

APPENDIX Z – RESPONSES TO "IT QUESTIONS"**Responses to "IT Questions"****I. Have the potential and real adverse environmental effects of the proposed facility been avoided to the maximum extent possible?**

Yes. The potential and real adverse environmental effects of the proposed facility have been avoided to the maximum extent possible.

Defiance Energy Services, LLC (Defiance) proposes to construct and operate the proposed commercial SWD facility using the best engineering and operational practices to avoid both potential and real adverse environmental effects, such as the release of approved Exploration and Production (E and P) liquid wastes. The proposed facility will be used to properly dispose of approved E and P waste fluids in an environmentally safe manner.

The residual solids that accumulate in tank bottoms will be periodically cleaned from the tanks, separated from the fluids, measured, manifested and transported to a facility authorized to accept solid waste. Skim oil will be separated from the approved E and P waste fluids and sold according to the regulatory provisions of DNR as they accumulate. The approved E and P waste fluids will be disposed of in proposed injection well, Edwards SWD No. 1. "Approximately 92 percent of produced water is managed through Class II well injection into subsurface reservoirs, and is generally considered the safest and most effective method for handling these type fluids" (*Overview of Exploration and Production Waste Volumes and Waste Management Practices in the United States, May 2000 API report, section 2.4.2.*). Based on an Argonne National Laboratory, "Offsite Commercial Disposal of E and P Wastes" presentation in 2005, it was shown that commercial disposal costs for produced water was far more economical than by any other method, except land spreading (a less environmentally safe means of disposal). Oil field practices across the United States have established underground injection as a viable alternative method for the disposal of these types of industrial wastes (*Offsite Commercial Disposal of Oil and Gas Exploration and Production Waste: Availability, Options, & Costs, USDOE, August 2006*). The same report found that injection was almost exclusively used to manage produced water. Disposal fees for injection of approved E and P waste fluids range between \$0.30/bbl and \$10.00/bbl across the United States. The majority of the facilities surveyed reported disposal fees under \$1.00/bbl. Because transportation costs typically increase proportionately with distance or time from well site to disposal site, economic incentives exist for operators to send their wastes to disposal facilities located within a reasonably short distance from the oil and gas E and P site.

The proposed Defiance Commercial Facility (The Facility) is to be located approximately six (6) miles northeast of the town of Coushatta, Louisiana, just to the west of U.S. Highway 371, and east of Interstate 49. The Facility is located in the Bracky Branch Field and will serve many operators of oil and gas wells in the Anticipated Market Range shown on pages 17-19.

The E and P waste fluids to be transported to and from The Facility by trucks (primarily vacuum trucks) will abide by the following control procedures to prevent approved E and P waste fluids from entering the environment:

- Only approved E and P waste fluids as defined in LDNR's rules at LAC 43:XIX.501 and listed on pages 1 and 2 of the WMOP (Appendix K) from approved generators of record will be received at this commercial saltwater disposal well facility. Other generators of approved E and P waste fluids will have to receive written approval from the Office of

Conservation in order to dispose of approved E and P waste fluids at this commercial facility.

- Before offloading at this commercial facility, each shipment of approved E and P waste fluids will be sampled and analyzed by Defiance personnel for pH, conductivity, and chloride content and documented on the UIC-28 manifest as required by regulations. Samples will be reviewed for percent solids. Records of these tests will be kept on file at The Facility for a period of three (3) years and will be available for review by an inspector employed by the Office of Conservation.
- A minimum of one (1) eight (8) ounce sample will be collected from each load and will be labeled with the date, operator, and manifest number. These samples will be retained at The Facility location for a minimum of thirty (30) days.
- E and P Waste Shipping Control Tickets (Form UIC-28) will be stored on-site for at least three (3) years for review by the Louisiana Department of Natural Resources.
- The Facility will comply with all regulations according to LAC 33: XV regarding NORM materials.
- A Waste Management Operations Plan (WMOP) and an Emergency Response Plan (ERP) have been developed for The Facility, which establishes procedures for responding to and cleaning up any spill and provides information to allow the operator of The Facility to immediately notify the appropriate agencies. Dry-chemical fire extinguishers will be maintained on-site.
- The unloading containment area will be constructed with seamless concrete to prevent the release of approved E and P waste fluids into the environment and surrounding soils. The concrete unloading area will be bermed and sloped to prevent run-off of approved E and P waste fluids and run-on of rainwater. The unloading area will be sloped toward an integrated seamless concrete sump so any spills can be properly captured and immediately pumped back through the flow process. This is shown on the detailed facility diagram, provided as Attachment 3 through-out this application. Approved E and P waste fluids from the trucks will be pumped to the settling tanks and back through the closed loop system. Specific unloading procedures will be followed by the employees to minimize errors and prevent spills and releases to the environment.
- Only approved liquid E and P waste fluids, as noted in the WMOP (Appendix K) will be accepted at The Facility. The liquid E and P waste fluids, primarily produced saltwater, will be pumped from the truck unloading area. A 4-in. flexible hose is connected to the tail end of the tank truck to allow the contents to be pumped by centrifugal pumps through screen baskets to a manifold where it is directed through two (2) 700-barrel fiberglass settling tanks. The fluids will then be sent through two (2) series of four (4) 1,000-barrel fiberglass tanks (8 Total) for solids separation and some minimal hydrocarbon separation. The fluids will then be transferred via centrifuge pumps to the two (2) fiberglass 1,000-barrel gun barrels for separating hydrocarbons from the water. The separated hydrocarbons are skimmed from the tops of the 1000-barrel tanks and siphoned from the gun barrels and transferred to two (2) 400-barrel steel oil tanks. Fluid from the gun barrels is directed to two (2) 750-barrel fiberglass suction tanks prior to being disposed of in the approved injection well. Fluid from the two (2) 750-barrel suction tanks are then transferred by one of three (3) triplex pumps to the one (1) approved SWD well. The hydrocarbons are temporarily stored until sold in accordance with DNR regulations.

- Monitoring of the tanks, valves, piping, containment areas, pumps, and other associated equipment will include daily inspections. Inspections of The Facility will be documented and recorded in accordance with an approved SPCC Plan. This plan will be developed by a professional engineer specifically for this facility upon approval in accordance with 40 CFR112 and LAC33.IX. The Facility will maintain onsite absorbent materials, such as pads, booms, and oil dry in the event of spills or releases of liquid approved E and P waste fluids. Emergency numbers will be posted in the event of a significant spill of approved E and P waste fluids.
- This commercial facility will be adequately manned during all hours of operation and shall receive approved E and P waste fluids by truck only.
- The Facility, offloading area, gun-barrels, tanks, injection pumps, and office/lab, locations will be secured by a 6-ft. chain-link fence with lockable gates. The one (1) SWD well will be surrounded by post and chain enclosures and any access roads to the well will have lockable gates that will remain locked at all times.

A. What are the potential environmental impacts of the permittee's proposed facility?

1. What wastes will be handled?

Only approved E and P waste fluids Types 01, 04, 08, 09, 10, 11, 14, 15, 16, and 99, as defined in §501 from approved generators of record, will be received at this commercial saltwater disposal well facility. Other generators of approved E and P waste fluids will have to receive written approval from the Office of Conservation in order to dispose of approved E and P waste fluids at this commercial facility.

a. Classes of chemicals

Only approved E and P waste fluids Types 01, 04, 08, 09, 10, 11, 14, 15, 16, and 99, as defined in §501 from approved generators of record, will be received at this commercial saltwater disposal well facility.

b. Quantities (hazardous and non-hazardous)

There will be no hazardous waste transported, treated, stored, or disposed at this facility. The average anticipated amount of approved E and P waste fluids to be disposed of is 15,000 barrels per day, and the maximum anticipated amount of E and P waste fluids to be disposed in the proposed injection well is 25,000 barrels per day. A repairable sealed/lined containment area measuring approximately 205' x 105', having 49-in. high steel sealed/lined containment walls, will have a total containment capacity of approximately 15,654 barrels. The tanks within the containment will have a maximum storage of 13,700 barrels of approved E and P waste fluids, consisting primarily of produced saltwater. The approved E and P waste fluids, primarily produced saltwater, will be pumped from the truck unloading area through a closed loop system by centrifugal pumps and transferred to the two (2) 700-

barrel fiberglass settling tanks. The fluids will then be sent through two (2) series of four (4) 1,000-barrel fiberglass tanks (8 Total) for solids separation and some minimal hydrocarbon separation. The fluids will then be transferred via centrifuge pumps to the two (2) fiberglass 1,000-barrel gun barrels for separating hydrocarbons from the water. The separated hydrocarbons are skimmed from the tops of the 1000-barrel tanks and siphoned from the gun barrels and transferred to two (2) 400-barrel steel oil tanks. Fluid from the gun barrels is directed to two (2) 750-barrel fiberglass suction tanks prior to being disposed of in the approved injection well. Fluid from the two (2) 750-barrel suction tanks are then transferred by one of three (3) triplex pumps to the one (1) approved SWD well. See the attached facility diagram.

c. Physical and chemical characteristics

E and P waste as defined in LAC 43:XIX.501: Such wastes include the following E and P waste fluids:

1. **Type 01** – Defined as: Salt water (produced brine or produced water), except for salt water whose intended and actual use is in drilling, workover, or completion fluids or in enhanced mineral recovery operations, processed fluids generated by approved salvage oil operators who only receive oil (BS&W) from oil and gas leases, and non-hazardous natural gas plant processing waste fluid which is or may be commingled with produced formation water;
2. **Type 04** – Defined as: Completion, workover, and stimulation fluids;
3. **Type 08** – Defined as: Produced formation fresh water;
4. **Type 09** – Defined as: Rainwater from firewalls, ring levees and pits at drilling and production facilities;
5. **Type 10** – Defined as: Washout water and residual solids generated from the cleaning of containers that transport E and P Waste and are not contaminated by hazardous waste or material; washout water and solids (E and P Waste Type 10) is or may be generated at a commercial facility or transfer station by the cleaning of a container holding a residual amount of E and P Waste;
6. **Type 11** – Defined as: Washout pit water and residual solids from oil field related carriers and service companies that are not permitted to haul hazardous waste or material;
7. **Type 14** – Defined as: Pipeline test water which does not meet discharge limitations established by the appropriate state agency, or pipeline pigging waste, i.e., waste fluids/waste generated from cleaning of the pipeline;
8. **Type 15** – Defined as: E and P Wastes that are transported from the permitted commercial facilities and transfer stations to permitted commercial treatment and disposal facilities, except those E and P Waste defined as Waste Types 01 and 06;

9. **Type 16** – Defined as: Crude oil spill clean-up waste;
10. **Type 99** – Defined as: Other E and P Waste not described above (shipment to a commercial facility or transfer station must be pre-approved prior to transport).

Defiance intends to receive only the liquid portions of approved E and P waste Types 15, 16, and 99 at The Facility.

d. Hazardous waste classification (listed, characteristic, etc.)

While approved E and P waste fluids are not regulated under the Louisiana Department of Environmental Quality regulations, it contains constituents that are common to fuel or oil. As the material typically contains less than one percent (1%) fuels, the material is still flammable and may contain toxic compounds associated with fuels. The low percentage of fuel and condensate associated with the produced water limits the explosiveness of approved E and P waste fluids. The fluids are not highly corrosive. The slightly corrosive nature of the saltwater will be managed with the use of minor amounts of corrosion inhibitor as indicated in the WMOP section of the permit application.

2. How will they be handled?

Approved E and P waste fluids will arrive through a security gate to the facility by truck transport. These trucks may be vacuum trucks, tanker trucks, and portable tanks. A Defiance employee trained in unloading procedures will witness the entry, then accept and process the entry of waste into the facility. To limit unauthorized access, The Facility has a secured gate at the entrance, and a 6 ft. chain link fence around the treatment and storage areas. A trained employee of Defiance will be at The Facility during the hours of operation to monitor facility operations and treatment/pumping of approved E and P waste fluids.

A minimum of one (1) eight (8) ounce sample will be collected from each incoming load. These samples will be monitored before offloading for the presence of NORMs as required by the applicable DEQ regulations and requirements. The eight (8) ounce sample of each load will be collected, dated, and labeled with the manifest number and operator identification. The samples will be analyzed in accordance with LAC 43:XIX.543.B.1 (pH, conductivity & Cl-) prior to being accepted for unloading. The collected samples will be stored in an area with minimum exposure to individuals at The Facility. Trucks will be directed to the unloading area where they will connect to a closed loop system to begin the treatment process.

a. Treatment

The approved E and P waste fluids, or primarily produced saltwater, will be pumped from the truck unloading area through a closed loop system. A 4-in. flexible hose connected to the tail end of the tank truck will allow the contents to be transferred by centrifugal pumps through screen baskets to a manifold where it is directed through one two (2) 700-barrel fiberglass settling tanks. The fluids will then be sent through two (2)

series of four (4) 1,000-barrel fiberglass tanks (8 Total) for solids separation and some minimal hydrocarbon separation. The fluids will then be transferred via centrifuge pumps to the two (2) fiberglass 1,000-barrel gun barrels for separating hydrocarbons from the water. The separated hydrocarbons are skimmed from the tops of the 1000-barrel tanks and siphoned from the gun barrels and transferred to two (2) 400-barrel steel oil tanks. Fluid from the gun barrels is directed to two (2) 750-barrel fiberglass suction tanks prior to being disposed of in the approved injection well. Fluid from the two (2) 750-barrel suction tanks are then transferred by one of three (3) triplex pumps to the one (1) approved SWD well. The residual solids from the saltwater tanks will be periodically removed during tank cleaning operations and placed in a lined steel roll-off container temporarily located at The Facility during tank cleaning operations. Solids will not be allowed to accumulate or be stored at The Facility. These solids will be sampled and profiled for disposal at an approved facility. The solids will be transported by an authorized transporter to an approved facility.

b. Storage

Approved E and P waste fluids, primarily produced saltwater, will be pumped from the truck unloading area through a closed loop system to the inlet of two (2) 700-barrel fiberglass settling tanks. The fluids will then be sent through two (2) series of four (4) 1,000-barrel fiberglass tanks (8 Total) for solids separation and some minimal hydrocarbon separation. The fluids will then be transferred via centrifuge pumps to the two (2) fiberglass 1,000-barrel gun barrels for separating hydrocarbons from the water. The separated hydrocarbons are skimmed from the tops of the 1000-barrel tanks and siphoned from the gun barrels and transferred to two (2) 400-barrel steel oil tanks. Fluid from the gun barrels is directed to two (2) 750-barrel fiberglass suction tanks prior to being disposed of in the approved injection well. Fluid from the two (2) 750-barrel suction tanks are then transferred by one of three (3) triplex pumps to the one (1) approved SWD well.

An SPCC Plan certified by a Professional Engineer will be implemented and maintained on-site. The Attachment 3 - Facility Diagram shows the layout of The Facility. The tanks, offloading area, pumps and ancillary equipment will all be placed in bermed, seamless concrete, and sealed/lined containment areas to prevent releases of approved E and P waste fluids to the surface soils, groundwater and recharge areas of aquifers.

c. Disposal

The approved E and P waste fluids, primarily produced saltwater, and pit water, will be injected in the permitted injection well. Injection pressures and the casing/tubing annulus pressure will be monitored according to the permit. The residual solids resulting from settling in the saltwater tanks will be periodically removed during tank cleaning operations and placed in a lined steel roll-off container during tank

cleaning operations. These solids will be sampled, profiled and manifested for disposal at an approved facility. The solids generated are expected to be less than 0.1 percent of the total throughput handled at The Facility. The solids will be transported by an authorized transporter to an approved facility. Solids will not be stored at The Facility and will be removed as processed.

There will be no discharge of contact storm water at this facility. Defiance anticipates having to clean some of the tanks to remove solids approximately twice per year and estimates no more than twenty (20) cubic yards of solids will be removed from each tank cleaning event. Once in operation, Defiance will evaluate the previous estimations.

3. Sources of waste

a. On-site generation (type and percentage of total handled)

Solids that are generated from approved E and P waste fluids managed at the facility through accumulation in the bottom of the two (2) 700-barrel fiberglass settling tanks, two (2) 1000-barrel fiberglass gun barrel, two (2) 400-barrel steel oil stock tanks, two (2) 750-barrel fiberglass suction tanks, and eight (8) fiberglass 1,000-barrel saltwater tanks will be removed by periodic cleanouts. During periodic cleaning of these tanks, solids will be removed and placed in a lined steel roll-off container temporarily located at The Facility only during tank cleaning operations. These solids will be sampled, profiled, and manifested for proper disposal at an available and approved facility that is authorized to receive E&P Waste solids. The solids generated will be less than 0.1 percent of the total throughput handled at The Facility. The solids will be transported by an authorized transporter to an approved facility.

Normal solid waste will be generated at The Facility. A dumpster will be kept on-site for disposal of trash, debris, and garbage at the local permitted landfill.

b. Off-site generation (type and percentage of total handled)

Approved E and P waste fluid is generated off-site as waste generated by the drilling and production of oil and gas. This facility is not expected to generate any form of waste outside The Facility boundaries.

4. Where will the wastes be shipped if not handled at this site?

Approved E and P waste fluid not disposed of or treated at The Facility and waste products generated at The Facility from facility operations will be shipped from The Facility to a disposal facility permitted to receive approved E and P waste fluids. Solids from cleaning tanks will be temporarily stored in a steel roll-off container. The roll-off container will only be located at The Facility during temporary routine maintenance, such as cleaning tank bottoms from above-ground storage tanks. Normal solid waste from facility operations will be stored in an on-site dumpster prior to disposal at the local permitted landfill.

5. What wastes will remain on-site permanently?

No waste will remain on-site permanently. A closure bond will be obtained as required by LAC 43:XIX.567.

B. By which of the following potential pathways could releases of hazardous materials from the proposed facility endanger local residents or other living organisms?**1. Air**

There is no potential exposure through the air pathway other than from vent lines on the oil/condensate storage tank, the separation tanks, and the temporary storage of solids in roll-off containers on the seamless concrete pad during periodic tank cleaning operations. Preliminary modeling calculations have been done to determine if this facility will require a minor source air permit from LDEQ. Based on the maximum throughput and tankage at this facility it was shown that such a permit will be necessary (6.5 tons VOC emissions/year and 0.55 tons of TAP emissions). Since this is above the 5 tons per year criteria pollution limit and above the minimum emission rate for the TAPs, there is a need for an air permit at this facility. Altec's modeling results were submitted to LDEQ for determination and DEQ determination and/or response is being forwarded to the Environmental Division of DNR with this application. This type of facility will emit Volatile Organic Compounds (VOCs) exceeding an LDEQ minimum emission rate or a de minimis rate established pursuant to the Clean Air Act; therefore, an air permit application was submitted to LDEQ. LDEQ issued Minor Source Air Permit No. 2420-00656-00 on August 2, 2019. Facility personnel will be monitored for possible Hydrogen Sulfide (H₂S) exposure using H₂S personnel monitors.

2. Water

The water pathway is protected by a seamless concrete unloading pad and sealed/lined containment system around the tanks and off-loading areas. The storage tanks at the facility are enclosed by a 205' x 105' x 49" steel sealed/lined containment wall having a spill containment capacity of approximately 15,654 barrels. The sealed/lined floor of the tank containment area is sloped slightly towards the west end of the tank containment area, towards integrated sealed/lined sumps in the center and corners of the containment floor to collect any rainwater or spilled E and P Waste Liquids. Fluids collected in these sumps will be pumped via automated submersible pumps back through the process flow.

The Facility will implement an approved SPCC Plan certified by a Professional Engineer to prevent and control spills of E and P waste or its recovered materials. The Facility will use secondary containment to ensure that contaminants will not enter the waters of the State of Louisiana. The offloading pad is contained by concrete berms and a seamless concrete pad that slopes to a sump that is automatically emptied by a submersible pump. Valves and hose connections associated with unloading of the skim oil tanks will be contained using 6.5 gallon polyethylene containment units with a cover and locking capabilities. The

drinking water aquifers are protected by two (2) strings of steel casing and cement. A cement bond log will be run on the surface casing string and the long string casing string of the well to prove isolation of the Underground Source of Drinking Water (USDW). The injection of fluid will be through steel tubing and a packer, thereby offering a further layer of protection of the USDW. The casing/tubing annulus will be monitored to ensure there are no leaks in the tubing, packer or outer long string casing.

In addition, the surface water pathway is protected through collection of any precipitation that falls on any stored solids or in the contained areas throughout The Facility. These solids are from temporary tank clean outs and are only temporarily stored in a roll-off container until disposal at an authorized disposal facility. These waters will be handled as waste to be injected into the disposal well. Thus, there will be no surface discharge of contact stormwater at this facility and no LPDES permit is necessary.

3. Soil

Contaminants from disposal of the approved E and P waste fluids in the proposed injection well will not come in contact with the soil. The storage tanks at the facility are enclosed by a 205' x 105' x 49" steel sealed/lined containment wall having a spill containment capacity of approximately 15,654 barrels. The entire system is contained by a 49-in. steel sealed/lined containment wall integrated into a sealed/lined floor that is slightly sloped towards the west end of the tank containment area, towards collection sumps to contain and collect any storm water, spills, or leaks of E and P Waste Liquids. Liquids collected in the sump are pumped to the inlet manifold and commingled with other approved E and P waste. The seamless concrete unloading pad is bermed on four sides with 6-in. roll over berms to prevent runoff of approved E and P waste fluids or run-on of stormwater. The E and P waste, primarily produced saltwater, will not come in contact with the soil. Possible minor spills and releases may occur during offloading of approved E and P waste fluids. The spills will be contained on concrete and run-on will be controlled by concrete roll-over berms. The unloading pad is slightly sloped towards an integrated concrete sump equipped with a float actuated sump pump to prevent the accumulation of any fluids on the unloading pad. Any fluids from the sump are sent back to the tanks in the containment to be ultimately disposed of in the disposal well. Absorbent materials will be kept on site for further containment in the unlikely event a spill might take place in a place other than the seamless concrete unloading pad.

4. Food

The Facility is located in a rural area of Red River Parish, Louisiana. No risk of significant release to the food chain is expected. The Facility will limit and minimize the risk of any contaminants to enter food or the food chain (i.e. animal, wildlife and related biology) by controlling and preventing air, water, and soil emissions. No emissions to the soil and water are expected because they will be controlled by concrete berms, a seamless concrete slab, and steel sealed/lined containment walls integrated into the sealed/lined floor with run-off controls, as noted above.

C. What is the likelihood or risk potential of such releases?

As noted above, no risk of significant emissions is expected. There is minimal risk, of potential exposure, to the water or soil through either leakage of containment areas, during the transfer of materials, or by way of the disposal well. All containment areas are adequately bermed to contain spills and include sump pumps to prevent accumulation or leakage offsite. Additional protection is being constructed in the form of a seamless, concrete containment unloading area and a sealed/lined tank battery, where the containment walls are integrated to the sealed/lined floor. The WMOP establishes procedures for proper handling of materials and protection from releases. The Facility will have a SPCC Plan, developed by a professional engineer in accordance with 40 CFR Part 112 and LAC 33:IX.905.B to provide protection against releases as well as containment and regular inspections. In addition, The Facility will be designed and operated to prevent such releases and implement an Emergency Response/Contingency Plan that will help to ensure that any accident or unexpected event will be quickly and effectively controlled and reported, as required.

The likelihood or risk potential of a release from the injection well is considered to be minimal when State imposed regulations are followed. Drinking water aquifers will be protected by two (2) strings of steel casing and cemented to ground surface, providing external cement isolation above and below the proposed injection zone as demonstrated in Attachment 4A of the UIC-2 Com SWD application. A cement bond log will be ran on both casing strings, in accordance with the LDNR Injection and Mining Divisions (IMD) "Cement Bond Logging Guidelines" and sent to IMD in order to prove sufficient isolation and protection of the Underground Source of Drinking Water (USDW) has been met. Fluids will be injected through steel tubing and a packer, thereby offering a further layer of protection of the USDW. The casing/tubing annulus will be pressure tested, monitored, and recorded in accordance with LAC 43.XIX.Subpart 1. Statewide Order No. 29-B, to ensure there are no leaks in the tubing, packer or outer long string casing.

D. What are the real adverse environmental impacts of the permittee's proposed facility?**1. Short-term effects****Land area taken out of system**

The short term effect of the land being taken out of the system is negligible. The land for the proposed facility is currently owned by Defiance. The total land area to be used is approximately 7.873 acres as shown on the plats at the end of Appendix H. The Permitted Facility Boundary encompasses 5 acres of this tract and includes the aboveground storage tanks, office/lab buildings, and injection well. The site is located six (6) miles northeast of the town of Coushatta, Louisiana, just to the west of U.S. Highway 371, and east of Interstate 49. The Facility is located in the Bracky Branch Field. The present land use is for timberland/agricultural purposes. The Haynesville Shale Play extends almost

more than 20 miles in all directions from the proposed facility. Oil and Gas Fields within the Anticipated Market Range to be served by this proposed facility include the Bracky Branch, Red River-Bull Bayou, Alpha, Redoak Lake, Coushatta, Gahagan, Liberty, Carroll Creek, Martin, East Hope, Madden Branch, Bayou Toulon, Grassy Lake, Swan Lake and Woodardville Fields.

2. Long-term effects

The Facility is designed and will be operated to minimize potential adverse effects to the environment. The Facility will implement an approved SPCC plan, provided by a Professional Engineer in accordance with 40 CFR Part 112 and LAC33:IX.905.B that will help prevent discharges to any drainage areas. The Facility will have the required closure financing in place to assure that the site is properly closed in accordance with LAC: XIX.567. The financial responsibility for any liability for damages will be in accordance with LAC 43:XIX.511 by obtaining and presenting a certificate of liability insurance in the amount set by the commissioner as documented in Appendix M.

In comparison to long-term waste storage facilities, such as, landfills or treatment systems that discharge to the waters of the State of Louisiana, this facility will not pose any threat for long-term environmental effects. Long-term environmental impacts are not expected at The Facility. Class II well injection into subsurface reservoirs, is generally considered the safest and most effective method for handling these type fluids" (*Overview of Exploration and Production Waste Volumes and Waste Management Practices in the United States, May 2000 API report, section 2.4.2.*). The process of deep well injection is the injection of approved E and P waste fluids, primarily produced saltwater, into porous and permeable formations that already contain saltwater. A simple explanation is: "saltwater will be injected in formations that already contain saltwater". Long term, the bottom hole pressure in the formations where fluid will be injected will dissipate and eventually reach a pressure not much higher than the original bottom hole pressure. The Closure Plan, included in Appendix N, details the method of plugging and abandoning the well and closure of The Facility. Financial assurance in accordance with LAC: XIX.567, will be in place before construction and before approved E and P waste fluids are injected in any well. This closure funding helps to insure that the facility operator is responsible and cognizant of any potential contamination and the ensuing long-term effects. The well and facility will be constructed and operated in a manner that protects surface waters, recharge areas of aquifers, groundwater and drinking water aquifers. Permits and plans will be in place to provide further protection of the environment. All of the reasons above and, others contained in the permit application and elsewhere herein, provide levels of protection to ensure there will be no long term impact to human health and the environment.

II. Does a cost benefit analysis of the environmental impact costs balanced against the social and economic benefits of the proposed facility demonstrate that the latter outweighs the former?

Yes. A cost benefit analysis of the environmental impact costs balanced against the socio-economic benefit of the proposed facility indicates the latter outweighs the former.

A. How was it determined that this facility was needed?

Defiance and ALTEC Environmental Consulting, LLC, researched available information at the Department of Natural Resources and surveyed the need for commercial saltwater disposal well with oil and gas operators in the area. There are 64 wells currently permitted (2/2020) within a 20 mile radius of the proposed facility, and there are currently 2,208 wells that are actively producing or shut-in waiting for completions or future utilization within a 20 mile radius of the proposed facility. There are currently only two (2) operational commercial E and P disposal facilities in Caddo Parish; one facility is operated by Key Energy Services, LLC (K087) and the second is operated by Republic EES, LLC (R5445). There are currently only two (2) operational commercial E and P disposal facilities in DeSoto Parish to serve the entire Haynesville Shale Play in this region; one facility is operated by Southern Water Disposal, LLC (S430) and the second is operated by Pinnergy, LTD (P308). There are also two (2) approved to construct commercial E & P disposal facilities in Desoto Parish, and one (1) approved to construct commercial E & P disposal facility in Red River Parish; of the two (2) Facilities in Desoto Parish, one facility is operated by Bulldog Oilfield Services, Inc. (B3920) and the second is operated by Brumley Investments, LLC (B2920), the facility in Red River Parish is operated by Pinnergy, LTD (P308). Both of the facilities in Desoto Parish have been constructed but have yet to receive a Permit to Inject E&P fluids, the facility in Red River Parish is currently under construction. There are also two (2) transfer stations in DeSoto Parish; Heckman Transfer Station (Site Code 1603), which receives approved liquid E and P waste fluids generated in Louisiana, and transfers across state lines to Texas, and Pinnergy Transfer Station (Site Code 1607), which receives approved liquid E and P waste fluids generated in Louisiana, and transfers to the Pinnergy, LTD (P308, Site Code 1604) commercial E and P disposal facility next door. There are currently only two (2) operational commercial E and P disposal facilities in Bienville Parish; one facility is operated by Bear Creek Services, LLC (B320) and the second is operated by Sugar Creek Environmental, LLC (S2740). There are currently only two (2) operational commercial E and P disposal facilities in Webster Parish; one facility is operated by Nelson Energy, Inc (N054) and the second is operated by Bigfoot Energy Services, LLC (B2240). There is currently only one (1) operational commercial E and P disposal facility in Sabine Parish; operated by Basic Energy Services, L.P. (B272). There is currently only one (1) operational commercial E and P disposal facility in Bossier Parish; operated by R360 Environmental Solutions of LA, LLC (R244). There is currently only one (1) operational commercial E and P disposal facility in Claiborne Parish; operated by Key Energy Services, LLC (K087).

There are currently no active commercial SWD facilities in Natchitoches or Red River Parishes and with further development of the Haynesville Shale Play, as well as additional plays in the Cotton Valley and Hosston formations, Defiance is of the opinion that a commercial E and P waste disposal facility will benefit the oil and gas operators in the Anticipated Market Range that surrounds the proposed Facility's location. In particular, it is known that horizontal wells in the Cotton Valley Formation and vertical wells in the Hosston, produce a large amount of water during production, and Haynesville Shale wells produce large amounts of water when drilled near faults or in highly fractured areas. Additionally, once a well is drilled it will continue to produce water for the life of the well. Further stated, Defiance has numerous haul trucks and is permitted to haul E & P Waste in Louisiana and Texas. This has provided them with insider knowledge of the relatively new and continuing exploration and production

activities in Northwest Louisiana. With this knowledge, Defiance fully expects this facility will receive an average of 15,000 barrels to a maximum of 25,000 barrels of approved E and P waste fluids each day and with other facility options, it would likely reduce the overall number of large trucks on U.S., State, and parish roads, as well as the bridges that lay between these active fields and commercial disposal facilities on the west side of the Red River.

1. Local or regional survey

The Facility's chosen location is near the oil and gas drilling and production industry's major operations in Northwest Louisiana where E and P waste is created. The Facility is centrally located in North Louisiana approximately 15 road miles east of Interstate 49 to provide a location in a rural area, but centralized to provide an environmentally safe means for disposal of produced fluids, primarily saltwater, from oil and gas wells in the region. The Facility is in the Bracky Branch Field. The proposed facility has easy access for truck traffic from U.S. Highway 371. There are currently no similar facilities within twenty (20) road miles of the proposed facility location.

2. On-site or off-site needs

The Facility will be fenced and gated with access only by entrance through a locked gate. As mentioned above, the source of approved E and P waste fluids, primarily produced saltwater, is near the majority of oil and gas wells drilling and production operations in the eastern part of the Haynesville Shale play. The approved E and P waste fluids that meet the requirements and are accepted at the proposed facility will be disposed of in the proposed injection well. The solids that accumulate in the separation and holding tanks will be removed, sampled and analyzed, then disposed of at an approved E and P solid waste facility.

Defiance anticipates having to clean some of the tanks to remove solids approximately twice per year and estimates no more than twenty (20) cubic yards of solids will be removed from each cleaning event.

3. Regional solid waste management benefit

The Facility will not accept solid wastes for disposal. Small amounts of solid E and P waste will be generated at The Facility during tank cleaning operations. These solids will be properly sampled, profiled, and disposed of at an approved solid waste facility. Therefore, there is no regional solid waste management benefit.

4. Generic survey of solid waste needs (compatibility with master plan)

The Facility will not accept solid wastes for disposal.

B. What will be the positive economic effects on the local community?

1. How many permanent jobs will be created?

The operation of The Facility will create approximately ten (10) positions at The Facility. Six (6) jobs will be created for operation of The Facility, plus two (2) positions for management, one (1) position for clerical assistance and quality control, and one (1) position for maintenance of The Facility. Additional positions will be created for truck drivers transporting approved E and P waste fluids to The Facility, and regulatory consultants to maintain regulatory requirements.

2. What is the expected annual payroll?

The expected annual payroll is estimated to be \$500,000.00.

3. What is the expected economic multiplier from item B2?

The expected multiplier, i.e., increase in local business activity, is three (3). This multiplier has been previously accepted in prior similar commercial SWD applications at LADNR and is also supported by a 2011 report that indicates an average multiplier for value added, employment, and labor income of 3.18 (*Macroeconomic Impacts of the Domestic Oil & Gas Industry, Working Document of the NPC North American Resource Development Study, September 15, 2011*).

4. What is the expected tax base and who will receive benefits?

The proposed facility would be subject to ad valorem taxes by Red River Parish. The ad valorem taxes will be based on the value of The Facility once it is in place, and will be assessed by the local tax assessor. Taxes will be paid on diesel fuel purchased to power the trucks transporting approved E and P waste fluids. The recipients of these taxes will be state and federal governing bodies.

C. What will be the potential negative economic effects on the local community?

1. What are the possible effects on property values?

There have been no formal impact studies done on nearby property values, but based on the current usage of the property and the rural location of the proposed facility, it is not expected that the proposed facility will have any adverse impact on local property values. The nearest residence to the subject facility is +/-1,024 feet northeast of the northeast corner of the facility boundary abutting U.S. Hwy 371. The nearest community is Edgefield, Louisiana, south of where the proposed facility is located. The proposed facility should have no adverse impact on adjacent or nearby property values.

2. Will public costs rise for:

a. Police protection

No significant increase in police protection cost should arise from the construction and operation of this facility. The proposed facility will operate 24

hours a day, seven days per week. The facility will be manned during these hours and any time injection of waste is occurring. When the subject facility is closed, a locked gate, and chain-link fencing, and a security system will secure the property. The proposed facility is to be located just off U.S. Highway 371.

b. Fire protection

The flammability of E and P waste at this facility is based mainly on the flammability of small amounts of fuel and oils within the E and P waste and the skimmed oil within the two (2) 400-barrel steel oil tanks. The Facility will have fire protection equipment to handle less significant emergencies. The Facility will develop an Emergency Response Plan that will allow quick and effective action during emergency situations. The nearest Fire Station is located approximately 4.5 miles to the south in Coushatta, Louisiana. The Red River Parish Fire District, located at 205 Ringgold Avenue, Coushatta, Louisiana provides fire protection for the proposed facility. There will be no significant increase in public cost due to the subject facility being installed.

c. Medical facilities

Public costs for medical facilities will not increase due to the construction and operation of the proposed facility. The nearest medical facilities are located approximately 6 road miles to the south in Coushatta, Louisiana. The medical facility is known as CHRISTUS Coushatta Health Care Center located at 1635 Marvel St, Coushatta, Louisiana. The materials handled at The Facility are in similar nature as the oil and condensate produced in oil fields in the area. The majority of the liquids handled at the proposed E and P waste facility will be produced saltwater, which is non-hazardous and non-flammable. There should be no new additional threats to human health.

d. Schools

Public costs for schools will not rise as a result of the construction and operation of the proposed facility. The nearest school is the Red River Elementary School located roughly 6 road miles south of the proposed facility. No adverse effect to the local schools is expected, based on the limited potential of environmental concerns and the distance to the schools.

e. Roads

The public costs for roads are not anticipated to increase as a result of the proposed facility. The proposed development will service existing facilities by providing a centralized location for the area, and the overall impact and miles driven by E&P waste trucks is expected to be reduced.

- The proposed facility is located off U.S. Highway 371 approximately 15 road miles to the east of Interstate 49. The facility location does not have posted weight restrictions on US 371. The positioning of the proposed facility is anticipated to reduce the truck impact for roadways within the Anticipated

Market Range as the existing truck traffic will utilize the proposed facility, reducing overall miles traveled on public roadways.

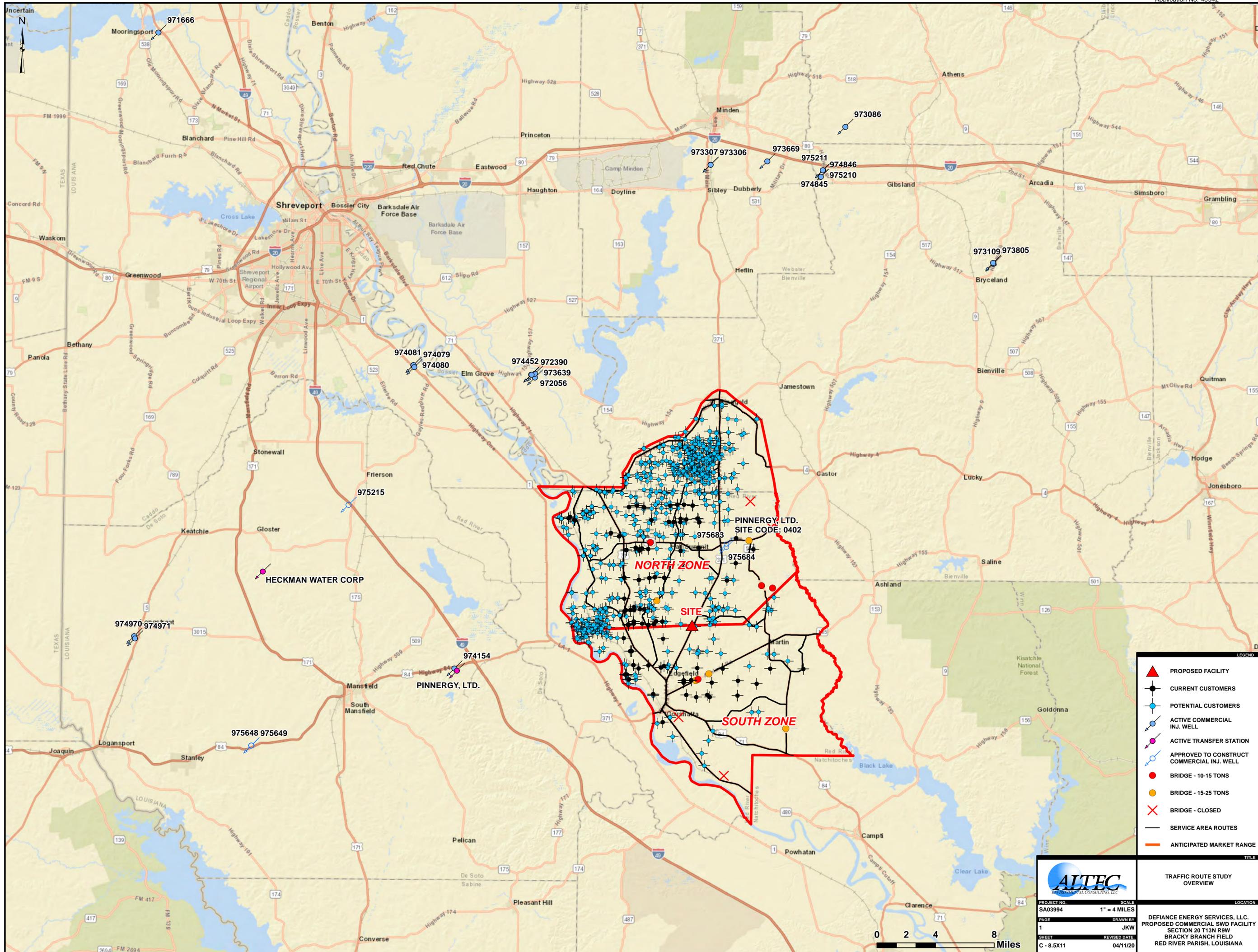
- Heavy vehicles accessing the proposed site are already operating on Parish roadways; utilizing existing facilities located further from source locations. Defiance currently transports E&P waste from well locations near the proposed facility to the Southern Water Disposal, LLC SWD Commercial Facility site code 1606, approximately 48 miles to the west; or to Sugar Creek Environmental, LLC SWD Commercial Facility site code 703, approximately 38 miles to the north. Providing a facility closer to sources will reduce the overall truck mileage for the existing E & P waste, see page 22 (II.D.3.a) for additional information.

- It is anticipated that heavy vehicle traffic of the Red River Bridge at Armistead-Coushatta and the Jimmie Davis Bridge at Shreveport-Bossier City will be reduced to a minimal impact. Based on Defiance's evaluation of current market conditions it is anticipated that waste generated east of the Red River within the Anticipated Market Range will be received by the proposed facility and waste generated to the west the Red River will utilize one of the Commercial E & P waste facilities on that side of the river, this evaluation was performed considering all E & P Waste Hauling Companies. Pinnergy, LTD (P308) currently has a Commercial Facility site code 0402, under construction less than 6 miles to the north of the proposed facility. This facility was taken into consideration and it was determined that it will not have an effect on the proposed facility as Defiance has agreements with generators and non-defiance haulers to transport E and P waste to the proposed facility if it is approved to construct.

- A Road Access Permit has been applied for with the Louisiana Department of Transportation and Development (LA DOTD) for purposes of providing access to the Facility from U.S. Highway 371. Parish road permit requirements have been and will continue to be met for the parish roads utilized by Defiance. If the Facility is approved to construct, additional Parish Road Permits will be obtained for any additional roads Defiance might utilize.

- Should transporters other than Defiance transport E & P waste to the proposed facility, prior to accepting the E & P waste, training will be provided regarding transportation, such as acceptable routes, bridge postings, parish road permit requirements, weight limits, and school zones.

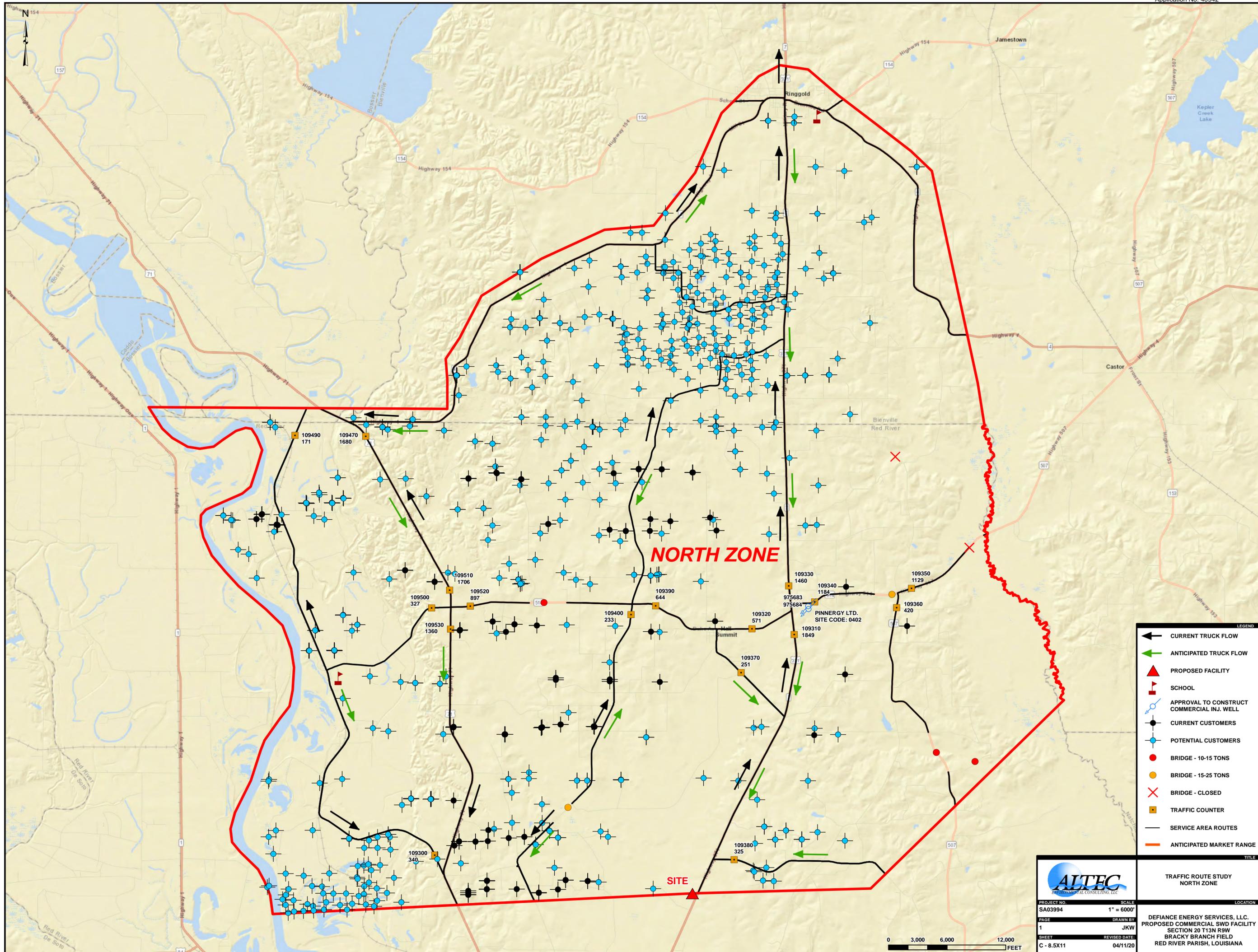
Please refer to the Traffic Impact Analysis maps on pages 17-19.



- LEGEND**
- ▲ PROPOSED FACILITY
 - CURRENT CUSTOMERS
 - POTENTIAL CUSTOMERS
 - ACTIVE COMMERCIAL INJ. WELL
 - ACTIVE TRANSFER STATION
 - APPROVED TO CONSTRUCT COMMERCIAL INJ. WELL
 - BRIDGE - 10-15 TONS
 - BRIDGE - 15-25 TONS
 - ✕ BRIDGE - CLOSED
 - SERVICE AREA ROUTES
 - ANTICIPATED MARKET RANGE

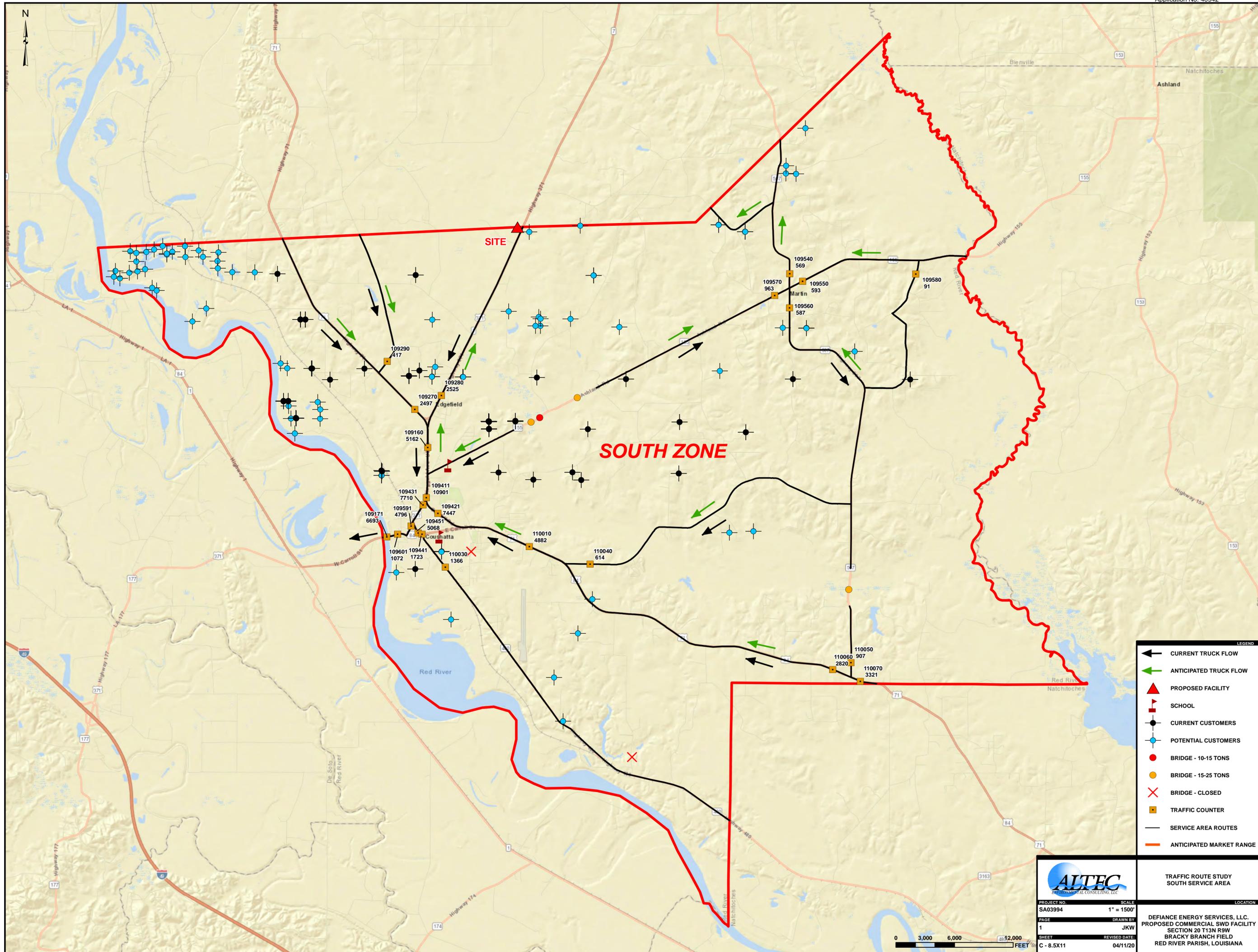
ALTEC ENVIRONMENTAL CONSULTING, LLC		TITLE	
PROJECT NO. SA03994		SCALE 1" = 4 MILES	
PAGE 1		DRAWN BY JKW	
SHEET C - 8.5X11		REVISED DATE: 04/11/20	
DEFIANCE ENERGY SERVICES, LLC.		LOCATION	
PROPOSED COMMERCIAL SWD FACILITY		TRAFFIC ROUTE STUDY OVERVIEW	
SECTION 20 T13N R9W		BRACKY BRANCH FIELD	
RED RIVER PARISH, LOUISIANA			





- LEGEND**
- ← CURRENT TRUCK FLOW
 - ANTICIPATED TRUCK FLOW
 - ▲ PROPOSED FACILITY
 - ▤ SCHOOL
 - ⊕ APPROVAL TO CONSTRUCT COMMERCIAL INJ. WELL
 - CURRENT CUSTOMERS
 - POTENTIAL CUSTOMERS
 - BRIDGE - 10-15 TONS
 - BRIDGE - 15-25 TONS
 - ✕ BRIDGE - CLOSED
 - TRAFFIC COUNTER
 - SERVICE AREA ROUTES
 - ANTICIPATED MARKET RANGE

		TITLE
TRAFFIC ROUTE STUDY NORTH ZONE		LOCATION
PROJECT NO. SA03994	SCALE 1" = 6000'	DEFIANCE ENERGY SERVICES, LLC. PROPOSED COMMERCIAL SWD FACILITY SECTION 20 T13N R9W BRACKY BRANCH FIELD RED RIVER PARISH, LOUISIANA
PAGE 1	DRAWN BY JKW	
SHEET C - 8.5X11	REVISED DATE 04/11/20	
0 3,000 6,000 12,000 FEET		



- LEGEND
- ← CURRENT TRUCK FLOW
 - ANTICIPATED TRUCK FLOW
 - ▲ PROPOSED FACILITY
 - SCHOOL
 - CURRENT CUSTOMERS
 - POTENTIAL CUSTOMERS
 - BRIDGE - 10-15 TONS
 - BRIDGE - 15-25 TONS
 - ✗ BRIDGE - CLOSED
 - TRAFFIC COUNTER
 - SERVICE AREA ROUTES
 - ANTICIPATED MARKET RANGE

		TRAFFIC ROUTE STUDY SOUTH SERVICE AREA	
		PROJECT NO. SA03994 SCALE 1" = 1500' PAGE 1 DRAWN BY JKW SHEET C - 8.5X11 REVISED DATE: 04/11/20	
DEFIANCE ENERGY SERVICES, LLC. PROPOSED COMMERCIAL SWD FACILITY SECTION 20 T13N R9W BRACKY BRANCH FIELD RED RIVER PARISH, LOUISIANA		LOCATION	



3. **Does the prospective site have the potential for precluding economic development of the area by business or industries because of risk associated with establishing such operations adjacent to the proposed facility?**

The proposed facility is located in a rural part of Red River Parish, which is one of the reasons why it was chosen. The property is currently used for timberland/agricultural purposes. It is not anticipated the prospective site will preclude economic development of the area by business or industry due to risks associated with the proposed facility. The operation of a commercial SWD facility at this location would generate a significant increase in local tax revenues to the parish as compared to the current use. Future drilling activity in the area, not only for Haynesville, but also other producing targets in the area would generate additional disposal requirements for this area. The risk associated with operations of the proposed facility is negligible to non-existent due to the WMOP and monitoring set in place to ensure there is no harm to human health and the environment. The injection well is monitored daily for pressure variances in the casing/tubing annulus. The underground sources of drinking water are protected by two (2) strings of steel casing and cement. Cement bond logs are run to prove isolation of the injection interval and the underground source of drinking water.

The proposed facility poses no risk to prevent economic development in the area by other industries or businesses.

D. Was transportation a factor in choosing the proposed site?

Yes, access to transportation was a primary factor in choosing the proposed site. Transportation of the approved E and P waste fluids by truck and the close proximity of the proposed location to the source of the E and P waste being generated in the Haynesville Shale play, Bracky Branch, Red River-Bull Bayou, Alpha, Redoak Lake, Coushatta, Gahagan, Liberty, Carroll Creek, Martin, East Hope, Madden Branch, Bayou Toulon, Grassy Lake, Swan Lake and Woodardville Oil & Gas Fields which are all within the Anticipated Market Range, provides the most practical and economical means of transportation and disposal of the approved E and P waste fluids from these fields. This location is located to take advantage of active development in the Hosston, Cotton Valley, and Haynesville plays, as well as reduce truck traffic across state lines and bridges.

1. What mode(s) of transportation will be used for the site?

a. Truck

Truck will be the only mode of transportation of approved E and P waste fluids to The Facility.

b. Rail

Rail transportation is not currently being considered at the subject location.

c. Barge

Barge transportation is not available to the subject location.

d. Other

Pipeline transportation is a future possibility for this site. Defiance would not utilize the pipeline until approved by LDNR and will comply with the requirements of LAC 43:XIX.571.

2. What geographical area will it serve?

This facility will serve the oil and gas production region in Northwest Louisiana, specifically the parishes shown within the Anticipated Market Range on pages 17-19. At this time it is not anticipated that any waste will be received from outside of the market range. Circumstances in which the E & P waste fluids would come from outside of the anticipated market range would be if an in-state or out-of-state Commercial Facility was shut down or unable to receive waste and this facility was the only one open to receive waste. If approved, and E and P waste fluids are received from out-of-state generators, the Manifest system shall be followed in accordance with LAC 43:XIX.545.

3. By how much will local road traffic volume increase?

The expected operating capacity of the proposed Defiance facility is 25,000 barrels of saltwater pit liquid and other associated approved E and P waste fluids per day. Each truck servicing the facility can transport approximately 130 barrels which equates to 192 trucks per day at maximum capacity. The facility is anticipated to operate 24 hours per day with a constant rate of trucks equating to eight (8) trucks per hour.

	Inbound	Outbound
Daily	192	192
Hourly	8	8

It is anticipated that the actual operation of the facility will be around 70-80 trucks per day; however, the maximum rate is considered for purposes of this analysis. The majority of the heavy vehicle trips to and from the proposed facility currently exist on Parish roadways. The following table is an evaluation of the traffic volumes on existing major routes, also refer to pages 18 and 19 for Traffic Route Study maps.

Route volumes are approximate estimations based on the existing facilities serviced. Routes are on a demand basis and regular hourly traffic will vary based on source sites being utilized. The existing processing facilities for the area are summarized in the Roads section on page 15.

To calculate the approximate roadway volumes, existing source sites were mapped and assigned to major roadways, the number of sites per route were then used to determine a percentage of the proposed facilities operating volume. (i.e.

59 sites will be serviced to the south on US 371 and 32 sites to the north giving a distribution of 65% and 35% respectively).

Service Area	Estimated Number of Defiance Trucks Per Hour		
	Route	Existing	Proposed
North	US 371 - Site to Ringgold	5	6
	SR 786 - US 371 to South Zone	0	1
	SR 783 - US 371 to US 514	4	2
	SR 783 - US 514 to Bridge	2	2
	SR 783 - Bridge to South Zone	1	1
	SR 515 - US 71 (north) to US 71 (south)	1	1
	US 71 - SR 4 to SR 515	3	3
	SR 514 - SR 783 to US 371	0	4
South	US 371 - Site to US 71	0	10
	US 71 - US 371 to North Zone	7	8
	US 71 - SR 507 to US 371	1	0
	SR 783 - US 71 to North Zone	1	1
	SR 784 - SR 507 to US 71	1	0
	SR 507 - Bridge to North Zone	1	0
	SR 155 - Bridge to US 71	2	2
	SR 155 - Bridge to SR 507	1	1
	US 371 - US 71 to West	10	0

There are minor increases and decreases in the study area due to the re-routing of trips from existing facilities to the proposed facility. The main noticeable changes are the increase for the sections on US 371 directly accessing the proposed developments, and reduction of trips on US 84 to the north and US 371 to the south west.

As mentioned previously the heavy vehicle trips are already present on Parish roadways and bridges servicing the existing E&P source sites. The proposed development provides a centralized location, reducing overall impact to Parish roadways that heavy vehicles are utilizing.

a. Can local roads handle the traffic volume expected?

Local roads can handle the increased traffic without negatively affecting other users based on the following:

- 1) Parish Road Permit requirements have been and will continue to be met for the roads traveled in the Anticipated Market Range Defiance will serve. If the Facility is approved to construct, additional Parish Road Permits will be obtained for any additional roads within the Anticipated Market Range Defiance might utilize. Please refer to the following section B and Appendix P of the application for additional information.

2) A Road Access Permit has been applied for with the Louisiana Department of Transportation and Development (LA DOTD) for purposes of providing access to the Facility from U.S. Highway 371.

3) LA DOTD average daily traffic count data along the anticipated traffic routes were reviewed at <http://www.wapps.dotd.la.gov/engineering/tatv/>. Following is a summary of the data nearest the proposed facility.

LA DOTD Traffic Counts for Highways Nearest the Proposed Facility				
Vehicles Per Day				
	Station # 109380	Station # 109370	Station # 109310	Station # 109280
YEAR	LA 786 east of Hwy 371	LA 788 West of Hwy 371	Hwy 371 South of Hwy 514	Hwy 371 North of Hwy 71
2017	325	251	1849	2525
2014	824	405	2295	3357
2011	692	460	3243	3920
2008	1012	430	2748	3815
2005	241	419	2495	8393
2002	211	405	1925	2499

b. Can local roads handle the weight of trucks?

The Facility is located immediately west of U.S. Highway 371 and is east of Interstate 49. A detailed evaluation of the roads and bridges along the anticipated routes was conducted using bridge data provided by the LA DOTD. The weight of the trucks will be no more than 80,000 pounds (40 Tons) and is dependent on many variables, such as how much E & P waste is being transported, the type of tires on the truck, and how much fuel is in the truck. These highways currently handle this kind of truck traffic with this kind of weight on a daily basis. The evaluation indicated the proposed routes are equipped with roads and bridges capable of handling the weight of the trucks, see pages 17-19 – Traffic Route Study Maps. It should be noted, that Bridge Postings on the Traffic Route Study Maps will be adhered to; routes are available that avoid these posted bridges and Defiance’s drivers are trained to adhere to such restrictions. Additionally, a LA DOTD Road Access Permit has been applied for, for purposes of providing the facility access from U.S. Highway 371 and parish road permits requirements have been and will continue to be met for the roads to be traveled in the area Defiance will serve. Should transporters other than Defiance transport E & P waste to the proposed facility, prior to accepting the E & P waste, training will be provided regarding transportation, such as acceptable routes, bridge postings, parish road permit requirements, weight limits, and school zones. LA DOTD representatives have previously encouraged site development where the site is in close proximity to a major Interstate and a U.S. Highway. See page 22 (II.D.3.a) for additional information.

4. What are the long-term expectations of the proposed site?**1. Longevity of the facility?**

Based on the average life of similar facilities, this Facility is estimated to operate at this location for roughly twenty (20) years. The length of time The Facility operates is also based on the time frame in which oil and gas is produced in the area.

2. Who owns the facility?

The property is owned by Defiance.

3. Are the owners financially backed by others?

The owners are not financially backed by others.

4. When is closure anticipated?

Closure is estimated to be 20 years from the date noted on the approval of this application. (Anticipated closure to be in 2040).

5. Who is responsible for the site after closure?

Defiance is responsible for the site after closure of The Facility.

6. What assurances will there be that the site will be closed in accordance with the plan?

Financial assurances will be in place as noted in Appendix N of this application, according to regulations (LAC 43:XIX.567) to fund closure prior to issuance of the permit.

7. What financial assurances will be established to demonstrate the ability to handle problems after closure?

Financial assurances will be provided and in place according to regulations (LAC 43:XIX.567) to assure that proper closure is funded and attained.

- A.** Defiance will follow all applicable local, state, and federal financial assurance requirements. Closure bond and/or letter of credit will be in place as required by regulatory statutes, and reviewed annually. The requirements of the permit for the well and facility limit environmental concerns after The Facility is closed.

1. Who certifies that the site is properly closed?

The site will be closed according to LAC 43:XIX.567. The Department of Natural Resources (DNR) Office of Conservation will certify that the site is properly closed. Closure of the site will be performed under DNR's supervision.

2. How are people protected from unwittingly buying land after closure?

A deed recodation describing the operation to be located on the site along with the closure documents will be filed in the conveyance records at the Red River Parish Courthouse.

a. Is the closed facility recorded in the deed?

The closed facility will be recorded in the records of the Red River Parish Courthouse.

b. What future uses are possible?

The future uses of the property will most likely be agricultural or timberland.

III. Are there alternative projects, which would offer more protection to the environment than the proposed facility without unduly curtailing non-environmental benefits?

No. The facility is located in a remote area and provides limited exposure to the public. The proposed location is strategically located to serve the oil and gas industry in the area with a means of disposal of E and P waste that is protective to the environment and provides an economical means of disposal of the E and P waste. Other alternative projects are not believed to be economically viable for disposal of approved E and P waste fluids in this area. Costs, practicality, and suitability of various alternative means of disposal are noted in a 2006, *Argonne National Laboratory report available through the US Department of Energy (Offsite Commercial Disposal of Oil and Gas Exploration and Production Waste; Availability, Options, and Costs)*. Most other alternatives cannot handle the volumes required at an economically viable cost and as safely and effectively as disposal by deep well injection for the conditions found in Louisiana. A survey noted in this report indicates that injection was almost exclusively used to manage approved E and P waste fluids. The Facility is a closed loop system designed to minimize emissions and exposure of contaminants to the environment compared to other methods. It is located in a rural area and provides limited exposure to the public. Alternatives to deep well injection may be recycling, or the treatment of the produced saltwater to remove impurities. There is not a current need for additional sources of salt water in the area, so recycling is not a viable alternative. Land treatment of approved E and P waste fluids or gas plant waste fluids is not an acceptable means of disposal of E and P waste fluids per LAC 43:XIX.549.C.7.f. Land treatment is typically utilized for solids and sludges with relatively low levels of hydrocarbons and salts. Salt, unlike hydrocarbons cannot biodegrade, but may accumulate in soils. Treatment and discharge of the approved E and P waste fluids to the surface poses additional risk to the environment, including risk of contaminating surface or ground water. Regarding treatment and surface discharge, reliable technologies have not been developed to effectively treat large volumes of approved E and P waste fluids for discharge to the waters of the State of Louisiana.

Thermal treatment is another option that has been tried in rare instances, but has the highest associated cost for disposal. No thermal treatment facilities for approved E and P waste fluids are believed to have been permitted in Louisiana. Burial in landfills for approved E and P waste fluids has been tried, but the requirement for solidification, which is generally required, drives up the costs.

The socio-environmental benefits of deep well injection far outweigh other methods of treatment and disposal of approved E and P waste fluids that includes land farming, land treatment, or incineration. Class II injection wells have been used to dispose of produced fluids since the 1930's and, today, there are over 170,000 such wells located in 31 states (*Groundwater Protection Council, Injection Wells: An Introduction to Their Use, Operation and Regulation, August 2005*). The Groundwater Protection Council and many others consider underground injection of produced fluids to be a safe technology. This method has been substantially improved, since the 1930's.

1. Waste water is injected into the ground between impermeable layers of rocks to avoid polluting fresh water supplies or adversely affecting quality of receiving waters. Injection wells are usually constructed of solid walled pipe cemented to a deep elevation in order to prevent injectate from mixing with the surrounding environment (*U.S. Environmental Protection Agency (EPA). Washington, DC. "Basic Information about Injection Wells." Updated 2010-01-22*).

Injection wells are widely considered to be the best method for disposal of treated waste water. (*Argonne National Laboratory, Offsite Commercial Disposal of Oil and Gas Exploration and Production Waste", 2006*). Unlike outfalls or other direct disposal techniques, injection wells utilize the earth as a filter to further clean the treated wastewater before it reaches the receiving water. This method of waste water disposal also serves to spread the injectate over a wide area, further decreasing environmental impacts.

Underground injection is a safe way to dispose of approved E and P waste fluids and LDNR regulations governing construction and operation of commercial SWDs, as well as The Facility's WMOP, help ensure protection of the environment (*Overview of Exploration and Production Waste Volumes and Waste management Practices in the United States, May 2001 API report*).

A. Why was this technology chosen (e.g., incineration over landfilling?)

Other technologies are available, such as landfilling, water treatment, and incineration, but none of the other alternatives are as protective of the environment as deep well injection. Deep well injection is also the most environmentally effective means of disposal of approved E and P waste fluids.

1. Are other technologies available?

Other technologies are available, water treatment and discharge, and incineration, but none of the other alternatives are as protective of the environment as deep well injection as an economically viable alternative as noted in the Argonne National Laboratory report noted previously in this appendix.

A 2000 API report (*Overview of Exploration and Production Waste Volumes and Waste Management Practices in the United States*) indicates that approximately 92% of approved E and P waste fluids is managed through Class II well injection into subsurface reservoirs, generally considered the safest and most effective method for handling these type fluids. Deep well injection is also noted as the

most cost-effective means of disposal of approved E and P waste fluids in the previously referenced Argonne National Laboratory report. Deep well injection is a process of pumping approved E and P waste fluids into a well and injecting into porous, subsurface rock or sand formations bounded by impermeable bounding beds. Deep well injection is the primary method of disposal of approved E and P waste fluids from oil and gas exploration. *(Statements in this section also supported by a presentation available online at http://www2.epa.gov/sites/production/files/documents/21_McCurdy_-_UIC_Disposal_508.pdf).* The Operators will often own Class II disposal wells for their operations. As of October 2019 there are a fifteen (15) active operator-owned Class II injection wells in Red River Parish. When these operator-owned Class II injection wells go down or require workover operations to remediate them, Operators need another means to dispose of approved E and P waste fluids.

Due to the continued development of the Haynesville Shale and Cotton Valley Play, the demand exists for a commercial SWD facility in the area. Only nine (9) active commercial liquid E and P waste disposal facilities and two (2) active E and P waste receiving and storage facilities are operating in the core areas of the Haynesville Shale and Cotton Valley Play. There are also two (2) approved to construct commercial E & P disposal facilities in Desoto Parish, and one (1) approved to construct commercial E & P disposal facility in Red River Parish; of the two (2) Facilities in Desoto Parish, one facility is operated by Bulldog Oilfield Services, Inc. (B3920) and the second is operated by Brumley Investments, LLC (B2920), the facility in Red River Parish is operated by Pinnergy, LTD (P308). Both of the facilities in Desoto Parish have been constructed but have yet to receive a Permit to Inject E&P fluids, the facility in Red River Parish is currently under construction. Continued development of these formations will generate significant quantities of produced saltwater. Discussions with industry personnel, familiar with operations in the area, indicate that many of the current facilities available nearby for disposal of approved E and P waste fluids may be approaching disposal capacity. Approved E and P waste fluid from Northwest Louisiana is piped and trucked daily across the state line to Texas, damaging Louisiana roads, risking a spill or release in environmentally sensitive areas, and further justifying the need for this commercial SWD facility.

Deep well injection is one of the most effective and environmentally sound methods for disposal of approved E and P waste fluids. Approved E and P waste fluids generated from oil and gas production is injected in porous formations already containing saltwater. These beds are bounded above and below by confining impermeable beds to prevent the vertical migration of the injected fluids. Injection pressures are limited below the fracture pressure of the rocks, as stated in Policy No. IMD 1999-03.

Approved E and P waste fluids are injected through 4-1/2-in. tubing and a packer, which allows for the first layer of protection of the USDW. The packer is set in the longstring 7-in. casing, at a depth that is equal to or deeper than the cement in the wellbore that is bonded to the first isolating shale formation immediately above the approved injection zone, to ensure the approved E and P waste fluids are migrating via the perforations within the approved injection zone. These pressures are monitored for integrity of the tubing, casing, and packer, so that the well can be shut down immediately in event of failure. This provides the first layer of protection of the USDW.

The second layer of protection of the USDW is the tested 7-in. steel casing and the cement pumped between the 7-in. casing and the 8 3/4-in. open hole all the way to the surface. A cement bond log is then run to provide evidence of proper isolation of the injection interval for the protection of the USDW. Logs are submitted to the Injection and Mining Division for approval prior to injecting the approved E and P waste fluids.

The third layer of protection of the USDW is the 9 5/8-in. steel surface casing. The surface casing is set at a minimum of 100-ft. below the base of the USDW and cemented back to surface. A cement bond log is then run to provide evidence of cement between the outside of the 9 5/8-in. casing and the drilled 12 1/4-in open hole, for protection of the USDW.

The IMD limits injection pressure below the fracture gradients of the confining zones, thereby eliminating the risk of vertical migration of fluids. In addition, an area of review evaluation is performed as part of the application preparation to determine if any artificial penetrations exist, that could potentially allow for approved E and P waste fluids to escape from the permitted formations. There were no artificial penetrations within the area of review for the proposed well's location. The confining zones, shales, multiple strings of tubing, casing, cement, and monitoring of injection pressure ensures that the injected approved E and P waste fluids stay within the permitted formations.

Approved E and P waste fluids or gas plant waste fluids may not be disposed of by land treatment in accordance with LAC 43:XIX.549.C.7.f.

Treatment of approved E and P waste fluids at the surface or waste water treatment is an option, but because of the high chloride content of the produced water, treatment is very costly; and if treatment is not managed and controlled, then impacts to the surface water could occur via the discharge of the treated approved E and P waste fluids.

Evaporation and incineration are other options to dispose of approved E and P waste fluids. Evaporation can cost as much as \$84.00 per barrel, while incineration of E and P waste liquids, which typically does not have high flammability characteristics, can be more expensive. Thermal treatment can range from \$10.50 to \$105.00 per barrel.

Ref: Technical Assessment of Produced Water Treatment Technologies, 1st Ed., RPSEA Project 07122-12, Colorado School of Mines, November 2009.

2. Describe the engineering design and operating techniques used to compensate for any site deficiencies.

The permitting procedures help ensure the integrity of the injection well, including casing and cement protection of the USDW and isolation of the injection interval. Procedures will be in place for monitoring the integrity of the casing strings, tubing strings, and packer. Injection pressures will be monitored and recorded daily to help ensure compliance with the permit. Each of these design and operational parameters and controls help ensure confinement of injected fluids to the authorized injection zone.

Secondary containment will be in place to help ensure containment of approved E and P waste fluids in the event of a spill, release, or rupture. A secondary defense against spills or release is the bermed, sealed/seamless, concrete unloading pad, and the sealed/lined containment areas. These areas will be constructed with appropriately sized berms to assure appropriate containment in the event of a spill. There will be no accumulation of fluids within the containment areas under normal operating conditions. Slightly sloped floors of the unloading and containment areas towards automated sump pumps are additional added measures to assure that no accumulation of fluids will occur in these areas. Facility personnel will supervise unloading and disposal operations and discontinue operations if any problems are noted until the problem is resolved. The offloading area will be contained to prevent run-on and run-off, and for containment of minor spills that might occur during offloading procedures. Absorbent pads will be available at the unloading and offloading areas in the event of minor spills.

The concrete unloading pad will be constructed of seamless concrete and the entire tank battery system is contained by a 49-in. steel repairable sealed/lined containment wall and repairable sealed/lined floor that is slightly sloped towards the west end of the tank containment area, towards integrated collection sumps to contain and collect any storm water, spills, or leaks. The 49-in. high steel wall will be constructed of 12 gauge steel panels (ASTM A653 SS, Grade 55) that are 8-ft. in length and are connected by overlapping 1-ft. of the panels on each end to ensure the panel joints are adequately sealed. The panels are secured to and supported by posts (H 8.25' x D 2.5", 8 gauge ASTM A653 SS, Grade 55), the panels will be bolted (7/16", SAE J429 Grade 8.2) with gaskets to the posts, and each post will be set on 56.25-ft. centers and set 2.5-ft. deep into the ground in concrete to help support the tank containment integrity in case it becomes full. A civil engineer will be consulted with to ensure adequate ground/soil strength to reinforce the in-ground posts used in the containment system. The metal panels will not be buried below ground, instead they will be sprayed with 40 mils of repairable polyurea on each side of the panel. The panels will then be sealed/lined against the floor by attaching a chemical/abrasion resistant polyurea sprayed 12 oz. repairable geotextile liner (60 mils thick) at 2-ft. above the wall base and then encapsulating the walls again with another 40 mils of repairable polyurea to integrate the geotextile liner and completely seal the containment. Polyurea is formed by reaction of diisocyanates and diamines, and it is one of the toughest synthetic polymer materials. Polyurea sealants are high strength with tensile strength over 5,000 psi and tear strength higher than 500 lbs/in, 100% solid with no volatile organic compounds (VOC), provides rust protection, chemical resistance, abrasion resistance, environmental resistance, water tight capabilities, and is repairable. The geotextile liner will be integrated into the polyurea sealant, will be installed over the soil, will have the sumps integrated into the liner/sealant, and will cover the entire containment floor. With this design no fluid will be able to drain under the geotextile liner. (<https://www.gantrade.com/blog/fast-setting-polyurea-spraycoatings>). The polyuria sealants that will be used in the construction of this facility

are Chemline 6900 PT A Neutral and Chemline 6900 PT B Tan, the MSDS sheets are attached in the Appendix K - WMOP section of this application. The Containment System will be installed, maintained, and repaired to the manufactures specifications. The integrity of the concrete unloading containment area and the repairable steel sealed/lined containment wall, and the repairable sealed/lined floor will be visually inspected once every hour on a daily basis for any cracks, tears, or problems which might compromise proper containment and for any evidence of unauthorized discharge. See attached Letter of Engineering (In Appendix K – WMOP) certifying that this containment system is capable of maintaining integrity and holding all tankage in case of a catastrophic release. In accordance with the attached Letter of Engineering, the waste handled at this facility will not exceed the maximum allowable fluid density of 69 lb/cu. ft.

Once the oil in the 400-barrel steel oil tanks is deemed in condition to be sold, an approved transporter will be notified to pick up the oil. When the transporter arrives on-site he will be directed to the oil load out unloading area on the south side of the containment wall by a trained Defiance Employee, a sample of the oil will be collected and the water percentage will be determined. If the oil is deemed acceptable, the driver will gauge the tank to determine the volume of oil in the tank. The oil will be transferred from the two (2) 400-barrel oil tanks to the load out line. The load out line has a polypropylene containment around the unloading valve to prevent any spills during the unloading process. The driver will then connect the suction hose to the loading valve in the polypropylene containment. The loading valve will be opened, the tank valve will be opened and the valve at the truck will be opened with the vacuum pump running. The driver will monitor the truck compartment with the site gauge and the tank the driver is pulling from with the gauge line. The onsite personnel for Defiance will be monitoring all activities and assisting the driver. Once the tanker is near capacity the driver will slow the vacuum pump down reducing the vacuum being pulled to move oil. The tank valve will be closed then the loading valve in the polyethylene container will be closed. The valve at the truck will be closed and disconnected. A five (5) gallon bucket will be placed beneath the hose and truck connection. The hose will then be disconnected at the loading valve in the polypropylene containment. Any spilled product in the five (5) gallon bucket or the polypropylene containment at the loading valve will be returned to the oil storage tank. Absorbent pads will be in place to absorb any minor amounts of oil that may be spilled. Fresh water connections are provided at the unloading pad and four sides of the containment to rinse off the containment floors and keep them clean.

The integrity of the concrete unloading containment area and the repairable steel sealed/lined containment wall, and the repairable sealed/lined floor will be visually inspected once every hour on a daily basis for any cracks, tears, or problems which might compromise proper containment and for any evidence of unauthorized discharge.

A Spill Prevention, Control, and Countermeasure Plan will be developed by a Professional Engineer and put in place in the event of a spill or release.

B. Is the proposed technology an improvement over that presently available?

The proposed technology is deep well injection of approved E and P waste fluids generated from the oil and gas industry. Improvements are made to the casing design to allow for increased volumes of fluid to be injected with less injection pressure at the surface. Improved separation and increased retention time at the surface will allow for "cleaner" approved E and P waste fluids to be injected that will not have an adverse effect on the formation where the fluid is injected. The injection of oils, sludges, mud, and freshwater often create a swelling effect on the clays in the formations and create impermeable barriers that eventually increase injection pressures. Improved monitoring of the types of fluids accepted, increased separation and retention time at the surface, and the mixing of freshwater with approved E and P waste fluids will help the operations at The Facility, specifically the injection pressure at the wellhead, to stay within the guidelines of the permit.

C. Describe the reliability of technology chosen.

The technology chosen provides an environmentally safe and economical method of disposal of approved E and P waste fluids with little or no harm to human health and the environment.

1. Past experiences

Approved E and P waste fluids managed through Class II well injection into subsurface reservoirs is generally considered the safest and most effective method for handling these types of fluids (*Overview of Exploration and Production Waste Volumes and Waste Management Practices in the United States, API, May 2000*). The approved E and P waste fluids are injected back in saltwater-bearing formations. Deep well injection has been proven effective in thousands of Class II injection wells across Louisiana. The surface facility designs, multiple casing and cement designs and tubing and packer designs provide multiple layers of protection to the surface environment and the USDW. By injecting the brine, Class II wells prevent surface contamination of soil and water. (http://dnr.louisiana.gov/assets/OC/im_div/uic_sec/EPPosterofwells.pdf)

2. Environmental impacts

The environmental impacts to the community and the area are minimal to none. The secondary containment, also constructed of sealed/seamless concrete and the sealed/lined containment areas, will prevent spills, releases, and ruptures of approved E and P waste fluids from entering the environment. The casing, tubing, packer, and cement requirements established by the DNR protect the USDW. The monitoring programs established and issued along with the permit for the proposed facility ensure compliance during operations, and virtually eliminate any possible release to the environment. The socio-environmental benefits of deep well injection over other technologies, such as land farming, landfilling, or surface treatment, include the fact the deep well injection will

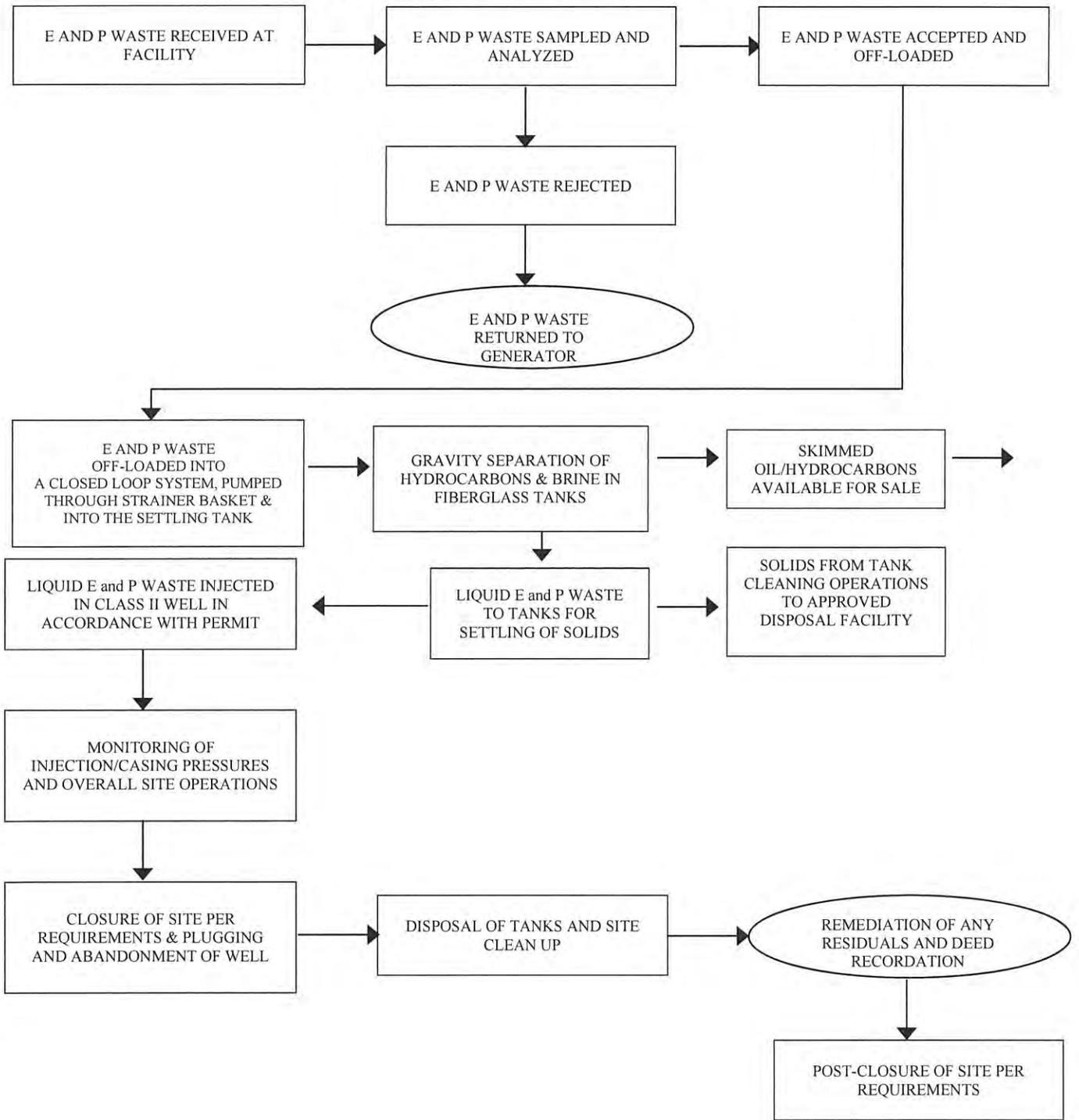
virtually eliminate any contact or exposure to the communities such as Edgefield and Coushatta.

This is based on common industry information and EPA document, EPA816-H-10-001 (http://dnr.louisiana.gov/assets/OC/im_div/uic_sec/EPAposterofwells.pdf)

D. Describe the sequence of technology used from arrival of wastes to the end process at The Facility (flow chart).

See flow chart on the following page.

PROCESS FOR THE ARRIVAL OF NEW WASTE



1. Analysis of waste

Upon the truck arriving at The Facility location, the site operator will take a sample of the fluid and inspect it for percent solids, and analyzed for pH, conductivity, chlorides and consistency with the waste type on the manifest. The E and P waste fluids will either be accepted or refused.

2. Unloading

Before unloading, the regulatory required testing will be performed and the reviewed manifest will be completed and given to the transporter. The approved E and P waste fluids will be unloaded from the tanker trucks through a closed loop system via hoses at the unloading rack. These hoses will pump the fluids through a strainer basket, into the inlet manifold, then on to the separation tanks.

3. Storage

A load of approved "Types" of E and P waste fluids enters The Facility through a security gate and is directed to an 8-in. thick concrete unloading slab with 6-in. berms that is sloped towards an integrated concrete sump to prepare for the unloading procedures. After taking a sample of the tank truck's contents, a 4-in. hose will be connected to the tail end of the tank truck to allow the contents to be pumped via centrifugal pumps to the inlet of two (2) 700-barrel fiberglass settling tanks. The fluids will then be sent through two (2) series of four (4) 1,000-barrel fiberglass tanks (8 Total) for solids separation and some minimal hydrocarbon separation. The fluids will then be transferred via centrifuge pumps to the two (2) fiberglass 1,000 gun barrels for separating hydrocarbons from the water. The separated hydrocarbons are skimmed from the tops of the 1000-barrel tanks and siphoned from the gun barrels and transferred to two (2) 400-barrel steel oil tanks. Fluid from the gun barrels is directed to two (2) 750-barrel fiberglass suction tanks prior to being disposed of in the approved injection well. Fluid from the two (2) 750-barrel suction tanks are then transferred by one of three (3) triplex pumps to the one (1) approved SWD well.

The storage area will have a spill containment capacity, in accordance with the requirements of NFPA, EPA, LDNR/Conservation and LDEQ. A SPCC Plan, developed and certified by a Professional Engineer will be maintained on-site. Solids generated from the separation process in the tanks will be profiled and disposed at a permitted facility. No solid E and P waste will be stored on site. The Facility Diagram depicts the layout of The Facility.

4. Treatment

The approved E and P waste fluids are treated physically by gravity methods in the tanks on-site to separate the brine, hydrocarbons and settle solids.

5. Monitoring

Trained Defiance employees will be at The Facility during all operating hours and will monitor and assist during unloading operations. When The Facility is not open, the front gate will be locked and the security system activated. Inspections of the tanks and lines will be performed daily. The site will be maintained at all times to prevent approved E and P waste fluids from contacting surface soils and entering the environment. The injection pressures on the injection well will be monitored and recorded on a daily basis and reported on Form UIC-21. The pressure on the casing/tubing annulus will be monitored and recorded on a daily basis and reported on Form UIC-21. Unloading operations will be monitored so that appropriate action can be taken to prevent spills.

6. Closure

Closure of The Facility will be in accordance with the closure plan included in the permit application. The injection well will be plugged and abandoned according to the Department of Natural Resources requirements. The solids and sludge in the tanks will be sampled, manifested, and properly disposed at an E and P waste facility permitted and approved to handle these materials. The tanks will be cleaned and the metal recycled. The concrete and steel will be removed from the site and recycled. The site will be returned as close as practicable to its original condition. In the event that future events or environmental concerns require closure confirmation samples, the cost of such sampling will be included in subsequent annual closure costs estimates and such samples will be collected to assure compliance and to ensure that remediation efforts are complete.

7. Post-closure

After closure of The Facility, inspections will be made to ensure that no contamination remains in place. There should be no reason for any post-closure after the well is properly plugged and abandoned and the site equipment and concrete are removed.

8. Disposal

Solids and sludges generated in the bottom of the tanks will be properly profiled (as required) and disposed at an E and P waste disposal facility. The concrete at the offloading area will be removed and properly disposed or recycled.

9. Any residuals requiring further handling

Any residual materials will be characterized and properly disposed or recycled.

E. Will this facility replace an outmoded/worse polluting one?

No, the proposed facility is a new facility with all new equipment and one (1) new well to be drilled. It is designed to provide a safe means of disposal of approved E and P waste fluids in accordance with the regulations stated in LAC 43, Chapters 4 & 5.

F. What consumer products are generating the waste to be disposed? Are there alternative products that would entail less hazardous waste generation?

Approved E and P activities associated with the production of oil and gas in North Louisiana generate the waste. This waste is a significant byproduct of area oil and gas production which necessitates additional disposal facilities be permitted to properly dispose of this E and P liquid waste product.

IV. Are there alternative sites that would offer more protection to the environment than the proposed facility site without unduly curtailing non-environmental benefits?**A. Why was this site chosen?**

The primary reasons this site was chosen is because the site meets the criteria, including the environmental criteria, necessary for the construction and operation of injection wells for produced fluids. The more significant criteria this site meets are strategic location to oil and gas production, zoning, proper subsurface geology and surface conditions, avoidance of a floodplain, avoidance of wetlands, availability of the site and the LDNR location criteria. The location also reduces the trucking time that is charged to the oil and gas operators that utilize local disposal means as opposed to trucking elsewhere in the state or across state lines, thereby reducing traffic on some Louisiana highways. The location is in a remote area of the parish and will have no adverse effect to the public.

1. Specific advantages of the site:

Based on oil & gas data available on the LDNR website SONRIS (Strategic Online Natural Resources Information System), the location of the site will provide a central location for oil and gas operators to properly dispose of approved E and P waste fluids.

The subsurface geology is appropriate for injection of approved E and P waste fluids. The subsurface geology is consistent and without any faulting within a two (2) mile radius.

Based on oil & gas production data available on SONRIS, The proposed injection formation is not productive in the area.

The site provides for avoidance of wetlands and floodplains, according to the Wetlands Study in Appendix G.

The rural area in which the site is located will not adversely affect the public.

The site is near the intersection of two primary U.S. roads, U.S. Hwy 371 and U.S. Hwy 71

A U.S. highway is adjacent to The Facility. The location is 15 road miles east of a major interstate.

There is a fire department (Red River Parish Fire District) within approximately 5 miles of The Facility in Coushatta, Louisiana.

The site is not located in a hurricane prone area.

2. Is the location of the site irrevocable; i.e., would denial of permit based on site preclude the project?

Denial of the permit based on the site location would prevent the project from being completed.

3. Were other sites considered and rejected?

Other sites were evaluated and considered. Each alternative site was evaluated based on the following criteria.

- a. Strategic location near oil and gas operations generating non-hazardous oilfield waste, liquids, as previously defined
- b. Zoning
- c. Land Use
- d. Proper Subsurface Geology and Surface Conditions
- e. Avoidance of Floodplain
- f. Ready Access
- g. Lack of Groundwater Contamination
- h. Greenfield
- i. Wetlands
- j. Infrastructure
- k. Availability
- l. Minimum Size and Configuration
- m. Location criteria of the regulations.

Several criteria were evaluated for each site. Naturally, the location must be strategically located near oil and gas exploration and production activities. An injection well may also only be located where proper subsurface geology and surface conditions exist. Both local zoning and land uses should also suit the intended use. The preferred location avoids wetlands and floodplains or its size and shape allow for avoidance of wetlands and floodplains. The chosen site should be free of groundwater contamination. The site must meet the LDNR location criteria as defined in LAC 43:XIX.507 which states that a site cannot be located as follows:

1.) within 1/4 mile of a public water supply water well or within 1,000 feet of a private water supply well for facilities permitted after January 1, 2002;

2.)where type A and B facilities and transfer stations, class II disposal wells, storage containers and E and P waste treatment systems and related equipment are located within 500 feet of a residential, commercial, or public building, church, school or hospital or for any proposed new commercial facility or transfer station where publication of the notice of intent or date of the permit application filed with the Office of Conservation is dated after the promulgation date of this rule, where type A and B facilities and transfer stations, class II disposal wells, storage containers and E and P waste treatment systems and related equipment are located within 1,250 feet of a school, hospital, or public park;)

It must also include the thickness and aerial extent of the proposed injection zone and adequate clay confining beds, avoidance of floodplains and wetlands, and be a location which does not pose a substantial, adverse threat to public health or safety. To ensure The Facility maximizes trucking use of established roadways, The Facility should have ready access to appropriate highways. All facilities require access to infrastructure as this facility does also. Infrastructure includes water, electrical, and roadways. It is preferred to avoid Greenfields though often impossible. In addition the property must be available. In very recent times, it has been quite difficult to locate and purchase available property suitable for injection wells in North Louisiana. In recent years, landowners have become accustomed to receiving lucrative lease revenues and/or have the fear of losing minerals, by prescription of selling the property. This has greatly limited property availability; therefore with all this in mind, Defiance located three properties within the estimated service area, not on the market, but believed would meet the required criteria. Each of the sites considered are discussed below.

Site No. 1: This site is located in Section 10, Township 15 North, Range 9 West, Bienville Parish, Louisiana. The site comprises approximately 6 acres. Site No. 1 is located on the east side of U.S. Highway 371, south of Ringgold, Louisiana.

- a. Strategic location near oil and gas operations generating non-hazardous oilfield waste – liquids as previously defined: The location of the site was acceptable.
- b. Zoning: Rural, no zoning.
- c. Land Use: Rural, Agricultural.
- d. Subsurface Geological conditions exist for disposal of approved E and P waste fluids as previously defined.
- e. Avoidance of Floodplain: This site falls within Zone X of the FEMA Flood Zone Map (Not a Special Flood Hazard Area).
- f. Ready Access: Access is available via Louisiana U.S. Highway 371.
- g. Lack of Groundwater Contamination: There is believed to be no groundwater contamination at the Site No. 1.
- h. Greenfield: The site is a Greenfield Site, i.e., agricultural land that is undeveloped.
- i. Wetlands: There are no wetlands on the property.
- j. Infrastructure: Infrastructure is available including water, electrical power and a U.S./Louisiana State Highway located in close proximity to Interstate 49.
- k. Availability: The property was not available.

- l. Minimum Size and Configuration: The size and configuration of Site No. 1 is adequate.
- m. Location criteria of regulations: Not all portions of the site met the location criteria as required in the regulations.

Site No. 1 meets some of the criteria appropriate for the proposed project. The site was considered after reviewing geological characteristics of the area. The site is a Greenfield. Though this site was not on the market, an effort was made to obtain the property. Ultimately, however, it was determined that the site was unavailable for purchase and it did not meet all portions of the site requirements for a SWD facility. Therefore, the site was determined unsuitable.

Site No. 2: This site is located in Section 17, Township 13 North, Range 9 West, Red River Parish, Louisiana. The site comprises approximately 8.79 acres. Site No. 2 is located on the west side of U.S. Highway 371, north of Coushatta, Louisiana.

- a. Strategic location near oil and gas operations generating non-hazardous oilfield waste – liquids as previously defined: The location of the site was acceptable.
- b. Zoning: Rural, no zoning.
- c. Land Use: Rural, Agricultural.
- d. Subsurface Geological conditions exist for disposal of approved E and P waste fluids as previously defined.
- e. Avoidance of Floodplain: This site falls within Zone C of the FEMA Flood Zone Map (Outside 500 yr. flood plain).
- f. Ready Access: Access is available via Louisiana U.S. Highway 371.
- g. Lack of Groundwater Contamination: There is believed to be no groundwater contamination at the Site No. 2.
- h. Greenfield: The site is a Greenfield Site, i.e., agricultural land that is undeveloped.
- i. Wetlands: There are no wetlands on the property.
- j. Infrastructure: Infrastructure is available including water, electrical power and a U.S./Louisiana State Highway located in close proximity to Interstate 49.
- k. Availability: The property was not available.
- l. Minimum Size and Configuration: The size and configuration of Site No. 2 is adequate.
- m. Location criteria of regulations: Not all portions of the site met the location criteria as required in the regulations.

Site No. 2 meets some of the criteria appropriate for the proposed project. The site was considered after reviewing geological characteristics of the area. The site is a Greenfield. Though this site was not on the market, an effort was made to obtain the property. Ultimately, however, it was determined that the site was unavailable for purchase and it did not meet all portions of the site requirements for a SWD facility. Therefore, the site was determined unsuitable.

Site No. 3, the Proposed Site: This site is located in Section 20 of Township 13 North, Range 9 West of Red River Parish, Louisiana. The site comprises approximately 7.873 acres. The Permitted Facility Boundary encompasses 5 acres of this tract and includes the aboveground storage tanks, office/lab buildings, and injection well. Site No.3 is located on the west side of U.S. Highway 371, between Coushatta, Louisiana and Hall Summit, Louisiana.

- a. Strategic location near oil and gas operations generating non-hazardous oilfield waste – liquids as previously defined: The location of site was acceptable.
- b. Zoning: Rural, no zoning.
- c. Land Use: Rural, Agricultural/Timber.
- d. Proper Subsurface Geology and Surface Conditions: Subsurface Geological conditions exist for disposal of E & P waste liquids as previously defined.
- e. Avoidance of Floodplain: This site falls within Zone C of the FEMA Flood Zone Map (Outside 500 yr. flood plain).
- f. Ready Access: Access via U.S. Highway 371.
- g. Lack of Groundwater Contamination: There is believed to be no groundwater contamination at the Site No. 3.
- h. Greenfield: The site is a Greenfield Site, i.e., agricultural land that is undeveloped.
- i. Wetlands: There are no wetlands on this property.
- j. Infrastructure: Infrastructure is available including water, electrical power and U.S. Highway 371, located in close proximity to Interstate 49.
- k. Availability: This property is owned by an officer of Defiance. An Act of Cash Sale agreement has been made with the landowner.
- l. Minimum Size and Configuration: The size and configuration of Site No. 3 are adequate.
- m. Location criteria of regulations: Site No. 3 met the location criteria as required in the Office of Conservation regulations.

Site No. 3, the proposed site, was selected based on the proven and appropriate subsurface geology and surface conditions, ability to obtain an acceptable lease and disposal agreement with the landowner, and conformity with the Office of Conservation's commercial facility permit regulations and location criteria. In addition, and significantly, the site lies within a Flood Zone C (Outside 500 yr. flood plain). This site, like all of the remaining sites is a Greenfield that has been recently clear cut. The site has good infrastructure, including direct access to U.S. Highway 371 and is within approximately 15 road miles of Interstate 49. Thus, the site has the benefit of good highways suitable for trucking while also being strategically located within an area of exploration and production. In addition, the site is located within an area considered to contain the Carrizo-Wilcox Aquifer, it is also located within a recharge zone. The casing and cement designed for the injection well and required by LDNR combined with the WMOP and LDNR requirements for operations will ensure no impact on the Carrizo-Wilcox Aquifer. Given the protection of the Carrizo-Wilcox Aquifer, Site No. 3 offers the highest level of protection of the environment. Moreover, given its remote nature, no site offers greater protection of public health and welfare. Site No. 3 is the most suitable site for the proposed project and is owned by Defiance.

B. Is the chosen site in or near environmentally sensitive areas?

The subject property is not located in or near environmentally sensitive areas.

1. Wetlands

An onsite review of the property by a wetlands consultant was done during the fatal flaw process and was found not to have wetlands on the property the facility will be built on. The proposed construction of the commercial saltwater facility and disposal well will not impact any wetlands or pose an adverse impact to the wetlands in the area.

2. Estuaries

The proposed facility is not located in an estuary.

3. Critical habitat

The proposed facility is not located in an area considered a critical habitat. This is supported by documents from a site assessment and review by the Castilaw Environmental Services and the LNHP (Appendix 7).

4. Historic or culturally significant areas

The subject property is not located on property that is considered historic or culturally significant. This is supported by documents from a site assessment and review by the Castilaw Environmental Services and the LNHP (Appendix 7).

a. Indian mounds

There are no Indian mounds on or near the subject site.

b. Antebellum houses

There are no antebellum houses near the subject site.

c. Tourist attractions or facilities (e.g., bed and breakfast inns)

There are no tourist attractions near the subject property.

d. Campgrounds or parks

There are no campgrounds or parks on or near the proposed facility.

C. What is the zoning and existing land use of the prospective site and nearby area?

The property is not within the bounds of a zoning authority. And the existing land is used for timber.

1. Is the site located near existing heavy industrial, chemical process, or refinery operations?

There are none, as defined in Appendix D – Location Criteria.

2. Is there a precedent for chemical contamination near the site or is the soil and water pristine?

There is no precedent for chemical contamination on or near the site. To the knowledge of the applicant, the soil at the site has no contamination.

3. Is the area particularly noted for its esthetic beauty?

The proposed location has been clear-cut of trees, therefore it is not noted for its esthetic beauty.

D. Is the site flood prone?

According to FEMA Flood Maps in Appendix G - CES Wetlands Investigation Report the 5.579 acre tract is not flood prone, but the location of the permitted facility and the permitted injection well will be located in a Flood Zone C (Outside 500 yr. flood plain) area. An additional 2.294 acres was acquired by Defiance in January 2020, to make the total acreage 7.873 acres. This acreage falls within Flood Zone C. The Permitted Facility Boundary encompasses 5 acres of this tract and includes the aboveground storage tanks, office/lab buildings, and injection well.

1. Is the site in a flood plain?

No. It lies within Flood Zone C (Outside 500 yr. flood plain)

a. How current are the maps used to make flood plain determinations?

Flood plains maps are available from the Federal Emergency Management Agency as recent as 1985.

b. What is the elevation of the site?

The elevation of the site ranges from approximately 190 feet to 205 feet above mean sea level.

c. Is diking required or desired to provide flood protection?

No diking will be required for flood protection.

n. What is the design height of the dike? N/A

- o. **How is the dike protected from erosion?** N/A
- p. **What frequency and design storm was used?** N/A
- q. **Is the access to the site over or through dikes?** N/A

2. Is the site hurricane vulnerable?

The proposed site is located in North Louisiana and is not vulnerable to a hurricane.

- a. **Is the site in an area subject to storm surge?** No
- b. **What are the design storm specifications?** Weather conditions, such as wind and rain, were taken into account when designing the facility, as thunderstorms are common in the area. The tanks used in the facility will be constructed of fiberglass or steel, placed in a sealed/lined containment area and tanks that are wider than they are tall will be at least half filled with fluid and tanks that are taller than they are wide will be anchored with guide wires to minimize wind effects during storms.
- c. **Should damage from wave action be considered?** No
- d. **For what levels of wind speed is the facility designed?**
100 mph – This is the wind speed that offshore/onshore production facilities are designed for utilizing the above method of keeping tanks at least half filled with fluid and anchoring tanks that are taller than they are wide.

E. Is groundwater protected?

Groundwater will be protected by the 6-in. drive over berms around the four sides of the concrete unloading pad, which is constructed of sealed/seamless concrete. All 49-in tank containment walls will be constructed of steel and then sealed/lined and integrated into the sealed/lined floor. The tank containment will have a spill capacity of approximately 15,654-barrels within containment. The floor of the tank containment area will be of sealed/lined and is sloped slightly towards the west end of the tank containment area, towards collection sumps to contain and collect any storm water, spills, or leaks of E and P waste liquids. Liquids collected in the sump are transferred to the inlet manifold and commingled with other approved E and P waste. Groundwater will also be protected by steel 9 5/8-in. surface casing set at a minimum of 100-ft. below the base of the USDW and cemented back to surface. A cement bond log will be run to verify cement behind the 9 5/8-in. surface casing. The steel 7-in. longstring casing will be set to total depth of the well and will be cemented back to the surface. A cement bond log will be run to verify cement bonding isolating the USDW from the injection zones. Inside the longstring casing will be an injection string which will be steel 4-1/2-in. tubing. The tubing will be set with a packer just above the injection zone. The tubing and the packer guarantees the injected fluids are going out only into the permitted zone or perforations. All of the casing strings mentioned ensures the protection of the USDW. Once the oil in the 400-barrel steel oil tanks is deemed in condition to be sold, an approved transporter will be notified to pick up the oil. When the transporter arrives on-site, a sample of the oil will be collected and the water percentage will be determined. If the oil is deemed acceptable, the driver will gauge the tank to determine the volume of oil in the tank. The oil will be transferred from the two (2) 400-barrel oil tanks to the load out line. The load

out line has a polypropylene containment around the unloading valve to prevent any spills during the unloading process. The driver will then connect the suction hose to the loading valve in the polypropylene containment. The loading valve will be opened, the tank valve will be opened and the valve at the truck will be opened with the vacuum pump running. The driver will monitor the truck compartment with the site gauge and the tank the driver is pulling from with the gauge line. The onsite personnel for Defiance will be monitoring all activities and assisting the driver. Once the tanker is near capacity the driver will slow the vacuum pump down reducing the vacuum being pulled to move oil. The tank valve will be closed then the loading valve in the polyethylene container will be closed. The valve at the truck will be closed and disconnected. A five (5) gallon bucket will be placed beneath the hose and truck connection. The hose will then be disconnected at the loading valve in the polypropylene containment. Any spilled product in the five (5) gallon bucket or the polypropylene containment at the loading valve will be returned to the oil storage tank. Absorbent pads will be in place to absorb any minor amounts of oil that may be spilled. Injection pressures will be below fracture pressure of the injection zone and confining zones to prevent vertical migration of injected fluids; each of these factors, along with the WMOP, help to ensure protection of the Carrizo-Wilcox Aquifer formation.

1. Are aquifers or recharge areas underlying the site used for drinking water?

There are aquifers/recharge areas underlying the site that are used for drinking water. The Carrizo-Wilcox Aquifer underlies the site. The Carrizo-Wilcox Aquifer is a member of the Wilcox Group and is found within the Red River Valley, which is where the proposed site is located. Surface sealed/seamless concrete containment of the unloading area and Steel sealed/lined containment walls integrated into the sealed/lined floor will help protect the Carrizo-Wilcox Aquifer from coming in contact with approved E and P waste fluids. Steel casing and cement, as described above, will help protect the approved E and P waste fluids from coming in contact with underground sources of drinking water. Steel sealed/lined containment walls and floors and sealed/seamless concrete containment at the offloading areas will help prevent the E and P waste from coming in contact with surface soils.

2. What is the relationship of the site to the water table?

Shallower, perched groundwater aquifers are encountered from 1.5 to 3 feet below ground surface (*USDA, Soil Survey of Red River Parish, pg 14, Falkner Series Soils*). The first shallow perched groundwater aquifer is encountered at approximately 22 feet below ground surface (Water Well No. 081-77). The first major drinking water aquifer is the Carrizo-Wilcox Aquifer and is encountered at approximately 122 feet below ground surface (Water Well No. 081-6310Z), the Wilcox Group extends to the base of the USDW at approximately 460 feet below ground surface (review of DNR water well records and well logs through the USDW).

3. What wells exist in the area?

There are no active freshwater wells within 1,000-ft. of The Proposed Facility.

4. What is the flow rate and direction of the groundwater flow?

The direction of groundwater flow generally follows topography, which would be to the south-southwest towards the Red River. According to <https://www.deq.louisiana.gov/assets/docs/Water/SWAPdocument.pdf> the estimated average groundwater velocity (Flow Rate) for the Carrizo-Wilcox Aquifer is 31 ft/yr.

5. What is the groundwater quality in the underlying aquifers?

The groundwater quality in the shallow aquifers is unknown. The water quality in the first drinking water aquifer (Carrizo-Wilcox Aquifer) is generally considered good for domestic use. The first good Carrizo-Wilcox Aquifer sand is located approximately 122-ft. below ground surface (Water Well No. 081-6310Z) with the Base of the USDW in the area at approximately 460 feet below ground surface (Oil/Gas Well Serial No. 155070) in the immediate area.

6. Is there a hydraulic connection between the aquifers?

Yes, there is a hydraulic connection between the shallow perched groundwater aquifers and the drinking water aquifers of the Wilcox Group, as the Wilcox group outcrops in the general area and is directly overlain by the shallow perched groundwater aquifer soils. Because the Carrizo Sand and the Wilcox Group are hydraulically connected, the units act as a single aquifer (*Ryals, 1982*) which is referred to as the "Carrizo-Wilcox aquifer." (*USGS, Potentiometric Surface, 2013, and Water-Level Differences, 1991-2013, of the Carrizo-Wilcox Aquifer in Northwest Louisiana, 2015*)

F. Does the prospective site pose potential health risks as defined by proximity to:

No. The proposed site does not pose a potential health risk as defined by proximity to:

1. Prime agricultural area (crop or pasture land)

The proposed location is currently used for timberland/agricultural purposes.

2. Residential area

The nearest residence to the subject facility is +/-1,024 feet northeast of the northeast corner of the facility boundary abutting U.S. Hwy 371. The nearest community is Edgefield, Louisiana, where the proposed facility is located.

3. Schools or daycare centers

There are no schools or daycare centers located within 1 mile of the subject facility. There are no known health risks posed to schools or daycare centers.

4. Hospitals or prisons

There are no hospitals or prisons located within 1 mile of the subject facility. There are no known health risks posed to hospitals or prisons.

5. Public buildings or entertainment facilities

There are no public buildings or entertainment facilities located within 500-ft. of the subject facility. There are no known health risks posed to public buildings or entertainment facilities. Oil and gas production facilities posing a far greater hazard are located within a shorter distance than the proposed commercial SWD facility.

6. Food storage area

There are no food storage areas located within 1-mile of the subject facility. There are no known health risks posed to food storage areas.

7. Existing community health problems that may be aggravated by operation of additional hazardous waste disposal capacity

There are no known existing community health problems that may be intensified by the operation of the proposed facility. This facility will not handle hazardous waste and no emissions or discharges are anticipated to occur from this facility into the environment, with the exception of an insignificant amount of emissions that may be released through the vent lines to the tanks. Air emission quantities were calculated based on the proposed tankage and the anticipated maximum throughput of the facility, indicating that such emissions will exceed the threshold that DEQ requires for a permit. Therefore a minor source air permit from LA DEQ was applied for and obtained. See Appendix P for LA DEQ Air Permit No.

G. Is air quality protected?

This facility handles approved E and P waste fluids through a closed loop system. There is no potential exposure through the air pathway other than the vent lines on the oil/condensate storage tanks, the separation tanks, and the temporary storage of solids in rolloff containers on the concrete pad during periodic tank cleaning operations. Based on air emissions estimates that have been calculated for this facility the anticipated operations will require a Minor Source Oil and Gas General Air permit to be obtained from LDEQ, which was obtained in August 2019. Anticipated operations will emit more than 5 tons per year Volatile Organic Compounds (VOCs) exceeding an LDEQ minimum emission rate or a de minimis rate established pursuant to the Clean Air Act.

1. Is the site within an ozone or non-attainment area?

No. Red River Parish has been determined to be an attainment parish by LDEQ.

2. What contaminants are likely to be generated at the site?

Common emissions occurring from venting storage tanks are minimal amounts of VOCs.

3. What protection is afforded from each contaminant generated by the site?

Other than the Minor Source Air Permit, there will be no protection necessary based on the calculated emissions rates.

4. What is the potential for unregulated emissions?

There is no potential for unregulated emissions.

5. What plans are implemented to provide for odor control?

There is no need for odor control at the proposed facility based on the calculated emissions projected from the proposed facility. If odor becomes an issue or if applicable air regulations change, necessary steps will be taken to stay within compliance of applicable rules and regulations.

6. Who will be affected by emissions?

There will be no one affected by the emissions due to the rural location of The Facility.

a. What is the direction of the prevailing winds?

The direction of the prevailing winds varies throughout the year, but is generally southerly.

(https://www.ncdc.noaa.gov/climate normals/clim60/states/Clim_LA_01.pdf)

b. Describe the expected frequency of "bad air" conditions.

There should be no "bad air" conditions caused from the operation of this facility based on the calculated emissions projected from the proposed facility. If "bad air" becomes an issue or if applicable air regulations change, necessary steps will be taken to stay within compliance of applicable rules and regulations.

7. Describe the control of vapors at various stage of process.

Control of vapors is provided by keeping tanks closed. There should be no need for the control of vapors generated from this facility. This facility will operate a closed loop system (with the exception of vent lines on the tanks). Vent lines will exceed twenty feet above ground surface and will extend outside the tank containment walls.

H. Have physical site characteristics been studied; what has been done in terms of a geotechnical investigation?

There has been no geotechnical investigation at the subject property since there will be no land treatment of E and P waste at the proposed facility.

1. Site geology

The Site consists of rural timberland land currently being utilized for timberland purposes. The Site is characterized by subtle hills and gently rolling topography. According to the USGS Topographic Map, Coushatta Quadrangle (Figure 3) and a review of the available LiDAR data, the elevation of the Site ranges from approximately 190 feet to 205 feet above mean sea level. The Site is bordered to the east by U.S. Highway 371.

2. Hydrology

Natural surface drainage is generally to the west and south on the subject property. An unnamed stream drains to the west into Grand Bayou on the south side of the subject site. Grand Bayou drains to the south on the west side of the subject site. Local groundwater flow in the area of the site appears to follow surface topography primarily toward the south-southwest, this is also evident on the Potentiometric Surface Map of the Carrizo-Wilcox Aquifer in Red River Parish. (*USGS, Potentiometric Surface, 2013, and Water-Level Differences, 1991-2013, of the Carrizo-Wilcox Aquifer in Northwest Louisiana, 2015*)

3. Topography

According to the USGS Topographic Map, and a review of the available LiDAR data, the elevation of the Site ranges from approximately 190 feet to approximately 205 feet above mean sea level. The southwest corner of the site slopes southwest. Storm water run-off drains to unnamed tributaries to the south, southwest, and northwest.

4. Soil

According to the published NRCS Soil Survey data for Red River Parish, the soils mapped on the Site are of the Faulkner-Boswell Association, Gently Sloping (FBB). The Faulkner-Boswell Association, Gently Sloping (FBB) is a nearly level, somewhat poorly to moderately well drained, loamy/clayey soil that is found on gently sloping uplands and has 1-5 percent slopes.

The soils on these uplands are identified as the Faulkner-Boswell Association, Gently Sloping (FBB). The Faulkner-Boswell Association, Gently Sloping (FBB) consists of somewhat poorly to moderately well drained, slowly permeable soils that have a subsoil that is loamy in the upper part and clayey in the lower part. These soils formed in clayey sediment of Tertiary age. These soils are on nearly level broad ridges and drainage divides. Slopes range from 1 to 5 percent.

TAXONOMIC CLASS:

Falkner - Fine-silty, siliceous, thermic, Aquic Paleudalfs, Alfisols.

Boswell - Fine, mixed, thermic, Vertic Paleudalfs, Alfisols.

According to the U.S. Department of Agriculture Natural Resources Conservation Service website (<http://websoilsurvey.nrcs.usda.gov/>, access date 11/14/2018), The underlying soil on these uplands is identified as the Falkner-Boswell Association (FBB) which have slopes of 1-5 percent.

Faulkner-Boswell Association, Gently Sloping (FBB) - silty/sandy loam, 1-5 percent slope. The Faulkner-Boswell Association, Gently Sloping (FBB) component makes up approximately 100 percent of Defiance Energy Services, LLC (Defiance) property boundary and the well pad boundary. This component is found on broad ridges and drainage divides with slopes of 1 to 5 percent. Depth to a root restrictive layer is greater than 80 inches. The natural drainage class is somewhat poorly drained with moderately low to moderately high water movement in the most restrictive layers. Available water storage in profile is high, about 11.4 inches. This soil is not flooded nor is it ponded. This soil does not meet hydric criteria.

5. **Aquifer Location**

The Carrizo-Wilcox Aquifer is the primary source of fresh groundwater for public supply as well as industrial, agricultural, and domestic uses in several parishes in northwestern Louisiana, including Bienville, Bossier, Caddo, De Soto, Natchitoches, Red River, Sabine, and Webster (*USGS, Potentiometric Surface, 2013, and Water-Level Differences, 1991-2013, of the Carrizo-Wilcox Aquifer in Northwest Louisiana, 2015*). The first shallow perched groundwater aquifer is encountered at 22 feet below ground surface (Water Well No. 081-77), the first major drinking water aquifer is the Carrizo-Wilcox Aquifer and is encountered at approximately 122 feet below ground surface (Water Well No. 081-6310Z) in the immediate area and multiple sands can be found to the base of the USDW at approximately 460 feet below ground surface (Oil/Gas Well Serial No. 155070) in the immediate area. Other shallow perched groundwater aquifers may exist above the Carrizo-Wilcox sands. The Carrizo-Wilcox Aquifer recharges in the area of the subject property, but the useable aquifers for fresh water are typically located below shale and silty horizons in the Carrizo-Wilcox Aquifer at depths greater than 122 ft below ground level. There may also be isolated shallow perched aquifers from 1.5 to 3 ft. that exist in the area, but these are rarely used as a water source (*USDA, Soil Survey of Red River Parish, pg 14, Falkner Series Soils*) (Review of electrical logs in the area, DNR groundwater information & USGS groundwater information). The bermed seamless concrete unloading area, the steel sealed/lined containment wall, and the integrated sealed/lined tank containment floor will protect the surface soils and shallow groundwater aquifers from spills and releases of saltwater. Surface casing and cement, longstring casing and cement and the injection tubing and packer will protect the Carrizo-Wilcox Aquifer.

6. **Subsidence problems**

There is no known surface evidence or historical evidence of subsidence problems in this area (web search review of historical data from authenticated sources).

7. Climatic conditions

Climatic conditions include annual average air temperature of 66 degrees Fahrenheit. The average annual precipitation is 52.5 in. (*U.S. Climate Data, 2017*). <https://www.usclimatedata.com/climate/shreveport/louisiana/united-states/usla0426>

V. Are there mitigating measures that would offer more protection to the environment than the facility as proposed without unduly curtailing non environmental benefits?

No. There are no mitigating measures that would offer more protection to the environment than The Facility as proposed without unduly curtailing non environmental benefits.

A. Is this facility part of a master plan to provide waste management? Whose plan?

The Facility is part of a master plan or objective by Defiance to provide environmental services to the oil and gas industry in Northwest Louisiana. Defiance will invest over three (3) million dollars in permitting, equipment, land acquisition, tanks and pumps, facility construction and drilling and completion of injection well in order to inject approved E and P waste fluids at this site. Licenses are being obtained to operate the equipment. In order to meet the needs of the oil and gas operators in North Louisiana, the proposed site was selected to provide an environmentally safe means of disposal of approved E and P waste fluids. The proposed facility will provide an economical alternative that will not adversely impact the environment. The proposed facility will provide a cost saving alternative to oil and gas operators and help reduce traffic of Louisiana highways.

Defiance developed this plan and is pursuing the permit for this facility to continue the plan.

1. How does it fit into the plan?

The proposed injection well and associated facility is a portion of the plan. This facility compliments the trucking operations, and provides the oil and gas operators a one-stop location for disposal of approved E and P waste fluids.

2. What geographical area is served by the plan?

This facility will serve the oil and gas production region in Northwest Louisiana, specifically the parishes shown within the Anticipated Market Range on pages 17-19. At this time it is not anticipated that any waste will be received from outside of the market range. Circumstances in which the E & P waste fluids would come from outside of the anticipated market range would be if an in-state

or out-of-state Commercial Facility was shut down or unable to receive waste and this facility was the only one open to receive waste. If approved, and E and P waste fluids are received from out-of-state generators, the Manifest system shall be followed in accordance with LAC 43:XIX.545.

B. Does this facility fit into an integrated waste management system? (*Reduction, recovery, recycling, sales tax, exchange, storage, treatment, disposal*).

The Facility is considered a disposal facility by deep well injection.

1. On-site

The deep well injection will occur on-site at the proposed location. There will be no off-site disposal, except when tanks are cleaned and solid E and P waste is generated.

2. Regional

The Facility will serve the oil and gas operators in Northwest Louisiana.

C. Can E and P Waste fluids be disposed by some other means?

The waste can be disposed of in other methods. A 2000 API report on the Overview of Exploration and Production Waste Volumes and Waste Management Practices in the United States indicates that Class II well injection is generally considered the safest and most effective method for handling these types of fluids.

1. Technology limitations

The E and P waste fluids accepted at this facility will be limited to approved E and P waste fluids associated with the drilling and production of oil and gas. These liquids will be primarily produced saltwater and pit fluids. Fluids with high contents of solids, such as drilling mud and tank bottoms, cannot be accepted at this facility.

2. Cost factors

Deep well injection is one of the most economical methods of disposal of approved E and P waste fluids (*Argonne National Laboratory/USDOE Report: Offsite Commercial Disposal of Oil and Gas Exploration and Production Waste: Availability, Options, and costs, 2006*). Other methods would not be cost-effective for oil and gas operators, and eventually would not allow a certain portion of the oil and gas reserves to be economically produced.

Other reasons

Class II well injection into subsurface reservoirs, is generally considered the safest and most effective method for handling these type fluids" (*Overview of*

Exploration and Production Waste Volumes and Waste Management Practices in the United States, May 2000 API report, section 2.4.2.) In actuality, produced saltwater is being injected in a saltwater-bearing formation, and not adversely impacting the environment.

D. What quality assurance control will be utilized to protect the environment?

1. Plans for lab work

A sample of each load of approved E and P waste fluids will be inspected for percent solids and analyzed prior to acceptance. The sample will be analyzed for pH, conductivity, and chloride.

2. How are out-of-spec E and P waste fluids handled?

Out-of-spec E and P waste fluids will be rejected.

3. What happens to rejected E and P waste fluids?

The rejected E and P waste fluids are the responsibility of the owner or generator. However, Defiance will follow the rejection regulations on documentation and notification according to LAC Title 43, Part XIX, Subpart 1, Chapter 5 Statewide Order 29-B. Should the facility refuse to accept a load of unauthorized E and P waste fluids, the Office of Conservation shall be notified immediately by electronic submission with the completed Form UIC-26, the manifest that accompanied the shipment, and identification of the generator and transporter of the shipment.

4. Treatment stabilization

The only stabilization expected at this facility will be of the settled solids periodically cleaned from the settling tanks of The Facility. These solids will be profiled, manifested and transported to a facility permitted and approved to accept this type of waste.

5. Segregation of non-compatible E and P waste fluids

There will be no non-compatible E and P waste fluids accepted at the proposed facility.

6. Handling of containerized wastes

There will be no containerized E and P waste fluids handled at this facility.

E. Innovative techniques used to control release of E and P waste fluids or waste constituents into the environment.

The facility will be constructed with a seamless concrete unloading pad, with 6-in. roll over berms providing containment in the unloading area and with sealed/lined 49-in. high steel containment walls integrated into the sealed/lined floor of the tank battery area of the facility and will prevent releases to the environment. Unloading takes place directly from the incoming trucks through a closed loop system to the tanks. All tanks, piping, pumps, well, and other related equipment will be checked daily for leaks and corrosion.

1. Surface impoundment

There will be no surface impoundments at this facility.

2. Land application treatment

There will be no land treatment at the subject facility.

3. Landfill (burial)

There will be no burial or landfilling of E and P waste at the subject facility.

4. Incinerator

There will be no incineration of materials at the subject facility.

5. Container storage

There will be no means of container storage at the subject facility.

The approved E and P waste fluids will be offloaded from the trucks using a 4-in. flexible hose that is connected to the tail end of the tank truck to allow the contents to be pumped by centrifugal pumps through screen baskets to a manifold where it is directed through two (2) 700-barrel fiberglass settling tanks. The fluids will then be sent through two (2) series of four (4) 1,000-barrel fiberglass tanks (8 Total) for solids separation and some minimal hydrocarbon separation. The fluids will then be transferred via centrifuge pumps to the two (2) fiberglass 1,000 gun barrels for separating hydrocarbons from the water. The separated hydrocarbons are skimmed from the tops of the 1000-barrel tanks and siphoned from the gun barrels and transferred to two (2) 400-barrel steel oil tanks. Fluid from the gun barrels is directed to two (2) 750-barrel fiberglass suction tanks prior to being disposed of in the approved injection well. Fluid from the two (2) 750-barrel suction tanks are then transferred by one of three (3) triplex pumps to the one (1) approved SWD well. The tanks storage area will have a spill containment capacity exceeding requirements and guidelines of the NFPA, EPA and LDEQ. A SPCC Plan, developed and certified by a Professional Engineer will be maintained on-site. Solids generated from the separation process in the settling and cleaning tanks will be profiled and disposed at a permitted facility.