

**LAYON MUNICIPAL SANITARY LANDFILL
ENTRANCE AREA FACILITIES
AND CELLS #1 and #2
LAYON, INARAJAN, GUAM
PROJECT NO. SWMD-09-02**

BOOK 5

May 22, 2009

**Prepared For:
DIVISION OF SOLID WASTE MANAGEMENT
DEPARTMENT OF PUBLIC WORKS
GOVERNMENT OF GUAM**

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**On Behalf Of:
Receiver – Gershman, Brickner & Bratton, Inc.
Government of Guam, Solid Waste Management Division
Pursuant to the Order of the United States District Court of Guam
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PERMIT APPLICATION**

T G ENGINEERS, PC

MEMORANDUM

INTRODUCTION TO
LAYON LANDFILL SOLID WASTE FACILITY PERMIT APPLICATION

Prepared for
Guam Environmental Protection Agency

May 22, 2009

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T G ENGINEERS, PC

The following is provided as an introduction to the Layon Landfill Permit Application.

1.0 INTRODUCTION

The Layon Municipal Solid Waste Landfill is designed for the disposal of municipal solid waste according to the requirements of the Guam Environmental Protection Agency (GEPA) as set forth in its Solid Waste Disposal Rules and Regulations (SWDRR).

2.0 PERMIT APPLICATION DOCUMENTS

The project submittal documents include the following Drawing Set and Document Books, plus other relevant documents that have been previously submitted. Note the book section titles are self explanatory to indicate where specific design requirements are included.

Drawing Set – Entrance Area Facilities and Cells #1 and #2

Book 1

- Technical Specifications, Divisions 1 – 16

Book 2

- Design Narrative
- Appendix A – Drawings
- Appendix B – Surface Water Drainage System Calculations
- Appendix C – Landfill Gas Master Plan
- Appendix D – Entrance Area Civil Engineering Calculations
- Appendix E1 – Structural Calculations
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- Appendix F – Earthwork and Airspace Calculations
- Appendix G – Leachate Collection and Removal System Design
- Appendix H – Subdrain Design

Book 3A

- Geotechnical Report, Feb 2006
- Supplementary Geotechnical Laboratory Test Results
- Site-Specific Groundwater Monitoring Plan

Book 3B

- Stability Analysis Review
- Shake Acceleration and Output Files, 06g
- Shake Acceleration and Output Files, 07g

Book 4

- Operations Plan
- Closure and Post-Closure Plan

Book 5

- Guam EPA Solid Waste Management Facility Permit Application, for Landfill

Documents previously submitted that are referenced herein include the following.

- Final Integrated Hydrogeologic Assessment, submitted November 26, 2008 to Guam EPA

3.0 SITE SELECTION AND LOCATION RESTRICTIONS

On February 11, 2004, the Government of Guam (Guam Department of Public Works and Guam Environmental Protection Agency) entered into a Consent Decree (Civil Case No. 02-00022) with the United States of America (U. S. Environmental Protection Agency with the U. S. Department of Justice) in the U. S. District Court, Territory of Guam. The Consent decree is a settlement agreement to resolve issues related to the unauthorized discharge of pollutants from the Ordot Dump into the Lonfit River. The historical and continuing discharge of pollutants to the Lonfit River is a violation of the Clean Water Act (CWA).

The Consent Decree provides a schedule that the Government of Guam has agreed to follow in completing specific tasks to correct the CWA violation. These tasks include the siting, design, construction and operations of a new municipal solid waste landfill facility (MSWLF) that is fully compliant with Subtitle D and the Federal Resource Conservation and Recovery act (RCRA).

The Government of Guam, Department of Public Works in association with the Guam Environmental Protection Agency conducted a preliminary site suitability screening study which used the Municipal Solid Waste Landfill Location Restrictions specified in the Guam Solid Waste Disposal Rules and Regulations in addition to considerations for engineering, hydrogeology and environmental land use evaluations to identify three (3) candidate landfill locations. The screening study report, entitled, "Preliminary Landfill Site Suitability Report" was published in March 2004.

The Site Selection Study for siting the new permitted landfill on Guam was completed in 2004 – 2005 and summarized in the, "Final Site Selection Report", dated March 14, 2005.

The purpose of this section is to serve as the required notification, per GEPA, in compliance with subsections of Article 2, Chapter 23, Division 4 of Title 22, GARR.

In Article 2 - Location Restrictions of Chapter 23, Division 4, Title 22, GARR of the Rules and Regulations for the Guam Environmental Protection Agency (GEPA) Solid Waste Disposal (or simply SWDRR)- there are 6 subsections;

1. §23201 Airport Safety,
2. §23202 Floodplains,
3. §23203 Wetlands,
4. §23204 Fault Areas,
5. §23205 Seismic Impact Zones and
6. §23206 Unstable Areas

Pages 12-32 of the Final Site Selection Report are attached for a more detailed summary of the site selection criteria. Further review of site selection criteria and findings can be reviewed in the Final Site Selection Report.

3.1 Airport Safety

"A preferred sanitary landfill site would not impact local airports including bird hazards to aircraft. The site must be at least 10,000-ft from any airport runway for turbojet aircraft and at least 5,000-ft from any airport runway used for only piston type aircraft. In addition, according to FAA Advisory Circular No. 150/5200-34, a new municipal solid waste landfill facility and certain categories of airports must have a 6-mile minimum separation.

The Layon Landfill site has approximately a 12-mile separation from the Guam International Airport runways."

3.2 Floodplains

"A preferred sanitary landfill site would not be located in a designated floodplain.

The Layon Landfill site is not designated as a floodplain by the Flood Insurance Rate Maps prepared by the Federal Emergency Management Agency."

3.3 Wetlands

"A preferred sanitary landfill site would not impact designated wetland areas or the effect could be easily mitigated.

The National Wetlands Inventory (NWI) maps (US Fish & Wildlife Service, 1983) were used for the initial wetland mapping at the Layon Landfill site. Actual wetland delineation work was completed at the site with the Environmental

Impact Statement and the landfill footprint was adjusted to avoid encroachment into wetlands."

3.4 Fault Areas

"A preferred sanitary landfill site would not be located on or close by to any active faults.

The Umatac Formation is transected by numerous high angle and normal faults and lineaments of uncertain age and displacement. Modern day faulting is not evident at Dandan. Most of the visible displacements were probably due to post depositional adjustments."

3.5 Seismic Impact Zones

"A preferred sanitary landfill site would not be located in a Seismic Impact Zone.

The entire island of Guam is within a Seismic Impact Zone."

The design includes a stability analysis to confirm that minimum static factors of safety for the liner / waste mass system and liner / drainage system are appropriate. Maximum permanent deformation due to the design seismic event is within the allowable limits.

3.6 Unstable Areas

"A preferred sanitary landfill site would not be located over unstable areas. This could include collapsing soils, steep slopes, cavernous or karst terrain.

Karst terrain is not present in the volcanic geology underlying the site. The soils encountered are not collapsible. The terrain is generally gently rolling. However, there are some steep erosion gullies in the area of the landfill footprint. These areas will require re-grading. None of these areas pose a stability concern with proper control of earthwork construction."

3.7 Hydrogeology

"A preferred sanitary landfill site would have a deep water table and thick low permeable deposits with a confining layer over any water bearing zone.

The general groundwater surface mirrors the topography and is located in the surficial alluvial or residual soils overlying the bedrock below the site. The groundwater system below the site is an unconfined system. The site investigations indicate the depth to groundwater surface varies from the ground surface in low lying stream beds to over twenty feet in the higher elevations of the badlands and Ugum Ridge. There are further seasonal variations in depth to

groundwater that were observed during the hydrogeology field work completed for the project. The preferred hydrogeologic conditions of a deep water table and thick, low permeability deposits with a confining layer over any water-bearing zone cannot be found anywhere in the Dandan region."

Detailed information on hydrogeology of the site was gathered from fieldwork, modeling and reports completed in 2-phases.

Phase 1 (2005) – Amehr, Inc., as the lead for hydrogeology

Phase 2 (2007) – AMEC GeoMatrix as the lead for hydrogeology

The current design is based on the Final Integrated Hydrogeologic Assessment (dated 11/26/2008) by AMEC GeoMatrix. The report contains the following sections.

4.0 OPERATING CRITERIA

Layon Landfill proposes to be permitted for disposal of non-hazardous municipal solid waste (MSW). MSW will be received from residential, commercial and industrial sources. Layon Landfill also proposes to be permitted to receive for disposal certain non-hazardous wastes managed under special operating procedures.

The following waste generation and waste stream processing scenario shows the range of possible and reasonable target 30-year cumulative volumes that were selected by the Department of Public Works and used for sizing the landfill.

- Nominal Source Reduction at 2 percent
- Generation Rate based on 20 percent over the national average, or 5.29 pcd
- 30-year cumulative volume = 14,019,081 cubic yards

The site is projected to begin operations in 2010 with waste volumes at an annual rate of approximately 152,000 tons per year, which is equivalent to approximately 485 tons per day on a 6 day/week basis. Total capacity of the site is estimated at 9,485,276 tons of waste which equals approximately 15,809,000cubic yards of waste. The total capacity exceeds the design requirement by approximately 12 percent.

The Operations Plan is included in Book 4 of the application submittal.

5.0 DESIGN CRITERIA

The design criteria are included in the Design Narrative in Book 2 of the application submittal. A brief introduction is provided for the major facilities and components as follows.

5.1 Landfill Access

The access corridor includes the access road and utility rights-of-way. The access to the facility would be controlled to prevent unauthorized disposal of restricted material, dumping and scavenging (rule 23308).

5.2 Office and Maintenance Facilities

The MSWLF includes office and maintenance facilities to provide the supporting infrastructure and recordkeeping (rule 23312).

5.3 Stormwater Runoff Control

The MSWLF includes stormwater run-on and run-off control systems (rule 23309). Onsite stormwater retention ponds are provided to accommodate stormwater runoff and provide controlled release to the adjacent streams.

Stormwater run-on has only limited potential and is accommodated by the design for the Layon site due to the topography at the site.

5.4 Liner Requirements

The fundamental design criteria for municipal solid waste landfills are generally set forth in rule 23401.

The liner system selected for the facility provides double liner and leachate collection systems and exceeds Guam and federal design requirements for environmental protection.

5.5 Leachate Collection, Transport and Treatment

The landfill must have a leachate collection and removal system (LCRS) designed and constructed to maintain a maximum of 30 centimeters (approximately 12 inches) of leachate above the liner system (rule 23401).

The LCRS designed provides for leachate collection in cell interior sumps and then pumped flow to a storage tank adjacent to the sump and piped flow to the Inarajan Wastewater Treatment Plant (WWTP).

A separate study of expected leachate quality and the capacity of the Inarajan Wastewater Treatment Plant to handle the added flow and treat the leachate liquid without disrupting the plant treatment process is ongoing concurrently.

The results of the study will provide recommendations for the following possible project requirements.

- Leachate treatment at the landfill site
- Inarajan WWTP Process System Improvements
- Inarajan WWTP Capacity Expansion

5.6 Subdrain System

Groundwater elevations below the site are generally shallow, ranging from elevations 330 to 290 based on the findings of the hydrogeologic investigations by the TG Engineers team. Groundwater elevations generally decrease from north to south across the site. The northerly half of the site also appears to overlie a groundwater mound, with elevations decreasing from the center of the site toward the east, west and south.

A subdrain system is provided to accommodate periodic high-groundwater levels at the site. The subdrain is a geocomposite blanket and piping system that will pipe the water to a holding tank such that it can be sampled and tested prior to controlled release adjacent to the site.

6.0 GROUNDWATER MONITORING AND CORRECTIVE ACTION

SWDRR §23501 and §23501 specify groundwater monitoring requirements for solid waste landfills, including groundwater monitoring wells upgradient and downgradient of the disposal unit, capable of detecting any release of contaminants to the uppermost aquifer at the point of compliance established for the landfill.

An approved monitoring well network will be constructed for groundwater sampling and testing.

7.0 CLOSURE

Final cover for the Layon Landfill will be designed and constructed in conformance with the requirements of rule 23601(a), which contains the following prescriptive elements:

- an infiltration layer consisting of a minimum of 18 inches of earthen material and having a permeability no greater than that of any bottom liner system or natural soils below the liner; and
- an erosion layer above the infiltration layer, containing a minimum of six inches of soil capable of sustaining native plant growth

An alternative to the prescriptive design may be approved if it can be shown to achieve infiltration and erosion control equivalent to the prescriptive design. The proposed final cover for the Layon Landfill site is an alternative design consisting of the following elements.

A foundation layer of 6 to 12 inches of soil (including previously placed daily or intermediate cover);

On top deck areas with a slope of less than 10 percent:

- 12 inches additional foundation layer of on-site soil;
- A geomembrane of low-density or other polyethylene material, to be specified in a final closure plan and design at the time of the first phased closure project;
- 24 inches vegetative soil layer of on-site soils.

On side slope areas:

- 12 inches additional foundation layer of on-site soil;
- A geomembrane of low-density or other polyethylene material, with thickness and specific compound to be specified in a final closure plan and design at the time of the first phased closure project;
- A geocomposite drainage layer; and
- 24 inches vegetative soil layer of on-site soils.

The final cover will be constructed using certified quality assurance procedures performed under the supervision of a qualified registered engineer. Final grades will be established and maintained to support effective surface water management and erosion control.

8.0 POST-CLOSURE CARE

The minimum period for which post-closure maintenance activities are required is 30 years from the date a partial final closure phase or complete final closure is certified as complete. This period may be extended by GEPA if the landfill continues to present a potential threat to health or the environment after 30 years.

It is anticipated the site will remain as restricted open space with no public access permitted during the post-closure period. The existing entrance area may be maintained as a business center for the site owner. Any other private activity permitted on the site would be closely controlled and restricted to prevent

any interference with or damage to critical facilities such as the landfill gas or leachate management systems, monitoring systems, closure cap and surface water management facilities.

Results and records of all inspections, monitoring and maintenance activities will be maintained in the Owner's records for a minimum of five years. It is anticipated that GEPA will specify requirements for recording and reporting results of inspections, monitoring and maintenance activities during the post-closure period. These requirements will be incorporated into this Plan and implemented throughout the post-closure period.

This section describes the specific activities to be conducted during the post-closure period in conformance with rule 23602, including:

- Inspection and maintenance of the final cover
- Operation and maintenance of leachate collection and removal systems
- Operation and maintenance of the LFG management system
- Inspection and maintenance of surface water management systems
- Inspection and maintenance of security systems
- Ground water monitoring
- Landfill gas monitoring and
- Settlement monitoring including maintenance of settlement monuments

Layon Landfill

May 22, 2009

APPENDIX A

Final Site Selection Report, Site Characteristics – Dandan Candidate Site, pages 12-32, dated March 14, 2005

4.4 Candidate Landfill Site Features

The features of each landfill footprint are summarized in Table 2.

TABLE 2. Summary of Conceptual Landfill Footprint Characteristics

Characteristic	Dandan	Sabanan Batea	Lonfit
Shape	Rectangular	Rectangular	Rectangular
Dimensions	1,800 ft. x 3,000 ft.	1,800 ft x 3,000 ft.	3,800 ft. x 940-2,400 ft.
Area	125 acres	125 acres	148 acres
Buffer	30 acres	30 acres	30 acres
Profile	Mound	Side valley fill	Valley fill
Top elevation	435 ft. msl	445 ft. msl	571 ft. msl
Maximum approximate height above grade	103 ft.	105 ft.	171 ft.
Depth below grade	15 feet	20 feet	20 feet

5.0 Site Characteristics – Dandan Candidate Site

The proposed footprint is located generally in the higher badland areas located at the west side of the Dandan candidate site. The landfill footprint is rectangular in shape and approximately 1,800 feet wide by 3,000 feet long, or approximately 125 acres in area. An additional 30 acres for site access control, office facilities, stormwater runoff control, etc. is anticipated to be set aside. See Figure 1.

5.1 Water Protection

5.1.1 Aquifer – A preferred sanitary landfill site would not be located over an aquifer that does, or could, provide a drinking water supply regardless of depth to aquifer.

The tuffs and basalts were laid down beneath the sea, a depositional environment which results in tightly packed rock ordinarily having very low permeability. The geological formations in Dandan do not offer promise of aquifers from which groundwater can be easily extracted. The weathered Bolanos pyroclastic member tuffaceous siltstone, tuff breccias, and associated reworked alluvial material, including well sorted soils, create a poorly permeable substrate. Although the volcanics may be considered a potentially exploitable aquifer, the yield from deep wells are likely to be too small to justify development. A single well has been drilled in the volcanics at Dandan, USGS Well 1845-50, in 1971. The well was bailed dry without pumping, an indication of its very low permeability.

Groundwater recovery tests were performed in the test pits in the surficial water table encountered below the landfill site. The permeability measured ranged from 2×10^{-4} to 3×10^{-3} cm/sec (9×10^{-3} to 1×10^{-4} ft/min) with an average of 1.7×10^{-3} cm/sec (3.3×10^{-3} ft/min). These relatively high permeabilities are restricted to the non-consolidated surficial weathered zone. The unconsolidated volcanics of the underlying bedrock has much lower permeability. The majority of the flow into the test pits was in the upper relatively thin surficial thin alluvial and residual soil deposits. The shallow depth of these soils and the lower permeability in the underlying bedrock do not provide favorable conditions for the development of a groundwater source.

5.1.2 Floodplains - A preferred sanitary landfill site would not be located in a designated floodplain.

None of the potential sites are located in a floodplain as identified by the Flood Insurance Rate Maps prepared by the Federal Emergency Management Agency.

5.1.3 Groundwater - A preferred sanitary landfill site would be located in an area where the groundwater is deep below the ground surface regardless of groundwater quality.

A total of 16 test pits and 3 deep borings were performed at the Dandan site (Appendix I). The test pits were excavated to a depth of 10 feet or greater. Borings were excavated to depths of 58 to 72 feet. Water levels were measured in all test pits. A piezometer was installed in all borings. The water table depths and elevations are provided in Table 3 below. Measurements to the water table were made by steel tape from a stable site on the ground surface. Test pits were completed using a trackhoe with a 3' wide bucket. The pits were excavated to the deepest possible depth (15-20' BLS at most locations), and samples for geotechnical analysis were taken from each stratum or soil horizon. The dimensions of each pit were recorded, as well as a field description of the various strata. The units were classified in accordance with the USCS (Unified Soil Classification System). Groundwater levels were also recorded in each pit, to an approximate 1/10 of a foot. Soil borings were completed using a truck-mounted rig with an 8" hollow stem auger. Geotechnical samples were taken, beginning at 3' BLS via split spoon (Dames & Moore sampler) at 5' intervals until the depth of 33' BLS was attained. Samples deeper than 33' BLS were taken every 10'. The borings were terminated at no less than 60' BLS, with some reaching 70' BLS. In some cases, water-cooled rock coring had to be undertaken to pass through highly resistant volcanic units. As the drilling commenced, field descriptions of water level, resistivity (blows/ft., as measured with a 140 lb. hammer), and other engineering and hydraulic properties of the strata were noted. Upon completion of the borings, 2" diameter, Sch-40 PVC casing of the appropriate length was installed into each borehole. The lower 15' of each casing was screened at a 0.10" interval. Clay was packed around the outside edge of the casing to form a seal in the open boring to ensure that water could not enter the hole via sheet flow. The borings were maintained as temporary monitoring wells to obtain periodic groundwater measurements.

TABLE 3. Water Table Depths and Elevations at Dandan

Test Pit/Boring Number	Depth to Groundwater BLS (ft)	Surface Elevation MSL (ft)	Groundwater Surface Elevation MSL (ft)
TP-1	7.2	252.04	241.84
TP-2	9.5	280.73	271.23
TP-3	5	287.08	282.08
TP-4	5.5	356.94	351.44
TP-5	5.4	392.38	386.98
TP-6	15.5	349.96	343.16
TP-7	15.5	332.21	327.11
TP-8	12.5	328.53	316.03
TP-9	18	371.81	353.81
TP-10*	>18	323.58	<305.58
TP-11	6	347.60	341.60
TP-12	5.8	349.63	343.88
TP-13	3	302.74	299.74
TP-14	11.5	295.82	284.32
TP-15*	>17.5	293.21	<275.71
TP-16	.8	307.54	299.54
B-1	26.2	356.52	329.52
B-2	2.5	307.66	301.66
B-3	22	327.31	307.31

Note: *Groundwater was not encountered, but it can be surmised that it occurs at a depth greater than the completion depth of the associated boring or test pit.

Figure 4 provides a contour map of the groundwater. Field observations during the site geotechnical investigations noted the infiltration of groundwater into the Tinago River channel. Elevations were recorded of the river channel bottoms adjacent to the landfill footprint as this level will be a control on the groundwater levels at the site.

The general groundwater surface mirrors the topography and is located in the surficial alluvial or residual soils overlying the bedrock below the site. The depth of the groundwater surface varies from at the ground surface in the low-lying stream beds to over twenty feet in the higher elevations of the badlands and ridge dividing the Tinago, Fintasa, Fensol and Ugum River drainage basins. The general flow of groundwater is from the highlands to the three streams, Tinago, Fintasa and Fensol Rivers surrounding the landfill footprint.

The landfill base elevation for purposes of this site selection has been located an average of 15 feet below grade. The base of the landfill is above the surface of the groundwater levels measured at the site and will not require any additional design features to reduce the natural groundwater levels below the base of the landfill. During detailed design the landfill base will be adjusted to maintain the separation between the base of the landfill and the groundwater table as each cell is developed.

5.1.4 Proximity to Drinking Water Sources - A preferred sanitary landfill site would be located far from drinking water sources (wells, surface reservoirs, production facilities).

There are no drinking water wells located adjacent or downstream of the landfill footprint.

The landfill footprint is located 2,700 feet from the Ugum River, which is a source of drinking water. The Ugum River drainage area taken from the *Ugum River Interim Report and Environmental Impact Statement* (U.S. Army Corp of Engineers, 1980) is depicted in Figure 5. The landfill footprint is not located within this drainage area.

Based on the groundwater levels recorded at the site a groundwater hydraulic divide exists between Ugum River and the landfill footprint that will isolate groundwater flows from the landfill to the Ugum River.

The 1994 "Surface Water Development Study" prepared by Barrett Consulting Group for the PUAG identified the Inarajan River as a potential site for a surface water dam and reservoir. No plans are in place for construction of the reservoir by the GWA. The proposed landfill footprint is located adjacent to the Fintasa River and is within the drainage basin for this potential reservoir site. The landfill footprint is located approximately 4,000 feet from the limits of the proposed reservoir pool boundary. Figure 5 shows the location of the potential Inarajan reservoir.

A portion of the flow in the Fintasa River is from exfiltration from groundwater into the river. Groundwater from below the landfill will flow into the Fintasa River.

5.1.5 Surface Hydrology - A preferred sanitary landfill site would not impact stormwater on the ground surface. This means that appropriate measures (dikes, berms, diversions) could be economically constructed to control both run-on (stormwater coming onto the sanitary landfill site) and runoff (stormwater from the sanitary landfill site).

The landfill footprint has been located in the higher elevations of the site. The general stormwater runoff flow direction will be away from the landfill footprint. Therefore the overall site stormwater run-on diversion requirements will be minimized and will not generate major changes in the existing stormwater drainage pattern in the area. Localized stormwater diversion will be required as the landfill development progresses.

The access road will require drainage culverts to allow the existing stormwater flow from the Ugum River drainage divide to the Tinago, Fintasa, and Fensol Rivers to continue.

The development of the landfill will require the construction of stormwater runoff control from the active areas of the landfill. A stormwater runoff retention pond is anticipated to be necessary to meet the requirements of rules §23309 and §23310. The detailed design and sizing of the runoff control system will be performed during detailed landfill design to conform to the development plan of the landfill. No unusual or engineering or construction will be required. The system must be sized to meet the climatic conditions for Guam. Restricting the size of active cells would reduce stormwater runoff from the landfill.

Stormwater runoff from landfill cells where final closure infiltration barriers and erosion cover have been completed will be directed to the original drainage patterns. Since this original drainage was generally away from the landfill footprint the final closure should not generate major changes to the original drainage patterns.

5.1.6 Wetlands - A preferred sanitary landfill site would not impact designated wetland areas or the effect could be easily mitigated.

The National Wetlands Inventory (NWI) maps (U.S. Fish and Wildlife Service, 1983) show approximately 1.8 acres of palustrine and open-water wetlands at the Dandan site within the footprint and buffer. BAE Systems (2004) estimated 7.5 acres of wetlands within the footprint, based on preliminary remote sensing studies of satellite imagery taken in late 2003 and early 2004 (Figure 6). These wetlands consist of reed marshes dominated by *Eleocharis dulcis* and *E. ochrostachys*, and karriso (*Phragmites karka*), with an assortment of ferns (*Thelypteris interrupta*), grasses (*Paspalum orbiculare* and *Sacciolepis indica*) and sedges. The wetlands are associated with the Tinago, Fensol and Fintasa Rivers. Mitigation would be required to offset impacts to wetland areas that cannot be avoided in the development of a landfill (see Section 5.5.7).

5.1.7 Water Quality - A preferred sanitary landfill site would have a water quality zone designation suitable for the development of a sanitary landfill facility.

The proposed Dandan site is located in an S-2 (medium) surface water category, based upon the Guam Water Classification Master Map (Guam EPA, 2001) (Figure 7). This category is used for recreational purposes; potable water use is only acceptable after adequate treatment is provided. GEPA performed a series of sampling events from 1974-1977 and in 1997. The data collected from 1974-1977 included some of the following constituents: dissolved oxygen, Temperature, pH, Phosphorus as P, fecal coliform, nitrogen and total suspended solids. This data was not included because most locations sampled at that time were not directly impacted by the proposed location or the data was outdated/incomplete. The 1997 data was reviewed and incorporated into this report. The samples were taken at both the Laolao and Pauliluc Rivers (see Figure 5). Both rivers may be influenced from the proposed Dandan site. Table 4 lists the results from the 1997 sampling event.

Salinity, nitrate-nitrogen ($\text{NO}_3\text{-N}$) and pH sampled during the 1997 GEPA sampling event all fall below the GWQS. Turbidity levels ranged between 2.6-127 NTU at the Laolao River and 4.4-174 NTU at the Pauliluc River. This wide range may be the result of heavy runoff and or heavy rains. As stated earlier the Dandan site is located in an S-2 category and would require treatment for the high turbidity removal. The phosphorus level at the Laolao River falls below the GWQS. The phosphorus level (P-tot) for the Pauliluc River frequently exceeds the GWQS and is most likely the result of agricultural activity in the Dandan area.

TABLE 4. Results from GEPA 1997 Sampling Events at Laolao and Pauliluc Rivers

Laolao River (GEPA Data location INRL)		Minimum	Maximum	Average	GWQS
pH	7.000	8.800	7.600	6.5-9.0	
Turbidity (NTU)	2.600	127.000	40.600	1.0 <	
NO ₃ -N (mg/L)	0.000	0.052	0.000	0.200	
P-tot (mg/L)	0.000	0.062	0.026	0.050	
Temp C	25.000	28.400	26.700	NA	
Dissolved Oxygen (mg/L)	7.500	8.900	8.100	NA	
Total Solids (mg/L)	100.000	100.000	100.000	20 <	
Salinity (ppt)	0.000	0.000	0.000	250 (mg/L) <	
Pauliluc River (GEPA Data location INRAP)		Minimum	Maximum	Average	GWQS
pH	7.100	7.400	7.300	6.5-9.0	
Turbidity (NTU)	4.400	174.000	58.600	1.0 <	
NO ₃ -N (mg/L)	0.000	0.016	0.009	0.200	
P-tot (mg/L)	0.034	0.138	0.077	0.050	
Temp C	26.000	26.000	26.600	NA	
Dissolved Oxygen (mg/L)	7.060	8.900	7.803	NA	
Total Solids (mg/L)	129.000	120.000	120.000	20 <	
Salinity (ppt)	0.000	0.000	0.000	250 (mg/L) <	

Notes: NA – Not Applicable;

GWQS – Guam Water Quality Standards (2001)

The 1994 Surface Water Development Study proposed placing a reservoir and treatment plant on both the Tinago and Inarajan Rivers. These proposals were labeled Alternative 19 and Alternative 8 respectively. Alternative 19 is located downstream of the three main tributaries to the Tinago River, one of which lies within the proposed Dandan landfill location. Alternative 8 is downstream of the Fensol River. The Fensol River lies on the proposed Dandan landfill location.

Alternative 19 suggested that 1.8 million gallons per day (MGD) could be produced if the Tinago River was to be dammed and a treatment plant constructed. This alternative ranked number 24 out of 30 sites. The Surface Water Development Study considered 30 alternatives and ranked by the following parameters: human life quality, economic, archaeological and environmental. The surrounding land use, which is predominately agricultural, and Economic/Environmental concerns all lead to Alternative 19's low ranking. Dandan is located in an agricultural "A" zone (see Section 5.5.13). Non-point source pollution from the agricultural activities in Dandan contributes to the degradation of water quality in Dandan and its receiving water bodies.

Alternative 8 suggested that 5.9 MGD could be produced if the Inarajan River was dammed and a treatment plant constructed. This alternative ranked number 12 out of 30 sites. The surrounding land use is similar to Alternative 19 and also contributed to its low ranking.

An additional study of the Inarajan River was conducted by the Water and Environmental Research Institute of the Western Pacific (WRI) in 2000. The report entitled *Environmental Impact Statement Inarajan River Dam Project* and published as Technical Report # 91 in 2000 analyzed metals and nutrients from samples taken from the Laolao and Fintasa River's in 1993. Most of the metals and nutrients fell below Federal and territorial upper limits, with exception to

iron and nitrate-nitrogen from agricultural waste and mobilization of metal precipitates (Fe, Mn) in volcanic rocks by GW.

The study suggests that the iron and magnesium levels reported were "some of the highest on Guam". Although the Laolao and Fintasa Rivers are not directly connected to the proposed Dandan site, they do directly influence the Inarajan River and any potential water resource development of the Inarajan River.

The 1994 *Surface Water Development Study* also considered diversion alternatives. Alternative 20 would place a diversion structure on the Tinago River (see Figure 5). This alternative ranked number 23 out of 30. Alternative 20 ranked low predominately because of the surrounding land use, which is agricultural, and a low yield especially during the dry season. Another diversion alternative was the Inarajan River diversion. This diversion was labeled alternative 9. Alternative 9 ranked 4 out of 30 which is the highest diversion ranking on the three sites. Similar concerns, however, were noted in the 1994 *Surface Water Development Study* these concerns being surrounding agricultural land use.

5.2 Geology

5.2.1 Bedrock - A preferred sanitary landfill site would have deep, consistent, competent, bedrock with no fracturing, discontinuities, or contact zones.

The rocks underlying the Dandan site consist of the Bolanos pyroclastic member of the Miocene Umatac Formation (Stark, 1963; Tracey, and others, 1964). According to Tracey and others (1964) the basal portion of the Bolanos pyroclastic member is reworked tuff breccia and volcanic conglomerate. Clasts within the tuff breccia are composed of basalt and andesite as well as recrystallized fragments of the Maemong limestone member of the Umatac Formation are also present. None of these clasts were chemically analyzed, however. Also found in scattered patches and individual large boulders are remnants of the Dandan flow member that range in composition from island arc tholeiitic basalt to andesite (Stark, 1963), and as defined by the IUGS (International Union of the Geological Sciences) rock classification and discussed in detail by Le Bas and Streckeisen (1991). The Dandan flow member is separated from the underlying Bolanos pyroclastic member by a flow breccia (Tracey and others, 1964). The Tracey and others, 1964 stratigraphy of the Umatac Formation was revised by Reagan and Meijer (1984); however, the stratigraphy defined by Tracey and others (1964) will be employed in this report.

Most of what was reported by Tracey and others was seen in the field within the proposed landfill location. These units were plotted on existing topographic map using a Garmin 12 GPS set to Guam 1963 datum. The best exposures are visible in the badland hills that form the northwestern boundary and in the Asmulate Hill area in the south. Fine grain thinly layered weathered red tuffaceous siltstones outcrop in the lower portion of the hill, while the upper part of the hill is capped by 6± ft. of highly weathered red tuff breccia. The clasts within this breccia layer are relatively uniform in size, being less than an inch across. The matrix material between the clasts is composed of fine weathered ash that appears lateritic. These units dip gently to the east. The sequence at this location is saprolitic in nature.

The tuffs and basalts were laid down beneath the sea, a depositional environment which results in tightly packed rock ordinarily having very low permeability. The geological formations in Dandan do not offer promise of aquifers from which groundwater can be easily extracted.

Virtually all of the moderately sloping area in the Tinago basin is underlain by fine grain tuff that weather to a variety of pale yellow and red colors. The weathered tuff loses its induration and is readily eroded by wind and overland flow of rainfall. This accounts for the "bad-land" topography of barren hills and depressions on which any sort of vegetation has difficulty in taking root. The weathered tuff is infertile

and only the toughest plants like swordgrass thrive on it. The contrasting verdure of the ravines and wetlands reflects the proximity of the groundwater table beneath the ground surface.

The layered tuffaceous siltstones, which underlie the tuff breccia, could be used for the landfill covering material. In addition, fine grain and thinly layered alluvial sediments occur east of the badland hills. Individual layers are between 2-3 inches thick. These well sorted soils appear to be found throughout the site. The soil is granular when undisturbed, but smears when stepped upon. A thick soil covering also appears to outcrop in the Asmulate Hill area (observed through binoculars).

Just north of the small wetland depression shown on the quadrangle map is an outcrop of an explosive pyroclastic lithic tuff deposit containing numerous large angular blocks of slightly weathered basalt (up to 0.5 ft. across) and broken accidental inclusions of recrystallized limestone. These blocks are contained in a cemented matrix of lapilli size fragments and weathered ash. Tracey and others (1964) conclude that the presence of recrystallized limestone found in the tuff breccias and volcanic conglomerate of the Bolanos pyroclastic member originate from the Maemong limestone, which may sporadically underlie the Bolanos pyroclastics. This outcrop may be explosive rather than depositional, with angular fragments of underlying basalt and recrystallized Maemong limestone incorporated into the eruption. Outcrops of the Maemong limestone are not mapped in the Dandan area (Tracey and others, 1964). The presence of recrystallized limestone so far inland could mean that there are limestone deposits at depth.

A thin section from a boring at depth of 43 ft. showed zeolites, weathered olivine grains, and diatoms fossils.

5.2.2 Cover soil availability - A preferred sanitary landfill site would have adequate and suitable soil quantity available for daily cover and other uses. Suitable soil for daily cover would include low permeability soil to limit stormwater percolation into the solid waste.

The surficial alluvial and residual soils encountered during the subsurface investigation are generally classified as low plastic to plastic silts (ML-MH) materials in accordance with the Unified Soil Classification System. The upper highly weathered tuffaceous rock was easily excavated without requiring ripping. These materials are generally fine grained and would restrict rainfall infiltration and promote runoff from active work areas. The conceptual layout of the landfill footprint excavation will provide sufficient material for cover soils within the boundaries of the landfill footprint.

5.2.3 Fault areas - A preferred sanitary landfill site would not be located on or close to any active faults.

The Umatac Formation is transected by numerous high angle and normal faults and lineaments of uncertain age and displacement, though none of these faults are plotted on the Tracey and others (1964) geologic map. Accurate identification and delineation of faults is difficult. Breccia zones may be indicative, as to a lesser degree are rock joints. Modern day faulting is not evident at Dandan. Most of the visible displacements were probably due to post depositional adjustments.

An old fault was exposed on the northwest end of the proposed landfill footprint. This fault appears to be an inactive fault based on the non-displacement of the upper depositional layers.

5.2.4 Hydrogeology - A preferred sanitary landfill site would have a deep water table and thick low permeable deposits with a confining layer over any water bearing zone.

The general groundwater surface mirrors the topography and is located in the surficial alluvial or residual soils overlying the bedrock below the site. The groundwater system below the site is an unconfined system. The site investigations indicates the depth of the groundwater surface varies from at the ground surface in the low lying stream beds to over twenty feet in the higher

elevations of the badlands and ridge dividing the Tinago, Fintasa, Fensol and Ugum River drainage basins. The landfill footprint has been located in the higher elevations of the site where the groundwater table surface is deeper.

The surficial alluvial and residual soils encountered during the subsurface investigation are generally classified as low plastic to plastic silts (ML-MH) materials in accordance with the Unified Soil Classification System. The upper highly weathered tuffaceous rock is generally fine grained. These soils would generally be low permeability.

Preferred hydrogeologic conditions of a deep water table and thick, low permeability deposits with a confining layer over any water-bearing zone cannot be found anywhere in the Dandan region.

5.2.5 Seismic Impact Zones - A preferred sanitary landfill site would not be located in a seismic impact zone.

The entire island of Guam is within a Seismic Impact Zone, as are all three candidate sites. Guam has a rich history of earthquakes with the most current large event (Magnitude 8.1) occurring on August 8, 1993. Guam has been identified as an active seismic area with a ten percent or greater probability that the maximum horizontal acceleration in lithified earth material, expressed as a percentage of the earth's gravity pull (g), will exceed 0.10g in 250 years. The U.S. Geological Survey seismic hazard map identifies Guam with a 0.2 Sec Spectral Response Acceleration (5% Critical Damping) of 150% g and a 1.0 Sec Spectral Response Acceleration (5% Critical Damping) of 60% g maximum considered earthquake ground motions. These numbers more specifically represent an acceleration response spectrum having a 2-percent probability of exceedence within a 50-year period.

5.2.6 Soils - A preferred sanitary landfill site would have soils with a low permeability (like a clay-type soil where liquids will move through it at a slower rate than a sand-type soil, for example).

The surficial alluvial and residual soils encountered during the subsurface investigation are generally classified as low plastic to plastic silts (ML-MH) materials in accordance with the Unified Soil Classification System. The upper highly weathered tuffaceous rock is generally fine grained. These soils would generally be low permeability.

5.2.7 Topography – A preferred sanitary landfill site would have generally level or gently rolling topography or possibly topography that would provide natural visual screening to adjacent properties or viewing areas.

The Dandan site has predominantly gently sloping terrain and is topographically suitable for landfill development. However, because a substantial portion of the area selected for the landfill footprint is located within the upland portion of the site where "badlands" conditions prevail, there is little vegetative cover that will provide natural visual screening. (See Figure 8). On the other hand, the selected area is situated well within the Dandan parcel such that visual screening from adjacent properties can be effectively provided during landfill development and subsequent operation.

5.2.8 Unstable Areas - A preferred sanitary landfill site would not be located over unstable areas. This could include collapsing soils, steep slopes, cavernous, or karst terrain.

Karst terrain is not present in the volcanic geology underlying the site. The soils encountered are not collapsible. The terrain is generally gently rolling. However, there are some steep erosion gullies in the area of the landfill footprint. These areas with require re-grading. None of these areas pose a stability concern with proper control of earthwork construction.

5.3 On-site Environment

5.3.1 Air Quality – A preferred sanitary landfill site would include distant receptors and low wind conditions.

The potential receptors within a 0.50-mile (2,640-foot) radius surrounding the Dandan footprint include farmlands along the Tinago River to the east of the footprint, and a portion of the NASA Tracking Station located to the northeast of the site. Residential uses are located over a mile away from the footprint, and are situated mostly to the east in Malojloj Village, and to the southeast in the Guam Housing and Urban Renewal Authority (GHURA) Southern Rental Housing areas. The Inarajan Middle School is also located over a mile away to the southeast of the project site.

5.3.2 Wildlife Resources – A preferred sanitary landfill site would limit impact adverse impacts to wildlife resources.

5.3.2.1 Terrestrial and Avian Species

a. Methods. Duenas & Associates, Inc. conducted a biological survey of the Dandan site from July to November 2004 to determine the presence of terrestrial and avian fauna within the proposed landfill footprint (Appendix J). Pedestrian surveys were the primary means of detecting fauna at the site. Eight-minute bird counts (Reynolds, 1980) to detect avian fauna were conducted at stations located within the proposed footprint and its vicinity from July to November 2004 (Figure 8).

b. Amphibians and Reptiles. Two land snails, the African snail (*Achatina fulica*) and *Bradybaena pellucida*, were observed at the Dandan site and may be considered rare. No tree snails (*Partula* sp. and *Samoana* sp.) were found in the project area proposed for landfill development. The black-spotted pond frog or barking frog (*Rana nigromaculata*) and marine or cane toad (*Bufo marinus*) were observed during pedestrian surveys at Dandan. The pond frog, an introduced terrestrial species with a distinctive, repetitive call, was common at the site. The frog favors areas of standing water in the property, such as temporary pools and puddles along the access trail and near the Tinago River, and in wetlands near the proposed landfill footprint. The marine toad occupies similar disturbed areas. At least two other introduced amphibian species, the arrowhead frog (*Microhyla pulchra*) and brown tree frog (*Polypaedes megacephalus*), have also been found at Dandan (Personal communication, Mr. David E. Gee II, Division of Aquatic and Wildlife Resources, Guam Department of Agriculture, July 27, 2004).

The nocturnal brown tree snake (*Boiga irregularis*) was not detected in the property during daytime surveys, but can be expected to occur at the site. Curious skinks (*Carlia fusca*) were commonly observed in the savannas and disturbed areas; blue-tailed skinks (*Emoia caeruleocauda*) were rare in the forested areas, such as the stand of da'ok (*Calophyllum inophyllum*) trees in the central sector.

c. Birds. Stationary bird counts conducted in the Dandan site (Figure 8) indicate that one native species, the yellow bittern (*Ixobrychus sinensis*), and four introduced species, i.e., Philippine turtle-doves or Island collared doves (*Streptopelia bitorquata*), black drongos (*Dicrurus macrocercus*), blue-breasted quail (*Coturnix chinensis*), and black francolins (*Francolinus francolinus*), utilize the area. The black francolin, a native of India, was first released into the wild on Guam at the Dandan area in 1961 and eventually spread to other areas of the island; a limited hunting season on francolins was established in 1980 (Department of Agriculture, Division of Aquatic and Wildlife Resources, 1980). Francolins may be considered common at the Dandan site, based on frequent vocalizations.

The Mariana common moorhen (*Gallinula chloropus guami*), a federally-listed endangered species, was not detected during observations at wetlands in the project area and vicinity. Playback calls and extended observations up to 45 minutes were conducted at early morning, late morning, and afternoon hours near the pond in the northwestern corner of the footprint that forms the headwaters to a tributary of the Fintasa River. Takano and Haig (2004) observed 90 adult moorhens at one seasonal wetland, and 21 permanent wetlands on Guam during islandwide surveys conducted in 2001. At Dandan, Takano observed a single moorhen in the Tinago River, and one in the seasonally inundated Assupian Pond during the 2001 surveys (Takano, 2003).

d. Mammals. Feral dogs (*Canis familiaris*) and pigs (*Sus scrofa*) were observed in the project area and its vicinity. Pig trails were noted in the ravine areas. No Philippine deer (*Cervus mariannus*) were observed in the property, although the grassland and forested habitats are suitable for this introduced species.

5.3.2.2 Aquatic Species

No macrofauna were detected in the sectors of the Fensol and Fintasa Rivers in the vicinity of the project area during pedestrian surveys in July and November 2004. The Fensol River was investigated by DAWR (Mr. Brent Tibbatts and Ms. Lillian Talijeron) and Duenas & Associates, Inc. personnel on 9 November 2004. The headwaters were explored by pedestrian survey, while inundated sections downstream were both observed from streambanks and swum or waded through. The only macrofauna observed were water striders, which are common insects in Guam's rivers. The freshwater eel, *Anguilla marmorata*, and the Tahitian prawn have been observed in the lower Fintasa River in the vicinity of Fintasa Falls by DAWR. Fintasa Falls is located approximately 0.25 mile from the Dandan footprint.

The northeastern corner of the proposed landfill footprint encompasses a short section of a tributary to the Tinago River mostly choked with wetland vegetation (*Eleocharis* sp.). The flagtail (*Kuhlia rupestris*), tilapia (*Oreochromis* sp.), and green-spotted pond frogs (*Rana nigromaculata*) were noted in a pedestrian survey of the northern branch of the Tinago River. Both freshwater and marine fish have been observed in the lower reaches of the Tinago River within 150 m upstream and 200 m downstream of the Tinago River Bridge (Division of Aquatic and Wildlife Resources (DAWR), Guam Department of Agriculture, unpublished data). These include *Anguilla marmorata*, *Awaous guamensis*, *Kuhlia rupestris*, *Lutjanus argentimaculatus*, *Moolgarda engeli*, *Sicyopterus macrostetholepis*, *Stenogobius* sp., *Stiphodon* sp., and *Zenarchopterus dispar*. Invertebrates, such as Tahitian prawn (*Macrobrachium lar*), thiariid snails, and possibly the grapsid crab *Varuna litterata* were also reported by DAWR. Local residents of Malojloj report that freshwater eels and shrimp are harvested from the river systems surrounding the proposed landfill site.

5.3.3 Archaeological/Historical Resources – A preferred sanitary landfill site would have no significant archaeological/historical locations on the site or on adjacent properties which would be adversely affected by the construction of the landfill and its operation. Sites are considered significant and therefore subject to adverse effects if they are eligible for nomination to the National Register of Historic Places. National Register Criteria A-D have been used to assess the archaeological/historical sites in the three parcels to the extent that present information allows. A finding of No Adverse Effect at significant sites may be determined if appropriate mitigation measures have been taken. After a complete inventory survey, these measures could include detailed documentation including hand excavations and artifact collection.

5.3.3.1 Archival Research

Archival research found that historic land use at Dandan included Spanish Period ranching and family subsistence farms, and that archaeological survey coverage of the Dandan parcel was less

comprehensive than in the other two parcels. Evidence of prehistoric land use is indicated by several archaeological surveys in and near the parcel. Figure 9 shows archaeological site locations from the Guam Historic Resources Division (HRD) data base and locations of sites found during the present project.

Within the parcel, five sites had been located but none of them within the landfill footprint. Previously known sites in the western portion of the parcel are 66-09-0529, an artifact scatter with subsurface deposits; 66-09-0532, an artifact scatter with subsurface deposits and latte stones (Highness et al. 1991) and 66-09-0098 (South Ugum Ridge), an artifact scatter (Reinman 1965-66); in the northeast corner of the parcel is Site T-1, a pottery scatter (Haun and Donham 1989); and in the eastern part of the parcel by Assupian Lake is 66-09-0099 (Assupian), a latte site (Reinman 1965-66).

The presence of wetlands in the Dandan parcel undoubtedly was a significant factor affecting prehistoric as well as historic land use patterns. In fact, Latte Phase sites tend to occur near wetlands in the interior of the island. Prehistorically, wetlands could have been used for rice cultivation as well as seasonal planting of taro. Wet soils are also conducive to cultivation of betel nut, coconut, and bananas. During Spanish and early American Periods, wetlands were important water sources for cattle raising and these wet soils were useful for subsistence farming as in prehistoric times.

5.3.3.2 Significance Recommendations

The five sites found during archival research are historically significant under National Register Criterion D. However, their present condition is unknown. Historically significant sites within the parcel, even outside the footprint, are potentially at risk from construction activities, such as equipment access roads and staging areas, and from utility line clearing and trenching. Adverse impacts to these sites can be avoided through careful project design and working with an archaeologist to verify the present condition and extent of the sites.

If the Dandan parcel is selected, oral history interviews should be conducted to complement the archival findings regarding historic land use in the area. Information regarding pre-war and post-war ranching, subsistence farming, family ties with coastal sites, recreation, and travel through the area should be sought.

5.3.3.3 Inventory Survey

During August and September 2004, PHRI conducted an inventory survey within the proposed landfill footprint and identified ten isolated occurrences (Table 5). The finds represent Prehistoric and Historic Period activities but the find locations lack the complexity and integrity normally associated with formal archaeological site designations. No such formal archaeological sites were identified during the survey.

Eight of the isolated occurrences are prehistoric; six consist of one or two slingstones and two are modified boulders, which were probably used in tool making. Near one of the boulders was a Latte Period pot sherd. A possible groundstone tool fragment and a chert core were also recovered. Two of the isolated occurrences are historic and relate to ranching: a single large wrought iron nail and a bail of barbwire.

A large quantity of bullet casings and spent bullets was noted throughout the landfill footprint. These bullets included .30, .45, and .50 caliber rounds commonly associated with WWII Era US military forces.

Table 5. Summary of Isolated Occurrences

Site No.	Description	Site Type	Site Environment
1	Wrought iron nail	Historic	Badland area
2	Barb wire	Historic	Badland area
3	Slingstone	Prehistoric	Partially vegetated Badland Area
4	Two slingstones	Prehistoric	Partially vegetated Badland Area
5	Groundstone fragment	Prehistoric	Badland area
6	Basalt boulder, sherd	Prehistoric	Badland area
7	Two slingstones	Prehistoric	Badland area
8	Chert core	Prehistoric	Badland area
9	Two slingstones	Prehistoric	Partially vegetated Badland Area
10	Basalt boulder	Prehistoric	Badland area

5.3.3.4 Significance Recommendations

All eight prehistoric isolated occurrences within the landfill footprint contain at least some information pertaining to the history of Guam, required by National Register Eligibility Criterion D (36 CFR Part 60). However, these finds lack the integrity of association and location necessary for nomination to the National Register of Historic Places. Lack of integrity is manifest in the isolated nature of these objects and their removal from original behavioral context due to erosional forces. Detailed documentation or removal of the isolated occurrences for study, in addition to archaeological monitoring in the landfill footprint, will be sufficient mitigation should the Dandan parcel be selected.

5.3.3.5 Reconnaissance Survey and Monitoring

In July 2004, MARS conducted a reconnaissance survey and provided archaeological monitoring of soil tests and borings within an alternative Dandan landfill footprint located immediately northwest of the current Dandan landfill footprint that was surveyed by PHRI in August and September. MARS' survey and monitoring located four sites: Dan S-1, Dan S-2, Dan S-3, Dan S-4 and three isolated occurrences: Dan IO-1, Dan IO-2, Dan IO-3. All of these localities are outside the current footprint of the landfill (Figure 9).

Dan S-1 is a scatter of five slingstones (collected) at the base of a low ridge. Dan S-2 is an artifact scatter consisting of two slingstones (collected), basalt flakes, World War II military issue beer bottles, other bottles, shrapnel, other metal machine parts, cartridges dated 1942, 1943, plastic, and wire located on an actively eroding slope. Dan S-3 is an historic fence remnant associated with economic tree plantings located on gently sloping terrain, probably part of the old Martinez ranch. Dan S-4 is a linear outcrop of weathered basalt with imprints from a tracked vehicle, possibly WWII military or a track hoe; it was located on a low ridge. The three isolated occurrences consist of single slingstones (collected); two were located in rolling terrain and one on a ridge.

5.3.3.6 Significance Recommendations

Two of the four sites found during the reconnaissance survey, Dan S-1 and Dan S-2, were determined to be significant under Criterion D. Since the artifacts were collected from these two localities and information about the sites recorded, the loss of these two sites from the archaeological record has been mitigated. Dan S-3 and Dan S-4 and Dan IO-1, Dan IO-2 and

Dan IO-3 do not appear to meet any National Register criteria. A finding of No Adverse Effect for all these localities is recommended.

Paleosediment coring with palynomorph (pollen, phytoliths, spores, etc.) analysis and radiocarbon dating (bulk soil and pollen) is recommended to help establish the age and possible prehistoric and historic uses of the Dandan wetlands. Such information could complement that obtained through oral history interviews.

5.3.4 Biological Resources (Habitat) - A preferred sanitary landfill site would not have significant existing habitat areas for biological resources.

The Dandan site contains four vegetation communities—savanna grassland, ravine forest, disturbed vegetation/badlands, and wetlands, based on a biological survey by Duenas & Associates, Inc. in July to November 2004 (Appendix J). The savanna grasslands are extensive, occupying most of the northern portion of the landfill footprint (Figure 10). The major species include swordgrass (*Misanthus floridulus*), foxtail (*Pennisetum polystachyon*), *Sorghum halepense*, *Dichanthium bladhii*, and wildcane (*Saccharum spontaneum*). Small herbs intermingled among the grasses include *Elephantopus mollis*, *Lycopodium cernuum*, *Stylosanthes guianensis*, *Stachytarpheta jamaicensis*, and *Rhynchospera rubra*. The vegetation transitions into a shrubby profile on slopes, with *Wikstroemia elliptica*, *Geniostoma micranthum*, *Decaspermum fruticosum*, *Glochidion Marianum*, *Phyllanthus saffordii*, and *Dianella saffordii*. Small trees, such as *Pouteria obovata* and *Cycas circinalis*, also occur among the mixed shrubbery. In some areas the savanna fern, *Gleichenia linearis*, forms a wiry blanket with dodder (*Cassytha filiformis*), an orange, parasitic vine.

The central and southern portions of the footprint are mostly badlands with exposed soils and sparse vegetation, such as *Gleichenia linearis*, *Lycopodium cernuum*, *Dimeria chloridiformis*, *Hyptis capitata*, *Chrysopogon aciculatus*, *Pennisetum polystachyon*, and *Melastoma malabathricum*. The disturbed vegetation community at the site is associated with past clearing activities for roads, trails or agricultural fields. Fires have also cleared the original plant community and produced disturbed areas with species such as carpetgrass (*Axonopus compressus*), sleeping grass (*Mimosa pudica*), dodder (*Cassytha filiformis*), and *Eragrostis atrovirens*.

Only small pockets of ravine forest remain among the badland and savanna vegetation, hinting at what may have been a more extensive community prior to fires and other disturbance. Forested areas are found in the southwestern sector of the footprint along a tributary into the Fintasa River. The community contains kafu (*Pandanus tectorius*), fadang (*Cycas circinalis*), da'ok (*Calophyllum inophyllum*), and lada (*Morinda citrifolia*), with an understory of bejucu halom tano (*Flagellaria indica*), *Scleria polycarpa*, *Chromolaena odorata*, and *Lantana camera*, and epiphytes such as pugua machena (*Davallia solida*) and *Pyrrosia lanceolata*. Da'ok trees also form small stands in the western sector, with a similar species composition.

The wetlands at Dandan have not been officially delineated and surveyed (Environmental Laboratory, 1987). The National Wetlands Inventory (NWI) maps for Guam (U.S. Fish and Wildlife Service, 1983) indicate that a total of approximately 1.8 acres may fall within the proposed landfill footprint and buffer area. Marsh or open-water wetlands comprise an estimated 7.5 acres within the landfill footprint based on remote sensing data by BAE Systems (2004) using 2003/2004 mosaic satellite imagery. The wetland reed karriso (*Phragmites karka*), and sedges *Eleocharis dulcis* and *E. ochrostachys* form the dominant vegetation in this community. Minor species include *Thelypteris interrupta*, *Hyptis capitata*, *Fuirena umbellata*, and *Paspalum orbiculare*.

5.3.5 Support Infrastructure - A preferred sanitary landfill site would have appropriate area on site for facility support infrastructure (generally, the bigger the site, the better) or that support

could be provided locally off site. Support infrastructure means maintenance shops, wash down areas, recycling areas, office and supply areas, parking areas, or scale and entrance facilities.

For the purposes of this site selection study an area of five acres was considered for supporting infrastructure. All sites have ample room for these facilities adjacent to the landfill footprint. Final location and arrangements will be determined during detailed design.

5.3.6 Threatened and Endangered Species - A preferred sanitary landfill site would not impact threatened or endangered species.

The federally-listed endangered Mariana common moorhen (*Gallinula chloropus guami*) is the only potential species of concern at the Dandan site, based on observations of moorhen at the Assupian pond, located approximately 5,000 feet from the proposed landfill footprint, and at the Tinago River by Takano (2003). The Assupian pond was listed among the wetlands on Guam that serve as known or potential moorhen habitat by the U.S. Fish and Wildlife Service (USFWS, 1992). Moorhen were not detected during extended observations at the wetlands within the proposed landfill footprint. The wetlands are open-water areas with varying degrees of emergent vegetation, and may provide potential habitat for moorhen.

The federally-listed endangered Mariana fruit bat (*Pteropus mariannus*) was not detected during pedestrian surveys and stationary bird counts at the project site. The U.S. Fish and Wildlife Service issued a final rule effective February 7, 2005 to reclassify the Guam population of the Marianas fruit bat from endangered to threatened, and to include the fruit bat population in the Commonwealth of the Northern Mariana Islands under the threatened status (70 Federal Register pp. 1190-1210). On Guam, the fruit bat population is concentrated in the native limestone forests at the northern end of the island; native limestone forest habitat does not occur at the Dandan site.

5.3.7 Wind Direction to abutting properties - A preferred sanitary landfill site would be downwind of any sensitive receptors.

Based on 37 years of observations between 1945 and 1982 obtained by the NOAA Weather Service Meteorological Observatory at Tiyan, Guam, the easterly tradewinds are dominant from April to December, while the prevailing wind from January to March is from the east northeasterly direction. The higher average wind speed (i.e., 7.4 to 9.4 mph) occurs during the dry season during December to June. This wind pattern places mostly recreational land uses downwind of the Dandan site (see Figure 13). Residential areas in Malojloj village and private homes along Dandan Road are situated east and northeast of the landfill footprint, respectively. The Inarajan Middle School and GHURA Southern Rental Housing are both located over one mile to the southeast of the Dandan site. These potential sensitive receptors are located upwind of the proposed landfill location. Other potential sensitive receptors comprising the villages of Umatac and Merizo are approximately three and four miles west and southwest, respectively, of the Dandan site.

5.4 Transportation

5.4.1 Access - A preferred sanitary landfill site would have major or suitable highway access and no required upgrading to the access roads.

Access to the Malojloj area will be via Route 4, the primary access road to the southern Guam. The primary access to the Dandan site (Lot B-3 REM) is through Dandan Road which extends from Route 4 at Malojloj to the former NASA Tracking Station as depicted in Figure 11. A suitable access road will have to be developed to create a 2-lane asphaltic-concrete paved roadway, complete with 8-foot wide paved shoulders, attendant roadside drainage improvements and

appropriate signage from Route 4 to the proposed landfill site having a approximate length of 2.75 miles. Approximately 2500 linear feet of Dandan Road passes through a portion of Malojloj Village.

According to the Guam Highway Master Plan, Route 4, from Ylig Bridge to Inarajan Village, will undergo reconstruction and widening to current Department of Public Works standards as part of the Short Range Highway Improvement Program. The current Route 4 reconstruction program features full highway improvements from Yona Village to Ylig Bridge and the upgrading of the section from Agana to Route 10 in Mangilao. Thus, the Route 4 reconstruction program appears to support the transportation corridor requirements for development of the Dandan candidate landfill site.

- 5.4.2 Haul Routes - A preferred sanitary landfill site would have haul routes that limit impacts to residential areas. These impacts could include noise, litter, potholes and driver line of sight.

Haul routes to the Dandan site will be via Guam's major highway routes to Route 4, then through Dandan Road which extends from Route 4 at Malojloj to the former NASA Tracking Station as depicted in Figure 11. Approximately 2500 linear feet of Dandan Road passes through a portion of Malojloj Village. As presented under Paragraph 5.4.1 .

- 5.4.3 Highway Safety – A preferred sanitary landfill site would not cause hazardous road conditions to existing vehicle and pedestrian traffic during the transportation of solid waste. This would include highways, intersections, and main and secondary roadways.

The upgrading of Dandan Road and the reconstruction of Route 4 will address any highway safety issues involved with the movement of traffic to and from the Dandan site. The integrated solid waste management strategy which features the use of regional transfer stations as the destination for solid waste collection vehicles will effectively limit landfill-bound solid waste-related vehicular traffic primarily to large waste haulers.

Haul vehicles that will be used to transport solid waste from the transfer stations to the landfill site must be "street legal", meaning that such vehicles must meet vehicle height and width requirements and must also not exceed the maximum vehicle loading requirements established by law for Guam's highways. Enforcement of vehicle weights rests with the Department of Revenue and Taxation in conjunction with the Guam Police Department.

- 5.4.4 Proximity to Waste Source - A preferred sanitary landfill site would be close to the waste generators (population centers).

The centroid of solid waste generation overlays the centroid of population and is located in the Dededo-Tamuning region. The Dandan candidate site is comparatively located the farthest from the centroid of solid waste generation at a distance of approximately 23 miles.

- 5.4.5 Traffic Congestion - A preferred sanitary landfill site would not congest the existing highways and access routes during construction or operations.

The integrated solid waste management strategy which features the use of regional transfer stations as the destination for solid waste collection vehicles will effectively limit landfill-bound solid waste-related vehicular traffic to large waste haulers. Current solid waste collection and transport practice features round trips by solid waste packer trucks and other waste haulers of all types (with capacities ranging from 1 to 20 cubic yards) from services areas to and from the Ordot dump. Current data recorded at the Ordot Dump show that over 200 vehicle loads totaling over 400 tons of waste can be experienced on certain days. Large waste haulers have a range in

nominal capacity of 55 to 145 cubic yards of compacted wastes. Preliminary calculations show that when compared to existing practice, the proposed new solid waste management strategy of limited access to the landfill to large waste haulers will significantly reduce the volume of landfill-bound traffic by a factor in the range of 8 to 14. Furthermore, it is anticipated that the frequency and hours of operation of bulk waste hauling from transfer stations to the landfill will be regulated as required to minimize impacts to the traveling public.

5.5 Land Use

- 5.5.1 Existing Land Use - A preferred sanitary landfill site would have previous land uses that are compatible with a sanitary landfill.

The existing land use in and around the Dandan site is a mixture of agricultural and recreational land use. Recreational land uses include mountain biking, hiking, fishing, hunting, and the use of 4x4 off-road vehicles. Tracks from off-road vehicles were observed during pedestrian surveys, as well as empty rifle shells from hunters. Dandan was the original release site for the introduced black francolin (*Francolinus francolinus*) by the Department of Agriculture, which permits licensed hunting of this game bird on private and Government of Guam lands. No permanent manmade structures are present within the proposed footprint. Agricultural uses include planting crops and animal husbandry. The western central sector shows evidence of previous planting activities (see Section 5.3.3.1).

- 5.5.2 Acreage Available - A preferred sanitary landfill site would have an adequate amount of acreage to meet the selected design life of the facility, including buffer areas and support facility requirements.

The site has sufficient acreage to meet the waste volume requirements for 30 years.

- 5.5.3 Aesthetics - A preferred sanitary landfill site would have a development, operations, and final closure plan that would be preferable from an aesthetics point of view.

Dandan is a relatively open expanse of land stretching between the Ugum watershed on the north and the Inarajan watershed to the south. The view corridor from the Dandan footprint encompasses Inarajan Middle School and GHURA housing to the south, private residences to the east, and the Talofofo Falls Park to the north. The landfill is envisioned as a mounded landfill. During development and operation of the landfill, approximately 10 acres would be developed at any time. Within this ten-acre area, only a 0.5-acre area would actively receive waste. The final elevation of the landfill upon closure would be approximately 435 feet above mean sea level, with a maximum approximate height of 103 feet above grade (Figure 12). The development of the landfill would leave the southernmost sectors for the final phase, thus, the landfill would not be perceived by southern receptors (such as the Inarajan Middle School) until much later in its lifespan.

- 5.5.4 Airport Safety - A preferred sanitary landfill site would not impact local airports including bird hazards to aircraft. Impact means that the site must be at least 10,000 feet from any airport runway for turbojet aircraft and at least 5,000 feet from any airport runway used for only piston type aircraft. In addition, according to FAA Advisory Circular No. 150/5200-33A, a new municipal solid waste landfill facility and certain categories of airports must have a 6-mile minimum separation. The advisory recommends minimum distances that airports should be sited from wildlife attractants and recommends prohibiting land use practices within this exclusion zone that "cause hazardous wildlife movement into or across the approach and departure airspace." The advisory recommends no new municipal landfill within this exclusion zone.

The Dandan candidate site is approximately 18 miles away from the Guam International Airport runway. Accordingly a landfill location and operation at Dandan will not violate any current airport safety rules.

- 5.5.5 Buffer Area Availability - A preferred sanitary landfill site would have adequate buffer area from adjacent property owners. The buffer area is generally measured from the fence or property line to the actual disposal footprint. Buffer areas can include greenspace, access roads, stormwater structures, and utility provisions. Buffer areas may also include landscaping and vegetation to provide a visual boundary.

The Dandan footprint is nestled entirely within Lot No. B-3 REM, and does not directly abut any private lots. The undeveloped parcel provides greenspace on all sides between the footprint and the nearest property boundaries. The footprint has a buffer of approximately 557 feet from the nearest adjacent property boundary to the south, i.e., Basic Lot No. 380, a Government of Guam parcel (Figure 13). The boundary of Lot No. 354-4 is about 0.64 mile (3,379 feet) south of the footprint; Inarajan Middle School is located within this property. The footprint is approximately 0.25 mile (1,312 feet) southwest of the Parcel 1 boundary, which encompasses the old NASA Tracking Station facility. On the east, the nearest property line is approximately 1.09 miles from the proposed footprint. The closest property to the west is Lot No. 275, which lies approximately 0.58 mile (3,083 feet) from the footprint. An undeveloped 60-foot right-of-way public access and utility easement divides Lot No. B-3REM from Lot No. B-3 to the north; the easement is approximately 2,230 feet north of the closest footprint boundary.

- 5.5.6 Compatible Adjacent Land Uses - A preferred sanitary landfill site would be compatible with adjacent land uses.

Historical land use within the Dandan parcel has been limited primarily to agricultural and recreational activities. Agricultural uses occur within a half-mile of the proposed footprint. Cultivated fields of watermelon and other crops, and a fenced enclosure for cattle are located to the north of the footprint, while a small garden plot is present to the southeast of the footprint. The Talofa Falls Park is a tourist-oriented facility located over a half-mile north of the footprint. Three waterfalls, the Fintasa, Laolao, and Inarajan Falls, are located along rivers to the south of the footprint. These waterfalls are attractions for hikers and outdoor enthusiasts. The former NASA Satellite Tracking Station site falls within a half-mile of the footprint in the northern sector.

- 5.5.7 Mitigation issues - A preferred sanitary landfill site would have no mitigation issues or have easily resolvable issues.

All eight prehistoric isolated occurrences within the landfill footprint contain at least some information pertaining to the history of Guam, required by National Register Eligibility Criterion D (36 CFR Part 60). However, these finds lack the integrity of association and location necessary for nomination to the National Register of Historic Places. Lack of integrity is manifest in the isolated nature of these objects and their removal from original behavioral context due to erosional forces. Detailed documentation or removal of the isolated occurrences for study, in addition to archaeological monitoring in the landfill footprint, will be sufficient mitigation should the Dandan parcel be selected.

Preliminary remote sensing studies of satellite imagery indicate that approximately 7.5 acres of wetlands fall within the proposed Dandan footprint (see Section 5.1.6). Mitigation for these wetlands would involve creation of new wetland area to comply with "no net loss" policies in the federal government. Acquiring the permits for impacting wetlands is a complex and lengthy process involving coordination with the U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, and local regulatory entities. There is also considerable expense involved to identify and purchase additional property for construction of wetlands. The biological survey for Dandan did not reveal the presence of any threatened or endangered species. The endangered Mariana

common moorhen is potential species of concern since the wetlands in the property may serve as potential habitat for this species.

5.5.8 Noise Concerns - A preferred sanitary landfill site would have no receptors close enough to the site where typical construction equipment noise would not be compatible or would have adequate screening capability to diffuse or adequately reduce the noise.

The Dandan footprint is located over one mile (5,280 feet) from potential receptors in the residential areas of Malojloj to the east, and GHURA's Southern Rental Housing and private residences to the southeast. The Inarajan Middle School is also situated over one mile southeast of the footprint. Private homes along an approximately 2,500 linear-foot sector of Dandan Road would be potential receptors of noise from vehicle traffic hauling waste to the site.

Table 6. Residential Uses in the Vicinity of Dandan Footprint

	Radius from Landfill Footprint		
	0.25 mile	0.50 mile	0.75 mile
Total Residential Uses	0	0	0

5.5.9 Property Acquisition - A preferred sanitary landfill site would have a single receptive owner for the acquisition of the entire property.

Ownership of the Dandan site (Lot No. B Estate No.16, Suburban) is by joint tenancy involving First Island Industry, Inc. (a subsidiary of Oxford Properties and Facilities, Ltd.) and Calvo's Insurance Underwriters. Oxford Properties opposes the landfill development on the candidate site while the joint owner (Calvo's Insurance) has not gone on record as to whether or not they are receptive to the acquisition of a portion of the site for landfill development.

5.5.10 Property Devaluation – A preferred sanitary landfill site would be designed to limit impact to surrounding property values.

Although real estate values can be affected by nearby solid waste disposal facilities, modern laws, permit restrictions, and management technologies can make it possible to limit or even remove the potential negative impact of a nearby sanitary landfill.

Sanitary landfills can be designed and managed to limit their effect on the surrounding community. Examples of design and management techniques include: shielding the actual dumping area from sight, remote entrance to the facility, shielded access roads on site, control of litter on-site, and frequent patrols for litter off-site. Modern management techniques also target operational activities to limit the propagation of disease vectors, fires, odors, blowing litter, and scavenging. The techniques used to combat these undesirable conditions include the timely placement of daily cover, portable litter fences, and visual barriers such as soil berms or vegetation.

A study that examined the impact of a well-designed and managed landfill on surrounding property values concluded that a landfill, if well-designed and managed, can be a good neighbor and have no statistically measurable negative impact on surrounding property values¹.

¹ Donald H. Bleich, PhD, M. Chapman Findlay III, PhD, and G. Michael Phillips, PhD, "An Evaluation of the Impact of a Well-Designed Landfill on Surrounding Property Values," The Appraisal Journal (April 1991) pp. 247-252.

A paper prepared by Bruce J. Parker, President and Chief Executive Officer of the National Solid Wastes Management Association (NSWMA)², acknowledges that the total effects of landfills on nearby residential properties are complicated, and that site specific and sweeping generalizations can be misleading. However, NSWMA concluded that academic research and other information indicated that residential property values are not necessarily adversely affected by proximity to a waste management facility.

Other references generally conclude that the distance from a solid waste management facility is inversely related to the potential impact that the facility can have with a closely located property. This means that the closer the property is to the facility, the more impact it may have on the other property. Note that with a properly designed, constructed, and operated solid waste management facility, the local infrastructure is typically improved also. This improvement is in the form of upgraded roads, utility access and capacity, and stormwater control. As these improvements are made, local properties can generally become more valuable resulting from the new industry coming to the area.

In accordance with the consent decree, the proposed sanitary landfill will be operated in accordance with §23304 which governs the operations of the facility. The proper management of the facility, along with a facility buffer area to allow sufficient distance or separation from abutting properties, will promote the facility as a good neighbor in the community. A good neighbor facility can have a neutral or positive effect in the area of the facility. Conversely, a facility that does not meet the requirements of §23304 or is not arranged to provide natural or constructed visual screening can have a negative impact in the area of the facility.

Modern sanitary landfills have been able to contribute to improved land values through host community fees, tax revenues, jobs, reliable waste disposal services, and infrastructure improvement. Because environmentally protective disposal facilities are needed, regardless of the level of source reduction or recycling, disposal facilities and communities must work together and accept each other for the benefit of the community. A key community goal should be the environmental protective disposal of solid waste and to show how a disposal facility and the surrounding community can work together.

The proposed Dandan site is located in the municipality of Inarajan in the southern portion of the island. The population of Inarajan is 3,054 (2000 Census). The approximately 2,800-acre site in Lot B-3-REM is a large land parcel consisting of relatively flat grasslands in the headwaters of the Tinago River. The rural site is bounded to the north by the Ugum River watershed, the west by the headwaters of the Fintasa River, the east by several farm plots and the Malojloj community, and to the south by the low hills of the headwaters of the Fensol River. The nearest abutting properties range from approximately 4,900 feet to the local high school to the southeast to other residences approximately 8,500 feet to the northeast.

The nearest land use activity is the former NASA Tracking Station and several farm plots. Current land uses in and adjacent to the site include farming, communications facilities, off-road activities, and other wilderness recreation. The large size of the parcel allows for significant flexibility in the final orientation and design of the sanitary landfill. Because of the size of the site, and distances to abutting landowners, it appears a well-designed and properly operated facility has the potential to exist in this location as a good neighbor to the community with limited impact to the local property owners.

² Bruce J. Parker, "Solid Waste Landfills and Residential Property Values," National Solid Wastes Management Association.

5.5.11 Proximity to Sensitive Receptors - A preferred sanitary landfill site would have significant distance or well-screened areas separating receptors (e.g., activities, industry, schools, hospitals, etc.) from the facility.

The Dandan footprint is not immediately adjacent to sensitive receptors, such as residences or schools. Potential residential sensitive receptors are over one mile to the east in Malojloj village, and to the southeast in GHURA's Southern Rental Housing. Inarajan Middle School is, likewise, over one mile southeast of the footprint. The Inarajan Mayor's Office and other facilities in the area are about 1.7 miles east of the Dandan footprint.

5.5.12 Utility availability - A preferred sanitary landfill site would have short distances to connect to existing utilities, including power, water, sewer, telephone, and other required utilities.

5.5.12.1 Power. The power demands of proposed landfill operations can be satisfied by connection to the Guam Power Authority power distribution system available near Route 4 approximately 8,300 feet from the proposed landfill footprint measured along the proposed access corridor.

5.5.12.2 Telecommunications. Telecommunication requirements can also be satisfied by connection to available communications infrastructure near Route 4 approximately 8,600 feet from the proposed landfill footprint measured along the proposed access corridor. Cable TV infrastructure is over 3 miles away.

5.5.12.3 Water. The water demand of proposed landfill operations can be satisfied by connection to the public water transmission system located along Route 4 approximately 2 miles from the proposed landfill footprint. A new 6" diameter water transmission line with the possible addition of a booster station will provide the required volume and pressure to support landfill operational requirements and fire protection.

5.5.12.4 Sewer. Sewage demand for landfill operations will be generated primarily from leachate disposal and limited restroom and kitchen facilities. Leachate and routine sewage treatment and disposal requirements may be handled properly by on-site facilities and will be addressed during the detailed design of landfill improvements. If on-site disposal of leachate and/or sewage is prohibited, then a pumped connection to the public sewer system located in Malojloj Village near Route 4 (approximately 2 miles away) will be necessary.

5.5.13 Zoning - A preferred sanitary landfill site would be (or be easily capable of being) zoned appropriately for a sanitary landfill facility.

Dandan is located in an "A" or Agricultural zone (Figure 14). The following uses are permitted in an "A" zone:

- one-family dwellings and duplexes;
- farming and fisheries, including all types of activities customarily carried on in the field of agriculture and fisheries, including the raising of crops and fruits, poultry and livestock, grazing and dairying, and tree and other vegetative production, whether for commercial or personal uses;
- uses customarily accessory to any of the above uses, including home occupations and private automobile parking areas as well as accessory buildings and structures such as private garages, warehouses, barns, corrals, or other similar structures.

The proper zone for a landfill facility is "M-2", Heavy Industrial, which permits any uses not specifically prohibited by law, including those which are or may be objectionable, obnoxious, or offensive by reason of odor, dust, smoke, noise, gas fumes, cinders, vibrations, or water-carried waste. The Guam Land Use Zoning Regulations do not identify sanitary landfills as a permitted use or conditional use on Agricultural zone lands. The development of a sanitary landfill at the

Dandan site would require re-zoning from Agriculture to Heavy Industrial via the Guam Land Use Commission or re-zoning via the legislative process. Both processes require approval by the Governor of Guam.

6.0 Site Characteristics - Sabanan Batea Candidate Site

6.1 Water Protection

6.1.1 *Aquifer* - A preferred sanitary landfill site would not be located over an aquifer that does, or could, provide a drinking water supply regardless of depth to aquifer.

The Alutom Formation is poorly permeable but is saturated with groundwater, some of which discharges into the Pulantat basin. No wells with a record have been drilled within the boundaries of the site. The four wells in Pulantat were drilled and tested in 1991. Data from these wells suggest groundwater conditions in the site. The wells were drilled at elevations from 215 to 245 feet, approximately 100 feet lower than the general elevation of the proposed landfill site. Depth to water ranged from 15 to 26 feet, and the lithologic logs show a weathered zone depth of 10 to 40 feet. Each well was pumped for one day and successfully extracted water from the volcanics. The most productive well yielded 67 gpm with 32 feet drawdown in the well. Specific capacities ranged from 1.8 gpm/ft to 5.6 gpm/ft. For a Guam volcanic aquifer, these yields are excellent. Should the same groundwater conditions prevail in the project site, the successful development of a moderate water supply is possible.

A groundwater recovery test was performed in a test pit in the surficial water table encounter below the landfill site. The permeability measured was 8×10^{-5} cm/sec (2×10^{-4} ft/min), relatively low permeability. Based on the permeability of the surficial materials the surficial groundwater system would not be expected to be suitable as a groundwater supply source.

6.1.2 *Floodplains* - A preferred sanitary landfill site would not be located in a designated floodplain.

None of the potential sites are located in a flood plain as identified by the Flood Insurance Rate Maps prepared by the Federal Emergency Management Agency.

6.1.3 *Groundwater* - A preferred sanitary landfill site would be located in an area where the groundwater is deep below the ground surface regardless of groundwater quality.

A total of 10 test pits and 1 deep boring were performed at the Sabanan Batea site. The test pits were excavated to a depth of 15 feet or greater except for test pits 5 and 10 where the high groundwater levels limited excavation to approximately 7 feet. The boring was excavated to depths of approximately 65 feet. Water levels were measured in all test pits when encountered. A piezometer was installed in the boring. The water table depths and elevations are provided in Table 7 below. Measurements to the water table were made by steel tape from a stable site on the ground surface. Test pits were completed using a trackhoe with a 3' wide bucket. The pits were excavated to the deepest possible depth (15-20' BLS at most locations), and samples for geotechnical analysis were taken from each stratum or soil horizon. The dimensions of each pit were recorded, as well as a field description of the various strata. The units were classified in accordance with the USCS (Unified Soil Classification System). Groundwater levels were also recorded in each pit, to an approximate 1/10 of a foot. Soil borings were completed using a truck-mounted rig with an 8" hollow stem auger. Geotechnical samples were taken, beginning at 3' BLS via split spoon (Dames & Moore sampler) at 5' intervals until the depth of 33' BLS was attained. Samples deeper than 33' BLS were taken every 10'. The borings were terminated at no less than 60' BLS, with some reaching 70' BLS. In some cases, water-cooled rock coring had to be

TG ENGINEERS, PC LETTER TO GEPA 12/14/2008

TG ENGINEERS, PC

December 24, 2008

Ms. Lorilee T. Crisostomo
Administrator
Guam Environmental Protection Agency
15-601 Mariner Avenue
PO Box 22439
Barrigada, Guam 96931

**RE: GUAM EPA SOLID WASTE LANDFILL PERMIT APPLICATION, LAYON,
INARAJAN**

Hafa ádai Administrator Crisostomo,

Attached please find the updated **Solid Waste Management Facility Landfill Permit Application** for the Layon, Inarajan site. We are resubmitting the application with the updated design submittal and with response to the comments regarding the original application submittal in 2006.

The letter received from Guam EPA dated April 21, 2006 noted the application was not complete due to the following deficiencies and the agency was unable to complete the application review. We hereby list the deficiencies and our response.

1. Part III, Part A, Section 1 – General Information, Item No. 4e – Zoning

DPW must submit the certification of compliance with zoning requirements from the Department of Land Management. In addition, submit a copy of the approved Zone Variance for Land Use Application form the Guam Land Use Commission (GLUC). [22 GAR 23104(b)(1)(B)]

RESPONSE: The Guam Land Use Commission (GLUC) approved the Zone Change of Lot B-3REM-2 from Agricultural "A" to Heavy Industrial "M2" in its meeting on December 11, 2008. The zone change is pending approval by the Legislature and Governor. The DLM certification of compliance and the GLUC Notice of Action will be submitted once received from the Government.

2. Part III, Part A, Section 1 – General Information, Item No. 5a – Land Owner

DPW must submit documentation to verify authorization of use of Lot B-3REM-2, Dandan Road, Malojloj. Also include a Title Report or similar document that verifies the ownership of the aforementioned lot. [22 GAR 23104(2)(2)]

RESPONSE: The Government of Guam is the land owner and this is confirmed in an opinion from the Office of the Attorney General, dated June 19, 2008, refer to the copy attached.

3. Part III, Part A, Section 1 – General Information, Item No. 7 – Applicant's Signature

DPW must have the application signed by the applicant of the facility. [22 GAR 23104(b)(3)]

RESPONSE: The application is signed for the applicant by Mr. David L. Manning, a representative of the court appointed receiver, Gershman, Brickner & Bratton, Inc.

4. Part III, Part A, Section 1 – General Information, Item No. 8 – Land Owner's Signature

DPW must have the application signed by the land owner of the facility. [22 GAR 23104(b)(3)]

RESPONSE: The application is signed for the land owner by Mr. David L. Manning, a representative of the court appointed receiver, Gershman, Brickner & Bratton, Inc.

5. Part III, Part A, Section 1 – General Information, Item No. 9 – Operator's Signature

DPW must have the application signed by the applicant, land owner and operator of the facility. [22 GAR 23104(b)(3)]

RESPONSE: The operator selection is pending.

We trust you will find this resubmittal is responsive to the comments received and complete for processing the application of the SWMF Landfill Permit Application. Please contact me at 647-0808 with any comments or questions.

Si Yu'os Ma'ase,
TG Engineers, PC



Tor Gudmundsen, PE
President

Attachments:

Office of the Attorney General of Guam – Legal Memorandum
Subject: Ownership of Land in Condemnation Proceeding
Dated June 19, 2008
(Pages 1-4)

Cc:

Mr. David L. Manning
Mr. Christopher Lund

Alicia G. Limtiaco
Attorney General



Alberto E. Tolentino
Chief Deputy Attorney General

Office of the Attorney General

June 19, 2008

LEGAL MEMORANDUM

Ref: DPW 08-0555

TO: Receiver, U.S.A. v. Government of Guam, District Court of Guam, Civil Case No. 02-00022

FROM: Attorney General *K.*

SUBJECT: Ownership of Land in Condemnation Proceeding

You have asked whether Gershman, Brickner & Bratton, Inc. as the Receiver appointed by the U.S. District Court of Guam judge in *U.S.A. v. Government of Guam, Civil Case No. 02-00022* may apply to the government of Guam for a zone change and solid waste permit as the "owner" of the Layon land being condemned for the government's new landfill site.

The application procedure for zone changes and solid waste permits require that the "owner" of the land, which is the subject of an application, sign off on the application. The land for which the zone change and solid waste permit is sought is currently the subject of a condemnation proceeding filed in the Superior Court of Guam in *Government of Guam v. 1,348,474 Square Meters, More or Less, Civil Case No. CV 0084-08*. On January 24, 2008, the government filed a Declaration of Taking to use the land as a new solid waste sanitary landfill, and deposited \$1,200,000 into the registry of the court as the estimated compensation for the land taking.

The two sections of Guam law on eminent domain relative to this discussion provide in pertinent part as follows:

§15107. Eminent Domain: Land, Easements, or Rights of Way for Public Use; Taking of Possession and Title; Authority; Procedure.

Upon the filing of said declaration of taking and of the deposit in the court to the use of the persons entitled thereto, of the amount of the estimated

LEGAL MEMORANDUM (08-0555)

To: Receiver

Subject: Title to Land in Condemnation Proceeding

June 19, 2008

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compensation stated in said declaration, title to the said lands in fee simple absolute, or such estate or interest therein as is specified in said declaration, shall vest in the government of Guam, and said lands shall be deemed to be condemned and taken for the use of the government of Guam, and the right to just compensation for the same shall vest in the persons entitled thereto; and said compensation shall be ascertained and awarded in said proceeding and established by judgment therein, . . .

21 G.C.A. §15107. [Emphasis added.]

§15110. Same: Taking in Advance of Final Judgment; Right as Additional to Existing Rights, Powers, and Authority.

The right to take possession and title in advance of final judgment in condemnation proceedings as provided in this Title shall be in addition to any right, power, or authority conferred by the laws of the government of Guam and shall not be construed as abrogating, limiting, or modifying any such right, power, or authority. [Emphasis added.]

21 G.C.A. §15110. [Emphasis added.] See, also, 21 G.C.A. §15108.¹

The sections quoted above make it clear that upon the happening of two things, title passes to the government of Guam, and that this passage of title takes place in advance of the final judgment. First, the government must file a declaration of taking that contains all the information required by the eminent domain law. Second, the government must file with the court a deposit in the amount of compensation estimated to cover the taking as specified in the declaration.

Section 15107 of Guam's eminent domain law is very similar to that of several other states² and that of the Federal government in that they all pass title immediately upon the payment of compensation, usually to the court. Compare the Federal law which

¹ Section 15108 provides "No appeal in any cause under this Chapter nor any bond or undertaking given therein shall operate to prevent or delay the vesting of title to such lands in the government of Guam."

² Some states that currently have, or used to have, a law almost identical to Guam's 21 G.C.A. §15107 vesting title upon filing of the declaration of taking and depositing an estimated compensation amount into court are California, Michigan, Pennsylvania, South Dakota, and Alaska. See, e.g., *Weston Investment Co. v. State*, 189 P.2d 262 (Cal. 1948); *Goodwill Community Chapel v. General Motors Corp.*, 503 N.W.2d 705 (Mich. App. 1993); *Urban Redevelopment Authority of Pittsburgh v. Hackaday*, 501 A.2d 349 (Pa. 1985); *South Dakota Department of Transportation v. Freeman*, 378 N.W.2d 241 (S.D. 1985); *State v. 18,018 Square Feet, More or Less*, 621 P.2d 887 (Ala. 1980). For the District of Columbia, see *District of Columbia Redevelopment Land Agency v. Dowdley*, 618 A.2d 153 (1992).

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provides in pertinent part:

(b) Vesting of Title. -- On filing the declaration of taking and depositing in the court, to the use of the persons entitled to the compensation, the amount of the estimated compensation stated in the declaration --

- (1) title to the estate or interest specified in the declaration vests in the Government;
- (2) the land is condemned and taken for the use of the Government; and
- (3) the right to just compensation for the land vests in the persons entitled to the compensation.

40 U.S.C. §3114(b).

On Guam, the title that vests is "fee simple absolute." *Black's Law Dictionary*, 5th ed., defines "absolute title" and "fee simple absolute," respectively, as:

... an exclusive title, or at least a title which excludes all others not compatible with it. An absolute title to land cannot exist at the same time in different persons or in different governments.

... an estate limited absolutely to a man and his heirs and assigns forever without limitation or condition. An absolute or fee-simple estate is one in which the owner is entitled to the entire property, with unconditional power of disposition during his life, and descending to his heirs and legal representatives upon his death intestate. Such estate is unlimited as to duration, disposition, and descendibility. *Slayden v. Hardin*, 79 S.W.2d 11,12 (Ky. xxxx).

Also, "to vest" means "to give an immediate, fixed right of present or future enjoyment" or "to deliver full possession of land or of an estate." *Black's Law Dictionary*, 5th ed.

When the ordinary meaning of the terms "to vest" and "fee simple absolute title" is applied to 21 G.C.A. §15107, one would have to conclude that the government of Guam acquired title immediately on January 24, 2008 when it filed in the Superior Court of Guam its Declaration of Taking and deposited \$1,200,000 as estimated compensation.

In fact, §15107 also provides that once the declaration and deposit are filed, the parties in interest may at any time file an application to have the deposit paid over to them. The right of private land owners to receive compensation is an important element in determining whether a taking has actually occurred, and when compensation is payable, a taking is deemed to have taken place. See *LaFontaine's Heirs at Law and Next of Kin*

LEGAL MEMORANDUM (08-0555)

To: Receiver

Subject: Title to Land in Condemnation Proceeding
June 19, 2008

Page 4

v. LaFontaine's Heirs at Law and Next of Kin, 107 A.2d 653 (Md. 1954). Since §15107 makes the compensation money available to the parties in interest immediately upon the government's filing of the declaration and deposit, then the last step necessary to complete the taking must have taken place when the declaration was filed and deposit made to the court.

Thus, Guam's eminent domain law makes it abundantly clear that the private landowners title is divested to the government immediately upon the filing of the declaration of taking and deposit of estimated compensation into court. In the case of *Government of Guam v. 1,348,474 Square Meters, More or Less*, Civil Case No. CV 0084-08, that took place on January 24, 2008.

Therefore, the government of Guam is now the owner of the property in the condemnation case, and the government of Guam may represent itself as the owner on the zone change and solid waste permit applications, or for any other purpose. The Department of Land Management has general jurisdiction over all government land not in the inventory of Chamorro Homelands, and the Department of Public Works (DPW) has control and administrative authority over the Layon landfill land.

When preparing the applications, the Receiver must indicate that the government of Guam is the title holder and owner of the property. However, since the Receiver has assumed all the powers and duties of the Solid Waste Division of DPW, and of DPW itself insofar as DPW affects the government's compliance with the Consent Decree, the Receiver may sign the application on behalf of DPW.



DEBORAH RIVERA
Assistant Attorney General

GEPA SOLID WASTE MANAGEMENT FACILITY PERMIT APPLICATION

TG ENGINEERS, PC

December 23, 2008

MUNICIPAL SOLID WASTE LANDFILL FACILITY LAYON, DAN DAN, INARAJAN PERMIT APPLICATION

The project Pre-Final (100%) Submittal documents include the following Drawing Sets and Document Books, plus other relevant documents that have been previously submitted.

Drawing Set No. 1 – Operations Road and Mass Grading of Cells #1 and #2

Drawing Set No. 2 – Entrance Area Facilities and Cells #1 and #2

Book 1A

- Technical Specifications, Divisions 1 – 7

Book 1B

- Technical Specifications, Divisions 8 – 16

Book 2

- Design Narrative
- Appendix A – Drawings
- Appendix B – Surface Water Drainage System Calculations
- Appendix C – Landfill Gas Master Plan
- Appendix D – Entrance Area Civil Engineering Calculations
- Appendix E1 – Structural Calculations
- Appendix E2 – Mechanical Calculations
- Appendix E3 – Electrical Calculations
- Appendix F – Earthwork and Airspace Calculations
- Appendix G – Leachate Collection and Removal System Design
- Appendix H – Subdrain Design
- Appendix I – Construction Schedule

Book 3

- Supplementary Geotechnical Laboratory Test Results
- Site-Specific Groundwater Monitoring Plan

Book 4

- Operations Plan
- Closure and Post-Closure Plan

Book 5

- Guam EPA Solid Waste Management Facility Permit Application, for Landfill

Documents previously submitted that are referenced herein include the following.

- Final Integrated Hydrogeologic Assessment, submitted November 28, 2008 to Guam EPA
- Geotechnical Report, submitted November 5, 2008 to Guam EPA as Book 3 of the Building Permit Application for the Operations Road and Mass Grading of Cells #1 and #2

Reference to documents included herein will be to Drawing Set / Drawing No. and Book No. / Section No.

I. SITE DEVELOPMENT PLANS

In addition to the complete Entrance Area and Landfill drawings in Drawing Set No. 2, we have prepared the following drawings that are attached in Appendix 1.0.

A. Site Maps

C1.0 Existing Site – Topographic Survey

C1.1 Proposed Site – Final Topographic Survey

C2.0 Landfill Site – The drawing includes the Landfill Site Property Boundary, Limits of Disposal Operations (Cells 1 – 11), and the area with the Entrance Area Buildings and Facilities targeted for Drawing No. C2.1.

C2.1 Entrance Area Site – The drawing shows the Buildings and Facilities at the Entrance Area. The drawing identifies the three buildings at the site as follows.

- Administration Building
- Maintenance Building
- Generator & Pump Building

Sanitary facilities for employees are provided in both the Administration and the Maintenance Buildings. Equipment maintenance work will be conducted in the Maintenance Building.

C3.0 Contiguous Property Map – The drawing shows the landfill parcel and surrounding parcels. The map includes radius lines with distances in north, south, east and west directions to demonstrate the remote location of

the site. Also to show there are few contiguous properties abutting the landfill parcel.

C4.0 ¼ Mile Radius Map – The drawing shows the landfill site with the natural features and facilities within a ¼-mile radius of the site. All lots within ¼ mile radius are zoned "A", Agricultural. Due to the remote location of the site the surrounding area is generally occupied by small farming plots and natural features such as rivers and wetlands. The radius limits extend into the Tracking Station property, but not to the facilities within the property. There are no existing utilities or wells within 500 feet of the landfill parcel.

A Zone Change Application was filed with the Guam Land Use Commission (GLUC). During the December 11, 2008 GLUC meeting the Zone Change Application was approved with the property being rezoned from "A", Agricultural to "M-2", Heavy Industrial. A municipal solid waste landfill facility is a permitted use in an M-2 zone. The GLUC Notice of Action will be forwarded once it is issued, along with the certification of compliance with zoning requirements.

B. Alternate Boundary

Not Applicable.

C. Site Investigations

1. Geotechnical Investigation

A Geotechnical Investigation was completed at the site with test pits and soil borings during the period of May – July 2005. Soil laboratory testing was completed using on-site soils. The Geotechnical Report was submitted November 5, 2008 to Guam EPA as Book 3 of the Building Permit Application for the Operations Road and Mass Grading of Cells #1 and #2. The report includes discussion about on-site soils, the use of on-site soils and general requirements for the liner, cover, drainage material and cap. We note that on-site soils are not satisfactory for drainage material and that imported aggregate and geocomposite materials will be used as appropriate. These items are discussed further in the Design Narrative, Book No. 2.

A supplementary hydrogeologic field exploration program was conducted from April to August 2007 for the revised locations of Cells #1 and #2.

- a. The site is generally underlain by a weathered soil of volcanic origin, consisting of a reddish brown to mottled reddish purple to yellow orange green brown black clayey silt (MH and ML). The boring logs and report discussion present the soil unit information. Refer to

- Geotechnical Report, Section 4 SITE CONDITIONS and the appropriate appendix sections.
 - b. The Geotechnical Report includes discussion of the on-site soil testing and the proposed amendment for use as part of the liner system material. Refer to Geotechnical Report, Section 3 GEOTECHNICAL LABORATORY TESTING.
 - c. The estimate of available volume of materials available for re-use at the site is discussed in the Design Narrative, Book 2, Section 4 LANDFILL MASTERPLAN.
2. Hydrogeologic Investigation
- a. The Site-Specific Groundwater Monitoring Plan, Book 3, Section 3 and the Final Integrated Hydrogeologic Assessment include the updated information on water table and groundwater data.
 - b. The Final Integrated Hydrogeologic Assessment includes the updated information on field test procedures and data.
 - c. The Site-Specific Groundwater Monitoring Plan, Book 3, Section 3 includes the regional geology, site geology and hydrogeology.
 - d. A Geologic Map of the site is included with the Geotechnical Report, Section 4 SITE CONDITIONS.

D. Zoning

A Zone Change Application was filed with the Guam Land Use Commission (GLUC). During the December 11, 2008 GLUC meeting the Zone Change Application was approved with the property being rezoned from "A", Agricultural to "M-2", Heavy Industrial. A municipal solid waste landfill facility is a permitted use in an M-2 zone. The GLUC Notice of Action will be forwarded once it is issued, along with the certification of compliance with zoning requirements.

II. DESIGN PLANS

Please note that Drawing Set No. 2, listed above, includes the Entrance Area and Landfill facilities.

A. Title Sheet (refer to Drawing No. T1.0)

C. Planned Uses for Post-Closure Period

The Layon MSW Landfill site is planned to be maintained as open space during the post-closure period. The existing entrance area may be maintained as a business center for the site owner. Other activities related to the solid waste industry may also be conducted on the site, provided they are compatible with safe and effective management of all post-closure care operations at the closed landfill.

VI. FINANCIAL ASSURANCE

The regulations require the landfill operator to provide financial assurance for the cost of hiring a third party to close and provide post-closure care for the site at any time in its operational life.

The estimated total cost for closure of the entire landfill footprint, including a 20% contingency factor, is \$17,002,759. Further discussion of the Financial Assurance is included in the Closure and Post-Closure Plan, Book 4, Section 7.

B. Existing Site Conditions

A Topographic Survey was completed of the existing project site. The existing site map is simplified in Appendix 1.0, Drawing No. C1.0 for reference. The C and L series drawings in Drawing Set No. 2 also include the topographic survey as appropriate in the background.

C. Base Grade Plans

The landfill Master Plan Liner Base Grades have been developed based on the project design in accordance with the regulations, (see Appendix 1.0, Drawing No. C5.0).

D. Engineering Modification Plan Sheets

Drawing Set No. 2 includes full engineering plans for the Entrance Area, Landfill and Access Road.

E. Final Site Topography Plan

The Final Site Topography Plan includes the landfill site when filled to capacity and ready for closure, (refer to Appendix 1.0, Drawing No. C1.1).

F. Phasing Plans

The site phasing will include construction of Cell Nos. 1 & 2 first with their planned opening in September 2010. Together with construction of Cell Nos. 1 & 2 - the access, operations, and part of the perimeter roads, along with the Entrance Area facilities will be constructed. Refer to the Design Narrative, Book 2, Section 4.3 STAGED DEVELOPMENT PLAN, Table 1 for the Staged Development Plan Summary and the L1 drawing series, Drawing Set No. 2, for the plan sheets with the site development progression.

G. Site Monitoring Plan

The landfill site will include groundwater, surface water and gas monitoring facilities. Refer to the Design Narrative, Book 2, Section 7.11 MONITORING FACILITIES and the Operations Plan, Book 4, Section 3.9.

H. Site Cross-Sections

Cross sections are provided to show details of the landfill site construction, (refer to the L drawing series in Drawing Set No. 2).

I. Details

Details are provided to show sufficient information for project construction, (refer to the L and C drawing series in Drawing Set No. 2).

J. Plan Sheets

Plan Sheets are provided to show the Entrance Area and Landfill Facilities with the final layout and interfacing of facilities. Refer to Drawing Set No. 2.

III. SITE OPERATING PLANS

A. Operations Plan

The Operations Plan is included in Book 4. The index of sections is listed as follows.

- Introduction
- General Site Description
- Site Development Plan
- Personnel and Equipment
- Operational Procedures
- Maintenance and Control
- Emergency Procedures
- Record Keeping
- Reporting

1. The population, wastes, and waste handling information are discussed in Sections 2 and 5 of the Operations Plan, Book 4.
2. The specific wastes to be excluded from the landfill are included in Section 5.4 of the Operations Plan, Book 4.
3. Detailed instructions for all aspects of the site operation are included in the Operations Plan, Book 4 and Construction Documents for the site. The Construction Documents include full construction of Cell Nos. 1 & 2 to place them into operation. Site closing information is presented in the Closure and Post-Closure Plan, Book 4.
 - a. Initial site preparation and site construction is included in the Construction Document set, Drawing Set Nos. 1 & 2, and Books 1A and 1B with the Technical Specifications.
 - b. The initial site preparation quality control and quality assurance is discussed in Division 1 of the Technical Specifications, Book 1A.

- c. Daily Operations are discussed in Section 5 OPERATIONAL PROCEDURES of the Operations Plan, Book 4.
- d. Development of subsequent Phases is discussed in the Design Narrative, Book 2, Section 4 LANDFILL MASTER PLAN.
- e. Site closing information is discussed in the Closure and Post-Closure Plan, Book 4.
- f. Inspection requirements are discussed in the Operations Plan, Book 4 specifically in Section 8 RECORD KEEPING.
- g. The Closure and Post-Closure Plan is included in Book 4.
- h. Safety is discussed in the Operations Plan, Book 4 Section 6 MAINTENANCE AND CONTROL and Section 7 EMERGENCY PROCEDURES.
- i. Prevention of unauthorized waste disposal is discussed in the Operations Plan, Book 4, Section 5 OPERATIONAL PROCEDURES.
- j. Landscaping is covered in the Technical Specifications, Book 1A, Section 02924.
- k. The Emergency Contingency Plan is discussed in the Operations Plan, Book 4, Section 7 EMERGENCY PROCEDURES.

B. Cover Material

On-site excavated soils will be stockpiled and used for daily cover material. Proposed stockpile plans are indicated on drawings C3.11 and C3.12, Drawing Set No. 1, and discussion of the Staged Development Plans are included in Book 2, Section 4 of the Design Narrative and Book 3, Section 3 of the Operations Plan.

Discussion of Daily, Interim and Final cover plans is included in the Operations Plan, Book 4, Section 5 OPERATIONAL PROCEDURES.

C. Disease Vector Control

Site personnel will be trained to observe and identify the first signs of vectors, including rodents, insects and birds. The daily cover operations for MSW disposal areas normally prevent vectors from actively using the site. Further discussion of vector control is included in the Operations Plan, Book 4, Section 6 MAINTENANCE AND CONTROL.

D. Explosive Gases Control

Methane gas is produced by the anaerobic decomposition of organic components of solid waste. The Layon MSW Landfill will implement a Gas Monitoring Plan to ensure that methane gas does not cause safety or environmental problems. Further discussion of explosive gas control is included in the Operations Plan, Book 4, Section 6 MAINTENANCE AND CONTROL.

E. Water Quality

Water Quality, field work, sampling and testing, and monitoring is discussed in the following plans.

- Supplementary Geotechnical Laboratory Test Results, Book 3
- Final Integrated Hydrogeologic Assessment
- Site-Specific Groundwater Monitoring Plan, Book 3

F. Run-on / Run-off Control Systems

Stormwater is managed by controlled grading on the surface of the landfill and by maintaining an engineered system of drainage ditches, channels, pipes and infiltration ditches. Further discussion of the stormwater control systems is included in Book 2, Design Narrative, Section 6 SURFACE WATER MANAGEMENT. There will also be an annual update of the Surface Water Management Plan, as required by the Operations Plan, Book 4, Section 6.10 STORMWATER.

G. Recordkeeping

The Layon MSW Landfill will maintain an operating record in a designated area of the landfill office, including an extensive list of categories of records and documents. Further discussion of the recordkeeping is included in the Operations Plan, Book 4, Section 8 RECORD KEEPING.

H. Aesthetics

A litter control program is included in the Operations Plan, Book 4, Section 6 MAINTENANCE AND CONTROL. In addition to litter control, the Entrance Area will be constructed with basic landscaping and the landfill site Final Cover planted with local vegetation.

I. Air Quality

The Layon MSW Landfill will operate in full compliance with Guam and federal requirements for air pollution control. Activities conducted in relation

to air programs include:

- Asbestos waste management
- Prohibition of open burning and implementation of programs to detect, prevent and suppress fires in solid waste loads
- Monitoring for emissions of landfill gas
- Control of dust and odors

Further discussion of the air quality is included in the Operations Plan, Book 4, Section 6.

IV. CLOSURE PLANS

A. Final Cover

The Layon MSW Landfill Final Cover is required to be designed and constructed in accordance with the regulations and prescriptive elements. An alternative to the prescriptive design may be approved if it can be shown to achieve infiltration and erosion control equivalent to the prescriptive design. The proposed final cover is an alternative design. Further discussion of the Final Cover is included in the Closure and Post-Closure Plan, Book 4, Section 5.

B. Largest Area Requiring a Final Cover

The permitted waste footprint is planned for closure in three stages as significant areas reach the permitted final grades. The three stages are described as follows.

Stage I closure will occur after Cells 1-5 have been developed and filled to interim final grades, and Cell 6 has been constructed and placed in service.

Stage II closure will occur after Cells 6-7 have been developed and filled to interim grades, and Cell 8 has been constructed and placed in service.

Stage III closure will occur after the remaining cells, Cells 8-11, have been filled to final grades.

Based on analysis, the largest area to require closure at any time would occur before Stage I closure is implemented (73.3-acres). Further discussion of the largest area requiring Final Cover is included in the Closure and Post-Closure Plan, Book 4, Section 5.

C. Maximum Waste Inventory

On a daily basis, the largest amount of waste not buried in the landfill is the maximum daily tonnage received at the site, which is projected to reach approximately 1,200 tons of municipal solid waste in the last years of site operation. Further discussion of the Maximum Waste Inventory is included in the Closure and Post-Closure Plan, Book 4, Section 5.

D. Completion Schedule

Closure of the Layon MSW Landfill will be implemented by the following sequence of activities.

- Final design and construction procurement
- Closure cap construction
- Removal of structures
- Closure documentation

Further discussion of the Completion Schedule is included in the Closure and Post-Closure Plan, Book 4, Section 5.

V. POST-CLOSURE PLANS

A. Monitoring and Maintenance Activities

Specific activities to be conducted during the post-closure period include the following.

- Maintenance of the final cover
- Operation and maintenance of leachate collection and removal systems
- Operation and maintenance of the landfill gas management system
- Groundwater monitoring
- Landfill gas monitoring

Further discussion of the Monitoring and Maintenance Activities is included in the Closure and Post-Closure Plan, Book 4, Section 6.

B. Contact Personnel / Information

The name, address and telephone number of the person responsible for the Layon MSW Landfill post-closure activities will be maintained in the site's operating records and updated in the Post-Closure Maintenance Plan whenever it changes after the post-closure plan begins.

APPENDIX 1.0

APPENDIX 1

APPLICATION FORM

**SOLID WASTE MANAGEMENT FACILITY PERMIT APPLICATION
LANDFILL**

SECTION 1 - GENERAL INFORMATION

1. DATE:

Month	Day	Year
12	12	08

2. APPLICATION: New Renewal Modification

3a. NAME OF APPLICANT:

G	E	R	S	H	M	A	N	,	B	R	I	C	K	N	E	R	&	B	R	A	T	T	O	N	,			
I	N	C	.	-	R	E	C	E	I	V	E	R																

3b. MAILING ADDRESS:

5	4	2	.	N.	M	A	R	I	N	E	C	O	R	P	S	D	R	I	V	E									
T	A	M	U	N	I	N	G	G	U	A	M	9	6	9	1	3													

3c. TELEPHONE NUMBER:

6	7	1	-	6	4	6	-	3	2	1	5
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4a. NAME OF FACILITY:

L	A	Y	O	N	M	U	N	I	C	I	P	A	L	S	O	L	E	F	D	W	A	S	T	E					
L	A	N	D	F	I	L	L																						

4b. MAILING ADDRESS:

S	A	M	E																												

4c. LOCATION (Lot Number, Street, Village):

B	-	3	R	E	M	-	2	D	A	N	D	A	N	R	O	A	D	M	A	L	O	J	L	O	J
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

4d. OPERATION FACILITY LOCATION(Lot Number, Street, Village):

S	A	M	E																												

4e. ZONING: Residential Commercial Industrial Agricultural

4f. TELEPHONE NUMBER:

6	7	1	-	6	4	6	-	3	2	1	5
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5a. LAND OWNER:

GOVERNMENT OF GUAM

5b. MAILING ADDRESS:

5c. TELEPHONE NUMBER:

6	7	1	-	6	4	6	-	3	2	1	5
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6a. FACILITY OPERATOR

6b. MAILING ADDRESS:

6c. TELEPHONE NUMBER:

7. APPLICANT'S SIGNATURE:


David L. Manahan
PLEASE PRINT NAME

DATE: 12/12/08

Receiver Representative
TITLE

8. LANDOWNER'S SIGNATURE:

John G. Miller

DATE: 12/12/88

9. OPERATOR'S SIGNATURE:

PLEASE PRINT NAME

Daniel L. Flannery

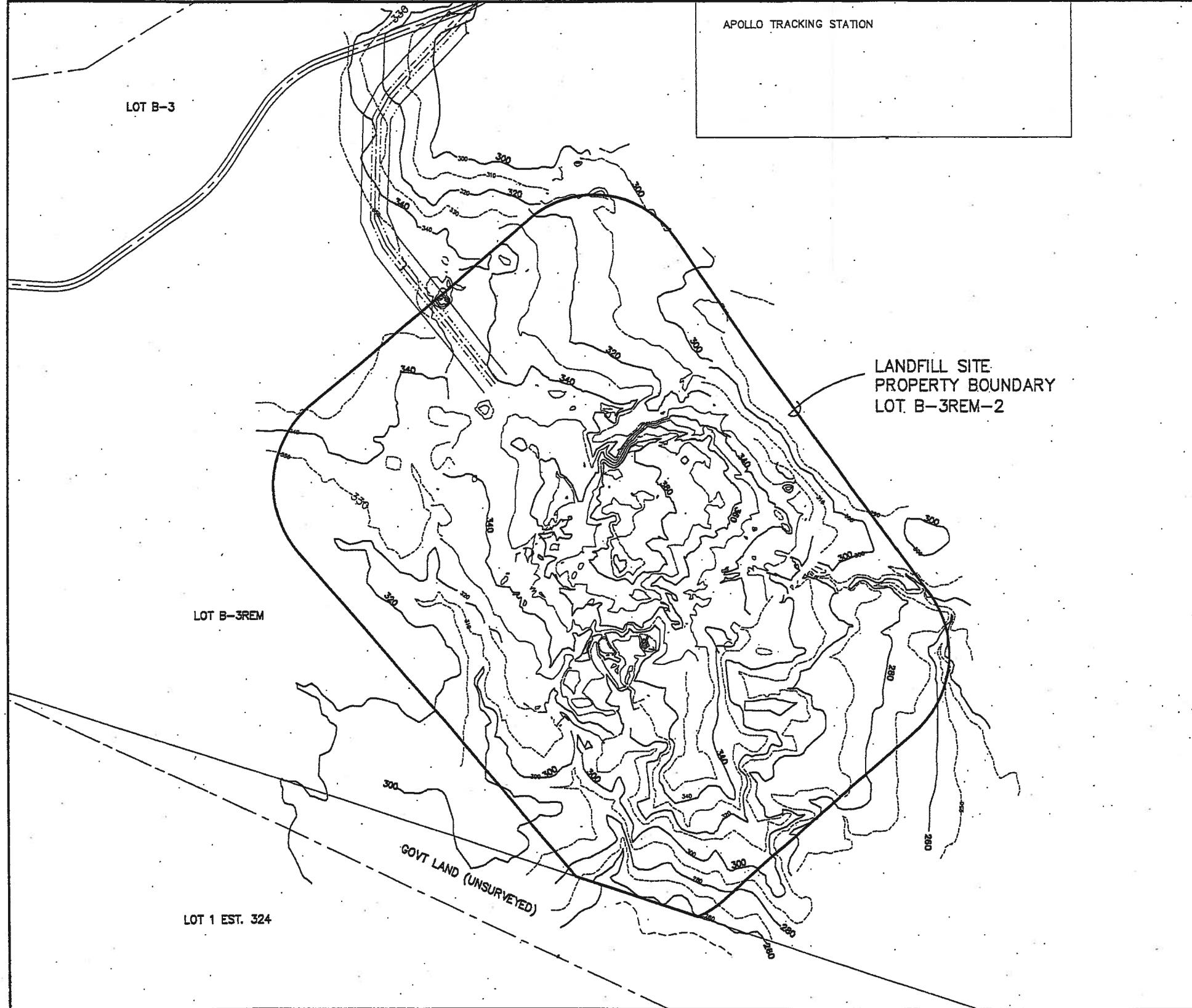
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DATE: 11/4/10 S

Receiver Representative
TITLE

NOTE: The information and plans required under Section 2 of the permit application must be attached for the application to be accepted. In addition, the applicable permit fee must accompany the application.

DRAWINGS



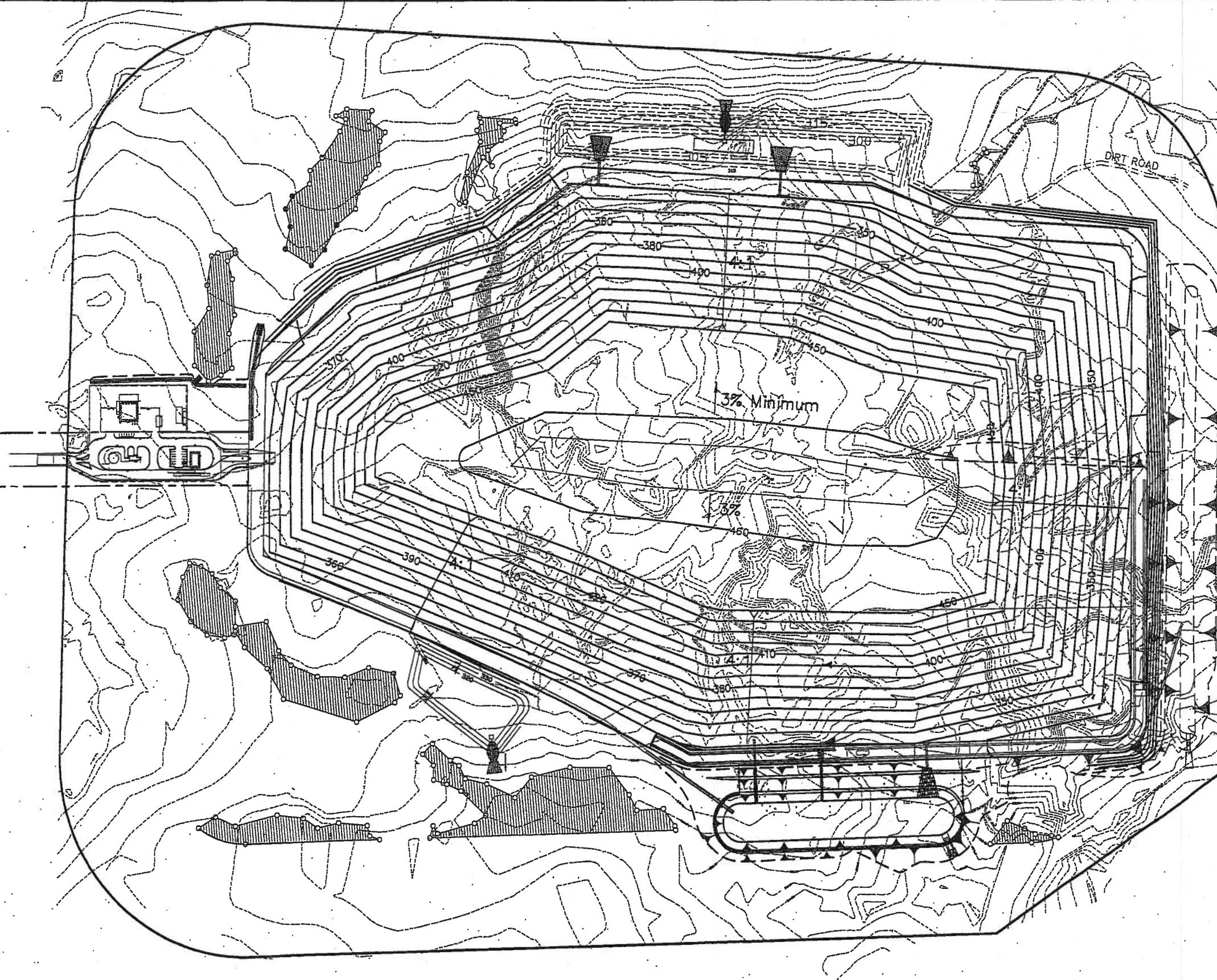
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TITLE	No.	BY	DATE	DESCRIPTION		



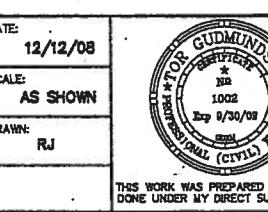
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TERRITORY
GUAM

PROJECT NAME
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GEPA MSW LANDFILL PERMIT APPLICATION
MASTER PLAN
FINAL GRADES
PROJECT NO. SWMD-09-02

DWG. NO. C1.1
SHEET OF -

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TITLE	No.	BY	DATE	DESCRIPTION

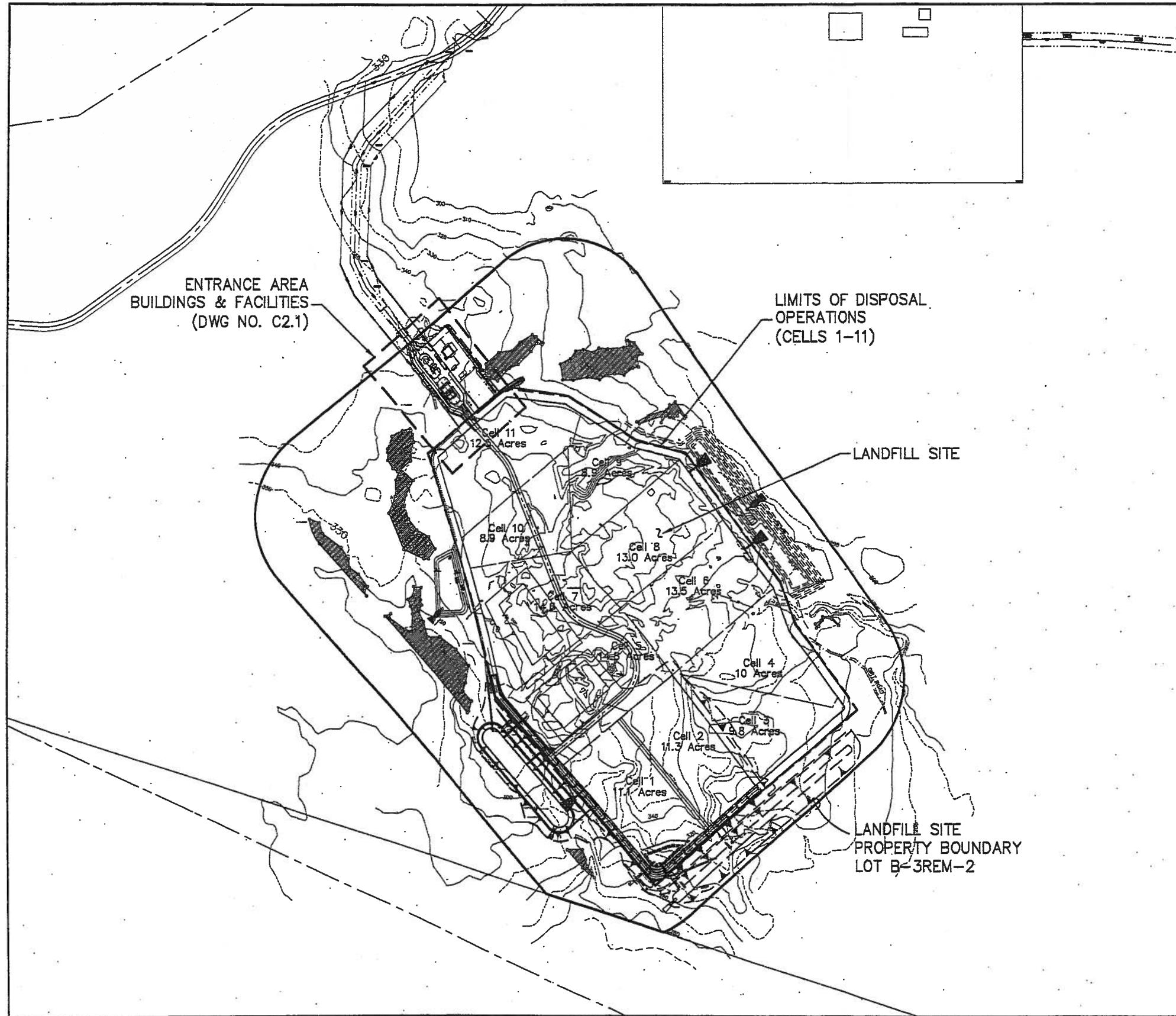


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DONE UNDER MY DIRECT SUPERVISION

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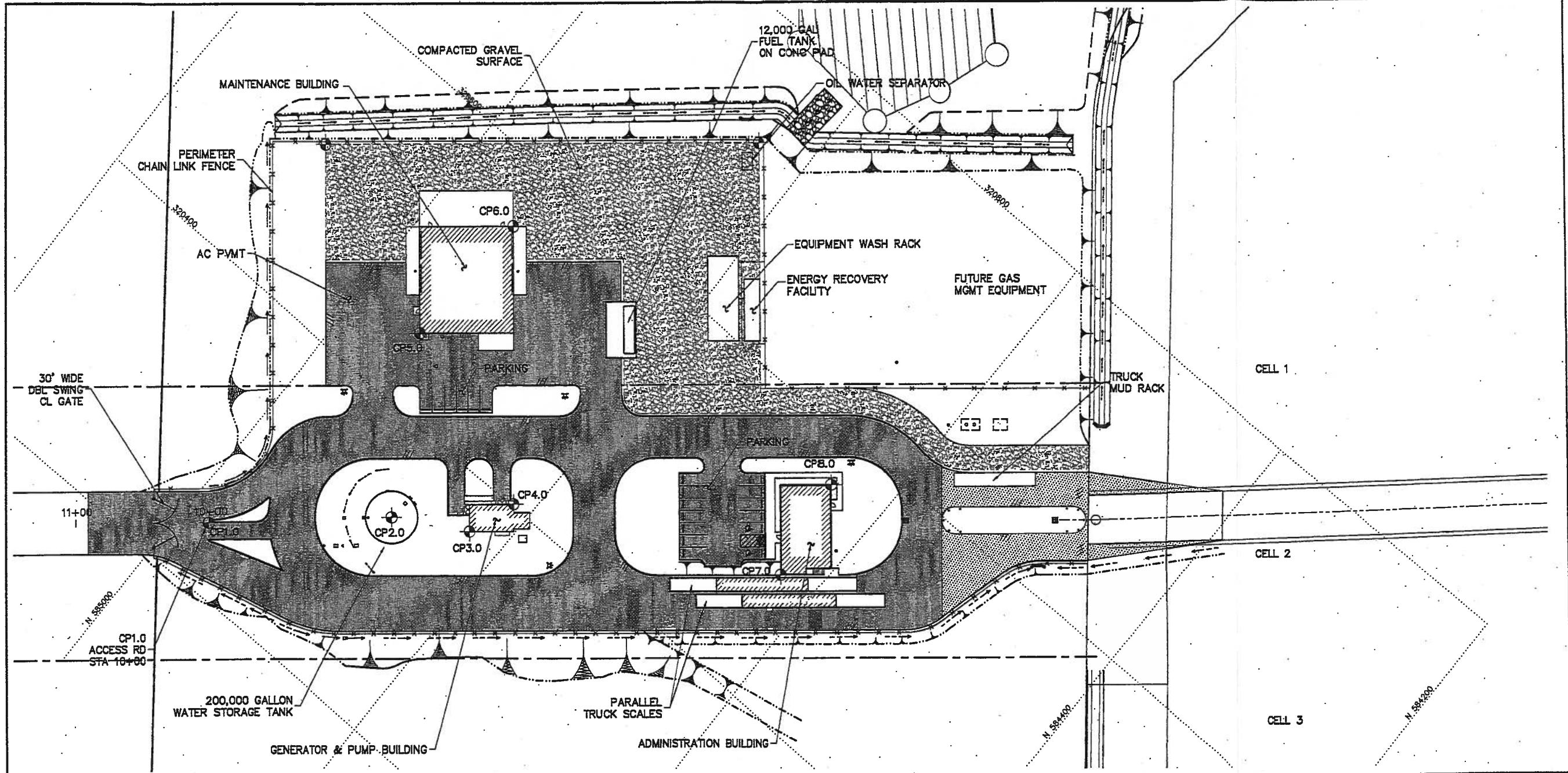
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**LAYON MUNICIPAL SANITARY LANDFILL
GFA MSW LANDFILL PERMIT APPLICATION**

PROJECT NO. SWMD-09-02

DWG. NO.
C2.0

OF
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NOTES:

1.0 REFER TO DRAWING SET NO. 1
FOR ACCESS ROAD.



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1 SITE GEOMETRY PLA

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CP2.0	584877.50	320336.
CP3.0	584947.57	320452.
CP4.0	584942.37	320554.
CP5.0	584627.38	320490.

CONTROL POINT DATA		
MARK	NORTHING	EASTHNG
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CP7.0	584826.44	320365.35
CP8.0	584814.34	320401.69
CP9.0	585066.48	320508.56
CP10.0	584838.28	320717.71



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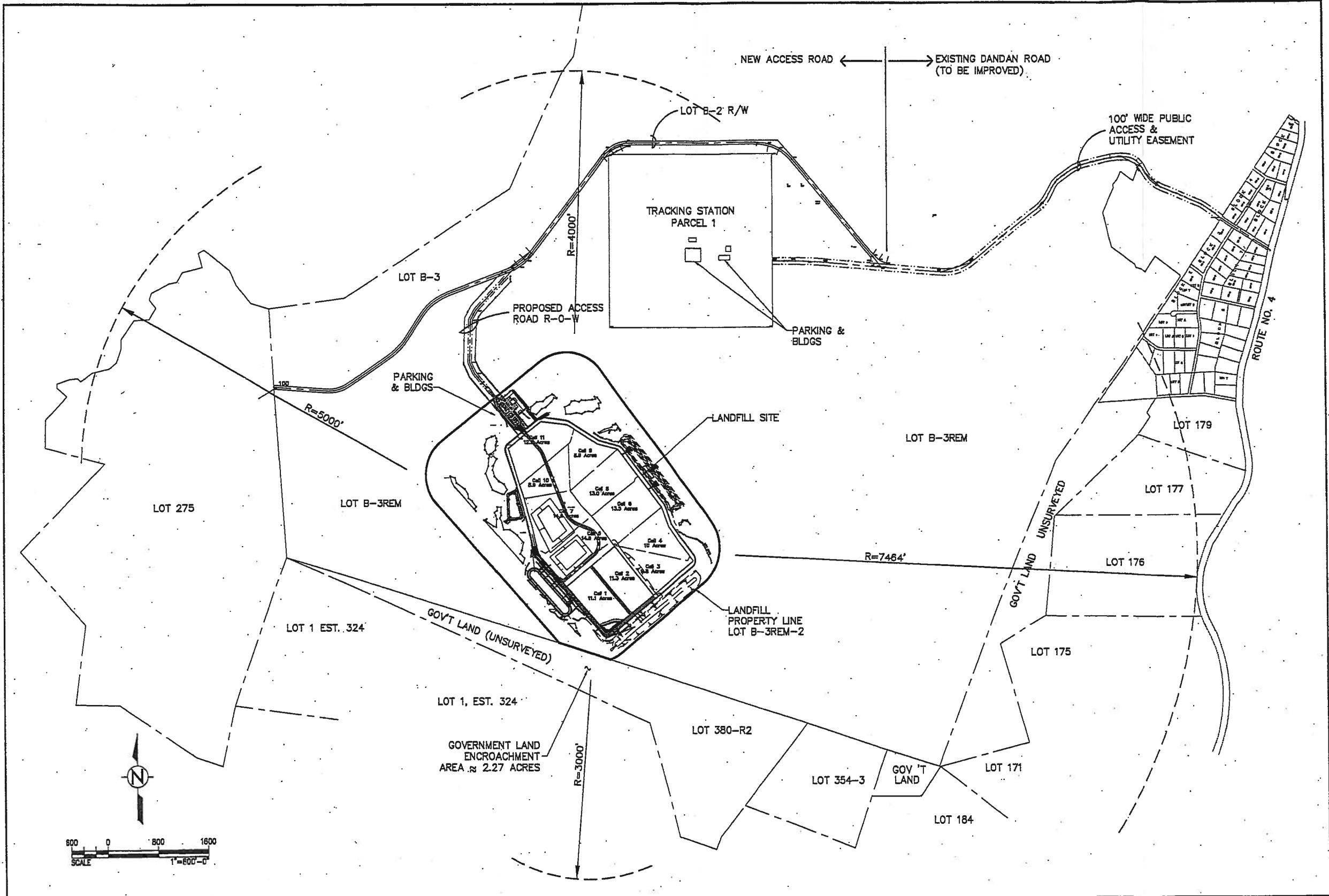
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LAYON MUNICIPAL SANITARY LANDFILL
GPA MSW LANDFILL PERMIT APPLICATION

ENTRANCE AREA SITE

DWG. NO.
C2.1



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DONE UNDER MY DIRECT SUPERVISION

STOKE GUDMUNDSEN
REGISTRATION NO.
1002
Exp. 9/30/09
CIVIL ENGINEER
SOUTHERN POLYNESIAN

PROJECT NAME	DWG. NO.	HEET
LAYON MUNICIPAL SANITARY LANDFILL GEPA MSW LANDFILL PERMIT APPLICATION	C3.0	- OF -
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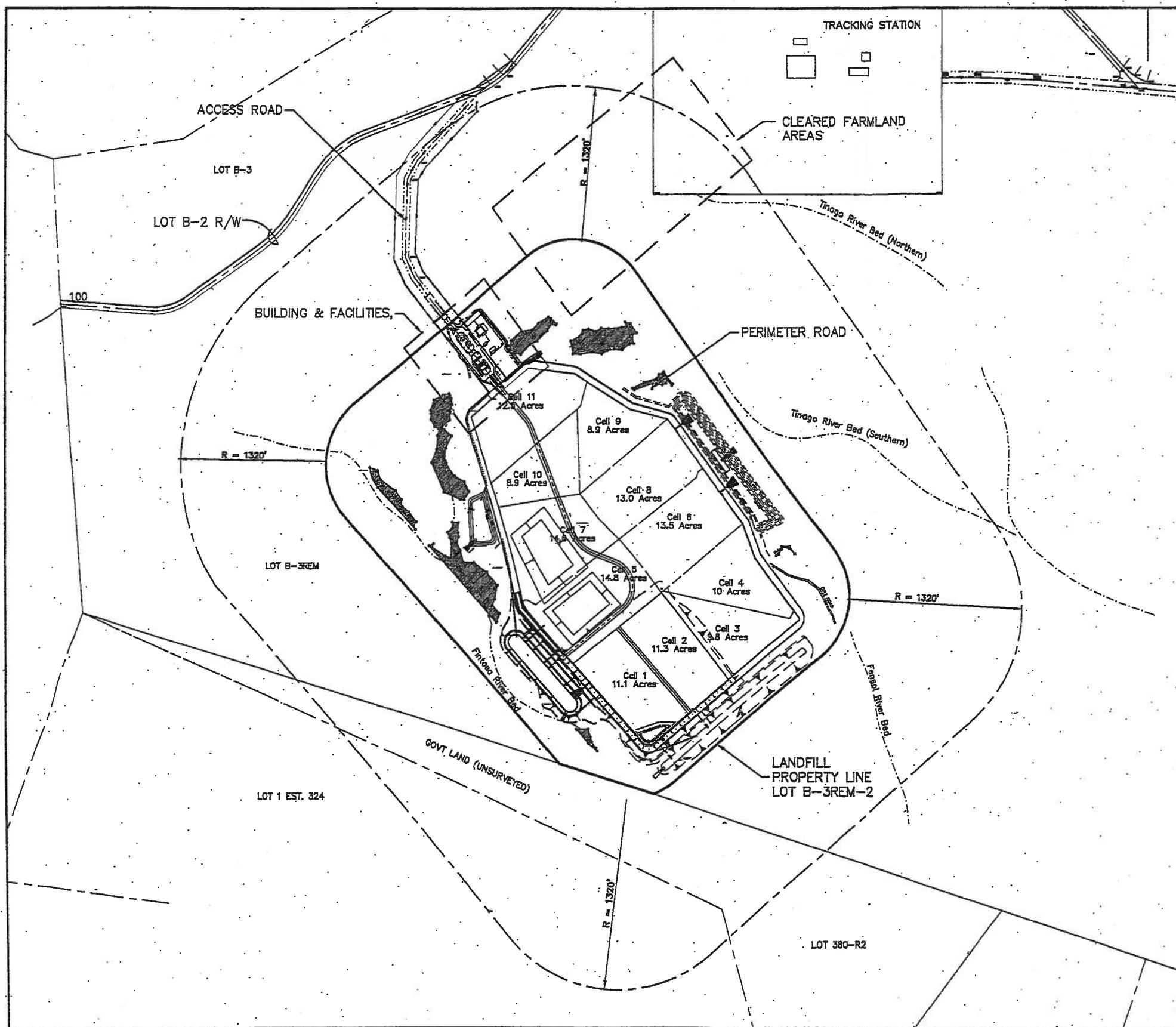
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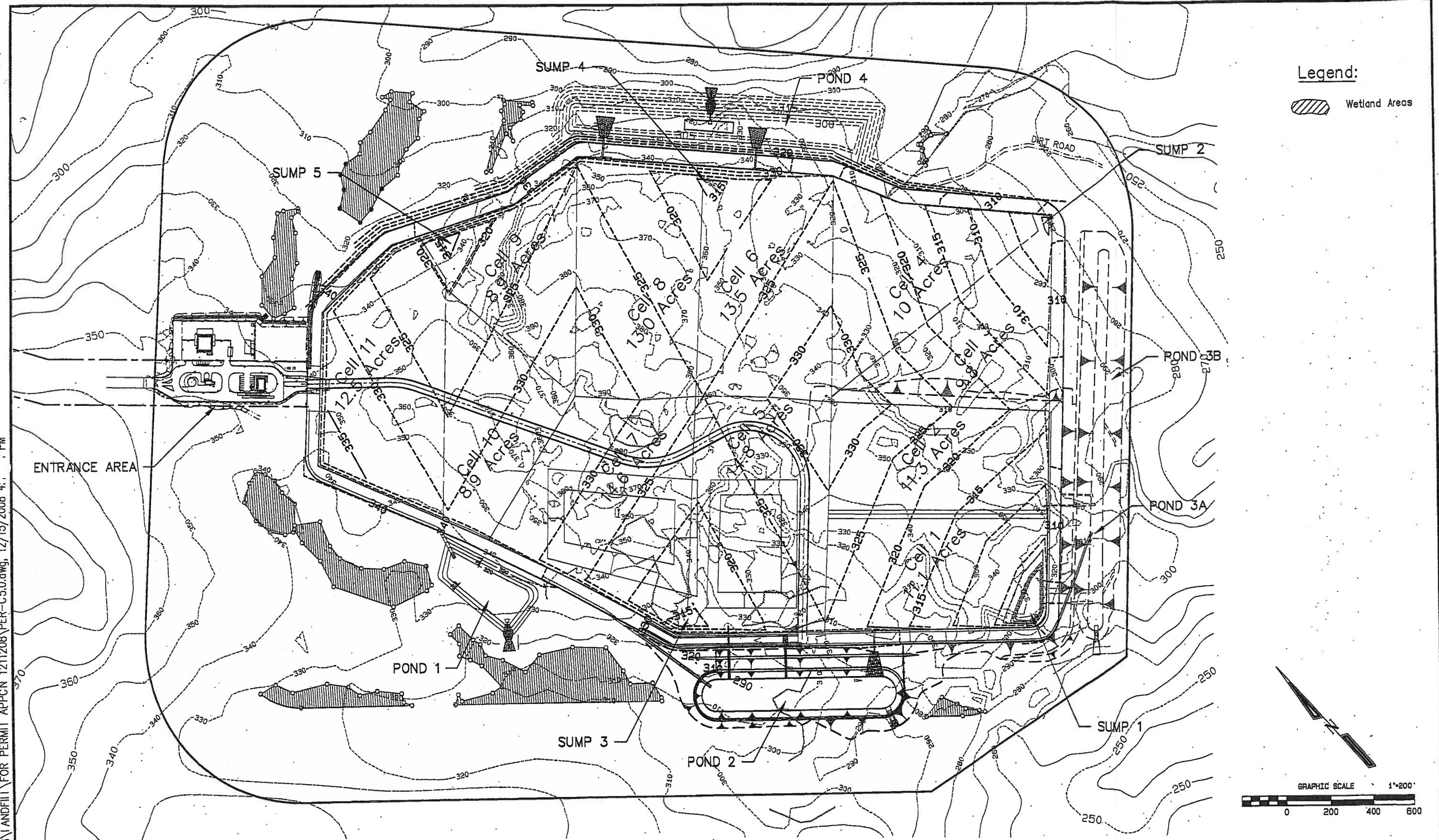
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PROJECT NO. SWMD-09-02	CAD FILE:	



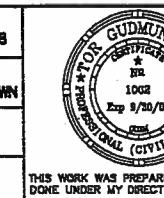
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REFERENCES		REVISION		
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GUAM

DESIGN: AM	DATE: 12/12/08
CHECKED: TG	SCALE: AS SHOWN
RECOMMENDED: TG	DRAWN: RM
APPROVED: TG	



This work was prepared by me or
done under my direct supervision

TERRITORY
GUAM

PROJECT NAME
LAYON MUNICIPAL SANITARY LANDFILL
CEPA MSW LANDFILL PERMIT APPLICATION
MASTER PLAN
LINER BASE GRADES
PROJECT NO. SWMD-09-02
CAD FILE:

DWG. NO. C5.0
OF

PERMIT APPLICATION CHECKLIST

Gerslman, Brickner &
Brooklyn Inc. - Receiver
Name of Applicant (G&B)
Name of Facility: Guam NW Landfill

SOLID WASTE MANAGEMENT FACILITY-LANDFILL
PERMIT APPLICATION CHECKLIST

* Specific technical adequacy info. specific to
liner system not included.

#	Section II Specific Information	Complete		Comments	Technically Adequate	
		Yes	No		Yes	No
I.A.	The applicant shall submit a map, delineating the general location of the proposed facility. A near-vicinity map shall be prepared. The vicinity map shall have a minimum scale of one (1) inch equals two hundred (200) feet (1"=200'). The vicinity map shall depict the following:	<input checked="" type="checkbox"/>				
I.A.1.	The landfill boundaries (and alternate boundaries if these are to be used) and the initial and proposed final topographies at contour intervals of 10 feet or less;	<input checked="" type="checkbox"/>				
I.A.1.	All homes, buildings or structures including the layout of the buildings which will comprise the proposed facility;	<input checked="" type="checkbox"/>				
I.A.1.	The limits of the actual disposal operations within the boundaries of the proposed facility, if applicable;	<input checked="" type="checkbox"/>				
I.A.4	Lots and blocks taken from the tax map for the site of the proposed facility and all contiguous properties;	<input checked="" type="checkbox"/>				
I.A.5	Land use and zoning within one-quarter (1/4) mile of the site including location of all residences, buildings, wells, water courses, historical sites, recreational areas, parks, wetland areas, monument areas, cemeteries, roads, all airports within two (2) miles and all utilities within five hundred (500) feet of the site;	<input checked="" type="checkbox"/>				
I.A.6	The location of sanitary facilities for employees and facilities for equipment maintenance.	<input checked="" type="checkbox"/>				
I.B.	If an alternate boundary is proposed to be used, the applicant shall submit a summary of analysis of the following:			<i>N/A</i>		
I.B.1.	The hydrogeologic characteristics of the facility and surrounding land within one-quarter (1/4) mile;			<i>N/A</i>		
I.B.2.	The volume and physical characteristics of the leachate from the facility			<i>N/A</i>		
I.B.3.	The quantity and direction of flow of the groundwater			<i>N/A</i>		
I.B.4.	The proximity and withdrawal rates of groundwater users;			<i>N/A</i>		
I.B.5.	The availability of alternate drinking water supplies			<i>N/A</i>		
I.B.6.	The existing quality of the groundwater including other sources of contamination and their cumulative impact; and			<i>N/A</i>		
I.B.7.	The effects of the alternate boundary use on public health, safety and welfare			<i>N/A</i>		

Name of Applicant: G&B
 Name of Facility: Layer Mesu Landfill

**GUAM EPA
SOLID WASTE MANAGEMENT FACILITY-LANDFILL
PERMIT APPLICATION CHECKLIST**

#	Section II Specific Information	Complete		Comments	Technically Adequate		Per Final Application
		Yes	No		Yes	No	
I.C.	The site investigation for a proposed landfill facility shall provide sufficient information regarding the geotechnical and hydrogeologic conditions at the site to allow a reasonable determination of usefulness of the site for development as a landfill.	✓					
I.C.I.	The geotechnical interpretation and report shall provide information regarding the viability and suitability of onsite soils for use in the various construction phases of the landfill including liner, cover, drainage material, and cap.	✓					
I.C.I.A.	Soil unit descriptions shall include estimates of soil unit thickness, continuity across the site, and genesis. Laboratory determinations of the soil unit's physical properties shall be discussed.	✓					
I.C.I.B.	Soil units that are proposed for use as a drainage layer, impermeable cap or impermeable liner material shall be supported by laboratory determinations of the remediated permeability.	✓					
I.C.I.C.	The geotechnical report shall provide an estimate of the available volume of materials suitable for use as liner, cap, and drainage layer. It should also discuss the anticipated uses of the on-site materials, if known.		✓				
I.C.I.I.	The hydrogeologic information shall be sufficient to determine the characteristics of the uppermost aquifer underlying the facility	✓					
I.C.I.I.A.	The report shall include water table elevations, direction and calculated rates of groundwater flow and similar information on the hydrogeology of the site. All raw data shall be submitted with calculations.		✓				
I.C.I.I.B.	The report shall contain a discussion of field test procedures and results, laboratory determinations made on undisturbed samples, recharge areas, discharge areas, adjacent or areal usage, and typical radii of influence of pumping wells		✓				
I.C.I.I.C.	The report shall also contain discussion of the regional geologic setting, the site geology and a cataloging and description of the uppermost aquifer from the site investigation and from referenced literature. The geologic description shall include a discussion of the prevalence and orientation of fractures, faults, and other structural discontinuities, and presence of any other significant geologic features. The aquifer description should address homogeneity, horizontal and vertical extent, isotropy, the potential for groundwater remediation, if required, and the factors influencing the proper placement of a groundwater monitoring network.		✓				

Name of Applicant: 688 Layer New Landfill
 Name of Facility:

**GUAM EPA
SOLID WASTE MANAGEMENT FACILITY-LANDFILL
PERMIT APPLICATION CHECKLIST**

Item	Section II Specific Information	Complete		Comments	Technically Adequate	
		Yes	No		Yes	No
IC2.1	The report shall include a geologic map of the site prepared from one of the following sources as available, in order of preference:	✓				
IC2.1(1)	Site specific mapping prepared from data collected during the site investigation.	✓				
IC2.1(2)	Published geologic mapping at a scale of 1:24,000 or larger;	✓				
IC2.1(3)	Published regional geologic mapping at a scale of 1:250,000 or larger; or	✓				
IC2.1(4)	Other published mapping.	✓				
II.D.	The applicant shall submit a certification of compliance with zoning requirements and copies of all necessary permits and licenses required for facility operation. For zoning requirements, the certification is to take the form of a letter to the Admin.istrator describing the exact location of the facility, its lot number, land-use zone, and a statement indicating compliance to be signed by a representative of the Department of Land Management.	✓		<i>GL UC Notice of Action for the Zone Change approval from "A" to "M-2" will be formulated once it is issued.</i>		
II. Design Plans. Design plans shall consist of, at least, the following:						
II.A.	A title sheet indicating the project title, who prepared the plans, the person for whom the plans were prepared, a table of contents, and a location map showing the location of the site and the area to be served.	✓				
II.B.	An existing site conditions plans sheet indicating site conditions prior to development.	✓				
II.C.	A base grade plan sheet indicating site base grades or the appearance of the site if it were excavated in its entirety to the base elevation, before installation of any engineering modifications or the beginning of any filling.	✓				
II.D.	An engineering modification plan sheet indicating the appearance of the site after installation of engineering modifications. More than one plan sheet may be required for complicated sites. This plan is required only for those sites with engineering modifications.	✓				

Reviewer: _____

Name of Applicant: Globe
 Name of Facility: Leyona - M&W Landfill

**GUAM EPA
SOLID WASTE MANAGEMENT FACILITY-LANDFILL
PERMIT APPLICATION CHECKLIST**

#	Section II Specific Information	Complete		Comments	Technically Adequate			
		Yes	No			Yes	No	Per Final Application
III.R.	A final site topography plan sheet indicating the appearance of the site, and final contours of the site at closing including the details necessary to prepare the site for long-term care.	<input checked="" type="checkbox"/>						
III.T.	A series of phasing plan sheets showing the progression of site development through time. At a minimum, a separate plan shall be provided for initial site preparations and for each subsequent major phase or new area where substantial site preparation must be performed. Each such plan shall include a list of construction items and quantities necessary to prepare the phase indicated.	<input checked="" type="checkbox"/>						
III.C.	A site monitoring plan sheet showing the location of all devices for the monitoring of leachate production, groundwater quality and gas production, groundwater quality and gas production and venting. This plan shall include a table indicating the parameters to be monitored for, the frequency of monitoring before and during site development.	<input checked="" type="checkbox"/>						
III.R.	A series of site cross-sections shall be drawn perpendicular and parallel to the site base line at a maximum distance of 500 feet between cross-sections and at points of grade break and important construction features. The location of the cross-sections shall be shown on the appropriate plan sheet(s) and the section labeled using the site grid system. Where applicable, each cross-section shall show existing, proposed base and final grades; soil borings and monitoring wells which the section passes through or is adjacent to; soil types, bedrock and water table; leachate control, collection, and monitoring systems; limits of filling for each major waste type; drainage control structures, access roads and ramps on the site parameter and within the active fill area; the filling sequence or phases; and other appropriate site features.							
III.I.	Detailed drawings and typical sections for, as appropriate, drainage control structures, access roads, fencing, leachate and gas control systems and monitoring devices, buildings, signs, and other construction details.	<input checked="" type="checkbox"/>						
III.I.I.	Plan sheet(s) shall include:	<input checked="" type="checkbox"/>						
III.I.I.I.	Survey Grid, with base lines and bench marks to be used for field control.	<input checked="" type="checkbox"/>						

Name of Applicant: GBC
Name of Facility: Layon Muly Landfill

GUAM EPA
SOLID WASTE MANAGEMENT FACILITY-LANDFILL
PERMIT APPLICATION CHECKLIST

#	Section II Specific Information	Complete		Comments		Technically Adequate	
		Yes	No	Yes	No	Yes	No
II.L.1.	Limits or filling for each major waste type or fill area	✓					
II.L.1.	All drainage patterns and surface water drainage control structures both within the actual fill area and at the site parameter. Such structures may include berms, ditches, sedimentation basins, pumps, pumps, culverts, pipes, inlets, velocity breaks, sodding, erosion matting, or other methods of erosion control.	✓					
II.L.4.	The direction and sequence of filling within each phase.	✓					
II.L.4.	Ground surface contours at the time represented by the drawing. Spot elevations should be indicated for key features.	✓					
II.L.4.	Areas to be cleared and grubbed and stripped of topsoil.	✓					
II.L.7.	Borrow areas for liner materials, gas venting materials, berms, roadway construction, daily cover and final cover.	✓					
II.L.8.	All soil stockpiles including daily cover and final cover, topsoil, liner materials, gas venting materials and other excavation.	✓					
II.L.9.	Access roads and traffic flow patterns to and within the active fill area.	✓					
II.L.10.	All temporary and permanent fencing	✓					
II.L.11.	The methods of screening such as berms, vegetation or special fencing.	✓					
II.L.12.	The leachate collection, control, storage, and treatment systems which may include pipes, manholes, trenches, berms, collection tanks, storage units, pumps, risers, liners, and liner splices	✓					
II.L.13.	Gas, leachate and groundwater monitoring devices and systems	✓					
II.L.14.	Severe weather disposal areas	✓					
II.L.15.	Support buildings, scale, utilities, gates, and signs	✓					
II.L.16.	Special waste handling areas	✓					
II.L.17.	Construction notes and references to details	✓					
II.L.18.	Other appropriate site features.	✓					
Site Preparation							

Name of Applicant: G.B.B.
 Name of Facility: Layton NW Landfill

**GUAM EPA
SOLID WASTE MANAGEMENT FACILITY-LANDFILL
PERMIT APPLICATION CHECKLIST**

#	Section II Specific Information	Complete		Comments	Technically Adequate	
		Yes	No		Yes	No
III.A.	An operations manual shall be prepared and included on how the design and construction plans will be implemented with the initial phase of operation until closure. The manual for a landfill operation shall consist of at least the following information	✓				
III.A.1.	The population and area to be served by the landfill; waste types, characteristics, quantities, and source of wastes to be disposed; and any special handling required and procedures for any special handling.	✓				
III.A.2.	Specific wastes to be excluded from the landfill and a plan for detecting and preventing the disposal of regulated hazardous wastes as defined in Guam's Hazardous Waste Management Regulations and polychlorinated biphenyl (PCB) wastes as defined in 40 CFR Part 761	✓				
III.A.3.	Detailed instructions to the site operator for all aspects of site operation. The specifications shall include, at a minimum, the following information	✓				
III.A.3.a.	Initial site preparations, including specifications for clearing and grubbing, topsoil stripping, other excavations, berm construction, drainage control structures, leachate collection system, access roads and entrance, screening, fencing, groundwater monitoring and other special design features	✓				
III.A.3.b.	The initial site preparation including a discussion of the field measurements, photographs to be taken, sampling and testing procedures to be utilized to verify that the in-field conditions encountered were the same as those defined in the plans and design report, and to document that the site was constructed according to the engineering plans and specifications submitted for Agency approval.	✓				

Name of Applicant: *Guam Solid Waste Management Facility -Landfill*
 Name of Facility: *Tayron Solid Landfill*

**GUAM EPA
SOLID WASTE MANAGEMENT FACILITY-LANDFILL
PERMIT APPLICATION CHECKLIST**

#	Section II Specific Information	Complete		Comments	Technically Adequate	
		Yes	No		Yes	No
III.A.c.	Daily operations including a discussion of the timetable for development, waste types accepted or excluded, typical waste handling techniques, hours of operation, traffic routing, drainage and erosion control, windy, wet and cold weather operations, fire protection equipment, manpower, methods for handling of any unusual waste types, methods for vector, dust and odor control, daily cleanup, direction of filling, salvaging, record keeping, parking for visitors and employees, monitoring, closure of filled areas, gas and leachate control and monitoring methods, number and responsibilities of site personnel, number and type of equipment to be used, backup equipment with names and telephone numbers where equipment may be obtained, and other special design features. A Training Plan for on-site personnel must be included to address safety, operations, personnel responsibilities, emergency responses, Inspections, recordkeeping, etc.					
III.A.d.	Development of subsequent phases to include a filling plan to show lift development, waste placement, survey points, compactions operations, etc.	✓				
III.A.e.	Site closing information consisting of a discussion of the anticipated sequence of events for site closing and discussion of those actions necessary to prepare the site for long-term care and final use in the implementation of the closure plan.			✓		
III.A.f	An inspection plan, which shall include a schedule for inspecting all applicable major aspects of facility operations necessary to ensure compliance with the requirements of the Solid Waste Disposal Rules and Regulations (SWDR). The plan shall include a schedule for inspecting monitoring, safety, and emergency equipment, security devices and process operating and structural equipment. The plan shall identify the types of problems which are to be looked for during the inspection and the frequency of inspection.					
III.A.g.	A post-closure care plan containing long-term care information including a discussion of the procedures to be utilized for the inspection and maintenance of run-off, control structures, settlement, erosion damage, gas and leachate control facilities, monitoring for gas, leachate and groundwater, and other long-term care needs			✓		
III.A.h.	A safety plan which shall include a description of the proposed measures to protect the facility and other personnel from injury during operation..				✓	

Reviewer:

Lynn L. Lauer Permit Application Checklist, Section 2, Specific Information, 12/20/2005

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Date Reviewed:

Name of Applicant: Colb
 Name of Facility: Loyne NEW Landfill

GUAN EPA,
SOLID WASTE MANAGEMENT FACILITY-LANDFILL
PERMIT APPLICATION CHECKLIST

#	Section II Specific Information	Complete		Comments	Technically Adequate		
		Yes	No		Yes	No	Per Final Application
III.A.3.i.	The control methods to be used by the operator to prevent unauthorized disposal of hazardous wastes, bulk liquids, or other wastes not authorized for disposal in the facility.	✓					
III.L.3.j.	A landscaping plan delineating the existing site vegetation to be retained, and discussing the methods to be employed in order to ensure protection during the clearing, grading, and construction phases of the project and the supplemental vegetation to be planted. Information relating to vegetation type, location and purpose, such as for buffer, screening or aesthetics, and schedules for planting, shall accompany the plan.	✓					
III.L.3.k.	An emergency contingency plan which delineates procedures for responding to fire, explosions or any unplanned sudden or non-sudden releases of harmful constituents to the air, soil, or surface water. This emergency plan will be submitted to the local police and fire department, and to the nearby health care facilities when the permit will be issued. The emergency plan shall contain:	✓					
III.L.3.k.(1)	A description of the actions facility personnel shall take in the event of various emergency situations.	✓					
III.L.3.k.(2)	A description of arrangements made with the local police and fire departments which allow for immediate entry into the facility by their authorized representatives should the need arise, such as in the case of personnel responding to an emergency situation.	✓					
III.L.3.k.(3)	A list of names, addresses and phone numbers (office and home) of all persons qualified to act as emergency coordinator for the facility. This list shall be kept up to date. Where more than one person is listed, one shall be named as primary emergency coordinator and the other shall be listed in the order in which they will assume responsibility as alternates.	✓					
III.R.1	Cover material (SWDRR, §2310g). The applicant shall submit plans to including the following: If an alternative cover material is proposed to be used, the applicant shall submit the information in 3.A through D for the alternative cover material.	✓					
III.R.1	Cover material sources and soil classification. To include any planned and estimated amount required for on-site stockpile cover material.	✓					
III.R.2	Surface grades and side slope						

Reviewer: _____

Name of Applicant: CBB
Name of Facility: Layon Main Landfill

GUAM EPA
SOLID WASTE MANAGEMENT FACILITY-LANDFILL
PERMIT APPLICATION CHECKLIST

#	Section II Specific Information	Complete		Comments		Technically Adequate Yes No	Per Final Application
		Yes	No				
III.B3.	Procedures to promote vegetative regrowth; and	<input checked="" type="checkbox"/>					
III.B4.	Procedures to maintain cover material integrity	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				
III.C.	Disease vector control (SWDRR, §23305). The applicant shall submit plans to include prevention and control mechanisms for disease vectors for the protection of human health and the environment.	<input checked="" type="checkbox"/>					
III.D.	Explosive gases control (SWDRR, §23306). The applicant shall submit a routine methane monitoring plan. The plan shall contain a discussion of the following:	<input checked="" type="checkbox"/>					
III.D1.	Soil conditions	<input checked="" type="checkbox"/>					
III.D2.	The hydrogeologic conditions surrounding the facility	<input checked="" type="checkbox"/>					
III.D3.	The hydraulic conditions surrounding the facility	<input checked="" type="checkbox"/>					
III.D4.	The location of facility structures and property boundaries; and	<input checked="" type="checkbox"/>					
III.D5.	The procedures to take if the methane gas levels exceed the limits specified in §23306 Subsection (e) are detected.	<input checked="" type="checkbox"/>					

Reviewer: _____

Lyons Landfill Permit Application Checklist, Sub 2, Specific Information, 12/20/2005

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Date Reviewed: _____

Name of Applicant: G&G
Name of Facility: Guam DSM Landfill

GUAM EPA
SOLID WASTE MANAGEMENT FACILITY-LANDFILL
PERMIT APPLICATION CHECKLIST

#	Section II Specific Information	Complete		Comments	Technically Adequate	
		Yes	No		Yes	No
III.1.	Water Quality. The plans for the landfill shall include:	✓				
III.1.	Current and projected uses of water resources in the potential zone of influence of the land disposal site;	✓				
III.2.	Groundwater elevation, movement and proposed separation between the lowest point of the lowest cell and the predicted maximum water table elevation.	✓				
III.3.	Potential interrelationships of the land disposal site, local aquifers and surface waters	✓				
III.4.	Background or initial quality of water resources in the potential zone of influence of the land disposal site	✓				
III.5.	Proposed location of monitoring wells, sampling stations and planned testing program	✓				
III.6.	Description of soil and other geological material to a depth adequate to allow evaluation of the water quality protection provided by the soil or material;	✓				
III.7.	Provisions for surface water run-off control to minimize infiltration and erosion of cover material	✓				
III.8.	Potential of leachate generation and proposed control system where necessary for protection of ground and surface water resources	✓				
III.9.	Groundwater monitoring program	✓				
III.10.	Detection monitoring program; and	✓				
III.11.	Assessment monitoring program	✓				

Reviewer:

Logan Landfill Permit Application Checklist, Section 2, Specific Information, 12/20/2009

Name of Applicant: G&G Lagoon
 Name of Facility: New Landfill

**GUAM EPA
SOLID WASTE MANAGEMENT FACILITY-LANDFILL.
PERMIT APPLICATION CHECKLIST**

#	Section II Specific Information	Complete		Comments	Technically Adequate		
		Yes	No		Yes	No	Per Final Application
III.F.	Run-on/run-off control systems. The plans shall discuss the following	✓					
III.I.	A run-on control system to prevent flow onto the active portion of the landfill during peak discharge from a Twenty-five (25) year storm; and	✓					
III.II.	A run-off control system from the active portion of the landfill to collect and control at least the wafer volume from a Twenty-hour (24) hour, Twenty-five (25) year storm.	✓					
III.II.A.	Recordkeeping. The applicant shall describe methods to be used in maintaining records and monitoring the environmental impact of the land disposal site.	✓					
III.II.B.	Aesthetics. The plans shall include a litter control program.	✓					
III.II.C.	Air quality. The plans shall include a dust control program.	✓					
IV.	Closure Plans. The applicant shall prepare and submit a written closure plan that describes the steps necessary to close the landfill facility. The plan shall be prepared in two parts, one reflecting those measures to be accomplished at the midpoint of the permit period, and the other when the useful life of the landfill is reached. The plan shall show how the facility will be closed to meet the requirements of §23601 of the Solid Waste Disposal Rules and Regulations. The closure plan, at a minimum, must include the following information						
IV.A.	A description of the final cover, designed in accordance with §23601 Subsection (e) and the methods and procedures to be used to install the cover;	✓					
IV.B.	An estimate of the largest area of the landfill unit requiring a final cover as required under §23601 Subsection (e) at any time during the active life	✓					
IV.C.	An estimate of the maximum inventory of wastes over on-site over the active life of the landfill facility; and	✓					
IV.D.	A schedule for completing all activities necessary to satisfy the closure criteria in §23601	✓					

Name of Applicant:
Name of Facility:

*GBO
Lafon NW Landfill*

GUAM EPA
SOLID WASTE MANAGEMENT FACILITY-LANDFILL
PERMIT APPLICATION CHECKLIST

#	Section II Specific Information	Complete		Comments	Technically Adequate	
		Yes	No		Yes	No
V.	Post-Closure Plans. The applicant shall prepare and submit a written post-closure plan that shows how the facility will conduct post-closure care to meet the requirements of §23602 of the Solid Waste Disposal Rules and Regulations. The post-closure plan, at a minimum, must include the following information:	✓				
	Maintaining the integrity and effectiveness of any final cover, including making repairs to the cover as necessary to correct the effects of settlement, subsidence, erosion, or other events, and preventing runoff and run-off from eroding or otherwise damaging final cover	✓				
	Maintaining and operating the leachate collection system in accordance with the requirements of §2340 of the Chapter. The Administrator may allow the owner or operator to stop managing leachate if the owner or operator demonstrates that leachate no longer poses a threat to human health and the environment.	✓				
	Maintaining the ground-water in accordance with the requirements of Article 5 of this Chapter and maintaining the ground water monitoring system, if applicable, and	✓				
	Maintaining and operating the gas monitoring system in accordance with the requirements of §2306	✓				
V.I.	A description of the monitoring and maintenance activities required in §23602 Subsection (a), and the frequency at which these activities will be performed	✓				
V.I.	Name, address, and telephone number of the person or office to contact about the facility during the post-closure period; and	✓				
V.C.	A description of the planned uses of the property during the post-closure period	✓				
	Post-closure use shall not disturb the integrity of the final cover, liner(s), or any other components of the containment system	✓				
	Post-closure use shall not disrupt the function of the monitoring systems, unless necessary to comply	✓				
V.L.	Financial Assurance. The applicant shall provide its completed documentation to demonstrate compliance with Article 7 of the Solid Waste Disposal Rules and Regulations	✓				

RESPONSE TO MARCH 2009 REVIEW COMMENTS (MAY 22, 2009)

GEPA

Deliverable Title/Subject: PRE-FINAL (100%) SUBMITTAL PLANS, SPECIFICATIONS, & ESTIMATES
Date Submitted: December 23, 2008

Reference Section, Page, or Sheet No.	Review Comment	Response
Drawing Set		
L1.4 and L3.1	Provide 18 inch min. benching.	The GEPA regulations require 18-ft wide benches, this requirement will be met with the final design.
L2.9	Section of LCRS shows the use of carbonate material for drainage media, verify material should resist leachate liquid.	Non-carbonate material is called out in Section 4. Spec section 02240, subsection 2.01 further requires non-calcareous material.
C2.4 and C4.7	Provide 3hor. to 1 vert. slopes on fill area	Concur, 3:1 slopes will be provided on the site sections shown on drawing C2.4. The details on drawing C4.7 are drainage swales where 2:1 side slopes are appropriate.
L	Subdrain outfall numerous discussion that a containment or lined pond with a dedicated pump onsite is needed. Subdrain liquid to be tested before releasing to the adjacent wetlands.	A subdrain discharge holding tank (5,000-gal) will be provided as an additional design feature, refer to L2.7.
Book 1A	Bid Documents and Technical Specifications (Divisions	
1.12 f. (01500)	Vehicular Access:	
	Provide means of removing mud from vehicles wheels before entering street.	Please see mud rack provided on Drawing C1.0, C1.2 and details on C4.6
	At what point of the project will this activity be located?	See Drawing C1.0 and C1.2.
1.14j (01500)	Progress cleaning and waste removal:	

Deliverable Title/Subject: PRE-FINAL (100%) SUBMITTAL PLANS, SPECIFICATIONS, & ESTIMATES
Date Submitted: December 23, 2008

Reference Section, Page, or Sheet No.	Review Comment	Response
	Dispose of excess excavated materials including rocks and boulders that can not be utilized. Where will the excavated materials be disposed off? All authorized hard fills are located on the northern part of the island. How will green waste be handled?	Rocks and boulders may be temporarily stored in an approved area within the site. Green waste will not be accepted at the landfill.
1.16a (01500)	Haul routes:	
	Will hauling of equipment /materials be done during non-peak traffic hours. Are the three bridges on route four capable of handling the increased truck/tonnage activities?	Hauling times will be at the discretion of the Contractor. The bridges are beyond the scope of the project team.
1.18 (01500)	Fire prevention and protection:	
	Fire break should be constructed around project site. Fire break must be constructed!	Concur, TGE will discuss the best method for fire prevention and control with GFD and include this for the construction phase. Similar fire prevention and controls will be included in the Operations Plan.
Book 1B	Technical Specifications (Divisions 8-16)	
General Comments	No incorporation and or consideration of any Green Construction Techniques in the design of the building and site.	The Book 1B comments are beyond the project scope except the underground power which is included. The suggestions can be incorporated as an additional service if authorized.
	Consider using solar H2O heaters.	
	Central Air condition unit vs. split units for each room.	
		TGE Team Response
		5/22/2009

Deliverable Title/Subject: PRE-FINAL (100%) SUBMITTAL PLANS, SPECIFICATIONS, & ESTIMATES
Date Submitted: December 23, 2008

Reference Section, Page, or Sheet No.	Review Comment	Response
	Consider using solar panels as supplemental power source.	
	Consider using a generator that is easily converted from liquid fuel to methane gas fuel.	Consider installing H2O tank to catch rain for use in toilet operations and landscaping functions.
	Consider using waterless urinals.	Consider using solar power street lights to light road to land fill.
	I read on some reports that leachate liquid is stronger than the regular sewer water, is treatment required before it goes to wastewater treatment plant?	A separate study is ongoing concurrently to evaluate the leachate quality and the Inarajan WWTP capacity to handle additional flow. The Draft Report is expected to be submitted on June 22, 2009.

Deliverable Title/Subject: PRE-FINAL (100%) SUBMITTAL PLANS, SPECIFICATIONS, & ESTIMATES
Date Submitted: December 23, 2008

Reference Section, Page, or Sheet No.	Review Comment	Response
	Leachate Treatment and Disposal - GWA Inarajan WWTP is currently not capable of accepting leachate without pretreatment. Discussion shall be made on pre-treatment procedures of leachate should GWA facility not be able to accept it at their facility either via trucking or sewer.	A separate study is ongoing concurrently to evaluate the leachate quality and the Inarajan WWTP capacity to handle additional flow. The Draft Report is expected to be submitted on June 22, 2009.
	Discussion shall be made on how leachate transportation and disposal shall be done in a manner that does not cause a hazard to public health or the environment, and in full accordance with the law. Furthermore, discussion shall be made on propose interim leachate management activities, collection, pre-treatment, transportation, and/or disposal prior to acceptance by GWA.	Concur, the section will be expanded with further discussion regarding leachate transportation and disposal. Refer to Book 2, Appendix G.
<u>4.6</u>	Subdrains	

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	<p>The subdrain provides an expressway for any failure of the liner system. The hydrogeological report makes great pains to assure us that contamination of the groundwater beneath the liner would not reach the nearby streams for at least 40 years. But the very presence of the subdrain would probably reduce that to 40 minutes. If a leak can be detected quickly, the subdrain could be used to prevent contamination of the groundwater and nearby streams. But the way it is presently designed, it simply discharges to daylight just upslope of the wetlands and streams. Guam EPA is requiring a lined sump/pond at the discharge point, with some sort of gated drain. During operations, Guam EPA recommends that during operations the pond drain shall be closed and periodic testing shall be conducted for basic leachate indicators (pH, BOD, TDS, maybe nitrate or ammonia) prior to allowing batch discharges. That way, maybe a leak could be caught prior to a release to the environment.</p>	<p>A subdrain discharge holding tank (5,000-gal) will be provided as an additional design feature, refer to L2.7.</p>

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Book 3	Geotechnical Report and Water Quality Monitoring Plan	
Groundwater Plan General	Discussion shall be made on the implementation and schedule of groundwater monitoring plan for each type (ground water, surface water, subdrain discharge, and leachate) to ensure compliance with applicable regulations.	Refer to the Amehr response to GEP A comments, Site-Specific Groundwater Monitoring Program Plan, attached.
	The groundwater monitoring system (well designs, spacing, etc.) requires a number of signed statements from the designer that it meets the requirements of SWDRR Article 5 and 40 CFR 258.51,	Refer to the Amehr response to GEP A comments, Site-Specific Groundwater Monitoring Program Plan, attached.
	Discussion shall be made that represents the quality of groundwater passing the relevant point of compliance to verify compliance with SWDRR Article 5	Refer to the Amehr response to GEP A comments, Site-Specific Groundwater Monitoring Program Plan, attached.
	At a minimum, groundwater samples for both the background determination and the semi-annual detection monitoring program must be analyzed for Appendix I constituents. Appendix II constituents shall be tested for during the 8-sample background determination.	Refer to the Amehr response to GEP A comments, Site-Specific Groundwater Monitoring Program Plan, attached.

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	<p>The method detection limits should be specified for each constituent and tested is low enough to characterize the groundwater with respect to groundwater monitoring standards.</p>	<p>Refer to the Amehr response to GEPA comments, Site-Specific Groundwater Monitoring Program Plan, attached.</p>
	<p>It is noted that determinations of groundwater flow conditions presented and discussed in the subject document are based on a potentiometric surface map of the landfill area constructed from water level elevations collected in July 2007. A more thorough understanding of preconstruction groundwater gradient would result through the analysis of additional potentiometric surface maps that depict any seasonal changes in groundwater conditions. In addition, it is recognized that construction of Phase one cells (cells one and two) will modify groundwater flow conditions to some extend in the vicinity of those cells. Therefore, it is critical that the Phase one groundwater plan adequately characterizes post construction groundwater conditions and establishes background for that phase of construction. As indicated in the plan, Phase one background conditions will be used to develop the detection groundwater monitoring plan for Phase one cells.</p>	<p>Refer to the Amehr response to GEPA comments, Site-Specific Groundwater Monitoring Program Plan, attached.</p>

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	<p>Because post-Phase one construction groundwater flow conditions are largely unknown, Guam EPA recommends that monitoring wells MW-15 and MW-16 be included in the baseline groundwater monitoring network to help define those conditions. In addition, the hydrogeologic study conducted at the site conclude that vertical groundwater gradients are consistently downward beneath the footprint. Potential impacts from cell construction activities to the upper sections of the saturated zone to baseline conditions of the underlying portions of the groundwater need to be characterized. It is therefore recommended</p>	<p>Refer to the Amehr response to GEPA comments, Site-Specific Groundwater Monitoring Program Plan, attached.</p>
	<p>Because it has been determined during the hydrogeologic study that vertical hydraulic gradients are consistently downward beneath the footprint, Guam EPA expects that deep monitoring wells will need to be included during the subsequent Phase 1 detection monitoring plan.</p>	<p>Refer to the Amehr response to GEPA comments, Site-Specific Groundwater Monitoring Program Plan, attached.</p>
<p>P.4-8 Sec 4.4.1</p>	<p>Guam EPA will be providing the actual recommended sites of two new monitoring wells and the deletion of the proposed MW-14A from the network</p>	<p>Refer to the Amehr response to GEPA comments, Site-Specific Groundwater Monitoring Program Plan, attached.</p>
	<p>Should not say concentration "Near or At Zero", should say "Non-Detect at MDL"</p>	<p>Refer to the Amehr response to GEPA comments, Site-Specific Groundwater Monitoring Program Plan, attached.</p>

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p.4-9	Need to define " Significant Concentrations"	Refer to the Amehr response to GEPA comments, Site-Specific Groundwater Monitoring Program Plan, attached.
p.5-2	4 WQ monitoring of events should occur after "significant" rain events to document conditions. "No Flow" should not equal "sample" should reschedule to get sample because of only 4 total proposed.	Refer to the Amehr response to GEPA comments, Site-Specific Groundwater Monitoring Program Plan, attached.
	Ground water and Monitoring Plan and QAP to comply with Article 5 Section 23501(c)(4).	Refer to the Amehr response to GEPA comments, Site-Specific Groundwater Monitoring Program Plan, attached.
	Leachate Treatment and Disposal - GWA Inarajan WWTP is not capable of accepting leachate without pretreatment.	A separate study is ongoing concurrently to evaluate the leachate quality and the Inarajan WWTP capacity to handle additional flow. The Draft Report is expected to be submitted on June 22, 2009.
Section 5.5	States that if initial observations regarding stream flow conditions indicate that insufficient flow exists to enable water quality sampling, that the surface monitoring station will be excluded from further sampling attempts during the baseline monitoring for Phase one. Guam EPA recommends that this statement be amended to indicate that consideration will be giving to the inclusion of additional surface water monitoring station as replacements for any stations that may not have adequate flow at any given time.	Refer to the Amehr response to GEPA comments, Site-Specific Groundwater Monitoring Program Plan, attached.
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Section 8.2	The report describes the collection of depth to static water level measurements that will be collected during the baseline monitoring. Guam EPA recommends that such water level monitoring be conducted using pressure transducer and data logger. Automated SWL data collection provides a much more reliable and continuous record of water level fluctuations than measurements collected manually.	Refer to the Amehr response to GEPAs comments, Site-Specific Groundwater Monitoring Program Plan, attached.
Book 4	Operations Plan, Closure & Post-Closure Plan, A site diagram showing all temporary material handling and storage areas should be provided (e.g., tire storage, white goods, designated unacceptable waste storage area)	Temporary material handling and storage area shall be as indicated in Figure 1. This is the north half of the energy recovery area (approx. 17,000 s.f. and not needed until the energy recovery equipment is installed).
Operations Plan General	A section on inspections (an inspection plan) should be developed and added into the Operations Plan, outlining the types of inspections, frequency, and reporting requirements for the facility as a whole, as required under section III.A.3.f of the application.	Concur, please refer to Section 8 of the updated Operations Plan. The section will be expanded to include Safety, Emergency Equipment and Security Devices.
	A landfill gas sampling and analysis plan (with QAP) needs to be provided.	Concur, A LFG Monitoring Plan is attached with Book 4, Operations Plan.
Section 4	General - the page numbering system in section 4 does not follow the system used in other chapters.	Concur, the page numbering system was corrected.

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	4.1.2 - there should be more detail regarding the types of training to be provided to employees, such as hazardous waste and unacceptable waste identification and handling. Most of this is covered elsewhere in the Ops Plan, but should be consolidated in this section for easier reference.	Concur, refer to the expanded subsection 4.1.2.
	4.1.2 - This section should require that the on-site landfill manager hold a current MOLO (Manager of Landfill Operations) certification	Concur, refer to the expanded subsection 4.1.2.
	4.2 - Why are dump trucks not included in equipment list? Dump trucks are normally an essential piece of equipment for transporting cover material to the working face, and for managing other types of materials (green waste, etc.) at the facility. Suggest specifying two (2) dump trucks	Concur, refer to the expanded subsection 4.2.1
Section 5	5.3.2 - Grammatical corrections are needed in the descriptions of items b, e, g, h, i, and j to avoid the appearance of allowing the disposal of hydrocarbon free product and other unacceptable wastes, e.g., "the following types of special wastes will be accepted ... j. Gasoline, jet fuel, kerosene and debris". Suggest "debris contaminated with gasoline, jet fuel, or kerosene." This same comment applies to the list provided in Section 2.0 of Appendix B.	Based on clarification from GEPA, most special wastes will be shifted to the waste exclusion program, refer to sections 5.3, 5.4 and Appendix B.

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	5.3.3 - The "notice of Contaminated Material Approval Form" should be provided as an appendix to the Operations Plan.	Concur, the form will be added to Appendix B Special Waste Acceptance & Hazardous Waste Exclusion Program.
	5.4.2 - This section repeats Section 3 of Appendix B, but appears to be slightly different. These two sections need to be checked for consistency with each other.	Section 5.4.2 and Appendix B, section 3 will be coordinated to be consistent and delete any unnecessary redundancy.

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	<p>5.4.4 - notification procedures - please revise to utilize the reporting conditions contained in the most recent GEPA permit for Ordot:</p> <ul style="list-style-type: none"> a. The Permittee shall report to the Administrator any noncompliance which may endanger human health or the environment. Any such information shall be reported orally within twenty-four (24) hours or less from the time the Permittee becomes aware of the circumstances. The report shall include the following: i. Information concerning release of any hazardous waste, constituents of concerns (COC), or potential constituents of concerns (PCOC) that may endanger public drinking water supplies. ii. Any information of a release or discharge of hazardous waste, constituents of concerns (COC), or potential constituents of concerns (PCOC) or of a fire or explosion from the solid waste management facility which could threaten the environment or human health outside the facility. iii. The description of the occurrence and its cause shall include: 	<p>Concur, Section 5.4.4, the notification procedures will be revised to match the 24-hour procedures included in the GEPA permit for Ordot and the other typical procedures.</p>

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	5.6 - Plans/Diagrams showing the cell filling sequence and lift construction details are required as per section III.A.3.d of the application, rather than only a narrative description as provided	Refer to Book 4 Operations Plan, Figures 13.1 - 13.12.
	5.6.2 - Plans/ Diagrams showing the typical installation of the rain cap should be provided in the operations plan	Concur, Figure 12 First Waste Lift Operations with Rain Cap, in the updated Operations Plan provides the installation guidelines.
	5.6.3 - Repeats Appendix B Special waste & exclusion plan, but with some apparent differences. For example, the section on dead animals and offal provides more detail and is closer to "standard" handling procedures for such wastes than the same section in Appendix B, which is slightly different and less stringent. Please review for consistency, or consider simply referencing Appendix B (with revisions) and eliminating the detailed discussion in section 5.	Concur, the plan was updated to be consistent between subsection 5.6.3 and Appendix B.
	5.6.3 - The plan should specify where contaminated soils will be stockpiled and the procedures for preventing such soils from migrating off-site, e.g. by requiring all contaminated soils be stockpiled within the lined area of the landfill, and/or by specifying acceptable levels of contamination and stabilization measures (covering, erosion control) for stockpiling such soils in other, non-lined areas of the facility.	GEPAP has excluded contaminated soil from the landfill, this is in subsection 5.4 Unacceptable Waste Exclusion Program.

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	5.7 - This section repeatedly refers to locations where different types of "non-disposable wastes" such as tires and white goods will be temporarily stored. A site plan showing these designated areas needs to be provided	Temporary material handling and storage area shall be as indicated in Figure 1. This is the north half of the energy recovery area (approx. 17,000 s.f. and not needed until the energy recovery equipment is installed).
	5.7 - The plan states that GEPA will set a permit limit for length of time and the number of tires that may be stockpiled at the landfill site. GEPA would prefer that the Operations Plan set these limits, and that the permit simply refer to the "approved Operations Plan" for details of this nature.	Concur, subsection 5.7 was updated with a maximum of 50-tires and maximum storage up to 6-months.
	5.7 - this section briefly discusses green waste, to the extent that it will not be immediately allowed at the facility, but may be added in the future. This should be reflected in the table outlining acceptable and unacceptable wastes contained in Appendix B, Section 2, which does not mention green waste.	Concur, Appendix B, subsection 2.4 was updated to include "bulk green waste" as unacceptable waste.
Section 6	6.5.1 - Will grease trap pumping wastes be accepted? If so, add some narrative detail clarifying the specifications/quality of grease trap waste that will be accepted into the other appropriate sections of the Operations Plan which have to do with waste acceptance and exclusion (Appendix B Section 2.0, and Ops Plan Section 5.3)	Grease trap pumping waste will not be accepted at the landfill. This will be deleted from Appendix B, subsection 2.2 and added to subsection 2.4.

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6.6 - More detail regarding the quality of leachate that is acceptable for disposal into the Inarajan treatment plant is required, including a plan for testing prior to discharge or trucking. Approval and conditions from Guam Waterworks Authority needs to be appended to the Operations plan, or placed elsewhere in the application documents and operating record.	Concur, a separate study is ongoing concurrently to evaluate the leachate quality and the Inarajan WWTP capacity to handle additional flow. The Draft Report is expected to be submitted by June 22, 2009.	
6.6 - This section should require training for certain landfill personnel by EPG (or another approved pump system manufacturer/supplier) in the maintenance, troubleshooting, and repair of the leachate pumping system. This has proven to the weakest link in the operation of the CNMI's Marpi Landfill, which has experienced numerous pump system failures which has resulted in long periods of excessive head over the liner and discharge of leachate to the environment.	Concur, refer to subsection 6.6.6 Leachate Operations Personnel Training for training requirements.	

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	<p>6.6 - Again based on experience in Saipan with the EPG-supplied leachate pumping system, this section should explicitly require that spare parts and pumps be kept on hand at all times, for each pump size installed. Typical failure components in Saipan have also included the level sensors and some of the control panel components which regulate the switching of the pumps. Suggest contacting Steve Hiney at CNMI DPW for more detail, and including list of typical part types that require frequent replacement in operations plan.</p>	<p>Concur, refer to subsection 6.6.5 Spare Leachate System Components for spare part inventory requirements.</p>
	<p>6.6 - Should add to daily inspection requirements the need for the operator to record pump hour meter readings (and/or flow) and sump level readings, to verify operation of these more failure-prone components of the leachate pumping system.</p>	<p>Concur, refer to subsection 6.6.4 Maintenance Procedures for the daily, weekly and monthly requirements for the Leachate System O&M.</p>
	<p>6.6 - The plan should require daily visual inspection for leachate blowouts on all side slopes (include in general site inspection plan as well) and procedures for correcting blowouts.</p>	<p>Concur, refer to subsection 8.1 Daily Inspection Activities, under bullet item 5, this requires daily sideslope inspections for leachate seeps. If leachate seeps are noted then corrective action listed in subsection 6.6.7 is required to be followed.</p>

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	6.8 - The section on landfill gas management should include some narrative on the sequence of installation of the gas collection system, including flares, risers, etc, and estimated times of when these items and tasks will be required.	This is premature; will be added as part of N.S.P.S. Design Plan report and related permitting process when the flare system will be installed. Refer to Book 2 Design Narrative, subsection 4.7.1 for the summary of LFG management plans. A potential implementation schedule is included.
	6.8 - Landfill gas sampling will require a detailed sampling and analysis plan and quality assurance plan, in accordance with section III.D of the application. The Operations Plan should reference this plan and clearly state the frequency with which the monitoring needs to be performed.	Concur, the Landfill Gas Sampling & Analysis Plan and QAP will be added. Subsection 6.7 will be updated to include reference to the plan.
	6.11 - Vector control - should add regular inspection and repair of fenceline for burrowing animals (such as dogs and pigs).	Concur, subsection 8.2 Weekly Inspection Requirements is added and includes perimeter fenceline inspections.
Section 7	7.0 - The detailed emergency management plan discussed in the first sentence should be provided in place of the general procedures discussed here, in accordance with the requirements of all parts of section III.A.3.k	The level of detail in this section of the Operations Plan is the most that can be specified at this time. The detailed emergency plan must contain personnel lists, corporate policies of the operator and other items that are unknown at this time. GEPA should make preparation and submittal of the plan a condition of approval.

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	7.3 - Post-earthquake inspection procedures should include sampling of subdrain outlet for indications of liner failures, at some period of time following a major earthquake.	Concur, subsection 7.3 is updated to include post-earthquake sampling and testing of subdrain liquids. Note it is now planned that a tank will be installed at the subdrain discharge to hold liquid for sampling and testing.
Section 8	Should add requirement to keep inspection records for inspections that should be compiled in the suggested Inspection Plan section.	Concur, subsection 9.14 is added to require that inspection report forms are maintained with site records.
	Should add requirement to keep records of complaints and what actions were taken to address the complaints.	Concur, subsection 9.15 is added to require that complaint forms with the complaints and resolution are maintained with site records.
Section 9	Incident reporting should be checked and revised to be consistent with the reporting requirements given above from the Ordot permit	Concur, the 24-hour Incident Reporting requirements were updated based on the Ordot Permit, other typical reporting requirements were clarified.
	9.1 - Change "DOH" to "GEPA" in last sentence	Concur, the revision is now subsection 10.1.
Appendix B	Section 2 - Waste Acceptance Policy - table needs to be revised to reflect comments above concerning green waste, grease trap waste,	Concur, the table is deleted and subsection 2.4 now lists the Unacceptable Wastes.

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	<p>Section 2 - The list of "special wastes" allowable for disposal at the top of page 2 needs grammatical corrections in the descriptions of items b, e, g, h, i, and j to avoid the appearance of allowing the disposal of hydrocarbon free product and other unacceptable wastes, e.g., "the following types of special wastes will be accepted ... j. Gasoline, jet fuel, kerosene and debris". Suggest "debris contaminated with gasoline, jet fuel, or kerosene."</p>	<p>Based on clarification from GEPA, most special wastes will be shifted to the waste exclusion program, refer to Appendix B section 2.4.</p>
Appendix B - Section 3	<p>3.2 - edit final sentence of second paragraph, which presently says "... Random load checks are performed at daily."</p>	<p>Concur, refer to the updated subsection 3.2.</p>
	<p>3.4 - refers to "Customer waste profile" form, which is not provided. This form needs to be provided as stated.</p>	<p>This request is premature. The form will be prepared by the site operator when selected, according to operator's own policies. A sample form is provided for reference.</p>
	<p>3.4.1 - Repeats 5.6.3 of Operations plan, but with some apparent differences. Suggest adopting the procedures described in 5.6.3 as they are more protective and closer to "standard" procedures we are familiar with.</p>	<p>Concur, the 2-sections will be coordinated and updated.</p>
	<p>3.4.2 - Add TCLP (toxicity characteristics leaching procedure) to the list of typical analyses that may be required for certain wastes.</p>	<p>Concur, refer to the updated subsection 3.4.2.</p>

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Appendix B – Section 4	4.0 - Make GEPA notification procedures consistent with the notification and reporting procedures provided above, taken from the Ordot permit.	Concur, the Incident Reporting procedures will be updated based on the Ordot Permit.
	4.1.2 - Provide site plan showing location of "designated unacceptable waste storage area" and any details necessary for it's construction.	Concur, Figure 1 will show the unacceptable waste storage area in the north half of the energy recovery area (approx. 17,000 s.f. not needed until energy recovery is installed).
	4.1.2 - Make sure a storage time limit and overall allowable quantities are specified to avoid violation of federal and local hazardous waste regulations.	Concur, refer to Appendix B, subsection 4.1.2.
Book 5	Guam EPA Landfill Permit Application, Guam Land Use Commission, Zone Variance Application	

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General Comments References and discussion of the plans and documents shall also include summary of regulatory compliance with the Guam Solid Waste Disposal Rules and Regulations where applicable. Book 5 may be the most appropriate area to place the introductory section since it is intended to be the organizing structure of the Permit Application, where the public could be directed to first for any complaints or questions. Therefore, although all the main requirements of Solid Waste Disposal Rules and Regulations and RCRA D, such as the location restriction demonstrations, the operating requirements, the design requirements, and the groundwater monitoring requirements, closure and post-closure requirements are contained in the documents, a tabulation all of this information and where they may be found would be useful.	A Memorandum titled, " <u>Introduction to Layon Landfill Solid Waste Facility Permit Application</u> " is attached.	
	Guam EPA recommends the development or submittal of an Operations Record which shall include all information currently available that is required by the Guam's Solid Waste Disposal Rules and Regulations and RCRA D.	The Operations Record will be prepared by others.

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Location Restriction s:	An introductory section of the permit application package, stating the Permittee's brief responses to each location restriction and design requirement of the regulations, and the location within the documents where the detailed demonstration is found would be acceptable.	A Memorandum titled, " <u>Introduction to Layon Landfill Solid Waste Facility Permit Application</u> " is attached.
	The introductory section should be worded to state that it also serves as the notification required (regulatory citation) that the following demonstrations have been placed in the operating record.	A Memorandum titled, " <u>Introduction to Layon Landfill Solid Waste Facility Permit Application</u> " is attached.
Airport safety	Provide discussion on the location of the landfill not within those distances as specified in the airport safety requirements and reference the document that supports this assertion.	A Memorandum titled, " <u>Introduction to Layon Landfill Solid Waste Facility Permit Application</u> " is attached.
Floodplains	Provide discussion on the location of the landfill not located within a 100 year floodplain, and reference the document that supports this assertion. However, to be proactive and address public concerns ahead of time, consider a brief statement that the management of all storm water generated are addressed and specify where within the permit application document supports this assertion..	A Memorandum titled, " <u>Introduction to Layon Landfill Solid Waste Facility Permit Application</u> " is attached.

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Wetlands	<p>Provide discussion on the location of the landfill not located within wetlands, and reference the document that supports this assertion. However, to be proactive and address public concerns ahead of time, the Permittee may wish to consider a brief statement that the management of any potential impacts to nearby wetlands are addressed and specify where within the permit application supports this assertion.</p>	<p>A Memorandum titled, "<u>Introduction to Layon Landfill Solid Waste Facility Permit Application</u>" is attached.</p>
Fault area	<p>Provide discussion on the location of landfill not located within a fault area, and reference the document(s) that supports this assertion, inclusive of the information provided in your email dated February 26, 2009.</p>	<p>A Memorandum titled, "<u>Introduction to Layon Landfill Solid Waste Facility Permit Application</u>" is attached.</p>
Seismic Impact Zones	<p>Provide discussion on demonstrating that all containment structures are designed to resist the maximum horizontal acceleration in lithified earth material for the site. Thus, the Permit Application must include the demonstration on how the facility will meet this requirement. If this issue has been addressed, the Permittee must state the landfill has met this criteria, and reference the document(s) that supports this assertion. If referencing the supplemental geotechnical report, Book 3, ensure that there is consistency with the approved alternative landfill liner design.</p>	<p>A Memorandum titled, "<u>Introduction to Layon Landfill Solid Waste Facility Permit Application</u>" is attached.</p>

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Unstable Areas	<p>Provide discussion on "unstable areas" referring to poor foundation conditions being areas susceptible to mass movement and Karst terrains and how the location of the landfill is not located within an unstable areas, and reference the document that supports this assertion. However, should the location be susceptible to natural or human-induced events or forces capable of impairing the integrity of some or all of the landfill structural components responsible for preventing releases from a landfill, please reference the documents or sections within the application that meets this requirement.</p>	<p>A Memorandum titled, "<u>Introduction to Layon Landfill Solid Waste Facility Permit Application</u>" is attached.</p>	
Operating Criteria	<p>An introductory section of the permit application package, stating the Permittee's brief responses to each operating criteria requirement of the regulations, and the location within the documents where the detailed demonstration is found would be acceptable.</p>	<p>A Memorandum titled, "<u>Introduction to Layon Landfill Solid Waste Facility Permit Application</u>" is attached.</p>	
Design Criteria	<p>An introductory section of the permit application package, stating the Permittee's brief responses to each design criteria requirement of the regulations, and the location within the documents where the detailed demonstration is found would be acceptable.</p>	<p>A Memorandum titled, "<u>Introduction to Layon Landfill Solid Waste Facility Permit Application</u>" is attached.</p>	

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Groundwater Monitoring and Corrective Action	An introductory section of the permit application package, stating the Permittee's brief responses to each groundwater monitoring and corrective action requirements of the regulations, and the location within the documents where the detailed demonstration is found would be acceptable.	A Memorandum titled, " <u>Introduction to Layon Landfill Solid Waste Facility Permit Application</u> " is attached.
Closure	An introductory section of the permit application package, stating the Permittee's brief responses to each Closure requirements of the regulations, and the location within the documents where the detailed demonstration is found would be acceptable.	A Memorandum titled, " <u>Introduction to Layon Landfill Solid Waste Facility Permit Application</u> " is attached.
Post-Closure Care	An introductory section of the permit application package, stating the Permittee's brief responses to each post-closure care requirements of the regulations, and the location within the documents where the detailed demonstration is found would be acceptable.	A Memorandum titled, " <u>Introduction to Layon Landfill Solid Waste Facility Permit Application</u> " is attached.
General Comments	A summary of all response to comments from the February 2006 submittal to present from Guam EPA and USEPA must be addressed in the final document.	The Response to 2006 Review Comments is attached with a summary Memorandum.

USEPA

	Project Name: Layon Municipal Landfill Deliverable: Review of Books 1-5, Response to February 2006 Submittal EPA Review Comments, and Drawing Set. Date: March 17, 2009	Reviewer: CH2M HILL
Reference Page or Sheet No. Book 1	Review Comment	Response
General	<p>There appears to be at least one specification that is not included: Leachate Storage Tanks. Per the drawings, there are two 25,000 gallon epoxy-lined steel storage tanks to be installed. However, a specification for said tanks is not included. This will be required in order to procure the tanks for construction.</p> <p>A QC check should be performed to coordinate the plans with the specifications. This includes reviewing the specifications and comparing them for conformity with the construction drawings and geotechnical report recommendations as well as making sure that all CQA requirements are adequately required since there will not be a CQA Plan developed for this project. A few examples, which should not be construed as being a comprehensive list, include the following:</p> <ul style="list-style-type: none"> - The Table of Contents is missing several specifications that are actually included in the package. - Section 02055 Soils requires testing, but does not provide a frequency for such testing. - Section 02060 Aggregate requires source quality control testing, but fails to provide a frequency. 	<p>Concur, refer to section 13211 which includes steel tanks for water storage, leachate and the subdrain.</p> <p>Concur, further QC checks completed.</p> <p>TOC to be updated.</p> <p>02055-PART 2, Section 2.3, B. Testing frequency shall be 1-test for every 5,000cy of Imported material.</p> <p>02060-PART 2, Section 2.3, B. Testing frequency shall be 1-test for every 5,000cy of Imported material.</p> <p>02220-PART 3, Section C. Finished surface of liner subgrade shall be +/- 1-inch from design grades.</p> <p>02225-PART 2, 2.1, C. (after the 3rd sentence) The frequency of</p>

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Reference Page or Sheet No.	<p>Review Comment</p> <ul style="list-style-type: none"> - Section 02225 Low Permeability Soil Liner requires conformance testing of the soils (tests performed to qualify the materials). There is not a frequency called out for the source testing. Is it one test per source, one test per change in material type, one test per specific volume, etc.? - Section 02225 Low Permeability Soil Liner requires one test per 15,000 cubic yards...or a minimum of one test for the project. Based on the wording, this will be interpreted as only requiring one test for the project, making the volume-based frequency null. It should at least include a "whichever is greater" clause. - Section 02315 Excavation and Fill requires density testing for subgrade preparation (subsection 3.3) but does not specify as to what ASTM standard the density is based on. - Section 02320 Backfill provides requirements for Structural Fill, but nowhere within the specifications is there a definition for Structural Fill. 	<p>Response</p> <p>source evaluation tests shall be 1-test for every 5,000cy of low permeability soil liner material.</p> <p>02225-PART 3, 3.3, K, 3. At a minimum frequency of one test per 15,000cy of compacted soil liner, or a minimum of one test for the project, whichever is greater.</p> <p>02315-PART 3, 3.3, A. Subgrade preparation: Scarify the subgrade to 6-inch depth, moisture condition and compact to 90 percent of maximum dry density for clay soils and 95 percent of maximum dry density for limestone sand and gravel. Both tests shall be in accordance with ASTM D1557 Laboratory Compaction Characteristics of Soil Using Modified Effort.</p> <p>02315-PART 3, 3.3, B. Place fill material meeting the specifications in 8-inch loose lifts and compact to 95 percent of maximum dry density in accordance with ASTM D1557 Laboratory Compaction Characteristics of Soil Using Modified Effort.</p> <p>02320-The soil and aggregate types will be confirmed with definitions and coordinated between the specification sections.</p> <p>02640-rock specifications will be coordinated with the drawings.</p>

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Reference Page or Sheet No.	<p>Review Comment</p> <ul style="list-style-type: none"> - Section 02640 Slope Protection Rock provides a specification based only on weight, where the construction drawings call out rock dimension or type. - Section 02725 Polyethylene Landfill Pipe requires a cell classification (PE 4534) that is both overly restrictive and potentially not available. - Section 02751 Geomembrane provides requirements for "Air Pressure Testing", but fails to provide the most important criteria, maximum permissible pressure differential. Additionally, the same requirement makes reference to "as outlined in the project specifications...", thus referencing itself. - Section 02751 Geomembrane makes reference to thickness testing using ASTM D5199. This test method is for smooth geomembrane, and the site is using textured. Actual test method should be ASTM D5994. - Section 15530 Leachate Sump Pumps call out a different pump manufacturer and size than the construction drawings. - The geotechnical report requires maximum 6" loose lifts for soils, while the specs call out lifts up to 8" compacted - much thicker than the geotechnical report requires. 	<p>Response</p> <p>Amehr - Response pending.</p> <p>02725-the pipe specification will be verified.</p> <p>02751-the test method will be revised.</p> <p>15530-the specifications will be coordinated with the drawings.</p> <p>The specifications will be coordinated with the geotechnical report.</p> <p>Concur, the anchor trench material shall be onsite excavated material. Backfill, compaction and testing specifications will be added to the appropriate sections for 02055 Soils, 02060 Aggregate and 02320 Backfill.</p>

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	Interface friction angle testing must be included within the specifications to demonstrate that the interface strength between liner materials assumed within the geotechnical report are met with actual materials being proposed. This is a typical test required within California and throughout the US.	Concur, interface shear strength testing will be added to Section 02751 GEOMEMBRANE and 01400A CONSTRUCTION QUALITY CONTROL AND QUALITY ASSURANCE (For Landfill Liner System).
Book 2		
Design Narrative	<p>A QC check should be performed to coordinate the design narrative with both the plans with the specifications. This includes reviewing the narrative and comparing it for conformity with the construction drawings and geotechnical report recommendations. A few examples, which should not be construed as being a comprehensive list, include the following:</p> <ul style="list-style-type: none"> - Section 3.2 states that the criteria for grading earthwork is based on the recommendations contained in the geotechnical report. At least one recommendation is not followed -- the maximum lift thickness for backfill. Additionally, the design and narrative should be updated with respect to the revised geotechnical report. - Section 4.2.1, the floor grades stated do not reflect the grades in Cells 1 and 2, nor does the sump depth of 4 feet (more at 6 feet per the drawings). <p>Section 4.2.4, total cut and fill does not match up with totals in Table 1 of Appendix F.</p>	<p>The documents will be updated to coordinate with the lift thickness recommended in the Geotechnical Report, subsection 6.2.4, unless amended.</p> <p>The Design Narrative, subsections 3.2 and 4.2.1 will be updated to match the grading plans.</p> <p>Subsection 4.2.4 and Appendix F will be updated to match as appropriate.</p>
	The narrative and analyses do not provide backup as to why two 25,000 gallon tanks were chosen for the leachate storage system. Additionally, there are no P&IDs for the leachate sump pumps/tanks/recirculation controls, etc. In either the analysis or the construction drawings that demonstrate how the level sensors, flow meters, etc. interact with the	Tank sizes were selected to provide a reasonable volume for emergency / backup storage. The tank sizing was further reviewed with the pump and piping system designed to pump leachate to the Inarajan WWTP. It was determined the leachate sump provides 15-days, peak flow storage capacity and that 1-12,000gallon holding tank would be sufficient. Refer to the Addendum 1 Design

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	different areas of the leachate collection system.	Please refer to LCRS Design Memorandum, Section 5.5 for description of control system logic.
	The Final Supplemental Environmental Impact Statement included a mitigation measure to provide a secondary containment for the leachate storage tanks. This design was not included in Book 2 or the construction drawings.	The leachate tanks are located on the fill plug above the lined sump / cell area. The top plug surface will be sloped to drain towards the cells. An earthen berm will be installed at the perimeter to provide secondary containment for any release.
	Section 4.6, p. 11: The on-site hydraulic conductivity is reported to be "low" and equal to 0.005 cm/sec. This number may be a typographical error. It is equivalent to about 14 feet per day (ft/d). This is a typical hydraulic conductivity of sand, i.e., not a "low" conductivity. However, Appendix H reports a range of hydraulic conductivities of about 0.2 to 2 ft/d.	This is a typographic error. The statement is based on subdrain calculations in the 2006 submittal, documenting 0.0005 cm/sec typical hydraulic conductivity.
	A final leachate collection and treatment plan was not provided, nor does one appear to be available. This plan is needed to determine whether design and permitting needs for leachate collection and treatment are being met. This comment also applies to the Operations Plan.	A separate design project is ongoing concurrently for a sewerline from Sump 1 to the Inarajan WWTP. A pre-final submittal was made March 30, 2009 and review comments are expected back from Guam Waterworks Authority and GEPA.
Appendix C	The landfill gas generation and collection analysis states that collection is assumed at 75% of the estimated LFG generation. However, the analysis is actually for 70% of the estimated LFG generation.	A separate study is ongoing concurrently to clarify the leachate quality, determine if pretreatment is necessary and review the Inarajan WWTP for capacity to handle the additional flow. The Draft Report is due to be submitted June 22, 2009.
Appendix G – Leachate Volume & Collection	HELP Model Calculations – The HELP model calculations should be reviewed for compliance with respect to the current design. Some	The documents were updated to include discussion of the LCRS plan.
		The tables will be updated with the 75% collection. The resulting 6.7% increase in predicted collection volumes can be managed without revision of any components of the LFG system.
		The HELP model was updated and it was determined there are just minor differences in leachate flow. Refer to Book 2, Appendix G for

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Reference Page or Sheet No. Calculations	<p>Review Comment</p> <p>Quality Control issues include the following:</p> <ul style="list-style-type: none"> - using a 0.6 cm thick geocomposite instead of a 0.76 cm thick geocomposite for some of the analyses - Not including a SCS curve number for at least one of the analyses, and using different values for different scenarios, when only two should be used: one for the rain cap scenario and one for the cover soils - Using a barrier soil liner with a permeability of 1×10^{-5} cm/sec instead of 1×10^{-6} cm/sec per design - Using a floor slope length of 210 ft (64 meters) instead of 600 ft per the design - Using actual design effective saturated hydraulic conductivity for the analysis (1×10^{-3} m²/sec transmissivity, 300-mil thick geocomposite translates to 13 cm/sec geocomposite) - Using a Leaf Area Index of 5 for the rain cap scenarios (provides for too much evapotranspiration) - Using different ways of generating the SCS curve number - Using a 40-mil geomembrane rather than the designed 80-mil and 60-mil geomembrane. <p>Some of the values used yield more conservative results than using the actual design values. However, there are also some that reduce final results, such as assuming a Leaf Area Index (LAI) of 5 instead of 0 for rain cap scenarios. Changing to bare ground, or 0 for LAI, has the result of reducing evapotranspiration while increasing the quantity of water that makes it into the LCRS system. A quick analysis shows that it could increase flows to both the primary and secondary LCRS by up to 4%.</p> <p>While most of the cells within the landfill area are 2%, the slopes within Cells 1 and 2 are greater than 2%. This should either be modeled, or provide a demonstration that 2% is more conservative.</p>	<p>Response</p> <p>the Addendum 1 memorandum.</p> <p>The HELP model was updated and it was determined there are just minor differences in leachate flow. Refer to Book 2, Appendix G for the Addendum 1 memorandum.</p>

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	<p>Section 4.3.2 indicates an effective saturated hydraulic conductivity of 33 cm/sec was used, along with 0.60 cm thick drainage net. The effective saturated conductivity used is substantially greater than the designed saturated hydraulic conductivity for a 300-mil thick geocomposite (thickness obtained from supplier that can meet the 1×10^{-3} m²/sec transmissivity requirement).</p> <p>Page 19, after looking at the graph for Permanet geocomposite, the transmissivity of 1.8×10^{-4} m/sec cannot be found. It would appear that the value is over 8×10^{-4} m²/sec for 20,000 psf at 0.02 gradient.</p>	<p>The HELP model was updated and it was determined there are just minor differences in leachate flow. Refer to Book 2, Appendix G for the Addendum 1 memorandum.</p> <p>The HELP model was updated and it was determined there are just minor differences in leachate flow. Refer to Book 2, Appendix G for the Addendum 1 memorandum.</p>
Appendix H – Subdrain Design	<p>Section 5.1.1, p. 5-7: First method of estimating subdrain capacity: The methodology applied here is invalid. Volume of water is calculated using specific storage, which applies to confined aquifers only. By definition, if the water table is rising the aquifer is unconfined (i.e., pore spaces that were previously unsaturated are becoming saturated as the water table rises), and therefore specific yield should be used instead of the specific storage term ($S_s * \Delta h$). The volume should therefore be calculated by the following equation:</p> $Q = S_y * (A * \Delta h), \text{ where } S_y = \text{specific yield.}$ <p>Using specific yield = 0.02, the value used in Geomatrix's groundwater model (see Figure 5.3-7 of Integrated Hydrogeologic Assessment) yields a discharge rate of about 50 gpm. Furthermore, 0.02 is a relatively low value of specific yield. While the model was calibrated using this value, it is not unreasonable to assume a higher specific yield of around 0.10, which would result in calculated discharge of about 250 gpm using the approach of Section 5.1.1.</p> <p>It should be noted that this methodology is "over-conservative" as stated on page 8. It assumes that there is no change in rainfall recharge to the system once the landfill is constructed, and it assumes that the water table is already at the elevation of the subdrain prior to the onset of precipitation-induced water level rise. However, it is a reasonable</p>	<p>The Final Integrated Hydrogeologic Assessment, dated November 26, 2008, identifies 0.1 gpm (0.0045gpm/acre) as the flow in the subdrain system with Phase 1 construction and peak precipitation. Appendix H, Subdrain Design Memorandum, Subsection 5.1.2 selects a conservative groundwater flow per acre (entire site average) of 0.026gpm/acre as the design flow rate. Based on 22.4 acres in Cells 1 & 2 this computes to 0.6gpm (6x higher than the HG study Phase 1 flow).</p> <p>The subdrain geocomposite selected provides a factor of safety of approx 19.0 with the flow capacity equal to 11.4gpm.</p> <p>AMEC Geomatix submitted a Technical Memorandum, Conservatism in Subdrain Design – Layon Landfill Groundwater Modelling, dated April 6, 2009 to confirm the design has a factor of safety to accommodate flows well above the reasonable worst case scenario.</p> <p>The AMEC technical memorandum confirms the subdrain design is conservative to account for modeling uncertainty and acceptable as submitted.</p> <p>Appendix H includes a summary memorandum to confirm the acceptance of the AMEC Geomatix Memorandum and the Subdrain Design. A subdrain holding tank was added to the site</p>

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	approach to calculate an upper-bound on flow to the subdrain.	such that the subdrain liquid will be sampled and tested prior to controlled release.
	Section 5.1.2, p. 7-8: Second method of estimating subdrain capacity: As stated previously, calibration of models is non-unique and results in uncertain predictions. It was previously recommended that uncertainty of model parameters be incorporated into an uncertainty estimate of predictions. In response to the previous comments, we understand that the design would be sufficiently conservative and documented in lieu of performing an uncertainty analysis. Please see comments below.	Refer to response above.
	Section 5.2, p. 9: The consultant used a slope gradient of 0.02, while the designed slope gradient is more on the order of 0.029.	The analysis is based on the overall site minimum slope. Designing the system for 0.02 slope produces a conservative design since a geocomposite designed for 0.02 gradient will carry 45% more liquid at a slope of 0.029.
	Section 5.2: While it is stated that the design is relatively conservative, we have not seen sufficient documentation to address the uncertainties that have been brought up by this and prior reviews. For example: by using the possible value of 250 gpm as noted above along with the actual design slope of 0.029, it can be shown that the geocomposite chosen for the subdrain does not meet the required transmissivity. Using the consultant's methodology and possible flows of up to 250 gpm results in a transmissivity greater than $1 \times 10^{-3} \text{ m}^2/\text{sec}$, exceeding the published transmissivity of the chosen geocomposite, and provides no factor of safety.	The Final Integrated Hydrogeologic Assessment, dated November 26, 2008, identifies 0.1gpm (0.0045gpm/acre) as the flow in the subdrain system with Phase 1 construction and peak precipitation. Appendix H, Subdrain Design Memorandum, Subsection 5.1.2 selects a conservative groundwater flow per acre (entire site average) of 0.026gpm/acre as the design flow rate. Based on 22.4-acres in Cells 1 & 2 this computes to 0.6gpm (6x higher than the HG study Phase 1 flow). The subdrain geocomposite selected provides a factor of safety of approx 19.0 with the flow capacity equal to 11.4gpm.
		AMEC Geomatrix submitted a Technical Memorandum, Conservatism in Subdrain Design – Layon Landfill Ground water Modeling, dated April 6, 2009 to confirm the design has a factor of safety to accommodate flows well above the reasonable worst case

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	prevent rising groundwater from contacting the landfill liner.	Appendix H includes a summary memorandum to confirm the acceptance of the AMEC Geomatix Memorandum and the Subdrain Design. A subdrain holding tank was added to the site such that the subdrain liquid will be sampled and tested prior to controlled release.
Book 3 (former Book 4)		
Response to Comment: 5.3.5	<p>The geotechnical analysis must be updated to evaluate the currently designed liner system. The previously submitted report is based on the old liner configuration, and as such does not reflect, nor evaluate, the current design. The stability of the new proposed liner design cannot be verified and confirmed without some level of analysis of the current design.</p> <p>The specifications must include material-specific interface shear strength testing to verify assumptions made in the analyses.</p> <p>Response to this comment does not address the concern, in context of other interface strength parameters used in the analyses. The following are noted in the stability analyses:</p> <ul style="list-style-type: none"> – The consultant has chosen a "high-end" MSW shear strength 	<p>The design team has evaluated the new design and determined that the original geotechnical report and stability analysis is still valid. Refer to the A-Mehr, Inc. Technical Memorandum, Stability Analysis Review, Layon Landfill, Guam – Cells 1 and 2, dated March 2009.</p> <p>A summary memorandum is provided in Book 3b to confirm the USEPA acceptance of the Technical Memorandum.</p> <p>Refer to Specification section 02751 for the shear strength testing requirements.</p> <p>Refer to the attached A-Mehr, Inc. Memorandum, titled, "USEPA / CH2M Hill Comments on Geotechnical Report, dated April 3, 2009, 10-pages.</p>

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	<p>value (36 degrees, 38 degrees, 100 psf) rather than an average value, which would be more appropriate in this type of evaluation. Provide documented evidence that the value used is an "average" strength value for MSW or justification as to why the "high-end" value was selected.</p> <p>In addition, the clay/geomembrane residual (large displacement) interface shear strength used in the deformation analyses is not consistent with laboratory test results presented in the report. A value of 9 degrees and 500 psf was used in the analyses. A value of 7 degrees and 430 psf was reported in the laboratory results.</p> <ul style="list-style-type: none"> - An interface strength of 15 degrees and 250 psf is assumed for the geocomposite (geotextile)/textured geomembrane interface. However, as discussed in the report, a geomembrane with the smooth side up overlaid by a non-woven geotextile (or geocomposite) will be used along the sideslopes. The interface strength between the smooth geomembrane and geocomposite geotextile will be less than the interface strength for a textured liner. A revised strength value should be used along the slope interface. <p>All of these noted above will have a cumulative effect impacting static and pseudo-static (yield acceleration) stability.</p>	<p>Refer to the attached A-Mehr, Inc. Memorandum, titled, "USEPA / CH2M Hill Comments on Geotechnical Report, dated April 3, 2009, 10-pages.</p>

Book 3 (former Book 6)

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Section 1.3, SSGWMP	<p>Text states that the Groundwater Detection Monitoring Program (DMP) per Chapter 23 of Guam Solid Waste Regulations is "expected to include" monitoring for subdrain liquid, lysimeter liquid, and landfill leachate. The additional non-groundwater monitoring is not suited for inclusion in the DMP. This additional monitoring represents management of contained waste streams at the landfill, and would be more appropriately located within the Operations Plan. Note that the purpose of the DMP is to detect leachate leaks from the landfill liner system. Monitoring of the leachate itself is related to leachate disposal, which is an operational issue not related to environmental monitoring.</p>	Inclusion of subdrain, leachate and surface water in detection monitoring programs is common in California monitoring plans, and is proposed here for convenience of the site and regulators to have a unified monitoring and reporting system. Ultimately GEPA will specify how it wants the different media monitored and reported.
Section 5, SSGWMP	<p>It would seem that stream water monitoring would be more appropriate for the NPDES permit since this is a typical monitoring protocol for industrial SWPPPs.</p>	Ultimately GEPA will specify how it wants the different media monitored and reported.
Attachment 1, SSGWMP	<p>The Quality Assurance Project Plan (QAPP) for the BMP is provided as the QAPP for the Hydrogeologic Assessment with some Specific Modifications. The content of these two components is similar to EPA QAPP guidelines in terms of completeness, with the following exception: the Phase 1 BMP includes field measurements for groundwater parameters such as pH, SEC, temperature, OPR, turbidity, and total alkalinity. The Geomatix QAPP does not include information on field equipment performance criteria, calibration, maintenance, testing, and inspection. Quality requirements for the rest of the analyses can be specified by reference in the QAP for laboratory, but the quality requirements for the field measurements need to be included in the QAPP.</p>	<p>This issue will be addressed in the context of GEPA review of the permit application and monitoring program.</p> <p>Refer to the updated Site Specific Groundwater Monitoring Plan and attachments in Book 3A.</p>
Book 4 (former Book 3)		
Operations Plan General - Section 3.5	<p>The subdrain pipe is stated to be 4" diameter, while other documents show other sizes for the subdrain pipe.</p>	<p>The Operations Plan at its next revision will omit reference to pipe sizes which are controlled by the subdrain design memo and drawings.</p>

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	LCRS pipe systems have a tendency to clog, and there are typically considerations incorporated into the design and operations for cleaning of the piping systems. In general, this is performed using cleanouts on the upgradient end of the LCRS pipe. The text should provide justification as to why cleanouts are not considered for this project, and since they are not included, how the pipes will be periodically cleaned.	In our experience with 100 or more landfills, A-Mehr, Inc. has occasionally encountered leachate cleanouts provided by others, and inevitably found them impractical, unused and unnecessary. Leachate collection systems are designed with redundancy including oversized pipes and significant flow capacity in the gravel pack around the pipe. This discussion is not appropriate for the Operations Plan. Cleanouts were added to the LCRS system.
Section 3.8.4	The first sentence states that rain cap material should be installed on interim final slopes. This wording should be changed to "...must be installed" because the leachate collection system is designed around use of the rain cap to reduce peak leachate generation.	Done.
Section 5.8.1	The daily and intermediate cover may consist of low permeability materials (based on the local materials present from construction of the landfill). As such, if the cover material is not adequately broken up prior to placement of the next lift of waste over the cover, this could lead to leachate seeps, stability issues, and preferential flow of landfill gas. Suggest adding a requirement that if low permeability materials are used for daily or intermediate cover, then they should be scarified prior to placement of waste, similar to the procedures for breaking up the rain cap.	Sentence added to require bulldozer traversing over low-permeability soil used for daily and interim soil cover.
Closure and Post-Closure Plan	Document was reviewed; however there were no comments.	No response required
Book 5	Book 5 was not reviewed since it is more procedural than design-oriented.	No response required.
Construction Drawings		

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General	A QC check should be performed to coordinate the plans with the specifications. There are several drawings that do not have adequate coordination between specifications, for example, the definition of a Class 1 riprap, definition of riprap based on size rather than weight, definition of structural fill, the use of either mortar or grout for riprap (shouldn't be both), different LCRS pump types, and the lack of specification for leachate storage tanks. Additionally, the index to drawings does not match the drawing titles.	QC checks and document coordination work was completed.
L0.3	The drawings are missing details on how to construct the foundation for the 25,000 gallon tanks. What fill and compaction will be required beneath the tank foundation? What are the dimensions for the pad and saddles? Is there an enclosure for the pump controls and power supply? Where are the P&IDs? Where is the flow meter located? What does the enclosure at the top of the LCRS sump look like? Does it contain a vent for release of gas? Is there a manhole entrance? If so, how is it connected to the stainless steel riser? Are there pipe racks needed for any of the piping coming to or from the tanks? What type of pipe is needed from the sump to the tanks and from the tanks to the sewer system? There are still many construction details needed for the leachate pumping and storage system that must be included/resolved.	The design is revised to include 1-12,000-gal tank with duplex transfer pumps leading to the leachate sewerline. Refer to drawings L1.7, L2.9, 2.10 and P4-111.
L1.1	The call out for a "select clay soil" should be changed to Low Permeability Soil Liner Material to correspond with Specification 02225 Section 2.1 since there is no definition of "select clay soil."	Stockpiles shown in L0.3 are existing with reference to this project. They will be created under the roads and mass excavation project presently under construction. Select Clay Soil is defined in the specifications for the mass excavation project.
L1.3/L1.4	There is a potential problem with turning radius of haul vehicles at the intersection of the access road with the perimeter road. Truck turn templates show that trucks may not be able to make the turn without conflict with other traffic.	The turning radius was revised on the plans for the truck traffic.
	Benches should be graded to drain. As shown, there doesn't appear to be adequate information for a contractor to: 1) install the benches since there is no survey control; 2) install the downdrains, including the rather large culvert discharge apron (how do they interact with the benches?);	The benches will be widened to meet the GEPA regulations for 18-

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Reference Page or Sheet No.	Review Comment	Response
L1.4	and 3) build the 22' x 12' riprap apron (how deep? How will people drive over the apron when they need access to the floor, particularly to clean out the pond?).	ft width, refer to updated plans.
L1.4	Where is the detail for the pond structural fill? Shouldn't the berm being created be keyed into the underlying ground? Did the geotechnical engineer evaluate this area (south embankment) since there is 15 feet of fill that must be placed and could remain saturated? It would seem prudent to have an analysis performed on this embankment, and a detail generated, to eliminate the potential for washing out the berm.	The toe of fill embankments will follow detail 1/L2.1. Further review of slopes will be completed at the pond.
L1.5	There are no survey controls for liner grades. How will a contractor construct if not provided with survey controls? This is standard practice for all grading-type projects, landfills included.	Refer to Drawing L1.5 for the liner geometry and controls.
L1.5	Perforated leachate collection pipes are known to clog due to biological and chemical reactions. Standard landfill practice is to include cleanouts for the laterals and trunk lines to enable the owner/operator with the ability to flush out the lines if necessary. These should be included in the design.	Leachate collection systems are designed with redundancy including oversized pipes and significant flow capacity in the gravel pack around the pipe. However, cleanouts will be provided, refer to Drawing L1.8.
L1.7	The grading shown does not match the grading shown on Detail 4, Sheet L2.9, i.e. 3:1 versus 2:1 slopes.	The slopes will be corrected to be consistent.
L1.8	Sheet calls out for 4" and 6" subdrain pipe, while both the analysis and details show 2" subdrain pipe. The size of the subdrain pipe should be consistently stated and shown in the drawings.	The pipe sizing will be coordinated between the plans and details.
L2.1	The legend indicates that the contours shown are subgrade elevations. However, they are at the same elevation as the liner system, not 1 foot lower per design.	Grading on the sheet will be checked and modified as necessary to show subgrade elevations
L2.1	It is unclear where Detail 1 will be used.	Detail 1 applies to all embankments adjacent to existing ground.
	There does not appear to be adequate space for a future perimeter drain along the southwesterly edge of Section 4. Section 3 shows a relatively large concrete perimeter channel running along road. If this channel is	As indicated, Sections 3 and 4 are mutually exclusive ("with

	Project Name: Layon Municipal Landfill Deliverable: Review of Books 1-5, Response to February 2006 Submittal EPA Review Comments, and Drawing Set. Date: March 17, 2009	Reviewer: CH2M HILL
Reference Page or Sheet No.	Review Comment	Response
	consistent around the perimeter of the landfill, then there will not be enough room in Section 4. Also, applicable stationing should be provided for each section to confirm where each type of drainage feature (ditch or channel) should be applied.	channel" vs. "with no channel". All the roads and channels shown on these sheets are being constructed as part of the access roads and mass excavation project presently under construction; plans for that project specify which section applies where.
L2.4	Section 3, it is not clear how the width shown from the edge of the drainage channel closest to the road to the hinge point of the embankment can vary, considering there is a measurement of 26 feet that confines that dimension, and another of 14 feet that further confines that dimension within the 26 feet.	The channel being constructed as part of earthwork package is specified as 12' wide overall, fitting into the 26' width.
L2.6	Grouted riprap is based on size, where the specification is based on weight.	The riprap specification will be coordinated between the spec and plans and details. The riprap spec is now based on weight.
L2.6	Drawing calls out for a specific manufacturer's pipe, i.e. ADS, whereas the specifications simply call out HDPE pipe.	The reference to the manufacturer was deleted from the plans.
L2.7	Detail 1 shows a v-ditch that terminates at a rectangular catch basin. What is not clear is how the transition will be handled between the v-ditch and rectangular box. Additionally, it is not clear if the top of the catch basin is at road grade or at the bottom of the v-ditch. Further detail should be provided.	Top of basin is at road grade; transition from V-ditch to be formed In concrete wall of basin. The details will be reviewed and revised if necessary to clarify beyond normal contractor RFI.
L2.7	Detail 1, the depth from bottom of LCRS trench and bottom of subdrain trench should be greater than 1 ft considering the soil above it is at least 1 ft thick.	The 1' dimension on the detail should be 2'. The change will be made.
L2.8	Detail 4, there are several different sizes for the subdrain shown either on the drawings or from within the design, i.e. there is 4", 6", and 2" shown/discussed. The size of the subdrain needs to be clarified.	The subdrain pipes are to be 4" SDR-11 HDPE as shown on the drawings. Other documents will be updated.
L2.8	Details for subdrain say 2", while there are several different sizes for the subdrain shown either on the drawings or from within the design, i.e. there is 4", 6", and 2" shown/discussed. The size of the subdrain needs	The subdrain pipes are to be 4" SDR-11 HDPE as shown on L1.8 and the details of L2.7, other documents will be updated.

	Project Name: Layon Municipal Landfill Deliverable: Review of Books 1-5, Response to February 2006 Submittal EPA Review Comments, and Drawing Set. Date: March 17, 2009	Reviewer: CH2M HILL
Reference Page or Sheet No.	Review Comment	Response
L2.9	Is there a primary geocomposite that runs up the sideslope in Detail 4? to be clarified.	Yes, a note was added to the detail. The control point was deleted from L2.9, refer to L1.7.
L2.11	Detail 1 – the control point shown should correspond with the control point shown on sheet L1.7. Detail 3 calls out for 1/2" thick stainless steel pipe, while Section 4 calls out for 1/4" stainless steel pipe. Which is it?	The specifications, which control, call out Schedule 10S which is 0.25" wall. The 1/2 inch wall callout will be changed. The designer's experience is that above-grade collector pipes are highly likely to be destroyed during placement of refuse. For this reason the pipes have been placed in an 18" bed of gravel below the top of protective soil. It should be recognized that (1) potential flooding with water is a seasonal issue; (2) as stated in the LFG master plan, the horizontal collectors will be supplemented with vertical wells before the system becomes operational. Refer to L2.11 for details.
P4-111	Drawings refer to civil drawings for the reinforced concrete pad, but the civil drawings do not contain these details. Additionally, the incorrect drawings are being referenced on several details.	The tank foundation details will be provided, refer to L1.7 and detail 3/C3.1.
	The specifications call out a different pump control and power supply model as well as LCRS pump than what the drawings show.	The specifications include the pump and control requirements.

May 22, 2009
Reponses to GEPA Comments
Site-Specific Groundwater Monitoring Program Plan

BOOK 3
GEOTECHNICAL REPORT AND
WATER QUALITY MONITORING PLAN

GROUNDWATER PLAN – GENERAL

- A. Discussion shall be made on the implementation and schedule of groundwater monitoring plan for each type (ground water, surface water, subdrain discharge, and leachate) to ensure compliance with applicable regulations.

Response: Section 2.4.1 of the Draft Site-Specific Groundwater Monitoring Plan (SSGWMP) describes the Federal and Territorial (Guam) regulations applicable to groundwater monitoring at the Layon Municipal Sanitary Landfill (LMSL). The implementation activities and schedules described in the SSGWMP have been established to provide for compliance with applicable requirements of 40CFR Part 258, Subpart E, and Title 22, Chapter 23, Article 5 of the Guam Solid Waste Management Rules and Regulation. Applicable sections of the SSGWMP may be expanded to further describe how the proposed implementation activities and schedules comply with these regulations.

- B. The groundwater monitoring system (well designs, spacing, etc.) requires a number of signed statements from the designer that it meets the requirements of SWDRR Article 5 and 40 CFR 258.51.

Response: The monitoring well network currently described in the SSGWMP is expected to provide the baseline monitoring information necessary to design an effective monitoring network for the facility's subsequent Phase 1 detection monitoring program (DMP). Consistent with Section 23502, the current SSGWMP will include a statement by a Qualified Groundwater Scientist (QGS) regarding certification of the proposed Phase 1 baseline monitoring program (BMP) groundwater monitoring well network and a discussion regarding the appropriateness of the network with respect to the goals of the BMP.

Upon completion of the Phase 1 BMP and prior to implementation of the facility's DMP, a final groundwater monitoring well network suitable for the facility's Phase 1 DMP will be proposed and subsequently certified by a qualified groundwater scientist.

C. Discussion shall be made that represents the quality of groundwater passing the relevant point of compliance to verify compliance with SWDRR Article 5.

Response: Please see above "Response to Comment B" regarding certification of the BMP and DMP groundwater monitoring well networks by a qualified groundwater scientist (QGS).

D. At a minimum, groundwater samples for both the background determination and the semi-annual detection monitoring program must be analyzed for Appendix I constituents. Appendix II constituents shall be tested for during the 8-sample background determination.

Response: As requested, the SSGWMP will be modified to include 8 sets of analyses for all Appendix II constituents at all BMP groundwater monitoring points. Given that the Appendix I list is a subset of the Appendix II list, all Appendix I constituents will also be analyzed at each BMP groundwater monitoring point during each of the eight events.

The Phase 1 BMP has been designed such that any or all of the Appendix I constituents can potentially be employed as monitoring parameters during the subsequent DMP. However, for most modern landfill facilities, the Appendix 1 monitoring parameters are replaced by a list of more-effective site-specific monitoring parameters which are based on background water quality and anticipated leachate chemistry (a replacement process which is allowed for in both Federal and Guam regulations). It is therefore strongly recommended that the selection of DMP monitoring parameters be made only after the Phase 1 BMP is complete.

E. The method detection limits should be specified for each constituent and tested is low enough to characterize the groundwater with respect to groundwater monitoring standards.

Response: At this time, it is expected that laboratory testing of liquid samples will be conducted by the Test America facility in Denver Colorado. Test America's standard method detection limits (MDLs) will be included in the SSGWMP along with Guam's corresponding drinking water standards (MCLs). Based on a comparison of Test America's anticipated MDLs to Guam drinking water standards, we expect that, using the currently proposed laboratory methods, seven of the more than 200 total analytes proposed for the project will have MDLs which slightly exceed Guam drinking water standards. These constituents are as follows:

- Benzo(a)anthracene, MDL = 0.35 ug/L, MCL = 0.1 ug/L;
- Benzo(k)anthracene, MDL = 0.460 ug/L, MCL = 0.2 ug/L;
- Benzo(a)pyrene, MDL = 0.31 ug/L; MCL = 0.2 ug/L;
- Chrysene, MDL = 0.54 ug/L, MCL = 0.32 ug/L;
- Indo(1,2,3-cd)pyrene, MDL = 0.65 ug/l, MCL = 0.4 ug/L;
- Pentachlorophenol, MDL = 20 ug/l, MCL = 1 ug/L;
- 1,2-Dibromoethane, MDL 0.18 ug/L, MCL = 0.05 ug/L;

It should be noted that current landfill regulations do not require that MDLs used for DMP be below drinking water MCLs. In the event that it is required that all MDL be below MCLs, it will be necessary to incorporate additional specialized laboratory methods that are not currently accounted for in our cost proposal. Such changes will also require the collection and shipping of substantial extra liquid volumes to the mainland laboratory, which will also likely increase costs substantially.

F. *It is noted that determinations of groundwater flow conditions presented and discussed in the subject document are based on a potentiometric surface map of the landfill area constructed from water level elevations collected in July 2007. A more thorough understanding of preconstruction groundwater gradient would result through the analysis of additional potentiometric surface maps that depict any seasonal changes in groundwater conditions. In addition, it is recognized that construction of Phase one cells (cells one and two) will modify groundwater flow conditions to some extend in the vicinity of those cells. Therefore, it is critical that the Phase one groundwater plan adequately characterizes post construction groundwater conditions and establishes background for that phase of construction. As indicated in the plan, Phase one background conditions will be used to develop the detection groundwater monitoring plan for Phase one cells.*

Response: We concur that accurate characterization of groundwater flow directions throughout the year is of critical importance to the project. To this end, the Phase 1 BMP will include the monthly measurement of depth to groundwater data from up to 30 on-site groundwater wells, as well as, the collection of water level data from pressure transducers placed in 13 BMP monitoring wells. Contour maps will be prepared for the site on at least a monthly basis during the BMP.

G. *Because post-Phase one construction groundwater flow conditions are largely unknown, Guam EPA recommends that monitoring wells MW-15 and MW-16 be included in the baseline groundwater monitoring network to help define those conditions. In addition, the hydrogeologic study conducted at the site conclude that vertical groundwater gradients are consistently downward*

beneath the footprint. Potential impacts from cell construction activities to the upper sections of the saturated zone to baseline conditions of the underlying portions of the groundwater need to be characterized. It is therefore recommend

Response: The SSGWMP will be updated to include baseline monitoring of monitoring well MW-15. It should be noted that monitoring well MW-15 is located within the landfill footprint and therefore will likely be decommissioned prior to completion of the BMP.

Monitoring well MW-16 is located in an area of ongoing construction activities and was therefore recently decommissioned. The well will therefore not be monitored as part of the BMP.

It should be stressed that the vertical gradients reported for site monitoring wells are small and represent only one component of the overall gradients. Horizontal components of groundwater flow at the site are orders of magnitude greater than vertical components. The SSGWMP for the Phase 1 BMP includes monitoring of groundwater elevations in 5 sets of shallow深深 well pairs near the Phase 1 area. This should provide substantial additional information regarding gradient components, both vertical and horizontal. This information will be integrated into the design of the monitoring network for the subsequent Phase DMP.

H. Because it has been determined during the hydrogeologic study that vertical hydraulic gradients are consistently downward beneath the footprint, Guam EPA expects that deep monitoring wells will need to be included during the subsequent Phase 1 detection monitoring plan.

Response: As noted in a previous response, data from 5 pairs of deep/shallow well pairs will be collected during the Phase 1 BMP. These data should provide clear indication regarding the magnitude and significance of vertical gradients in the vicinity of Phase 1.

The proposed Phase 1 BMP scope has been modified so that sufficient data will be collected to allow any or all of the deep monitoring wells to be retained as compliance monitoring wells in the subsequent DMP. However, we strongly recommend that the actual Phase 1 DMP monitoring wells be selected only after the Phase 1 BMP data is collected and fully evaluated.

I. Guam EPA will be providing the actual recommended sites of two new monitoring wells and the deletion of the proposed MW-14A from the network

Response: According to the Hydrogeologic Characterization Report by Geomatrix (Page 22), Monitoring Well MW-14B, rather than MW-14A, suffers from a partial obstruction (grout). We therefore anticipate deleting deep well MW-14B from the Phase 1 BMP, rather than shallow well MW-14A.

Monitoring well MW-14B will be replaced in the BMP by a proposed new monitoring well (MW-14BR) which will be located approximately 10 feet from monitoring well MW-14A. At the current time, we also anticipate installing a second "new" upgradient deep monitoring well near existing shallow groundwater well TG-3 (a.k.a MW-3). We will be pleased to consider any alternative locations recommended by GEPA for these two new upgradient wells.

J. P.4-8 Sec 4.4.1: Should not say concentration "Near or At Zero", should say "Non-Detect at MDL"

Response: The phrase "at or near zero" as used on Page 4-8 of the SSGWMP refers to the expected detection frequency, not the expected concentration. The phrase is respectfully therefore considered appropriate as written.

K. P.4-9: Need to define "significant concentrations".

Response: This comment is no longer relevant given that all analytes from the "Trace Organics Plus Cyanide" Group will be analyzed during each of the eight monitoring events, rather than just the first event.

L. P.5-2: 4 WQ monitoring of events should occur after "significant" rain events to document conditions. "No Flow" should not equal "sample" should reschedule to get sample because of only 4 total proposed.

Response: Stream water sample collection activities for the baseline monitoring program will be conducted during four of the twelve regularly scheduled monthly monitoring events. Stream water sampling stations will be established and if necessary re-established, such that at least four sets of liquid samples are collected for analysis over the baseline monitoring period. Attempting to "time" Phase 1 BMP monitoring events relative to significant rain events is considered impractical.

M. Ground water and Monitoring Plan and QAP to comply with Article 5 Section 23501(c)(4).

Response: Section 23501(c)(4) requires that the facility comply with Section 23502 through 23506 prior to placement of waste within the landfill. The timing of Phase 1 BMP implementation and of initial waste disposal is contingent on a number of factors, many of which are beyond our control. The SSGWMP describes a one-year long, predisposal baseline monitoring and reporting program for Phase 1 which, if completed prior to waste disposal, should allow the facility to fulfill the requirements of Section 23501.

N. Leachate Treatment and Disposal - GWA Inarajan WWTP is not capable of accepting leachate without pretreatment

Response: The leachate quality characterization analyses described in the SSGWMP are limited to only those activities considered necessary to support the selection of effective site specific-groundwater monitoring parameters for the facility. Sample collection and analysis necessary to support leachate disposal/management decisions e is beyond the scope of the SSGWMP, and is considered to be more appropriately addressed in the facility's operation plan.

O. States that if initial observations regarding stream flow conditions indicate that insufficient flow exists to enable water quality sampling, that the surface monitoring station will be excluded from further sampling attempts during the baseline monitoring for Phase one. Guam EPA recommends that this statement be amended to indicate that consideration will be giving to the inclusion of additional surface water monitoring station as replacements for any stations that may not have adequate flow at any given time.

Response: As noted in response to comment "L" above, stream water sample collection activities for the Phase 1 BMP will be conducted during four of the twelve regularly scheduled monthly monitoring events. Stream water sampling stations will be established and if necessary re-established, such that at least four sets of liquid samples are collected for analysis over the course of the baseline monitoring period.

P. The report describes the collection of depth to static water level measurements that will be collected during the baseline monitoring. Guam EPA recommends that such water level monitoring be conducted using pressure transducer and data logger. Automated SWL data collection provides a much more reliable and continuous record of water level fluctuations than measurements collected manually.

Response: The Phase 1 BMP will include continuous monitoring of water levels in 13 groundwater monitoring wells using dedicated pressure transducers.

A-MEHR, INC.
Memorandum

April 3, 2009

TO: Tor Gudmundsen, P.E.

FROM: Ali Mehrzarin, P.E. *M. Ali M.*

RE: USEPA / CH2M-Hill Comments on Geotechnical Report

Our recommended responses to the comments received relative to Book 3 of the December 2008 submittal are presented below, following the text of each comment. Our Technical Memorandum dated March 2009 containing an updated stability analysis is attached.

Comment 1: *The geotechnical analysis must be updated to evaluate the currently designed liner system. The previously submitted report is based on the old liner configuration, and as such does not reflect, nor evaluate, the current design. The stability of the new proposed liner design cannot be verified and confirmed without some level of analysis of the current design.*

Response: The design team has evaluated the new design and determined that the original geotechnical report and stability analysis is still valid. In order to provide clear documentation and incorporate the revised cell sequencing (south to north), we have prepared the attached memorandum including updated stability analyses.

Comment 2: *The specifications must include material-specific interface shear strength testing to verify assumptions made in the analyses.*

Response: The following additions will be incorporated into project specifications, section 02751:

Interface Shear Testing

Interface shear testing shall be performed on samples of textured HDPE in accordance with ASTM D5321. Strain rates shall not exceed 0.04 inch per minute and tests shall proceed to a minimum shear displacement of 3.0 inches. The frequency of testing shall be one set of tests for each of the following interfaces:

1. 60-mil textured geomembrane / low permeability soil
2. 60-mil textured geomembrane / geocomposite
3. 80-mil textured geomembrane / geocomposite

Interface shear testing shall be performed at the following normal stresses:

2,000 psf
5,000 psf
10,000 psf
15,000 psf

Low permeability soil used in interface shear testing shall be taken from stockpiles of material used to construct low permeability soil liner in accordance with Section 02225. Low permeability soil shall be compacted to a minimum 95 percent of maximum dry density, at 4 percent above optimum moisture content per ASTM D698 (Standard Proctor).

Geocomposite and geomembrane used for testing shall be from material that will be used for this project and shall comply with applicable specifications.

Before shearing, the interface materials shall be consolidated under the confining pressure for at least 48 hours. Shear tests shall be performed under wet conditions at a shear rate of no more than 0.04 inch per minute.

Minimum interface shear strength parameters shall be as set forth below:

Interface Materials	Normal Stress (psf)	Required Large-displacement Shear Strength at 3.0 inches Displacement
60-mil textured geomembrane / low permeability soil	2,000	817
	5,000	1,292
	10,000	2,084
	15,000	2,876
60-mil textured geomembrane / geocomposite	2,000	726
	5,000	1,590
	10,000	2,929
	15,000	4,268
80-mil textured geomembrane / geocomposite	2,000	785
	5,000	1,580
	10,000	2,929
	15,000	4,269

Comment 3 (related to response to 2006 comment 5.3.5): *Response to this comment does not address the concern, in context of other interface strength parameters used in the analyses. The following are noted in the stability analyses:*

- *The consultant has chosen a "high-end" MSW shear strength value (36 degrees, 38 degrees, 100 psf) rather than an average value, which would be more appropriate in this type of evaluation. Provide documented evidence that the value used is an "average" strength value for MSW or justification as to why the "high-end" value was selected.*

Response: The values used are in fact conservative ("low-end") based on our experience. This comment, like the original comment on which it is based, relates to one of the significant gaps in the materials science of solid waste landfills. Virtually all the data typically used in stability analyses of refuse slopes was derived from tests and observations of landfills constructed and filled prior to implementation of Subtitle D. Since that time the character of municipal solid waste has changed significantly due to the prohibition of liquids, elimination of industrial sludges, and removal of recyclable materials. As a result, the refuse shear strength parameters often used in stability analyses based on the pre-Subtitle D literature are no longer applicable.

Like all engineers with significant field experience in solid waste landfills, we have observed numerous refuse slopes standing at well in excess of 45 degrees. Over the years we have worked on and documented: at least three 1:1 (45 degrees) refuse slopes as high as 70 feet standing for periods of months at a site in Los Angeles County; a near-vertical slope over 20 feet high exposed for a month or more during a liner tie-in during one of our projects in San Diego County; a 1:1 refuse slope up to 100 feet high during liner tie-in projects at a site in Hawaii; and a refuse slope excavated at 45 degrees at another Hawaii site to repair a leachate system.

Other professionals and academicians active in the industry have made these kinds of observations and recognized the inadequacies of the present knowledge in this field. We have discussed the issue with professors at the University of California at Irvine, University of Hawaii, and Arizona State University. The Department of Civil and Environmental Engineering at Arizona State is currently a major participant, along with the University of California at Berkeley and the University of Texas at Austin, in a multi-year collaborative research project sponsored by the National Science Foundation on the *Static and Dynamic Properties of Municipal Solid Waste*. Based on our conversations with the principal researcher at ASU, we expect this study to provide an updated set of

shear strength parameters that more closely match the results we observe in the field.

Based on our discussions with experts in the field, our practical experience, and on our observation of existing refuse slopes in Guam, we are quite comfortable with the prudent parameters selected for the stability analysis.

- *In addition, the clay/geomembrane residual (large displacement) interface shear strength used in the deformation analyses is not consistent with laboratory test results presented in the report. A value of 9 degrees and 500 psf was used in the analyses. A value of 7 degrees and 430 psf was reported in the laboratory results.*

Response: This comment relates to test results for bentonite-amended soil, which is no longer part of the project.

- *An interface strength of 15 degrees and 250 psf is assumed for the geocomposite (geotextile)/textured geomembrane interface. However, as discussed in the report, a geomembrane with the smooth side up overlaid by a non-woven geotextile (or geocomposite) will be used along the sideslopes. The interface strength between the smooth geomembrane and geocomposite geotextile will be less than the interface strength for a textured liner. A revised strength value should be used along the slope interface.*

Response: Lined sideslopes in Cells 1 and 2 have a maximum height of approximately 10 feet and are not significant factors in the slope stability analysis. To demonstrate this, we ran an analysis of the case with the lowest static safety factor, with parameters on the slope for a geocomposite/smooth HDPE interface (14 degrees and 50 psf). The static factor of safety remained at 2.16 and the pseudostatic yield acceleration was computed at 0.21 g, compared with 2.2 g for the base case. The difference is negligible, demonstrating that the analyses as presented in the Technical Memorandum are appropriate. The analytical results for the two example cases are attached in Attachment A.

Comment 4 (related to response to 2006 comment 5.3.8): *Response to this comment does not address the concern. Results of yield analysis indicates less than 1 inch of displacement for a 150 feet tall landfill subjected to a Magnitude 8 earthquake with base accelerations of 0.6g and 0.7g. This displacement was checked using simple calculations using the Makdisi and Seed Permanently Displacement Chart (Makdisi and Seed, 1978). Using the reported yield accelerations of 0.2g indicates much greater displacements. In order to determine adequacy of the analysis, all backup for the site-specific response analysis must be provided.*

Tor Gudmundsen, P.E.
April 3, 2009
Page 5

Response: The inputs to the Shake-91 computer program used to develop the displacement-yield acceleration curves are described in detail in Section 5.3.7 of the 2006 Geotechnical Report. The detailed acceleration input and output data are contained in the compressed electronic file "SHAKE Output and Acceleration Files" transmitted with this memorandum. The inputs and outputs for analyses of yield acceleration are contained in Appendix E.3 of the 2006 report and Appendix C of the attached Technical Memorandum dated March 2009.

SUMMARY OF REVIEW COMMENTS 2006 - PRESENT

TG ENGINEERS, PC

May 22, 2009

MEMORANDUM

To: Conchita Taitano, GEPA
From: Tor Gudmundsen

RE: SUMMARY OF RESPONSE TO REVIEW COMMENTS, 2006 to PRESENT, LAYON MUNICIPAL SANITARY LANDFILL, GUAM

The following is provided as a summary of the response to review comments received for the Layon Landfill design project.

1.0 Review Comments Received

1.1 2006 Comments – Response issued December 24, 2008

- GEPA (18-pages)
- USEPA / CH2M Hill (34-pages)

1.2 2009 Comments – Response issued April – May 2009

TGE Team Response to Comments – 4/21/2009

Submittal No. 1 – April 21, 2009

- Technical Memorandum from AMEC Geomatrix, Conservatism in Subdrain Design, Layon Landfill Groundwater Modeling
- Technical Memorandum from Amehr, Inc., Stability Analysis Review

Submittal No. 2 – May 05, 2009

- Addendum 1, Leachate Collection & Removal System Design

Updated TGE Team Response to Comments – 5/22/2009

May 22, 2009

The 2006 and updated 2009 comment response documents are included in the May 22, 2009 submittal with Book 5. Submittal 1 & 2 Documents listed above were documents to address specific comments as titled and have been incorporated into the design documents as appropriate.

RESPONSE TO 2006 REVIEW COMMENTS

T G ENGINEERS, PC

December 24, 2008

Ms. Lorilee T. Crisostomo
Administrator
Guam Environmental Protection Agency
15-601 Mariner Avenue
PO Box 22439
Barrigada, Guam 96931

Mr. Christopher Lund
Senior Project Engineer
GBB Receiver
542 North Marine Drive
Upper Tumon, Guam 96913

**RE: PRE-FINAL DESIGN SUBMITTAL, ENTRANCE AREA FACILITIES AND
CELLS 1 & 2, MUNICIPAL SOLID WASTE LANDFILL, LAYON,
INARAJAN**

Hafa adai Administrator Crisostomo and Mr. Lund,

Attached please find Part 2 of 2 for the Pre-Final Design Submittal for the Layon Landfill project. The design submittal is a component of the Guam EPA SWMF Landfill Permit application and submitted together to facilitate the project design and permitting review. The Part 2 submittal includes the following.

- Book 4 – Operations Plan and Closure & Post-Closure Plan
- Book 5 – Guam EPA MSW Landfill Permit Application with attachments
- Response to 2006 Pre-Final Submittal Review Comments

We note the 2006 list of comments included 2-documents as follows.

- USEPA letter Dated may 04, 2006, (2-pages)
- CH2M Hill Technical Memorandum 8, Dated May 03, 2006, revised June 30, 2006, (76-pages)

The comment response is issued as 2-documents.

- Response to USEPA and CH2M Hill Comments, (34-pages)
- Comment Response – Operations Plan, Closure and Post-Closure Plan, (18-pages)

We note the response to comments for the Geotechnical Report and Water Quality Monitoring Plan are in progress and will be submitted separately the week of Jan 05, 2009.

For this submittal we are issuing numbers of copies of the documents as follows.

GEPA – 3

DPW – 2

USEPA – 3

In addition the complete submittal will be posted to the GBB website and available to download from there.

We look forward to your review and working through review comments such that the final design and submittal can be completed on schedule and ready for permitting and construction.

Please contact me at 647-0808 with any comments or questions.

Si Yu'os Ma'aase,
TG Engineers, PC



Tor Gudmundsen, PE
President

Cc:

Mr. Ali Mehrazarin, Amehr, Inc.

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- **RESPONSE TO USEPA AND CH2M HILL COMMENTS**

- **COMMENT RESPONSE – OPERATIONS PLAN (34-pages)**
CLOSURE AND POST-CLOSURE PLAN (18-pages)

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Layon Municipal Sanitary Landfill
Project No. SWMD-09-02

RESPONSE TO FEBRUARY 2006 SUBMITTAL REVIEW COMMENTS - 1

RESPONSE TO USEPA AND CH2M HILL COMMENTS

Response to CH2M-Hill Comments

EPA LETTER – MAY 4, 2006

1) Alternative Final Cover and Side-Slope Liner System - the alternative final cover and side-slope liner systems have been selected but there is a general lack of technical analysis to support their selection. Most importantly, the HELP modeling analyses need to be robust and able to demonstrate that the proposed alternative systems will perform equal to or better than the prescriptive systems.

The basic setup of the HELP model scenarios and input parameters do not reflect the proposed landfill design. As presented, the HELP modeling does not verify that the proposed liner system will be constructed in accordance with Section 23401 of Guam EPA Solid Waste Disposal rules and regulations, specifically maintaining less than a 30 cm depth of leachate over the liner system.

It is important to note that the results of the HELP modeling will also have an impact on the design of the Leachate Collection and Removal System including blanket drain, pipe, sump, and pump sizing as well as tank/lagoon sizing for leachate management.

Response: HELP modeling of the selected alternative liner system and design calculations for liner and LCRS components are contained in Appendix G, Leachate Calculations technical memorandum.

2) Beneficial use of groundwater/surface water - The design documents do not provide information about potential beneficial uses of groundwater or surface water around the landfill area. This information should be discussed in the permit documents along with references to demonstrate that the proposed liner system will be protective of groundwater/surface water.

Response: This topic is addressed in the final hydrogeologic model report by GeoMatrix.

3) Wetland Impacts - The design does not provide an analysis of the potential impact to the wetlands due to installation of both surface and sub-drain systems, which will remove a substantial amount of surface and subsurface drainage. The analysis is required to demonstrate that the proposed sub-drain design complies with the requirements of Guam EPA rules and regulations Section 23203.a.3, (i.e., that the landfill will not cause or contribute to the significant degradation of wetlands).

Response: This topic is addressed in the final hydrogeologic model report by GeoMatrix.

4) Leachate Collection and Removal System (LCRS) - The current design does not contain detailed calculations/design of key LCRS components, e.g., tanks, control systems, etc. Due to high rainfall amounts for Guam, these items are critical for effective management of leachate. The landfill should not begin operations without these systems in place, therefore it would be difficult to permit the landfill for operation without a complete design that of the entire leachate management system, including both storage and proposed leachate recirculation.

Response: Leachate system design calculations are included in Appendix G. Leachate recirculation is no longer a part of the plan, and design work is under way for a pipeline that will carry leachate to the Inarajan Treatment Plant.

6) Technical Specifications not included - Critical technical specifications are not included in the design documents and must be completed. For example, there are no technical specifications for the Composite Drainage Net or the Leachate Collection and Removal System components.

Response: Additional specification sections have been added.

7) Quality Assurance - A Construction Quality Assurance Plan needs to be developed to demonstrate that construction will remain in conformance with appropriate rules and regulations.

Response: The Construction Quality Assurance (CQA) Plan is integrated with the Technical Specifications, and contains all necessary CQA procedures. This form of combined document was developed to eliminate wasteful duplication of effort in separate specification and CQA documents, and ensure that contractors and CQA consultants have consistent information. It has been approved by the California Regional Water Quality Board, and has been used on numerous landfill construction projects in Hawaii and southern California for over six years, including projects with extremely complex double composite liner systems. USEPA has concurred this approach is acceptable for this project.

CH2M HILL MEMORANDUM, MAY 3, 2006 REVISED JUNE 30, 2006.

COMMENT	2006 RESPONSE	2008 RESPONSE
Page 2 BOOK 1 Technical Specifications		
Specifications that did not appear to be present include: Riprap for energy dissipaters; Composite Drainage Net (or Geocomposite); Stormwater Drainage System, such as concrete specification, grout, riprap, etc.; Leachate Tank; Leachate Pumps; Leachate Pump Package Control System; Leachate Collection and Removal System Riser Pipe (pipe type, HDPE flatstock, fasteners, etc.); Landfill Gas Condensate Sumps and associated Pneumatic Pumps; Landfill Gas Compressed Air Supply for pneumatic pumps; Landfill Gas Collection System Piping	If absent, sections will be added. If included in related sections, appropriate cross-references or statements in scope definitions will be added.	Specifications for riprap, concrete and other elements of stormwater control systems are contained in the civil specifications sections. The following new sections have been added to the landfill facilities sections: 02725 Polyethylene Landfill Pipe 02730 Leachate Collection Riser Assembly 02735 Landfill Gas Collection System Components 02754 Rain Cap 15530 Leachate Sump Pump 15540 Liquid Level Pressure Sensor 15545 Three-Point Level Sensor 15550 Pump Control Panel 15560 Leachate Flow Meters 15570 Breakout Junction Box Refer to Book 1A and 1B.
In general, all specifications should include a References section under Part 1, General that show the standards that the materials/finished product must meet. There are some that do not include this section	As written the specifications provide adequate information for bidding and construction. The requested sections will be added for clarity as requested.	The requested sections have been added.
It is unclear where the backfill requirements for anchor trenches are located.	Please see section 02230 Anchor Trench Excavation and Backfill	Please see section 02320 Backfill and section 02751 Geomembrane.
Page 3 Section 02225 Low Permeability Soil Liner		

Part 3.2.E should include testing using a Sealed Double Ring Infiltrometer (SDRI). This test is the standard practice throughout the US and demonstrates the large-scale permeability of the soil liner.	A-Mehr, Inc. does not concur that this "standard practice" is useful, and it is not normally required in southern California or Hawaii. The Two Stage Borehole Procedure (ASTM D6391) is specified as a more practical test for this project.	With the replacement of the bentonite amended clay liner by a 10^{-6} cm/sec soil liner of on-site soils, the need for a test pad has been eliminated. Hydraulic conductivity by ASTM D5084 will be required.
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Page 3

Part 3.4.E, hydraulic conductivity of the in-place liner must be verified using undisturbed samples collected during construction and tested in accordance with ASTM D5084. While BAT testing is generally a good indication of permeability in the field, laboratory testing of undisturbed samples provides the greatest accuracy and level of confidence.	There are no laboratories in Guam capable of testing using the ASTM D5084 procedure. As a substitute we have specified use of the Two Stage Borehole Procedure (ASTM D6391) in addition to BAT testing of field permeability	There are no laboratories in Guam capable of testing using the ASTM D5084 procedure. Shelby tube samples will be taken and shipped to qualified laboratories in Hawaii for D5084 testing in addition to in-situ BAT testing.
Part 3.4.K must include permeability testing of undisturbed samples using ASTM D5084.	Please see above.	This requirement is incorporated in the specifications and CQA Plan.
Section 02240 Gravel Drainage Media This section must be revised to reflect the design narrative to exclude carbonaceous limestone gravel from the LCRS.	The additional requirement will be added.	The additional requirement has been added. Section 02240, Part 2, section 2.01 Materials.
Section 02571 Geomembrane Part 2.E, suggest allowing QAC or designated representative to obtain conformance samples from the manufacturing plant prior to shipment. This will expedite the testing process, will reduce costs associated with sample shipment from Guam, and will allow the Installer to begin installation much quicker than having to wait for conformance test results while on-island.	Agreed—this change will be made.	This change has been made. Refer to section 02751 Geomembrane, Part 2, section 1.03 Conformance testing.

Page 4

<p>Part 3.9 should include provisions for restricting seaming operations during inclement weather, i.e. rain and high winds. Both rain and wind can affect the integrity of the welds</p>	<p>These conditions are commonly understood to preclude liner installation. Additional language will be added to the specifications to formalize universal industry practice.</p>	<p>Additional language has been added to the specifications to formalize universal industry practice. Section 02751, Part 3, section 3.3.1 Deployment Weather Conditions.</p>
<p>Part 3.12, destructive tests should be obtained every 500 linear feet (most common testing increment). This will provide a greater level of confidence that the seams meet the minimum requirements</p>	<p>A-Mehr, Inc. disagrees. Each destructive test requires a geomembrane repair, creating a potential weak spot in the liner. In our opinion, 1,000 feet is an appropriate balance between the need for effective testing and a minimum number of seams and repairs.</p>	<p>This change has been made. Refer to Section 02751, Part 3, section 3.11.2 Location and Frequency.</p>
<p>Book 2 Design Narrative</p> <p>Section 4.5.1 indicates that two alternatives for the LCRS were evaluated. However, only one set of HELP model calculations were performed, and that was on the gravel LCRS. Thus, the proposed LCRS system was not adequately modeled. See discussion regarding Appendix G below.</p>	<p>The HELP model analysis for the gravel LCRS produced the estimate of maximum leachate generation. The computations contained in the calculation appendix evaluated the performance of the geocomposite LCRS using the same leachate generation, with significantly greater precision than the HELP model is capable of.</p>	<p>Please see Appendix G for complete HELP Modeling of the alternative liner system as currently configured.</p>
<p>Section 4.5.1 indicates the use of geotextile on sideslopes. This was not modeled and cannot be considered until it has been shown to meet the regulatory requirements, i.e. allowable head over the liner. See discussion regarding Appendix G below.</p>	<p>An equivalent computation will be included in an updated design narrative.</p>	<p>Geocomposite is presently specified for installation on sideslopes.</p>

Page 5

<p>There should be a narrative discussing the adjacent wetlands. It was our understanding that the Wetlands Mitigation Plan would be developed during this phase of work. The findings of the wetlands investigation should be summarized in the design narrative.</p>	<p>Additional narrative will be added after completion of the supplemental hydrogeologic studies being undertaken by GeoMatrix Associates.</p>	<p>The landfill footprint was modified to avoid encroachment into wetlands. As such, there is no longer a Wetland Mitigation Plan required for encroachment. The Final Integrated Hydrogeologic Assessment was completed for the site and issued 11/26/2008. The design follows the assessment's</p>
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		<p>recommendations for proper stormwater management to largely mitigate potential indirect wetland impacts.</p> <p>Monitoring of wetlands is planned to determine if indirect impacts occur and mitigation would be required. Appropriate mitigation would be determined based on future impacts that might occur.</p>
There should be an analysis performed for the sizing of the pond outfall/orifice plate, pipe, and spillway.	Additional design calculations will be documented in the design narrative.	Additional design calculations are documented in Appendix B, Hydrology Calculations.
An analysis must be performed to demonstrate that the landfill complies with the floodplain requirements of Guam Rules and Regulations §23202.	The discussion will be added, based on previous site selection study analyses	This issue was addressed in the original site selection study analyses. Refer to the Final Site Selection Report and Final Supplemental Environmental Impact Assessment.
The narrative and analyses should include the entire leachate collection and removal system, including leachate tanks/lagoons, leachate piping to tanks/lagoons, control systems, P&ID for leachate sump pumps/tanks/recirculation controls, etc. The landfill cannot begin operation until adequate measures have been taken to control leachate immediately	Additional detail will be added.	<p>Please see Appendix G, Leachate Calculations for a description of the leachate handling system and related calculations.</p> <p>The current plan is to pipe the leachate to the Inarajan Wastewater Treatment Plant (WWTP). A study and design are beginning for the piping system and WWTP upgrades required. This will be submitted separately.</p>
There should be an analysis performed for soil loss using, at a minimum, the Revised Universal Soil Loss Equation to demonstrate that there will not be adverse erosion (at most 2 tons/acre/year) due to site construction/operations.	This analysis will be added to the report.	The soil loss calculations and analysis are included in the SWPPP for the Operations Road and Mass Grading for Cells 1 & 2.

<p>Section 3.2, assumes that an alternative monolithic final cover system will be approved for the site at closure. The justification for this assumption should be provided since it will impact the soil balance calculations</p>	<p>The assumption of a monolithic cover provides a conservative estimate of the soil required over the life of the site. It is important that the soil requirement be estimated on the high side to minimize the potential for a shortfall—a much more serious operational problem than excess soil.</p>	<p>The assumption of a monolithic cover provides a conservative estimate of the soil required over the life of the site. It is important that the soil requirement be estimated on the high side to minimize the potential for a shortfall—a much more serious operational problem than excess soil. The Closure Plan has been revised to include geomembrane barrier layers in both top deck and sideslope areas, in addition to 4 feet of soil.</p>
<p>Section 4.2.2, same comment as above. In addition, the slopes on the referenced drawing, L0.3, should be 3:1 since these slopes are used in quantity calculations and would likely be present at the time of closure. In addition, the slopes are of varying thickness and as such will settle differentially. Therefore, they will not be a uniform 4:1 slope but will likely vary over the length of the slope.</p>	<p>This comment is well taken; however, it is our judgment that the client is best served in this instance by conservatively estimating capacity using the 4:1 slopes (will produce slightly lower overall volume). Potential increases in cover soil requirements for greater volume are considered to be within the range of uncertainty in other assumptions of soil balance and capacity calculations</p>	<p>This comment is well taken; however, it is our judgment that the client is best served in this instance by conservatively estimating capacity using the 4:1 slopes (will produce slightly lower overall volume). Potential increases in cover soil requirements for greater volume are considered to be within the range of uncertainty in other assumptions of soil balance and capacity calculations.</p>
<p>Section 4.4.2 presents alternatives for the sideslope liner system. The first alternative is the prescriptive system, while the second is an alternative to the design. The justifications presented for the alternative do not provide adequate justification for consideration of the alternative. To demonstrate equivalency, the designer must, at a minimum, demonstrate that the proposed alternative is at least as protective as the prescriptive liner. This is typically demonstrated using the HELP model and comparing percolation rates from the bottom of the liner system. This has not been performed; therefore the alternative should not be approved.</p>	<p>As stated in the Design Narrative, the TGE design team will consult with Guam EPA during the final permitting process to establish an approved configuration for the sideslope liner system. A mutually acceptable equivalency analysis will be performed. It may or may not include use of the HELP model, which is a useful guideline tool but not of great relevance in comparing alternative sideslope liner systems.</p>	<p>The revised design has established a definitive sideslope liner design. Its performance has been established by HELP Modeling in the 2007 Alternative Liner design submittal and in Appendix G.</p>

<p>Section 4.5.3 indicates that the primary leachate management technique will be primarily through recirculation. This system should be designed and presented with these documents. This is necessary to enable Guam EPA to permit recirculation of leachate. In addition, the use of sprinkler systems for leachate recirculation is not recommended. There is a substantial risk of leachate exposure to site personnel when this method is employed.</p>	<p>Additional detail will be developed as requested, including descriptions of appropriate conditions for application of the alternative means of recirculation of leachate. (Clearly, sprinkling would be an option for future times when substantial areas of the top deck have been created, at a distance from active working face areas.)</p>	<p>Leachate recirculation has been eliminated as a management alternative. Leachate will be piped to the Inarajan Wastewater Treatment Facility.</p>
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<p>Section 4.6, while the subdrains may be effective at reducing impact from seeps, the current design may negatively impact the adjacent wetlands. Groundwater that would typically migrate to adjacent wetlands will be diverted to a location downgradient. It is recommended that a wetlands biologist approve of the proposed subdrain system since it will impact the adjacent wetlands.</p> <p>Section 4.6, while the subdrains may be effective at reducing impact from seeps, the current design may negatively impact the adjacent wetlands and surface water resources. Groundwater that would typically migrate to adjacent wetlands will be diverted to a location downgradient. The subdrain system design must be based on the final "Guam EPA approved" pre-construction conceptual site hydrogeologic model (CSHM). The subdrain system design should minimize or negate adverse wetland impacts by directing flow as indicated by the pre-construction CSHM. It is also recommended that a wetlands biologist approve of the proposed subdrain system since it may impact the adjacent wetlands.</p> <p>(Suggested changes to comments provided by Guam EPA's Omar Damian on July 18, 2006)</p>	<p>The subdrain design will be reviewed in light of impending findings of the supplemental hydrogeologic studies by Geomatrix Associates, including the CSHM referenced in the additional comment by GEPA. The design team will consult with a qualified wetlands biologist in final design of the subdrain system.</p>	<p>The subdrain design and impact has been considered in the Final Integrated Hydrogeologic Assessment (11/26/2008) by Geomatrix Associates.</p>
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Section 4.7.1 indicates that the model predicts a peak generation rate of 2,400 cfm. This appears to be relatively low based on a review of the model. See discussion regarding Appendix C below.	This comment is addressed below in relation to Appendix C.	The revised Landfill Gas Master Plan uses wet landfill input parameters to the LandGem model and projects a peak generation rate of 4,100 scfm.
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Section 4.7.1, there should be an analysis of potential condensate generation to allow for adequate design and management of condensate.	The condensate system shown on the drawings was designed using computations of condensate generation from the projected maximum flow. These computations will be included in the updated design narrative.	Condensate calculations are included in the revised Landfill Gas Master Plan.
Section 6.3, the current design has essentially removed all runoff from the headwaters of the Tinago River. Analysis by a wetlands and/or riparian biologist should be provided demonstrating that this reduction will not adversely affect the wetlands both adjacent to the site as well as downstream.	Potential impact of the subdrain system will be addressed in the supplementary hydrogeologic studies that will be implemented concurrently with final design.	Potential impact of the subdrain system is addressed in the Final Integrated Hydrogeologic Assessment by GeoMatrix.
Section 7.11.3, there are gas probes that are substantially further than 1,000 feet apart. See comments to Drawing L0.5 for further discussion. There should be discussion as to the subsurface conditions, and justification for the gas probe locations.	The probe locations will be reviewed and adjusted as necessary to maintain a maximum 1,000 ft. interval between probes. Additional commentary will be added to address this comment.	The probe locations will be reviewed and adjusted as necessary to maintain a maximum 1,000 ft. interval between probes. Additional commentary has been added to address this comment.

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<p>The narrative should discuss the underlying hydrogeology and the beneficial use of groundwater/surface water. If the groundwater/surface water is of beneficial use, a more restrictive liner system may be required. The narrative should discuss in great detail the results of the pre-construction and postconstruction hydrogeologic conceptual site models indicating the impacts (if any) to groundwater and surface water resources. The narrative should also discuss how the modeling results are addressed in the proposed landfill design (i.e., liner system design, liner grades, and sub-drain system design). (Suggested changes to comments provided by Guam EPA's Omar Damian on July18,2006)</p>	<p>Additional information will be incorporated, taken in part from previous site selection studies and in part from the supplemental hydrogeologic studies to be performed concurrently with final design. Additional narrative will be added to the report as suggested in the GEPA additional comment.</p>	<p>These issues are addressed by the Final Integrated Hydrogeologic Assessment by GeoMatrix Associates.</p>
<p>There should be an analysis performed for sizing of riprap. However, if all riprap is grouted, an analysis may not be warranted.</p>	<p>The riprap detail will be modified to provide geotextile underlying the rock and grouting of the riprap.</p>	<p>Grouted riprap has been specified.</p>

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<p>Section 3.2, top deck slopes are shown as 3% on the drawings, but stated as 4% in the narrative. Please clarify.</p>	<p>The text of the drawings will be corrected to call out 4% minimum, as designed.</p>	<p>The text of the drawings has been corrected to call out 4% minimum, as designed.</p>
<p>Section 4.4.1 indicates that Wyo-Ben, Inc "Envirogel 200" will be used as the bentonite source. However, there are many manufacturers of bentonite that could meet the project requirements. A single manufacturer should not be required to allow for competitive bidding, and a bentonite specification should be developed.</p>	<p>Cost estimates are based on this supplier. The specifications provide "or equal" opportunities for alternatives, and objective specifications for their evaluation.</p>	<p>Bentonite amendment has been eliminated from the project.</p>

Section 4.4.1 calls for an 80-mil HDPE geomembrane, siting improved security for the containment system. This should be justified using industry-accepted engineering principles and procedures. Using an 80-mil HDPE geomembrane will add both material and shipping costs, while potentially not being justified using sound engineering judgment.	80-mil HDPE is provided as a means of providing additional security for protection against releases to the environment. It is specified in recognition of the high visibility of the project and the expressed concern of Guam and USEPA to ensure against environmental degradation.	80-mil HDPE is specified for the primary liner geomembrane as a means of providing additional security for protection against releases to the environment. It is specified in recognition of the high visibility of the project and the expressed concern of Guam and USEPA to ensure against environmental degradation. 60-mil geomembrane is used for the secondary liner.
Section 4.5.3 should provide a detail for the temporary barriers or "rain flaps." It is unclear what is being suggested from the narrative.	Appropriate details will be added to the design drawing set and referenced in the updated narrative.	Rain flaps have been replaced by geomembrane rain cap material over the protective soil in the entire new cell area. Specification section 02754 provides the rain cap requirements.
Section 4.7.1, the potential implementation schedule should expedite the installation of the flare system. Landfill gas will be generated much quicker at this landfill due to climate and recirculation, and should begin management within the first few years.	The schedule is based on the gas curve presented in Appendix C. As indicated in the narrative, the schedule for blower and flare installation will be adjusted based on actual gas generation rates after operation begins.	The implementation schedule set forth in the revised LFG Master Plan will be adjusted in practice to comply with the GCOS requirements of 40 CFR 60.752 to install a system within 30 months after the first annual report in which NMOC emissions exceed 50 megagrams per year.

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Section 6.3, it is unclear where the 2-year storm criteria was obtained for sediment collection. Is this a local requirement?	This comment refers to a typographical error in a sentence referring to Table 6.2, containing results of analysis of the 25 year storm. The typographical error will be corrected.	The engineer determined it was a reasonable criterion based on the standard of practice in Guam.
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Appendix A – Design Drawings		
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<p>Drawing L1.4, this drawing demonstrates that the subdrain system will remove a substantial amount of both surface and subsurface drainage adjacent wetlands to the north. This could have a detrimental effect on the wetlands. A biologist should be consulted to verify this will not adversely impact the wetlands.</p> <p>Drawing L1.4, this drawing demonstrates that the subdrain system will remove a substantial amount of both surface and subsurface drainage from adjacent wetlands to the north. The subdrain system design must be based on the final "Guam EPA approved" pre-construction conceptual site hydrogeologic model (CSHM). The subdrain system design should minimize or negate adverse wetland impacts by directing flow as indicated by the pre-construction CSHM. It is also recommended that a wetlands biologist approve of the proposed subdrain system since it may impact the adjacent wetlands.</p> <p>(Suggested changes to comments provided by Guam EPA's Omar Damiani on July 18, 2006</p>	<p>The subdrain design will be reviewed in light of impending findings of the supplemental hydrogeologic studies by Geomatrix Associates, including the CSHM referenced in the additional comment by GEPA. The design team will consult with a qualified wetlands biologist in final design of the subdrain system.</p>	<p>Potential impacts of the subdrain design have been reviewed in the Final Integrated Hydrogeologic Assessment by Geomatrix Associates.</p>
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<p>Drawing L2.2, where is the sizing analysis for the riser pipe orifices? An analysis must be performed to demonstrate that the sizing and spacing of the holes adequately reduces the off-site flows to pre-existing conditions.</p>	<p>This issue will be addressed in the supplemental hydrogeologic studies to be performed concurrently with final design.</p>	<p>Please see Appendix B, the Hydrology Calculations.</p>
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Drawing L2.2, where is the determination of appropriate freeboard? This must be demonstrated to allow for sizing of the top-of-riser and top-of-outfall.	Additional analysis will be provided in the updated design narrative.	Pond routing analyses contained in Appendix G indicate a minimum of 2 feet of freeboard is maintained during the design storm.
Drawing L2.2, the riser will be a very tall structure. Was there a structural analysis performed to demonstrate the riser will remain intact through typhoons, seismic events, or other UBC criteria?	No analysis was performed. We will request a review by the project structural engineer and document it in the updated design narrative.	The redesigned structure has a wider base and is less tall than the previous design. It is not subject to UBC requirements.

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Drawing L2.4, the alternative should be eliminated from the drawings. The design narrative and associated calculations did not adequately demonstrate equivalence. In addition, the geotextile on the sideslopes may need to be changed to geocomposite based on a re-evaluation of the system.	As stated in the Design Narrative, the TGE design team will consult with Guam EPA during the final permitting process to establish an approved configuration for the sideslope liner system. A mutually acceptable equivalency analysis will be performed.	The alternative sideslope design alternative has been removed.
Drawing L2.12, a calculation should accompany the design demonstrating that the pipe will not be crushed by vehicular traffic impacting the pipe road crossing.	This is a HDPE pipe with a minimum wall thickness of 1" and 6 feet of cover. Calculation should not be necessary to see it will not be crushed.	This is a HDPE pipe with a minimum wall thickness of 1" and 6 feet of cover. The installation fits within allowable manufacturer's installation criteria.

Drawing L2.14, should have a minimum of two nested gas probes, one at mid-height of landfill and one at bottom elevation of waste.	As stated in the Design Narrative, probes located where the surface elevation is within 10 feet of the bottom elevation of the nearest waste will be completed with a single screened section located 5 to 10 feet below ground. Probes at higher elevations will be constructed with two screened sections separated by a bentonite plug, with one at 5 to 10 feet below surface and the other at the elevation of nearest waste or 20 feet below surface, whichever is deeper. All gas probes will be constructed above the expected highest elevation of groundwater. Based on the selected probe locations and liner base grades, the deepest probe will be 15 feet below surface, making a nested probe impractical. Please see Drawing L0.5	As stated in the Design Narrative, probes located where the surface elevation is within 10 feet of the bottom elevation of waste will be completed with a single screened section located 5 to 10 feet below ground. Probes at higher elevations will be constructed with two screened sections separated by a bentonite plug, with one at 5 to 10 feet below surface and the other at the elevation of nearest waste or 20 feet below surface, whichever is deeper. All gas probes will be constructed above the expected highest elevation of groundwater. Based on the selected probe locations and liner base grades, the deepest probe will be 15 feet below surface, making a nested probe impractical.
General – check all callouts. There were callouts that did not match details or were not included on the drawing set.	Additional cross-checking will be done, and details fully coordinated with plans.	Additional cross-checking has been done, and every effort made to coordinate details fully with plans.
General – There should be a drawing showing the proposed vertical LFG well design to allow for approval of the proposed system.	The drawing set in Appendix A is intended for use as construction documents for the initial construction, which does not include vertical wells. A typical landfill gas well diagram is included in the Landfill Gas Master Plan report.	The drawing set in Appendix A is intended for use as construction documents for the initial construction, which does not include vertical wells. A typical landfill gas well diagram is included in Appendix C the Landfill Gas Master Plan report.
Drawing C4.6, drainage from the mud rack should be diverted to the landfill ponds to reduce offsite sedimentation.	All drainage from the entrance area will be conveyed to the landfill perimeter drainage system for transfer to the ponds. Drawings will be revised as needed to show this intent.	Drainage from the entrance area will be conveyed to the perimeter drainage system.

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Drawing G1.2, notes indicate the wetlands were delineated as part of the EIS. However, the results of the wetlands mitigation plan preparation and associated investigations should also be referenced.	Please note that this set is a construction drawing set. Data related to wetlands is contained in the Design Narrative and environmental documents.	Please note that this set is a construction drawing set. Data related to wetlands is contained in the Design Narrative and environmental documents.
Drawing L0.3 should show 3:1 slopes (maximum per the operations plan and design narrative). Additionally, roads and benches should either be shown or accounted for by modifying the design grades to the gross slope (i.e., 3.5:1).	This comment is well taken; however, it is our judgment that the client is best served in this instance by conservatively estimating capacity using the 4:1 slopes (will produce slightly lower overall volume). Potential increases in cover soil requirements for greater volume are considered to be within the range of uncertainty in other assumptions of soil balance and capacity calculations.	This comment is well taken; however, it is our judgment that the client is best served in this instance by conservatively estimating capacity using the 4:1 slopes (will produce slightly lower overall volume). Potential increases in cover soil requirements for greater volume are considered to be within the range of uncertainty in other assumptions of soil balance and capacity calculations. Updated Master Plan drawings include benches on final grade slopes.
Drawing L0.4, suggest adding bearings to the perimeter road layout for ease of construction.	Actual construction information is contained on Sheet L1.1. Sheet L0.4 is an overview of the total perimeter road to be developed in stages over the life of the site.	Actual construction information is contained on the plan and profile sheets.
Drawing L0.5, suggest moving GP-1 to the east, on the other side of the entrance road. The reasons are: this would make distances between wells closer to every 1,000 ft; would be located generally between site facilities and the bulk of the waste, allowing for early detection of landfill gas migration toward site facilities.	Gas probe locations will be reviewed and adjusted as needed	Gas probe locations will be reviewed and adjusted as needed.

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Drawing L0.6, suggest using horizontal gas collectors in lieu of vertical wells. This will provide earlier gas collection during operations (can be installed and operated during operations of a cell whereas vertical wells are typically installed after closure) along with several other benefits such as reduction in ineffectiveness of wells due to presence of liquid. Early extraction becomes even greater when working with a wet, recirculating landfill.	Please see sheets L1.11 and L2.10 for plan and details of the extensive system of horizontal collectors to be installed in Cells 1-III. Also please review Section 4.7 of the Design Narrative Report for a description of the proposed collections system combining vertical wells with horizontal collectors on the floor of each cell.	Horizontal collectors will be installed above the protective soil in Cells 1-II. Determination of the mix of horizontal collectors and vertical wells in subsequent development will be made by the landfill operator at the time of implementation.
Drawing L0.6, the size of laterals and headers is unclear. Suggest using different line types for different sizes to make the layout clearer.	This comment will be addressed in the final construction drawing set.	This comment is being addressed in the final construction drawing set.
Drawing L0.7 suggests compacting the stockpiles to a minimum 90% max dry density per ASTM D698. Will this be enforced through density testing? If not, suggest providing method rather than performance requirement.	Density testing will be required.	Density testing will be required.
Drawing L1.0 should show drainage patterns through the Phase 1 area.	This comment will be addressed in the final construction drawing set.	This comment is not applicable to the revised design beginning with Cell 1 & 2 in the south end of the site.
Drawing L1.1, there should be benches located on the cut slopes south of the cell.	This comment will be addressed in the final construction drawing set.	This comment is not applicable to the revised design beginning with Cell 1 & 2 in the south end of the site. Benches are being provided on slopes in accordance with the GEPA Erosion Control Manual.
Drawing L1.1, Section 1 is not shown on sheet L1.2.	This comment will be addressed in the final construction drawing set.	This comment is not applicable to the revised design beginning with Cell 1 & 2 in the south end of the site.
Drawing L1.2, should provide vertical curve data for roadway.	This comment will be addressed in the final construction drawing set.	Vertical curves are presently indicated as necessary on Perimeter Road and Operations Road drawings.

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Drawing L1.3, it is unclear what the northern-most coordinate is referencing. Is this a point on the curve?	This comment will be addressed in the final construction drawing set.	This comment is not applicable to the revised design beginning with Cell 1 & 2 in the south end of the site.
Drawing L1.3, the northerly riprap dissipater is shown as 18' wide where detail shows 20' wide.	This comment will be addressed in the final construction drawing set.	This comment is not applicable to the revised design beginning with Cell 1 & 2 in the south end of the site.
Drawing L1.3, the entrance ramp to the pond is very steep (over 11% grade). There is adequate room to reduce the slope; suggest reducing grade to allow for all-weather access and ease of operations.	Access to the pond is required infrequently, and only during dry weather conditions by equipment capable of making a steep grade.	Access ramps in the revised design are concrete surfaced to provide all-weather access.
Drawing L1.3, it is not clear if the riprap dissipaters are grouted or not, and what the stone size is. Should be consistent with Drawing L1.10.	Grout and stone size will be specified.	Grout and stone size have been specified.
Drawing L1.3, survey control and identification of the subgrade line should be provided. This will be constructed in the future, and may become lost if accurate control and protection is not provided.	This comment will be addressed in the final construction drawing set	Critical control points are indicated on the final construction drawing set.
Drawing L1.4, should provide survey control for beginning of perforated pipe.	This comment will be addressed in the final construction drawing set	This comment is not applicable to the revised design beginning with Cell 1 & 2 in the south end of the site.
Drawing L1.4 should indicate what grades are shown. Are these top of liner, top of operations layer, top of subgrade, etc.?	They are top of liner; a note will be added in the final construction drawing set.	Revised plans include legends defining grades shown on each sheet.

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Drawing L1.5, suggest placing a berm at the limit of liner/waste. This will allow for: 1) identification of the underlying liner termination, 2) diversion of surface stormwater from the waste, and 3) assurance that waste is not placed over the temporary liner termination.	Good suggestion. We will add berms to details 7 and 9 on sheet 2.4.	Temporary berms are provided on temporary liner termination details. Refer to Drawing L2.8.
Drawing L1.10, it is unclear what the "18" Stone Riprap..." is. Is this 18" thick, or 18" max stone size? In addition, there should be a sizing in the specifications for the riprap stone as well as the grout to be used.	The depth of the stone bed is 18". This will be clarified in the final construction drawing set. Specifications will be added.	Riprap stone size and placement depths have been clarified in the final construction drawing set. Specifications are included in the civil engineering sections of the specifications.
Drawing L1.10, what is the radius at the "radius point?"	This will be clarified in the final construction drawing set.	No longer applicable.
Drawing L1.10, stone at outfall structure energy dissipater should be grouted. This will be a very high-energy location if it ever overtops the pond.	Grouting will be specified.	Grouting is specified.
Drawing L1.10, the entrance ramp to the pond is very steep (over 11% grade). There is adequate room to reduce the slope; suggest reducing grade to allow for all-weather access and ease of operations. In addition, there is an energy dissipater located at the end of the ramp. It will be very difficult for a vehicle to maneuver over this dissipater.	Access to the pond is required infrequently, and only during dry weather conditions by equipment capable of making a steep grade. If there is need to bring equipment into the basin that has problems with the riprap, a temporary dirt ramp can be constructed across it.	Access ramps in the revised design are concrete surfaced to provide all-weather access.

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Drawing L1.11, a sizing analysis should be prepared for the wellfield layout, but is not included?	The horizontal collectors are laid out using previous design. No project-specific analysis was conducted.	Please see analysis of horizontal collectors in revised Landfill Gas Master Plan. Refer to the Design Narrative, Appendix C.
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Drawing L2.1, how deep should existing grade be scarified and recompacted (see Paving Section detail).	The road subgrade will generally be constructed on cut or fill material. This work is subject to Technical Specifications Section 02315, which specifies 6" scarification and compaction to 90% of maximum dry density.	The road subgrade will generally be constructed on cut or fill material. This work is subject to Technical Specifications Section 02315, which specifies 6" scarification and compaction to 90% of maximum dry density.
Drawing L2.2, suggest adding a trash rack over the top of the riser pipe to reduce potential for debris buildup within discharge pipe.	A trash rack will be added.	A trash rack has been added.
Drawing L2.2, the riprap is located at a high-energy location, specifically with respect to the spillway. Suggest grouting riprap.	Grouting will be specified.	Grouting is specified.
Drawing L2.2, suggest using a concrete collar placed at the pipe entrance to the berm to reduce the potential for erosion around the pipe interface.	A collar will be added.	A collar has been added.
Drawing L2.2, suggest installing a trash rack at the outflow of the pond. This will likely become a habitat location, which could reduce the effectiveness of the pipe.	We believe the potential for habitat use of the pipe is small, and that any obstruction will be cleared out during high flow conditions.	We believe the potential for habitat use of the pipe is small, and that any obstruction will be cleared out during high flow conditions.

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Drawing L2.3, it is common practice to place a geotextile beneath stone riprap. This keeps the underlying soils from generating preferential pathways during low-flow storms and undermining the riprap, which could result in excess sedimentation and an eventual collapse of the dissipater.	Geotextile will be added and specified.	Geotextile has been added as necessary.
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Drawing L2.3, an analysis is typically performed for bedding and integrity of a culvert. This was not included in the calculation package. In addition, sizing of the culverts was not evident in the analysis package.	This culvert is a temporary drainage structure under a temporary road. It is conservatively designed and specified using typical construction features. Detailed analysis was not considered necessary.	Culvert sizing calculations are included in the Operations Road and Mass Grading for Cells 1 & 2 document set. Culvert installation details are standard.
Drawing L2.4, how far of an overlap is required for geotextile over the leachate collection trench?	Overlap will be specified.	Overlap is specified as minimum 2 feet on both sides. Refer to Drawing L2.8.
Drawing L2.4, callout for the bentonite-amended low permeability liner should call out a maximum hydraulic conductivity of 1.0×10^{-7} cm/sec, not just 10^{-7} cm/sec.	This change will be made in the final drawing set.	No longer applicable with bentonite amended liner deleted. Specifications contain controlling language on hydraulic conductivity requirements for low permeability soil liner, refer to section 02225, part 2, section 2.1.
Drawing L2.4, should have a detail showing the interim edge of liner termination.	This information is shown on Details 7 and 9. A temporary berm will be added to define the temporary waste limits.	This information is shown on liner detail sheets. A temporary berm will be added to define the temporary waste limits. Refer to Drawing L2.8.

<p>Drawing L2.5, suggest modifying sump to the conventional HDPE pipe running up the sideslopes. The current design appears to be relatively expensive, both from a materials standpoint as well as elimination of airspace. For instance, while overall the removal of airspace from both the wedge and the resulting continuation up the sideslope is minor, it will result in the following: assume an area of approximately 80' x 80', or 6,400 sf over a total height of 120 feet (depth of wedge plus to top of final cover); this results in a volume of 768,000 cubic feet, or 28,400 cubic yards; assuming a density of 1,200 lbs/cubic yard, this results in a volume of 17,000 tons; Assuming a tipping fee of \$25/ton (relatively small), this results in a loss of \$425,000, possibly justifying a revision of the LCRS to a more conventional design. Drawing L2.5, modify sump design to the conventional HDPE pipe running up the sideslopes. This requirement is absolutely non-negotiable. (Suggested changes to comments provided by Guam EPA's Omar Damian on July 18, 2006)</p>	<p>The proposed vertical riser system is recommended by the landfill designer based on the following considerations:</p> <ul style="list-style-type: none"> ▪ Long-term operational simplicity, eliminating potential problems related to pump insertion and removal from a sideslope riser; ▪ Provision of capability for maintaining leachate management operations solely above the liner system ▪ Operational simplicity and reliability is a major consideration in a location such as Guam, which does not have ready access to expertise and vendors who can respond to problems with leachate pumping and management systems. <p>These are considered sufficient tradeoffs for the construction cost and potential lost airspace.</p> <p>The Value Engineering consultant team reviewed this issue in August 2006 and determined that the above benefits of the vertical riser system outweighed the potential cost benefits of a sideslope riser.</p> <p>Mr. Damian of GEPA participated in the Value Engineering workshop and did not express the opinion that revision to a sideslope riser is an absolute requirement of GEPA.</p>	<p>A sideslope riser is provided for the secondary LCRS in the revised double liner design.</p> <p>The vertical riser system is recommended for the primary LCRS riser, which will manage over 90% of the system leachate, based on the following considerations:</p> <ul style="list-style-type: none"> • Long-term operational simplicity, eliminating potential problems related to pump insertion and removal from a sideslope riser; • The soil plug associated with the vertical riser allows the site to maintain leachate management operations solely above the liner system <p>These are considered sufficient tradeoffs for the construction cost and potential lost airspace.</p> <p>The Value Engineering consultant team reviewed this issue in August 2006 and determined that the above benefits of the vertical riser system outweighed the potential cost benefits of a sideslope riser.</p> <p>Mr. Damian of GEPA participated in the Value Engineering workshop and did not express the opinion that revision to a sideslope riser is an absolute requirement of GEPA.</p> <p>Refer to Drawing L2.10.</p>
<p>Drawing L2.7, are the liner grades shown to top-of-liner or top of operations layer? Please verify.</p>	<p>The indicated grades are top of liner elevations.</p>	<p>The indicated grades are top of liner elevations. Legends have been added to drawings to identify grading shown on each sheet.</p>

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Drawing L2.7, is the headwall constructed of concrete? How long? What is the angle of the wingwalls? Should include further clarification of details.	Additional information will be added to the details.	Additional information has been added to the details of the ponds shown in the revised design. Refer to Drawing L2.4.
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Drawing L2.8, it is unclear where the pipe terminates. Does it terminate at a location downgradient? And if so, where? Should also be shown on sheet L1.10.	Northing, easting and elevation of the pipe termination are given in the plan on Sheet L2.8.	Comment is not applicable to revised design and location of Cell 1.
Drawing L2.9, what are the subgrade preparation requirements below concrete-lined ditches, such as depth of scarification and recompaction?	Notes will be added. This work is subject to Technical Specifications Section 02315, which specifies requirements for scarification and recompaction of subgrades.	This work is subject to Technical Specifications Section 02315, which specifies requirements for scarification and recompaction of subgrades.

Drawing L2.10, suggest placing gravel overlain by a geotextile in lieu of the "protective soil cap." This will allow for a greater connectivity between the trench and overlying waste while protecting the underlying collector. In addition, suggest placing collector on top of protective cover and mounding gravel (overlain by geotextile) over the top to reduce the potential for waterlogging in the collector trench (protective cover soil has lower permeability than collector gravel, which would cause the gravel trench to be a preferential pathway for leachate).	Good suggestion – the change will be made.	This is an excellent suggestion and we intended to implement it until the overriding concern of leachate management required the addition of a raincap geomembrane above the protective soil. The effectiveness of the raincap depends on having no barriers to the drainage of to the cell low point where it can be pumped from the cell. Having collectors above the level of the protective soil would cause ponding and detract from effectiveness of the raincap. The revised collector design has a deeper gravel bed within the protective soil, with the collector pipe midway in it. This should allow leachate in the gravel an opportunity to infiltrate through the cover soil before water-blocking the gas collector pipe.
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Drawing L2.11, the drawings should reflect the recommended piping connections and vault section recommended by Landtec.	Because an equivalent sump is allowed, we prefer to handle this through a shop drawing submittal process.	The specific features referenced in this comment are not included in the revised project. Detail design plans will be prepared when the GCCS is implemented.
Drawing L2.13, it is unclear where the "Typical Fill Over Slope Bench" detail is referenced.	This detail will be relocated and referenced to the applicable grading plans.	The detail is typical for the Contractor to follow when working on slopes steeper than 5:1, refer to Drawing L2.1.

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<u>Appendix B – Surface Water Management Analysis</u>		
It appears that the pond layout for the site has been modified from the recommendations presented in Appendix B. This section must be revised to reflect the proposed modifications to the design as presented in the design narrative, and to demonstrate that eliminating runoff from the Tinago River does not adversely impact the regional drainage, associated riparian community, and wetlands.	The revised design will be addressed in an updated hydrologic analysis and report. Impacts on wetlands will be addressed in the supplemental hydrogeologic studies being undertaken by GeoMatrix Associates.	Please see the revised Appendix B. With the facility now being developed from the south end, development of Pond 4 (formerly Pond 1) will be delayed for a number of years. We now recommend it be constructed with two outlets, one to the Tinago and one to the Fensol River so that flow may be balanced to the two rivers in order to approximate current conditions.
There does not appear to be a hydraulic analysis for the ponds. This must be performed to demonstrate that the ponds are sized adequately to protect against stormwater runoff.	This comment will be addressed in an updated hydrologic analysis and report.	Please see the revised Design Narrative, Appendix B for these analyses.
Why was a 1-foot freeboard used for the drainage channel? Should include reference where the criteria was obtained, i.e., Guam stormwater manual, US Army Corps of Engineers, etc.	This comment will be addressed in an updated hydrologic analysis and report.	This is an engineering judgment call without reference to outside criteria.
It is unclear if a freeboard was used in designing the ponds. Each pond should have an adequate freeboard determined either by local drainage manuals or other documented recommendations..	This comment will be addressed in an updated hydrologic analysis and report.	The revised Design Narrative, Appendix B demonstrates a minimum 2 feet of freeboard is maintained.

<p>There should be a section that presents the criteria used and why, such as the 25-year, 24-hour storm for runoff and runoff control, the 2-year storm for sedimentation, etc. All Guam regulations should be referenced.</p>	<p>This comment will be addressed in an updated hydrologic analysis and report.</p>	<p>The controlling criteria are those in Guam solid waste regulations, which specify the 25-year storm as the design basis for flow control. Sedimentation is not regulated in terms of a design storm event and the 2-year storm was selected as reasonable based on the engineer's judgment.</p>
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<p>It is not clear why the 2-year storm event was used to contain sediment. What is the criterion, and why was it used?</p>	<p>This comment will be addressed in an updated hydrologic analysis and report.</p>	<p>The engineer determined it was reasonable based on the standard of practice in Guam.</p>
<p>The conclusions of the Technical Memorandum should also indicate findings of the hydraulic design, i.e. height of pond, height of spillway, maximum water elevation and associated freeboard, dimension of downdrains into pond, sizing of riprap, sizing of riser pipe orifices to control outflow, etc.</p>	<p>This comment will be addressed in an updated hydrologic analysis and report.</p>	<p>This information is contained in Book 2, the revised Design Narrative, Appendix B.</p>
<p><u>Appendix C – Landfill Gas Master Plan</u></p> <p>General – It is standard to include the calculations as part of the Landfill Gas Master Plan. The plan should include the “conventional flow and pressure drop computations” mentioned in Section 3.2. In addition, it is standard to present the tables and other data obtained from suggested references. However, these were not provided.</p>	<p>An appendix containing the calculations will be added to the report.</p>	<p>Appendices containing the calculations are included in the revised report. Refer to Book 2, the Design Narrative, Appendix C for the Landfill Gas Masterplan.</p>

<p>Section 2.2.3, it appears that the appropriate L_0 factor was used for a wet climate. However, it is unclear if the waste composition is similar to the defaults used (waste composition impacts L_0). If there is a waste characteristic study available, or other waste characteristic estimates, these should be provided to demonstrate that the waste is similar to the default used.</p>	<p>No waste characterization information from Guam is available that would address this concern.</p>	<p>The updated modeling of LFG generation uses wet landfill parameters including $L_0 = 0.3$ year¹. See the revised Landfill Gas Master Plan for details of the analysis. Refer to Book 2, the Design Narrative, Appendix C.</p>
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<p>Section 2.2.3, it appears that Guam's average annual rainfall is up to 10% greater than Hong Kong, which would lead to wetter waste characteristics, thus impacting the input variables.</p>	<p>This is considered a minor difference, given the general level of approximation in the EPA model.</p>	<p>Rainfall is not an input to the LandGem model. Wet landfill input parameters documented in the literature were used in the revised Master Plan.</p>
<p>Section 3 presents a conceptual design. However, the design drawings are providing for construction of adjacent headers, which requires a level of design beyond conceptual.</p>	<p>Headers have been designed using the projected gas volumes at full site development, and pressure drop calculations for major pipe segments. The narrative discussion is a summary.</p>	<p>Headers have been sized using the projected gas volumes at full site development, and pressure drop calculations for major pipe segments. Calculations are contained in Book 2, the Design Narrative, Appendix C, revised LFG Master Plan.</p>
<p>Section 3.1.1 and 3.1.2, there is no mention of how the collectors were sized. The analysis and assumptions should be presented in this plan.</p>	<p>Collectors are based on standard designs that work at other sites. No project-specific analyses were done.</p>	<p>Calculations are contained in Book 2, the Design Narrative, Appendix C, revised LFG Master Plan.</p>
<p>Section 3.3, condensate collection system should be sized using industry-standard calculations. These should be presented as part of the calculation package to demonstrate adequate sizing of the system.</p>	<p>Calculations will be included in an appendix to be added to the report.</p>	<p>Calculations are contained in Book 2, the Design Narrative, Appendix C, revised LFG Master Plan.</p>

Section 4, the flare and blower system should be based on the "conventional flow and pressure drop calculations." These should be presented to provide justification for the sizing of the blower/flare system.	Calculations will be included in an appendix to be added to the report.	Calculations are contained in Book 2, the Design Narrative, Appendix C, revised LFG Master Plan.
Section 5, this is a very conceptual description and will require re-permitting if and when an actual design is proposed.	The same comment applies to Section 4. The flare system and any future energy recovery system will require additional permitting after they are designed. The information presented regarding flares and energy recovery in this plan is intended to be conceptual in nature, providing only a basis for establishing the size and location of the future gas treatment and recovery area.	The flare system and any future energy recovery system will require additional permitting after they are designed. The information presented regarding flares and energy recovery in this plan is intended to be conceptual in nature, providing only a basis for establishing the size and location of the future gas treatment and recovery area.

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Section 2.2.4, this will be a very wet landfill, particularly considering leachate recirculation. Therefore, "Inventory Wet (Bioreactor)" k-values should be used. However, the designer may wish to present the documentation from prior experience to provide the justification for the substantial reduction in the methane generation rate constant.	The analysis considered use of the referenced bioreactor parameters, but produced results that on their face were unreasonable. Even with leachate reintroduction, the proposed landfill is not considered to be a true bioreactor, in that no additional liquids or organic nutrients will be added. We believe the normal default parameters are appropriate.	The updated modeling of LFG generation uses wet landfill parameters including $L_0 = 0.3$ year ⁻¹ . See Book 2, Design Narrative, Appendix C., the revised Landfill Gas Master Plan for details of the analysis.
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Appendix D – Civil Engineering Calculations Appendix D.4, D.5, D.6. These analyses should present a problem statement, assumptions, givens, description of methodology, and associated calculations. Without a standard calculation sheet format, it is difficult to follow the methodology used, and thus provide an accurate review of the adequacy of calculations.	Responses to these comments will be prepared by others under separate cover.	The updated prefinal design includes Appendix D1 – D3, the entrance area drainage calculations, the water main line and water storage tank sizing and the oil water separator sizing.
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Appendix D.7, Traffic Calculations. What is the level of service for the intersections at and near the entrance to the site? Will these intersections warrant stop signs, traffic signals, etc.?	Responses to these comments will be prepared by others under separate cover	Refer to the Access Road Final Submittal, March 2007.
Appendix F – Earthwork & Airspace Calculations. This appendix must provide a calculation sheet that summarizes problem statement, assumptions, methodology used to obtain quantities, and a summary of results. This appendix cannot be reviewed for adequacy in its current condition.	A summary will be provided.	The revised Appendix F contains summary sheets providing data on earthwork, airspace and soil balance calculations.

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Leachate Volume & Collection Calculations, HELP Model Calculations – The HELP Model Analysis does not accurately reflect the conditions proposed in the design, and therefore cannot be used to demonstrate adequacy of the leachate collection system or the liner system. There should be, at a minimum, a calculation cover sheet that summarizes the problem statement, assumptions, methodology, references, design criteria used, climate data used, time period modeled, and a summary of results. It is unclear if all conditions within the landfill were adequately modeled due to the current organization of the appendix.	The analysis contained in the submittal was prepared during the preliminary design phase. An updated HELP model analysis will be conducted based on final design, and documented in accordance with this and other related comments.	An updated HELP model analysis is contained and described in Book 2, Design Narrative, Appendix G.
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<p>After reviewing the models in their current state, it is apparent that the system was not modeled accurately. The sideslopes were not modeled at all, and the existing analyses included a gravel drainage layer in lieu of a geocomposite. The geocomposite on the floor must be included in the model (please note, hydraulic head must be less than the thickness of the geocomposite for the model to accurately simulate the system; if greater, then a geocomposite likely will not work). Additionally, the proposed geotextile on the sideslopes must be modeled, with the results demonstrating compliance with the regulations. Please note, there are several other calculations that use the results from the HELP modeling that will also require revision.</p>	<p>The analysis contained in the submittal was prepared during the preliminary design phase. An updated HELP model analysis will be conducted based on final design, and documented in accordance with this and other related comments.</p>	<p>The analysis contained in the submittal was prepared during the preliminary design phase. An updated HELP model analysis is contained in Book 2, Design narrative, Appendix G.</p>
<p>Slopes for drainage layer of liner system are listed as 1% in the document text, and 2% in the HELP model. The actual proposed design slope should be used for modeling.</p>	<p>The drainage layer is graded at 2% toward the LCRS trench (Drawings, Design Narrative section 4.2.1). The model accurately portrays the design.</p>	<p>The drainage layer is graded at 2% toward the LCRS trenches. The model accurately portrays the design.</p>
<p>It appears that the modeled final cover consists of cover soil and clay. The top slope for cover soil is listed as 20 percent, but is not representative of either the proposed top-deck or sideslope grades. The final cover should be modeled as designed.</p>	<p>Model assumptions for the updated analysis will be reviewed and conformed to the final design.</p>	<p>Model assumptions have been updated to reflect the revised design, which includes geomembranes on both the deck and slope areas of the final cover cap.</p>

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The conclusions of the analysis should demonstrate that the liner and cover system meet Guam regulatory requirements. However, this analysis cannot demonstrate compliance and must be revised.	The updated analysis will include conclusions relative to compliance.	Please review the updated Technical Memorandum for design of the LCRS, Book 2, Design Narrative, Appendix G.
Geocomposite Drainage Layer & Collection Pipe Calculations – These calculations should be based on the industry standard: Giroud, J.P., Zornberg, J.G., and Zhao, A., 2000, "Hydraulic Design of Geosynthetic and Granular Liquid Collection Layers." Geosynthetics International, Special Issue on Liquid Collection Systems, Vol. 7, Nos. 4-6, pp. 285-380.	This comment goes somewhat beyond the proper purview of a peer review. It is inappropriate to suggest there is only one correct way or source of conducting engineering calculations. The reviewer is welcome to conduct check analyses using alternative methods, and we will respond.	This comment goes somewhat beyond the proper purview of a peer review. It is inappropriate to suggest there is only one correct way or source of conducting engineering calculations. The updated design memorandum is based substantially on methods documented in the Geosynthetic Research Institute standard method GC-8, "Standard Guide for Determination of the Allowable Flow Rate of a Drainage Geocomposite (GRI 2000). The reviewer is welcome to conduct check analyses using alternative methods, and we will respond.
The HELP model allows for modeling of a recirculating landfill. Therefore, the system should be modeled using the proposed recirculation percentages, with justification presented.	The HELP model analysis was conducted assuming 100% recirculation of leachate. Please see pages H-4, H-11 and H-26 in the appended calculations.	The previous HELP model analysis was conducted assuming 100% recirculation of leachate. The present design and analysis does not assume recirculation of leachate, which we have determined is not feasible at this site.
The analysis used a field capacity for MSW of 0.292 vol/vol in model. Documented evidence suggests that field capacity can range from 0.40 to 0.60 vol/vol. In addition, since Guam is generally wet and leachate recirculation is being proposed, the moisture content of the waste will be substantially higher than the model default for field capacity. Therefore, the field capacity should be increased.	The updated analysis will consider this comment; however, it is noted that increasing both the moisture content of waste and field capacity will tend to minimize the effect of the changes on the results.	We have considered this comment and determined that the default field capacity (0.292 v/v) in the HELP model is appropriate. In our opinion, the important variable is not field capacity, but the difference between initial moisture and field capacity.

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The graphs presented cannot be interpreted due to clarity. Graph labels cannot be read.	More attention will be paid to presentation in the updated modeling report.	We have tried to make graphics more clearly in the updated modeling report; however some quality is lost in the process of scanning and transmitting documents electronically.
The use of 0.809 for installation defects is very low, indicating that the liner is installed "excellent", yet the placement quality of "4" indicates "Poor Installation". Use of these values should be justified.	These and other assumptions will be reviewed and documented in the updated model analysis.	Please review revised inputs in Book 2, Design Narrative, Appendix G.
Sump Design Calculations - This section will require revision based on revisions of the HELP model. In addition, there should be, at a minimum, a calculation cover sheet that summarizes the problem statement, assumptions, methodology, references, design criteria, and a summary of results.	Calculations will be updated and documented.	Please review Book 2, Design Narrative, Appendix G.
The pump should be sized based not only on the flow rate, but also including hydraulic head, friction losses, etc.	Updated detailed calculations will be provided.	Updated calculations are contained in the revised Appendix G.
<u>Construction Cost Estimate</u> Vendor's quotes and associated R.S. Means unique ten-digit line numbers should be included for reference. Unit rates based on previous projects should indicate whether the costs are recent, or include inflationary factors to account for old unit rates.	RESPONSE BY TG ENGINEERS	Quotes and comments to justify rates used will be included in the updated cost estimate.
Mobilization and demobilization seems to be extremely high. Justification and assumptions should be provided.	RESPONSE BY TG ENGINEERS	Justification will be provided.

The cost estimate should include a Basis of Cost Estimate that includes a statement of conformance with the Association for the Advancement of Cost Engineering (AACE) International Recommended Practice No. 17R-97 "COST ESTIMATE CLASSIFICATION SYSTEM." In addition, the Basis of Cost Estimate should present all assumptions that were used in generating the quantities used, such as any overage of materials used, assumed trench dimensions, etc.	RESPONSE BY TG ENGINEERS	A basis of cost estimate will be provided. The project is not required to conform with AACE.
Should justify why some unit costs are based on 2005 RS Means estimates and others are based on 2006.	RESPONSE BY TG ENGINEERS	The updated estimate will be based on 2009 RS Means and appropriate quotes and recent project pricing data.
Should indicate what regional index factor was used to escalate unit costs for Guam.	RESPONSE BY TG ENGINEERS	Clarification on index factors to be provided.
Should provide a Net Present Value analysis for costs occurring after 2006.	RESPONSE BY TG ENGINEERS	An NPV analysis is available as an additional service.
<u>Construction Schedule</u> The construction schedule appears to be adequate. However, it would be beneficial to show the individual activities involved with Cell construction, such as excavation, subdrain construction, soil liner construction, geosynthetic liner installation, LCRS installation, operations layer construction, etc. to verify that the schedule is reasonable.	RESPONSE BY TG ENGINEERS	The schedule is developed based on typical production rates and looking at the 2-dry season overall schedule. Additional detail may be provided as appropriate.

Pages 34-48

Operations Plan (all comments)	The 14 pages of comments on the Operations Plan contain many good suggestions for improving the level of detail and clarity of the document. However, many comments relate to subjects that are included in the Plan solely as background information. We do not propose to add significantly to the following sections: Section 2 – General Site Description Section 3 – Site Development Plan Comments regarding these sections are generally addressed in relation to the Design Narrative and drawings. Any changes in design will be appropriately reflected in the Operations Plan, but analyses and detailed discussion of design basis will be retained in the Design Narrative. We will use these comments as a checklist in updating the Operations Plan.	
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Pages 48-57

Closure and Post-Closure Plan (all comments)	The Plan document will be updated using the review comments as a checklist, with additional information added as appropriate.	
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Scope of Work, Construction Management and Quality Assurance (CMQA) Plan.

This is not a Construction Quality Assurance Plan but rather a scope of work for Construction Management-related services. CQA Plan typically includes:

- Project Description
- Roles and Responsibilities of the QA Team
- Procedures for Project Meetings
- Procedures for Inspection Activities
- Earthworks Testing Program
- Geosynthetics Testing Program
- Documentation Requirements

This scope of work was not reviewed any further.

	<p>The construction quality assurance (CQA) plan for construction of landfill facilities is contained in Book 1, Technical Specifications and Construction Quality Assurance Plan. The document contains all the elements listed in this comment, integrated with Technical Specifications. The combined document provides construction contractors and suppliers, the CQA consultant and regulatory agencies with a single source of data on the project and its quality assurance components.</p>	
A Construction Quality Assurance Plan must be developed and obtain permit approval	Please see response to previous comment.	Refer to section 01400A, Construction Quality Control and Quality Assurance.

Pages 58-59

Spill Prevention Control and Countermeasure (SPCC) Plan (all comments)	These comments will be addressed in an updated SPCC Plan	The comments will be addressed in the updated SPCC Plan.
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Pages 60-61

Stormwater Pollution Prevention Plans (SWPPPs) (all comments)	These comments will be addressed in updated Plan documents.	The SWPPP has been submitted for the Operations Road and Mass Grading for Cells 1 & 2 with the Building Permit application. The SWPPP for the access road and the entrance area and landfill facilities will follow after the review of this prefinal submittal is complete.
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Pages 62-66

Book 4 - Geotechnical Report (all comments)	All comments in this section will be addressed in an updated geotechnical report. As a clarification relative to the comment regarding subdrains in Section 4.4.2, it should be understood that subdrains are planned for installation under all phases of the landfill.	The comments will be addressed under a separate document.
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Pages 66-76

Book 5 – Applications	Please see response to the following comment regarding hydrogeology.	Refer to the Final Integrated Hydrogeologic Assessment, dated 11/26/2008, prepared by AMEC Geomatrix.
Groundwater and Surface Water Monitoring Plans	Comments regarding hydrogeology and monitoring well installations will be addressed in updated documents prepared during or upon completion of the supplemental hydrogeology studies being conducted concurrently with final design.	Refer to Book 3, Site Specific Groundwater Monitoring Plan. The response to comments will be addressed under a separate document.

COMMENTS RESPONSE

OPERATIONS PLAN, CLOSURE AND POST-CLOSURE PLAN

Section No.	Comment	Category	Response
Operations Plan General	Provide a Revision Process and Control procedure at the start of the document	N	Document Revision Log is added behind front Inside cover.
	Provide a section on Regulatory/Compliance listing all site permits and agencies having jurisdiction.	N	New Section 1.2 Regulatory Compliance is added.
2.	In addition to the information contained in §2., provide a summary of the following site conditions that support the landfill design, operation and closure; Geology; Hydrogeology (including seep locations and flowrates, seasonal fluxuations); Baseline Groundwater Quality ; Wetlands; Habitat; Regional Hydrology	N	Please see new sections 2.7 – 2.10. Some of suggested detail is not included but is available in other project documents. Refer to the following. Final Integrated Hydrogeologic Assessment, 11/26/2008, prepared by AMEC Geomatix Book 2, Design Narrative.
2.1	Describe how site is accessed; main access route. Figure would be helpful.	N	Please see revised text of Section 2.1.
2.2	Incomplete; if Owner is not known, who is project proponent?	S	The property owner is now the Government of Guam. The project proponent is the Government of Guam. This information will be amended after the project operator is known.
2.3	States 127.4 acres but Closure/Postclosure Plan states 128.4 acres; clarify to remove inconsistency. Figure would be helpful.	N	The documents have been conformed to 127.4 acres.
2.4	Total waste volume reported only for the first 10 years; needs to report annual totals and total at buildout.	S	The requested information has been added refer to section 2.5.
	Estimate and report separate waste volume estimates for each major category of waste anticipated; primarily non-hazardous and special wastes or subdivide as appropriate. Special wastes are separately noted in §5.3.2. These quantities should be estimated to support other site development analyses involving waste types.	S	This information is not known at this time. The topic is addressed in this section in order to inform the operator and regulators that the site will be prepared to handle such wastes. It is not known at this time what categories of the listed wastes will be allowed under the future solid waste permit to be issued for the site.
	This section should also address and discuss the "non disposable wastes" addressed in §5.7. They may not occupy airspace but will need to be managed onsite.	S	The volumes will be minimal. The text has been updated to eliminate scrap autos which are not likely to be brought to the site.
	Total waste volumes reported are 500-700 TPD. Closure Postclosure Maintenance Plan reports volume as 550 TPD Initially to 1200 TPD ultimately; clarify to remove inconsistency.	N	The information has been updated with consistent information in the two documents. Refer to Operations Plan section 2.5, Closure and post-Closure Plan section 2.10.

Section No.	Comment	Category	Response
2.5	Rainfall totals reported here do not match those reported in the CPCMP; clarify to remove inconsistency.	N	The same estimates are now provided in both documents. Refer to Operations Plan section 2.6, Closure and Post-Closure Plan section 3.1.
3.2.2	Liner Grades: Liner-groundwater separation noted but not quantified: Is it 5 feet? State as such.	N	Minimum separation criterion is 5 feet; design provides 6 feet as indicated in discussion of liner sections. Refer to Operations Plan section 3.3 and Closure and Post-Closure Plan section 2.2.
3.2.3 and 5.1	Net airspace volume of 15.5MM cyds appears to have been used to calculate site life but the 15.5 value needs to first be reduced by daily and intermediate cover volume to get to the net airspace available for waste. Using 3.1MM cyds reported in 3.2.4, airspace available for waste is 12.4MM cyds.	S	Revised airspace calculates to 15.8 million cubic yards net of protective cover soil and final cover. Capacity and life are calculated using the parameter Airspace Utilization Factor (AUF), which has the units of tons of waste disposed per cubic yard of net airspace consumed by waste and daily/intermediate cover. This is the method preferred in the waste industry for evaluating airspace use and is used by all the major private sector waste firms. Refer to the Operations Plan section 3.13.
3.2.4	How is the 10% bentonite volume accounted for in the soil balance?	S	Bentonite amended soil is no longer a part of project design.
3.3	Analysis should consider whether site soils need to be processed (ex: to remove oversize fraction) to achieve material properties needed for performance requirements and if that processing will create a "spoil" component that is significant enough to consider in the soil balance.	N	On-site soils are fine-grained, and it is not expected that any materials will be excavated that are unsuitable for use as daily/intermediate cover.
Airspace calculations	The term "Interim capacity" is introduced but not defined. What is meant by interim?	N	Interim capacity is that which is reached when a given cell or group of cells cannot receive any additional waste until adjacent cells have been lined and filled so that waste can be filled against previously filled sideslopes. As additional cells are added, the top deck of previously filled cells can also receive additional waste.
3.4.1	It is reported that airspace calculations are based on grades shown on Drawing L0.3. See prior comment regarding 3:1 vs. 4:1 sideslope gradients	N	All calculations are based on 4:1 final grade sideslopes.
3.4.3	Need to see typical cell-to-cell liner/LCRS tie-in details	N	Please see Drawing L2.8 for typical temporary liner terminations. Under the revised phasing plan Cells 1 and 2 will be constructed as one unit; hence adjacent cells will have independent LCRS draining to different sumps.
	First sentence states LCRS will utilize a geocomposite but the CPCMP reports the LCRS will be pipe and gravel system; clarify to remove inconsistency.	S	The language has been revised to make clear that gravel and pipes are limited to interception trenches. Trenches are placed at intervals on the floor to keep geocomposite flows within design parameters established in the Design Narrative. Refer to Book 2,

Section No.	Comment	Category	Response
			Design Narrative, Appendix G.
Geocomposite	Second sentence states geocomposite will have geotextile on both sides. Single sided geotextile should be adequate as a fabric is not needed on the bottom against the geomembrane. If proposed, provide justification.	N	We prefer double sided geocomposite to maintain a cushion between the geomembrane and geonet, and to have the improved interface shear strength of the geotextile/geomembrane interface.
Geonet	Provide evidence, through analysis/modelling, that the transmissivity of the proposed geonet is adequate given the long-term vertical loading of 120 ft of waste and soil. What assumptions have been made regarding loss of performance in the geonet due to blocking?	S	This documentation is contained in the LCRS Design Memorandum which is included in Book 2, Design Narrative, Appendix G.
	Provide a discussion of proposed cleanout configuration for this system.	S	There are no cleanout provisions in the LCRS design. We find these to be impractical and of little value, and do not provide them in any design.
3.7/3.8	Both sections titled the same; 3.7 appears incomplete	S	This was an editing problem.
	Provide detail or description of how and where stormwater from landfill area gets across roadway and into perimeter channel	N	Please see revised drawings showing perimeter drainage swales, catch basins and culverts. Landfill Operations Road and Mass Grading for Cells 1 & 2, drawing set Entrance Area Facilities and Cells 1 & 2 drawing set.

Section No.	Comment	Category	Response
3.9	Provide a declaration that the landfill facility is not within a 100-year floodplain nor will its operation impact a 100-year floodplain.	S	This information is provided in various site selection and permit documents. Refer to the Final Site Selection Report; March 2005; and the Final Supplemental Environmental Impact Statement; July 2005.
3.10.6	No discussion of signage is provided. Describe entrance signs and minimum information it will contain. Describe other signage around perimeter or within site.	N	Please see additional text added to Section 3.9.6. Refer to drawings C1.4 and C1.5 for road signage plans and details.
4.1.1	Which personnel have primary responsibilities for health and safety on site? How is the health and safety role maintained across all shifts?	S	Appendix A states that the Site Manager has primary responsibility. It is the Manager's responsibility to assign this task, as all others, to appropriate staff members to ensure it is filled at all times. It can be expected that the operating entity, when named, will develop its own health and safety policies that will become a part of the Operating Plan. Refer to Appendix A, Personnel Position Descriptions.
	Identify how the personnel listed will be used in the role of "spotter" or add spotter to the list of staffing assignments.	N	Spotters and Laborers are the same labor category, as indicated in Appendix A, Personnel Position Descriptions.

Section No.	Comment	Category	Response
5.0	<p>General Comment: This section is titled OPERATIONAL PROCEDURES but there are many operational elements of this facility that are not addressed under this section; rather they are contained in 6, Maintenance and Control. These include: LCRS and recirculation system operation; Landfill gas collection and treatment system operation; Stormwater management including erosion control; Litter control including unauthorized dumping ; Odor control;</p> <p>There is little or no discussion on: Greenwaste unloading, processing, stockpiling and final disposition; Types of scales; Contingency plans/actions for many of the operational procedures identified; Stockpile locations and management including BMPs; Survey control and monuments</p>	S	The organization of this document is one we have used for numerous sites. It intentionally separates the operational aspects of receiving, compacting and covering wastes (Section 5) from the primary topics of interest to regulators (Section 6). We believe the applicable discussions of the topics listed in the comment are adequately covered.
5.3.1	First sentence indicates acceptability of material at the gate is left to the Site Supervisor. Recommend all scalehouse operators be trained and authorized as first screening/load checking.	N	Please see Section 4.0, the first paragraph of Section 4.1.2.

Section No.	Comment	Category	Response
5.3.2	In accordance with §23302 (C)(1), many of the wastes listed in this section are excluded from being landfilled. All wastes other than municipal solid waste must be approved for disposal by the facility operating permit through a permit application process; the status for this facility of which is unknown.	S	We agree. This section, like many others in this document will be updated after issuance of the solid waste permit, when the identity of the operator and all permit conditions are known.
5.4.1	Unacceptable wastes must include those listed in applicable regulations or those listed in the facility operating permit.	S	We agree. This section, like many others in this document will be updated after issuance of the solid waste permit, when the identity of the operator and all permit conditions are known. The language in this section is generic, based on a typical Hawaii permit.
5.4.2	Describe measures to fully contain the load checking areas from contaminating surrounding area. Will it be lined? Is there an alternative approach during inclement weather? How will the unauthorized waste be secured until a licensed hauler arrives?	S	Please see revised text in Section 5.4.2.
	Other than having the waste removed, what are the actions taken against the generator and the hauler if unauthorized waste is discovered during the screening process? Notification? Warnings? Fines? Charges?	S	Sanctions will be determined by the as yet unknown site operator's policies. They may include any of those listed in the comment.
	Random Inspections: suggest random inspections be limited to suspicious loads. One random load check each day of all loads has a low percentage chance of identifying unauthorized waste through the gate.	N	Suspicious loads would be checked in any event. Please see section 5.4.2 related to scalehouse monitoring and inspection, and landfill working face inspections. All jurisdictions we work in require a random load check program to emphasize to all haulers that they are subject to inspection.
	Recommend unauthorized waste discovered during the screening process be photo documented.	N	This would be the prerogative of the Operator.
5.4.3	Subitem #1 states "...site personnel will remove these wastes...and transport...to an offsite County facility." Which County facility is proposed? Has it been confirmed that the County facility is permitted for such wastes. Has the County agreed, in writing, to this arrangement?	S	The revised text, section 5.4.3 Management of Unacceptable Wastes, references management of unacceptable wastes by a "properly licensed facility". It will be the Operator's responsibility to identify and make arrangements for disposal in accordance with Guam regulations.
	First sentence states "site personnel will...require the prohibited wastes to be reloaded onto the...vehicle." This may require the use of site equipment and operators resulting in the following issues: Site personnel must be trained in handling special wastes; Only authorized site personnel should be allowed to perform these operations; Reloading these wastes must occur only after it has been determined by trained personnel that moving the material will not cause further dispersion or impacts to surrounding areas.	N	These procedures will be part of the training programs described in Section 4.1.2.

Section No.	Commitment	Category	Response
5.4.5	See prior comments regarding training; scalehouse staff, unauthorized waste loading, etc.	N	We believe this topic is adequately covered.
	Training should be a part of all new hires and should include refresher training as applicable.	N	Please see Section 4.1.2.
5.5	Clarify whether private traffic will be kept separated from commercial traffic.	N	We believe, the site will accept only commercial traffic, but that decision has not been finalized by the Landfill Permit and the Government of Guernsey and may be subject to review after an Operator has been named.
5.6	In order to protect the integrity of the liner system, identify specific procedures (and restrictions) for the initial waste lift intended to avoid damage to the completed liner system. This will include prohibiting sharp or angular material that could penetrate the protective soil cover under spreading or compaction loadings. It is recommended that landfill equipment not be allowed to operate directly on the protective layer.	S	Please see new Section 5.6.2, Fill Operations in New Cells.
	In order to avoid eccentrically loading the slope liner and causing slope instability, it is recommended that a fill ratio be specified (height-to-runout) derived from the site specific slope stability analysis. In this way, the height of any fill is controlled by the length of fill in front.	S	This site will have maximum sideslopes about 15 to 20 feet high. The first lift is specified to be 6 to 8 feet high. Accordingly, the chance of fill-induced slope instability is extremely remote.
5.6.1	Help control litter and manage the conditions at the tipping deck by controlling the push distance at the face.	N	Please see updated text in Section 5.6.1.
5.6.2	There do not appear to be any special procedures provided for wastes b.-d. and k.-p. as listed in §5.3.2. Provide procedures for each type of waste.	S	No special procedures are proposed for special wastes other than contaminated soils, asbestos, dead animals and medical waste. Other special wastes will be managed as conventional MSW unless otherwise provided by regulation or permit conditions.

Section No.	Comment	Category	Response
	Contaminated Materials, Subpart a.: Makes reference to an ash monofill area. Clarify.	S	This reference has been deleted.
	Contaminated Materials, Subpart e.(3): Locate disposal locations and limits. Information is required in all instances there is disposal.	S	Location is specified in terms of nothing, easting and elevation.
	Contaminated Material, Asbestos: 4 th para: Reference is made to a soil remediation facility. Clarify.	S	This reference has been deleted.
	Contaminated Material, Asbestos: 5 th para: clarify that this documentation should be similar to that described in §5.6.2(e).	S	The referenced language is essentially the same.
	Contaminated Materials, Subpart e.: Recommend the requirement be added that all forms and approvals must be completed and secure prior to unloading.	N	Please see Section 5.3.2 relative to special wastes: "When a special waste load arrives at the scalehouse, the scale attendant will direct the driver to the landfill office for inspection of the load and accompanying documentation."
	Contaminated Materials, Subpart e.(4): Describe how wind and precipitation is measured.	N	This is not intended to imply measurement. The comments to be recorded are general estimates intended to provide information on any unusual conditions that may have been extant at time of disposal.
5.7	Storage and disposition of bulk green waste and scrap vehicles is not discussed.	S	Reference to scrap vehicles has been eliminated due to the low possibility of their delivery to the site. Green waste is subject to as-yet undefined permit conditions and will be addressed in a revision to the Plan.
	Tire stockpile limits must be limited, defined and adhered to. Once limits are reached, tires must be processed and disposed of.	S	This is a limit to be addressed by the GEPA permit.
	Define a contingency plan if spills or releases occur from waste stockpiles.	S	The comment refers to green waste, tires and white goods, from which spills or releases are unlikely to occur.
5.8	Clarify that although 6" and 12" is the minimum cover thickness for daily and intermediate cover respectively, adequate soil must be applied to completely cover all waste with a minimum thickness.	N	Regardless of the Operator's diligence in applying cover soil, there is always a minor amount of litter that works its way into the cover soil. The suggested terminology is an invitation to continual controversy over the adequacy of cover.
	Cover soil should be track-walked after initial placement to aid in "sealing" the surface. Minimum cover thickness is measured after track-walking.	N	This recommendation has been added, section 5.8.1.
	Prior to subsequent waste placement, break up the soil cover to allow vertical percolation of leachate and minimize the potential for seeps.	N	Please see updated text of Section 5.8.1.

Section No.	Comment	Category	Response
6.	All information in this section pertaining to OPERATIONS should be moved to §5.	N	The organization of the document is one we have used for many sites. It intentionally separates waste placement operations from other issues related to environmental compliance.
6.3	First para states the water truck will be used "...during dry weather..." Clarify that the water truck must be used AS NEEDED to control dust.	S	Refer to section 6.3, additional language has been added to implement this suggestion.
6.4	Clarify that all litter screens must be cleared regularly to prevent them from blowing over and to keep them effective. Offsite litter collection needs to be addressed; outside fences, along access/entrance road, as needed.	S	Refer to section 6.4, additional language has been added to implement this suggestion.
6.5	Identify a contingency plan should the three measures listed prove ineffective in controlling odors to acceptable levels.	S	Refer to section 6.4, additional language has been added to implement this suggestion.
6.5.1	Wastes listed in this section should be landfilled in interior zones of the fill away from temporary or final slopes to help control odors and minimize the potential for seeps.	N	Please see new language at end of the introductory section in 6.5.
6.5.2	See prior comments on application of minimum daily cover soil	N	Regardless of the Operator's diligence in applying cover soil, there is always a minor amount of litter that works its way into the cover soil. The suggested terminology is an invitation to continual controversy over the adequacy of cover.
	This section is titled Daily Cover Soil. Reference is made to "Regular inspection and maintenance..." Clarify the need or benefit of inspection and maintenance of daily cover unless it is/has been in place for several days OR if this is also meant to cover Intermediate Cover. Define the specific inspection frequency. Inspection and maintenance of these covers is not addressed in the CPCMP.	N	Refer to section 6.5.2, language has been added to provide inspections on a quarterly basis or whenever pervasive odors are present, with a future change to inspection combined with surface emissions monitoring after installation of a GCCS.
6.6	Provide on the Drawings proposed locations for leachate tanks, piping and control panel.	S	Please see Drawings L1.7 and L2.12.

Section No.	Comment	Category	Response
	How is head buildup in the LCRS measured? What are the operational contingencies if the maximum allowable head is exceeded?	S	A pressure-sensing level meter will be integral with the leachate pumps. Liquid level in the sump can be correlated with head on the liner outside the sump. Contingency is obvious: pump it out. Refer to Book 2, Design Narrative, Appendix G.
6.6.1	Second para: Describe the specific operational scenario selected and modeled to determine the peak daily volumes. Include discussion of how reinjected leachate was considered in the models.	S	Leachate recirculation has been deleted from the project.
6.6.3	Describe how, where and at what frequency leachate is tested prior to disposal. What are the constituents of concern/action and what are the action levels?	S	Refer to Book 3, Site-Specific Groundwater Monitoring Plan, section 7. Leachate Monitoring; leachate sampling will be conducted at a minimum on a semiannual basis as specified.
6.6.4	It is described that infiltration wells will be terminated when they become ineffective; clarify how "ineffective" is measured. Is this termination permanent or temporary? If temporary, how is determined that they can again be used effectively? This same comment applies to the use of vertical infiltration galleries or any other leachate injection system utilized.	S	Work has started under a separate task to determine the requirements of the Inarajan wastewater treatment plant. Leachate recirculation has been deleted from the project proposal.
6.6.6	Daily Requirements: Include inspection for seeps and stops movements in the daily inspection.	S	This is not necessary in the absence of leachate recirculation.
6.7	Identify a contingency plan should the proposed landfill gas control measures prove ineffective in controlling gas levels or migration to acceptable levels.	S	Such procedures would be among those included in the Operations Plan revisions to be made when a GCCS is implemented, as stated in the last paragraph of Section 6.8.
6.8	This section should be made part of §7.	N	This section (now 6.9) is part of Section 6, Maintenance and Control, and is focused on detection and prevention of fires. Section 7's Emergency Procedures, and property addresses responses to a fire.
	It is stated that scalehouse and unloading personnel will be trained to notice signs of fire. Recommend all staff receive this training.	N	Section 4.1.2 states that all staff receive broad training in all aspects of the site.
6.9	This operations plan must have a subsection under stormwater dedicated to "winterization," the process of preparing the site for the wet weather season through inspections, repairs and protective measures.	S	Please see Section 6.10.4, Annual Surface Water Management Plan.

Section No.	Comment	Category	Response
	Add to the bullet list of reasons drainage is managed: "to prevent waste washout."	N	This is covered by the general term "erosion"
6.9.2	Expand the discussion regarding the use of BMPs (types, locations, maintenance, etc).	S	Please see Section 6.10.4, Annual Surface Water Management Plan.
	Implement measures to minimize flow concentrations.	S	The measures described in the updated document will minimize flow concentrations.
6.10	The use of daily cover alone may not prevent birds. Describe contingency plans for bird control.	N	Please see additional text in Section 6.11.

Section No.	Comment	Category	Response
6.11	Clarify that the "comprehensive program" mentioned is a site specific Health and Safety (HS) Plan and provide a copy of the HS Plan as an attachment to the Operations Plan. The HS Plan must address all site safety issues including, but not limited to: working in and around municipal waste and the risks associated with landfill gas (fire, asphyxiation, etc), exposures to waste, exposure to leachate, etc.; animals (snakes, dogs, pigs, etc); weather (heat exhaustion, etc); confined spaces	S	Section 6.12 of the Operations Plan is intended to be general. It is understood that the Operator, when selected, will create a site specific Health and Safety Plan according to policies of the Operator's organization. We have not attempted to specify those policies.
7.	Provide a primary contact list with names and phone numbers.	S	This information will be included in the Emergency Management Plan to be developed by the Operator after an Operator has been selected.
	Provide information on the closest hospital including a route map and phone numbers.	S	This information will be included in the Emergency Management Plan to be developed by the Operator after an Operator has been selected.
	Provide contact information on local agencies for poison control and disease control and any other local health departments.	S	This information will be included in the Emergency Management Plan to be developed by the Operator after an Operator has been selected.
8.	Not reviewed	N.A.	
9.	Not reviewed	N/A	
Closure and Post-Closure Plan	First para: "It describes the activities that will be taken to close, inspect, and maintain the site..."	N	Refer to section 1, paragraph 1, the word "inspect" has been added.
1.			
2.	Include in this section a brief description of each primary element of the landfill facility. Including, but not limited to: Landfill footprint; Support facilities (scalehouse, maint, admin, fuel storage, etc); Liner system; LCFS including recirculation system; Subdrain system; Landfill gas collection and treatment system; Stormwater control facilities; Access and site roads; Soil stockpiles; Site security; Non-disposal operations (greenwaste, etc)	N	Please see expanded section 2, Facility Description, which covers site elements of relevance to closure.
2.2	See comments under Operations Plan regarding field vs lab permeability values, liner design and supporting analysis/modelling and leachate recirculation system design.	S	As stated previously, these topics are covered in the Design Narrative and are not essential to the Closure / Post-closure Plan.

Section No.	Comment	Category	Response
2.3	As part of the CPCMP, provide a brief summary of those operational elements that may be of significance relative to how the site was operated and how it resulted in the closed configuration (final grades). Examples of this type of information are: how waste placement was sequenced and how waste was placed and compacted; how daily cover was placed and what was utilized for daily cover; how the leachate collection system was installed and operated; how the landfill gas collection system was installed and operated; how settlement was monitored and documented.	N	We do not consider these topics germane to a preliminary closure plan for a site not yet constructed.
2.4	Provide more information on the anticipated waste stream characteristics (types and percentages, moisture content, etc.). Discuss any diversion efforts.	N	Such information is neither available nor significant to closure and post-closure activities.
2.4.2.	List of wastes is not the same as that provided in Operations Plan.	N	The list of wastes is now consistent.
2.5	Will the open space be vegetated? Secured? Will there be development restrictions?	N	The word "vegetated" has been added. Details are contained in Section 6.
3.	In addition to the information contained in §3, provide a summary of the following site conditions that support the landfill design, operation and closure: Geology; Hydrogeology (including seep locations and flowrates; seasonal fluxuations); Baseline Groundwater Quality; Wetlands; Habitat; Regional Hydrology; Wind Rose	N	Please see Sections 3.4 – 3.7 for this additional information. Further information is available in the Final Integrated Hydrogeologic Assessment, 11/26/2008, prepared by AMEC Geomatix.
3.4	Signs should also warn against unauthorized dumping	N	Such signs would be appropriate on public roads leading to the site.
3.5	Clarify the statement that there are no natural drainage courses on site; drawings show a number of drainage courses outside the footprint but within the site boundary.	N	Please see updated text in Section 3.5.
5.	The Closure Plan appears to reflect only a full, final closure scenario. As the sequencing plan contemplates a phased closure scenario, the closure and postclosure maintenance plan must reflect how phased closure will be implemented and how post closure inspection and maintenance is accomplished by phase. This is not just a phased closure schedule; it refers to addressing each element of the CPCMP from a phased perspective.	S	This is a preliminary closure plan that must be updated prior to any phased closure activity, with specific detailed design plans for closure construction. The function of the preliminary plan is to provide regulators with assurance that closure will be properly conducted, and most importantly to provide a basis for financial assurance. The incremental financial assurance approach detailed in Sections 7.4 and 7.5 are very specific as to how partial final closure, if implemented, would be managed. Inspection and maintenance activities for partial closure areas would be identical to those for a complete site closure.

Section No.	Comment	Category	Response
	No diversion figures are reported; assume greenwaste and other non-disposal waste is not counted in gate inflow rates and no diversion is anticipated throughout the life of the landfill. Otherwise, site life needs to be recalculated considering diversion.	N	The waste volume data used in all project documents were specified by the Government of Guam based on waste studies that accounted for potential diversion and recycling activities. Consideration of potential future diversion would be speculative. Furthermore, site life is not critical to any design or financial aspects of the Closure Plan.
5.2	Proposed final cover does not comply with regulations having permeabilities greater than the bottom liner system (10^{-7} cm/sec and 10^{-8} cm/sec, for deck and slopes, respectively)	F	Section 5.2 Final Cover has been revised to include a geomembrane on both top deck and sideslope areas.
	Side slope final cover proposal of 10^{-8} cm/sec achieved using site soils only will require a demonstration of equivalent performance before approval can be obtained.	F	Section 5.2 Final Cover has been revised to include a geomembrane on both top deck and sideslope areas.
	Clarify final cover certification must be by a qualified registered engineer.	N	Refer to section 5.2, we have added this clarification.
5.3.1	Discuss contingency if the leachate tanks or exterior piping (to and from tanks and to reinjection points) leaks.	S	This is addressed in Section 6.5.2 as part of post-closure maintenance.
5.6	Final Design and Construction Procurement: clarify that Construction Quality Assurance Plan will be prepared with technical specifications. Further, clarify that final design plans will include final grading, extension of wells as needed, construction of access roads and deck road, landfill gas treatment system and leachate reinjection system modifications.	S	Please see updated Section 5.6 with reference to CQA plan, among documents to be approved by GEPA prior to construction.
	Insert second step in closure sequence: Notify Administrator of intent to close.	N	Please see paragraph captioned "Obtain regulatory approval".
5.7	Again, this schedule reflects only a full, one-time closure; a schedule for phased closure needs to be developed.	S	Refer to section 5.7, The schedule description has been modified to make it applicable to full or partial final closure construction. Clearly, this is a conceptual schedule that would be made more specific at the time actual closure plans are developed and submitted for approval.

Section No.	Comment	Category	Response
	<p>Given the four bullets shown and the durations noted, a total of 7 months is being proposed from start of final design package (as a minimum to include plans, technical specifications, CQA Plan, upfront bidding and contract documents, bid schedule, quantity takeoff, engineers estimate, and final design report) to start of closure construction. Assuming at least 3 months for the advertisement, bid opening, bid evaluation/selection of contractor, approval of selected bidder by governing body, bonds and insurance paperwork, this leaves only 4 months for the entire design process including review periods by GEPA and US EPA; this timeframe may not be adequate.</p>	N	Refer to section 5.7, the conceptual time frames have been expanded. An actual schedule will be developed prior to each closure construction project.
6.	<p>Define the postclosure period as a minimum of 30 years from completion of closure.</p> <p>Discuss the end use(s) anticipated for the closed site and how the integrity of the closed facility (specifically the key elements of the closed landfill; final cover, stormwater control facilities, landfill gas control facilities, monitoring wells/probes, access roads, etc) will be maintained in light of said end uses.</p>	N	<p>Refer to section 6.2 Post-Closure Period.</p> <p>Please see revised text of Section 6.3 Post Closure Uses.</p>

Section No.	Comment	Category	Response
6.1	Provide a staff matrix (Site Supervisor, Site Engineer, etc) populated with names and contact information. Identify who is the first point of contact for the facility.	N	Refer to section 6.1, a blank table has been provided, to be filled in after an Operator is Identified.
6.2	In addition to the elements noted, include inspection and maintenance of stormwater control facilities, security systems, and settlement monuments.	N	Refer to section 6.5, the list is expanded.

Section No.	Comment	Category	Response
6.2.1	Recommend more frequent settlement surveys during the first 5 years after closure.	N	Refer to section 6.5.1, the language has been modified to indicate that partial closure areas should be surveyed annually along with the operational area, and indicate a minimum 5 year period otherwise. The settlement surveys are more for documentation than for closure cap maintenance; regular inspections will identify need for grade corrections on the top deck based on presence or absence of ponded water.
7.2	Estimated costs are in 2005 dollars. Escalate to 2006 dollars.	N	Refer to section 7. Financial Assurance and Tables 7-1 and 7-2. Costs in the current plan are in 2009 dollars.
Table 7-1	Closure Costs: include a line item for: mobilization/demobilization surveying/construction staking primary access road and site access, haul and deck roads	S	Mobilization / demobilization and surveying have been added. Roads will be in place at closure; modifications are included in the allowance for drainage.
	Bring all future annual costs forward and convert them to present value; will require that industry standard inflationary factors be considered.	S	We disagree. The method used for cost estimating and computing financial assurance is consistent with requirements of the State of California. Present value is an arbitrary quantity entirely dependent on assumed future Inflation rates and the discount rate used in the formulas. The proper way, as required by California regulation and proposed here, is to estimate costs based on current dollars and escalate the amount annually in the future based on actual Inflation rates, typically based on the local consumer price Index.
	There appears to be no consideration of phased closure scenario. If phased closure is implemented, then closure capital costs in the future need to be inflated and brought forward and converted to present value.	S	Please see Section 7.4 and Section 7.5 relative to Incremental financial assurance and phased closure.
Closure Cost Estimate	Final Cover: It appears the assumption has been made that all foundation soil is already in place and of adequate thickness since no foundation layer is reflected. However, the estimate must conservatively consider that there will be a significant soil quantity needed to re-establish final grades subsequent to settlement; estimate that quantity and include in estimate. Revise cost estimate to include costs for leachate recirculation system modifications consistent with approach taken with landfill gas control	S	Refer to section 5.2, the revised final cover section provides a 12-inch foundation layer above 6-12 inches of existing cover. We assume that the Operator will place refuse in a manner that achieves applicable final grades before closure is implemented. Any grade corrections for settlement after closure are covered by post-closure costs. Leachate recirculation has been deleted from the project proposal. The engineering and CQA allowance has been extended to cover all closure activities.

Section No.	Comment	Category	Response
System	Engineering allowance is included for final cover but not for other closure elements. Revised as appropriate.		
Post Closure Cost Estimate	<p>Leachate sampling costs listed here but leachate sampling was not discussed in the GPCMMP.</p> <p>Clarify that the 20 labor hours/week include time for maintenance and repairs to leachate recirculation system. Clarify that power costs are included for operation of the leachate system and landfill gas control system.</p>	N	<p>Leachate sampling has been added as a post-closure function in Section 4.1.</p> <p>Power costs are added as a line item under gas management. Power for leachate management and other functions is minor in comparison.</p>