HollyFrontier Navajo Refining LLC
501 East Main, Artesia, New Mexico 88210
Tel: 575-748-3311
hollyfrontier.com

August 27, 2021

Ms. Teresa L. McDill
Oil Conservation Division
New Mexico Energy, Minerals & Natural Resources Department
1220 South St. Francis Drive
Santa Fe, NM 87505

RE: Modification Request and Response to Comments: Reuse Water Sales by HollyFrontier Navajo Refining LLC (Facility Number fRF00000000003)
Artesia Refinery Discharge Permit GW-028: Reuse Water
Discharge Permits UICI-8-1 and UICI-8-4 (WDW-1 and WDW-4 respectively):
Custody Transfer Locations

Dear Ms. McDill:

On February 27, 2020, HollyFrontier Navajo Refining LLC (HFNR) submitted a modification request (request) to the New Mexico Oil Conservation Division (OCD) pursuant to Water Quality Control Commission ("WQCC") Regulation 20.6.2.3107 C New Mexico Administrative Code ("NMAC"). HFNR is required to notify the Director of any facility expansion, production increase, or process modification that would result in any change in the water quality or volume of the discharge. Upon that notification, OCD concluded that administrative changes to Discharge Permit GW-028 are in order.

HFNR has made changes to the piping near the WDW-1 and WDW-4 wellheads to install custody transfer locations to divert treated refinery effluent (also referred to as oilfield non-hazardous non-exempt "Reuse Water") for sale and reuse as product by third parties solely for oil and gas exploration and production-related uses. HFNR is currently in the process of marketing the Reuse Water to multiple potential customers. The purpose of this request is to support the State of New Mexico's goal to conserve scarce fresh groundwater resources by facilitating reuse/recycling of the treated effluent, thereby reducing the demand for freshwater in the oil and gas sector.

Pursuant to GW-028 (Permit Condition 1.G), UICI-8-1, and UICI-8-4, HFNR is required to notify the OCD of any facility expansion, production increase, or process modification that would result in any significant modification in the quality of the discharge. Although this planned modification request will not change the quality or increase the quantity of the treated effluent above permitted levels, HFNR is hereby notifying OCD. Based on HFNR communications with the OCD, OCD has indicated it may handle the changes herein administratively as a request to document the equipment changes and associated custody transfer of the Reuse Water for reuse/recycling in the oilfield.

On August 22, 2019 and through various phone calls, HFNR received comments on the draft modification from OCD, and developed the following updated documents to address those comments, that were submitted on February 27, 2020:

- Attachment A - Explanation of the regulatory jurisdiction(s) and rationale for the sale of refinery Reuse Water for reuse/recycling in the oilfield;
- Attachment B - Simplified block flow diagram (B-1), Mechanical Flow Sheets for WDW-1 and WDW-4 (B-2) and example secondary containment specification sheet (B-3) for the custody transfer locations[1];
- Attachment C - Figures showing the location of wells WDW-1 and WDW-4 and associated custody transfer locations[2];
- Attachment D – Refinery Reuse Water Release Contingency Plan in the event of a release at the transfer locations and/or within the Refinery boundary;
- Attachment E – Fluids Management Plan to ensure Reuse Water is not characteristically hazardous and does not contain listed hazardous waste subject to RCRA Subtitle "C"; and
- Attachment F – Updated Secondary Reverse Osmosis (SRO) Unit figure exhibiting the RO fluids contribution to the treated effluent injected or sold (as Reuse Water) at the custody transfer locations at WDW-1 and WDW-4.

Subsequently, OCD provided a letter dated June 30, 2021 requesting submittal of a revised stand-alone Reuse Water Plan by August 30, 2021 that would combine all the above attachments in one Reuse Water Plan. A crosswalk is provided here to document the previous attachments and where in the (new) Reuse Water Plan they are located:

Original Attachment	**Reuse Water Plan**
Attachment A - Explanation of the regulatory jurisdiction(s) and rationale	Section 2, Permit Modification Request
Attachment B - Simplified block flow diagram, Mechanical Flow Sheets and example secondary containment	Figures 2-1 through 2-5
Attachment C - Figures showing the location of the wells	Figures 1-1 through 1-3
Attachment D – Refinery Reuse Water Release Contingency Plan	Section 3, Refinery Reuse Water Contingency Plan
Attachment E – Fluids Management Plan	Section 5, Fluids Management Plan, Table 5-1 and Figures 5-1 and 5-2
Attachment F – Updated Secondary Reverse Osmosis (SRO) Unit figure	Section 6, Reverse Osmosis Units and Figure 6-1

[1] OCD should note that the Mechanical Flow Sheets for WDW-1 and WDW-4 specifically relate to the operation of the wells rather than the Reuse Water sales project. However, as requested by OCD, these have been annotated to provide additional information on specific components related to the Reuse Water sales. The construction notes were removed since the wells have already been installed.
[2] GPS coordinates of the transfer locations are indicated on Figures 1-1 through 1-3.

In the June 30, 2021 letter, OCD also provided comments which are addressed in this letter (below) and in the Reuse Water Plan.

OCD Comment #1:

Confirm if the project will or will not involve any Reuse Water storage tanks. If storage tanks will be involved, please describe the tanks and secondary containment.

HFNR Response:

The project does not contemplate any storage tanks for Reuse Water. Reuse Water will be transferred via buyers' pipeline for distribution.

OCD Comment #2:

Provide additional information regarding a description and schedule for site maintenance, including a schedule for attendance by HFNR staff to prevent and/or address leaks and spills. Also, describe the planned removal and disposal of any accumulated fluids in the secondary containment areas.

HFNR Response:

Once water sales have commenced, HFNR will perform daily inspections according to a checklist, to ensure that all necessary items are inspected, any items needing attention or repair are noted and scheduled, and that the scheduled items have been addressed. The example checklist is provided as Appendix 2 to the Reuse Water Plan.

If fluids accumulate in the secondary containment, HFNR will, in conjunction with the daily inspections, pump these out and into a vacuum truck for transportation back to the Artesia refinery wastewater treatment system.

These revisions have been added to the Reuse Water Plan, in Section 4.0.

OCD Comment #3:

Please provide photographs or other graphics to show the relationship between the standard water truck and the secondary containment.

HFNR Response:

Reuse water will only be transferred for sale through piping to the buyers' distribution system(s). Water trucks will not be used in the reuse water sales transactions. Secondary containment structures have been provided around the points of transfer, as shown in the Reuse Water Plan Figures 3-2 through 3-5. Any release at the connection points (e.g., during connection or disconnect) will be collected by the secondary containment and will be vacuumed up by HFNR for transport back to the Refinery wastewater system as part of the regular inspections and maintenance.

These revisions have been added to the Reuse Water Plan, in Section 3.0.

OCD Comment #4:

Attachment E, Fluids Management Plan, indicates historical data is available to demonstrate that benzene and selenium concentrations are below their associated hazardous toxicity characteristic value. Please provide two-years of historical data to support the non-hazardous designation for the Reuse Water, and if applicable, note if any values exceeded the hazardous toxicity characteristic value.

HFNR Response:

HFNR has provided the requested data for selenium and benzene in the Reuse Water Plan, Section 5.0. No exceedances of the hazardous toxicity characteristic values were recorded for either constituent. These data are from the permit-required quarterly monitoring of the wastewater effluent per the UICI permits, which is reported to OCD quarterly and annually.

To recap what has been previously discussed with OCD, no modifications will be made to the wastewater treatment facility at the Refinery. Additional piping has been added to the existing pigging station near the WDW-1 and WDW-4 wellheads. The piping equipment includes totalizing flow meters and pressure controls to protect the pipeline. The HFNR meters will serve as the point of custody transfer of ownership of and responsibility for the Reuse Water to initial purchasers. Specifically, once the product has passed the HFNR meter (Figures 2-1, 2-2, 2-3 and 2-4), it is the property and sole responsibility of the purchaser. Secondary containment has been installed at the custody transfer locations to prevent releases of Reuse Water during piping hook-up and removal and is anchored to the ground with straps. Figures 2-3 and 2-4 show the approximate locations and configurations of the proposed secondary containment areas at custody transfer locations. The secondary containments are fabricated from ¼" steel plates, measuring 15' L x 2' W x 18" H and are coated with an impervious liner. Appendix 3 provides the Technical Data Sheets and Safety Data Sheets for the two-part liner. The custody transfer locations and associated secondary containment areas are protected from accumulation of rainwater via a covered shelter. A back-pressure relief system is installed to protect and prevent releases from occurring

in the fiberglass effluent pipeline at the custody transfer locations. If an alarm sounds indicating a possible leak, HFNR will immediately mobilize to inspect and pump out the secondary containment to prevent overflows, in addition to implementing the pipeline shutdown procedure. Additional piping equipment will also be installed downstream of the new pressure controls but will not be owned or installed by HFNR. This additional piping will allow transfer of the Reuse Water by the initial purchaser(s) to its oil and gas exploration and production customers. The purchase agreement will require buyers to obtain all applicable permits and approvals from the OCD, be the responsible party for releases/disposal downstream from the custody transfer points of WDW-1 and WDW-4, and to operate in accordance with all applicable laws and regulations.

Only the piping associated with WDW-1 and WDW-4 has been modified. The operation of WDW-1, WDW-2, WDW-3 and WDW-4 will continue unchanged (except anticipated reduction of injection volumes due to the sale of Reuse Water to buyers) to meet the requirements of the UIC permits. No change in constituents or quality is expected because of the proposed changes.

Historical refinery wastewater effluent sampling and monitoring shows that the two primary constituents of concern that could cause the Reuse Water to exhibit a hazardous characteristic are benzene and selenium. HFNR has implemented, and will continue to implement, benzene and selenium operational monitoring under the UIC Permits as well as additional controls to ensure that the Reuse Water does not meet the definition of a RCRA Subtitle "C" Hazardous Waste. The benzene monitoring includes sampling to verify that the benzene concentration in the Reuse Water to be sold is below 0.5 mg/L and therefore non-hazardous. Similarly, the selenium monitoring includes sampling to verify that Reuse Water has less than 1.0 mg/L of selenium and is non-hazardous. In addition, the Refinery will continue to follow the monitoring requirements contained in Section 2.A. of the UICI-8-1 and UICI-8-4 Permits. No listed hazardous wastes are introduced to the Refinery's wastewater treatment system; thus, the Reuse Water is not a listed hazardous waste.

Should you have any questions or comments about this notification, or need any additional information, please do not hesitate to contact me by phone at (575) 746-5487 or via email at kawika.tupou@hollyfrontier.com. I look forward to your response to our proposal and appreciate your assistance in this matter.

Sincerely,

Kawika Tupou
Environmental Manager

c: HollyFrontier: M. Holder, J. Leik

Attachments:

- HFNR Reuse Water Plan

Reuse Water Plan

August 2021

HollyFrontier Navajo Refining LLC

Discharge Permits UICI-8-1 (WDW-1) and UICI-8-4 (WDW-4)

Prepared For:

HollyFrontier Navajo Refining LLC
501 E Main Street,
Artesia, NM 88210

Prepared By:

TRC Environmental Corporation
Fort Collins, CO

HOLLYFRONTIER®

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TABLES

FIGURES

APPENDICES

Acronyms and Abbreviations

Notation	Definition
ABT	Aggressive biological treatment unit
HFNR	HollyFrontier Navajo Refining LLC
mg/L	milligrams per liter
MOV	Motor operated valve
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
OCD	Oil Conservation Division
Refinery	HollyFrontier Navajo Refining LLC Artesia Refinery
Reuse Water	Reuse of treated effluent as product
RO	Reverse osmosis
SeRT	Selenium Removal Technology unit
UIC	Underground Injection Control
WWTP	wastewater treatment plant
WQCC	Water Quality Control Commission

1.0 Introduction

This Reuse Water Plan presents the planned approach by HollyFrontier Navajo Refining LLC (HFNR) to allow reuse of some its wastewater generated at its Artesia, New Mexico, Refinery (Refinery) that would otherwise be disposed of via deep-well injection. The information previously provided to OCD on February 27, 2020 and consolidated, as requested, into this Reuse Water Plan is being submitted to allow modification of the Refinery's Discharge Permit No. GW-028 issued by the Energy, Minerals and Natural Resources Department, Oil Conservation Division (OCD), as further explained below.

HFNR operates four (4) underground injection control (UIC) wells designated as Waste Disposal Wells WDW-1, WDW-2, WDW-3, and WDW-4 used to dispose of non-hazardous oil field waste fluids, including wastewaters. HFNR maintains permits issued by the OCD (Permit Nos. UICI-8-1 through UICI-8-4) to allow the use of these wells for deep-well disposal, primarily for treated effluent from HFNR's wastewater treatment plant (WWTP). HFNR also maintains a discharge permit issued by the OCD (Discharge Permit No. GW-028) for managing the reject water from its reverse osmosis (RO) units. The RO reject water historically was land applied via spray irrigation, but since 2018 has been comingled with the treated effluent from the WWTP for deep well injection.

Because HFNR plans to divert some of its wastewater from deep well injection at the wellhead so that it can be reused, Discharge Permit GW-028 must be modified to accommodate the change. This Reuse Water Plan outlines the steps that HFNR is proposing to allow reuse of some treated effluent (Reuse Water) via piping diversions from two of the UIC wells (WDW-1 and WDW-4). Instead of being deep-well injected, the diverted effluent will be sold to the oil and gas exploration and production industry for reuse in its operations. HFNR's UIC wells are located east of its Artesia, New Mexico, refinery (Refinery), as shown in Figure 1-1. Figures 1-2 and 1-3 show the locations and GPS coordinates of the two subject UIC wells and the proposed transfer points. The remaining sections of this Reuse Water Plan provide more details about the proposed changes and how operations, maintenance and monitoring will be performed to ensure protection of human health and the environment.

2.0 Permit Modification Request

Pursuant to the Water Quality Act, New Mexico Statues Annotated 1978, Sections 74-6-1 et seq. and the Ground and Surface Water Protection regulations, 20.6.2 New Mexico Administrative Code (NMAC), HFNR provides notice to the OCD of its proposed permit modification to alter the location of an existing water discharge from its Artesia Refinery (Refinery), which is regulated under Discharge Permit GW-028 and 20.6.2.1201(A) NMAC. HFNR has made changes to the piping near the WDW-1 and WDW-4 wellheads to allow the Refinery to make the necessary equipment changes to divert some of its treated effluent from the injection wells to customers through custody transfer locations. These customers will purchase the Reuse Water from HFNR and reuse it solely for oil and gas exploration and production purposes in lieu of fresh water or other water products. No modifications will be made to the existing WWTP at the Refinery. Additional piping has been added to the existing pigging station near the WDW-1 and WDW-4 wellheads. Figures 2-1 and 2-2 show the existing and modified well configurations for WDW-1 and WDW-4 that will facilitate reuse water sales to HFNR's customers. Appendix 1 provides photographs of the configurations for the WDW-1 and WDW-2 transfer points. The piping equipment includes totalizing flow meters and pressure controls to protect the pipeline. Figures 2-3 and 2-4 provide the mechanical flow sheets for

WDW-1 and WDW-4. The HFNR water sales meters will serve as the location of transfer of ownership of the Reuse Water. Specifically, Reuse Water that has passed through the HFNR water sales meters becomes the property and responsibility of the purchaser. Secondary containment has been installed by HFNR at the transfer locations to catch potential releases (if any) of Reuse Water during customer piping hook-up and disconnect from this piping. The containment(s), which consist of prefabricated steel catch basins (15'L X 2' W X 18' H) with an impervious liner (liner specifications are provided in Appendix 3) are anchored to the ground with straps and protected from rainfall by a shelter. Additional piping equipment will also be installed downstream of the new pressure controls but will not be owned or installed by HFNR. This additional piping will allow transfer of the Reuse Water by the purchasers to their third-party oil and gas exploration and production customers.

HFNR has consolidated the previously submitted Release Contingency Plan (Section 3) and Fluids Management Plan (Section 5) into this Reuse Water Plan and has included Reuse Water Transfer Procedures (Section 4), to support management of the sales of Reuse Water from the Refinery. The Release Contingency Plan provides for alarms, immediate response, proper reporting, remediation, and maintenance follow-up, should a release occur. Unauthorized personnel will not have access to the custody transfer equipment. The equipment that will monitor and control the transfer of Reuse Water to initial purchasers will be totally enclosed inside a fenced area, equipped with secondary containment, and protected from rainfall. Only Refinery personnel will have the ability to enter. Entry will be controlled by HFNR and thus, unauthorized releases or transfers are not likely to occur. Releases prior to the custody transfer locations (i.e., the HFNR meters) and/or on HFNR property are the responsibility of HFNR, to be handled under the WDW-1 and/or WDW-4 UIC Water Quality Control Commission (WQCC) Permits.[1] Releases downstream from the custody transfer locations are the responsibility of the initial purchaser and/or the third-party customer. The Reuse Water Transfer Procedures provide the steps by which the transfers will be performed. The Fluids Management Plan ensures the proper oversight of fluids with hazardous constituents (even though constituent levels are well below hazardous standards).

Only the piping associated with WDW-1 and WDW-4 has been modified. The operation of WDW-1, WDW-2, WDW-3 and WDW-4 will continue to meet the requirements of the UIC permits, including the submittal of quarterly environmental analytical laboratory monitoring data results and notification to the OCD in the event the Reuse Water is determined to be subject to RCRA Subtitle C Hazardous Waste regulations. No change in effluent constituents or quality is expected due to the proposed change request.

Modification of GW-028 (without public notice) is permissible by OCD under Section 20.6.2.3109 G. NMAC and Condition 1.G of the Discharge Permit because Reuse Water product sales do not trigger the requirements of a formal Modification under the WQCC Regulations. HFNR has provided appropriate notice to OCD in accordance with the terms of GW-028 and the UIC Permits, and the OCD has the authority under the regulation cited above to apply modifications that are requested by the discharger or to modify GW-028 or the UIC Permits as required by the Director.

[1] OCD has been granted the authority by statute and delegation from the New Mexico Environment Department, WQCC, to administer the Water Quality Act Chapter 74 Article 6 NMSA 1978 as it applies to Class 1 non-hazardous waste injection wells.

3.0 Refinery Reuse Water Contingency Plan

In the event of a pipeline release of the Refinery's Reuse Water, the following steps are to be followed. These steps are generally sequential, following the OCD C-141 Form process, but can overlap, as needed.

1. If an alarm sounds indicating an increase in pipeline effluent flow or for low pipeline pressure, utilize the Refinery's pipeline shutdown procedure.
2. Close motor operated valves (MOVs) located along the pipeline in order to isolate the pipeline and decrease the volume of Reuse Water released.
3. Immediately notify HFNR Maintenance Department and Environmental Department for prompt mobilization to inspect, identify potential causes and location(s), and mitigate releases at pipeline and custody transfer station.
    a. HFNR Maintenance Department shall inspect and identify cause(s) of any release, identify needed repairs of HFNR pipeline and equipment, and initiate immediate response and repairs as soon as practicable.
    b. HFNR Environmental Department shall inspect and determine: (i) release reporting, including verbal notifications and OCD Form C-141 (as applicable); (ii) immediate measures, as appropriate, to control and/or contain released fluids; and (iii) steps to investigate and remediate impacted soils, as described below.
4. Action Based Upon Release Location.
    a. At Custody Transfer Location. If the release is at the custody transfer location, HFNR will mobilize to pump out the secondary containment to prevent overflows.
    b. Before Custody Transfer Location. If the release is along the pipeline (prior to the custody transfer location), HFNR will follow its standard procedures for release reporting and mitigation (including use of the C-141 Form).
    c. After Custody Transfer Location on HFNR Property. Releases occurring past the point of custody transfer and on HFNR property are the contractual responsibility of the Reuse Water initial purchaser. However, HFNR will notify the OCD of the discovery of any such releases to the extent required per Condition 2.C of the Refinery's Groundwater Discharge Permit (GW-28) and 20.6.2.1203 NMAC through submission of a "Discovery" Form C-141 (Initial Release Notification). HFNR will work with the OCD and the responsible initial purchaser to ensure that the release is reported, addressed through immediate measures, as appropriate, to control and/or contain released fluids, and impacted soils investigated and remediated.
    d. After Custody Transfer Location Off HFNR Property. Releases occurring past the point of custody transfer and not on HFNR property are the contractual responsibility of the Reuse Water initial purchaser. In the event that HFNR has first-hand knowledge of such releases, HFNR will notify the OCD of the discovery of any such releases to the extent required under 20.6.2.1203 NMAC and provide contact information for the responsible initial purchaser through submission of a "Discovery" Form C-141 (Initial Release Notification).
5. Permitting:
    a. Notify One-call to initiate excavation for pipeline repairs.
    b. Identify and complete, as applicable, the Refinery's required Excavation Permitting and Safe Work Permitting (e.g., confined space).

6. Promptly secure area of release and commence and complete equipment repairs safely and expeditiously.
7. Following repairs, conduct Pre-startup Safety Review.
8. Following Pre-startup Safety Review, start up the Reuse Water pipeline using the startup procedure to place the line back in service.
9. Address surface impacts as applicable in conjunction with OCD via the C-141 process in accordance with this Contingency Plan.
10. Submit the final C-141 Form with remediation details to OCD for review in accordance with this Contingency Plan.

4.0 Reuse Water Transfer Procedures

The following procedures cover the steps for discontinuing the injection of treated effluent water into the injection wells and initiating Reuse Water transfer. These steps are summarized below:

1. To start pumping water to Customer, slowly lower effluent pipeline pressure by opening spillbacks to Tank 809 (809 TK).
2. Open MOV 80MOV201 to start sending water to Customer.
3. Start closing the MOV's to all Injection Wells.
4. Shut down the Booster Pumps for each well as the MOV is closing.
5. Adjust spillbacks as needed to maintain effluent pipeline pressure.
6. To stop pumping water to Customer, open MOV's to the Injection Wells.
7. When the MOV's are OPEN, close 80MOV201 to Customer.
8. Start slowly closing spillbacks to increase effluent pipeline pressure back up to normal.
9. Start Booster Pumps at Injection Wells.
10. Monitor the differential pressure on the Well Filters and notify the HFNR Maintenance Department if any filters need to be changed.

In addition to the Reuse Water transfer procedures, a Reuse Water Well Site Inspection Checklist has been developed and is provided as Appendix 2.

5.0 Fluids Management Plan

HFNR has two constituents of concern in the Refinery's treated effluent – selenium and benzene.

Selenium:

- Managed by a primary process, the Selenium Removal Technology unit (SeRT) treats water prior to introduction to the WWTP. High selenium water streams are routed through this filtration unit to remove selenium.
- Ferric chloride injection is a secondary treatment or backup for any operational issues with the SeRT. This is a simple chemical addition (small chemical pump) that is located upstream of the secondary clarifier unit in the WWTP.
- From quarterly monitoring of the wastewater effluent data, the wastewater effluent selenium concentration is generally 10% of the hazardous toxicity characteristic value (1.0 milligrams per liter [mg/L]). On-going selenium monitoring includes sampling to

verify that the effluent/Reuse Water has less than 1.0 mg/L of selenium and is non-hazardous.

- Saturation of the SeRT media occurs very slowly and is monitored to ensure continued selenium removal. The use of the SeRT, in conjunction with the ferric chloride injection, process knowledge based on a large body of historical data, and the current permit-required monitoring program is sufficient to prevent the release of selenium hazardous wastewater/Reuse Water.

Benzene:

- HFNR is currently batch treating wastewater in two aggressive biological treatment units (ABTs).
- Wastewater is tested in the ABTs during treatment and is retained and treated until the effluent benzene concentration is below the hazardous toxicity characteristic value (0.5 mg/L). A large body of historical data also supports the use of process knowledge in determining if operation of the WWTP and ABTs is sufficient to meet discharge levels. HFNR also utilizes carbon filtration post-ABT for additional benzene removal on an as needed basis.

Refinery wastewater is sampled regularly per Section 2.A of the UICI-8-1 (WDW-1) and UICI-8-4 (WDW-4) WQCC Discharge Permits to ensure wastewater either injected into an injection well or sold as Reuse Water to an initial purchaser(s) or third-party purchaser(s) is NOT characteristically hazardous. No listed wastes are introduced to the Refinery's wastewater treatment system; thus, the Reuse Water is not a listed hazardous waste. In addition, HFNR has a large amount of historical data from permit-required sampling that confirms the non-hazardous designation for the Reuse Water and supports the use of process knowledge for its continued characterization in conjunction with the required sampling.

In accordance with Section 2.C of the GW-28 Discharge Permit, HFNR will notify OCD, NMED, and the Buyer immediately or within 24 hours if sample test results determine that the effluent or Reuse Water is characteristically hazardous under RCRA Subtitle "C". The injection well discharge permits shall dictate the terms of injection if effluent or Reuse Water is discovered to be characteristically hazardous at the transfer locations. Flow through the custody transfer location shall cease immediately upon discovery of characteristically hazardous constituent levels in the Reuse Water (e.g., through notification by Buyer or determination by HFNR) and shall not resume until the Reuse Water is verified to the OCD as non-hazardous. The Reuse Water will be sampled immediately upon notification/discovery at the sample point located at the transfer location. The C-141 Form shall be used to document discoveries similar to those required for a release. HFNR (the seller) shall notify the purchaser(s) immediately, upon having knowledge and/or upon receipt of test results that the Reuse Water contains constituents at a characteristically hazardous level. The parties shall immediately comply with RCRA Subtitle "C."

Figures 5-1 and 5-2 provide the last approximately three (3) years of Selenium and Benzene data for the treated effluent, which is collected at the exit of Tank 809 Pipeline Surge Tank, prior to being piped to the injection wells.

Table 5-1. Quarterly Selenium and Benzene Data

WDW-1,2,3 &4 SAMPLE DATE	Result (mg/L)	
	Benzene	Selenium
03/26/19	0.024	0.04
06/26/19	<0.00017	<0.035
09/30/19	0.19	<0.18
12/30/19	<0.00017	0.13
03/29/20	<0.00023	<0.021
06/30/20	<0.00023	<0.021
09/24/20	<0.00023	0.027
01/22/21	<0.00023	0.082
03/21/21	<0.00023	<0.021

Note: Less than ("<") values are reported as less than the method detection limit (MDL)

6.0 Reverse Osmosis Units

Discharge Permit No. GW-028 issued by the OCD regulates the management and disposal of the reject water from the Refinery's RO units. This section of the Reuse Water Plan summarizes the operation of the RO units and the general makeup of the reject water covered by Discharge Permit No. GW-028. HFNR operates three (3) RO units to remove dissolved solids from incoming fresh water by passing high-pressure feed water through a series of filter elements that contain a semipermeable RO membrane (Figure 6-1 provides a process schematic). This membrane prevents large molecules, or dissolved solids, from passing through the membrane, but does allow smaller water molecules to pass through the membrane. The clean water then becomes the RO permeate, or product water (suitable for use in critical needs for boiler steam generation and cooling tower operation), while the concentrated, dissolved solids in the feed water becomes the RO concentrate, or reject water. Each of the Refinery's RO units function similarly in the pre-treatment of fresh groundwater.

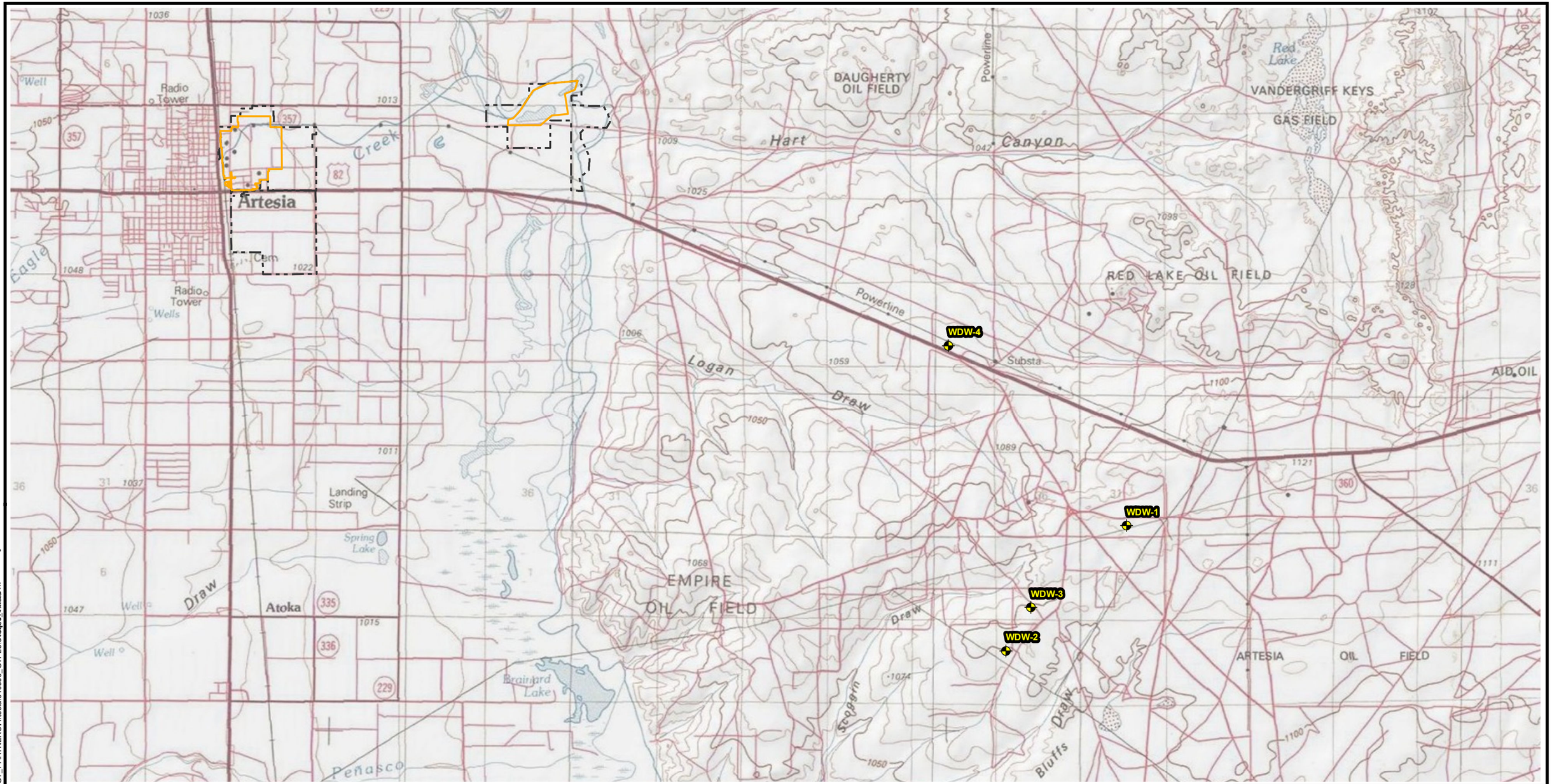
The volume of reject water generation depends on the recovery percentage of the clean water. Typically, RO systems are designed to operate at 75% recovery, though the achievable percent recovery is dependent on several factors and, consequently, can vary. In practice, recovery percentages vary based upon the quality of the incoming water, system design, and other operational factors; however, a minimum concentrate, or reject water discharge, flow rate must always be maintained to effectively remove the concentrated dissolved solids from the system.

The minimum concentrate flow rate is determined by the minimum velocity requirements of the membrane manufacturer and the design of the system arrays. RO systems are designed to operate at a specific rate of permeate production and require a minimum concentrate flow to achieve this permeate production level. The percent recovery is achieved by setting the concentrate flow rate. A concentrate flow that is too low will lead to scaling and deposition on the membrane surface; a concentrate flow rate that is too high will decrease the amount and quality of the permeate water produced. In summary, the concentrate flow, or reject water discharge volume, should be maintained at a volume equal to or greater than the minimum volume required for efficient operation of the system, i.e., concentrate flow cannot be lowered with the sole purpose of minimizing reject water discharge volumes.

More detailed process information was previously provided to OCD in Attachment 3 of Navajo's Application for Modification of Discharge Permit GW-028 (May 22, 2015), to increase the volume of RO fluids authorized for land application. The May 2015 permit modification request package contains a technical summary of the RO water treatment process that generates the RO reject fluids and process drawings that depict the RO units' pump and vessel skid layouts, instrumentation and controls, and plot plans.

On December 17, 2018, HFNR notified OCD of the equipment changes associated with the secondary RO system to eliminate surface discharge of RO reject water and route that water to the permitted injection wells. OCD responded with approval of the equipment changes on January 18, 2019 via email.

Figures



LEGEND

- UIC WELLS
- REFINERY FENCELINE
- FACILITY PROPERTY BOUNDARY (FENCELINE SHOWN WHERE COINCIDENT)

SOURCE: USGS TOPO QUADS (SPRING LAKE, NM; RED LAKE, NM; ILLINOIS CAMP, NM; DAYTON, NM; LAKE MCMILLAN N, NM).

N W E S

0 6,000 12,000 Feet

1 " = 6,000 '
1:72,000

PROJECT:
HOLLYFRONTIER NAVAJO REFINERY LLC
ARTESIA REFINERY, EDDY COUNTY, NEW MEXICO

TITLE:
UIC WELLS

DRAWN BY:	M. HORN	PROJ. NO.:	349393
CHECKED BY:	C. SMITH		
APPROVED BY:	C. SMITH		**FIGURE 1-1**
DATE:	DECEMBER 2019		

TRC
505 East Huntland Drive
Suite #250
Austin, TX 78752
Phone: 512.329.6080

FILE NO.: 349393_1.mxd

TRC - GIS
Plot Date: 12/10/2019, 12:52:11 PM by MHORN -- LAYOUT: ANSI B (11"x17")
Path: \\employees\gis\GIS\1-PROJECTS\HOLLY_ENERGY_PARTNERS\Artesia\349393_GW-28\Maps\
Coordinate System: NAD 1983 2011 StatePlane New Mexico East FIPS 3001 Ft US (Foot US)
Map Rotation: 0

LEGEND

- TRANSFER LOCATION
- UIC WELL

TRANSFER LOCATION: -104.214149, 32.785043 WDW-1: -104.213953, 32.785228

N
W E
S

0 100 200 Feet

1 " = 100 '
1:1,200

BASEMAP IMAGERY FROM GOOGLE AND THEIR DATA PARTNERS (12/30/2016).

PROJECT:
HOLLYFRONTIER NAVAJO REFINERY LLC
ARTESIA REFINERY, EDDY COUNTY, NEW MEXICO

TITLE:
WDW-1 METER LOCATION

DRAWN BY:	M. HORN	PROJ. NO.:	349393
CHECKED BY:	C. SMITH		
APPROVED BY:	C. SMITH		**FIGURE 1-2**
DATE:	DECEMBER 2019		

TRC
505 East Huntland Drive
Suite #250
Austin, TX 78752
Phone: 512.329.6080

FILE NO.: 349393_2.mxd

Plot Date: 12/10/2019, 12:19:49 PM by MHORN -- LAYOUT: ANSI B(11"x17")
Path: \\employees\gis\GIS\1-PROJECTS\HOLLY_ENERGY_PARTNERS\Artesia\349393_GW-28\Maps\349393_2.mxd
Coordinate System: NAD 1983 2011 StatePlane New Mexico East FIPS 3001 Ft US (Foot US)
Map Rotation: 0
TRC - GIS

LEGEND

TRANSFER LOCATION

UIC WELL

TRANSFER LOCATION: -104.25017, 32.816042 WDW-4: -104.249967, 32.816029

N
W
E
S

0 75 150 Feet

1 " = 75 '
1:900

BASEMAP IMAGERY FROM GOOGLE AND THEIR DATA PARTNERS (12/30/2016).

PROJECT: HOLLYFRONTIER NAVAJO REFINERY LLC ARTESIA REFINERY, EDDY COUNTY, NEW MEXICO	
TITLE: WDW-4 METER LOCATION	
DRAWN BY: M. HORN	PROJ. NO.: 349393
CHECKED BY: C. SMITH	FIGURE 1-3
APPROVED BY: C. SMITH	
DATE: DECEMBER 2019	
TRC	505 East Huntland Drive Suite #250 Austin, TX 78752 Phone: 512.329.6080
FILE NO.:	349393_3.mxd

TRC - GIS

Plot Date: 12/10/2019, 12:14:32 PM by MHORN -- LAYOUT: ANSI B(11"x17")
Path: \\employees\gis\GIS\1-PROJECTS\HOLLY_ENERGY_PARTNERS\Artesia\349393_GW-28\349393_3.mxd
Coordinate System: NAD 1983 2011 StatePlane New Mexico East FIPS 3001 Ft US (Foot US)
Map Rotation: 0

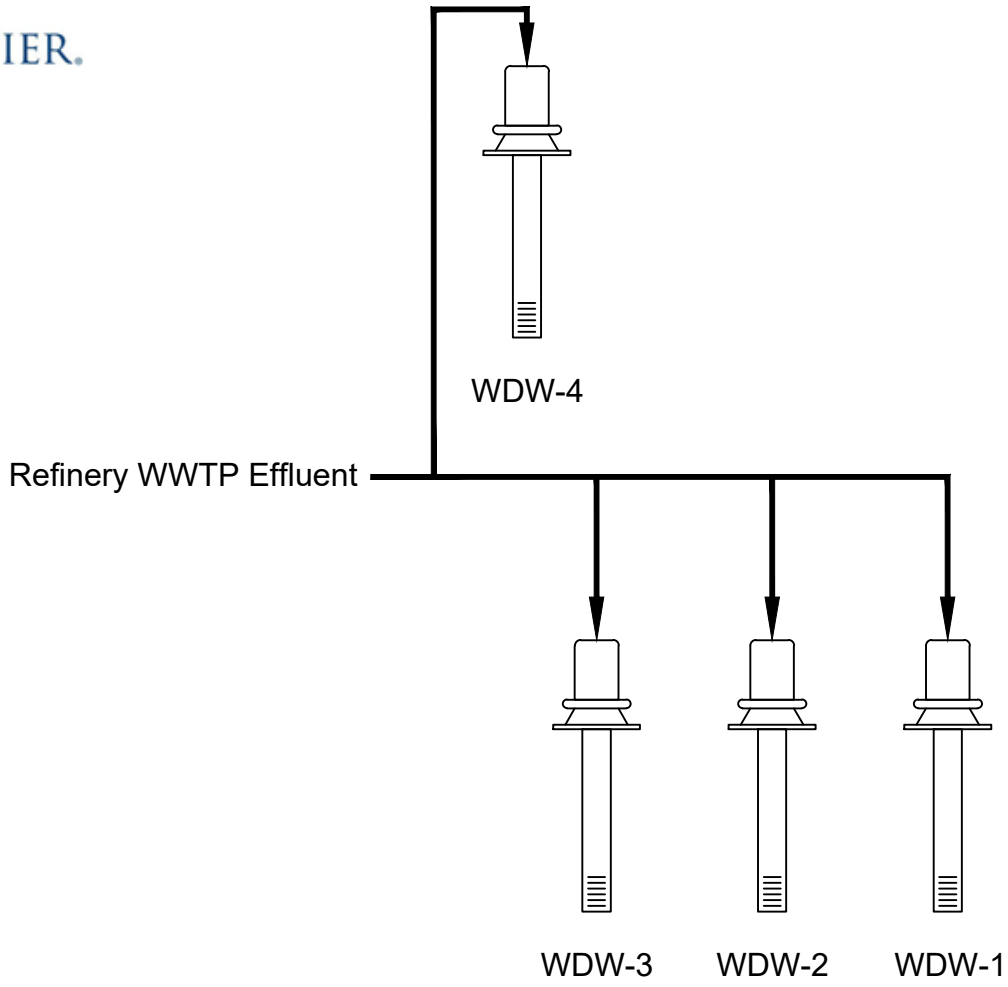


Figure 2-1. Existing Wells Configuration

FILE: J:\HOLLY FRONTIER\TULSA\2208853\2019\2208532019.01.DWG

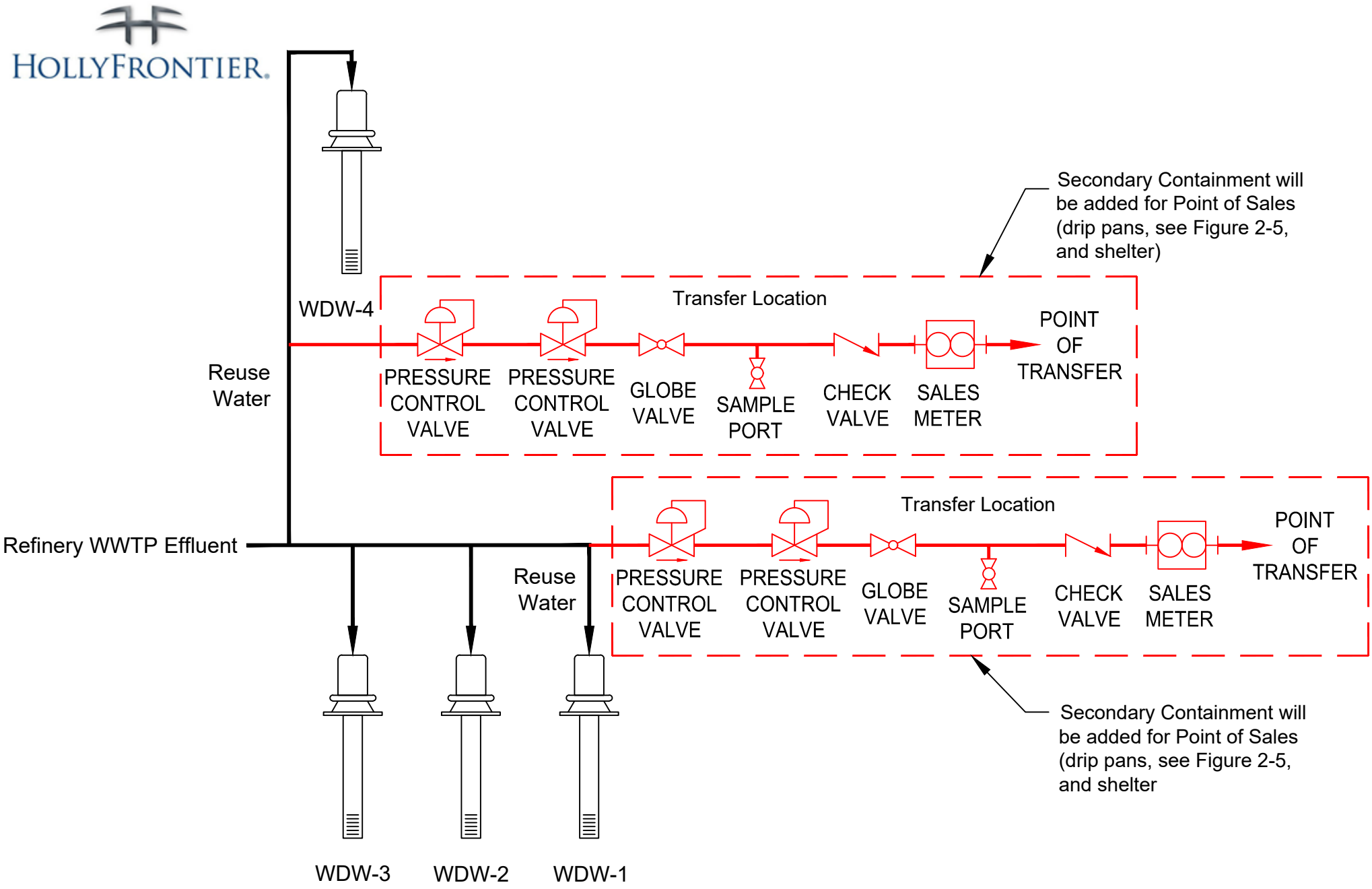


Figure 2-2. Modified Wells Configuration

FILE: J:\HOLLY FRONTIER\TULSA\2208853\2019\2208532019.01.DWG

T-0454 WELL MONITOR TANK

SIZE: _____
VOLUME: _____gallons
DESIGN: _____psig @ _____°F
OPER: _____psig @ _____°F
MATERIAL: _____
CODE: _____
NAT'L BD: _____

P-8018/M-8018 WELL MONITOR PUMP

MFR: _____ MODEL/SIZE: _____
MAT'L: CASE: _____ IMPELLER: _____
OPER. FLOW: _____ gpm @ _____°F
NPSHR: _____FT. NPSHA: _____FT.
SG: _____ DIFF: _____FT. _____psig
MOTOR DATA: _____ HP _____ RPM _____ SF
SEALS: _____ DEAD HEAD: _____FT.

D-8005/D-8006 FILTERS

SIZE: _____
VOLUME: _____gallons
DESIGN 1440@125psig @ -20° °F
OPER: _____psig @ _____°F
MATERIAL: CARBON STL
CODE: ASME CODE DES. & U STAMP
NAT'L BD: _____
CORR ALLOW .032"
TEST PRESS 1872 PSIG

1 P-8019/M-8019 INJECTION WELL #4 PUMP

MFR: _____ MODEL/SIZE: _____
MAT'L: CASE: _____ IMPELLER: _____
OPER. FLOW: _____gpm @ _____°F
NPSHR: _____FT. NPSHA: _____FT.
SG: _____ DIFF: _____FT. _____psig
MOTOR DATA: _____ HP _____ RPM _____ SF
SEALS: _____ DEAD HEAD: _____FT.

Figure 2-3 - Mechanical Flow Sheet (1)

8-WT-80050-E-D2-1 8" 8" 8-WT-80050-N-D37-1 8" 8" 8-WT-80050-E-D2-1
TP 01 N E
ABOVE GRADE BELOW GRADE ABOVE GRADE
8-WT-80050-N-D37-1 EXIST'G FROM PLANT BELOW GRADE
TO GAINES, CHUKKA FEDERAL AND MEWBOURNE WELLS
D37-1 D2-1 D2-1 D37-1
D37-1 D2-1

HS 500 | HS 501 | TI 500 | FI 500
LAH 500 | LAL 500 | LAHH 500 | LI 500
LALL 500 | DPI 500 | PI 501 | PAH 501
PAL 501 | PI 506

MODBUS TO FCC CONTROL ROOM
DCS UPLINK
RADIO SIGNAL TO DCS PLC SUPPLIED BY ESA
PLC COMPACT LOGIC 632E MOTOROLA RADIO

PI 506 | PT 506 | 3/4"
DPT 501 | 3/4" | 8"x6" | ZSC 501 | ZSO 501 | HS 501 | 3/4" | M | MOV 501 | 6" 600
1"x1/4" | 6" 600 | 1" | D-8005 | 2"x1" | 1"
6-WT-80051-E-D2-1
ZSC 500 | ZSO 500 | HS 500 | MOV 500 | M | 6" 600
1"x1/4" | 6" 600 | 1" | D-8006 | 2"x1" | 1"
6-WT-80053-E-D2-1
3/4" | 3/4"
TT 500 | TE 500 | TW 500
FT 500 | 6" | FE 500
PZC 505 | PZC 506

LSL500 | LSH 500 | LG | LSLL 500 | T-0454 | LT 500 | SOL
PS HIGH | PS HLOW | PG501 | PT501
LOCAL PANEL
P-8019 M-8019
P-8018 M-8018

4" PV 506
6-WT-80052-E-D2-1
6" | 6"x4" | 6"x4" | 6" | 3/4" | 3/4" | 6" | 3/4" | 6"x4" | 6" | 6" | D2-1 | E2-1 | 6" | FUTURE PUMP | 6-WT-80052-E-E2-1 | 3/4" | PT500 | 6" W.V.
SECONDARY CONTAINMENT
WELL #4
Check valve to prevent backpressure on pipeline
Transfer Location
S.S. TUBING
PCV XXX | PCV | 3 | SALES METER | TO CUSTOMER | 2
Two stage pressure control to reduce pressure prior to Point of Transfer
Sample Point

NOTES

1.) UNLESS OTHERWISE NOTED, BULL PLUGS ARE REQUIRED FOR ALL ¾" & ½" DRAIN, VENT & BLEEDER VALVES PER NRC POLICY AND ARE NOT SHOWN.

REFERENCE DRAWINGS

DOCUMENT UNCONTROLLED IF PRINTED

NO.	REVISIONS	BY	CHK	DATE	APPR	APPR
3	REVISED TO ADD PCV AND VALVES	DJB		11/26/19		
2	REVISED PER DRF #19-084 (REB) COMMENTS	RRK		9/5/19		
1	REVISED PER DRF# 19-013 (GKD)	RRK		1/28/19		
0	DRF# 18-093 FOR I.F.C. (GKD)	WDC		10/24/18	JM	

DRAWING TITLE

MECHANICAL FLOW SHEET
WASTEWATER TREATMENT
INJ. WELL #4
UNIT 80

NAVAJO REFINING CO.
ENGINEERING DEPARTMENT
P.O. DRAWER 159
ARTESIA, NEW MEXICO

DRAWN BY	CHKD BY	SCALE	
DGJ		NONE	
DATE	APPR BY	DRAWING NUMBER	REV.
9/13/17		80-V-02-D-14	3

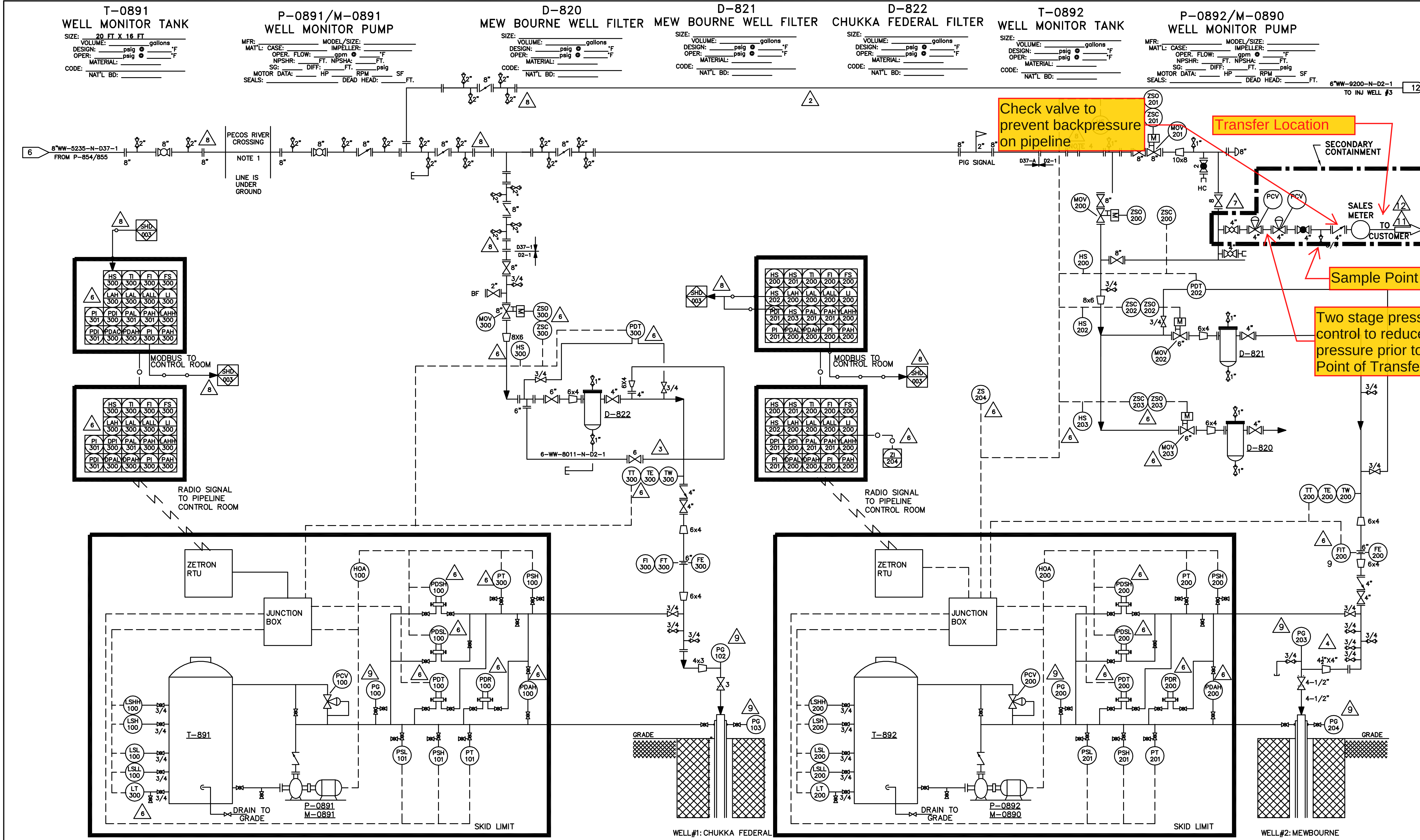


Figure 2-4 Mechanical Flow Sheet (2)

NOTES

1.) RIVER AT REFERENCE 27,250', ELEVATION 3268'.
2.) GAINES BANCH REFERENCE 64,458', ELEVATION 3606'.
3.) CHUKKA BRANCH REFERENCE 66,424', ELEVATION 3612'. 8
4.) MEWBOURNE REFERENCE 78,440', ELEVATION 3680'.
5.) SHD003 WILL ONLY ALARM WHEN PIPLINE SHUTDOWN CONDITIONS ARE MET. WHEN THE SHUTDOWN ALARMS PUMPS P-857/856/854/849 ARE TO BE SHUTDOWN.
6.) NOTE, UNLESS OTHERWISE NOTED, BULL PLUGS ARE REQUIRED FOR ALL ¾" AND ½" DRAIN, VENT AND BLEEDER VALVES PER NRC POLICY AND ARE NOT SHOWN.

REFERENCE DRAWINGS

DOCUMENT UNCONTROLLED IF PRINTED

NO.	REVISIONS	BY	CHK.	DATE	APPR.	APPR.
12	REVISED TO ADD ADDITIONAL PCV AND VALVES	DJB		11/26/19		
11	REVISED PER DRF #19-084 (REB) COMMENTS	RRK		9/5/19		
10	REVISED PER FIELD WALKDOWN(MC)	JRP		11/17/14		
9	REVISED PER MAINT. DATA STREAM UPDATE	RRK		8/14/14		

NO.	REVISIONS	BY	CHK.	DATE	APPR.	APPR.
8	AS-BUILT PER M2011807-001 (JDE)	JNB	JDE	8/02/11	JDE	
7	AS-BUILT PER M2011578-001	YSF		8/10/11		
6	REVISED PER MSW RED LINES	JNB		02/11		
5	AS-BUILT PER M2010457-001	YSF		01/11		
4	M2010335-001 AS-BUILT PER JDE	DGJ		11/10		
3	REVISED PER MOC M2009089-001	DGJ		8/09		
2	UPDATED PER RFC 26180 INJ WELL #3	RDJ		11/06		
1	UPDATED PER JLH	DGJ		6/04		
0	ISSUED FOR REVIEW AND COMMENTS	JLM		6/99		

DRAWING TITLE

MECHANICAL FLOW SHEET

WASTEWATER TREATMENT

NAVAJO REFINING CO.
ENGINEERING DEPARTMENT
P.O. DRAWER 159
ARTESIA, NEW MEXICO

DRAWN BY	CHK'D BY	SCALE
JLM	DBK	NONE

DATE	APPR BY	DRAWING NUMBER	REV.
5/23/99		80-V-02-D-08	12

Figure 5-1. Quarterly Selenium Data

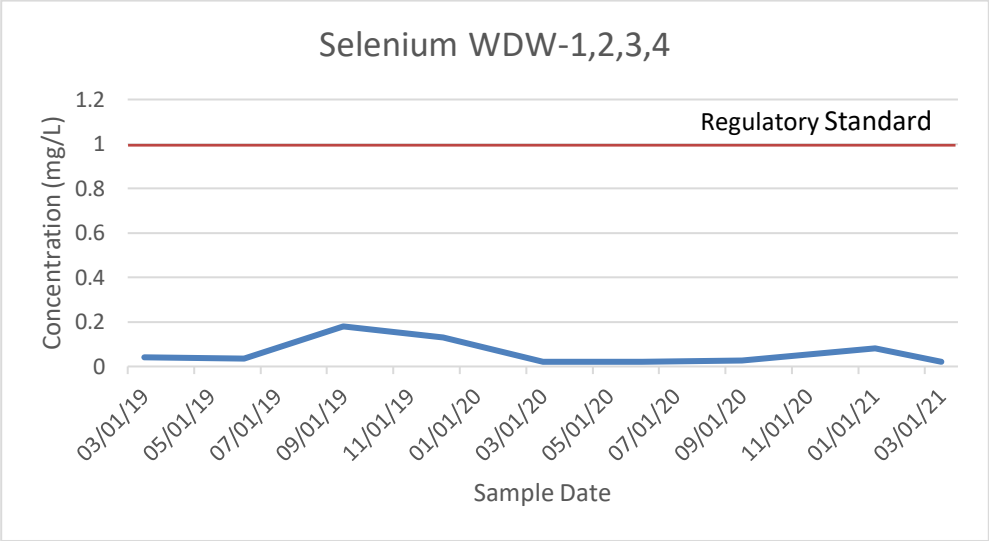


Figure 5-2. Quarterly Benzene Data

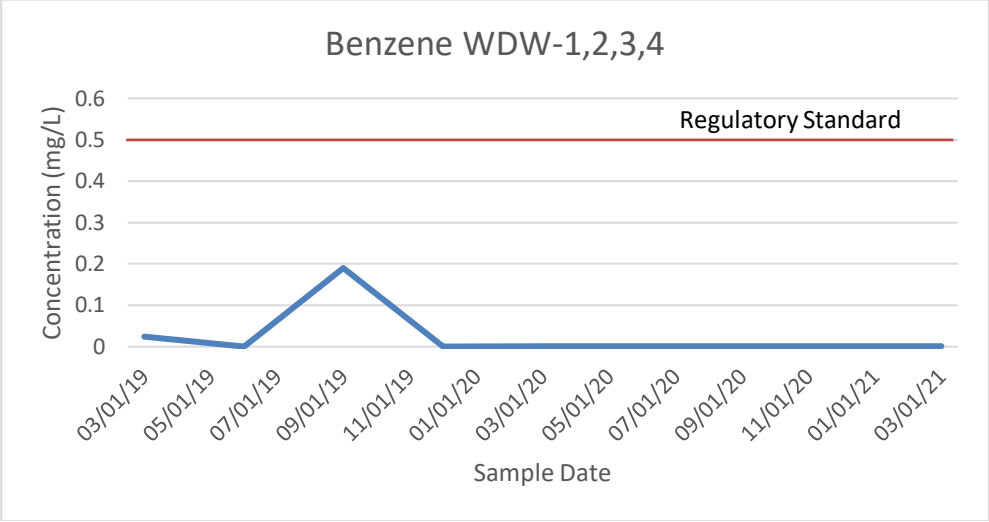
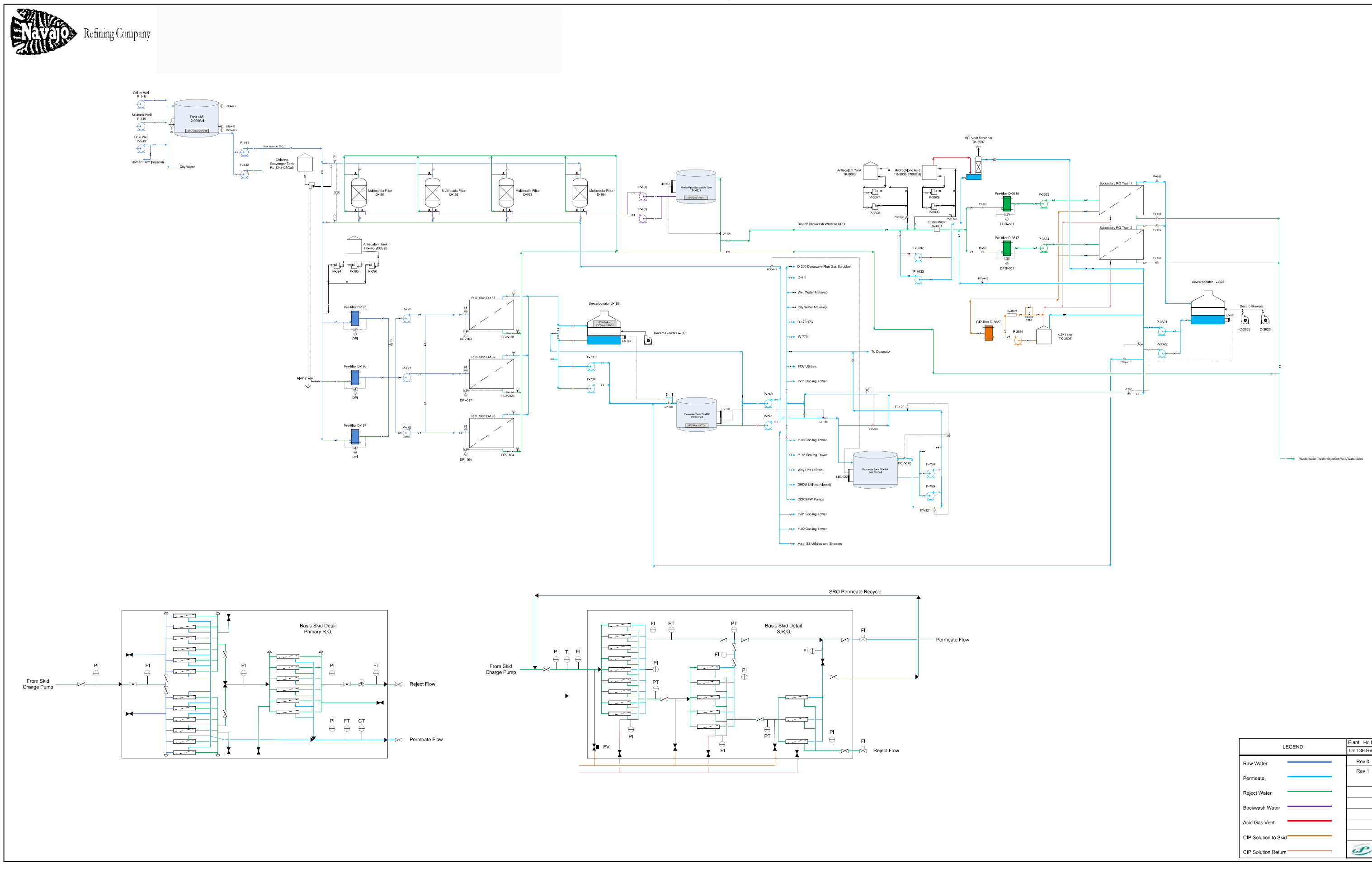


Figure 6-1. Reverse Osmosis Units



Equipment

Acronym	Description
A	Mixer
C	Compressor
CT	Cooling Tower
D	Drum
D	Diameter
Gal	Gallon
H	Height
P	Pump
T	Tank
TK	Tank (used interchangeably with T)
W	Tower
Y	Cooling Tower

Instrumentation

Acronym	Description
AI	Analyzer Indicator
ΔP	Delta P (Differential Pressure)
DPI	Differential Pressure Indicator
DPIT	Differential Pressure Indicator Transmitter
FDC	Flow Differential Controller
FI	Flow Indicator
FT	Flow Transmitter
FV	Flow Valve (Control Valve)
FY	Flow Valve (Control Valve)
LG	Level Gauge (Local Indication)
LIC	Level Indicator Controller
LSH	Level Switch High
LSL	Level Switch Low
LSLL	Level Switch Low Low
LT	Level Transmitter
LV	Level Valve (Control Valve)
P	Pressure Transmitter (error- should be PT)
PDIT	Pressure Differential Indicator Transmitter
PI	Pressure Indicator
PIC	Pressure Indicator Controller
PT	Pressure Transmitter
PTC	Pressure Transmitter Controller
Σ	Totalizer
TCV	Temperature Control Valve

Process Unit/Stream

Acronym	Description
BFW	Boiler Feed Water
CCR	Continuous Catalytic Reformer (Process Unit)
DHDU	Diesel Hydrodesulfurization Unit (Process Unit)
FCC	Fluidized Catalytic Cracker (Process Unit)
RO	Reverse Osmosis
SRO	Secondary Reverse Osmosis
SS	South Side (South Plant)

Notes/Chemical/Other

Acronym	Description
CIP	Clean in Place
HCl	Hydrochloric Acid
RL	RL-124 - Chlorine Scavenger Chemical
TK	TK-448 - Antiscalant Chemical

Figure 6-1. SRO Equipment Acronym List

Appendix 1. WDW-1 and WDW-2 Photographs

WDW-1

Photograph 1. Main Cage View

Photograph 2. Main Cage View (Side)

Photograph 3. Main Cage View (Front)

Photograph 4. Transfer Point Access Point, with Secondary Containment

Photograph 5. Cage Access Door

Photograph 6. Transfer Equipment and Secondary Containment

WDW-4

Photograph 1. Main Cage View

Photograph 2. Transfer Valve Access Door

Photograph 3. Main Cage Door

Photograph 4. Cage Side View

Photograph 5. Transfer Equipment, with Secondary Containment

Photograph 6. Transfer Equipment with Secondary Containment

Photograph 7. Transfer Flow Meter
with Secondary Containment

Appendix 2. Reuse Water Well Site Inspection Checklist

Item	Yes /No	Note Corrective Actions Requested or Completed	Inspection Date	Initials
1. Are gates secured and locked?				
2. Are there any leaks or evidence of spills?				
3. Does secondary containment have any collected liquid that needs to be pumped out?				
4. Is the customer piping in good condition without any leaks?				
5. Check and note the Annulus Tank level				
6. Is site clean and free of any trash?				
7. Does roll off trash bin need to be emptied?				

NOTE: this is a draft checklist and items may be added or revised as necessary.

Appendix 3. Technical Data Sheet and Safety Data Sheets, UL Geo 491

UL GEO 491

TECHNICAL DATA SHEET

PRODUCT MANUFACTURER

Ultimate Linings
10301 Round Up Lane
Houston, TX 77064
800-989-9869

DESCRIPTION

UL GEO 491 is a 100% solid, rapid curing, odorless, flexible, two component spray polyurea developed for specialty application such as a geotextile lining mem-brane. It may also be applied to concrete and steel substrates. UL GEO 491 is volatile free, and mixed at a 1:1 ratio with plural component spray equipment.

COLOR

Petro Tan, Industrial Tan, Carlsbad Canyon, and Covert Green. Custom colors are available upon request.

PACKAGING

10-gallon kit: 5 gallons Part-A (Isocyanate side) and 5 gallons Part-B (Resin side).

100-gallon kit: 50 gallons Part-A (Isocyanate side) and 50 gallons Part-B (Resin side).
TOTES

COVERAGE

UL GEO 491 may be applied at any rate to achieve desired Thickness. Theoretical coverage for 1 mil (0.254 microns) thickness is one gallon per 1600 sqft (3.78 liters per 149 sqm) Estimating Formula: (1600 sqft per gal /Dry Mil Thickness) x Solids Content = Application Rate per gallon.

APPLICATION

Both Part-A and Part-B material should be preconditioned at 80-90°F before application. Recommended surface temperature must be at least 5°F above the dew point. UL GEO 491 should be applied using a plural component, heated, high pressure 1:1 spray mixing equipment like Graco's Reactor, Glass Craft or another equivalent machine may be used. Both Part-A and Part-B materials should be sprayed at a minimum of 2000 psi and at temperatures above 150°F. Adequate pressure and temperature should be maintained always. UL GEO 491 should be sprayed in smooth, multidirectional passes to improve uniform thickness and appearance.

SURFACE PREPARATION

In general, coating performance and adhesion are directly proportional to surface preparation. Most failures in the performance of surface coatings can be attributed to poor surface preparation. Polyurea coatings rely on the structural strength of the substrate to which they are applied. All surfaces must be free of dust, dirt, oil, grease, rust, corrosion and other contaminants. When coating substrates previously used, it is important to consider the possibility of substrate absorption, which may affect the adhesion of the coating system, regardless of the surface preparation. Ultimate Linings Ltd recognizes the potential for unique substrates from one project to another. The following information is for general reference, and for project-specific questions, contact Ultimate Linings Ltd

CHEMICAL TECHNICAL DATA

Mix Ration by Volume	1A : 1B
Tack Free Time	46-50 sec.
Gel Time	12-14 sec.
Sag Time	14 sec.
Viscosity "A" side	80-120cps
Viscosity "B" side	50-100cps

Test Name	Test Method	Value
Hardness	ASTM D-2240	80 ± 5 shore A
Tensile	ASTM D-412	2000 ± 700 psi
Elongation	ASTM D-412	350 ± 50
Impact Resistance	ASTM G14	> 200 lbs.

STORAGE

UL GEO 491 has a shelf life of one (1) year from date of manufacture in original, factory-sealed

containers. Avoid freezing temperatures. Store drums on wooden pallets to avoid direct contact with the ground. If stored for a long period of time, rotate Part-A and Part-B drums regularly.

PRODUCT DISCLAIMER

All guidelines, recommendations, statements, and technical data contained herein are based on information and tests we believe to be reliable and correct, but accuracy and completeness of said tests are not guaranteed and are not to be construed as a warranty, either expressed or implied. It is the user's responsibility to satisfy himself, by his own information and test, to determine suitability of the product for his own intended use, application and job situation and user assumes all risk and liability resulting from his use of the product. We do not suggest or guarantee that any hazards listed herein are the only ones that may exist. Neither seller nor manufacturer shall be liable to the buyer or any third person for any injury, loss or damage directly or indirectly resulting from use of, or inability to use, the product. Recommendations or statements, whether in writing or oral, other than those contained herein shall not be binding upon the manufacturer, unless in writing and signed by a corporate officer of the manufacturer. Technical and application information is provided for establishing a general profile of the material and proper application procedures. Test performance results were obtained in a controlled environment and ULTIMATE LININGS has no claim that these tests or any other tests accurately represent all environments.

UL GEO 491, A-Side

Safety Data Sheet
Revised: 03/22/2018

1. Identification

Product identifier used on the label

UL GEO 491, A-Side

Details of the supplier of the safety data sheet

Company:

Ultimate Linings, LTD
10301 Round Up Lane
Houston, TX 77064, USA

Customer Information: Telephone: 1-800-989-9869

Emergency telephone number

24-Hour Emergency Contact: CHEMTREC: 1-800-424-9300

2. Hazards identification

According to Regulation 2012 OSHA Hazard Communication Standard; 29 CFR Part 1910.1200

Classification of the product

Acute Tox.	4 (Inhalation - mist)	Acute toxicity
Eye Dam./Irrit.	2B	Serious eye damage/eye irritation
Skin Corr./Irrit.	2	Skin corrosion/irritation
Skin Sens.	1B	Skin sensitization
Resp. Sens.	1	Respiratory sensitization
STOT SE	3 (irritating to respiratory system)	Specific target organ toxicity – since exposure
STOT RE	2 (by inhalation)	Specific target organ toxicity — repeated exposure

Label Elements

Pictogram:

UL GEO 491, A-Side

Safety Data Sheet
Revised: 03/22/2018

Signal Word:
Danger

Hazard Statement:

H320	Causes eye irritation.
H315	Causes skin irritation.
H332	Harmful if inhaled.
H334	May cause allergy or asthma symptoms or breathing difficulties if inhaled.
H317	May cause an allergic skin reaction.
H335	May cause respiratory irritation.
H373	May cause damage to organs (Olfactory organs) through prolonged or repeated exposure (inhalation).

Precautionary Statements (Prevention):

P280	Wear protective gloves.
P271	Use only outdoors or in a well-ventilated area.
P260	Do not breathe dust/gas/mist/vapors.
P261	Avoid breathing mist.
P284	In case of inadequate ventilation wear respiratory protection.
P272	Contaminated work clothing should not be allowed out of the workplace.
P264	Wash with plenty of water and soap thoroughly after handling.

Precautionary Statements (Response):

P312	Call a POISON CENTER or doctor/physician if you feel unwell.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P304 + P340	IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P314	Get medical advice/attention if you feel unwell.
P303 + P352	IF ON SKIN (or hair): Wash with plenty of soap and water.
P333 + P311	If skin irritation or rash occurs: Call a POISON CENTER or doctor/physician.
P332 + P313	If skin irritation occurs: Get medical advice/attention.
P362 + P364	Take off contaminated clothing and wash before reuse.
P337 + P311	If eye irritation persists: Call a POISON CENTER or doctor/physician.

Precautionary Statements (Storage):

P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P405	Store locked up.

Precautionary Statements (Disposal):

P501	Dispose of contents/container to hazardous or special waste collection point.

3. Composition / Information on Ingredients

According to Regulation 2012 OSHA Hazard Communication Standard; 29 CFR Part 1910.1200

CAS Number	Content (W/W)	Chemical Name
0068092-58-0	42%-78% 17%-31%	POLYURETHANE PREPOLYMER
000101-68-8		4,4'-METHYLENEDIPHENYL DIISOCYANATE
000108-32-7	6%-11%	4-METHYL-1,3-DIOXOLAN-2-ONE
0026447-40-5	1.1%-2.0%	MDI (MONOMER)

4. First-Aid Measures

Description of first aid measures

General advice:
Remove contaminated clothing.

If inhaled:
Remove the affected individual into fresh air and keep the person calm. Assist in breathing if necessary. Immediate medical attention required. If experiencing respiratory symptoms: Call a POISON CENTER/doctor. If breathing is difficult, trained personnel should administer emergency oxygen if advised to do so by the POISON CENTER/doctor. If exposed/feel unwell/concerned: Call a POISON CENTER/doctor.

If on skin:
Wash affected areas thoroughly with soap and water. Continue to gently flow water over area for 15 minutes. If irritation develops, seek medical attention.

If in eyes:
In case of contact with the eyes, rinse immediately for at least 15 minutes with plenty of water. Immediate medical attention required.

If swallowed:
Rinse mouth and then drink plenty of water. Do not induce vomiting. Never induce vomiting or give anything by mouth if the victim is unconscious or having convulsions. Immediate medical attention required.

5. Fire-Fighting Measures

Extinguishing media
Suitable extinguishing media:
water spray, dry powder, carbon dioxide, foam

Special hazards arising from the substance or mixture
Hazards during fire-fighting:
nitrous gases, fumes/smoke, isocyanate, vapor

Advice for fire-fighters
Protective equipment for fire-fighting:
Firefighters should be equipped with self-contained breathing apparatus and turn-out gear.

Further information:
Keep containers cool by spraying with water if exposed to fire. Dispose of fire debris and contaminated extinguishing water in accordance with official regulations.

6. Accidental Release Measures

Personal precautions, protective equipment and emergency procedures
Clear area. Ensure adequate ventilation. Wear suitable personal protective clothing and equipment.

Environmental precautions
Do not discharge into drains/surface waters/groundwater.

Methods and material for containment and cleaning up
For small amounts: Absorb isocyanate with suitable absorbent material (see § 40 CFR, sections 260, 264 and 265 for further information). Shovel into open container. Do not make container pressure tight. Move container to a well-ventilated area (outside). Spill area can be decontaminated with the following recommended decontamination solution: Mixture of 90 % water, 8 % concentrated ammonia, 2 % detergent. Add at a 10 to 1 ratio. Allow to stand for at least 48 hours to allow escape of evolved carbon dioxide.

For large amounts: If temporary control of isocyanate vapor is required, a blanket of protein foam or other suitable foam (available from most fire departments) may be placed over the spill. Transfer as much liquid as possible via pump or vacuum device into closed but not sealed containers for disposal.

For residues: The following measures should be taken for final cleanup: Wash down spill area with decontamination solution. Allow solution to stand for at least 10 minutes.

Dike spillage.

7. Handling and Storage

Precautions for safe handling
Provide suitable exhaust ventilation at the processing machines. Ensure thorough ventilation of stores and work areas. Avoid aerosol formation. When handling heated product, vapours of the product should be ventilated and respiratory protection used. Wear respiratory protection when spraying. Danger of bursting when sealed gastight. Protect against moisture. If bulging of drum occurs, transfer to well-ventilated area, puncture to relieve pressure, open vent and let stand for 48 hours before resealing.

Protection against fire and explosion:
No explosion proofing necessary.

Conditions for safe storage, including any incompatibilities
Keep away from water. Segregate from foods and animal feeds. Segregate from acids and bases. Segregate from bases.

Suitable materials for containers: Carbon steel (Iron), High density polyethylene (HDPE), Low density polyethylene (LDPE), Stainless steel 1.4301 (V2)

Further information on storage conditions: Formation of CO2 and build-up of pressure possible. Keep container tightly closed and in a well-ventilated place. Outage of containers should be filled with dry inert gas at atmospheric pressure to avoid reaction with moisture.

Storage stability:
Storage temperature: 60 - 80 °F
Protect against moisture.

8. Exposure Controls/Personal Protection

Components with occupational exposure limits

Diphenylmethane-4,4'-diisocyanate (MDI)	OSHA PEL	CLV 0.02 ppm 0.2 mg/m3 ; CLV 0.02 ppm 0.2 mg/m3 ;
	ACGIH TLV	TWA value 0.005 ppm ;

Advice on system design:
Provide local exhaust ventilation to maintain recommended P.E.L.

Personal protective equipment
Respiratory protection:
When workers are facing concentrations above the occupational exposure limits they must use appropriate certified respirators. When atmospheric levels may exceed the occupational exposure limit (PEL or TLV) NIOSH-certified air-purifying respirators equipped with an organic vapor sorbent and particulate filter can be used as long as appropriate precautions and change out schedules are in place. For emergency or non-routine, high exposure situations, including confined space entry, use a NIOSH-certified full facepiece pressure demand self-contained breathing apparatus (SCBA) or a full facepiece pressure demand supplied-air respirator (SAR) with escape provisions.

Hand protection:
Chemical resistant protective gloves should be worn to prevent all skin contact. Suitable materials may include, chloroprene rubber (Neoprene), nitrile rubber (Buna N), chlorinated polyethylene, polyvinylchloride (Pylox), butyl rubber, depending upon conditions of use.

Eye protection:
Tightly fitting safety goggles (chemical goggles). Wear face shield if splashing hazard exists.

Body protection:
Cover as much of the exposed skin as possible to prevent all skin contact. Suitable materials may include, saran-coated material, depending upon conditions of use.

General safety and hygiene measures:
Wear protective clothing as necessary to prevent contact. Eye wash fountains and safety showers must be easily accessible. Observe the appropriate PEL or TLV value. Wash soiled clothing immediately. Contaminated equipment or clothing should be cleaned after each use or disposed of.

9. Physical and Chemical Properties

Density	9.28 lb/gal
Specific Gravity	1.11
VOC Regulatory	0.00 lb/gal
VOC Part A & B Combined	N.A.
Appearance Clear	Liquid
Odor Threshold	N.A.
Odor Description	Mild Aromatic
pH	N.A.
Water Solubility	Reacts with Water
Flammability	N/A
Flash Point Symbol	N.A.
Flash Point	94 °C
Viscosity	N.A.
Lower Explosion Level	N.A.
Upper Explosion Level	N.A.
Vapor Pressure	N.A.
Vapor Density	Heavier than air
Freezing Point	N.A.
Melting Point	N.A.
Low Boiling Point	150 °C
High Boiling Point	N.A.
Auto Ignition Temp	N.A.
Decomposition Pt	N.A.
Evaporation Rate	Slower than ether
Coefficient Water/Oil	N.A.

10. Stability and Reactivity

Reactivity
Corrosion to metals: No corrosive effect on metal.
Oxidizing properties: Not an oxidizer.

Chemical stability
The product is stable if stored and handled as prescribed/indicated.

Possibility of hazardous reactions
Reacts with water, with formation of carbon dioxide. Risk of bursting. Reacts with alcohols. Reacts with acids. Reacts with alkalis. Reacts with amines. Risk of exothermic reaction. Risk of polymerization. Contact with certain rubbers and plastics can cause brittleness of the substance/product with subsequent loss in strength.

Conditions to avoid
Avoid moisture.

Incompatible materials
Acids, amines, alcohols, water, alkaline, strong bases, substances/products that react with isocyanates.

Hazardous decomposition products

Decomposition products:
Hazardous decomposition products: carbon monoxide, carbon dioxide, nitrogen oxide, hydrogen cyanide, nitrogen oxides, aromatic isocyanates, gases/vapors

Thermal decomposition:
No decomposition if stored and handled as prescribed/indicated.

11. Toxicological Information

Skin Corrosion/Irritation:
Isocyanates react with skin protein and moisture and can cause irritation. Prolonged contact can cause reddening, swelling, rash, scaling, blistering, and, in some cases, skin sensitization. Individuals who have developed a skin sensitization can develop these symptoms as a result of contact with very small amounts of liquid material or as a result of exposure to vapor. Causes skin irritation

Serious Eye Damage/Irritation:
Liquid, aerosols or vapors are severely irritating and can cause pain, tearing, reddening and swelling. Prolonged vapor contact may cause conjunctivitis. Any level of contact should not be left untreated. Causes serious eye irritation.

Carcinogenicity:
Suspected of causing cancer.

Respiratory/Skin Sensitization:
May cause allergy or asthma symptoms or breathing difficulties if inhaled
May cause an allergic skin reaction

Germ Cell Mutagenicity:
No data available

Reproductive Toxicity:
No data available

Specific Target Organ Toxicity - Single Exposure:
May cause respiratory irritation

Specific Target Organ Toxicity - Repeated Exposure:
May cause damage to organs through prolonged or repeated exposure.

Aspiration Hazard:
No data available

Acute Toxicity:
No data available

0000101-68-8 4,4'-METHYLENEDIPHENYL DIISOCYANATE
LC50 (rat): 369-490 mg/m3 (aerosol) (4-hour exposure) (1)
LC50 (rat): 178 mg/m3 (17.4 ppm) (duration of exposure not reported) (2)
LD50 (oral, rat): greater than 10,000 mg/kg (1,2)
LD50 (dermal, rabbit): greater than 10,000 mg/kg (1)
LD50 (oral, mouse): 2,200 mg/kg (3)

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12. Ecological Information

Toxicity:
No data available.

Persistence and Degradability:
No data available.

Bioaccumulative Potential:
No data available.

Mobility in Soil:
No data available.

Other Adverse Effects:
No data available.

13. Disposal Considerations

Waste disposal of substance:
Incinerate or dispose of in a licensed facility. Do not discharge substance/product into sewer system.

Container disposal:
DRUMS:
Steel drums must be emptied and can be sent to a licensed drum reconditioner for reuse, a scrap metal dealer or an approved landfill. Do not attempt to refill or clean containers since residue is difficult to remove. Under no circumstances should empty drums be burned or cut open with gas or electric torch as toxic decomposition products may be liberated. Do not reuse empty containers.

14. Transport Information

Land transport
USDOT

Not classified as a dangerous good under transport regulations

Sea transport
IMDG

Not classified as a dangerous good under transport regulations

Air transport
IATA/ICAO

Not classified as a dangerous good under transport regulations

15. Regulatory Information

CAS	Chemical Name	% By Weight	Regulation List
0068092-58-0	POLYURETHANE PREPOLYMER	42% - 78%	DSL,SARA312,TSCA
0000101-68-8	4,4'-METHYLENEDIPHENYL DIISOCYANATE	17% - 31%	DSL,CERCLA,HAPS,SARA312,SARA313,VHAPS,VOC,TSCA
0000108-32-7	4-METHYL-1,3-DIOXOLAN-2-ONE	6% - 11%	DSL,SARA312,TSCA
0026447-40-5	MDI (MONOMER)	1.1% - 2.0%	DSL,SARA312,TSCA

16. Other Information

NOTE: As per GHS, Cat 1 is the greatest level of hazard within each class.

SDS Prepared on: 03/22/2019

IMPORTANT: WHILE THE DESCRIPTIONS, DESIGNS, DATA AND INFORMATION CONTAINED HEREIN ARE PRESENTED IN GOOD FAITH AND BELIEVED TO BE ACCURATE, IT IS PROVIDED FOR YOUR GUIDANCE ONLY. BECAUSE MANY FACTORS MAY AFFECT PROCESSING OR APPLICATION/USE, WE RECOMMEND THAT YOU MAKE TESTS TO DETERMINE THE SUITABILITY OF A PRODUCT FOR YOUR PARTICULAR PURPOSE PRIOR TO USE. NO WARRANTIES OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ARE MADE REGARDING PRODUCTS DESCRIBED OR DESIGNS, DATA OR INFORMATION SET FORTH, OR THAT THE PRODUCTS, DESIGNS, DATA OR INFORMATION MAY BE USED WITHOUT INFRINGING THE INTELLECTUAL PROPERTY RIGHTS OF OTHERS. IN NO CASE SHALL THE DESCRIPTIONS, INFORMATION, DATA OR DESIGNS PROVIDED BE CONSIDERED A PART OF OUR TERMS AND CONDITIONS OF SALE. FURTHER, YOU EXPRESSLY UNDERSTAND AND AGREE THAT THE DESCRIPTIONS, DESIGNS, DATA, AND INFORMATION FURNISHED BY OUR COMPANY HEREUNDER ARE GIVEN GRATIS AND WE ASSUME NO OBLIGATION OR LIABILITY FOR THE DESCRIPTION, DESIGNS, DATA AND INFORMATION GIVEN OR RESULTS OBTAINED, ALL SUCH BEING GIVEN AND ACCEPTED AT YOUR RISK. LINE-X LLC WILL NOT MAKE ITS PRODUCTS AVAILABLE TO CUSTOMERS FOR USE IN THE MANUFACTURE OF MEDICAL DEVICES WHICH ARE INTENDED FOR PERMANENT IMPLANTATION IN THE HUMAN BODY OR IN PERMANENT CONTACT WITH INTERNAL BODILY TISSUES OR FLUIDS.

END OF DATA SHEET

UL GEO 491, B-Side

Safety Data Sheet
Revised: 03/22/2019

1. Identification

Product identifier used on the label

UL GEO 491, B-Side

Details of the supplier of the safety data sheet

Company:

Triple T's Linings, LLC
4220 Old Cavern Hwy.
Carlsbad, NM 88220

Customer Information: Telephone: 806-549-1253

Emergency telephone number

24-Hour Emergency Contact: CHEMTREC: 1-800-424-9300

2. Hazards identification

According to Regulation 2012 OSHA Hazard Communication Standard; 29 CFR Part 1910.1200

Classification of the product

Specific Target Organ Toxicity	Single Exposure - Category 1
Specific Target Organ Toxicity	Repeated Exposure - Category 2
Skin Corrosion	Category 1C
Serious Eye Damage	Category 1
Carcinogenicity	Category 2
Chronic aquatic toxicity	Category 2
Flammable Liquids	Category 4
Acute aquatic toxicity	Category 2
Acute toxicity, Dermal	Category 5
Acute toxicity, Oral	Category 4

Label Elements

Pictogram:

Signal Word:
Danger

Hazard Statement:

H320	Causes eye irritation.
H315	Causes skin irritation.
H332	Harmful if inhaled.
H334	May cause allergy or asthma symptoms or breathing difficulties if inhaled.
H317	May cause an allergic skin reaction.
H335	May cause respiratory irritation.
H373	May cause damage to organs (Olfactory organs) through prolonged or repeated exposure (inhalation).

Precautionary Statements (Prevention):

P280	Wear protective gloves.
P271	Use only outdoors or in a well-ventilated area.
P260	Do not breathe dust/gas/mist/vapours.
P261	Avoid breathing mist.
P284	In case of inadequate ventilation wear respiratory protection.
P272	Contaminated work clothing should not be allowed out of the workplace.
P264	Wash with plenty of water and soap thoroughly after handling.

Precautionary Statements (Response):

P312	Call a POISON CENTER or doctor/physician if you feel unwell.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P304 + P340	IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P314	Get medical advice/attention if you feel unwell.
P303 + P352	IF ON SKIN (or hair): Wash with plenty of soap and water.
P333 + P311	If skin irritation or rash occurs: Call a POISON CENTER or doctor/physician.
P332 + P313	If skin irritation occurs: Get medical advice/attention.
P362 + P364	Take off contaminated clothing and wash before reuse.
P337 + P311	If eye irritation persists: Call a POISON CENTER or doctor/physician.

Precautionary Statements (Storage):

P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P405	Store locked up.

Precautionary Statements (Disposal):

P501	Dispose of contents/container to hazardous or special waste collection point.

Hazards not otherwise classified
No specific dangers known, if the regulations/notes for storage and handling are considered.

UL GEO 491, B-Side

Safety Data Sheet
Revised: 03/22/2019

3. Composition / Information on Ingredients

Cas	Chemical Name	% by Weight
0009046-10-0	POLYOXYPROPYLENEDIAMINE	39% - 69%
0005285-60-9	BENZENEAMINE, 4,4'-METHYLENEBIS[n-(1-METHYLPROPROPYL)-	15% - 28%
0068479-98-1	AROMATIC AMINE	8% - 15%
0064852-22-8	Poly[oxy(methyl-1,2-ethanediyl)], alpha.,.alpha.',.alpha.''-1,2,3-propanetriyltris[.omega.-(2-aminomethylethoxy)-	4% - 7%
0013463-67-7	TITANIUM DIOXIDE	3% - 6%

4. First-Aid Measures

Description of first aid measures

General advice:
Remove contaminated clothing.

If inhaled:
Remove the affected individual into fresh air and keep the person calm. Assist in breathing if necessary. Immediate medical attention required. If experiencing respiratory symptoms: Call a POISON CENTER/doctor. If breathing is difficult, trained personnel should administer emergency oxygen if advised to do so by the POISON CENTER/doctor. If exposed/feel unwell/concerned: Call a POISON CENTER/doctor.

If on skin:
Wash affected areas thoroughly with soap and water. Continue to gently flow water over area for 15 minutes. If irritation develops, seek medical attention.

If in eyes:
In case of contact with the eyes, rinse immediately for at least 15 minutes with plenty of water. Immediate medical attention required.

If swallowed:
Rinse mouth and then drink plenty of water. Do not induce vomiting. Never induce vomiting or give anything by mouth if the victim is unconscious or having convulsions. Immediate medical attention required.

5. Fire-Fighting Measures

Extinguishing media
Suitable extinguishing media:
water spray, dry powder, carbon dioxide, foam

Special hazards arising from the substance or mixture
Hazards during fire-fighting:
nitrous gases, fumes/smoke, isocyanate, vapor

Advice for fire-fighters
Protective equipment for fire-fighting:
Firefighters should be equipped with self-contained breathing apparatus and turn-out gear.

Further information:
Keep containers cool by spraying with water if exposed to fire. Dispose of fire debris and contaminated extinguishing water in accordance with official regulations.

6. Accidental Release Measures

Personal precautions, protective equipment and emergency procedures
Clear area. Ensure adequate ventilation. Wear suitable personal protective clothing and equipment.

Environmental precautions
Do not discharge into drains/surface waters/groundwater.

Methods and material for containment and cleaning up
For small amounts: Absorb isocyanate with suitable absorbent material (see § 40 CFR, sections 260, 264 and 265 for further information). Shovel into open container. Do not make container pressure tight. Move container to a well-ventilated area (outside). Spill area can be decontaminated with the following recommended decontamination solution: Mixture of 90 % water, 8 % concentrated ammonia, 2 % detergent. Add at a 10 to 1 ratio. Allow to stand for at least 48 hours to allow escape of evolved carbon dioxide.

For large amounts: If temporary control of isocyanate vapor is required, a blanket of protein foam or other suitable foam (available from most fire departments) may be placed over the spill. Transfer as much liquid as possible via pump or vacuum device into closed but not sealed containers for disposal.

For residues: The following measures should be taken for final cleanup: Wash down spill area with decontamination solution. Allow solution to stand for at least 10 minutes.

Dike spillage.

7. Handling and Storage

Precautions for safe handling
Provide suitable exhaust ventilation at the processing machines. Ensure thorough ventilation of stores and work areas. Avoid aerosol formation. When handling heated product, vapours of the product should be ventilated and respiratory protection used. Wear respiratory protection when spraying. Danger of bursting when sealed gastight. Protect against moisture. If bulging of drum occurs, transfer to well-ventilated area, puncture to relieve pressure, open vent and let stand for 48 hours before resealing.

Protection against fire and explosion:
No explosion proofing necessary.

Conditions for safe storage, including any incompatibilities
Keep away from water. Segregate from foods and animal feeds. Segregate from acids and bases. Segregate from bases.

Suitable materials for containers: Carbon steel (Iron), High density polyethylene (HDPE), Low density polyethylene (LDPE), Stainless steel 1.4301 (V2)

Further information on storage conditions: Formation of CO2 and build-up of pressure possible. Keep container tightly closed and in a well-ventilated place. Outage of containers should be filled with dry inert gas at atmospheric pressure to avoid reaction with moisture.

Storage stability:
Storage temperature: 60 - 80 °F
Protect against moisture.

8. Exposure Controls/Personal Protection

Components with occupational exposure limits

Chemical Name	OSHA TWA (mg/m3)	OSHA Tables Z1,2,3	NIOSH TWA (ppm)	NIOSH TWA (mg/m3)	NIOSH Carcinogen	ACGIH TWA (mg/m3)
Carbon Black	3.5	1		3.5A	1	3(I)
Titanium Dioxide	15	1	B		1	10

Advice on system design:
Provide local exhaust ventilation to maintain recommended P.E.L.

Personal protective equipment

Respiratory protection:

When workers are facing concentrations above the occupational exposure limits they must use appropriate certified respirators. When atmospheric levels may exceed the occupational exposure limit (PEL or TLV) NIOSH-certified air-purifying respirators equipped with an organic vapor sorbent and particulate filter can be used as long as appropriate precautions and change out schedules are in place. For emergency or non-routine, high exposure situations, including confined space entry, use a NIOSH-certified full facepiece pressure demand self-contained breathing apparatus (SCBA) or a full facepiece pressure demand supplied-air respirator (SAR) with escape provisions.

Hand protection:

Chemical resistant protective gloves should be worn to prevent all skin contact. Suitable materials may include, chloroprene rubber (Neoprene), nitrile rubber (Buna N), chlorinated polyethylene, polyvinylchloride (Pylox), butyl rubber, depending upon conditions of use.

Eye protection:

Tightly fitting safety goggles (chemical goggles). Wear face shield if splashing hazard exists.

Body protection:

Cover as much of the exposed skin as possible to prevent all skin contact. Suitable materials may include, saran-coated material, depending upon conditions of use.

General safety and hygiene measures:

Wear protective clothing as necessary to prevent contact. Eye wash fountains and safety showers must be easily accessible. Observe the appropriate PEL or TLV value. Wash soiled clothing immediately. Contaminated equipment or clothing should be cleaned after each use or disposed of.

9. Physical and Chemical Properties

Density	8.50 lb./gal
Specific Gravity	1.02
VOC Regulatory	0.00 lb./gal
VOC Part A & B Combined	N.A.
Appearance	Amber/ Pigmented Liquid
Odor Threshold	N.A.
Odor Description	Mild Chemical
pH	N.A.
Water Solubility	N.A.
Flammability	N/A
Flash Point Symbol	N.A.
Flash Point	92 °C
Viscosity	N.A.
Lower Explosion Level	N.A.
Upper Explosion Level	N.A.

Vapor Pressure	N.A.
Vapor Density	Heavier than air
Freezing Point	N.A.
Melting Point	N.A.
Low Boiling Point	308 °C
High Boiling Point	N.A.
Auto Ignition Temp	N.A.
Decomposition Pt	N.A.
Evaporation Rate	Slower than ether
Coefficient Water/Oil	N.A.

10. Stability and Reactivity

Chemical stability
The product is stable if stored and handled as prescribed/indicated.

Possibility of hazardous reactions
Reacts with water, with formation of carbon dioxide. Risk of bursting. Reacts with alcohols. Reacts with acids. Reacts with alkalies. Reacts with amines. Risk of exothermic reaction. Risk of polymerization. Contact with certain rubbers and plastics can cause brittleness of the substance/product with subsequent loss in strength.

Conditions to avoid
Avoid moisture.

Incompatible materials
Acids, amines, alcohols, water, alkalines, strong bases, substances/products that react with isocyanates.

Hazardous decomposition products

Decomposition products:
Hazardous decomposition products: carbon monoxide, carbon dioxide, nitrogen oxide, hydrogen cyanide, nitrogen oxides, aromatic isocyanates, gases/vapors

Thermal decomposition:
No decomposition if stored and handled as prescribed/indicated.

11. Toxicological Information

Primary routes of exposure

Routes of entry for solids and liquids are ingestion and inhalation, but may include eye or skin contact. Routes of entry for gases include inhalation and eye contact. Skin contact may be a route of entry for liquefied gases.

Acute Toxicity/Effects
If ingested: In humans, irritation or chemical burns of the mouth, pharynx, esophagus and stomach can develop following ingestion, and injury may be severe and cause death.
Repeated and prolonged exposure at low levels may result in adverse skin and eye effects, liver and kidney disorders.

0001333-86-4 CARBON BLACK
LC50 (rat): 6750 mg/m3 (4-hour exposure); cited as 27000 mg/m3 (27 mg/L) (1-hour exposure) (3)

Chronic Exposure
0001333-86-4 CARBON BLACK
CARCINOGENIC EFFECTS: In 1996, the IARC reevaluated Carbon Black as a Group 2B carcinogen. This evaluation is given to carbon black for which there is inadequate human evidence, but sufficient animal evidence. Prolonged inhalation of Carbon black can result in lung disease. Symptoms include coughing, shortness of breath, wheezing and
reduced pulmonary function.

Potential Health Effects – Miscellaneous
0001333-86-4 CARBON BLACK
Is an IARC, NTP or OSHA carcinogen. Has shown carcinogenic activity in laboratory animals at high doses. Significance to man is unknown. The following medical conditions may be aggravated by exposure: asthma, respiratory disease. WARNING: This chemical is
known to the State of California to cause cancer.

0013463-67-7 TITANIUM DIOXIDE
Is an IARC, NTP or OSHA carcinogen. In a lifetime inhalation test, lung cancers were found in some rats exposed to 250 mg/m3 respirable titanium dust. Analysis of the titanium dioxide concentrations in the rat's lungs showed that the lung clearance mechanism
was overwhelmed and that the results at the massive 250 mg/m3 level are not relevant to the workplace Results of a DuPont epidemiology study showed that employees who had been exposed to Titanium Dioxide were at no greater risk of developing lung
cancer than were employees who had not been exposed to Titanium dioxide. No pulmonary fibrosis was found in any of the employees and no association was observed between Titanium dioxide exposure and chronic respiratory disease or x-ray abnormalities. Based on
the results of this study DuPont concluded that titanium dioxide will not cause lung cancer or chronic respiratory disease in humans at concentrations experienced in the workplace.

12. Ecological Information

Toxicity:
Toxic to aquatic life with long lasting effects.
Toxic to aquatic life
Toxic to aquatic life with long lasting effects.

Mobility in Soil:
No data available.

Other Adverse Effects:
No data available.

Bio-accumulative Potential
0001333-86-4 CARBON BLACK
A relevant bioaccumulation potential of carbon black is not expected based on its insolubility in organic solvents and in water. Furthermore, since the aggregate diameter of carbon black varies between 80 nm and 810 nm, bioaccumulation of particulate carbon
black is not likely owing to the large diameter of the solid aggregate particles.

Persistence and Degradability
0001333-86-4 CARBON BLACK
Carbon Black's insolubility in water results in it not being biodegradable in any medium or by biota. It is considered persistent in the
natural environment.

13. Disposal Considerations

Waste disposal of substance:
Under RCRA, it is the responsibility of the user of the product, to determine the time of disposal whether the product meets RCRA criteria for hazardous waste. Waste management should be in full compliance with federal, state, and local laws.
Empty containers retain product residue which may exhibit hazards of material, therefore do not pressurize, cut, glaze, weld or use for any other purposes. Return drums to reclamation centers for proper cleaning and reuse.

14. Transport Information

U.S. DOT Information:
Shipping Name: Amines, Liquid, Corrosive, n.o.s. (Polyoxypropylenediamine)
UN/NA #: 2735
Hazard Class: 8
Packing Group: III
Placard: Corrosive

IMDG Information:
Shipping Name: Amines, Liquid, Corrosive, n.o.s. (Polyoxypropylenediamine)
UN/NA #: 2735
Hazard Class: 8
Packing Group: III
Marine Pollutant: No data available

IATA Information:
Shipping Name: Amines, Liquid, Corrosive, n.o.s. (Polyoxypropylenediamine)
UN/NA #: 2735
Hazard Class: 8
Packing Group: III

15. Regulatory Information

CAS	Chemical Name	%by Weight	Regulation List
0009046-10-0	POLYOXYPROPYLENEDIAMINE	39-69%	TSCA
0005285-60-9	BENZENEAMINE, 4,4'-METHYLENEBIS[n-(1-METHYLPROPROPYL)-	15-28%	DSL,SARA312,TSCA
0068479-98-1	AROMATIC AMINE	8-15%	DSL,SARA312,VOC,TSCA
0064852-22-8	Poly[oxy(methyl-1,2-ethanediyl)],.alpha.,.alpha.',.alpha.''-1,2,3-propanetriyltris[.omega.-(2- aminomethylethoxy)	4-7%	NDSL,SARA312,TSCA
0013463-67-7	TITANIUM DIOXIDE	3-6%	DSL,SARA312,TSCA,California Proposition 65
0001333-86-4	CARBON BLACK	0.3-0.4%	DSL,SARA312,TSCA,California Proposition 65

California Proposition 65

⚠ **WARNING**: This product can expose you to chemicals including Titanium Dioxide which is known to the State of California to cause cancer. For more information go to www.P65Warnings.ca.gov.

16. Other Information

SDS Prepared on: 03/22/2019

UL GEO 491, B-Side

Safety Data Sheet
Revised: 03/22/2019

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END OF DATA SHEET