CEFE F. VALENZUELA LANDFILL
CITY OF CORPUS CHRISTI

CORPUS CHRISTI, TEXAS

NUECES COUNTY

Part IV
SITE OPERATING PLAN
(CHAPTER 330.D, TITLE 30, TEXAS ADMINISTRATIVE CODE)

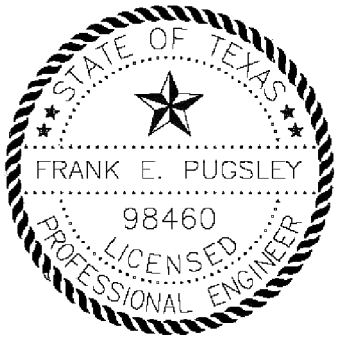
TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

MSW PERMIT NO.: 2269

Applicant:

CITY OF CORPUS CHRISTI
SOLID WASTE SERVICES DEPARTMENT
2525 HYGEIA STREET
CORPUS CHRISTI, TEXAS 78415

REVISED: JULY 2013



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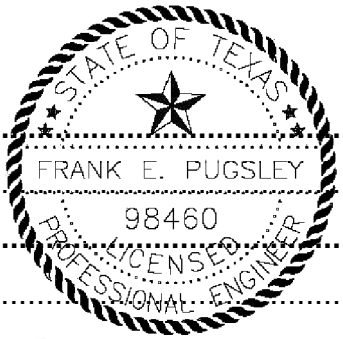

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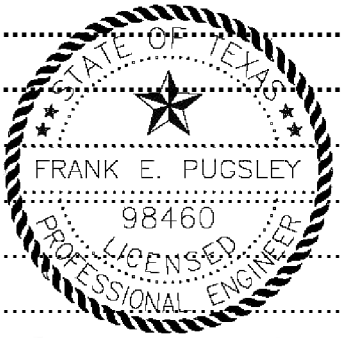

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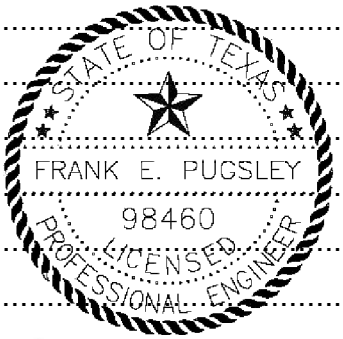

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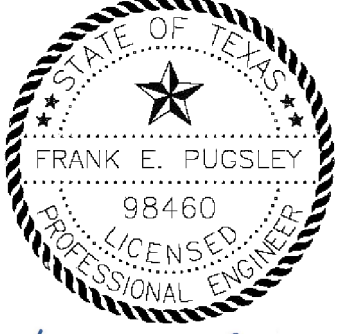

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1. Introduction

The City of Corpus Christi's Cefe F. Valenzuela Landfill (Facility), Municipal Solid Waste Permit 2269, is located in Nueces County, 14 miles southwest of Corpus Christi's City Hall, at the intersection of Farm to Market 2444 and County Road 20. The coordinates and elevation are: Latitude 27° 38' 12" N, Longitude 97° 34' 05" W, and Elevation 46.07 feet above mean sea level (MSL).

The Cefe F. Valenzuela landfill property covers 2,273.59 acres. The layout will include the construction of two Type I municipal solid waste landfill units, which combined measure approximately 810 acres.

This Site Operating Plan (SOP) is a modification to the currently approved permit 2269, and is designed to bring the SOP into conformance with rule changes that became effective in March 2006 by the Texas Commission on Environmental Quality (TCEQ).

The landfill is owned by the City of Corpus Christi (City). The City is responsible for day-to-day landfill operations using both contract operators and City personnel,

This Site Operating Plan (SOP) is intended to provide guidance from the design engineer to the site management and operating personnel. It will facilitate site operations in compliance with applicable TCEQ regulations and current standards of practice in the industry, compatible with the design of the facility. This Plan will serve as a reference source and is to be used as a training tool for landfill personnel. The contents of this SOP are consistent with the current permit and its supporting documents, except for portions which revisions are necessary to comply with the current SOP rules. The intent of this modified SOP is to provide additional detailed information as required under Subchapter D of 30 TAC §330.

1.1. Description of On-Site Facilities

The facility includes an approximately 810 acre Type I MSW disposal area which will be developed in several phases as described in the Site Development Plan. Several buildings will be located on site to serve several functions including an administrative building, maintenance building, scale and scale house and other facilities to service the landfill's operations.

The facility will also include infrastructure (pumps, pipes, valves, etc.) to allow Enhanced Leachate Recirculation (ELR)—collection, storage, and reintroduction of leachate to the waste mass, as well as injection of other allowable liquids.

2. Recordkeeping Requirements

To be compliant with the recordkeeping requirements of 30 TAC § 330.125, the City of Corpus Christi keeps an organized library consisting of a copy of the facility permit, the site development plan, the site operating plan, the final closure plan, the landfill gas management plan, and any other plans required by permit along with all issued modifications, and any temporary authorizations granted. The table below lists the filing location of the records, areas/groups, document type, and site location of the records.

Table 2.1: Recordkeeping Requirements

Document Type	Site Location of Records	Frequency of Submittal to Site Operating Record (see Note 1)	Regulatory Reference
Landfill Permit	Landfill Office	Permit Application — no additional submittals required	§330.125(a)
Site Development Plan	Landfill Office	Permit Application — no additional submittals required	§330.125(a)
Site Operating Plan	Landfill Office	Permit Application – no additional submittals required	§330.125(a)
Final Closure Plan	Landfill Office	Permit Application — no additional submittals required	§330,125(a)
Post-closure Maintenance Plan	Landfill Office	Permit Application --- no additional submittals required	§330.125(a)
Landfill Gas Management Plan	Landfill Office	Permit Application — no additional submittals required	§330.125(a)
Location Restriction Demonstrations	Landfill Office	Permit Application — no additional submittals required	§330,125(b)(1)
Inspection Records	Landfill Office	Within 7 working days of day completion	§330.125(b)(2)
Training Procedures	Landfill Office	Annually	§330.125(b)(2), §330.125(f)

Notification procedures relating to excluding the receipt of prohibited waste	Landfill Office	As required	§330.125(b)(2)
Gas Monitoring Results and Remediation Plans	Landfill Office	Quarterly	§330,125(b)(3)
Leachate or Gas Condensate placement and unit design documentation	Landfill Office	As constructed	§330.125(b)(4)
ELR Records	Landfill Office	Per Occurrence	See Appendix IV-E for ELR Reports
Groundwater Monitoring documentation	Landfill Office	Quarterly / Semiannually	§330.125(b)(5)
Closure and Post-closure Care Plans and related data	Landfill Office	Permit Application — no additional submittals required	§330.125(b)(6)
Cost Estimates and Financial Assurance Documentation	Landfill Office	Annually	§330.125(b)(1)
Compliance with small community exemption criteria	N/A	N/A	§330,125(b)(8)
Copies of correspondence relating to the operation of the facility	Landfill Office	As required	§330.126(b)(9)
Copies of correspondence relating to modifications to the permit, approbals of matters	Landfill Office	As required	§330,125(b)(9)
Documentation of receipt of any special wastes	Landfill Office	As required	§330,125(b)(10)
Records of spray-applied ADC	Landfill Office	As required	§330.125(b)(11)
Other documents	Landfill Office	As required	§330.125(b)(12)

Note 1: All documentation and data will be placed in the Site Operating Record within 7 days of completion or receipt of data, as appropriate

Disclosure Statement: "In addition to the records mentioned above, the City of Corpus Christi reserves the right to add more documents to the library in order to optimize the landfill operations. If the City of Corpus Christi decides to add documents to the document library then the table listing the filing location of the records, areas/groups, document type, and site location of the records will be updated and added to Section 1 of the SOP."

All information contained in the SOP records will be furnished to the TCEQ upon request and will be made available at all reasonable times for inspection.
The operating record as described in this section, plus any other related operational plans, or documents will generally be maintained at the landfill office.

2.1. Breach Related Reporting & Records

In the event of an access breach, notice will be given to the TCEQ's regional office to document when a breach has been identified and when a repair is completed, if a repair is necessary, and if the repair is not completed within eight hours, The TCEQ's regional office will be notified of the breach within 24 hours of detection. The breach will be temporarily repaired within 24 hours of detection and will be permanently repaired by the time specified to the TCEQ regional office when it was reported in the initial breach report. If a permanent repair can be made within eight hours of detection, no notice Will be submitted. A copy of these notices will be retained in the operating record in accordance with 330.131(b)(9).

2.2. Fire Incident Reporting & Records

After any waste related fire occurs on-site that cannot be extinguished in ten minutes, the City will contact the TCEQ regional office. The notification will include: contact by telephone as soon as possible, but no later than 4 hours following fire

discovery, and a written description of the cause and extent of the fire and the resulting fire response within 14 days of fire detection.

The following agencies or personnel will be contacted:

- Fire — 911
- Landfill Manager — Landfill Office
- TCEQ Regional Office

2.3. Final Cover Reporting and Records

As final cover is applied to the landfill, a log will be maintained of area covered, date applied, thickness and activities and management practices. Any damage to the cover, including anticipated repairs will be reported to the TCEQ and repaired within five days.

2.4. Waste Inspections and Unauthorized Waste Reporting

The Landfill Manager will maintain and include in the site operating record the following reports: (1) load inspection reports, (2) records of regulated hazardous or PCB waste notifications, and (3) personnel training records. The report will include the date and time of the inspection, the name of the hauling company and driver, the type of vehicle, the size and source of the load, contents of the load, indicators of prohibited waste and the results of the inspection. A record of any removal of unauthorized material will be maintained in the site's operating record.

2.5. Long Term Record Keeping

The City will retain all information contained within the Operating Record and the different plans required for the facility for the life of the facility including the post-closure care period. Once the landfill closes, the records will be maintained at the Department of Solid Waste Services.

2.6. Groundwater Evaporation Ponds

Operations of dewatering activities using evaporation ponds may be present during and after cell construction. Inspections of the ponds will be conducted monthly to ensure perimeter berms are intact, in good condition and functioning to contain

evaporation waters within the pond areas. Documentation of the inspections will be included with inspection records. Inspections of the ponds when not in use, removed or relocated will be noted as part of the inspection procedure and record.

3. Waste Acceptance Rates

As per the waste acceptance rate requirements of 30 TAC 330.125(h) and 330.675, the City of Corpus Christi is required to perform quarterly reporting to the TCEQ. The waste acceptance rate monitoring is intended to ensure that the facility's operations continue to be adequate when waste acceptance rates increase. Whenever the annual waste acceptance rate as established by the sum of the previous four quarterly summary reports exceeds the annual waste acceptance rate estimated in the permit application, and the waste increase is not due to a temporary occurrence, the City of Corpus Christi will file an application to modify the permit within 90 days of the exceedance. Once the 0quarterly waste acceptance rates are calculated then an average annual waste acceptance rate will be calculated. Data will be generated from actual scale data. The average is based on quantities accepted at the landfill divided by the actual number of operating days waste is accepted during the reporting period.

If an exceedance of the annual waste acceptance rate occurs, the following provisions of the SOP will be evaluated and modified as necessary.

- Number of operating personnel
- Number and types of equipment
- Waste compaction procedures
- Odor prevention plan and control
- Unloading of waste procedures
- Waste screening procedures
- Control of windblown waste and litter
- Soil management, placement, and compaction of daily, intermediate and final cover
- Other SOP provisions, as necessary

3.1. Projected Waste Acceptance Rates

The table below presents a projection of estimated waste acceptance rate based on an assumption that after 2010 the waste accepted per year will increase at 1.5% per year.

Projected Waste Quantities shown in Table 3.1 are consistent with the previously approved permit for the Cefe F. Valenzuela Landfill.

Table 3.1: Projected Waste Quantities

Year	Tons/Year	Tons/Day	Annual % Increase
2003	428,127	1385	
2004	441,196	1427	3.0
2005	449,446	1454	1.9
2006	426,420	1380	-5.1
2007	432,816	1401	1.5
2008	439,309	1422	1.5
2009	445,898	1443	1.5
2010	452,587	1465	1.5
2011	459,375	1487	1,5
2012	466,266	1509	1.5
2013	473,260	1532	1.5
2014	480,359	1555	1.5
2015	487,564	1578	1.5
2016	494,878	1602	1.5
2017	502,301	1626	1.5
2018	509,836	1650	1.5
2019	517,483	1675	1.5
2020	525,245	1700	1.5
2021	533,124	1725	1.5
2022	541,121	1751	1.5
2023	549,230	1777	1.5
2024	557,476	1804	1.5
2025	565,838	1831	1.5

* Based on a 309 day year and annual population growth of 1.5%. Quantities for 2003 to 2006 are based on City records.

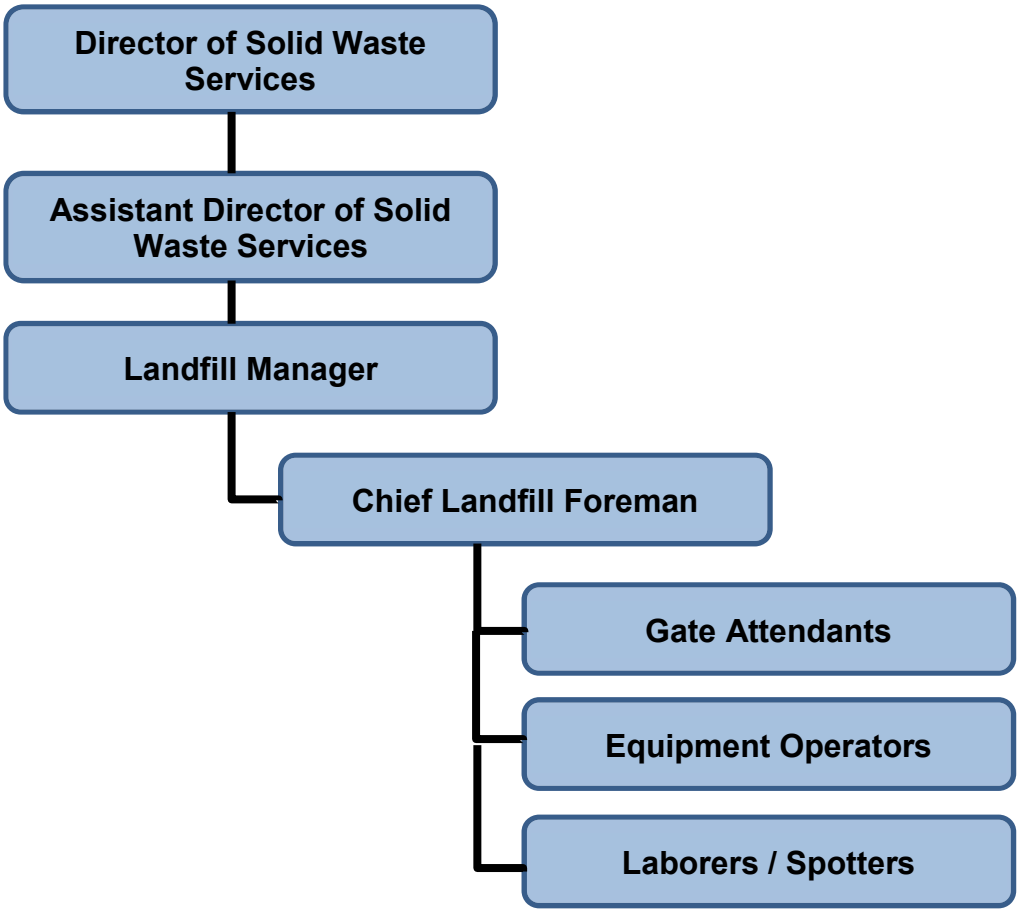
To determine if the projected waste quantity has been exceeded, each year the previous four quarterly waste quantities (calculated) will be compared to the projected waste quantities in Table 3.1.

4. Types of Landfill Personnel

4.1. Organizational Chart

The figure below represents the Cefe F. Valenzuela Organization Chart.

Figure 4.1: Landfill Organization Chart



The City may contract with private entities to perform certain activities at the landfill. The City understands it is responsible for all regulatory requirements of the permit regardless of whether the contractor is responsible for performing specific duties.

4.2. Key Personnel Job Description

The City of Corpus Christi is required to provide a job description for each position held by key personnel on site. The list below presents a description for each key position listed in the Cefe F. Valenzuela Landfill Organizational Chart.

Director of Solid Waste Services:

The Director of Solid Waste Services (SWS) is ultimately responsible for the overall site management. The contact person for matters related to regulatory compliance is the Director of SWS.

Assistant Director of Solid Waste:

The Assistant Director of Solid Waste directs and oversees the overall management and operation of the Solid Waste Services Department. The Assistant Director is responsible for the following:

- conducts short and long term planning associated with the collection and disposal of municipal waste;
- supports and facilitates the coordination and scheduling of personnel, materials and equipment;
- prepares and oversees the department division operating budget, capital outlay, revenues, and fiscal programs;
- prepares written reports, documentation, technical data/reports, agenda memoranda on various solid waste issues; and
- prepares and delivers oral presentations on the Division's aspects of Solid Waste Services operations.

Landfill Manager:

Under the general direction of the Assistant Director of Solid Waste Services, the Landfill Manger administers the facility's SOP. The Landfill Manager is responsible for assuring that adequate personnel and equipment are available to provide efficient and compliant operations in accordance with the Site Development Plan (SDP), the SOP, and the TCEQ rules and regulations. The Landfill Manager will serve as the emergency coordinator during all site emergencies. The duties of the Landfill Manager may be assigned to a qualified alternate individual in the event the Landfill Manager is away from the facility. The landfill manager's qualified designee, who must be an employee from a position shown on the organizational chart and who must have the equivalent training as the Landfill Manager shall act on behalf of the Landfill Manager with the same authority and responsibilities required for that position. In addition, the Landfill Manager may conduct random inspection of vehicles for prohibited wastes.

Chief Landfill Foreman:

The Chief Landfill Foreman monitors landfill operations which include: environmental activities such as management of leachate, condensate, methane collection, and methane flaring; supervisions and monitoring landfill personnel and equipment; and scheduling and managing services for equipment and vehicles.

Gate Attendants:

The Gate Attendants' primary responsibility is to visually inspect the waste loads for unauthorized wastes and maintain complete and accurate records of loads rejected. The Gate Attendants will also direct traffic at the entry gate to the landfill to assure a steady flow of traffic and minimize the possibility of any potential traffic accidents. In addition, Gate Attendants may conduct random inspection of vehicles for prohibited wastes.

Equipment Operators:

The equipment operators are responsible for the safe operation of both light duty and heavy equipment, which is required to operate the landfill. These employees are responsible for being alert for potentially dangerous conditions, including careless and improper actions of other employees and other authorized persons at the site. The equipment operators general area of responsibilities includes, but is not limited to, overseeing unloading of waste from vehicles; detecting the presence of unauthorized waste, general site maintenance, construction activities, litter abatement, and site clean up. The equipment operators will intervene as necessary to prevent accidents and report unsafe conditions immediately to the Landfill Manager and for designee. In addition, Equipment Operators may conduct random inspection of vehicles for prohibited wastes.

Laborers/Spotters:

Landfill laborers are responsible for overall site maintenance including litter pick up, general site maintenance, and, in certain instances, waste screening. Some, but not all, laborers on site will be trained to conduct waste screening.

4.3. Key Personnel Minimum Qualifications Criteria

The City of Corpus Christi is also required to provide a description of the minimum qualifications for each position held by key personnel located on site, including City and current contractor personnel. The following Table 4.1 shows minimum personnel training and qualifications.

Table 4.1: Personnel Types and Descriptions

Position	Training
Director of Solid Waste Services*	Must hold and maintain MSW Supervisor Occupational license Grade A or be able to obtain one within one year of hire. Minimum of five years' experience in the field of solid waste management.
Assistant Director of Solid Waste Services*	Must hold and maintain MSW Supervisor Occupational license Grade A or be able to obtain one within one year of hire. Minimum of five years' experience in the field of solid waste management. Complete training in site safety, fire protection and waste screening.
Landfill Manager**	Must hold and maintain MSW Supervisor Occupational license Grade C within 1 year of hire. Minimum three years solid waste or related regulatory experience. Complete training in site safety, fire protection.
Chief Landfill Foreman	Must hold and maintain MSW Supervisor Occupational license Grade C within 1 year of hire. Complete training in site safety, fire protection.
Gate Attendant	Waste screening training, 40-hour HAZWOPR within 1 year of hire.
Equipment Operator	Waste screening training, 40-hour HAZWOPR within 1 year of hire.
Laborer/Spotter	Waste screening training, 40-hour HAZWOPR within 1 year of hire.

*These personnel will have other duties within the department.
**The Landfill Manager's designee must possess a license (Class A, B, or C) issued in accordance with Chapter 30, Subchapter F.

The City does intend to periodically contract with private firms to operate portions of the landfill. Private operators must demonstrate qualifications criteria for equivalent positions described in this section.

The table below lists the types and required staff as a function of the waste acceptance rates. The intention of this projection is to make sure that enough qualified personnel are present for the varying levels of waste acceptance.

Table 4.2: Landfill Disposal Operations Staffing Requirements

Personnel	1 -1000 TPD	1001— 2000 TPD	2001 -3000 TPD	3001 -4000 TPD
Director of Streets and Solid Waste	1	1	1	1
SSW Assistant Director	1	1	1	1
Landfill Manager	1	1	1	1
Chief Landfill Foreman	1	1	1	1
Equipment Operators	3	3	4	4
Gate Attendants	2	3	3	4
Laborers/Spotters	3	4	5	6

5. Types of Equipment

As per the "Types of Equipment" requirements of 30 TAC §330.127(2), the City of Corpus Christi is required to list and discuss in the SOP the description, sizes, types, numbers, and functions of the equipment to be used at the facility.

The City's contractor is required to handle the incoming waste after it has been accepted and screened by the City. The waste will be pushed to the proper location and compacted to achieve the desired density and waste elevations. The contractor is also responsible for covering the waste at the end of the day.

The table below lists the types of equipment used in day-to-day operations according to the waste acceptance rate. The intention of this list is to anticipate the amount of equipment necessary in the event that an increase in waste acceptance occurs.

Table 5.1: Minimum Equipment per Waste Acceptance Rate

Equipment	1-1000 TPD	1001 -2000 TPD	2001-3000 TPD	3001 —4000 TPD
Landfill Compactor > 100,000 lbs	2	2	2	3
Bulldozers CAT D6 or Equivalent	2	3	3	4
Excavator 180 hp or equivalent	1	1	1	1
Articulating Truck CAT 725 or equivalent	2	2	3	3
Motor Grader 145 hp or equivalent	1	1	1	1
Front End Loader 140 hp or equivalent	1	1	1	1
Tractor Mower	1	1	1	1
Pickup Truck (various models)	2	2	2	3
Fuel Truck	1	1	1	1
Water Truck 1000 gallon or equivalent	1	1	1	1
Water Pump	1	1	1	1

The following generally describes the functions of the heavy equipment listed in Table 5.1 above.

- Dozer/loader — removing, replacing, moving daily and intermediate cover soils; repair levees and berms, building and repairing roads
- Excavator — general excavation work; excavating for cover soil (daily and interim)
- Dump trucks — transporting cover soil
- Compactor — compacting waste and cover
- Water truck — dust control; transporting leachate; supplemental watering

- Scraper —moving gravel and soils for daily and intermediate cover soils, levees and berms.
- Motor grader — building and repairing on-site roads and drainage features
- Tractor Mower — site maintenance, grass cutting
- Water Pump — operating leachate collection and recirculation system and for managing areas where water ponding may occur on the site.

Disclosure Statement

"In addition to the above list, miscellaneous pickups, vans, and other light utility vehicles as well as various pumps, instruments, and safety and training equipment will be on-site as necessary for operational efficiency. At infrequent times, such as during equipment breakdown or periodic maintenance, some pieces of equipment may not be immediately available."

6. Personnel Training

As per the "Personnel Training" requirements specified in 30 TAC § 330.127(4), the City of Corpus Christi is required to provide training and keep track of the personnel training records necessary to ensures the facility's compliance with rule requirements. Training and safety meetings will be scheduled at least once per month. If a regularly monthly meeting is cancelled, it shall be rescheduled or combined with the scheduled training the following month. Records of personnel attending each training session and the topics covered will be maintained at the site. The training will be provided by qualified personnel.

Topics for training may vary each month but must be conducted at least annually for

1. Fire protection, prevention and evacuation
2. Fire extinguisher use
3. Asbestos waste management
4. Emergency response
5. Litter control and windblown waste pick-up
6. Hazardous waste management and PCB waste detection and control
7. Prohibited waste management

8. Properties of methane gas and safety procedures for methane gas
9. Additional training for job specific activities as needed
10. Safety
11. Random inspection procedures

Facility personnel must take part in an annual review of their training in accordance with 335.586 (c).

The Landfill Manager will review each employee on an annual basis to see that adequate training is held to maintain the required licenses and that training in site safety and waste screening is provided at least annually. As per 30 TAC 335.586(a)(2), the training program will include — at minimum — procedures for using, inspecting, repairing, and replacing facility emergency and monitoring equipment; communications or alarm systems; response to fires or explosions; response to ground-water contamination incidents; and shutdown of operations.

7. Detection and Prevention of Disposal of Prohibited Waste

As per the "Detection and Prevention of Prohibited Waste, Hazardous Waste, and PCBs" requirements specified in 30 TAC §330.127(5), the City of Corpus Christi is required to have a protocol to exclude prohibited waste, including hazardous waste, PCBs, and waste listed in §330.15(e).

Prohibited waste includes but is not limited to lead acid batteries, used motor vehicle oil, used-oil filters from internal combustion engines, whole used or scrap tires, items containing chlorinated fluorocarbons (CFCs) unless all the CFCs contained within the item have been properly managed, liquid waste as defined in 30 TAC §330.3 (relating to definitions), regulated hazardous waste as defined in 30 TAC §330.3 (relating to definitions), polychlorinated biphenyl (PCB) waste, as defined under 40 Code of Federal Regulations Part 761, and radioactive material as defined in 30 TAC §336.

7.1. Control of Incoming Waste

Incoming waste will be controlled in three ways to preclude the inadvertent receipt of prohibited wastes.

First Level of Control consists of informing the customers that make inquiries via phone or in person of the types of waste accepted at the landfill. Screening of waste will also take place at the transfer station prior to waste from this location being hauled to the landfill.

Second Level of Control consists of informing key personnel at the landfill of the typical characteristics of these prohibited wastes. Key personnel will be trained according to the "Personnel Training" requirements listed in Section 6 of this SOP. Personnel from both the City of Corpus Christi and the current contractor are instructed to contact the Landfill Manager or his designee on duty if prohibited material is detected anywhere on site.

Third Level of Control will be provided by the Landfill Manager, Gate Attendants, and Equipment Operators. Random inspections of a certain percent of vehicles entering the landfill will be made daily at the gate by landfill site personnel listed above. The percent of randomly inspected vehicles will vary according to special events and circumstances. However, at least one vehicle per day shall be randomly inspected. The daily random inspections will be filed in the Site Operating Record.

Fourth Level of Control will be provided by the Landfill Manager, and/or other qualified personnel at the working face. Random inspections of a certain percent of vehicles at the working face will be made daily by current contractor personnel; the percent of randomly inspected vehicles will vary according to special events and circumstances. However, at least one vehicle per day shall be randomly inspected from the working face. Trucks will be selected via a random number sheet identifying the number of trucks entering the site each day before the random inspection(s) will be conducted. The daily random inspections will be filed in the Site Operating Record.

If there is an incident involving the receipt or disposal of regulated hazardous waste or PCB waste at the landfill, the ED and any local pollution agency with jurisdiction will be notified within two days of discovery, as required by §330.127(5)(D).

Personnel shall be trained on an on-the-job basis by their supervisors related to acceptable and unacceptable wastes. Records of employee training on prohibited

waste control procedures shall be maintained in the facility operating record. The personnel shall be trained to look for the following indications of prohibited waste:

- Yellow hazardous waste on PCB labels
- DOT hazard placards or markings
- Liquids
- 55-gallon drums
- 85-gallon overpack drums
- Powders or dusts
- Odor or chemical fumes
- Bright or unusual colored wastes
- Sludges

7.2. Protocol for Random Waste Inspections

The random inspections will be performed daily at the entry point to the landfill and at the working face. The purpose of the random inspections is to detect prohibited waste, hazardous waste, and PCBs that could potentially enter the site concealed within loads of authorized waste. The selection of loads for random inspection will exclude only waste in transfer vehicles that has already been screened.

All other vehicles will be included in the pool of loads for random waste inspections. However, if at any time an excluded vehicle outside the pool is found to have suspicious waste within a load, the exemption status of that vehicle will become null and void, thereby subjecting it to random waste inspection consideration.

STEPS FOR RANDOM WASTE INSPECTION

Step One Direct the selected vehicle to the designated random waste inspection site.

Step Two Qualified Personnel will inspect the load searching for signs of prohibited waste, hazardous waste, and PCB's that could potentially enter the site concealed

within loads of authorized waste. The personnel performing the random waste inspection reserves the right to ask the driver to completely empty the load for a thorough examination.

Step Three The results from the random waste inspections loads will be recorded in the Site Operating Record.

Step Four In the event that a prohibited waste, hazardous waste, or PCB waste is detected then the waste must be managed in accordance with Section 7.3 or 7.4 of this SOP.

7.3. Management of Prohibited Wastes, Hazardous Wastes, and PCB's detected at the Entry Point of Cefe Valenzuela Landfill

If a prohibited waste is discovered at the entry point of the landfill, the gate attendant shall immediately notify the Landfill Manager or its designee of the situation. The driver shall he advised that the waste cannot be accepted and where the waste may be disposed of legally. He or she shall be responsible for the proper disposal of this rejected waste. Gate attendants will complete a waste screening form indicating that the load carried a suspected unauthorized waste. The waste screening report will be entered in the Site Operating Record.

7.4. Management of Prohibited Wastes, Hazardous Wastes, and PCBs detected at the Working Face

If a prohibited waste is discovered at the working face, personnel at the working face shall immediately notify the Landfill Manager or designee of the prohibited waste location and actions taken. Prohibited wastes that are not discovered until after they have been unloaded shall be returned to the vehicle that delivered the waste. The driver shall be advised where the waste may be disposed of legally and he or she shall be responsible for the proper disposal of this rejected waste. Personnel at the working face or other personnel assigned by the Landfill Manager or designee will complete a waste screening form indicating that the load carried a suspected unauthorized waste. The waste screening report will be entered in the Site Operating Record, In the event that the unauthorized waste is not discovered until after the

vehicle that delivered the waste is gone, the waste shall be segregated and controlled as necessary. An effort shall be first made to identify the entity that deposited the prohibited waste and have them return to the site and remove the waste. In the event that identification is not possible, the Landfill Manager will notify the TCEQ and seek guidance on how to dispose of the waste as soon as possible. The Landfill Manager or designee will enter the incident in the Site Operating Record.

7.5. Large Items Containing CFCs

Large items containing CFCs will be kept separate from the working face. A licensed contractor will be responsible for removing CFCs in accordance with 40 CFR §82.156(f). Once CFCs are removed, the appliances can be either recycled or disposed as a large item in accordance with procedures defined in section 17.0 of this SOP.

8. Fire Protection Plan

As per the "Fire Protection" requirements specified in 30 TAC § 330.129, the City of Corpus Christi is required to have fire protection procedures in place to protect the safety of the employees, protect the environment, and minimize damage to the integrity of the site and structures.

8.1. Preventive Actions

The following steps must be taken by designated landfill personnel as precautionary measures to prevent fires:

- Landfill personnel will take the necessary steps to prevent facility access to wastes that might present a fire hazard
- Fuel spills must be contained and cleaned up immediately
- No smoking will be allowed in prohibited areas and other areas that have not been specifically designed for smoking
- A stock pile of soil will be kept at the working face to be used as a fire control measure in case a fire occurs in the working face or adjacent areas.

The open burning of solid waste, except for the infrequent burning of waste generated by on-site land cleaning operations or emergency clean-up operations as authorized by the TCEQ is prohibited at the site.

Unattended landfill equipment will not remain in the active area of the site overnight. Additionally, fuel spills will be contained and cleaned-up in a timely fashion.

Dead trees, brush or heavy vegetation will be moved at least 100 feet from the limits of the waste, and grass and weeds around the limits of waste will be moved so that forest, grass or brush fires cannot spread to the landfill.

8.2. Fire Protection Training

All employees shall receive fire protection training regarding the provisions of this Fire Protection Plan. A review of fire control measures for all landfill personnel shall be conducted on an annual basis. At a minimum, each landfill employee shall receive training regarding the following:

- Fire prevention
- Procedures to follow to respond to fires
- Firefighting techniques
    - The use and limitations of fire extinguishers
    - When and whom to contact in case of an emergency
    - Other methods for fire control and prevention

8.3. General Rules for Fire incidents

- Contact the Fire Department by calling 9-1-1. The City's Fire Department is approximately 3.5 miles away and ready to respond if necessary.
- Alert other facility personnel.
- Assess the extent of fire, possibilities for the fire to spread and alternatives for extinguishing the fire.

- Proceed to attempt to contain or extinguish the fire only if it appears that the fire can be safely extinguished with available firefighting devices and personnel.
- Do not attempt to fight a fire alone; always wait for back up personnel to arrive.
- Do not attempt to fight a fire without adequate personal protective equipment.
- Upon the arrival of the Fire Department, direct Fire Fighting personnel to the fire and inform them of the actions taken.

8.4. Specific Fire Fighting Actions

- If a fire occurs on a vehicle or piece of equipment, then the first step is to bring the vehicle to a safe stop and isolate it. If the situation allows, the vehicle must be parked away from any fuel sources, uncovered solid wastes, personnel and vehicles. Shut off the engine, engage the brake, or use some other appropriate method to prevent subsequent movement of the vehicle.
- If the fire is in the "working face" the burning area should be isolated and contained. Soils should be directly placed on the fire to prevent additional oxygen from feeding the combustion. If this is not possible or is unsafe, then attempt to cover the work face with additional soils, alternate fire mitigation materials or water spray.

A common firefighting method at landfills includes covering the area in question with a significant amount of soil so as to prevent any more oxygen from feeding the combustion. Also, water could be sprayed from the water truck to help extinguish the fire or prevent it from spreading. If a fire is detected early enough, then a small fire may be fought with a hand held extinguisher. Fire extinguishers will be located at the Gatehouse and on each piece of operating equipment.

8.4.1. Stockpiling Fire-Fighting Materials

Generally, the fire-fighting technique that can be quickly employed to fight a landfill fire is smothering with soil. The faster stockpiled soil can be placed over

the fire, the more effective this method will be in controlling and extinguishing the fire. Enough cover soil will be stockpiled within 2,300 feet of the working face as an aid to fighting fires. A typical fire control stockpile is made up of one day's worth of daily cover material. Based on the maximum working face size of 150' by 150', a total of approximately 417 cubic yards of soil will be available within 2,300 feet. This amount of soil will vary depending on the quantities of waste accepted at the site. Only one area of the landfill will typically be open at any given time. During wet weather conditions, a wet weather operating area will be maintained, but the normal working area will not be open at that time. During cell transition periods, it may be necessary to operate two areas at the same time. This will be a short-term condition. Trained staff will be located at both areas.

Each quarter, the Landfill Manager will evaluate waste acceptance at the site, and based on the largest quantities accepted per day, establish a stockpile quantity for the next quarter. The calculation will be made by multiplying the active working face area times .5 feet (cover thickness) divided by 27 cubic feet to determine cubic yards of stockpile. The landfill water truck will also be available on-site for firefighting.

Sufficient equipment is available on site to provide a minimum of six inches of soil over the working face in the event of a fire; however, this is not always deemed to be the most appropriate method for fire control. Under most circumstances, when the fire is limited to a small area of the site, material that is on fire will be removed from the working face to limit the size of the fire. Once removed, the fire can be extinguished using soil, fire extinguishers, or water from the water truck. If the fire becomes too large for control using these methods, the fire department will be notified immediately. Below is a calculation of the City's ability to place six inches of material over the maximum working face of 150' x 150'.

Calculation Assumptions:

Amount of soil required = surface area (150'x150') * cover thickness (.5') = 417 cubic yards

20 cubic yards per load (average) = 20.85 loads (11 per truck)

10 miles per hour average (includes loading and unloading time) — 880 feet / minute

11 loads @ 2,300' * 2 way = 50,600 ft / 880 ft per minute = 57.5 minutes which is less than the required 60 minutes.

The staff will be trained upon hire and annually in fire protection and containment techniques and will be advised of the procedural listing in this document,

Sufficient material will be available for fire prevention and to assist in extinguishing a fire if one should occur. The projected maximum size of the working face will vary with throughput. The working face sizes will be limited to the following sizes under normal site operations. The ranges represent the size of the working face including the wet weather area.

Table 8.1: Maximum Size of Working Face & Wet Weather Area

Tons per day	Maximum Square Feet of Working Face
1 - 100	2,500
101 - 1,000	10,000
1,001 - 2,000	22,500
2,001 - 3,000	40,000

Under normal working conditions, only one area will be allowed for disposal of municipal solid waste. During wet weather conditions, a designated wet weather area will be used. The maximum size of the wet weather area will correspond to the size of the normal working face. A trained employee (equipment operator or spotter) will monitor the working face during disposal operations.

8.5. Operational Activities that Store, Process, or Dispose of Combustible Materials

Fueling Tank Operation: The City of Corpus Christi owns a 10,000 gallon fuel tank used for the fueling of heavy equipment vehicles servicing the landfill and surrounding City properties.

8.6. Fire Fighting Equipment

Facility equipment will include fire extinguishers, a water truck with powered spray capability, earth moving equipment, and a water pump. A fire extinguisher shall be placed at all buildings on site, on each piece of heavy equipment, and at the fueling station. Each extinguisher shall be inspected at least annually and recharged as necessary.

The site will have a bulldozer and earth moving equipment, either a scraper and/or excavator and dump truck, and water pump available for firefighting purposes. The bulldozer will be available for spreading soil over the burning waste and for dispersing any incoming load that is on fire. The scraper or excavator and dump truck will provide cover soils for covering burning waste and for transferring extinguished and cooled loads for disposal. The water truck may be used for dumping or spraying water on fires. The water pump may be used for loading water into the water truck or for pumping water directly onto a fire.

8.7. Hot Loads

Burning waste will not be unloaded in the active area of the landfill. After the gate attendant, equipment operator, or other site personnel have identified signs of a possible load of burning waste or a hot load, the truck will be directed to a pre-designated portion of the landfill away from the working face, fuel areas, and other combustion sources. The waste will be unloaded and the water truck will water down the waste. The bull dozer may smother the fire with soil if the water does not sufficiently extinguish the fire. The waste will then be inspected for signs of fire or hot spots. When the fire has been extinguished and the waste has been cooled, the waste will then be transferred to the landfill active area and disposed.

8.8. Equipment Cleaning

Limited high pressure hot water or steam will be used to remove combustible waste and caked material that can cause equipment overheating and increase the threat of fire. The cleaning will be limited to equipment used primarily on the working face and will be accomplished in an area that was constructed in a manner that is compliant

with Subtitle D requirements. There is no limit on the number of times cleaning can occur.

8.9. Fire Protection Standards

The City of Corpus Christi adopted the "2003 edition of the International Fire Code" as the Fire Prevention Code Section of the City Code of Ordinance.

8.10. Different Types of Fires

The table below describes the four common types of fires and the proper extinguishing agent to use in each case.

Table 8.2: Fire Type and Extinguishing Agent

Fire Type	Characteristics	Extinguisher Type
Class A Fire	Wood, paper, textiles, and other ordinary combustibles.	Class A or ABC Extinguisher: Uses water, water-based chemical, foam, or multi-purpose dry chemical. A strictly Class A extinguisher contains only water.
Class B Fire	Flammable liquids, oils, solvents, paint, grease, etc.	Class ABC or BC Extinguisher: Uses foam, dry chemical, or carbon dioxide, to put out the fire by smothering it or cutting off the oxygen.
Class C Fire	Electrical, live or energized electric wires or equipment.	Class ABC or BC Extinguisher: Uses foam, dry chemical, or carbon dioxide to put out the fire by smothering it or cutting off the oxygen.
Class D Fire	Combustible metals (magnesium, titanium, potassium, etc.)	Class D Extinguisher: Uses dry powder or other special sodium extinguishing agents.

9. Access Control

As per the "Access Control" requirements specified in 30 TAC § 330.131 all municipal solid waste management facilities must control access. The City of Corpus Christi is required to have adequate access control to prevent unauthorized waste disposal.

Public access to the landfill is limited to one main entrance/exit located on CR 20. The Gate Attendants will control access and monitor all vehicles entering and exiting the site.

9.1. Access from Public Road

Access to the site will be controlled at the main site entrance/exit. A site entrance sign is prominently displayed adjacent to the main entrance, There is also a gate located at the entrance to the facility. This gate is locked when the facility is not in operation.

9.2. Vehicle Access

Landfill vehicles and waste vehicles will have access to the active portion of the landfill. All visitor vehicles not related to waste hauling activities are required to sign-in at the gatehouse and are then directed to go to the landfill office to discuss the nature of business with the Landfill Manager. The Landfill Manager reserves the right to accept or deny entry if they feel that the visitor's presence or intended activity might hinder the overall landfill performance.

9.3. All-Weather Access

The main site entrance at CR20 is paved asphalt roadway that transitions into all-weather roads in the interior of the site. Site personnel maintain the caliche roads for all-weather access. The entrance road to the facility from CR20 and interior access roads within the site are all-weather roads. The all-weather road and access area should be constructed of caliche, limestone, concrete or asphalt. A "pad" may be constructed near the disposal area so that vehicles will have maneuverability to dispose of the waste at the working face during wet weather. The materials used for all-weather road construction may be salvaged and reused as the access roads' locations change across the site.

9.4. Traffic Control

The Gate Attendant will restrict site access only to authorized vehicles and will direct the traffic to the corresponding disposal area. Most commercial waste transportation will be weighed at the scales and then directed to the active portion of the landfill. Most non-commercial waste transportation vehicles will be directed where to go by the Gate Attendant or by the different signs placed on site. Site personnel, signs,

and barricades will be used to control traffic flow and to expedite safe movement of vehicles.

9.5. Site Security and Access Control Breach

Site security measures are designed to prevent unauthorized persons from entering the site, to prevent unauthorized disposal, to protect the facility and its equipment from potential damage caused by trespassers, and to prevent disruption of facility operations caused by unauthorized site entry.

If an access breach is detected and the repairs take up to 8 hours after first discovery, then the TCEQ does not need to be notified of the incident. However, the incident will be recorded in the Site Operating Record as a non-reportable incident.

If an access breach is detected and the repairs are anticipated to take more than 8 hours after first discovery, then the TCEQ must be notified of the incident. Furthermore, the incident will be recorded in the Site Operating Record as a reportable incident.

The following table summarizes the repair and reporting requirements for access breaches repaired within 8 hours and not permanently repaired in 8 hours.

Table 9.1: Repair and Reporting Requirements for Access Breaches

Requirements	If an Access Breach occurs and it can be repaired within 8 hours	If an Access Breach occurs and it cannot be permanently repaired in 8 hours
Then, notification to TCEQ regional office of breach and repair schedule...	Is Not required	Is required within 24 hours
Then, temporary repairs must be completed...	Do not apply	Within 24 hours
Then, permanent repairs must be completed...	Within 8 hours	Within the schedule submitted to TCEQ regional office in the initial notice
Then, notification to TCEQ regional office when permanent repair is completed...	Is Not required	Is required within the schedule submitted to TCEQ regional office in the initial notice

9.6. Site Fencing

An appropriate fence will be maintained in areas where natural barriers are not available to prevent public access to the facility. The types, sizes and performance specifications for the fences are listed in table below.

Table 9.2: Fence Specifications

Type of Fence	Performance Specifications	Location of Fence
Galvanized Wire Fence	5 feet high, 14 Gauge, consisting of 2"x 4" Galvanized Wire Fence	Perimeter Fence
Galvanized Wire Fence	8 feet high, 14 Gauge, consisting of 2"x 4" Galvanized Wire Fence	Containment Fence

10. Unloading of Waste

As per the "Unloading of Waste" requirements of 30 TAC § 330.133, the City of Corpus Christi is required to have a protocol pertaining to the unloading of wastes. The unloading of solid waste must be confined to as small an area as practically possible, the maximum allowable working face area will be 40,000 ft2. Trained personnel will be available to monitor each load that is disposed of in the working face. 30 TAC § 330.133 gives the facility staff the authority and responsibility to reject unauthorized loads and have unauthorized material removed from the working face. A record of unauthorized material removed from the working face will be entered in the Site Operating Record.

Trained personnel refers to the Landfill Manager, landfill foreman, equipment operators and laborers with waste screening training who will monitor the incoming waste at the working face. These personnel will be familiar with the rules and regulations governing the various types of waste that can or cannot be accepted into the facility, including knowledge of 30 TAC § 330.171. The personnel will also have a basic understanding of both industrial and hazardous waste and their transportation and disposal requirements.

10.1. Management of Wastes Disposed in Unauthorized Areas

Unloading of waste in unauthorized areas is prohibited. Solid waste unloading will be controlled to prevent disposal in locations other than those specified by site

management. Signs with directional arrows and portable traffic barricades will help to restrict traffic to designated disposal locations. Signs will be placed along the access roads to the current disposal area or other designated disposal areas that may be established. Any waste deposited in an unauthorized area will be promptly removed and disposed of at the working face. Controls will also be used to confine the working face to a minimum width consistent with the rate of incoming waste, while allowing for safe and efficient operation. As mentioned before, the maximum allowable working face area will be 40,000 ft2. Normally, only one working face should be active on any given day.

10.2. Random Load Inspections at the Working Face

Random load inspections for all unauthorized wastes at the working face will be conducted at least once every day and they will be entered in the Site Operating Record. The random load inspections will follow the protocol established in Section 7.2 of this SOP.

10.3. Management of Prohibited or Unauthorized Wastes and PCBs detected at the Working Face

If a prohibited waste, hazardous waste, PCBs, or any other unauthorized waste is discovered at the working face, then the Landfill Manager or its designee shall be notified immediately of the unauthorized waste location and actions taken. The prohibited waste, hazardous waste, or PCBs shall be managed according to the provisions set in Section 7.4 of this SOP.

11. Facility Operating Hours

As per the "Facility Operating Hours" requirements specified in 30 TAC § 330.135, the City of Corpus Christi is required to specify the operating hours when the facility may be open to accept waste and the operating hours when materials may be transported on or off site. The facility is authorized for waste acceptance 24 hours per day, 7 days per week. Actual hours of operation will be set by the Director of Solid Waste Services. Prior to initial opening of the facility, the Landfill Manager will inform TCEQ in writing of the planned hour of operation.

12. Site Signs

An "entrance sign" is displayed at the CR 20 entrance to the site. The sign will measure at least 4 feet by 4 feet, and have lettering of at least 3 inches in height which states the name of the site, type of site, hours and days of waste acceptance, and the TCEQ MSW permit number. A sign prohibiting certain types of waste such as hazardous waste, and "smoking wastes" will be posted near the landfill entrance. In addition, a sign stating that all waste transport vehicles must be properly covered will be posted at the CR 20 entrance and at the gate house. The City is authorized to operate the facility 7 days per week, 24 hours per day. At the City's discretion, waste acceptance hours will be set within this timeframe and will be included on the site sign.

The sign will also indicate the phone numbers of emergency contact personnel available 24 hours per day, including the Landfill Manager and the emergency fire department contact.

Rules related to requirements that any loads delivered to the landfill must be covered will be included with the site sign.

13. Control of Windblown Solid Waste and Litter

As per the "Control of Windblown Solid Waste and Litter" requirements specified in 30 TAC § 330.139, the City of Corpus Christi is required to control onsite windblown waste and litter scattered along fences, access roads, and at the gate, due to wind currents or as a result from waste falling from vehicles at least once a day on days that the facility is in operation.

Windblown Wastes and Litter will be controlled using the following means:

- Waste disposal vehicles using the landfill will be required to have adequate covers or other means of containment for the wastes they transport. The adequacy of covers and/or containment will be checked at the site entrance.
- Displaying signs indicating that unsecured loads will not be admitted and they will be subjected to enforcement action from the Solid Waste Code Enforcement Officers.

- Personnel from Solid Waste Code Enforcement will be responsible for issuing violations for improperly secured loads.
- Portable litter control fences will be provided, as necessary, at appropriate locations. The litter control fences may be constructed of wire mesh screens attached to portable frames or other appropriate anchor methods. The litter control fences should be of sufficient height to control windblown waste and litter. The litter control fence should be located as close as practical to the active area to control windblown waste and litter.
- At least once a day that the facility is in operation, litter will be collected that may have accumulated on-site near the gate house and access roads used by waste disposal vehicles. The actions taken and volumes handled will be recorded daily in the Site Operating Record. The City is responsible for litter control within two miles of the site entrance in either direction on CR 20. The City will provide this litter pickup on each day that the landfill is in operation. The collected waste will be taken to the landfill for disposal.
- The working face shall be covered at least once daily during the operational hours using approved daily cover materials to avoid prolonged exposure of wastes and to minimize windblown effects.

14. Easements and Buffer Zones

As per the "Easement and Buffer Zones" requirements of 30 TAC § 330.141, the City of Corpus Christi is required to address the location and operations concerning easements and buffer zones.

14.1. Easements

In accordance with 30 TAC§ 330.141, solid waste unloading will not occur within an easement or right of way that crosses the site. No solid waste disposal will occur within 25 feet of the centerline of any utility line or pipeline easement, unless otherwise authorized by the TCEQ. Easements, will be clearly marked as specified in Section 15 (relating to Landfill Markers and Benchmarks) of this SOP.

Electrical and telephone service to the site will be provided by a combination of overhead lines on utility poles and underground piping. Drinking water will be provided by underground piping from an on-site water supply well. Wastewater from the buildings will be handled by an onsite septic tank system or will be transported to a City wastewater treatment plant by tank truck. Natural gas will not be used at the site at this time.

Several underground pipeline easements cross the site, as identified in Part III of the Permit Application and Site Development Plan, attachment 1-Site Layout Plans. This map identifies specific easement widths as well. Waste shall not be placed within 25 feet of the centerline of any underground pipeline easement. A copy of the Permit Application and Site Development Plan can be found in the landfill's organized document library.

14.2. Buffer Zones

The buffer zone is located between the permit boundary and the waste footprint. The buffer zone for the site is composed of a 500-foot wide band of site property located adjacent to the property boundary. No solid waste unloading, storage, disposal, or processing operations will occur within any buffer zone or right-of-way that crosses the site. Perimeter drainage, buffer zone planting, farming, and other non-waste related activities may occur within the buffer zone, in accordance with the SDP. The buffer zone and/or perimeter access roads adjacent to the waste footprint will be maintained at a width of at least 50 feet with no obstacles to provide safe passage for firefighting and other emergency vehicles. The Landfill Manager will make provisions to ensure that proper lighting at the working face is oriented so that it does not become a nuisance to adjacent residents. Due to long distances between landfill and residences, it is not anticipated that physical barriers between the site and residences will be needed. However, if additional mitigation of light or noises becomes necessary, the Landfill Manager or its designee will take appropriate measures to promptly address the issue. All buffer zones will be clearly marked with a yellow marker.

15. Landfill Markers and Benchmark

As per the "Landfill Markers and Benchmark" requirements specified in 30 TAC § 330.143, the City of Corpus Christi is required to indicate how the landfill markers and benchmarks will be maintained.

15.1. Landfill Markers

Landfill markers will be installed to clearly mark significant features. The markers will be steel, wooden, plastic or other appropriate materials of construction. The markers will not be obscured by vegetation and will be placed in sufficient numbers to clearly show the required boundaries. Markers that are removed or destroyed will be replaced within 15 days after first discovery. Guidelines for types, placements, and color-coding of markers are outlined below.

- **Site Boundary:** Site Boundary markers will be painted black. The markers will be placed at each corner of the site and along each boundary line at intervals no greater than 300 feet. Fencing may be placed within these markers as required. In areas where the fence is located on the property boundary the fence posts may be painted black and used as site boundary markers. In this case, the post may be no less than 6 feet in height
- **Buffer Zone:** Buffer zone markers will be painted yellow. The markers will be placed in sequence with development of the site (see Part II of the Permit Application and Site Development Plan, Attachment 1) along the buffer zone boundary, at corners, and between corners at intervals of approximately 300 feet. The buffer zones will be a minimum of 500 feet wide. A copy of the Permit Application and Site Development Plan can be found in the landfill's organized document library.
- **Easements and Right-of-Way:** Easements and rights-of-ways markers will be painted green. The markers will be placed in sequence with development of the site (see Part III of the Permit Application and Site Development, Attachment 1) and only within the areas of solid waste activities. Markers south of grid line N8000 will be placed as follows: At site opening (see Figure 1.13 located in

Part III of the Permit Application and Site Development, Attachment 1) the Hanlon-Buchanan Pipeline from its intersection with the site entrance road southward, and all other known pipelines and utility easements will have markers placed at intervals of approximately 300 feet along the centerline of the easement along the boundary of right-of-way, at each corner within the site (each changed direction of the pipeline), and at the intersection of the pipeline with the site boundary. The Hanlon-Buchanan Pipeline easement and right-of-way will be marked at its intersection with the site entrance road, but not further marked north of that intersection until site development eliminates agricultural production north and east of this intersection (see Figure 1.16 located on Part III of the Permit Application and Site Development, Attachment 1). at that time the Hanlon-Buchanan pipeline easement and right-of-way will be marked at 300-foot intervals from the entrance road to gridline N8000.

Easements and rights-of-way located north of grid line N8000 will be marked at the site opening only where they cross the entrance road and at their intersections with the site boundary. Internal markers north of grid line N8000 will not be utilized so as to not otherwise interfere with agricultural activities. Disposal of solid wastes north of grid line N8000 cannot occur under this permit. Future development of areas north of gridline N8000, should it be desired, will comply with applicable solid waste regulations in effect at the time of the desired new development. A copy of the Permit Application and Site Development Plan can be found in the landfill's organized document library.

- **Landfill Grid System:** Grid markers will be painted white. The grid system will consist of lettered markers along two opposite sides and numbered markers along the other two sides. These markers will be spaced no greater than 100 feet apart measured along perpendicular lines. Intermediate markers will be installed in the case where markers cannot be seen from opposite boundaries. The grid markers will be maintained during the active life of the site and throughout the post-closure period. The grid system will mark at least the area that will be filled with solid waste within the next three years.

- **SLER or GLER Area:** SLER or GLER markers will be painted red. The markers will be placed so that all areas for which a SLER or GLER has been submitted and approved by the TCEQ are readily determinable. Such markers are to provide site workers immediate knowledge of the extent of the approved disposal areas. The location of these markers will be tied into the landfill grid system and will be reported on each SLER or GLER submitted. SLER or GLER markers will not be placed inside the evaluated areas.
- **Flood Plain:** There are no areas of this site inundated by the 100-year flood plain. Therefore, such markers are not necessary.
- **Class 1 Areas:** Specific areas dedicated to the burial of Class 1 non-hazardous industrial solid wastes will be marked at all corners of the approved composite liner for the Class 1 area. Such markers will provide site workers immediate knowledge of the extent of the approved disposal areas. Markers will be located so that they are not destroyed during operations.

15.2. Landfill Benchmarks

As required by 30 TAC § 330.143(b)(8), a permanent benchmark will be established onsite in areas that are accessible and will not be used for disposal. The benchmark will be a bronze survey pin set in concrete on monitor well pads. The benchmark elevation has been surveyed from a known United States Geological Survey (USGS) benchmark or other reliable benchmark.

16. Materials Along the Route to the Site

As per the "Materials Along the Route to the Site" requirements specified in 30 TAC § 330.145, the City of Corpus Christi is required to take steps to encourage waste disposal vehicles to carry their load in enclosed containers or provide a tarpaulin, net, or other means to properly secure the load. A sign will be posted stating this policy at the CR20 entrance and at the gate house. These steps are necessary to prevent the escape of any part of the load by blowing or spilling. The landfill personnel will be responsible for the cleanup of waste material spilled along and within the right-of-way of all public access roads serving the site for a distance of 2 miles in either direction from

the entrance on CR20. This will be done every day that the landfill is in operation. The actions taken and volumes handled will be recorded in the Site Operating Record.

17. Disposal of Large Items

As per the "Disposal of Large Items" requirements specified in 30 TAC § 330.147, the City of Corpus Christi is required to manage large items in such a way that they do not present an interference to site operations and/or to avoid any potential environmental issue that might impact the site and/or its surroundings.

Refrigerators, freezers, air conditioning units, or other items containing CFC refrigerant will not be accepted for disposal at the working face unless the CFCs contained in the item have been removed completely by a licensed contractor in accordance with 40 CFR § 82.156(f), as amended. The City of Corpus Christi will hire a licensed contractor to remove the CFCs contained in the items prior to disposal at the working face. The City of Corpus Christi will temporarily store items containing CFCs in the "Appliance Area" located inside the landfill. The Appliance Area is sufficiently large to temporarily store large items awaiting CFC extraction. The Appliance Area will be separated from the working face by more than 500 feet to avoid any possible interference with disposal operations and/or to avoid any potential environmental issue that might impact the site and/or its surroundings.

17.1. Items classified as Large, Heavy or Bulky Items (White Goods)

The following list gives examples of items that are considered large, heavy, or bulky.

- Refrigerators of various sizes
- Air conditioners of various sizes
- Clothes Dryers of various sizes
- Clothes or Dish Washers of various sizes
- Freezers of various sizes

The above list is not comprehensive and more items can be added at the Landfill Manager's discretion.

Large items will be placed in the designated Appliance Area and recycled when possible. Large items including appliances will be removed at least monthly to eliminate the potential from these materials from becoming a nuisance. Tires that are delivered comingled with other waste and that are removed from the working face will be stored at the white goods area and recycled. Whole used or scrap tires will not be knowingly disposed. Scrap tires will be removed from this area every two weeks. Tires and appliances will be managed in a manner to reduce and eliminate possible ponding of water to eliminate potential conditions that would promote disease vectors.

If disposed, they will be reduced in size at the working face to the extent practical. Large and bulky items, including brush will be disposed near the bottom of the fill face. Items that can be classified as large, heavy, or bulky can include, but are not limited to, white goods (household appliances), air conditioner units, metal tanks, large metal pieces, large pieces of brush and automobiles. Special care will be taken to achieve the maximum practical compaction of these items prior to placement of the next layer of waste in the lift. Special care will be taken while disposing these materials so that the liner is not damaged while this material is disposed. These materials will not be placed within the first five feet above the liner or sidewalls.

17.2. Management of Items Containing CFCs

The respective license and certifications for the contractor will be kept on file at the landfill office. The contractor will remove all CFCs from the site upon extraction. The Landfill Manager will work to keep the storage of appliances on site to a minimum number of days, never to exceed more than one month.

18. Air Criteria

As per the "Air Criteria" requirements specified in 30 TAC § 330.149, the City of Corpus Christi is subject to TCEQ rules concerning burning and air pollution control, this includes nuisance odors, outdoor burning, visible emissions, and particulate matter control requirements.

Sources of Odor

Potential odor sources associated with. a municipal solid waste landfill facility may include the wastes being delivered to the landfill, the open working face, the leachate collection system, leachate storage ponds or tanks, ponded water, and landfill gas. Many of the wastes received at a landfill are a source of odor upon receipt, such as sludges and dead animals. Other wastes have the potential for becoming sources as they biodegrade during the decomposition process. Leachate, liquid that has passed through or emerged from solid waste, may also be a source of odor if not properly handled or managed in a timely manner. Ponded water and landfill gas could become a source of odor as well. Due to the landfill being in a remote area with few neighbors, problems associated with odors will be minimal.

18.1. Odor Management Plan

The odor management plan addresses the handling of particular odorous waste at the landfill. Odor control measures may include, but are not limited to the following items:

- Control of any ponded. water at the site to avoid its becoming an odor nuisance
- Incoming waste should be promptly landfilled.
- To avoid spillage and to minimize exposure to the atmosphere, removal of leachate should be done under appropriate weather conditions (i.e. low wind speeds, no rain).
- Regular inspections and repairs of the gasket, cap, and leachate riser backfill material.
- Use of vapor-tight gaskets on all leachate sumps.
- Adding leachate collection systems to the gas management system.
- Daily visits on days that the landfill is in operation will be made to the leachate storage ponds or tanks to determine any odor problems. In the event of odor problems, the storage facilities will be examined and appropriate measures will be employed to minimize the odors. We do not anticipate any issues arising

from odor. The wind is predominantly from the southeast and the nearest neighbor is approximately 1.5 miles from the ponds. If the wind is from the north, there are no neighbors within two miles of the south property line. The areas adjacent to the ponds are agricultural and no development is anticipated. However, if odor becomes an issue (complaint from a nearby neighbor specifically regarding odor from the ponds), then the City shall interview the neighbor and determine the cause of the odor. If it is determined that the odor is from the ponds and is a nuisance, then proper measures shall be taken as appropriate in accordance with current design standards. Such measures may include, but are not limited to, the use of aerators, bubblers, and as a last resort removing the leachate and transporting it off-site for treatment.

- In the event objectionable odors occur, appropriate measures should be taken to alleviate the condition.
- Identify known sources of odorous wastes and specify a time of day for these wastes to be received so that they can be given special attention.
- If odors are a result of improper use of alternate daily cover material, the cover material will need to be re-evaluated.
- Spills of odorous material should be promptly managed.
- Damage or erosion of daily, alternate or FML cover should be promptly repaired

NOTE: The City of Corpus Christi (Nueces County in general) is not in a State Implementation Plan (SIP) designated jurisdiction; therefore SIP criteria does not apply.

18.2. Open Burning

Open burning is banned at the landfill, unless specifically authorized by the TCEQ to manage emergency situations, such as burning of brush when an emergency situation arises, e.g. hurricanes.

19. Disease Vector Control

As per the "Disease Vector Control" criteria specified in 30 TAC § 330.151, the City of Corpus Christi is required to control vectors such as rodents, flies, and mosquitoes at

landfills through daily site operations, which include the application of daily, intermediate, and final cover. Landfill operators will conduct routine checks for insects or rodents associated with the operations and will report problems to the Landfill Manager_ If necessary, a licensed professional should apply pesticides to ensure that proper chemicals are used and are properly applied.

20. Site Access Roads

As per the "Site Access Roads" requirements of 30 TAC § 330.153, the City of Corpus Christi is required to control and minimize mud, dust and litter from the landfill onto public roadways The entrance to the facility from CR20 and interior access roads within the landfill are all weather roads. These roads are provided for access to the active disposal area. Re-grading to minimize potholes will be performed as necessary. The following steps will be taken to control and minimize the impact of mud, dust and litter from the facility:

20.1. Control and Minimization of Mud:

The road construction material will consist of caliche, limestone, or recycled asphalt, which provides mud control for waste disposal vehicles prior to exiting the site and returning to public roadways. The entrance to the landfill will be swept at least once per day on days when mud and associated debris are being tracked onto the public roadway, and as necessary to control excessive amounts of mud that the daily maintenance crew cannot handle. Mud and associated debris will be controlled through the use of all-weather roads, mechanical or hand sweepers, and equipment capable of scraping mud from the roads.

20.2. Control and Minimization of Dust:

Dust at the facility will be controlled by watering the access roads as necessary to suppress dust generation. The water source may be clean storm water (including that storm water captured during cell construction), or applicable potable water supply system.

20.3. Control and Minimization of Litter:

For control and minimization of windblown solid waste and litter see Section 13.

20.4. Re-grading of Site Access Roads:

The site access roads will be re-graded at the discretion of the Landfill Manager but at least once a quarter.

21. Salvaging and Scavenging

As per the "Salvaging and Scavenging" requirements specified in 30 TAC § 330,155, the City of Corpus Christi is required to take the necessary steps to ensure that salvaging efforts do not interfere with sanitary disposal operations, and that scavenging activities do not occur on site.

21.1. Salvaging Operations

Salvaging operations proceed at the Landfill as prescribed by Texas Law, i.e. “controlled removal of waste materials for utilization, recycling, or sale.” Salvaged materials should be considered as potential recyclable materials and may be stored in a designated collection area. Salvaged items should be recycled often enough to prevent an excessive accumulation of the material at the site to prevent odor or other nuisance conditions from developing and to eliminate the risk of discharge of pollutants. Items recovered through salvage operations will be removed from the site at least once per month.

21.2. Scavenging Activities

Scavenging is the uncontrolled and/or unauthorized removal of materials from the waste stream. Such activities will be prohibited at all times on site because of the dangers they present to human health and the environment. The City of Corpus Christi will take necessary measures to prevent scavenging activities on site.

22. Endangered Species Protection

Based on previous studies and a determination by both the Texas Parks and Wildlife Department and the U.S. Fish and Wildlife Service, operations of the site is not likely to impact endangered species (animal or plant). As the facility is developed site personnel should notify the Landfill Manager if any change in this status is suspected.

Previous evaluation and the findings of the Texas Historical Commission indicated that cultural resources do not exist on site. As the facility is developed, site personnel should notify the Landfill Manager if any change in this status is suspected.

The Landfill Manager will be responsible for reporting suspected changes to the status of endangered species or cultural resources to the Director of Solid Waste Services, The Director will then take appropriate action which may include notification of authorities as appropriate, and ordering modification of activities in the area of concern.

23. Landfill Gas Control

As per the "Landfill Gas Control" requirements of 30 TAC § 330.159, the City of Corpus Christi is required to control and monitor landfill gas in accordance with the "Gas Management Plan" included in Part HI of the Permit Application and Site Development Plan, Attachment 14. The Permit Application and Site Development Plan can be found in the landfill's document library as per the "Recordkeeping Requirements" specified in 30 TAC § 330A25. The landfill gas monitoring results will be kept in the facility's operating record and submitted to the TCEQ in accordance with the Site Development Plan, Attachment 14.

23.1. Perimeter Monitoring

23.1.1. Perimeter Monitoring Network

The LFG monitoring probe network will include LFG monitoring probes and utility trench vents. The LFG monitoring probes will be located along the permit boundary and north of Unit 2. The utility trench vents will be located on each utility easement within 2,000 feet of the waste disposal areas. The probes and vents will be installed sequentially as the development of the fill areas progress. The probes and vents will be installed at locations when waste disposal is within 2,000 feet. Locations of the proposed monitoring probes and vents, as well as the installation sequence plan, are shown in Appendix 14A, Figure 14A. 1.

Permanent LEG monitoring probes of a single tube design will be used to detect the presence of LFG in subsurface soil. The single tube probe design was chosen for two reasons. First, it provides monitoring of the soil strata for the total depth of the

probe, minimizing the possibility of undetected LFG migration through an unscreened zone. Second, it is difficult to achieve and maintain positive seals between separate monitoring zones within a single well-bore, which increases the chance for misinterpreted monitoring results.

Utility trench vents will be used to detect the presence of LFG within the utility easements. Utility trench vents will be installed with a monitoring port for monitoring for the presence of LPG, The vent was selected to serve as a means of monitoring due to its ability to also be used to mitigate LFG migration within the utility easements should it occur.

23.1.2. Landfill Gas Monitoring Probes and Utility Trench Vents

Proposed LFG monitoring probes will be installed consistent with guidelines presented in the TCEQ Municipal Solid Waste Division Methane Monitoring Handbook, Version 2, December 1993. Probes will be installed to monitor the soil strata above the higher of the lowest measured groundwater level at the monitoring point or the lowest current or planned future elevation of waste within 1,000 feet of the monitoring point. The probes will be screened from approximately 1.5 feet above the bottom of the borehole to within approximately 5 feet of the ground surface. Washed pea gravel will be placed in the borehole to approximately 6 inches above the screened interval and approximately 6 inches of sand will be placed over the pea gravel. Bentonite pellets will be placed above the sand and hydrated to form an impermeable layer to prevent air and water intrusion into the probe boring, A concrete pad and a steel casing extending into the borehole and above the ground surface will also be installed. A PVC cap with a quick connect coupling will be installed at the top of the probe for ease of monitoring. No solvents or PVC cement, which may affect monitoring results, will be used during construction of the probes. A typical detail of the proposed LFG monitoring probes is provided on Figure 14A.2 in Appendix 14A in the SDP.

23.1.3. Monitoring Procedures

Methane concentrations will be measured using a combustible gas indicator calibrated against a methane standard with a sampling line for drawing samples

directly to the indicator without diluting the sample. The indicator should give a direct reading of methane concentration by volume. Equipment maintenance requirements, monitoring procedures, and calibration information for the instruments used to monitor methane concentrations should be kept on site with the LFG monitoring records described in Section 3.3. Monitoring will be conducted under the oversight of the Chief Landfill Foreman by qualified personnel or a qualified consultant. The results will be recorded on the attached Quarterly Landfill Gas Monitoring Report (Appendix 14B to the SDP), or similar form, and maintained in the Site Operating Record.

If one of the tests indicate that the allowable concentration of methane has been exceeded, verification procedures, described in Section 4 of Part III, Attachment 14 to the SDP, will be implemented. If verification procedures indicate allowable limits are being exceeded, notification procedures, also described in Section 4, will be implemented.

23.1.4. Maintenance Procedures

Each time LFG monitoring is conducted, the integrity of the LFG monitoring probes and utility trench vents will be inspected by the sampler. The sampler will record pertinent information on the Quarterly Landfill Gas Monitoring Report (Appendix 14B to the SDP) or similar forms. The Quarterly Landfill Gas Monitoring Report will be kept on file at the facility.

The sampler will perform the following at each monitoring event:

- Verify that the LFG monitoring probe or utility trench vent number is clearly labeled on the outer casing or lid.
- Verify that the protective casing is intact and is not bent or excessively corroded.
- Verify that the concrete pad is intact (no evidence of cracking or heaving).
- Verify that the padlock is functional.
- Verify that the inner casing is intact.

If damage or excessive wear to the LFG monitoring probe or utility trench vent is observed, it will be reported to the Landfill Foreman. If it is not possible to repair the LFG monitoring probe or utility trench vent and the damage can potentially affect the accuracy of future monitoring results, the LFG monitoring probe or utility trench vent will be decommissioned and replaced with a new LFG monitoring probe or utility trench vent in accordance with Sections 3.1.2 and 3.4 of the Landfill Gas Management Plan.

The combustible gas monitoring instrument should be calibrated and maintained in accordance with the manufacturer's instructions. The maintenance requirements for the monitoring instrument will be available on site with the LEG monitoring records described in Section 3.3.

23.2. Recordkeeping/Reporting

Field monitoring data records will be maintained for the methane monitoring and kept on site as part of the Site Operating Record. Field data will be recorded on the Quarterly Landfill Gas Monitoring Report form (or similar form) as shown in Appendix 14B of Part III.

Monitoring probes and utility trench vents will be monitored quarterly during the following periods:

LFG Monitoring Quarters

First Quarter:	January - March
Second Quarter:	April - June
Third Quarter:	July - September
Fourth Quarter:	October - December

The LFG Monitoring Program will continue for a period of 30 years after the final closure of the facility or until the owner or operator receives written authorization from TCEQ to revise or discontinue the program.

24. Oil, Gas, and Water Wells

As per the "Oil, Gas and Water Wells" requirements specified in 30 TAC § 330.161 the City of Corpus Christi is required to identify the location of any known abandoned oil or water wells on site.

Oil wells, gas wells, and water wells associated with support of oil and gas drilling, are known to have been drilled on the site. During the course of site development, but prior to beginning construction on the site, the Landfill Manager will:

a) Provide written notification to the TCEQ of the location of all known existing or abandoned water wells, crude oil wells, natural gas wells, or other wells associated with mineral recovery, situated within the site.

b) Provide written certification to the TCEQ, that all such abandoned wells have been properly capped in accordance with applicable rules and regulations of the Railroad Commission of Texas.

c) Provide a demonstration to the TCEQ that all such wells which are still in use at the time of the notification will not conflict with the development of the site. The demonstration will include a schedule for abandonment and plugging of wells which are anticipated to eventually conflict with the site development. Also included will be plans for protection of such wells, if necessary, until they are abandoned and plugged.

24.1. Discovery of Water Wells during Facility Operation

As the site is developed, if any water wells are encountered they should be exposed, and the casing should be cut to a minimum of 2 feet below the excavation, and the well should be capped and plugged in accordance with all applicable rules and regulations of the TCEQ, the Railroad Commission of Texas, or other applicable state agency. If water wells are located the Landfill Manager or designee must, within 30 days, provide written notification to the TCEQ's executive director of the location of any and all existing or abandoned water wells. Within 30 days of discovery, the Landfill Manager will provide written certification to the Executive Director that all such wells have been capped, plugged, and closed in accordance

with all applicable rules and regulations of the TCEQ or other state agency. A copy of all well plugging reports and closure documentation will be submitted with the closure certification.

24.2. Discovery of Oil and Gas Wells during Facility Operations

The Landfill Manager will immediately provide written notification to the Executive Director of the location of any and all existing or abandoned on-site crude oil or natural gas wells, or other wells associated with mineral recovery. The Landfill Manager will provide the Executive Director a written notification that all such wells have been properly capped, plugged, and closed in accordance with all applicable rules and regulations of the Texas Railroad Commission. A copy of the well plugging report required to be submitted to the appropriate state agency will also be submitted to the Executive Director of the TCEQ within 30 days after the well has been plugged.

25. Compaction

As per the "Compaction" requirements specified in 30 TAC § 330.163, the City of Corpus Christi is required to compact the incoming waste to provide a more efficient use of available space and reduce the amount of settling after the fill is complete. Compaction will be accomplished with an adequately sized landfill garbage compactor(s) to minimize the volume of loose material and have more air space available for waste disposal operations.

25.1. Compaction of Waste during Placement of Ballast

If waste is used as ballast, the Landfill Manager and/or designee will be on-site full time during the placement of the first five (5) feet of waste over the liner system. He/she will verify that this lower five (5) feet of waste does not contain large bulky items that could damage the liner system or that cannot be compacted to the required density. The Landfill Manager and/or designee will document that the waste used for ballast has been compacted.

25.2. Compaction Near ELR Pipelines

Equipment Operators will take special care not to crush or otherwise damage ELR liquids distribution pipelines that have been installed near active waste filling operations. Any damage will be immediately reported to the Landfill Manager.

26. Landfill Cover

As per the "Landfill Cover" requirements specified in 30 TAC § 330.165, the City of Corpus Christi is required to apply daily cover to control disease vectors, windblown waste, odors, fires, and scavenging, and to promote runoff from the fill area.

26.1. Soil Management

A stockpile or borrow source for soil cover material will be maintained on-site. The cover material will not have been previously mixed with wastes. On-site soils are suitable for cover material as well as other soils deemed appropriate by the landfill manager. The cover material should be managed so as to not interfere with vehicular traffic or impede drainage. At least a portion of this cover material should be stockpiled near the workface for potential emergency fire control.

Temporary excess soil will be stockpiled in the buffer areas, on filled areas and on side slopes for future use on the site or for removal from the site. All stockpiles will be maintained in conformance with the Erosion Control Plan. Stockpiles will be oriented generally parallel to the direction of surface drainage in any given area and will not alter drainage patterns nor block the use of the buffer areas by fire and emergency equipment.

26.2. Daily Cover

Daily cover of waste will be applied at least once daily to control disease vectors, windblown waste, odors, fires, scavenging, and to prevent excessive accumulation of water within the fill. Soils and alternate daily covers that include tarps or foams, or a combination of the three, will be utilized to complete the daily cover at the site. The use of Saniform (or equivalent) or polyethylene tarps as an alternative daily cover was previously approved for the Cefe F. Valenzuela Landfill. Alternate daily cover material will not be used if the landfill will be closed more than 24 hours. Quarterly

status reports will be submitted to the TCEQ for four consecutive quarters in the event that alternative daily cover is used.

26.2.1. 3-M Sanifoam (or equivalent)

3-M Sanifoam (or equivalent) cover will be used routinely as daily cover. 3-M Sanifoam is an air-injected, two component synthetic foam that can be sprayed onto the landfill solid waste surface to form an expanded protective foam blanket. The spray thickness will be between one (1) and two (2) inches. The applied foam "sets up" within 60 seconds to a durable solid state with consistency similar to crushable expanded polystyrene. The foam is non-toxic and non-combustible, and is biodegradable. The hardened foam is water insoluble which promotes rainfall runoff, exhibits extremely low gas permeability that prevents escape of vapors and odors, it seals the waste from flies, rodents, and other vectors, and adheres to the waste preventing litter and dust from blowing. The foam is mechanically crushed and broken up during subsequent landfill operations for unimpeded movement of methane gas and leachate in the cell. Technical data sheets and MSDS are attached for further information in Appendix IV-A.

The foam is sprayed on with a machine specially designed for this product. The machine (Coverfoam Services, Inc., model PB-250-D, or equivalent) uses a spray bar system to apply an even coat of foam over the solid waste. The machine is pulled by a dozer or other tractor over the solid waste making several adjacent passes until the surface is completely covered.

During periods of inclement weather (e.g., rain) where the foam may not set properly, foam operations will be suspended and the working face will be covered by the use of polyethylene tarps or soil.

26.2.2. Polyethylene Tarps

Polyethylene tarp covers will also be used for daily cover. Typically these tarps will be used on small working faces (less than 200' x 200') and on slopes too steep for 3-M Sanifoam application. The tarps are fifty feet by fifty feet (50' x 50') in size and are made out of a fire retardant woven fabric which repels water. The

taps are an effective bather against vectors, odors, and windblown litter by effectively sealing in the waste. MSDS and physical properties for the tarp materials are attached in Appendix IV-A.

These tarps will be installed by landfill personnel by hand at the end of the day, Tarp installation will be such that they overlap by a minimum of one foot in such a manner so that rainfall will run off with minimal or no infiltration. Tarps will be weighted down with automobile tires along the perimeter and the center to prevent the wind from blowing them off the working face. The following morning, the tarps will be pulled off the working face by landfill personnel either by hand or using a dozer before the start of the day's operations.

26.3. Soil

A well-compacted six (6) inch soil cover will be used to cover solid waste when ADC materials are not used. The soil cover will be clean and not previously mixed with waste materials. When a period of greater than 24 hours is expected to lapse before solid waste disposal will resume at a specific working face or area, soil cover will be used in lieu of ADC. A period of greater than 24 hours may occur when the site closes on a weekend, when the working face is temporarily moved to a new area, or other reasons.

26.4. Intermediate Cover

The top and sides of the landfill working face will be shaped to conform to landfill operations. Intermediate cover soil will then be transported to the working face or any area that has already received daily cover, where it will be deposited near the upper end of the working face, spread, and compacted. Intermediate cover will consist of soils that have not been previously mixed with wastes and will be capable of sustaining native plant growth.

All areas that receive waste and then become inactive for longer than 180 days will be covered with an additional six (6) inches of compacted cover material, for a total cover thickness of at least 12 inches. When the area is to be reused, some of this

cover material will then be removed from use as daily cover on new areas, if it can be removed cleanly.

To minimize erosion and maintain adequate control of storm water, temporary let down structures may be used on intermediate cover. The intermediate cover will be seeded or sodded following its application, and vegetation and other erosion control features will be maintained on areas that have received intermediate cover. Grading of the intermediate cover will be undertaken in a manner to prevent ponding of water. This is discussed in Section 27.0.

26.5. Final Cover over Class 1 Waste

Final cover construction and maintenance will be in compliance with Attachment 12, relating Final Closure Plan in the Site Development Plan, and with Texas Administrative Code Chapter 330, Subchapter K.

26.6. Final Cover

The Final Closure Plan allows for successive closure of areas of the site as they become filled to capacity. The final cover will be maintained in a manner consistent with Attachment 12 of Part HI — Final Closure Plan and the requirements of Chapter 330 Subchapter K. Closure of individual areas will be in accordance with the "Sector Fill Plan." The City will implement the plan as ongoing landfilling operations continue until the time of final closure. The surface will be managed throughout the active life of the site to minimize infiltration into the filled areas and to minimize contact with solid waste. In general, closure of completed portions of the site will consist of the following steps:

1. Survey controls will be implemented to control the filling of solid waste to the lower level of the final cover.
2. A surveyed grid system or other suitable surveying measures will be used to control placement of the final infiltration layer.
3. Testing of the various components of the final cover system will be performed in accordance with the TCEQ regulations.

4. During the first growing season following application of final cover system, the area will be vegetated with appropriate grasses to minimize erosion.

26.7. Cover Application Log

Throughout the active life of the landfill, a cover application log will be maintained and made readily available for inspection. For intermediate cover and daily cover, the log will specify the area covered, how it was placed and when it was completed. For final cover, the log will specify the amount of cover applied over each area (thickness) and when it was applied. The cover log will be located inside the landfill office unless otherwise directed by the Landfill Manager.

27. Ponded Water

As per the "Ponded Water" requirements of 30 TAC § 330.167, the City of Corpus Christi is required to prevent and control the ponding of water inside the landfill. Ponded water can be breeding grounds for vectors, and can be a source of harborage for vectors. Site grading and maintenance activities will be performed on an as needed basis to help minimize the ponding of water over waste areas. Should ponded water occur, it will be removed and depressions will be filled as soon as practicable but no later than seven (7) days after the occurrence. If the ponded water has come into contact with waste, leachate, or waste contaminated soils, the ponded water will be treated as leachate and managed in accordance with Part III of the Permit Application and Site Development Plan, Attachment 15-Leachate and Contaminated Water Plan, The Permit Application and Site Development Plan can be found in the landfill's organized document library.

27.1. Ponded Water Prevention

The City will manage the working face of the landfill in a manner that reduces the potential for water collecting and ponding. This will be accomplished by maintaining the working face at sufficient grades so as to promote water running off the exposed waste or daily cover. Water that may pond at the working face will be removed using landfill equipment. Water that comes in contact with waste will be treated as

contaminated water and disposed of accordingly. Water that may pond in areas where it does not come in contact with waste will be treated as storm water.

27.2. Routine Inspections to Identify Potential Ponding Locations

Following major storm events, the City will undertake an assessment of the site to identify areas of potential or actual ponding. In addition, the City conducts at least monthly reviews of the entire site to identify possible depressions as locations of possible future ponding. City crews will be directed to these locations to re-grade areas to reduce the potential for future ponding.

Directives to fill and re-grade potential ponding locations will be undertaken as soon as practical after they have been identified. Ponded water that occurs in the active portion of the landfill will be eliminated and the area in which the ponding occurred will be filled in and regarded within seven days of detection.

During extremely wet conditions, or periods of extended storms, disposal activities will be limited to the wet weather area. Priorities for staff during these periods are to maintain access into and out of the site and provide disposal services as efficiently as possible. Within 7 days of extended wet weather conditions, the City will evaluate the site to identify areas where ponding has occurred and will take corrective actions to reduce ponding in areas of the working face and closed areas.

27.3. Preventing Ponding of Surface Applied ELR Liquids

Landfill staff will take special care to prevent ponding of leachate and other allowable liquids recirculated by means of surface application. Specifically, they will apply liquids to the surface in such a way as to ensure immediate infiltration into the waste mass. Any surface-applied liquids that remain in puddles at the end of a day will be pushed into the waste with a bulldozer.

27.4. Record Keeping

As a part of the overall site review, records will be maintained to identify areas where ponding has occurred. Documentation of work completed will also be placed in the site's file.

28. Disposal of Special Wastes

As per the "Disposal of Special Wastes" requirements specified in 30 TAC § 330.171, the City of Corpus Christi is required to handle special wastes in a manner consistent with TCEQ regulations.

The definition of special waste can be found in 30 TAC § 330.3, which states that special wastes are wastes that because of their quantity, concentration, or physical, chemical, or biological properties require special handling and disposal to protect human health or the environment. The facility will handle special waste according to the following guidelines.

28.1. Protocol for Disposal of Special Waste

If a generator wishes to dispose of a special waste at Cefe F. Valenzuela Landfill, the generator must submit to the Landfill Manager a completed City of Corpus Christi Generator's Waste Profile Sheet (GWPS) in order to provide a complete profile for the special waste. The City of Corpus Christi will determine if the special waste falls in the category of special wastes that do not require further disposal authorization from TCEQ, or if the waste falls in the category of special wastes that do require special disposal authorization from TCEQ.

If the special waste falls in the category of special wastes that do not require special disposal authorization from TCEQ, then the special waste will be further evaluated using the criteria established for special wastes. If the special waste meets all the conditions mentioned previously, then the special waste will be considered "acceptable for disposal."

If the special waste falls in the category of special wastes that do require special disposal authorization from TCEQ, then the generator or its designee will be responsible for obtaining special disposal authorization from TCEQ.

The Landfill Manager will reserve the right to accept or reject any special waste load, even if the special waste load is deemed acceptable, if at any point he feels that the facility could potentially experience a negative impact from the acceptance of the special waste load.

28.2. Special Wastes That Do Not Require Special Waste Disposal Authorization from TCEQ

According to 30 TAC § 330.171(c) the following special wastes do not require written authorization for acceptance provided that the waste is handled in accordance with the noted provisions for each waste.

a) Special Waste from Health Care Related Facilities

Special wastes from health care related facilities which have been previously treated in accordance with the procedures specified in 30 TAC § 330 Subchapter Y (relating to Medical Waste Management) may be accepted.

b) Dead Animals and/or Slaughterhouse Waste

Dead animals and/or slaughterhouse waste may be accepted at without further approval from the TCEQ provided that the carcasses and/or slaughterhouse waste are covered by three feet of other solid waste or at least two feet of earthen material immediately upon receipt.

c) Regulated Asbestos-Containing Materials (RACM)

RACM may be accepted at the facility in accordance with TAC § 330.171(0(3) and as authorized in the original permit. Prior to initial receipt of RACM at this facility, the Landfill Manager will dedicate a specific area(s) of the landfill for receipt of RACM and notify the TCEQ in writing of the designated area(s). The Landfill Manager will also prepare a contingency plan in case of ruptured bags and designate appropriate personnel for implementation of the contingency plan. As the operation continues, the Landfill Manager will notify the TCEQ in writing of any new dedicated areas for RACM. Each load of RACM that arrives on-site will be documented. This documentation will include the volume of material, and the location and depth of its disposal. RACM disposal locations will be identified by survey (Registered Professional Land Surveyor) and identified on a current site drawing at the site.

Delivery of RACM will be coordinated with the Landfill Manager so that the waste will arrive during times that it can be properly managed by site personnel. RACM will be

accepted at the site only if it is contained in tightly closed containers or bags, or wrapped as necessary with 6-mil thick polyethylene.

RACM will be placed in landfill units such that it will not be exposed as a result of erosion or weathering. When possible this will be achieved by placing the RACM below the natural grade. At a minimum, the RACM will be placed at least 20 feet away from exterior final sideslopes, and at least 10 feet below final grade. During unloading and placement of RACM in the waste fill, care will be exercised to prevent breaking open the bags or containers. One foot of soil cover or 3-feet of asbestos-free municipal solid waste will be placed over the RACM immediately after it is placed in the landfill unit.

RACM that has been designated as Class I industrial solid waste, and that arrives at the facility will be disposed of in accordance with TAC § 330.173(g)-(i) or in accordance with this section of the Site Operating Plan.

Upon closure of the facility, a notation indicating that the site accepted RACM will be placed in the deed record. This notation will indicate where the RACM was disposed of on the property by showing its location on a site diagram. A copy of this documentation will be provided to the TCEQ.

d) Non-regulated Asbestos-Containing Materials (non-RACM)

Non-regulated asbestos containing materials (non-RACM) may be accepted for disposal provided the wastes are placed on the active working face and covered in accordance with the requirements of 30 TAC § 330 (relating to Municipal Solid Wastes). Under no circumstances may any material containing non-RACM be placed on any surface or roadway which is subject to vehicular traffic or disposed of by any other means by which the material could be crumbled into a friable state.

e) Empty Containers which have been used for Pesticides, Herbicides, Fungicides, or Rodenticides

Empty containers which have been used for pesticides, herbicides, fungicides, or rodenticides must be disposed of in accordance with the provisions mentioned below.

These containers may be disposed of provided that the following 3 conditions are met:

- The containers are triple-rinsed prior to receipt at the landfill
- The containers are rendered unusable prior to or upon receipt at the landfill; and
- The containers are covered by the end of the same working day they are received.

Those containers for which triple-rinsing is not feasible or practical (e.g. paper bag, cardboard containers) may be disposed of under the provisions of 30 TAC §330.171(c)(5).

f) Municipal Hazardous Waste from Conditionally Exempt Small Quantity Generators (CESQG)

Municipal hazardous waste from a conditionally exempt small quantity generator (CESQG) may be accepted at a Type I municipal solid waste landfill without further approval from the executive director provided the amount of waste does not exceed 220 pounds (100 kilograms) per month per generator, and provided the landfill owner or operator authorizes acceptance of the waste.

g) Sludge, Grease Trap Waste, Grit Trap Waste, or Liquid Waste from Municipal Sources

Sludge, grease trap waste, grit trap waste, or liquid wastes from municipal sources can be accepted at Type I municipal solid waste landfill for disposal only if the material has been, or is to be, treated or processed and the treated/processed material has been tested, in accordance with Test Method 9095 (Paint Filter Liquids Test), as described in "Test Methods for Evaluating Solid Wastes, Physical/chemical Methods" (EPA Publication Number SW-846), as amended, and is certified to contain no free liquids. Prior to treatment or processing of this waste at the landfill, the owner or operator shall submit written notification to the executive director of the liquids processing activity as required in 30 TAC § 330.11.

28.3. Special Wastes That Require Special Waste Disposal Authorization from TCEQ

Special wastes that are not specifically identified in 30 TAC § 330.171(c) require prior written authorization by the TCEQ for disposal. If the special wastes are not specifically addressed in Section 28.2 of this SOP then the generator of the special waste will be required to request written authorization from TCEQ prior to disposal. Additionally, the generator of the special waste will be required to complete the City of Corpus Christi Waste Profile Sheet prior to disposal,

28.4. Special Waste Prohibited for Disposal in any MSW Landfill

The following special wastes will not be accepted for disposal at any MSW facility:

- Used-oil filters from internal combustion engines
- Lead acid storage batteries

29. Disposal of Industrial Wastes

As per the "Disposal of Industrial Wastes" requirements of 30 TAC § 330.173, the City of Corpus Christi is required to address the types of Non-Hazardous Industrial Wastes that are acceptable for disposal at Cefe Valenzuela Landfill. Industrial Wastes are defined in 30 TAC § 330.3 as solid wastes resulting from or incidental to any process of industry or manufacturing, or mining or agricultural operations.

29.1. Protocol for Disposal of Industrial Waste

If an industrial generator wishes to dispose of waste at Cefe F. Valenzuela, the industrial generator will first classify the waste and submit a completed Waste Profile Sheet to the City of Corpus Christi for evaluation. The City of Corpus Christi will determine if the classification performed by the industrial waste generator seeking disposal authorization is consistent with the waste classification criteria in §330.3 (Definitions) and Chapter 335, Subchapter R. Wastes should be classified by generator prior to delivery to the landfill. The City of Corpus Christi will determine if the waste is a Class 1, 2, or 3 Industrial Waste. The Cefe F. Valenzuela Landfill is permitted to accept Class 1, 2, and 3 Non-Hazardous Industrial Wastes.

Disposal of Class 1 Non-Hazardous Industrial Solid Wastes will be accomplished in accordance with the requirements of 30 TAC§ 330,173. The phrase "dedicated trench" as used in the regulations means the specific area in which Class 1 waste is placed for disposal.

All shipments of Class 1 waste will be accompanied by a manifest (waste-shipping control ticket) as required by the commission. The Landfill Manager will sign the manifest for any authorized shipments of Class 1 waste. The Landfill Manager will not accept or sign for shipments of Class I waste for which the authorization to accept has not been granted by the executive director • or has not been authorized by permit provisions. The landfill will retain the disposal facility copy of the manifest for a period of three years. This time period is automatically extended if any enforcement action involving the City or the landfill is initiated or pending by the executive director.

When the landfill accepts any Class I waste, a written report of Class 1 waste received will be submitted to the executive director. This report will be submitted no later than the 25th day of the month following the month that the waste was received. Reports will be submitted on forms provided by the TCEQ and will include all the required information. Monthly reports regarding acceptance of Class 1 waste will be submitted, including those months in which no Class 1 waste is received at the landfill unless an exception is granted by the executive director.

While Class 1 Non-Hazardous Industrial Solid Waste will be placed only in dedicated areas, specific dedicated areas have not been identified at this time. All permitted disposal areas that are below the elevation of the surrounding natural grade may be dedicated to Class 1 waste disposal. However, specific areas to be dedicated to Class 1 waste disposal will be identified as the site is developed. When new dedicated areas for Class 1 waste are identified, site drawings will be modified as appropriate. Modified site drawings will be submitted to the TCEQ for review and approval. Areas dedicated to Class I waste disposal will be constructed in accordance with the requirements as discussed in Part III of the Permit Application and Site Development Plan, Attachment 10 Soil and Liner Quality Control Plan.

The volume of Class 1 Non-Hazardous waste disposed at the site in any one year will not exceed 20 percent of the total amount of waste (not including Class I wastes) accepted during the same or previous year of operation.

Wastes which are Class 1 Non-Hazardous Industrial Solid Wastes only because of asbestos content may be accepted at the facility in accordance with the requirements of 30 TAC § 330.171.

Class 2 and 3 Non-Hazardous Industrial Solid Wastes, except special wastes as defined in §330.3, will be accepted for disposal at any point in time provided they can be managed with regular MSW in any available disposal area and will not interfere with facility operation.

29.2. Class 1 Non-Hazardous Industrial Wastes

A Class 1 Non-Hazardous Industrial Waste is any industrial solid waste or mixture of industrial solid wastes that because of its concentration or physical or chemical characteristics is toxic, corrosive, flammable, a strong sensitizer or irritant, a generator of sudden pressure by decomposition, heat, or other means, and may pose a substantial present or potential danger to human health or the environment when improperly processed, stored, transported, or otherwise managed as defined in 30 TAC §335.505 (relating to Class 1 Waste Determination).

29.3. Class 2 Non-Hazardous Industrial Wastes

A Class 2 Non-Hazardous Industrial Waste is any individual solid waste or combination of industrial solid wastes that cannot be described as hazardous, Class 1, or Class 3 Non-Hazardous Industrial Wastes, as defined in 30 TAC § 335.506 (relating to Class 2 Waste Determination).

29.4. Class 3 Non-Hazardous Industrial Wastes

A Class 3 Non-Hazardous Industrial Wastes is any inert and essentially insoluble industrial solid waste, including materials such as rock, brick, dirt, and certain plastics and rubber, etc., that are not readily decomposable as defined in 30 TAC § 335.507 (relating to Class 3 Waste Determination).

30. Visual Screening of Deposited Wastes

The development of the disposal sectors or cells is perforated in such a way as to minimize the visual appearance of waste disposal operations from beyond the property border. Disposal operations take place in different sectors or cells depending on the circumstances and weather conditions. All disposal operations are conducted in accordance with the following sections of this SOP to minimize the visual impact of waste disposal operations:

- Section 26 (relating to Landfill Cover)
- Section 25 (relating to Compaction)
- Section 21 (relating to Salvaging and Scavenging)
- Section 19 (relating to Disease Vector Control)
- Section 13 (relating to Control of Windblown Solid Waste and Litter)
- Section 10 (relating to Unloading of Waste)

Unless otherwise indicated by the TCEQ, the City of Corpus Christi will continue performing operations as usual observing the sections mentioned above and implementing good housekeeping practices as necessary.

Visual screening of waste disposal activities will be accomplished primarily by:

- Vegetative screening on outer perimeter of the landfill area, and
- Vegetative screening along eastern side of the entrance road.

Visual screening will be developed in general accordance with the Fill Sequence plans in Attachment 1 of the Site Development Plan. Vegetation will consist of appropriate trees, shrubs, and grasses recommended for the Corpus Christi area by the USDA or the Texas Forestry Service.

31. Operational Standards for Class 1 Waste Management

Class 1 industrial solid waste will not be accepted and disposed of at this landfill unless compliance with §330.179 is achieved and maintained.

31.1. General Inspection Requirements

In accordance with §335.585 and §330.179(a)(1), the City or its operator will inspect the landfill for compliance with the site operating plan and will develop and follow a written schedule for inspecting monitoring equipment, safety and emergency equipment, and operating and structural equipment (such as dikes and sump pumps) that are important to preventing, detecting, or responding to environmental or human health hazards. The schedule will be maintained at the landfill office and will identify the types of problems (e.g., malfunctions or deterioration) that are to be looked for during the inspection (e.g., inoperative sump pump, leaking fitting, or eroding dike). This schedule will be updated to reflect the types of Class I Industrial Waste to be accepted at the landfill.

The frequency of inspection may vary for the items on the schedule. However, the frequency will be based on the rate of deterioration of the equipments and the probability of an environmental or human health incident if the deterioration, malfunction, or any operator error goes undetected between inspections. Areas subject to spills, such as loading and unloading areas, will be inspected daily when in use. At a minimum, the inspection schedule must include the items and frequencies required in 40 Code of Federal Regulations §264.303 for hazardous waste landfills.

The City or its operator will remedy any deterioration or malfunction of equipment or structures that the inspection reveals on a schedule that ensures that the problem does not lead to an environmental or human health hazard. Where a hazard is imminent or has already occurred, remedial action will be taken immediately.

The City or its operator will record inspections in an inspection log or summary, and retain these records in accordance with the requirements of §335.113(d) (relating to Reporting of Emergency Situations by Emergency Coordinator). At a minimum, these records will include the date and time of the inspection, the name of the inspector, a notation of the observations made, and the date and nature of any repairs or other remedial actions.

31.2. Personnel Training

In accordance with §335.586 and §330.179(a)(2), landfill personnel must successfully complete a program of classroom instruction or on-the-job training that teaches them to perform their duties in a way that ensures the facility's compliance with the requirements of §335, Subchapter T. The City will ensure that this program includes all the elements described in the document required under subsection §335.586(d)(3). This program will be directed by a person trained in waste management procedures, and will include instruction that teaches landfill personnel waste management procedures (including contingency plan implementation) relevant to the positions in which they are employed.

At a minimum, the training program will be designed to ensure that landfill personnel are able to respond effectively to emergencies by familiarizing them with emergency procedures, emergency equipment, and emergency systems, including, where applicable:

- procedures for using, inspecting, repairing, and replacing facility emergency and monitoring equipment;
- communications or alarm systems;
- response to fires or explosions;
- response to ground-water contamination incidents; and
- shutdown of operations.

Landfill personnel must successfully complete the program required in §335.586(a) within six months after the date of their employment or assignment to the landfill. Employees will not work in unsupervised positions until they have completed the training requirements of §335.586(a). Landfill personnel must take part in an annual review of the initial training required to ensure that ongoing training needs are addressed and maintained. The owner or operator must maintain the following documents and records at the facility:

- The job title for each position at the facility related to waste management, and the name of the employee filling each job;

- A written job description for each position listed above. This description may be consistent in its degree of specificity with descriptions for other similar positions in the same company location, but must include the requisite skill, education, or other qualifications, and duties of employees assigned to each position;
- A written description of the type and amount of both introductory and continuing training that will be given to each person filling a position listed above; and
- Records that document that the training or job experience required has been given to, and completed by, landfill personnel.

Training records on current landfill personnel will be kept until closure of the facility and training records on former employees will be kept for at least three years from the date the employee last worked at the facility. Landfill personnel training records may accompany personnel transferred within the same company.

31.3. Waste Analysis

In accordance with §335.587 and §330.179(a)(3), the following waste analysis requirements apply to the landfill:

- Before treating, storing, or disposing of any waste, the City will obtain a chemical and physical analysis of a representative sample of the waste. At a minimum, the analysis will contain all the information that must be known to treat, store, or dispose of the waste in accordance with §335, Subchapter T.
    - A waste generator's studies conducted on waste generated from processes similar to that which generated the waste to be managed at the facility may be included in the data base required.
    - The City may arrange for the generator of the waste to supply the information required by §335.587(a)(1). If the generator does not supply the information, and the City chooses to accept a waste, City will be responsible for obtaining the information required to comply with the regulations.

- The analysis may include data developed under §335, Subchapter R (relating to Waste Classification), and existing published or documented data on a waste or on such waste generated from similar processes.
- The analysis must be repeated as necessary to ensure that it is accurate and up-to-date. At a minimum, the analysis must be repeated:
    - when the owner or operator is notified, or has reason to believe, that the process or operation generating the waste has changed; and
    - when the results of the inspection required in §335.587(a)(4) of this subsection indicate that the waste received at the landfill does not match the waste designated on the accompanying manifest or shipping paper.
- The City will inspect and, if necessary, analyze each waste received at the landfill to determine whether it matches the identity of the waste specified on the accompanying manifest or shipping paper.

The City will develop and follow a written waste analysis plan that describes the procedures which the City will carry out to comply with the regulations. This plan will be submitted to the TCEQ and will be kept at the landfill office. The plan will specify:

- the parameters for which each waste will be analyzed and the rationale for the selection of these parameters (i.e., how analysis for these parameters will provide sufficient information on the waste's properties);
- the test methods which will be used to test for these parameters; and
- the sampling method that will be used to obtain a representative sample of the waste to be analyzed. A representative sample may be obtained using either one of the sampling methods described in Appendix I of Title 40 Code of Federal Regulations Part 261 or an equivalent sampling method approved by the executive director;
- the frequency with which the initial analysis of the waste will be reviewed or repeated to ensure that the analysis is accurate and up-to-date;

- the waste analyses that waste generators have agreed to supply; and
- where applicable, the methods that will be used to meet any additional waste analysis requirements in §335.588 (relating to General Requirements for Ignitable, Reactive, or Incompatible Wastes).

This plan will be developed when Class 1 wastes are proposed for disposal and will be updated as needed to meet the specific needs of the individual Class 1 wastes.

31.4. Ignitable, Reactive, or Incompatible Wastes

In accordance with §335.588 and §330.179(a)(4), the City will take precautions to prevent accidental ignition or reaction of wastes that are ignitable or reactive as defined in §335.505 (relating to Class I Waste Determination). This waste will be separated and protected from sources of ignition or reaction including, but not limited to: open flames, smoking, cutting and welding, hot surfaces, frictional heat, sparks (static, electrical, or mechanical), spontaneous ignition (e.g., from heat-producing chemical reactions), and radiant heat. While ignitable or reactive waste is being handled, the owner or operator shall confine smoking and open flame to specially designated locations. "No Smoking" signs must be conspicuously placed wherever there is a hazard from ignitable or reactive waste.

The landfill may dispose ignitable or reactive waste, or mix incompatible waste or incompatible wastes and other materials, therefore requiring the landfill to take precautions to prevent reactions which:

- generate extreme heat or pressure, fire or explosions, or violent reactions;
- produce uncontrolled toxic mists, fumes, dusts, or gases in sufficient quantities to threaten human health or the environment;
- produce uncontrolled flammable fumes or gases in sufficient quantities to pose a risk of fire or explosions;
- damage the structural integrity of the device or facility; or
- through other like means threaten human health or the environment.

When the above-mentioned conditions apply, the City will document compliance with §335.588(a) and (b). This documentation may be based on references to published scientific or engineering literature, data from trial tests (e.g., bench scale or pilot scale tests), waste analyses as specified in §335.587 (relating to Waste Analysis), or the results of the treatment of similar wastes by similar treatment processes and under similar operating conditions.

31.5. Contingency Plan

In accordance with §335.589 and §330.179(a)(5), the City has developed a contingency plan for the landfill. The contingency plan is designed to minimize hazards to human health or the environment from fires, explosions, or any unplanned sudden or non-sudden release of waste or constituents of such waste to air, soil, or surface water. The contingency plan will be submitted to the executive director with the permit application and, after modification or approval, will become a condition of any permit issued. The provisions of the plan will be carried out immediately whenever there is a fire, explosion, or release of waste or constituents of such waste that could threaten human health or the environment.

The contingency plan describes the actions landfill personnel will take to comply with §335.589(a) and (f) in response to fires, explosions, or any unplanned sudden or non-sudden release of waste or constituents of such waste to air, soil, or surface water at the landfill. Also included are arrangements agreed to by local police departments, fire departments, hospitals, contractors, and state and local emergency response teams to coordinate emergency services. The City will maintain a list of names, addresses, and phone numbers (office and home) of all persons qualified to act as emergency coordinator, and this list must be kept up-to-date and at the landfill.

A list of all emergency equipment will be kept at the facility (such as fire extinguishing systems, spill control equipment, communications and alarm systems, and decontamination equipment), where this equipment is required. This list must be kept up-to-date. In addition, the plan must include the location and a physical description of each item on the list, and a brief outline of its capabilities.

The plan includes an evacuation plan for landfill personnel in the event that evacuation is necessary. This plan describes signals to be used to begin evacuation, evacuation routes, and alternate evacuation routes in case the primary route is blocked by releases of waste or fires.

A copy of the contingency plan and all revisions to the plan must be maintained at the landfill and submitted to all local police departments, fire departments, hospitals, and state and local emergency response teams that may be called upon to provide emergency services.

The contingency plan will be reviewed and updated, if necessary, whenever:

- the landfill permit is revised;
- the plan fails in an emergency;
- the landfill changes in its design, construction, operation, maintenance, or other circumstances in a way that materially increases the potential for fires, explosions, or releases of waste or constituents of such waste, or changes the response necessary in an emergency; or
- the list of emergency equipment changes.

At all times Class 1 waste is accepted for disposal, there must be at least one employee either on the landfill property or on call (i.e., available to respond to an emergency by reaching the facility within a short period of time) with the responsibility for coordinating all emergency response measures. This emergency coordinator will be thoroughly familiar with all aspects of the landfill's contingency plan, all operations and activities at the landfill, the location of all records at the landfill, and the landfill layout. In addition, this person will have the authority to commit the resources needed to carry out the contingency plan.

Whenever there is an imminent or actual emergency situation, the emergency coordinator (or his designee when the emergency coordinator is on call) will immediately activate facility alarms or communication systems, where applicable, to notify all facility personnel and notify appropriate state or local agencies with designated response roles if their help is needed. Whenever there is a release, fire,

or explosion, the emergency coordinator will immediately identify the character, exact source, amount, and areal extent of any released materials. The emergency coordinator may do this by observation or review of facility records or manifests, and, if necessary, by chemical analysis. Concurrently, the emergency coordinator will assess possible hazards to human health or the environment that may result from the release, fire, or explosion. This assessment will consider both direct and indirect effects of the release, fire, or explosion (e.g., the effects of any toxic, irritating, or asphyxiating gases that are generated, or the effects of any waste surface water run-off from water or chemical agents used to control fire and heat-induced explosions).

If the emergency coordinator determines that the landfill has had a release, fire, or explosion that could threaten human health, or the environment, outside the landfill property boundary and if the emergency coordinator's assessment indicates that evacuation of local areas may be advisable, the emergency coordinator will immediately notify appropriate local authorities, and must be available to help appropriate officials decide whether local areas should be evacuated.

The emergency coordinator will immediately notify either the government official designated as the on-scene coordinator for that geographical area, (in the applicable regional contingency plan under 40 CFR Part 1510) or the National Response Center (using their 24-hour toll free number 1-800-424-8802). The report will include:

- name and telephone number of reporter;
- name and address of facility;
- time and type of incident (e.g., release, fire);
- name and quantity of material(s) involved, to the extent known;
- the extent of injuries, if any; and
- the possible hazards to human health, or the environment, outside the facility.

During an emergency, the emergency coordinator will take all reasonable measures necessary to ensure that fires, explosions, and releases do not occur, recur, or

spread to other waste at the landfill. These measures include, where applicable, stopping processes and operations, collecting and containing release waste, and removing or isolating containers.

If the facility stops operations in response to a fire, explosion, or release, the emergency coordinator shall monitor for leaks, pressure buildup, gas generation, or ruptures in valves, pipes, or other equipment, wherever this is appropriate.

Immediately after an emergency, the emergency coordinator will provide for treating, storing, or disposing of recovered waste, contaminated soil or surface water, or any other material that results from a release, fire, or explosion at the landfill. The City will classify all recovered waste, contaminated soil or surface water, or any other material that results from a release, fire, or explosion at the facility in accordance with §335, Subchapter R (relating to Waste Classification) and in accordance with all applicable requirements of §335, Subchapter A (relating to Industrial Solid Waste and Municipal Hazardous Waste in General). The City will notify the executive director, and other appropriate state and local authorities, that the landfill is in compliance before operations are resumed in the affected area(s) of the landfill.

The emergency coordinator will ensure that in the affected area(s) of the landfill:

- no waste that may be incompatible with the released material is treated, stored, or disposed of until cleanup procedures are completed; and
- all emergency equipment listed in the contingency plan is cleaned and fit for its intended use before operations are resumed.

The City will note in the operating record the time, date, and details of any incident that requires implementing the contingency plan. Within 15 days after the incident, the City will submit a written report on the incident to the executive director. The report must include:

- name, address, and telephone number of the City's representative;
- name, address, and telephone number of the landfill;
- date, time, and type of incident (e.g., fire, explosion);

- name and quantity of material(s) involved;
- the extent of injuries, if any;
- an assessment of actual or potential hazards to human health or the environment, where this is applicable; and
- estimated quantity and disposition of recovered material that resulted from the incident.

31.6. Operational and Design Standards

In accordance with §335.590(25) and §330.179(a)(6), hazardous waste from a conditionally exempt small quantity generator as defined in §335.78(a) (relating to Special Requirements for Hazardous Waste Generated by Conditionally Exempt Small Quantity Generators), may be accepted for disposal at the Cefe F. Valenzuela Landfill, provided the amount of hazardous waste accepted from each conditionally exempt small quantity generator does not exceed 220 pounds (100 kilograms) a calendar month, and provided the City is willing to accept the hazardous waste.

In accordance with §330.179(b), nonhazardous industrial waste may be placed above natural grade provided that the conditions in §335.590(24)(F)(i)-(vi) of this title are met, except as provided in §335.590(24)(F)(vii).

32. Enhanced Leachate Recirculation

The Cefe F. Valenzuela Landfill practices Enhanced Leachate Recirculation (ELR). ELR includes recirculation of leachate and gas condensate back into the active landfill waste mass, as well as introduction of other allowable liquids, with the goal of elevating moisture content to more effectively manage waste in the long term. Appendix IV-E to this SOP is the Enhanced Leachate Recirculation Operating Plan (ELROP), which contains details of implementation and operation of the ELR systems, including

- Appropriate Infrastructure;
- Allowable Liquids;
- Required Personnel;

- Standard Operational Procedures;
- Regular Monitoring;
- Thorough Recordkeeping;
- Accurate Reporting;
- Safety Measures; and
- Contingency Plans.

CEFE F. VALENZUELA LANDFILL
CITY OF CORPUS CHRISTI

CORPUS CHRISTI, TEXAS

NUECES COUNTY

APPENDIX IV-E
ENHANCED LEACHATE RECIRCULATION OPERATING PLAN

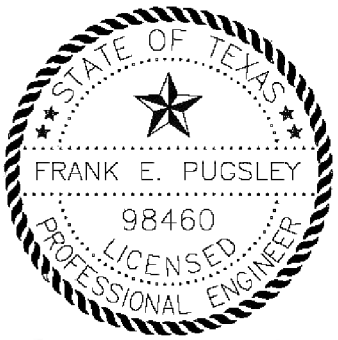
TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

MSW PERMIT NO.: 2269

Applicant:

CITY OF CORPUS CHRISTI
SOLID WASTE SERVICES DEPARTMENT
2525 HYGEIA STREET
CORPUS CHRISTI, TEXAS 78415

JULY 2013



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APPENDIX IV-E ENHANCED LEACHATE RECIRCULATION PLAN
CITY OF CORPUS CHRISTI—CEFE F. VALENZUELA LANDFILL

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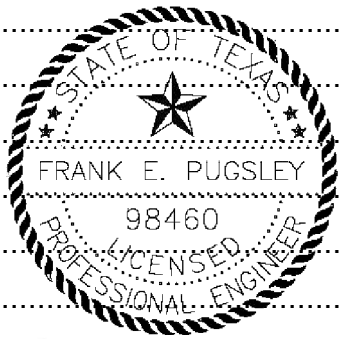

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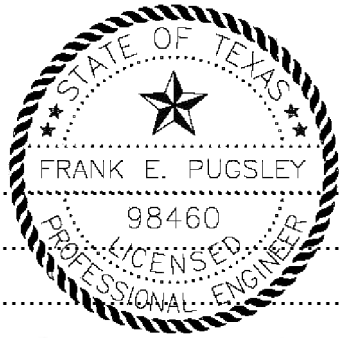

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NONE

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1. ELR Introductory Items

Following the lead of several other landfills around Texas that have successfully implemented Enhanced Leachate Recirculation (ELR), the City of Corpus Christi will conduct ELR at its Cefe F. Valenzuela Landfill ("Landfill"). This Plan provides information regarding the implementation of ELR at the Landfill.

1.1. ELR Defined

Many landfills in Texas recirculate leachate and/or landfill gas condensate back into the waste mass in accordance with Texas law which allows such activity in a landfill unit with a composite liner and leachate collection system (LCS). Specifically, Section 177 of Chapter 330 of Title 30 of the Texas Administrative Code [30TAC330.177] allows recirculation as long as the landfill operator includes the procedures in the Site Operating Plan (SOP). The Cefe F. Valenzuela Landfill is among those landfills in Texas authorized to recirculate leachate into cells with composite liner and LCS.

Several landfills in Texas have taken an additional step, gaining authorization to inject specific additional liquids into the waste mass. This so called "Enhanced" Leachate Recirculation or ELR seeks to elevate the moisture content (up to a limit of 40% by weight) of the MSW to accelerate anaerobic biodegradation of the material. Studies have shown that doing so results in several short- and long-term benefits at landfills and the surrounding communities, including

- Accelerated rate of waste stabilization,
- Reduced leachate storage and volume within the waste,
- Improved leachate quality,
- Accelerated landfill settlement prior to final closure,
- Increased LFG generation rate, and
- Reduced leachate treatment costs, including avoidance of transport to distant Publicly Owned Treatment Works (POTWs).

1.2. ELR Management Plan

Safe and effective implementation of ELR at the Landfill requires well-documented consideration of several aspects of the operations, including

- Appropriate Infrastructure;
- Knowledgeable Personnel;
- Standard Operational Procedures;
- Regular Monitoring;
- Thorough Recordkeeping;
- Accurate Reporting;
- Safety Measures; and
- Contingency Planning.

This ELR Management Plan (Plan) outlines the background, design, operation, and monitoring programs for the ELR Landfill system at the Landfill. The plan also describes the proposed sampling and analysis of leachate, safety procedures, reporting requirements and operation associated with leachate management at the Landfill, and includes a contingency plan to address system malfunctions.

1.3. Allowable ELR Liquids

ELR Landfills have successfully introduced a wide variety of liquids into the waste mass, including leachate, gas condensate, clean storm water & groundwater, effluents from wastewater treatment plants & grease and grit trap processing facilities, etc. At the Cefe F. Valenzuela Landfill, the City of Corpus Christi will recirculate and inject

- Leachate from the Landfill itself;
- Gas condensate from the Landfill itself;
- On- site storm water;

- Groundwater from the Landfill property; and
- Other approved liquids.

1.4. Definitions

This ELROP uses the following meanings for words and phrases:

Field Capacity: The liquid absorptive capacity of a given material, typically expressed as a moisture content (percent) limit. When a material reaches field capacity, additional liquids will effectively pass through unabsorbed. At a landfill, this adds directly to leachate production.

Subtitle D Composite Liner: A landfill cell liner system constructed in accordance with standards set forth in Subtitle D of the Resource Conservation and Recovery Act (RCRA), including composite liner systems, leachate collection systems, and related accessories.

2. Generalized ELR Process

In general, ELR includes the following actions:

- Install appropriate recirculation infrastructure, e.g. pumps, pipelines, permeable beds (PBs), recirculation laterals (RLs), injection wells, etc.
- Monitor incoming waste moisture content;
- Collect leachate from landfill cells via the LCS;
- Reintroduce leachate and/or other approved liquids (Section 1.3) into waste mass [only over locations with an approved Subtitle D Composite Liner, see 30TAC330.331(b)];
    - Combine stored leachate with clean liquids;
    - Recirculate into landfill using permeable beds, recirculation laterals, and/or vertical injection wells;
    - Limit daily average recirculation to 100,000 gallons per landfill cell (annual average). Refer to Appendix IV E-1 calculations;

- Limit liquids injection to maintain moisture content of the in-place waste at 35% moisture by weight, plus or minus 5% to account for variations in the waste pack, but at all times remaining below 40% moisture by weight;
- Monitor leachate and gas generation rates to determine effects of recirculation activities.

3. Preparatory Analysis and Design

Prior to implementation of ELR, qualified individuals or teams must perform thorough analyses to ensure the landfill is prepared to handle likely changes in leachate production & quality, head on the liner, and landfill gas production rates.

3.1. Leachate Production

Implementing ELR typically results in increased leachate production, especially if the waste mass reaches field capacity. The Hydrologic Evaluation of Landfill Performance (HELP) Model provides useful predictions regarding leachate production within landfills. HELP Model calculations in Appendix 15A (in Part III, Attachment 15) account for liquids injection associated with ELR Operations. The results of the HELP Model runs confirm that head conditions on the liner will remain below 30 centimeters in depth with the recirculation volumes limited to the amount indicated in Section 2. If leachate generation rates increase substantially, indicating that areas of the Landfill have reached field capacity, the design of the LCS is such that it can handle the additional flow of moisture.

3.2. Leachate Quality

Recirculating leachate through the waste mass typically improves its chemical qualities, making it less difficult to manage in the event it must be sent to a wastewater treatment plant (WWTP). Though studies and experience show the likely improvements in chemical characteristics, each landfill is a unique environment where actual changes may vary. Any unexpected changes to leachate chemistry can be addressed through an ELR Contingency Action Plan (See Section 11—ELR Contingency Plan).

3.3. Head on the Liner

Higher leachate production can lead to increased hydraulic head on the liner without expansion of the leachate collection system (LCS). Design of the LCS in cells with ELR implemented will follow the appropriate indications in Appendix 15B (in Part III, Attachment 15) to ensure that the LCS manages additional leachate effectively, keeping hydraulic head on the liner under 30 cm of liquid.

3.4. Landfill Gas Production Rates

The increased moisture in the waste mass encountered due to ELR operations typically leads to accelerated production of landfill gas. Upon installation of a landfill gas collection system, as needed, the Landfill will conduct thorough analyses to ensure the appropriate landfill gas collection infrastructure necessary to ensure safe collection and handling of the landfill gas generated within the waste mass under ELR conditions.

4. ELR Infrastructure

The ELR system is designed to reintroduce leachate and other approved liquids back into the waste mass at a landfill by means of recirculation laterals (RLs), permeable beds (PBs), vertical injection wells (VIW), and surface application (SA).

4.1. Existing Conditions

The City will install PBs and/or RLs within future cells as they are developed. Figure 15-E.1 shows a typical development detail of ELR cells. Subsequent cells will follow a similar design and designation.

4.2. Recirculation Laterals (RLs)

Recirculation laterals (RLs) are perforated pipes installed within the Landfill to inject leachate and other approved liquids back into the landfill waste. The laterals are placed in trenches within the landfill waste pack, or imbedded in a granular material and overlain with geotextile fabric to act as a filter. If granular material is used, it should be larger in size than the pipe perforations. Suitable materials include gravel, crushed glass, tire chips, shredded tires, and crushed concrete. All of these materials are suitable for disposal in the landfill under TCEQ regulations, but provide

a more uniform hydraulic conductivity when compared with mixed MSW. If tire chips are used, they shall be 12-inch nominal or smaller in size and shall not be placed within 2 feet of any liner or final cover installation unless steel belts are removed.

The RL will be solid, fused, 3- to 6-inch diameter HDPE pipe located a minimum of 100 feet inside any side slopes to reduce leachate seep potential. The perforated sections of the RLs will be constructed of 6--inch diameter perforated HDPE pipe. In order to more evenly distribute leachate, the RL design may also have variable perforation size, with perforation diameter increasing as the distance from the tank and pump increases. A pair of holes will be placed at 5-foot intervals and increase in size from the inlet end of the pipe to the terminal end to provide more equal distribution of recirculated liquids.

Solid sections of RLs will connect the perforated piping to the Recirculation Manifold (Section 4.5 of this Plan). Installation of RLs may begin at an elevation within the Landfill of approximately 20 feet above the liner elevations. The perforated section of the RL will be centered in a rectangular trench and backfilled with recycled shredded tires, aggregate, other granular material or MSW. Installers will shingle a geotextile filter shingled over the top of the trench to minimize the infiltration of fines, then cover the trench with a foot of intermediate cover. Landfill staff will ensure that compactors not pass above RL's until at least 5 feet of waste have been placed above them.

Clean out risers will be furnished at the ends of the RLs and will daylight either at the waste limits or on the sideslope. Cleanouts may also provide connection for LFG control as a horizontal gas collector. Cleanouts can be extended as future cells piggyback over these sideslopes.

Figure 15-E.2 provides typical RL details.

4.3. Permeable Beds (PBs)

Permeable beds (PBs) are a second type of distribution method consisting of a 0.1 to 2-foot thick layer of relatively high hydraulic conductivity material, overlain with a geotextile fabric filter. PB installation occurs over the waste surface with a

perforated pipe running through the center of the PB, and then covered with a layer of waste. Thickness of the PBs will vary dependent on the material used and the quantity of material available at the time of placement. The PB can be made of geocomposite, gravel, crushed glass, tire chips, shredded tires, or crushed concrete. If tire chips are used, they shall be 12-inch nominal or smaller in size and shall not be placed within 2 feet of any liner or final cover installation unless steel belts are removed. All of these materials are suitable for disposal in the landfill under TCEQ regulations but provide a more uniform hydraulic conductivity when compared to MSW. The PBs have much greater surface area then the RLs. Research indicates the following advantages of PBs over RLs:

- Increased volume of leachate recirculated per unit mass of waste.
- Avoided construction costs due to the lack of trenching and fewer pipes required (e.g., distance between PBs is 2-4 times greater than RLs).
- Uniform liquid distribution reducing dry zones and differential settlement.
- Increased landfill gas generation rate.
- More efficient LFG collection.

The PBs will be approximately 350 to 450-feet long and 100-feet wide depending on their horizontal and vertical location within each Phase. The PB designs show them at least 100 feet from any exterior side slope.

PB installation will occur directly on the waste surface as the waste lift in these areas attain design grade. One main 3 to 6-inch diameter, solid HDPE header will lead from the Recirculation Manifold along the centerline of each PB at each elevation. Each PB will have a cleanout at the landfill sideslope. The length of pipe inside the PB will be constant-diameter perforated pipe, similar to the RLs. Like the RLs, installers will drill two holes at each 5-foot interval.

The Landfill operator should take care to avoid compactor movement over a PB until 5-feet of waste has been placed over the constructed area.

Plans are in place for future connections to a LFG control system at both cleanouts on each PB. Additionally, a loop of perforated HDPE pipe may be installed around the perimeter of each PB for LFG collection.

Figure 15-E.3 provides typical PB details.

4.4. Vertical Injection Wells (VIWs)

Vertical Injection Wells (VIWs) can combine with or substitute for PBs and/or RLs to inject ELR liquids into the waste pack. A VIW will adhere to the same design as a vertical landfill gas collection well as detailed in Appendix III-F because any VIW will eventually connect to a LFG control system. Additionally, existing vertical landfill gas collection wells can serve as ELR VIWs if operational needs dictate. Figure 15-E.2 provides typical VIW details.

4.5. Recirculation Manifolds (RMs) and Forcemains

As described in Appendix III-A (Water Pollution Control), leachate is collected and stored in permanent and/or temporary storage tanks or pond(s). From the storage tank(s) or pond(s), a recirculation forcemain discharges into various recirculation manifolds (RM) within the Landfill. The RMs have valves capable of discharging to each PB and RL line in each cell. When pipelines extend beyond the limits of the lined area of the Landfill, they shall be double-walled pipe.

4.6. Infrastructure ID Codes

Each RL, PB, and VIW will have an identification code based on the design (RL, PB, VIW), cell location, elevation and location laterally. For example, the southern-most RL installed in Phase 3 at elevation 140 ft would have the ID code “RL-3-140-1,” the RL located immediately to the north of RL-3-140-1 would have the ID code “RL-3-140-2,” and so on. Similarly, the southern-most PB installed in Phase 3 at elevation 180 feet would have the designation PB-3-180-1 and the PB installed immediately north of PB-3-180-1 would have the ID code “PB-3-180-2,” and so on.

4.7. Infrastructure Inspections

Landfill staff will regularly inspect the ELR infrastructure to ensure it is working properly. Inspections will primarily focus on detecting leaks and/or spills, but will also check for proper functionality.

5. ELR Personnel

ELR requires well-trained Landfill staff to ensure smooth operations. Each of the following tasks needs to be assigned as a responsibility to one person or position at the landfill. In some cases, multiple responsibilities may be assigned to one employee.

- Liquids Recirculation Management
- Liquids Recirculation Operations
- Liquids Recirculation Recordkeeping
- Liquids Recirculation Infrastructure Inspection
- Liquids Recirculation Infrastructure Maintenance

5.1. ELR Management

The Landfill Manager will ensure proper management of the ELR system. He or she will be responsible for planning and development of the system and will assign tasks to designees, as needed.

5.2. ELR Operation

The Landfill Manager assumes responsibility for effective operation of the ELR system. He or she will be responsible for scheduling dosing and startup and shutdown of the system. He or she may assign such tasks to other Landfill staff, as needed.

5.3. ELR Recordkeeping

The Landfill Manager will be responsible for maintaining accurate records of ELR system operations, including dose dates, liquid qualities & amounts, and maintenance activities. He or she may assign recordkeeping duties to Landfill staff, as needed.

5.4. ELR Inspection

The Landfill Manager will ensure the ELR system undergoes regularly scheduled inspections. During these inspections, he or she, or a designee, will conduct observations of the ELR infrastructure, making note of any deficiencies that could lead to improper operation of the system. Observations of staff during everyday landfill operations will supplement the regularly scheduled inspections. Operators will inform the Landfill Manager, or designee, of any irregularities they notice as they work. The Landfill Manager, or designee, will ensure any noted issues receive appropriate attention and any necessary repairs and/or maintenance.

5.5. ELR Maintenance

The Landfill Manager will be responsible for maintenance of the ELR system. In response to deficiencies noted during inspections, he or she will schedule and carry out repair and/or maintenance activities, or will clearly assign these tasks to a member of landfill staff. On occasion, repair or maintenance may require the service of an outside vendor—this determination will be at the Landfill Manager's discretion.

5.6. Training of ELR Personnel

The Landfill Manager will ensure that Landfill staff receives appropriate training regarding their interactions with the ELR system.

Topics covered in training will include:

- ELR Infrastructure Basics (All Staff)
    - Location & Arrangement
    - Function & Operation
    - Benefits & Responsibilities
        - Airspace Recapture
        - Accelerated Gas Production
        - Leachate Management
        - Caution around Pipelines, Manifolds & Fixtures

    - Report Observed Irregularities
- Inspection Procedures (Any staff assigned inspection duties)
- Records Requirements (Any staff assigned recordkeeping duties)
- Maintenance Procedures (Any staff assigned maintenance duties)

6. ELR Operational Procedures

ELR operations will occur in units called dosing events. A dosing event will consist of pumping leachate from the storage tank(s) or pond(s) along with other approved liquids through the recirculation pipeline(s) and manifold(s) to an RL or PB when recirculation is scheduled for that cell. The daily average dosing event will be 100,000 gallons with an annual maximum of 36,500,000 gallons for each Phase (Appendix IV E-1 calculations). Landfill staff will determine recirculation volumes using flow meter readings.

6.1. Recirculation Lateral Dosing

Experience gathered during the operation and review of other recirculation projects indicates that, to encourage optimum conditions, RLs dosing should amount 25 to 50 gallons per dosing event per foot of perforated trench, that dosing should occur in only one trench at a time, and that trenches need rest between doses in order to develop uniform wetting fronts. With this in mind, the following criteria govern dosing of the RLs:

- During each dosing, an RL will receive 25 to 50 gallons per foot of trench up to a maximum of 50 gallons per dosing event per foot of trench during each dosing event. This means that each RL will not receive more than 50 gallons for each perforated foot within the trench independent of time unless the daily maximum is reached.
- Dosing will rotate to the next RL when the maximum volume is reached.
- RLs will be rested a minimum of one day between dosing events.

Because RL lengths will vary, dosing volumes will also vary as follows:

- For the shortest RLs (estimated at about 120 feet of perforated pipe), estimates of liquid injection dosing range between 3,000 and 6,000 gallons per event.
- For the longest RLs (estimated at about 480 feet of perforated pipe), estimates of liquid injection dosing range between 12,000 and 24,000 gallons per event.
- For RLs of intermediate lengths (***x*** feet of perforated pipe), estimated dosing ranges will range between ***25x*** and ***50x*** gallons per event.

Landfill staff will make regular observations of the pipelines' and manifolds' flow meters and pumps' hour meters during ELR system operation to ensure that RL dosing quantities remain within the prescribed limits. Each RL will have a flow meter that staff can use to determine the liquid volume injected during each dosing event. The Landfill will retain records showing appropriate dosing in accordance with Section 8—ELR Recordkeeping.

6.2. Permeable Bed Dosing

PBs will be loaded at a conservative rate of 1 to 3.5 gallons/dosing event/square foot. Dosing, at flows varying between 35,000 and 157,500 gallons/dosing event on average, will rotate to each PB similar to the RLs.

Landfill staff will make regular observations of the pipelines' and manifolds' flow meters and pumps' hour meters during ELR system operation to ensure that dosing PB dosing quantities remain within the prescribed limits. Each PB will have a flow meter that staff can use to determine the liquid volume injected during each dosing event. The Landfill will retain records showing appropriate dosing in accordance with Section 8—ELR Recordkeeping.

6.3. Vertical Injection Well Dosing

VIW dosing of ELR liquids may occur at any dedicated VIW. Dosing may also occur at any landfill gas collection well such that the well is offline during dosing and the resting period. The following criteria will govern dosing at VIWs:

- VIW dosing shall utilize a permanent recirculation header pipeline connected to the VIW or a water wagon or other temporary water delivery methods.
- Dosing shall continue until well is full and refuses additional ELR liquids.
- Care shall be taken when dosing to avoid overfilling as damage to the well, well plug, or well casing may occur.
- Each VIW shall be rested a minimum of one day between dosing events.

If a connection to a permanent recirculation lateral supplies the VIW's liquid supply, Landfill staff will monitor the flow meter and pump hour meters on days when the recirculation system is operated. Each VIW will have a flow meter that staff can use to determine the liquid volume injected during each dosing event.

Should the VIW's liquid supply originate from a temporary delivery method, such as a water wagon, the dosing volume of the ELR liquids shall be determined based on the known volume of the delivery tank and the number of full tanks dosed. In the event the well refuses a complete tank, the full tank volume shall be recorded for that dosing event.

Landfill management will decide appropriate use of VIW's based on operational needs of the site.

6.4. Surface Application

Landfill staff may recirculate leachate and other allowable liquids via surface application (SA) on the Landfill crown area or level areas (i.e. not side slopes), as needed. The groundwater or clean surface water may be applied to the Landfill intermediate cover or working face, depending on the method or procedure chosen. Prior to any surface application, Landfill staff will install surface controls (e.g. soil containment berms) to prevent runoff from the surface applied areas. During surface applications, Landfill operators will take care to ensure no more than 100,000 gallons (Attachment IV E-1) of groundwater or clean surface water will be land-applied per day.

Surface application methods may include:

- Direct mixture of the groundwater or clean surface water with the Landfill waste loads in the working face.
- A spray irrigation system.
- Driving an irrigation or water dispensing tank truck or water wagon with a spreader bar or liquid dispensing nozzle over the site.
- Excavating trenches for direct groundwater or clean surface water deposit with subsequent backfilling of trenches.

The surface application procedure used will be dependent on the properties of the liquid, and the cost, maintenance and ease of use of the process.

7. ELR Monitoring

Monitoring of the Landfill is critical to determine how the Landfill responds to the ELR. In order to safely and effectively operate an ELR landfill several conditions shall be monitored during and after a dosing event.

7.1. Monitoring

Monitoring of the waste will include sampling the in-place waste to determine initial moisture content and surveying the fill area to determine placement densities and settlement data.

7.1.1. Waste Settlement

One of the ELR process goals is to increase waste settlement rates. To determine where settlement is occurring in the landfill, an annual survey shall be conducted. This information will enable the landfill to place additional waste in areas of settlement and reclaim that airspace.

7.1.2. Airspace Utilization Factor

The calculated airspace utilization factor (AUF) is an important factor for the evaluation of the ability to increase waste settlement, providing more airspace. Landfills practicing leachate recirculation and/or ELR have experienced improvements to their AUF ranging from 20 to 50 percent.

AUF calculations are based upon the tonnage of waste placed in the Landfill and the airspace consumed during a fixed period of time.

For example, top of waste topographic surveys were conducted in January 2010 and January 2011. Landfill scalehouse records show the tonnage of waste disposed between those dates. With these data, one can compute the AUF between January 2010 and January 2011. For each survey, the volume of waste and cover soils between the top of waste and the top of protective layer is determined. The difference between these two volumes is the airspace consumed between the two survey dates. The relative density (AUF) in pounds per cubic yard can be calculated by dividing the tons of waste landfilled between the survey dates (converted to pounds) by the airspace consumed. This value is not a measure of in-place waste density, but more a measure of air space utilization efficiency.

AUF monitoring will occur at the frequency indicated in Table 7-1.

7.1.3. Waste Moisture Content

Effective implementation of ELR requires knowledge of the moisture content of the waste mass. The Landfill will establish moisture content of the waste through a procedure outlined by the Environmental Protection Agency (EPA). In the guidance document "Example Moisture Mass Balance Calculations for Bioreactor Landfills," [EPA-456/R-05-004, August 2005] the EPA describes appropriate methods to determine moisture content at MSW Landfills.

The EPA publication states, "The NESHAP allows moisture content to be determined using a variety of methods, as long as the procedures and assumptions are documented and appropriate. A range of appropriate methods exist. For example the landfill owner/operator can perform a simple mass balance calculation. The calculation must take into account the waste mass, moisture content of the incoming waste, mass of liquids added to the bioreactor (including recirculated leachate), precipitation falling on the bioreactor surface, and mass of water removed as leachate. The landfill can perform more complex mass balances using models that take into account additional factors such as

surface runoff, landfill cover types that reduce the amount of precipitation entering the waste mass, and water loss mechanisms such as evapotranspiration. Another possible method for an established bioreactor would include sampling the moisture content of the waste at multiple locations within the bioreactor, and performing statistical calculations to determine the average percent moisture. However, it is expected that in most cases, a mass balance approach will be adequate to determine whether the moisture content is above or below 40 percent and comprehensive sampling will not be needed."

Method B: The Landfill will use the Advanced Set of Calculations in the EPA's Water Balance Method to determine the moisture content and to calculate the appropriate quantities of leachate, gas condensate, and other liquids to add into the waste mass. The Water Balance Method performs calculations in sequence on a monthly time basis to estimate the average moisture content.

Table 7-1: Solid Waste Monitoring Schedule

Parameter	Interval
Waste Settlement	Quarterly
Airspace Utilization Factor (AUF)	Annually

7.2. Liquids Monitoring

Monitoring of the liquids introduced to and generated by the Landfill will occur on a regular schedule and the data will be used to develop a relationship between recirculation and waste degradation.

7.2.1. Leachate Generation

Flow meters on the leachate collection system will indicate the amount of leachate generated in the landfill. In addition, liner leachate head readings recorded as directed in the Leachate and Contaminated Water Plan (Attachment 15 to Part III) will confirm that hydraulic head on the liner remains under 30 centimeters.

7.2.2. Leachate Level on Liner

The City will monitor the depth of leachate on the landfill liner (above the top of the sump) with a pressure transducer located on each submersible pump within the side slope risers. The regulatory point of compliance is 30-cm of leachate head on the liner (above the top of the sump). In areas where ELR will be used, the regulatory point of compliance is level with the top of the sump. Each pump control panel uses a digital readout of the leachate head above the transducer. Each panel is programmed such that the pump turns on when the head in the sump reaches the top of the sump. The pump is programmed to turn off when the head level drops to approximately 1-ft of head above the bottom of the sump. The transducers provide continuous measurement of head, and the control panel(s) are equipped to provide a visual indication when the head over the liner approaches the regulatory limit. All head levels are checked and recorded monthly.

7.2.3. Precipitation

The Landfill keeps records of precipitation data as part of its Storm Water Pollution Prevention Plan (SW3P). Staff can readily access those records, as needed, as it relates to ELR operations.

7.2.4. Volume of Liquids Recirculated

One goal of ELR is to increase the moisture content of the MSW to provide a better environment for the sustenance of microbes responsible for biodegradation of water. MSW typically enters landfills with moisture content around 20% by weight. Corpus Christi would like MSW moisture content at the Cefe F. Valenzuela Landfill to rise to 35% +/- 1%. Attachment IV-E-1 contains tables showing how many gallons should be injected per incoming cubic yard of waste (the values vary depending on assumed incoming waste density). Immediately after, Attachment IV-E-2 presents the methodology to determine the calculated waste moisture content due to liquids injection and environmental conditions. Table 7-2 lists the ELR liquid characteristics that landfill staff will monitor regularly with their respective monitoring schedules.

Table 7-2: Liquids Monitoring Schedule		
Parameter	Interval	Units
Leachate Generation (Non ELR Cells)	Daily*	gal (L)
Leachate Generation (ELR Cells)	Daily*	gal (L)
Leachate Level on Liner	Monthly	inch (mm) datum = top of sump
Precipitation (rainfall and snowfall)	Daily*	inch (mm)
Volume of leachate and landfill gas condensate recirculated	Daily*	gal (L)
Volume water and other liquids recirculated	Daily*	gal (L)

* - Days that the Landfill is open.

7.3. Landfill Gas Monitoring

An ELR landfill is designed to accelerate the rate of waste decomposition. This in turn accelerates the rate of LFG production. If the Landfill installs a landfill gas collection system, staff will monitor it to measure the percentage of the methane and oxygen in the LFG and determine if the ELR process is functioning correctly.

7.3.1. Gas Parameters

Landfill gas parameters to be monitored will be established prior to installation of any landfill gas collection system. Typically, landfills test collected gas to determine the content of a variety of chemical constituents. Table 7-3, provided for reference only, shows a typical monitoring schedule for a landfill gas collection system.

Table 7-3: Typical Landfill Gas Monitoring Schedule	
Parameter	Interval
Landfill Gas Flow/Production at each LFG Lateral Connection	Monthly
NMOC	Per Air Permit
HAPs, Surface Emissions, etc.	Per Air Permit

8. ELR Recordkeeping

Implementation of ELR at the Landfill will generate records of relevant operational and monitoring characteristics. ELR Records include

- Dose Liquid Quantity Records,
- Recirculation System Installation Records,
- Recirculation System Inspection Records, and
- Other information necessary to ensure effective implementation.

ELR records will become part of the Landfill's Site Operating Record and will remain at the Landfill for the life of the Site.

9. ELR Reporting

Operations of ELR Landfills do not trigger any special reporting requirements. Thus, the Landfill will simply abide by the reporting schedules already in place at the facility.

10. ELR Safety Measures

Implementing ELR will not require application of any specific safety measures beyond those already practiced by facility staff to ensure safe operation of the Landfill. Thus, Landfill staff will keep themselves, customers, visitors, and the environment safe through adherence to the Landfill's Safety Plan.

11. ELR Contingency Action Plan

Implementing Enhanced Leachate Recirculation (ELR) at a landfill can lead to some situations that may require special remedial actions in a short amount of time. With this in mind, the managers of the Cefe F. Valenzuela Landfill have developed an ELR Contingency Action Plan (CAP) to address the most likely potential emergencies. Conditions requiring activation of the CAP may turn up during routine inspections, monitoring, maintenance, etc. Any activation of the CAP will result a staff generation of an event report, a copy of which will go in the facility operating record.

11.1. Events Leading to Contingency Actions

Certain known events and/or conditions, if encountered in the ELR portion of the Landfill, could threaten human health and/or the environment. Discovery of any of these would thus trigger implementation of this CAP:

- Infrastructure damage from motor vehicle;
- Significant leachate seep;
- Leachate pump failure;
- Leachate spill;
- Impending tank or pond overflow;
- Significant erosion damage to cover;
- Cover integrity failure;
- Unexpected decrease in recovered leachate flow;
- Increase in leachate head over liner (above regulatory limits); and/or
- Significant change in leachate chemistry.

11.2. Contingency Action Procedures

In the event of implementation of this CAP, Landfill staff shall apply the following steps:

- Identify the Problem(s)
- Evaluate Potential Remedies
- Develop an Event-Specific CAP
- Implement Remedial Actions
- Notify Regulatory Agencies & Follow-up Internally

Subsequent sections of this CAP provide detailed descriptions of the actions required in each step.

11.2.1. Identify the Problem(s)

Upon discovery of any condition that threatens human health and/or the environment, landfill staff must first identify the problem(s) generating the root cause of the abnormality. Determination of the cause includes

- Clearly stating what factor led to the condition;
- Listing known realized effects;
- Listing potential future effects;
- Determining other facilities at the Landfill threatened by the problem(s), and securing them to protect against damage (if any); and
- Classification of events according to their severity.

Determination of the cause of the problem(s) will provide direction to Landfill staff as they implement the provisions of this CAP.

11.2.2. Evaluate Potential Remedies

After identifying the problem(s), Landfill staff will evaluate potential remedies and select the best ones to correct them. Remedy evaluation includes

- Examination of the extent of the hazard(s) to human health and/or the environment;
- Review of the actions required to mitigate the hazard(s);
- Assessment of capability of on-site staff to carry out the actions;
- In cases where actions exceed on-site capacities, generate a list of appropriate contacts that can assist in remediation.

11.2.3. Develop an Event-Specific CAP

Section 11.3 contains a number of action plans to address issues commonly encountered at ELR landfills When Landfill staff discovers any of those, they will implement the appropriate action plan. However, on occasion, multiple

problem(s) and/or unanticipated problem(s) will arise. In such cases, Landfill staff will develop an event-specific action plan to remediate.

- If multiple problems exist, prioritize them by severity and/or threat so as to address them in order of seriousness;
- Ensure effective security measures are in place to protect other facilities, operations, and/or structures at the Landfill from any threat;
- Identify corrective actions required to address each problem;
- Establish a schedule to implement corrective actions;

11.2.4. Implement Remedial Actions

When Landfill staff has settled upon an effective action plan, they will then initiate remedial activities. During remediation, staff will be sure to

- Contain any potential environmental contaminants for removal, disposal, and/or treatment;
- Protect other threatened structures or facilities;
- Repair any earthwork damage with on-site equipment, up to the capability of facility personnel; and
- Secure assistance from specialized personnel, as needed, to complete certain tasks (e.g. electrical work, liner repair, pump repair, etc.).

11.2.5. Notify Regulatory Agencies & Follow-up Internally

Depending on the type and severity of the incident, provisions of Title 30 of the Texas Administrative Code [30TAC] may require notification to the TCEQ regarding its occurrence and the remedial actions. After remediation, Landfill management will assess the need for notification to the TCEQ, and will do so in accordance with the appropriate sections of Texas Law.

For the sake of improved operations going forward, any incident requiring implementation of this CAP will trigger a follow-up review of the event. The evaluation will include

- Review of the stated cause(s) of the incident, with corrections and/or additions to them, as needed;
- Determination of the effectiveness of the remedial actions, with suggested changes to address future occurrences, if appropriate;
- A written event report describing the cause of the incident, the response actions, their results, and the overall effect(s) of the event itself.
- Modifications to this CAP if the review determines they are necessary.

11.3. Event Specific Remedial Actions

Some issues commonly encountered at ELR landfills have establish best practices to remediate them. This section of the CAP lists several of these and describes the actions that Landfill staff will undertake to repair them if they occur.

11.3.1. Infrastructure Damage from Motor Vehicle

- Immediately cease operation or isolate a portion of the damaged system (Leachate recirculation, gas collection, etc.);
- Determine the extent of damage;
- If repairs are necessary, contact the design engineer for direction in making the repairs;
- Complete repairs, and return the system to normal operation.

11.3.2. Leachate Seep

- Immediately suspend recirculation in the portion of the landfill affected, and record the coordinates of the seep;
- Contact the design engineer;
- Place a temporary containment berm around the seep to prevent migration, and excavate a drainage trench inside the berm to promote infiltration;

- Determine if the seep is resulting from the recirculation of leachate and liquid amendments. If so, assess the need to clean the RLs to promote uniform infiltration.
- Upon restarting the recirculation system, rest the RLs in the affected area for one month, and reduce the dose volume in the affected area by 50%;
- If settlement or erosion caused the seep to occur, repair the region surrounding the seep according to design specifications;
- If the seep persists, evaluate the need to modify recirculation plan, or modify the area by installing further leachate control to manage the seep.

11.3.3. Leachate Pump Failure

- Immediately pull pump and replace with a new backup pump;
- Cease recirculation in the region contributing to the failed pump;
- Assess cause for pump failure;
- If applicable, correct problem leading to pump failure;
- Resume recirculation once any causes of the failure have been corrected.

11.3.4. Leachate Spill

- Contain spilled leachate by constructing temporary berms or containment trenches;
- Pump the spilled leachate into either a tanker truck, storage tank, or pond;
- If any soil or surface water has been contaminated by leachate, this material shall be removed and placed either in the landfill or into leachate storage, respectively;
- Determine the cause of the spill. If the spill occurred due to infrastructure (piping, etc.) damage, see the appropriate Contingency Actions;
- Correct the cause of the leachate spill, if applicable.

11.3.5. Impending Tank or Pond Overflow

- Immediately cease any tank or pond filling operations;
- Either begin discharging leachate from the tank or pond to the recirculation system, or load leachate into a tanker truck for disposal;
- Determine the cause for the overfilling of the storage tank(s) or pond(s). Correct the problem, and resume normal leachate operations.

11.3.6. Cover Erosion Damage

- Assess extent of damage;
- Determine if the storm water control system needs modifications to prevent future damage. If so, contact the engineer for design changes;
- If weather conditions threaten to further damage the cover system, install temporary storm water controls such as sandbags or hay bales;
- If the membrane barrier is damaged, excavate to expose the damaged portion of the membrane and repair per the manufacturer's recommendations;
- Replace drainage and soil layers to design specifications, and revegetate the area as required.

11.3.7. Cover Integrity Failure

Note: Some settlement of the cover over the areas receiving recirculation is expected.

- Inspect the cover for evidence of cracks or movement;
- Relocate landfill operations if the failure causes a safety issue;
- Evaluate cause of failure, and determine remedial options;
- Contact the engineer for direction on permanent repair of the cover system;

- If the failure has affected the membrane layer, excavate to expose the damaged portion and repair per the manufacturer's recommendations;
- Replace the appropriate drainage and soil layers and regrade to allow for proper drainage, and revegetate as necessary.

11.3.8. Unexpected Decrease in Recovered Leachate Flow

- Check leachate pump(s) performance, and compare to manufacturer supplied literature;
- If the pump appears to be failing, follow actions in "Leachate Pump Failure;"
- If the pump appears to be operating as intended, clean-out collection piping as needed. Leachate volume should return to normal.

11.3.9. Increase in Leachate Head Over Liner

- Check leachate pump(s) performance, and compare to manufacturer supplied literature;
- If the pump appears to be failing, follow actions in "Leachate Pump Failure;"
- Clean-out collection piping as needed. Head over liner should return to normal.;
- If head does not return to normal, and the pump appears to be operating as intended, insert a higher capacity pump into the affected sump to improve leachate removal. Leachate head should return to normal;
- If head fails to return to normal, suspend recirculation in the affected cell for one week; after head levels have returned to normal reduce recirculation volume by 50% for one week and monitor head and pump performance.

11.3.10. Significant Change in Leachate Chemistry

If pH drops to 6.2 or less in raw leachate:

- Discontinue recirculation immediately;
    - Dose Unit with buffered liquid amendments, or neutral liquid amendments (e.g. stormwater) for two cycles;
    - Monitor pH daily.
- If pH returns above 6.2
    - Continue dosing buffered amendments for 1 month;
    - Monitor pH weekly;
    - After the month, resume normal recirculation.
- If pH remains at or below 6.2
    - Suspend recirculation and evaluate addition of nutrients or buffers to adjust pH.

If pH rise above 9 in raw leachate:

- Limit recirculation volume to 25% of target amount unless pH is adjusted to below 9, or use only neutral liquid amendments;
- If pH remains above 9
    - Suspend recirculation;
    - Evaluate addition of nutrients or buffers to adjust pH.
- If pH returns below 9
    - Continue dosing buffered amendments for 1 month;
    - Monitor pH weekly;
    - After the month, resume normal recirculation.

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CEFE F. VALENZUELA LANDFILL
CITY OF CORPUS CHRISTI

CORPUS CHRISTI, TEXAS

NUECES COUNTY

APPENDIX IV E-1
ENHANCED LEACHATE RECIRCULATION OPERATING PLAN
MSW MOISTURE TABLES

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

MSW PERMIT NO.: 2269

Applicant:

CITY OF CORPUS CHRISTI
SOLID WASTE SERVICES DEPARTMENT
2525 HYGEIA STREET
CORPUS CHRISTI, TEXAS 78415

JULY 2013

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Management of Moisture Addition

This section presents an overview of moisture calculations and a straightforward method for determining the correct amount of moisture to add to the MSW based upon collected data. Moisture does not have to be added in a short period of time in order to reach field capacity. Liquids can be recirculated and/or surface applied at lower volumes at first. When liquids are reinjected in the same areas, these calculations can be used to estimate how much moisture levels may have increased in MSW as received. This is important throughout the life of the ELR development. As more liquids are recirculated into each phase, settlement occurs. This affects landfill density and, as seen in the following tables, directly affects the ability to absorb further moisture. This means that liquid injection volumes can be lowered as each Phase matures in degradation.

An optimum moisture level exists for each municipal solid waste landfill that will allow the process of biological stabilization and compaction to proceed at the highest rate possible. Existing literature suggests that the optimum moisture level is between 35-50%. For this project the moisture content will be maintained at or below field capacity (less than or equal to 35%)

.

MSW Moisture Content Determination

The gravimetric procedure for determining the moisture content of MSW is relatively simple and is based upon the methods for determining total solids as presented by "Standard Methods for the Examination of Water and Wastewater and/or EPA Method 160.3. An initial weight is obtained for a significant field sample of MSW (sample size between 0.5-1.0 kg) collected from the working face. The moist sample is dried at 103-105 C to a constant weight. The percent moisture is calculated as follows:

Percent Moisture = 100 - (dry weight/wet weight * 100)

For example: A 1000-gram field sample of MSW is obtained and dried. The constant dry weight of the sample is found to be 700 grams. The percent moisture is calculated:

Percent Moisture = 100 - (700/1000 * 100)
= 100 - (0.70 * 100)
= 100 - 70 = 30%

Moisture Addition Determination

The moisture addition tables included in this attachment should be used once the working face percent moisture results are obtained from the laboratory. An explanation of the preparation of the tables follows.

A simple algebraic expression was developed to demonstrate the relationship between the total weight for each cubic yard of MSW and any given percent moisture found for collected field samples. A typical moisture level for freshly compacted MSW is 25%. The in-place moisture weight, X, was calculated for MSW dry weights from 800 to 2000 Pounds per cubic yard from the formula:

X = Decimal Fraction Moisture (Dry Weight Density + X)

For example, for a Moisture Level of MSW = 25 Percent:
Let the dry weight density equal 1000 pounds/cubic yard and the moisture equal 25% (0.25 as decimal).

X = 0.25 (1000 + X) = 250 + 0.25X
0.75X = 250
X = 333.33 pounds

Pounds may be converted to gallons by dividing by 8.34 lbs/gal water.
So, 333.33/8.34 = 39.97gallons.

Wet weight = Dry weight + Moisture weight = 1000 + 333.33 = 1333.33 pounds/yd^3

These equations served to generate the first four columns of the tables in this Attachment.

The equation may be checked by the formula for percent previously presented.
Percent Moisture = 100 - (dry weight/wet weight * 100)
Percent Moisture = 100 - (1000/1333.33 * 100) = 100 - 75 = 25%

Addition of Liquids to Achieve Moisture Goal
Using the same line in the table with the MSW moisture level at 25% and 1000 pounds/cubic yard dry weight, the liquid weight present at 35% moisture is calculated.

Calculation check:

X = 0.35 (1000 + X)
X = 350 + 0.35X
0.65X = 350
X = 538.46 pounds

Percent Moisture = 100 - (dry weight/wet weight * 100)
= 100 - (1000/1538.46 * 100)
= 35%

The amount of moisture to be added to MSW at 25% to achieve 35% was done by subtraction.

Moisture to be added = 538.46 - 333.33 = 205.13 pounds or 24.60 gallons/cu yd.

The amount of liquid that is required to achieve 35 % moisture in existing MSW was calculated similarly by determining the moisture weights for 35 % moisture and

subtracting the existing moisture weight for the various densities and moisture levels presented.

Addition of Liquids to Achieve 35% Moisture

The estimated annual compaction rate at Cefe F. Valenzuela Landfill is 1175 lbs/yd^3, as reported in the Landfill's 2012 Annual Report to the TCEQ. The following calculations yield the amount of enhanced leachate to be recirculated to the MSW at 20% to achieve 35%.

Calculation check:

FY	Cubic Yards
2009	802190
2010	741986
2011	714956
Average Annual	753,044

X = 0.20 (1175+ X)
X = 221+ 0.20X
0.80X = 221
X = 276.75 pounds/ cu yd.

X = 0.35 (1175 + X)
X = 411 + 0.35X
0.65X = 411
X = 632.69 pounds/cu yd.

To determine the weight of moisture to add, subtract the 20% moisture weight from the 35% moisture weight.

Moisture to be added : 632.69 - 276.75 = 355.94 pounds/cu yd. or 42.73 gallons/cu yd.

The average daily dosing event:

42.73 gal/cu yd. x 753,044 cu yd./yr x (1 yr/365 days) = 88,157 gal/day

Operational experience shows that daily incoming waste rates fluctuate regularly from the average typically peakin in early summer and waning through the winter. Most landfills will see peak daily rates about 20% above the allowable daily average. Thus, the cap on daily liquids injection account for this fluctuation:

88,157 gal/day x 1.25 = 110,197 gal/day.

Hence, to maintain a moisture content of 35% +/- 5% in the MSW, the cap on liquids injection is set at 100,000 gallons per day.

TABLE IV-E2-10%
MOISTURE ADDITION FOR 10% FRESH MSW CONTENT

Dry Wt. Density (lbs/yd^3)	Wet Wt. Density (lbs/yd^3)	Incoming Moisture Present		Liquid to be Added to Achieve:	
		10% (lbs/yd^3)	10% (gal/yd^3)	35% (lbs/yd^3)	35% (gal/yd^3)
800	888.89	88.89	10.66	341.88	40.99
900	1000.00	100.00	11.99	384.62	46.12
1000	1111.11	111.11	13.32	427.35	51.24
1100	1222.22	122.22	14.65	470.09	56.37
1200	1333.33	133.33	15.99	512.82	61.49
1300	1444.44	144.44	17.32	555.56	66.61
1400	1555.56	155.56	18.65	598.29	71.74
1500	1666.67	166.67	19.98	641.03	76.86
1600	1777.78	177.78	21.32	683.76	81.99
1700	1888.89	188.89	22.65	726.50	87.11
1800	2000.00	200.00	23.98	769.23	92.23
1900	2111.11	211.11	25.31	811.97	97.36
2000	2222.22	222.22	26.65	854.70	102.48

TABLE IV-E2-15%
MOISTURE ADDITION FOR 15% FRESH MSW CONTENT

Dry Wt. Density (lbs/yd^3)	Wet Wt. Density (lbs/yd^3)	Incoming Moisture Present		Liquid to be Added to Achieve:	
		15% (lbs/yd^3)	15% (gal/yd^3)	35% (lbs/yd^3)	35% (gal/yd^3)
800	941.18	141.18	16.93	289.59	34.72
900	1058.82	158.82	19.04	325.79	39.06
1000	1176.47	176.47	21.16	361.99	43.40
1100	1294.12	194.12	23.28	398.19	47.74
1200	1411.76	211.76	25.39	434.39	52.09
1300	1529.41	229.41	27.51	470.59	56.43
1400	1647.06	247.06	29.62	506.79	60.77
1500	1764.71	264.71	31.74	542.99	65.11
1600	1882.35	282.35	33.86	579.19	69.45
1700	2000.00	300.00	35.97	615.38	73.79
1800	2117.65	317.65	38.09	651.58	78.13
1900	2235.29	335.29	40.20	687.78	82.47
2000	2352.94	352.94	42.32	723.98	86.81

TABLE IV-E2-20%
MOISTURE ADDITION FOR 20% FRESH MSW CONTENT

Dry Wt. Density (lbs/yd^3)	Wet Wt. Density (lbs/yd^3)	Incoming Moisture Present		Liquid to be Added to Achieve:	
		20% (lbs/yd^3)	20% (gal/yd^3)	35% (lbs/yd^3)	35% (gal/yd^3)
800	1000.00	200.00	23.98	230.77	27.67
900	1125.00	225.00	26.98	259.62	31.13
1000	1250.00	250.00	29.98	288.46	34.59
1100	1375.00	275.00	32.97	317.31	38.05
1200	1500.00	300.00	35.97	346.15	41.51
1300	1625.00	325.00	38.97	375.00	44.96
1400	1750.00	350.00	41.97	403.85	48.42
1500	1875.00	375.00	44.96	432.69	51.88
1600	2000.00	400.00	47.96	461.54	55.34
1700	2125.00	425.00	50.96	490.38	58.80
1800	2250.00	450.00	53.96	519.23	62.26
1900	2375.00	475.00	56.95	548.08	65.72
2000	2500.00	500.00	59.95	576.92	69.18

TABLE IV-E2-25%
MOISTURE ADDITION FOR 25% FRESH MSW CONTENT

Dry Wt. Density (lbs/yd^3)	Wet Wt. Density (lbs/yd^3)	Incoming Moisture Present		Liquid to be Added to Achieve:	
		25% (lbs/yd^3)	25% (gal/yd^3)	35% (lbs/yd^3)	35% (gal/yd^3)
800	1066.67	266.67	31.97	164.10	19.68
900	1200.00	300.00	35.97	184.62	22.14
1000	1333.33	333.33	39.97	205.13	24.60
1100	1466.67	366.67	43.96	225.64	27.06
1200	1600.00	400.00	47.96	246.15	29.51
1300	1733.33	433.33	51.96	266.67	31.97
1400	1866.67	466.67	55.96	287.18	34.43
1500	2000.00	500.00	59.95	307.69	36.89
1600	2133.33	533.33	63.95	328.21	39.35
1700	2266.67	566.67	67.95	348.72	41.81
1800	2400.00	600.00	71.94	369.23	44.27
1900	2533.33	633.33	75.94	389.74	46.73
2000	2666.67	666.67	79.94	410.26	49.19

TABLE IV-E2-30%
MOISTURE ADDITION FOR 30% FRESH MSW CONTENT

Dry Wt. Density (lbs/yd^3)	Wet Wt. Density (lbs/yd^3)	Incoming Moisture Present		Liquid to be Added to Achieve:	
		30% (lbs/yd^3)	30% (gal/yd^3)	35% (lbs/yd^3)	35% (gal/yd^3)
800	1142.86	342.86	41.11	87.91	10.54
900	1285.71	385.71	46.25	98.90	11.86
1000	1428.57	428.57	51.39	109.89	13.18
1100	1571.43	471.43	56.53	120.88	14.49
1200	1714.29	514.29	61.66	131.87	15.81
1300	1857.14	557.14	66.80	142.86	17.13
1400	2000.00	600.00	71.94	153.85	18.45
1500	2142.86	642.86	77.08	164.84	19.76
1600	2285.71	685.71	82.22	175.82	21.08
1700	2428.57	728.57	87.36	186.81	22.40
1800	2571.43	771.43	92.50	197.80	23.72
1900	2714.29	814.29	97.64	208.79	25.03
2000	2857.14	857.14	102.77	219.78	26.35

TABLE IV-E2-35%
MOISTURE ADDITION FOR 35% FRESH MSW CONTENT

Dry Wt. Density (lbs/yd^3)	Wet Wt. Density (lbs/yd^3)	Incoming Moisture Present		Liquid to be Added to Achieve:	
		35% (lbs/yd^3)	35% (gal/yd^3)	35% (lbs/yd^3)	35% (gal/yd^3)
800	1230.77	430.77	51.65	0.00	0.00
900	1384.62	484.62	58.11	0.00	0.00
1000	1538.46	538.46	64.56	0.00	0.00
1100	1692.31	592.31	71.02	0.00	0.00
1200	1846.15	646.15	77.48	0.00	0.00
1300	2000.00	700.00	83.93	0.00	0.00
1400	2153.85	753.85	90.39	0.00	0.00
1500	2307.69	807.69	96.85	0.00	0.00
1600	2461.54	861.54	103.30	0.00	0.00
1700	2615.38	915.38	109.76	0.00	0.00
1800	2769.23	969.23	116.21	0.00	0.00
1900	2923.08	1023.08	122.67	0.00	0.00
2000	3076.92	1076.92	129.13	0.00	0.00

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CITY OF CORPUS CHRISTI

CORPUS CHRISTI, TEXAS

NUECES COUNTY

APPENDIX IV-E-2
ENHANCED LEACHATE RECIRCULATION OPERATING PLAN
MSW MOISTURE CALCULATIONS

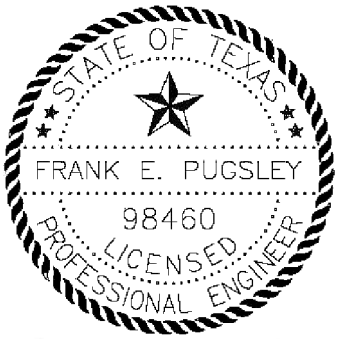
TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

MSW PERMIT NO.: 2269

Applicant:

CITY OF CORPUS CHRISTI
SOLID WASTE SERVICES DEPARTMENT
2525 HYGEIA STREET
CORPUS CHRISTI, TEXAS 78415

JULY 2013



Frank E. Pugsley, P.E.
7/29/2013

Prepared by:

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Firm No. F-1741

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This Attachment IV-E-2 is an excerpt from U.S. Environmental Protection Agency Document EPA-456/R-05-004, dated August 2005. The Landfill will apply the appropriate methodology to show that waste moisture content remains below the permitted limits.

2.0 WATER BALANCE METHOD

The Water Balance Method performs several calculations in sequence on a monthly time basis to estimate the average moisture content of the waste. It was originally designed to measure evapotranspiration from soils and was then adapted for landfill conditions. Our suggested procedure for using the Water Balance Method involves a two-tiered approach. Method A is a simplified equation that only incorporates factors which most significantly affect the average moisture content of the waste mass. The simplified equation also assumes that all precipitation falling directly on the landfill's surface will become moisture in the waste mass. The primary factors that are accounted for in the simplified equation are:

- Incoming waste moisture,
- Precipitation (only precipitation that falls directly on the landfill's surface; assuming that all surface runoff from adjacent areas is diverted around the landfill surface),
- Liquids addition (recirculated leachate, water, etc.), and
- Leachate production.

If landfill owners/operators are satisfied with the results of the Method A equation, then no further calculations are needed. However, if further analysis is required, then landfill owners/operators can proceed to Method B which comprises a more advanced set of calculations. This more complex procedure takes into account the four factors included in the simplified equation of Method A plus the following four elements:

- Moisture retained in the landfill surface or cover material,
- Surface runoff,

- Surface evaporation, and
- Evapotranspiration.

A detailed description of each step is discussed in Sections 2.1 and 2.2, respectively, of this attachment.

2.1 Method A: Simplified Equation

The potential moisture content of the waste mass in the bioreactor landfill can be estimated using the following simplified equation of the Water Balance Method:

$$PMC = \frac{(Lo \times M) + P + LA - LCH}{M + P + LA - LCH} \times 100$$

Where,

PMC = estimated potential moisture content of the waste mass (% moisture content on a wet weight basis);

Lo = moisture entering with the waste mass (kg moisture/kg total waste mass as received);

M = total waste mass in bioreactor cell on an as received basis (kg total waste mass as received);

P = total precipitation (kg total precipitation);

LA = total liquids added to the waste mass, including recirculated leachate (kg total liquids); and

LCH = total leachate collected (kg total leachate).

If the bioreactor landfill has been at steady state (i.e., no fluctuations in any of the factors above) since the bioreactor cell or entire bioreactor landfill opened, then M, P, LA, and LCH can be calculated as monthly averages instead of totals. However, this scenario is not likely to occur.

When using Equation 1, landfill owners/operators must keep records of data and assumptions used to determine values of Lo, M, P, LA, and LCH for their bioreactor

landfill. The following bullet points provide potential guidelines for determining and recording these values.

- Lo: According to Tchobanoglous' Integrated Solid Waste Management: Engineering Principles and Management Issues, most MSW in the United States has a moisture content of 15 to 40 percent, with 25% as typical. Moisture content of MSW depends primarily on the composition of the waste, the season of the year, and the humidity and weather conditions of the surrounding environment. For example, the moisture content of 100 kilograms of incoming wet waste can be estimated as: [(100 kg - d)/100 kg], where d is the total dry weight in kilograms of the solid waste components within the 100 kilograms of wet waste received.
- M: To calculate total waste mass, waste acceptance or waste placement data is needed and should be documented accordingly.
- P: Total precipitation in inches of water can be obtained from precipitation measurements at the landfill or from nearby weather station data. Convert the precipitation from inches to kilograms of moisture using the following equation:

$$Total\ Precipitation\ (P) = (in.\ of\ total\ precipitation) \times \frac{1\ ft}{12\ in} \times (ft^2\ of\ bioreactor\ landfill\ surface) \times \frac{1\ gal}{0.134\ ft^3} \times \frac{3.78\ kg}{1\ gal\ water}$$

- LA: The total amount of liquids added can be estimated using measurements currently taken at the bioreactor site for design and operational purposes. For example, if a closed loop bioreactor with horizontal trenches uses a flow meter to measure the amount of leachate recirculated, then flow meter reading records can be used to estimate total leachate addition (e.g., converting the flow rate each month to kilograms of leachate per month and then summing the monthly readings to obtain a total liquids added amount). Water introduced at the surface of the landfill via truck could be measured

using a simple volume displacement calculation, such as: (gallons of water stored per tank truck) * (number of tank trucks emptied onto landfill surface) * (3.78 kilograms per gallon of water). The types of liquid addition methods vary by bioreactor landfill site, therefore, the types of measurement methods will differ as well. We recommend that each landfill owner/operator calculate total liquids using methods most appropriate for their bioreactor design.

- LCH: Similar to liquids addition, the total amount of leachate produced can be estimated using leachate collection records generated at the landfill bioreactor for design, operational, and possibly regulatory purposes. For example, if a bioreactor landfill uses a flow meter to measure the amount of leachate produced or collected, then flow meter reading records can be used to estimate total leachate generation (e.g., converting the total flow rate each month to kilograms of leachate per month and then summing the monthly readings to obtain a total leachate amount). The leachate value used in Equation 1 should include leachate that is recirculated as well as any excess leachate that may be treated or disposed of by other means. We recommend that each landfill owner/operator calculate total leachate generated using methods most appropriate for their leachate collection system design.

2.2 Method B: Advanced Set of Calculations

The following items are required inputs for Method B of the Water Balance Method calculations:

- Average monthly temperatures in degrees Fahrenheit (ºF)
- Site latitude
- Average monthly precipitation in inches of water
- Landfill surface conditions
- Soil & vegetation type for final cover (if any)

The 17 calculation steps of the advanced Water Balance Method procedure are listed below. Steps 1 through 16 of the sequence calculate and confirm the

percolation of precipitation into the bioreactor landfill considering moisture contained in the landfill surface or final cover, surface runoff, evaporation losses, and evapotranspiration. Step 17 is very similar to Equation 1 for Method A. The only difference between Step 17 and Equation 1 is that Step 17 replaces the amount of precipitation with the amount of moisture that percolates into the waste mass. The foundation for this sequence of calculations and example spreadsheet comes directly from McBean's Solid Waste Landfill Engineering and Design.

Sequence of Calculations for the Advanced Water Balance Method (Method B):

Steps 1 - 5: Determine potential evapotranspiration

1. Collect average monthly temperatures (T) in ºF for the area surrounding the bioreactor landfill. Enter this information in the spreadsheet.
2. Using the monthly temperatures, determine the monthly heat index (h) for each month. Monthly heat indices can be determined using Table A.1 in the Reference Tables. For months where the temperature is less than 32 ºF, set h to zero. Sum the monthly heat indices to obtain a yearly heat index (H).
3. Using the monthly temperatures and yearly heat index, find the Unadjusted Potential Evapotranspiration (UPET) for each month using Table A.2 in the Reference Tables.
4. Using the latitude at the bioreactor landfill site, find the monthly correction factor for sunlight duration (r) in Table A.3 in The Reference Tables.
5. Multiply the monthly UPET by the monthly r to result in the monthly Adjusted Potential Evapotranspiration (PET) for each month in inches of water.

Steps 6 - 9: Determine amount of precipitation that infiltrates the bioreactor landfill

6. Enter the average monthly precipitation (P) in inches of water for the bioreactor landfill site.

7. Enter the appropriate runoff coefficient (Cr/o) to calculate the runoff for each month. Table A.4 in The Reference Tables can be used to determine the most appropriate runoff coefficient based on the landfill surface conditions.

8. Multiply the monthly precipitation by the monthly runoff coefficient to obtain the runoff (r/o) for each month in inches of water.

9. Subtract the monthly r/o from the monthly P to obtain the monthly infiltration (I) in inches of water.

Steps 10 - 13: Calculate moisture storage in the landfill surface cover material

10. Subtract the monthly PET from the monthly I to determine the moisture available for storage at the landfill surface (I - PET) in inches of water.

11. For negative (I - PET) values only, add the (I - PET) value for the preceding month to the current month to calculate the Cumulative Water Loss (ACCWL). Begin the summation with zero accumulated water loss for the last month having a positive (I - PET) value.

12. Determine the monthly Soil Moisture Storage (ST) in inches of water for the landfill surface by following the steps outlined below:

a. Determine the initial ST for the soil depth and type. Table A.5 can be used to configure the initial ST (retention) value.
b. Assign the initial ST value to the months having a positive (I - PET) value, prior to months that have a negative (I - PET) value.
c. Determine the ST for each subsequent month having a negative (I - PET) value. Use the monthly ACCWL values and Table A.6 to obtain the ST.
d. For subsequent months having an (I - PET) value greater than or equal to zero, add the (I - PET) value for each month to the preceding month's ST. Be careful not to exceed the soil field capacity (i.e., fraction of water in the soil based on the dry weight of the soil). Enter the soil field capacity for monthly soil moisture storage if the sum exceeds the field capacity.

13. Calculate the change in the ST, or)ST, for each month in inches of water by subtracting the ST for the preceding month from the current month's ST.

Steps 14 - 16: Calculate actual evapotranspiration and percolation of moisture into the bioreactor landfill waste mass

14. Calculate the Actual Evapotranspiration (AET) by following the steps outlined below:

a. For wet months where the (I - PET) value is greater than or equal to zero, set the AET equal to the PET.

b. For dry months where the (I - PET) value is negative, use the following equation for the AET: AET = PET + ((I - PET) -)ST). This equation represents the fact that the evapotranspired amount is the amount potentially evapotranspired plus that available from excess infiltration that would otherwise add to soil moisture storage plus that available from previously stored soil moisture.

15. Calculate the monthly percolation (PERC) as follows:

a. For wet months where the (I - PET) value is greater than or equal to zero, use the following equation for the PERC: PERC = ((I - PET) -)ST).

b. For dry months where the (I - PET) value is negative, set the PERC equal to zero.

16. As a check for Steps 7 through 15, calculate the average monthly precipitation (P) in inches of water to be sure they match the original precipitation values entered in Step 6. The precipitation calculation is as follows: P = PERC + AET +)ST + r/o.

Step 17: Estimate moisture content of the waste mass in the bioreactor landfill

17. Convert PERC from inches of moisture to kilograms of moisture per kilogram of waste (e.g., [PERC (in) * (1 ft/12 in) * (ft2 of bioreactor landfill surface) * (1 gal/0.134 ft3) * (3.78 kg/gal water)] / (total kg wet waste mass in bioreactor)). Then, estimate the potential moisture content of the waste mass, on a monthly wet weight basis, using the following equation:

PMC = Lo + PERC + LA - LCH (Equation 2)

Where,

PMC = estimated potential moisture content of the waste mass (kg moisture/kg wet waste);

Lo = average amount of moisture in the initial waste added each month (kg moisture/kg wet waste);

PERC = monthly percolation (kg moisture/kg wet waste);

LA = amount of liquids added to the waste each month, including recirculated leachate (kg liquids/kg wet waste); and

LCH = amount of leachate produced each month (kg leachate/kg wet waste).

Lo, LA, and LCH should be estimated and documented similarly to Method A procedures described under Equation 1 in Section 2.1 of this attachment. The difference between Equations 1 and 2 is that Lo, LA, and LCH are monthly values per kilogram of waste in Equation 2, not total values. Therefore, for Equation 2, monthly values will need to be determined and then divided by the amount of waste added each month.

3.0 REFERENCES

1. McBean, E.A., Rovers, F.A., and Farquhar, G.J. Solid Waste Landfill Engineering and Design. Prentice-Hall: New Jersey, 1995. Chapter 7 and Appendix C.

2. Tchobanoglous, G., Theisen, H., and Vigil, S. Integrated Solid Waste Management: Engineering Principles and Management Issues. McGraw-Hill: New York, 1993. pp. 70-73, 421-424.

CEFE F. VALENZUELA LANDFILL
CITY OF CORPUS CHRISTI

CORPUS CHRISTI, TEXAS

NUECES COUNTY

APPENDIX IV-E-2 REFERENCE TABLES

The following tables are from the Environmental Protection Agency's memorandum in August of 2005, "Example Moisture Mass Balance Calculations for Bioreactor Landfills Attachment A: Reference Tables for Water Balance Method Calculations" at the following web address:

- **http://www.epa.gov/ttnatw01/landfill/massbalexcalc_9-15-05.pdf**

1. **Page A-2, Table A.1: Monthly Values of Heat Indices Corresponding to Monthly Mean Temperatures**
2. **Page A-5, Table A.2: Values of Unadjusted Daily Potential Evapotranspiration (in.) for Different Mean Temperatures and I Values**
3. **Page A-16, Table A.3: Mean Possible Monthly Duration of Sunlight in the Northern Hemisphere (12 Hours)**
4. **Page A-18, Table A.4: Runoff Coefficients**
5. **Page A-19, Table A.5: Provisional Water Holding Capacities for Combinations of Soil and Vegetation**
6. **Page A-20, Table A.6: Soil Moisture Retention Table for Various Amounts of Potential Evapotranspiration for a Root Zone Water-Holding Capacity of Four Inches**

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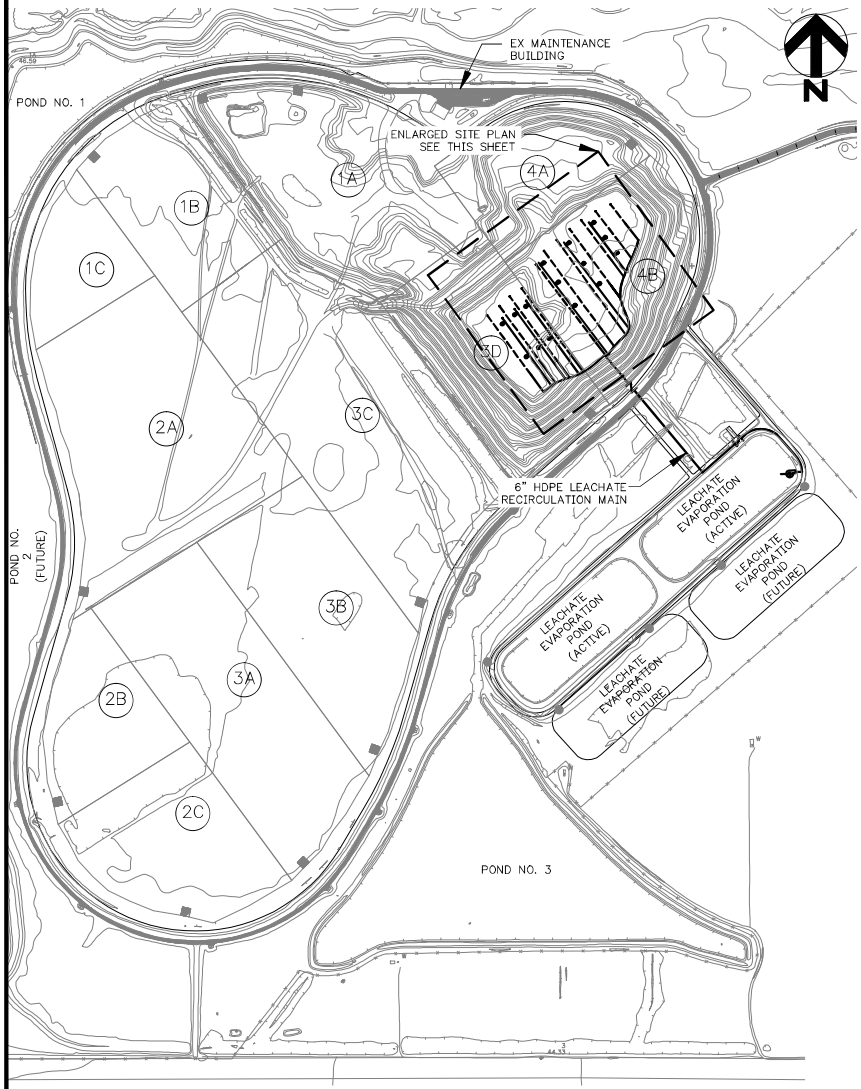
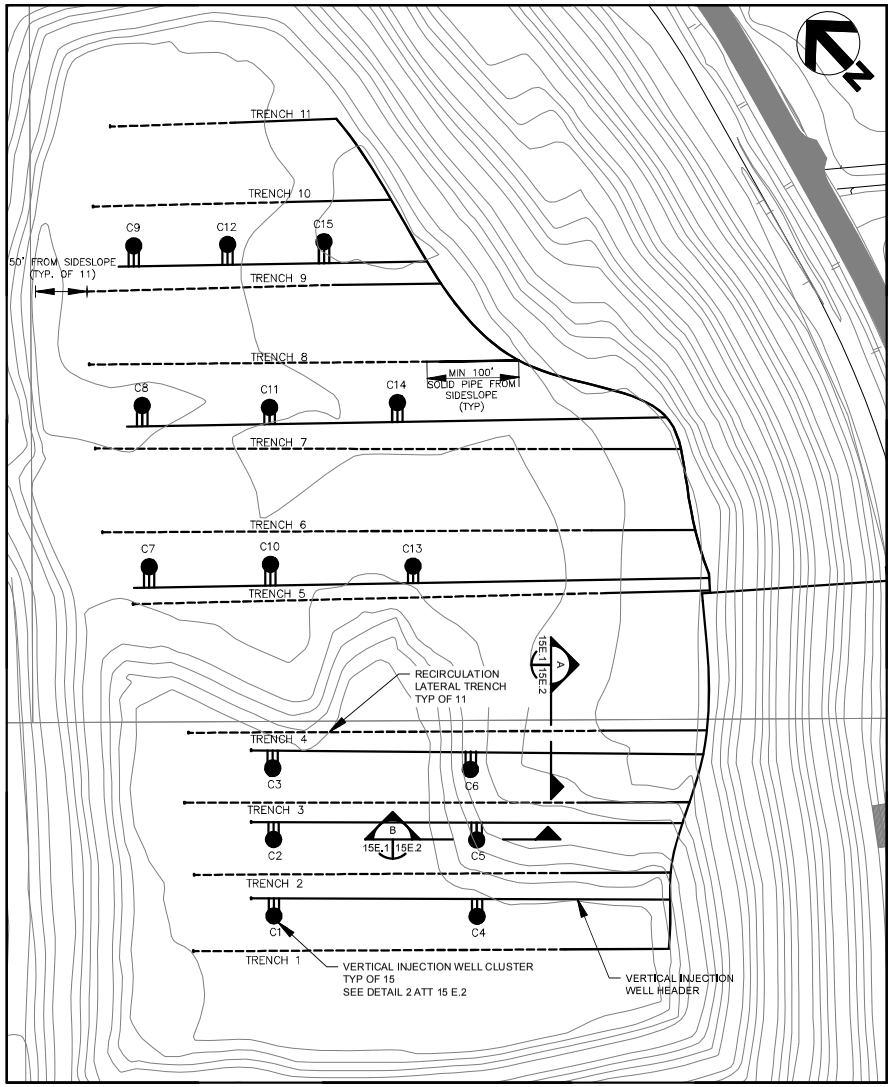


SITE PLAN

0 300 600
SCALE IN FEET



ENLARGED SITE PLAN: INITIAL ELR DEVELOPMENT

0 60 120
SCALE IN FEET

PERFORATED HDPE PIPE

SOLID HDPE PIPE

NOTE: ELR MAY BE IMPLEMENTED ON ALL FUTURE CELLS AS WELL.

Frank E Pugsley, P.E.

REVISION NO.	DATE	BY	DESCRIPTION

CONSULTANT'S SHEET 15E.1
PROJECT NO. CORP1301

7/29/2013

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TEXAS
Department of Engineering Services

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PERMITTING PURPOSES ONLY

SITE PLAN

FIGURE
APPENDIX 15E
15 E.1

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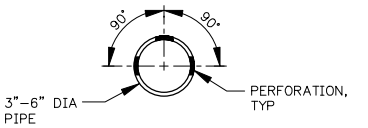
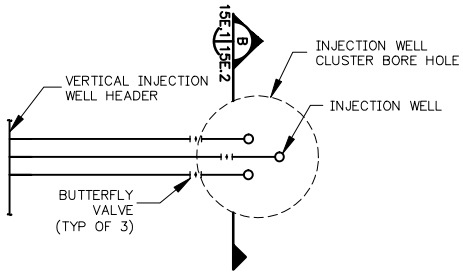


PERFORATION GUIDE		
DISTANCE ALONG PIPE	SPACING	HOLE DIA
0'–180'	5' OC	¼"
180'–300'	5' OC	½"

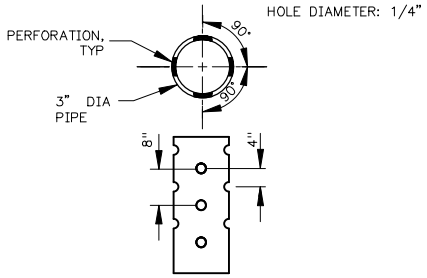
NOTES:

1. PERFORATED PIPE SHALL BE COVERED WITH 8 OZ/SY. GEOTEXTILE FILTER MATERIAL TO PREVENT MIGRATION OF FINES INTO PERFORATIONS.

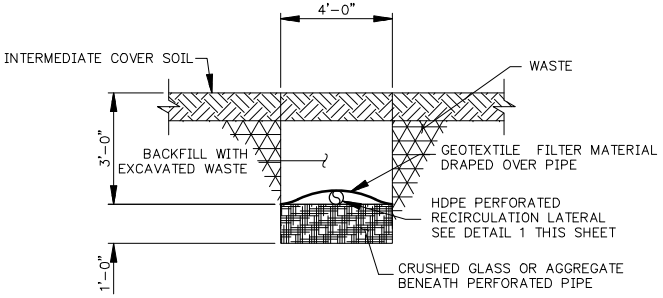
1 PERFORATION DETAIL
15E.2 | 15E.2 NTS



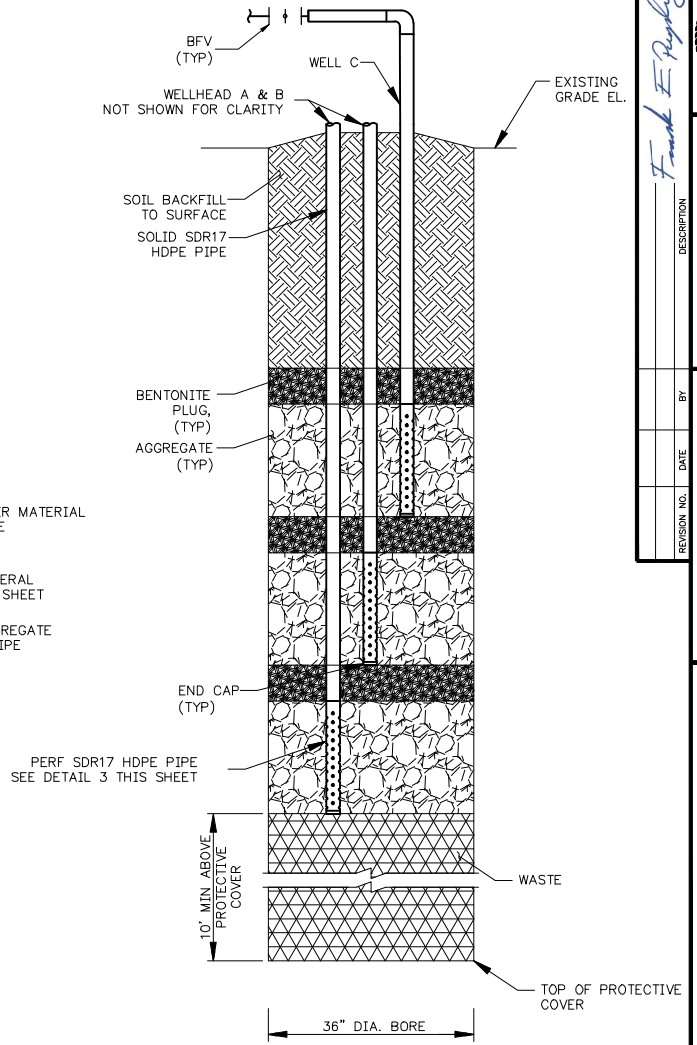
2 VERTICAL INJECTION WELL CLUSTER DETAIL
15E.1 | 15E.2 NTS



3 PIPE PERFORATION DETAIL
15E.2 | 15E.2 NTS



A RECIRCULATION TRENCH SECTION (TYP)
15E.1 | 15E.2 NTS



B VERTICAL INJECTION WELL CLUSTER SECTION (TYP)
15E.1 | 15E.2 NTS

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Frank E Pugsley, P.E.

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PROJECT NO. CORP1301

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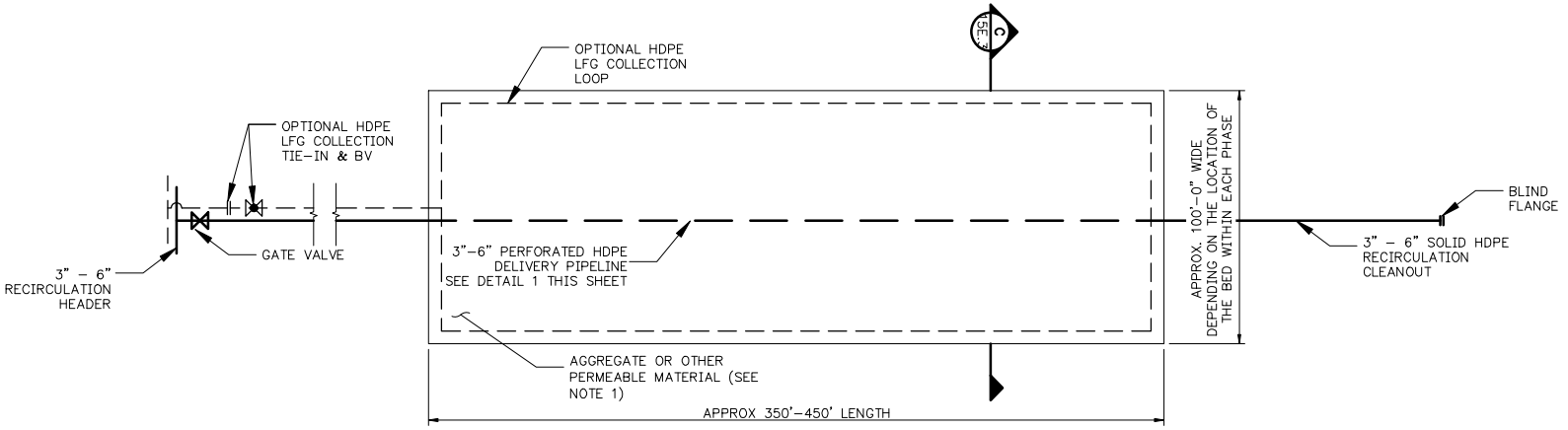
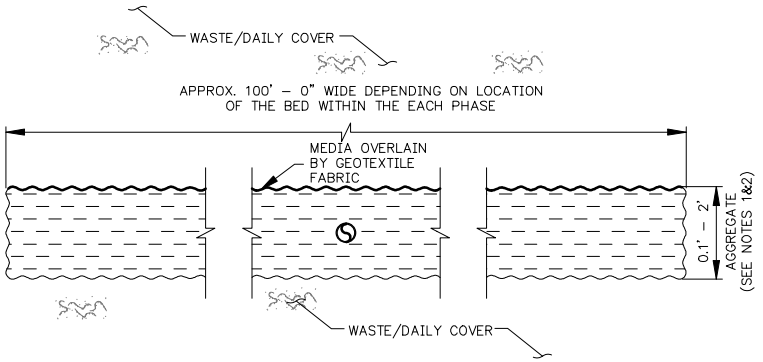
LEACHATE RECIRCULATION DETAILS I

FIGURE
15E.2

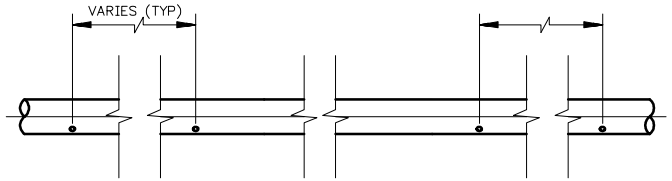
CITY PERMIT # 2269



PERMEABLE BED DETAIL (TYP)



C 15E.3 **PERMEABLE BED SECTION**
NTS



1 **DELIVERY PIPELINE PERFORATIONS DETAIL**
NTS

PERFORATION GUIDE		
DISTANCE ALONG PIPE	SPACING	HOLE DIA
0'-180'	5' OC	¼"
180'-300'	5' OC	½"

NOTES:
1. GEOCOMPOSITE, GRAVEL, CRUSHED GLASS, TIRE CHIPS, SHREDDED TIRES, OR CRUSHED CONCRETE WILL BE CONSIDERED AS AN ACCEPTABLE MEDIA.
2. THE THICKNESS OF THE PERMEABLE BEDS SHALL BE 0.1-2 FEET DEPENDING ON THE MATERIAL AND THE QUANTITY OF MATERIAL AVAILABLE AT THE TIME OF PLACEMENT.

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REVISION NO.	DATE	BY	DESCRIPTION

CONSULTANT'S SHEET C-03
PROJECT NO. CORP1301
7/29/2013

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LECHATE RECIRCULATION DETAIL II

FIGURE
APPENDIX 15E
ATT 15 E.3

CITY PERMIT # 2269