

BAGHDAD MUNICIPAL
SOLID WASTE LANDFILL

SIGIR PA-06-067
OCTOBER 19, 2006

Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE 19 OCT 2006		2. REPORT TYPE		3. DATES COVERED 00-00-2006 to 00-00-2006	
4. TITLE AND SUBTITLE Baghdad Municipal Solid Waste Landfill				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Office of the Special Inspector General for Iraq Reconstruction, 400 Army Navy Drive, Arlington, VA, 22202				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT Same as Report (SAR)	18. NUMBER OF PAGES 33	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			



SPECIAL INSPECTOR GENERAL FOR IRAQ RECONSTRUCTION

October 19, 2006

MEMORANDUM FOR COMMANDING GENERAL, MULTI-NATIONAL FORCES-
IRAQ
DIRECTOR, IRAQ RECONSTRUCTION MANAGEMENT
OFFICE
COMMANDER, JOINT CONTRACTING COMMAND-IRAQ
COMMANDER, GULF REGION DIVISION, U.S. ARMY CORPS
OF ENGINEERS AND DIRECTOR, PROJECT AND
CONTRACTING OFFICE

SUBJECT: Report on Project Assessment of the Baghdad Municipal Solid Waste Landfill,
Baghdad, Iraq (Report Number SIGIR-PA-06-067)

We are providing this project assessment report for your information and use. We assessed the construction work performed on the Baghdad Municipal Solid Waste Landfill, a DFI funded project located in the Baghdad Governorate, to determine its status and whether intended objectives will be achieved. This assessment was made to provide you and other interested parties with real-time information on a relief and reconstruction project in order to enable appropriate action to be taken, if warranted. The assessment team included an engineer and an auditor.

This report does not contain any negative findings. As a result, no recommendations for corrective action are made and further management comments are not required.

We appreciate the courtesies extended to our staff. This letter does not require a formal response. If you have any questions please contact Mr. Brian Flynn at (703) 604-0969 or brian.flynn@sigir.mil or Mr. Jon Novak at (703) 343-9149 or jon.novak@iraq.centcom.mil.

For public or congressional queries concerning this report, please contact SIGIR Congressional Relations and Public Affairs at publicaffairs@sigir.mil or at (703) 428-1100.

Stuart W. Bowen, Jr.
Inspector General

Special Inspector General for Iraq Reconstruction

SIGIR PA-06-067

October 19, 2006

Baghdad Municipal Solid Waste Landfill Synopsis

Introduction. This project assessment was initiated as part of our continuing assessments of selected sector reconstruction activities for Public Works and Water. The overall objectives were to determine whether selected sector reconstruction contractors were complying with the terms of their contracts or task orders and to evaluate the effectiveness of the monitoring and controls exercised by administrative quality assurance and contract officers. We conducted this project assessment in accordance with the Quality Standards for Inspections issued by the President's Council on Integrity and Efficiency. The assessment team included a professional engineer and an auditor.

Project Assessment Objectives. The objective of this project assessment was to provide real-time relief and reconstruction project information to interested parties in order to enable appropriate action, when warranted. Specifically, we determined whether:

1. Project components were adequately designed prior to construction or installation;
2. Construction or rehabilitation met the standards of the design;
3. Sustainability was addressed in the contract or task order for the project;
4. Project results were consistent with original objectives; and
5. The constructed facility is being used for its intended purpose.

Conclusions. The assessment determined that:

1. The project components were adequately designed prior to construction. The design package submittal, including the reports, drawings, and specifications appeared complete and detailed enough for the contractor to construct the landfill and supporting facilities.
2. The completed project work we observed met the standards of the design. However, we did note marginal quality workmanship associated with the vehicle maintenance building. Specifically, we noted deficiencies with the electrical generator, electrical wiring, and building exterior.
3. Sustainability was addressed in the contract requirements. The contract design package included the operations and maintenance manuals for the day-to-day operation of the landfill and for the leachate collection system pumps. The task order required the contractor submit a training plan to accommodate the required number of staff to manage and operate the landfill. In addition, the task order required the contractor provide at least one full time person to provide at least two months of on-site training and supervision. The contractor provided training material, including two study guides.
4. The Baghdad Municipal Solid Waste Landfill project results were consistent with the original contract objectives. As a result of the new construction, the Iraqi

local government was provided with a municipal solid waste landfill. In addition, the prime contractor utilized local Iraqi subcontractors to maximize employment for the local community.

5. The project was closed out in November 2005 prior to completion because of security issues that presented a health threat and security risk to Coalition Forces and Iraqis working at the site. When the assessment team visited the site in June 2006, we determined the landfill was not being utilized. However, there is a plan to complete construction on the landfill and promote its usage. According to the U.S. Embassy Military Liaison to the Iraqi Municipal Government, Coalition Forces are now coordinating with the U.S. Agency for International Development to establish a management staff with the local government to use the site efficiently. Implementation of the plan has begun and the local government started utilizing the landfill for trash disposal on 13 August 2006. Full implementation, with trucks hauling solid waste to the landfill is projected for November 2007.

Recommendations and Management Comments. This report does not contain any negative findings or recommendations for corrective action. Therefore, management comments were not required. However, the Gulf Region Division reviewed the draft of this report and concurred with the conclusions contained in the report and provided a comment for clarifying contract information. The comment was incorporated into the final report.

Table of Contents

Synopsis	i
Introduction	
Objective of the Project Assessment	1
Pre-Site Assessment Background	1
Contract, Task Order and Costs	1
Project Objective	3
Description of Facility (preconstruction)	4
Scope of Work of the Task Order	4
Current Project Design and Specifications	5
Site Assessment	
Project Background	8
Site Visit	9
Satellite Assessment	20
Project Sustainability	20
Future Plan for the Landfill	21
Conclusions	22
Recommendations and Management Comments	23
Appendixes	
A. Scope and Methodology	24
B. Acronyms	25
C. Report Distribution	26
D. Assessment Team Members	28

Introduction

Objective of the Project Assessment

The objective of this project assessment was to provide real-time relief and reconstruction project information to interested parties in order to enable appropriate action, when warranted. Specifically, we determined whether:

1. Project components were adequately designed prior to construction or installation;
2. Construction or rehabilitation met the standards of the design;
3. Sustainability was addressed in the contract or task order for the project;
4. Project results were consistent with original objectives; and
5. The constructed facility is being used for its intended purpose.

Pre-Site Assessment Background

Contract, Task Order and Costs

The Baghdad Municipal Solid Waste (MSW) Landfill was constructed under contract W914NS-04-D-0008, Task Order (TO) 0006. Contract W914NS-04-D-0008, dated 23 March 2004, was a design build, indefinite delivery/indefinite quantity (IDIQ) contract with a \$600 million ceiling. The contract was between the Coalition Provisional Authority (CPA) and Fluor-Amec, LLC.

There are 11 modifications to Contract W914NS-04-D-0008, which are summarized in Table 1.

Table 1: Modifications to Contract W914 NS-04-D-0008

Modification Number	Date	Description
P00001	29-Apr-04	Incorporated FAR Clause 52.244-5, Competition in Subcontracting.
P00002	19-May-04	Provided an address to send copies of invoices.
P00003	21 Sep-04	Added a new element number to capture Home Office Direct Support at level 7 of the WBS.
P00004	05-Nov-04	Transferred administrative responsibility for task orders to the Gulf Region Division in accordance with the pre and post definitization matrix.
P00005	29-Nov-04	Delegated three pricing and cost accounting functions to DCMA
P00006	06-Jan-05	Added various AFARS clauses.
P00007	06-Jul-05	Incorporated a change to the standards for contract reporting which will allow U.S. Government insight into contractor costs.

Modification Number	Date	Description
P00008	07 Jan 06	Incorporated the requirements for subcontract and capacity development reporting into the Subcontracting Excellence Program (SCEP) Database.
P00009	21-Feb-06	Exercised Option Period 1 to extend contract from 24 March 2006 to 23 March 2007.
P00010	28-Feb-06	Changed the Contractor's date for recurring reporting requirements to on or about the fifteenth of each month.
P00011	30-Apr-06	Added FAR clause 52.222-50 – Combating Trafficking in Persons (April 2006).

None of the modifications listed in Table 1 resulted in an increase in the contract funding.

TO 0006, issued 09 May 2004, by the CPA to Fluor-Amec, LLC, for a not to exceed (NTE) amount of \$21,853,147 required the design, construction, equipment procurement, commissioning, initial operations, and training for a solid waste landfill. The project was funded with an allocation from the Development Fund for Iraq. Also on 9 May 2004, the contracting officer issued a limited notice-to-proceed (NTP) in the amount of \$500,000 for Phase 1 (contract line item number [CLIN] 0001) until the task order could be definitized. Subsequent to the NTP, 10 modifications to TO 0006 were issued. They included the following:

- Modification 01, dated 10 May 2004, added an award fee in the amount of \$2,185,315. The task order value was increased by \$2,185,315 from \$21,853,147 to \$24,038,462.
- Modification 02, dated 02 February 2005, definitized for the Baghdad MSW Landfill Project:
 - CLIN 0001, The design and construction work
 - CLIN 0002, Other direct costs
 - CLIN 0003, Life support costs
 - CLIN 0004, Training costs

The CLIN Structure for the estimated cost and fee for the Baghdad Landfill Water Project was definitized as follows in Table 2.

Table 2. CLIN Definitization Structure

CLIN	ITEM DESCRIPTION	COST
0001	Estimated Costs for Design and Construction Work	\$18,100,778
0002	Other Direct costs	\$139,762
0003	Life Support Costs	\$2,463,214
0004	Training Costs	\$72,028
	Total Estimated Cost	\$20,775,782
0005	Base Fee	\$585,483
0006	Award Fee	\$2,234,684
	Total Estimated Costs Including Fee(s)	\$23,595,949

CLINS 0001 through 0004 established the completion date as 01 June 2005. The issuance of the modification constituted full NTP on CLINS 0001 through 0004 to completion. The NTE amount for CLINS 0001 through 0004 was \$20,775,782.

- Modification 03, dated 15 April 2005, increased the total cost of the task order by \$400,000 from \$23,595,949 to \$23,995,949.
- Modification 04, dated 20 April 2005, authorized the contractor to invoice for the award fee earned during the rating period of 10 September 2004 through 09 March 2005, to remove unearned award fee from the total award fee pool, and to properly allocate remaining award fee to appropriate rating periods. There was no increase or decrease in TO funding.
- Modification 05, dated 9 June 2005, increased the total cost of the TO by \$1,511,468, from \$23,995,949 to \$25,507,417.
- Modification 06, dated 13 November 2005, transferred Government property to the local Water Resources Ministry of the Amanant. There was no increase or decrease in TO funding.
- Modification 07, dated 15 December 2005, authorized the Contractor to invoice for earned award fee for the rating period of 10 March 2005 through 09 September 2005, in the amount of \$796,630.14. The modification also removed unearned award fee for the period of 10 March 2005 through 09 September 2005, in the amount of \$197,169.94, from the award fee pool. The modification added unearned award fee from this period (\$197,169.94) and the previous period (\$76,934.80) in the amount of \$274,104.74 to CLIN 0001, thereby increasing CLIN 0001 to \$20,286,350.74. The NTE amount CLINs 0001 through 0004 was increased to \$23,272,733.00. The total amount of the TO remained \$25,507,417.
- Modification 08, dated 09 January 2006, increased the total amount of the TO by \$3,342,513, from \$25,507,417 to \$28,849,930.
- Modification 09, which was not dated, and finalized pending signatures, transferred Government furnished property from W914NS-04-D-0008-0006 to W914NS-04-D-0003-0006. There was no proposed increase or decrease in TO funding.
- Modification 10, which was not dated, and finalized pending signatures, transferred Government furnished property from W914NS-04-D-0008-0006 to W914NS-04-D-0022-0002. There was no proposed increase or decrease in TO funding.

At the time of our assessment, the project was reported in the 7 July 2006 GRD-PCO database as 100% complete.

Project Objective

The objective of this project was to design and construct a regional municipal solid waste (MSW) landfill for the Amanat¹ and the Governorate of Baghdad. An ancillary objective was to make maximum use of subcontractors, suppliers,

¹ Amanat functions as the Public Works Directorate for the City of Baghdad Government.

craftsmen, and laborers in the local area to maximize rapid employment opportunities for local Iraqis. Further, the TO also stated:

“The DB [design-build] contractor must ensure that the constructed project will provide economic, sustainable and best life cycle cost solutions.”

Description of the Facility (preconstruction)

The description of the facility (preconstruction) was based on information obtained from the GRD-PCO project file. The landfill site is in the southwest sector of Baghdad, approximately 15 kilometers from the city center, west of the Tigris River. The Al Kerkh Waste Water Treatment Plant (WWTP) is adjacent to the landfill, on the north side of the site. The area surrounding is essentially rural. The topography of the landfill site is generally flat, ranging from about 30.70 m to 29.40 m above mean sea level. The ground water table is within 0.8 to 1.1 meters of the ground surface, which precluded any deep excavation for the landfill.

Scope of Work of the Task Order

Based on the TO technical requirements for the project, the scope of work (SOW) included the design and construction of a regional MSW landfill for waste generated within the Baghdad Governorate. The landfill design parameters included a capacity of 2,230 cubic meters (m³) of waste per day (compacted), for a population of 2 million people and a minimum design life of two years, with expansion capability for 10 years.

The SOW required the contractor to include the following design features:

- Leachate² controls and drainage
- Gas controls
- Surface water controls
- Security guard building and facilities
- Landfill site office, utilities, and weighing scales
- Lighting
- Perimeter fencing
- Groundwater monitoring facilities
- Landscaping and access roads
- All ancillary electrical, mechanical, and site civil work
- All required operating equipment with spares

In addition to the sanitary landfill area for domestic waste, the SOW included design and construction of areas for rubble (brick, concrete, demolition, and construction debris) disposal, a recycling and sorting area for municipal solid waste, and a temporary hazardous waste storage area.

The SOW also included requirements for operations and maintenance (O&M) manuals and on-site training for the staff that would manage and operate the landfill.

The total area for the landfill site, as indicated by the Contractor's Design Report, is approximately 82.1 hectares³. The entire landfill facility is an L-shaped site, as

² Leachate is the byproduct produced in a landfill as a result of rain percolating through the solid waste and reacting with the products of decomposition, chemicals, and other materials in the waste.

shown in Figure 1. In addition to the MSW landfill, the facility includes area for the construction debris landfill, the administration building and maintenance building, as well as area for future expansion. Within this L-Shaped site, the MSW landfill footprint is about 39 hectares (including expansion) with the first cell designed at 9.72 hectares.

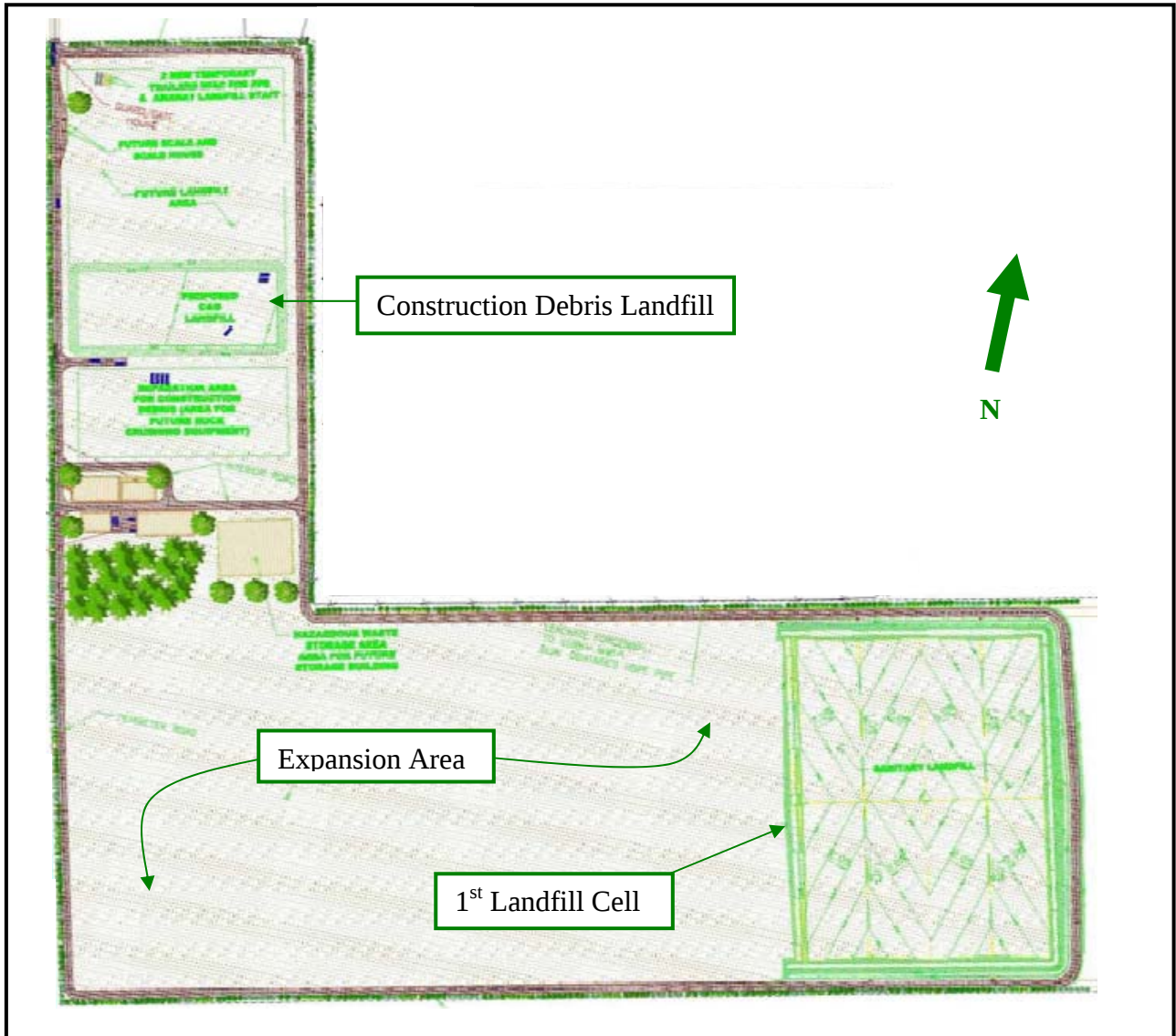


Figure 1. Baghdad Landfill site

Current Project Design and Specifications

The TO required the contractor to submit construction plans, specifications, and a design report to the Sector Project Management Office (SPMO)⁴. The design report contained design calculation summaries for items such as settlement

³ One hectare is approximately 2.47 acres.

⁴ SPMO is the Sector Project Management Office, which preceded the establishment of PCO. After PCO was established, the functions of SPMO were shifted to the respective PCO sector, i.e., Sector Project & Contracting Office (SPOC).

evaluation, slope stability analysis, and liner system comparison. The report also contained details on the liner system, leachate collection system, surface water management, landfill gas management, and environmental monitoring. The design report included separate appendices for the following:

- Design calculations to support the landfill design
- Soils and subsurface investigation report
- Topographical report
- Contractor's quality control plan
- Groundwater monitoring plan
- Landfill operations plan
- Landfill closure plan

The design report listed the MSW landfill design components, which included the following:

- High density polyethylene (HDPE) geomembrane liner system
- Leachate collection and management system
- Surface water management system
- Final cover and gas management system
- Environmental monitoring system

The liner system cross section is diagrammed in Figure 2. It consists of a 1.5 millimeter (mm) thick HDPE geomembrane underlain by a 0.3 m thick layer of compacted select fill or native material that serves as the soil liner. The compacted soil liner is designed to have a low hydraulic conductivity so very little leachate could actually permeate the layer. A protective geotextile fabric layer covers the liner and serves as a cushion between the liner and the drainage layers. The overlying drainage layers include granular material consisting of a 0.3 m gravel base, topped with a sand layer, 0.2 m in thickness. As the trash, rubbish, and other solid waste material are deposited, the liner system in place will prevent chemicals from the decaying solid waste from “leaching” into the underlying soil and groundwater. Further, because of the sloped construction of the landfill floor, the liner will channel any leachate to the collection system piping.

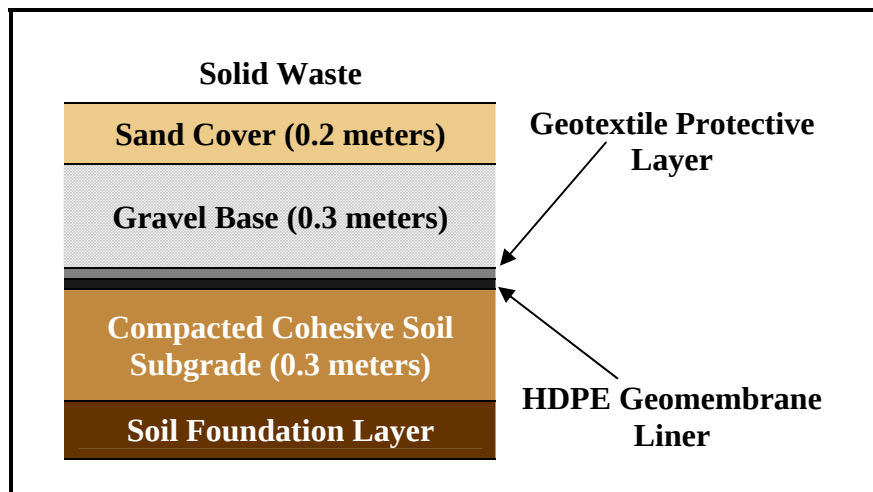


Figure 2: Cross section of liner system for MSW landfill

When the MSW landfill becomes fully functional, the operating practices include compacting and covering waste with 15 centimeters of soil or crushed rubble on a daily basis. The contractor's O&M Plan shows the deposited wastes formed into

cells, 2 m high that will create a horizontal lift compacted trash and cover material across the landfill area. The landfill is filled this way in 2 m lifts until reaching a height of about 40 m above the floor of the landfill. The side slopes along the perimeter are designed for an exterior face with a 3 (horizontal) to 1 (vertical) slope. The O&M Plan also includes requirements for the final cover over the landfill, once the landfill sections reach design capacity. The contractor's plan and design also show the installation of gas monitoring and passive gas venting systems in conjunction with the final cover placement.

The design report also discussed the construction debris landfill requirements. This construction debris landfill contains the following components:

- Construction debris separation area
- Compacted select fill (soil) liner system
- Surface water management system
- Final cover

The design package contained 21 drawings for constructing the MSW landfill and the construction debris landfill. The drawings included the following:

- | | |
|--------------------------------------|---|
| • Title/drawing index sheet | • Landfill surface water management plan |
| • Facility layout plan | • Landfill gas management plan |
| • Landfill base grades | • Construction debris landfill final cover grades |
| • Landfill coordinate location plan | • Cross sections |
| • Landfill control point coordinates | • Liner and leachate collection details |
| • Construction debris landfill | • Leachate collection details |
| • Interior road grades and detail | • Leachate collection pump station |
| • Perimeter road grades and detail | • Final cover & surface water mgmt. details |
| • Perimeter road grades (2 drawings) | • Gas management details |
| • Landfill final cover grades | • Site electrical plan |

The design site plan showed a guard house at the site entrance, a vehicle maintenance building, and an administration building. The contractor, in its Design Report, stated: "the facility's buildings for support functions will be designed and constructed by an Iraqi Engineering and Construction Firm." The drawings for these buildings prepared by the Iraqi subcontractor included an architectural plan and section views, as well as building elevations, and structural, plumbing, and electrical drawings.

In addition to drawings, the contractor prepared detailed specifications. The specifications included requirements for the following:

- Leachate collection system piping, pumps, and valves
- Erosion control
- Earthwork at the landfill
- Geomembrane liner
- Geotextile protective cover
- Road building materials
- Testing piping systems

Based on our review of the design package submittal, the reports, drawings, and specifications appeared complete and detailed enough for the contractor to construct the landfill and supporting facilities.

Site Assessment

Project Background

The Baghdad MSW Landfill Facility was substantially complete in November 2005. However, the project was closed out prior to completion as a result of security issues that presented a health threat and security risk to Coalition Forces and Iraqis working at the site.

The landfill site is located in an area that has seen recurrent violence during the course of construction. The contractor reported that since the beginning of earthwork construction, the project site was beset with vandalism, violence, extortion, kidnappings, and the death of subcontractor personnel. Additionally, the contractor's workers at the landfill site were subject to indirect and direct fire, as well as, threats, and warnings not to work on the landfill project.

Due to the security issues, the contractor filed a claim for the escalating costs on the previously negotiated material and labor agreements. According to the contractor:

“These costs escalated after each security incident due to the local suppliers and equipment owners/renters leaving the site out of fear for their personnel and safety of their equipment and only then returning when rental rates and material costs were raised as an enticement. In a lot of cases, previous hired equipment operators by ICCB⁵ refused to come back on site due to the violence and new subcontractors had to be recruited but at much higher rates.”

In November 2005, the Joint Contracting Command-Iraq/Afghanistan (JCC-I/A) settled the claim for approximately \$2.4 million.

Due to funding limitations, increasing costs, and a degraded security situation, the JCC-I/A directed the contractor to complete all work on the TO no later than 31 October 2005. A review of the contract documentation indicated the contractor completed required work on the landfill project, except for the MSW landfill. When construction ended at the landfill site, approximately 25% of the MSW landfill's liner still needed to be covered with the sand-gravel drainage layer (0.5 m thick).

Since construction ended and the contractor demobilized, the Amanat has not utilized the landfill. According to one U.S. Embassy Military Liaison Officer to the Amanat:

“Ongoing security incidents ranging from IED emplacement, murder of Amanat sewer staff at the adjacent Al Kerkh WWTP, small arms and mortar attacks, and the intimidation of WWTP and landfill workers have prevented the local Iraqi Government from commissioning these two key infrastructure sites [Al Kerkh WWTP and the landfill facility] supporting public health/security within the city of Baghdad.”

As a result, the Baghdad MSW landfill remains vacant. However, there is a plan to reactivate the landfill and promote its usage. We will discuss this plan later in the assessment report.

⁵ ICCB is FluorAmec's subcontractor on the MSW Landfill.

Site Visit

On 24 June 2006, we performed an on-site assessment of the Baghdad MSW Landfill project. The PCO database, dated 7 July 2006, reported the project status as 100% complete, with an actual completion date of 30 November 2005. We inspected the following facilities at the landfill:

- MSW landfill
- Leachate collection system
- Perimeter road
- Vehicle maintenance building
- Administration building

MSW Landfill Cell

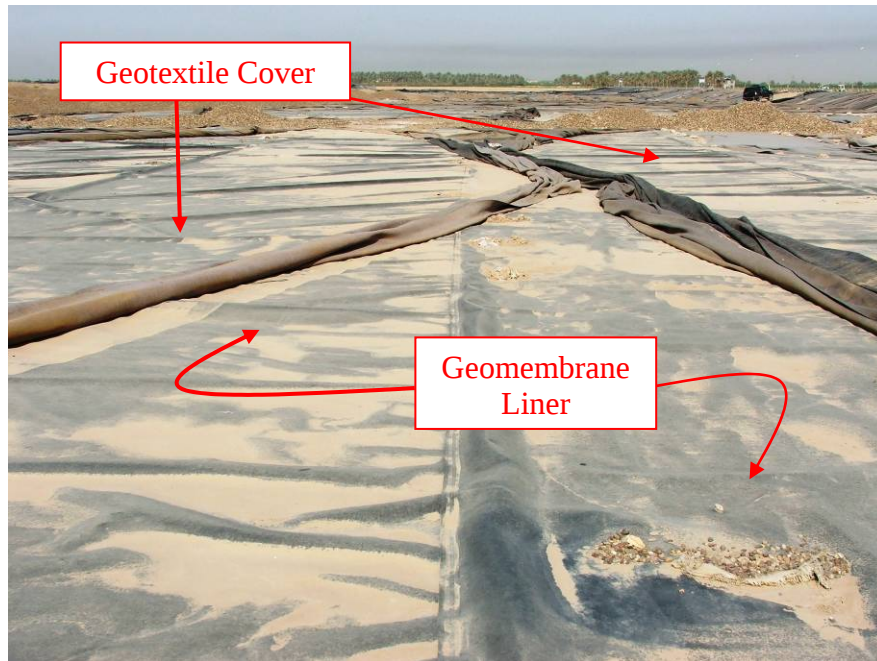
The MSW landfill construction included the first cell (Figure 1), with an area of approximately 9.7 hectares, located on the eastern part of the site. The MSW landfill site components visible for inspection included the geomembrane liner system, a drainage layer, a perimeter berm, and a leachate collection system.

Geomembrane Liner and Cover

As mentioned previously, the cell construction was not completed when the project was closed out in November 2005. The geomembrane liner and geotextile cover were in place in every part of the 9.7 hectare cell. However, on approximately 25% of the cell in the northeast quadrant, the gravel base and sand cover (Figure 2) had not been spread over the liner and geotextile protective cover. Site Photo 1 shows part of the MSW landfill's northeast quadrant with the geotextile protective cover lying over the geomembrane liner. During our inspection, we noticed that in some areas of the unfinished section, the geotextile covering had stripped away from the geomembrane liner, as shown in Site Photo 2. It appeared wind action in the previous seven months had blown parts of the geotextile cover off of the geomembrane liner.



Site Photo 1. Geotextile protective liner covering



Site Photo 2. Exposed geomembrane liner

There was also wind blown sand covering parts of the geomembrane liner and geotextile covering as seen in Site Photos 1 and 2. If the landfill is commissioned into service, the geomembrane liner and geotextile cover will require remedial work to bring their condition up to standards. The contractor's geotextile cover specification states:

"During placement of geotextiles, care shall be taken not to entrap in or beneath geotextiles stones, excessive dust, or moisture that could damage the geomembrane, cause clogging of drains or filters, or hamper subsequent seaming."

Thus, the geomembrane needs cleaning prior to covering with the geotextile fabric.

The specification also required seaming of the geotextile sections, either by sewing or thermally bonding the seams together. Based on our observations, many sections of the geotextile fabric in the uncovered part of the MSW landfill needed to be seamed. This seaming process should take place after the underlying geomembrane is cleaned, followed by the cleaning and placement of the geotextile fabric over the geomembrane.

In areas around the unfinished portion of the MSW landfill, we observed stockpiles of gravel that can be spread over the liner and geotextile cover. Site Photo 3 shows some of the gravel piles that could be used for constructing the gravel drainage layer over the liner system. Also, to ensure there is an adequate supply of gravel, an estimate of the amount required to finish the drainage layer is needed. We did not see any sand stockpiles, so sand would also need to be delivered to the site to complete the drainage layer.



Site Photo 3. Stockpiles of available gravel at landfill site

Drainage Layer

The drainage layer as shown in Figure 2 consists of 0.2 m of sand over 0.3 m of gravel that is supported by a compacted 0.3 m cohesive soil subgrade. The geomembrane liner and the geotextile cover lie between the subgrade layer and the gravel. The drainage layer was in place on the majority (approximately 75%) of the 9.7 hectare MSW landfill cell. We could not verify thicknesses of the sand layer and gravel layer, but the surface of the sand layer appeared to be graded and finished in accordance with the design. Site Photo 4 provides an example of an area where the drainage layer in the landfill is complete. The foliage in the picture occurred in the preceding seven months after construction ended in November 2005.



Site Photo 4. Surface of the drainage layer

The finished portions of the landfill are ready to receive municipal solid waste, and in one small area, we observed a truck load of trash had actually been dumped (Site Photo 5).



Site Photo 5. Trash located in one section of the landfill.

Perimeter Berm

The perimeter berm around the MSW landfill consists of an embankment of various heights constructed with a horizontal to vertical slope of 3 to 1. The design required the berm slope cross section to be the same as the landfill floor. Figure 3 illustrates the cross sectional requirements for the berm slope. The required thicknesses for the subgrade and gravel layers are 0.3 m, and 0.2 m for the sand layer.

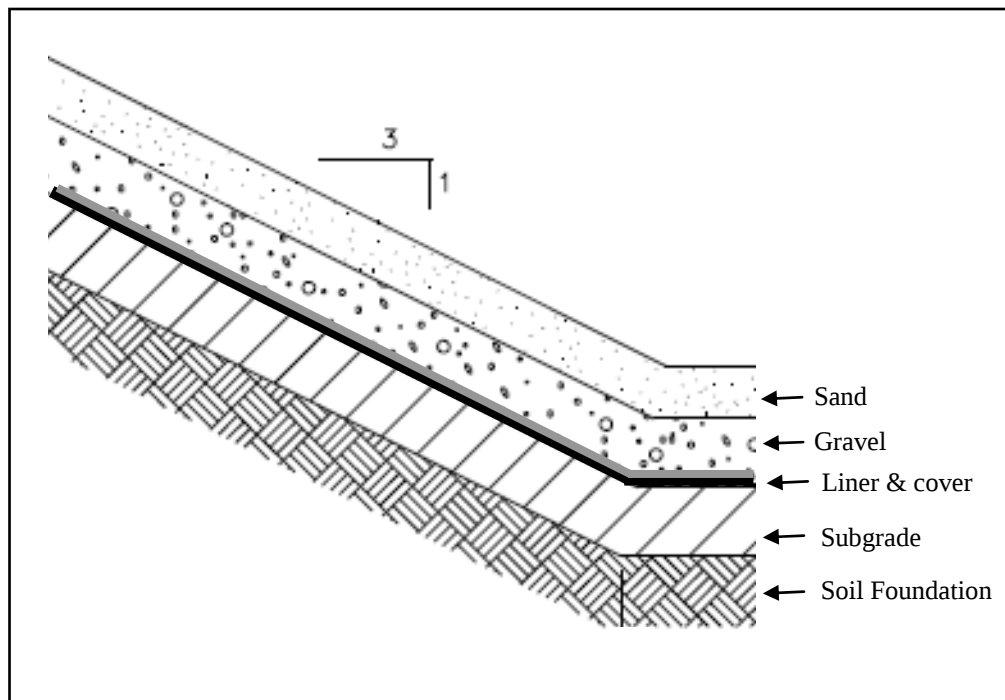


Figure 3. Cross section of the berm slope

We observed the berm in place along the perimeter of the MSW landfill. The design required the liner system to extend up the 3 horizontal to 1 vertical side slope of the berm and terminate in an anchor trench along the top of the perimeter berm. In the unfinished areas of the landfill, the liner along the inside of the berm, as shown in Site Photo 6, will require remedial work to ensure it is placed and anchored properly.



Site Photo 6. Section of the perimeter berm requiring remedial work to anchor the liner

The portion of the berm adjacent to the future expansion area of the MSW landfill cell, along the west side, was designed as an *interphase berm*, which would be integrated into the next landfill phase if the MSW landfill is expanded to the west. We found the interphase berm in place. However, along most of the length of this berm, we saw geomembrane liner material loosely lying on top of the berm, as seen in Site Photo 7. It appeared this geomembrane material was excess.



Site Photo 7. Interphase berm bordering future expansion area

Leachate Collection System

As designed, the leachate generated within the landfill when operational will percolate through the sand-gravel drainage layer to the liner. The landfill floor and overlaying liner is sloped so the leachate will drain into a collection trench. There are four main collection trenches, one in each quadrant of the landfill. The sloped collection trenches convey the leachate to one of four leachate collection pipes. The perforated collection pipes are located at opposite sides of the MSW landfill, two on the north side and two on the south side. Each collection pipe will run under the perimeter berm and connect to a leachate collection pump station. Gravity flow will convey the leachate through the collection pipes to the leachate collection pump stations located outside the landfill cell.

In the unfinished portion of the landfill, two of the collection pipes were exposed because the drainage layer had not been applied. The design required a 150 mm diameter, HDPE, perforated pipe. We measured the pipe and verified a 150 mm diameter, HDPE perforated pipe in place at the correct locations within the landfill. Site Photo 8 shows one of the pipes in the unfinished portion of the landfill.



Site Photo 8. HDPE Leachate Collection Pipe

We also inspected the four leachate collection pump stations. The design called for submersible pumps inside a concrete enclosure. The access cover was locked on each station, so we did not inspect or verify the presence and the condition of the pumps. The exposed features of the pump stations (concrete housing, access cover, ventilation pipe, etc.) appeared to be constructed as designed. We did notice on two of the stations, the ventilation pipes were dislodged and no longer attached to the concrete cover of the pump housing. Also on one of the stations, the concrete ring supporting the access cover was crumbling (Site Photo 9). Additionally, on each of the pump stations, the electrical cable to and from the motor starter cabinet to the pump was exposed and not enclosed in conduit, as depicted in the design.

The design shows each pump station, connected to a HDPE solid wall force main, buried beneath the ground surface. The design shows the force main running parallel to the perimeter road around the MSW landfill. The original plan showed the force main transporting leachate to the Al Kerkh WWTP, located adjacent to the landfill site. However, the manager of the Al Kerkh WWTP refused to grant permission to connect the leachate collection system force main to the treatment plant because of concern regarding the effect of the leachate on the plant biological processes used to treat sewage. As a result, JCC-I/A directed the contractor to cap the force main at the property line.



Site Photo 9. Pump enclosure with broken vent pipe and access cover ring

Perimeter Road

The design required a crushed gravel perimeter road, 9 m in width, with V-shaped drainage ditches along both sides of the roadway with a cross section consisting of a base (surface) course of crushed stone (0.3 m thick), supported by a 0.3 m sub-base of well graded fill material. We drove on approximately 75% of the entire perimeter road and inspected the road at two locations. We did not observe any noticeable surface defects, such as wash boarding or eroded areas. The road appeared adequately constructed to support trash hauling trucks. Site Photo 10 shows one section of the crushed gravel road along the landfill perimeter.



Site Photo 10. Perimeter road along the MSW landfill cell

Vehicle Maintenance Building

The maintenance building design required a 27.9 m by 8.0 m building, which included three maintenance bays and a two story office/storage building. The maintenance building, as well as the other landfill facilities, including the leachate collection pumps, the administration building, and the guard house, was powered with a 250 kilo-volt ampere (KVA) generator. The assessment team inspected the exterior of the building, including the generator. We noted the following deficiencies:

Electrical Generator

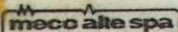
The generator on site is shown in Site Photo 11. The factory plate attached to the generator shows an Italian made “Mecc Alte Spa ECO 37-1L/4250 KVA” generator. However, the generator skid indicates an “AKSA” model generator. AKSA generators are manufactured in Turkey. Further, the factory plate (Site Photo 12) has yellow paint on its surface indicating the generator was painted after the factory plate was attached.

In addition, we observed several examples of questionable workmanship associated with the installation of the generator.

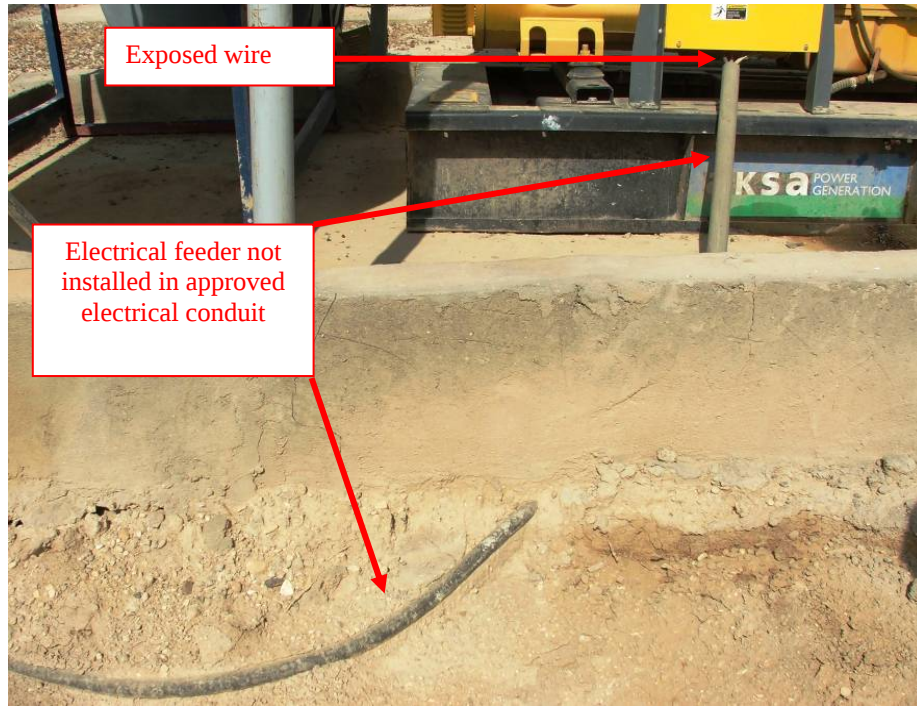
- The exhaust stack, shown in Site Photo 11, was not properly supported. Also, it appears vibration of the generator could damage the roof and/or generator because the stack location being so close to the metal frame and the roof skin.
- The feeder cable shown in Site Photo 13 was not properly installed in conduit. The connection to the generator control panel was made with exposed wire, not enclosed in conduit. Further, part of the feeder cable was lying exposed on the ground surface. The cable was not in conduit as required by the design nor buried to a proper depth.
- The generator skid was not anchored to the concrete pad.



Site Photo 11. Landfill site electrical generator

		Via Roma n.20, 36051 Tel +39 0444/396111-R.A.		 INSULATION SYSTEM DY-30-3 LOC. 1		 187933			
CREAZZO VICENZA ITALIA Fax +39 0444/396166									
TYPE	ECO 37-1L/4				N. 0001010710		PHASE		3
KVA	250	BR	300	BR	COSPHI	0.8	INS. CL.		H
R.P.M.	1500	1800				Hz	50/60		
V	115/200/230/400				138/240/276/480				
A	1255/722/628/361				AMBIENT TEMPERATURE 40°C				
CONNECTION	DD/SS/D/S				D=Δ	S=Υ	IP.	21	
SERV.	S1	V.exc.		38.4		I.exc.		2.51	
KG	724	J		2.92		COD.	ECO371L		
CUSCINETTI BEARINGS ROULEMENTS	6314.2RS				DATE	2003		MADE IN ITALY	
10% OVERLOAD FOR 2 h IN A 24 h PERIOD									
ALTERNATORE AUTOREGOLATO-SELF REGULATED ALTERNATOR-ALTERNATEUR AUTOREGULE									
EN 60034-1 CEI 2-3 - IEC 34-1 - VDE 0530 - BS4999-5000 - NF 51.111									

Site Photo 12. Generator factory plate



Site Photo 13. Exposed cable and wire

Electrical Wiring

We also observed poor wiring installation on one of the dedicated electrical circuits in the maintenance bays (Site Photo 14). It appears there is a non-acceptable splice on the line side of the circuit breaker, as evidenced with the taped wiring. We also observed exposed wiring at other locations around the exterior of the building. In addition, the circuit breaker shown below should be in an enclosed circuit breaker panel.



Site Photo 14: Wiring to one of the dedicated circuits

Other Building Exterior Needs

Although partially covered with a sheet metal sun shade, the water heater for the building was located outside and exposed to the elements. We also observed some cracking in the concrete perimeter sidewalk around the building. In addition, there was a need for touch up painting, particularly in areas where rust had started such as window frames, lighting brackets for exterior fixtures, and even structural steel components.

Administration Building

The design for the administration building showed a one story, 12 m by 5 m building. We inspected the exterior of the building and verified the building generally met the standards of the design. However, we noted some cracking in the perimeter sidewalk. Additionally, the partially covered water heater, shown in Site Photo 15, had started to rust. We also noted the building was surrounded on all sides by thick vegetation (Site Photo 16) that had grown since November 2005. The vegetation will require removal prior to the landfill becoming operational.



Site Photo 15. Water heater outside administration building



Site Photo 16. Administration building (truck maintenance building to the right)

Satellite Assessment

A comparison of two images taken on 14Mar05 and 19Feb06 shows construction progress of the Baghdad Landfill, outlined in red on Aerial Image 1. On imagery dated 14Mar05 the only noticeable construction is the ground preparation of the Construction Debris Landfill (Figure 1, pg. 5) portion of the Baghdad Landfill. Imagery dated 19Feb06 shows what appears to be a nearly completed landfill. Structures visible as of 19Feb06 consist of the Administration, Vehicle Maintenance, and Guardhouse buildings.



Aerial Image 1. Baghdad Landfill imagery comparison 14MAR05 and 19FEB06.

Project Sustainability

The contractor's design package includes drawings and specifications that provide information on the operational aspects of the landfill including:

- Management of gases produced within the landfill by decomposing wastes
- Leachate collection
- Surface water controls
- Final cover

In addition, the contractor produced an Operations and Maintenance (O&M) manual prior to the end of the project. The manual outlines minimum standards for performance, and presents information guidance for the landfill staff to conduct day-to-day operations of the landfill. The contractor also submitted an O&M manual for the leachate collection system pumps. We did not find, in the contract information provided by GRD-PCO, an O&M manual for the 250-KVA electrical generator or for the weight handling equipment located at the vehicle maintenance facility.

The TO required the contractor submit a training plan to accommodate the required number of staff to manage and operate the landfill. The TO required the contractor provide at least one full time person to provide at least two months of on-site training and supervision. Based on our review of the contract files, the contractor produced training material, including study guides entitled "Controlling Landfill Operations Study Book" and "Introduction to Municipal Solid Landfills."

We could not locate any record of the training occurring. The contractor, in a letter dated 25 September 2005, indicated problems in scheduling and conducting training because of the security situation, pending contractor demobilization, and unavailable equipment.

In summary, it appears based on our review of the contract file documentation, the contract design package including the O&M manual, the design drawings and specifications provided an adequate overview of landfill operations and maintenance requirements. Further, the training materials we reviewed augment the information in the design package. Although it appears the security situation precluded the completion of training, the O&M manual and other training materials can be used in the future when the landfill is placed into operation by the Amanat.

Future Plan for Landfill

This section of the report is based on information provided by a U.S. Embassy Military Liaison Officer to the Amanat.

Although the Baghdad MSW Landfill has not operated as a functional landfill since FluorAmec LLC completed its construction requirements, Coalition Forces and the U.S. Department of State have developed a plan to activate the landfill for the Amanat's use. The plan involves securing the route into, and out of, the landfill site to allow trucks to safely move in and out of the landfill. Securing the route has already begun. During our site visit to the landfill, we noted an active presence of Coalition Forces along the route to the landfill.

In addition, Coalition Forces are currently constructing two waste transfer stations⁶ along the main route to the landfill. The transfer stations are located closer to the urban areas of Baghdad to make it easier for Iraqis to dispose of their trash, rubbish, and debris by bringing it to the transfer station. The transfer stations will also reduce the travel time for the trucks picking up trash in Baghdad and thus, enable the trucks to haul more loads of trash out of the city. In addition, in an effort to encourage Iraqis to bring their trash to a transfer station, local "Cash for Trash" programs will be implemented.

For landfill operations, the U. S. Agency for International Development's consultant, International Relief and Development (IRD),⁷ will activate and manage the landfill. For the first three months, IRD's employees will operate the landfill; the second three months, the Amanat will operate the landfill, with IRD providing technical assistance and training to the Amanat personnel. The IRD intends to hire people from the local neighborhoods to work in the landfill. This includes remedial work on the landfill liner and completion of the 0.5 m sand-gravel drainage layer.

The implementation of this plan has started. The transfer stations are currently being constructed. The IRD is expected to begin by October 2006 the remaining construction work on the landfill. The Local Iraqi Government started utilizing the landfill for trash disposal on 13 August 2006. Full implementation, with trucks hauling solid waste to the landfill, is projected for November 2007. Coalition Forces are now coordinating with USAID to establish a management staff with the Amanat to use the site efficiently.

⁶ A transfer station is a facility which receives solid waste and typically transfers it directly from one container to another or from one vehicle to another for further transport, or temporarily store solid waste prior to final disposal.

⁷ International Relief and Development (IRD), is a U.S. based non-governmental organization specializing in providing relief and development programs in civil society, food security, health, humanitarian assistance, infrastructure, and economic development. (Source: <http://www.usaid.gov/press/releases/2006/pr060811.html>)

Conclusions

We reached the following conclusions for the assessment objectives 1, 2, 3, 4, and 5. Appendix A provides details pertaining to Scope and Methodology and limitations of this project assessment.

1. Determine whether project components were adequately designed prior to construction or installation.

The project components were adequately designed prior to construction. The design package submittal, including the reports, drawings, and specifications appeared complete and detailed enough for the contractor to construct the landfill and supporting facilities.

2. Determine whether construction met the standards of the design.

The completed project work we observed met the standards of the design. However, we did note marginal quality workmanship associated with the vehicle maintenance building. Specifically, we noted deficiencies with the electrical generator, electrical wiring, and building exterior.

3. Determine whether sustainability was addressed in the contract or task order for the project.

Sustainability was addressed in the contract requirements. The contract design package included the operations and maintenance manuals for the day-to-day operation of the landfill and for the leachate collection system pumps. The task order required the contractor to submit a training plan to accommodate the required number of staff to manage and operate the landfill. In addition, the task order required the contractor provide at least one full time person to provide at least two months of on-site training and supervision. The contractor provided training material, including two study guides.

4. Determine whether project results were consistent with original objectives.

The Baghdad Municipal Solid Waste Landfill project results were consistent with the original contract objectives. As a result of the new construction, the Baghdad local government was provided with a municipal solid waste landfill. In addition, the prime contractor utilized local Iraqi subcontractors to maximize employment for the local community.

5. Determine if the constructed facility is being used for its intended purpose.

The project was closed out in November 2005 prior to completion because of security issues that presented a health threat and security risk to Coalition Forces and Iraqis working at the site. When the assessment team visited the site in June 2006, we determined the landfill was not being utilized. However, there is a plan to complete construction on the landfill and promote its usage. According to the U.S. Military Liaison to the Iraqi Municipal Government, Coalition Forces are now coordinating with the U.S. Agency for International Development to establish a management staff with the local government to use the site efficiently. Implementation of the plan is ongoing and the local government started utilizing the landfill for trash disposal on 13 August 2006. Full implementation, with trucks hauling solid waste to the landfill is projected for November 2007.

Recommendations and Management Comments

This report does not contain any negative findings. Therefore, management comments were not required. However, the Gulf Region Division reviewed the draft of this report and concurred with the conclusions contained in the report and provided a comment for clarifying contract information. The comment was incorporated into the final report.

Appendix A. Scope and Methodology

We performed this project assessment from June through August 2006 in accordance with the Quality Standards for Inspections issued by the President's Council on Integrity and Efficiency. The assessment team included a professional engineer and an auditor. In performing this Project Assessment we:

- Reviewed contract documentation to include the following: Contract, Contract Modifications, Task Order, Task Order Modifications, Contract documentation, and Statement of Work;
- Reviewed the design package (drawings, design reports, and specifications), Progress Photos and the Quality Assurance Reports;
- Interviewed the U.S. Army Corps of Engineers-Project and Contracting Office Public Works and Water Sector staff and the U.S. Embassy Military Liaison Officer to the Local Iraqi Government; and
- Conducted an onsite assessment of the Baghdad Municipal Solid Waste Landfill.

Appendix B. Acronyms

BOQ	Bill of Quantity
cm	centimeter
CPA	Coalition Provisional Authority
CQC	Contractor Quality Control
HDPE	High Density Polyethylene
IRD	International Relief and Development
km	kilometer
KVA	kilo-volt ampere
m	meter
m ³	cubic meters
mm	millimeter
MSW	Municipal Solid Waste
O & M	Operations and Maintenance
PCO	Project and Contracting Office
SOW	Scope of Work
SPCO	Sector Project and Contracting Office
TO	Task Order
USACE	United States Army Corps of Engineers
USAID	United States Agency for International Development
WWTP	Waste Water Treatment Plant

Appendix C. Report Distribution

Department of State

Secretary of State

Senior Advisor to the Secretary and Coordinator for Iraq

U.S. Ambassador to Iraq

Director, Iraq Reconstruction Management Office

Inspector General, Department of State

Department of Defense

Secretary of Defense

Deputy Secretary of Defense

Director, Defense Reconstruction Support Office

Under Secretary of Defense (Comptroller)/Chief Financial Officer

Deputy Chief Financial Officer

Deputy Comptroller (Program/Budget)

Inspector General, Department of Defense

Department of the Army

Assistant Secretary of the Army for Acquisition, Logistics, and Technology

Principal Deputy to the Assistant Secretary of the Army for Acquisition,

Logistics, and Technology

Deputy Assistant Secretary of the Army (Policy and Procurement)

Assistant Secretary of the Army for Financial Management and Comptroller

Chief of Engineers and Commander, U.S. Army Corps of Engineers

Commanding General, Gulf Region Division

Auditor General of the Army

U.S. Central Command

Commanding General, Multi-National Force - Iraq

Commanding General, Joint Contracting Command – Iraq/Afghanistan

Commanding General, Multi-National Corps – Iraq

Commanding General, Multi-National Security Transition Command – Iraq

Commander, Joint Area Support Group – Central

Other Defense Organizations

Director, Defense Contract Audit Agency

Other Federal Government Organizations

Director, Office of Management and Budget
Comptroller General of the United States
Inspector General, Department of the Treasury
Inspector General, Department of Commerce
Inspector General, Health and Human Services
Inspector General, U.S. Agency for International Development
Mission Director – Iraq, U.S. Agency for International Development

Congressional Committees and Subcommittees, Chairman and Ranking Minority Member

U.S. Senate

Senate Committee on Appropriations
 Subcommittee on Defense
 Subcommittee on State, Foreign Operations and Related Programs
Senate Committee on Armed Services
Senate Committee on Foreign Relations
 Subcommittee on International Operations and Terrorism
 Subcommittee on Near Eastern and South Asian Affairs
Senate Committee on Homeland Security and Governmental Affairs
 Subcommittee on Federal Financial Management, Government Information and International Security
 Subcommittee on Oversight of Government Management, the Federal Workforce, and the District of Columbia

U.S. House of Representatives

House Committee on Appropriations
 Subcommittee on Defense
 Subcommittee on Foreign Operations, Export Financing and Related Programs
 Subcommittee on Science, State, Justice and Commerce and Related Agencies
House Committee on Armed Services
House Committee on Government Reform
 Subcommittee on Management, Finance and Accountability
 Subcommittee on National Security, Emerging Threats and International Relations
House Committee on International Relations
 Subcommittee on Middle East and Central Asia

Appendix D. Project Assessment Team Members

The Office of the Assistant Inspector General for Inspections, Office of the Special Inspector General for Iraq Reconstruction, prepared this report. The principal staff members who contributed to the report were:

Andrew Griffith, P.E.

Kevin O'Connor

Nancy Soderlund, R.N., C.P.A.