Waste Management and Remediation Division
Waste and Underground Tank Management Bureau
Solid Waste Section
PO Box 200901
Helena, MT 59620-0901

Record of Decision and Final Environmental Assessment for the Proposed Clean Solutions, LLC Class II Resource Recovery Facility Bainville, MT

November 21, 2017

Table of Contents

Section I - RECORD OF DECISION

1 Introduction

1.1 Background

On March 13, 2017, Clean Solutions, LLC, (Clean Solutions) submitted a Solid Waste Management System (SWMS) license application to the Montana Department of Environmental Quality's (DEQ) Solid Waste Program (SWP) for the licensure of a Class II Resource Recovery Facility (RRF). The site is known as the Clean Solutions Resource Recovery Facility. Clean Solutions proposed to resume operations of an existing (but currently unlicensed) SWMS for the recovery of marketable petroleum products from sludges, slurries, and production water generated by oilfield exploration and production activities. The application underwent deficiency reviews, and was revised prior to DEQ determining that it was complete and in compliance with the substantive requirements of the Solid Waste Management Act (SWMA). DEQ published a Draft Environmental Assessment (EA) on October 10, 2017.

1.2 Project Area Description

The Clean Solutions RRF is located approximately three miles east of Bainville just off U.S. Highway 2 in the S ½ of the NW ¼ and the NW ¼ of the NW ¼ of Section 31, Township 28 North, Range 59 East, M.P.M., Roosevelt County, Montana (Figure 1.1). Strategic Holdings, LLC owns a total of 147 acres of land. Of the 147 acres, only 6.8 acres are proposed for licensure of the Clean Solutions RRF. The property surrounding the proposed 6.8-acre RRF is not being proposed for solid waste management activities, but currently includes a saltwater disposal well permitted by the Montana Board of Oil and Gas Commission (MBOGC).

1.3 DEQ's Responsibilities and Purpose of the Record of Decision

The purpose of this record of decision (ROD) document is to set forth DEQ's decision on Clean Solutions application for a license and reason for the decision. The ROD documents DEQ's application of the decision criteria set forth in the SWMA.

DEQ administers the SWMA, Title 75, Chapter 10, Part 2, Montana Code Annotated (MCA) and its associated administrative rules. The Montana Environmental Policy Act (MEPA) required an environmental review of actions taken by State agencies that may significantly affect the quality of the human environment. The environmental review, culminating in the issuance of the Final EA on November 16, 2017, was conducted to fulfill MEPA.

2 Public Involvement

DEQ published the Draft EA on October 10, 2017, beginning a 30-day public comment period. DEQ distributed the Draft EA to adjacent landowners and published a notice on the document availability in the local area newspaper. A copy of the document was sent to the Bainville town office. DEQ received no comments from the public. The comment period on the Draft EA closed on November 10, 2017.

3 Alternatives Considered

Alternatives evaluated in the EA included the No Action and the Proposed Action Alternative.

3.1 No Action

If the application failed to meet the minimum requirements of the SWMA and could not be processed as submitted, DEQ would deny the license application and the facility would not be licensed. If the application is denied, activities at the facility would not resume and the impacts identified in the Final EA would not occur.

3.2 Proposed Action

The Proposed Action Alternative would allow the licensed operation of the existing resource recovery facility.

4 Decision and Rationale for Decision

DEQ may deny an application for licensure of a solid waste management system if it fails to meet the requirements of the SWMA. DEQ may not withhold, deny, or impose conditions on any permit based on the provision of MEPA. However, MEPA allows the license applicant for a SWMS license and DEQ to mutually develop measures that may be incorporated into a license.

Pursuant to Section 75-10-221, MCA and the Administrative Rules of Montana (ARM) 17.50.513, DEQ determined Clean Solutions' application was complete and complied with the requirements of the SWMA. DEQ has selected the Proposed Action Alternative and issued a SWMS license authorizing Clean Solutions to operate the resource recovery facility.

Clean Solutions will be required to operate and maintain all stormwater control features in accordance with the Stormwater Pollution Prevention Plan and the General Industrial Montana Pollution Discharge Elimination System Permit throughout the life of the facility.

5 Findings Required by Laws and Policies

5.1 Montana Environmental Policy Act (MEPA)

MEPA requires State agencies to conduct an environmental review when making decisions or planning activities that may have a significant impact on the environment. MEPA and the administrative rules promulgated under MEPA define the process to be followed when conducting an environmental review. The Draft and Final EA that DEQ prepared in regards to the Clean Solutions application for licensure complies with the procedural requirements of MEPA.

5.2 Solid Waste Management Act (SWMA)

The Solid Waste Management Act recognizes that the health and welfare of Montana citizens is endangered by improperly operated solid waste management systems and by the improper and unregulated disposal of wastes. The SWMA and associated Administrative Rules control solid waste management systems to protect the public health and safety and to conserve natural resources whenever possible (Section 75-10-202, MCA). The basic objective of the Clean Solutions Resource Recovery facility licensure is to establish a solid waste management system that controls, on a continuing basis, the on-site recovery of solid wastes, the operation and maintenance of facility monitoring structures, and the final vegetative cover subsequent to any final use of the area.

The site will be operated according to the approved facility Operation and Maintenance (O&M) Plan. All facility monitoring features will be in place prior to the acceptance of wastes for resource recovery. The facility will maintain a DEQ-approved financial assurance mechanism, funded prior to the resumption of resource recovery activities, to cover the costs associated with facility closure and post-closure care. Clean Solutions will not depart from the approved facility design, O&M Plan, or Closure/Post-Closure Plan without first obtaining from DEQ written approval for the proposed change.

6 Appeal of DEQ's Decision

This decision is subject to validation by the local health officer. According to Section 75-10-222, MCA, the license issued by DEQ under this section is not valid until signed by the local health officer having jurisdiction in the county in which the solid waste management system will be operated. The local health officer may refuse to validate a license issued only upon a finding that the requirements of the SWMA and associated administrative rules cannot be satisfied, Section 75-10-223, MCA. The applicant or any person aggrieved by the decision of the local health officer not to validate a license may appeal the decision to the Board of Environmental Review within 30 days after receiving written notice of the local health officer's decision. The hearing before the board must be held pursuant to the contested case provisions of the Montana Administrative Procedure Act.

Section II - FINAL ENVIRONMENTAL ASSESSMENT

1 PURPOSE AND NEED FOR ACTION

1.1 Summary

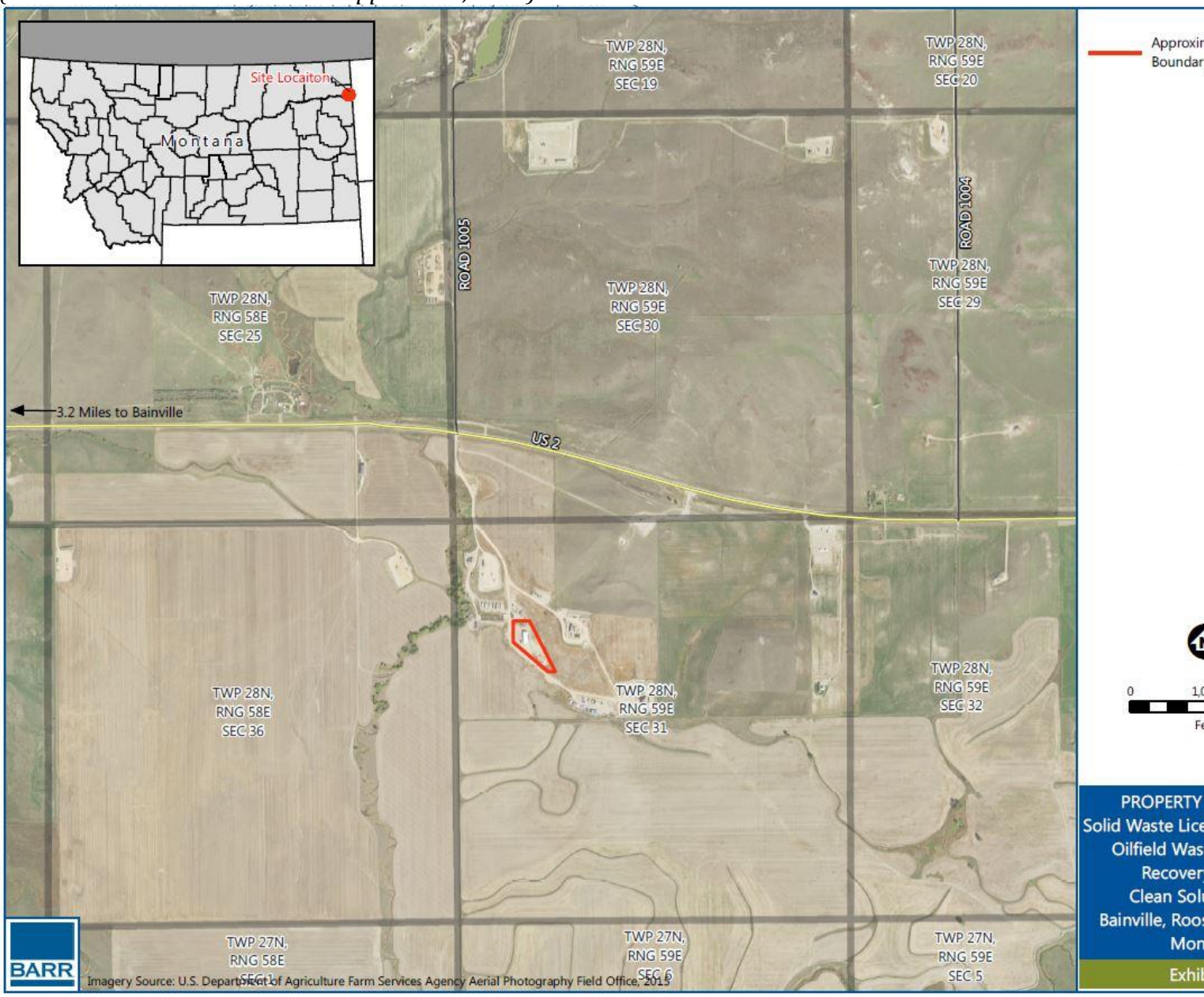
On March 13, 2017, Clean Solutions, LLC, (Clean Solutions) submitted a Solid Waste Management System (SWMS) license application to the Montana Department of Environmental Quality's (DEQ) Solid Waste Program (SWP) for the licensure of a Class II Resource Recovery Facility (RRF). The site is known as the Clean Solutions Resource Recovery Facility. Clean Solutions proposed to resume operations of an existing (but currently unlicensed) SWMS for the recovery of marketable petroleum products from sludges, slurries, and production water generated by oilfield exploration and production activities. These products may contain Technologically Enhanced Naturally Occurring Radioactive Materials (TENORM).

There are no federal regulations or guidance specific for managing TENORM waste. However, TENORM is regulated as a Group II waste in Montana. TENORM waste contains alpha and beta particles and gamma rays, but is not nuclear waste because the concentration of naturally occurring radionuclides is very low. The vast majority of radiation emitted from TENORM is in the form of alpha particles. Alpha particles created by radioactive decay can only travel a few feet through the air and can be stopped by a sheet of paper. Skin stops alpha particles from entering the body, but alpha particles pose a human health risk if inhaled or ingested. Facilities that manage TENORM waste must protect human health and the environment through measures such as dust mitigation, air monitoring, and other site operation and employee monitoring controls.

A Class II SWMS is a system that provides the storage, treatment, recycling, recovery, and/or disposal of Group II, III, and IV solid wastes. In Montana, wastes are grouped based upon their physical and chemical characteristics to determine the degree of care required in their handling and disposal, as well as the potential of the wastes to cause environmental degradation or public health hazards. Group II wastes include decomposable wastes and mixed solid wastes containing decomposable materials, but exclude regulated hazardous waste. Group III wastes include clean wood wastes and other clean non-water soluble or inert solids. This category includes, but is not limited to, brick, rock, dirt, concrete, unpainted and unglued wood materials, and tires. Group IV wastes include construction and demolition wastes and asphalt, but exclude regulated hazardous wastes. The Clean Solutions Class II RRF would generate Group II wastes from facility operations.

The Clean Solutions RRF is an existing solid waste management facility owned by Strategic Holdings, LLC. Strategic Holdings, LLC acquired the 147-acre parcel that includes the saltwater injection well and the RRF after the former landowner, who constructed the facility, declared bankruptcy. Strategic Holdings intends to operate the site through the applicant, Clean Solutions, LLC.

Figure 1.1 – General Location of Clean Solutions, LLC Class II Resource Recovery Facility
(Source: Clean Solutions License Application, 2017)



1.2 Purpose and Need

The Montana Integrated Waste Management Act (IWMA) establishes goals for waste reduction in the state through the development of an integrated approach to solid waste management. The IWMA's priority for solid waste management focuses first on source reduction, reuse, recycling, and composting. Landfill disposal and incineration are the final options for solid waste management. While source reduction, reuse, recycling, and composting all play a role in solid waste management in Montana, most solid waste is landfilled.

The Montana Solid Waste Management Act (SWMA) establishes the minimum requirements for the development of solid waste management facilities. The administrative rules adopted in accordance with the authority provided by the SWMA establish requirements for the design, operation, financial assurance, closure, and post-closure care of solid waste management facilities.

Clean Solutions has applied to DEQ for a license to resume operations at the RRF according to Montana's solid waste management regulations. The proposed action is Clean Solution's operation of the RRF to recover marketable petroleum products from wastes generated by the oil and gas industry. The petroleum products would be stored onsite for resale. The solid waste and wastewater components generated from the resource recovery activities would be disposed at a facility licensed by DEQ to accept the solid wastes or an MBOGC permitted saltwater disposal well for the liquid wastes.

Because DEQ's Solid Waste Program received an application for licensure of the facility, DEQ is required to review the application to determine the significance of impacts according to the Montana Environmental Policy Act (MEPA). The purpose of this environmental assessment is to provide the results of the environmental review conducted in accordance with MEPA.

According to 75-1-102, Montana Code Annotated (MCA), MEPA requires the "adequate review of state actions in order to ensure that environmental attributes are fully considered by the legislature in enacting laws to fulfill constitutional obligations; and the public is informed of the anticipated impacts in Montana of potential state actions." Environmental assessments (EA's) and Environmental Impact Statements (EIS's) are typically the form of documents that DEQ uses to identify a range of potential environmental impacts anticipated from a given state action and to reach a given decision that leads to the state action. An EA or EIS does not result in a certain decision, but rather serves to identify the potential effects of a state action within the confines of existing laws and rules governing such proposed activities so that agencies make balanced decisions. The MEPA process does not provide regulatory authority beyond the authority explicitly provided in existing statute.

1.3 Project Location and Study Area

The 6.8-acre resource recovery system is located on property owned by Strategic Holdings, LLC, approximately three miles east of Bainville, Montana, just off U.S. Highway 2. The site of the RRF proposed for licensure is zoned commercial rural property. The remainder of the 147-acre site not used for resource recovery activities includes a permitted salt-water disposal well and associated structures and equipment. The Clean Solutions RRF is not

currently in operation, but operations have occurred intermittently since the facility was constructed in 2012. The topography of the site consists of rolling upland grassland and low-lying drainages. There are no local restrictions that prohibit the location of the RRF at the site. The study area includes the RRF parcel and adjacent areas that may be impacted. The size of the study areas vary by resource. Adjacent land uses include rural residential, agricultural, and light industrial.

1.4 Regulatory Responsibilities and Requirements

DEQ administers the SWMA including the administrative rules adopted pursuant to these state laws. DEQ is responsible for analyzing the possible environmental impacts of a proposed solid waste management system under the procedural requirements of MEPA. In order for DEQ to approve a proposed solid waste management system, DEQ must determine that the proposed solid waste management system complies with the requirements of the SWMA.

Table 1.1 provides a listing of agencies and their respective regulatory responsibilities pertinent to the application for a SWMS license.

TABLE 1.1
Regulatory Responsibilities

ACTION	REGULATORY AGENCY
Solid Waste Management System License	DEQ – Waste and Underground Tank Management Bureau
Air Quality Permitting	DEQ – Air Quality Bureau
General Permit for Storm Water Discharge Associated with Industrial Activity	DEQ-Water Protection Bureau
Montana Pollutant Discharge Elimination System Permit (MPDES)	DEQ – Water Protection Bureau
SWMS License Validation by County Health Officer	Roosevelt County Health Officer
County Road Construction, Maintenance, and Land Use, Weed Plan Approval	Roosevelt County

2 DESCRIPTION OF ALTERNATIVES

2.1 Introduction

This chapter summarizes the alternatives DEQ evaluated including the No Action alternative required by MEPA. MEPA requires the evaluation of reasonable alternatives to the Proposed Action. Reasonable MEPA alternatives are those that are achievable under current technology and are economically feasible as determined solely by the economic viability for similar projects having similar conditions and physical locations and determined without regard to the economic strength of the specific project sponsor.

According to ARM 17.4.609(3)(f), an EA must discuss reasonable alternatives whenever alternatives are reasonably available and prudent to consider. However, DEQ has not included any alternatives to mitigate impacts because Clean Solutions' application and

operation and maintenance plan contain the mitigations necessary to prevent significant impacts.

2.2 No Action Alternative

If the application failed to meet the minimum requirements of the SWMA and could not be processed as submitted, DEQ would deny the license application and the facility would not be licensed. If the application is denied, activities at the facility would not resume and the impacts identified in the Final EA would not occur.

2.3 Proposed Action

The Proposed Action Alternative would allow the licensed operation of the existing resource recovery facility. DEQ would approve the license application and the facility would be licensed. Clean Solutions would operate the resource recovery facility according to the DEQ-approved Operation and Maintenance Plan. The Proposed Action consists of the RRF as depicted on Figure 2.1.

2.3.1 Resource Recovery Facility Features

The facility features are comprised of existing oilfield waste storage tanks, processing equipment, and bins for the temporary storage of solids separated from oilfield waste liquids. Solid waste disposal does not occur on the site; solid wastes generated from operation of the resource recovery facility would be disposed of at a licensed solid waste landfill.

The resource recovery operations would utilize the following existing onsite features (Figure 2.1):

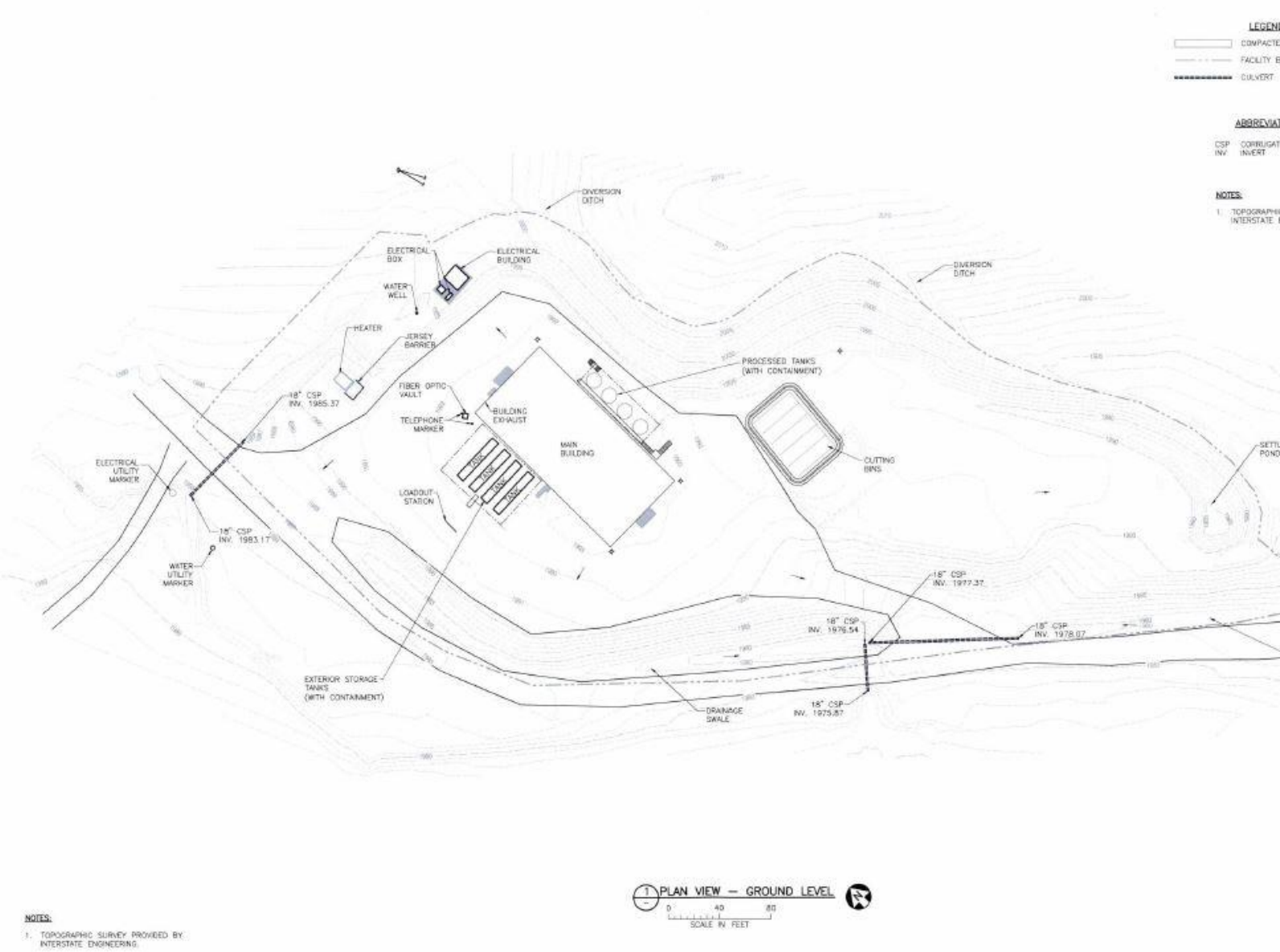
1. A truck loadout station to accept waste fluids for initial screening;
2. Four primary slurry storage tanks with fines;
3. Underground piping;
4. A fluid heater to prepare slurry for processing;
5. A lined process building with equipment and piping for fluid-solid separation;
6. Two recovery tanks and upload station for sale of liquid hydrocarbon;
7. Two final tanks for reuse or disposal of processed wastewater;
8. A lined pad with mixing bins for rejected solids;
9. An electrical and equipment storage building; and
10. Stormwater pond and perimeter berms.

2.3.2 Processing Plant and Storage Bin Liner Design

The processing plant includes structures located both inside and outside of the process plant building. Four horizontal storage tanks, four vertical storage tanks, an offloading station, a heating unit, and four mixing bins for waste solids separated from the resource recovery process are located outside the plant building, but within the area proposed for licensure. The exterior storage tank areas are lined with a 20-mil high-density polyethylene (HDPE) liner, e.g. plastic liner, and surrounded by sealed steel vertical containment structures. The waste solids bins are underlain by a 40-mil HDPE liner that is overlain with 12 inches of compacted sand and six inches of well-graded crushed gravel. The bin area is surrounded by a 12-inch high soil containment berm. The berm would be lined with a 40-mil HDPE liner prior to the recommencement of resource recovery activities.

Figure 2.1 – Proposed Clean Solutions, LLC Class II Resource Recovery Facility – Facility Features

(Source: Clean Solutions License Application, 2017)



The processing plant building is a 72-foot by 147-foot steel Quonset-shaped building with large overhead doors located on both the north and south sides of the building. The building is constructed over a six-inch concrete pad with a six-inch high interior perimeter concrete berm around the top of the pad. The interior berm surrounds all features inside the building. The concrete pad is underlain by a ½-inch thick steel plate. The concrete pad slopes toward the solids collection pit that is located on the south end of the building floor. The solids collection pit is lined with ¼-inch thick sealed steel.

A battery of eight large vertical tanks is inside the building on top of the six-inch concrete pad. The tank battery is surrounded by a reinforced 3.8-ft high sealed steel secondary containment wall. The tanks are equipped with valves for tank isolation. Any drips or spills of liquids from the plant would be contained within the tank battery by the berms, and captured by draining into the collection pit. The concrete floor and steel containment walls are treated with a spray liner to reduce the potential for infiltration from incidental drips and spills. All pumps in the building are equipped with catch pans. An overhead shaker, centrifuge, and filter press is located above the solids collection pit on the catwalk (Figure 2.2).

2.3.3 Stormwater Control

Stormwater generally flows from the northeast towards the southwest on the 147-acre parcel. Ditches constructed on the north and west sides of the site divert stormwater around the facility (Figure 2.3). Stormwater that currently falls onsite is either routed into the stormwater pond located at the southeast corner of the site, or drains to a system of ditches that route flows off the site through one of two 18-inch culverts that flow under the facility access road. The existing stormwater pond has the capacity to contain the 25-year 24-hour storm event as required by regulation. The system of grading, ditches, and culverts divert and control run-off so that it does not impact the onsite solid waste storage bins.

Any run-off from the slope immediately adjacent to the bins would be captured by the one-foot high berm surrounding the storage bins. Any run-off captured within this bermed area would be managed as leachate and would be removed and processed in the processing plant. Prior to the recommencement of facility operations, the berm around the storage bins would be lined with a 40-mil high density polyethylene liner; the access road would be raised by 0.6 feet; the north 18-inch culvert would be replaced with a 48-inch culvert; the south 18-inch culvert would be replaced with a 24-inch culvert; and the diversion ditch on the northeast corner of the proposed license boundary would be deepened by one foot.

Figure 2.2 – Proposed Clean Solutions Class II Resource Recovery Facility – Process Layout

(Source: Clean Solutions License Application, 2017)

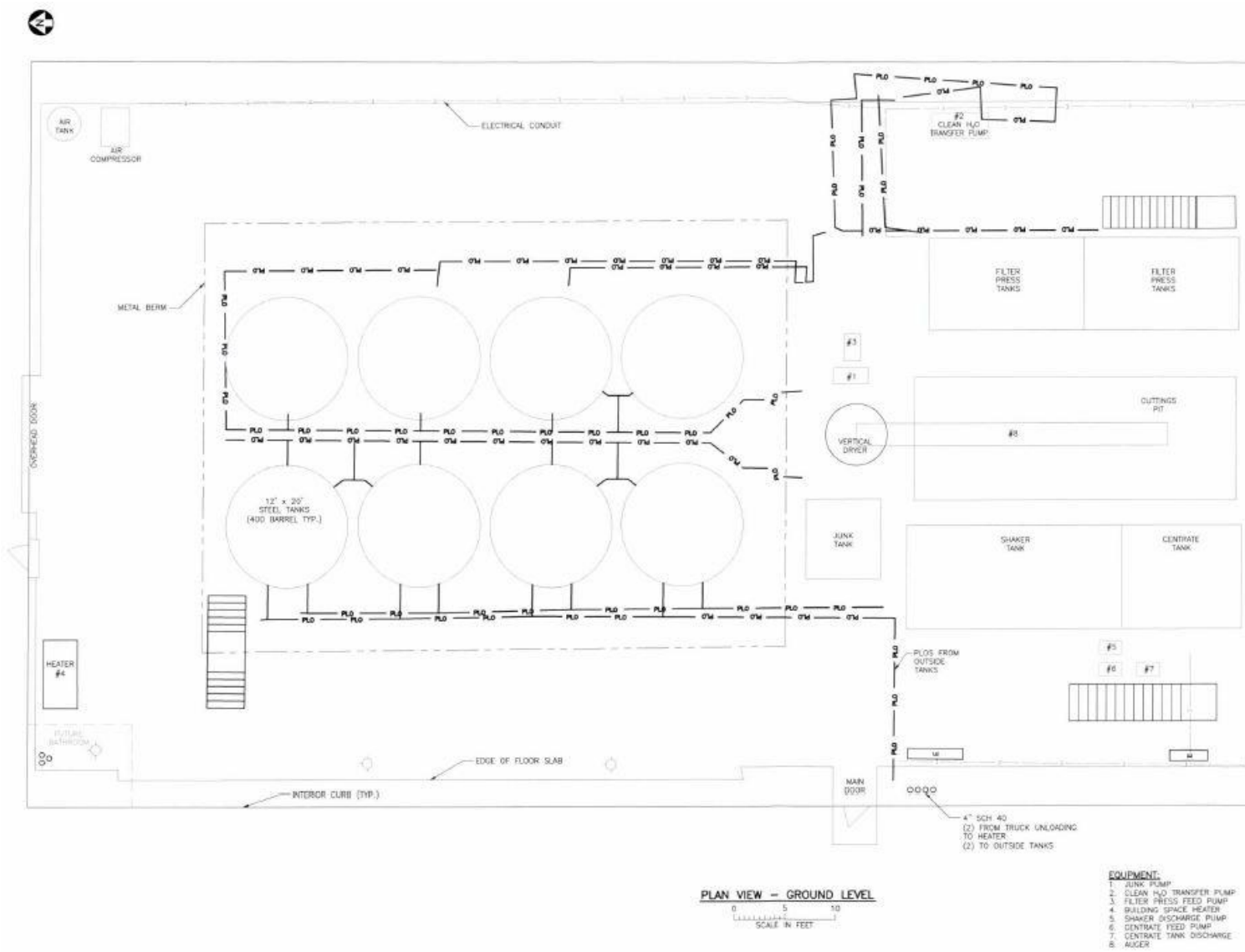
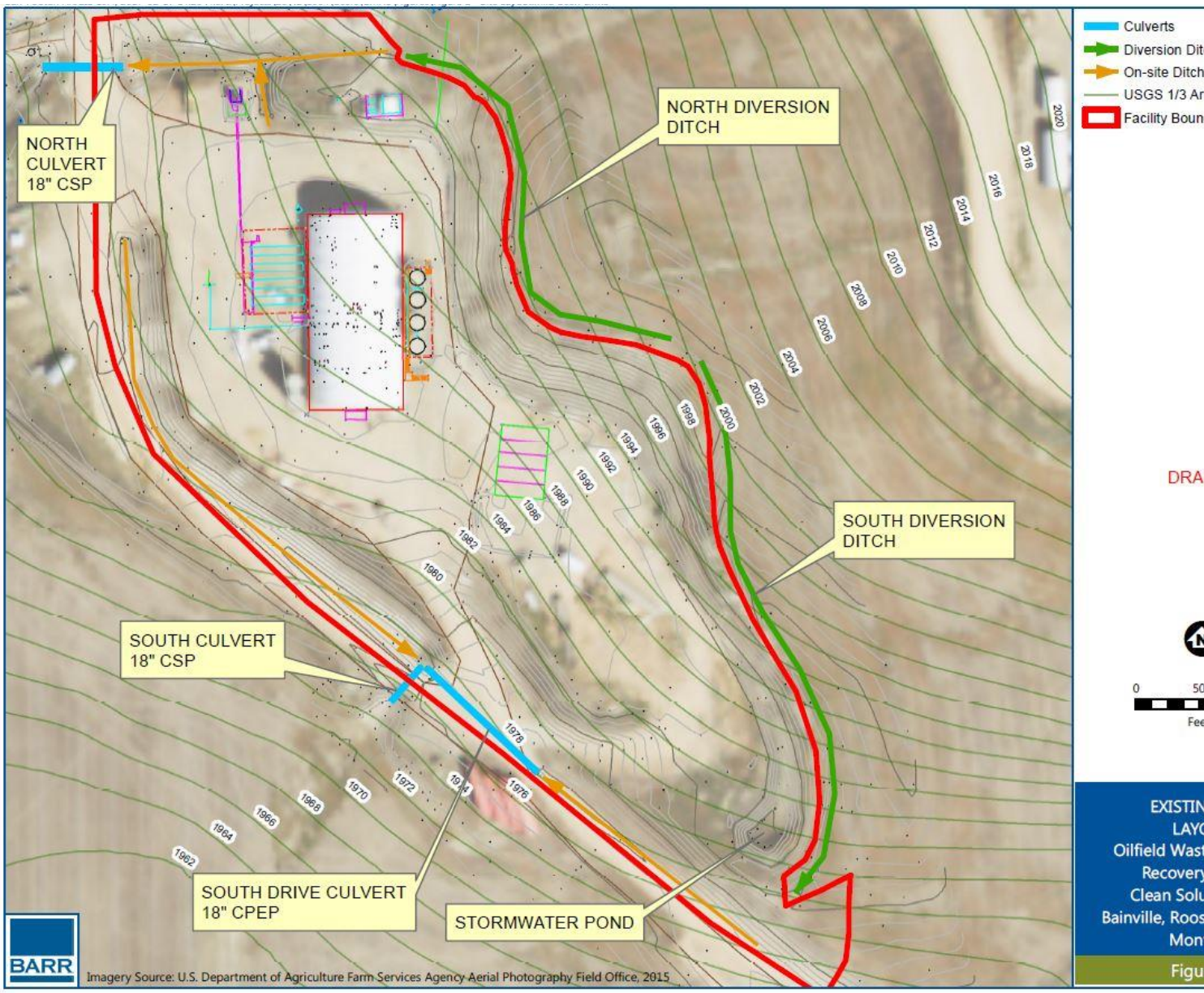


Figure 2.3 – Proposed Clean Solutions Class II Resource Recovery Facility – Storm Water Controls

(Source: Clean Solutions License Application, 2017)


NORTH CULVERT 18" CSP
NORTH DIVERSION DITCH
SOUTH DIVERSION DITCH
SOUTH CULVERT 18" CSP
SOUTH DRIVE CULVERT 18" CPEP
STORMWATER POND
BARR
Imagery Source: U.S. Department of Agriculture Farm Services Agency Aerial Photography Field Office, 2015
Culverts
Diversion Dit
On-site Ditch
USGS 1/3 Ar
Facility Boun
DRA
EXISTIN
LAYO
Oilfield Wast
Recovery
Clean Solu
Bainville, Roos
Mon
Figu

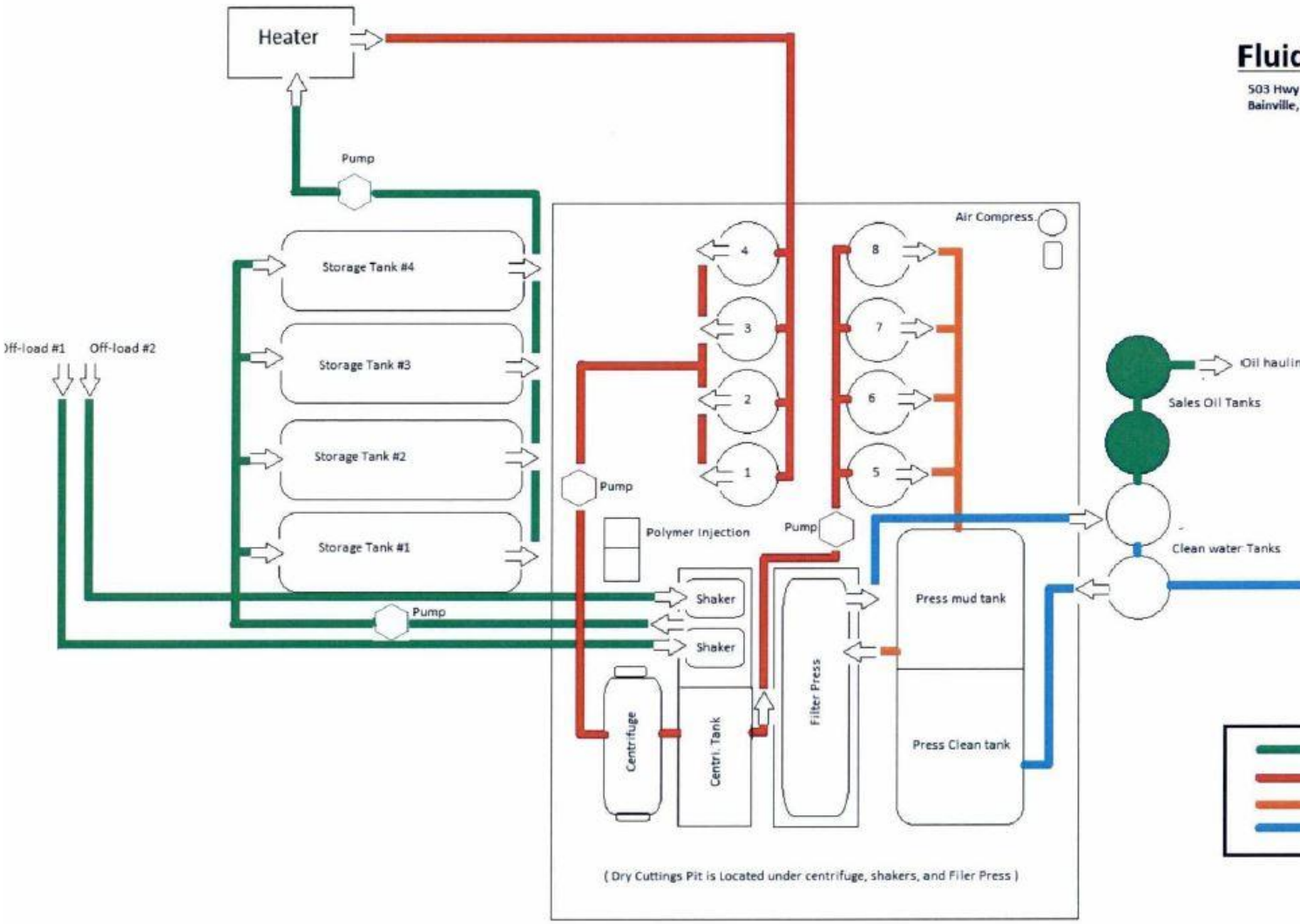
2.3.4 Facility Operations

The separation of solids, hydrocarbon liquids, and wastewater from wastes delivered to the facility would be accomplished through the processing plant. The percentage of these three fractions would vary depending on the loads delivered. The slurries and liquids accepted for processing are largely derived from bulk mixtures of drill cuttings, muds, crude oil, production water, and drilling or flow back liquids.

The existing 6.8-acre RRF would accept oilfield exploration and production wastes in slurry or liquid form. The treatment process plant, housed in the onsite building, contains the equipment necessary to recover marketable petroleum products. The resource recovery process separates the petroleum fractions from the solid and wastewater (saltwater) portions of the incoming wastes. The recovered petroleum liquids are stored in two outside, upright storage tanks on the east side of the building. The produced wastewater is stored in two outside upright storage tanks also located on the east side of the building. This wastewater is either reused in the resource recovery process or pumped via underground piping to the adjacent permitted saltwater injection well for disposal. Rejected drill cuttings are captured in the indoor concrete lined collection pit located beneath the filter press. These solids are removed from the building for storage in the bins located outside on the south side of the processing building. All solids are sampled and analyzed by an off-site laboratory for hydrocarbon and radionuclide content prior to shipment offsite for disposal at a licensed landfill.

Figure 2.4 provides a visual representation of the material resource recovery and separation process. Materials are brought to the site by truck and then conveyed through a pipeline into the building. Coarse solids are separated from the liquids and conveyed to a central concrete collection pit; the liquids are transferred to collection tanks. The liquids are then piped to a 2,000,000 BTU stainless steel fluid heater to bring the fluid temperature to 175°F, which assists in the fluid separation process. These fluids are then transferred via underground piping from the fluid heater to the upright vertical tanks inside the building and piped to the horizontal centrifuge. After the centrifuge, the fluids are pumped to the filter press. The filtered fluids are then pumped in to the vertical storage tanks located outside on the east side of the building and the filtered solids are dropped directly into the concrete solids collection pit.

Figure 2.4 – Proposed Clean Solutions Class II Resource Recovery Facility – Separation Process
(Source: Clean Solutions License Application, 2017)



2.3.4.1 Personnel

The Clean Solutions RRF would be operated by at least three employees trained to properly operate the facility and effectively manage site issues as they arise. Site personnel would assist with offloading, operate the equipment in the processing building, monitor liquid levels in the storage tanks, perform routine and regular inspections of site operations, and perform maintenance. Additional site personnel would be added as needed.

2.3.4.2 Operating Hours

The proposed Clean Solutions RRF would be open to receive wastes for processing seven days per week from 7:00 a.m. to 7:00 p.m.

2.3.4.3 Facility Monitoring and Maintenance

Clean Solutions would perform regular inspections of the RRF to ensure compliance with all applicable regulations. Facility fencing and gates would be inspected for integrity; building equipment would be inspected for proper system performance; surface water management features would be inspected for erosion, sediment build-up, and uncontrolled vegetative growth; access roads would be inspected for excessive settlement, rough surfaces, and erosion; and concrete pads would be inspected for excessive settlement, surface cracks, and any other signs of deterioration or damage. Maintenance and repairs would be made as issues are identified, and would be recorded in the facility operation records.

2.3.4.4 Dust Control

Site access roads that have accumulated fine soils prone to dust generation would be cleaned, watered, or chemically treated to aid in minimizing dust generation. When water is used as a dust suppressant, the operator would apply water at a rate that would not cause run-off or erosion. The water would be applied to the road any time the operator observes that visibility of the drivers could be obstructed. In windy conditions, the operator would implement dust control measures to prevent dust generation.

2.3.4.5 Onsite Traffic Control

Trucks currently access the facility from US Highway 2. The current design of the onsite roadway allows for two-way traffic and accommodates the physical and performance characteristics of an interstate semitrailer design vehicle type.

2.3.5 Final Closure

Prior to commencing closure activities, Clean Solutions would submit a Notification of Intent (NOI) to DEQ at least 30 days prior to the commencement of planned closure activities. Pursuant to DEQ regulations, all closure activities must be completed within 180 days following the NOI, unless otherwise approved by DEQ. Closure activities would include removal of the site and facility infrastructure features, and soil sampling investigation performed within the license boundary. Then, comparison of the results of the soil investigation to current environmental regulations would determine whether contamination exists, and whether or not soils need to be removed from the site. Vegetation would also be restored over the license boundary area with a seed mixture approved by the local soil conservation district, and then monitored annually to ensure that it becomes established.

2.3.6 Financial Assurance

In accordance with ARM 17.50.540, all Class II facilities must provide and maintain a Financial Assurance (FA) mechanism to cover costs associated with facility closure and post-closure care. Financial assurance ensures that work associated with facility closure and post-closure care is completed, in the event the operator cannot or would not do so of their own accord. Financial assurance would be required for the Clean Solutions RRF.

Clean Solutions has proposed a Certificate of Deposit (CD) as the mechanism for providing the required FA for closure and post-closure care. The current projected total closure cost for FA is $244,000; the current projected annual post-closure care cost for FA is $1,800. The facility would update the closure and post-closure care costs annually and provide additional funds as necessary to ensure the mechanism is adequately funded. A separate CD for closure and post-closure care would be established and approved by DEQ prior to the resumption of resource recovery activities at the facility. DEQ would be the beneficiary of the CD and would control all funds released.

2.3.7 Post-Closure Care

Once all final closure activities have been completed and approved by DEQ, Clean Solutions would begin the post-closure care period for the RRF. Post-closure care would be conducted according to the DEQ-approved Post-Closure Care (PCC) Plan. The PCC Plan identifies the inspection, maintenance, and monitoring activities (along with the frequency for conducting these activities) necessary during the post-closure care period.

According to the proposed PCC Plan, Clean Solutions will conduct detailed inspections of the closed facility during the post-closure care period. The inspections would include:

- Evaluation of the vegetative cover for erosion and quality of vegetation;
- Inspection of the drainage control features for stability and erosion.

3 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES BY RESOURCE

3.1 Introduction

Section 3 describes resources that could be affected by the Proposed Action and discusses the environmental effects of the Proposed Action and the No Action Alternative.

3.2 Location Description and Study Area

The project location and associated study area for the Proposed Action include all lands and resources in the proposed Project Area, plus those additional areas identified by technical disciplines as "resource analysis areas" that are beyond the Project Area. Resource analysis areas are identified for each technical discipline.

3.3 Terrestrial and Aquatic Life and Habitats

3.3.1 Analysis Area and Methods

The analysis area for terrestrial and aquatic life and habitats is the 147-acre parcel that includes the proposed 6.8-acre Clean Solutions RRF. The analysis methods included DEQ's research of the Natural Resource Heritage Program database to determine the presence of threatened, listed, and/or endangered plant and animal species. The following analysis provides a habitat-based approach to determine effects of the proposed project on listed species.

3.3.2 Affected Environment

The proposed Clean Solutions RRF is located in the Plains Grassland ecosystem of eastern Montana. Plants in this ecosystem are adapted to extreme temperatures and low moisture. Precipitation ranges from 10 to 16 inches, with most of the precipitation occurring during late spring and early summer months.

The proposed Clean Solutions RRF is surrounded by agricultural activities and cultivated crops. There are some surrounding streams and wetlands, but none are located within the proposed 6.8-acre facility license boundary or within the remainder of the 147-acre parcel with the exception of an intermittent unnamed tributary of Shotgun Creek. This intermittent tributary borders the northwestern boundary of the 147-acre parcel, but does not come in contact with the proposed 6.8-acre RRF. There are no aquatic systems to support aquatic life within the proposed 6.8-acre RRF. The Missouri River is located approximately six miles south of the project area.

The proposed Clean Solutions RRF is not located within a sage grouse core, general habitat, or a connectivity area. A search of the Montana Natural Heritage Program found records for Roosevelt County, Township 28N, Range 59E having two animal species of concern. There were no other animal species identified as threatened, endangered, or as a species of concern.

Species Subgroup	Scientific Name	Common Name	Family Scientific Name	Family Common Name	Habitat
Birds (Aves)	Dolichonyx oryzivorus	Bobolink	Icteridae	Blackbirds	Moist Grasslands
Birds (Aves)	Grus americana	Whooping Crane	Gruidae	Cranes	Wetlands

3.3.3 Environmental Consequences

3.3.3.1 No Action Alternative

Under this alternative, because there would be no resumption of site activities, impacts to terrestrial and aquatic life and habitats would be permanent. If facility activities do not resume, the habitat currently occupied by the facility could be lost because the site might not be reclaimed.

3.3.3.2 Proposed Action

Transient wildlife populations occupy habitat near the facility. While these animals likely occupy, or pass through, the 147-acre Strategic Holdings parcel, they are not likely to occupy this parcel permanently as a result of the ongoing human activity on the site. Transient, by definition, means "lasting only for a short time" or "impermanent." Wildlife exhibit transient behavior, relocating regularly, and rarely remaining in one area for long periods of time, especially areas with regular, recurring human activity. The resumption of activity at the Clean Solutions RRF would relocate any transient population that occupies or passes through the area. However, considering the vast amount of similar habitat surrounding the proposed facility boundary, the impact to these transient populations would be negligible.

The Bobolink bird is an uncommon to fairly common breeding resident in Montana. They typically arrive in the state in mid-May and depart in August. Bobolinks nest from late-May to mid-July and prefer nesting in wet meadows and hay fields with high grass-to-legume ratios. Bobolinks prefer large tracts of dense, fairly tall grasses and avoid areas of woody vegetation. Observations made of the Bobolink in Montana have been made infrequently. Populations have greatly declined in the state largely because of changes in land use. The 147-acre parcel that includes the 6.8-acre RRF lacks the habitat necessary to attract and sustain the Bobolink. As a result, resumption of resource recovery activities on the property would not impact the Bobolink.

The whooping crane was federally listed as threatened with extinction in 1967 and endangered in 1970; both listings were "grandfathered" into the Endangered Species Act of 1973. Critical habitat for the whooping crane was designated in 1978. The individuals representing the Aransas Wood Buffalo Population (AWBP) in Texas comprise one of the rarest and most

imperiled self-sustaining avian populations in the world, with a population size of less than 300 individuals. The species breeds in wetland habitat associated with Wood Buffalo National Park in Alberta and the Northwest Territories of northern Canada, and overwinters on the Texas coast. The migration corridor for the AWBP follows an approximate straight path, with the cranes traveling through Alberta, Saskatchewan, extreme eastern Montana, North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, and Texas. The migration route approximately follows the Missouri River corridor through the mid-western United States. Though whooping cranes historically nested in Montana, they are currently a migrant in the spring and fall through the far eastern portion of the state. According to the Montana Bird Distribution Committee, the migration route of the Whooping Crane includes a portion of the extreme northeastern corner of Montana. However, the main migration through the Great Plains occurs in North and South Dakota. The occasional migrant has been observed in Montana mostly in Sheridan and Roosevelt Counties, as the bird travels between Canada and Texas. During migration, whooping cranes use stopover habitat opportunistically. In general, they avoid rocky substrates and heavily vegetated sites and are most likely to be present in wetlands, but may also be found during migration in marshes, shallow lakes, lagoons, salt flats, and grain and stubble fields. They typically use shallow marshes with minimal to no emergent zone for roosting, and nearby (within two miles) upland cropland and pastures for foraging.

Since the location of the RRF is within the whooping crane migratory corridor, whooping cranes may occur in the vicinity of the project during the April 1 – May 15 and/or September 10 – October 31 migration periods.

Agricultural activities and cultivated crops dominate the area surrounding the 147-acre parcel. No direct impacts to these areas would occur as a result of the resumption of facility operations. Wind energy and associated overhead powerlines are thought to be the highest source of mortality for whooping cranes. Wind energy resources within the whooping crane migratory corridor would likely continue to be developed at their current rates. Wind development in eastern Montana is generally south of the project area, but this resource continues to be developed throughout the state. Oil and gas development would also likely continue at current rates. This development would continue to indirectly impact whooping crane stopover habitat by converting crop fields and agricultural wetlands to exploration and production sites. Whooping cranes would also be deterred from stopovers due to an increase in human activity. Human activity from the current operation of the saltwater disposal well already likely indirectly deters whooping cranes from using this area as stopover habitat. Therefore, indirect impacts to migrating whooping crane are unlikely to occur as a result of the resumption of resource recovery activities at this location.

There are no aquatic systems to support aquatic life within the proposed 6.8-acre RRF. The intermittent tributary that borders the northwestern boundary of the 147-acre parcel, does not come in contact with the proposed 6.8-acre RRF. The intermittent drainage does not support aquatic life, but may be a source of water for transient wildlife populations. The overall design of Clean Solutions RRF includes the two perimeter ditches, culverts, and berms that would keep stormwater run-on that originates upgradient of the project site from entering the 6.8-acre license boundary area. Stormwater flow along the upgradient perimeter is conveyed to downgradient areas outside the license boundary as natural flow via the perimeter ditches and culverts. Stormwater flow from the perimeter ditches is directed to flow through the natural drainage swales downgradient of the project area in the northwest corner and along the southwest side of the site. When the precipitation rate exceeds the infiltration rate, stormwater would continue to flow naturally from these drainage swales toward the unnamed intermittent drainage located on the northwestern edge of the 147-acre parcel. As a result, there are no additional impacts anticipated to the unnamed intermittent drainage as a result of the resumption of operations at the project site.

The resumption of activities at this location would not accelerate oil and gas developments in the area since RRFs are not currently the limiting factor in oil and gas production. The cost of development and the price of oil determines the rate of oil and gas exploration. Operation of the facility would not reduce or degrade potential whooping crane stopover habitat within the project area, and therefore cumulative effects as a result of the proposed project would be negligible and discountable.

There were no critical, protected, or unique habitat features identified on the site. There are no anticipated impacts to the species of concern identified in Section 3.3.2 because their habitat features are not found on the project site. While any other terrestrial species that currently occupy the site may be forced to relocate to adjacent areas, there would not be additional habitat lost as a result of the resumption of resource recovery activities at this location because the facility is already constructed and has operated in the past. Once operations cease and the facility is closed, the site would be reclaimed. Therefore, the impact to terrestrial and aquatic species is negligible.

3.4 Hydrology

3.4.1 Analysis Area and Methods

The analysis area for hydrology is the 147-acre parcel that includes the 6.8-acre RRF, and properties surrounding the parcel. The analysis methods for hydrology included the review of wetlands and jurisdictional waters information, onsite drilling reports, publications of the Montana Bureau of Mines and Geology (MBMG), and published topographic maps of the area.

3.4.2 Affected Environment

3.4.2.1 Surface Water

There are two drainages (Figure 3.1) located to the southwest and southeast of the site. Little Muddy Creek is located approximately 1.25 miles toward the south-southeast; Shotgun Creek is located 1.25 miles southwest of the site. Little Muddy Creek and Shotgun Creek join approximately 1.5 miles south of the facility and drain south towards the Missouri River. There is an unnamed intermittent tributary that eventually flows into Shotgun Creek that borders the northwestern boundary of the 147-acre parcel, but does not come in contact with the proposed 6.8-acre RRF. There are no wetlands or permanent water bodies within the 147-acre parcel that includes the 6.8-acre RRF. The average total precipitation in the area is approximately 13.5 inches per year, with the majority falling from May through July.

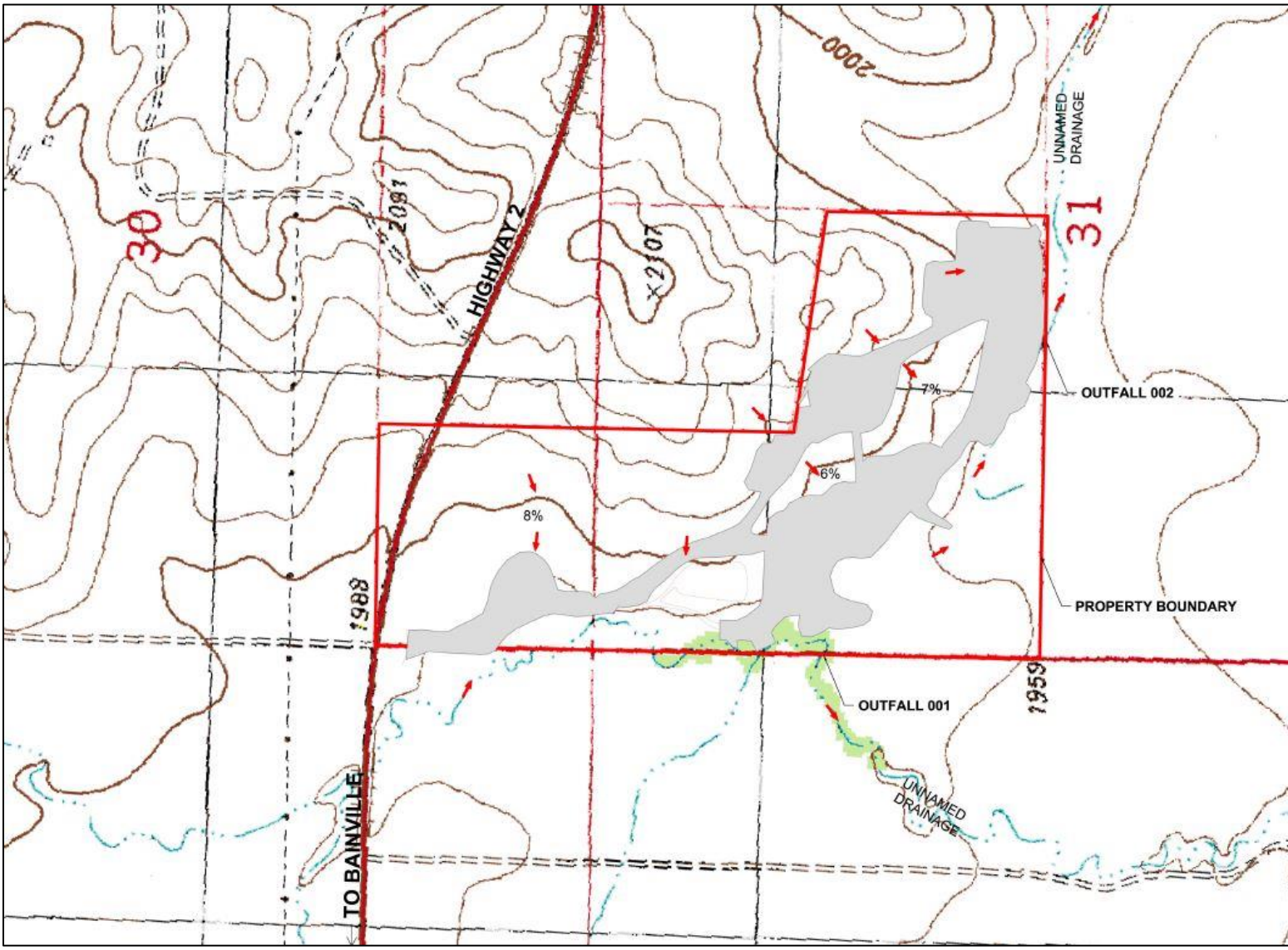
The Missouri River is located approximately six miles south of the project area. Surface water flows would occur in this unnamed intermittent drainage only during periods of heavy rainfall or rapid snowmelt. There are no known natural springs within the facility, or in the immediate vicinity.

An approximately 26-acre upslope area drains towards the 147-acre parcel with a general flow direction from the northeast towards the southwest. A stormwater diversion ditch is located on the north and west sides of the proposed 6.8-acre license boundary, which directs stormwater flow from the 26-acre area away from the 6.8-acre Clean Solutions RRF. Stormwater that flows from this upslope area would be collected in the stormwater pond located in the southeast corner of the site, or diverted by the system of ditches and culverts to areas off site.

3.4.2.2 Groundwater

The distribution and physical properties of the underlying geologic units affect the availability, movement, and quality of groundwater. Throughout northeastern Montana, groundwater typically occurs along the basal contact of glacial till and the underlying Tertiary sediments. On occasion, groundwater resources are found within sand and gravel lenses as perched isolated pockets. The town of Bainville is built on quaternary shotgun creek alluvium. To the south of Bainville, quaternary alluvium blankets the Missouri River valley. Quaternary alluvial fan and colluvium deposits commonly apron the base of terraces and slopes on the margins of the Missouri River valley. Tertiary Fort Union formation underlies the Quaternary alluvium, colluvium, and glacial deposits outcrop in incised Missouri River tributary drainages, and discontinuously along the Missouri River valley margins. Sandstones and coals within the Fort Union formation contain important aquifers that are utilized for drinking water supplies in the area. These aquifers are usually confined above and below

Figure 3.1 – Proposed Clean Solutions Class II Resource Recovery Facility – Surface Water Features
(Source: Clean Solutions License Application, 2017)



by low permeability siltstones and claystones and can therefore sometimes exhibit artesian characteristics, such as static water levels that rise above the screened interval.

Locations of nearby groundwater wells (including stock wells and public water supply wells within one mile of the proposed expansion area boundary) were identified by a search of the MBMG's Groundwater Information Center (GWIC) database. The GWIC database identified 31 wells located within a one-mile radius of the facility. Of the wells in the GWIC database, there are nine domestic wells, ten stock water wells, six Montana Salinity Control Association monitoring wells, two Montana Department of Transportation (MDT)geotechnical borings, two wells of unknown use, and one abandoned well (Table 3.1). As shown in Table 3.1, well yields range from 4 to 18 gallons per minute. The nearest well is a domestic well (GWIC ID 40342), located 0.32 mile south of the facility, that is screened from 178 feet to 198 feet below ground surface (bgs) and had a reported static water level at the time of construction of 38 feet bgs. The next well closest to the facility (GWIC ID 269565) is located one-half mile north that is screened from 365 to 375 feet bgs and a reported static water level of 54 feet bgs at the time of construction. The locally utilized potable groundwater resource is encountered beneath the facility at depths from 26 to 365 feet bgs in limestone, sandstone, clay, and coal units within the Lebo Member and underlying Tullock Sandstone of the Fort Union Formation. There are several wells that are shallow (less than 25 feet) that penetrate the surficial upper clays and silts. These are generally set in a gravel formation just below the surface clays and silts, although several of the wells lack lithologic information.

The facility's consultant oversaw the drilling of seventeen soil borings around the 147-acre parcel. The results of this activity revealed that the near-surface soils consist of silty sand, clayey sand, and silty clay. The underlying unconsolidated deposits, present from 30-60 feet bgs, consist of silty clay, silt, and laminated silt and clay. Coal was noted in some of the borings. A zone of shallow groundwater was generally encountered from 15 to 30 feet bgs depending upon the boring location in relation to local topography. These findings are consistent with the well logs for the area and regional hydrologic studies. Based on the well log for the facility's water supply well (GWIC ID 269565), the site lithology is comprised of yellow clay from 0-39 feet bgs; dense glacial till composed of sandy blue clay from 39-145 feet bgs; a 10-foot layer of coal from 145-155 feet bgs; a layer of gray clay from 155-235 feet bgs; and interbedded laminations of limestone, coal, and grey clay to 340 feet bgs.

Table 3.1 – Summary of GWIC Wells within One-Mile of Proposed Clean Solutions, LLC Class II Resource Recovery Facility

(Source: Montana Bureau of Mines and Geology, Ground Water Information Center)

Gwic Id	PDF	Township	Range	Sec	Q Sec	Total Depth	Static Water level	Pwl	Date	Use
40339		28N	59E	29	AD	26	18		11/5/1977	DOMESTIC
40340		28N	59E	29	ADD	14	9		9/7/1976	STOCKWATER
40341		28N	59E	29	CBBB	332	148	258	5/2/1968	STOCKWATER
704674		28N	59E	29	CC					STOCKWATER
704673		28N	59E	29	CC	300				STOCKWATER
704676		28N	59E	29	DD	8				STOCKWATER
704675		28N	59E	29	DD	12				DOMESTIC
269565		28N	59E	31	BD	365	54		12/18/2012	DOMESTIC
40342		28N	59E	31	CACC	240	38		10/22/1976	OTHER
137014		28N	59E	31	CACC	80			10/26/1976	
225776		28N	59E	32	AAB	76.1	5.5		6/15/2004	GEOTECH
225758		28N	59E	32	AAB	76.4	9.8		6/16/2004	GEOTECH
190330		28N	59E	32	BCCD	18			4/26/2001	MONITORING
190331		28N	59E	32	BDBD	13			4/26/2001	MONITORING
190332		28N	59E	32	BDDA	18			4/26/2001	MONITORING
190334		28N	59E	32	CABA	18			4/26/2001	MONITORING
190335		28N	59E	32	CCBA	18			4/26/2001	MONITORING
190336		28N	59E	32	CDAB	53			4/26/2001	MONITORING
190337		28N	59E	32	CDBB	18			4/26/2001	MONITORING
263028		28N	58E	25	DA	235	54		9/22/2011	DOMESTIC
704644		28N	58E	25	DB	80				DOMESTIC
206203		27N	59E	5	AA	76			7/8/2003	STOCKWATER
206205		27N	59E	5	AA	362			7/11/2003	STOCKWATER
203054		27N	59E	5	AA	360	40.5	115	4/21/2003	STOCKWATER
704291		27N	59E	5	AA	20				DOMESTIC
704292		27N	59E	5	AC	9				STOCKWATER
919426		27N	58E	1	BCBB					
704251		27N	58E	1	BD	65				DOMESTIC
704252		27N	58E	1	CD	14				DOMESTIC
704253		27N	58E	1	CD	6				DOMESTIC
39471		27N	58E	1	DBC	115	25		8/20/1988	STOCKWATER

The general direction of the deeper regional groundwater flow in the vicinity of Bainville is from west to east, following the structural trend of the Williston basin. The generalized shallow groundwater flow direction in the area of the facility would likely be due south and southwest, toward the confluence of Little Muddy creek and Shotgun creek. The shallow upper aquifer in the area is not the prime aquifer of use in the area, due to its limited yield. The shallow wells in this area are set in areas adjacent to stream drainages.

3.4.3 Environmental Consequences

3.4.3.1 No Action Alternative

Under this alternative, because facility operations would not be resumed, there would be no impacts to site surface water or groundwater.

3.4.3.2 Proposed Action

3.4.3.2.1 Surface Water

Surface water at the Clean Solutions RRF consists of the natural flow of water discharged when the excess water generated by rain, snowfall, or the melting of accumulated snow flows freely over the land surface into the intermittent drainage.

Surface water flow may occur over bare rock or ice, when the soil is saturated and ponding capacity is exceeded, when precipitation falls more quickly than the soil can absorb it, or more typically, when a combination of all these conditions exists. Stormwater run-off can cause erosion and may transport sediments some distance from their source depending upon the intensity of the run-off, vegetative cover, soil characteristics, and topography.

The current solid waste regulations require licensed solid waste management systems to control stormwater run-off. The stormwater control system for the Clean Solutions RRF is designed to enhance the existing natural drainage patterns of the site, directing stormwater discharges outside the license boundary to the existing natural drainage areas. The design includes general site grading and the construction of berms, culverts, and ditches surrounding the waste management area to ensure that stormwater does not mix with waste. In addition, the facility maintains a Spill Prevention, Control, and Countermeasures Plan (SPCC). The SPCC is required to prevent a discharge of oil into navigable waters or adjoining shorelines. The stormwater controls described herein comply with the requirements of the SPCC.

The overall design of Clean Solutions RRF includes the two perimeter ditches, culverts, and berms that would keep

stormwater run-on that originates upgradient of the project site from entering the 6.8-acre license boundary area. Stormwater flow along the upgradient perimeter is conveyed to downgradient areas outside the license boundary as natural flow via the perimeter ditches and culverts. The perimeter ditches are designed to carry the maximum 25-year 24-hour storm flow volume (3.4 inches per day) as required to control site erosion during large storm events. As noted in Section 2.3.3, prior to the recommencement of facility operations, the north 18-inch culvert would be replaced with a 48-inch culvert; the south 18-inch culvert would be replaced with a 24-inch culvert; and the diversion ditch on the northeast corner of the proposed license boundary would be deepened by one foot. Stormwater flow from the perimeter ditches is directed to flow through the natural drainage swales downgradient of the project area in the northwest corner and along the southwest side of the site. When the precipitation rate exceeds the infiltration rate, stormwater would continue to flow naturally from these drainage swales toward the unnamed intermittent drainage located on the northwestern edge of the 147-acre parcel. As a result, there are no additional impacts anticipated to the unnamed intermittent drainage, or to Shotgun and Muddy Creek, as a result of the resumption of operations at the project site.

Stormwater flow within the license boundary area is conveyed to the stormwater pond. The stormwater detention pond is designed to settle the solid particles in the stormwater and retain at a minimum the total volume of water from the 25-year 24-hour storm event in accordance with State and Federal requirements. As designed, the stormwater sediment retention ponds would contain any expected stormwater run-off generated by an intense rainfall or snowmelt event, allowing any suspended sediment to settle in the ponds. Because the ponds are designed to settle out any solid particles contained in the stormwater, any discharge from the stormwater ponds would not contain the sediment found in the run-off events at the site.

All exterior tanks located adjacent to the east side of the building have secondary containment which are bounded by reinforced steel walls and are underlain by 20-mil HDPE liner covered by eight inches of gravel to minimize wear. The volume of the secondary containment exceeds the required 110 percent of the largest tank, and the volume calculated from a 25-year 24-hour storm event.

The aboveground solid waste cutting bins are also located over a lined containment area which consists of a 40-mil HDPE liner. The liner is covered by 12 inches of well-graded sand overlain with six inches of gravel. As noted in Section 2.3.3, prior to the recommencement of facility operations, the solid waste cutting bins would be surrounded by a 12-inch high lined containment berm to capture run-off. Any run-off accumulated in this containment berm would be collected and conveyed to the facility for management with the other incoming materials.

Clean Solutions would be required to operate and maintain all stormwater control features in accordance with the Stormwater Pollution Prevention Plan and the General Industrial Montana Pollution Discharge Elimination System Permit throughout the life of the facility. Maintenance would include the implementation of Best Management Practices (BMPs) to control erosion and sediment transport.

Operation of the Clean Solutions RRF would not have a negative impact on surface water in the project area. Because the stormwater retention pond is designed to settle out any solid particles contained in the stormwater, any discharge from the stormwater ponds would not contain the sediment found in the natural run-off events at the current location. The existing stormwater pond has the capacity to contain the 25-year 24-hour storm event as required by regulation. The stormwater management system comprised of the ditches, culverts, and stormwater pond routes run-on and run-off flows from this event to prevent impacts on the waste management areas. Typical onsite best management practices include site grading and modifications to the existing ditches and culverts to control the flow from a 25-year 24-hour storm event. The Clean Solutions facility maintains an active construction stormwater permit #MTR105855 from DEQ's Water Protection Bureau. Due to the small size of the upslope area that drains toward the 147-acre parcel, the low precipitation the area receives, the effectiveness of the perimeter ditches, and the stormwater controls (including the stormwater pond and berms), the impacts to surface water from the resumption of resource recovery activities are expected to be negligible.

3.4.3.2.2 ***Groundwater***

The exterior storage tank containment consists of reinforced steel walls that are underlain with a 20-mil HDPE liner that is covered with eight inches of gravel. The waste solids bins are underlain by a 40-mil HDPE liner that is overlain with 12 inches of compacted sand and six inches of well-graded crushed gravel.

The bin area is surrounded by a 12-inch high soil containment berm. The berm would be lined with a 40-mil HDPE liner prior to the recommencement of resource recovery activities. The high-density polyethylene liner is a very low permeability (highly impermeable), flexible, synthetic membrane. This is the same material that is often used to contain or control liquid and gas migration in an engineered project, structure, or system. HDPE pipe is commonly used to convey water or wastewater for municipal systems because it is impermeable to water. In landfill construction, HDPE liners are used as impermeable barriers to prevent the contamination of groundwater from chemicals in liquids that may be derived from the waste.

The processing plant building is a 72-foot by 147-foot steel Quonset-shaped building constructed over a six-inch concrete pad liner with a six-inch high interior perimeter concrete berm around the top of the pad. The interior berm surrounds all features inside the building. The concrete pad liner is underlain by one-half inch thick steel plate. The concrete pad liner slopes toward the waste solids collection pit that is located on the south end of the building floor. The solids collection pit is lined with ¼-inch thick sealed steel. The battery of eight large vertical tanks inside the building sits on top of the six-inch concrete pad. This tank battery is surrounded by a reinforced 3.8-ft high sealed steel secondary containment wall. Any drips or spills of liquids from the plant would be contained within the tank battery by the berms and captured by draining into the concrete lined collection pit. All pumps in the building are equipped with catch pans. The concrete floor and steel containment walls are treated with a spray liner to reduce the potential for infiltration from incidental drips and spills.

Concrete is an acceptable impermeable and tough material widely used for the flooring of processing plants in similar situations, involving the operation of dynamic machines, movement of heavy equipment, storage and control of fluid mixtures, and regular capture and handling of abrasive and muddy natural particles and pastes. The containment surrounding the indoor tank battery provides the volume necessary to capture 45,500 gallons of process materials. The valves necessary for tank isolation are in place; the tank and pipe systems passed the standard pressure testing for potential leaks. Any leak or spill within the contained areas resulting from facility operations would be removed and properly disposed. Any leak or spill to soil on site would be cleaned up and clean soil would replace the material that was removed.

Based on the well log for the facility (GWIC ID #269565), the site lithology consists of; 0-39 (bgl) shallow silts clay; from 39-145 feet bgl a dense glacial till composed of sandy blue clay: 145-155 feet bgl a 10 foot layer of coal: 155-235 feet bgl a layer of gray clay, and interbedded laminations of limestone, coal and grey clay to 340 feet bgl. This unit belongs to the Lebo Member of the Fort Union formation. Any releases which may have occurred on the property would generally migrate to the upper aquifer very slowly in the upper silts and clays. Static water levels in these wells are between 25 and 38 feet below ground level (bgl), in the two closest wells. The possibility of a release from the surface making it to the lower, more productive aquifer is very low. The site well is screened from 178 to 198 feet bgl. The flow gradient would be expected to be relatively flat, due to the generally flat terrain, with increasing gradient closer to the Missouri River. Hydraulic conductivities would be expected to range from 1×10^{-5} to 1×10^{-7} cm/sec, which translates to 0.028 feet per day to 0.00028 feet per day. Based on the static water levels from the nearest wells onsite, the estimated vertical travel time using a hydraulic conductivity of 1×10^{-5} cm/sec would be 10 feet per year; using a hydraulic conductivity of 1×10^{-7} cm/sec, the estimated vertical travel time would be 0.10 feet per year, or 250 years for 25 feet bgl and 375 years for 38 feet bgl. This range is typical for glacial till material found thought the area and further illustrates lack of potential for significant lateral or vertical migration of any unintended release.

There would be no disposal of solid waste onsite; therefore, groundwater monitoring is not required. However, impacts to groundwater associated with the resumption of operations at the RRF would not have an adverse impact to groundwater. The facility has been constructed using concrete, HDPE liners, and other containment, and would also implement spill cleanup requirements to protect against impacts to groundwater.

3.5 Geology and Soils

3.5.1 Analysis Area and Methods

The analysis area for geology is area the 147-acre parcel and surrounding properties. A discussion of regional geology, based upon published reports, is also provided herein. The analysis methods for geology included reviewing onsite drilling information, as well as publications of the Montana Bureau of Mines and Geology, the U.S. Geological Survey, and the U.S. Department of Agriculture's Natural Resource Conservation Service, along with their associated geology and soil maps and drawings.

3.5.2 Affected Environment

The Clean Solutions RRF project site is situated within the Missouri River Plateau of the Northern Great Plains physiographic province. The regional topography of the area is characterized by floodplains and benches along the Yellowstone and Missouri Rivers. The facility location is primarily rolling prairie that has been incised by intermittent drainages.

Northeastern Montana geology generally consists of alluvium and glacial deposits that overlie the bedrock of the Fort Union Formation. Alluvium is derived from unconsolidated sediments that have been eroded and redeposited by water in a non-marine setting and is made up of a variety of fine to coarse-grained sand, silt, clay, and gravel. The alluvium is primarily present at the surface and in incised drainages. The Upper Cretaceous Hell Creek formation and the overlying Tertiary Fort Union formation in the vicinity of Bainville underwent structural deformation during basin formation.

The continental glaciers that extended into northeastern Montana left behind deposits of glacial sediments known as glacial till and glacial outwash. Glacial till is the unsorted sediment left behind by the ice, while outwash is the sediments deposited by running water coming off the melting glacier. In some places, the glacial sediments deposited by the melting ice buried the older stream valleys in the area. The sediment layer from five to approximately 145 feet deep is made up of glacial till.

The glacial deposits are underlain by discontinuous beds of poorly cemented sandstone, shale, clay, and coal of the Fort Union Formation. In Eastern Montana, the Fort Union Formation has been subdivided into (from oldest to youngest) the Tullock, Lebo, and Tongue River Members. The bedrock in this part of northeastern Montana lies on the western flank of the Williston Basin, a large-scale geologic structure centered near Williston, North Dakota. During the formation of the Williston Basin, the Fort Union Formation underwent structural deformation that resulted in the beds dipping in a southeasterly direction in the vicinity of the town of Outlook.

The facility's consultant oversaw the drilling of seventeen soil borings around the 147-acre parcel. The activity revealed that the unconsolidated near surface sediments from 30-60 feet bgs consisted of silty clay, silt, and laminated silt and clay. Coal was noted in some of the borings. These findings are consistent with the well logs for the area and regional hydrologic studies. Based on the well log for the facility (GWIC ID 269565), the site lithology is comprised of shallow clay from 0-39 feet bgs; dense glacial till composed of sandy blue clay from 39-145 feet bgs; a 10-foot layer of coal from 145-155 feet bgs; a layer of gray clay from 155-235 feet bgs; and interbedded laminations of limestone, coal, and grey clay to 340 feet bgs.

As noted above, the region is comprised of alluvial and glacial deposits derived from sedimentary rock underlain by the Tertiary Fort Union Formation. The soils typically associated with the glacial till parent materials are silty clay type soils and

are generally thin and poorly developed. The natural soils at the site include the Farland-Cherry Silt Loams, the Blanchard loamy fine sand, and the Zahill loams. These soils were developed from the glacial tills and alluvium derived from shale and siltstone. The Farland-Cherry Silt Loams are the dominant soil type at the site, compromising 67 percent of the site soils; the Zahill-Cabba-Cambert complex, the Blanchard loamy fine sand, and the Zahill loam each comprise approximately 10 percent of the site soils total. Key soil properties are summarized in Table 3.2; the map of soil types is provided in Figure 3.2.

3.5.3 Environmental Consequences

3.5.3.1 No Action Alternative

Under this alternative, because the site would not be developed, there would be no impacts to site geology and soils.

3.5.3.2 Proposed Action

The site was previously graded to create a level building pad, install underground piping, and to construct site access and parking. The site was also excavated to construct the tank and solids bin secondary containment features. General site grading was also done to facilitate the stormwater control features.

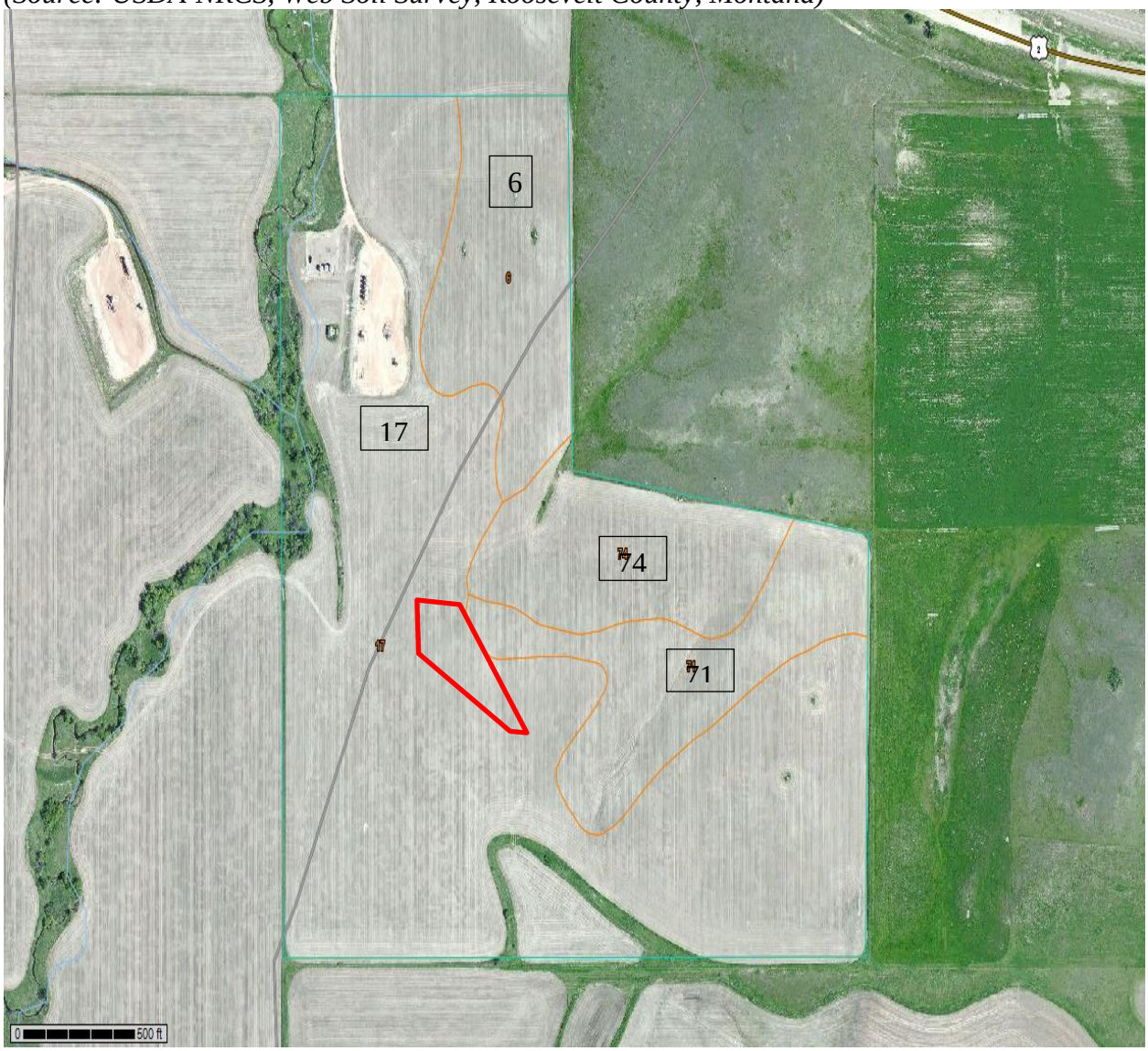
Any precipitation or liquids contacting the soils in this area would generally permeate through the soils rapidly, as indicated by the moderately high-to-high saturated hydraulic conductivity for the Farland-Cherry silt loams and the Zahill complex. However, the site also has stormwater management features to control run-on and run-off from a 25-year 24-hour storm event to prevent flow onto the site during a peak storm discharge.

Impacts to geology and soils have been minimized during construction of the facility through the implementation of stormwater BMP's. The BMP's included the construction of berms, ditches and culverts to route stormwater away from the facility. In addition, the stormwater pond was designed and constructed to contain stormwater run-off within the 6.8-acre Clean Solutions RRF license boundary. Because these soils are well drained, construction and operation of the facility has not resulted in soil erosion or the substantial loss of viable topsoil. There are no additional anticipated impacts to site soils and geology as a result of the resumption of resource recovery activities at the site.

Table 3.2: Summary of Major Soil Properties at Proposed Clean Solutions, LLC Class II Resource Recovery Facility
(Source: USDA-NRCS, Web Soil Survey, Roosevelt County, Montana)

Soil Type	Map Key	Depth profile	Drainage	Saturated Hydraulic Conductivity (Ksat)	Available Water Capacity	Erosion Hazard	Soil Compaction Resistance
Farland-Cherry silt loams	17	0 to 7 inches: Silt loam. 7 to 18 inches: Silty clay loam 18 to 60 inches: Silt loam	Well Drained	Moderately High to High (0.20 to 0.57 in/hr)	High	Medium	Low Resistance
Zahill-Cabba-Cambert complex	74	0 to 4 inches: Loam. 4 to 60 inches: Clay loam	Well Drained	Moderately High (0.20 to 0.57 in/hr)	High	Medium	Low Resistance
Blanchard loamy fine sand	6	0 to 4 inches: Loamy fine sand. 4 to 60 inches: Fine sand	Excessively Drained	High to very High (5.95 to 19.98 in/hr)	Low	Medium	Moderate Resistance
Zahill loam	71	0 to 4 inches: Loam. 4 to 60 inches: Clay loam	Well Drained	Low (0.20 to 0.57 in/hr)	High	Medium High	Low Resistance

Figure 3.2: Map of Soil Types: Approximate CS RRF boundary is outlined in red
(Source: USDA-NRCS, Web Soil Survey, Roosevelt County, Montana)



3.6 Vegetation

3.6.1 Analysis Area and Methods

The analysis area for vegetation is cultivated crops and sparse local areas of the Great Plains Mixed grass Prairie landscape in eastern Montana. The analysis method for vegetation consisted of using published reports from the Montana Natural Heritage Program. The Level 3 Land Cover Summary describes the different land coverages for the 640 acres within Section 31 of Township 28 North and Range 59 East. The Level 3 summary narrows down the search criteria to only the 640 acres that make up the section that encompasses the project area.

Level 3 Land Cover Summary	
84% (539 acres)	Cultivated Crops
7% (47 acres)	Great Plains Mixed grass Prairie
7% (45 acres)	Great Plains Sand Prairie

(Source: Montana Natural Heritage Program, http://mtnhp.org/)

3.6.2 Affected Environment

Cultivated crops are described as areas used for the production of crops such as alfalfa, corn, small grains, seed crops, and vegetables. The proposed facility is surrounded on all sides by property designated as agricultural rural.

The common native grass species in the Great Plains Mixed grass Prairie landscape in eastern Montana are the western wheatgrass (*Pascopyrum smithii*), thickspike wheatgrass (*Elymus lanceolatus*), green needlegrass (*Nassella viridula*), blue grama (*Bouteloua gracilis*), and needle and thread (*Hesperostipa comata). Previously cultivated areas that have been re-vegetated with no native plants include* Kentucky bluegrass (*Poa pratensis*)/western wheatgrass *(Pascopyrum smithii)* or into pure crested wheatgrass (*Agropyron cristatum).*

3.6.3 Environmental Consequences

3.6.3.1 No Action Alternative

Under this alternative, because the RRF activities at this site would not resume, there would be no impacts to existing vegetation.

3.6.3.2 Proposed Action

A search of the Montana Natural Heritage Program website revealed that there are no records of threatened or endangered plant species, or plant species of concern, in the area surrounding the Clean Solutions RRF. Construction of the facility has already occurred and native vegetation was removed during that time to facilitate the construction of buildings and roads, as well as the installation of tanks and pipelines.

The existing vegetation at the location of the Clean Solutions RRF site is not unique or limited. The Clean Solutions project site is surrounded by an extensive amount of similar land. Waste disposal activities would not occur at this site. With no species of concern at this location, or in the local area, and no new planned construction activities at the site, there are no anticipated impacts to vegetation. As noted in Section 2.3.4, upon closure, all facility infrastructure would be removed and the site would be graded and seeded with a seed mixture approved by the local conservation district. Weeds would be controlled and vegetation would be monitored annually to ensure that it becomes established.

3.7 Air Quality

3.7.1 Analysis Area and Methods

The analysis area for air quality is the site of the Clean Solutions project site and surrounding properties. The analysis methods for air quality included a review of the application documents.

3.7.2 Affected Environment

At the present time, activities on the 147-acre parcel are limited to operation of the existing saltwater disposal well. Traffic associated with this activity results in the generation of windblown dust that would vary depending upon the time of year, demand for services, and maintenance needs of the facility. The facility is not located in a special or designated air-quality zone.

3.7.3 ENVIRONMENTAL CONSEQUENCES

3.7.3.1 No Action Alternative

Under this alternative, because the site would not be developed, there would be no additional impacts to existing air quality.

3.7.3.2 Proposed Action

Air quality concerns related to oilfield processing facilities are frequently associated with fugitive dust emissions from traffic, and with day-to-day facility operations. All incoming wastes delivered to the site would be in liquid or slurry form. These wastes would contain technologically enhanced naturally occurring radioactive material (TENORM) that must be managed in a manner that minimizes the generation of TENORM dust and potential exposures. The facility would perform perimeter air monitoring for TENORM exposure to ensure activities do not result in an exceedance of the maximum annual exposure limit of 100 millirems per year.

TENORM waste would be contained in the waste deposited in the concrete-lined solid waste cuttings pit in the processing building. The waste solids would be transferred from the interior cuttings pit to the exterior cuttings bins before being transferred for offsite disposal facility. The control of fugitive dusts from these areas is critical for minimizing TENORM exposure, and to prevent contamination of the surrounding environment. The solid waste material generated inside the building from the solids collection pit would be kept damp to control fugitive dust. Once the lined solids collection pit in the processing building is full, the solids would be transferred to the cutting bins located outside using a front end loader. A stabilizing agent would be mixed in with the solids in the cutting bin to minimize dust generation. In addition, the solids in the cutting bins would be kept damp so that the solids do not dry out and become airborne. Clean Solutions would install area monitors inside the processing building near the cuttings pit and at the exterior cutting bins. The area monitors would measure gamma radiation and would provide constant monitoring of the areas potentially most affected by TENORM. The monitors would be equipped with alarms

for elevated levels and have a battery back-up. Radiation levels would be recorded once per day and an annual report of average levels would be submitted to DEQ. Exceedances of the maximum annual exposure limit would result in the requirement for corrective actions, which may include changes to the facility management of the waste solids. If necessary, the cutting bins may be covered to minimize the generation of fugitive windblown dust.

Traffic to the facility should not result in an increase in the levels of airborne dust because Highway 2 is paved. Clean Solutions anticipates that the resumption of facility operations would result in an increase of 20 trucks per day. Normal operational traffic within the facility could cause a minor increase of suspended dust during the dry summer months. To minimize dust, the facility would maintain interior roads by either wetting with water or chemical treatment (e.g. magnesium chloride).

The application of water to keep the cuttings damp while they are being stored prior to transfer for offsite disposal, and the application of dust palliatives to the interior roads to minimize dust generation, would mitigate the impact to air quality onsite and in the surrounding areas.

3.8 Industrial, Commercial, and Agricultural Activities

3.8.1 Analysis Area and Methods

The analysis area for industrial, commercial, and agricultural activities is the site of the Clean Solutions RRF and the surrounding area. The analysis methods for these activities included a site reconnaissance to determine current land uses.

3.8.2 Affected Environment

The site of the Clean Solutions RRF encompasses a total of 147 acres, of which only 6.8 acres would be licensed as the RRF. The 147-acre parcel includes the oilfield waste RRF, and a saltwater disposal well regulated by the Montana Board of Oil and Gas Conservation. The 6.8-acre Clean Solutions RRF facility includes the processing building as well as a fluid heater, an electrical building and equipment, external storage tanks, process tanks, stormwater detention pond, and waste solids bins. Land use in the areas surrounding the Clean Solutions RRF consists of rural agricultural land and rural residential property. The 147-acre parcel is zoned commercial rural property and is surrounded by mostly agricultural property. The nearest residence is located approximately 0.4 miles northeast of the project site zoned agricultural rural; the next nearest residence is located approximately 0.8 miles northwest of the project site designated as farmstead rural. There are no other commercial or industrial uses of the parcel.

3.8.3 Environmental Consequences

3.8.3.1 No Action Alternative

Under this alternative, because the resource recovery activities would not resume, there would be no additional impacts to existing land use activities.

3.8.3.2 Proposed Alternative

The resumption of resource recovery activities at the site would have a minimal effect on the industrial, commercial, and agricultural activities in the surrounding area. The nearest residences are located between 0.4 and 0.8 miles from the facility. The project site is not visible to the residence located to the northeast, but is visible to the residence located across the highway to the northwest. The 147-acre parcel includes a saltwater disposal well that is actively utilized for the disposal of produced water by oilfield production facilities in the area. The only proposed change in operations is licensure of the previously constructed, but unlicensed RRF within 6.8 acres of the 147-acre parcel. Land use within the remainder of the 147-acre parcel is not expected to change. Thus, current industrial, commercial, and agricultural activities would not be impacted as a result of licensure of the RRF.

3.9 Traffic

3.9.1 Analysis Area and Methods

The analysis area for traffic is the site of the 147-acre parcel, and Montana Highway 2 as it approaches the entrance to the proposed facility. The analysis methods for these activities included a site reconnaissance to identify potential traffic issues and necessary improvements, and research conducted by the Montana Department of Transportation.

3.9.2 Affected Environment

MDT maintains records of average annual daily traffic on state roadways; data for US Highway 2 is available for the segment west of the intersection of Montana Highway 16 with US Highway 2. According to the MDT data, the annual average daily traffic (AADT) observed in 2015 along US Highway 2 was 1,689 vehicles from the intersection of US Highway 2 and Montana Highway 16, to the intersection of US Highway 2 and Route 327. Of the 1,689 vehicles, 228 of them were commercial vehicles. The AADT observed from the intersection of US Highway 2 and Route 327 to the North Dakota state line was 2,025 vehicles, with 642 of those vehicles being commercial vehicles.

3.9.3 Environmental Consequences

3.9.3.1 No Action Alternative

Under this alternative, because resource recovery activities would not be resumed, there would be no additional impacts to existing traffic attributable to the facility operations.

3.9.3.2 Proposed Alternative

US Highway 2 currently supports traffic from automobiles and large semi-trucks and trailers. US Highway 2 is classified as a Principal Arterial road. The design truck operating capacity exceeds the Montana legal truck load limit of 80,000 pounds. During 2015 when MDT's vehicle count (referenced

above) was being conducted, the RRF was operating as an unlicensed facility. As a result, the AADT count includes traffic associated with resource recovery operations that were going on at the time the vehicle count was taken. Clean Solutions anticipates that the resumption of facility operations would result in an additional 20 trucks per day entering the facility from US Highway 2. The 20 additional trucks anticipated would be less than 10% of the overall commercial truck traffic. Therefore, the anticipated impacts which could be attributed to the resumption of operations at the facility would be minor.

3.10 Tax Base

3.10.1 Analysis Area and Methods

The analysis area is the Clean Solutions RRF site, and properties adjacent to the project area. The analysis method consisted of DEQ's examination of aerial photos of the Analysis Area and data collected from the application for licensure.

3.10.2 Affected Environment

At the present time, the property proposed for the Clean Solutions RRF encompasses a 6.8-acre parcel within a 147-acre parcel owned by Strategic Holdings, LLC. The Clean Solutions RRF is not currently operating. Land surrounding the project site is agricultural rural, vacant rural, light industrial (e.g., two pumpjacks, an injection well facility, and residential rural properties.

3.10.3 Environmental Consequences

3.10.3.1 No Action Alternative

Under this alternative, because resource recovery activities would not be resumed at the site, additional workers that would be hired for facility operation would not be hired. No long-term impacts, either positive or negative, are anticipated.

3.10.3.2 Proposed Alternative

Under the Proposed Action, a similar industrial process would be resumed at the Clean Solutions property, using existing equipment. Existing studies regarding property value changes relative to solid waste handling tend to revolve around disposal facilities, not, as in this case, the effects on property values of an existing oilfield waste processing facility that does not intend to dispose of solid waste. Further, DEQ is not aware of any proposed subdivisions planned adjacent to the proposed Clean Solutions facility, nor is there any compelling reason to believe that population growth in the Bainville area would lead to adjacent subdivision growth in the near future. DEQ has no basis to believe that adjacent property values would either rise or fall as a result of the use of this facility for processing, but not disposal, of solid waste, if operated as in the Proposed Action, in accordance with applicable laws and regulations. As a result, DEQ believes that the potential impacts to adjacent property values of the Proposed Action would be negligible. Further, because the facility is constructed, there would only be a

minor increase in local employment due to the need for additional employees to operate the facility. The long-term employment requirements would result in the addition of two to five employees for facility operations and maintenance activities. Therefore, operation of the proposed Facility could have a minor impact on the local tax base and revenues to businesses in the area.

3.11 Historical and Archaeological Resources

3.11.1 Analysis Area and Methods

The analysis area consists of the area included within Sections 30 and 31, Township 28 North, Range 59 East. Analysis methods used included consultation with the State Historic Preservation Office (SHPO).

3.11.1.1 Affected Environment

The Clean Solutions RRF is constructed but not operational and currently encompasses 6.8 acres within a 147-acre parcel owned by Strategic Holdings, LLC. The Clean Solutions RRF is located approximately three miles east of Bainville just off U.S. Highway 2 in the S ½ of the NW ¼ and the NW ¼ of the NW ¼ of Section 31, Township 28 North, Range 59 East, M.P.M., Roosevelt County, Montana. SHPO identified six cultural resources during their search of previously recorded sites. Five of the six sites are located in Section 30, Township 28 North, Range 50 East. The one cultural resource, a historic irrigation system, is located within Section 31, but is ineligible for the National Register of Historic Places (NRHP).

3.11.1.2 Environmental Consequences

3.11.1.2.1 No Action Alternative

Under this alternative, because resource recovery activities would not be resumed at the site, the current cultural resources would remain as they are. The cultural resources identified by SHPO may be at risk for continued degradation of historical integrity from both natural and human influenced actions unrelated to the project proposal.

3.11.1.2.2 Proposed Alternative

The cultural resource identified by SHPO located within Section 31 is ineligible for the NRHP. The facility has already been constructed and the only additional ground disturbance anticipated is the modification of the perimeter berms to control stormwater. It is anticipated that these modifications would have no adverse impact.

The State has no authority on private lands to require pedestrian survey to record or evaluate any undocumented or undiscovered cultural sites. Further, Montana DEQ has no authority to impose regulation regarding the impacts on cultural resources on private land.

3.12 Cumulative Effects

Cumulative effects are the effects of the Proposed Action added to the impacts of past and present activities in the area, along with the potential impacts of future actions under consideration by the state. Cumulative impact analyses help to determine whether an action would result in significant impacts when added to other activities.

The proposed licensure and subsequent operation of the Clean Solutions RRF is the only proposed RRF in the immediate area. There is a permitted saltwater disposal well actively operating within the 147-acre parcel owned by Strategic Holdings, LLC. There are no other known large or medium scale commercial enterprises planned, or in existence within, the 147-acre parcel or within the general area.

Land uses in the area include rural commercial, farmstead, agricultural, and residential activities. Cumulative impacts from the Proposed Action would be negligible for all resources.

3.13 Unavoidable Adverse Effects

Residual impacts from the Proposed Action would include irreversible commitments of Strategic Holdings, LLC privately owned land resources. The Clean Solutions RRF has already been constructed and has resulted in the loss of 6.8 acres of native soil for use on roads and for the construction of berms and other landfill features. However, topsoil would be added as part of the facility closure activities. The topsoil would be reseeded with native vegetation. All structures would be removed from the site.

Noxious weeds would increase from the replacement of the topsoil, but weeds would be treated, ensuring revegetation of native local grasses occurs as required by the county weed control program. The disturbed areas would be reclaimed, reseeded, revegetated, and a program implemented to inventory and treat noxious weeds.

4 CONCLUSIONS AND FINDINGS

4.1 A listing and appropriate evaluation of mitigation, stipulations, and other controls enforceable by the agency or another government agency:

The proposed licensure of the Clean Solutions RRF would meet the requirements of the SWMA, as well as the associated administrative rules regulating solid waste management. Adherence to the solid waste, water quality, and air quality regulations, and the DEQ-approved facility O & M Plan would eliminate the potential for harmful releases and impacts to human health and the environment by the proposed resource recovery facility.

4.2 Findings:

An EIS is not required under the Montana Environmental Policy Act because the project lacks significant adverse effects to the human and physical environment based on the following criteria in ARM 17.4.608(1)(a) through (g):

(a) the severity, duration, geographic extent, and frequency of occurrence of the impact;

(b) the probability that the impact will occur if the proposed action occurs; or conversely, reasonable assurance in keeping with the potential severity of an impact that the impact will not occur;
(c) growth-inducing or growth-inhibiting aspects of the impact, including the relationship or contribution of the impact to cumulative impacts;
(d) the quantity and quality of each environmental resource or value that would be affected, including the uniqueness and fragility of those resources or values;
(e) the importance to the state and to society of each environmental resource or value that would be affected;
(f) any precedent that would be set as a result of an impact of the proposed action that would commit the department to future actions with significant impacts or a decision in principle about such future actions; and
(g) potential conflict with local, state, or federal laws, requirements, or formal plans.

As indicated in the previous portions of this EA, the impacts of this facility are not severe or geographically extensive. The project would continue for a number of years, but it would not create a permanent land use. The project is not significantly growth-inducing or growth-inhibiting. The environmental resources are not unique. Issuance of the license would not set a precedent or commit DEQ to future actions with significant impacts. Operation of the facility would not conflict with any local, state, or federal law, requirement, or formal plan.

DEQ has determined that there are no significant impacts from this project that would require the preparation of an EIS.

4.3 Groups or agencies contacted or contributing to this EA:

Montana Natural Heritage Program
State of Montana Historic Preservation Office
Barr Engineering
U.S. Geological Survey
Montana Bureau of Mines and Geology
U.S. Department of Agriculture - Natural Resource Conservation Service
Montana Department of Transportation
Montana State Library

4.4 Authors:

Final EA prepared by:
Mary Louise Hendrickson, Tim Stepp, John Collins, Fred Collins, and David Sanborn
State of Montana DEQ, Solid Waste Section

Date: November 21, 2017

REFERENCES:

Alt, David and Hyndman, Donald W., 1986, Roadside Geology of Montana: Mountain Press Publishing Company, Missoula MT.

Alt, David and Hyndman, Donald W., 1995, Northwest Exposures: Mountain Press Publishing Company, Missoula MT.

Anna, Lawrence O., 1986, Geologic framework of the groundwater system in Jurassic and Cretaceous rocks in the northern Great Plains, in parts of Montana, North Dakota, South Dakota, and Wyoming - Regional aquifer system analysis*:* U.S. Geological Survey Professional Paper 1402-B, 36 p.

Barr Engineering, Solid Waste Management System License Application, prepared for

Colton, R.B., 1963, Geologic map of the Spring Creek quadrangle, Valley County, Montana: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-369, scale 1:62,500.

Colton, R.B., 1963, Geologic map of the Porcupine Valley quadrangle, Valley County, Montana: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-368, scale 1:62,500.

Colton, R.B., and Bateman, F.A., Jr., 1956, Geologic and structure contour map of the Fort Peck Indian Reservation and vicinity, Montana: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-225, scale 1:125,000

Downey, Joe S., 1986, Geohydrology of bedrock aquifers in the northern Great Plains, in parts of Montana, North Dakota, South Dakota, and Wyoming - Regional aquifer system analysis: U.S. Geological Survey Professional Paper 1402-E, 87 p.

Huffmyer, Russell, and John Van Gehuchten, Recovering valuable byproducts from oil and gas wastes, Tech Document IWC 13-37, IWC Oils and Refinery LLC, International World Commerce Group Inc., San Antonio, TX. https://www.mckimcreed.com/wp-content/uploads/2015/09/IWC-13-37-Paper_Final-Draft_7.12.2013.pdf (accessed April 12, 2017)

Larry N. Smith, Montana Groundwater Assessment Atlas No. 1, Part B, Map1, Montana Bureau of Mines and Geology, October 1998, Revision 1 – Dec. 21, 1998

Montana Bird Distribution Committee. 2012. *P.D. Skaar's Montana bird distribution.* 7th Edition. Montana Audubon, Helena, Montana. 208 pp. + foldout map.

Montana Field Guide, http://fieldguide.mt.gov/speciesDetail.aspx?elcode=ABNRB02020, downloaded 2/29/2016.

Montana Natural Heritage Program, Ecology Mapviewer, http://mtnhp.org/default.asp, 2017.

Montana State Library, Montana Cadastral, http://svc.mt.gov/msl/mtcadastral, Data downloaded 8/4/2017.

Montana Tech of the University of Montana, 2016, Montana Bureau of Mines and Geology, Groundwater Information Center, http://mbmggwic.mtech.edu/, Data downloaded on 6/13/2016.

Montana Department of Environmental Quality, Source Water Delineation Assessment Report, 11/20/2002, downloaded 6/13/2016.

Noble, R.N., et al., 1982, *Occurrence and characteristics of groundwater in Montana*: Montana Bureau of Mines and Geology Open File Report 99, 214 p.

United States Department of Agriculture, Natural Resources Conservation Service, Web Soil Survey, http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm, Data downloaded 6/1/2016.

Weaver Boos Consultants Report, April 2015; Proposed Windy Butte Reclamation Facility.