



USAID | JORDAN

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USAID Water Reuse and Environmental Conservation Project

Rehabilitation of Amman and Zarqa Old Closed Landfill in Russeifah

May 2014

Implemented by AECOM





OUTLINE

- **Introduction**
- Site issues
- Scope of work and site investigations
- Proposed design and remedial measures
- Relevance for current landfills
- Next steps

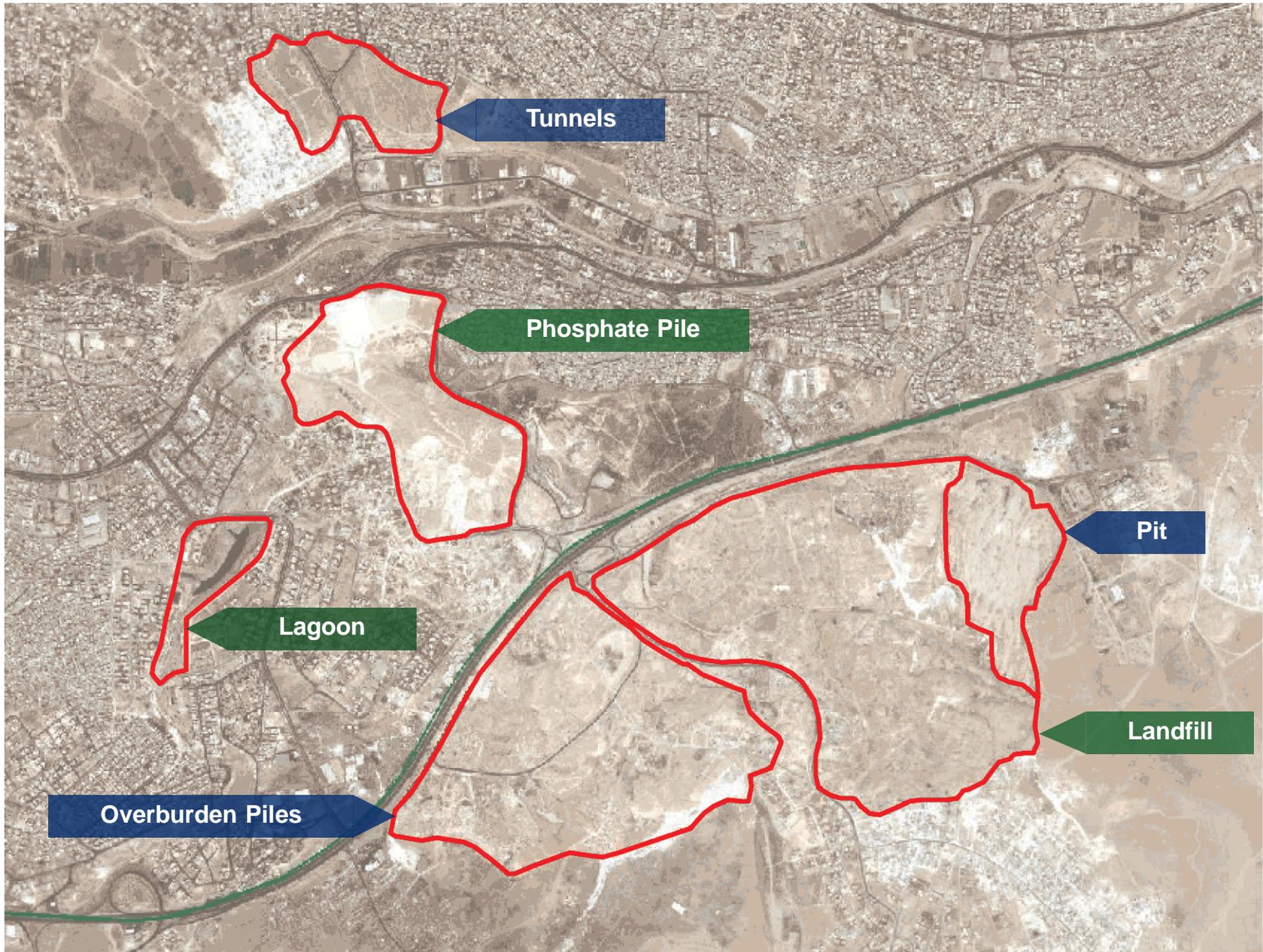




SITE HISTORY



- Russeifah located in Zarqa Governorate
- Phosphate mining started in mid-1930s
- One of largest mining areas in Jordan
- Several affected sites
 - Result of intensive phosphate mining
- Requires rehabilitation and redevelopment



Tunnels

Phosphate Pile

Lagoon

Overburden Piles

Pit

Landfill



LANDFILL DESCRIPTION

- Used by GAM in 1986 for solid waste disposal
- Stopped in 2003
- Wastes from Amman, Zarqa
- One of largest in Jordan
 - 1,128 donums
 - 828 covered with municipal solid waste



General View of Landfill Area

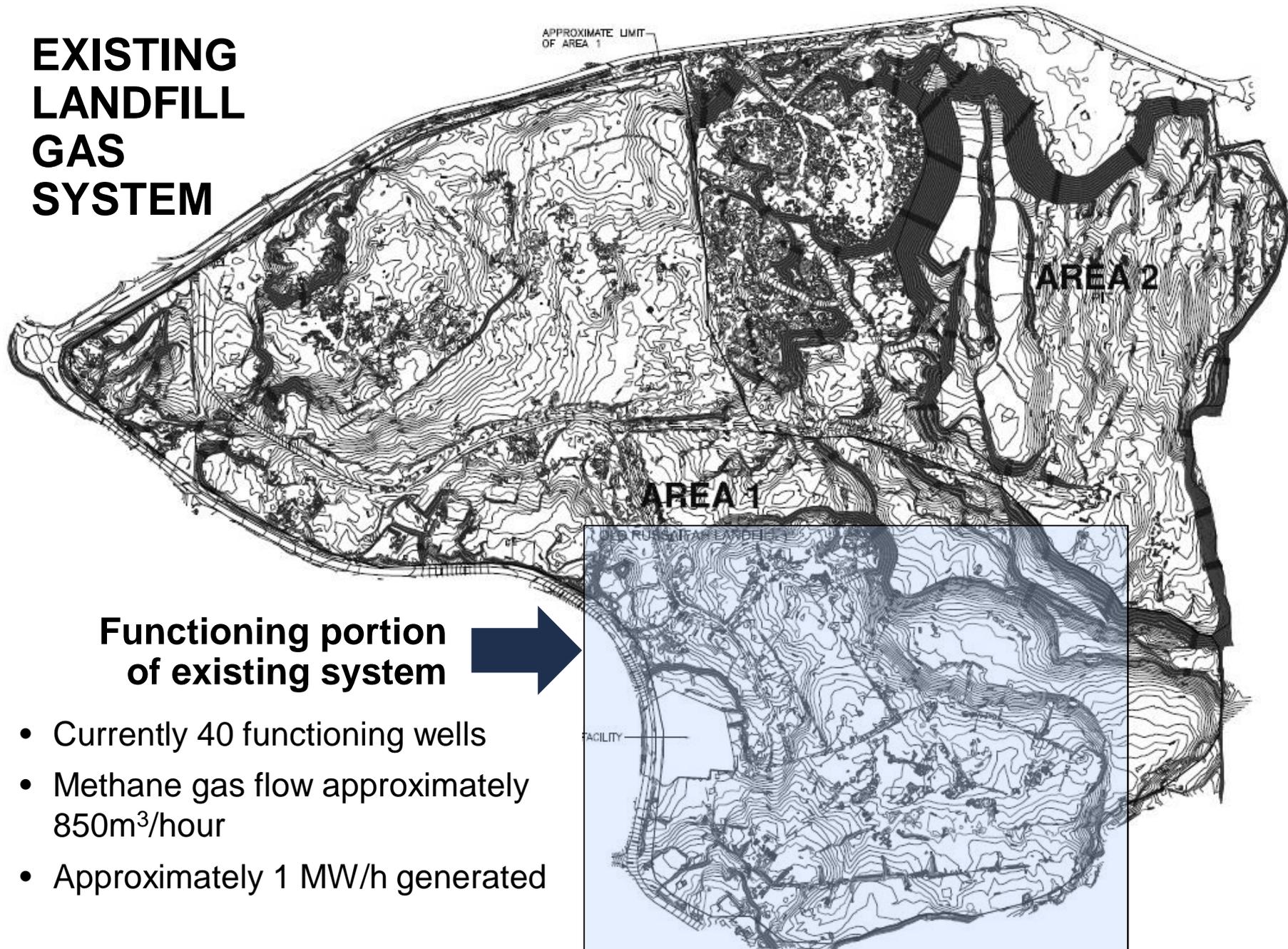


LANDFILL DESCRIPTION

- 2,100 metric tons/day
- Jordan Biogas Company (JBC) established Russeifah Biogas Plant in 1998
 - Organic digestion unit
 - LFG collection system
 - Electric generation facility



EXISTING LANDFILL GAS SYSTEM



**Functioning portion
of existing system** →

- Currently 40 functioning wells
- Methane gas flow approximately 850m³/hour
- Approximately 1 MW/h generated



EXISTING LANDFILL GAS SYSTEM

Year	Collected Biogas (cubic meter)	Generated Power (MW)	CERs of CO2 (Ton)
2000	1586148	2506	11277
2001	2692413	4862	21879
2002	3182204	5376	24192
2003	3566809	6000	27000
2004	3363367	5993	26968
2005	3563701	5142	23139
2006	3924876	6239	28075
2007	5906004	9494	42723
2008	5809125	9178	41301
2009	4511554	7411	33349
2010	8487702	8739	39325
2011	7604750	8005	36022
2012	5641100	5938	26721
2013	5548947	6098	27441
Total	65388700	90981	409414

Jordan Biogas Company (JBC), 2014



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Area 1: Landfill Site Issues

- **No proper protection for ground water & atmosphere**
- **No proper fencing or protection for neighbors**
- **Landfill fires**

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SCOPE OF WORK

- Feasibility study for proper landfill closure
- Site investigations
 - Topographic and boundary survey
 - Geotechnical investigation
- Design drawings and report





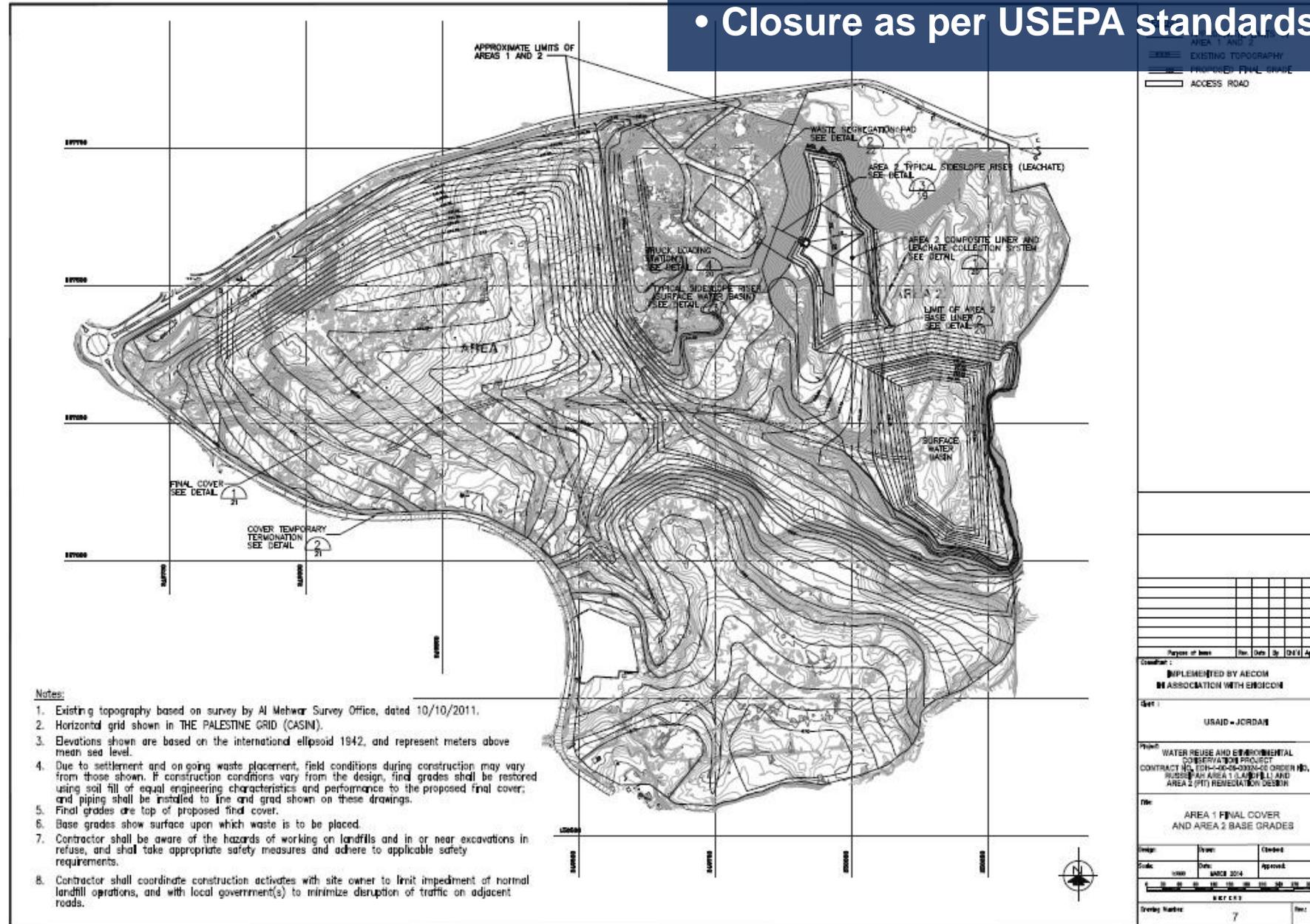
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Landfill Remediation Plan

• Closure as per USEPA standards



Notes:

1. Existing topography based on survey by Al Mehwar Survey Office, dated 10/10/2011.
2. Horizontal grid shown in THE PALESTINE GRID (CASINI).
3. Elevations shown are based on the international ellipsoid 1942, and represent meters above mean sea level.
4. Due to settlement and on going waste placement, field conditions during construction may vary from those shown. If construction conditions vary from the design, final grades shall be restored using soil fill of equal engineering characteristics and performance to the proposed final cover; and piping shall be installed to line and grad shown on these drawings.
5. Final grades are top of proposed final cover.
6. Base grades show surface upon which waste is to be placed.
7. Contractor shall be aware of the hazards of working on landfills and in or near excavations in refuse, and shall take appropriate safety measures and adhere to applicable safety requirements.
8. Contractor shall coordinate construction activities with site owner to limit impediment of normal landfill operations, and with local government(s) to minimize disruption of traffic on adjacent roads.

Prepared by	Rev.	Date	By	CHKD	APP.
Prepared by: IMPLEMENTED BY AECOM IN ASSOCIATION WITH ENRICO					
Client: USAID - JORDAN					
Project: WATER REUSE AND ENVIRONMENTAL CONSERVATION PROJECT CONTRACT NO. F01-04-0-00000 ORDER NO. 4 RUSSIAN AREA 1 (LANDFILL) AND AREA 2 (PT) REMEDIATION DESIGN					
Title: AREA 1 FINAL COVER AND AREA 2 BASE GRADES					
Design	Drawn	Checked			
Scale	Date	Approved			
1:500	MARCH 2004				
D R E C O					
Drawn Number					Doc. No.
					7



COMPONENTS

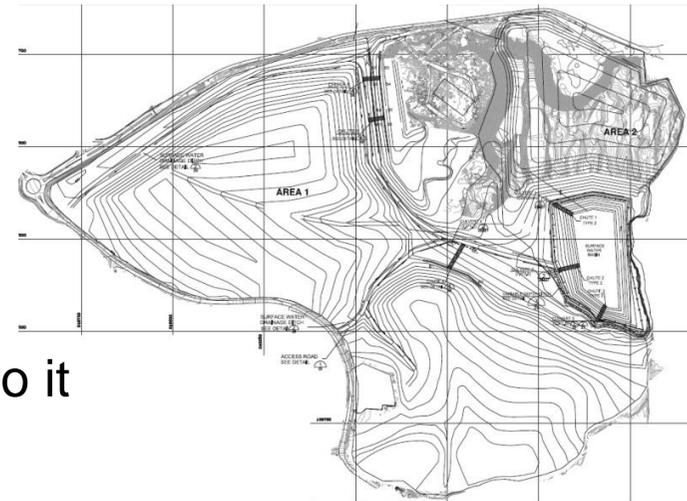
- Site security
 - Fencing
 - Signage
- Stormwater Drainage
- Landfill cap and cover
- Landfill gas (LFG) system enhancement





STORMWATER DRAINAGE

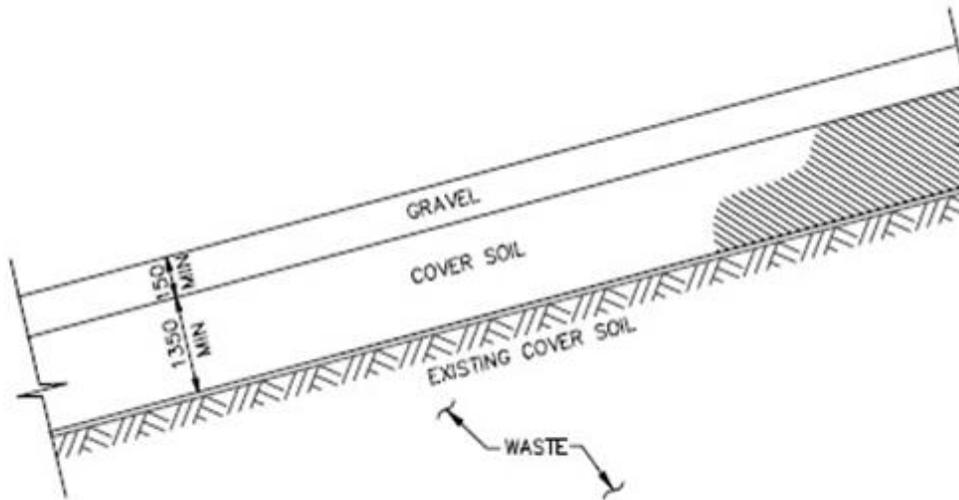
- Stormwater system components
 - Benches: drainage, erosion control
 - Chutes: concrete, grouted riprap
 - Ditches, Culverts
 - Stormwater basin: 4 culverts drain into it
- Smooth surface
 - Capping, Stormwater drainage
 - Access roads



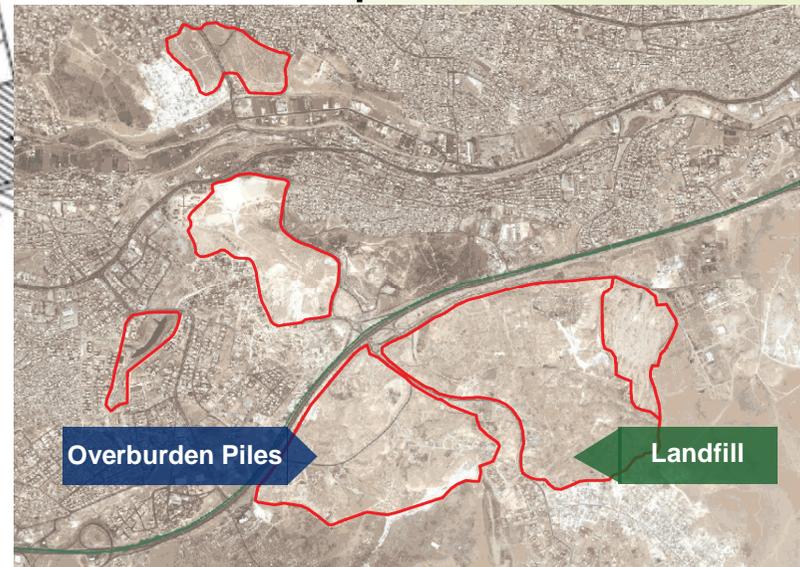


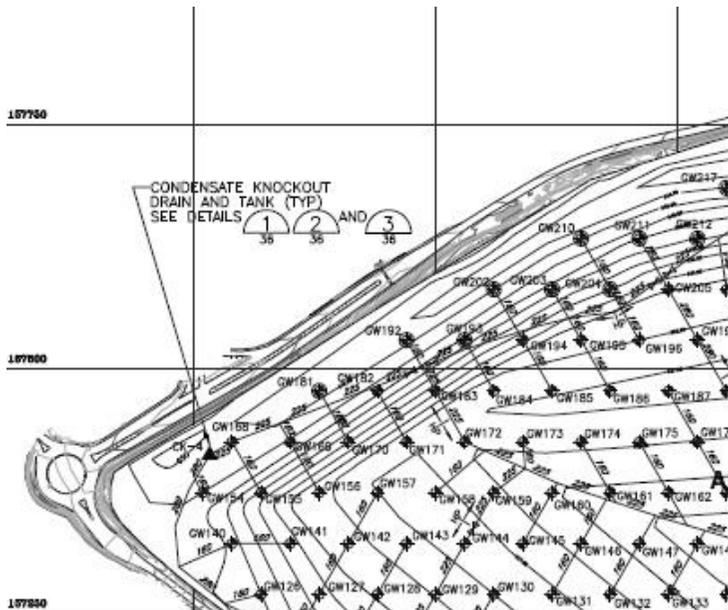
LANDFILL CAP: EVAPORATIVE COVER

- Use soil layer(s) for water retention
- Takes advantage of semi-arid climate
- Lower cost alternative to standard synthetic cover used elsewhere
- Use of cover material from the overburden piles



Evaporative Cover Design, Project team

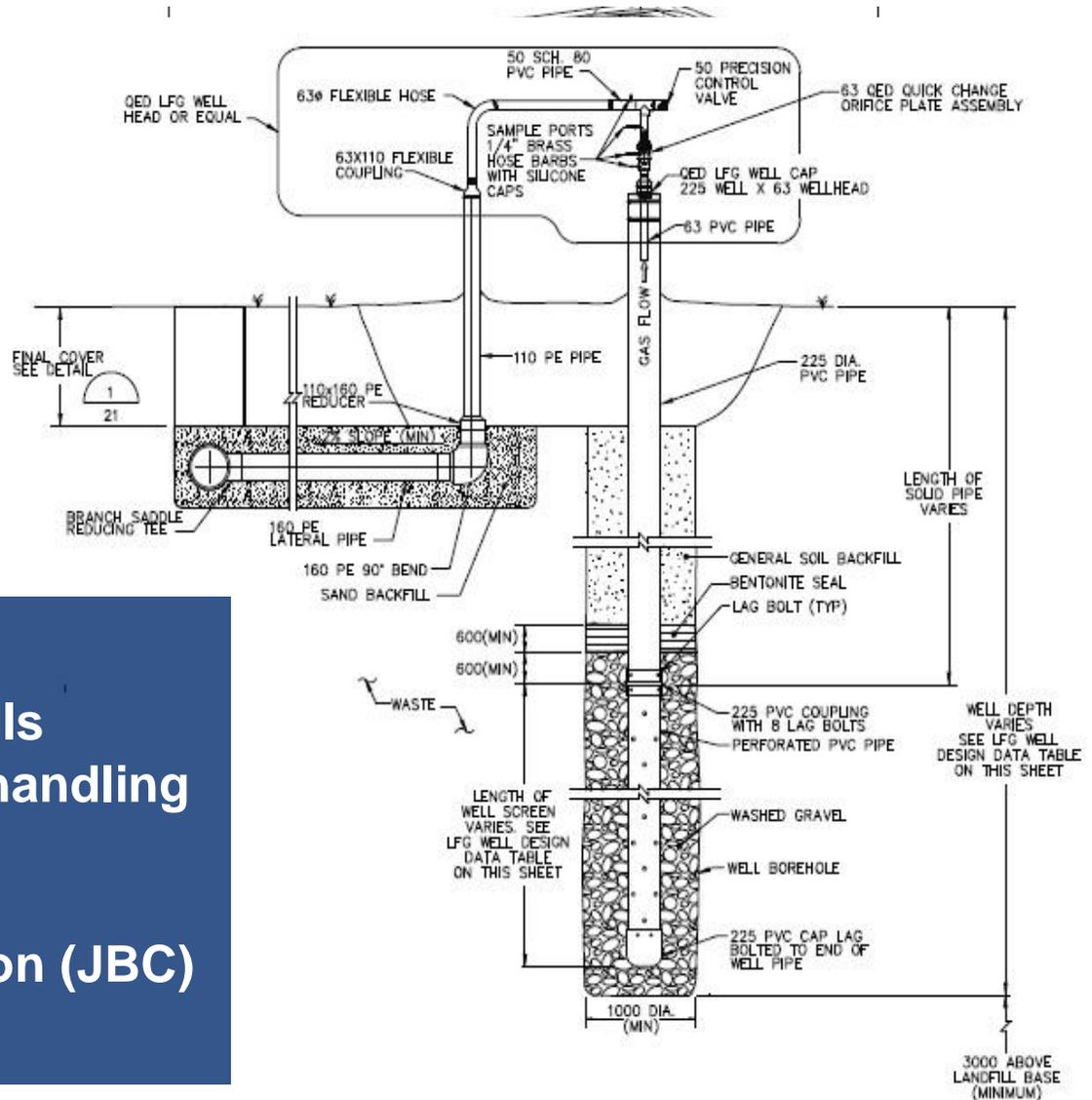




Proposed System

- 222 vertical extraction wells
- Condensate collection & handling facilities
- Blower
- Flare / electricity generation (JBC)

LFG SYSTEM ENHANCEMENT



VERTICAL EXTRACTION WELL (TYP) 1

NTS

NOTE:
ALTERNATE WELLHEAD CONFIGURATIONS MAY BE UTILIZED.



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RELEVANCE FOR CURRENT LANDFILLS

- Transition from active dumps to engineered fills
- Maximize tonnage per unit air space (expand landfill life span)
- Daily cover
- Fill today with vision of final shape tomorrow





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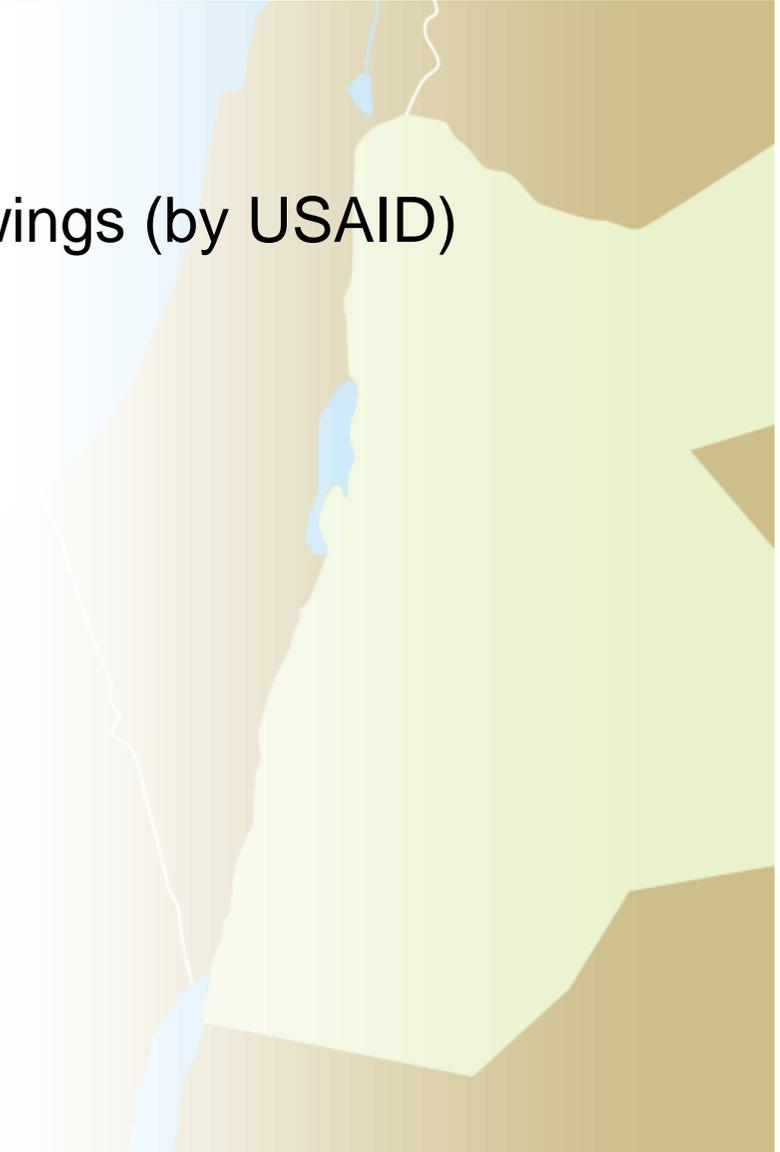
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NEXT STEPS

- Complete final design and drawings (by USAID)
- Secure funding (by others)
- Tender (by others)
- Implement (by others)





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