analyte was also detected in the associated method blank.

J

Indicates an estimated value.

J3

The associated batch QC was outside the established quality control range for precision.

J4

The associated batch QC was outside the established quality control range for accuracy.

Q

Sample was prepared and/or analyzed past recommended holding time.

V3

Internal standard exhibited poor recovery due to sample matrix interference; analytical result biased high.

Table 4B - Summary of Groundwater Analytical Data - Total Metals
2022 Annual Groundwater Monitoring Report
HF Sinclair Navajo Refining LLC, Artesia Refinery, Artesia, New Mexico

Analyte Group				Total Metals													
				Arsenic	Barium	Boron	Cadmium	Cobalt	Chromium	Iron	Lead	Manganese	Mercury	Nickel	Selenium	Uranium	Vanadium
				7440-38-2	7440-39-3	7440-42-8	7440-43-9	7440-48-4	7440-47-3	7439-89-6	7439-92-1	7439-96-5	7439-97-6	7440-02-0	7782-49-2	7440-61-1	7440-62-2
				CAS	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
				Units													
CGWSL				0.0100	2.00	0.750	0.00500	0.0500	0.0500	1.00	0.0150	0.200	0.00200	0.200	0.0500	0.0300	0.0631
CGWSL Source				WQCC HH	WQCC HH	WQCClrr	WQCClrr	WQCC HH	WQCC HH	WQCC Dom	WQCC HH	WQCC Dom	WQCC HH	WQCClrr	WQCC HH	WQCC HH	NMED TW
Area	Well ID	Date	Dup														
Cross-Gradient	KWB-13	Apr-19		0.00485	0.0372	0.376	0.000325 J	0.00113 J	0.00514 B	2.18	0.00472	0.0829	<0.0000490	0.00325	0.0151	0.0250	0.0308
	KWB-13	Jun-20		0.00587	0.0485	0.306	<0.000478	0.00163 J	0.00721	4.41	0.00654	0.113	<0.000100	0.0110	0.0103	0.0260	0.0327
	KWB-13	Apr-21		0.00822	0.0713	0.287	0.000652 J	0.00279	0.0152	10.8	0.00870	0.179	<0.000100	0.0107	0.0115	0.0196 J	0.0446
	KWB-13	Apr-22		0.00263	0.0198	0.308	<0.000150	0.000227 J	0.00217	0.933	0.000921 J	0.0195	<0.000100	<0.000816	0.0109	0.0223	0.0210
	MW-136	Jun-20		0.00245	0.0147 J	0.571	<0.000478	0.000685 J	<0.00149	0.171	<0.00249	0.0352	<0.000100	0.00183 J	0.00593	0.0639	0.0161
	MW-136	Oct-20		0.00247	0.0123 J	0.556	<0.000478	<0.000477	<0.00149	0.0705 J	<0.00249	0.0123 B	<0.000100	0.00248	0.00553	0.0558	0.0158
	MW-136	Apr-21		0.00252	0.0122 J	0.475	<0.000150	0.000526 J	0.00160 J	0.116	0.00247	0.0207	<0.000100	0.00359	0.00730	0.0459	0.0153
	MW-136	Sep-21		0.00287	0.0125	0.505	<0.000150	0.000760 J	<0.00124	0.0558 J	<0.000849	0.0162	<0.000100	0.00251	0.00591	0.0396	0.0149
	MW-136	Apr-22		0.00250	0.0118	0.486	<0.000150	0.000959 J	0.00402	0.112	<0.000849	0.0166	<0.000100	<0.000816	0.00657	0.0380	0.0156
	MW-136	Oct-22		0.00262	0.0111	0.505	<0.000150	0.000968 J	<0.00124	0.0480 J	<0.000849	0.0184	<0.000100	0.00280	0.00649	0.0368	0.0155
	NP-5	Apr-15		0.00288	0.0159				0.00109 J	0.437	0.000415 J	0.00318 J			0.0125		
	NP-5	Apr-17		0.00305	0.00938				<0.000540	0.0632 J	<0.000240	0.000586 J			0.0124		
	NP-5	Apr-19		0.00313	0.00844				<0.000540	0.0278 J	0.000709 J	0.000563 J			0.0119		
	NP-5	Apr-21		0.00331	0.00873 J				<0.00124	0.0551 J	<0.000849	0.00154 J			0.00904		
RA-3156	Apr-19																
RA-3156	Jun-20																
RA-3156	Apr-21																
RA-3156	Apr-22																
Evaporation Ponds	MW-1R	Apr-19		0.00176 J	0.0213				<0.000540	2.17	<0.000240	0.995			<0.000380		
	MW-1R	Jun-20		0.00119 J	0.0219				<0.00149	1.87	<0.00249	1.30			<0.000657		
	MW-1R	Apr-21		0.00120 J	0.0204				<0.00124	1.67	<0.000849	0.996			<0.000300		
	MW-1R	Apr-22		0.00220	0.0203				<0.00124	2.95	<0.000849	1.26			<0.000300		
	MW-2A	Jun-20		0.0140	0.0200				<0.00149	2.78	<0.00249	1.74			<0.000657		
	MW-2A	Oct-20		0.00798	0.0148 J				<0.00149	0.700	<0.00249	0.491 V			0.000658 J		
	MW-2A	Apr-21		0.00878	0.0266				0.00282	0.335	<0.00424	1.66			0.00169 J		
	MW-2A	Sep-21		0.00921	0.0322				0.00135 J	0.375	<0.000849	1.17			0.00287		
	MW-2A	Apr-22		0.00698	0.0228				0.00163 J	0.185	<0.000849	0.579			0.00412		
	MW-2A	Oct-22		0.0145 J	0.0295				<0.0124	1.76	<0.00849	0.777			0.00356 J		
	MW-3	Jun-20		0.0278	0.0125 J				<0.00149	<0.0489	<0.00249	0.880			0.00995		
	MW-3	Jun-20	FD	0.0299	0.0152 J				<0.00149	<0.0489	<0.00249	0.913			0.0100		
	MW-3	Oct-20		0.0340	0.0142 J				<0.00149	0.0772 J	<0.00249	1.27			0.00722		
	MW-3	Oct-20	FD	0.0343	0.0150 J				<0.00149	0.0500 J	<0.00249	1.38			0.00646		
	MW-3	Apr-21		0.0415	0.0154 J				0.0536	0.503	<0.000849	1.96			0.00471		
	MW-3	Apr-21	FD	0.0417	0.0158 J				0.0174	0.334 J	<0.00424	1.90			0.00570 J		
	MW-3	Sep-21		0.0275	0.0150				<0.00124	0.0896 J	<0.000849	0.764			0.0167		
	MW-3	Sep-21	FD	0.0276	0.0157				<0.00124	0.0840 J	<0.000849	0.839			0.0172		
	MW-3	Apr-22		0.0505	0.0151				<0.00124	0.552	<0.000849	1.96			0.00370		
	MW-3	Apr-22	FD	0.0497	0.0122				<0.00124	0.569	<0.000849	1.91			0.00398		
	MW-3	Oct-22		0.0286	0.0138				<0.00620	0.191 J	<0.00424	0.860			0.0112		
	MW-3	Oct-22	FD	0.0282	0.0146				0.0135	0.235 J	<0.00424	0.856			0.0108		
	MW-4A	Jun-20		0.111	0.0125 J				<0.00149	2.55	<0.00249	1.79			<0.000657		
	MW-4A	Oct-20		0.114	0.0133 J				0.00183 J	1.73	<0.00249	1.74			<0.000657		
	MW-4A	Apr-21		0.0799	0.0125 J				<0.00124	1.20	<0.000849	1.78			0.000630 J		
	MW-4A	Sep-21		0.0304	0.0130				<0.00124	0.465	<0.000849	2.17			0.000490 J		
	MW-4A	Apr-22		0.108	0.0111				<0.00124	2.06	<0.000849	1.64			0.000494 J		
	MW-4A	Oct-22		0.0601	0.0126				<0.00620	1.43	<0.00424	1.71			<0.00150		
	MW-4B	Apr-15		0.101	0.0349				<0.00110	3.60	0.00189 J	8.68			<0.000760		
	MW-4B	Apr-17		0.0371	0.0182				<0.000540	3.42	<0.000240	7.35			<0.000380		
	MW-4B	Apr-19		0.0699	0.0165				0.000725 J	1.54	0.000544 JB	11.1			<0.000380		
	MW-4B	Apr-21		0.0515	0.0169 J			</									

Table 4B - Summary of Groundwater Analytical Data - Total Metals
2022 Annual Groundwater Monitoring Report
HF Sinclair Navajo Refining LLC, Artesia Refinery, Artesia, New Mexico

Analyte Group				Total Metals													
Analyte				Arsenic	Barium	Boron	Cadmium	Cobalt	Chromium	Iron	Lead	Manganese	Mercury	Nickel	Selenium	Uranium	Vanadium
CAS				7440-38-2	7440-39-3	7440-42-8	7440-43-9	7440-48-4	7440-47-3	7439-89-6	7439-92-1	7439-96-5	7439-97-6	7440-02-0	7782-49-2	7440-61-1	7440-62-2
Units				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L				mg/L	mg/L	mg/L	mg/L	mg/L
CGWSL				0.0100	2.00	0.750	0.00500	0.0500	0.0500	1.00	0.0150	0.200	0.00200	0.200	0.0500	0.0300	0.0631
CGWSL Source				WQCC HH	WQCC HH	WQCClrr	WQCClrr	WQCC HH	WQCC HH	WQCC Dom	WQCC HH	WQCC Dom	WQCC HH	WQCClrr	WQCC HH	WQCC HH	NMED TW
Area	Well ID	Date	Dup														
Evaporation Ponds	MW-15	Apr-19		0.0204	0.0242				<0.000540	0.0520 J	0.000401 J	0.166			0.00101 J		
	MW-15	Jun-20		0.00841	0.0175 J				<0.00149	<0.0489	<0.00249	0.547			<0.000657		
	MW-15	Apr-21		0.0192	0.0168 J				<0.00124	0.0483 J	<0.000849	0.206			0.000799 J		
	MW-15	Apr-22		0.0249	0.0149				<0.00124	<0.0281	<0.000849	0.0627			0.000468 J		
	MW-18A	Jun-20		0.00419 J	<0.0389 J5	1.88	<0.00239	<0.00238	<0.00745	1.65	<0.0124	1.13 O1V	<0.000100	0.00735 J	<0.00328	<0.0377 J5	<0.00493
	MW-18A	Oct-20		0.00468	0.0171 J	1.98	<0.000478	0.00139 J	<0.00149	0.348	<0.00249	1.39	<0.000100	0.00846	<0.000657	0.0226	<0.000986
	MW-18A	Apr-21		0.00467	0.0160 J	1.93	<0.000150	0.000366 J	0.00204 B	0.0895 JB	<0.000849	0.0562	<0.000100	0.0122	0.000977 J	0.0275	<0.000664
	MW-18A	Sep-21		0.00452	0.0168	2.02	<0.000150	0.000294 J	<0.00124	0.310	<0.000849	1.52	<0.000100	0.0103	<0.000300	0.0221	0.000672 J
	MW-18A	Apr-22		0.00572	0.0169	1.87	<0.000150	0.00446	0.00154 J	0.864	<0.000849	0.477	<0.000100	0.0115	0.000709 J	0.0247	0.00196 JB
	MW-18A	Oct-22		0.00472 J	0.0175 J	2.04	<0.00150	<0.000596	<0.0124	0.623 J	<0.00849	1.54	<0.000100	0.00820 J	<0.00300	0.0222	<0.00664
	MW-18B	Apr-15		0.0120	0.0125				0.000942 J	0.139	0.000814 J	0.789			<0.000380		
	MW-18B	Apr-17		0.00883	0.0137				<0.000540	0.0793 J	0.00104 J	0.803			<0.000380		
	MW-18B	Apr-19		0.0115	0.0168				<0.000540	0.138	0.000778 J	1.26			<0.000380		
	MW-18B	Apr-21		0.00806	0.0137 J				<0.00124	0.0497 JB	<0.000849	1.09			<0.000300		
	MW-22A	Jun-20		0.0299	0.0168 J				<0.00149	2.21	<0.00249	2.94			0.00271		
	MW-22A	Jun-20	FD	0.0311	0.0177 J				<0.00149	1.77	<0.00249	3.10			0.00171 J		
	MW-22A	Oct-20		0.0309	0.0163 J				<0.00149	3.96	<0.00249	3.57			0.00147 J		
	MW-22A	Oct-20	FD	0.0301	0.0165 J				<0.00149	4.02	<0.00249	3.69			0.00132 J		
	MW-22A	Apr-21		0.0277	0.0138 J				<0.00124	0.976	<0.000849	3.63			0.000986 J		
	MW-22A	Apr-21	FD	0.0262	0.0143 J				<0.00620	0.725	<0.00424	3.67			<0.00150		
	MW-22A	Sep-21		0.0335	0.0268				<0.00124	0.195	<0.000849	0.849			0.0279		
	MW-22A	Sep-21	FD	0.0328	0.0285				<0.00124	0.168	<0.00849	0.868			0.0288		
	MW-22A	Apr-22		0.0274	0.0156				<0.00124	0.268	<0.000849	0.670			0.00292		
	MW-22A	Apr-22	FD	0.0264	0.0136				<0.00124	0.254	<0.000849	0.657			0.00304		
	MW-22A	Oct-22		0.0334	0.0256				<0.0124	<0.281	<0.00849	0.311			0.0274		
	MW-22A	Oct-22	FD	0.0331	0.0227				<0.0124	<0.281	<0.00849	0.326			0.0319		
	MW-22B	Apr-15		0.0389	0.0160 J				<0.00270	2.32	0.00134 J	4.32			<0.00190		
	MW-22B	Apr-17		0.0255	0.0116				<0.000540	1.03	0.000313 J	3.35			0.000603 J		
	MW-22B	Apr-19		0.0316	0.0134				0.00173 J	1.99	<0.000240	4.31			0.000766 J		
	MW-22B	Apr-21		0.0298	0.0150 J				<0.00124	2.04	<0.000849	5.02			0.000614 J		
	MW-70	Jun-20		0.0157	0.0156 J				<0.00149	4.07	<0.00249	0.257			<0.000657		
	MW-70	Oct-20		0.0166	0.0171 J				<0.00149	4.50	<0.00249	0.299			<0.000657		
	MW-70	Apr-21		0.0168	0.0144 J				<0.00124	1.78	<0.000849	0.0996			<0.000300		
	MW-70	Sep-21		0.0187	0.0193				<0.00124	6.21	<0.000849	0.987			<0.000300		
	MW-70	Apr-22		0.0148	0.0127				<0.00124	1.05	<0.000849	0.189			<0.000300		
	MW-70	Oct-22		0.0196	0.0167				0.00158 J	7.56	<0.000849	0.317			<0.000300		
	MW-72	Apr-19		0.0109	0.0123				0.000785 J	1.21	<0.000240	1.27			0.00232		
	MW-72	Jun-20		0.00851	0.0124 J				<0.00149	1.99	<0.00249	1.91			0.00175 J		
	MW-72	Apr-21		0.00548	0.0114 J				0.00175 J	0.730	<0.00424	0.952			0.00102 J		
	MW-72	Apr-22		0.00435	0.0112				0.00134 J	0.313	<0.000849	0.493			0.00171 J		
	MW-73	Apr-19		0.0806	0.0106				0.00152 J	0.315	<0.000240	0.0807			0.00616		
	MW-73	Jun-20		0.0493	0.00886 J				0.00186 J	2.78	<0.00249	1.89			0.00195 J		
	MW-73	Apr-21		0.0440	0.00786 J				0.00337	1.45	<0.00424	0.337			0.00136 J		
	MW-73	Apr-22		0.0424	0.00967				0.00158 J	2.35	<0.000849	0.597			0.00114 J		
	MW-74	Jun-20		0.0552	0.0160 J				0.00165 J	0.325	<0.00249	1.13			0.151		
	MW-74	Oct-20		0.0779	0.0153 J				<0.00149	0.0779 J	0.00433 J	1.39			0.0354		
	MW-74	Apr-21		0.104	0.0120 J				0.00131 J	0.0333 J	<0.000849	1.36			0.0146		
	MW-74	Sep-21		0.101	0.0151				<0.00124	1.49	0.00121 J	2.03			0.0132		
	MW-74	Apr-22		0.107	0.0145				0.00295	0.121	<0.000849	2.13			0.0137		
	MW-74	Oct-22		0.107	0.0163 J				<0.0124	0.468 J	<0.00849	2.13			0.0111 J		
	MW-75	Jun-20		0.270	0.0149 J				0.00163 J	4							

Table 4B - Summary of Groundwater Analytical Data - Total Metals
2022 Annual Groundwater Monitoring Report
HF Sinclair Navajo Refining LLC, Artesia Refinery, Artesia, New Mexico

Analyte Group				Total Metals													
				Arsenic 7440-38-2 mg/L CGWSL 0.0100	Barium 7440-39-3 mg/L 2.00	Boron 7440-42-8 mg/L 0.750	Cadmium 7440-43-9 mg/L 0.00500	Cobalt 7440-48-4 mg/L 0.0500	Chromium 7440-47-3 mg/L 0.0500	Iron 7439-89-6 mg/L 1.00	Lead 7439-92-1 mg/L 0.0150	Manganese 7439-96-5 mg/L 0.200	Mercury 7439-97-6 mg/L 0.00200	Nickel 7440-02-0 mg/L 0.200	Selenium 7782-49-2 mg/L 0.0500	Uranium 7440-61-1 mg/L 0.0300	Vanadium 7440-62-2 mg/L 0.0631
CGWSL Source				WQCC HH	WQCC HH	WQCClrr	WQCClrr	WQCC HH	WQCC HH	WQCC Dom	WQCC HH	WQCC Dom	WQCC HH	WQCClrr	WQCC HH	WQCC HH	NMED TW
Area	Well ID	Date	Dup														
Evaporation Ponds	MW-87	Jun-20		0.00424	0.0145 J				0.00174 J	0.0502 J	<0.0124	2.65			<0.000657		
	MW-87	Oct-20		0.00783	0.0169 J				<0.00149	0.925	<0.00249	1.56 v			<0.000657		
	MW-87	Apr-21		0.00657	0.0156 J				<0.00124	0.881	<0.000849	1.08			<0.000300		
	MW-87	Sep-21		0.00620	0.0167				<0.00124	0.361	<0.000849	1.90			<0.000300		
	MW-87	Apr-22		0.00467	0.0139				0.00209	0.181	<0.000849	0.0806			0.000323 J		
	MW-87	Oct-22		0.00536 J	0.0162 J				<0.0124	<0.281	<0.00849	1.37			<0.00300		
	MW-88	Jun-20		0.00559	0.00971 J				<0.00149	0.0546 J	<0.00249	0.807			<0.000657		
	MW-88	Oct-20		0.00645	0.0106 J				<0.00149	<0.0489	<0.00249	0.898			<0.000657		
	MW-88	Apr-21		0.00716	0.0110 J				0.00295	0.0286 JB	<0.000849	0.983			0.000381 J		
	MW-88	Sep-21		0.00750	0.0103				<0.00124	0.0347 J	<0.000849	0.982			<0.000300		
	MW-88	Apr-22		0.00732	0.0116				<0.00124	0.0285 J	<0.000849	0.937			<0.000300		
	MW-88	Oct-22		0.00715 J	0.0110				<0.00620	<0.140	<0.00424	0.750			<0.00150		
	MW-120	Jun-20		0.00614	0.00971 J				<0.00149	2.94	<0.00249	0.973			<0.000657		
	MW-120	Oct-20		0.00769	0.0109 J				<0.00149	4.31	<0.00249	1.38			0.000719 J		
	MW-120	Apr-21		0.00624	0.0107 J				<0.00124	4.59	<0.000849	1.32			<0.000300		
	MW-120	Sep-21		0.00561	0.0104				<0.00124	4.29	<0.000849	1.36 o1v			0.000527 J		
	MW-120	Apr-22		0.00541	0.0106				<0.00124	4.34	<0.000849	1.27			0.00110 J		
	MW-120	Oct-22		0.00257 J	0.0124 J				<0.0124	4.24	<0.00849	1.41 v			<0.00300		
	MW-121	Jun-20		0.131	0.0115 J				<0.00149	2.33	<0.00249	2.29			0.00453		
	MW-121	Oct-20		0.105	0.0134 J				0.00380	1.88	<0.00249	2.51			0.00320		
	MW-121	Apr-21		0.0252	0.0120 J				<0.00124	0.0709 J	<0.000849	1.83			0.00686		
	MW-121	Sep-21		0.0251	0.0120				<0.00124	0.0384 J	<0.000849	1.94			0.0108		
	MW-121	Apr-22		0.0461	0.0121				<0.00124	0.552	<0.000849	1.70			0.00509		
	MW-121	Oct-22		0.0566	0.0146				<0.00124	0.823	<0.000849	2.00			0.00898		
	MW-122	Jun-20		0.00412	0.0194 J				<0.00149	3.11	<0.00249	1.02 v			0.000840 J		
	MW-122	Oct-20		0.00425	0.0223				<0.00149	4.97	<0.00249	1.01			<0.000657		
	MW-122	Apr-21		0.00184 J	0.0191 J				0.00163 J	1.02	<0.000849	0.115			<0.000300		
	MW-122	Sep-21		0.00393	0.0221				<0.00124	5.22	<0.000849	1.16			<0.000300		
	MW-122	Apr-22		0.00179 J	0.0204				0.00182 J	1.18	<0.000849	0.451			<0.000300		
	MW-122	Oct-22		0.00387	0.0224				<0.00124	4.51	<0.000849	1.11			<0.000300		
	MW-123	Jun-20		0.0185	0.0328				<0.00149	0.0870 J	<0.00249	3.19			<0.000657		
	MW-123	Oct-20		0.0195	0.0317				<0.00149	0.0586 J	<0.00249	3.23			<0.000657		
	MW-123	Apr-21		0.0181	0.0316				<0.00124	0.0591 J	<0.000849	3.40			0.000398 J		
	MW-123	Sep-21		0.0182	0.0305				<0.00124	0.0900 J	<0.000849	3.44			<0.000300		
	MW-123	Apr-22		0.0182	0.0379				<0.00124	0.0518 J	<0.000849	3.47			<0.000300		
	MW-123	Oct-22		0.0194 J o1	0.0317				<0.0124	<0.281	<0.00849	3.28 v			<0.00300		
	MW-124	Jun-20		<0.00368	<0.0389				<0.00745	6.01	<0.0124	0.440			<0.00328		
	MW-124	Oct-20		0.00195 J	0.0214				<0.00149	5.78	<0.00249	0.435			<0.000657		
	MW-124	Apr-21		0.00144 J	0.0180 J				<0.00124	3.65	<0.000849	0.390			<0.000300		
	MW-124	Sep-21		0.00182 J	0.0190				<0.00124	3.85	<0.000849	0.579			<0.000300		
	MW-124	Apr-22		0.00150 J	0.0185				<0.00124	3.33	<0.000849	0.671			<0.000300		
	MW-124	Oct-22		<0.00180	0.0193 J				<0.0124	4.75	<0.00849	0.540			<0.00300		
	OCD-1R	Jun-20		0.00374	0.0202				<0.00149	1.19	<0.00249	2.06			<0.000657		
	OCD-1R	Oct-20		0.00318	0.0176 J				0.00201	0.435	<0.00249	1.03			0.000844 J		
	OCD-1R	Apr-21		0.00254	0.0194 J				0.00169 J	0.155	<0.000849	0.178			0.000499 J		
	OCD-1R	Sep-21		0.00689	0.0236				<0.00124	2.41	<0.000849	2.00			0.000465 J		
	OCD-1R	Apr-22		0.00235	0.0181				0.00532	0.224	<0.000849	0.205			0.000402 J		
	OCD-1R	Oct-22		0.0307	0.0388				<0.0124	14.7	<0.00849	5.93			<0.00300		
	OCD-2A	Jun-20		0.00147 J	0.0206				<0.00149	1.85	<0.00249	1.32			<0.000657		
	OCD-2A	Oct-20		0.00376	0.0224				<0.00149	4.39	<0.00249	1.16			<0.000657		
OCD-2A	Apr-21		0.00108 J	0.0221				0.00166 J	0.794	<0.000849	0.445			0.000378 J			
OCD-2A	Sep-21		0.00279	0.0217				<0.00124	2.04	<0.000849	0.736			0.000395 J			
OCD-2A	Apr-22		0.00129 J	0.0208				0.00128 J	0.								

Table 4B - Summary of Groundwater Analytical Data - Total Metals
2022 Annual Groundwater Monitoring Report
HF Sinclair Navajo Refining LLC, Artesia Refinery, Artesia, New Mexico

Analyte Group				Total Metals													
Analyte	CAS	Units	CGWSL	Arsenic	Barium	Boron	Cadmium	Cobalt	Chromium	Iron	Lead	Manganese	Mercury	Nickel	Selenium	Uranium	Vanadium
				7440-38-2	7440-39-3	7440-42-8	7440-43-9	7440-48-4	7440-47-3	7439-89-6	7439-92-1	7439-96-5	7439-97-6	7440-02-0	7782-49-2	7440-61-1	7440-62-2
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
CGWSL Source				0.0100	2.00	0.750	0.00500	0.0500	0.0500	1.00	0.0150	0.200	0.00200	0.200	0.0500	0.0300	0.0631
CGWSL Source				WQCC HH	WQCC HH	WQCClrr	WQCClrr	WQCC HH	WQCC HH	WQCC Dom	WQCC HH	WQCC Dom	WQCC HH	WQCClrr	WQCC HH	WQCC HH	NMED TW
Area	Well ID	Date	Dup														
Field East of Refinery	KWB-7	Jun-20		0.00153 J	0.0692	0.418	<0.000478	<0.000477	<0.00149	0.678	0.00545	2.57	<0.000100	0.00133 J	<0.000657	<0.00754	0.00412 J
	KWB-7	Oct-20		<0.00368	0.0528 J	0.439	<0.00239	<0.00238	<0.00745	<0.244	<0.0124	2.15	<0.000100	<0.00476	<0.00328	<0.0377	<0.00493
	KWB-7	Apr-21		0.00346	0.259	0.435	<0.000150	0.00108 J	<0.00124	1.58	0.00264	1.34	<0.000100	0.00336	0.000427 J	0.00404 J	0.00459 J
	KWB-7	Sep-21		0.000478 J	0.0668	0.450	<0.000150	0.000222 J	<0.00124	0.673	0.00123 J	2.06	<0.000100	0.000855 J	<0.000300	0.000474 J	0.00116 J
	KWB-7	Apr-22		0.00198 J	0.0642	0.449	<0.000150	0.00121 J	<0.00124	1.43	0.00124 J	1.42	<0.000100	0.00374	<0.000300	0.000367 J	0.00362 JB
	KWB-7	Oct-22		0.000673 J	0.0583	0.441	<0.000150	0.000173 J	<0.00124	0.243	<0.000849	2.31	<0.000100	0.000968 J	<0.000300	0.000476 J	0.00288 J
	KWB-8	Oct-16		0.00109 J	0.139	0.665	<0.000160	<0.000260	0.000710 JB	0.672	0.00387	0.997	<0.0000490 JB	0.00102 JB	0.000475 J	0.000746 J	0.00122 J
	KWB-8	Apr-17		0.00129 J	0.106	0.632	<0.000160	0.000264 J	0.000851 J	1.07	0.00495	1.83	<0.0000490	0.00120 J	<0.000380	<0.000330	0.00157 J
	KWB-8	Oct-17		0.00135 J	0.130	0.769	<0.000160	<0.000260	0.00153 J	0.0804 J	0.00296	0.510	<0.0000490	0.000997 J	0.0463	<0.000330	0.00112 J
	KWB-8	Oct-20		0.00348	0.0706	0.661	<0.000478	0.000490 J	0.00626	1.32	0.00678	0.0432	<0.000100	0.00306	<0.000657	<0.00754	0.00115 J
	KWB-10R	Apr-17		0.0157	3.82					<0.000540	5.21	0.000971 J	0.157		<0.000380		
	KWB-10R	Oct-17		0.0170	3.85					<0.000540	5.24	0.000996 J	0.163		<0.000380		
	KWB-10R	Apr-18		0.0169	3.91					<0.000540	4.57	0.00320	0.170		<0.000380		
	KWB-10R	Oct-18		0.0164	3.93					<0.00270	4.24	0.00124 J	0.168		<0.00190		
	KWB-11A	Jun-20		0.0111	0.0329	0.380	<0.000478	0.00371	<0.00149	7.33	0.00307 J	0.570	<0.000100	0.00429	0.00104 J	0.0143 J	0.00286 J
	KWB-11A	Oct-20		0.00403	0.0227	0.387	<0.000478	0.00271	<0.00149	1.05	<0.00249	0.471	<0.000100	0.00413	0.00134 J	0.0118 J	0.00555
	KWB-11A	Sep-21		0.00815	0.0251	0.379	<0.000150	0.00133 J	<0.00124	4.00	0.00116 J	0.651	<0.000100	0.00286	0.000361 J	0.0115	0.00404 J
	KWB-11A	Oct-22		0.00238	0.0219	0.360	<0.000150	0.000703 J	<0.00124	0.732	<0.000849	0.336	<0.000100	0.00270	<0.000300	0.0142	0.00792
	KWB-11B	Jun-20		0.00119 J	0.0144 J	0.0989 J	<0.000478	<0.000477	<0.00149	<0.0489	<0.00249	0.00213 J	<0.000100	<0.000952	0.00865	0.0125 J	0.00855
	KWB-11B	Oct-20		<0.00368	<0.0389	0.111 J	<0.00239	<0.00238	<0.00745	<0.244	<0.0124	<0.00660	<0.000100	<0.00476	0.00750 J	<0.0377	0.00905 J
	KWB-11B	Apr-21		0.00147 J	0.0146 J	0.102 J	<0.000150	<0.0000596	0.00141 J	0.0796 J	<0.000849	0.00333 J	<0.000100	<0.000816	0.00854	0.0125 J	0.00965
	KWB-11B	Sep-21		0.00146 J	0.0149	0.115 J	<0.000150	<0.0000596	<0.00124	<0.0281	<0.000849	0.00340 J	<0.000100	<0.000816	0.00639	0.0132	0.00872
	KWB-11B	Apr-22		0.000340 J	0.0119	0.0973 J	<0.000150	<0.0000596	<0.00124	0.0306 J	<0.000849	0.000734 J	<0.000100	<0.000816	0.00694	0.00777	0.00241 J
	KWB-11B	Oct-22		0.00157 J	0.0142	0.116 J	<0.000150	<0.0000596	<0.00124	<0.0281	<0.000849	0.00167 J	0.000160 J	<0.000816	0.00605	0.0141	0.00953
	KWB-12A	Jun-20		0.00217	0.0182 J	0.552	<0.000478	<0.000477	<0.00149	0.195	<0.00249	0.0199	<0.000100	0.00213	0.00292	0.0268	0.0112
	KWB-12A	Oct-20		0.00148 J	0.0188 J	0.535	<0.000478	<0.000477	<0.00149	<0.0489	<0.00249	0.00279 JB	<0.000100	<0.000952	0.00371	0.0267	0.00976
	KWB-12A	Sep-21		0.00158 J	0.0194	0.503	<0.000150	0.0000641 J	0.00124 J	0.0498 J	<0.000849	0.00144 J	<0.000100	0.000944 J	0.00549	0.0260	0.0135
	KWB-12A	Oct-22		0.00180 J	0.0174	0.556	<0.000150	0.0000698 J	<0.00124	<0.0281	<0.000849	0.000810 J	<0.000100	0.000856 J	0.00368	0.0259	0.0156
	KWB-12B	Jun-20		0.00169 J	0.00835 J	0.594	<0.000478	<0.000477	<0.00149	<0.0489	<0.00249	<0.00132	<0.000100	<0.000952	0.00268	0.0275	0.0129
	KWB-12B	Jun-20	FD	0.00178 JB	0.00890 J	0.590	<0.000478	<0.000477	<0.00149	<0.0489	<0.00249	<0.00132	<0.000100	0.0162	0.00254	0.0266	0.0126
	KWB-12B	Oct-20		0.00189 J	0.00994 J	0.580	<0.000478	<0.000477	<0.00149	<0.0489	<0.00249	<0.00132	<0.000100	0.00146 J	0.00294	0.0287	0.0135
	KWB-12B	Oct-20	FD	0.00173 J	0.00955 J	0.577	<0.000478	<0.000477	0.00173 J	<0.0489	<0.00249	<0.00132	<0.000100	<0.000952	0.00269	0.0268	0.0134
	KWB-12B	Apr-21		0.00177 J	0.0102 J	0.600	<0.000150	0.0000762 J	<0.00124	0.0567 J	0.00113 J	0.00260 J	<0.000100	0.00113 J	0.00317	0.0278	0.0133
	KWB-12B	Apr-21	FD	0.00170 J	0.0103 J	0.594	<0.000150	0.0000869 J	<0.00124	0.0513 J	<0.000849	0.00145 J	<0.000100	0.000957 J	0.00265	0.0296	0.0130
	KWB-12B	Sep-21		0.00183 J	0.0133	0.596	<0.000150	0.0000597 J	<0.00124	<0.0281	<0.000849	0.00255 J	<0.000100	<0.0008			

Table 4B - Summary of Groundwater Analytical Data - Total Metals
2022 Annual Groundwater Monitoring Report
HF Sinclair Navajo Refining LLC, Artesia Refinery, Artesia, New Mexico

Analyte Group				Total Metals													
				Arsenic 7440-38-2 mg/L CGWSL 0.0100	Barium 7440-39-3 mg/L 2.00	Boron 7440-42-8 mg/L 0.750	Cadmium 7440-43-9 mg/L 0.00500	Cobalt 7440-48-4 mg/L 0.0500	Chromium 7440-47-3 mg/L 0.0500	Iron 7439-89-6 mg/L 1.00	Lead 7439-92-1 mg/L 0.0150	Manganese 7439-96-5 mg/L 0.200	Mercury 7439-97-6 mg/L 0.00200	Nickel 7440-02-0 mg/L 0.200	Selenium 7782-49-2 mg/L 0.0500	Uranium 7440-61-1 mg/L 0.0300	Vanadium 7440-62-2 mg/L 0.0631
CGWSL Source				WQCC HH	WQCC HH	WQCClrr	WQCClrr	WQCC HH	WQCC HH	WQCC Dom	WQCC HH	WQCC Dom	WQCC HH	WQCClrr	WQCC HH	WQCC HH	NMED TW
Area	Well ID	Date	Dup														
Field East of Refinery	MW-131	Apr-17		0.0214	2.75				<0.000540	1.29	<0.000240	0.294			<0.000380		
	MW-131	Oct-17		0.0223	1.98				<0.000540	1.56	<0.000240	0.283			<0.000380		
	MW-131	Oct-19		0.0261	1.65				<0.000540	1.55	0.000845 JB	0.293			<0.000380		
	MW-131	Jun-20		0.0241	2.39				<0.00149	1.35	<0.00249	0.294			<0.000657		
	MW-133	Nov-14		0.0190	0.130				0.000600 J	3.50	0.000800 J	0.380			<0.000380		
	MW-133	Apr-15		0.00897	0.157				<0.000540	5.53	0.00145 J	0.312			0.00124 J		
	MW-134	Jun-20		0.00368	0.00896 J				<0.00149	<0.0489	<0.00249	0.00741			0.00631		
	MW-134	Jun-20	FD	0.00384	0.00932 J				<0.00149	<0.0489	<0.00249	0.00677			0.00602		
	MW-134	Oct-20		0.00362	0.0101 J				<0.00149	0.0916 J	<0.00249	0.0370			0.00592		
	MW-134	Oct-20	FD	0.00356	0.0101 J				<0.00149	0.0671 J	<0.00249	0.0339			0.00527		
	MW-134	Apr-21		0.00352	0.00901 J				0.00150 J	0.0433 J	<0.000849	0.0163			0.00550		
	MW-134	Apr-21	FD	0.00344	0.0103 J				<0.00124	<0.0281	<0.000849	0.0165			0.00500		
	MW-134	Sep-21		0.00375	0.00927				<0.00124	0.0299 J	<0.000849	0.115			0.00469		
	MW-134	Sep-21	FD	0.00386	0.0106				<0.00124	0.0307 J	<0.000849	0.120			0.00443		
	MW-134	Apr-22		0.00350	0.00866				<0.00124	0.0424 J	<0.000849	0.00706			0.00416		
	MW-134	Apr-22	FD	0.00334	0.00859				0.00192 J	0.0328 J	<0.000849	0.00566			0.00441		
	MW-134	Oct-22		0.00961	0.0104				0.00144 J	0.542	<0.000849	0.0910			0.00478		
	MW-134	Oct-22	FD	0.00898	0.0103				0.00191 J	0.500	<0.000849	0.0927			0.00464		
	MW-135	Jun-20		0.00326	0.0158 J				<0.00149	0.203	<0.00249	0.0119			0.0221		
	MW-135	Oct-20		<0.00368	<0.0389				<0.00745	0.745	<0.0124	0.0315			0.0186		
	MW-135	Apr-21		0.00321	0.0116 J				<0.00124	0.127	<0.000849	0.00777			0.0197		
	MW-135	Sep-21		0.00300	0.0186				<0.00124	0.253	<0.000849	0.0142			0.0221		
	MW-135	Apr-22		0.00294	0.0176				<0.00124	0.208	<0.000849	0.0131			0.0221		
	MW-135	Oct-22		0.00324	0.00895				<0.00124	0.0470 J	<0.000849	0.00340 J			0.0224		
	MW-145	Oct-20															
	MW-145	Oct-20	FD														
	MW-145	Apr-21		0.00414	0.00871 J				<0.00124	0.0308 J	<0.000849	0.0259			0.00398		
	MW-145	Sep-21		0.00362	0.0102				0.00140 J	0.228	0.00237	0.0278			0.00345		
	MW-145	Apr-22		0.00448	0.0217				0.00210	0.765	0.000995 J	0.0395			0.00271		
	MW-145	Oct-22		0.00371	0.00879				<0.00124	0.0285 J	<0.000849	0.0261			0.00239		
	MW-146	Oct-20															
	MW-146	Apr-21		0.00463	0.00848 J				<0.00124	<0.0281	<0.000849	0.00171 J			0.00815		
	MW-146	Sep-21		0.00404	0.00850				<0.00124	<0.0281	<0.000849	<0.000704			0.00953		
	MW-146	Sep-21	FD	0.00390	0.00907				<0.00124	<0.0281	<0.000849	<0.000704			0.00983		
	MW-146	Apr-22		0.00407	0.00863				0.00181 J	0.0430 J	<0.000849	0.00195 J			0.00591		
	MW-146	Apr-22	FD	0.00407	0.0102				<0.00124	0.0764 J	<0.000849	0.00329 J			0.00699		
	MW-146	Oct-22		0.00438	0.00856				<0.00124	<0.0281	<0.000849	<0.000704			0.0107		
	MW-146	Oct-22	FD	0.00426	0.00800				<0.00124	<0.0281	<0.000849	<0.000704			0.0104		
	MW-147	Oct-20															
	MW-147	Apr-21		0.00308	0.0825				0.00282	1.40	0.00648	0.0783			0.0193		
	MW-147	Sep-21		0.00286	0.0156				0.00140 J	0.259	0.00381	0.0112			0.0180		
	MW-147	Apr-22		0.00286	0.0577				<0.00124	0.571	0.00417	0.0482			0.0177		
	MW-147	Oct-22		0.00307	0.00746				<0.00124	0.0731 J	0.00130 J	0.00866			0.0229		
	MW-148	Oct-20															
	MW-148	Apr-21		0.00268	0.0192 J				0.00135 J	0.264	0.000893 J	0.0507			0.0114		
	MW-148	Sep-21		0.00317	0.0977				0.00275	2.02	0.00322	0.477			0.0101		
	MW-148	Apr-22		0.00302	0.0844				0.00281	2.10	0.00392	0.400			0.0101		
	MW-148	Oct-22		0.00279	0.00989				0.00126 J	0.0903 J	0.00392	0.0253			0.00933		
	RA-4196	Apr-19															
	RA-4196	Oct-19															
	RA-4196	Jun-20															
	RA-4196	Oct-20															
	RA-4798	Jun-20															
	RA-4798	Oct-20															
	RA-4798	Apr-21															
	RA-4798	Sep-21															
	RA-4798	Apr-22															
	RW-12R	Apr-17		0.000503 J	0.0409				0.0359	0.241	0.00193 J	0.398			<0.000380	</	

Table 4B - Summary of Groundwater Analytical Data - Total Metals
2022 Annual Groundwater Monitoring Report
HF Sinclair Navajo Refining LLC, Artesia Refinery, Artesia, New Mexico

Analyte Group				Total Metals													
Analyte				Arsenic	Barium	Boron	Cadmium	Cobalt	Chromium	Iron	Lead	Manganese	Mercury	Nickel	Selenium	Uranium	Vanadium
CAS				7440-38-2	7440-39-3	7440-42-8	7440-43-9	7440-48-4	7440-47-3	7439-89-6	7439-92-1	7439-96-5	7439-97-6	7440-02-0	7782-49-2	7440-61-1	7440-62-2
Units				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
CGWSL				0.0100	2.00	0.750	0.00500	0.0500	0.0500	1.00	0.0150	0.200	0.00200	0.200	0.0500	0.0300	0.0631
CGWSL Source				WQCC HH	WQCC HH	WQCClrr	WQCClrr	WQCC HH	WQCC HH	WQCC Dom	WQCC HH	WQCC Dom	WQCC HH	WQCClrr	WQCC HH	WQCC HH	NMED TW
Area	Well ID	Date	Dup														
NCL	MW-56	Apr-19		0.00631	0.0132				<0.000540	0.0310 J	0.000718 J	0.325			0.00217		
	MW-56	Jun-20		0.00529	0.0104 J				<0.00149	<0.0489	<0.00249	0.302			0.000968 J		
	MW-56	Apr-21		0.00529	0.0113 J				<0.00124	<0.0281	0.00105 J	0.287			0.00177 J		
	MW-56	Apr-22		0.00501	0.0104				<0.00124	0.0459 J	<0.000849	0.219			0.00177 J		
	MW-108	Jun-20		0.00111 J	0.0411				<0.00149	0.230	<0.00249	0.0401			<0.000657		
	MW-108	Oct-20		0.00115 J	0.0469				<0.00149	<0.0489	<0.00249	0.0593			<0.000657		
	MW-108	Apr-21		0.00120 J	0.0709				0.00169 JB	0.703	0.00174 J	0.231			<0.000300		
	MW-108	Sep-21		0.00103 J	0.0593				0.00152 J	0.363	<0.000849	0.0665			<0.000300		
	MW-108	Apr-22		0.000526 J	0.0461				<0.00124	0.0411 J	<0.000849	0.0392			<0.000300		
	MW-108	Oct-22		0.000445 J	0.0442				<0.00124	0.700	<0.000849	0.0573			0.0638		
	NCL-31	Jun-20		0.0135	0.0134 J				<0.00149	1.13	<0.00249	2.24			<0.000657		
	NCL-31	Oct-20		0.0120	0.0129 J				<0.00149	0.689	<0.00249	2.15			<0.000657		
	NCL-31	Apr-21		0.00668	0.0326				0.00265 B	1.37	0.00233	1.49			<0.000300		
	NCL-31	Sep-21		0.0104	0.0217				<0.00124	0.526	0.000940 J	1.47			<0.000300		
	NCL-31	Apr-22		0.0115	0.0143				<0.00124	0.476	<0.000849	1.55			<0.000300		
	NCL-31	Oct-22		0.0134	0.0258				<0.00124	0.616	<0.000849	1.69			0.00374		
	NCL-32	Jun-20		0.00203	0.0165 J				<0.00149	<0.0489	<0.00249	1.31			0.00321		
	NCL-32	Oct-20		0.00236	0.0160 J				<0.00149	0.0494 J	<0.00249	1.73			0.00271		
	NCL-32	Apr-21		0.00270	0.0318				0.00688 B	1.06	0.00515	1.60			0.00222		
	NCL-32	Sep-21		0.00214	0.0185				0.00301	0.676	0.00172 J	1.67			0.00265		
	NCL-32	Apr-22		0.00232	0.0219				0.00544	0.353	0.00255	1.33			0.00239		
	NCL-32	Oct-22		0.00276	0.0199				<0.00124	0.0726 J	<0.000849	2.00			0.00501		
	NCL-33	Jun-20		0.00452	0.0289				<0.00149	3.52	<0.00249	0.194			0.00130 J		
	NCL-33	Oct-20		0.00531	0.0231				<0.00149	4.03	<0.00249	0.188			0.00144 J		
	NCL-33	Apr-21		0.00613	0.0243				<0.00124	3.00	<0.000849	0.191			0.00167 J		
	NCL-33	Sep-21		0.00642	0.0206				<0.00124	3.17	<0.000849	0.167			0.00154 J		
	NCL-33	Apr-22		0.00652	0.0224				0.00146 J	3.76	<0.000849	0.165			0.00158 J		
	NCL-33	Oct-22		0.00573	0.0202				<0.00124	2.72	<0.000849	0.155			0.00809		
	NCL-34A	Oct-18		0.000692 J	0.376				<0.000540	<0.0150	<0.000240	0.0191			0.000423 J		
	NCL-34A	Apr-19		0.000663 Jv	0.966 V				<0.000540	0.0216 J	<0.000240	0.0158 o1			0.101 JJJ601		
	NCL-34A	Oct-19		0.000719 J	0.293				0.000842 JB	0.0403 JB	0.000906 JB	0.0318			0.000403 J		
	NCL-34A	Jun-20		0.000811 J	0.242				<0.00149	<0.0489	<0.00249	0.0416			<0.000657		
	NCL-44	Jun-20		0.0305	0.0218				<0.00149	1.09	<0.00249	0.842			<0.000657		
	NCL-44	Oct-20		0.0211	0.0201				0.00369	0.641	<0.00249	0.820			<0.000657		
	NCL-44	Apr-21		0.0211	0.0196 J				0.00152 JB	1.14	<0.000849	0.831			0.000456 J		
	NCL-44	Sep-21		0.0188	0.0190				<0.00124	0.661	<0.000849	0.743			<0.000300		
	NCL-44	Apr-22		0.0149	0.0186				0.00237	0.611	0.00107 J	0.777			0.000418 J		
	NCL-44	Oct-22		0.0155	0.0179				<0.00124	0.591	<0.000849	0.770			0.0205		
	NCL-49	Jun-20		0.00135 J	0.0145 J				<0.00149	<0.0489	<0.00249	0.0222			0.00832		
	NCL-49	Jun-20	FD	0.00123 J	0.0126 J				<0.00149	<0.0489	<0.00249	0.00204 J			0.00717		
NCL-49	Oct-20		0.00141 J	0.0129 J				0.00153 J	<0.0489	<0.00249	<0.00132			0.00873			
NCL-49	Oct-20	FD	0.00155 J	0.0123 J				<0.00149	<0.0489	<0.00249	<0.00132			0.00920			
NCL-49	Apr-21		0.00157 J	0.0132 J				<0.00124	<0.0281	<0.000849	0.00243 J			0.0104			
NCL-49	Apr-21	FD	0.00163 J	0.0128 J				<0.00124	<0.0281	<0.000849	<0.000704			0.0103			
NCL-49	Sep-21		0.00149 J	0.0112				<0.00124	<0.0281	<0.000849	<0.000704			0.0121			
NCL-49	Sep-21	FD	0.00145 J	0.0129				<0.00124	<0.0281	<0.000849	<0.000704			0.0105			
NCL-49	Apr-22		0.00168 J	0.0130				<0.00124	<0.0281	<0.000849	<0.000704			0.0116			
NCL-49	Apr-22	FD	0.00160 J	0.0123				<0.00124	<0.0281	<0.000849	<0.000704			0.0105			
NCL-49	Oct-22		0.00159 J	0.0133				<0.00124	<0.0281	<0.000849	<0.000704			0.0125			
NCL-49	Oct-22	FD	0.00150 J	0.0122				<0.00124	<0.0281	<0.000849	<0.000704			0.0193			
North Refinery	MW-23	Apr-19		0.00499	9.47				0.000969 JB	0.0226 J	0.00230	0.0709			0.00135 J</		

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2022 Annual Groundwater Monitoring Report
HF Sinclair Navajo Refining LLC, Artesia Refinery, Artesia, New Mexico

Analyte Group				Total Metals													
				Arsenic	Barium	Boron	Cadmium	Cobalt	Chromium	Iron	Lead	Manganese	Mercury	Nickel	Selenium	Uranium	Vanadium
				7440-38-2	7440-39-3	7440-42-8	7440-43-9	7440-48-4	7440-47-3	7439-89-6	7439-92-1	7439-96-5	7439-97-6	7440-02-0	7782-49-2	7440-61-1	7440-62-2
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
				CGWSL	0.0100	2.00	0.750	0.00500	0.0500	0.0500	1.00	0.0150	0.200	0.00200	0.200	0.0500	0.0300
CGWSL Source				WQCC HH	WQCC HH	WQCClrr	WQCClrr	WQCC HH	WQCC HH	WQCC Dom	WQCC HH	WQCC Dom	WQCC HH	WQCClrr	WQCC HH	WQCC HH	NMED TW
Area	Well ID	Date	Dup														
North Refinery	MW-90	Jun-20		0.00299 B	0.0150 J					<0.00149	0.295	<0.00249	0.0909			<0.000657	
	MW-90	Oct-20		0.00318	0.0163 J					0.00157 J	0.495	<0.00249	0.124			<0.000657	
	MW-90	Apr-21		0.00598	0.0161 J					<0.00124	0.511	<0.000849	0.107			0.000845 J	
	MW-90	Sep-21		0.00920	0.0174					<0.00124	0.800	<0.000849	0.533			0.00178 J	
	MW-90	Apr-22		0.00603	0.0259					0.00450	0.129	<0.000849	0.0463			0.000543 J	
	MW-90	Oct-22		0.00358	0.0212					<0.00124	0.0355 J	<0.000849	0.0781			0.0724	
	MW-91	Oct-18		0.00772	0.0484					0.000738 J	0.0472 J	0.00440 B	0.00539			0.000542 J	
	MW-91	Apr-19		0.00693	0.0460					<0.000540	0.0388 J	0.00412 B	0.00762			0.00460	
	MW-91	Oct-19		0.00392	0.0552					<0.000540	0.0186 J	0.00475	0.00710 B			0.0214	
	MW-91	Jun-20		0.00524 B	0.0561					<0.00149	0.197	0.00610	0.00381 J			<0.000657	
	MW-92	Apr-16		0.00316 J	3.44 oiv					<0.00270	0.328 J	<0.00120	0.0363			0.00207 J	
	MW-92	Oct-16		0.00732	2.81					0.00101 JB	0.0744 J	0.00183 J	0.0274			0.00172 J	
	MW-93	Apr-17		0.00456	0.0228					0.00367	0.278	0.00116 J	0.0258			0.00683	
	MW-93	Apr-18		0.00706	0.0304					0.00945	0.145 B	0.00152 JB	0.0325			0.00377 B	
	MW-93	Apr-19		0.00456	0.0394					0.00174 JB	0.110	0.00105 J	0.0615			0.0144	
	MW-93	Jun-20		0.00827	0.0351					0.00257	0.181	<0.00249	0.208			0.00412	
	MW-94	Oct-15		0.0215	1.57					0.00144 J	<0.0150	<0.000240	0.00194 J			0.000935 J	
	MW-94	Apr-16		0.0286	0.353					<0.00270	<0.0750	<0.00120	0.00666 J			<0.00190	
	MW-94	Oct-16		0.0115	0.635					0.00119 JB	0.0159 J	0.000255 J	0.00631			0.000962 J	
	MW-94	Apr-17		0.0170	0.873					0.00141 J	0.134	0.000298 J	0.00382 J			0.00304	
	MW-95	Apr-17		0.00173 J	0.0612					<0.000540	<0.0150	<0.000240	0.0330			0.000407 J	
	MW-95	Apr-18		0.00154 J	0.0691					<0.000540	0.0155 J	<0.000240	0.0556			<0.000380	
	MW-95	Apr-19		0.00141 J	0.0597					<0.000540	<0.0150	0.000528 JB	0.0904			<0.000380	
	MW-95	Jun-20		0.00135 JB	0.0431					<0.00149	0.0879 J	<0.00249	0.156			<0.000657	
	MW-96	Jun-20		0.00241 B	0.176					<0.00149	<0.0489	<0.00249	<0.00132			<0.000657	
	MW-96	Oct-20		0.00207	0.175					<0.00149	<0.0489	<0.00249	<0.00132			<0.000657	
	MW-96	Sep-21		0.00294	0.175					<0.00124	0.892	<0.000849	0.0364			0.000317 J	
	MW-96	Apr-22		0.00198 J	0.289					<0.00124	<0.0281	<0.000849	0.00153 J			0.000743 J	
	MW-96	Oct-22		0.00172 J	0.226					<0.00124	0.156	<0.000849	0.000793 J			0.0425	
	MW-98	Jun-20		0.000895 J	0.0180 J					0.00316	0.0721 J	0.00815	0.0213			<0.000657	
	MW-98	Oct-20		0.000795 J	0.0176 J					<0.00149	<0.0489	0.00690	0.0208			<0.000657	
	MW-98	Apr-21		0.000700 J	0.0193 J					0.00134 J	0.0480 J	0.00642	0.0219			0.000516 J	
	MW-98	Sep-21		0.000689 J	0.0171					0.00133 J	0.0339 J	0.00671	0.0192			<0.000300	
	MW-98	Apr-22		0.00131 J	0.0162					<0.00124	<0.0281	0.00563	0.0149			<0.000300	
	MW-98	Oct-22		0.00132 J	0.0172					<0.00124	<0.0281	0.00659	0.0165			<0.000300	
	MW-137	Oct-17		0.0156	0.0756	1.03	<0.000160	<0.000260	0.00109 J	0.260	0.00338	0.209	<0.0000490	0.0198	0.0393	<0.000330	0.00771
	MW-137	Apr-18		0.0512	0.0711	0.997	<0.000160	<0.000260	0.00132 J	0.0740 JB	0.00433	0.154	<0.0000490	0.0134	0.00240 B	<0.000330	0.00718
	MW-137	Oct-18		0.0129	0.0942	0.989	<0.000160	<0.000260	0.000586 J	0.0553 J	0.00318	0.183	<0.0000490	0.0126	0.341	<0.000330	0.00844
	MW-137	Apr-19		0.0285	0.103	1.02	<0.000160	<0.000260	0.000596 JB	0.0240 J	0.00268	0.157	<0.0000490	0.0133	0.00601	<0.000330	0.00838
	MW-138	Oct-17		0.00507	0.103	1.11	<0.000160	<0.000260	0.000747 J	0.0334 J	0.000271 J	0.0931	<0.0000490	0.00619	0.00945	<0.000330	0.00195 J
	MW-138	Apr-18		0.00514	0.124	0.984	<0.000160	<0.000260	0.000785 J	0.160 B	<0.000240	0.103	<0.0000490	0.00977	0.000667 JB	<0.000330	0.00169 J
	MW-138	Oct-18		0.00464	0.108	0.927	<0.000160	<0.000260	<0.000540	0.0235 J	0.000249 J	0.111	<0.0000490	0.00490	0.0973	<0.000330	0.00120 J
	MW-138	Apr-19		0.00560	0.141	0.951	<0.000160	<0.000260	0.000855 JB	0.0228 J	0.000353 J	0.128	<0.0000490	0.00504	0.00102 J	<0.000330	0.00121 J
	RW-1R	Apr-16		0.00695 J	0.0414					<0.00270	17.1	0.00149 J	0.317			0.00246 J	
	RW-1	Apr-17		0.0359	0.0243					0.00254	4.88	0.00492	0.240			0.00573 B	
	RW-1	Apr-18		0.0204	0.0328					0.000826 JJ3J4	1.50	0.00156 J	0.0237			0.00213	
	RW-1	Apr-19		0.0172	0.0357					0.00100 JB	1.14	0.00100 JB	0.0173			0.00211	
	RW-2	Apr-15		0.0264	0.0245 J					0.00553 J	0.381 J	0.00233 J	0.313			0.0705	
	RW-2R	Apr-16		0.00552 J	0.171				</								

Table 4B - Summary of Groundwater Analytical Data - Total Metals
2022 Annual Groundwater Monitoring Report
HF Sinclair Navajo Refining LLC, Artesia Refinery, Artesia, New Mexico

Analyte Group				Total Metals													
Analyte				Arsenic	Barium	Boron	Cadmium	Cobalt	Chromium	Iron	Lead	Manganese	Mercury	Nickel	Selenium	Uranium	Vanadium
CAS				7440-38-2	7440-39-3	7440-42-8	7440-43-9	7440-48-4	7440-47-3	7439-89-6	7439-92-1	7439-96-5	7439-97-6	7440-02-0	7782-49-2	7440-61-1	7440-62-2
Units				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
CGWSL				0.0100	2.00	0.750	0.00500	0.0500	0.0500	1.00	0.0150	0.200	0.00200	0.200	0.0500	0.0300	0.0631
CGWSL Source				WQCC HH	WQCC HH	WQCClrr	WQCClrr	WQCC HH	WQCC HH	WQCC Dom	WQCC HH	WQCC Dom	WQCC HH	WQCClrr	WQCC HH	WQCC HH	NMED TW
Area	Well ID	Date	Dup														
South Refinery	MW-28	Apr-19		0.00422	0.0660	1.48	<0.000160	<0.000260	0.00131 JB	0.0910 J	0.00990	0.0749	<0.0000490	0.00465	<0.000380	<0.000330	0.00270 J
	MW-28	Oct-19		0.00396	0.0522	1.53	<0.000160	<0.000260	0.000933 J	0.0502 JB	0.00717	0.0261	0.0000582 JB	0.00275	0.00329	<0.000330	0.00228 J
	MW-28	Jun-20		0.00705	0.0449	1.32	<0.000478	0.000802 J	<0.00149	0.122	0.0117	0.708	<0.000100 J6	0.00624	<0.000657	<0.00754	0.00364 J
	MW-28	Oct-20		0.00538	0.0371	1.32	<0.000478	<0.000477	<0.00149	0.0940 J	0.00540	0.389	<0.000100	0.00504	<0.000657	<0.00754	0.00375 JB
	MW-48	Apr-18		0.00554	1.82				<0.000540	0.105	0.00142 J	0.136			0.247		
	MW-48	Oct-18		0.00561	1.13 V				0.00119 J	0.231	0.00268	0.347			0.00132 J		
	MW-48	Apr-19		0.00395	1.04				0.000613 JB	0.195	0.00297	0.481			0.0405		
	MW-48	Oct-19		0.00646	1.04				0.00117 J	0.234	0.00232	0.604			0.000428 J		
	MW-50	Jun-20		0.00379 B	0.0113 J				<0.00149	0.226	<0.00249	0.536			0.0309		
	MW-50	Oct-20		0.00301	0.0128 J				<0.00149	0.0795 J	<0.00249	0.450			0.0377		
	MW-50	Apr-21		0.0121	0.0142 J				<0.00124	3.96	0.00161 J	1.04			0.000675 J		
	MW-50	Sep-21		0.00292	0.0142				<0.00124	0.191	<0.000849	0.156			0.120		
	MW-50	Apr-22		0.00338	0.0112				<0.00124	0.164	<0.000849	0.473			0.0132		
	MW-50	Oct-22		0.00373	0.0151				<0.00124	0.126	<0.000849	0.507			0.0551		
	MW-52	Jun-20		0.00344	0.0149 J	0.767	<0.000478	0.000742 J	0.00273	0.252	<0.00249	0.0928	<0.000100	0.0260	0.00612	0.0131 J	0.0247
	MW-52	Oct-20		0.00361	0.0123 J	0.772	<0.000478	0.000636 J	<0.00149	<0.0489	<0.00249	0.0661	<0.000100	0.0304	0.00578	0.0125 J	0.0240
	MW-52	Apr-21		0.00350	0.0126 J	0.765	<0.000150	0.000735 J	<0.00124	0.0283 J	<0.000849	0.0738	<0.000100	0.0314	0.00522	0.0117 J	0.0255
	MW-52	Sep-21		0.00363	0.0113	0.774	<0.000150	0.000791 J	<0.00124	<0.0281	<0.000849	0.0640	<0.000100	0.0377	0.00312	0.0104	0.0243
	MW-52	Apr-22		0.00384	0.0113	0.762	<0.000150	0.000818 J	<0.00124	<0.0281	<0.000849	0.0673	<0.000100	0.0446	0.00355	0.00937	0.0266
	MW-52	Oct-22		0.00384	0.0126	0.761	<0.000150	0.00101 J	<0.00124	0.0543 J	<0.000849	0.0783	<0.000100	0.0436	0.00363	0.0120	0.0247
	MW-64	Jun-20		0.0246	2.29				<0.00149	0.349	<0.00249	0.0920			<0.000657		
	MW-64	Oct-20		0.0249	2.15				<0.00149	0.0846 J	<0.00249	0.0742			<0.000657		
	MW-64	Apr-21		0.0237	1.91				<0.00124	0.0631 J	0.00110 J	0.0619			0.000381 J		
	MW-64	Sep-21		0.0234	1.88				<0.00124	0.0938 J	<0.000849	0.0667			0.000570 J		
	MW-64	Apr-22		0.0231	2.13				<0.00124	0.0716 J	<0.000849	0.0566			0.000401 J		
	MW-64	Oct-22		0.0248	2.12				<0.00124	0.0336 J	<0.000849	0.0610			0.000550 J		
	MW-65	Apr-18		0.0108	2.60				<0.000540	2.18	0.000448 J	0.527			<0.000380		
	MW-65	Oct-18		0.00679 J	1.71				<0.00270	0.624	<0.00120	0.431			<0.00190		
	MW-65	Apr-19		0.00832	1.88				<0.000540	0.739	0.000373 JB	0.530			<0.000380		
	MW-65	Oct-19		0.00653	1.58				<0.000540	0.265	0.000311 JB	0.405			<0.000380		
	MW-66	Oct-19		0.00236	1.44	0.206	<0.000160	<0.000260	0.000717 J	0.426 B	0.00104 JB	0.283	0.0000567 JB	0.0131	0.00393	<0.000330	0.00180 J
	MW-66	Jun-20		0.00235	1.99	0.250	<0.000478	<0.000477	<0.00149	0.748	<0.00249	0.306	<0.000100	0.00565	<0.000657	<0.00754	<0.000986
	MW-66	Oct-20		0.00267	1.68	0.229	<0.000478	<0.000477	<0.00149	0.704	<0.00249	0.339	<0.000100	0.00675	<0.000657	<0.00754	0.00212 JB
	MW-66	Apr-21		0.00481	2.28	0.294	0.000184 J	0.00135 J	0.00745	3.81	0.0176	0.412	<0.000100	0.0133	0.000342 J	0.000188 J	0.00606
	MW-99	Oct-18		0.00821	0.452				0.000542 J	0.163	0.000718 J	0.224			0.00169 J		
	MW-99	Apr-19		0.00789	0.404				0.00207 B	0.346	0.00319	0.225			0.000538 J		
	MW-99	Oct-19		0.00338	0.200				0.00124 J	0.465 B	0.00301	0.193			0.00451		
	MW-99	Jun-20		0.00301	0.209				0.00275	0.168	<0.00249	0.229			<0.000657		
	MW-101	Jun-20		0.0735	0.0551				<0.00149	3.42	<0.00249	1.15			<0.000657		
	MW-101	Oct-20		0.0107	0.0786				<0.00149	1.75	<0.00249	0.912			<0.000657		
	MW-101	Apr-21		0.00423	0.168				0.00212	0.337	0.00181 J	0.669			0.00102 J		
	MW-101	Sep-21		0.00301	0.0949				<0.00124	0.182	<0.000849	0.651			<0.000300		
	MW-101	Apr-22		0.00428	0.126				<0.00124	0.133	<0.000849	0.665			<0.000300		
	MW-101	Oct-22		0.00450	0.117				<0.00124	0.622	<0.000849	0.747			<0.000300		
	MW-102	Jun-20		0.0129	8.69				<0.00149	0.187	0.00498 J	0.0370			<0.000657		
	MW-102	Oct-20		0.0147	8.81				0.00155 J	0.159	0.00387 J	0					

Table 4B - Summary of Groundwater Analytical Data - Total Metals
2022 Annual Groundwater Monitoring Report
HF Sinclair Navajo Refining LLC, Artesia Refinery, Artesia, New Mexico

Analyte Group				Total Metals														
				Arsenic	Barium	Boron	Cadmium	Cobalt	Chromium	Iron	Lead	Manganese	Mercury	Nickel	Selenium	Uranium	Vanadium	
				7440-38-2	7440-39-3	7440-42-8	7440-43-9	7440-48-4	7440-47-3	7439-89-6	7439-92-1	7439-96-5	7439-97-6	7440-02-0	7782-49-2	7440-61-1	7440-62-2	
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
				CGWSL	0.0100	2.00	0.750	0.00500	0.0500	0.0500	1.00	0.0150	0.200	0.00200	0.200	0.0500	0.0300	0.0631
CGWSL Source				WQCC HH	WQCC HH	WQCClrr	WQCClrr	WQCC HH	WQCC HH	WQCC Dom	WQCC HH	WQCC Dom	WQCC HH	WQCClrr	WQCC HH	WQCC HH	NMED TW	
Area	Well ID	Date	Dup															
South Refinery	RW-5R	Apr-15		0.00136 J	0.0259					<0.000540	0.0952 J	0.000336 J	0.0177			<0.000380		
	RW-5R	Apr-16		0.00183 J	0.0282					<0.00270	<0.0750	<0.00120	0.0191 J			<0.00190		
	RW-6	Apr-15		0.0332	1.66					<0.000540	13.8	0.000574 J	0.280			<0.000380		
	RW-6R	Apr-16		0.0712	0.480					<0.00270	3.70	<0.00120	0.553			<0.00190		
	RW-6	Apr-18		0.0170	1.94					0.00106 J	1.59	0.000764 JB	0.298			<0.000380		
	RW-6	Apr-19		0.00630	6.89					0.000826 JB	0.173	0.000482 J	0.156			<0.000380		
	RW-15C	Apr-17		0.0274	0.885					<0.000540	0.316	0.0116	0.358			0.000461 JB		
	RW-15C	Apr-18		0.0239	1.19					0.000699 J	0.264	0.000822 J	0.372			0.000836 J		
RW-15C	Apr-19		0.0135	1.70					0.00534 B	0.473	0.00106 JB	0.457			0.00895			
South RO Field	MW-114	Jun-20		0.00348	0.0145 J					<0.00149	<0.0489	<0.00249	0.980			0.00355		
	MW-114	Oct-20		0.00400	0.0131 J					<0.00149	<0.0489	<0.00249	0.925			0.00293		
	MW-114	Apr-21		0.00459	0.0148 J					<0.00124	0.340	<0.000849	0.834			0.00440		
	MW-114	Sep-21		0.00483	0.0151					<0.00124	<0.0281	<0.000849	0.842			0.00321		
	MW-114	Apr-22		0.00377	0.0120					<0.00124	<0.0281	<0.000849	0.695			0.000752 J		
	MW-114	Oct-22		0.00529	0.0181					<0.00124	<0.0281	<0.000849	0.890			0.00182 J		
	MW-115	Jun-20		0.00388	0.00892 J					<0.00149	<0.0489	<0.00249	0.115			0.00483		
	MW-115	Oct-20		0.00435	0.0112 J					<0.00149	<0.0489	<0.00249	0.0983			0.00844		
	MW-115	Apr-21		0.00467	0.0111 J					<0.00124	<0.140	<0.000849	0.0602			0.00972		
	MW-115	Sep-21		0.00433	0.0101					<0.00124	<0.0281	<0.000849	0.0334			0.00669		
	MW-115	Apr-22		0.00444	0.00893					0.00296	<0.0281	<0.000849	0.0593			0.00576		
	MW-115	Oct-22		0.00533	0.0106					<0.00124	<0.0281	<0.000849	0.0465			0.00406		
	MW-116	Jun-20		0.00294	0.00939 J					<0.00149	0.161	<0.00249	0.0241			0.00730		
	MW-116	Oct-20		0.00300	0.00929 J					<0.00149	0.0902 J	<0.00249	0.0150 B			0.00619		
	MW-116	Apr-21		0.00289	0.0144 J					0.00169 J	0.366	<0.000849	0.0199			0.00685		
	MW-116	Sep-21		0.00306	0.00954					0.00147 J	0.0549 J	<0.000849	0.0227			0.00754		
MW-116	Apr-22		0.00296	0.00856					<0.00124	0.0323 J	<0.000849	0.0366			0.00656			
MW-116	Oct-22		0.00373	0.00971					<0.00124	0.0502 J	<0.000849	0.0916			0.00573			
TEL	MW-49	Jun-20		0.00514	0.0552	0.638	<0.000478	<0.000477	<0.00149	<0.0489	<0.00249	0.147	<0.000100	0.00696	<0.000657	<0.00754	<0.000986	
	MW-49	Oct-20		0.00538	0.0500	0.661	<0.000478	<0.000477	<0.00149	0.0526 J	<0.00249	0.220	<0.000100	0.00835	<0.000657	<0.00754	<0.000986	
	MW-49	Apr-21		0.00564	0.0467	0.691	<0.000150	<0.0000596	<0.00124	0.113	<0.000849	0.295	<0.000100	0.00991	<0.000300	<0.0000700	<0.000664	
	MW-49	Sep-21		0.00466	0.0472	0.698	<0.000150	<0.0000596	<0.00124	0.0669 J	<0.000849	0.213	<0.000100	0.00919	0.000783 J	0.0000789	<0.000664	
	MW-49	Apr-22		0.00488	0.0505	0.701	<0.000150	0.0000771 J	<0.00124	0.0693 J	<0.000849	0.188 JB	<0.000100	0.00944	<0.000300	<0.0000789	0.000690 J	
	MW-49	Oct-22		0.00430	0.0665	0.728	<0.000150	<0.0000596	<0.00124	0.0800 J	0.00135 J	0.173	<0.000100	0.00935	<0.000300	<0.0000789	0.000728 J	
	TEL-1	Oct-18		0.0173	0.0171					0.00240	0.0675 J	<0.000240	0.0419			<0.000380		
	TEL-1	Apr-19		0.0142	0.0203					0.00480	0.158	0.000325 J	0.0425			<0.000380		
	TEL-1	Oct-19		0.0136	0.0158					0.00444 B	0.0598 JB	0.000418 JB	0.0365			<0.000380		
	TEL-1	Jun-20		0.0116	0.0152 J					0.00273	0.120	<0.00249	0.0315			<0.000657		
	TEL-2	Oct-18		0.0152	0.101					0.00151 J	0.0287 J	0.000727 J	0.0273			0.000520 J		
	TEL-2	Apr-19		0.0117	0.111					0.00208	0.0688 J	0.00130 J	0.0190			0.00137 J		
	TEL-2	Oct-19		0.0115	0.0914					0.00295 B	0.0484 JB	0.000814 JB	0.0281			0.000498 J		
	TEL-2	Jun-20		0.00826	0.131					0.00193 J	0.0517 J	<0.00249	0.0341			<0.000657		
	TEL-3	Apr-18		0.0109	0.0248					0.334	1.47	0.000726 J	0.0114			<0.000380		
	TEL-3	Apr-19		0.00228	0.0214					0.0851	0.336	0.00111 J	0.0142			0.000982 J		
	TEL-3	Oct-19		0.00161 J	0.0182					0.0248	0.112 B	0.000803 JB	0.0205			<0.000380		
	TEL-3	Oct-20		0.00434	0.0158 J					0.0275	0.158	<0.00249	0.0170			<0.000657		
	TEL-4	Jun-20		0.00632	0.0169 J					0.103	0.455	<0.00249	1.17 v			0.000712 J		
	TEL-4	Jun-20	FD	0.00618	0.0178 J					0.125	0.506	<0.00249	1.19			<0.000657		
	TEL-4	Oct-20</																

Table 4B - Summary of Groundwater Analytical Data - Total Metals
2022 Annual Groundwater Monitoring Report
HF Sinclair Navajo Refining LLC, Artesia Refinery, Artesia, New Mexico

Analyte Group				Total Metals														
				Analyte	Arsenic	Barium	Boron	Cadmium	Cobalt	Chromium	Iron	Lead	Manganese	Mercury	Nickel	Selenium	Uranium	Vanadium
				CAS	7440-38-2	7440-39-3	7440-42-8	7440-43-9	7440-48-4	7440-47-3	7439-89-6	7439-92-1	7439-96-5	7439-97-6	7440-02-0	7782-49-2	7440-61-1	7440-62-2
				Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
				CGWSL	0.0100	2.00	0.750	0.00500	0.0500	0.0500	1.00	0.0150	0.200	0.00200	0.200	0.0500	0.0300	0.0631
CGWSL Source				WQCC HH	WQCC HH	WQCClrr	WQCClrr	WQCC HH	WQCC HH	WQCC Dom	WQCC HH	WQCC Dom	WQCC HH	WQCClrr	WQCC HH	WQCC HH	NMED TW	
Area	Well ID	Date	Dup															
Three Mile Ditch	NP-1	Jun-20																
	NP-1	Oct-20																
	NP-1	Apr-21																
	NP-1	Sep-21																
	NP-1	Apr-22																
	NP-1	Oct-22																
	NP-6	Apr-15																
	NP-6	Apr-17																
	NP-6	Apr-19																
NP-6	Apr-21																	
Upgradient	UG-1	Apr-19		0.00158 J	0.0165	0.727	<0.000160	0.000332 J	0.000624 JB	<0.0150	<0.000240	0.00109 J	<0.0000490	0.00226 B	0.0149	0.0353	0.0147	
	UG-1	Jun-20		0.00139 J	0.0137 J	0.691	<0.000478	<0.000477	<0.00149	<0.0489	<0.00249	<0.00132	<0.000100	0.000984 J	0.0131	0.0385	0.0133	
	UG-1	Apr-21		0.00134 J	0.0137 J	0.741	<0.000150	0.000148 J	0.00204 B	<0.0281	<0.000849	0.00184 J	<0.000100	0.00238	0.0167	0.0388	0.0140	
	UG-1	Apr-22		0.00162 J	0.0132	0.733	<0.000150	0.0000957 J	<0.00124	<0.0281	<0.000849	<0.000704	<0.000100	<0.000816	0.0130	0.0431	0.0140	
	UG-2	Apr-19		0.00227	0.0183	0.299	0.000295 J	0.000357 J	0.000732 JB	0.0286 J	0.00107 JB	0.0129	<0.0000490	0.00316 B	0.00766	0.0160	0.0174	
	UG-2	Jun-20		0.00253	0.0141 J	0.274	<0.000478	<0.000477	<0.00149	<0.0489	<0.00249	0.00395 J	<0.000100	0.00250	0.00616	0.0161 J	0.0185	
	UG-2	Apr-21		0.00224	0.0160 J	0.265	<0.000150	0.000107 J	0.00271 B	0.0303 J	<0.000849	0.00420 J	<0.000100	0.00295	0.00599	0.0161 J	0.0200	
	UG-2	Apr-22		0.00238	0.0152	0.267	<0.000150	0.0000828 J	<0.00124	<0.0281	<0.000849	0.00569 B	<0.000100	0.00183 J	0.00570	0.0156	0.0198	
	UG-3R	Apr-19		0.00164 J	0.0183	0.223	<0.000160	<0.000260	0.000713 JB	<0.0150	<0.000240	0.00132 J	<0.0000490	0.000581 JB	0.00266	0.0160	0.00947	
	UG-3R	Jun-20		0.00126 J	0.0205	0.173 J	<0.000478	<0.000477	<0.00149	<0.0489	<0.00249	<0.00132	<0.000100	<0.000952	0.00389	0.0167 J	0.00867	
	UG-3R	Apr-21		0.00140 J	0.0221	0.169 J	<0.000150	0.000113 J	0.00429 B	0.0430 J	0.000853 J	0.00180 J	<0.000100	0.00108 J	0.00420	0.0181 J	0.00939	
	UG-3R	Apr-22		0.00149 J	0.0191	0.183 J	<0.000150	0.0000759 J	<0.00124	<0.0281	<0.000849	0.000775 JB	<0.000100	<0.000816	0.00472	0.0273	0.00900	
	UG-4	Apr-19		0.00128 J	0.0171	1.07	<0.000160	<0.000260	<0.000540	0.0596 J	<0.000240	0.00792	<0.0000490	0.000696 JB	0.0167	0.0379	0.00813	
	UG-4	Jun-20		0.00105 J	0.0164 J	1.02	<0.000478	<0.000477	<0.00149	<0.0489	<0.00249	0.00403 J	<0.000100	0.00177 J	0.00925	0.0357	0.00757	
	UG-4	Apr-21		0.00146 J	0.0150 J	0.983	<0.000150	0.000184 J	<0.00124	0.0350 J	<0.000849	0.00426 J	<0.000100	<0.000816	0.00959	0.0356	0.00929	
	UG-4	Apr-22		0.00147 J	0.0229	0.749	<0.000150	0.000862 J	0.00295	0.200	<0.000849	0.0492	<0.000100	0.00120 J	0.0119	0.0334	0.00923	

Definitions

X	Reported concentration, X, exceeds the CGWSL.
X	Analyte detected above the detection limit at a concentration equal to X.
<x	Analyte not detected at detection limit equal to x.
<x	Analyte not detected at detection limit equal to x, but x exceeds the CGWSL.
	Blank cell indicates a sample was collected from the well during the indicated sampling event, but the analyte was not analyzed.

Abbreviations

CGWSL	Critical Groundwater Screening Level (see Table 3)
CGWSL Source	Source for CGWSL value (see Table 3)
Dup	Duplicate sample
FD	Field duplicate sample
mg/L	Milligrams per Liter
NMED TW	NMED Risk Assessment Guidance for Site Investigations and Remediation, November 2022, Table A-1, Tap Water Screening Level
WQCC Dom	NMED Groundwater standard for domestic exposure, 20.6.2.3103.B NMAC
WQCC HH	NMED Groundwater standard for human health exposure, 20.6.2.3103.A NMAC
WQCC Irr	NMED Groundwater standard for irrigation exposure, 20.6.2.3103.C NMAC

Lab Footnote

B	Analyte was also detected in the associated method blank.
J	Indicates an estimated value.
J3	The associated batch QC was outside the established quality control range for precision.
J4	The associated batch QC was outside the established quality control range for accuracy.
J5	The sample matrix interfered with the ability to make any accurate determination; spike value is high.
J6	The sample matrix interfered with the ability to make any accurate determination; spike value is low.
O1	The analyte failed the method required serial dilution test and/or subsequent post-spike criteria. These failures indicate matrix interference.
V	The sample concentration is too high to evaluate accurate spike recoveries.

Table 4C - Summary of Groundwater Analytical Data - Water Quality and Cyanide

2022 Annual Groundwater Monitoring Report
HF Sinclair Navajo Refining LLC, Artesia Refinery, Artesia, New Mexico

Analyte Group				Water Quality Parameters								Cyanide	
				Calcium	Chloride	Fluoride	Potassium	Sodium	Sulfate	TDS	Nitrate/Nitrite	Cyanide	
				7440-70-2	16887-00-6	16984-48-8	7440-09-7	7440-23-5	14808-79-8	TDS	NO ₃ NO ₂	57-12-5	
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
CGWSL				--	250	1.60	--	--	600	1000	10.0	0.200	
CGWSL Source				--	WQCC Dom	WQCC HH	--	--	WQCC Dom	WQCC Dom	WQCC HH	WQCC HH	
Area	Well ID	Date	Dup										
Cross-Gradient	KWB-13	Apr-19		630	125	0.605	1.69	220	2470	3580	14.0	<0.00180	
	KWB-13	Jun-20		598	121	0.791	2.10	169	2430	3710	14.9	<0.00180	
	KWB-13	Apr-21		660	128	0.689	3.54	181	2090	3610	16.1	<0.00180	
	KWB-13	Apr-22		493	133	1.15	1.06	179	2350	3540	15.7	<0.00180	
	MW-136	Jun-20		631	300	1.62	2.53	139	2370	4290	13.2	<0.00180	
	MW-136	Oct-20		640	290	1.54	2.55	148	2150	4180	14.4	<0.00180	
	MW-136	Apr-21		580	272	1.57	2.25	128	2020	3640	13.8	<0.00180	
	MW-136	Sep-21		542	268	1.53	2.42	115	1700	3360	12.2	<0.00180	
	MW-136	Apr-22		528	337	1.86	2.33	108	1940	3560	12.0	<0.00180	
	MW-136	Oct-22		549	319	1.36	2.12	102	1650	2630	10.8	<0.00180	
	NP-5	Apr-15		448	993	2.13	0.484	209	3030	6060	1.38		
	NP-5	Apr-17		514	444	1.63	0.422	212	3770	4810	2.22		
	NP-5	Apr-19		529	310	2.16	0.320	206	3370	5240	1.06		
	NP-5	Apr-21		529	253	2.49	0.258	226	3320	5410	0.721		
	RA-3156	Apr-19		83.5	807	0.751	0.679	87.0	1650	3240	1.50		
	RA-3156	Jun-20		180	280	0.313	2.62	97.8	603	1250	<0.0500		
RA-3156	Apr-21		338	533	0.587	2.49	268	1340	2970	0.0923			
RA-3156	Apr-22		457	1110	0.716	3.40	643	1590	4080	0.0633			
Evaporation Ponds	MW-1R	Apr-19		407	1160	0.710	3.80	1050	2000	4980	<0.0197		
	MW-1R	Jun-20		540	1430	0.732	4.01	831	2060	3200	<0.0500		
	MW-1R	Apr-21		418	1000	0.706	3.48	704	1430	3030	1.88		
	MW-1R	Apr-22		473	1160	0.835	3.80	662	1730	4250	0.0763		
	MW-2A	Jun-20		487	879	2.70	3.28	610	1730	3960	<0.0500		
	MW-2A	Oct-20		292	1240	2.96	3.46	908	1860	4770	0.0609		
	MW-2A	Apr-21		533	2660	2.58	3.74	2380	3770	9880	0.930		
	MW-2A	Sep-21		637	3360	1.93	4.43	3220	4730	13100	<0.0500		
	MW-2A	Apr-22		534	3530	1.18	4.11	2440	4710	11900	0.0701		
	MW-2A	Oct-22		606	3480	2.49	4.99	2620	4050	10900	0.111		
	MW-3	Jun-20		553	1280	2.40	7.64	818	2140	5200	0.0662		
	MW-3	Jun-20	FD	553	1290	2.52	7.54	827	2260	4970	J4	<0.0500	
	MW-3	Oct-20		514	1250	1.97	5.94	822	1980	5250	0.210		
	MW-3	Oct-20	FD	506	939	1.69	5.85	812	1440	5090	0.245	J6	
	MW-3	Apr-21		479	1060	1.93	5.09	785	1690	3990	0.214		
	MW-3	Apr-21	FD	493	1110	1.55	5.16	J	889	1850	3790	0.171	
	MW-3	Sep-21		680	1510	1.80	5.14	897	2300	6070	1.45		
	MW-3	Sep-21	FD		1470	1.90			2400	6060	1.46		
	MW-3	Apr-22		532	1360	1.92	5.29	879	2140	5100	Q	<0.0500	
	MW-3	Apr-22	FD	497	1380	1.92	5.00	814	2190	4730	Q	<0.0500	
	MW-3	Oct-22		602	1480	2.01	6.35	J	908	2340	3970	0.266	
	MW-3	Oct-22	FD	603	1500	1.99	6.25	J	889	2350	4720	0.288	
	MW-4A	Jun-20		403	1440	1.98	4.72	962	1890	4870	<0.0500		
	MW-4A	Oct-20		415	1350	2.31	5.63	921	1640	5000	<0.0500		
	MW-4A	Apr-21		414	1280	2.04	6.03	914	1630	3210	<0.0500		
	MW-4A	Sep-21		505	1390	1.90	5.14	924	2060	5680	1.35		
	MW-4A	Apr-22		394	1410	2.40	4.95	883	1830	4810	Q	<0.0500	
	MW-4A	Oct-22		391	1350	V	2.23	6.02	J	888	1840	V	<0.0500
	MW-4B	Apr-15		367	1110	0.963	2.32	696	1340	3410	J	<0.0200	
	MW-4B	Apr-17		360	1330	0.985	2.55	758	1410	3690	<0.0197		
	MW-4B	Apr-19		442	1320	0.775	2.50	703	1430	4370	<0.0197		
	MW-4B	Apr-21		406	1130	0.835	2.51	748	1300	3310	<0.0500		
	MW-5A	Jun-20		286	1810	3.40	5.65	2040	3550	7460	<0.0500		
	MW-5A	Oct-20		374	2110	3.84	8.27	2280	4220	9910	<0.0500		
	MW-5A	Apr-21		419	2540	3.07	7.69	2480	5140	11700	<0.0500		
	MW-5A	Sep-21		549	3210	3.45	7.37	3540	7090	15400	<0.0500		
	MW-5A	Apr-22		396	2850	4.06	7.53	2980	5440	11000	Q	<0.0500	
	MW-5A	Oct-22		490	2890	3.92	4.87	J	3120	7580	12800	<0.0500	
	MW-5B	Apr-15		482	1590	1.41	9.01	1580	3510	5980	<0.0200		
	MW-5B	Apr-17		420	1560	1.73	9.18	1650	2590	6290	0.0210	J	
	MW-5B	Apr-19		389	1530	1.70	9.69	1490	2660	6370	<0.0197		
	MW-5B	Apr-21		359	524	1.05	3.74	431	1370	2930	<0.0500		
	MW-5C	Apr-15		427	585	0.910	3.97	J	485	2020	3290	<0.0200	
	MW-5C	Apr-17		383	576	0.971	3.90	500	1740	3110	<0.0197		
	MW-5C	Apr-19		390	591	0.896	4.11	450	1540	3200	<0.0197		
	MW-5C	Apr-21		379	1360	2.06	10.5	1420	2380	5050	<0.0500		
	MW-6A	Apr-19		340	803	1.38	1.38	696	1700	3520	<0.0197		
	MW-6A	Jun-20		290	669	1.55	1.18	J	670	1670	3640	<0.0500	
	MW-6A	Apr-21		297	647	1.67	1.24	J	697	1450	3070	0.0885	J
	MW-6A	Apr-22		301	710	2.13	1.35	J	673	1730	3660	<0.0500	
	MW-6B	Apr-15		568	1740	0.669	J	5.09	873	2280	4760	<0.0200	
	MW-6B	Apr-17		418	1250	0.694	3.97	738	1730	4150	<0.197		
	MW-6B	Apr-19		462	1140	0.519	4.45	O1	682	1460	4190	<0.0197	
	MW-6B	Apr-21		462	970	0.614	4.71	651	1330	6950	0.289		
	MW-7A	Jun-20		345	2000	1.20	3.28	1560	2670	6630	<0.0500		
	MW-7A	Jun-20	FD	370	1950	1.18	3.54	J	1550	2600	6580	0.0594	J
	MW-7A	Oct-20		327	1770	1.42	3.83	1470	2130	6330	<0.0500	J6	
	MW-7A	Oct-20	FD	315	1550	1.29	3.71	B	1550	1870	6260	<0.0500	
	MW-7A	Apr-21		334	1690	1.21	3.68	1360	2100	4800	0.0648	J	
	MW-7A	Apr-21	FD	341	2870	1.15	3.93	1430	3460	6460	<0.0500		
MW-7A	Sep-21		484	2190	1.16	3.92	1750	3060	8170	<0.0500			
MW-7A	Sep-21	FD	495	2260	1.14	3.83	1740	3160	8250	<0.0500			
MW-7A	Apr-22		335	V	2010	1.71	3.58	1340	2470	6060	Q	0.0793	J
MW-7A	Apr-22	FD	339	2000	1.72	3.71	1610	2450	4820	Q	0.0694	J	
MW-7A	Oct-22		425	2450	1.40	J	3.07	J	1680	3160	4020	0.170	
MW-7A	Oct-22	FD	405	2530	1.45	J	4.07	J	1620	3270	3680	0.141	
MW-7B	Apr-15		556	1060	0.795	6.27	672	2200	4640	<0.0200			
MW-7B	Apr-17		530	1060	0.966	6.71	652	1750	4720	0.0670	J		
MW-7B	Apr-19		581	1100	0.823	6.70	581	1910	4760	<0.0197			
MW-7B	Apr-21		562	1030	0.881	6.66	561	1800	3430	<0.0500			
MW-10	Jun-20		445	1300	0.933	3.							

Table 4C - Summary of Groundwater Analytical Data - Water Quality and Cyanide

2022 Annual Groundwater Monitoring Report
HF Sinclair Navajo Refining LLC, Artesia Refinery, Artesia, New Mexico

Analyte Group				Water Quality Parameters							Cyanide	
				Calcium	Chloride	Fluoride	Potassium	Sodium	Sulfate	TDS	Nitrate/Nitrite	Cyanide
				7440-70-2	16887-00-6	16984-48-8	7440-09-7	7440-23-5	14808-79-8	TDS	NO ₃ NO ₂	57-12-5
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
CGWSL				--	250	1.60	--	--	600	1000	10.0	0.200
CGWSL Source				--	WQCC Dom	WQCC HH	--	--	WQCC Dom	WQCC Dom	WQCC HH	WQCC HH
Area	Well ID	Date	Dup									
Evaporation Ponds	MW-15	Apr-19		614	1670	1.44	5.73	667	2770	4720	1.58	
	MW-15	Jun-20		480	1200	0.610	5.52	563	1440	3830	<0.0500	
	MW-15	Apr-21		581	1220	1.39	5.39	738	1660	3490	5.18	
	MW-15	Apr-22		650	1500	3.53	6.09	841	2190	5410	2.91	
	MW-18A	Jun-20		574	5140	2.52	33.6 O1	3030 O1V	5780	15500	<0.0500	<0.00180
	MW-18A	Oct-20		616	4600	2.72	39.3	3380	4820	16800	<0.0500	<0.00180
	MW-18A	Apr-21		661	5540	2.60	39.9	3700	5570	15600	<0.0500	<0.00180
	MW-18A	Sep-21		696	5350	2.30	38.0	3880	5780	16500	<0.0500	<0.00180
	MW-18A	Apr-22		618	5400	1.20	36.1	3100	5730	16500 Q	<0.0500	<0.00180
	MW-18A	Oct-22		646	5580	2.73	36.9	3410	5700	13800	<0.0500	<0.00180
	MW-18B	Apr-15		581	763	0.931	5.91	460	1840	4410	0.0280 J	
	MW-18B	Apr-17		576	860	0.797	5.91	481	2070	4080	<0.0197	
	MW-18B	Apr-19		807	919	0.727	8.43	506	2030	4690	<0.0197	
	MW-18B	Apr-21		612	821	0.802	6.66	534	1790	4350	<0.0500	
	MW-22A	Jun-20		575	4500	0.900	4.36	2610	3310	11900	0.0816 JB	
	MW-22A	Jun-20	FD	566	4450	1.02	4.20	2270	3330	11300 J4	<0.0500	
	MW-22A	Oct-20		458	2770	0.821	3.75	1920	2450	7820	0.0711 J	
	MW-22A	Oct-20	FD	453	2290	0.795	3.71 B	2240	2060	8210	<0.0500	
	MW-22A	Apr-21		383	1490	0.682	3.08	1280	1750	4840	<0.0500	
	MW-22A	Apr-21	FD	399	1550	0.712	3.14 J	1370	1910	4940	<0.0500	
	MW-22A	Sep-21		947	12200	0.447	8.27	7360	6680	29300	1.76	
	MW-22A	Sep-21	FD	976	12600	0.542	8.60	7080	7100	28400	1.71	
	MW-22A	Apr-22		488	3570	1.62	4.15	2190	3380	9440 Q	<0.0500	
	MW-22A	Apr-22	FD	452	3590	1.58	4.01	2710	3400	9980 Q	<0.0500	
	MW-22A	Oct-22		769	13400	2.48	6.19 J	7210	8620	25900	1.55	
	MW-22A	Oct-22	FD	767	13600	2.49	7.17 J	7270	8740	25800	1.55	
	MW-22B	Apr-15		477	1400	0.823	4.02 J	1150	2170	5590	<0.0200	
	MW-22B	Apr-17		396	1400	0.771	4.15	1150	2080	5670	0.408 J	
	MW-22B	Apr-19		414	1300	0.818	4.30	985	2170	5480	<0.197	
	MW-22B	Apr-21		420	1190	0.677	3.99	1080	1830	4760	<0.0500	
	MW-70	Jun-20		764	1400	0.577	5.22	764	2510	5360 J3	<0.0500	
	MW-70	Oct-20										
	MW-70	Apr-21		740	1200	0.595	5.52	832	2060	5790	<0.0500	
	MW-70	Sep-21										
	MW-70	Apr-22		668	1440	1.08 J	4.92	753	2500	5830 Q	<0.0500	
	MW-70	Oct-22										
	MW-72	Apr-19		645	2880	5.61	7.71	1850	2740	8500	2.67	
	MW-72	Jun-20		627	2830	5.71	6.56	1730	2810	8060	0.645	
	MW-72	Apr-21		651	2490	5.61	6.98	1740	2360	5940	4.22	
	MW-72	Apr-22		663	2830	4.88	6.55	1470	2610	8200 Q	2.70	
	MW-73	Apr-19		600	2590	2.95	2.60	2330	3350	9180	4.66	
	MW-73	Jun-20		561	2540	1.67	2.29	2410	3990	8860	<0.0500	
	MW-73	Apr-21		609	3100	1.83	2.46	2590	4570	9400	0.371	
	MW-73	Apr-22		575	2660	1.30	2.46	2110	3800	9780 Q	0.374	
	MW-74	Jun-20		507	1540	7.75	32.7	2260	4190	7180	48.4	
	MW-74	Oct-20		554	1800	8.34	35.8	2000	3610	8370	7.45	
	MW-74	Apr-21		562	1850	7.50	30.5	2120	3400	6560	4.80	
	MW-74	Sep-21		607	1780	6.32	29.6	2100	3190	8640	<0.0500	
	MW-74	Apr-22		563	2000	6.38	26.6	1740	3660	8120 Q	2.90	
	MW-74	Oct-22		543	1960	7.82	28.1	1870	3220	4200		
	MW-75	Jun-20		366	1470	7.22	16.6	1340	2080	6110	<0.0500	
	MW-75	Oct-20		362	1520	7.66	17.9	1470	2010	5680	<0.0500	
	MW-75	Apr-21		370	1350	6.71	17.6	1370	1770	4730	2.16	
	MW-75	Sep-21		381	1400	7.43	18.2	1460	1910	5720	<0.0500	
	MW-75	Apr-22		384	1570	7.45	18.3	1290	2100	5560 Q	1.87	
	MW-75	Oct-22		364	1390	7.02	15.4 J	1360	2070	3580	<0.0500	
	MW-76	Jun-20		454	1150	2.89	26.2	975	2270	5620	<0.0500	
	MW-76	Oct-20		426	1220	3.14	25.7	975	2090	5330	<0.0500	
	MW-76	Apr-21		425	1090	3.00	25.3	914	1800	4300	<0.0500	
	MW-76	Sep-21		490	1130	2.94	26.4	940	1940	5420	<0.0500	
	MW-76	Apr-22		438	1260	3.19	25.4	954	2130	4870 Q	0.0893 J	
	MW-76	Oct-22		464	1240	3.71	26.0	926	2040	5050	<0.0500	
	MW-77	Apr-19		491	335	3.20	66.0	1230	4370	7850	<0.0197	
	MW-77	Jun-20		488	428	2.53	64.2	1070	3950	7430	<0.0500	
	MW-77	Apr-21		495	514	3.61	65.9	1060	3200	5240	<0.0500	
	MW-77	Apr-22		505	353	10.3	52.2	876	4350	6030	1.17	
	MW-78	Apr-19		343	20.4	17.2	13.4	81.7	1580	3150	5.82	
	MW-78	Jun-20		584	51.7	13.9	16.6	184	2580	4460	<0.0500	
	MW-78	Apr-21		319	317	14.8	17.8	365	1410	3480	8.33	
	MW-78	Apr-22		321	183	17.0	15.6	208	1700	2500 J3	2.68	
	MW-79	Jun-20		768	2150	5.09	6.82	1160	2540	7550	<0.0500	
	MW-79	Oct-20		726	2180	5.58	7.03	1200	2600	6470	<0.0500	
	MW-79	Apr-21		647	1700	5.90	6.84	1110	2120	5550	2.35	
	MW-79	Sep-21		615	1500	5.24	5.86	1180	2070	6100	0.708	
	MW-79	Apr-22		590 O1V	1680	5.68	6.52	1000	2160	5910 Q	2.25	
	MW-79	Oct-22		514	1430	5.25	5.88 J	966	1830	3910	0.902	
	MW-80	Apr-19		559	1180	3.03	2.72	768	2260	5120	0.355	
	MW-80	Jun-20		620	1210	2.19	2.99	680	1980	4990	<0.0500	
	MW-80	Apr-21		592	980	2.46	2.77	684	1750	3780	2.02	
	MW-80	Apr-22		542	983	2.57	2.61	720	1940	4700 Q	0.371	
	MW-81	Apr-19		527 O1V	1210	6.81	7.33	969 v	2190	5740	14.7	
	MW-81	Jun-20		441	1050	5.73	5.49	908	1990	4750	3.54	
	MW-81	Apr-21		456	987	6.61	6.52	962 v	1840	4940	1.65	
	MW-81	Apr-22		449	1010	6.19	6.31	1070	2010	4930 Q	8.37	
	MW-82	Apr-19		395	1360	11.4	8.60	1300	2250	5730	3.50	
	MW-82	Jun-20		422	1430	9.31 J	8.75	1150	2180	5560	<0.0500	
	MW-82	Apr-21		520	1410	8.40	9.31	1080	1870	5810	1.40	
	MW-82	Apr-22		531	1540	9.26	9.50	1110	2380	5620 Q	1.12	
	MW-83	Jun-20		544	314	4.63	48.9	319	4190	6810	1.31	
	MW-83	Oct-20		349	957	4.48	31.8	659	2380	5040	<0.0500	
	MW-83	Apr-21		324	992	3.94	18.5	810	1270	3430	8.03	
	MW-83	Sep-21		552	126	5.11	94.1	220	4840	8160	21.4	
	MW-83	Apr-22		504	633	5.18	39.4	544	3040	5250 Q	3.16	
	MW-83	Oct-22		555	98.3	5.54	62.5	284	4410	6220	12.4	
	MW-84	Jun-20		568	1480	6.24	7.06	1400	4710	9700	<0.0500	
	MW-84	Oct-20		579	1670	6.29	6.23	1350	4910	10800	<0.0500	
	MW-84	Apr-21		592	1320	5.81	6.44					

Table 4C - Summary of Groundwater Analytical Data - Water Quality and Cyanide

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Analyte Group				Water Quality Parameters							Cyanide					
				Calcium	Chloride	Fluoride	Potassium	Sodium	Sulfate	TDS	Nitrate/Nitrite	Cyanide				
				7440-70-2	16887-00-6	16984-48-8	7440-09-7	7440-23-5	14808-79-8	TDS	NO ₃ NO ₂	57-12-5				
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L				
CGWSL				--	250	1.60	--	--	600	1000	10.0	0.200				
CGWSL Source				--	WQCC Dom	WQCC HH	--	--	WQCC Dom	WQCC Dom	WQCC HH	WQCC HH				
Area	Well ID	Date	Dup													
Evaporation Ponds	MW-87	Jun-20		596	4070	1.41	20.7	2690	4840	12500	<0.0500					
	MW-87	Oct-20														
	MW-87	Apr-21		649	3420	1.32	22.1	2640	3780	13500	<0.0500					
	MW-87	Sep-21														
	MW-87	Apr-22		602	4040	1.02	20.2	2430	4760	12300	Q	<0.0500				
	MW-87	Oct-22														
	MW-88	Jun-20		406	1510	0.951	2.83	997	2040	5240	<0.0500					
	MW-88	Oct-20														
	MW-88	Apr-21		428	1640	1.16	3.22	1290	2340	6300	<0.0500					
	MW-88	Sep-21														
	MW-88	Apr-22		431	1840	1.69	3.17	1210	2530	6020	Q	<0.0500				
	MW-88	Oct-22														
	MW-120	Jun-20		455	1260	2.90	2.23	992	2530	5500	<0.0500					
	MW-120	Oct-20		608	1540	3.81	2.67	1200	2870	7000	<0.0500					
	MW-120	Apr-21		592	1410	3.64	2.28	1080	2850	5450	<0.0500					
	MW-120	Sep-21		607	1330	3.75	2.23	1300	3010	7220	0.276					
	MW-120	Apr-22		603	1750	3.64	2.93	1190	3080	6880	0.0655	J				
	MW-120	Oct-22		662	V	2310	3.76	3.17	J	1450	V	2830	6060	0.166		
	MW-121	Jun-20		560	752	5.05	2.71	613	2790	4890	0.0855	J				
	MW-121	Oct-20		595	690	4.87	3.34	665	2400	5180	<0.0500					
	MW-121	Apr-21		657	1070	4.52	3.31	636	2300	4360	J3	0.0576	J			
	MW-121	Sep-21		671	987	4.75	3.06	617	2290	5430	0.638					
	MW-121	Apr-22		651	1030	5.18	3.27	633	2600	5160	Q	0.221				
	MW-121	Oct-22		676	1350	4.47	3.80	680	2200	4660	0.536					
	MW-122	Jun-20		413	1470	2.58	4.03	1080	2450	6070	<0.0500					
	MW-122	Oct-20		353	940	2.54	3.78	737	1590	4220	<0.0500					
	MW-122	Apr-21		357	895	2.61	3.60	750	1600	3300	0.0894	J				
	MW-122	Sep-21		395	1450	1.74	3.32	673	2250	4240	<0.0500					
	MW-122	Apr-22		350	940	2.28	3.57	714	1520	4090	Q	0.0631	JP1			
	MW-122	Oct-22		357	980	1.89	3.81	637	1450	2830	<0.0500					
	MW-123	Jun-20		513	1420	1.04	3.54	984	2140	5380	<0.0500					
	MW-123	Oct-20		524	1390	1.07	3.55	1100	1920	5460	<0.0500					
	MW-123	Apr-21		519	1270	0.938	3.54	970	1780	3770	<0.0500					
	MW-123	Sep-21		554	1350	0.968	3.16	981	1820	5540	<0.0500					
	MW-123	Apr-22		540	1350	V	0.897	3.68	1020	1960	V	4990	Q	<0.0500		
	MW-123	Oct-22		507	V	1460	1.01	J	2.87	J	1040	V	2100	1810	<0.0500	
	MW-124	Jun-20		785	3510	1.01	6.50	J	1700	4500	7780	<0.0500				
	MW-124	Oct-20		758	2490	1.03	6.57	1840	3030	9940	<0.0500					
	MW-124	Apr-21		792	3080	0.949	6.88	1750	3580	10500	0.0985	J				
	MW-124	Sep-21		799	3280	0.817	7.25	1740	3890	10600	<0.0500					
	MW-124	Apr-22		781	3470	1.58	6.60	1520	4020	10600	Q	0.147				
	MW-124	Oct-22		730	3410	1.26	J	6.02	J	1720	3850	5340	<0.0500			
	OCD-1R	Jun-20		599	1640	2.60	3.82	986	2350	5850	0.0815	JB				
	OCD-1R	Oct-20		500	1070	2.78	3.50	1070	2020	5560	0.0603	J				
	OCD-1R	Apr-21		474	1010	2.77	2.92	834	1800	4340	0.335					
	OCD-1R	Sep-21		547	1740	2.54	3.15	1480	4480	7020	<0.0500					
	OCD-1R	Apr-22		471	1190	2.52	2.40	869	2340	5500	Q	<0.0500				
	OCD-1R	Oct-22		707	2360	2.64	4.08	J	1830	3970	4400	<0.0500				
	OCD-2A	Jun-20		609	1290	0.853	4.93	755	2240	5020	<0.0500					
	OCD-2A	Oct-20														
OCD-2A	Apr-21		592	1150	0.706	5.28	656	1690	4070	0.672						
OCD-2A	Sep-21															
OCD-2A	Apr-22		588	1450	0.709	5.40	810	2070	5210	Q	0.177					
OCD-2A	Oct-22															
OCD-3	Jun-20		375	585	1.10	7.17	446	1580	3150	0.0713	JB					
OCD-3	Oct-20															
OCD-3	Apr-21		398	573	0.887	7.28	447	1480	2950	0.149						
OCD-3	Sep-21															
OCD-3	Apr-22		402	595	0.809	7.11	420	1500	3310	Q	0.113					
OCD-3	Oct-22															
OCD-4	Jun-20		840	5000	0.990	33.5	2580	3300	12700	<0.0500						
OCD-4	Oct-20															
OCD-4	Apr-21		858	4670	0.815	36.1	2980	3100	11600	0.0991	J					
OCD-4	Sep-21															
OCD-4	Apr-22		769	4590	0.390	29.2	2430	3260	11600	Q	0.0754	J				
OCD-4	Oct-22															
OCD-5	Jun-20		824	4770	0.950	37.3	2660	3490	10700	J4	<0.0500					
OCD-5	Oct-20		850	4120	0.702	35.8	3010	2690	12100	<0.0500						
OCD-5	Apr-21		851	4420	0.837	41.2	2980	3030	11500	<0.0500						
OCD-5	Sep-21		898	5170	0.745	36.0	3550	3300	13100	<0.0500						
OCD-5	Apr-22		787	4820	0.348	36.5	2530	3320	12200	Q	<0.0500					
OCD-5	Oct-22		819	V	5300	0.885	J	31.7	3010	V	3330	11000	<0.0500			
OCD-6	Jun-20		918	4880	2.04	15.0	2710	3160	10800	<0.0500						
OCD-6	Oct-20		922	4850	2.27	15.8	2720	2870	11400	<0.0500						
OCD-6	Apr-21		925	4320	2.19	15.6	2770	2650	7740	3.58						
OCD-6	Sep-21		979	4590	2.06	15.8	2910	2720	12000	<0.0500						
OCD-6	Apr-22		890	4860	1.08	14.7	2220	2920	11800	Q	0.795					
OCD-6	Oct-22		788	V	4150	<6.40	12.9	2360	3240	9740	<0.0500					
OCD-7AR	Jun-20		619	2990	2.13	6.10	2520	3990	9740	<0.0500						
OCD-7AR	Oct-20		643	2680	2.75	6.37	2590	3640	10800	<0.0500						
OCD-7AR	Apr-21		635	2660	2.99	6.42	2530	3780	9800	1.95						
OCD-7AR	Sep-21		639	2650	2.70	5.57	2650	3700	10600	<0.0500						
OCD-7AR	Apr-22		662	2930	1.79	6.09	2200	4010	10400	Q	0.242					
OCD-7AR	Oct-22		662	2970	<6.40	6.81	2430	4050	9300	<0.0500						
OCD-7B	Apr-15		641	910	0.852	11.9	685	2580	4520	<0.0200						
OCD-7B	Apr-17		564	960	1.05	11.0	629	2100	4540	<0.0197						
OCD-7B	Apr-19		590	874	0.839	11.7	678	2260	4760	<0.0197						
OCD-7B	Apr-21		590	822	0.950	11.6	680	2170	4100	<0.0500						
OCD-8A	Jun-20		665	5120	2.01	8.85	3440	4510	12600	<0.0500	<0.00180					
OCD-8A	Oct-20		758	5270	2.36	10.8	3710	4260	15600	<0.0500	<0.00180					
OCD-8A	Apr-21		729	4880	2.											

Table 4C - Summary of Groundwater Analytical Data - Water Quality and Cyanide

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Analyte Group				Water Quality Parameters							Cyanide	
				Calcium 7440-70-2 mg/L	Chloride 16887-00-6 mg/L	Fluoride 16984-48-8 mg/L	Potassium 7440-09-7 mg/L	Sodium 7440-23-5 mg/L	Sulfate 14808-79-8 mg/L	TDS TDS mg/L	Nitrate/Nitrite NO ₃ NO ₂ mg/L	Cyanide 57-12-5 mg/L
CGWSL				--	250	1.60	--	--	600	1000	10.0	0.200
CGWSL Source				--	WQCC Dom	WQCC HH	--	--	WQCC Dom	WQCC Dom	WQCC HH	WQCC HH
Area	Well ID	Date	Dup									
Field East of Refinery	KWB-7	Jun-20		330	458	0.915	<0.534	275	834	2810	<0.0500	<0.00180
	KWB-7	Oct-20		371	330	0.794	<2.67	263	1260	3180	0.0590 J	<0.00180 J6
	KWB-7	Apr-21		251	369	0.710	0.376 J	269	349	2000	0.109	<0.0450
	KWB-7	Sep-21		371	348	0.736	0.288 J	231	1340	3020	<0.250	<0.0180
	KWB-7	Apr-22		239	397 v	0.883	0.410 J	250	340 v	1320	<0.500	<0.00900
	KWB-7	Oct-22		386	404	1.26 J	0.287 J	265	1270	2720	<0.250	<0.00180
	KWB-8	Oct-16		251	579	0.467	0.351 J	443	701	3120	0.0380 JB	<0.00900
	KWB-8	Apr-17		237	574	0.623	0.414 J	320	442	2400	0.0510 J	<0.00180
	KWB-8	Oct-17		273	913	0.467	0.411 J	462	417	3270	<0.985	<0.00180
	KWB-8	Oct-20		301	398	0.694	<0.534	546	1660	4440	<1.00	<0.0180
	KWB-10R	Apr-17		134	230	1.57	0.521 J	131	0.475 J	1130	<0.0197	
	KWB-10R	Oct-17		138	186	1.39	0.453 J	123	3.08 J	1080	0.440	
	KWB-10R	Apr-18		138	183	1.35	0.430 J	122	<0.0774	1060	0.0250 J	
	KWB-10R	Oct-18		130	188	1.33	0.836 JB	110	<0.0774	1040	<0.0197	
	KWB-11A	Jun-20		408	676	0.753	0.800 J	319	1180	3180	0.0536 J	<0.00180
	KWB-11A	Oct-20		396	541	0.652	0.676 J	306	1090	2930	0.414	<0.00180
	KWB-11A	Sep-21		385	501	0.822	0.676 J	270	1110	3080	<0.0500	<0.00180
	KWB-11A	Oct-22		410	388	1.00 J	0.642 J	266	1390	2860	<0.0500	<0.00180
	KWB-11B	Jun-20		515	369	0.453	2.24	97.1	1710	2880	3.34	<0.00180
	KWB-11B	Oct-20		509	365	0.395	<2.67	100	1380	3130	3.03	<0.00180
	KWB-11B	Apr-21		519	313	0.365	2.24	95.6	1360	2810	2.93	<0.00180
	KWB-11B	Sep-21		495	367	0.371	2.28	98.2	1390	3000	2.61	<0.00180 J6
	KWB-11B	Apr-22		405	256	0.365	2.36	78.0	1420	2540	2.60	<0.00180
	KWB-11B	Oct-22		499	349	0.832 J	2.09	106	1470	2720	2.08	<0.00180
	KWB-12A	Jun-20		519	115	0.587	1.46 J	135	2270	3490	7.15	<0.00180
	KWB-12A	Oct-20		541	129	0.537	1.07 JB	133	2020	3520	6.85	<0.00180
	KWB-12A	Sep-21		544	195 B	0.623	1.07 J	185	2090	3960	10.6 v	<0.00180
	KWB-12A	Oct-22		547	158	0.993 J	0.950 J	177	1960	1790	8.00	<0.00180
	KWB-12B	Jun-20		537	120	0.441	0.673 J	130	2460	3790	11.5	<0.00180
	KWB-12B	Jun-20	FD	525	114	0.343	0.742 J	126	2210	3600	8.27	<0.00180
	KWB-12B	Oct-20		578	130	0.386	0.656 JB	141	2210	3820	6.35	0.00596
	KWB-12B	Oct-20	FD	533	126	0.395	0.642 J	141	2140	3760	7.25	0.0565
	KWB-12B	Apr-21		562	136	0.374	0.691 J	140	2350	3890	7.85	<0.00180
	KWB-12B	Apr-21	FD	556	121	0.394	0.669 J	143	2070	3900	8.05	<0.00180
	KWB-12B	Sep-21		553	204 B	0.419	0.653 J	172	2050	4020	13.8	0.00210 J
	KWB-12B	Sep-21	FD	545	201 B	0.413	0.618 J	165	2090	3970	13.2	<0.00180
	KWB-12B	Apr-22		550	132	0.825 J	0.695 J	143	2700	3890	6.75	<0.00180
	KWB-12B	Apr-22	FD	540	133	0.892 J	0.643 J	137	2660	3930	6.65	
	KWB-12B	Oct-22		539	174	0.969 J	0.581 J	165	2030	2420	11.2	<0.00180
	KWB-12B	Oct-22	FD	561	174	0.883 J	0.587 J	166	2050	3590	11.3	<0.00180
	KWB-P4	Apr-15										
	KWB-P4	Apr-17										
	KWB-P4	Apr-19										
	KWB-P4	Apr-21										
	MW-57	Jun-20		568	131	2.63	1.21 J	388	3190	4840	13.8	
	MW-57	Oct-20		529	135	1.99	2.97	287	2140	4040	4.83	
	MW-57	Apr-21		460	210	1.88	1.50 J	265	1910	3730	7.90	
	MW-57	Sep-21		652	496	3.42	3.11	455	3310	3170	34.2	
	MW-57	Apr-22		436	321	2.80	2.13	319	2270	3950	3.10	
	MW-58	Oct-17		235	249	1.26	0.553 J	116	13.1	1340	<0.0197	<0.00180
	MW-58	Apr-18		215	207	1.37	0.290 J	98.5	2.59 J	1250	<0.0985	<0.00180
	MW-58	Oct-18		176	151	1.06	1.20	74.3	56.9	1040	<0.394	<0.00180 J3J6
	MW-58	Oct-19		229	294	1.33	2.06	70.3	1.49 JB	1140	<0.0197	<0.00180
	MW-111	Oct-18		203	412	1.46	0.588 JB	221	331	1810	<0.0197	
	MW-111	Apr-19		340	375	0.957	1.83	209	322	2000	<0.0197	
	MW-111	Oct-19		212	429	1.38	0.214 J	239	317	2070	<0.0197	
	MW-111	Jun-20		251	409	1.08	1.11 J	206	372	1970	<0.0500	
	MW-112	Nov-14		190	230	1.00	0.310 J	190	5.40	1200	<0.0200	
	MW-113	Jun-20		317	192	0.519	0.598 J	159	1210	2440	<0.0500	
	MW-113	Jun-20	FD	313	184	0.605 J	<0.534	152	958	2460	<0.0500	
	MW-113	Oct-20		274	177	0.527	<0.534	158	773	2200	0.199	
	MW-113	Oct-20	FD	280	185	0.536	<2.67	177	786	2210	0.128	
	MW-113	Apr-21		331	169 B	0.480	0.602 J	170	956	2480	0.121	
	MW-113	Apr-21	FD	318	185	0.554	0.519 J	155	1130	2480	<0.0500	
	MW-113	Sep-21		202	348	0.539	0.385 J	208	55.2	1710	<0.0500	
	MW-113	Sep-21	FD	200	317 B	0.537	0.390 J	208	61.0	1720	<0.500	
	MW-113	Apr-22		294	188	0.564	0.562 J	154	996	2320	<0.0500	
	MW-113	Apr-22	FD	278	177	0.511	0.471 J	149	975	2370	<0.0500	
	MW-113	Oct-22		231	371	0.630	0.295 J	328	284	2160	<2.50	
	MW-113	Oct-22	FD	225	370	0.616	0.231 J	318	370	2090	17.7	
MW-125	Jun-20		543	330	1.19	1.41 J	221	2950	4500	0.212 J5		
MW-125	Oct-20		541	271	1.10	1.42 JB	221	2270	4350	0.0919 J		
MW-125	Apr-21		549	261 B	0.983	1.36 J	224	2300	4440	0.155		
MW-125	Sep-21		519	271 B	1.06	1.32 J	213	2210	4370	0.0618 J		
MW-125	Apr-22		473	273	1.07	1.19 J	189	2360	3330 Q	<0.0500		
MW-125	Oct-22		486	261	1.42 J	1.06 J	206	2100	7840	<0.0500		
MW-126A	Apr-19		382	191	0.757	0.547 JB	138	1350	2540	<0.0197		
MW-126A	Oct-19		325	136	0.937	0.670 J	152	1330	2330	<0.0197 J5		
MW-126A	Jun-20		357	198	0.869	<0.534	152	1590	2680	<0.0500		
MW-126A	Oct-20		396	210	0.706	<0.534	189	1510	3150	<0.0500		
MW-126B	Jun-20		539	272	0.784	2.27	210	2440	4010	0.414		
MW-126B	Oct-20		562	256	0.705	2.36	195	2140	3990	0.429		
MW-126B	Apr-21		552	243	0.739	2.31	202	2210	4080	0.509		
MW-126B	Sep-21		539	249 B	0.712	2.28	198	2010	4020	0.399		
MW-126B	Apr-22		516	275	1.19 J	2.25	201	2410	3980	0.423		
MW-126B	Oct-22		532	260	1.24 J	2.17	207	1950	3970	0.371		
MW-127	Oct-17		262	231	0.993							

Table 4C - Summary of Groundwater Analytical Data - Water Quality and Cyanide

2022 Annual Groundwater Monitoring Report
HF Sinclair Navajo Refining LLC, Artesia Refinery, Artesia, New Mexico

Analyte Group				Water Quality Parameters							Cyanide		
				Calcium	Chloride	Fluoride	Potassium	Sodium	Sulfate	TDS	Nitrate/Nitrite	Cyanide	
				7440-70-2	16887-00-6	16984-48-8	7440-09-7	7440-23-5	14808-79-8	TDS	NO ₃ NO ₂	57-12-5	
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
CGWSL				--	250	1.60	--	--	600	1000	10.0	0.200	
CGWSL Source				--	WQCC Dom	WQCC HH	--	--	WQCC Dom	WQCC Dom	WQCC HH	WQCC HH	
Area	Well ID	Date	Dup										
Field East of Refinery	MW-131	Apr-17		151	285	0.773	0.275 J	153	10.3	1230	<0.197		
	MW-131	Oct-17		149	284	0.807	0.200 J	149	15.5	1290	<0.0197		
	MW-131	Oct-19		145	288	0.845	0.251 J	150	19.7	1210	<0.0197		
	MW-131	Jun-20		153	283	0.865	<0.534	163	24.7	1270	<0.0500		
	MW-133	Nov-14		200	170	1.10	0.460 J	140	140	1300	<0.0200		
	MW-133	Apr-15		163	174	1.19	0.323 J	122	116	1190	<0.200		
	MW-134	Jun-20		515	370	1.16	1.51 J	234 V	2910	4870	1.73 J5		
	MW-134	Jun-20	FD	516	363	1.45 J	1.43 J	239	2530	4960	<0.0500		
	MW-134	Oct-20		501	349	1.01	1.67 JB	243	2700	4950	1.37		
	MW-134	Oct-20	FD	503	366	1.32 J	1.64 J	251	2530	4970	1.39		
	MW-134	Apr-21		540	295 B	0.959	1.77 J	269	2610	4870	1.17		
	MW-134	Apr-21	FD	513	335	1.45 J	1.64 J	241	2780	4820	1.09		
	MW-134	Sep-21		503	324	0.905	1.44 J	248	2820	4900	5.94		
	MW-134	Sep-21	FD	513	313 B	1.06	1.43 J	255	2620	4800	0.586		
	MW-134	Apr-22		488	314	1.11	1.80 J	235	2700	4470	0.697		
	MW-134	Apr-22	FD	461	289	0.935	1.62 J	224	2610	3750	0.676		
	MW-134	Oct-22		484	305	1.42 J	1.39 J	242	2450	4070	0.504		
	MW-134	Oct-22	FD	500	302	1.39 J	1.46 J	247	2410	4380	0.585		
	MW-135	Jun-20		542	542	1.14	0.801 J	594	2940	5600	16.0		
	MW-135	Oct-20		538	504	1.13	<2.67	621	2970	5460	10.9		
	MW-135	Apr-21		527	440	1.16	0.832 J	606	3070	5550	7.25		
	MW-135	Sep-21		538	514	1.24	0.875 J	560	2960	5640	11.9		
	MW-135	Apr-22		548	579	1.14	0.816 J	580	3410	5600	12.7		
	MW-135	Oct-22		538	570	1.41 J	0.684 J	621	2830	4790	10.1		
	MW-145	Oct-20											
	MW-145	Oct-20	FD										
	MW-145	Apr-21			334	1.20			2560	4920			
	MW-145	Sep-21			369	1.11			2640	4910			
	MW-145	Apr-22		542	383 B	1.19	1.38 J	240	2990	4640			
	MW-145	Oct-22		574	377	1.55	1.17 J	247	2400	4070			
	MW-146	Oct-20											
	MW-146	Apr-21			294	1.21			2840	5130			
	MW-146	Sep-21			303	1.17			2890	5060			
	MW-146	Sep-21	FD		311	1.15			2990	5020			
	MW-146	Apr-22		498	300 B	1.21	1.45 J	235	3340	5010			
	MW-146	Apr-22	FD	502	300 B	1.15	1.34 J	232	3280	5270 Q			
	MW-146	Oct-22		548	298	1.58	1.25 J	262	2670	4630			
	MW-146	Oct-22	FD	542	302	1.59	1.33 J	263	2660	4540			
	MW-147	Oct-20											
	MW-147	Apr-21			475	0.791			2730	5340			
	MW-147	Sep-21			484	1.80			3420	6460			
	MW-147	Apr-22		560	499	0.925	0.804 J	460	3230	5170			
	MW-147	Oct-22		572	583	1.98	0.726 J	672	2990	4950			
	MW-148	Oct-20											
	MW-148	Apr-21			255	1.06			2110	4190			
	MW-148	Sep-21			270	1.07			1890	3660			
	MW-148	Apr-22		582	291 B	1.55	9.47	211	2390	4100			
	MW-148	Oct-22		569	243	1.53	4.94	166	1780	3270			
	RA-4196	Apr-19		370	112	0.309	2.34	90.6	1060	1920	<0.0197		
	RA-4196	Oct-19		363	131	0.299	1.96	89.2	1250	2160	<0.0197		
	RA-4196	Jun-20		365	126	0.324	2.17	90.1	1330	2290	<0.0500		
	RA-4196	Oct-20		382	123	0.348	2.36	98.7	1250	2340	0.842 J6		
	RA-4798	Jun-20		449	163	0.321	2.30	117	1620	2820	1.50		
	RA-4798	Oct-20		356	104	0.358	2.36	87.6	1080	2200	1.18		
	RA-4798	Apr-21		424	122	0.347	2.45	106	1410	2510	1.49		
	RA-4798	Sep-21		461	171	0.281	2.29	126	1660	2830	1.05		
	RA-4798	Apr-22		236	65.3	0.386	2.04	41.2	781	1330	0.811		
	RW-12R	Apr-17		392	189	0.623	0.293 J	152	1740	2420 J3	<0.197		
	RW-12R	Apr-18		378	155	0.700	0.220 J	171	1400	2400	<0.0197		
	RW-12R	Apr-19		369 V	154	0.609	0.408 JB	164 V	1180	2450	<0.0394		
	RW-12R	Jun-20		337	143	0.716	<0.534	158	1300	2750	<0.0500		
	RW-13R	Apr-16		202	222	0.691	0.346 J	167	341	1190	0.0460 J		
	RW-13R	Apr-18		242	207	0.650	0.378 J	183	525	1700	0.0260 JP1		
	RW-18A	Apr-17		504	176	2.51	1.09	141	2870	4400	1.90		
	RW-18A	Apr-18		491	206	1.82	0.832 J	132	2750	3940	0.408		
	RW-18A	Apr-19		549	199	1.94	0.832 J	130	2390	3970	0.286		
	RW-18A	Jun-20		515	211	2.03	0.990 J	120	2490	4280	0.460		
	RW-20	Apr-15		228	256	0.530	<0.180	228	125	1430	<0.200		
	RW-22	Apr-15		184	402	0.860	0.319 J	274	78.4	1680	<0.200		
NCL	MW-18	Apr-19		536	86.7	2.04	7.60	76.6	1910	3310	32.6	<0.00180	
	MW-18	Jun-20		421	154	1.61	1.66 J	58.7	1510	2870	18.3	<0.00180	
	MW-18	Apr-21		393	206	1.64	1.56 J	63.7	1150	2170	9.30	<0.00180	
	MW-18	Apr-22		367	216	1.34	1.61 JB	58.1	1200	2390	11.7	<0.00180	
	MW-45	Jun-20		574	413	1.54	4.80	339	2490	4480	<0.0500	0.00225 J	
	MW-45	Oct-20		577	429	1.70	4.70	359	2350	4970	<0.0500	<0.00180	
	MW-45	Apr-21		603	372	1.97	4.42	375	2450	3680	0.0756 J	<0.0180	
	MW-45	Sep-21		548	334	1.34	4.12	339	2110	4010	<0.0500	<0.00180	
	MW-45	Apr-22		534	338	1.34	3.45	324	2350	4330 Q	<0.0500	<0.00180	
	MW-45	Oct-22		511	291	1.15 J	4.03	327	2150	3400	<0.0500	<0.00180	
	MW-53	Apr-16		459	346	1.06	1.42 J	161	1340	2890	25.3		
	MW-53	Apr-17		340	222	0.904	1.12	130	1330	2290	15.6		
	MW-53	Apr-18		315	72.9	1.13	1.12 B	118	1250	1860	1.58 J6		
	MW-53	Apr-19		259	59.6	1.30	1.17	88.4	1100	1880	0.290		
	MW-53R	Oct-20		298	66.7	1.11	4.08	69.1	955	1920	<0.0500		
	MW-53R	Apr-21		312	64.8	1.29	2.37	78.2	1110	1870	0.132		
	MW-53R	Apr-22		288	64.7	1.27	2.12 B	74.7	1140	1710	<0.0500		
	MW-54A	Jun-20		366	198	0.809	<0.534	55.5	838	2030	<0.0500		
	MW-54A	Oct-20		374	196	0.913	<0.534	60.8	768	1990	<0.0500 J5		
	MW-54A	Apr-21		414	217	0.969	0.355 J	64.3	916	1940	0.115		
	MW-54A	Sep-21		410	221	1.03	0.319 J	61.1	923	2300	<0.0500		
	MW-54A	Apr-22		407	241	0.816	0.414 JB	62.4	1100	2300	0.0516 J		
	MW-54A	Oct-22		436	244	1.39 J	0.313 J	69.7	1160	2270	0.389		
	MW-54B	Apr-15		307	166	0.613	0.767 J	48.0	752	1890 J	0.0276 J		
	MW-54B	Apr-17		317	127	0.617	1.18	54.5	1040	1840	0.100 J		
	MW-54B	Apr-19		319	140	0.634	0.811 J	50.5	818	1870	0.0410 J		
	MW-54B	Apr-21		458	205	0.654	1.47 J	69.9	1320	2290	0.0845 J		
	MW-55	Jun-20		410	580	1.55	0.672 J	225	1540	3480	0.0643 J	<0.00180	
	MW-55	Oct-20		333	505	1.30	0.842 JB	228	949	3010	<0.0500	<0.00180	
	MW-55	Apr-21		293	463	1.62	0.683 J	244	781	2130	0.0762 J	<0.00180	
	MW-55	Sep-											

Table 4C - Summary of Groundwater Analytical Data - Water Quality and Cyanide

2022 Annual Groundwater Monitoring Report
HF Sinclair Navajo Refining LLC, Artesia Refinery, Artesia, New Mexico

Analyte Group				Water Quality Parameters								Cyanide
				Calcium	Chloride	Fluoride	Potassium	Sodium	Sulfate	TDS	Nitrate/Nitrite	Cyanide
				7440-70-2	16887-00-6	16984-48-8	7440-09-7	7440-23-5	14808-79-8	TDS	NO ₃ NO ₂	57-12-5
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
CGWSL				--	250	1.60	--	--	600	1000	10.0	0.200
CGWSL Source				--	WQCC Dom	WQCC HH	--	--	WQCC Dom	WQCC Dom	WQCC HH	WQCC HH
Area	Well ID	Date	Dup									
NCL	MW-56	Apr-19		475	221	1.06	1.99	212	1890	3560	<0.0197	
	MW-56	Jun-20		496	219	1.08	1.70 J	142	1990	3520	<0.0500	
	MW-56	Apr-21		484	211	1.19	1.80 J	140	1740	2860	0.252	
	MW-56	Apr-22		388	193	1.15	1.55 J	121	1400	2020	<0.0500	
	MW-108	Jun-20		157	17.9	1.63	<0.534	45.5	365	1270	<5.00	
	MW-108	Oct-20		139	15.8	1.48	<0.534	46.8	221	1150	<0.0500	
	MW-108	Apr-21		209	27.0	1.66	0.412 J	64.6	718	1610	<0.0500	
	MW-108	Sep-21		308	40.3	1.90	0.801 J	63.0	963	2190	<2.50	
	MW-108	Apr-22		190	29.7	1.30	0.593 JB	48.7	737	1540	<1.00	
	MW-108	Oct-22		234	29.7	1.81	0.472 J	49.3	881	1750	<2.50	
	NCL-31	Jun-20		308	21.3	1.36	<0.534	65.4	1600	2580	<0.0500	
	NCL-31	Oct-20		290	28.6	1.23	<0.534	69.7	1360	2460	<0.0500	
	NCL-31	Apr-21		251	45.1	1.62	0.539 J	70.8	1100	1890	0.118	
	NCL-31	Sep-21		206	50.2	1.67	0.346 J	43.1	828	1680	<0.0500	
	NCL-31	Apr-22		199	32.7	1.34	0.563 JB	33.4	966	1610	<0.0500	
	NCL-31	Oct-22		212	31.0	1.73	0.280 J	32.1	895	1500	<0.0500	
	NCL-32	Jun-20		472	90.7	1.36	3.12	107	1730	2940	6.45	
	NCL-32	Oct-20		483	90.7	1.27	3.47	118	1640	3040	5.82	
	NCL-32	Apr-21		511	87.3	1.47	3.79	113	1670	2490	6.30	
	NCL-32	Sep-21		453	92.6	1.45	3.39	98.0	1650	2920	4.59	
	NCL-32	Apr-22		454	99.8	1.21	3.71	101	1780	2720	2.89	
	NCL-32	Oct-22		513	204	1.51	3.51	111	1750	2730	0.855	
	NCL-33	Jun-20		714	692	2.44	5.60	166	1540	3890	0.0547 J	
	NCL-33	Oct-20		688	667	2.64	6.43	178	1340	3960	<0.0500	
	NCL-33	Apr-21		678	790	2.72	4.74	273	1330	3420	0.0825 J	
	NCL-33	Sep-21		548	647	2.90	6.37	254	1340	3690	<0.0500	
	NCL-33	Apr-22		581 v	794	2.28	4.50	290 v	1370	3930 Q	0.106	
	NCL-33	Oct-22		542	607	2.55	4.55	279	1100	3230 Q	<0.0500	
	NCL-34A	Oct-18		270	289	1.21 J3J5	1.25	111	117	1710	<0.394	
	NCL-34A	Apr-19		251 v	262	1.37	1.11	107 v	42.6	1370	<0.394	
	NCL-34A	Oct-19		235	245	1.38	1.15	116	119	1470	0.110	
	NCL-34A	Jun-20		283	260	1.31	1.13 J	104	234	1680	<5.00	
	NCL-44	Jun-20		373	141	1.66	2.15	135	1290	2700	<0.0500	
	NCL-44	Oct-20		358	126 B	1.63	2.29	142	1170	2730	<0.0500	
	NCL-44	Apr-21		362	121	1.80	2.27	146	1200	2180	0.114	
	NCL-44	Sep-21		334	125	1.84	2.12	136	1170	2550	<0.0500	
	NCL-44	Apr-22		332	118	1.64	2.17 B	145	1380	1870	0.0656 J	
	NCL-44	Oct-22		338	123	2.05	2.05	154	1270	2150	<0.0500	
	NCL-49	Jun-20		486	128	0.609	0.686 J	133	1910	3350	9.98	
	NCL-49	Jun-20	FD	472	128	0.613	0.652 J	135	1920	3350	9.95	
	NCL-49	Oct-20		487	135 B	0.606	0.692 JB	135	1830	3380	10.1	
	NCL-49	Oct-20	FD	482	135 B	0.600	0.675 JB	133	1820	3430	10.0	
	NCL-49	Apr-21		501	115	0.692	0.786 J	154	1970	2930	6.70	
	NCL-49	Apr-21	FD	491	118	0.645	0.706 J	149 v	2030	2910	7.30	
	NCL-49	Sep-21		491	105	0.697	0.726 J	140	1980	3400	13.3	
	NCL-49	Sep-21	FD	483	105	0.704	0.710 J	140	1970	3340	13.3	
	NCL-49	Apr-22		473	128	0.794	0.661 JB	148	2230	2600	14.1	
	NCL-49	Apr-22	FD	473	126	0.820	0.790 JB	150	2170	2370	14.7	
NCL-49	Oct-22		514	181	0.781 J	0.700 J	158	2080	3040	13.2		
NCL-49	Oct-22	FD	472	182	0.781 J	0.704 J	155	2080	2980	12.8		
North Refinery	MW-23	Apr-19		97.5	444	1.70	1.12	482	18.9	2000	<0.0197	
	MW-23	Oct-19		95.6	428	1.59	1.27	410	18.7	2020	<0.0197	
	MW-23	Jun-20		96.4	410	1.42	1.10 J	426 v	15.6	1970	<0.500	
	MW-23	Oct-20		96.8	408	1.19	1.29 J	459	7.39	1990	<0.0500	
	MW-29	Jun-20		396	383	1.71	2.03	356	1890	3610	<0.0500	
	MW-29	Oct-20		336	418	1.47	1.90 J	333 v	1430	3530	<0.0500	
	MW-29	Apr-21		379	457	1.83	2.06	330	1580	3730	0.105	
	MW-29	Sep-21		590	502	1.47	2.77	328	2170	4180	0.0504 J	
	MW-29	Apr-22		378	571	1.68	2.14	317	1720	3190	<0.0500	
	MW-29	Oct-22		461	631	1.62	2.52	358	1670	3130	<0.0500	
	MW-39	Apr-19		52.6	111	4.21	0.164 J	891	1000	2580	<0.0197	
	MW-39	Oct-19		45.8	86.8	4.26	0.245 J	771	929	2590	<0.0197	
	MW-39	Jun-20		61.8	97.7	3.45	<0.534	721	821	2410	<0.0500	
	MW-39	Oct-20		63.8	91.5	3.28	<0.534	655	686	2260	<0.0500	
	MW-40	Apr-17		474	156	1.76	1.62	110	1550	3190	<0.197	
	MW-40	Apr-18		425	141	1.80	1.41	107	1440	2390	<0.985	
	MW-40	Apr-19		450	106	1.52	1.39	107	1400	2600 J3	<0.394	
	MW-40	Jun-20		374	88.4	1.88	1.30 J	90.4	1380	2430	<0.500	
	MW-41	Apr-18		329	682	0.934	0.571 J	624	1500	4060	<0.0197	
	MW-41	Apr-19		238	721	0.884	0.590 J	624	1140	4110	<0.394	
	MW-41	Jun-20		282	875	1.00	0.653 J	828	1780	4930	<0.0500	
	MW-41	Apr-21		274	856	1.02	0.586 J	812	1590	5010	0.117	
	MW-42	Apr-19		233	319	0.780	0.449 J	425	1010	2590	<0.394	
	MW-42	Jun-20		246	336	0.851	<0.534	358	1020	3310	<2.50	
	MW-42	Apr-21		314	585	0.869	0.397 J	452	1290	3870	0.0775 J	
	MW-42	Apr-22		265	699	0.722	0.452 J	425	1120	3770 Q	14.7	
	MW-43	Apr-19		152	639	1.71	0.923 J	491	444	2610	<0.394	<0.0180
	MW-43	Oct-19		205	662	1.66	0.961 J	406	479	2120	<0.985	<0.0180 J4
	MW-43	Jun-20		141	547	1.36	0.828 J	341	198	2210	<0.250	<0.0360
	MW-43	Oct-20		141	550	1.09	0.896 J	350	102	2150	<0.0500	<0.0180
	MW-59	Apr-17		467	184	1.13	0.519 J	134	1870	3160	<0.197	
	MW-59	Apr-18		492	180	1.31	0.507 J	151	1680	2760	<0.0197 J6	
	MW-59	Apr-19		475	173	1.10	0.468 J	153	1400	3110	<0.0197	
	MW-59	Jun-20		366	201	1.33	<0.534	184	1340	2900	<0.0500	
	MW-60	Jun-20		418	206	0.778	<0.534	178	1770	3720	<2.50	<0.0360
	MW-60	Jun-20	FD	424	219	1.18 J	<0.534	176	1660	3790	<0.500	<0.0360
	MW-60	Oct-20		418	202	0.715	<0.534	189	1510	3560	0.203	<0.0180
	MW-60	Oct-20	FD	401	219	1.21 J	<0.534	190	1780	3660	<0.0500	<0.0180
	MW-61	Jun-20		292	471	1.09	0.933 J	299	541	2570	<5.00	
	MW-61	Oct-20		246	339	1.06	0.820 JB	302	532	2110	<	

Table 4C - Summary of Groundwater Analytical Data - Water Quality and Cyanide

2022 Annual Groundwater Monitoring Report
HF Sinclair Navajo Refining LLC, Artesia Refinery, Artesia, New Mexico

Analyte Group				Water Quality Parameters								Cyanide
				Calcium	Chloride	Fluoride	Potassium	Sodium	Sulfate	TDS	Nitrate/Nitrite	Cyanide
				7440-70-2	16887-00-6	16984-48-8	7440-09-7	7440-23-5	14808-79-8	TDS	NO ₃ NO ₂	57-12-5
				Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
CGWSL				--	250	1.60	--	--	600	1000	10.0	0.200
CGWSL Source				--	WQCC Dom	WQCC HH	--	--	WQCC Dom	WQCC Dom	WQCC HH	WQCC HH
Area	Well ID	Date	Dup									
North Refinery	MW-90	Jun-20		331	173	2.25	1.13 J	142	1790	3120	<2.50	
	MW-90	Oct-20		293	210	1.05	0.913 J	171	1280	2910	<0.0500	
	MW-90	Apr-21		314	230	1.06	0.760 J	170	1250	2960	<0.0500	
	MW-90	Sep-21		452	163	3.03	1.75 J	133	2330	4090	<1.00	
	MW-90	Apr-22		290	265	1.78	0.993 J	177	1570	3020	<1.00	
	MW-90	Oct-22		319	262	1.89	1.09 J	185	1430	2620	<2.50	
	MW-91	Oct-18		433	221	1.27	0.639 J	35.2	966	2820	<0.985	
	MW-91	Apr-19		460	295	1.27	0.468 J	38.9	915	3290	<1.97	
	MW-91	Oct-19		451	422	1.29	0.520 J	39.6	1020	2430	<0.197	
	MW-91	Jun-20		478	501	1.19	<0.534	36.7	813	2830	<10.0	
	MW-92	Apr-16		130 O1	415	1.30	1.73 J	450 O1V	24.1	2310	0.602 J	
	MW-92	Oct-16		134	539	1.63	2.02	454	14.6	2150	<0.985	
	MW-93	Apr-17		489	192	2.38	2.97	167	1430	2930	<0.197	
	MW-93	Apr-18		537	193	2.39	3.55	191	1400	2760	<0.197	
	MW-93	Apr-19		505	214	2.09	3.76	195	1400	2810	0.0220 J	
	MW-93	Jun-20		491	233	1.88	3.11	163	1070	2820	<2.50	
	MW-94	Oct-15		109	245	1.01	0.224 J	355	75.8	2530	<0.197	
	MW-94	Apr-16		124	217	1.02	0.189 J	532	199	2980	<0.197	
	MW-94	Oct-16		137	172	1.04	0.467 J	319	175	2530	<0.0197	
	MW-94	Apr-17		95.6	196	0.874	0.331 J	427	85.7	2660	<0.197	
	MW-95	Apr-17		203 V	349	0.868	0.730 J	194 V	420	1710	<0.197	
	MW-95	Apr-18		229	258	0.884	0.602 J	163	471	1770	<0.0197	
	MW-95	Apr-19		246	264	0.830	0.472 J	172	561	2020	<0.0197	
	MW-95	Jun-20		250	300	0.739	<0.534	151	682	2020	<0.0500	
	MW-96	Jun-20		147	131	1.32	1.52 J	200	95.2	1320	<2.50	
	MW-96	Oct-20		142	128	1.15	1.17 J	218	69.3 P1	1420	<0.0500	
	MW-96	Sep-21		207	129	1.37	1.29 J	193	422	1800	<0.500	
	MW-96	Apr-22		133	149	1.27	1.16 J	195	104	1430 Q	<1.00	
	MW-96	Oct-22		167	154	1.41	1.10 J	205	191	1340	<2.50	
	MW-98	Jun-20		561	239	1.69	<0.534	129	1590	3280	<5.00	
	MW-98	Oct-20		515	195	1.73	<0.534	125	1300	3060	<0.0500	
	MW-98	Apr-21		580	195	1.58	0.219 J	166	1390	3380	<50.0	
	MW-98	Sep-21		510	177	1.56	0.284 J	175	1320	3220	<2.50	
	MW-98	Apr-22		484	187 B	1.70	0.222 J	156	1590	3190 Q	<2.50	
	MW-98	Oct-22		536	90.4	2.14	0.323 J	145	1410	2190	<2.50	
	MW-137	Oct-17		141	548	1.11	0.979 JB	759	683	2910	<0.394	<0.00180
	MW-137	Apr-18		143	446	1.41	1.23	955	713	3420	<0.985	<0.180
	MW-137	Oct-18		133	406	0.873	0.971 J	632	384	2730	<1.97	<0.180
	MW-137	Apr-19		142	407	1.28	1.14	845	607	3380	<1.97	<0.0900
	MW-138	Oct-17		124	453	1.06	1.50 B	401	27.9	2100	<0.0985	<0.00180
	MW-138	Apr-18		130	453	0.874	1.58	436	26.8	1910	<0.0197	<0.00180
	MW-138	Oct-18		122	408	0.802	1.60	362	30.3	1510	<0.0197	<0.00180
	MW-138	Apr-19		130	435	0.966	1.62	402	41.4	1730	<0.0197	<0.00180
	RW-1R	Apr-16		505	180	1.38	6.39	203	1500	2990	0.422 J	
	RW-1	Apr-17		558	246	1.41	7.37	268	1860	3690	<0.197	
	RW-1	Apr-18		363	255	0.913	2.24	247	1030	1810	<1.97	
	RW-1	Apr-19		337	286	0.866	1.87	266	939	2690	<1.97	
	RW-2	Apr-15		726	365	1.75	5.55 J	383	3510	5310	<0.200	
RW-2R	Apr-16		875	430	2.09	5.80	396	2200	3810	0.281 J		
RW-2	Apr-17		519	251	2.35	2.86	261	1200	3030	<0.197		
RW-2	Apr-18		402	317	1.75	2.25	335	731	2600	<0.394		
RW-7	Apr-17		266	204	0.513	0.922 J	105	693	1740	<0.197		
RW-7	Apr-18		295	217	1.22	2.54	149	475	1820	<0.985		
RW-7	Apr-19		247	239	1.05	1.63	150	426	1830	<0.197		
RW-7	Jun-20		184	218	0.995	0.651 J	151	162	1530	<2.50		
RW-8	Apr-15		227	115	0.801	0.353 J	209	473	1600	<0.200		
RW-8	Apr-17		218	163	0.731	0.360 J	161	665	1820	<0.197		
RW-9	Apr-19		309	399	1.46	1.91	356	1160	3100	<1.97		
RW-9	Jun-20		293	469	1.21	1.51 J	425	1140	3330	<2.50		
RW-9	Apr-21		300	556	1.22	1.27 J	439	1180	3560	<0.500		
RW-9	Apr-22		294	554	0.895	1.12 J	432	901	2980	<2.50		
RW-10	Apr-18		499	131	3.41	3.49	143	1530	2670	<0.985		
RW-10	Apr-19		572	65.9	3.66	3.68	102	1470	2540 J3	<0.197		
RW-10	Jun-20		485	92.9	3.87	4.43	151	1450	2520	<0.0500		
RW-10	Apr-21		353	193	3.26	3.53	312	1110	2730	0.0679 J		
RW-16B	Apr-17		499	291	4.90	0.832 J	372	2740	5030	2.20		
RW-16B	Apr-18		546	43.5	4.89	0.788 J	259	2660	4240	0.894 J6		
RW-16B	Apr-19		540	83.0	4.48	0.677 J	333	2690	4440	1.47 J3J6		
RW-16B	Jun-20		516	181	3.78	1.65 J	492	2970	4720	<0.0500		
RW-17A	Apr-17		568	398	2.61	4.02	306	2950	4820	3.33		
RW-17A	Apr-18		635	358	2.31	3.87	345	3080	4430	0.0920 J		
RW-17A	Apr-19		563	398	2.64	2.97	286	3290	5430	<0.0197		
RW-17A	Jun-20		554	389	2.58	4.62	306	2940	5730	0.386		
North RO Field	MW-117	Jun-20		578	299	3.43	6.39	129	2300	3640	2.46	
	MW-117	Oct-20		587	271	3.25	6.68	133	2030	3870 J3	4.05	
	MW-117	Apr-21		663	304	2.89	5.49	147	2290	4080	5.55	
	MW-117	Sep-21		614	325 B	2.66	5.98	144	1910	4020	1.76	
	MW-117	Apr-22		571	365	3.03	5.39	169	2140	3830	1.82	
	MW-117	Oct-22		507	248	2.89	4.52	163	1730	2960	0.527	
	MW-118	Jun-20		586	290	5.20	3.45	171	2950	4620	2.43	
	MW-118	Oct-20		558	262	5.06	3.07 B	178	2600	4640	2.03	
	MW-118	Apr-21		575	241	4.51	2.85	192	2880	4840	2.29	
	MW-118	Sep-21		568	253 B	4.12	2.38	186	2720	4770	2.06	
	MW-118	Apr-22		562	265	4.40	2.09	186	3180	4750	2.25	
	MW-118	Oct-22		588	245	4.36	2.04	202	2630	4440	1.94	
	MW-119	Jun-20		629	345	1.66	0.637 J	202	2990	4500	0.281	
	MW-119	Oct-20		641	298	1.39	0.832 JB	200 V	2490	4420	0.106	
	MW-119	Apr-21		620	278	1.49	0.690 J	189 V	2580	4400	0.237	
MW-119	Sep-21		607	282 B	1.70	0.786 J	192	2320	4360	0.314		
MW-119	Apr-22		585	294	1.88	0.684 J	186	2730	3520	1.43		
MW-119	Oct-22		582	263	1.69	0.724 J	183	2140	3930	0.107		
South Refinery	KWB-2R	Apr-17		280	279	0.904	0.460 J	286	1060	2550	0.0220 J	
	KWB-2R	Oct-17		139	240	1.09	1.33	283	259	1770	<0.394	
	KWB-2R	Apr-19		322	246	0.656	0.516 JB	304	1040	2370	0.991 J	
	KWB-2R	Oct-19		169	253	0.927	0.534 J	246	345	1590 J3	<0.0197	
	KWB-5	Oct-17		220	565	0.877	1.41	208	21.9	1560	0.0530 J	
	KWB-5	Apr-18		233	546	0.861	1.95	215	9.96	1730	1.93	
	KWB-5	Oct-18		200	546	0.869	1.76 JB	208	11.8	1450	<0.0197	
	KWB-5	Apr-19		244	525	0.761	2.10	241	18.7	1680	<0.010	

Table 4C - Summary of Groundwater Analytical Data - Water Quality and Cyanide

2022 Annual Groundwater Monitoring Report
HF Sinclair Navajo Refining LLC, Artesia Refinery, Artesia, New Mexico

Analyte Group				Water Quality Parameters									Cyanide
				Calcium	Chloride	Fluoride	Potassium	Sodium	Sulfate	TDS	Nitrate/Nitrite	Cyanide	
				7440-70-2	16887-00-6	16984-48-8	7440-09-7	7440-23-5	14808-79-8	TDS	NO ₃ NO ₂	57-12-5	
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
CGWSL				--	250	1.60	--	--	600	1000	10.0	0.200	
CGWSL Source				--	WQCC Dom	WQCC HH	--	--	WQCC Dom	WQCC Dom	WQCC HH	WQCC HH	
Area	Well ID	Date	Dup										
South Refinery	MW-28	Apr-19		361	138	1.14	0.964 J	112	1030	2920	<0.985	<0.0180	
	MW-28	Oct-19		360	143	1.60	0.571 JB	101	1630	2860	<0.985	<0.0180 J4	
	MW-28	Jun-20		285	149	1.10	4.23	109	1310	2610	<0.250	<0.0360	
	MW-28	Oct-20		281	132	1.02	4.03	114	1140	2670	<0.0500	<0.00180	
	MW-48	Apr-18		200	689	1.90	0.776 J	269	9.52	2490	0.0860 J		
	MW-48	Oct-18		172 V	498	1.20	0.863 J	293 V	125	1730 J4	<0.394		
	MW-48	Apr-19		168	179	1.82	1.16	290	1210	1630 J4	<0.394		
	MW-48	Oct-19		159	429	1.08	1.12	297	85.7	1580 J3	<0.985		
	MW-50	Jun-20		495	418	2.92	4.42	577	3370	5550 Q	74.6		
	MW-50	Oct-20		490	390	3.64	4.05	682	4100	7810	78.5 V		
	MW-50	Apr-21		387	191	1.47	2.42	242	1650	3370	0.0950 J		
	MW-50	Sep-21		513	477	5.41	9.75	851	4950	9740	266		
	MW-50	Apr-22		376	281	2.99	3.59	456	3250	5260 Q	6.75		
	MW-50	Oct-22		506	313	3.94	3.65	574	3930	5930	50.8		
	MW-52	Jun-20		239	195	1.71	<0.534	340	1140	2810	13.0	<0.00180	
	MW-52	Oct-20		223	195	1.62	<0.534	332	1110	2720	15.3 V	<0.00180	
	MW-52	Apr-21		212	166 B	1.54	0.319 J	358	958	2530	11.0	<0.00180	
	MW-52	Sep-21		211	179	1.53	0.240 J	308	1050	2560	12.0	<0.00180	
	MW-52	Apr-22		187	176	1.81	0.373 J	309	994	2450	19.2	<0.00180	
	MW-52	Oct-22		198	182	1.99	0.271 J	338	1130	2040	11.1	<0.00180	
	MW-64	Jun-20		90.7	324	0.993	0.655 J	350	5.03	1620	<0.100		
	MW-64	Oct-20		88.5	310	0.710	0.586 JB	343	8.17	1590	<0.0500 J3J6		
	MW-64	Apr-21		93.9	275	0.750	0.581 J	350	23.4	1580	<0.0500		
	MW-64	Sep-21		88.9	286 B	0.878	0.536 J	329	9.58	1600	<2.50		
	MW-64	Apr-22		79.2	295	0.619	0.571 J	318	1.81 J	1310	<0.500		
	MW-64	Oct-22		87.2	294	0.723	0.537 J	338	3.00 J	1500	<0.250		
	MW-65	Apr-18		132	306	1.33	0.732 J	264	10.2	1340	<0.0985		
	MW-65	Oct-18		127	284	1.12	0.823 JB	229	4.80 J	1280	<0.0197 J6		
	MW-65	Apr-19		155	284	0.967	0.532 JB	262	1.23 J	1310	<0.0197		
	MW-65	Oct-19		113	234	1.23	0.466 J	223	5.53 B	1080	<0.0197		
	MW-66	Oct-19		121	168	1.04	1.18	131	6.99	912	<0.0197 J6	<0.00180	
	MW-66	Jun-20		136	188	1.13	0.842 J	155	1.16 J	1070	0.0979 J	<0.00180	
	MW-66	Oct-20		140	189	1.12	1.71 JB	145	6.68	1060	<0.0500	<0.00180	
	MW-66	Apr-21		176	257	1.26	2.12	205	1.59 J	1230	0.0769 J	<0.00180	
	MW-99	Oct-18		162	254	0.612	0.792 J	212	124	1420	<0.394		
	MW-99	Apr-19		184	225	0.572	1.31	214	145	1390	<0.394		
	MW-99	Oct-19		109	66.7	0.517	4.66	58.1	81.1	547	0.0300 J		
	MW-99	Jun-20		138	73.2	0.323	7.77	60.7	109	727	<0.0500		
	MW-101	Jun-20		183	202	0.965	0.556 J	144	183	1330	<0.0500		
	MW-101	Oct-20		207	185	0.915	0.881 JB	137	234	1410	<0.0500		
	MW-101	Apr-21		178	190	0.839	0.652 J	149	150	1250	0.112		
	MW-101	Sep-21		173	195	0.918	0.934 J	138	200	1270	<2.50		
	MW-101	Apr-22		164	190	0.931	0.762 J	135	125	1210	<0.500		
	MW-101	Oct-22		168	177	1.10	0.715 J	148	114	1130 J3	<0.250		
	MW-102	Jun-20		84.2	285	0.984	<0.534	446	21.2	1610	<0.0500		
	MW-102	Oct-20		91.9	282	0.812	<0.534	431	5.16	1610	<0.0500		
	MW-102	Apr-21		98.1	242 B	0.823	0.435 J	430	39.6	1570	0.0911 J		
	MW-102	Sep-21		118	226 B	0.899	0.532 J	410	55.5	1650	<2.50		
	MW-102	Sep-21	FD	117	253	1.05	0.601 J	423	55.0	1620	<2.50		
	MW-102	Apr-22		77.1	153	0.815	0.289 J	357	23.3	1390	<2.50		
	MW-102	Apr-22	FD	78.1	143	0.812	0.297 J	361	23.5	1350	<2.50		
	MW-102	Oct-22		98.3	131	1.14 J	0.279 J	358	84.5	1280	<2.50		
	MW-102	Oct-22	FD	99.2	134	1.15 J	0.291 J	366	97.1	1380	<2.50		
	MW-103	Apr-19		91.2	4550	5.85	1.16	3990	133	9260	<0.0197		
	MW-103	Jun-20		120	4480	4.50	1.21 J	2830	44.3	7620	<0.500		
	MW-103	Apr-21		186	4530	3.47	1.26 J	3010	157 J	8460	<0.500		
	MW-103	Apr-22		81.5	4670	4.33	1.06 J	2800	67.2	8280 Q	<0.500		
	MW-104	Jun-20		224	69.8	1.51	5.03	77.2	703	1290	<0.250		
	MW-104	Jun-20	FD	218	69.2	1.33	4.88	73.6	703	1140	<0.500		
	MW-104	Oct-20		256	71.7	1.34	5.63	73.9	785	1470	0.153		
	MW-104	Oct-20	FD	241	71.7	1.36	5.28	73.7	702	1450	<0.0500		
	MW-104	Apr-21		321	55.4	1.15	4.78	67.3	935	1820	0.109		
	MW-104	Apr-21	FD	314	55.8	1.18	4.58	67.3	929	1760	<0.0500		
	MW-104	Sep-21		306	69.0	1.31	6.26	70.5	834	1830	<2.50		
	MW-104	Apr-22		190	41.6	1.28	3.79	47.4	623	1060	<0.500		
	MW-104	Oct-22		198	58.2	1.58	5.40	60.2	542	1030	<2.50		
	MW-105	Jun-20		243	98.8	1.43	2.74	71.7	177	1220	<2.50		
	MW-105	Oct-20		170	99.9	1.47	2.73	89.5	17.4	1050	<0.0500		
	MW-105	Apr-21		325	119 B	1.32	3.02	94.8	683	1910	<0.0500		
	MW-105	Apr-22		400	50.7	1.24	3.58	58.4	1020	1980	<2.50		
	MW-105	Oct-22		181	17.8	0.633	4.04	11.7	372	740 J3	8.85		
	MW-106	Oct-19		360	217	1.29	1.74	264	1340	3240	<0.985		
	MW-106	Jun-20		295	206	1.11	1.53 J	258	1130	2890	<10.0		
	MW-106	Oct-20		285	213	0.865	0.777 J	318	980	3110	<0.0500		
	MW-106	Apr-21		308	322	1.01	1.02 J	333	1580	3260	<0.0500		
	MW-107	Oct-16		186	271	1.82	0.965 J	80.1	72.4	1480	0.170 B		
	MW-107	Apr-17		140	313	1.76	0.655 J	75.4	<0.0774	1260	<0.197		
	MW-107	Apr-18		147	269	1.66	0.555 J	81.7	1.08 J	1370	0.0410 J		
	MW-107	Apr-19		147	246	1.33	0.631 J	82.5	0.657 J	1270	<0.0197		
	MW-109	Jun-20		87.7	191	1.97	0.786 J	423	496	2150	<2.50		
	MW-109	Oct-20		70.2	200	1.86	0.700 JB	430	376	1990	<0.0500		
	MW-109	Apr-21		60.3	218	1.78	0.591 J	492	204	1820	0.104		
	MW-109	Sep-21		76.6	61.9	1.44	0.758 J	394	321	2020	<0.500		
	MW-109	Apr-22		60.9	201	1.96	0.852 J	389	276	1910	<1.00		
	MW-109	Oct-22		113	198	1.83	1.12 J	431	207	1210	<0.250		
	MW-110	Jun-20		97.8	95.6	1.39	<0.534	251	316	1300	<0.0500		
	MW-110	Oct-20		95.9	92.9	1.32	<0.534	25					

Table 4C - Summary of Groundwater Analytical Data - Water Quality and Cyanide

2022 Annual Groundwater Monitoring Report
HF Sinclair Navajo Refining LLC, Artesia Refinery, Artesia, New Mexico

Analyte Group				Water Quality Parameters								Cyanide
				Calcium	Chloride	Fluoride	Potassium	Sodium	Sulfate	TDS	Nitrate/Nitrite	Cyanide
				7440-70-2	16887-00-6	16984-48-8	7440-09-7	7440-23-5	14808-79-8	TDS	NO ₃ NO ₂	57-12-5
				Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
				CGWSL	--	250	1.60	--	--	600	1000	10.0
CGWSL Source				--	WQCC Dom	WQCC HH	--	--	WQCC Dom	WQCC Dom	WQCC HH	WQCC HH
Area	Well ID	Date	Dup									
South Refinery	RW-5R	Apr-15		4.82	260	0.965	0.461 J	189	0.376 J	565	<0.0200	
	RW-5R	Apr-16		4.61 J	262	0.564	0.364 J	203	0.655 J	399	0.495 J	
	RW-6	Apr-15		168	414	0.628	0.686 J	205	129	1650	0.0335 J	
	RW-6R	Apr-16		191	405	0.747	0.356 J	226	104	1470	0.485 JP1	
	RW-6	Apr-18		183	409	0.804	0.684 J	224	45.6	1530	0.0460 J	
	RW-6	Apr-19		165	325	0.620	0.598 J	191	3.36 J	1350	<0.394	
	RW-15C	Apr-17		160	409	0.774	1.59	269	19.4	1610	0.442 J	
	RW-15C	Apr-18		211 v	652	0.868	1.28	349 v	0.754 J	1850	<0.0197	
RW-15C	Apr-19		247	264	0.882	1.63	322	1070	2110 J4	<0.0197		
South RO Field	MW-114	Jun-20		586	251	2.17	2.42	127	2060	3470	0.478 J5	
	MW-114	Oct-20		528	233	2.07	2.37 B	119	1590	3300	0.110	
	MW-114	Apr-21		532	180 B	1.98	2.46	118	1410	2960	0.110	
	MW-114	Sep-21		466	227	2.32	2.26	109	1380	2820	<0.0500	
	MW-114	Apr-22		380	114	2.75	1.89 J	97.1	1320	2080	<0.0500	
	MW-114	Oct-22		467	408	2.25	2.09	158	1170	2670	<0.0500	
	MW-115	Jun-20		475	424	2.09	<0.534	187	2590	4320	3.94	
	MW-115	Oct-20		467	406	1.73	<0.534	179	2350	4590	3.99	
	MW-115	Apr-21		508	357 B	1.54	0.552 J	212	2240	4560	3.56	
	MW-115	Sep-21		466	357	1.75	0.547 J	215	2170	4330	1.85	
	MW-115	Apr-22		437	342	1.57	0.516 J	219	2220	4070 Q	1.60	
	MW-115	Oct-22		433	306	1.85	0.363 J	251	1870	3390	0.492	
	MW-116	Jun-20		559	282	1.59	1.11 J	177	2270	4210	0.520	
	MW-116	Oct-20		550	260	1.53	1.14 JB	176	1920	4040	0.476	
	MW-116	Apr-21		588	278 B	1.52	1.39 J	186	2080	4000	0.636	
	MW-116	Sep-21		542	283 B	1.38	1.03 J	174	1940	3860	0.709	
	MW-116	Apr-22		534	320 B	1.56	1.09 J	164	2300	4010	0.505	
	MW-116	Oct-22		573	321	1.57	1.03 J	167	1910	3980	0.313	
TEL	MW-49	Jun-20		210	442	1.38	2.90	309	487	2350	<2.50	<0.0900
	MW-49	Oct-20		196	451	1.30	2.45	308	437	2340	<0.0500	0.0121 J
	MW-49	Apr-21		184	395	1.24	1.81 J	333	383	1900	<5.00	0.0990 J
	MW-49	Sep-21		164	333	1.26	1.96 J	290	317	1810	<2.50	<0.0900
	MW-49	Apr-22		144 v	265	1.30	1.76 J	270 v	258	1470	<0.500	<0.0900
	MW-49	Oct-22		146	233	1.47	1.93 J	277	179	1410	<2.50	<0.0450
	TEL-1	Oct-18		160	238	2.13	0.650 J	474	719	2080	<0.394	
	TEL-1	Apr-19		172	250	2.14	0.685 J	460	803	2000	<0.394	
	TEL-1	Oct-19		144	234	2.23	0.629 J	474	640	2200	<0.0197	
	TEL-1	Jun-20		143	184	1.98	0.565 J	435	699	2140	<0.500	
	TEL-2	Oct-18		266	205	0.967	1.14	363	1360	2730	<0.394	
	TEL-2	Apr-19		274	224	1.09	1.73	377	1250	2940	<0.394	
	TEL-2	Oct-19		298	159	1.28 B	1.30	407	1610	3550	<0.394	
	TEL-2	Jun-20		280	130	0.988	1.05 J	373	1540	3400	<0.500	
	TEL-3	Apr-18		302	696	2.51	6.00	308	442	2440	<0.0985	
	TEL-3	Apr-19		562	52.7	2.77	5.37	44.1	1300	2290	<0.0985	
	TEL-3	Oct-19		603	36.7	3.06	5.26	36.2	1470	2790	<0.985	
	TEL-3	Oct-20		424	114	1.73	2.55	86.5	1290	2880	<0.0500 J6	
	TEL-4	Jun-20		305	456	0.932	<0.534	284 O1V	1480	3770	<0.500	
	TEL-4	Jun-20	FD	308	455	0.841	<0.534	286	1490	3770	<0.0500	
	TEL-4	Oct-20		294	400	0.904	<0.534	296 v	1140	3470	<0.0500	
	TEL-4	Oct-20	FD	291	450	0.834	<0.534	307	1230	3510	<0.0500	
	TEL-4	Apr-21		342	290	0.829	0.513 J	367	1240	3510	0.0747 J	
	TEL-4	Apr-21	FD	341	325	0.825	0.521 J	356	1410	3540	0.0730 J	
	TEL-4	Sep-21		441	316	0.765	0.588 J	406	1990	4670	0.0517 J	
	TEL-4	Sep-21	FD	442	308	0.767	0.669 J	396	2030	4700	<0.0500	
	TEL-4	Apr-22		245	138 B	1.14	0.499 J	320	1310	2330	<0.500	
	TEL-4	Apr-22	FD	242	132 B	1.13	0.508 J	326	1300	2130	<0.500	
	TEL-4	Oct-22		275	209	1.05	0.570 J	382	1290	2570	<0.250	
	TEL-4	Oct-22	FD	282	204	1.03	0.580 J	385	1290	2530	<0.250	
	Three Mile Ditch	MW-8	Apr-19		499	450	2.08	1.85	336	3050	4640 J4	18.7
MW-8		Jun-20		534	599	2.04	1.98 J	393	3060	5260	16.0	
MW-8		Apr-21		595	625	1.55	2.05	464	2690	5790	19.4	
MW-8		Apr-22		542	724	2.08	2.06	433	3040	5650 Q	14.7	
MW-16		Apr-19		555	349	2.57	9.13	472	2590	4590 J4	0.790	
MW-16		Jun-20		500	446	2.69	8.82	424	2610	4390	0.331	
MW-16		Apr-21		487	339	2.34	8.73	371	2040	4000	1.20	
MW-16		Apr-22		500	363	2.63	7.99	305	2350	3980 Q	0.512	
MW-20		Apr-19		541	373	2.27	0.509 J	284	2980	4710 Q	2.02	
MW-20		Jun-20		522	382	2.26	0.601 J	284	2830	4590	2.38	
MW-20		Apr-21		572	399	1.85	0.598 J	295	2590	4820	3.60	
MW-20		Apr-22		513 v	518	1.85	0.566 J	250 v	2570	4530	5.45	
MW-21		Jun-20		586	641	2.02	2.17	440	3130	5480	18.6	
MW-21		Oct-20		552	616	1.41	2.15	429	2700	5600	17.5	
MW-21		Apr-21		592	601	1.77	2.18	467	2570	5560	17.8	
MW-21		Sep-21		546	647	1.91	2.06	423	2770	5490	17.1	
MW-21		Apr-22		541	703	2.22	2.20	422	2960	5190	13.5	
MW-21		Oct-22		545	670	1.93	1.80 J	423	2440	4440	13.4	
MW-25		Apr-19		330	1040	1.00	4.19	771	1510	3810	2.98	
MW-25		Jun-20		323	976	1.31	3.90	653	1450	3610	0.143	
MW-25		Apr-21		358	940	1.01	3.54	472	1350	3660	0.466	
MW-25		Apr-22		1250	5220	1.10	7.69	2480	3430	25300	<0.0500	
MW-26		Apr-19		584	1010	2.09	5.77	674	4420	7020 Q	1.66	
MW-26		Jun-20		585	671	2.06	5.18	530	3660	5990	1.69	
MW-26		Apr-21		517	527	1.82	4.86	530	3130	5690	1.79	
MW-26		Apr-22		505	605	2.36	4.50	452	3670	6070 Q	1.52	
MW-27		Apr-19		297	55.2	1.42	7.82	104	1030	1720 J4	0.987	
MW-27		Jun-20		301	56.7	1.38	7.62	91.0	1070	1820	1.78	
MW-27		Apr-21		335	60.0	1.18	7.70	94.6	1110	1990	0.418	
MW-27		Apr-22		338	45.5	1.16	8.41	86.4	1270 v	2060	0.598	
MW-46R		Jun-20		607	204	1.43	0.731 J	172	2550	3930	0.0922 J	
MW-46R		Oct-20		553	175 B	1.16	0.725 JB	166	2070	3860	<0.0500	
MW-46R		Apr-21		596	203	1.18	0.838 J	179	2100	3850	0.127	
MW-46R		Sep-21		466	119 B	1.47						

Table 4C - Summary of Groundwater Analytical Data - Water Quality and Cyanide

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HF Sinclair Navajo Refining LLC, Artesia Refinery, Artesia, New Mexico

Analyte Group				Water Quality Parameters							Cyanide
Analyte				Calcium	Chloride	Fluoride	Potassium	Sodium	Sulfate	TDS	Nitrate/Nitrite
CAS				7440-70-2	16887-00-6	16984-48-8	7440-09-7	7440-23-5	14808-79-8	TDS	NO ₃ NO ₂
Units				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
CGWSL				--	250	1.60	--	--	600	1000	10.0
CGWSL Source				--	WQCC Dom	WQCC HH	--	--	WQCC Dom	WQCC Dom	WQCC HH
Area	Well ID	Date	Dup								
Three Mile Ditch	NP-1	Jun-20		436	409	1.89	2.59	311	2260	4060	3.27
	NP-1	Oct-20									
	NP-1	Apr-21		479	402	1.50	1.69 J	325	1870	4090	3.17
	NP-1	Sep-21									
	NP-1	Apr-22		392	411	1.96	1.70 J	279	1920	3760 Q	1.29
	NP-1	Oct-22									
	NP-6	Apr-15									
	NP-6	Apr-17									
	NP-6	Apr-19									
	NP-6	Apr-21									
Upgradient	UG-1	Apr-19		525	98.3	0.623	1.29	105	1800	3150	10.1
	UG-1	Jun-20		503	97.3	0.784	1.16 J	84.0	2060	3550 B	10.6
	UG-1	Apr-21		499	93.5	0.638	1.19 JB	93.1	1860	2950	11.1
	UG-1	Apr-22		536	113	0.662	0.985 J	84.8	2330	3570	12.4
	UG-2	Apr-19		357	61.3	1.32	1.58	90.6	1020	2040 Q	7.70 J6
	UG-2	Jun-20		342	75.9	1.52	1.41 J	85.7	1190	2150 B	9.75
	UG-2	Apr-21		330	66.3	1.36	1.33 JB	83.6	1070	1710	7.30
	UG-2	Apr-22		310	70.4	1.41	1.20 J	78.9	1080	1950	9.64
	UG-3R	Apr-19		479	36.3	0.502	1.99	37.1	1390	2440	0.905
	UG-3R	Jun-20		440	39.6	0.582	1.93 J	30.1	1560	2430	1.93
	UG-3R	Apr-21		489	61.7	0.466	2.10	34.9	1530	2300	3.16
	UG-3R	Apr-22		529 V	58.4	0.433	2.01	31.9	1840	2860	2.49
	UG-4	Apr-19		694	133	0.544	1.96	190	2420	4210	0.418
	UG-4	Jun-20		622	108	0.605	1.78 J	168	2810	4210 B	0.326
	UG-4	Apr-21		635	76.0	0.676 J	1.82 J	164	2610	3800	0.491
	UG-4	Apr-22		614	112	0.441	1.96 J	197	2890	4280	0.307 J3J6

Definitions	
X	Reported concentration, X, exceeds the CGWSL.
X	Analyte detected above the detection limit at a concentration equal to X.
<x	Analyte not detected at detection limit equal to x.
<x	Analyte not detected at detection limit equal to x, but x exceeds the CGWSL.
	Blank cell indicates a sample was collected from the well during the indicated sampling event, but the analyte was not analyzed.
---	No applicable CGWSL.
Abbreviations	
CGWSL	Critical Groundwater Screening Level (see Table 3)
CGWSL Source	Source for CGWSL value (see Table 3)
Dup	Duplicate sample
FD	Field duplicate sample
mg/L	Milligrams per Liter
WQCC Dom	NMED Groundwater standard for domestic exposure, 20.6.2.3103.B NMAC
WQCC HH	NMED Groundwater standard for human health exposure, 20.6.2.3103.A NMAC
Lab Footnote	
B	Analyte was also detected in the associated method blank.
J	Indicates an estimated value.
J3	The associated batch QC was outside the established quality control range for precision.
J4	The associated batch QC was outside the established quality control range for accuracy.
J5	The sample matrix interfered with the ability to make any accurate determination; spike value is high.
J6	The sample matrix interfered with the ability to make any accurate determination; spike value is low.
O1	The analyte failed the method required serial dilution test and/or subsequent post-spike criteria. These failures indicate matrix interference.
P1	Relative percent difference value not applicable for sample concentrations less than 5 times the reporting limit.
Q	Sample was prepared and/or analyzed past recommended holding time.
V	The sample concentration is too high to evaluate accurate spike recoveries.

Table 4D - Summary of Groundwater Analytical Data - Semi-Volatile Organic Compounds

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HF Sinclair Navajo Refining LLC, Artesia Refinery, Artesia, New Mexico

Analyte Group				Semi-Volatile Organic Compounds					
Analyte				1-Methyl naphthalene	2-Methyl naphthalene	Bis (2-ethylhexyl) phthalate	Dibenzofuran	Naphthalene	Phenol
CAS				90-12-0	91-57-6	117-81-7	132-64-9	91-20-3	108-95-2
Units				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
CGWSL				0.0300	0.0300	0.00600	0.00790	0.0300	0.00500
CGWSL Source				WQCC HH	WQCC HH	USEPA MCL	USEPA TW	WQCC HH	NMED TW
Area	Well ID	Date	Dup						
North Refinery	MW-23	04/03/2019		0.0531	<0.00156	0.00460 J	0.00394 J	0.0450	0.0133 J
	MW-23	10/23/2019		0.0922	<0.00622	<0.0142	0.00924 J	0.0262	0.0166 J
	MW-43	04/03/2019		0.0323	0.0232	0.000920 J	0.00192 J	0.0749	0.00703 J
	MW-43	10/23/2019		0.0956	0.0603	<0.0142	<0.00676	0.249	<0.00668
	MW-61	04/03/2019		0.0722	0.0119	0.00818	0.00293 J	0.0701	0.00457 J
	MW-61	10/23/2019		0.0902	0.0163	0.00187 J	0.00398 J	0.0831	0.00164 J
	MW-61	09/14/2021		0.0631	0.0245	0.00884	0.00276 J	0.0894	<0.00433
	MW-61	04/13/2022		0.101	0.0418	0.0152	0.00406 J	0.143	<0.00433
	MW-61	10/11/2022		0.0738	0.0280	0.0143	0.00311 J	0.0978	<0.00433
	MW-62	04/03/2019		0.0628	0.0320	0.00168 J	0.00458 J	0.0861	<0.000334
	MW-62	10/23/2019		0.144	0.0581	<0.0142	0.0128 J	0.168	<0.00668
	MW-62	09/14/2021		0.0984	0.0537	<0.00448	0.00575 J	0.157	<0.0217
	MW-62	04/12/2022		0.108	0.0581	<0.00448	0.00579 J	0.161	<0.0217
	MW-62	10/11/2022		0.0506	0.0124	<0.000895	0.00334 J	0.0534	<0.00433
	MW-93	04/03/2019		0.0313	0.00507	0.00129 J	0.00397 J	0.0307	0.00492 J
	MW-93	06/17/2020		0.0340	<0.000585	<0.00448	0.00396 J	0.0298	<0.0217
TEL	MW-95	04/03/2019		<0.000332	<0.000311	0.000850 J	0.00173 J	<0.000372	0.00279 J
	MW-95	06/16/2020		<0.000188	<0.000278	<0.00213	0.00259 J	0.00115 JB	<0.0103
	MW-137	04/03/2019		0.0480	0.0474	<0.0142	<0.00676	0.116	<0.00668
	MW-138	04/03/2019		0.00549	0.00356	<0.000709	0.000611 J	0.0117	0.00288 J
	TEL-4	04/02/2019		0.00498	<0.000311	0.0641	0.00177 J	<0.000372	0.00150 J
TEL	TEL-4	04/02/2019	FD	0.00531	<0.000311	0.000835 J	0.00205 J	<0.000372	0.00177 J
	TEL-4	10/22/2019		0.00275	<0.000311	0.00120 J	0.00161 J	0.000383 J	0.000961 J
	TEL-4	10/22/2019	FD	0.00300	<0.000311	0.00146 J	0.00169 J	0.000395 J	0.00146 J

Definitions

X	Reported concentration, X, exceeds the CGWSL.
X	Analyte detected above the detection limit at a concentration equal to X.
<x	Analyte not detected at detection limit equal to x.
<x	Analyte not detected at detection limit equal to x, but x exceeds the CGWSL.

Abbreviations

CGWSL	Critical Groundwater Screening Level (see Table 3)
Dup	Duplicate sample
FD	Field duplicate sample
mg/L	Milligrams per Liter
MCL	Maximum Contaminant Level
NMED TW	NMED Risk Assessment Guidance for Site Investigations and Remediation, November 2022, Table A-1 Tap Water Screening Level
USEPA MCL	United States Environmental Protection Agency MCL Screening Level, "Regional Screening Levels (RSL) Summary Table", November 2022
USEPA TW	United States Environmental Protection Agency Tap Water Screening Level, "Regional Screening Levels (RSL) Summary Table", November 2022
WQCC HH	NMED Groundwater standard for human health exposure, 20.6.2.3103.A NMAC

Lab Footnote

B	Analyte was also detected in the associated method blank.
J	Indicates an estimated value.

Table 5 - Summary of Production from Recovery Trenches and Wells

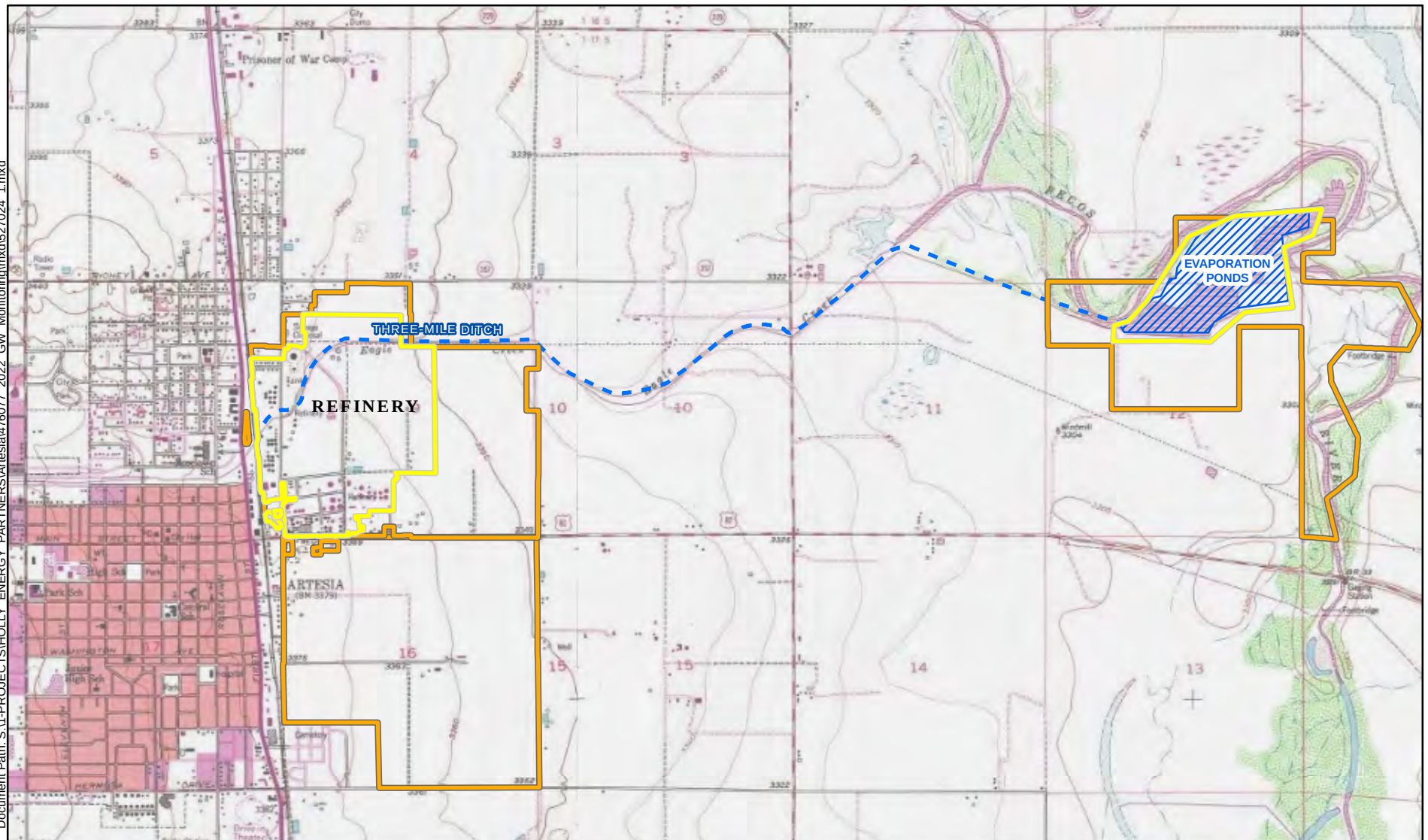
2022 Annual Groundwater Monitoring Report

HF Sinclair Navajo Refining LLC, Artesia Refinery, Artesia, New Mexico

Recovery Well	Recovery Method	Volume of Water Recovered ⁽¹⁾ (gallons)					Volume of PSH Recovered ⁽¹⁾ (gallons)				
		1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Total 2022	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Total 2022
RW-1R	Automated Pump	0	0	0	0	0	5,161	2,645	4,850	0	12,656
RW-2R	Automated Pump	227,055	241,450	457,113	410,806	1,336,424	8,797	17,048	12,778	19,443	58,066
RW-4R	Automated Pump	1,523,721	25,202	932,582	835,080	3,316,585	1	3	190	0	194
RW-5R	Automated Pump	18,958	16,788	6,221	33,330	75,297	0	7	127	1,666	1,800
RW-6R	Automated Pump	0	0	0	0	0	3	14	34	0	51
RW-7R	Automated Pump	169,072	13,587	467,432	306,602	956,693	5,761	10,561	3,043	11,755	31,120
RW-8R	Automated Pump	0	0	0	0	0	0	0	0	0	0
RW-12R	Automated Pump	0	0	0	0	0	0	0	0	0	0
RW-13R	Automated Pump	0	0	0	0	0	0	0	0	0	0
RW-14R	Automated Pump	0	258,635	1	1	258,637	0	12,589	13,315	2,253	28,157
RW-15	Automated Pump	0	0	0	0	0	0	0	0	0	0
RW-19	Automated Pump	0	0	151,624	7,133	158,757	0	0	60	181	241
RW-20	Automated Pump	0	0	0	0	0	0	0	0	0	0
RW-22	Automated Pump	1	1	0	3	5	0	12,333	14,422	2	26,757
TOTAL VOLUME RECOVERED:		1,938,807	555,663	2,014,973	1,592,955	6,102,398	19,723	55,200	48,819	35,300	159,042

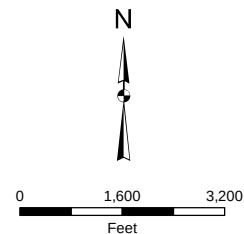
⁽¹⁾ Volumes of recovered water and PSH are based on automated system readings, rounded to the nearest gallon

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**LEGEND**

- | | | | |
|---|--|---|-------------------|
|  | FENCELINE |  | THREE-MILE DITCH |
|  | HFSNR PROPERTY BOUNDARY (FENCELINE SHOWN WHERE COINCIDENT) |  | EVAPORATION PONDS |

SOURCE: BASE MAP USGS 7.5 MINUTE
SERIES QUADS, ARTESIA AND SPRINGLAKE
QUADRANGLES, 1955, PHOTOREVISED 1983.

**SITE LOCATION MAP**

HF SINCLAIR NAVAJO REFINING LLC
ARTESIA REFINERY, EDDY COUNTY, NEW MEXICO

PROJECT NUMBER: 467077

FILE NAME: 527024_1

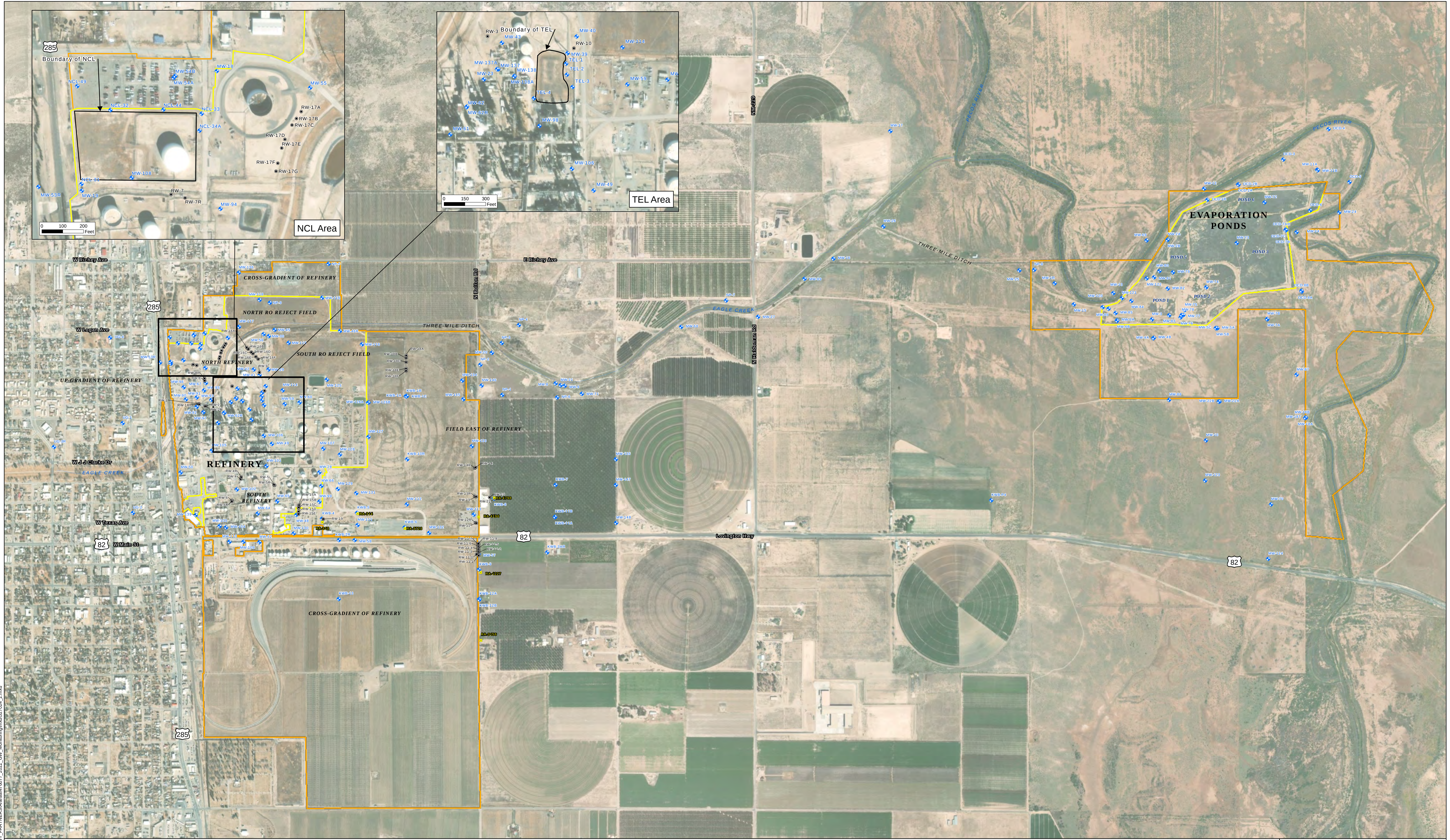
AUTHOR: MJAGOE

DATE: 2/8/2023



505 E. HUNTLAND DR.
SUITE 250
AUSTIN, TX 78752
PH: 512-329-6080

FIGURE**1**



LEGEND

■

 IRRIGATION WELL

+

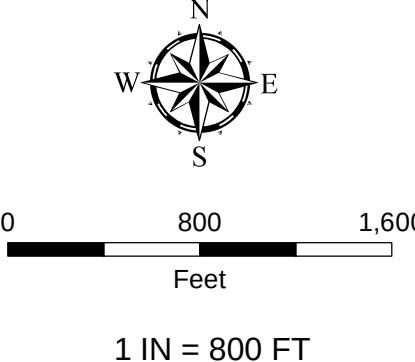
 MONITORING WELL

●

 RECOVERY WELL

FENCELINE

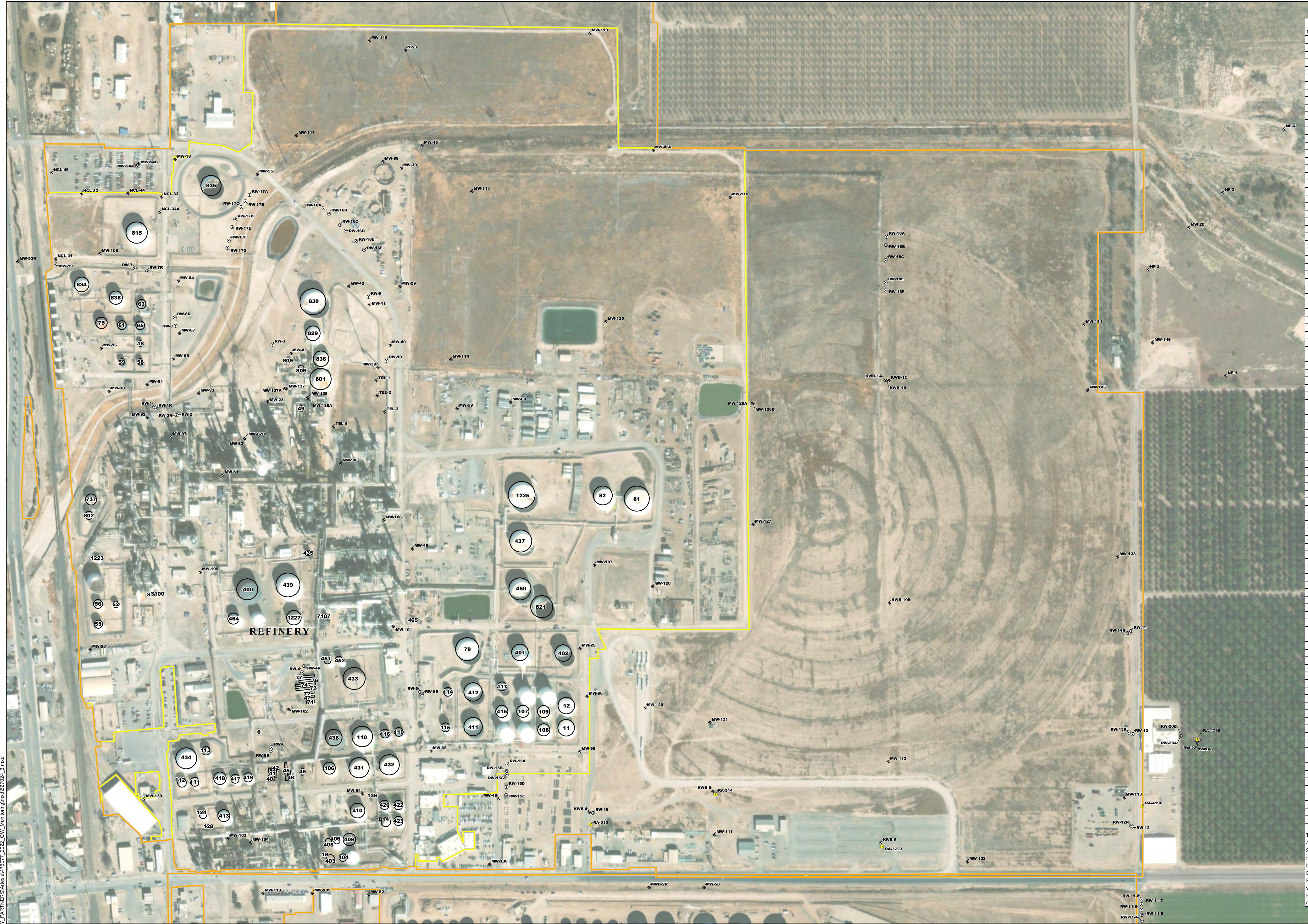
HFSNR PROPERTY BOUNDARY (FENCELINE SHOWN WHERE COINCIDENT)



WELL LOCATION MAP

HF SINCLAIR NAVAJO REFINING LLC
ARTESIA REFINERY, EDDY COUNTY, NEW MEXICO

AUTHOR: MJAGOE	SAVED: 2/9/2023	MXD: 527024_2
 505 E. HUNTLAND DR. SUITE 250 AUSTIN, TX 78752 PH: 512-329-6080		FIGURE 2

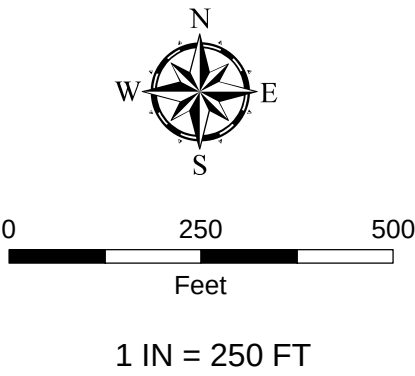


Tank Number	Location in Relation to AOCs & SWMUs	Diameter (ft)	Height / Length (ft)	Capacity (bbl)	Date Constructed	Contents
6	RW-6 between AOC 3 & AOC 4					Out of Service
11	AOC 3	89	29	31,500	B. 1983	Reformate
12	AOC 3	89	29	31,500	B. 1983	Reformate
13	AOC 8	10	20	250	1990	Slop
18	SWMU 17	29	24	2,250	B. 1979	Out of Service
20	AOC 3	80	56	50,000	2021	Gasoline
21	AOC 3	80	56	50,000	2021	Gasoline
22	AOC 3	80	56	50,000	2021	Gasoline
23	AOC 3	80	56	50,000	2021	Gasoline
40	Between AOC 3 & AOC 4	9	72	730	B. 1973	Caustic w/HC
41	Between AOC 3 & AOC 4	9	72	730	B. 1973	Out of Service
42	Between AOC 3 & AOC 4	9	67	700		Wild Naphtha
45	Between AOC 3 & AOC 4	11	90	1,400		Butane
46	Between AOC 3 & AOC 4	12	47	920		Isobutane
47	West of AOC 3	11	36	700		Out of Service
48	Between AOC 3 & AOC 4	11	36	700		Butane
49	Between AOC 14 & SWMU 24	11				Slop
52	AOC 7	45	36	10,800	RBLT 1979	Out of Service
55	AOC 7	48	36	10,800	B. 1976	Desulfurized Naphtha
56	AOC 7	48	36	10,800	B. 1976	Desulfurized Naphtha
58	SWMU 17	35	30	4,700	B. 1979	Out of Service
59	SWMU 17	35	30	4,700	B. 1979	Light Cycle Oil
61	SWMU 17	50	30	9,700	B. 1987	Light Cycle Oil
63	SWMU 17	51	30	10,000	B. 1987	Carbon Black Oil
65	SWMU 17	50	30	10,380	1999	Carbon Black Oil
71	West of AOC 3	10.5	44	714		Propane
72	West of AOC 3	10.5	44	714		Propane
73	West of AOC 3	10	103	1,525		Propane
74	West of AOC 3	3	10	103	1,525	Propane
75	SWMU 17	65	32	18,900	2003	Carbon Black Oil
76	West of AOC 3	11	79			Propane
77	West of AOC 3	11	79			Propane
79	AOC 3	125	40	70,000	2008	Reformate
81	AOC 6	108.5	40	60,000	2009	Asphalt/Pitch
82	AOC 6	140	40	100,000	2009	Asphalt/Pitch
106	AOC 3	67	40	22,500	B. 1971	Out of Service
107	AOC 3	67	40	22,500	B. 1971	Isom Gasoline
108	AOC 3	67	40	22,500	1951	Alkylate
109	AOC 3	67	40	22,500	B. 1971	Alkylate
110	AOC 3	108	35	54,000	1929	Asphalt/Pitch
111	AOC 4	49	30	9,100	B. 1981	Gasoline
112	AOC 4	49	30	9,100	B. 1981	Splitter Bottoms
113	AOC 4	48		10,300		Out of Service
114	AOC 3	38		5,100		N-Butane
115	AOC 3	51		12,300		N-Butane
116	AOC 3	48		12,300		Isobutane
117	AOC 3	48	48	15,470	1960	Splitter Bottoms
119	AOC 3	51		12,300		Isobutane
124	AOC 4	40	30	6,700	1955	Gasoline
128	AOC 4	12	15	300		Out of Service
136	AOC 8	12	15	300		Out of Service
400	AOC 5	120	48	86,786	1983	Gas Oil
401	AOC 3	90	50	55,000	1982	Isom Gasoline
402	AOC 3	90	50	55,000	1983	Light Cat Naphtha
403	AOC 8	45	36	8,250		Removed
404	AOC 8	45	36	8,250		Removed
405	AOC 8	37	28	4,575		Removed
406	AOC 8	38	28	5,400		Removed
409	AOC 8	67	40	21,450		Removed
410	AOC 8	79	40	30,850	B. 1973	Asphalt/Pitch
411	AOC 3	100	40	52,000	1951	Isom Gasoline
412	AOC 3	100	40	52,000	1951	Splitter Bottoms
413	AOC 4	67	39	22,500	about 1960	Raw Kerosene
415	AOC 3	67	40	25,000	1953	Alkylate
417	AOC 4	50	30	9,300	B. 1981	Gasoline
418	AOC 4	67	33	25,000	B. 1987	Raw Kerosene
419	AOC 4	53	28	10,300	B. 1981	Diesel
420	AOC 8	50	30	8,200	B. 1989	Fuel Oil
422	AOC 8	50	30	8,200	B. 1973	Heavy Light Cycle Oil
423	AOC 8	50	30	8,200	B. 1970	Heavy Light Cycle Oil
431	AOC 3	109	32	45,800	B. 1984	Fuel Oil
432	AOC 3	109	32	45,800	B. 1973	Fuel Oil
433	AOC 3	117	42	72,500	B. 1984	Gas Oil
434	AOC 4	117	42	7,600	1979	Raw Diesel
435	AOC 5	30	40	5,000	Reloc. 1997	Sour Water
437	AOC 6	120	45	80,000	1976/2009	Crude Oil
438	AOC 3	90	48	54,500	1978	Gas Oil
439	AOC 5	130	46	107,900	1978	Naphtha
450	AOC 3	120	40	80,570	1997	Naphtha
451	AOC 3	35	40	6,800	2015	Diesel
452	AOC 3	35	40	6,800	2015	Ethanol
464	AOC 5	60	40	20,000	2016	RO Permeate
465	North of AOC 3					Fresh Water
737	AOC 7	63	40	20,000	2009	Sour Water
801	AOC 9	110	32	54,000	1987	Wastewater
802	AOC 7	45	40	10,000	2002	Sour Water
806	AOC 11	30	7	800		Separator (OOS)
809	West of AOC 11	20	16	850	1954	Treated Wastewater
814	AOC 8	50	32	10,000	2005	Asphalt/Pitch
815	SWMU 6	116	43	90,000	2005	Diesel
821	AOC 3	105	40	65,000	2016	Light Cat Naphtha
829	North of AOC 9	106	40	30,500	2015	Wastewater
830	North of AOC 9	140	40	100,000	2011	Stormwater
834	AOC 1	85	40	40,000	1967	Diesel
835	Northeast of SWMU 6	111	40	68,000		Diesel
836	AOC 9	82.5	32	30,460	1998	Wastewater
838	AOC 1	74	40	29,900		Diesel
904	AOC 8	72	40	28,000	2021	Animal Fats/Vegetable Oils
905	AOC 8	72	40	28,000	2021	Animal Fats/Vegetable Oils
914	AOC 5	65	40	23,628	2021	Animal Fats/Vegetable Oils
1223	AOC 7	25	24	2,000	2002	Caustic
1225	AOC 5	150	40	100,000	2009	Crude Oil
1227	AOC 5	77	40	30,000	2008	Asphalt/Pitch
7107	East of AOC 5	25	40	3,300	2015	Treated Wastewater

TANK TABLE NOTES:
AOC = Area of Concern
SWMU = Solid Waste Management Unit
ft = Feet
bbl = barrels
B. = Before date shown, actual date unknown
RBLT = Rebuilt date shown
w/HC = with hydrocarbon
RO = Reverse Osmosis
OOS = Out of Service

LEGEND

- IRRIGATION WELL
- MONITORING WELL
- RECOVERY WELL
- FENCELINE
- HFSNR PROPERTY BOUNDARY (FENCELINE SHOWN WHERE COINCIDENT)
- TANK



WELL LOCATIONS AND TANK INFORMATION WITHIN REFINERY

2022 ANNUAL GROUNDWATER REPORT
HF SINCLAIR NAVAJO REFINING LLC
ARTESIA REFINERY, EDDY COUNTY, NEW MEXICO

AUTHOR: MJAGOE

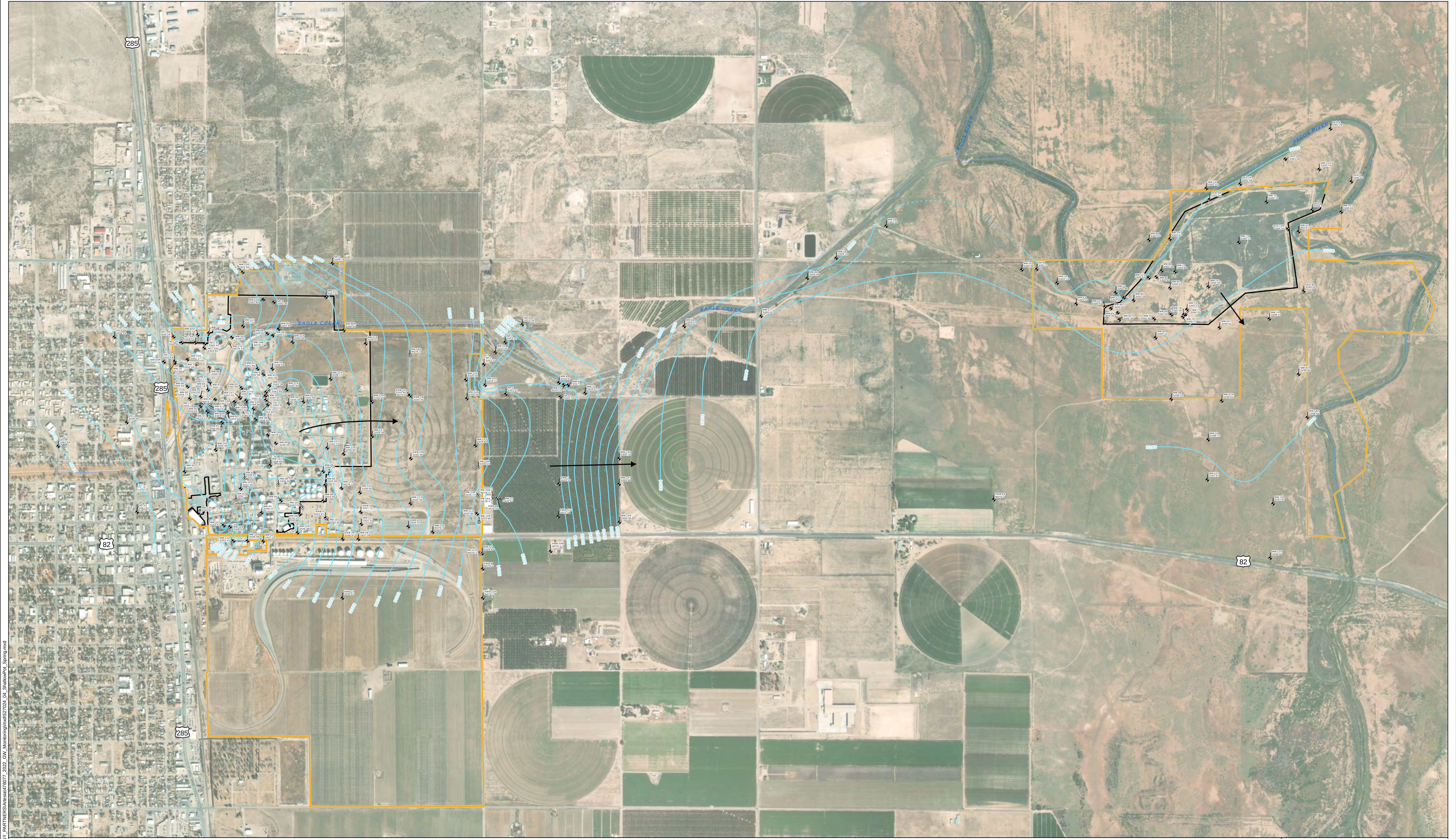
SAVED: 2/23/2023

MOX: 527024_3

505 E. HUNT LAND DR.
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PH 512-329-6080

FIGURE

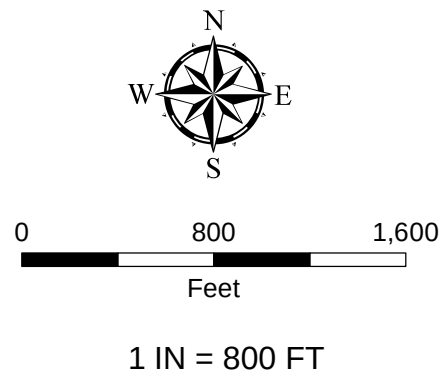
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LEGEND

- MONITORING WELL
- RECOVERY WELL
- GROUNDWATER FLOW DIRECTION
- SHALLOW SATURATED ZONE POTENTIOMETRIC SURFACE CONTOURS - DASHED WHERE INFERRED (FEET ABOVE MEAN SEA LEVEL)
- FENCELINE
- HFSNR PROPERTY BOUNDARY (FENCELINE SHOWN WHERE COINCIDENT)
- GROUNDWATER ELEVATION (FEET)



NOTE:
1. GROUNDWATER ELEVATION WAS NOT MEASURED BECAUSE WELL IS NOT IN GAUGING PROGRAM, WELL COULD NOT BE LOCATED, WELL WAS DAMAGED, OR WELL COULD NOT BE ACCESSED.
2. WELL WAS DRY AT TIME OF GAUGING.
3. GROUNDWATER ELEVATION NOT MEASURED DUE TO PUMP IN WELL.
4. GROUNDWATER ELEVATION NOT USED IN POTENTIOMETRIC SURFACE CONTOURING.



SHALLOW SATURATED ZONE
POTENTIOMETRIC SURFACE MAP
2022 FIRST SEMIANNUAL EVENT

2022 ANNUAL GROUNDWATER REPORT
HF SINCLAIR NAVAJO REFINING, LLC
ARTESIA REFINERY, EDDY COUNTY, NEW MEXICO

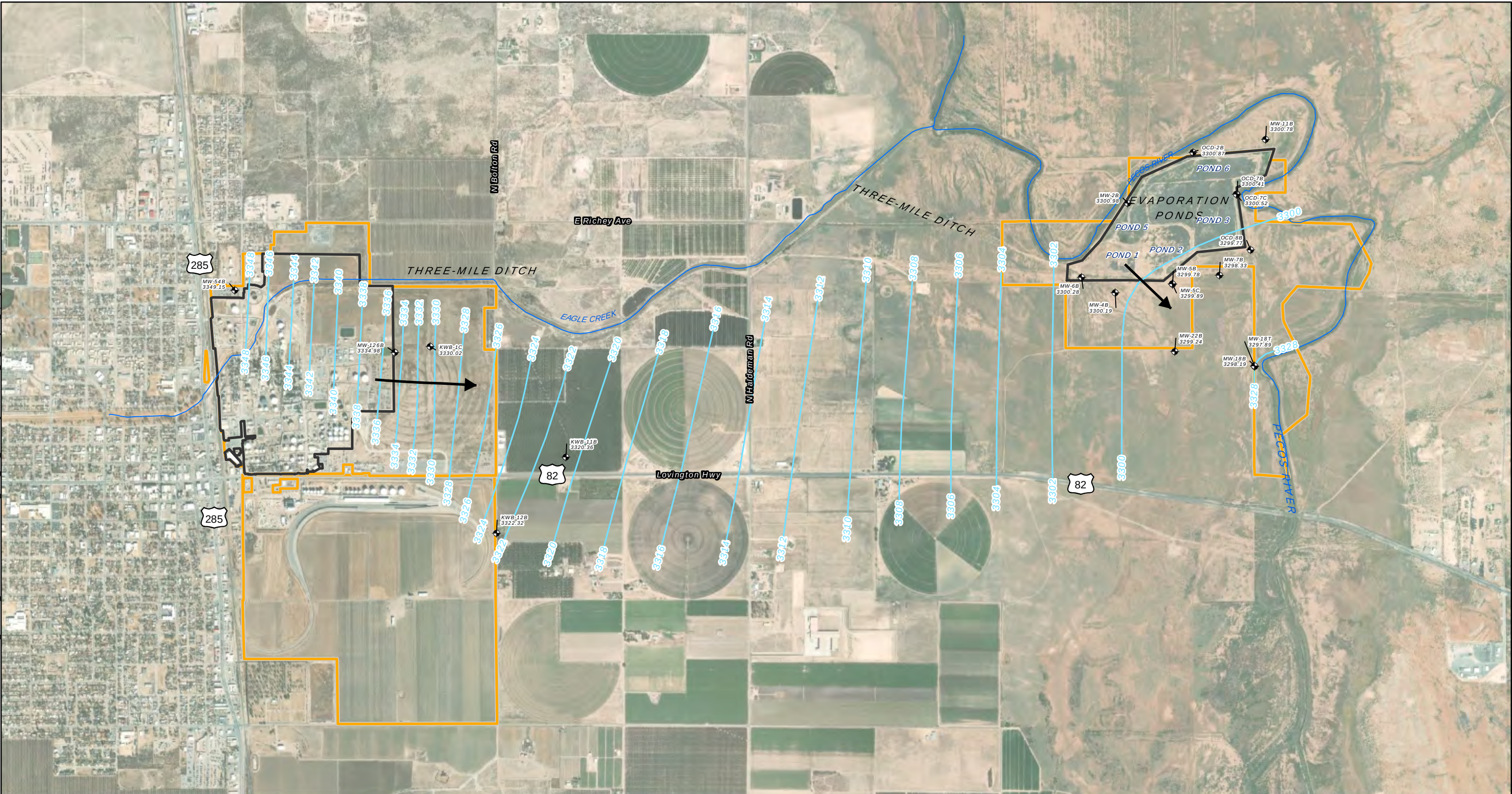
AUTHOR: MJAGOE	SAVED: 2/9/2023	MXID: 527024_04_ShallowPot_Spring
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505 E. HUNTLAND DR.
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AUSTIN, TX 78752
PH: 512-329-6080

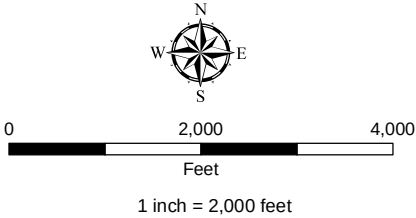
FIGURE
4

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LEGEND

- MONITORING WELL
- FENCELINE
- HFSNR PROPERTY BOUNDARY (FENCELINE SHOWN WHERE COINCIDENT)
- GROUNDWATER FLOW DIRECTION
- GROUNDWATER ELEVATION (FEET)
- VALLEY FILL ZONE POTENTIOMETRIC SURFACE CONTOURS (FEET ABOVE MEAN SEA LEVEL)



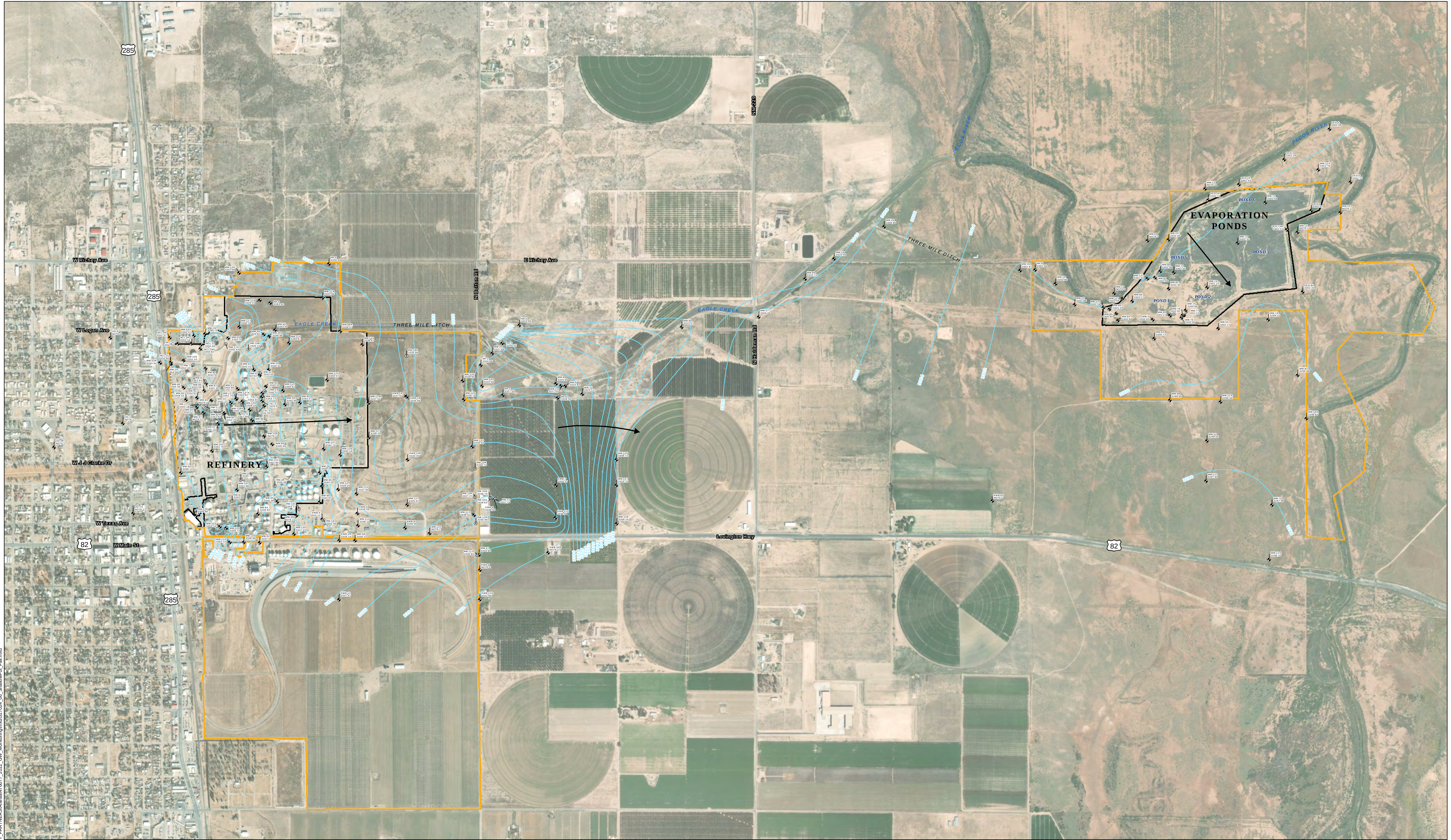
VALLEY FILL ZONE
POTENTIOMETRIC SURFACE MAP
2022 FIRST SEMIANNUAL EVENT
2022 ANNUAL GROUNDWATER REPORT
HF SINCLAIR NAVAJO REFINING LLC
ARTESIA REFINERY, EDDY COUNTY, NEW MEXICO

AUTHOR: MJAGOE SAVED: 1/31/2023 MXD: 527024_05_ValleyPot_Spring



505 E. HUNTLAND DR.
SUITE 250
AUSTIN, TX 78752
PH:512-329-6080

FIGURE
5



LEGEND

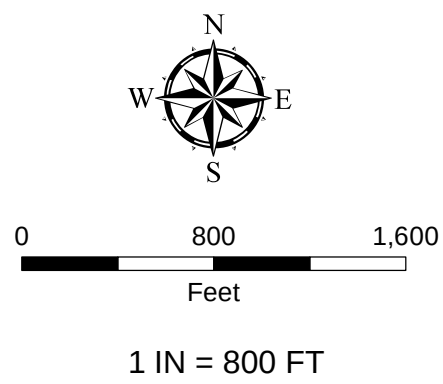
- MONITORING WELL
- RECOVERY WELL
- GROUNDWATER FLOW DIRECTION

SHALLOW SATURATED ZONE POTENTIOMETRIC SURFACE CONTOURS - DASHED WHERE INFERRED (FEET ABOVE MEAN SEA LEVEL)

FENCELINE

HFSNR PROPERTY BOUNDARY (FENCELINE SHOWN WHERE COINCIDENT)

3337.67 GROUNDWATER ELEVATION (FEET)



NOTE:

1. GROUNDWATER ELEVATION WAS NOT MEASURED BECAUSE WELL IS NOT IN GAUGING PROGRAM, WELL COULD NOT BE LOCATED, WELL WAS DAMAGED, OR WELL COULD NOT BE ACCESSED.
2. GROUNDWATER ELEVATION NOT MEASURED DUE TO PUMP IN WELL.



SHALLOW SATURATED ZONE
POTENTIOMETRIC SURFACE MAP
2022 SECOND SEMIANNUAL EVENT

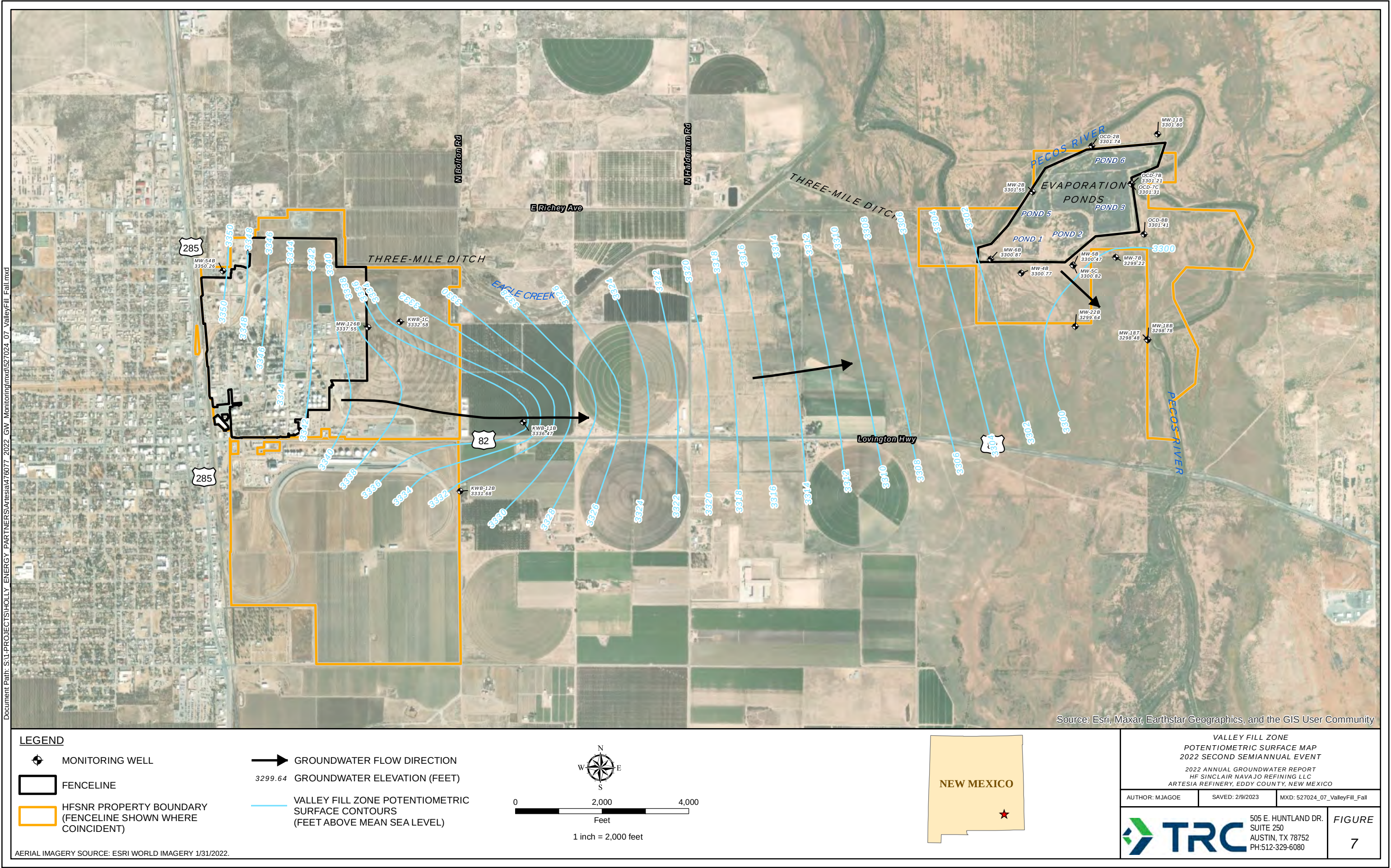
2022 ANNUAL GROUNDWATER REPORT
HF SINCLAIR NAVAJO REFINING, LLC
ARTESIA REFINERY, EDDY COUNTY, NEW MEXICO

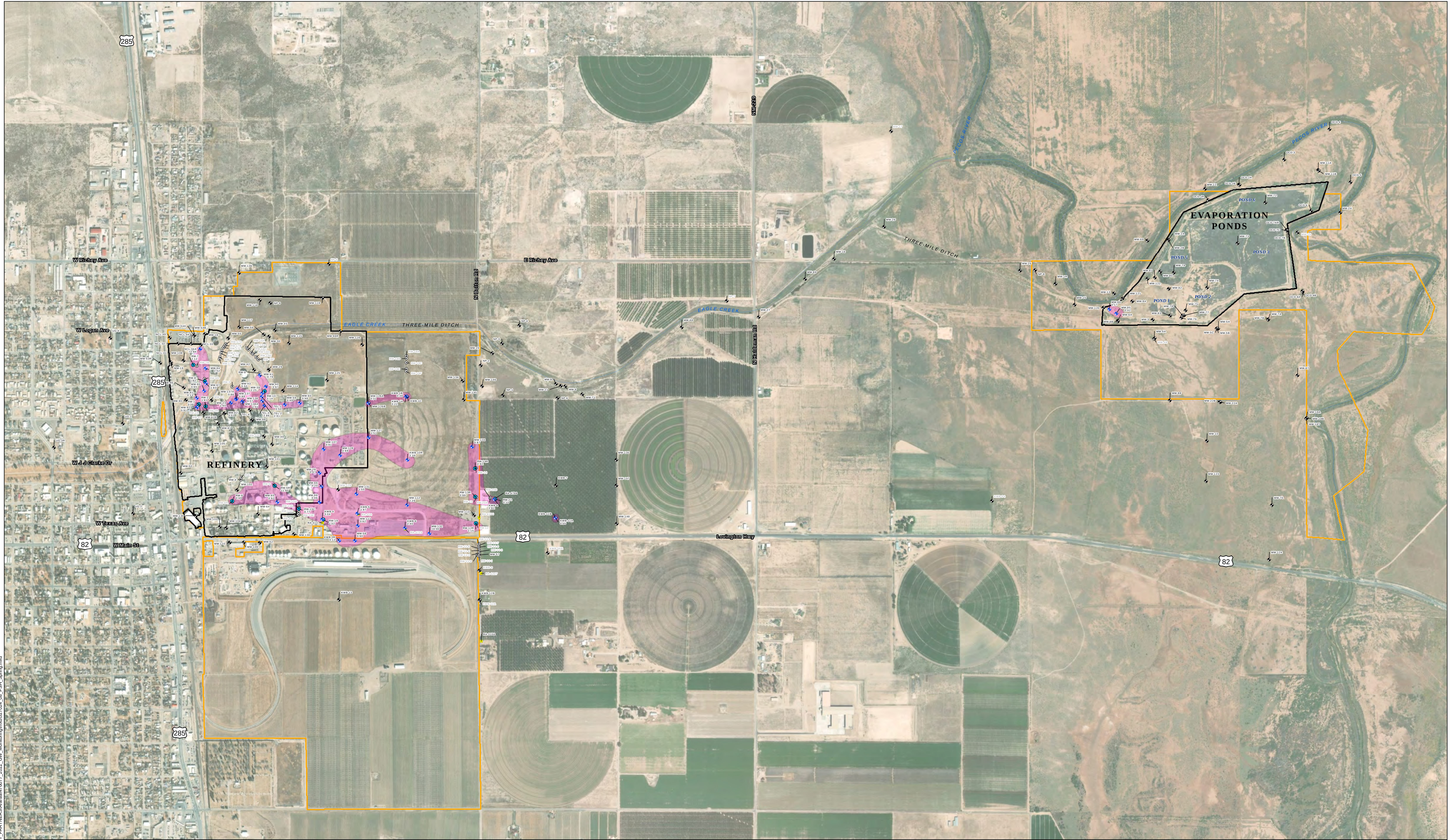
AUTHOR: MJAGOE SAVER: 2/10/2023 MOD: 5/27/2024_06_ShallowPot_Fall.mxd



505 E. HUNTLAND DR.
SUITE 250
AUSTIN, TX 78752
PH: 512-329-6080

FIGURE
6





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AERIAL IMAGERY SOURCE: ESRI WORLD IMAGERY 3/31/2022

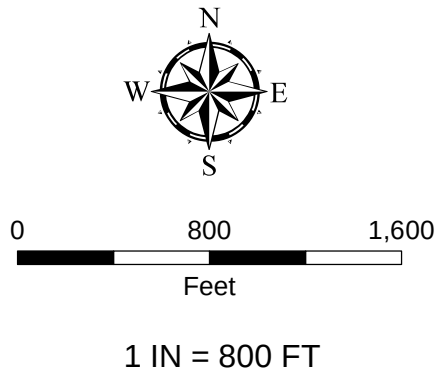
LEGEND

- RECOVERY WELL
- ✦ MONITORING WELL
- ✦ IRRIGATION WELL
- ▭ FENCELINE
- ▭ HFSNR PROPERTY BOUNDARY (FENCELINE SHOWN WHERE COINCIDENT)

- WELLS WITH PSH
- ✦ MONITORING WELL
 - RECOVERY WELL
- PSH THICKNESS
- RW-13R 0.86
 - RW-15A WELL NOT GAUGED
- PSH THICKNESS IN FEET
- 0.01 - 6.26 FEET

NOTE:

1. ALL PHASE-SEPARATED HYDROCARBON (PSH) THICKNESSES PROVIDED IN FEET.



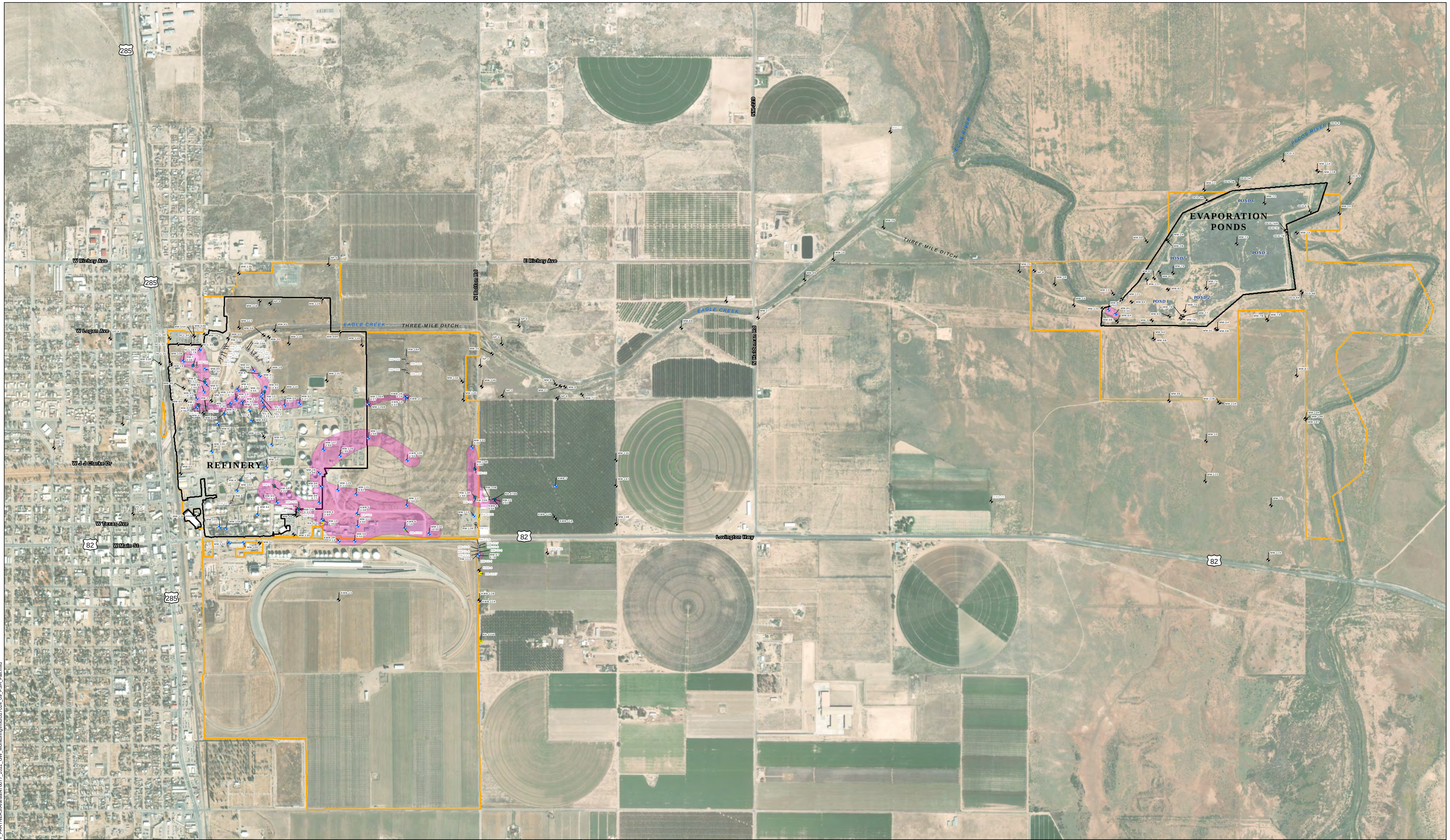
PHASE-SEPARATED HYDROCARBON
THICKNESS MAP
2022 FIRST SEMIANNUAL EVENT
2022 ANNUAL GROUNDWATER REPORT
HF SINCLAIR NAVAJO REFINING LLC
ARTESIA REFINERY, EDDY COUNTY, NEW MEXICO

AUTHOR: MJAGOE SAVED: 2/8/2023 MOD: 527024_08_PSH_Spring



505 E. HUNTLAND DR.
SUITE 250
AUSTIN, TX 78752
PH: 512-329-6080

FIGURE
8

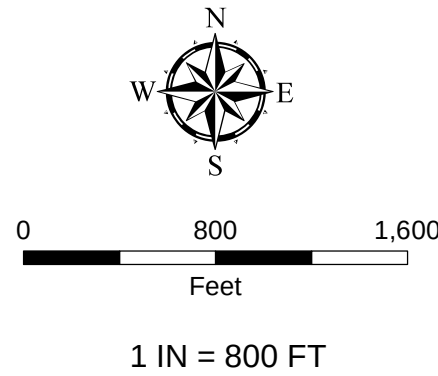


LEGEND

- RECOVERY WELL
- ◆ MONITORING WELL
- ◇ IRRIGATION WELL
- ▭ FENCELINE
- ▭ HFSNR PROPERTY BOUNDARY (FENCELINE SHOWN WHERE COINCIDENT)

- WELLS WITH PSH**
- ◆ MONITORING WELL
 - RECOVERY WELL
- PSH THICKNESS**
- WW-88 0.50
 - WW-28 WELL NOT GAUGED
- PSH THICKNESS IN FEET**
- 0.01 - 5.51 FEET

NOTE:
1. ALL PHASE-SEPARATED HYDROCARBON (PSH) THICKNESSES PROVIDED IN FEET.



PHASE-SEPARATED HYDROCARBON
THICKNESS MAP
2022 SECOND SEMIANNUAL EVENT
2022 ANNUAL GROUNDWATER REPORT
HF SINCLAIR NAVAJO REFINING, LLC
ARTESIA REFINERY, EDDY COUNTY, NEW MEXICO

AUTHOR: MJAGOE SAVED: 2/8/2023 MXD: 5/27/24_09_PSH_Fail

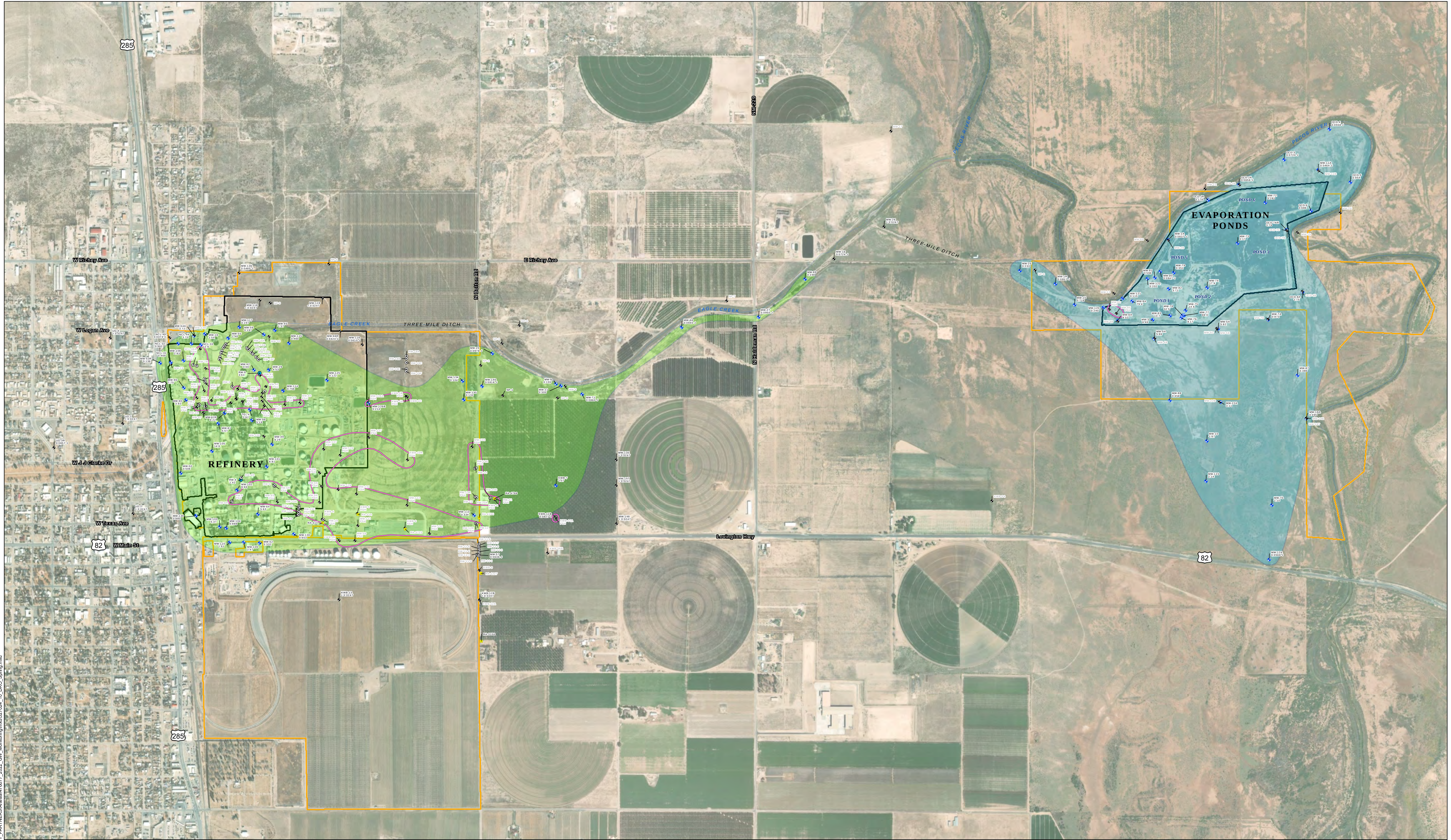


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FIGURE
9

Document Path: S:\PROJECTS\HOLLY ENERGY PARTNERS\Artesia\78077_2022_GW_Monitoring\mxd\527024_09_PSH_Fail.mxd

AERIAL IMAGERY SOURCE: ESRI WORLD IMAGERY 3/31/2022



LEGEND

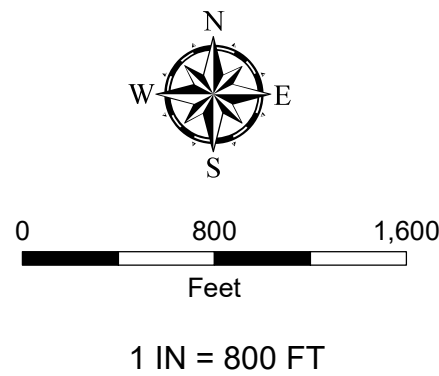
- ◆ MONITORING WELL EXCEEDS SCREENING LEVELS
- ◆ MONITORING WELL
- IRRIGATION WELL
- RECOVERY WELL EXCEEDS SCREENING LEVELS
- RECOVERY WELL
- 7.98 DRO CONCENTRATION

- 5.37 DRO NOT DETECTED ABOVE METHOD DETECTION LIMIT
- MW-11B WELL NOT SAMPLED
- PSH PHASE-SEPARATED HYDROCARBON PRESENT IN WELL (≥ 0.03 FEET THICK)
- DRO CRITICAL GROUNDWATER SCREENING LEVEL EXCEEDANCE AREA (CONCENTRATION > 0.0858 mg/L)
- DRO CRITICAL GROUNDWATER SCREENING LEVEL EXCEEDANCE AREA, EVAPORATION PONDS (CONCENTRATION > 0.0167 mg/L)
- FENCELINE

- HFSNR PROPERTY BOUNDARY (FENCELINE SHOWN WHERE COINCIDENT)
- PHASE-SEPARATED HYDROCARBON (PSH)

NOTES:

1. ALL CONCENTRATIONS ARE IN MILLIGRAMS PER LITER (mg/L).
2. DRO = DIESEL RANGE ORGANICS
3. J = CONCENTRATION QUALIFIED AS AN ESTIMATED VALUE.



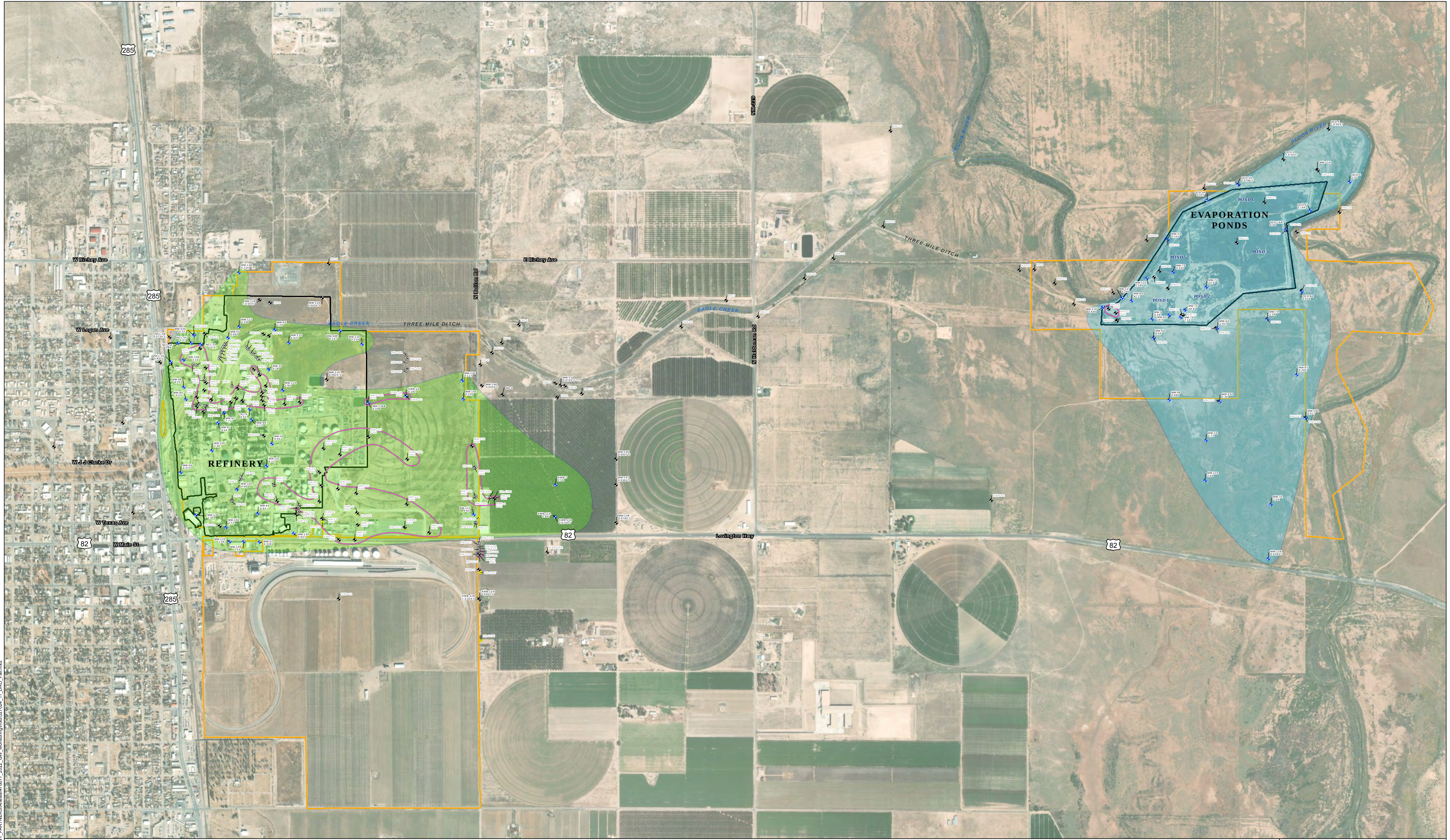
DRO CRITICAL GROUNDWATER
SCREENING LEVEL EXCEEDANCE MAP
2022 FIRST SEMIANNUAL EVENT
2022 ANNUAL GROUNDWATER REPORT
HF SINCLAIR NAVAJO REFINING LLC
ARTESIA REFINERY, EDDY COUNTY, NEW MEXICO

AUTHOR: MJAGOE SAVED: 2/8/2023 MXD: 5/27/2024_10_DRO_Spring



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FIGURE
10



LEGEND

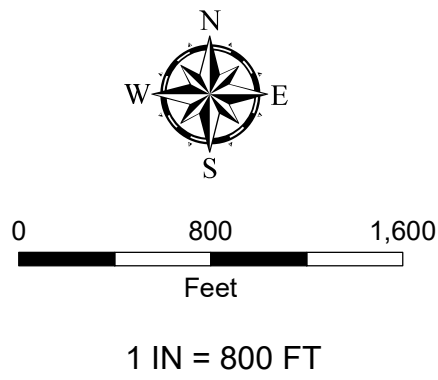
- ◆ MONITORING WELL EXCEEDS SCREENING LEVELS
- ◆ MONITORING WELL
- IRRIGATION WELL
- ⊙ RECOVERY WELL
- 2.21 DRO CONCENTRATION

- 2.43 DRO NOT DETECTED ABOVE METHOD DETECTION LIMIT
- MW-129 WELL NOT SAMPLED
- PSH PHASE-SEPARATED HYDROCARBON PRESENT IN WELL (≥ 0.03 FEET THICK)
- 🔗 DRO CRITICAL GROUNDWATER SCREENING LEVEL EXCEEDANCE AREA (CONCENTRATION > 0.0658 mg/L)
- 🔗 DRO CRITICAL GROUNDWATER SCREENING LEVEL EXCEEDANCE AREA, EVAPORATION PONDS (CONCENTRATION > 0.0167 mg/L)
- ▭ FENCELINE

- ▭ HFSNR PROPERTY BOUNDARY (FENCELINE SHOWN WHERE COINCIDENT)
- 🔗 PHASE-SEPARATED HYDROCARBON (PSH)

NOTES:

1. ALL CONCENTRATIONS ARE IN MILLIGRAMS PER LITER (mg/L).
2. DRO = DIESEL RANGE ORGANICS
3. J = CONCENTRATION QUALIFIED AS AN ESTIMATED VALUE.



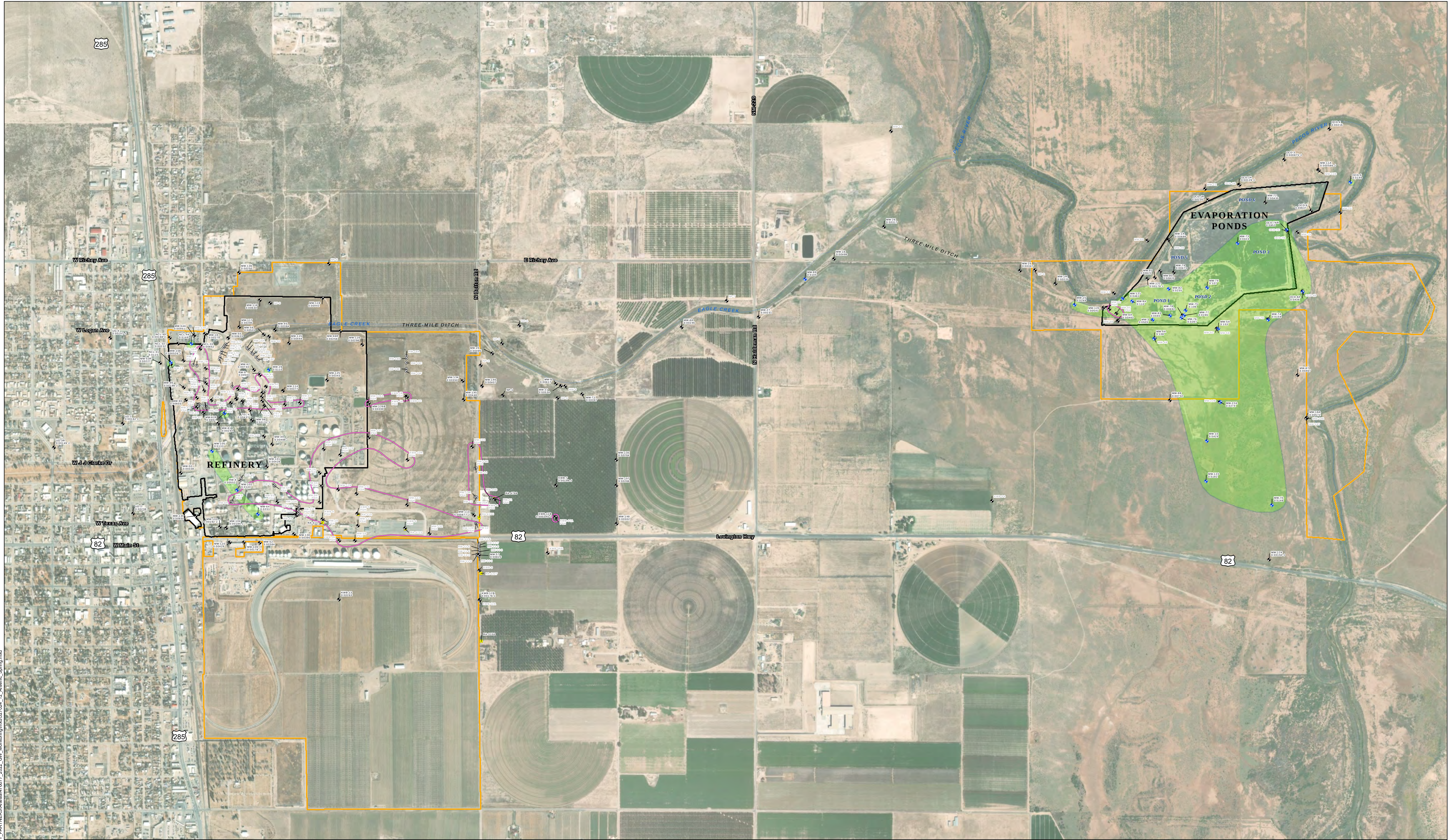
DRO CRITICAL GROUNDWATER
SCREENING LEVEL EXCEEDANCE MAP
2022 SECOND SEMI-ANNUAL EVENT
2022 ANNUAL GROUNDWATER REPORT
HF SINCLAIR NAVAJO REFINING LLC
ARTESIA REFINERY, EDDY COUNTY, NEW MEXICO

AUTHOR: MJAGOE	SAVED: 1/27/2023	MOD: 5/27/2024_11_DRO_Fail.mxd
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FIGURE
11



Document Path: S:\PROJECTS\HOLLY ENERGY PARTNERS\Artesia\478077_2022_GW_Monitoring\mxd\27024_12_Arsenic_Spring.mxd

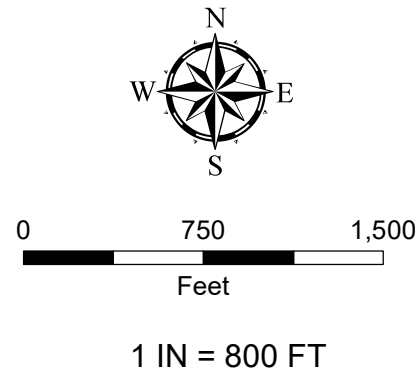
LEGEND

- ♦ MONITORING WELL EXCEEDS SCREENING LEVELS
- ♦ MONITORING WELL
- IRRIGATION WELL
- RECOVERY WELL EXCEEDS SCREENING LEVELS
- RECOVERY WELL

- 0.00394 ARSENIC CONCENTRATION
- < .00368 ARSENIC NOT DETECTED ABOVE METHOD DETECTION LIMIT
- WELL NOT SAMPLED
- PSH PHASE-SEPARATED HYDROCARBON PRESENT IN WELL (≥0.03 FEET THICK)
- ARSENIC CRITICAL GROUNDWATER SCREENING LEVEL EXCEEDANCE AREA (CONCENTRATION > 0.01 mg/L)
- FENCELINE

- HFSNR PROPERTY BOUNDARY (FENCELINE SHOWN WHERE COINCIDENT)
- PHASE-SEPARATED HYDROCARBON (PSH)

- NOTES:
1. ALL CONCENTRATIONS ARE IN MILLIGRAMS PER LITER (mg/L).
 2. J = CONCENTRATION QUALIFIED AS AN ESTIMATED VALUE.



ARSENIC CRITICAL GROUNDWATER SCREENING LEVEL EXCEEDANCE MAP 2022 FIRST SEMIANNUAL EVENT

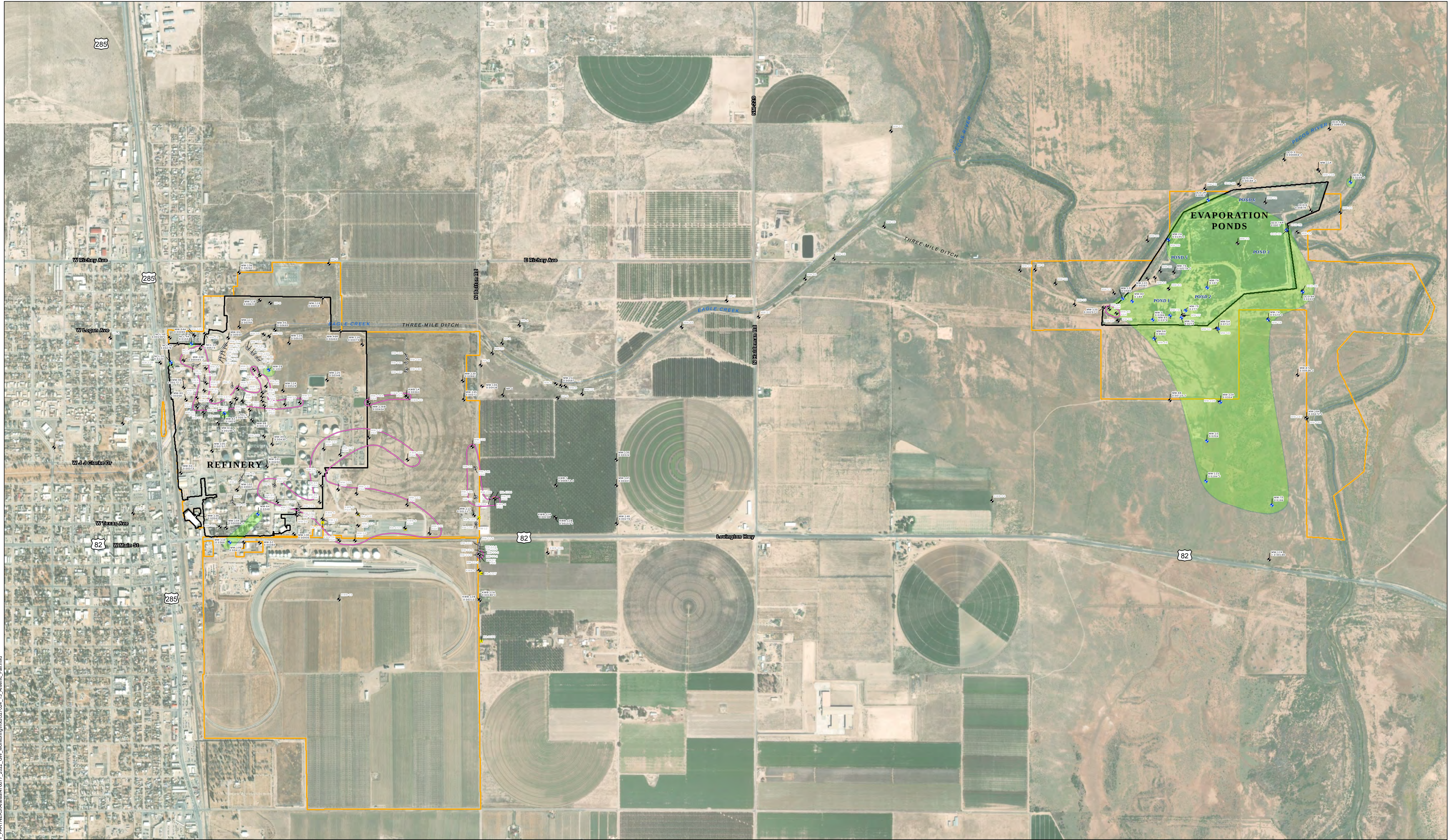
2022 ANNUAL GROUNDWATER REPORT
HF SINCLAIR NAVAJO REFINING LLC
ARTESIA REFINERY, EDDY COUNTY, NEW MEXICO

AUTHOR: MJAGOE SAVED: 2/8/2023 MOD: 527024_12_Arsenic_Spring



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FIGURE
12



LEGEND

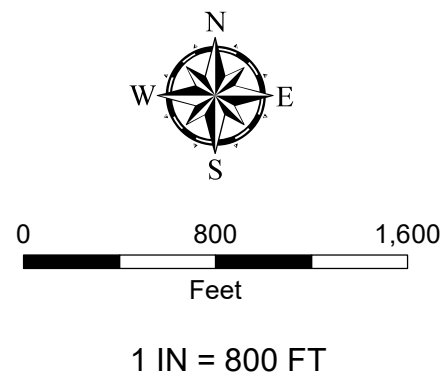
- ♦ MONITORING WELL EXCEEDS SCREENING LEVELS
- ♦ MONITORING WELL
- IRRIGATION WELL
- RECOVERY WELL

- 0.00533 ARSENIC CONCENTRATION
- < 0.00368 ARSENIC NOT DETECTED ABOVE METHOD DETECTION LIMIT
- WELL NOT SAMPLED
- PSH PHASE-SEPARATED HYDROCARBON PRESENT IN WELL (≥0.03 FEET THICK)
- ARSENIC CRITICAL GROUNDWATER SCREENING LEVEL EXCEEDANCE AREA (CONCENTRATION > 0.01 mg/L)
- FENCELINE

- HFSNR PROPERTY BOUNDARY (FENCELINE SHOWN WHERE COINCIDENT)
- PHASE-SEPARATED HYDROCARBON (PSH)

NOTES:

1. ALL CONCENTRATIONS ARE IN MILLIGRAMS PER LITER (mg/L).
2. J = CONCENTRATION QUALIFIED AS AN ESTIMATED VALUE.



ARSENIC CRITICAL GROUNDWATER SCREENING LEVEL EXCEEDANCE MAP 2022 SECOND SEMIANNUAL EVENT

2022 ANNUAL GROUNDWATER REPORT
HF SINCLAIR NAVAJO REFINING, LLC
ARTESIA REFINERY, EDDY COUNTY, NEW MEXICO

AUTHOR: MJAGOE SAVER: 1/24/2023 MOD: 5/27/2024_13_Arsenic_Fall



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FIGURE
13

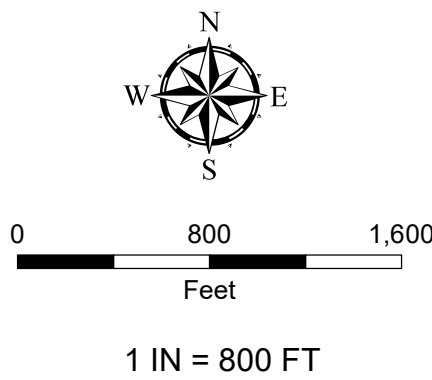
- MONITORING WELL EXCEEDS SCREENING LEVELS
- MONITORING WELL
- IRRIGATION WELL
- RECOVERY WELL EXCEEDS SCREENING LEVELS
- RECOVERY WELL

1.55	BENZENE CONCENTRATION
0.00331	BENZENE NOT DETECTED ABOVE METHOD DETECTION LIMIT
MW-19	WELL NOT SAMPLED
PSH	PHASE-SEPARATED HYDROCARBON PRESENT IN WELL (≥ 0.03 FEET THICK)
	BENZENE CRITICAL GROUNDWATER SCREENING LEVEL EXCEEDANCE AREA (CONCENTRATION > 0.005 mg/L)
	FENCELINE

 HFSNR PROPERTY BOUNDARY
(FENCELINE SHOWN WHERE
COINCIDENT)

 PHASE-SEPARATED HYDROCARBON (PSH)

2. J = CONCENTRATION QUALIFIED AS AN ESTIMATED VALUE.



2022 ANNUAL GROUNDWATER REPORT
HF SINCLAIR NAVAJO REFINING LLC
ARTESIA REFINERY, EDDY COUNTY, NEW MEXICO

AUTHOR: MJAGOE	SAVED: 2/9/2023	MXD: 527024_14_Benzene_S
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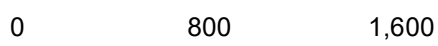
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14

- MONITORING WELL EXCEEDS SCREENING LEVELS
- MONITORING WELL
- IRRIGATION WELL
- RECOVERY WELL

MVV-1:

1. ALL CONCENTRATIONS ARE IN MILLIGRAMS PER LITER (mg/L).

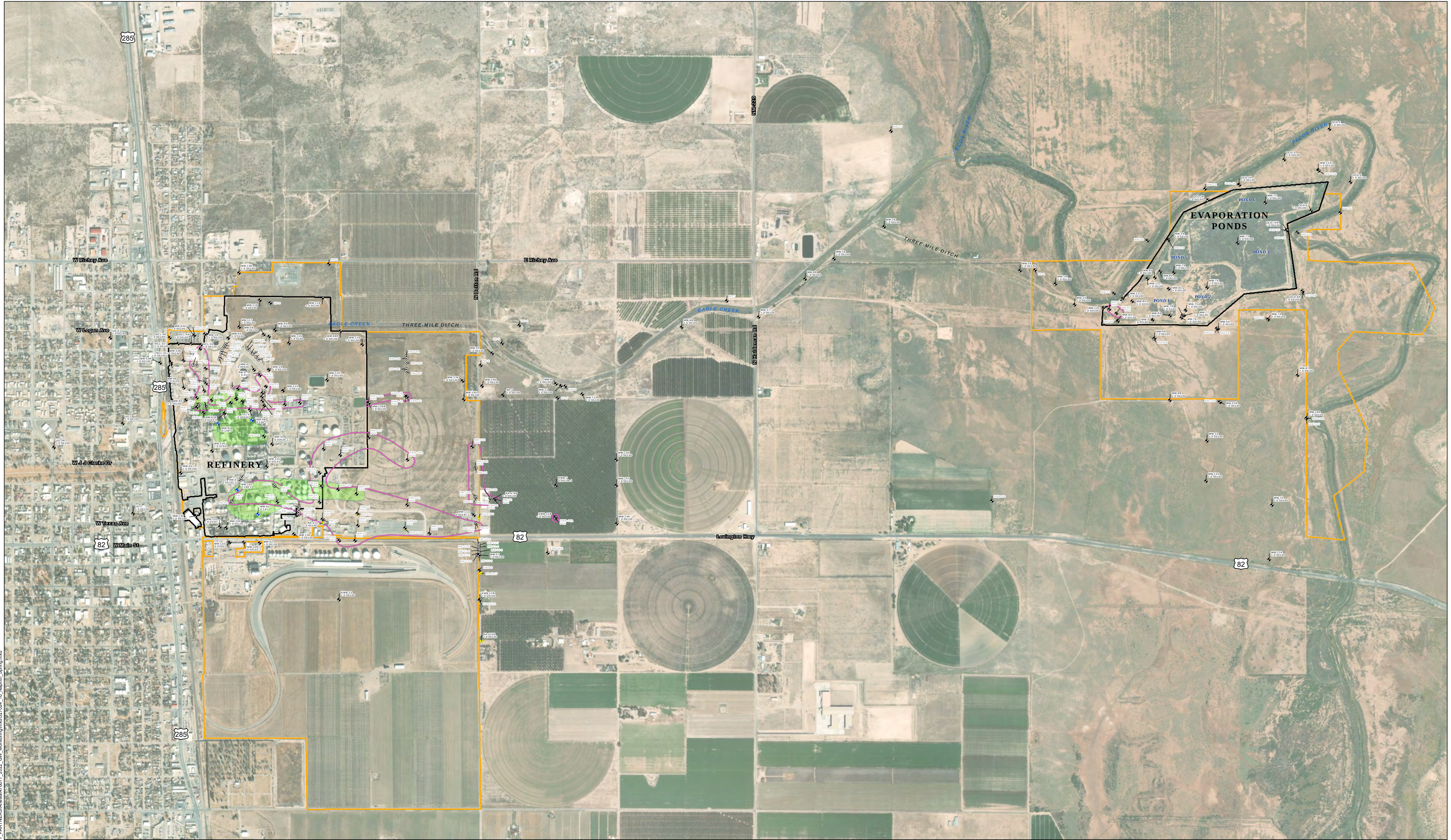


2022 ANNUAL GROUNDWATER REPORT
HF SINCLAIR NAVAJO REFINING LLC
ARTESIA REFINERY, EDDY COUNTY, NEW MEXICO

AUTHOR: MJAGOE	SAVED: 2/23/2023	MXD: 527024_15_Benzene_
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FIGURE 15



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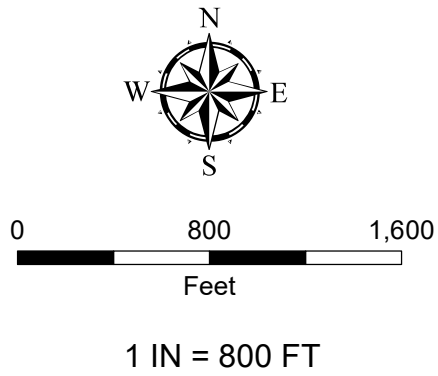
LEGEND

- ♦ MONITORING WELL EXCEEDS SCREENING LEVELS
- ♦ MONITORING WELL
- IRRIGATION WELL
- RECOVERY WELL EXCEEDS SCREENING LEVELS
- RECOVERY WELL

- 0.141 NAPHTHALENE CONCENTRATION
- <0.0001000 NAPHTHALENE NOT DETECTED ABOVE METHOD DETECTION LIMIT
- MW-19 WELL NOT SAMPLED
- PSH PHASE-SEPARATED HYDROCARBON PRESENT IN WELL (≥ 0.03 FEET THICK)
- ✚ NAPHTHALENE CRITICAL GROUNDWATER SCREENING LEVEL EXCEEDANCE AREA (CONCENTRATION > 0.03 mg/L)
- FENCELINE

- HFSNR PROPERTY BOUNDARY (FENCELINE SHOWN WHERE COINCIDENT)
- ✚ PHASE-SEPARATED HYDROCARBON (PSH)

- NOTES:
1. ALL CONCENTRATIONS ARE IN MILLIGRAMS PER LITER (mg/L).
 2. J = CONCENTRATION QUALIFIED AS AN ESTIMATED VALUE.



NAPHTHALENE CRITICAL GROUNDWATER SCREENING LEVEL EXCEEDANCE MAP 2022 FIRST SEMIANNUAL EVENT

2022 ANNUAL GROUNDWATER REPORT
HF SINCLAIR NAVAJO REFINING, LLC
ARTESIA REFINERY, EDDY COUNTY, NEW MEXICO

AUTHOR: MJAGOE SAVED: 2/8/2023 MXD: 527024_16_Naphth_Spring

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FIGURE
16

District I
1625 N. French Dr., Hobbs, NM 88240
Phone:(575) 393-6161 Fax:(575) 393-0720
District II
811 S. First St., Artesia, NM 88210
Phone:(575) 748-1283 Fax:(575) 748-9720
District III
1000 Rio Brazos Rd., Aztec, NM 87410
Phone:(505) 334-6178 Fax:(505) 334-6170
District IV
1220 S. St Francis Dr., Santa Fe, NM 87505
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 227892

CONDITIONS

Operator: HF Sinclair Navajo Refining LLC ATTN: GENERAL COUNSEL Dallas, TX 75201	OGRID: 15694
	Action Number: 227892
	Action Type: [UF-DP] Discharge Permit (DISCHARGE PERMIT)

CONDITIONS

Created By	Condition	Condition Date
Ibarr	None	10/3/2023