QUALITY ASSURANCE PROJECT PLAN
FOR THE SALT LAKE REFINERY
POST CLOSURE PERMIT GROUNDWATER SAMPLING

CHEVRON PRODUCTS COMPANY
Salt Lake Refinery
Salt Lake City, Utah

July 2017

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CHAPTER 1

INTRODUCTION

This Quality Assurance Project Plan ("QAPP") describes procedures to be followed during groundwater monitoring and analysis and other field work that is performed per the conditions in the Post Closure Permit ("Permit") for the Chevron Salt Lake Refinery (UTD 092029768) ("Permittee"). Its purpose is to present methods for the collection, preservation, and handling of groundwater samples and associated data collected from monitor wells identified in the Permit. This plan is formatted in accordance with *EPA Requirements for Quality Assurance Project Plans*, U.S.EPA, March 2001 and *Guidance for Quality Assurance Project Plans*, U.S. EPA, December 2002 ("QAPP Guidance").

This QAPP summarizes the groundwater monitoring related requirements and is intended as a standalone companion to the Permit. Revisions to elements of this plan that reflect a change to conditions in the Permit that are not addressed in this QAPP must be proposed to the Director of Utah Division of Waste Management and Radiation Control, Department of Environmental Quality (UDEQ) via the RCRA Permit modification process. Revisions to the number and location of monitoring wells other than those specified in the permit, sampling frequencies, analytical requirements, and/or the field methodology described in this Plan may be proposed to the Director via a review and approval process outside of the RCRA Permit modification process.

This QAPP consists of five chapters including this introduction. Chapters 2 through 4 include a discussion of project management, data generation and acquisition, quality assurance assessments, and data validation, respectively. This Plan does not follow the exact order of the elements discussed in the QAPP Guidance. Table 1-1 presents a correlation of applicable provisions of the QAPP Guidance to Section headings presented in this Plan. Tables, drawings and appendices follow the text.

CHAPTER 2
PROJECT MANAGEMENT

2.1 INTRODUCTION

This chapter addresses project administrative functions and project goals. It defines key roles and overall project objectives.

2.2 MANAGEMENT APPROVAL

On September 2, 1997 the Utah Solid and Hazardous Waste Control Board issued the Permit to stipulate certain requirements for the monitoring and maintenance of RCRA regulated units at Chevron's Salt Lake Refinery ("Refinery"). The Permit has been renewed and or modified every five years since the 1997 original issue. It was a during the 2012 review process that this new QAPP was developed.

The Authorized Refinery Representative is the responsible person authorized to commit the necessary resources to implement this Plan.

Authorized Representative: John Amato

Signature: ______________________________ Date: ______________________________

Environmental Project Manager, Chevron Salt Lake Refinery

2.3 DISTRIBUTION

This QAPP, including any future revisions, will be distributed to sampling personnel and key management personnel. As of the date of this Plan, key management personnel include:

- Chevron Project Manager. Chevron Environmental Management Company ("CEMC").
- Chevron On-Site Environmental Lead at the Salt Lake Refinery.
- Environmental Consultant.
- QA Manager.

Revisions to the QAPP will be referred to by date of issue and will supersede all previous versions. Notification of changes to key management personnel and their contact information will be provided to the UDEQ as addenda to this section of the QAPP on an Annual basis that will coincide with the Annual Report stipulated in Permit Module IV.

2.4 PERSONNEL RESPONSIBILITIES

Key personnel with responsibilities for implementing and maintaining the Plan include:

- Environmental Project Manager, Chevron EMC. Responsibilities include overall implementation of the QAPP including funding, contract management, guarantee of regulatory compliance, and oversight of all subcontractors (including environmental consultants and analytical laboratories).

- On-Site Environmental Lead, Chevron Refinery. Responsibilities include coordinating on-site field activity with daily refinery operations and coordinating all required permitting.

- Environmental Consultant or Refinery Environmental Staff. Responsibilities include performance of field work, report writing, managing and interpreting data, data storage, serving as liaison to regulatory personnel, and coordinating with the analytical laboratory.

- Analytical Laboratory. Responsibilities include analyzing groundwater samples for parameters specified in the Permit Module IV.E using EPA-approved analytical methods, providing a standard Level II data quality assurance package consistent with the EPA Contract Laboratory Program, and managing the budget approved by Chevron for assigned work tasks.

- Data Validation. Responsibilities include performing a Level 2 Data Validation for each compliance sampling event as specified in the Permit. Data validation details are included in Section 4.5 of this plan.

- QA Manager: Responsibilities include maintaining the QAPP and assuring that it is consistent with the most recent version of the Permit. Duties also include overseeing implementation of the QAPP in the field during activities that require compliance with the QAPP.

2.5 BACKGROUND

The Refinery Office is located at 685 South Chevron Way, North Salt Lake, UT 84054 (see Figure 1). Currently, the refinery runs continuously as a 24-hour per day operation producing refined oil products such as gasoline, low-sulfur diesel, Jet-A, and JP-8 fuel.

In 1984, the refinery entered into a Compliance Order on Consent that required the performance of a Resource Conservation and Recovery Act Facility Assessment ("RFA"). In support of the RFA (performed by U.S. EPA), a Waste Site Characterization Report and a Groundwater Quality Assessment Report were developed. In 1994, Chevron entered into a Corrective Action Order that required it to designate Solid Waste Management Units and Hazardous Waste Sites for non-hazardous and hazardous waste sources at the facility, respectively. This work was performed according to RCRA Facility Investigation procedures. Following remediation of the identified sites, in 1997 Chevron entered into a Post-Closure Permit status. The Permit was reviewed in 2003, renewed in 2007, modified through a Class 3 modification in 2014 and a Class 1 modification in 2015, and will be renewed again in 2017.

The purpose of this QAPP is to define measures for monitoring groundwater in the uppermost aquifer in a manner that will detect the release of hazardous constituents and track overall groundwatergroundwater quality and remedial progress.

2.6 SCOPE OF WORK

The general scope of work includes the annual collection of groundwater samples from compliance monitor wells for analysis of a selected list of parameters, and every five years, collection of groundwater samples from compliance wells for analysis of an expanded list of parameters. . Each sampling event (annual and five-year) will be conducted between April 1 and May 31. In support of the overall purpose of this QAPP, laboratory analytical data will be reviewed to determine whether a hazardous constituent may have been released. This will include internal data quality assurance performed by the laboratory and Level 2 Data Validation as described in Section 4.5. An annual report describing the methods and results of each sampling event will be submitted to UDEQ. The Annual Report will include a summary of field activities, laboratory analytical results, development of the groundwater potentiometric surface, data quality assurance, data validation, and statistical evaluation of data with conclusions and recommendations. The report is due to the UDEQ by July 31. Detailed sampling and analytical methods together with site maps and groundwater monitoring parameters are discussed in Chapter 3.

2.7 PROJECT QUALITY OBJECTIVES

Monitoring groundwater in the uppermost aquifer assists in determining whether a release or potential release of hazardous waste constituents may have occurred from LWMA and RWMA and assessing the groundwater quality at other locations of the Refinery where a release has occurred or may occur. Monitoring parameters, approved U.S. EPA test methods, and approved Method Detection Limits (“MDLs”) are discussed in Section 3.3 of this Plan. Adequately verifying whether the referenced monitoring parameters are present in the uppermost aquifer is the primary project quality objective of this QAPP. Quality assurance measures and data validation methods discussed in Chapter 4 of this QAPP, respectively, ensure that groundwater analytical results are valid and reliable indicators of actual groundwater conditions at the facility.

Should monitoring parameters from a five-year or annual sampling event be detected above the regulatory threshold limits, re-sampling must be performed. Based on results of the re-sampling, corrective measures to protect human health and the environment may be considered, according to state of Utah Administrative Rule R315-101.

In determining whether corrective measures are warranted, the Director and/or Permitee will consider:

- Time required for developing and implementing a final remedy,
- The actual and potential exposure of human and environmental receptors,
- The actual and potential contamination to the environment,
- The potential for further degradation of the medium absent interim measures,
- The presence of hazardous waste in containers that may pose a threat of release,
- The presence and concentration of hazardous waste including hazardous waste constituents in soils which have the potential to migrate to groundwater or surface water,
- Weather conditions that may affect the current levels of contamination,
- The risks of fire, explosion, or accident, and
- Other situations or conditions that may pose a threat to human health and the environment.

2.8 PERSONNEL TRAINING

Field personnel are required to complete and pass regular training courses and medical surveillance clearance to qualify for work at the Refinery. These include:

- Utah Industrial Training Course ("UITC") Contractor Safety Orientation. Conducted by the Utah Safety Council. This is a course developed by Utah that is suitable and accepted by all Utah refineries.

- 29 CFR 1910.120 40-hour Hazardous Waste Operations and Emergency Response Standard ("HAZWOPER") training. This is conducted once and records for each employee are on file at the office of the Environmental Consultant.

- 29 CFR 1910.120 8-hour HAZWOPER Refresher training (as above).

- Chevron Salt Lake Refinery site-specific training. This training is conducted by Chevron at the refinery and includes Chevron Incident and Injury Free training. Chevron issues completion certificates good for two years.

- OSHA Medical Screening for Performing Work at Industrial Facilities. All employees of the Environmental Consultant receive annual HAZMAT physicals that conform with OSHA requirements. Certificates of completion are on file at the office of the Environmental Consultant.

- OSHA Respirator Fit Test Certification Fit tests are also performed.

Training records and medical clearance of field personnel are maintained at the offices of the Environmental Consultant, at the Refinery, or at their respective medical monitoring records management service provider.

2.9 RECORDS MANAGEMENT

Field personnel will be in possession of and have reviewed the most recent version of the QAPP prior to conducting monitoring and sampling activities in the field. Information derived from each sampling event will be collected, recorded, reported, and stored in hard copy or electronic format and the field records will be included in the Annual Report that is submited to the UDEQ. Information to be collected, recorded, reported, and stored will include:

- Field data recorded on field log forms,
- Chain-of-custody forms that record the sample identification, time the sample was collected, date the sample was collected, sampler's signature, etc.,
- Analyses requested, (Permit Module IV Tables IV-2 and IV-2A)
- Laboratory analytical results and data quality assurance packages,
- Minimum Level 2 Data Validation,
- A detailed report summarizing the results of the sampling event and quality control issues.

The data will be compiled in an electronic database for purposes of evaluating historic trends and performing statistical analyses, as needed. Data will include monitor well locations, boring logs, well completion details and depths, well total depth data, and analytical data for each well throughout the post-closure care period. Raw data will also be provided by the analytical laboratory. These data packages are provided in an electronic format by the lab for each event. The electronic files will be uploaded to Chevron's enterprise environmental data management system and will be retained in the Refinery records.

Sampling event reports will include:

- Groundwater elevation data, with a facility-wide potentiometric surface map
- Measured well depths (applies to five-year events),
- Tabulation of chemical analyses,
- Analytical results,
- Contaminant iso-concentration maps when monitoring parameters are detected above the MDL's, and/or trend analyses using the simplified Mann-Kendall Trend Analyses (Permit Module IV.G),
- Laboratory Quality Assurance and Data Validation Package
- Conclusions

CHAPTER 3
DATA GENERATION AND ACQUISITION

3.1 INTRODUCTION

This chapter discusses groundwater data collection and well sampling methods to be used during all sampling events at Permit compliance wells. It includes methods for the preservation and handling of groundwater samples and documentation of field activities.

3.2 PERMIT COMPLIANCE WELL LOCATIONS

A facility map depicting the Permit compliance wells for the facility-wide Groundwater Waste Management Area ("GWMA") is provided on Figure 2. Figure 2 also shows the location of compliance wells for the Reservoir Waste Management Area ("RWMA") and the Landfill Waste Management Area ("LWMA"), as well as the. North Tank Farm ("NTF") and the Southwest Plume ("SWP") groundwater recovery systems. Table 3-1 presents a tabularized version of well identifications with total well depths for each area referenced above.

3.3 GROUNDWATER MONITORING PARAMETERS AND CONSTITUENTS

Groundwater monitoring parameters and constituents for the five-year sampling events shown on Table 3-2 of this plan. Groundwater monitoring parameters and constituents for annual sampling events are provided in Table 3-3 of this plan.

3.4 ADDITIONAL GROUNDWATER MONITOR WELLS

Additional non-compliance groundwater monitor wells may be utilized during sampling events to collect water level data for use in generating potentiometric surface maps, and to monitor free product at certain locations. However, the primary well network as identified on Figure 2 provides adequate spatial coverage for measurement and depiction of the site potentiometric surface and reference to the additional wells will generally not be necessary.

3.5 COLLECTION OF GROUNDWATER ELEVATION AND FREE-PHASE HYDROCARBON THICKNESS DATA

3.5.1 Introduction

This section presents procedures for the collection of water level and free-phase hydrocarbon thickness data from monitor wells. The collection of water levels from these wells is important for determining the direction of groundwater flow beneath the site and, thus, aids in defining the extent of groundwater contamination.

3.5.2 Groundwater Elevation Measurements

All water level and free-phase hydrocarbon measurements shall be collected relative to the north top of the well casing on each monitor well. It is important that each measurement be collected relative to the same point on the top of the well casing so that data can be properly interpreted. All water and hydrocarbon level measurements shall be collected to the closest 0.01 foot. These data shall be entered on the field log form.

Water-level data are used to indicate the shape of the groundwater surface at a point in time and shall be representative of static conditions. To avoid variations caused by short-term fluctuations in the groundwater surface, measurements shall be collected from all required monitor wells within a twenty-four hour period just prior to sampling Permit compliance wells during any given groundwater sampling event. This will avoid anomalies in the development of potentiometric surface mapping due to the depression of groundwater elevations that occurs in the wells as a result of sampling activities.

Although historic data collected from monitor wells at the refinery have indicated that high specific-gravity fluids (commonly known as Dense Non-Aqueous Phase Liquids ["DNAPL”]) are not present at the site, during five-year groundwater sampling events, total depths of wells will be measured as described in Section 3.5.4 to verify the total depth of the well and to determine whether or not DNAPL has accumulated as a separate phase in the wells.

To measure water levels, the cap which covers the well shall be removed and set aside in a clean sealable plastic bag or similar receptacle to ensure that the cap remains clean and contaminants are not introduced into the well via the cap. Sampling personnel shall stand upwind from the monitor wells during removal of the cap to minimize the potential for inhalation of vapors that may be present in the well and that could be a health detriment. Appropriate health and safety precautions (as outlined in the site health and safety plan) shall be taken while working near the monitor wells.

To avoid cross contamination during the collection of fluid-level measurements, the measuring units shall not be allowed to contact the ground surface or other sources of contaminants outside of the well. The probe and cable of water level indicators shall be thoroughly rinsed with distilled water prior to and after measurements are completed at each well and shall be visibly inspected during each use for foreign materials (e.g., soil, oil, etc.). If persistent residues exist, the probe and cable shall be decontaminated using the procedures outlined in Section 3.5.3.

3.5.3 Measurements Using a Water Level Indicator and Oil/Water Interface Probe

If at least three successive sampling-campaign measurements in a given monitor well have indicated that free-phase hydrocarbons are not present in that well, subsequent water-level measurements may be made using a water-level indicator. If future measurements suggest that free-phase hydrocarbons may be present at the groundwater surface (e.g., oil observed on the probe of the water-level indicator), liquid levels shall be measured using an oil/water interface probe to verify whether or not free-phase hydrocarbons have accumulated in the well. The thickness of free-phase hydrocarbons and the depth of the static water level will be recorded to within 0.01 feet.

A water-level indicator typically consists of an electrical conductivity circuit which is completed when water is encountered. A buzzer or light at the surface is activated when the water surface is encountered. Depth indicators on the device shall be permanently marked on the cable to prevent slipping during use.

Oil/water interface probes operate on a similar premise, but emit a differentiated tone when the probe encounters non-aqueous phase liquids (NAPL) versus water. Typically an oil/water interface probe will emit a continuous tone when NAPL is encountered, and an intermittent/beeping tone when immersed in water. When utilizing an oil/water interface probe, these steps should be followed:

1. To measure the thickness of a product layer, lower the probe into the well until the signals activate. If there is an oil/product layer on the top of the water (LNAPL), the light and tone will be steady, indicating an air/product interface.
2. Read the depth off the permanently marked tape. Lower the probe further into the water, where the signals become intermittent, then pull back up and take a reading at the product/water interface. The thickness of the product layer is then determined by subtracting the first reading from the second.
3. If there is only water in the well and no product, there will only be intermittent (water) signals.

Care shall be taken to lower the cable of the fluid-level indicator in such a way that the cable does not rub on the edge of the well casing and thus damage the cable. As soon as the probe contacts the water or LNAPL surface, the surface meter will be activated. The probe of the fluid-level indicator shall be carefully raised and lowered following initial contact with the water or LNAPL surface to ensure that the fluid-level measurement is accurate to within 0.01 feet.

Once the probe is retracted from a well it shall be inspected for the presence of free-phase hydrocarbons using visual or tactile senses. If the probe shows evidence of free-phase hydrocarbons, it will be decontaminated using a non-phosphate soap wash followed by a distilled water rinse. If evidence of free-phase hydrocarbons persists on the probe (i.e., distilled water on the probe readily separates into droplets) the probe will be washed with a more aggressive surfactant (e.g., Simple Green®), washed with a non-phosphate soap, and rinsed with distilled water. This procedure will be implemented before inserting the probe into the next well. Additionally, the probe will be decontaminated prior to measuring the first well during a sampling event and again at the end of the event. If evidence of contamination persists on the device after decontamination procedures have been performed, it will not be used to collect further groundwater data. Rather, it will be replaced. Equipment blanks and field blanks will be collected from the water level meter probes for each ten percent or part thereof for wells measured during the five-year sampling events.

3.5.4 Total Well Depth Measurements

As mentioned in Section 3.5.2, during five-year groundwater sampling events total depths of GWMA, RWMA, and LWMA compliance monitor wells will be measured to verify the total depth of the well and to determine whether or not NAPL have accumulated as a separate phase in the wells. The collection of total depth measurements will be performed using a total depth well gauge (e.g., Solinst® Tag Line) or a rigid engineer's measuring tape. Measurements will be accurately recorded to within 0.10 feet. Well measurements shall be compared to initial completion depths recorded on Table 3-5. The comparisons shall be presented in the appropriate groundwater sampling reports.

After a measurement is collected and the gauge or tape is retracted from the well, it will be inspected for the presence of NAPL using visual and tactile observations. If they are observed, they will be measured using an oil/water interface probe and recorded to an accuracy of 0.01 feet.

Prior to placing a measuring device in a well, it shall be thoroughly decontaminated using a non-phosphate soap wash and a distilled water rinse. After all of the total depth measurements are collected from the wells during a given sampling event, the measuring device shall be decontaminated in like manner. If hydrocarbon or other residues persist on the device following these wash and rinse procedures, a more aggressive wash and rinse regimen shall be performed as described in Section 3.5.3. If evidence of contamination still persists on the device, it will not be used to collect further groundwater data. Rather, it will be replaced. Equipment blanks and field blanks will be collected from the total depth measurement probe for each ten percent or part thereof for wells measured during the five-year sampling events.

3.6 SAMPLING ORDER AT PERMIT COMPLIANCE WELLS

When using non-dedicated equipment to sample monitor wells, it is customary to sample from the least contaminated to the most contaminated wells to avoid cross-contamination between wells. At the Chevron Salt Lake Refinery, all compliance monitor wells will be sampled using dedicated equipment or disposable equipment that will be used just once at each well. Therefore, it is not necessary to sample wells in a particular order since sampling equipment that will come in contact with groundwater samples will not be transferred from one well to the next.

3.7 BOTTLE ORDER

Sample bottles shall be filled in the following order:

1. Volatile organics
2. Semi-volatile organics
3. Metals

4. General parameters

3.8 SAMPLING METHODS AT PERMIT COMPLIANCE WELLS

3.8.1 Pre-sampling Operations

Prior to sampling, all meters (e.g., water level indicators, oil/water interface probes, gas monitors, etc.) and other equipment that may be used at multiple compliance monitor wells shall be decontaminated and calibrated. Decontamination procedures for non-dedicated equipment are outlined in Sections 3.5.3 and 3.5.4.

Prior to the collection of water-quality samples from the monitor wells, the depths to the top of any free-phase hydrocarbon surface and the water surface shall be determined in accordance with the procedures outlined in Section 3.5.3. Additionally, the depth to the bottom of the casing shall also be determined during five-year sampling events as a measure of the integrity of the well. This depth measurement shall be made using the methods detailed in Section 3.5.4.

3.8.2 Health and Safety Considerations

During sampling operations, personnel shall remain upwind from the well to minimize the potential for inhalation of organic vapors that may be present in the well. All sampling operations shall be conducted in a manner that complies with the site health and safety plan. Thus, in addition to the collection of groundwater data from the monitor wells, health and safety data shall be collected as required to ensure the safety of the sampling personnel.

3.8.3 Sample Collection

Groundwater samples will be collected via industry-standard low-flow non-volatizing sample collection methodology (e.g. peristaltic pump or similar).Sample bottles shall be filled in the order described in Section 3.6. Bottles in which sample portions are collected for analysis of volatile organic compounds shall be filled by creating a laminar flow wherein the groundwater flows gently along the side of the bottle rather than pouring as a stream directly to the bottom of the bottle. Bottles for analysis of volatile organic compounds ("VOAs" or "VOA bottles") commonly consist of 40 ml glass vials with Teflon-lined septa. Additionally, the sample will be allowed to overflow the sample bottle as it is filled such that a convex meniscus forms at the top of the bottle. The bottle will then be capped immediately without headspace. The bottle shall be turned upside-down after it is capped to check for headspace. If bubbles are introduced into the bottle due to sampler error, the cap shall be carefully removed and a convex meniscus shall be re-formed to remove any air space. Repeated attempts to remove air bubbles will eventually dilute the preservative such that the sample will not be adequately preserved in the field. After two failed attempts to successfully remove air bubbles from a preserved bottle, the bottle shall be replaced with a new bottle, or if acceptable under the analytical method, the bottle shall be preserved at the lab.

Due to differing solubility and diffusion properties of gases in liquid matrices at different temperatures, and the reaction of preservatives with groundwater, it is possible for the sample to generate some headspace during storage. This headspace will appear in the form of micro bubbles, and should not invalidate a sample for volatiles analysis. Effervescence of the liquid matrix may be observed as the bottle is filled. If this phenomenon is observed, every effort shall be made to reduce effervescence by slowly filling the bottle as described above to reduce the creation of air bubbles. If effervescence persists, the bottle shall be preserved at the lab if acceptable under the analytical method.

Bottles in which sample portions are collected for other analyses shall be filled and preserved by following instructions provided by the analytical laboratory.

During purging and sampling, all appropriate information shall be entered on the field log form. Chain-of-custody, sample handling, and field quality-control procedures shall be followed as indicated in Sections 3.8, 3.9, and 3.10, respectively.

3.8.4 Sampling Free-phase Hydrocarbons

If free-phase hydrocarbons on the water surface, known as Light Non-Aqueous Phase Liquids ("LNAPL"), are detected during water-level measurements, they may be sampled prior to groundwater sampling using a peristaltic pump, if the LNAPL is newly present in the well and it is determined that LNAPL analysis might aid with evaluation of the LNAPL origin. If the viscosity of the LNAPL prevents sampling with a peristaltic pump, the LNAPL shall be sampled with a top-entry disposable bailer.

Down-hole tubing used with a peristaltic pump shall be constructed of polyethylene. If a tubing weight is required to assist in collecting the sample, it shall be constructed of stainless steel. To sample LNAPL, the tubing (with the tubing weight attached as needed) shall be lowered carefully to a depth that is just lower than that of the LNAPL/water interface. The LNAPL shall then be slowly pumped to the surface and discharged into VOA bottles.

If a bailer is used to collect the free-phase hydrocarbon sample, the bailer shall be lowered slowly through the free phase to a depth where the top of the bailer is just below the top of the free-phase hydrocarbon. Following filling, the bailer shall be raised to the surface and the free-phase hydrocarbon shall be slowly emptied into the VOA bottles.

The VOA bottles shall be filled slowly until they are approximately one-half to two-thirds full. Filling the vial to a greater depth with a free-phase hydrocarbon could cause the vial to burst as a result of thermal expansion of the fluid. Once the vial is filled to the proper depth, it shall be immediately capped. The sample shall then be handled as indicated in Section 3.9.

Free-phase samples shall be stored and shipped in containers separate from those used to store and ship water samples, thus minimizing the potential for cross contamination between the samples.

Following collection of the LNAPL, any tubing used for sample collection shall be discarded and the tubing weight shall be decontaminated as described in Section 3.5.3.

3.9 DOCUMENTATION OF FIELD CHAIN-OF-CUSTODY

3.9.1 Analysis Request Forms

Table 3-2 will be submitted to the laboratory as the analysis request form for samples collected during five-year sampling events; Table 3-3 will be submitted as the analysis request form for samples collected during annual sampling events. Submittal of the analysis request form shall be the responsibility of the sample collector. One analysis request form shall accompany each sample cooler. The analysis request forms shall be reviewed by the sample collector immediately prior to sampling and then again prior to shipping to ensure that the appropriate form is submitted and the appropriate type and number of sample bottles are filled and shipped with the analysis request.

3.9.2 Sample Labels

Sample labels shall be used to identify the samples. Labels shall be sufficiently durable to remain legible even when wet.

Labels shall be marked with indelible ink and affixed to sample containers prior to sample collection. Affixing the labels after sample collection may be difficult because the bottles may be wet or cold. In the event labels must be added after collection, the bottle shall be dried and the labels shall be taped onto the bottle using polyethylene tape wrapped around the bottle.

The sample location, date, and time of collection and preservatives shall be recorded on each sample label for each sample.

Example: RWMA-1, 08-12-13, 1020

3.9.3 Chain-of-Custody Forms

To establish the documentation necessary to trace sample possession from the time of collection through laboratory analysis, a chain-of-custody form shall accompany all samples. This form shall be in duplicate. The original of the form shall be shipped to the laboratory with the samples and the duplicate copy shall be kept in the project files.

One chain-of-custody form shall accompany each shipping container of samples. Information on the form shall include, as a minimum, a unique identification for each sample (sample I.D.), date and time the sample was collected, date and time the samples on the form were relinquished, the sampler collector's signature, and the name and contact information of the client. After the collected samples are recorded in the spaces provided on the chain-of-custody form, the sample collector shall sign the form and place it in a sealed plastic bag in the shipping container with the samples to await shipment at the end of the day. While the samples are in the custody of the collector, they shall not be left unattended at locations where the samples may be tampered with.

When the samples are relinquished to the laboratory or air courier, the collector shall sign the appropriate relinquishment box on the form. The collector shall then ensure that the receiver acknowledges receiving the samples by also signing the form.

3.9.4 Custody Seals

Custody seals are used to detect unauthorized tampering with the containers in which the samples are shipped. Each custody seal shall be signed and dated by the sampler. The seal must be attached to the shipping container (normally an ice chest supplied by the analytical laboratory) in such a way that it is necessary to break the seal to open the shipping container. Custody seals shall be used whether the samples are delivered to the laboratory in person by the sampling personnel or by an air courier service.

The custody seal must be affixed to the shipping container before the samples leave the custody of the sampling personnel. The custody seal shall be secured to the shipping container by affixing clear strapping tape to the seal to prevent accidental breakage or removal during handling of the shipping containers.

3.9.5 Field Log Forms

All field data shall be recorded in ink on field log forms. Table 3-5 illustrates field log forms for the collection of groundwater data at each well. The field log forms shall be used each time sampling is performed.

It is the responsibility of the sample collector to ensure that the information recorded on the log forms is accurate. These data are vital to interpretation of the sample results. Thus, it is imperative that the information be entered during sample collection to ensure that the data are accurately recorded.

The log forms shall be bound into field log books. The covers of the log books shall indicate:

- The name and address of the Salt Lake Refinery

- The name and address of the Chevron Project Manager
- The purpose of the sampling (annual or five-year event)
- The inclusive dates during which the books were in use

These log books shall be kept in the custody of the sample collector during sampling and in the custody of the sampling personnel during non-sampling periods.

3.10 SAMPLE HANDLING PROCEDURES

3.10.1 Sample Containers

Sample bottles will be stored in a safe location, out of direct contact with the sun or any other source of heat which may raise the temperature of the sample as it enters the bottle. Sample bottles shall at no time be placed on the ground. Bottles awaiting use during actual collection of the sample will be placed on a table, tailgate or other hard surface free of any objects which may damage the bottle. Upon collection of the sample, each bottle will be capped and placed directly into the same shipping carton or cooler from which it was originally taken.

3.10.2 Sample Preservation

Samples shall be placed in coolers and cooled to 4 ºC after they are collected. Cooling to $4^{o}C$ is achieved by placing the sample bottles in an ice chest and covering the bottles with crushed ice. Ice shall be placed around the sample bottles immediately following collection. All samples collected shall be cooled in this manner regardless of their chemical preservation unless advised otherwise.

Chemical preservatives include several acids and bases. In most cases, these preservatives will be added to the bottles by the laboratory prior to receipt. Under the current US EPA CLP-approved laboratory procedure the only preservative that must be added in the field is zinc acetate for the sulfide analysis. Otherwise, the laboratory will provide preservatives to the sample collector should preservatives need to be added in the field. Most of the chemical preservatives are corrosive and must be treated with caution. Sampling personnel shall avoid skin or eye contact with the preservatives and wear protective glasses and disposable waterproof gloves for protection at all times during handling. During sampling, large quantities of clean water shall be available for irrigation should skin or eye contact occur.

3.10.3 Sample Packing

Samples shall be placed in ice chest shipping containers with crushed ice. The samples shall be placed vertically, with the capped end up, in a single layer. Bottles shall not be packed on top of one another. The laboratory should provide a small temperature blank for use in confirming that the samples are at the proper temperature when they arrive at the laboratory.

Glass bottles shall be placed in protective foam, bubble-pack sleeves, or corrugated cardboard dividers. All bottles shall be checked for cap tightness to prevent sample leakage during transport. Care shall be taken to prevent over tightening and breakage of bottle caps.

Sufficient ice and packing material shall be placed in each ice chest to minimize the potential for bottle movement and damage during shipment. In addition, care shall be taken to insure that plastic caps on bottles are adequately protected to prevent breakage.

In the event a bottle breaks between the time of initial collection and sample shipment, it shall be removed immediately from the shipping container. If the contents of the bottle spilled inside the container, all bottles, ice, and packing material shall be removed and the container shall be cleaned. The sample with the broken bottle shall be re-collected within 24 hours from the time the well was purged. Otherwise, the sample suite shall be entirely re-collected, including those bottles associated with the sample that were not broken. The ice and packing material shall be replaced. All bottles shall be wiped dry before being placed back into the clean container.

Sampling personnel shall inventory the sample bottles from each sampling site prior to shipment to insure that all samples listed on the analysis request form and the chain-of-custody form are present. All bottles collected from a specific sampling station shall be packed and shipped together in the same container.

3.10.4 Sample Shipping

Each shipping container shall contain an analysis request form and a chain-of-custody form for the sample(s) within the container (see sample chain-of-custody form in Sections 3.9.1 and 3.9.3, respectively). The analysis request form may be included with or may be part of the Chain-of-Custody form. If samples are shipped via air-courier service, the number from the air-courier bill that accompanies the shipping containers shall be entered on the chain-of-custody form. The sampler shall complete the chain-of-custody form at the time the samples are relinquished (either to the laboratory for local analytical work or to the air-courier service for out-of-state analytical work). Sampling personnel shall sign their name and the time the samples are relinquished in the proper location on the form. The receiving party shall also sign his or her name on the form upon receipt.

The originals of the analysis request and chain-of-custody forms shall be sealed in a waterproof plastic bag and placed inside the ice chest prior to sealing of the container. The ice chest shall be securely closed and latched, and a custody seal shall be placed across the transition between the container body and lid as discussed in Section 3.9.4. After applying the custody seal, strapping tape shall be applied to secure the lid to the body to prevent it from opening during shipment. Tape shall also be used to secure the custody seal to the shipping container.

Sampling personnel shall prepare air-courier bill identification labels in strict accordance with the U.S. Department of Transportation procedures if any of the samples being shipped are suspected to contain listed hazardous materials. Labeling procedures have been detailed by the Association of American Railroads (1989 et seq.) and the International Air Transport Association (1991 et seq.).

Samples shall be shipped such that they are received by the laboratory within laboratory holding times and at a maximum temperature of 4C.

3.11 FIELD QUALITY CONTROL

Quality control is essential to ensure the reliability and validity of field data. Field quality control procedures may include the collection of equipment blanks, field blanks, trip blanks, and blind duplicates. These samples are collected as an aid in determining sample biases introduced by equipment decontamination procedures, sample handling, laboratory procedures, transportation procedures, and random errors.

3.11.1 Equipment Blanks

Equipment blanks are collected on a regular basis from non-dedicated sampling equipment to ensure that cross-contamination has not been introduced between monitor well samples as a result of using the equipment at more than one sampling location. They are also routinely collected when dedicated sampling equipment is cleaned.[1] Equipment blanks are normally generated by pouring distilled water over non-dedicated sampling equipment and collecting the distilled water into sample bottles.

Sampling equipment used to collect groundwater at the refinery Permit compliance wells is dedicated, meaning that it is used at just one well location. Additionally, it is disposable, meaning that it is used just once at each well location and is then discarded. Therefore, except as noted in Section 3.5.3 and 3.5.4, equipment blanks are not required for groundwater sampling events conducted at compliance wells.

3.11.2 Field Blanks

When an equipment blank is collected, a field blank is usually also collected. Field blanks consist of collecting a sample from the source of distilled water that is used to generate equipment blanks. This sample verifies the purity of the distilled water. Since equipment blanks are not required when sampling Permit compliance wells, field blanks are not

[1] *Ground-Water Sampling Guidelines for Superfund and RCRA Project Managers*, Douglas Yeskis and Bernard Zavala, U.S. EPA, EPA 542-S-02-001, May 2002, p.11.

required. The only equipment and field blanks to be collected under this QAPP with be during the five-year sampling events on the water level and total depth probes as detailed in Sections 3.5.3 and 3.5.4

3.11.3 Trip Blanks

Trip blanks serve to indicate (1) if interaction between the sample and the container is occurring, (2) if a handling procedure alters the analytical results, and (3) if the sample bottles are being properly cleaned and rinsed by the analytical laboratory before field use.

A sufficient number of trip blanks shall be ordered from the analytical laboratory to correspond to 10 percent of the total number of samples to be collected during the sampling campaign. The trip blanks shall be subjected to the same analyses as the water sampled at the respective sampling sites. They shall be labeled TB-1 for the first blank, TB-2 for the second blank, etc. Appropriate information shall be recorded on the field log for each trip blank. The analytical laboratory shall be requested to ship bottles of each type that have been pre-filled by the laboratory with distilled or de-ionized water.

Ten percent of the groundwater sampling stations shall be randomly selected prior to the beginning of a sampling campaign. One set of trip-blank bottles shall be taken to each of these randomly-selected stations during the collection of normal samples at those locations. The bottles shall be retained at the location but not opened during sampling of the station. The trip-blank bottles shall be handled identically to the handling procedures for bottles used for actual sample collection. Trips blanks are provided by the lab to comply with the 10% rule incorporated into this QAPP.

3.11.4 Blind Duplicates

Duplicate samples or blind duplicates are commonly collected at a given sampling location as a quality control measure. One of the two samples is submitted to the laboratory "blind", meaning that it is labeled with a pseudonym to separate its identity from the companion sample. Blind duplicates serve to verify the reproducibility of laboratory and field procedures and to determine if there is non-homogeneity between the original sample and the duplicate sample.

During each sampling campaign, 10 percent of the Permit compliance wells shall be randomly selected for the collection of blind duplicates. A suite of sample bottles identical to those used at the randomly-selected well shall be used for each blind duplicate. Both blind duplicate and actual sample bottles shall be filled by alternately filling an actual sample bottle followed by a blind duplicate bottle according to the bottle order sequence described in Section 3.6.

Groundwater blind duplicates shall be labeled GW-1 for the first duplicate of a sampling campaign, GW-2 for the second duplicate, etc. Sampling personnel shall document in the field log book all blind duplicates collected and the actual samples that they correspond to. This will allow subsequent correlation of the water chemistry data.

3.12 ACQUISITION OF SAMPLING SUPPLIES

Prior to beginning a sampling campaign, sampling personnel shall check all equipment to ensure that it is in proper working order. Equipment shall be maintained and repaired in accordance with the manufacturer's instructions. Personnel shall also inventory all disposable sampling supplies to determine quantities required to complete the upcoming sampling campaign.

Disposable sampling supplies shall be ordered in sufficient quantity to provide an excess of each item required to complete the sampling round. Disposable supplies include:

- Disposable point source flexible membrane samplers,
- Disposable weighted polyethylene bailers,
- Polyethylene tubing,
- Certified clean sample bottles with preservatives,
- Shipping containers and packing material,
- Required forms and labels,
- Disposable gloves and other safety equipment,
- Distilled water, and
- Disposable paper towels.

Bottles required for sampling (with preservatives added) and ice chests shall be ordered directly from the analytical laboratory. Information concerning the bottle types required for various analytes will be provided by the laboratory.

3.13 MANAGEMENT OF FIELD RECORDS

The original signed and dated sample logs are a component of the sampling record of the Refinery. Sampling personnel shall periodically make a secondary copy of all log books and forms to provide a backup source of data in the event that the original copy is lost or destroyed. All forms shall be kept on file in electronic or hard copy format for future program auditing and analysis review. These data shall be retained through the post-closure care period of the Refinery.

CHAPTER 4
QUALITY ASSURANCE ASSESSMENTS AND DATA VALIDATION

4.1 INTRODUCTION

This chapter discusses quality assurance assessments of field and laboratory work that are performed in connection with annual and five-year sampling events. Quality assurance assessments help increase confidence that the Plan is being implemented as approved and that data derived from sampling events are reliable indicators of actual groundwater conditions.

4.2 ASSESSMENT ACTIVITIES AND RESPONSE ACTIONS

During each sampling event, at least one assessment of field activities will be performed by field sampling personnel and one additional assessment of field activities will be performed by the environmental consultant's project manager. These assessments will be performed using the assessment form provided in Table 4-1. Additionally, independent assessments may be performed by the Chevron project manager, the Chevron on-site project manager, or UDEQ personnel.

At any time during a sampling event, stop work authority is given to sampling personnel, the environmental consultant's project manager, the Chevron project manager, the Chevron on-site project manager, and UDEQ personnel for matters related to non-compliance with the Plan. If stop work authority is exercised, a tailgate meeting will be held to discuss the non-compliance issue, to agree on corrective measures that will resolve the issue, and to implement corrective measures so that execution of the Plan will result in data that are reliable indicators of actual groundwater conditions. Stop work events, should they occur, will be documented on the assessment form and documentation will include corrective action measures that were implemented to improve the performance of field activities.

In keeping with Chevron's goal to maintain an incident and injury-free workplace, employees and contractors are responsible and authorized to stop any work that is unsafe. Accordingly, any person that observes an unsafe work practice during the performance of sampling event activities may stop work to prevent an accident or injury.

4.3 ASSESSMENT REPORTS

Documentation of assessment activities will be recorded on the assessment form in Table 4-1. Assessment forms will be attached to the field log forms referenced in Section 3.9.5 and will be included in each annual and five-year sampling event report.

4.4 LABORATORY QUALITY ASSURANCE

The analytical laboratory contracted by Chevron to perform analyses on groundwater samples shall be certified under the National Environmental Laboratory Accreditation Program ("NELAP") and the International Standard Organization's ("ISO") Standard 17025 for the competence of testing and calibration laboratories and be Utah certified for the methods they are reporting for compliance. Currently, Chevron retains a laboratory under contract ("contract laboratory") for the performance of analytical services and it meets these requirements. Additionally, Chevron has rigorously evaluated its quality assurance practices to ensure that laboratory data are accurate and defensible according to Chevron standards.

Eurofins - Lancaster Laboratories, Inc. located in Lancaster, Pennsylvania is the current contract laboratory for the analyses of groundwater samples collected at the refinery during annual and five-year sampling events. Other laboratories meeting equivalent standards may also be utilized. Lancaster Laboratories maintains an Environmental Quality Policy Manual (effective February 3, 2012) to promote quality assurance procedures that will comply with the requirements of the NELAP and ISO accreditation programs. An electronic copy of the manual is included in Appendix A of this Plan. Specifically, Chapters 10-12 of the referenced manual discuss the quality assurance of test results, audits and inspections, and corrective and preventive actions, respectively. Eurofins - Lancaster Laboratory, or any other laboratories utilized, will maintain Utah certification for the method used for compliance sample results.

Should a change in the contract laboratory occur, notification of the change will be provided to the UDSHW and Appendix A will be updated.

4.5 DATA VALIDATION

A Level 2 data validation will be performed on all data to assess the quality of the groundwater data. The quality of data was assessed following *the USEPA Contract Laboratory Program National Functional Guidelines for Organic Superfund Methods Data Review,* January 2017 and *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Methods Data Review, , January 2017, or the most recent editions*.

The purpose of data validation is to identify any issues that may impact the usability of the ground water data. In summary, at a minimum, the following quality control (QC) elements will be reviewed:

> *Data Package Completeness:* Information in the analytical reports reviewed for completeness, including analytical methods, reporting limits, dilution factors, quality control, case narrative, qualification narrative, and proper documentation of the Chain of Custody report.
>
> *Preservation and Holding Times:* The condition, temperature and holding times of samples will be reviewed and compared to QAPP method specifications.

Blank Evaluation: Analytes detected in blank samples will be documented. Any result detected in a sample at a value less than 10 times the blank concentration will be qualified.

Matrix Spike Evaluation: Matrix spike and matrix spike duplicate samples will be reviewed to evaluate the overall efficiency of the analytical method in recovering target analytes from the matrix. Matrix spike recoveries outside laboratory limits will be evaluated.

Surrogate Evaluation: Surrogate spikes will be included in the quality control assessment as a measure of accuracy, that is to say the true value of the parameter being measured. Surrogate recoveries are compared to acceptable limits.

Field Duplicate and Analytical Duplicate Evaluation: To evaluate sampling and analytical precision, field duplicates and blind duplicates will be evaluated by calculating relative percent differences (RPDs).

Calibration Range Evaluation: Initial calibration standards and continuing calibration verification standards were compared to acceptable method criteria by the laboratory.

If, after performance of data validation the data are deemed suitable for use under Module IV of the Permit, the following note will added to the text of the data validation report

Data Validation will include, at a minimum the following:

Data validation when reporting the short analyte list includes the following:
—Cover letter
— Sample results
— Chain of Custody
—Sample ID Cross-reference
— QC Summary Table
— Enhanced Case Narrative—

Data validation when reporting full analyte lists every five years also includes the following in addition to the data validation performed for the above short list :
— Instrument QC Summary
— Preparation sheets
— Analytical Run log
— Calibration data
— Corrective action report.

Data validation report
The data validation report will include the validated data set and the results of the data validation. The report will include a discussion of the following elements:

<u>Precision</u> - Precision is the measure of variability of sample measurements. Measurements of data precision are necessary to demonstrate the reproducibility of the analytical data. Precision will be determined by evaluating the calculated relative percent difference (RPD) values from field duplicate pairs, laboratory duplicate pairs, matrix spike (MS) and matrix spike duplicate MSD) pairs, and/or laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) pairs.

<u>Accuracy</u> - Accuracy is the relationship of the reported data to the accepted or “true” value. Accuracy is a measure of sampling and analysis bias. Biased results generally arise from personnel, instrument, or analytical method influences. Accuracy is determined by analyzing a reference material of known concentration, or reanalyzing a sample which has been spiked with a known concentration of an analyte. Accuracy is expressed as a percent recovery.

Method Compliance – Method compliance will be established by reviewing sample integrity, holding times, detection limits, surrogate recoveries, laboratory blanks, initial and continuing calibrations (where applicable), and the LCS/LCSD percent recoveries against method-specific requirements..

<u>Completeness</u> - Completeness is a measure of the percentage of analytical data and field measurements that meet all acceptance criteria. Completeness will be evaluated by determining the overall ratio of the number of samples and analyses planned versus the number of samples with valid analyses. Determination of completeness includes a review of the chain-of-custody (CoC), laboratory analytical methods, and other laboratory and field documents associated with the analytical data set.

TABLE 1-1
CROSS REFERENCE TO QAPP ELEMENTS[(a)]

PLAN ELEMENT	PLAN SECTION	SECTION
Project Management	**Project Management**	**Chapter 2**
Title and Approval Sheet	Management Approval	2.2
Table of Contents	Table of Contents	Page ii
Distribution List	Distribution	2.3
Project/Task Organization	Personnel Responsibilities	2.4
Problem Definition/Background	Background	2.5
Project/Task Description	Scope of Work	2.6
Quality Objectives and Criteria for Measuring Data	Project Quality Objectives	2.7
Special Training Needs/Certification	Personnel Training	2.8
Documents and Records	Records Management	2.9
Data Generation and Acquisition	**Data Generation and Acquisition**	**Chapter 3**
Sampling Process Design	Data Generation and Acquisition	Chapter 3
Sampling Methods	Sampling Methods at Compliance Wells	3.4, 3.5, 3.6
Sample Handling and Custody	Documentation of Field Chain of Custody, Sample Handling Procedures	3.7 and 3.8, respectively
Analytical Methods	Analyte List for Annual Sampling Campaigns and Analyte List for Five Year Sampling Campaigns	3.2.2 and 3.3.2, respectively
Quality Control	Field Quality Control	3.9
Instrument/Equipment Testing, Inspection, and Maintenance	Pre-sampling Operations and Acquisition of Sampling Supplies	3.7.1 and 3.11, respectively
Instrument/Equipment Calibration and Frequency	Pre-sampling Operations and Acquisition of Sampling Supplies	3.7.1 and 3.11, respectively
Inspection/Acceptance of Supplies and Consumables	Pre-sampling Operations and Acquisition of Sampling Supplies	3.7.1 and 3.11, respectively
Non-direct Measurements	Not applicable to this Plan	Not applicable
Data Management	Records Management	3.11

[(a)] From: *EPA Guidance for Quality Assurance Project Plans*, Chapters 2 and 3 Table of Contents, U.S EPA, December 2002.

TABLE 1-1 (Continued)
CROSS REFERENCE TO QAPP ELEMENTS[a]

PLAN ELEMENT	PLAN SECTION	SECTION
Assessment and Oversight	**Quality Assurance Assessments**	**Chapter 4**
Assessments and Response Actions	Assessment Activities and Response Action	4.2
Reports to Management	Assessment Reports	4.3
Data Validation and Usability	**Data Validation**	**Chapter 4**
Existing Data		

[a] From: *EPA Guidance for Quality Assurance Project Plans*, Chapters 2 and 3 Table of Contents, U.S. EPA, December 2002.

TABLE 3-1
ROUTINE MONITORING WELLS

Well Number	Well Depth (ft.)[a]	Well Diameter (in.)	Screened From (ft.) [b]	Screened To (ft.)	Slot Aperture (in.)
GWMA Wells					
S-1	15.0	2.0	1.0	15.0	0.010
S-4A	18.0	2.0	2.7	17.7	0.010
S-5	15.0	2.0	2.0	15.0	0.010
S-24	11.3	2.0	1.3	11.3	0.016
S-35	16.0	2.0	4.0	16.0	0.016
PCP-1	17.0	2.0	1.5	16.5	0.010
PCP-2	20.0	2.0	10.0	20.0	0.010
PCP-3	18.0	2.0	3.0	18.0	0.010
PCP-4	25.0	2.0	2.5	22.5	0.010
PCP-5	18.0	2.0	3.0	18.0	0.010
RWMA Wells					
RWMA-1	25.0	2.0	9.5	25.0	0.010
RWMA-2A	25.6	2.0	9.5	25.0	0.010
RWMA-3	25.0	2.0	10.0	25.0	0.010
RWMA-4	23.5	2.0	8.5	23.5	0.010
LWMA Wells					
LWMA-1	40.9	2.0	10.0	40.0	0.010
LWMA-2	41.9	2.0	11.9	41.9	0.010
LWMA-3	41.6	2.0	11.6	41.6	0.010
LWMA-4	40.9	2.0	11.5	40.9	0.010
SW PLUME Wells					
SWP P-1	18.6	2.0	8.0	18.0	0.010
SWP P-3	17.3	2.0	7.0	17.0	0.010
SWP P-4	16.0	2.0	6.0	16.0	0.010
SWP P-5	13.5	2.0	3.5	13.5	0.010
NTF Wells					
S-14	12.0	2.0	2.0	12.0	0.016
NWTF-2	12.0	2.0	2.0	12.0	0.010
EF-9	16.3	2.0	1.3	16.3	0.010

TABLE 3-2
GROUNDWATER MONITORING PARAMETERS
FOR FIVE-YEAR SAMPLING EVENTS

Parameter	Test Method [a]	MDL [b]	Preservative [c]	Holding Time	Bottle Type
General Parameters					
Chloride	300.0	5,000	---	28 days	(2) 40 ml glass vials
Nitrate + Nitrite as N[c]	300.0	80	---	48 hours	
Sulfate	300.0	100,000	---	28 days	
Fluoride	300.0	500	---	28 days	(1) 500 ml polyethylene
Total Dissolved Solids	160.1	10,000	---	7 days	
Sulfide	376.1	10,000	NaOH/ZnAC add in field	7 days	(1) 250 ml glass
pH	150.1	Report Measured Value	---	Immediate	(1) 250 ml polyethylene
Specific Conductance	120.1	Report Measured Value	---	28 days	
Alkalinity	310.1	2,000	---	14 days	
Oil and Grease	1664A	2,200	HCl	28 days	(2) 1-liter glass
Metals					
Calcium	6010C	100	HNO3	6 months	(1) 250-ml polyethylene
Magnesium	6010C	100	HNO3	6 months	
Potassium	6010C	300	HNO3	6 months	
Sodium	6010C	300	HNO3	6 months	
Arsenic	6010C	500	HNO3	6 months	
Barium	6010C	---	HNO3	6 months	
Cadmium	6010C	40	HNO3	6 months	
Chromium	6010C	50	HNO3	6 months	
Lead	6010C	40	HNO3	6 months	
Mercury	6010C	---	HNO3	28 days	
Selenium	6010C	---	HNO3	6 months	
Silver	6010C	---	HNO3	6 months	
Volatile Organic Compounds with Hydrocarbon Fractionation					
VOC's	8260C				(3) 40-ml glass
Semi-Volatile Organic Compounds with Hydrocarbon Fractionation					
SVOC's	8270D				Varies

[a] Permittee shall use the most current, equivalent EPA method (I.F.13b.).
[b] Method Detection Limit reported as *ug*/L unless noted.
[c] All samples will be delivered to the laboratory on ice. The laboratory will determine and report the temperatures of the samples.

.

TABLE 3-3
GROUNDWATER MONITORING PARAMETERS AND CONSTITUENTS
FOR ANNUAL SAMPLING EVENTS

Parameter or Constituent	Test Method [a]	MDL[b]	Bottle Type	Preservative [c]	Holding Time
Metals					
Arsenic	6010C	10	(1) 250 ml polyethylene	HNO3	6 months
Cadmium	6010C	5			
Chromium	6010C	50			
Lead	6010C	15			
Volatile Organic Compounds					
Benzene	8260C	5	(3) 40 ml VOAs	HCl	14 days
Ethylbenzene	8260C	5			
Toluene	8260C	5			
Xylene[e]	8260C	5			
TPH-GRO (C6-C10)	8260C	250	From BTEX Bottles		
TPH-DRO (C10-C28) [d]	8015D	500	2–1 Liter Ambers	None	7-Days
TPH-ORO (C28-C40) [d]	8015D	500	2-1 Liter Ambers	None	7-Days

(a) Permittee shall use the most current, equivalent EPA method (I.F.13b.).
(b) Method Detection Limit reported as *ug*/L unless noted.
(c) All samples will be delivered to the laboratory on ice. The laboratory will determine and report the temperatures of the samples.
(d) TPH-DRO and TPH-ORO samples shall be analyzed after Silica Gel Cleanup
(e) Xylene reported as total ortho-, meta-, and para-isomers.

TABLE 3-4
ADDITIONAL MONITOR WELLS FOR THE COLLECTION OF WATER LEVEL DATA

Well Identification	
WFP-14	EF-9
WFP-15	LACT-4
S-32	S-14
EF-13	S-16
EF-15	S-18
ODW-1	S-22
ODW-2	S-23
NWTF-1	S-18
NWTF-3	
NWTF-4	

TABLE 3-5
Field Log Form
CHEVRON PRODUCTS COMPANY, SALT LAKE REFINERY

Groundwater Field Log

Well Number:	**Date:**
Sampling Company:	**Sampling Personnel:**
Description of Purging/Sampling Methodology	
□ Point Source	□ Purge and Bail
Description of Purging/Sampling Equipment	
□ Disposable Point Source Flexible Membrane Liner	
□ Disposable Polyethylene Tubing and Peristaltic Pump	
□ Disposable Weighted Polyethyelene Bailer	
General Observations:	
Hydrocarbon/Water Level Measurements	
Static Water Level Meter Used:	
Static Water Level Meter Calibration Details:	
Depth to Top of Floater (ft. BNTOC[(a)]):	
Depth to Top of Water (ft. BNTOC):	
Disposable Point Source Flexible Membrane Liner Information	
Depth of Liner Opening Below Top of Casing (1 foot below top of water or top of screen, whichever is lower):	
Top of Screen (feet below top of casing per well log):	
Date/Time Liner Was Deployed:	
Date/Time Liner Was Retrieved (at least 24 hours from time of deployment):	
Well Purge Information (if applicable)	
Total Well Depth (ft.):	
Depth to Top of Water (ft.):	
Total Water Column (ft.) ($D_{well} – D_{water}$) :	
(1) Casing Volume (gal.) (Water Column X 0.041):	
(3) Casing Volumes (gal.):	
Well Purge Date/Time:	
Well Sample Information	
Well Sample Date/Time:	
Sample Description:	
Additional Information:	
Signature of Sampler:	

TABLE 4-1
CHEVRON SALT LAKE REFINERY
Quality Assurance Assessment Form for Groundwater Well Sampling

Assessment Type: Field Personnel □ **Environmental Consultant** □ **Other** □				
Name: **Organization:**				**Date/Time:**
Activities Observed:				
Activity	**Yes**	**No**	**NA/ NO[(a)]**	**See Comments**
Pre-sampling operations				
Correct type and number of bottles ordered?				
Equipment cleaned and calibrated?				
Sampling supplies inventoried before going to the field?				
Groundwater elevation measurements				
Measurements collected from north top of casing?				
Measurements collected to within 0.01 ft.?				
Measurements collected within a 24-hr. period prior to sampling?				
Well cap set aside in clean location (e.g., plastic bag)?				
Water level indicator decontaminated prior to measuring well?				
Free-phase hydrocarbons observed?				
Free-phase hydrocarbons measured to within 0.01 ft.?				
Free-phase hydrocarbons sampled prior to sampling groundwater?				
Total well depth measurements (applicable to five-year events)				
Depth measured using total depth gauge or rigid measuring tape?				
Depth recorded to within 0.10 ft.?				
Gauge/tape inspected for evidence of DNAPL?				
Gauge/tape decontaminated between wells?				
Well sampling using point source flexible membrane sampler				
Samplers deployed at least the day before the sample is collected?				
Samplers deployed 1-ft. below static water level or 1-ft. below top of screen, whichever is lower?				
Samples collected using manufacturer's sampling straw?				
Samplers deployed using narrow gauge nylon string (e.g., 0.01 cm)?				
Samplers properly disposed of in a plastic bag?				

TABLE 4-1 (Continued)
CHEVRON SALT LAKE REFINERY
Quality Assurance Assessment Form for Groundwater Well Sampling

Activity	Yes	No	NA/ NO[(a)]	See Comments
Sample collection				
Were the VOA bottles filled using a laminar flow?				
Were the VOA bottles capped with a positive meniscus?				
Were the sample bottles filled in the proper order?				
Sample bottles stored out of the sun and not on the ground prior to and after sampling?				
Sample bottles kept off of the ground?				
Sample bottles placed in cooler immediately after filling?				
Sampling free-phase hydrocarbons				
Free-phase samples collected before groundwater samples?				
Free-phase samples collected using poly bailer or peristaltic pump?				
Were sample bottles filled with 1/3-1/2 headspace by volume?				
Free-phase samples stored/shipped separate from GW samples?				
Trip blank samples				
Number of trip blanks equals 10% of the wells sampled?				
Trip blanks labeled as TB-1, TB-2, etc.?				
Trip blanks were supplied by the contract laboratory?				
Trip blanks accompanied the sampler to the well?				
Trip blank bottles paired the sample bottles for the well?				

TABLE 4-1 (Continued)
CHEVRON SALT LAKE REFINERY
Quality Assurance Assessment Form for Groundwater Well Sampling

Activity	Yes	No	NA/NO[(a)]	See Comments
Blind duplicate samples				
Number of blind duplicates equals 10% of the wells sampled?				
Blind duplicates labeled GW-1, GW-2 and field log forms identify the well where the duplicate was collected?				
Blind duplicate bottles paired the sample bottles for the given well?				
Sample handling procedures				
One analysis request form included in each cooler in a plastic bag?				
One original Chain-of-Custody form in each cooler in a plastic bag?				
Chain-of-Custody has all sample locations/times/dates noted for all sample bottles in a given cooler?				
Chain-of-custody relinquishment is signed and dated by the sampler?				
Sample labels appropriately fixed to bottles prior to shipment?				
Sample labels include location/date/time in indelible ink?				
Sample bottles are capped, properly filled, placed in a single layer in each cooler, and properly protected against breakage?				
Sample coolers have sufficient ice to convey samples to lab at 4C?				
A temperature blank is included in each cooler?				
One signed and dated custody seal is affixed to each cooler and taped to the cooler using clear adhesive tape?				
Field log forms				
A field form is completed for each well sampled?				
Information is complete and accurate?				
Information is legible?				
Field log is signed?				
Stop work relative to sampling procedure concerns				
Was stop work authority initiated?				

TABLE 4-1 (Continued)

CHEVRON SALT LAKE REFINERY
Quality Assurance Assessment Form for Groundwater Well Sampling

Sampling Personnel
Name - _________________ Lead Sampler Did lead sampler review QAPP prior to the performance of sampling activities? Yes □ No □ Name - _________________ Sampler Did sampler review QAPP prior to the performance of sampling activities? Yes □ No □

Comments

(a) Not Applicable or Not Observed