Starkey Gulch
Centralized Waste Management
Facility

OPERATING PLAN

March 2020

Revision 1.0

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1. Introduction

In accordance with COGCC Rule 908, *Centralized E&P Waste Management Facilities*, TEP Rocky Mountain, LLC (TEP) proposes to construct a non-commercial, centralized Exploration and Production (E&P) waste management facility on land owned by TEP north of Parachute, CO. The proposed facility will be constructed adjacent to Starkey Gulch, which is located approximately 4.7 miles north of Parachute, CO. The purpose of this centralized waste management facility (WMF) is to treat, dispose, recycle, and beneficially re-use E&P solid wastes generated by TEP during drilling, completions, and production operations conducted in the Piceance Basin of Western Colorado.

This Operating Plan has been prepared and submitted in accordance with COGCC Rule Section 908.b(8), and describes the process and procedures used to treat, dispose, recycle, and beneficially re-use specific wastes generated by TEP during drilling, completions, and production operations. Only drill cuttings and oily wastes will be managed at this centralized waste management facility. No fluids or produced water will be managed at this location. The drill cuttings and oily wastes to be managed at this facility meet the definition of an E&P waste as outlined in COGCC rule 100.

The Starkey Gulch Centralized Waste Management Facility (CWMF) will be constructed on land owned by TEP and will be managed in accordance with COGCC Rules 907, 908, and 1003. This facility will be a non-commercial, centralized waste management facility that is designed and operated for the exclusive use and benefit of TEP operations.

2. Operating Plan

2.1 General Description – 908.b.(8).A

The Starkey Gulch CWMF is located in Garfield County in the NE ¼ NE¼ of Section 32, and the SE ¼ SE¼ of Section 29 of Township 6 South, Range 96 West of the 6th P.M.; and at Latitude 39.487328 and Longitude -108.126739 (see Attachment A – *Area Location Map*).

The Starkey Gulch CWMF will be constructed and used primarily for drill cuttings management and disposal. At multi-well pad locations, where multiple wells are drilled from a single pad, the volume of drill cuttings generated may exceed the storage capacity of the cuttings trench (i.e., drilling pit) located on the pad, especially where the pad footprint is limited due to topographic, environmental, or other physical constraints. Where pad size is insufficient for the volume of cuttings generated, the excess cuttings may be transported to the Starkey Gulch CWMF where they can be properly managed and disposed of. A list of planned drilling locations (and individual wells) that will be transported to and managed at the Starkey Gulch CWMF is provided in Table 1 – *Waste Generation Locations*. This list may be amended to include additional locations as needed.

In addition to the management and disposal of drill cuttings, the Starkey Gulch CWMF will also be used occasionally for the treatment and disposal of oily waste per COGCC rule 907.e.(1).C, which allows for land treatment of oily wastes at a centralized E&P waste management facility that is permitted in accordance with Rule 908. All land treatment operations will be conducted in strict accordance with the Land Treatment requirements as outlined in Rule 907.e.(2).A-H.

As shown in Attachment B – *Site Construction and Layout Map*, The Starkey Gulch CWMF will be constructed and operated in three phases to ensure there is adequate surface area for the efficient management, treatment, and disposal of waste materials. The Phase 1 area is reserved for receiving, managing, and disposal of drill cuttings derived from bentonitic, water-based drilling fluids. The Phase 2 area is reserved for receiving, managing, and disposal of drill cuttings derived from oil-based drilling fluids. The Phase 3 area in reserved for receiving, managing, and disposal of oily waste soils and materials. Excess soils produced from the excavation of the facility will be stockpiled to the west of the waste treatment / management areas. Topsoil will be stockpiled separately to the northeast of the location. The total design capacity of the Starkey Gulch CWMF is estimated to be approximately 58,230 cubic yards.

2.1.1 Description of Wastes to be Treated / Managed at the Starkey Gulch CWMF

Drill Cuttings Generated from Water-Based Bentonitic Drilling Fluids

The primary function of the Starkey Gulch CWMF is to manage and treat water-based drill cuttings that will subsequently be buried in an on-site disposal trench. Only drill cuttings derived from bentonitic, water-based drilling fluids will be managed in the Phase I area as shown on the Site Construction and Layout Map (Attachment B). All drill cuttings must be treated to meet COGCC 910-1 cleanup standards prior to final burial / disposal in the on-site trench. As drill cuttings are brought to the Starkey Gulch CWMF they will placed inside a temporary staging area where the wastes will be processed, treated, and mixed. Treatment of the drill cuttings will consist of mixing / blending the drill cuttings with clean soil / fill material, applying soil amendments (e.g., biological treatment reagents), and adding nutrients as needed to facilitate the decomposition of organic compounds. Additionally, mechanical mixing, tilling, and turning the materials will be routinely conducted to further facilitate the reduction of volatile organic compounds.

After the cuttings/wastes have been processed in the staging / working area, soil samples representative of the entire volume will be collected to ensure that the cleanup thresholds specified on the COGCC 910-1 list have been met. All samples will be sent to a certified, accredited environmental laboratory for analysis. If the analytical results indicate that all contaminants (excepting inorganics and arsenic) are below COGCC cleanup thresholds, the cuttings will be

removed from the temporary staging area and placed inside the Phase 1 pit area for permanent disposal. If the analytical results indicate that hydrocarbon contaminants exceed COGCC cleanup thresholds, the cuttings / wastes will undergo further treatment (land-farming) within the temporary staging area until subsequent sampling demonstrates that the materials comply with COGCC 910-1 cleanup thresholds. This process will continue until the design capacity for the Phase I pit area has been met, after which this portion of the facility will be capped, closed, and reclaimed to comply with COGCC Rule 908.g and the applicable portions of Rule 909. It is estimated that the treatment and disposal of drill cuttings generated from *water-based drilling muds* at this facility will comprise the majority of the total waste volume (~ 85%) that will ultimately be managed at this location.

Drill Cuttings Generated from Oil-Based Drilling Fluids

Several horizontal wells targeting the Niobrara formation may also be drilled over the next several years. Drilling the horizontal segment of these wells will require the use of a synthetic, oil-based drilling mud. The horizontal segment of these wells is approximately one-third of the total length (depth) of a typical Niobrara well. The vertical portion of these wells will be drilled using the same bentonitic, water-based muds that are used for standard, vertical Mesa Verde wells. The drill cuttings produced from drilling these Niobrara wells will be managed at the Starkey Gulch CWMF.

As shown on the Site Construction and Layout Map (Attachment B), the Phase 2 area of the Starkey Gulch CWMF is reserved for receiving, managing, and disposal of drill cuttings derived from oil-based drilling fluids. Any drill cuttings produced from oil-based drilling muds will be managed and disposed of separately from drill cuttings generated from water-based drilling muds. The primary reason for segregating and managing the oil-based mud cuttings separate from water-based mud cuttings is due to the differences in the basic chemical composition of each type of drilling mud. Additionally, it is anticipated that the oil-based mud cuttings will require additional, and possibly different treatment methods in order to ensure that treated cuttings meet the COGCC 910-1 cleanup standards prior to final disposal. The basic treatment procedure will be the same as outlined above for the water-based mud cuttings, however, actual treatment times may be longer, and different bio-reactive reagents agents and nutrients may be required to successfully treat these materials. If after treatment, the analytical data indicate that the treated drill cuttings will not meet COGCC 910-1 cleanup standards, the oil-based drill cuttings will be transported to an off-site commercial disposal facility that is permitted to accept E&P oily waste for final disposal. It is estimated that the treatment and disposal of drill cuttings generated from *oil-based drilling muds* at this facility will be a relatively small percentage (< 10%) of the total waste volume that will ultimately be managed at this location.

Oily and Other E&P Wastes (Soils)

In addition to drill cuttings, the Starkey Gulch CWMP will be used for the occasional treatment and subsequent disposal of oily wastes such as soil, frac sand, and pit sludges that contain hydrocarbons as provided in Rule 907.e.(1).C and 907.f(2). As shown on the Site Construction and Layout Map (Attachment B), the Phase 3 area in reserved for receiving, managing, and disposal of oily waste soils and materials. The most common source of oily wastes that are expected at this facility will be from the cleanup and removal of soils contaminated from spill and leaks of fluids related to the production of oil and natural gas (e.g., E&P wastes such as produced water, condensate, etc.). The basic treatment procedure for reducing contaminants in oily waste soils will be the same as described above for the treatment of drill cuttings (i.e., mixing, blending, amending, tilling, and monitoring). Once oily soils have been successfully treated (i.e., to below COGCC 910-1 cleanup standards) and verified through confirmation soil sampling, the treated soil may be disposed of on-site, or put to beneficial reuse as needed.

The Starkey Gulch CWMF will provide a centralized location for the occasional treatment of oily contaminated soils and will greatly reduce / eliminate the need for land farming small volumes of contaminated soils at the location where the spill occurred. A centralized facility dedicated to this practice will provide the benefits of:

- Centralizing waste treatment and management activities to a single location (instead of having multiple, small, uncontrolled land-farms scattered throughout a wide area), and
- Treatment activities will be conducted at a single secured, controlled, and more protected location which ensures better control of the contaminated soils until treatment objectives have been achieved.

It is estimated that the treatment and disposal of *oily waste soils* at this facility will be a relatively small percentage (~ 5%) of the total waste volume that will ultimately be managed at this location.

2.1.2 Waste Materials Handling and Management

The Starkey Gulch CWMF is designed to be used exclusively for the treatment and management of dry, solid, E&P wastes as described in this document and as provided for by Rules 907.d-f, and 908. Free liquids or waste materials with free liquids will not be allowed or accepted for treatment at any time.

All drill cuttings and oily wastes brought into the Starkey Gulch CWMF will be coordinated through TEP's Environmental Compliance staff, who will be responsible for maintaining an up-to-date inventory and record of all materials brought into the facility for treatment and disposal. Specifically, the inventory shall include the following information: An accurate description of the material being received at the facility; The location from which the cuttings / waste originated; The volume of

material brought to the facility; The date the materials were received, treated, sampled, and placed for final placement after COGCC 910-1 standards were met. In additional to maintaining an accurate materials inventory, all sampling records and analytical laboratory data will also be maintained for all sampling events.

Waste materials will be managed in small "batches" (i.e., 1000 cubic yards, or less) to ensure accurate characterization of the waste material, allow accurate identification of the treatment method (if needed), and expedite the final reclamation of the site. Each individual batch of cuttings will be sampled and analyzed for compliance with COGCC Table 910-1 prior to placement and disposal in the cuttings trench. If a batch of drill cuttings / waste material does not meet the COGCC Table 910-1 concentration levels, the wastes will continue to be treated until the allowable concentration levels are met (see Section 8.0 for cuttings treatment options). Once a batch of cuttings meets the COGCC Table 910-1 concentration levels, an appropriately sized portion of the cuttings trench will be excavated to dispose of the batch of cuttings within the trench boundary.

The disposal trench area will only be excavated as treated materials become available and are ready for burial. Not excavating the entire trench area at once will minimize the amount of storm water that may come into contact with waste materials inside the trench, and it will also reduce the amount of storm water that would otherwise collect inside a large excavation area requiring removal and/or further management.

As described in the Engineering Data section of this Form 28 application package, the entire Starkey Gulch CWMF will be protected by site-specific storm water Best Management Practices (BMPs) and perimeter berms that have been engineered and designed to prevent off-site migration of contaminated materials from the facility. The facility will be covered under TEP's Storm Water Discharge Permit issued by the Colorado Department of Public Health and Environment (CDPHE) for the North Grand Valley field. Routine storm water compliance inspections will be conducted at the facility in accordance with the Colorado Discharge Permit System (CDPS) Storm Water Discharge Permit and applicable CDPHE storm water regulations, and COGCC Rules 1002(f).

Waste Treatment Methods

TEP has several options to treat drill cuttings / oily wastes that exceed Table 910-1 contaminant concentration levels. The following treatment methods may be used to ensure that wastes are suitable for disposal at the Starkey Gulch CWMF:

(1) **Moisture Control for Transportation.** Drill cuttings are often blended first with sawdust and/or excess clean soil (not topsoil) that has been excavated and stockpiled during pad/trench

construction. The purpose of this blending is to ensure that drill cuttings are sufficiently dry prior to loading and transporting by truck. Also, using heavy equipment to physically blend and mix waste materials contaminated with volatile organic compounds (VOC) helps to introduce oxygen into heavy soils and facilitates the release (flashing) of VOC compounds from the soil matrix, thereby reducing the overall concentration of VOCs in the soils. Blending with clean soil also provides the added benefit of diluting and reducing elevated concentrations of contaminants to acceptable levels prior to final disposal.

(2) **Arsenic.** Naturally occurring concentrations for arsenic in the Piceance Basin usually exceed the COGCC 910-1 clean-up standard for arsenic in soils of 0.39 mg/Kg. Waste materials that exceed Table 910-1 concentration levels for arsenic will be evaluated by comparison to site-specific background analytical data and documented; however, because background arsenic concentrations typically exceed the COGCC cleanup standard, TEP anticipates that the E&P waste materials treated, managed, and disposed at the Starkey Gulch CWMF will likewise exceed the COGCC cleanup standard for arsenic in soils. Therefore, TEP is requesting relief from the arsenic standard as provided for by COGCC FAQ #31.

(3) **Inorganics**. Drill cuttings / wastes that exceed Table 910-1 concentration levels for inorganics (pH, SAR, and EC), which were established to be protective of vegetative growth, are allowed to be buried in cuttings pits or trenches at depths of at least three (3) feet below the ground surface to avoid potential adverse impacts to the growth of vegetation per COGCC FAQ #32. After treatment, all drill cuttings / waste materials will be buried at depths greater than three below the ground surface. All sampling data documenting final concentrations of all chemical constituents will be maintained and provided to COGCC upon request.

(4) **Organic Compounds.** Organic compounds in drill cuttings / waste materials will be treated either by adding clean soil, as described in section 2.1.2(1), and/or using bio-remediation techniques. Bioremediation (i.e., biotreatment) uses bacteria and nutrients to breakdown residual hydrocarbons into carbon dioxide and water. The objective of biotreatment is to accelerate the natural decomposition process by adding or cultivating bacterial populations and controlling certain parameters such as oxygen, temperature and moisture in the cuttings/waste materials. Biotreatment and blending contaminated waste materials with clean soil will be used to reduce hydrocarbon concentrations to levels that comply with the appropriate COGCC Table 910-1 cleanup standards.

2.2 Dust and Moisture Control – 908.b.(8).B

Dust will be controlled by using typical dust suppressant methods such as watering (i.e., with fresh water) the roads and pad surface or using magnesium chloride when needed.

2.3 Sampling – 908.b.(8).C

Samples of the treated drill cuttings / waste materials will be collected in accordance with solid waste sampling methodologies, environmental sampling and monitoring protocols, and quality assurance practices developed and prepared by the Environmental Protection Agency's (EPA) Office of Solid Waste; specified in *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods,* 3rd Edition, Update IV.

2.3.1 Drill Cuttings / Oily Waste Sampling

Drill cuttings / waste materials transported to the Starkey Gulch CWMF will be characterized prior to final disposal. Cuttings / wastes will be managed in separate cells containing no more than 1000 cubic yards of material. Prior to each disposal event, a composite sample comprised of four grab samples from separate locations within each cell will be collected using a shovel, track hoe or rubber-tired backhoe. The grab samples will be stockpiled in an area adjacent to the pile and mixed. The composite sample will be collected from the mixed materials and will be considered to be representative of the area from which the grab samples were collected. The composite sample will then be placed directly into laboratory specified sample containers and labeled according to the relevant COGCC Table 910-1 analytes. For transport, sample containers will be placed inside a cooler, and cooled to 4°C or less to preserve sample integrity. Samples will be submitted according to the laboratory's Chain of Custody (COC) protocol unless otherwise specified. **Error! Reference source not found.** identifies the specific analytical test methods for each of the COGCC 910-1 chemical constituents, their allowable concentration levels, and sample handling information.

2.3.2 Sample Handling

Only pre-cleaned, wide-mouth, glass sampling containers will be used to collect samples and ship to the analytical laboratory for analysis. For transportation, sample containers will be placed inside a cooler, and cooled to 4°C or less to preserve sample integrity. Samples will be submitted following a Chain of Custody protocol to an accredited analytical laboratory.

2.3.3 Sampling Analysis

Sampling parameters for drill cuttings / waste materials can be categorized into three types of contaminants of concern: organics, inorganics, and metals. Cuttings samples will be analyzed in accordance with the EPA methods specified in latest version of "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" (SW-846) and Rule 910 of COGCC Rules and Regulations. The analytical parameters in these three categories include:

- **Organic compounds** – *TEPH (DRO - diesel), TVPH (GRO - gas), BTEX, and PAHs (Polycyclic Aromatic Hydrocarbons)*
- **Inorganic properties** – *pH, Electrical Conductivity (EC), and Sodium Adsorption Ratio (SAR)*
- **Metals** – *Total metals*

The specific analytical test methods and chemical constituents in these categories and their allowable concentration levels, as specified in COGCC Table 910-1, are summarized in Table 2.

2.3.4 Quality Control and Quality Assurance

Samples submitted to the laboratory will be subject to their standard quality assurance/quality control (QA/QC) measures to satisfy a Level II Standard Analytical Result package from an accredited laboratory, which includes:

- Level I Data Summary Package
- Surrogate Recoveries with QC limits
- Sample matrix, units, effective dilutions, prep batch number if available (for tracking prep QC) and percent moisture, if appropriate.
- Batch QC Summary Reports (including Method Blanks, Laboratory Control Spike Recoveries, Matrix Spike/Duplicate Recoveries and RPDs, etc.).

2.4 Inspection and Maintenance – 908.b.(8).D

2.4.1 Inspections

To ensure that the Starkey Gulch CWMF is performing as designed, and is operated in compliance with applicable COGCC requirements, the facility will be inspected for the following items at the specified frequency:

INSPECTION ITEM	FREQUENCY
Fencing / Gates / Locks	Monthly
Housekeeping	Monthly
Berm Integrity	Monthly
Wildlife Activity Inside Facility	Daily during active drilling operations
Excessive / Nuisance Odors	Monthly
Stormwater BMPs	Bi-weekly during construction; Monthly after construction: + after any significant storm event
Drainage Diversion Channels	Monthly + after any significant storm event
Accumulation of Liquids	Monthly + after any significant storm event
Noxious Weeds	Spring and Summer

Groundwater Monitoring Wells	Annually

All inspections, environmental sampling, and on-going monitoring associated with the Starkey Gulch CWMF will be performed by TEP's Environmental Compliance staff. Completed inspection forms will be maintained in TEP's Parachute office. Any issues (i.e., Corrective Actions) observed during inspections will be brought to the attention of TEP's Construction Superintendent and will be addressed in a timely manner.

2.4.2 Maintenance

Maintenance and day-to-day operations of the Starkey Gulch CWMF will be the responsibility of the TEP Construction Superintendent. Primary maintenance activities will consist of:

- Receiving and managing waste materials within the facility. Routine treatment, mixing, and placement of waste materials into the appropriate disposal area / cell within the facility.
- Maintaining integrity of site perimeter berms, working area berms, and storm water BMPs. Ensuring there is no encroachment of storm water run-off / snowmelt coming into or leaving the facility.
- Fence maintenance. A portion of the facility (i.e., along the south-eastern border and including the entrance to the facility) will be fenced as needed to ensure site security. A metal panel gate will be installed to control access at the site entrance and will be locked whenever there are no active operations occurring on-site. Any fencing and gates installed will be maintained in good working condition at all times, and repairs will be made as needed.
- Weed control. The area will be kept free of noxious weeds (as listed by Garfield County) at all times. Noxious weed control will be accomplished by using a contractor to inspect the site for noxious weeds during the active growing seasons (i.e., spring and summer) and spray any noxious weeds with an appropriate herbicide as needed.
- Dust control. Typical dust-suppression methods such as applying fresh water or magnesium chloride will be employed on disturbed areas / high traffic areas as needed.
- Odor control. Odors are not expected to be an issue at this facility; however, if needed, any nuisance odors will be controlled using an appropriate biocide product, or biological treatment as appropriate to mitigate nuisance odors.
- Accumulation of liquids. Since only dry materials will be accepted and managed at this facility, the only liquids that could accumulate inside the facility would be from occasional heavy rain events or snow melt occurring within the boundaries of the facility. If significant volumes of rainwater and/or snow melt accumulate within the facility, a vac-truck will be used to remove the water to prevent contact with waste materials being managed within the facility and reduce the potential for leaching of contaminants into the sub-soils.

2.4.3 Environmental Monitoring

- Groundwater: To comply with COGCC Rule 908.b.(9), TEP is proposing to install 1 up-gradient and 2 down-gradient monitoring wells that will be used to monitor for any subsurface contamination potentially migrating from the facility. These monitoring wells will be sampled annually. The sampling results will be maintained at TEP's Parachute Field Office and will be provided to COGCC upon request.

2.5 Emergency Response – 906.b.(8).E

Unlike other Centralized Waste Management facilities, the wastes to be stored and managed at the Starkey Gulch CWMF will consist entirely of soils / solid E&P wastes. No E&P liquid wastes, pits, tank batteries, oil storage, etc. will be allowed at this location. Therefore, the Starkey Gulch CWMF is an extremely low-risk facility in terms of presenting any type of risk to human health and the environment. In the event of some catastrophic event where materials were released from the facility, the emergency response protocols as outlined in the current TEP Emergency Response Plan, and the TEP Spill Prevention and Response Plan would be followed. These plans are maintained TEP's main field office in Parachute, CO.

2.6 Recordkeeping – 908.b.(8).F

Records will be maintained at TEP's main field office in Parachute, CO. TEP will maintain facility inspection forms, maintenance documentation, analytical sample data, storm water management and weed control documentation, an accurate inventory of the materials received and managed at the facility, and any other information relative to the operation of this facility for a period of at least 5 years from the original date that the record was created. Upon request, these records will be made available for review by COGCC.

2.7 Site Security – 908.b.(8).G

The Starkey Gulch CWMF is authorized to receive E&P wastes (i.e. drill cuttings and oily waste) from TEP-owned wells and operations only. A sign stating that the facility is restricted to "Authorized Users Only" and prohibiting any other use will be maintained at the facility entrance. A portion of the facility (i.e., along the south-eastern border and including the entrance to the facility) will be fenced as needed to ensure site security. A metal panel gate will be installed to control access at the site entrance and will be locked whenever there are no active operations occurring on-site. Any fencing and gates installed will be maintained in good working condition at all times, and repairs will be made as needed.

The facility is located on private surface owned and operated by TEP Rocky Mountain, LLC, and there is no access to the general public or other operators in this area; therefore, the likelihood for

misuse by any other party is very low. Personnel will be instructed to report any unusual or unauthorized use of the facility to their manager immediately.

2.8 Hours of Operation – 908.b.(8).H

The facility will be available for use year-round; however, most activities will occur during normal daylight hours (i.e., 7:00 a.m. – 5:00 p.m.). No night-time operations are planned for this facility. During winter months (December 1 – April 30) activities will be limited to the hours between 10:00 a.m. and 3:00 p.m. whenever possible.

2.9 Noise and Odor Mitigation – 908.b.(8).I

Noise: At times, this facility may have equipment operating on site that will contribute to noise production in the area. The ambient noise level during normal operating procedures was an average of 42.7 dB (A) taken over fifteen (15) minutes. This facility will be operated in compliance with the COGCC 802 b. regulation which states: "*Oil and gas operations at any well site, production facility, or gas facility shall comply with the following maximum permissible noise levels.*" This facility is located in the light industrial zone.

Zone	7:00 am to next 7:00 pm	7:00 pm to next 7:00 am
Residential/Agricultural/Rural	55 dB(A)	50 dB(A)
Commercial	60 dB(A)	55 dB(A)
Light Industrial	70 dB(A)	65 dB(A)
Industrial	80 dB(A)	75 dB(A)

Odor: CDPHE Regulation 2 (5 CCR 1001-4 Part A.1) States '*No person, wherever located, shall cause or allow the emission of odorous air contaminants from any single source such as to result in detectable odors which are measured in excess of the following limits…*'. The facility is subject to this regulation and TEP will comply with the requirements of this regulation. No liquid wastes are allowed to be received, stored, managed, or disposed at this facility.

2.10 Final Disposition of Waste – 908.b.(8).J

The final disposition of drill cuttings / waste materials that have been successfully treated to meet COGCC 910-1 cleanup standards will be permanent burial and disposal at the Starkey Gulch CWMF. These materials will not be re-used for any other purpose, nor will they be transported to any other off-site location. As cuttings / wastes are successfully treated, they will be buried and covered with at least three (3) feet of clean fill material. Upon final closure of the facility, the entire facility will be reclaimed to match pre-existing contours and revegetated with a seed mix that is compatible with the surrounding area.

3. Waste Profiles – 908.b.(6)

Analytical data for each of the waste types to be received and managed at the Starkey Gulch CWMF are provided in Appendix C. The data provided for each waste type is considered to be a representative waste profile for that type of waste that will be received, managed, and disposed at this facility.

4. Closure – 908.g.(1)

4.1 Preliminary Closure Plan – 908.g.(1)

The Starkey Gulch CWMF will be closed and reclaimed in accordance with the COGCC Rule 905.a. and 1003.d. Treated cuttings / waste materials stored in the trench will meet the concentration levels of Table 910-1 as described above and will be sufficiently dry prior to backfilling and recontouring activities. After cuttings have been treated to comply with Table 910-1 standards, the treated cuttings will be placed into the trench and backfilled against the cut slopes above the trench. After placement of treated cuttings within the trench has been completed, previously segregated subsoil and topsoil materials will be used to cover the treated materials. A minimum of three (3) feet of clean cover will be backfilled over all treated cuttings. The reclaimed site will be monitored for a period of 2 years after final closure. If subsidence occurs over the closed location, additional topsoil will be added to the depression, and the area will be re-leveled as close to the intended contours as practicable, and the disturbed areas will be reseeded. The total estimated costs to accomplish final reclamation and closure of the facility (e.g., final cover, backfilling, grading, recontouring, reclamation, etc.) is $250,000. TEP has secured a financial surety bond for final reclamation purposes for the same amount. Additional site closure and reclamation details are provided in Attachment D.

4.2 Final Closure Plan – 908.g.(2)

As required in Rule 908.g.(2), a detailed Site Investigation and Remediation Workplan (Form 27) will be submitted at least sixty (60) days prior to closure of this facility for approval by the Director. The Workplan shall include a description of the activities required to decommission the facility. For the purposes of the Starkey Gulch CWMF, these activities would include:

- Collecting final confirmation samples as needed to verify compliance with soil and ground water standards;
- Removal and disposal of all fencing materials used at this facility for site security purposes;
- Removal and reclaiming any access roads and working pad surfaces within the boundaries of the facility;
- Final contouring of the reclaimed surface and successfully revegetating all disturbed areas.

5. Objective Criteria Mitigation Measures

In compliance with SB 19-181 Objective Criteria requirements, TEP has considered potential impacts of this facility upon public health, safety, and the environment. To accomplish this evaluation, TEP used the Objective Criteria Mitigation Measure Toolbox (https://cogcc.state.co.us/sb19181.html#/doc) as an aid to determine which criteria are applicable to this facility, and how to mitigate potential impacts (if any) that may be applicable to the facility and its related operations. The Objective Criteria and the mitigation measures applicable to each criterion are summarized below:

- **Traffic Hazards / Access Road Nuisances**: TEP has implemented speed restrictions for all lease roads and requires that all TEP employees and contractors adhere to the posted speed restrictions. The Starkey Gulch CWMF will be constructed on private surface owned and controlled by TEP Rocky Mountain LLC. There is no public access to the area where the facility will be constructed, and the only traffic in the area is directly related to oil and gas operations.
- **Aesthetic Degradation**: This has been addressed in Section 2.4.
- **Drinking Water Contamination**: Ground water monitoring is addressed in Section 2.4.3. The distance to the nearest permitted water well that is used for domestic purposes is ~2,000 feet northeast of the proposed Starkey Gulch facility, and the depth to groundwater at this location is approximately 30 feet bgs. However, this well is located up- and cross-gradient from the Starkey Gulch CWMF and it is unlikely that it could be hydrologically impacted by the Starkey Gulch facility.
- **Fire/Emergency Response**: This is addressed in Section 2.5 of the operating plan, and within the Form 28 application as well.
- **Emissions**: Potential air emissions from the facility have been reviewed and evaluated for potential air permitting requirements through the CDPHE Air Pollution Control Division. Based upon data that is representative of the type and volume of cuttings to be placed into the Starkey Gulch CWMF, the estimated emissions calculated for this facility fall below any CDPHE permitting threshold.
- **Fishery Contamination**: Parachute Creek is located approximately 2,500 feet due east of the proposed location of the Starkey Gulch CWMF. There will no impact to any fish populations that may be present in this reach of Parachute Creek. The facility is designed such that there will be no potential for migration of sediments, cuttings, or oily wastes outside the boundaries of the facility as depicted in the construction layout drawing. Over-sized stormwater BMPs and site berms will effectively contain any sheet flow from leaving the facility.
- **Fugitive Dust**: This is addressed in Section 2.2.
- **Groundwater Contamination**: Groundwater monitoring is addressed in Section 2.4.
- **Light Pollution**: No night work operations planned for this location. This topic is addressed in Section 2.8.
- **Noise and Odors**: These topics are addressed in Section 2.9.

- **Soil Contamination / Spills**: These topics are addressed in Section 2.1. Drill cuttings and oily wastes will be treated on-site through mixing/blending drill cuttings and oily wastes with clean soil, adding nutrients, and/or use bio-remediation additives to reduce contaminant levels to below COGCC 910-1 cleanup standards. Only solid/soil materials will be accepted and processed at this facility. No liquid wastes will be stored or treated at any time.
- **Stormwater Impacts**: This site will be covered under a CDPHE Construction Stormwater Discharge Permit that has been approved for TEP's Grand Valley field. Stormwater BMPs will be implemented before, during, and after construction in accordance with the CDPHE to mitigate any potential stormwater discharges associated with the construction and operation of this facility. Inspections and subsequent maintenance of BMPs are discussed in Section 4 and will be conducted in accordance with the terms and conditions of the CDPHE Stormwater Discharge Permit.
- **Trespass and Vandalism**: The location where the proposed facility is located is on land owned, operated, and controlled by TEP Rocky Mountain LLC. There is no public access to this area. Fencing and installation of gates that are locked on the main entrance to the facility will further control / eliminate any unauthorized activities related to this facility.
- **Viewshed Obstruction**: The disturbance associated with construction of the Starkey Gulch CWMF is in an obscure location at the mouth of Starkey Gulch and will be difficult to discern from any given location. The site does not present a risk to any significant viewshed area. The disturbance will be temporary after which the site will be reclaimed and restored back to its pre-existing site conditions.
- **Vegetation Loss**: This area where the facility is proposed, was previously permitted and constructed to be used as a drill cuttings management / disposal facility, but it was never used. The disturbed area has since been reclaimed and is currently comprised of grasses, forbes, and native shrubs. The area to be disturbed represents only a minimal amount of vegetation loss on a temporary basis. Once the facility has been filled, the facility will undergo final reclamation and all disturbed areas will be restored with vegetation that is representative of the surrounding area.
- **Wildlife Impacts / Habitat Fragmentation / Reduction**: The Starkey Gulch CWMF is located within Mule Deer Critical Winter Range and Elk Winter Concentration Area sensitive wildlife habitat boundaries as mapped per the current COGCC geospatial data. The existing access road to the Starkey Gulch CWMF traverses through Mule Deer Critical Winter Range and Elk Winter Concentration Area sensitive wildlife habitat. The Starkey Gulch CWMF is being constructed within an area previously disturbed by O&G activities. Impacts to wildlife will be minimized through planned construction methods (i.e. wildlife ramp), periodic inspections and the proposed wildlife BMPs listed on the O&G Location Assessment (Form 2A).

Table 1

Waste Generation Locations

Table 1. Summary of Locations Generating Drill Cuttings to be Managed at Starkey CWMF

Cuttings Volume by Well				Cuttings Volume for Transport to Starkey Gulch CWMF			
Pad Name	Well Name	Water Based Cuttings	Oil Based Cuttings	Total Water Based Cuttings by Pad	Total Oil Based Cuttings by Pad	Total Cuttings Volume by Pad	Total Volume
GR 12-29	GM 41-30	600	0	8,400	0	8,400	21,200
	GM 341-30	600	0				
	GM 441-30	600	0				
	GM 541-30	600	0				
	GM 422-29	600	0				
	GM 13-29	600	0				
	GM 413-29	600	0				
	GM 313-29	600	0				
	GM 544-19	600	0				
	GM 32-30	600	0				
	GM 342-30	600	0				
	GM 442-30	600	0				
	GM 532-29	600	0				
	GM 312-29	600	0				
GM 12-20	GM 32-19	400	0	5,600	0	5,600	
	GM 332-19	400	0				
	GM 632-19	400	0				
	GM 432-19	400	0				
	GM 532-19	400	0				
	GM 442-19	400	0				
	GM 43-19	400	0				
	GM 343-19	400	0				
	GM 443-19	400	0				
	GM 543-19	400	0				
	GM 31-19	400	0				
	GM 331-19	400	0				
	GM 431-19	400	0				
	GM 531-19	400	0				
GM 14-2	GM 710-31-15-HN1	400	400	0	800	800	
	GM 710-41-15-HN1	400	400				
GM 264-2	GM 711-11-14-HN1	400	400	0	800	800	
	GM 711-21-14-HN1	400	400				
GM 265-2	GM 711-31-14-HN1	400	400	0	800	800	
	GM 711-41-14-HN1	400	400				
GM 237-36	GM 735-44-35-HN1	400	400	0	2,000	2,000	
	GM 736-14-25-HN1	400	400				
	GM 736-24-25-HN1	400	400				
	GM 736-34-25-HN1	400	400				
	GM 736-44-25-HN1	400	400				
GM 21-2	GM 735-14-35-HN1	400	400	0	1,200	1,200	
	GM 735-24-35-HN1	400	400				
	GM 735-34-35-HN1	400	400				
GM 23-34	GM 734-14-27-HN1	400	400	0	1,600	1,600	
	GM 734-24-27-HN1	400	400				
	GM 734-34-27-HN1	400	400				
	GM 734-44-27-HN1	400	400				

Table 2

Sample Collection, Handling, and Analysis Summary

Table 1. Soil Sample Collection, Handling and Analysis Summary

Analyte Class	Analysis	COGCC Table 910-1 Concentrations Standard	Holding Time	Method
Organics	TEPH (DRO)	500 mg/kg	14 days	SW 8015 mod
	TVPH (GRO)	500 mg/kg		
	Benzene	0.17 mg/kg	14 days	SW 8021
	Toluene	85 mg/kg		
	Ethylbenzene	100 mg/kg		
	Xylenes (total)	175 mg/kg		
	Acenaphthene	1,000 mg/kg	14 days	SW 8270
	Anthracene	1,000 mg/kg		
	Benzo (A) anthracene	0.22 mg/kg		
	Benzo (B) fluoranthene	0.22 mg/kg		
	Benzo (K) fluoranthene	2.2 mg/kg		
	Benzo (A) pyrene	0.022 mg/kg		
	Chrysene	22 mg/kg		
	Dibenzo(A,H)anthracene	0.022 mg/kg		
	Fluoranthene	1,000 mg/kg		
	Fluorene	1,000 mg/kg		
	Indeno(1,2,3,C,D)pyrene	0.22 mg/kg		
	Napthalene	23 mg/kg		
	Pyrene	1,000 mg/kg		
Inorganics	Electrical Conductivity	< 4 mmhos/cm or 2x background	28 days	USDA Hdbk
	Sodium Adsorption Rate	< 12	180 days	
	pH	6-9	< 24	SW 9045
Total Metals	Arsenic	0.39 mg/kg	28 days for Hg & 180 days for remaining	SW 6010, 6020, 7470
	Barium	15,000 mg/kg		
	Cadmium	70 mg/kg		
	Chromium (III)	120,000 mg/kg		
	Chromium (VI)	23 mg/kg		
	Copper	3,100 mg/kg		
	Lead (inorganic)	400 mg/kg		
	Mercury	23 mg/kg		
	Nickel (soluble salts)	1,600 mg/kg		
	Selenium	390 mg/kg		
	Silver	390 mg/kg		
	Zinc	23,000 mg/kg		

Attachment A

Area Location Map

Section 32
T. 6 S., R. 96 W.

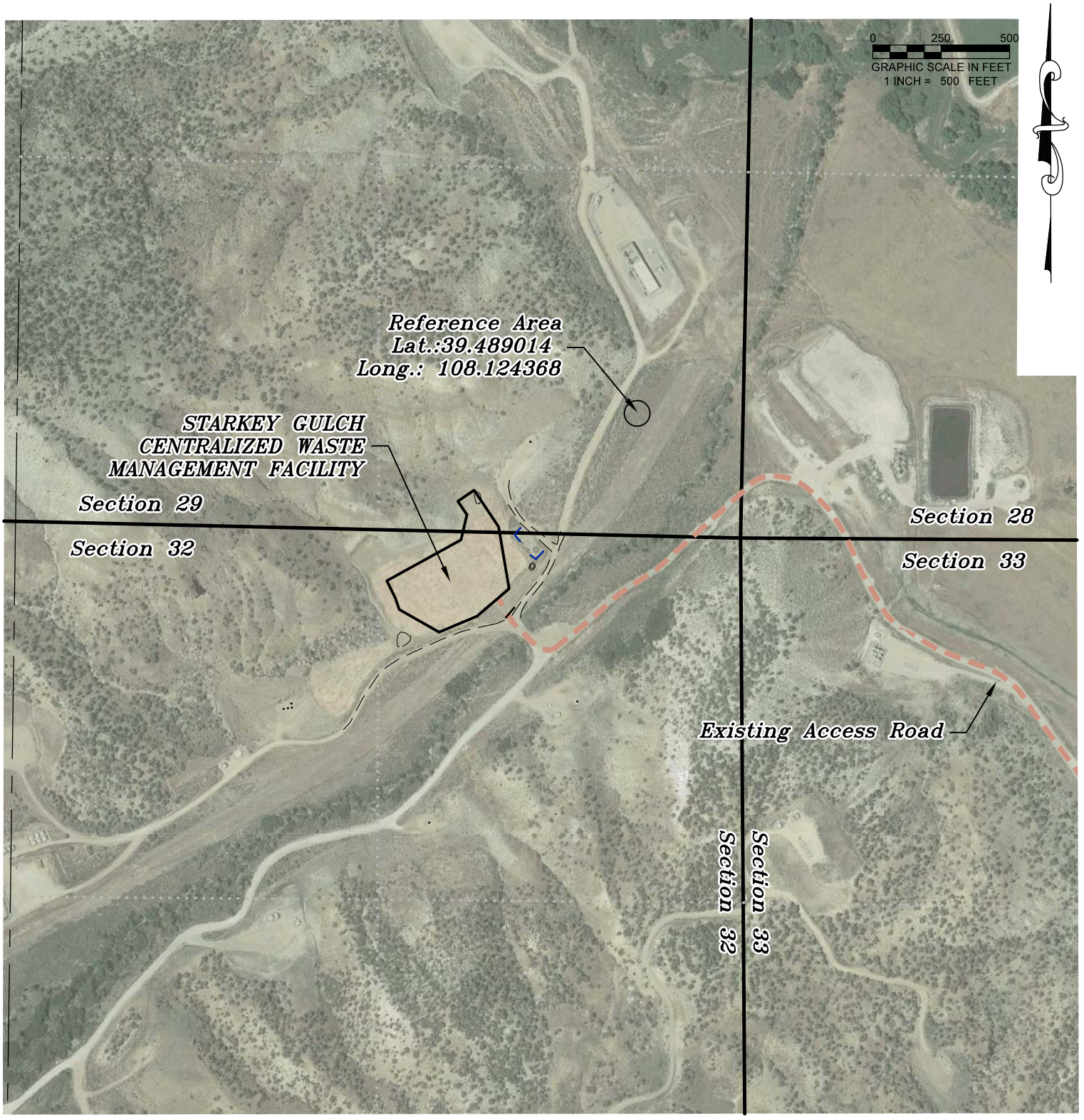

Figure 1

REVISED: 2/19/20

136 East Third Street
Rifle, Colorado 81650
Ph. (970) 625-2720
Fax (970) 625-2773
BOOKCLIFF Survey Services, Inc.

SCALE:	1" = 500'
DATE:	3/19/19
PLAT:	3B of 5
PROJECT:	TEP Valley
DFT:	cs

Construction Plan Prepared for:
TERRA ENERGY PARTNERS
TEP Rocky Mountain LLC

Starkey Gulch Centralized Waste Management Facility
REFERENCE AREA MAP

Attachment B

Site Construction and Layout Map

Section 32
T. 6 S., R. 96 W.

0 40 80
GRAPHIC SCALE IN FEET
1 INCH = 80 FEET

Exist. Limit of Disturbance (4/4/18)
Maintain Exist. Sediment Trap
Exist Sed. Trap
Approx. Limit of Disturbance
Maintain Exist. Diversion Ditch
Daylight Line
Edge of Pad
Maintain Exist. Diversion Ditch
Pit Fencing
Edge of Trench Bottom
Phase 1 Drilling Pit
19' Depth
(Vol.: 24,850 cy)
Top Edge of Pit
Phase 2 Drilling Pit
19' Depth
(Vol.:13,540 cy)
Proposed Diversion Ditch
Daylight Line
Proposed Center
N: 1613105.4
E: 2258744.9
Exist. El.: 5545.88
Upper Pad El.: 5542.4
Lower Pad El.: 5532.4
Edge of Pad
Top Edge of Pit
Phase 3 Drilling Pit
13.3' Depth
(Vol.: 1,720 cy)
Existing Pond
Prop. Sediment Trap
Topsoil Stokcpile Area
(6,000 cy)
Existing Pad
Approx. Limit of Disturbance
Maintain Exist. Sediment Trap
Excess Soil Stockpile Area
(±33,800 cy)
Existing Sed. Trap
Proposed Diversion Ditch
Exist. Access Road
Approx. Limit of Disturbance
Proposed Gate
Exist. Culvert
Proposed Culvert
Exist. Limit of Disturbance (4/4/18)
Exist. Sed. Trap
Exist. Culvert
Exist. Access Road
Surface Roughening

Figure 2

REVISED: 2/26/20

136 East Third Street
Rifle, Colorado 81650
Ph. (970) 625-1330
Fax (970) 625-2773
BOOKCLIFF Survey Services, Inc.

SCALE:	1" = 80'
DATE:	4/18/18
SHEET:	1A of 5
PROJECT:	TEP Valley
DFT:	cs

Construction Plan Prepared for:
TERRA ENERGY PARTNERS
TEP Rocky Mountain LLC

Starkey Gulch Centralized Waste Management Facility
CONSTRUCTION LAYOUT

Attachment C

Waste Profile Information

Waste Profile for Typical Drill Cuttings and Oily Wastes to be Placed at the Starkey Gulch CWMF

COGCC Table 910-1 Contaminants of Concern	COGCC Table 910-1 Threshold	Waste Profile for Typical Drill Cuttings and Oily Wastes to be Placed at the Starkey Gulch CWMF			
		Drill Cuttings Derived from Bentonitic Water-Based Drilling Fluids (A)		Drill Cuttings Derived from Oil-Based Drilling Fluids (B)	Oily Soils / E&P Wastes (C)
		0 to 6000' depth	6000' to 8000' depth	At Vertical Depth of 8000': Horizontal Leg 4000' to 8000'	Representative values for materials that are expected to be managed at Starkey Gulch CWMF
TEPH (DRO)	500	62	83.3	61500	200 - 700
TVPH (GRO)		ND	50.8	186	10 - 200
BENZENE	0.17	ND	1.85	ND	ND - 2
TOLUENE	85	ND	6.59	ND	ND - 1
ETHYLBENZENE	100	ND	0.27	ND	ND - 1
XYLENE TOTAL	175	ND	5.4	ND	ND - 1
ACENAPHTHENE	1,000	ND	ND	ND	ND
ANTHRACENE	1,000	ND	0.13	ND	ND
BENZO(A)ANTRHACENE	0.22	ND	0.56	ND	ND
BENZO(A)PYRENE	0.022	ND	0.012	ND	ND
BENZO(B)FLUORANTHENE	0.22	ND	0.015	ND	ND
BENZO(K)FLUORANTHENE	2.2	ND	ND	ND	ND
CHRYSENE	22	ND	0.21	ND	ND
DIBENZO(A,H)ANTHRANCENE	0.022	ND	ND	ND	ND
FLUORANTHENE	1,000	ND	0.03	ND	ND
FLUORENE	1,000	ND	0.28	ND	ND
INDENO(1,2,3-CD)PYRENE	0.22	ND	ND	ND	ND
NAPHTHALENE	23	0.027	2	ND	ND
PYRENE	1,000	ND	0.09	ND	ND
ARSENIC	0.39	3.6	2.5	7.6	2 - 10
BARIUM	15,000	310	1,569	3,300	ND - 1100
CADMIUM	70	0.43	0.16	ND	ND - 2
CHROMIUM	-	6.6	6.35	10.8	5 - 40
CHROMIUM (III)	120,000	0.43	6.6	ND	5 - 40
CHROMIUM (IV)	23	ND	ND	ND	ND
COPPER	3,100	12	28.1	25	3 - 50
LEAD	400	9.7	17	12	ND - 20
MERCURY	23	0.075	0.082	0.07	ND - 0.1
NICKEL	1,600	8.5	11	33	5 - 25
SELENIUM	390	ND	0.55	3.7	ND - 40
SILVER	390	ND	ND	ND	ND
ZINC	23,000	35	59	66	ND - 60
ELECTRICAL CONDUCTIVITY (EC) (mmho/cm)	<4 mmhos/cm or x2 bkgd	8.0	6.2	28.0	0.5 - 12
pH	6 to 9	8.02	8.88	10	7.5 - 9.8
SODIUM ADSORPTION RATIO (SAR)	12	11	23.3	4.1	1 - 30

(A) Calculated average value based upon cuttings data from 18 Mesa Verde wells

(B) Calculated average value based upon cuttings data from 5 Niobrara wells

(C) Ranges derived from soils remediation data associated with various condensate and produced water spills

Attachment D

Site Reclamation and Closure Diagram

Section 32
T. 6 S., R. 96 W.

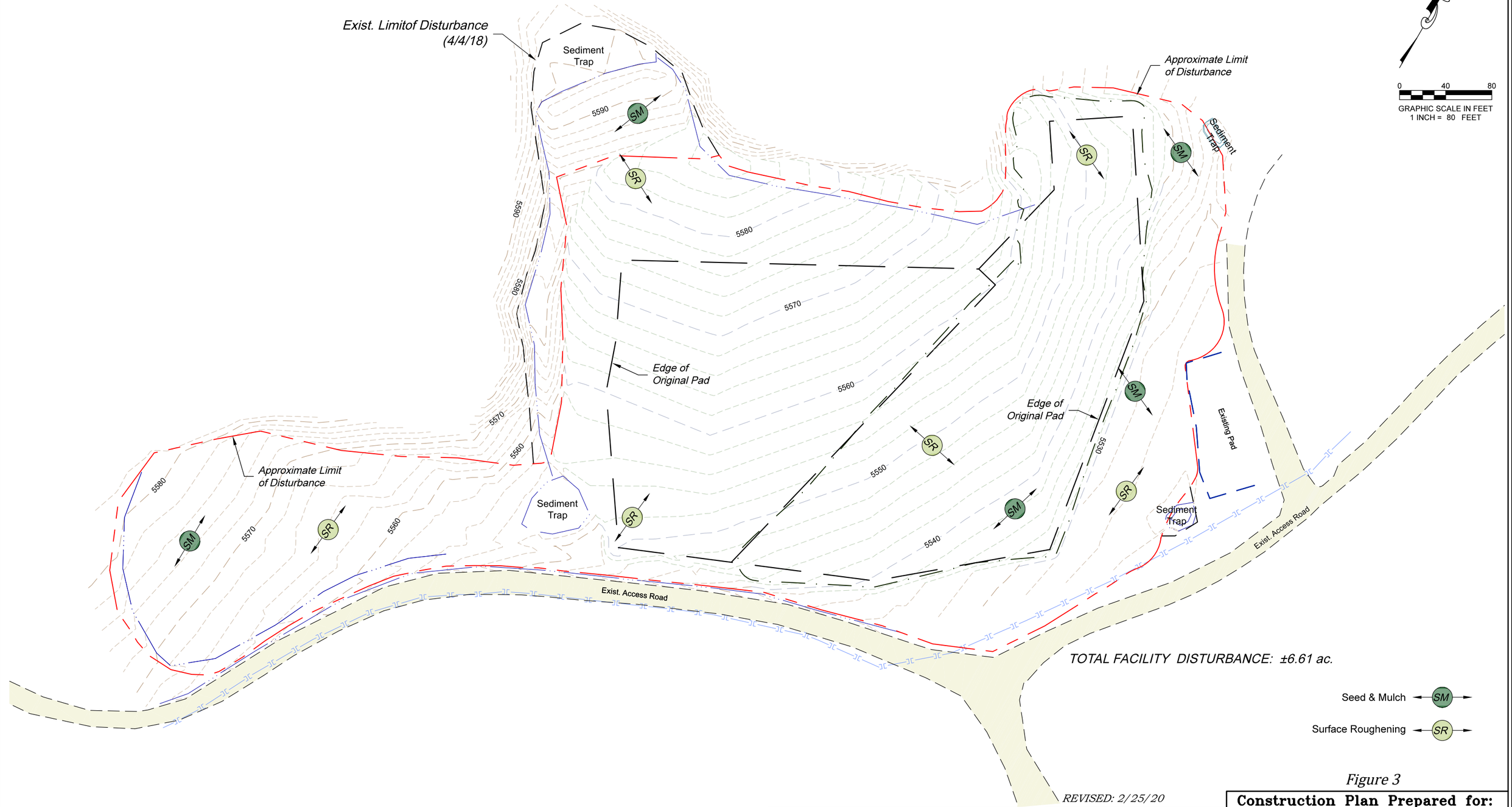

Figure 3

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136 East Third Street
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Fax (970) 625-2773

BOOKCLIFF Survey Services, Inc.

SCALE:	1" = 80'
DATE:	3/18/19
SHEET:	5 of 5
PROJECT:	TEP Valley
DFT:	cs

Construction Plan Prepared for:

TERRA ENERGY PARTNERS — TEP Rocky Mountain LLC

Starkey Gulch Centralized Waste Management Facility
INTERIM RECLAIM

Attachment 15 – Construction Plats

Section 32
T. 6 S., R. 96 W.

0 40 80
GRAPHIC SCALE IN FEET
1 INCH = 80 FEET

Exist. Limit of Disturbance (4/4/18)
Maintain Exist. Sediment Trap
Exist Sed. Trap
Approx. Limit of Disturbance
Maintain Exist. Diversion Ditch
Daylight Line
Edge of Pad
Maintain Exist. Diversion Ditch
Pit Fencing
Edge of Trench Bottom
Phase 1 Drilling Pit
19' Depth
(Vol.: 24,850 cy)
Top Edge of Pit
Phase 2 Drilling Pit
19' Depth
(Vol.:13,540 cy)
Proposed Diversion Ditch
Daylight Line
Proposed Center
N: 1613105.4
E: 2258744.9
Exist. El.: 5545.88
Upper Pad El.: 5542.4
Lower Pad El.: 5532.4
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Phase 3 Drilling Pit
13.3' Depth
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Existing Pond
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Topsoil Stokcpile Area
(6,000 cy)
Existing Pad
Approx. Limit of Disturbance
Maintain Exist. Sediment Trap
Excess Soil Stockpile Area
(±33,800 cy)
Existing Sed. Trap
Proposed Diversion Ditch
Exist. Access Road
Approx. Limit of Disturbance
Proposed Gate
Exist. Culvert
Proposed Culvert
Exist. Limit of Disturbance (4/4/18)
Exist. Sed. Trap
Exist. Culvert
Exist. Access Road
Surface Roughening

Figure 2

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BOOKCLIFF Survey Services, Inc.

SCALE:	1" = 80'
DATE:	4/18/18
SHEET:	1A of 5
PROJECT:	TEP Valley
DFT:	cs

Construction Plan Prepared for:
TERRA ENERGY PARTNERS
TEP Rocky Mountain LLC

Starkey Gulch Centralized Waste Management Facility
CONSTRUCTION LAYOUT

Section 32
T. 6 S., R. 96 W.

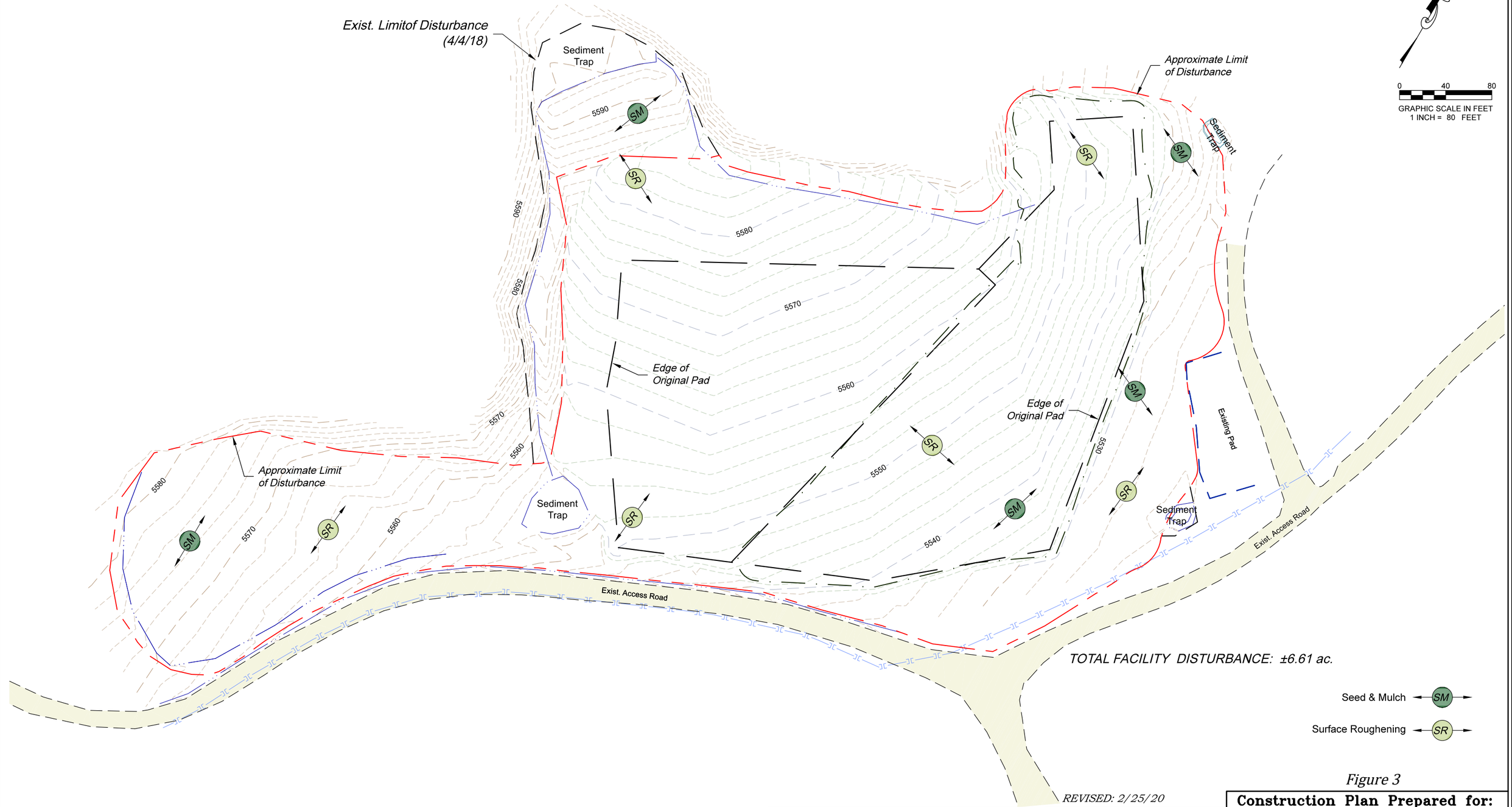

Figure 3

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Construction Plan Prepared for:

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Starkey Gulch Centralized Waste Management Facility
INTERIM RECLAIM