ENVIRONMENTAL MANAGEMENT PLAN (EMP)

TABLE OF CONTENTS

LIST OF TABLES

1. INTRODUCTION

In accordance with terms of E&P Agreements, and pursuant to applicable local Laws and generally accepted international oil industry standards, Gran Tierra Energy Inc. (GTE) has developed an Environmental Management Plan (EMP) to address environmental issues arising from the various Development Projects and Operations.

This document serves as the EMP for the various Gran Tierra Energy exploration and development projects and it will be used by development construction teams and contractors for all GTE developments. In addition, it will also apply to field operations (exploitation phase). Parts of the EMP are applicable to abandonment and remediation phases. The EMP is a controlled document, owned by the GTE Director Corporate Health, Safety and Environment (HSE) and Social Responsibility It will be amended and updated periodically with the approval of the GTE HSE and CSR Director. It should be noted, that in any and all instances where local law or regulations differ from the standards contained in the GTE EMP, GTE will adhere to the more stringent requirement.

2. DOCUMENT ORGANIZATION

This document is presented in two parts:

- An Environmental Management Plan – including the Environmental, Health and Safety Policy, worker code of conduct, EMP organization and responsibilities, and EMP provisions;
- A Waste Management Plan.

3. ENVIRONMENT HEALTH AND SAFETY POLICY

Gran Tierra Heath, Safety and Environment Policy

Gran Tierra Inc. is committed to the efficient and responsible development of hydrocarbon resources to the mutual benefit of the people of the countries where we operate and the employees and investors of Gran Tierra. Gran Tierra believes that oil and gas developments can and must be undertaken in a manner that is safe for our employees, our contractors and our neighbors. We are committed to ensuring that our operations and activities are protective of human health and the environment.

Gran Tierra will comply with all applicable laws and regulations. Where such standards do not exist we will apply sound international standards of the oil and gas industry.

Health:

Oil and Gas Operation can sometimes present special challenges regarding Health. Gran Tierra will:

- Implement best industry practices to ensure that employees are informed of health risks and are provided with the knowledge and supplies to protect themselves from disease.
- Where employees do become ill, Gran Tierra will provide access to modern medical clinics and, where warranted, medical evacuation.

Safety:

Gran Tierra has a simple objective with regard to safety: we want to ensure that no one gets hurt as a consequence of our operations. To achieve that goal we will systematically assess risks and take actions to eliminate or reduce areas of safety concern. Gran Tierra will:

- Implement proven safety management systems, procedures and tools with a goal of driving accident and incident rates to zero.
- Work closely with Contractors on our sites and we will insist that they also implement effective safety management processes.
- Set annual goals for safety performance; we will steward our performance to Gran Tierra's senior management and to the Board of Directors.

Environment:

The protection of the environment is a key component of all Gran Tierra's development plans and operations. In addition to meeting regulatory requirements, Gran Tierra will:

- Conduct such environmental assessments as are appropriate to the nature and scope of the activity.
- Develop and implement an Environmental Management Plan (EMP) that addresses all aspects of environmental protection and sets out specific plans and measures to avoid or limit harmful impacts.
- Ensure that wastes are minimized and disposed of properly.
- Implement an effective spill prevention program and quickly and thoroughly clean up any spills that do occur.
- Track GHG emissions and take steps to reduce them where we can do so in a cost effective manner
- Ensure we have consistent and capable environmental expertise and oversight to educate and train employees/contractors and to ensure that the EMP is being properly implemented.

Community:

Gran Tierra is committed to ensuring our activities do no not adversely affect local communities. To this end, Gran Tierra will:

- Communicate with and listen to local communities as we prepare for operations or activities that may affect them.

- Implement an effective community grievance process
- Ensure that our hiring and purchasing procedures deliver economic opportunities and benefits to local communities.

4. WORKER CODE OF CONDUCT

The following general environmental protection measures will apply to all GTE Employees, Contractors and Sub-Contractors.

4.1. Environmental Code of Conduct

- Workers, housed in GTE camps, are prohibited from fishing, hunting, collecting or trading of wildlife;
- Workers, housed in GTE camps, shall not feed or harass wildlife or livestock;
- Workers, housed in GTE camps, are prohibited to trade in bush meat and forest products; and
- Sensitive biological areas will be identified and marked in the field using a standard ribbon colour, such as red, to indicate that project personnel and equipment cannot enter the location.

4.2. Social Code of Conduct

- Non-local workers will recognize that they are visitors in the host region and that they will minimize the impact of daily work activities on local communities and people. Cordiality and respect are key factors in maintaining good relationships with communities;
- Where possible, contact with the local communities and people will be avoided. All project contact will be coordinated with and/or through the GTE Social Team;
- Local land use shall be respected and daily work activities shall minimize impacts on local land uses;
- Archaeological and cultural sites shall not be disrupted and the taking of artifacts is strictly prohibited;
- Areas known to support rare or protected species will be respected through route selection and careful construction;
- All Project vehicles will respect project speed limits including special restrictions imposed when traveling through local communities. A maximum limit of 30 km/hr shall be set in communities, and lower where specific conditions warrant;
- Where waterways traversed by small local watercraft are used for project logistics, speed restrictions will be in place to minimize risk to local users;
- Procedures to be implemented in order to minimize the probability and severity of Road Traffic Accidents (RTAs) include the employment of flag men to slow traffic in communities and the development of a community education program on the dangers of construction traffic, making use of visual aids;
- All vehicle drivers (including those employed from local community) shall be well trained, and vehicles shall, as practical, be equipped with a monitoring system and an efficient communication (radios as well as mobile phones) system;

- Workers are prohibited from transporting local residents in project vehicles;
- Children shall not be offered candy, water or other items which could encourage them to approach vehicles and cause a transportation safety hazard;
- Firearms are prohibited for employees and contractors at the camp and construction sites;
- Workers living and based at the camps will not be allowed to leave the camp areas, except for work purposes, or if approved by senior level management:
- Camps operated by or for GTE, or Contractors, will be "Closed" (no unauthorized 3rd party entry/egress)and "Dry" (no alcoholic beverages) Camps;
- GTE camps will be maintained in good condition and subject to inspection by GTE; and
- Food quality and camp hygiene shall be to international standards for oil and gas camps.

4.3. Cultural Code of Conduct

- GTE will respect the cultural diversity of our host countries and customs of their peoples;
- Religious beliefs and traditions shall be respected, and
- Upon discovery of burial sites, sacred sites and archaeological resources during project activities, the competent authority will be duly informed and all necessary measures to flag and protect the site will be implemented, including deviation and/or relocation of the planned activity;

4.4. Environmental and Social Awareness Training

GTE shall provide Environmental Training for all construction workers and staff to ensure that all concerned staff are made aware of the relevant environmental and social requirements as stipulated in relevant environmental legislation, GTE environmental and social policies and the Contract specifications. The following provisions shall be implemented:

- All employees and contractors shall be required to comply with environmental protection procedures;
- GTE is responsible for providing appropriate training to all staff according to their level of responsibility for environmental matters. Managerial staff shall receive additional training;
- GTE Contractors are also expected to include such training for their workers appropriate to their job functions. GTE may provide training materials for contractor use.
- The Environmental Policy and all relevant material to the EMP shall be clearly posted at key locations around the camp;
- All training materials and methods -- which shall include formal training sessions, posters, pamphlets or newsletters, signs in construction and camp areas and 'tool box' meetings -- shall be reviewed by the GTE onsite environmental supervisor;
- Construction personnel will be provided with orientation and/or training program according to the particular environmental and socioeconomic sensitivities to be encountered.

- Potential topics for inclusion are fish and wildlife sensitivities, water protection, prohibition of activities outside the ROW, prohibition of hunting and fishing while at worksites or construction camps, spill prevention and response/clean-up.
- Topics may also be covered during regular HSE tool box talks.
- Training records shall be maintained (e.g. attendance records for environmental awareness training, topics covered) and submitted to the GTE environmental supervisor upon request.

5. EMP ORGANIZATION AND RESPONSIBILITIES

The management of operations and activities to prevent or minimize environmental harm is an integral part of GTE's day-to-day business. Each line manager is responsible for understanding the aspects of his or her business that could cause harm and for ensuring that the requirements of this EMP are met. To support that goal, GTE will employ Site Environmental Inspectors/Advisors to work closely with the drilling, construction or operations organization. The Site Environmental Inspectors/Advisors will provide training and information about environmental concerns (e.g. morning tool box meetings) and provide on-site expertise in specialized areas such as spill prevention, waste management and in conducting operations near surface water.

GTE will maintain written documentation, supported by photos and quantitative data, to allow for periodic internal assessment of environmental performance and progress and to respond to concerns or allegations raised by outside parties.

The GTE HSE and CSR Director, in cooperation with other members of the management team, will develop a short list (3 or 4) of Environmental Performance Indicators (EPI's). These data will be tracked carefully and results will be reviewed on a quarterly basis with the Company Management team.

In addition to the recording of EPI's, the HSE and CSR Director or his site representatives will conduct an assessment of one or more aspects of the Company's operations on a monthly basis and will document any areas of non-compliance with the EMP. These areas of non-compliance or potential non-compliance will be recorded in a spreadsheet and tracked to closure.

5.1. EMP Non-Compliance Situations

Non-Compliance Situations (NCS) reports are a tool to be utilized as situations in the field arise that are contrary to what is committed in the EMP and Waste Management Plan and where initial less formal notifications of such situations do not achieve the necessary actions/results. NCS situations will be classified as Level 1, 2, or 3 according to their severity. Their goal is not to fix blame, but rather to take corrective actions and also prevent repeat occurrence. It is fully expected that Level 1 NCS situations will be periodically identified, as this also demonstrates a robust monitoring effort is underway. Ideally, proactive contractors will identify and prepare their own NCS reports, as they are ever-present at their work sites and also are best suited to quickly identify and implement corrective actions to close out the NCS. GTE field personnel will also prepare NCS reports as needed and verify their close out.

6. ENVIRONMENTAL MANAGEMENT PLAN PROVISIONS

The following provisions of the EMP shall apply to GTE planning, construction and operation phases.

6.1. Biodiversity Conservation

Planning and implementation of GTE activities will incorporate principles of World Bank IFC Performance Standard 6- Biodiversity Conservation and Sustainable Management of Living Natural Resources. This commences during the initial Environmental and Social Impact Assessment process, where planned activities are considered relative to the potential impacts they may have on various types of habitats that exist within the project area. Particular attention will be placed on relevant threats to biodiversity and ecosystem services, habitat loss, degradation and fragmentation, invasive alien species, overexploitation, hydrological changes, nutrient loading and pollution.

During the initial ESIA process, detailed project activities and site selections likely will not be finalized. Additionally, predicting project impacts on biodiversity and ecosystem over the long term is not an exact science. Thus the need for a robust Environmental Management Plan and system that utilizes processes such as site-specific Environmental Baseline Assessments and targeted ongoing environmental monitoring to identify unforeseen impacts to biodiversity and ecosystems. Those impacts can then be addressed and mitigated through adaptive management measures.

The IFC specifies a hierarchy of habitats with varying biodiversity values including modified, natural and critical habitats. Activities within critical habitats must meet specific criteria to be implemented, and a mitigation strategy will be described in a Biodiversity Action Plan.

In regions where locally produced food and provisions are procured by GTE and there is a risk of significant conversion of natural or critical habitats to produce these items, systems and verification practices will be adopted to ensure suppliers are not adversely impacting such habitats.

6.2. Camps

Camps are required in support of project operations. The following environmental and social protection measures will apply to all temporary and permanent camps used by GTE or its subcontractors:

- Campsites will be selected to minimize impact on wildlife, forest resources, protected areas, natural habitats and local communities. All camps will be closed camps and dry (no alcohol);
- Representatives from GTE Environment will review and comment on all proposed camp locations;
- The camp location will consider the constraints of local topography, natural drainage and run-off;
- Wherever possible, campsites shall be located in previously disturbed or developed areas;
- The camp footprint (surface disturbance) shall be minimized;

- All camps will be equipped with proper sewage handling and/or treatment facilities. This may include the use of holding tanks and transport to licensed 3rd party treatment facilities or treatment and disposal on site. Contractors may prearrange with GTE to utilize GTE sewage treatment facilities (package STP or engineered wetlands). Temporary holding of sewage will be in tanks or lined pits. Effluent shall be treated to meet IFC standards[1] or, if used for irrigation, an appropriately justified WHO agricultural use standard.
- GTE fixed facilities may incorporate utilization of an engineered wetlands for long-term sewage treatment.
- Sewage discharges will be monitored by the Field Environmental Specialist to ensure compliance with effluent criteria and proper functioning of the wastewater treatment;
- There may be cases where sewage treatment capacities warrant gray water to be segregated from the wastewater stream and allowed to run through a sand filter prior to surface discharge.
- Grease traps shall be installed for the kitchen drainage to reduce the load on the sewage treatment facility;
- Water wells drilled at camp locations will ensure that groundwater extraction does not impact water usage and availability for surrounding communities;
- Groundwater monitoring will be established for GTE's fixed facility locations, with preliminary plans to install an up-gradient and down-gradient well at sites where oil storage and/or water wells are to be located. In addition, local water wells within a 1 km radius of these sites will be included in the groundwater monitoring program to ensure no adverse effects from project activities. Sampling and analyses will be conducted initially and at least on an annual basis, as defined by the individual program to be prepared, preferably prior to production start-up.
- The collection, storage and handling of camp solid wastes shall ensure that no public health risks are created, that wind borne trash and odors are minimized;
- Particular attention will be given to food wastes, with properly-managed composting the preferred option if managed on-site.
- Camp wastes should be stored in a Central Waste Accumulation Area and segregated into recyclable and non-recyclable components; and
- Disposal of all camp waste shall comply with provisions of the GTE Waste Management Plan.

In addition to the foregoing camp selection measures, GTE shall also ensure the following aspects of camp operation and maintenance:

- Camps will be maintained in good condition and subject to inspection by GTE;

[1] IFC, Environmental, Health and Safety (EHS) Guidelines, April 30th 2007, p. 30. (pH 6-9, BOD 30 mg/L, COD 125 mg/L. Total N 10 mg/L, Total P 2 mg/L, oil and grease 10 mg/L, TSS 50 mg/L and Total Coliform Bacteria 400 MPN/100 ml)

- Assignment of rooms shall be made according to seniority and employment level; and
- Food quality and camp hygiene shall be to international standards for oil and gas camps.
- Variances to the above camp waste management criteria may be considered for remote short-term seismic, drilling and construction camps where preferred waste management alternatives are not feasible/practical. These cases will be evaluated and require approval by the GTE HSE and CSR Director.

6.3. Construction Impacts

6.3.1. Watercourse Protection

Watercourse flows may be temporarily disrupted due to the construction, upgrading or maintenance of Project roads and bridges, or due to installation of flowlines or pipelines. These activities can result in reduced downstream flows, creating an upstream area of still water, creating a barrier to fish passage and, in some cases, creating pooled water that becomes breeding habitat for disease bearing insects. Moreover, surface drainage in the immediate vicinity of cleared land may cause high sediment levels in adjacent streams.

In addition, physical disturbance of stream beds and banks can occur as a result of construction or upgrading of roads/bridges or Project pipelines/flowlines. These disturbances can adversely impact water quality or fish habitat by altering the bottom of a watercourse, increasing water turbidity (suspended solids) or altering/reducing habitat.

GTE and its contractors will implement the following management measures:

- Where practical, construction at watercourses will be planned so as to occur during low flow periods;
- Time that machinery is working within a watercourse will be minimized to the extent practical;
- Limit or avoid blasting in watercourses;
- Culverts and ditches and other construction methods will be used to limit temporary flow disruption at watercourses due to construction activities;
- Implement stream fording restrictions for project vehicles/equipment;
- Implement good erosion control and sediment control measures including, as appropriate, mulching, seeding, trench plugs, geotextiles, silt fence and rip-rap;
- Temporary bridges will be designed and constructed to prevent flow restriction and withstand seasonal rains and high waters normally seen during planned duration, and will be removed as soon as practical;
- Reinstatement of year-round and seasonal stream banks/beds will be planned and undertaken promptly upon removal of the crossing; and
- Water body crossings must be constructed perpendicular to the flow axis to the extent feasible.

6.3.2. Soil Protection

Construction activities can lead to reduced fertility or physical loss of soils due to:

- Consumption of land for project roads, well pads, tanks and other equipment;
- Removal or loss of topsoil associated with project site preparation;
- Erosion; and
- Soil contamination due to oil spills or small leaks of dangerous or hazardous materials (chemicals, fuel, etc.).

GTE will implement the following management measures to minimize soil impacts:

- When practical, limit project footprint by using previously disturbed areas, stage work activities sequentially so that the same area may be reused, limiting construction of new roads;
- Reclaim disturbed land as soon as possible and return to its original use;
- Where possible, after wells have been drilled from well pads, the size of the well pad will be reduced to that required for the work-over rig. After completion and testing, the land shall be returned to prior use;
- Drill multiple wells from well pads to the extent practical during field development
- Land clearing will be conducted in a way that limits topsoil disturbances (e.g., when practical, keeping the blade of a bulldozer just above ground level when clearing vegetation);
- Where possible, vegetation will be cut at ground level, leaving the root system intact so as to limit soil erosion;
- Areas to be cleared will be clearly marked as well as sensitive areas to be avoided;
- Topsoil depths to be salvaged are generally 15 cm in agricultural areas, but to be verified and specified in environmental assessments. Topsoil will be stored in a manner that preserves its fertility (storage for < 6 months if practical and protection from loss during rainfalls) and segregated from subsoil;
- Topsoil will be stockpiled above the high water mark, outside riparian zones and outside of areas where the material could be easily washed back into the watercourse;
- Erosion of stockpiled topsoil will be limited by using proper erosion control measures (silt fencing, sediment barriers, etc.). It may be covered by tarps or other protective devices if necessary;
- Land will be reclaimed as soon as practical and when that is done, topsoil will be replaced on cleared areas. In addition, reclaimed lands will be scarified to address compaction and reduce erosion, fertilizer and mulch will be added if necessary and in some cases the area may be seeded; and
- Establish refueling, refilling, maintenance areas and areas devoted to the storage of hazardous materials and wastes in previously disturbed areas, when practical, and away from water bodies. No fuel will be stored within 100 m of a water body, to the extent operational area allows.

6.3.3. Protecting Fish and Wildlife

Construction activities could adversely affect fish and fish habitat by disrupting stream flows or harming the quality of spawning areas (such as by silt covering stream bottoms temporarily).

Terrestrial wildlife could be harmed by temporary or permanent loss of habitat for project roads/infrastructure as well as vegetation removal (loss of food). Perhaps most important, improved access to remote areas or an influx of people seeking economic opportunity could result in increased fishing and hunting/snaring that places pressure on fish and wildlife populations.

GTE will implement the following management measures:

- Limit vegetation impacts and reclaim sites as soon as practical;
- Leave large shade trees in place to provide shade, seed and root stock for natural revegetation;
- Prohibit any project worker from hunting, fishing or trading in wildlife - when on project work sites, during working hours and while residing in project provided housing; and
- Prohibit the purchase or serving of any “bush meat” at project sites or camps.

6.3.4. Use of Explosives

Use of explosives is possible during the construction phase, wherever blasting is required. Activities that require use of explosives will follow the mitigation measures below in order to avoid negative impacts on neighboring communities and wildlife:

- Minimize these activities in the vicinity of local populations wherever possible;
- Consult with local populations and plan these activities during a time that will result in least disturbance;
- Consider using noise abatement devices such as temporary noise barriers and deflectors if possible;
- Identify areas and time periods sensitive to wildlife (feeding, breeding) and avoid use of explosive for the duration of these periods; and
- Survey for sensitive species and monitor their presence before use of explosives.

6.4. Noise Control

Primary sources of noise are expected to be related to heavy construction equipment, welding machines and electrical generators used during construction activities and from drilling rigs during drilling operations. Increased traffic levels, including helicopters in some areas, will also affect noise levels in the area.

GTE will implement the following management measures:

- All construction equipment and vehicles will be equipped with appropriate and functioning mufflers
- Inspection, maintenance and repairs of mufflers will be performed as required on a regular basis
- Vehicle traffic will avoid access through local communities when possible;
- When construction is occurring in the vicinity of villages or population centers:
- Monitoring for noise will be performed;
- Activities with local noise impacts will be limited to daylight hours whenever possible;
- Noises sources will be limited and kept away from population centers as much as feasible;
- Consultation activities will inform population of the expected noise sources and duration

During the operations/exploitation phase, the main sources of noise are expected to emanate from vibration from equipment (compressors, pumps, generators, heaters). The Project will be designed to limit noise levels and disturbances to neighboring communities whenever possible as to conform to IFC Noise Level Guidelines[2]. For example, siting permanent facilities away from community areas and taking advantage of the natural topography as noise buffers when practical. In addition, noise levels of equipment selected will be taken into account in the design of facilities. Residual noise issues will be mitigated through the following measures:

- Noise monitoring to ensure noise levels at nearest receptor (residence) comply with IFC guidelines;
- Installing silencers for fans and mufflers;
- Applying sound/vibration insulation, installing acoustic enclosures for equipment casing radiating noise, acoustic barriers; and
- A complaint/grievance mechanism will be put in place to record and respond to complaints.

6.5. Drilling and Well Site Selection

The well site consists of the drilling rig, infrastructure and support facilities. Environmental protection measures for well sites shall include the following:

- Wherever possible, attempts will be made to minimize the amount of surface area required for the well lease;
- The lease should be clearly staked to ensure that equipment and vehicles do not operate outside the designated lease area;
- Above ground fuel and product tanks shall be located within areas underlain and bordered by impermeable liners and berms. Containment areas will have a minimum of 110% of the volume of the largest tank;

[2] IFC, Environmental, Health and Safety (EHS) Guidelines, April 30th 2007, p. 53.

- Vehicle and equipment fueling and maintenance shall only be done in a designated re-fueling area;
- Adequate and proper oil spill containment and clean-up materials (e.g., sorbents, booms) shall be present on site at all times and personnel shall be properly trained in their use;
- Spills or leaks shall be contained and cleaned up immediately and reported to the Health, Safety and Environment (HSE) field supervisor; and
- All waste materials shall be contained, stored and disposed of (fluids, drill cuttings, containers, solid garbage, etc.) in the manner consistent with the GTE Waste Management Plan.

6.6. Erosion Control

Site clearing, earth moving and excavation activities during the construction phase may negatively impact soil stability and create or augment erosion problems. Mobilization and transport of soil particles may affect surface drainage patterns. Ensuing sedimentation and turbidity problems can have adverse impact on the water quality and aquatic species and their habitat. Erosion at work sites also poses a risk to company assets and ongoing activities. In order to avoid risks to work site stability and alteration of the natural water systems, erosion control measures will be implemented as required, prior to work initiation or immediately after soil disturbance. Inspection shall be completed regularly.

GTE will implement the following management measures to minimize erosion:

- Minimizing construction activities during heavy rainfall periods;
- Contouring and minimizing steepness of slopes;
- Mulching to stabilize exposed areas;
- Prompt reseeding, as needed, for early re-vegetation of exposed areas;
- Designing channels and ditches with proper erosion control measures for post-construction flows;
- Lining steep channel and slopes;
- Use of settlement ponds, check dams and silt fences to prevent off-site transport of sediments; and
- Reinforcing or otherwise stabilizing watercourse shorelines where facilities are located along watercourses

Road construction and upgrades, well pad and facility construction site preparation can affect soil stability due to removal of vegetation and slope cut and fill. The following measures will be implemented to avoid soil destabilization:

- Cut and fill slope length and angles will be minimized as to reduce the amount of newly exposed slopes as much as possible while ensuring the safety of road users;

- Effective temporary measures for slope stabilization and sediment control will be provided until long-term measures are implemented; and
- Adequate drainage systems will be provided based on surface material, soil compaction and slope

6.7. Water Use

The construction and operations phases of the Project have the potential to contaminate surface water and groundwater through:

- Improper storage or disposal of wastes;
- Improper storage of dangerous or toxic materials including hydrocarbons;
- Small spills of fuels, chemicals, lubricants etc. to the land surface, seeping to the groundwater;
- Oil spills from equipment operation or pipeline operation to the surface of the land or to surface waters; and
- Improper well drilling or casing practices, casing failure.

GTE will implement the following management measures:

- GTE will not withdraw from any aquifer if withdrawal is likely to affect local water supply
- Wastes will be properly managed on-site and/or disposed at a licensed 3rd party facility;
- Implementation of appropriate soil erosion control measures, especially in the vicinity of surface waters/streams;
- Development and implementation of a comprehensive oil spill prevention and response plan, OSRP;
- Limit surface water withdrawals - nominally less than 10% of flow or volume of surface waters or 10% of total volume for ponds;
- Wherever feasible, source water wells will be drilled into deeper aquifers than community wells as to avoid depleting communities water supply;
- GTE fixed facility water wells will typically be included in a Groundwater Monitoring Program where an up-gradient and down-gradient monitoring wells will be installed to assess potential impacts (quality and quantity) on community water supply, focusing on local wells within approximately 1 km of the facilities;
- Provide alternative water supply to inhabitants or villages if Project water consumption or construction activities are found to have adverse impact on normal water supplies; and
- Reclaim construction disturbed lands to facilitate re-establishment of vegetation (reclamation may include scarification, mulching, fertilizing, seeding).

6.8. Flaring

During well testing operations, raw gas volumes will be flared. This is unavoidable and must be performed to ensure the safety of the workers during those operations. The following measures will be implemented to minimize adverse impacts from flaring:

- "Low-smoke" test flares will be used for well testing;
- The flare burner will be sited in a bermed area in order to contain any carryover from flaring: for example, hydrocarbon mists from the burning of crude oil; and
- The bermed flaring area will be remediated after completion of well testing operations.

Flaring of associated gas during the development phase will likely occur for the early months of production until GTE is able to utilize (fuel gas) or reinject gas or otherwise establish a gas market for the produced gas. The flares will be designed to meet emissions levels as per Table 7-1 on page 33. An emergency flare may be used briefly and infrequently, if needed.

GTE will implement the following measures to reduce impacts from gas flaring during production:

- Economically viable options to use/sell the associated gas will be preferred to flaring / incineration;
- In the absence of a viable gas marketing option, and if volumes of associated surplus gas are significant, GTE will consider re-injecting the gas into the formation;
- The flare will be designed to meet the WHO Ambient Air Quality Guidelines (see Table 7-1);
- Appropriate technical, environmental and economic justification for flaring will be prepared and submitted as required prior to production start-up.

Unplanned flaring events will also occur in emergency situations or plant upset conditions: these events are unavoidable and flaring must be performed to ensure the safety of the workers and the operations. The following flaring practices will be implemented:

- Efficient flare tips and optimization of burning nozzle;
- Optimization of flare combustion efficiency by control of flare fuel/air stream flow ratio;
- Minimization of pilot blow out by ensuring sufficient exit velocity and providing wind guard;
- Reliable pilot ignition system;
- Smokeless flares stacks located at safe distance from buildings and facilities; and
- Burner maintenance program to ensure maximum flare efficiency.
- The flare stack height will comply with IFC Guidelines[3] to avoid excessive ground level concentrations and ensure good dispersion to minimize impacts.

[3] IFC, Environmental, Health and Safety General Guidelines, 2007, p. 16.

6.9. Decommissioning and Abandonment

Land reclamation will be performed for all areas disturbed during project construction in a timely manner. GTE will ensure that the footprint of Project activities is minimized throughout the operations and completely remediated following the cessation of operations. The following guidelines will be applied to decommissioning, reclamation and abandonment:

- A final site cleanup shall be completed prior to land reclamation. This will include the removal of all litter, barrels, cans, drums, contaminated materials from accidental spills and any other work refuse or excess material;
- Clean up and reclamation shall be initiated immediately following construction/drilling, or as soon as practicable when weather and ground conditions permit;
- Containment berms and culverts shall be removed to restore pre-disturbance drainage patterns;
- Access roads will be re-graded following Project closure;
- Scarification of the subsoil may be required to alleviate compaction. Topsoil and subsoil material shall be replaced to pre-development conditions. Topsoil material shall be spread evenly on the site; with the goal of maximizing pre-construction topsoil depth;
- Wetlands shall be restored consistent with the topographic features and drainage patterns; and
- If not restored to agricultural use, natural vegetation recovery shall be promoted.

6.10. Pipeline Routing and Construction

6.10.1. Routing

- Pipeline routing will be done in a way that avoids impacting areas of sensitive cultural resources identified by the socioeconomic advisory team;
- Pipeline routing will traverse rivers and watercourses nearly perpendicular to the axis of channel to allow for the shortest riverbed disturbance; and
- Pipeline routing will avoid sensitive environmental habitat (e.g., wildlife corridors or habitat, wetlands, valuable vegetation, cropland or forests) to the maximum extent possible, with guidance from project environmental advisor.

6.10.2. Construction

Pipeline Right-of-Way (ROW)

- Minimize surface disturbance by maintaining ROW width of 30 m up to 40 m;
- During clearing activities in intensive agricultural areas, preserve top 15 cm (or to a depth otherwise dictated by the environmental assessment) of surface soil (may utilize double windrows) to allow for more effective ROW reinstatement. It may also be advisable to leave vegetation root stock intact where soil does not need to be disturbed, though compaction may need to be addressed during ROW reinstatement; and

- Limit construction activities and traffic to ROW.

Camps and staging areas

- Limit areas used for construction camps and staging to the minimum area practical.

Trenching

- Manage trenching and backfill operations in a manner that limits amount of time that trenches remain open, generally less than 2 weeks;
- Provide trench plugs for human, livestock and wildlife crossing of open trench areas. In high use areas, these should be spaced no more than 500 m apart, otherwise 1 km spacing will be maintained; and
- Provide wildlife ramps for egress of trapped wildlife, spaced similar to trench plugs. Trench plugs may serve same purpose if sloped accordingly.

River and watercourse crossings

- Timing- River and watercourse crossings will be undertaken during the dry season/low flow periods to minimize disturbance to the watercourse. In addition, in-stream activities will be limited to the shortest practical duration;
- If river has subsistence or commercial fisheries importance, construction activities will be coordinated with socioeconomic team and the environmental advisor to adequately communicate with local community leaders and to undertake construction monitoring (see section 7.9.4);
- Horizontal drilling of larger and/or more significant watercourses may be preferable and will be properly considered
- Vehicle and mobile equipment fueling and maintenance shall not be performed within a 100m buffer along watercourses, to the extent reasonably possible; and
- Following construction of stream and river crossings (both seasonal and year-round), the streambed will be restored to prior topography to allow a return to normal flow conditions. In addition, the banks of watercourses will be rehabilitated consistent with surface topographic features and drainage patterns. The top 15 cm of native material will be salvaged along riverbanks, up to the high-water mark to facilitate natural revegetation. Implementation of additional measures (e.g., mulching, seeding, trench plugs, sand bags, geotextiles, hay bales, rip-rap and vertical silt fences draped with filter cloth) may be appropriate to reduce sediment loading and/or erosion potential, particularly for year-round streams. This will reduce impacts to the fisheries resources by enhancing bank stabilization and by reducing post-construction sediment loading.

6.10.3. Spill prevention and response

- Servicing of equipment and vehicles shall be performed in designated areas, utilizing appropriate spill containment measures at the worksite and with appropriate spill response equipment

elsewhere on site. Equipment refueling in the field will utilize drip trays to catch potential spills; and

- Hydrocarbon spills will be reported to the environmental monitor and cleaned up promptly. Contaminated soil and spill materials will be removed and stored in the waste management area.

6.10.4. Monitoring

The following activities will be undertaken to monitor pipeline construction:

- Clearing activities- Verify topsoil stockpiling practices where required, and ensure activities are limited to the construction zone on acquired/compensated land;
- Erosion control and reclamation- Visually inspect to verify implementation of necessary measures and evaluate effectiveness subsequent to their installation. This would normally require inspection during/following subsequent rainy season;
- Major River crossings- Monitoring may be necessary during construction at major river crossings for fisheries resources and stream conditions. This monitoring will be conducted by the environmental field monitor, with support and input from a fisheries specialist, as necessary. The following types of information may be collected:
    - Amount of time that construction activities affected the river (active work in the channel, plus riverbank runoff into the water from riverbank work);
    - Water turbidity each day during times the river is affected (upstream and downstream, qualitative may be sufficient);
    - Amount of time fishermen are unable to use reaches of river for fishing;
    - Any fish kills noted;
    - Documentation of fishing effort above and below the construction zone during construction; and
    - Photo documentation of typical construction-related disturbance and of fish species collected.

6.10.5. Pipeline Setback Distances

GTE has established a GTE decision team (Calgary & BU based) whereby GTE Management, Operations, Environment, Social, Land and Field Personnel all work together to make decisions that are both efficient for operations and fair for the people impacted by the Project's scope of work. GTE has land acquisition team specialists, as part of their overall Environmental Management Team, who are environmentally, socially and culturally aware specialists and who have worked on other projects in our host countries. These specialists practice sustainable management approaches to their required work. GTE understands the importance of communication with the regional, and local authorities.

GTE has established that they will maintain a minimum 40 m distance from houses/homesteads along the pipeline right-of-way. GTE will endeavour to have a minimum 100 m distance from major facilities to

adjacent houses/homesteads. In circumstances where not possible, GTE will consult with affected households to ensure they are treated openly and fairly.

6.11. Roads

GTE will insure road construction, operation and maintenance will be done in such a manner as to protect employees and local communities. The following environmental and social considerations will be taken into account during road construction and operation.

6.11.1. Road Construction

When constructing new well access roads:

- Select the best route that avoids environmentally, socially and culturally sensitive areas;
- Consult with regional authorities and then local communities to ensure that required access agreements are negotiated in advance of construction;
- When crossing watercourses, road and bridge construction will minimize impacts to aquatic systems through the installation of erosion control measures and the use of properly sized culverts;
- Road construction shall not disturb natural drainage flows;
- Keep cuts and fills to a minimum;
- Leave as many stumps and roots in the ground as possible to maintain soil cohesion and promote re-growth of vegetation; and
- The road right-of-way should be reduced in width, as safety allows, within environmentally sensitive areas.

6.11.2. Road Operation

The upgrading of existing roads and building of new roads could have a long-term impact on the environment and local communities. Local residents often value new roads because they provide better access for supplies and the marketing of agricultural/local goods. They may also result in more exploitation of natural resources, with increased hunting, fishing, deforestation, fuel wood collection and collection of local plant materials or forest products. Therefore, the preferred route and decommissioning and reclamation of roads after cessation of exploration activities will not only depend on GTEs oil development plans, but will also be decided upon after consultation with local inhabitants and appropriate governing agencies.

The following general protection measures for project roads will be applied:

- Appropriate signage will be erected posting speed limits, warning signs, and/or awareness signs indicating environmentally sensitive areas (e.g., main wildlife use areas) or nearby communities;

- Limit project vehicle speed near communities to 30 km/h or less if conditions warrant (people on the road, excessive dust);
- Restrict traffic speeds to 70 km/hr. on road segments away from communities,
- Driving will be limited to daylight hours, where possible;
- Traffic safety awareness campaigns will be undertaken in local communities;
- Enforcing speed limits on project vehicles by radar;
- Flagmen may be used when moving large equipment, or if truck convoys are to be used; and
- Road watering or application of other environmentally acceptable dust controls/suppressants shall be undertaken in communities, when necessary, to reduce dust levels and wind erosion.

6.12. Dust Control and Air Emissions

6.12.1. Dust control

Oilfield Exploration, Development and Production activities entail considerable road construction, maintenance and transport activities. Further challenges are encountered in maintaining aggregate roads during heavy rains and controlling dust during dryer times.

GTE monitoring and management measures include:

- Monitoring of levels of dust produced by project-related vehicles dust control activities and limit vehicle speeds on roads.
- Incorporation of control sites to determine effects from road traffic.
- Monitoring of complaints received from local residents or other sources. These complaints should be tracked and tabulated centrally.
- During dry periods of the year, when the surface of unpaved roads is likely to cause significant dust, GTE will take effective steps to reduce dust. Particular care will be taken in the vicinity of villages or gardens. Measures that may be utilized to control dust include:
    - Routine watering of roads and work sites;
    - Application of dust suppressants as a longer term (full season) solution to road dust.

Dust control planning and performance will be reviewed with local environmental authorities annually or as otherwise needed.

6.12.2. Air emissions control

During drilling, construction and operations there are three potential air emissions:

- Venting of hydrocarbons;
- Emission of the products of combustion, notably oxides of nitrogen (NOx), sulphur dioxide (SO_2) and particulate or smoke. Potentially significant combustion sources include flare stacks, waste incinerator stacks and electric generator drivers, either diesel or gas driven; and

- Dust, particularly road dust from trucks and other vehicles.

GTE will implement the following management measures:

- ;
- If there is a need to release hydrocarbons during drilling, well testing or production operations, these hydrocarbons will be sent to a high efficiency flare where they are burned;
- All stationary sources (generators, etc) and mobile sources such as trucks will be of modern low emission design and will be maintained to ensure efficient, low emission operation and minimal or no visible smoke;
- Wastes at main camps will be burned in a properly designed camp waste incinerator that emits minimal smoke;
- Air quality will be monitored as required and the following Ambient Air Guidelines (WHO, 2007) will be followed at GTE's facilities (Table 1):

Table 1 Maximum Concentration limits for Air Emissions

WHO Ambient Air Quality Guidelines		
	Averaging Period	Guideline value in µ g/m^3
Sulfur dioxide (SO_2)	24-hour 10 minute	125 (Interim target-1) 50 (Interim target-2) 20 (guideline) 500 (guideline)
Nitrogen dioxide (NO_2)	1-year 1-hour	40 (guideline) 200 (guideline)
Particulate Matter PM_{10}	1- year 24-hour	70 (Interim target-1) 50 (Interim target-2) 30 (Interim target-3) 20 (guideline) 150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (guideline)
Particulate Matter $PM_{2.5}$	1-year 24-hour	35 (Interim target-1) 25 (Interim target-2) 15 (Interim target-3) 10 (guideline) 75 (Interim target-1) 50 (Interim target-2) 37.5 (Interim target-3) 25 (guideline)
Ozone	8-hour daily maximum	160 (Interim target-1) 100 (guideline)

6.13. Solid and Liquid Waste Management

6.13.1. Solid and Liquid Wastes

See Waste Management Plan.

6.13.2. Drilling Waste

See Waste Management Plan.

6.13.3. Produced Water Management

Produced water is water produced in association with oil and gas extraction, naturally occurring in the formation. This water may contain salts (e.g., chlorides), hydrocarbons or materials added to the water by the operator, such as corrosion inhibitors, biocides, oxygen scavengers or demulsifiers. Produced water is generated in the process of testing wells or producing crude oil.

Disposal of produced water is by subsurface injection except in exceptional circumstances with prior approval by the Director of HSE and CSR. Such approval of alternative disposal methods will normally be limited to a specified time period and muct comply with all applicable laws and regulations or license conditions. Subsurface injection is either to help maintain reservoir pressure or simply to dispose of the water in a manner that prevents any harm to the land, surface water or groundwater. In some instances, the produced water does not contain harmful levels of salts or other contaminants. In this case, it is sometimes possible to remove trace hydrocarbons through innovative treatment techniques, and subsequently use the water for irrigation in dry areas or for other beneficial purposes.. In any event, no untreated produced water will be released to the land surface or into surface water bodies. Treatment technology used will depend on the final disposal alternative selected and the chemical nature of the water. Sufficient treatment system and backup capability will be in place. All discharges will be monitored to ensure that they comply with project standards.

6.14. Hazardous and Chemical Substances

- All hazardous material / substances (e.g. petrochemicals, oils, etc.) shall be stored on site only under controlled conditions;
- All hazardous material / substances shall be stored in a secured, appointed area that is fenced and has restricted entry;
- All storage shall take place using suitable containers as approved by the onsite environmental advisor;
- No storage of hazardous materials, chemicals, fuels, lubricating oils, pesticides, herbicides shall be allowed within 100 m of streams or watercourses unless site does not allow this. Hazard signs indicating the nature of the stored materials shall be displayed on the storage facility or containment structure. Material Safety Data Sheets of all hazardous materials on site shall be readily available;

- Fuel shall be stored in a steel tank or proper fuel bladder. This shall be located in a secure, demarcated area with proper secondary containment; and
- Personnel working with hazardous materials shall be required to wear appropriate personal protective equipment (PPE) including respirators when appropriate. All personnel shall be trained in handling procedures and cautions with respect to hazardous substances.

6.15. Hydrocarbon Storage and Transport

6.15.1. Storage

All oil storage tanks on GTE production facilities will be designed to meet the API 128 standard for petroleum storage tanks. The tanks generally will be bolted fixed roof type steel tanks with internal and external coating and set on a compacted gravel pad with a concrete base ring. The tanks will be generally set in individual isolated berms designed to contain the full content of the tank plus 10% additional volume and equipped with a sump and a sump pump to remove collected rainwater. Tanks will also be equipped with automatic level measurement and recording devices as well as alarms for low and high levels, and pressure and vacuum relieving devices with flame arrestors. The tanks will be vented to atmosphere.

6.15.2. Oil Transportation

While preference for transporting oil is generally flow lines and pipelines, field conditions and pipeline options may require the use of tanker trucks or river barges. GTE will implement the following measures to prevent and control potential adverse impacts from transportation accidents:

- Conduct a spill risk assessment and implement measures to adequately prevent or lessen the likelihood and impact of spills;
- If tanker trucks are utilized, implement a robust vetting process for trucks and operators, incorporate suitable journey management procedures to promote safe transport, and conduct regular inspections;
- If river transport via barges is utilized, preference should be given to utilizing double-hulled barges. If not available, additional mitigation measures will be incorporated to reduce risks accordingly.
- Ensure adequate corrosion allowance for the lifetime of the pipelines and install corrosion control and prevention systems;
- Implement a pipeline maintenance program;
- Ensure adequate training is provided for oil spill prevention and containment/clean-up;
- Ensure spill response and containment equipment is deployed or made available; and
- Develop and implement a Spill Response Plan.

6.16. Cultural and Archaeological Resources

It is possible that Project activities and land use could take place in areas that have sacred or cultural significance such as:

- Burial sites;
- Locations of important medicinal plants and sacred trees;
- Archaeological, historical and paleontological sites

GTE will implement the following management measures:

- Prior to the beginning of earthworks or excavation in any area that has not been disturbed earlier for development of pre-existing well pads or roads, a. preliminary assessment of cultural/archaeological values in the area to be disturbed will be conducted by a qualified specialist. If significant sites exist or are suspected, appropriate measures to protect or document these sites and recovery of any artifacts will be implemented;
- In areas of suspected high archaeological value, a local archaeologist will be employed to provide on-site support in identifying chance discoveries and developing an appropriate approach to avoiding or preserving them; and
- In addition to conventional "archaeological" type sites, there is potential that land to be developed may have local cultural significance. To address this possibility, consultation with local leaders and elders will be conducted and the results of these exercises will inform the project development in order to preserve culturally significant areas as practical.

6.16.1. Chance Find Procedures

In the event that archaeological sites, historical sites, remains and objects, including graveyards and/or individual graves are encountered during excavation or construction, GTE shall:

- Stop the construction activities in the immediate area of the chance find;
- Delineate the discovered site or area with marking tape or stakes;
- Secure the site to prevent any damage or loss of removable objects. In cases of removable antiquities or sensitive remains, a night guard shall be arranged until the responsible local authorities or the appropriate Cultural Authority takes over;
- Notify the GTE Environmental Representative who in turn will notify responsible local or national authorities
- Relevant local or national authorities will be in charge of protecting and preserving the site before deciding on subsequent appropriate procedures. Decisions on how to handle the finding shall be taken by the responsible authorities. This could include conservation, preservation, restoration and salvage; and

- If the cultural sites and/or relics are of high value and site preservation is recommended, it may be necessary to make required design changes to accommodate the request and preserve the site.

7. CONSTRUCTION SUPERVISION

Environmental supervision is required during the construction phase to ensure construction activities follow the mitigation measures described in this EMP.

7.1. Construction Supervision Framework

Supervision of construction is continuous during Project activities. The Supervisor will be a designated individual or group and will be accountable for compliance with the EMP.

It is the responsibility of the GTE Environmental Advisor or Specialist to verify contractor compliance with the EMP. This will be done by simplifying the EMP into matrices and/or tables and incorporating them into the project execution plan. EMP provisions will also be contractually binding to all GTE contractors and they are expected to provide their own stewardship supervision of EMP compliance.

Any inspection results and associated recommendations on improvements to the environmental protection and pollution control works shall be submitted in a timely manner to the GTE HSE manager and the Contractor for reference and immediate remedial action, if required.

7.2. Site Inspections

Construction environmental supervision will focus on the following:

- **Noise:** Monitoring of noise levels shall be done at identified sensitive receptors by portable monitoring equipment. Monitoring shall take place during construction activities, such as excavation, drilling, power generation, material transportation and night time construction, if any. Noise monitoring shall be conducted near communities schools, and other sensitive receptors along the project alignment;
- **Air:** Visual inspections or air sampling to check for air-borne dust and identify possible ambient air issues, bulk material handling and storage, transportation routes near the villages; and
- **Water:** Visual and equipment assisted inspections (i.e. turbidity monitors) to check the water quality in the receiving rivers, fish ponds and lakes affected by any construction activity such as increased turbidity, smell, color, etc. Inspections should also include sampling of waste water discharges and receiving water bodies adjacent to construction sites and construction camps.

Details on the Construction Supervision Program are provided in Table 2.

Table 2: Construction Supervision Framework and Procedures

Environmental/Social Concern	Parameter	Location	Procedure
Forest / vegetation clearing	Clearing techniques Waste storage and disposal Exploitation of natural resources Local community involvement	Construction sites Camp sites	Daily visual observations Incident reporting Photos
Noise	Noise generated during construction (hours and days) Frequency of disturbance to local residents	Construction sites Settlements in close proximity	Auditory observations or portable noise monitors Report forms
Dust	Quantity of dust generated during construction Need for dust control and availability of water	Construction sites Access Roads Water withdrawal sites	Daily visual observations Incident reporting Sampling and analysis in potential problem areas
Hazardous Waste	Storage location, containment and housekeeping	Hazardous materials storage area	Inventory checklists and manifests Incident reporting Photos
Non-Hazardous Construction Waste	Volume generated Volume disposed Recycling and proper disposal	Approved disposal location Construction sites Camp sites	Waste tracking sheets Incident reporting Photos

Environmental/Social Concern	Parameter	Location	Procedure
Wastewater	Wastewater discharge quality and quantity	Construction sites	Daily checklists Sampling and analysis of appropriate parameters
	Receiving water body quality	Camp sites	Incident reporting Wastewater register
Water Resources	Water withdrawals	Construction site	Daily checklists, withdrawal limits
	Contamination of potable water	Camp sites	Incident reporting Groundwater monitoring program
Maintenance of construction equipment and vehicles	Equipment and vehicles are properly operated maintained	Construction site	Daily checklists
	Leaks and spills of oil, fuel, and lubricant and gas emissions	Equipment storage area	Incident reporting
	Disorderly conduct or misuse of equipment / vehicles	Access roads	Access road management plan
Worker Code of Conduct and Safety	Worker safety	Construction site	Daily safety meetings
	Incidents and accidents Conflict with residents	Camp sites	Incident reporting

8. WASTE MANAGEMENT PLAN

8.1. Purpose of the Waste Management Plan: Desired Outcomes

The Waste Management Plan is intended to provide clear guidance and instruction leading to appropriate and prudent management of wastes associated with GTE activities. This WMP sets out procedures and provides tools that will allow the Company to comply with all applicable waste management standards, including and especially all applicable laws and regulations, and to ensure the protection of human health and the environment from potential harmful effects of improper waste management.

8.2. Scope of the Waste Management Plan: Inclusions & Exclusions

This Plan addresses handling of both solid waste and liquid waste (i.e. wastewater) anticipated from Project activities. The plan covers wastes generated directly by Company facilities and operations and it also covers waste generated by Contractors working directly for the Company at Project sites or on company facilities. This Plan also covers air emissions (primarily during the operational phase) including steps to be taken to control and limit air emissions and to monitor or measure air quality.

8.3. Company Philosophy and Approach to Waste Management

The Company recognizes its responsibility to manage wastes properly and it also recognizes that its more remote operations may not have adequate and approved third party waste management facilities available. The Company's overall approach will first be to utilize competent third party facilities, while minimizing volumes sent to sanitary landfills. For remote operations, the utilization of portable or small fixed camp incinerators for incinerable waste, along with composting of organic (food) waste can reduce wasteful transport of bulk wastes and also produce beneficial organic compost for revegetation efforts. The Company intends to take all practical efforts to avoid the generation of wastes, to minimize the volume of wastes to the extent possible, and to recycle or re-use waste (including cooperative programs with local communities, if possible). In the case of small quantities of hazardous wastes such as used batteries, the approach will be to store in a secure area until there is adequate volume to justify a shipment to an approved off site waste management or recycling facility.

The general approach for waste management will be to:

- Follow a systematic program that applies the waste management hierarchy to reasonably minimize wastes requiring disposal.
    - Manage organic waste by composting on-site if practicable;
    - Utilize 3rd party waste management contractor if available and we are able to exercise adequate influence and monitoring of such a contractor to ensure performance while minimizing both environmental and corporate liability risk.
    - Off-site re-use and recycling (to facilities not owned by Company) is accomplished in a controlled manner, giving priority to methods that benefit the applicable community

- Establish facilities and procedures appropriate to prudently manage wastes requiring disposal on-site in accordance with applicable standards.

Industry Guidance Documents

The following industry guideline documents have also been resources in the development of this WMP.

- The International Association of Oil and Gas Producers (OGP) *Guidelines for Waste Management with Special Focus on Areas with Limited Infrastructure (2009)*
- The OGP and IPIECA good practices guideline on *Oil Spill Waste Minimization and Management (2014)*

8.4. IFC Waste Management Requirements and Guidelines

This Waste Management Plan is based on industry best practices, including the practices being applied today. The WMP is consistent with expectations set out in the International Finance Corporations Environmental Performance Standards (2012) as well as international requirements such as the Basel Convention on the Control of Trans boundary Movement of Hazardous Wastes and Their Disposal (1989). The waste management process will include procedures to accomplish the following:

- Manage waste in accordance with the principles of avoid, reduce, reuse, recycle and appropriate disposal.
- Limit the risk of incidents, such as fuel/chemical spills that could cause nuisance or harm to the environment.
- Manage the disposal of waste in accordance with applicable guidelines and standards.

The International Finance Corporation (IFC) has developed eight performance standards and complementary guidance notes that set out the requirements that a project must meet to receive IFC financial support (IFC, 2012).

In addition to the performance standards and associated guidance notes, IFC has developed Environmental, Health and Safety (EHS) Guidelines that serve as a technical reference to support implementation.

The EHS Guidelines that would be applicable to waste management are described below:

- IFC's Policy and Performance Standards on Social and Environmental Sustainability (IFC, 2012)
- Environmental, Health, and Safety General Guidelines (IFC, 2007)
- Environmental, Health, and Safety Guidelines for Waste Management Facilities (IFC, 2007)
- IFC's Guidance Notes: Performance Standards on Social and Environment Sustainability (IFC, 2012).

The Project will meet the intent of IFC guidelines to develop waste management guidance for the construction and operations phases.

The IFC states that the waste management processes and activities throughout the project should:

- Establish waste management priorities at the outset of activities, based on an understanding of potential environmental, health, and safety risks and impacts and considering waste generation and its consequences
- Establish a waste management hierarchy that considers prevention, reduction, reuse, recovery, recycling, removal and finally disposal of wastes
- Avoid or minimize the generation of waste materials, as far as practicable
- Where waste generation cannot be avoided, but has been minimized- recover and reuse it
- Where waste cannot be recovered or reused, treat, destroy and dispose of it in an environmentally sound manner.

8.5. Waste Reduction / Minimization and Recycling

As per the company's philosophy in regards to waste management, efforts will be directed to avoid the generation of waste and maximize reuse and recycling practices. These goals will be achieved through purchasing strategies, activity planning, reuse of some project waste and a recycling program.

8.5.1. Products Used/Purchased

Preference will be given to environmentally favorable products that can be reused, recycled or that are in bulk form/large containers to reduce wastes associated with packaging whenever possible. Use of materials that will produce unwanted and/or restricted waste will be avoided. To this end, certain substances will be avoided for use on project sites. These chemicals and substances, and suggested safer alternatives, are listed below in Table 5.

Table 3: Chemicals and Substances to Avoid

Substance to Avoid	Alternatives
Polychlorinated Biphenyls (PCBs)	Silicones, esters, cast resin.
Asbestos	Non-asbestos containing materials.
Pentachlorophenol (PCP) and formaldehyde (biocides)	Glutaraldehyde, Isothlazolin (or other low-toxicity biocides).
Chlorofluorocarbons (CFCs)	Depends on use. Documents that list accepted alternatives for various uses are shown below. Links below provide CFC alternatives list. http://www.epa.gov/ozone/title6/snap/lists/index.html and CFR reference, 40 CFR 82 Subpart G Appendices. http://www.uneptie.org/Ozonaction/library/tech/tradename/main.html
Lead-based coatings, primers, and paints	Unleaded coatings, primers, and paints. Also, water-based or low-volatility solvent formulations.
Chlorinated solvents (e.g., carbon tetrachloride, 1,1,1-trichloroethane, trichloroethylene)	Non-chlorinated hydrocarbon-based solvents, steam cleaning. http://www.epa.gov/ozone/title6/snap/lists/index.html
Heavy metals (in reverse emulsion breakers, and grit blast)	Polymer (non-latex)-based formulation, low metals concentration barite and grit blast.
Mercury (in pressure-measuring devices/instrumentation)	Differential pressure cells/transmitters, pneumatic or electric instrumentation.
Fluorescent lights containing Mercury	Mercury-free fluorescent lights
Lead naphthenate (lubricant)	Lead-free lubricants.
Leaded thread compound	Lead-free thread compounds such as Bestolife 2000 (for tubing and casing).
Chromate corrosion inhibitors	Sulfite or organic phosphate corrosion inhibitors, especially those with reduced toxicity amine function.
High-phosphate laundry detergent	Low-phosphate or phosphate free laundry detergents

8.5.2. Source Reduction Techniques

Construction processes will be planned and executed to prevent, or minimize the quantities of wastes generated and hazards associated with the wastes generated in accordance with the following strategy:

- Substituting raw materials or inputs with less hazardous or toxic materials or with those where processing generates lower waste volumes.
- Instituting good housekeeping practices, including material acquisition and inventory control to avoid waste resulting from materials that are out-of-date, off specification, contaminated, damaged, or excess to project needs.
- Instituting procurement measures that recognize opportunities to return usable materials such as containers and which prevent the over-ordering of materials.
- Minimizing restricted waste generation by implementing stringent waste segregation to prevent the commingling of non-restricted and restricted waste to be managed.

8.5.3. Reuse, Recycle, Return to Suppliers

Whenever possible, opportunities to reuse materials that may be of continued benefit to the project will be identified and utilized. Certain types of materials can and shall be reused such as plastic and metal containers, plastic sheets and wrapping, glass or aluminum containers. Similarly, opportunities to reuse construction debris (vegetation debris, scrap metal, pipes) and other materials may present themselves and should be taken advantage of.

Recycling procedures will encompass the following elements:

- Evaluation of waste production processes and identification of potentially recyclable materials
- Identification and recycling of products that can be reintroduced into the construction process or related activities at the site
- Investigation of external markets for recycling by other industrial processing operations located in the neighborhood or region of the facility (e.g., waste exchange)
- Recycling waste lumber to local villages for community projects
- Establishing recycling objectives and formal tracking of waste generation and recycling rates
- Providing training and incentives to employees in order to meet objectives.

Material and equipment acquisition will seek to reduce waste generation through the implementation of supplier-return agreements. Where feasible, supplier agreement will be sought to specifically include the collection of used items. Such items are not considered to enter the waste stream. This option will include specific agreements for the supplier to handle return items responsibly.

8.6. Waste Management Practices

8.6.1. Interim Waste Management

During certain exploration and initial construction activities, interim waste management procedures and facilities will be utilized as necessary, pending development of construction-phase facilities and/or permanent facilities. Interim measures need to comply with local regulations and also require approval by the GTE HSE and CSR Director and may include:

- Use of portable incinerators for combustibles, possibly in conjunction with innocuous waste burial pits;
- Use of Composting methods where possible to generate a valuable product from food and organic wastes (also a preferred waste management measure for permanent facilities)
- Containment storage of restricted wastes in secured, drainage-controlled Waste Management Areas (WMAs), pending final disposal;
- Domestic (camp) wastewater treatment capability (e.g., skid-mounted or trailer-mounted package plants) commensurate with maximum camp population. Composting toilets may also be employed to fill interim or outlying needs.

8.6.2. Waste Management for Linear Infrastructure Construction

Construction of linear infrastructure (pipelines, flowlines, roads, power lines) limits the ability to practicably treat and dispose of wastes. Wastewater production will generally be limited to raw sanitary waste. Solid wastes types will vary with the type of construction.

- All waste should generally be collected and stored in satellite accumulation areas and transported to Waste Management Areas (WMAs) for treatment and disposal.
- Interim waste management measures may be employed as necessary, especially in remote areas with difficult physical access.

8.7. Waste Streams

Wastes to be produced during Project construction will include both solid waste and wastewater. The solid wastes are to be managed in accordance with their “restricted” or “non-restricted” classifications, or otherwise as required by local regulations. The restricted wastes are wastes that some jurisdictions categorize as Hazardous (Attachment A provides definitions of “restricted” and “non-restricted” wastes, and Table 4 below lists typical wastes occurring in these classifications.

Solid wastes expected to be produced will result from construction activities and on-site workforce domestic camp and office operations. Combustible wastes are those amenable to treatment/volume reduction via incineration, though some waste types (including non-restricted) shown as “combustible” would require handling in incinerators more capable than a simple camp incinerator. Composting may also be an option for some combustible wastes such as wood, vegetation, paper and cardboard. Restricted and non-restricted solid wastes are defined in Attachment A.

Table 4: Waste Classification (restricted vs non-restricted)

Waste Type	Classification	Combustibility
Non-restricted Wastes		
Soil (incl excess from clearing/grubbing)	Non-restricted	Non-combustible
Vegetation (incl excess from clearing/grubbing)	Non-restricted	Combustible
Glass	Non-restricted	Non-combustible
Scrap Metal (ferrous and nonferrous)	Non-restricted	Non-combustible
Scrap Metal (drilling tubulars)	Non-restricted	Non-combustible
Paper and Cardboard	Non-restricted	Combustible
Plastic Materials	Non-restricted	Combustible
Plastic thread protectors (end caps)	Non-restricted	Combustible
Camp and Office Refuse	Non-restricted	Combustible
Sludge (wastewater, tank and vessel bottom waste, vehicle wash-down solids)	Non-restricted	Combustible
Timber (pallets, crates etc.)	Non-restricted	Combustible
Tires	Non-restricted	Combustible
Electrical parts, fittings, cable, electrodes	Non-restricted	Non-combustible
Empty metal containers (incl. drums etc)	Non-restricted	Non-combustible
Empty plastic containers	Non-restricted	Combustible
General Construction Debris	Non-restricted	Non-combustible
Empty Gas Cylinders	Non-restricted	Non-combustible
Air filters (spent)	Non-restricted	Combustible
Restricted Wastes		
Engine oil filters (spent)	Restricted	Combustible
Batteries - spent motor vehicle	Restricted	Non-combustible
Medical Waste	Restricted	Combustible
Oil, spent lube	Restricted	Combustible
Paint Waste- (oil base)	Restricted	Combustible
Unused, spent, expired, contaminated solvents, chemicals and additives	Restricted	Combustible
Miscellaneous Restricted	Restricted	Combustible

8.8. Waste Management Areas

Waste generated at work sites will be conveyed to a Waste Management Area (WMA). WMAs will be secured, controlled, and operated by personnel trained to perform the functions of the Area.

For restricted wastes, proper secondary containment will be incorporated, capable of containing any potential spills. For non-restricted wastes, storage may be accomplished outside of WMAs with appropriate containers (drums, dumpsters, etc).

The following facilities could potentially be utilized to enable proper solid waste management:

- Containers: containers such as drums (fiber or steel), dumpsters, roll-off boxes, etc. will generally be used for waste storage and conveyance. Restricted waste will be containerized; no land-based or bulk storage is acceptable. Non-restricted wastes may be stored in bulk within hard-surfaced, secure, drainage-controlled areas.
- Domestic refuse incinerators: Camps may be provided with waste incinerators to reduce waste quantities prior to final disposal of ash (i.e., sanitay landfill or innocuous waste pit after verification as non-hazardous). Combustible wastes will generally be designated for incineration prior to final disposal, and the volume reduction is assumed to be of the order of 90%.
- Composting area for food and other organic waste as well as separate area for contaminated soil bioremediation/composting
- Industrial wood chipper and plastic shredder: Chipping or shredding may be used to augment composting or for volume reduction prior to shipping/recycling or innocuous burial.
- Spoils area: excess topsoil, overburden, and vegetation will be stored in a stable, drainage-controlled, and monitored area for composting, disposal or for use in site reclamation activities.
- Innocuous waste burial pit for disposal of non-hazardous incinerator ash and some amounts of other inert waste (generally limited to remote upland areas where allowed by local regulations).

8.9. Waste Segregation, Storage and Containment

Generated waste must be sorted and segregated to ensure implementation of this WMP. The following segregation requirements apply to non-hazardous wastes:

- Non-hazardous waste must be segregated from hazardous waste and recyclable waste and stored in physically separate locations to avoid mixing
- Non-hazardous waste must be sorted into the following categories:
    - Waste that will be reused or recycled. Further sorting of recyclables may be required
    - Non-reusable/non-recyclable combustible waste for incineration
    - Non-reusable/non-recyclable non-combustible waste for disposal in sanitary waste landfill

The procedures in this section are applicable to wastes that must be stored onsite prior to reuse/recycle, incineration, or disposal. Storage units should be designed according to waste type and considering the following waste characteristics:

- Quantity
- Composition
- Classification
- Storage time

The following management practices for containers will be followed, as appropriate:

- Storage areas for restricted wastes will be built with secondary containment to isolate wastes from the ground surface (or rising surface water) and prevent rainfall run-on or run-off. Restricted waste storage areas where more than 220 L of liquid wastes are stored will provide secondary containment capacity of 110% of the largest container volume, or 25% of the total storage capacity (whichever is greater).
- Wastes will be stored in containers that are in good condition (i.e., no apparent structural defects).
- Wastes will be stored in containers that are compatible with the waste (i.e., the waste will not react with the container and impair its ability to contain the waste).
- Waste containers will be kept closed (e.g., bungs in drums, covers or tarps over roll-off bins, etc.) unless waste is being added to or removed from the container.
- Containers holding wastes will be inspected periodically for damage or leaks and a written record kept of the inspection.
- Containers holding waste will be protected from the weather (e.g., rain and wind) and sources of ignition to help maintain the integrity of the container and reduce the potential for a spill. Such protection could include storage buildings, roofed areas, tarps, and plastic drum covers to keep water off the tops of the drums.
- Containers storing wastes will be labeled to provide information that facilitates the safe and proper management of the waste, including:
    - Name of the waste stream
    - Composition and physical state (e.g., solid, liquid, sludge) of the waste
    - Restricted properties of the waste (e.g. "Corrosive", “Ignitable”, etc.)
    - Name of the activity, process, and/or location that generated the waste
    - Date the first waste entered the container
    - Waste Manifest Form number

8.10. Tracking and Documentation

Procedures will be established and followed to track the types of wastes generated and the designated sequential handling steps followed to manage the wastes from the point (area) of generation through collection, storage, treatment, and final disposal.

A complete waste inventory will be developed and maintained as an element of each WMP. Also, waste-specific management procedures will be established for each waste stream. Attachment C provides preliminary waste-specific management procedures for most solid wastes anticipated.

Waste tracking procedure for each waste generated and managed will record the following:

- Quantity/volume of each waste stream generated
- Description of handling and disposal method(s) used, and
- Ultimate disposal (e.g., specific landfill, off-site recycle and location).

For restricted wastes movement, and off-site disposal of waste, a waste tracking form should be used. An example is provided in Attachment D. The *Waste Manifest Form* will be used to record appropriate information about each waste stream and enable control of the waste disposition by confirming receipt by the designated recipient. Thus, the tracking form will be used for control and documentation of on-site and off-site restricted waste disposal.

Where it is necessary and acceptable to bury some types of innocuous waste, a *Non-Hazardous Waste Burial Form* will be used to record the types and amounts of innocuous non-hazardous wastes that are disposed of in innocuous solid waste pits. Information regarding the facility, source site location, burial pit location and specification and contact person will be tracked on the form.

An *Incinerator Waste Record Form* will be used to track types and amounts of combustible non-reusable /non-recyclable non-hazardous domestic refuse that is incinerated at Projects incinerators. This form will record the source site location, name of responsible operator, description and quantities of wastes and any noteworthy observations.

Data from waste handling activities and restricted waste tracking forms will be used to produce reports to document conformance with the management plan, including:

- Volume of each waste type generated by source and/or over time
- Volume of each waste type generated by location
- Volume and disposal methods used for each waste stream over time.

This data will be evaluated periodically to identify trends that could lead to potential opportunities to improve waste management practices or reduce the generation of certain waste streams.

8.11. Waste Treatment

Waste treatment will be performed in accordance with waste-specific and unit-specific treatment plans. For example, a combustible waste stream may be designated for treatment via volume reduction and incineration, with residues to be disposed via sanitary landfills or innocuous waste burial pit.

8.12. Planned Discharges and Releases

8.12.1. Solid Wastes

For solid wastes requiring disposal, the project will seek to minimize the potential adverse impacts on human health and the environment. This approach will limit disposal-related releases to the following:

- Air emissions from incineration and transportation of waste to disposal facility and/or fuel for incinerator
- Land disposal via
    - Sanitary landfill or innocuous waste burial pit for non-combustible unrestricted wastes and residues
    - spoils area(s) for excess soil and non-compostable vegetation from clearing and grubbing

These actions will be controlled by application of design and operating criteria, as described below.

8.12.2. Incineration

Incineration reduces the volume and weight of waste and destroys nearly all of the organic compounds in the waste. It also generates air emissions and waste residues that need to be appropriately managed. To minimize potential environmental, health, and safety impacts, the following measures will be employed:

- Implement stringent waste control procedures so that only wastes that can be effectively managed are incinerated
- Utilize control systems to prevent feeding of restricted waste to the incinerator when operating conditions deviate from the acceptable range (e.g., during startup and shutdown or upset conditions).

Ash Disposal

Incinerators required to dispose of non-hazardous combustible (non-recyclable) and some oily waste generated during the Project's activities are anticipated to consist of stationary or portable units. Incinerators will be operated as per the manufacturer's directions and operators will receive proper training to ensure safe operations. Ash will be periodically removed from the incinerator and placed in appropriate containers.

Smoke and Air Emissions

Waste incinerators used for combustion of non-hazardous waste should be designed to function within the IFC air emission standards for municipal solid waste incinerators. Understanding that start-up and recharging simpler fixed camp incinerators may result in initial limited smoke until secondary chamber temperature reaches operating level. Smaller portable incinerators (e.g., SmartAsh) are anticipated for limited use in remote areas and may also produce limited smoke during initial firing, though manufacturer tests show very good burn efficiency.

8.13. Drilling Waste Management

Drilling sumps will be built to collect drilling waste, including cuttings and fluids (muds): they will not be used to collect other types of wastes. Sumps will be built away from or otherwise designed to protect water bodies and with sufficient capacity to contain the anticipated volume of waste with a minimum of 1m of freeboard which may be augmented if drilling occurs during the wet season. Surface drainage around the base of the drilling rig and mud tanks will be directed to the drilling sumps to collect any spills on to the ground. The sumps will also be designed and shaped as to allow for maximum reuse of clean water for mud make-up.

Drilling sumps will be lined with clay, a synthetic membrane or other impervious materials to prevent infiltration of drilling fluids into the soil. Sumps will be inspected regularly to verify integrity. Above ground tanks may be considered as another option for drilling waste storage.

8.13.1. Decommissioning of Drill Sumps

Sumps will be decommissioned as soon as reasonably possible following rig release from the final well to contribute drilling waste to the sump. Procedures will be implemented to dispose of sump fluid and drilling waste and to restore the sump locations to their pre-disturbance state. Prior to disposal, the drilling solids and cuttings, will be analyzed for a number of characteristics depending on the waste disposal method selected and the type of drilling fluids used at that location. In the absence of local regulations/restrictions, well-tested and proven regulatory standards such as Louisiana Statewide Rule 29-B will be used to guide drill solids disposal and reserve pit closure. There may also be opportunities to solidify and stabilize these materials where a mix-bury-cover process is precluded from use due to inundated locations. Decommissioning of sumps will be undertaken in such a manner that:

- Subsidence does not result in a depression that may collect surface water;
- Does not result in the upward migration, through the soil profile, of salts and other substances from the soil/waste mixture; and
- All reclaimed areas will be vegetated to a self-sustaining cover as to prevent erosion and promote soil stabilization.

Alternative options for drilling waste disposal may include:

- Injection of the fluid and cuttings mixture into a dedicated disposal well;
- Injection in the annular space of a well;
- Recycling of spent fluids back to a central location for treatment and re-use if available and feasible

8.14. Wastewater Management

Wastewater management will include procedures and practices to achieve the following goals:

- Water-use efficiency to reduce the amount of wastewater generation,
- Process optimization, including waste minimization, and reducing the use of hazardous materials to reduce the load of pollutants requiring treatment, and
- Application of wastewater treatment technologies to reduce the load of contaminants to acceptable levels prior to discharge, minimizing residuals generation (sludge) and minimizing potential impacts of cross-media transfer of contaminants during treatment (e.g., from water to air or land).

Any water that has been adversely affected in quality by human activities is considered wastewater. The type of wastewater can be segregated as sanitary and non-sanitary based on the activity that generated the wastewater. Rainwater (or storm water) run-off that comes in contact with construction areas is addressed elsewhere in terms of preventing siltation of surface waters due to run-off from disturbed sites. Wastewater generated is primarily sanitary wastewater. The sources of this wastewater are from the water usage for domestic purposes (sinks, laundry, toilets, and showers). Non-sanitary wastewater is generated from construction and operations-associated activities. The anticipated sources of process wastewater are: heating/cooling process for construction camps, hydro-test waters, fire-fighting water, wash down water/fluids, equipment drains, vehicle and heavy equipment maintenance, etc.

Wastewater treatment will be required to treat sewage, gray water and domestic wastewater produced by operations of camps and other facilities. Raw wastewater will be collected and conveyed through a combination of tanks and pipes to the wastewater treatment plants. Wastewater conveyance by ditches is prohibited. All effluents from sewage treatment plants will be disinfected by use of a chlorine contactor. Where capacity of sewage treatment is limited during peak loading periods, it may be acceptable to segregate gray water and run it through a sand filter prior to discharge.

Raw wastewater from linear infrastructure construction is expected to be limited to sanitary waste; this wastewater will be contained and trucked to WMA for treatment. Chemical toilets or composting toilets are also acceptable and sensible options for temporary or remote toilet facilities.

Sewage Treatment Plants (STP) will have three distinct process units:

- Units to treat the liquid waste
- Units to dewater the sludge generated from treating liquid waste
- Unit(s) to dry the sludge from dewatering process. Sludge drying is not necessary where the sludge will be composted.

STPs will be used as per the manufacturer's instruction and operators will receive proper training to ensure safe operations.

For GTE fixed facilities in some situations and environments, an alternative to package STP's may be an engineered wetlands system. This process may also be coupled with beneficial agricultural use of the treated effluent. Such a system would incorporate adequate monitoring and documentation of effluent,

demonstrating treatment effectiveness in accordance with World Health Organization (WHO) Guidelines for such purposes.

Where practical, GTE will avoid discharge of treated wastewater to local watercourses even when such water complies with all applicable (including IFC) effluent standards. GTE will, on new developments, seek to release treated wastewater to through subsurface tile fields or spray irrigation systems to avoid potentially affecting downstream users of a watercourse.

8.14.1. Hydro testing Water

Pressured water is used to test pipelines and equipment to detect leaks and verify integrity: this activity results in non-sanitary waste water if it contains chemical additives that could cause unwanted environmental impacts if discharged to the environment. Different alternatives for safe discharge of hydrotest water will be considered: it may be disposed of into an injection wells or directly to land surface if any additive concentrations are not problematic. If surface land disposal method is chosen, the following practices will be applied:

- Reduce the use of chemicals as much as possible
- Select the most environmentally-friendly chemicals;
- Reuse the same hydro test water for multiple tests;
- Do not discharge the hydro test water to cultivated land, to land immediately upstream of community water intake; to or near a water body;
- Discharge site should be selected to limit flooding, erosion or lowered agricultural capability;
- Monitor water quality before discharge:

8.14.2. Completion and Workover Fluids

The processes of completing a well or working on a well may entail the use of special fluids containing contaminants such as acids, solid materials, oil and chemical additives that can be harmful to the environment in certain concentrations. Feasible options for disposal of these fluids will be assessed and may include one or a combination of the following:

- Collection in a closed system and return to suppliers for treatment and recycling;
- Injection in a dedicated disposal well;
- Include as part of the produced water waste stream for treatment and disposal. Spent acid should be neutralized before treatment and disposal;
- On-site or off-site biological or physical treatment in accordance with this WMP

8.14.3. Estimated Flows

Sanitary wastewater treatment systems will be provided to accommodate a design flow of approximately 360 L/day/person (95.1 gal/day/person) unless regional experience suggests otherwise, to be concurred with by GTE HSE and CSR Director. The volume of wastewater generated will vary with each stage of an individual Contractor's construction activities. Wastewater treatment facilities will be designed and furnished commensurate with the anticipated construction activities such that no discharges of untreated or partially-treated wastewater become necessary. In addition, the design will include provisions for peak-loading and upset conditions.

The non-sanitary wastewater flow is anticipated to vary with each activity and stage of construction, and is not estimated here.

8.14.4. Discharge methods

It is anticipated that treated wastewater will primarily be discharged to a land surface area via a near surface soil infiltration/absorption system (spray type irrigation system or underground tile field system), or to a basin for irrigation use. In this case, effluent quality will be primarily based on TPH (for produced water) and health risk-based limits provided in World Health Organization (WHO) Guidelines for The Safe Use of Wastewater Excreta and Greywater, which focuses on bacteriological limits.

In the event that treated wastewater is released to a watercourse, effluent quality will meet the criteria in Tables 8 and 9, taken from respective IFC documents[4].

Table 5: Sanitary Sewage Effluent Criteria for Discharge into Watercourse

Pollutants	Guideline value
pH	6 to 9
BOD	30 mg/l
COD	125 mg/l
Total Nitrogen	10 mg/l
Total Phosphorus	2 mg/l
Oil and grease	10 mg/l
Total Suspended solids	50 mg/l
Total coliform bacteria	Less than 400[a] MPN[b]/100 ml
Notes [a] Non applicable to centralized, municipal wastewaters treatment systems which are included in the EHS Guidelines for Water and Sanitation. [b]MPN : Most Probable Number	

[4] IFC, April 30th 2007, General EHS Guidelines: Environmental (Table 8) Environmental, Health and Safety Guidelines for Onshore Oil and Gas Development (Table 9).

Table 5: Produced Water Effluent Criteria if Released to Surface Water Body

Pollutants	Guidelines value
Total hydrocarbon content	10 mg/L
pH	6 à 9
BOD	25 mg/L
COD	125 mg/L
TSS	35 mg/L
Phenols	0.5 mg/L
Sulfides	1 mg/L
Heavy metals (total)[1]	5 mg/L
Chlorides	600 mg/L (average) 1200 mg/L (maximum)

[1] Heavy metals include: arsenic, cadmium,, chromium, copper, lead, nickel, silver, vanadium and zinc.

Limits for Treated Water Used for Irrigating Crops or Trees;

The use of treated waste water for food or tree production has become increasingly common in recent decades. This approach allows for the conservation and use of not only the water but also the nutrient value of the organic material that remains in the treated wastewater. Gran Tierra Energy has reviewed applicable normative documents; most notably the publications of the World Health Organization (WHO) including the 2006 (3rd Edition) document entitled WHO Guidelines for the Safe Use of Wastewater, Excreta and Grey Water, as well as the USEPA limits on TPH of Water used for Irrigation of Crops in Western States.

Where treated Camp Waste Water or Produced Water (non-saline) is to be used for irrigation of crops or trees under the supervision and control of Gran Tierra Energy staff or representatives, the following standards shall apply:

- TPH < 35 mg/l (USEPA limit)
- E. coli, <=10^3/100ml
- Helminth eggs, <=1 per litre

Sampling and analysis will be done more frequently until there is clear evidence that these limits are consistently met. Thereafter the frequency will be reduced, with the approval of the HSE Manager, but never to be less than once per month.

Note that if produced water is treated and used for irrigation, trace elements, including heavy metals, are to be analyzed in soil pre-irrigation; in effluent; and in soil irrigated with effluent after one year. The results will be compared to WHO standards for agricultural soils. If all values are low, ongoing monitoring will be revised to once every 3 years, or when there is a change in water source or other input factor.

8.14.5. Solids and Sludge Management

If required (e.g., mechanical sewage treatment systems) will use a mechanism for removing and dewatering excess solids and sludge materials from the clarifier. Dewatered solids and sludge will be dried in the sludge drying component of the system. The dried residue will then be collected, contained and disposed through land spreading or burial at onsite innocuous waste solid waste dump. If adequately monitored and documented composting is available, any sludge resulting from wastewater treatment may be composted without drying.

8.15. Off-site Disposal

Off-site disposal of solid waste will make use of properly authorized sanitary landfills, in addition to recycling facilities, contaminated soil treatment operations and commercial incineration facilities. In all cases, GTE will make efforts to ensure such facilities are properly authorized and operated.

8.16. Transportation of Waste

GTE's operational areas appear to have some regulatory control and licensing of transportation of waste. Waste will be transported according to accepted standards to ensure delivery at their intended destination without any safety or environmental incidents. It must be performed using specifically designed vehicles, which are adequately adapted to ensure safe transportation of wastes. General requirements regarding vehicle requirements; driver's education; route planning and security; and documentation apply to the transportation of each category of waste. Additional requirements apply to hazardous waste.

8.17. Records and Tracking

Tracking and maintaining records of waste types and quantities is important for proper management of waste disposed of off-site. A tracking system will be utilized to track waste quantities and types disposed at the off-site facilities.

The Waste Manifest Form (Attachment D), or otherwise standardized local form, will be used to provide disposition control and facilitate recordkeeping for this activity.

Onsite waste tracking is also required including type, source, quantity/volume and disposition.

8.18. Waste Ownership

In general, wastes generated during the Project construction (within project lease boundaries) will be considered to be owned by Company.

Exceptions to this condition are:

- Materials to be returned to suppliers by Contractors in accordance with Contractor agreements
- Materials released, to GTE approved off-site recipients for reuse, recycle or disposal after acceptance by the recipient. Materials conveyed off-site should be tracked in accordance with applicable procedures.

8.19. Contractors

Contractors are responsible for conducting waste management in accordance with this WMP.

8.20. Staffing and Training

All personnel and workers will be provided with training appropriate to their level of responsibilities on key environmental issues and required waste avoidance and management measures.

The specifics of training program elements will vary according to the employee or contractor's work scope and the type of waste stream they will exposed to, but generally will include:

- Importance and goals of the waste management program
- Waste avoidance and reduction
- Types of wastes that may be encountered at respective job activities
- Specific information regarding restricted wastes
- Waste sorting and segregation requirements
- Waste re-use/recycling
- Waste handling procedures
- Health, safety, and training requirements (including required Personal Protective Equipment (PPE)) related to waste management
- Types and labeling of waste-specific containers
- Nature and limitations of on-site waste management facilities
- Project waste management facilities
- Required waste management-related documentation
- Facility- and/or equipment–specific training for waste facility operators.

All personnel that will be involved with waste handling will trained and provided with appropriate PPE, enabling them to safely perform the tasks. PPE requirement may vary according to the waste stream, but will minimally include the following:

- Gloves suitable for materials being handled
- Safety glasses, goggles or face shields
- Steel toed shoes or boots
- Hearing protection (as necessary)
- Dust mask (as necessary)
- Coveralls

8.21. Compliance Assurance and Reporting

Waste management activities will be monitored to confirm that WMP commitments, requirements, and objectives are satisfied.

- The Project's Site Environmental Advisor or Inspector will conduct on-the-ground monitoring activities to confirm that work is in compliance with the project's environmental requirements obligations, commitments, and specifications.
- The Host Government may use representatives from its own ministerial organizations to assess the environmental performance of the Project and its Contractors.

Monitoring activities associated with the management of wastewater, restricted and non-restricted solid waste should include:

- Regular visual inspection of waste storage collection and storage areas for evidence of accidental releases and to verify that wastes are properly labeled and stored. When significant quantities of wastewater and restricted wastes are generated and stored on site, monitoring activities should include:
    - Inspection of vessels for leaks, drips or other indications of loss
    - Identification of cracks, corrosion, or damage to tanks, protective equipment, pipelines, or floors
    - Verification of locks, emergency valves, and other safety devices for easy operation (lubricating if required and employing the practice of keeping locks and safety equipment in standby position when the area is not occupied)
    - Checking the operability of emergency systems
    - Documenting results of testing for integrity, emissions, or monitoring stations (air, soil vapor, or wastewater)
    - Documenting any changes to the storage facility, and any significant changes in the quantity of materials in storage
- Regular audits of waste segregation and collection practices
- Tracking of waste generation trends by type and amount of waste generated, preferably by facility departments
- Keeping all tracking forms and other records that document the amount of waste generated and its destination
- Regular monitoring and documentation of treated wastewater effluent quantity and quality prior to discharge
- Monitoring records for restricted waste collected, stored, or shipped should include:
    - Name and identification number of the material(s) composing the restricted waste
    - Physical state (i.e., solid, liquid, gaseous or a combination of one, or more, of these)
    - Quantity (e.g., kilograms or liters, number of containers)
    - Analytical records documenting waste characteristics
    - Waste shipment tracking documentation to include, quantity and type, date dispatched, date transported and date received, record of the originator, the receiver and the transporter
    - Method and date of storing, repacking, treating, or disposing at the facility, cross-referenced to specific manifest document numbers applicable to the restricted waste

- Location of each restricted waste within the facility, and the quantity at each location

9. REFERENCES

International Finance Corporation (2007). Environmental Health and Safety (EHS) General Guidelines. Washington, D.C.

International Finance Corporation (2012). IFC Performance Standards on Environmental and Social Sustainability

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International Finance Corporation (2007). Environmental, Health, and Safety Guidelines for Waste Management Facilities

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OGP and IPIECA good practices guideline (2014). *Oil Spill Waste Minimization and Management*

ATTACHMENT A: Definition for Restricted vs Non-Restricted Wastes

Waste Descriptions

Restricted Waste:

The definition of a restricted waste follows the US EPA Characteristic Hazardous Waste guidelines as defined in 40 CFR Part 261, Subpart C.

1. **Ignitability** – A solid waste exhibits the characteristic of ignitability if a representative sample of the waste has any of the following properties:

    a) It is a liquid, other than an aqueous solution containing less than 24 percent alcohol by volume and has flash point less than 60 °C (140 °F), as determined by a Pensky-Martens Closed Cup Tester, using the test method specified in ASTM Standard D 93–79 or D 93–80 (incorporated by reference, see §260.11), or a Setaflash Closed Cup Tester, using the test method specified in ASTM Standard D 3278–78 (incorporated by reference, see §260.11).
    b) It is not a liquid and is capable, under standard temperature and pressure, of causing fire through friction, absorption of moisture or spontaneous chemical changes and, when ignited, burns so vigorously and persistently that it creates a hazard.
    c) It is an ignitable compressed gas:
        i. The term “compressed gas” shall designate any material or mixture having in the container an absolute pressure exceeding 40 p.s.i. at 70 °F or, regardless of the pressure at 70 °F, having an absolute pressure exceeding 104 p.s.i. at 130 °F; or any liquid flammable material having a vapor pressure exceeding 40 p.s.i. absolute at 100 °F as determined by ASTM Test D–323.

2. **Corrosivity** - A solid waste exhibits the characteristic of corrosivity if a representative sample of the waste has either of the following properties:

    a) It is aqueous and has a pH less than or equal to 2 or greater than or equal to 12.5, as determined by a pH meter using Method 9040C in “Test Methods for Evaluating Solid Waste, Physical/Chemical Methods,” EPA Publication SW–846, as incorporated by reference in §260.11 of this chapter.
    b) It is a liquid and corrodes steel (SAE 1020) at a rate greater than 6.35 mm (0.250 inch) per year at a test temperature of 55 °C (130 °F) as determined by Method 1110A in “Test Methods for Evaluating Solid Waste, Physical/Chemical Methods,” EPA Publication SW–846, and as incorporated by reference in §260.11 of this chapter.
    c) A solid waste that exhibits the characteristic of corrosivity has the EPA Hazardous Waste Number of D002.

3. **Reactivity** - A solid waste exhibits the characteristic of reactivity if a representative sample of the waste has any of the following properties:

    a) It is normally unstable and readily undergoes violent change without detonating.
    b) It reacts violently with water.
    c) It forms potentially explosive mixtures with water.
    d) When mixed with water, it generates toxic gases, vapors or fumes in a quantity sufficient to present a danger to human health or the environment.
    e) It is a cyanide or sulfide bearing waste which, when exposed to pH conditions between 2 and 12.5, can generate toxic gases, vapors or fumes in a quantity sufficient to present a danger to human health or the environment.
    f) It is capable of detonation or explosive reaction if it is subjected to a strong initiating source or if heated under confinement.
    g) It is readily capable of detonation or explosive decomposition or reaction at standard temperature and pressure.
    h) It is a forbidden explosive as defined in 49 CFR 173.51, or a Class A explosive as defined in 49 CFR 173.53 or a Class B explosive as defined in 49 CFR 173.88.
    i) A solid waste that exhibits the characteristic of reactivity has the EPA Hazardous Waste Number of D003.

4. **Toxicity** - A solid waste (except manufactured gas plant waste) exhibits the characteristic of toxicity if, using the Toxicity Characteristic Leaching Procedure, test Method 1311 in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," EPA Publication SW–846, as incorporated by reference in §260.11 of this chapter, the extract from a representative sample of the waste contains any of the contaminants listed in Table 1 at the concentration equal to or greater than the respective value given in that table. Where the waste contains less than 0.5 percent filterable solids, the waste itself, after filtering using the methodology outlined in Method 1311, is considered to be the extract for the purpose of this section.

Maximum Concentration of Contaminants for the Toxicity Characteristic

EPA HW No.[1]	Contaminant	CAS No.[2]	Regulatory Level (mg/L)
D004	Arsenic	7440–38–2	5.0
D005	Barium	7440–39–3	100.0
D018	Benzene	71–43–2	0.5
D006	Cadmium	7440–43–9	1.0
D019	Carbon tetrachloride	56–23–5	0.5
D020	Chlordane	57–74–9	0.03
D021	Chlorobenzene	108–90–7	100.0
D022	Chloroform	67–66–3	6.0
D007	Chromium	7440–47–3	5.0
D023	o-Cresol	95–48–7	[4]200.0
D024	m-Cresol	108–39–4	[4]200.0
D025	p-Cresol	106–44–5	[4]200.0
D026	Cresol		[4]200.0

EPA HW No.[1]	Contaminant	CAS No.[2]	Regulatory Level (mg/L)
D016	2,4-D	94–75–7	10.0
D027	1,4-Dichlorobenzene	106–46–7	7.5
D028	1,2-Dichloroethane	107–06–2	0.5
D029	1,1-Dichloroethylene	75–35–4	0.7
D030	2,4-Dinitrotoluene	121–14–2	[3]0.13
D012	Endrin	72–20–8	0.02
D031	Heptachlor (and its epoxide)	76–44–8	0.008
D032	Hexachlorobenzene	118–74–1	[3]0.13
D033	Hexachlorobutadiene	87–68–3	0.5
D034	Hexachloroethane	67–72–1	3.0
D008	Lead	7439–92–1	5.0
D013	Lindane	58–89–9	0.4
D009	Mercury	7439–97–6	0.2
D014	Methoxychlor	72–43–5	10.0
D035	Methyl ethyl ketone	78–93–3	200.0
D036	Nitrobenzene	98–95–3	2.0
D037	Pentachlorophenol	87–86–5	100.0
D038	Pyridine	110–86–1	[3]5.0
D010	Selenium	7782–49–2	1.0
D011	Silver	7440–22–4	5.0
D039	Tetrachloroethylene	127–18–4	0.7
D015	Toxaphene	8001–35–2	0.5
D040	Trichloroethylene	79–01–6	0.5
D041	2,4,5-Trichlorophenol	95–95–4	400.0
D042	2,4,6-Trichlorophenol	88–06–2	2.0
D017	2,4,5-TP (Silvex)	93–72–1	1.0
D043	Vinyl chloride	75–01–4	0.2

1Hazardous waste number.

2Chemical abstracts service number.

3Quantitation limit is greater than the calculated regulatory level. The quantitation limit therefore becomes the regulatory level.

4If o-, m-, and p-Cresol concentrations cannot be differentiated; the total cresol (D026) concentration is used. The regulatory level of total cresol is 200 mg/l.

Non-restricted Waste:

Waste that does not exhibit characteristics defined as “Restricted” is deemed to be “Non-restricted” such as:

- Domestic Garbage: discarded items from kitchens, bathrooms, laundries, offices, generally a by-product of project camps
- Innocuous solid waste: non-hazardous waste that is inert and not expected to undergo sufficient transformation to produce materials that pose a threat to human or environment health when placed in an unlined waste dump
- Land treatable waste: non-hazardous waste (e.g. oily-contaminated soil) that can be biochemically treated by mixing with fertilizer and nutrients or composted

ATTACHMENT B: Typical Wastes – Description

Typical Non-Restricted Wastes	
Acid Sulfate Soils	Commonly associated with mangroves and low-lying coastal landforms. Saturated soils of tidal plains are recharged with each high tide and maintain an oxygen-free environment, with traces of acid neutralized by the overlying seawater. When the soils are excavated and allowed to drain the acid sulfate soil is exposed to oxygen in the air and the sulfate oxidizes to sulfuric acid. Subsequent exposure to water yields a toxic acid solution, which can affect aquatic life, and attack the concrete and steel of engineered structures and equipment.
Ash from incinerators	Residual matter remaining after combustion. Ash from incinerators should ne periodically tested to confirm non-restricted characteristics. Ash that exhibits restricted waste characteristics should be treated to render the material non-restricted prior to landfill.
Clearing and Grubbing Waste	Excess soil, rock, and vegetative material produced from the clearing of plant site for construction.
Electrical parts, fittings, cable, electrodes	Electrical goods waste.
Empty containers	Generated from containerized products used, including: steel drums, steel and plastic buckets, plastic totes, and any other containers, that did not contain materials that would be restricted wastes if discarded, or that have been emptied and cleaned of such contents.
General Construction Debris	Non-combustible waste generated during contraction activities.
Glass	Produced from glass containers and construction waste.
Paper and Cardboard	Paper and cardboard produced from packaging materials and paper products.
Plastic and Insulation	Plastic and insulation used for construction and shipment of materials.
Plastic Materials	Consumables and domestic products from packaging materials, and repair/replacement of rubber or plastic parts.
Refuse	Camp operations and office operations - i.e. discarded items from kitchens, living quarters, bathrooms, laundries, warehouses, offices, etc. at camp/job sites.
Hydrocarbon-contaminated rags and sorbent pads	Contaminated rags and sorbent pads from routine maintenance and spill cleanup. Such materials can be safely incinerated in mall camp incinerators.
Scrap Metal	Metal waste un-fit for construction uses, or leftover after construction. Separated into three categories: ferrous

Typical Non-Restricted Wastes	
	metal, non-ferrous metal and spent welding rods.
Sludge-sanitary	Solid waste from the sewage treatment plant.
Tires	Used tires from vehicles on site.
Wood scrap (Dunnage)	Wood waste from packaging and/or construction activities.
Empty gas cylinders	Empty pressurized gas tanks.
Filters	Spent air filters used for vehicles.

Typical Restricted Wastes	
Filters	Spent engine oil filters used for vehicles. Crushing and removing free oil may eliminate restricted classification
Medical Waste	Wastes generated by medical procedures, first aid, medical laboratory tests and specimens, and routine clinical procedures.
Miscellaneous Restricted	Restricted waste not represented in any other category.
Paint Waste	Unused or spent paint materials.
Spent Batteries	Lead-acid electrical storage batteries and disposable dry cells used in various fields and plant operations, including vehicles and construction equipment.
Spent lubricating oils	Oil waste from maintenance and operations of construction equipment and vehicles.
Unused, spent, expired and contaminated solvents, chemicals and additives	Chemical compounds and products used for maintenance and facility construction.
Fluorescent Tubes	Mercury-containing gas-discharge lamps or tubes that use electricity to excite metal vapor causing a phosphor coating to glow.

ATTACHMENT C: Preliminary Waste-Specific Management Procedures

Preliminary Waste-specific Management Procedures Contents:

- Acid and Caustic Solutions
- Ash from Waste Incinerator
- Batteries (Spent)
- Construction Debris (Glass)
- Construction Debris (Lumber & Packaging Materials)
- Contaminated Soil (Oily, TPH > 1000 ppm)
- Contaminated Soil (Oily, TPH < 1000 ppm)
- Domestic Wastewater

- Domestic Wastewater Sludge
- Domestic Waste or Trash (Refuse)
- Drilling Wastes
- Empty Barrels, Drums & Containers [containing non-restricted materials]
- Empty Barrels, Drums & Containers [containing restricted materials]
- Empty Gas Cylinders
- Medical Waste
- Oily Debris
- Oily Debris (Filters)
- Plastics
- Process Wastewater (Oily)
- Produced Water
- Scrap Metal
- Separator/Vessel Sludges and Pigging Wastes
- Spent Lubricating Oils
- Tires
- Top Soil and Vegetation
- Unused, Spent, Expired, and Contaminated Solvents, and Additives

Acid and Caustic Solutions

Waste generating process	Waste acids/caustics, which are generated from the use of an acid or caustic cleaner or from workover operations. These wastes should be handled as hazardous (corrosive) wastes if their pH is less than 2.0 or greater than 12.5. Typically includes: • Caustic (NaOH) • Cleaning acids • Vessel cleaners • Engine block flushing agents or cleaners • Neutralized acids • Completion and workover fluids
Classification	Restricted
Handling	Refer to original MSDS. Avoid skin contact or ingestion. Wear protective clothing and glasses when handling. These solutions should be neutralized prior to disposal. Safe practices need to be implemented to minimize risk while combining solutions.
Storage	Tanks, drums or containers that are compatible with material being stored
Labeling	Containers are to be properly labeled as to contents or what it had contained and appropriate warning/precautions. Deliver same information to WMA Operators
Tracking	Drilling contractor to monitor and record quantities generated and disposed; Report monthly to HSE
Monitoring	Test for pH, TPH as necessary
Minimization	• Judicious use of products and chemicals. • Evaluate preventative maintenance schedule/program elements. • Reuse until spent or neutral. • Product substitution (less toxic or recyclable). • Inventory control/proper storage. • Use inhibitors to prevent scale build-up and vessel cleaning requirements.
Disposal method	Acids/caustics may be chemically neutralized or diluted with water such that the resulting pH is in the target range of 6-8. Aqueous solutions may be bled into water treatment system as long as significant pH change to the treatment system does not occur. As appropriate, check with wastewater treatment system operator before discharge.

ASH FROM CAMP WASTE INCINERATOR

Waste generating process	Portable Domestic refuse incinerators (e.g., SmartAsh). High temperature incinerators.
Classification	Non-restricted, once representative sample is analyzed (TCLP) and shown to not leach heavy metals in hazardous quantities
Handling	Reduce risk of airborne ash while handling. Avoid skin contact or ingestion. Wear standard PPE (i.e., hard hat, steel-toed shoes/boots, safety glasses/goggles), leather gloves, and dust mask when handling this waste. No ash handling activities will occur during high wind conditions.
Storage	Store in a tarp- or plastic sheet covered properly labeled roll-off bin placed in a contained area underlain by an impervious liner or in sealed, properly labeled metal or plastic drums placed in the waste storage facility/ area at each camp site.
Labeling	Each container to be labeled "*ash from domestic or high temperature incinerator*"
Tracking	Waste Management Area operators to record waste cleaned from incinerators and turn in with their daily waste management activities. WMA Operators to provide monthly reports to HSE Group to track waste streams and quantities.
Monitoring	Test for leachable heavy metals pending waste type incinerated.
Minimization	N/A
Disposal method	Sanitary landfill, if locally available. Alternative is Innocuous waste burial at WMA, if allowed.

BATTERIES (SPENT)

Waste generating process	Vehicles, engines, emergency power systems. Instruments/ small equipment.
Classification	Restricted
Handling	Avoid skin contact or ingestion of acid. Avoid acid fumes. Wear standard PPE (i.e., hard hat, steel toed shoes/boots, safety glasses/ goggles), potentially supplemented with acid/ caustic-resistant gloves, acid/ caustic resistant apron, and/or face shield when handling this waste. Do not damage or crack batteries. Includes spent lead acid, Ni, Cd, lithium, and mercury-cell batteries. Neutralizing materials should be readily on hand in the event of an accident or spillage at place of work
Storage	Store in sealed, properly labeled and segregated plastic drums or containers equipped with suitable absorbent and neutralizing material(s) and placed in a special closed shipping container located within the designated restricted waste storage facility/area at camp site.
Labeling	Each container to be labeled as battery or acid
Minimization	**Recycle:** Best and only available option. Field Operations Management Team to review annually for waste reduction efforts.
Tracking	Waste Management Area operator and Auto Shop Supervisor to keep records of batteries sent out for recycling and submit these monthly to HSE Group. HSE Group to track waste streams and quantities, and provide quarterly reports
Disposal method	Acid solution should be removed from used/ spent lead acid batteries and properly managed as an acidic solution via the WMA wastewater management system. **Recycle**. Lead-acid batteries may be recycled, subject to approval by Company. **Landfill**. Neutralize drained battery fluid. Attempts will be made to collect small batteries from flashlights, and hold for eventual shipment

CONSTRUCTION DEBRIS (GLASS)

Waste generating process	Glass from housing, vehicle windows, bottles, jars, human consumables, and "household products".
Classification	Non-restricted
Handling	Wear standard PPE (i.e. hard hat, steel-toed shoes/boots, safety glasses/ goggles) and leather gloves when handling this waste. Clean for local recycling or crush/break where buried.
Storage	Collect in labeled metal or plastic drums or other suitable containers placed at designated/ strategic locations. Store in closed, properly labeled containers placed in an appropriate designated non-restricted waste storage area at camp/job site.
Labeling	Both the containers and storage area are to be properly labeled
Tracking	Waste Management Area operators to keep records of waste delivered to the WMA for landfill. WMA operators to provide monthly reports to HSE Group to track waste streams and quantities. Quarterly report shall be submitted by HSE Group to Management.
Disposal method	Local recycling to extent available, local sanitary landfill, alternativel by innocuous burial at WMA , if allowed

CONSTRUCTION DEBRIS (LUMBER & PACKAGING MATERIALS)

Waste generating process	Construction activities Includes: Wood, insulation, and other combustible waste and debris associated with the construction of buildings, wharves, warehouses, roads, etc
Classification	Non-restricted
Handling	Wear standard PPE (i.e., hard hat, steel-toed shoes/boots, safety glasses/goggles) and leather gloves when handling this waste. **PVC or other chlorinated materials should not be incinerated in domestic garbage incinerators.** Recovery of scraps, surplus or waste material should be controlled via written approval from the HSE Group Supervisor.
Storage	**Uncontaminated, reusable/recyclable, combustible, and non-combustible materials:** bulk storage in a suitable location at camp/job site or store in sealed, properly labeled containers placed in an appropriate designated non-restricted waste storage area at camp/ job site. **Restricted/contaminated materials:** store in tarp- or plastic sheet covered properly labeled roll-off bin placed within a contained area underlain by an impervious liner or in suitable, labeled, sealed containers placed in a special closed shipping container located within the designated restricted waste storage facility/area at camp/ job site.
Labeling	Each container to be labeled as follows: "Construction Debris (Wood)" – additional labeling required if wood is contaminated.
Tracking	WMA operators to provide monthly reports to HSE Group to track waste streams and quantities. Quarterly report shall be submitted by HSE Group to appropriate Management.
Minimization	Reuse/recycle wood to the max\mum extent practical. Order materials in bulk to decrease packaging materials.
Disposal method	Recycle should be the first priority for usable wood, while smaller pieces may be chipped for compost or used for caloric value in incinerator. Other materials are destined for sanitary landfills or subject to incineration at the WMA. **PVC or other chlorinated materials should not be incinerated in domestic garbage incinerators.** Heavy plastics are to be consolidated for recycling.

CONTAMINATED SOIL (OILY, TPH > 10000 ppm or 1%)

Waste generating process	Routine operations and maintenance or as a result of accidental releases, spills, or leaks located near tanks, facilities, and vehicle maintenance areas contaminated with hydrocarbon liquids.
Classification	Likely non-restricted
Handling	Avoid skin contact or ingestion. Wear standard PPE (i.e., hard hat, steel toed shoes/boots, safety glasses/goggles), potentially supplemented with disposable coveralls, rubber gloves, dust mask and/or activated carbon-equipped breathing protection device when handling this waste.
Storage	Small quantities: Store in sealed, properly labeled metal or plastic drums placed in a special closed shipping container located within the designated hazardous waste storage facility/area at a camp site or within a contained area underlain by an impervious liner. Large quantities: Store in roll-off bins placed on temporary contained areas underlain by an impervious liner. Temporarily cover large piles with plastic sheeting pending removal to storage.
Labeling	Each container to be labeled as follows: “Contaminated Soil”. Additional label(s) giving more specific information re the nature of the contaminant required.
Tracking	Waste Management Area operator or Auto Shop Supervisor to submit records of quantities treated for disposal. Contractor SHES Group to track waste streams and quantities.
Minimization	Properly maintain equipment/machinery to prevent drips/leaks/spills.
Disposal method	Remove any free oil. Bioremediation or Composting is first option. Third party facility may be available, but verify proper operation and authorization. Landfarming can be considered in larger volume cases. Incineration in commercial incinerator may be an option for small amounts.

LIGHTLY-CONTAMINATED SOIL (TPH < 10000 ppm)

Waste generating process	Routine operations and maintenance or as a result of accidental releases, spills, or leaks located near tanks, facilities, and vehicle maintenance areas contaminated with hydrocarbon liquids.
Classification	Non-restricted
Handling	Avoid skin contact or ingestion. Wear standard PPE (i.e., hard hat, steel toed shoes/boots, safety glasses/goggles), potentially supplemented with disposable coveralls, rubber gloves, dust mask and/or activated carbon-equipped breathing protection device when handling this waste.
Storage	Small quantities: Store in sealed, properly labeled metal or plastic drums placed in a special closed shipping container located within the designated hazardous waste storage facility/area at a camp site or within a contained area underlain by an impervious liner. Large quantities: Store in roll-off bins placed on temporary contained areas underlain by an impervious liner. Temporarily cover large piles with plastic sheeting pending removal to storage.
Labeling	Each container to be labeled as follows: “Contaminated Soil”. Additional label(s) giving more specific information re the nature of the contaminant required.
Tracking	Waste Management Area operator or Auto Shop Supervisor to submit records of quantities treated for disposal. Contractor SHES Group to track waste streams and quantities.
Minimization	Properly maintain equipment/machinery to prevent drips/leaks/spills.
Disposal method	Bioremediation or composting is first option, followed by landfarming, seeking acceptable endpoint for agricultural use. Alternatively, slightly contaminated final material can be considered for road base or other construction use.

DOMESTIC WASTEWATER

Waste generating process	Camps, laundries, toilets, showers, sinks and dishwashers.
Classification	Non-restricted
Handling	Avoid skin contact or ingestion. Wear standard PPE (i.e., hard hat, steel toed shoes/boots, safety glasses/ goggles), potentially supplemented with disposable coveralls, rubber gloves, and/or activated carbon equipped breathing protection device when handling this waste. Treated wastewater effluents must meet the effluent quality criteria stipulated in WMP.
Storage	Domestic wastewater treatment plant (WWTP)
Labeling	Not applicable
Tracking	WWTP operator to record daily quantities and test results and submit weekly to HSE Environment Group. b) HSE Environment Group to track waste streams, do monthly effluent monitors and quantities and provide appropriate reports
Disposal method	**Treatment:** Packaged biological activated sludge-type treatment unit is standard. Effluent to be tested and discharged. Gray water may be segregated and run through sand filter prior to discharge where treatment capacity is limited. Composting or chemical toilets are preferred for sites w/o access to camp toilets. Engineered wetlands may be and alternative for fixed facilities.

DOMESTIC WASTEWATER SLUDGE

Waste generating process	Wastewater treatment units
Classification	Non-restricted
Handling	Avoid skin contact or ingestion. Wear standard PPE (i.e., hard hat, steel toed shoes/boots, safety glasses/goggles), potentially supplemented with disposable coveralls, rubber gloves, and/or breathing protection device when handling this waste.
Storage	In dedicated containers for transfer
Labeling	N/A
Transportation	In dedicated containers and vehicle
Tracking	Contractors are to keep records of sludge quantities sent out for disposal and submit these records monthly to HSE Group. HSE Group to track and monitor quantities and provide quarterly reports
Disposal method	-Incineration after dewatering and drying -Composting- Only if proper documentation/procedure is in place for human wastes

DOMESTIC WASTE OR TRASH (Refuse)

Waste generating process	Site and camp operations/administrative operations – i.e. discarded items from kitchens, living quarters, bathrooms, laundries, warehouses, offices, etc. at camp/job sites.
Classification	Non-restricted
Handling	Wear standard PPE (i.e., hard hat, steel-toed shoes/boots, safety glasses/ goggles) and leather gloves when handling this waste.
Storage	Collect in labeled bins/containers placed at designated/strategic locations. Segregate reusable/recyclable materials using separate, labeled containers. Store in closed, properly labeled containers placed in an appropriate designated non-restricted waste storage area at camp/job site.
Labeling	Both the containers and storage area are to be properly labeled
Tracking	WMA operators to record waste delivered to disposal destinations, and provide monthly reports to the HSE Group to track waste streams and quantities.
Minimization	Items such as plastic containers should be recycled and reused whenever possible.
Disposal method	Sanitary landfill; Camp Incineration of combustible non-recyclable wastes. Paper and cardboard may be recycled or shredded for composting.
Disposal Site	Landfill or recycling companies. Remote locations may incinerate onsite.

Drill Solids/Cuttings (From Fresh Water Gel and PHPA Mud)

Waste generating process	Fragments of rocks dislodged by the bit and brought to the surface in the drilling mud. May be coated with drilling mud, including additives, such as barite, that may settle out. These materials may contain organics or heavy metals. If an oil or solvent based pill is added during drilling, or an oil zone is cut, it may be advisable to segregate associated cuttings and treat as oily wastes.
Classification	Non-restricted
Handling	Avoid ingestion or physical contact. Wear protective gloves when handling the waste. Consult original MSDS for details about constituents.
Storage	Lined or unlined pit, or surface tanks, depending on properties
Labeling	N/A- Contained in sumps
Tracking	Drilling contractor to track volumes and report monthly to HSE
Monitoring	Monitoring and control sites will be established to ensure no lasting impact of drilling waste disposal on local soils.
Minimization	•Use alternative mud systems to minimize hole sloughing. •Optimize drilling mud additive usage to minimize hole sloughing. •Substitute additives with less toxic alternatives. •Reuse cuttings for road base, cement, etc. •Optimize shale shaker operation to recover mud.
Disposal method	Onsite burial Land application and cultivation or otherwise vegetate **Mix-Bury-Cover Disposal Method** In the absence of specific criteria for the disposal of drilling muds, Gran Tierra Energy will follow best management practices for disposal of drill cuttings from water based mud systems. If necessary,Gran Tierra Energy will develop a drilling reserve pit closure procedure for use with these types of mud systems. It would focus on achieving acceptable KCl-chlorides concentrations, along with other potential contaminants (primarily TPH). The goal is to prevent any hazard due to contact and restore agricultural capability of the soils.

EMPTY BARRELS, DRUMS & CONTAINERS [containing non-restricted materials]

Waste generating process	Drums/barrels/containers used to contain foodstuffs or other non-restricted materials, including dried paint
Classification	Non-restricted
Handling	Consult labeling of original material stored in the drum/barrel/container. Avoid physical contact with residues in empty containers. Wear standard PPE (i.e., hard hat, steel-toed shoes/boots, safety glasses/ goggles) and appropriate protective gloves (leather, chemically-resistant rubber) when handling this waste.
Storage	Store in appropriately designated non-restricted waste storage area.
Labeling	Drums are to be properly labeled as to contents or what it had contained and appropriate warning/precautions. Deliver same information to WMA Operators
Tracking	Waste Management Area operator to keep records of drums received for recycling or landfill. SHES group to track waste streams and quantities.
Disposal method	**Recycle** - Rinse and cleanse drums thoroughly prior to shipment, according to prior contents - Drums are to be completely empty.
Disposal Site	Reuse or transport to scrap metal recycler
Minimization	**Recycle -** Drums in acceptable condition are to be returned to the supplier or drum recycling facilities, or crushed and recycled. Some local recycling/reuse may be acceptable **Bulk Containers -** Use returnable bulk containers whenever possible. **Reuse -** Drums can be reused for storing the same product if in good condition. Metal drums may be used as trash containers once cleaned. Review annually for waste reduction efforts. **Paint containers with dried paint-** May be crushed and sent to sanitary landfills or buried in innocuous waste pit 9where allowed)

EMPTY BARRELS, DRUMS & CONTAINERS [containing restricted materials]

Waste generating process	Drums/barrels/containers used to contain restricted material
Classification	Sometimes may be Restricted, but generally unrestricted based on contents and USEPA RCRA definition of "empty"
Handling	Consult labeling and MSDS of original material stored in the drum/barrel/container. Avoid physical contact with residues in empty containers. Wear standard PPE (i.e., hard hat, steel-toed shoes/boots, safety glasses/ goggles) and appropriate protective gloves (leather, chemically-resistant rubber) when handling this waste. Additional PPE (e.g. Canister-equipped breathing protection masks) may be required. Metal containers that have come into contact with restricted chemicals or oily materials should be triple rinsed to ensure removal of potentially restricted materials prior to re-use or crushing for final disposal. Specialized cleaning procedures may be required in some instances therefore MSDS along with other info should be delivered to WMA operators.
Storage	Store in tarp or plastic-sheet-covered properly labeled roll-off bin placed within a contained area underlain by an impervious liner or in suitable, labeled, sealed container placed in a special closed shipping container located within the designated restricted waste storage facility or WMA at the site.
Labeling	Drums are to be properly labeled as to contents or what it had contained and appropriate warning/precautions.
Tracking	Waste Management Area operator to keep records of drums received for recycling or landfill. WMA Operator to provide monthly reports to HSE group to track waste streams and quantities.
Disposal method	Wash and cleanse thoroughly first, some instances will require specialized procedures such as triple rinsing or incineration to burn residues. Re-use for waste storage purposes (restricted wastes only) or dispose via scrap metal recycler after cleaning and crushing.
Disposal Site	Scrap metal recycler
Minimization	**Recycle -** Drums in acceptable condition are to be returned to the supplier or crushed and recycled as scrap metal **Bulk Containers -** Use returnable bulk containers whenever possible. **Reuse -** Drums can be reused for storing the same product if in good condition. Metal drums may be used as trash containers once cleaned. Review annually for waste reduction efforts.

EMPTY GAS CYLINDERS

Waste generating process	Welding activities
Classification	Non-Restricted
Handling	Wear standard PPE (i.e., hard hat, steel-toed shoes/boots, safety glasses/ goggles) when handling this material.
Storage	Properly secure and store in the designated empty gas cylinder storage area at a WMA and/or job site.
Labeling	Each container to be labeled as follows: “Empty Gas Cylinders”. Additional label(s) giving more specific information re the nature of the material the cylinder contained required.
Tracking	None
Disposal method	No disposal - Empty gas cylinders: return to supplier(s) for refilling.

MEDICAL WASTE

Waste generating process	**Clinical Treatment** **Medical Lab Test** Wastes generated by medical procedures, first aid, medical laboratory tests and specimens and routine clinical procedures.
Classification	Restricted
Handling	Specialized and/or trained personnel to handle waste, wear disposable latex gloves when handling this waste.
Storage	Sharps: Collect in special designated/labeled sharps disposal container. Non-sharps: Collect in special designated/ labeled biohazard bag. Store both in an onsite medical clinic until the time of disposal or in sealed, properly labeled containers placed in a special closed shipping container located within the WMA.
Labeling	Each container to be labeled as follows: “Medical Wastes”. Additional label(s) giving more specific information re the nature of the containerized waste required, including a special “Hazardous Medical Waste” sticker.
Minimization	N/A
Tracking	A Waste Tracking Form shall be generated by the Contractor SHES Group as to the quantity disposed. Contractor SHES Group to track waste streams and quantities.
Disposal method	**Incineration:** Waste shall be stored at the clinics or in a hazardous waste storage area/facility at the WMA until sufficient quantities are ready for disposal. Ensure proper incineration at local hospital incinerator, third party commercial incinerator or in camp incinerator.

OILY DEBRIS

Waste generating process	Oily rags from maintenance of vehicles, equipment. Oily absorbents/materials from maintenance shop and spill clean-up activities.
Classification	Unrestricted
Handling	Avoid skin contact or ingestion. Wear standard PPE (i.e., hard hat, steel-toed shoes/boots, safety glasses/ goggles), potentially supplemented with disposable coveralls, chemically resistant gloves, and/or activated carbon-equipped breathing protection device when handling this waste.
Storage	Collect in labeled metal or plastic drums placed at designated/strategic locations. Store in closed, properly labeled metal or plastic drums placed in a special closed shipping container located within the designated restricted waste storage facility/area at a camp/job site.
Labeling	Containers are to be properly marked as to contents.
Tracking	Waste Management Area operators to keep records of waste delivered to the WMA for incineration. WMA operators to provide monthly reports to HSE Group to track waste streams and quantities.
Disposal method	Incineration – third party or in camp incinerator

OILY DEBRIS (FILTERS)

Waste generating process	**Autos -** vehicle maintenance **Motorized Equipment –** maintenance & repair (e.g. of internal combustion engines, pumps, compressors, etc.).
Classification	Restricted, though crushing and removal of free oil may allow declassification
Handling	Avoid skin contact with or ingestion of oil. Wear standard PPE (i.e., hard hat, steel-toed shoes/boots, safety glasses/goggles), potentially supplemented with disposable coveralls, chemically resistant gloves, and/or activated carbon-equipped breathing protection device when handling this waste. Drain free liquids from filters prior to placement in a storage drum (recover removed liquids and manage as a restricted waste). Crush drained filters - high pressure compaction followed by appropriate storage and disposal as restricted waste.
Storage	Collect in labeled metal or plastic drums placed at designated/ strategic locations. Store in closed, properly labeled metal or plastic drums placed in a special closed shipping container located within the designated restricted waste storage facility/area at the job site.
Labeling	
Minimization	**Reduction:** Review processes to ensure waste is not being generated unnecessarily. Consider use of more effective filters that have a longer frequency between replacements. Waste stream shall be reviewed annually by appropriate supervisory personnel.
Tracking	Waste Management Area operators to submit records of filters delivered to the WMA and submit these monthly to HSE Group.
Disposal method	Incineration of drained, crushed filters. Recycle remaining scrap metal or send to sanitary landfill.

PLASTICS

Waste generating process	Packaging: Consumables and domestic products. Repair/replacement of rubber or plastic parts. Plastic drinking water bottles.
Classification	Non-restricted
Handling	Wear standard PPE (i.e., hard hat, steel-toed shoes/boots, safety glasses/ goggles) when handling this material. PVC plastic-containing materials should not be incinerated.
Storage	Collect in labeled metal or plastic drums or other suitable containers placed at designated/strategic locations – segregate to enable recycling. Store in super-sacks or properly labeled containers placed in an appropriate designated nonhazardous waste storage area.
Labeling	Each container to be labeled “Plastic”. Containers designated for recycle should be so labeled. Additional label(s) giving more specific information re the nature of the waste required.
Tracking	Waste Management Area operator to submit records of quantities treated for disposal. Contractor SHES Group to track waste streams and quantities.
Minimization	Reuse/recycle to the maximum extent practical. Order materials in bulk to decrease packaging materials.
Disposal method	Uncontaminated (i.e., non-hazardous) non-reusable/ non-recyclable and non-halogenated plastic materials: incineration with combustible trash and/or send to sanitary landfill. Halogenated plastics (PVC, PTFE, etc.) should not be incinerated but, if non-recyclable, should be sent to sanitary landfill.

PROCESS WASTEWATER (OILY)

Waste generating process	Rainfall runoff from under/around equipment. Vehicle and equipment oily wash water. Water with oil and emulsions recovered during oil spill recovery or clean-up activities.
Classification	Restricted or non-restricted
Handling	Avoid skin contact or ingestion. Wear standard PPE (i.e., hard hat, steel toed shoes/boots, safety glasses/ goggles), potentially supplemented with disposable coveralls, rubber gloves, and/or activated carbon equipped breathing protection device when handling this waste.
Storage	Sumps/vacuum trucks/tanks.
Tracking	Contractors are to keep records of oily water releases and sent out for recycling, processing or disposal and submit these records monthly to HSE Group. HSE Group to monitor external releases monthly including quality and quantities,
Labeling	Each tank/vessel to be labeled as follows: “Process Wastewater”. Additional label(s) giving more specific information re the nature of the tank/vessel contents required.
Disposal method	May be cycled through water polishing equipment at production facilities, and/or treated as industrial wastewater. Recovered oil should go to sales or be managed as Lube Oil/Motor Oil (used). De-oiled water should be managed as Industrial Wastewater.

Produced Water

Waste generating process	Water produced in association with oil and gas. This waste may contain salts (e.g., chlorides); hydrocarbons; well treatment, oil separation and produced water treatment chemicals (corrosion inhibitors, biocides, oxygen scavengers, demulsifiers, clarifiers, etc.)
Classification	Restricted, unless make-up constituents and/or analysis determines otherwise
Handling	Avoid ingestion and physical contact. Wear protective gloves when handling the waste. See MSDS for treatment chemicals.
Storage	Restricted: Temporarily in tanks within lined and bermed area or in lined pit Non-restricted: Pits that may be unlined
Tracking	Production data to include produced water, including that which is treated and reinjected. Waste Management group to keep records of released water (and quality) and submit these records monthly to HSE Group. HSE Group to monitor external releases monthly including quality and quantities,
Labeling	Tanks and pits to be properly marked with contents
Disposal method	Reinject for pressure maintenance, inject into disposal well, If water is fresh (non-saline), there may be an opportunity to treat via engineered wetlands and discharge to agricultural use

SCRAP METAL

Waste generating process	Plant construction. Vehicle/equipment repair and maintenance.
Classification	Non-restricted
Handling	Wear standard PPE (i.e., hard hat, steel-toed shoes/boots, safety glasses/ goggles) and leather gloves when handling this waste. Scrap metals should be cut to size and sorted prior to conveyance to the WMAs. Any contaminated scrap metal should be thoroughly decontaminated.
Storage	Bulk storage (potentially using a roll-off bin) in an appropriate location at camp/job site or store in the designated area for reusable/ recyclable materials at camp/job site.
Labeling	None required.
Minimization	**Recycle:** Sell uncontaminated scrap metal for salvage where possible. **Reuse:** Reduce quantities through salvage efforts and reuse scrap metal for other projects where feasible. Review annually for waste reduction efforts.
Tracking	Waste Management Area operators to keep records of quantities delivered to the WMA. HSE Group to track waste streams and quantities.
Disposal method	**Recycle** – via local sources subject to Company approval. **Landfill -** Uncontaminated, unrecyclable scrap metal can be be sent to a sanitary landfill. In remote areas, it may be possible to bury limited amounts in an innocuous waste pit.

Separator/Vessel Sludges and Pigging Wastes

Waste generating process	Separator/vessel sludges consist of produced solids that accumulate in production vessels and equipment and that are typically recovered when performing maintenance on these vessels. These sludges are often called tank bottoms. This waste category includes pigging waste, including paraffin, from pipelines.
Classification	Restricted
Handling	Avoid ingestion or physical contact. Wear protective gloves, clothing and possibly breathing apparatus if necessary when handling the waste. Consult MSDS for crude oil.
Storage	Store in drums or tanks with proper secondary containment
Labeling	Label as “Separator Sludge” or “Pigging waste”
Minimization	• Use emulsion breakers to recover oil from sludges. • Perform downhole diagnostics to ensure gravel packing is intact. • Minimize downhole corrosion. • Reduce sand production by gravel packing wells, installing slotted liners, and selective perforating. • Filter out solids to recover oil and water.
Tracking	Waste Management Area operator to submit records of quantities treated for disposal.
Disposal method	Incinerate Commercial or on-site bioremediation or composting may be an option

SPENT LUBRICATING OILS

Waste generating process	**Autos -** Lube oil, motor oil, transmission oil **Motorized Equipment** **Gear Box Crankcase Fluid** Equipment and vehicle maintenance and repair (e.g. of internal combustion engines, pumps, compressors, etc.).
Classification	Restricted
Handling	Avoid skin contact or ingestion. Wear standard PPE (i.e., hard hat, steel-toed shoes/boots, safety glasses/ goggles), potentially supplemented with disposable coveralls, chemically resistant gloves, and/or activated carbon-equipped breathing protection device when handling this waste. Drums containing used lube/motor oil will be conveyed in devices that provide secondary containment.
Storage	Collect in labeled metal or plastic drums placed at designated/ strategic locations. Store in a designated, properly labeled steel tank placed within a contained area underlain by an impervious liner or in sealed, properly labeled metal or plastic drums with prper secondary containment within the designated restricted waste storage facility/area at camp/job site. **Drums / Containers:** Used gear and lube oils may be stored on site until picked up for disposal.
Labeling	Containers are to be properly marked as to contents.
Minimization	**Incineration:** Used oil and used oil containers can be incinerated. **Recycle:** Recycling of used oils into the crude oil production system is a potential method, subject to review. Other recycling may become available through local refiners. **Reduction:** Review processes to evaluate the effectiveness of current materials used to ensure maximum efficiency is obtained prior to changing oils and lubes.
Tracking	Waste Management Area and Facility Operators will track and submit records of amounts recycled or incinerated to HSE Group monthly.
Disposal method	• **Incineration on site or at authorized 3rd Party WM Facility** • **Recycle**. Used oils may be injected into the crude oil stream, subject to transport company considerations. Third-party recycling may also be available at local refinery.

TIRES

Waste generating process	**Vehicles - Auto Shop** and **Heavy Equipment**
Classification	Non-restricted
Handling	Wear standard PPE (i.e., hard hat, steel-toed shoes/boots, safety glasses/goggles), potentially supplemented with leather gloves when handling this waste.
Storage	Bulk storage in an appropriate location at job site or store in the WMA ready for shredding. Steps should be taken to ensure that stored tires do not collect water and form a habitat for mosquitoes.
Labeling	N/A
Minimization	**Reuse.** Where possible, use tires for bumper guarding, etc. Project to review annually for waste reduction efforts. Monitor tire pressure regularly to maximize service life.
Tracking	Waste Management Area operator to keep records of tires delivered to the WMA. Provide monthly reports to HSE Environment Group.
Disposal method	**Recycling-** Seek proper third-party recyclers **Incineration**.- Some commercial incinerators may be able to incinerate limited amounts..

TOP SOIL AND VEGETATION

Waste generating process	Clearing and Grubbing
Classification	Non-restricted
Handling	Wear standard PPE (i.e., hard hat, steel-toed shoes/boots, safety glasses/ goggles) when handling this material. PVC plastic-containing materials should not be incinerated.
Storage	Stockpiled and protected from wind and water erosion, as well as from contamination.
Labeling	Not Applicable
Tracking	Not Applicable
Minimization	• Only clear the area required for safe operations. • Only grub when necessary. • Make material available to the local population for building materials and fuel. • Chip small trees and brush and use as soil amendment, as bulking agent for composting, or for erosion mitigation over areas to be reclaimed.
Disposal method	Topsoil, overburden, and low-quality materials should be properly removed, segregated, stockpiled near the site, and preserved for rehabilitation

UNUSED, SPENT, EXPIRED, AND CONTAMINATED SOLVENTS, CHEMICALS, AND ADDITIVES

Waste generating process	**Parts Cleaning -** Vehicles, liquid-cooled engines, dehydrators in vehicles **Hydrocarbon Based Detergents** **Machine/ Maintenance Shops**
Classification	Restricted
Handling	Avoid skin contact or ingestion. Wear standard PPE (i.e., hard hat, steel-toed shoes/boots, safety glasses/ goggles), potentially supplemented with disposable coveralls, chemically resistant gloves, chemically resistant apron, and/or activated carbon equipped breathing protection device when handling this waste. Drums containing waste glycol/antifreeze should be transported in over-packs or equivalent device that provides secondary containment.
Storage	Collect in labeled plastic or metal drums placed at designated/strategic locations. Store in closed, properly labeled metal or plastic drums with adequate secondary containment located within the designated restricted waste storage facility/area at camp/job site. **Drums / Containers:** Spent fluids shall be stored in drums or containers awaiting disposal.
Labeling	Drums shall be properly labeled as to contents and warning labels.
Waste minimization	**Recycle:** Recycle and recovery through production systems? **Reduction:** Personnel shall ensure that the materials are fully used before generating as a waste. Waste stream to be reviewed annually by appropriate supervisory personnel.
Tracking	Waste Management Area and Facility Operators to keep records of quantities recycled or incinerated and submit these monthly to HSE Group.
Disposal method	**Recycle**. Hydrocarbon-based products may be injected into crude oil stream, subject to transport company considerations. **Incineration:** Some waste streams, including their containers may be incinerated via incineration at an authorized 3rd party commercial waste disposal facility.

ATTACHMENT D: Sample Waste Tracking Form

Waste Manifest Form

PART A - Generator												
Responsible Facility	□					□						
	□					□						
Source Site Location												
Waste Description	Waste Code	NH of H	Class	Quantity Shipped	Units	Container		Hand Code	Receiver Use Only (PART C)			
						No.	Type		Quantity Received	Units	Hand Code	
Intended Receiver	□ Project Landfill			□			□		□			
	□Other (not Listed, include full address)											

Certification:	*I declare that the information I have provided in Part A is correct and complete.*	
Name (Print):	**Signature:**	**Date (dd/mm/yy):**
Phone:	**Fax:**	**24-hr Emergency:**

PART B - Transporter	
Company:	□ Approved Contractor #1, City, Name:
	□ Approved Contractor #2, City, Name:
	□ Approved Contractor #3, City, Name:
	□ Other: Company Name:
	Address (Street, City, Province, Code)

Certification:	*I declare that I have received wastes as described in Part A for delivery to the intended Receiver and that the information in Part B is correct and complete.*	
Name (Print):	**Signature:**	**Date (dd/mm/yy):**
Phone:	**Fax:**	**24-hr Emergency:**

PART C – Receiver (also see Part A above)

Receiving location:	□ Project	□	□	□
	□ Other (not listed, include full address)			

Date Received:	**Intended Receiver:** (See Part A)	□ Yes	□ No

Discrepancies between Waste Received and Part A (use attachments as necessary)

Certification:	*Except for the discrepancies noted above, I declare that I have received wastes as described in Part A and that the information in Part C is correct and complete.*	
Name (Print):	**Signature:**	**Date (dd/mm/yy):**
Phone:	**Fax:**	**24-hr Emergency:**

PART D - Generator

Explanation of Discrepancies Noted by Receiver (if any) / Corrective Actions Taken (use attachments as necessary)

Name of Authorized Person (Print):	**Signature:**	**Date:**	**Phone:**

ATTACHMENT E: Point Source Emissions Limits

High Temperature Incinerator Point Source Emissions Limits*

Air Pollutant	Emission Limitation**
Cadmium	0.004 milligrams per dry standard cubic meter
Carbon Monoxide	157 parts per million by dry volume
Dioxins/furans (toxic equivalence basis	0.41 nanograms per dry standard cubic meter
Hydrogen chloride	62 parts per million by dry volume
Lead	0.04 milligrams per dry standard cubic meter
Mercury	0.47 milligrams per dry standard cubic meter
Opacity	10 percent
Oxides of nitrogen	388 parts per million by dry volume
Particulate matter	70 milligrams per dry standard cubic meter
Sulfur dioxide	20 parts per million by dry volume

* US EPA 40 CFR Part 60 – Standard of Performance for New Stationary Sources (NSS Subpart CCCC – Standards of Performance for Commercial and Industrial Solid Waste Incineration Units.

** All emission limitations (except for opacity) are measured at 7 percent oxygen, dry basis at standard conditions.