Corrective Action Plan 35040 & 35041

Farmers Union Oil Co.

906 A Avenue

Circle, MT 59215

Facility ID# 29-06376, Release# 3689 & 3803

Work Plan# 35040 & 35041

TREADS ID 24902 & 32428

Prepared for:

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WCEC Project No. 14-10045-70

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1.0 Introduction

West Central Environmental Consultants (WCEC) has prepared this Standard Generic Application Corrective Action Plan (AC-07) for the Farmers Union Oil Company facility (Facility ID# 29-06376, Release# 3689 & 3803, Work Plan# 35040 & 35041 TREADS ID 24902 & 32428) as requested by the Montana Department of Environmental Quality (MTDEQ) in a letter issued May 20, 2025.

1.1 Site Location

The Farmers Union Oil Company facility is located at 906 A Avenue, Circle, Montana. A site location map is included as Figure 1 and a site details map is included as Figure 2. The Public Land Survey System (PLSS) description for the site is the NW/4, SW/4, SE/4 of Section 10, T19N, R48E. The geographic coordinates are Latitude 47.4159°, Longitude -105.5866°. Township, range, and section information was obtained using the United States Geological Survey (USGS) Circle, Montana 1:24,000 Quadrangle. The site is located within the Redwater River Hydrologic Unit.

1.2 Geologic/ Hydrogeologic Setting

The surficial geology at the location of Farmers Union Oil facility consists of Quaternary alluvium and colluvium deposits from the Holocene Epoch. These alluvial deposits consist of light brown and gray poorly sorted and well stratified clay, silt, sand and gravel deposits with thicknesses between 10 and 30 feet. Soil boring logs for the facility identified silt to a depth of 16 feet with increasing sand to 20 feet. From 20 feet to 32 feet, the subsurface lithology consisted of well sorted fine sand. Groundwater is present at approximately 30 feet below grade.

2.0 Site History

2.1 AST and Pump Island History

The site has been operated as a fuel storage facility for more than 70 years. The current capacity of the above ground storage tanks (ASTs) is 78,500 gallons and includes 32,000 gallons of gasoline, 44,000 gallons of diesel, and 2,500 of used oil. These tanks supply the bulk loading rack and the fuel islands. Historically a pump island was located at the corner of 10th Street and A Avenue. The historic pump island was used until the 1980's until it was replaced with the pump islands that are currently in use at the facility. Reports of an AST and bulk rack southwest of the current location were reported to have existed prior to the construction of the current bulk rack and AST containment. These tanks were most likely in use prior to 1970, although the exact time frame is not known. An historic UST basin was located southeast of the tire service center prior to 1970. The approximate location of historic petroleum storage and dispensing equipment is depicted in Figure 9.

On March 29, 1999, diesel fuel was released from Tank F, which inadvertently had a valve left open at the same time that Tank C was being filled. This caused an estimated 200 gallons of dyed diesel to flow out of the top of Tank F. Soils inside the unlined containment were excavated to the maximum extent practicable following the release.

2.2 Remedial Investigation

BNSF required Farmers Union Oil to conduct a Phase II site assessment under their lease agreement in 2014. WCEC conducted the Phase II site assessment at the facility in April 2014. Seven soil borings were advanced to 32 feet below ground surface. Soil and water samples were collected from these borings. WCEC contacted the MTDEQ during the event to report the hydrocarbon affected soils as a new release. Following the report to the MTDEQ, it was discovered that the previous release that occurred in 1999 was not resolved, and the hydrocarbon impacts that WCEC identified during the Phase II site assessment were deemed to be part of the former release at the facility.

2.3 LIF Investigation

In April 2016, the adsorbed light non-aqueous phase liquid (LNAPL) plume underlying the site was delineated. The total area of the 2D horizontal LNAPL impacted area is approximately 62,600 square feet. The vertical extent of the LNAPL plume body ranged in depth between near ground surface to 35 feet below ground surface (bgs). A continuous horizon of smear zone impacts is present across the site between 25 and 30 feet

bgs. The total volume of the three-dimensional LNAPL plume body is approximately 17,600 cubic yards. This delineated plume body extends from approximately 50 feet southwest of the tire warehouse, north to the water tower. The western extent of the plume lies under the Farmers Union Oil Co. store, and the eastern extent lies under the AST basin. The length of the LNAPL plume is approximately 300 feet and the width is approximately 210 feet.

2.4 Site Conceptual Model (SCM)

The site geologic setting described in Section 1.2 in conjunction with historical sampling data and the results of the LIF investigation allow for interpretation of the site conceptual model (SCM) which includes the following assertions:

1. The subsurface lithology consists of medium to fine sand, silt and some clay. These layers tend to be interbedded and are likely the result of wind deposition of sediments. These discontinuous layers tend to affect the vertical migration of hydrocarbon impacts until the groundwater surface is encountered. This unconfined aquifer is underlain by a confining layer at approximately 35 to 40 feet below ground surface and is likely comprised of geologic depositions of the Tongue River Member of the Fort Union Formation [Vuke, 2011] [GWIC, 2019]. It is expected that the groundwater elevation will correlate with fluctuations in the Redwater River located south of the site. Initial indications of groundwater flow based on the distribution of LNAPL is to the north/northeast. This is consistent with the general flow direction of surface water in the area. The confluence of Horse Creek and the Redwater River is located 0.9 miles northeast of the site.

2. LNAPL impacts above the groundwater interface exist around the ASTs, southwest of the tire warehouse, and along A Avenue near the Farmers Union Oil retail store and tire shop. LNAPL impacts penetrate the subsurface vertically with a small amount of horizontal movement around unconsolidated fingers of silt/clay until the groundwater surface is encountered at a depth of approximately 26 feet. The LNAPL impacts underlie an area of 62,600 square feet (1.4 acres) and has an estimated total volume of 17,600 cubic yards. LNAPL impacted soils near the surface should be completed to the maximum extent practicable.

3. The primary factors affecting the horizontal transport of LNAPL is the interface with groundwater at approximately 26 feet below ground surface. Due to the soil types delineated and depth of groundwater it does not appear that buried utilities will play any role in the migration of NAPL at the facility [Figure 2].

4. The primary factor limiting vertical migration of LNAPL is groundwater. Static groundwater was measured in monitoring wells at 26 to 27 feet below ground surface. These elevations correlate with

the depth of smear zone impacts at the site (WCEC, 2016). Groundwater flow at the facility has varied with the addition of more monitoring wells. The groundwater gradient is very flat and has shown notable variation in flow direction throughout the site history.

5. The LNAPL plume appears to be stable in its current location based on its area of spread and time since the known release occurred. Free product has been measured in MW2, MW4, MW6, MW7, MW8, and MW9 during past sampling events. The dissolved phase plume extends toward Main St. This dissolved phase plume is also co-mingled with a release at the Conoco located at the corner of Main St, and 2nd Ave/ Highway 200. Limited down gradient movement is occurring due to the flat groundwater gradient underlying the site.

3.0 Scope of Work

3.1 Required Scope of Work

The Scope of Work requested by the MTDEQ consists of:

- Operate SVE/AS system and complete quarterly system operation, maintenance, and effluents sampling.
- Record product thickness and collect free product from all site wells that contain free product. Place absorbent socks in all wells with free product for passive collection between system O&M/ free product events.
- Complete groundwater monitoring of all site wells that exceeded DEQ RBSLs during the last year of semiannual sampling.
- Combine mobilization and work under this WP for releases 3689 & 3803.
- Assess LNAPL transmissivity and potential for active recovery of LNAPL present at the site.
- Validate all laboratory analytical data using DEQ's Data Validation Summary Form (DVSF).
- Discuss ongoing WP tasks and results with DEQ's project manager; submit written agreed- upon WP modifications as required to complete the WP objectives.
- Prepare a Release Closure Plan (RCP); discuss results with DEQ's project manager. DEQ expects the RCP to cover the Release investigation, cleanup, and monitoring information.
- Prepare and submit a Remedial Activities Report detailing the remedial actions completed and the results of free product recovery, SVE/AS system operation, and groundwater monitoring events. The Report is expected to include all the content outlined in the Cleanup Report format.
    - o Append the DVSF for each sampling event and update the facilities RCP.

4.0 SVE/AS System

4.1 SVE/AS Rational

Historic site investigations have identified LNAPL impacts at the facility. A large portion of these impacts are located approximately 30 feet below ground surface and are present in sand layers. LNAPL impacted soils are an ongoing source for groundwater impacts at the facility. Based on the depth below ground surface and soil lithology, soil vapor extraction (SVE)/ Air Sparge (AS) technology was determined to be the most feasible remedial alternative to address LNAPL impacts at greater than 15 feet in depth. WCEC installed three separate SVE/AS systems in 2023 based on a pilot study completed in 2018. Continued operation of this system is recommended for the next 2 years, with further assessment of the effectiveness of operation at the end of that period.

4.2 SVE/AS System Equipment

Three soil vapor extraction/ air sparge skids were placed across the site. Separate enclosed SVE/AS skids containing regenerative blowers and compressors were installed to allow operation of system wells on opposite sides of public right-of -ways, and avoid larger piping runs that would have to transect underground petroleum piping runs and other utilities. Each SVE/AS system skids contain a regenerative blower with the capability of delivering 175 ACFM @ 40" H_2O vacuum @ 60Hz. Each system box contains inline vacuum relief valves and particulate filters. Inflow and discharge sampling ports are included in the SVE system. A TotalSep 55-gallon vapor/liquid separator ensures that the SVE system does not pull water into the regenerative blower. This tank has a high-level switch to shut the system down if excessive water is drawn during wet periods of the year. A liquid level site glass and drain allow for visual inspection during system operation and maintenance checks. System piping has vacuum, temperature, and air flow meters for adjustment of flow and pressure to maximize recovery from the system. Each system skid contain a 2-Point Manifold (Schedule 40 PVC Construction) with 4-inch gate valves to allow for control of separate SVE trunk lines at the facility.

The air sparge portion of the system uses two reciprocating oil-less piston compressors capable of 10 scfm at 20 psi. The compressors are driven with 2HP single phase motors. The AS system includes inlet filter mufflers, pressure relief valves, gate valves and galvanized piping. Pressure and flow gauges are installed in the system plumbing allow assessment of system operation and performance.

Three separate power meters were installed due to the separation of the system across the site. This decreased the length of supply lines and was required to address the issue of the two release numbers being on separate sides of the public right-of-way.

4.3 SVE / AS System Sampling, Operation & Maintenance

SVE/AS system sampling, operation, and maintenance events will be conducted on a quarterly basis for a period of 2 years at the facility. WCEC will collect system operation parameters including system flows, vacuum, temperature, PID effluent readings, and SVE effluent samples during each SVE/AS event. SVE effluent sample collection will be conducted using a flow calibrated pump and charcoal tubes and analytical analysis of TPH/BTEX will be requested. SVE/AS system operation, soil gas, analytical results, and total TPH removal will be included in the cumulative annual report.

5.0 Groundwater Monitoring

5.1 Groundwater Monitoring

WCEC will conduct semiannual groundwater monitoring at the facilities for a period of two years using low flow sampling methodologies. Monitoring wells will be purged with a downhole pump until groundwater parameters stabilize prior to sampling. Groundwater quality parameters (pH, DO, conductivity, temperature, salinity, ORP, and turbidity) will be obtained using a flow through cell attached to the down hole bladder pump from all site monitoring wells. Depth to water measurements will be collected from all site monitoring wells during each groundwater monitoring event for calculation of groundwater flow direction and gradient. Groundwater samples will be preserved in accordance with the analytical method, packed on ice and delivered to Energy Laboratory in Billings, Montana.

Groundwater monitoring and sampling will be conducted as follows:

- Depth to water measurements will be collected from all 16 site monitoring wells
- If free product is not present in the well VPH samples will be collected from MW1, MW2, MW3, MW4, MW5, MW6, MW8, MW9, MW10, MW11, MW12, MW14, MW16, and MW17. (MW7 was abandoned during the remedial excavation and replaced with MW12).
- If free product is not present MW1, MW3, MW6, MW9, MW10, MW11, MW12, MW14, MW16, and MW17 will be sampled for lead scavengers (EDB & DCA) on an annual basis.
- If free product is not present MW9 will be sampled for VOCs by EPA 8260B, EPH screen, with PAH and fraction analysis if EPH screen exceeds 1000 ug/L.

Analytical Analysis Chart						
Sample Location	VPH	EPH	Lead Scavengers	PAH	VOC 8260B	Depth to Water only
MW1	x		x			
MW2	x					
MW3	x		x			
MW4	x					
MW5	x					
MW6	x		x			
MW8	x					
MW9	x	x	x	x	x	
MW10	x		x			
MW11	x		x			
MW12	x		x			
MW13						x
MW14	x		x			
MW15						x
MW16	x		x			
MW17	x		x			
Analysis per event	14	1	10	1	1	2
Total all events	56	4	40	4	2	8
Sampling Frequency	SA	SA	A	SA (potential to reduce after first year)	SA (potential to reduce after first year)	SA
Q (quarterly), SA (semi- annual), A (Annual)						

5.2 Free Product Recovery

Free product gauging and recovery will be conducted in conjunction with SVE/AS quarterly system O&M events. Depth to product and depth to water will be measured in each well using an oil/water interface probe accurate to 0.01 feet. Free product thickness measurements will be obtained by subtracting the depth to water in each well from the depth to product.

Free product will be removed from the wells by either a downhole skimmer pump equipped with an oil/water interface sensor or a peristaltic pump attached to downhole tubing. The pumps will be operated until either the sensor detects the oil/water interface or water is noted in the discharge line. Gallons of product removed will be measured using a graduated 5-gallon bucket modified with a sealed-top and fittings

for product collection and transfer. Recovered free product will ultimately be placed in portable 5-gallon fuel containers to facilitate transport to an oil recycler in Billings, Montana for disposal. Oil absorbent socks will be placed in wells that contain less than 0.10 feet of product and will be changed out during each event until socks saturation is less than ¼ saturated over the three-month period.

During the last sampling event conducted at the site MW2, MW4, MW8, and MW9 contained free product.

5.3 Transmissivity Testing

WCEC conducted an LNAPL Transmissivity/ free product baildown test during the last sampling event to assess the potential for automated free product recovery as a remedial method. The LNAPL transmissivity test will be conducted on the monitoring well with the greatest average thickness over the initial three groundwater monitoring events. The baildown tests and subsequent data analysis and calculations will be conducted according to ASTM E2856-13 Standard Guide for Estimation of LNAPL Transmissivity [ASTM, 2013]. This LNAPL transmissivity test is an accurate metric for understanding LNAPL recoverability and can be used to estimate the rate of recovery for a given drawdown from various technologies.

Baildown testing procedures consist of near instantaneous removal of all LNAPL from within the well followed by a period of monitoring to gauge recharge rates for both the air/LNAPL and LNAPL/water interfaces. An initial LNAPL thicknesses will also be recorded prior to product removal. WCEC will removed all the free product using a down hole free product skimming pump with integrated oil/water interface probe. Gauging will be initiated at a rapid interval and extended to greater time gaps as the test progresses to correlate with corresponding 0.05 to 0.1 feet changes in LNAPL thickness. It is anticipated that the test will be conducted over a 24 hour period.

WCEC will analyzed the data from the baildown test data using the American Petroleum Institute (API) Transmissivity Workbook [API, 2012] which consists of a series of interconnected Microsoft Excel worksheets containing scripted formulas for analyzing LNAPL drawdown data and calculating LNAPL transmissivity values. The workbook uses three main analytical methods for calculating LNAPL transmissivity: Generalized Bouwer and Rice (1976); Cooper and Jacob (1946); and Cooper, Bredehoeft, and Papadopulos (1967).

5.4 Aquifer Tests

WCEC will perform an aquifer tests in conjunction with LNAPL transmissivity test. Single well slug tests will be conducted on monitoring well MW1 and MW10. Two falling head and rising head slug tests were completed via introduction and removal of solid slugs with pre-determined displacement volumes of 18 and 24 inches. Recovery and drawdown in the test wells were monitored with submersible pressure transducers connected by a data cable to an uphole data logger for instantaneous data transmission.

The data from the aquifer tests were analyzed using Aqtesolv® software. The graphical output of the data analysis and the raw data from the aquifer tests will be presented as an appendix of the report. The slug tests will be analyzed using the Bouwer and Rice solution.

6.0 Landfarm Sampling and Tilling

WCEC will conduct soil sampling from the landfarm during the initial groundwater monitoring event under this work plan. With additional sampling being conducted following each tilling season or until sample results allow for the landfarm to be closed. Landfarm tilling will be conducted in April, May June, July, August, and September of each year that is required. Once landfarm samples meet applicable regulation for closure seeding for revegetation will be conducted during the following spring to ensure proper vegetative cover is achieved.

WCEC will collect one five-point composite soil sample from each half acre per the DEQ solid waste division protocol. A total of six samples will be collected during each sampling event. All samples will be analyzed for VPH, EPH, and TCLP metals.

7.0 Report Preparation

WCEC will complete and submit a cumulative report following the completion of all remedial actions. The report will include the content outlined in the Montana Groundwater Monitoring Work Plan and Report Guidance for Petroleum Release. The report will include discussion of SVE/AS system operation, and cumulative product removal. Trend lines for free product recovery and removal and groundwater COCs will be included in the final report. The report will also include cumulative analytical tables, potentiometric surface plots for each sampling event, and maps detailing monitoring well location, utilities, and petroleum infrastructure. A DVSF will be appended to each groundwater analytical report and an RCP will be included in the final report. Based on analysis of all available data, WCEC will make recommendations for continued remedial action and remediation to address impacts and move the site toward closure.

8.0 Timeline and Cost

The attached *Estimated Cost Sheets* [Appendix A] details anticipated project costs to complete the MTDEQ required scope of work. The scope of work outlined in this work plan is tentatively scheduled to be initiated in Fall 2025 pending governmental approval.

8.1 Planned Workflow & Cost Explanations

The estimated costs presented in Appendix A detail the tasks included in this work plan. WCEC will complete these tasks during eight individual field events as follows:

Event 1: Groundwater monitoring, free product recovery, system O&M, and landfarm sampling **(1 staff, 1 vehicle)**. Mobilization costs included in *PTRCB Groundwater Monitoring & Sampling Unit Cost Worksheet* (PTRCB GWM Tool). Fall 2025.

Event 2: System O&M, SVE effluent sampling **(1 staff, 1 vehicle)**. Mobilization costs included in *Estimated Costs for Corrective Action Plan #35040 & 34041 Spreadsheet. Winter 2025-26*

Event 3: Groundwater monitoring, free product recovery, and system O&M**(1 staff, 1 vehicle)**. Mobilization costs included in *PTRCB Groundwater Monitoring & Sampling Unit Cost Worksheet* (PTRCB GWM Tool). Spring 2026.

Event 4: System O&M, SVE effluent sampling **(1 staff, 1 vehicle)**. Mobilization costs included in *Estimated Costs for Corrective Action Plan #35040 & 34041 Spreadsheet. Summer 2026.*

Event 5: Groundwater monitoring, free product recovery, system O&M, and landfarm sampling **(1 staff, 1 vehicle)**. Mobilization costs included in *PTRCB Groundwater Monitoring & Sampling Unit Cost Worksheet* (PTRCB GWM Tool). Fall 2026.

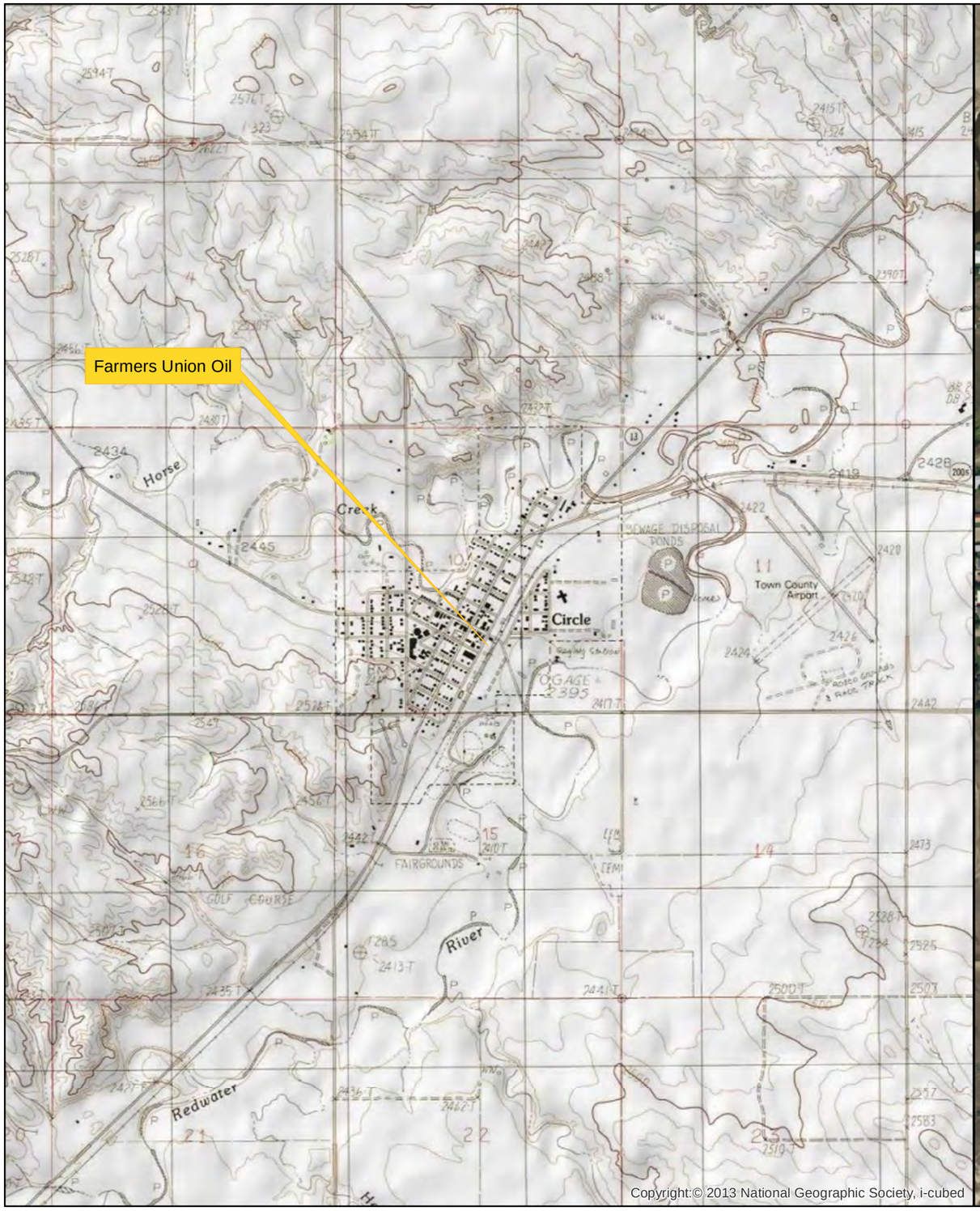
Event 6: System O&M, SVE effluent sampling **(1 staff, 1 vehicle)**. Mobilization costs included in *Estimated Costs for Corrective Action Plan #35040 & 34041 Spreadsheet. Winter 2026-27*

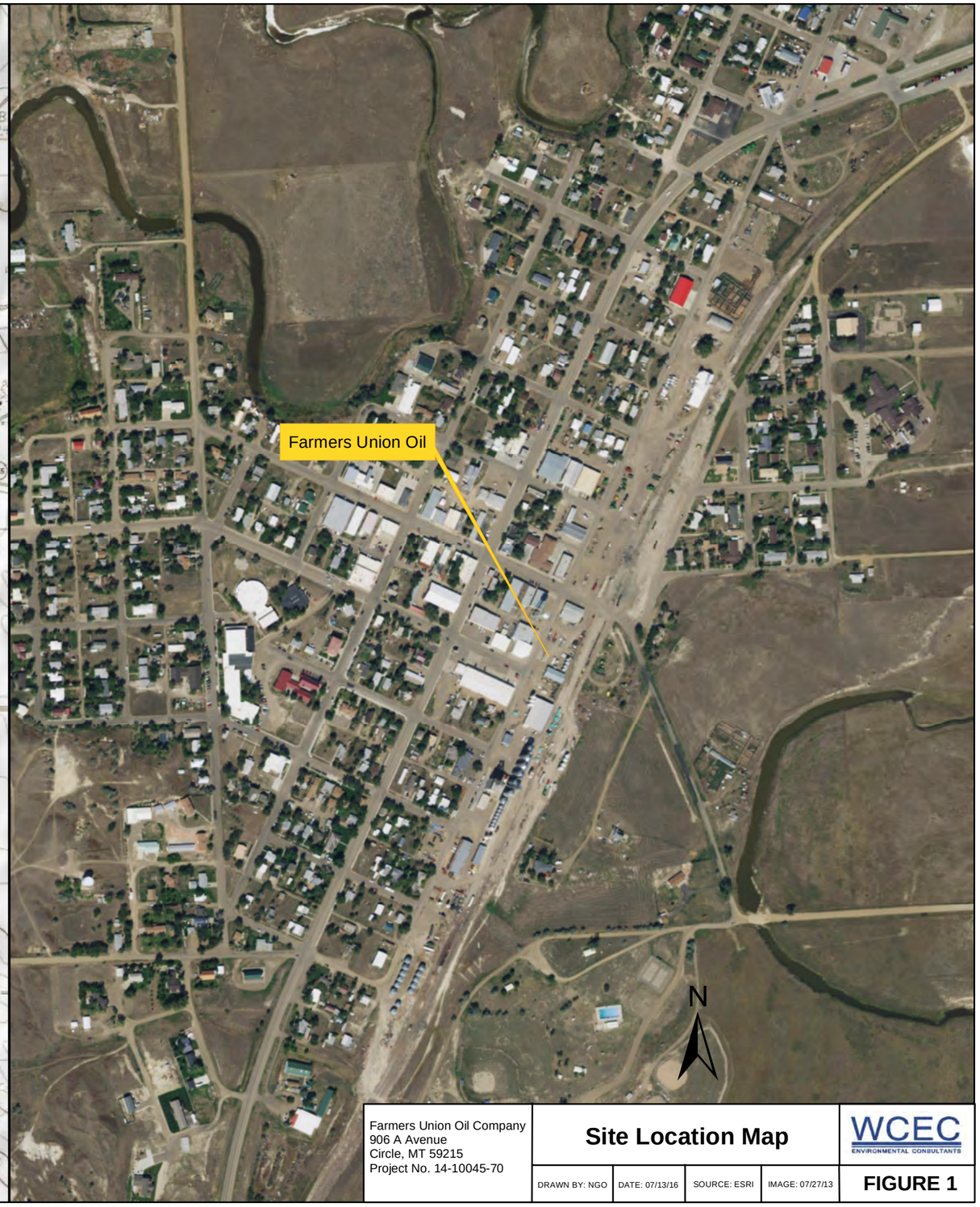
Event 7: Groundwater monitoring, free product recovery, and system O&M**(1 staff, 1 vehicle)**. Mobilization costs included in *PTRCB Groundwater Monitoring & Sampling Unit Cost Worksheet* (PTRCB GWM Tool). Spring 2027.

Event 8: System O&M, SVE effluent sampling **(1 staff, 1 vehicle)**. Mobilization costs included in *Estimated Costs for Corrective Action Plan #35040 & 34041 Spreadsheet. Summer 2027*

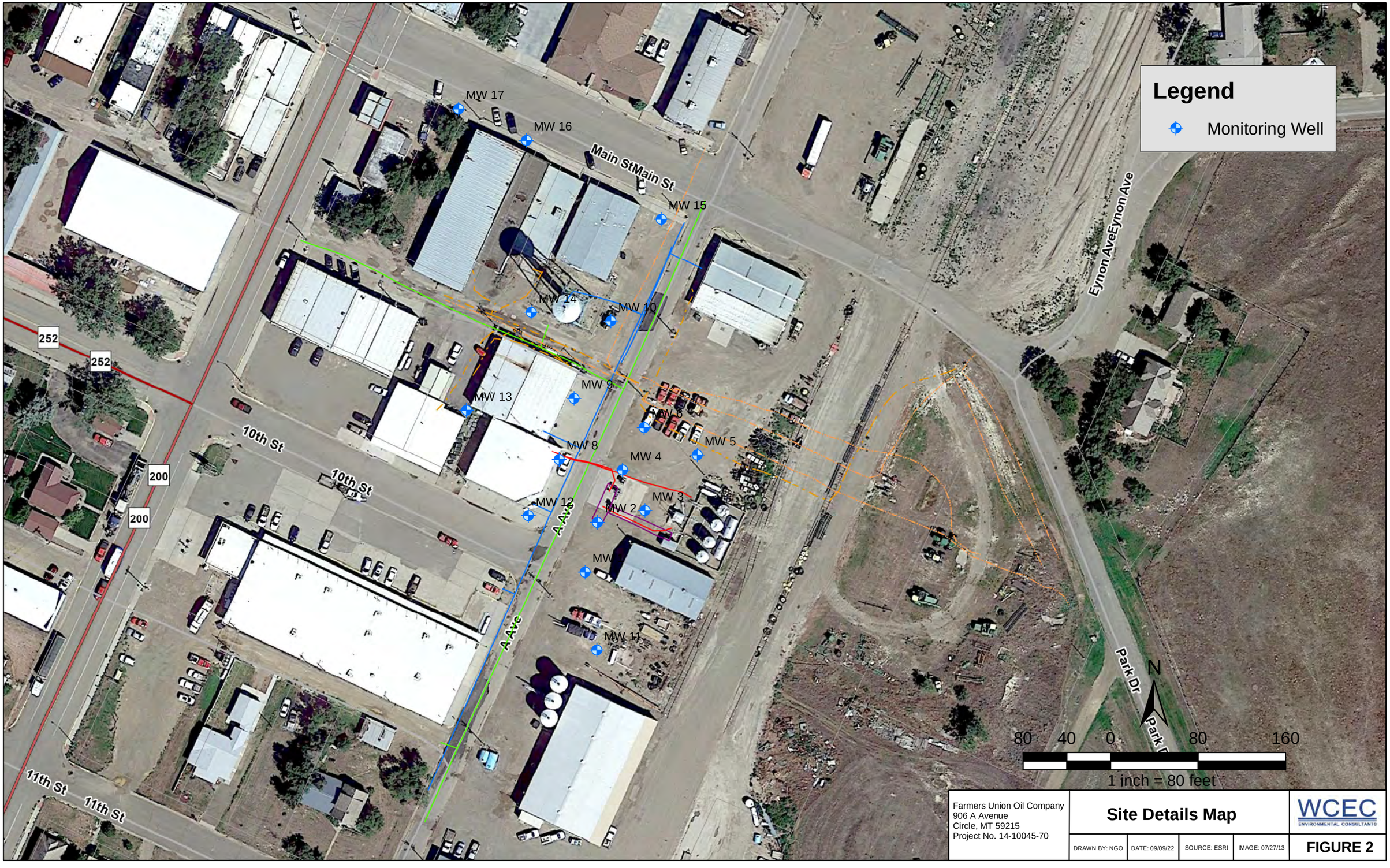
Report submitted and CAP 35040 & 35041 completed November 1, 2027

List of Figures





Farmers Union Oil Company 906 A Avenue Circle, MT 59215 Project No. 14-10045-70	**Site Location Map**				WCEC ENVIRONMENTAL CONSULTANTS
	DRAWN BY: NGO	DATE: 07/13/16	SOURCE: ESRI	IMAGE: 07/27/13	**FIGURE 1**



Farmers Union Oil Company 906 A Avenue Circle, MT 59215 Project No. 14-10045-70	**Site Details Map**				WCEC ENVIRONMENTAL CONSULTANTS
	DRAWN BY: NGO	DATE: 09/09/22	SOURCE: ESRI	IMAGE: 07/27/13	**FIGURE 2**