

Internship Report

Department: EPD-FMG

In the past two months, I have worked in the Environmental Protection Department (EPD) as a summer intern. I was assigned to the Facilities Management Group and stationed in the site office at the South-East New Territories Landfill Extension (SENTX), an extension of the SENT landfill site. Throughout my internship, I have mainly been involved in two parts of activities within the SENT and SENTX sites: Learning about the operation of SENTX and follow alongside the EPIs during environmental monitoring of both SENT and SENTX sites.

Operation:

Activities related to the operation of SENTX can be divided into several parts:

1. Waste Reception and Screening
2. Landfill Disposal
3. Leachate Treatment Plant (LTP)
4. Landfill Gas (LFG) Management System

Waste Reception and Screening:

Trucks would first enter the waste reception zone of the SENTX landfill and be weighed on the weighbridge, where all incoming trucks would also be screened of its contents. For the weighing process, incoming trucks would be firstly parked on the weighbridge to be weighed, whilst at the same time the eight laser distance measuring meters above the weighbridge would activate to measure the depth of the truckload and the height of waste underneath it. Based on the type of truck and Depth and weight of the waste, the weighbridge computer system will determine whether the truck is approved to enter or is rejected. Depending on the reasoning for rejection, rejected vehicles may be sent to the nearby Temporary Construction Waste Sorting Facilities in Area 137 (operated by the CEDD) or asked to leave the sites directly. This is called the Construction Waste Acceptance Criteria, where trucks of a certain weight ratio of waste is not allowed to enter the disposal area. During the weighing process, the computer system will note down the data of the truck (such as time entering, weight, license plate, etc.) to be manually reviewed at a later date if necessary. After passing through the weighbridge, all trucks are required to go to the truck spotter to be assigned a location within the tipping face to dispose of its waste. Occasionally, the operator might assign trucks to the surveying station within the site, where non-inert construction waste (i.e. Wood and Bamboo) is separated from inert construction waste (i.e. Stone) by the use of a grapple or a mini excavator. This is to reduce the amount of inert waste disposed on the Landfill, decreasing the void space present within the waste pile and extending the lifetime of SENTX by reducing the amount of inert waste disposed in the landfill. After dropping off the waste, these trucks would leave the site.

Landfill Disposal:

The operator will assign the location within the tipping face according to the discretion of the Operations Manager or the Duty Active Face Supervisor. The tipping face consists of two platforms, with multiple trucks simultaenously disposing of their wastes on both platforms. After the waste has been disposed of, compactors, excavators and bulldozers are used to flatten and compact the waste pile. This is to ensure minimal void space is achieved within the flattened waste pile, ensuring that the height of the waste pile would not exceed the daily waste piling height limit. At the end of each day's work, daily cover material is placed over the exposed waste to limit its odour and minimizes potential dust problems. The daily cover

material for SENTX is usually soil, taken from the temporary storage in the SENT site., However, other materials approved in the GVL operation plan, such as posi-shell, could also be used as daily cover whenever necessary. As for the trucks who had offloaded its construction waste, they would have to go through a car wash and the weighbridge on its way out before it can exit the landfill site. The car wash has both manual spraying and an automatic spraying system. This allows for the truck to be cleaned thoroughly, preventing mud from sticking onto the wheels and being dragged out to the highway roads. It also reduces the probability of dust flying out of the truck's container during driving and reducing the dust pollution both in and out of the landfill sites. After going through the car wash, the trucks would go through the weighbridge on the way out to accurately determine the weight of waste disposed within the landfill. This also allows the fee for disposal to be calculated based on the weight of construction waste disposed at the tipping point.

Leachate Treatment

Leachate is created from both regular rainfall on the landfill cells and water deposited within the landfill waste. Leachate collection pipes were set up prior to any waste deposition in order to collect any leachate created during the lifetime of the landfills. Alongside site sanitary sewer waste, leachate gathered from the pipes would be pumped to the Leachate Treatment plant for processing. Firstly, it will be pumped into the Equalization Tanks, where it will be combined and stored as wastewater to be treated. The wastewater would be then pumped into the ammonia stripping system. Using high pressure hot water, the wastewater would be heated up into a gaseous state and maintained at the required temperature using steam. Then, the off-gas that contains ammonia would be oxidized and released through the flare within the LTP at around 850°C. The wastewater would then undergo a metal precipitation and pH adjustment process to remove it of any harmful metal residues. Then, it will be kept in a sequencing batch reactor (SBR) to be removed of its remaining organic pollutants and ammonia. The treated wastewater would be stored in an Effluent Holding Tank and would be released into the DSD drainage system for further processing.

Landfill Gas Management

Landfill Gas (LFG) produced within the sites are also extracted from a system of horizontal gas trenches, vertical wells, and surface collectors. Mobile Flares and Gas Extraction Wells are installed along the system to prevent an excess of Landfill Gas from being within the system, creating fire and explosion hazards. Collected Landfill Gas would be transported through the LFG extraction system, which would gather the gas into the gas skids to be either transferred to the engine generator sets (genset) within the LFG Plant or to the LTP to be used as fuel. Gas blowers within the system will help with drawing in the Landfill Gas. Landfill Gas are fed to the gensets to power the gas engines in order to generate electricity. The electricity generated by the gensets is enough to power all on-site activities within SENTX (such as the LTP, LFG Plant and all administrative buildings), with any surplus gas to be exported off-site, delivered

to the processing facility owned by Towngas and sold for the production of synthetic natural gas. Any excess Landfill Gas exiting would be directed into the flares within the LFG Plant to be burnt and released periodically.

Environmental Monitoring of the sites:

The Environmental Monitoring procedures that I have shadowed during my internship includes landfill inspection and landfill monitoring using parameters such as dust, Volatile Organic Compounds (VOC), Surface Water and Groundwater, Leachate, Landfill Gas and Noise. Typically, these parameters would be monitored on a regular basis, and they are to be inspected by EPIs on either a daily (i.e., daily inspection), weekly, monthly, or even on a quarterly basis. I would follow the EPIs out on their inspections to learn more about how and when they are to be monitored. The current parameters monitoring frequency is shown below in Table 1.

	Daily	Weekly	Monthly	Quarterly
Dust	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
VOC	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Surface Water	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> (SENTX) (SENT under SEMP)	<input checked="" type="checkbox"/> (SENT)
Ground Water	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> (SENTX)	<input checked="" type="checkbox"/> (SENT)
Leachate	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
LFG	<input type="checkbox"/>	<input checked="" type="checkbox"/> (Roadside)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Noise	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Table 1: Environmental Parameters Monitoring Frequency Table

Special Environmental Monitoring Plan (SEMP)

The Special Environmental Monitoring Plan (SEMP) involves the failsafe for when any monitoring parameters reached or exceed the trigger level. For any parameter that exceeded the trigger level, its relevant monitoring procedure's frequency time would be increased. If, after raising the monitoring frequency, the monitoring parameter achieves 3 times of falling back under the trigger level, the monitoring frequency will reset back to its original standard. For example, SENT gas probes can be done monthly, but if GP-31 in the SENT landfill exceeds the methane trigger level of 1.0%, the SENT gas probes will all be adjusted to weekly. This situation would remain until all gas probes in the SENT landfill falls below the trigger level for three weeks straight, then the SEMP is no longer in action and the frequency would be lowered back to monthly for all SENT gas probes.

Safety:

Safety was treated with the utmost importance on the landfill sites, as such safety equipment such as Safety Helmets, Reflective Vests, and Safety Boots are provided by EPD, and interns must wear it during their site inspections. Pictures of the safety equipment is shown below.

