April 29, 2021

Mr. Peter Campbell
Alaska Department of Environmental Conservation
43335 Kalifornsky Beach Rd #11
Soldotna, AK 99669

RE: 2021 Recovery Well Rehabilitation Work Plan
Tesoro Kenai Refinery

Dear Mr. Campbell:

Tesoro Alaska, LLC (Tesoro) is submitting this letter work plan for Pump and Treat Recovery (Recovery) well rehabilitation at the Kenai Liquified Natural Gas facility (KLNG). Rehabilitation of wells falls under maintenance activities of the RCRA Post-Closure Permit No. AKD 04867 9682 (Permit); but requires Alaska Department of Environmental Conservation approval due to the use of acid and bio-dispersant as part of the rehabilitation process. Rehabilitation is planned for Recovery wells R40, R-41, R54, R-55 and R-56 as shown on Figure 1. Attachment 1 outlines well rehabilitation procedures and Figure 2 provides typical well details. The project is tentatively scheduled for May – June 2021.

PURPOSE

R-40 and R-41 are A-aquifer recovery wells installed in 1993. R-54, R-55 and R-56 are B-aquifer recovery wells. R54 and R-55 were installed in 2014 and R-56 was installed in 2016. Recovery wells need to be periodically cleaned to ensure pumping flow rates can be maintained to meet permit requirements. Decreased well function and eventual failure due to iron fouling is a common problem with Permit treatment system wells including recovery wells, injection wells, and air sparge wells.

SCOPE OF WORK

Well Rehabilitation

Pump and Treat Recovery well operations cause well screen fouling, limiting flow capacities. The screen interval on recovery wells appear to have fouling from deposits of iron and biogenic material based on down hole videos from 2020 inspections. The goal of rehabilitation is to remove biofouling and iron encrustation from the well casing and screen. Recovery wells R-40, R-41, R-54, R-55, and R-56 will be cleaned to maintain required flow rates and extend well life. The primary steps for well rehabilitation include:

- Preliminary scrubbing and bailing of the well casing and screen to remove loose scale and solids
- Acid and bio-dispersant treatment
- Purging well to pre-treatment groundwater conditions

Well rehabilitation procedures are further outlined in Attachment 1.

Waste Management

Fluids generated during rehabilitation activities will be containerized in a suitable vessel. The fluids will be included in the refinery waste management program for offsite disposal and treatment.

Schedule

The proposed schedule for 2021 recovery well rehabilitation and possible installation is:

- April – Schedule with Tesoro and subcontractors, complete safety and permitting requirements
- May/June – Complete well rehabilitation
- August – Document rehabilitation efforts in Quarterly Progress Report 21-3

If you have questions or comments please contact me at (907) 262-2315 or bforce@trihydro.com.

Sincerely,
Trihydro Corporation

Brianna Force
Project Manager

39B-003-007

cc: Stephanie Plate, Marathon Petroleum Company

FIGURES

TW-5
TW-5A
TW-8
R-39
E-254
E-209
1/2
WORK AREA
R-56
E-151
RECOVERY WELL PIPELINES
R-40
P-40
R-55
PI-06A
PI-06B
I-06
E-243
E-205
R-46
E-144
INJECTION WELL (TYP.)
P-46
R-54
A-RECOVERY WELL (TYP.)
R-41
P-41
R-51RR
PI-07
E-140
R-51R
E-225
P-51
R-51
A-MONITORING WELL (TYP.)
E-141
R-45
P-45
O-2
B-MONITORING WELL (TYP.)
O-5
O-4
E-202B
E-202A
R-52R
R-52
E-176
R-47
P-47
R-42
PI-08
I-08
P-50
P-40/41
R-50R
B-RECOVERY WELL (TYP.)
FLARE BERM
N
2/2
SALAMATOF RD
KENAI SPUR HWY
N

1 VICINITY MAP
SCALE: 1" = 1,500'
0 1,500'

2 SITE MAP
SCALE: 1" = 50'
0 50'

Image Citation: ©2012 TerraMetrics; ©2012 Google

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REV.	DATE	DESCRIPTION	BY	CHK'D
A	4/02/21	ISSUE FOR INTERNAL REVIEW	BJ	BF

REVISIONS

DRAWN BY: JWM
CHECKED BY: BF
DATE: 4/18/19
SCALE: AS SHOWN
FILE: 39B R57_REHAB_SITEMAP

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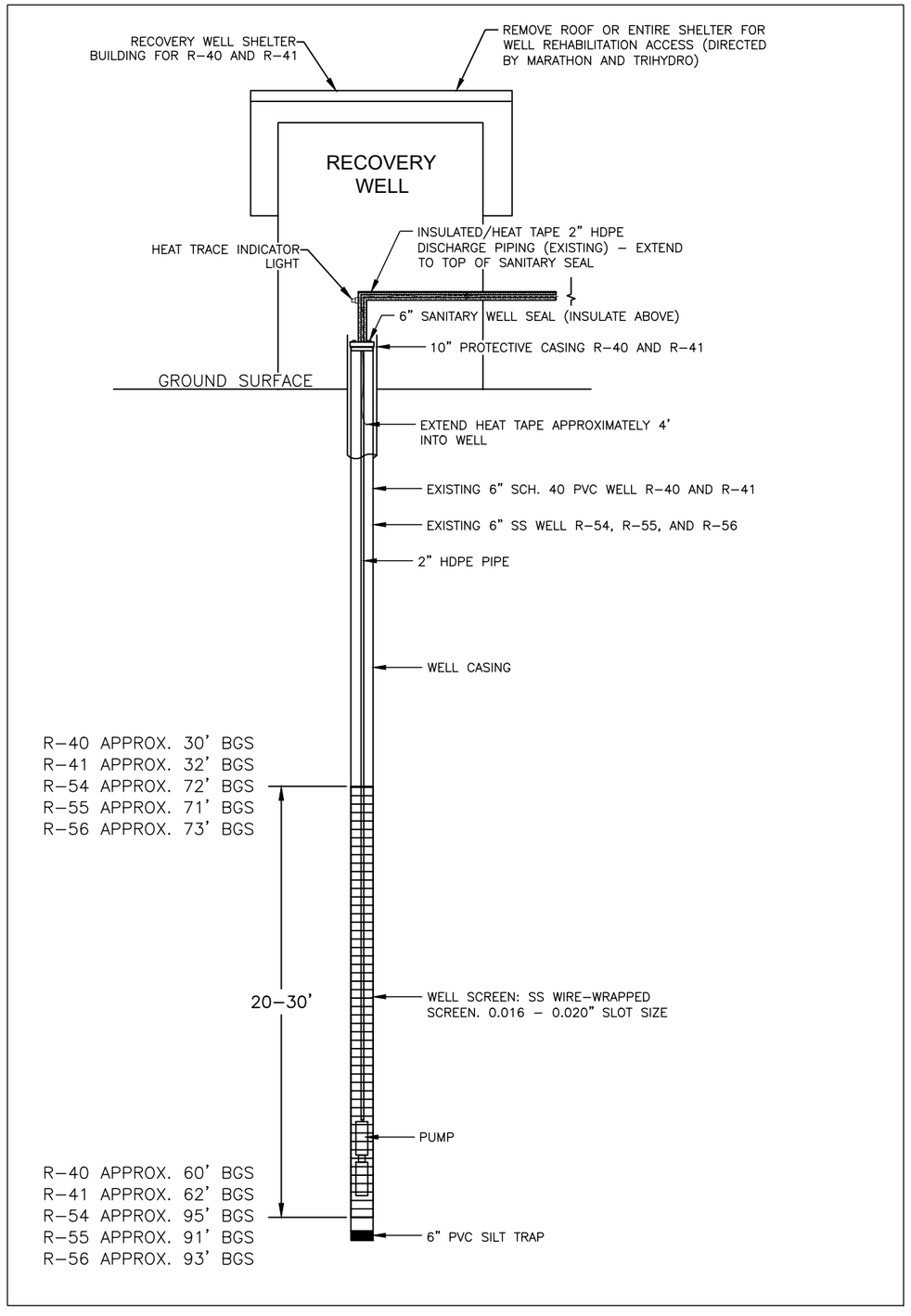
SITE PLAN

INJECTION WELL REHABILITATION
MARATHON KENAI REFINERY
KENAI, ALASKA

SHEET 1 1 OF 2
REV: B



1 WELL REHABILITATION DETAIL
SCALE: NONE

EXPLANATION

APPROX.	APPROXIMATELY
PVC	POLYVINYL CHLORIDE
DIA.	DIAMETER
HDPE	HIGH-DENSITY POLYETHYLENE
SCH.	SCHEDULE
SS	STAINLESS STEEL
TYP.	TYPICAL

REV.	DATE	DESCRIPTION	BY	CHK'D
A	4/1/2021	ISSUE FOR INTERNAL REVIEW	BJ	BF

REVISIONS

DRAWN BY: JWM
CHECKED BY: BF
DATE: 4/1/2021
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FILE: 39B R57_REHAB_202104

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RECOVERY WELL DETAIL

RECOVERY WELL REHABILITATION
MARATHON KENAI REFINERY
KENAI, ALASKA

SHEET 2
2 OF 2
REV: B

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ATTACHMENT 1

WELL REHABILITATION PROCEDURES

The goal of well rehabilitation is to remove biofouling and iron deposits from the well casing and screen so the screen can function at or near intended capacity. The primary steps for well rehabilitation are:

1. Preliminary well casing/screen scrubbing and bailing to remove loose scale and solids
2. Acid and bio-dispersant treatment
3. Purging well to pre-treatment groundwater conditions

1.0 Procedure for Scrubbing Well

1.1 Prior to cleaning a recovery well, **de-energize pump** and lockout-tagout **(LOTO) the appropriate breaker**. Verify all electrical is off by using a fluke meter at the electric control box near the well head.

1.2 Prior to cleaning an injection well, close well isolation valve and **LOTO the isolation valve**.

1.3 **Remove downhole pumps and equipment** from the well casing. Use equipment appropriate to lift well equipment out of well without damaging (drill rig, crane, or excavator as appropriate).

For recovery wells, ensure aboveground piping or piping connected via pitless adapter are appropriately disconnected. Pull pump by connecting to and drop tube and safety cable. If the safety cable is not visible from the top of the well casing, then the pump will be pulled up using the HDPE drop tube. If a pitless adapter is in place, a pipe will be secured to the pitless adapter down well and used to begin lifting pump. Once a section is exposed above ground, the HDPE drop tube will be clamped at the well head to prevent it from falling while the drill rig releases the pipe. Once the clamps are secured to the HDPE at the well head, the drill rig will clamp on to the HDPE pipe near the well head and pull another 10' section. This process will be repeated until the pump is above ground. Once removed, the pipe and pump will be carefully placed on the ground for inspection and any needed reconfiguration or replacement.

For injection wells, stinger piping will be removed using same techniques as pulling pump, but the load will be lighter, so rigging and connections can be modified as appropriate to lighter load. Depending on depth, the pipe can also be pulled by hand if a crew of 2 is available.

1.4 Assess the condition of the well prior to rehabilitation. **Collect a grab sample from the well to confirm background pH levels** using a disposable bailer and PH meter. Measure the bottom depth of each well for reference. Subtract the actual depth measured from the installation bottom depths; this will provide the amount of buildup in the bottom of the well. Confirm well depths and configuration from boring logs and/or well logs so depth of sediment can be assessed.

1.5 **Prior to scrubbing the well, all workers should don standard PPE: hard hat, safety glasses, FRCs, steel toed boots, and hand protection (leather work gloves, nitrile gloves).**

1.6 The well brush will be raised and lowered using appropriate equipment (preferably a drill rig, but excavator or other lifting equipment might be appropriate). **Attach the lifting mechanism to the top of the metal brush.**

1.7 As an extra precaution, **attach a safety wire to the metal part of the brush**. This serves as a backup connection in case the rope is severed, or a knot comes loose.

1.8 **The well will be scrubbed until the brush reaches the associated bottom depths**. Check this periodically with the fluid level meter when the brush is out of the injection well.

Use a hard bristle, non-metallic, multi-stage brush. If a metallic or semi-metallic brush is used, it cannot come in contact with any PVC materials since it will permanently scour, weaken, or compromise the PVC.

1.9 **Pump all loose material from the well** and store it in a container stationed near the injection well for disposal. After scrubbing, use an air-lift pump to pump loose material from the well and into a container. Pump until water is clear with no sediment or orange staining is present.

1.10 Continue to **scrub the length of the well for at least 30 minutes**. This should become easier as the brush travels up and down the well. Check with the fluid level meter that the well is cleared to the bottom depth.

1.11 Clean the brush and other equipment after use.

1.12 Re-assess the condition of the well prior to chemical rehabilitation. **Collect a grab sample from well with disposable bailer to assess pH levels** using a pH meter. Measure the bottom depth to confirm well is clear to the bottom.

2.0 Procedure for Chemically Treating Wells

Verify that the mechanical well cleaning has removed encrustation, bio fouling, and loose sediments. Do not chemically treat wells prior to mechanical cleaning.

2.1 Prior to cleaning a recovery well, **de-energize pump** and lockout-tagout **(LOTO) the appropriate breaker**. Verify all electrical is off by using a fluke meter at the electric control box near the well head.

2.2 Prior to cleaning injection well or injection, close well isolation valve and **LOTO the isolation valve**.

2.3 **Don appropriate PPE**. Chemical well cleaning involves using hazardous acid solutions. Acid resistant suit, goggles, face shield, chemical resistant gloves (not nitriles), and chemical resistant steel toe boots are required.

2.4 Chemical treatment includes three gallons of Hydrochloric Acid (31% strength) and 0.4 - 0.5 gallons NW-310 Bio dispersant.

2.5 Pre-mix acid and bio-dispersant chemicals with potable water in the large 55-gallon plastic drum dedicated for chemical mixing. Place the 55-gallon drum on a duck pond secondary containment and **place the drum near the injection well**. Stage all chemicals near the work area before mixing begins. The chemical mixture must be mixed in the following order:

1. **Add 23 gallons of potable water to the 55-gallon drum**.
2. **Add the 0.4 to 0.5 gallons of bio-dispersant to the 23 gallons of potable water inside of the drum**.
3. **Add 3 gallons of Hydrochloric Acid to the mixture inside of the drum**.

The chemicals in these proportions should achieve a pH of 3 in the injection well.

2.6 Use a long mixing stick to mix the chemicals inside the drum. **Mix chemicals at a slow pace to prevent splashing**. **DO NOT** lean over the drum while chemicals are being mixed. The chemicals being mixed can adversely affect human health through injection, skin contact, and inhalation. See SDS for hazards associated with both NW-310 Bio dispersant, and Hydrochloric Acid (31% strength).

2.7 Use at least 70 feet of polypropylene tubing (poly tubing) to syphon the chemicals out of the mixing barrel and into the injection well. The poly tubing will be available on-site and will be gravity fed down well. **Fill the 70 feet of poly tubing by submerging it in the barrel and filling the last 5' with water then lower the poly tube down the well**.

2.8 Visually verify that the chemical mixture is flowing down the injection well. Do not pull poly tubing out of well until all of the solution is down the well.

2.9 **Use a surge block to adequately mix the applied chemicals in the well.** Continue surging for a period of two hours while periodically confirming the pH level inside the well. Samples should be recovered using a disposable bailer and analyzed using a PH meter. Allow the solution to sit in the well overnight at a pH level of 3. If a pH of 3 is not achieved, repeat steps 5 and 6 in the following mixture ratio of 6.5 parts HCL, 1-part NW-310, 50-parts potable water.

2.10 Surge the well for a period of one hour the following day. Pump a sufficient amount of groundwater from the well to restore pH levels to within background conditions (approximate). Chemicals need to be pumped out of the injection wells since acidic conditions will neutralize the chemicals used to disinfect the well during the second phase of well rehabilitation. Pumped groundwater can be transported and consolidated into the container staged near the recovery wells for eventual transport and disposal upon completion of well rehabilitation activities.

2.11 After reinstalling appropriate well pumps, pipes, and wire, and before energizing and putting well back into service, perform a system walkthrough to ensure that all valves restoring flow to the injection wells are in the correct position, and all electrical connections have been appropriately completed.

2.12 Put well back into service and set appropriate flows and pressures.